UniTerm® Payment Interface Application

UniTerm Integration and Deployment Guide

Revision: 9.0.0
Publication date April 10, 2018

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Main Street Softworks, Inc.

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1 Revision History

Version	Date	Changes
v9.0.0	2018-04-10	• Note that UniTerm v9 requires access to Monetra v8.7 or higher to operate. • New EMV certifications listed. • Apple iOS MFi (Made for iOS) no longer supported as if it was a BlueTooth device, new MFi device type. • Addition of Bluetooth LE communication method. • Removed `uniterm.ini` configuration items which are instead configured Monetra server-side now: • `tippercent` • `cashbackamount` • `cashbackmax` • New `uniterm.ini` configuration settings (SSL/TLS, shared secret, database, logging, tab, stand-in, blacklist). • New feature of Stand-In/Store and Forward processing added. • New feature of ChipTab/Bar Tab processing added. • Document new storage/database, key management, and logging facilities. • Shared Secret usage has changed to using `HMAC-SHA256`, added new section for clarity. • Removal of `u_cardclass` as it is not possible to do with EMV as the terminal will auto-select the best `AID`. POS vendors should not have a "tender type" button in their POS but instead rely on the response from UniTerm. • Update of PCI PA-DSS Security cross-reference appendix. • List BBPos/Anywhere Commerce device
v8.4.0	2017-08-21	• `signaturetimeout`configuration parameter for determining the action to take when a user forgets to sign. • New EMV Kernel for Ingenico `RBA` with new certifications • Updates to the `unsupportedcard` configuration value with additional options. • Update `u_status` codes to be more descriptive, this removes `CARD` as a response parameter in order to add further clarification on card presentation being requested. • Add `u_represent` reason field for status requests to indicate a reason for why card re-presentation is being requested. • Add `cardwait` configuration value for `[uniterm]` to configure timeout duration for the card prompt (mostly for unattended environments). • Add new receipt response parameter `rcpt_emv_pinbypass` to indicate the cardholder explicitly requested to bypass pin entry. • New Device Server mode, where the Ethernet-connected device connects outbound to UniTerm (instead of UniTerm initiating

Version	Date	Changes
		the connection to the device). Connected devices are addressed by serial number. Supports both unencrypted IP and SSL/TLS. • u_action=reqinput now allows requesting a zip code • Add pole display support for use with Quick Chip (txnstart) transactions.
v8.3.2	2017-04-14	• iOS UniTerm is now available on the iOS App Store. • Recommended Ingenico RBA version is now 19.0.8.
v8.3.0	2017-03-06	• New First Data certification for EMV Debit and EMV Contactless • Update recommended RBA versions. • Add new cdcvm card holder verification method response.
v8.2.5	2017-01-19	• Additional clarifications for use of the iOS framework. • Add DELAYRESPONSE u_flags. • Add fullscreen modifier to guimode configuration.
v8.2.4	2016-12-21	• Clarifications for use of the iOS framework. • Various other clarifications and fixes for typos. • Addition of u_flowflags response parameter.
v8.2.3	2016-12-01	• Add serialquirks flags for uniterm.ini
v8.2.2	2016-11-15	• Add u_foodamount value of maybe for txnstart. • u_cardclass=EBT has been split into EBTFS and EBTCB for clarity. • Add [uniterm] configuration parameter returnbin to return the first 6 digits (in addition to the last 4 digits) of a card number in the txnstart response message so transaction decisions can be made (e.g. health benefits qualification).
v8.2.0	2016-10-17	• All references to monetra_uniterm have been changed to just uniterm, including executable names and paths. • Added EMV industry question • Split out u_action values and descriptions into their own section for clarity. • GUI can now use Device Licensing when passing a u_flags or GUIONLY while also passing valid values for device and devicetype. This prevents requiring duplicate licensing for workstations with physical devices that sometimes perform gui card entry. • Ingenico RBA recommended version is now 18.04 • Linux HID device permission section has been added • Asynchronous processing (multiplexing/interleaving transactions on a single connection) is now supported. • QuickChip overview. • USB is now known as HID, all usb references changed, hidlist report parameters and u_device format have also changed • New commands (u_action values): • txnstart

Version	Date	Changes
		• `txnfinish` • `deviceupload` • `deviceprint` • `devicereboot` • `reqsignature` • `reqconfirm` • `reqinput` Associated request parameters for these new commands: • `u_b64data` • `u_filename` • `u_text` • `u_message` • `u_inputtype` Associated response parameters for these new commands: • `u_needreboot` • `u_confirmed` • `u_input` • `u_signature` • Interchange requirement information. • New/Changed configuration parameters: • `[monetra] persist_conn` - Default changed to "no" • `[uniterm] tippercent` • `[uniterm] cashbackamount` • `[uniterm] cashbackmax` • Note that `uniterm.ini` isn't actually distributed anymore, instead a template of `uniterm_example.ini` is provided. • New `u_flags`: • `NOTIP` • `NOCASHBACK` • `NOCONFIRM` • `NOSIGNATURE` • Section added on Tip processing, including the addition of the `u_tip` response parameter. • Section added on Cash Back processing, including the addition of the `u_cashback` response parameter. • Section added on EBT processing, including the addition of the `u_foodamount` request parameter and `u_wasfood` response parameter. • The OS-provided SSL/TLS root trust list is now automatically loaded and there is no longer an included `caroots` directory. • In Deployment, discuss the new standalone installers provided. • Update `devicetypes` functionality values. • Update Apple iOS integration information for the framework variant. • New `Ingenico RBA` form of `UTASEL.K3Z` used. • Add guidance for Pay at the Table.

Version	Date	Changes
		• Add information about automatic signature capture. • Note that `CPX/uCPX` is limited to UniTerm v8.0, and not supported on v8.2 • Configuration parameter `nosigfloor` has been changed to `nocvmfloor` • `modifyconfig` parameters now use `"."` as a delimiter instead of `"/"` • `u_action=status` request now returns a `u_status` machine-readable status code • Add section on updating `RBA` firmware. • Add `skipped` `rcpt_emv_cvm` return value
v8.0.3	2016-03-02	• Note limitation for asynchronous processing (or lack thereof) • Update status of various certifications • Add sections relating to iOS support • Updated device application version support
v8.0.2	2015-11-16	• Update status of various certifications • Add section on obtaining devices. • `UID_NOT_FOUND` error code addition, and clarify possible `u_errorcode` values for status requests. • Missing required permission of `CARDTYPE` added. • Added `persist_conn` configuration parameter for the `[monetra]` section. • Added `deviceinfo` transaction type to request information about the connected device. • Added `GIFTPIN` `u_flags` to prompt for PIN entry if a gift card is used.
v8.0.1	2015-09-28	• Re-word and clarify configuration information for `Ingenico RBA` • Clarify fields can be sent in to pre-populate key entry fields in GUI mode. • Receipt should show "CALL ISSUER" for a response code of "CALL". • Cardholder Name on receipts can be printed under the signature line. • Document how to configure an `RBA` device for contactless. • Remove unused `monetra_host` and `monetra_port` variables in example code. • Add touchscreen mode support via `[uniterm]` config option of `guimode=touchscreen`. • SSL is no longer a valid communication option for Android. Only Service communication is allowed. • Add `ssl_auth_key` and `ssl_auth_cert` configuration parameters for the `[monetra]` section. • Add `ssl_cert_validate` configuration parameter for the `[monetra]` section.

Version	Date	Changes
		- Add `ssl_cadir` configuration parameter for the `[monetra]` section. - `Verifone` recommended `XPI` version updated to 8.24D. - `Ingenico` recommended `RBA` version updated to 15.06. - `Ingenico RBA` added support for `USB-HID`. - Update receipt examples to the latest generated by UniTerm Tester.
v8.0.0	2015-08-17	- Initial revision

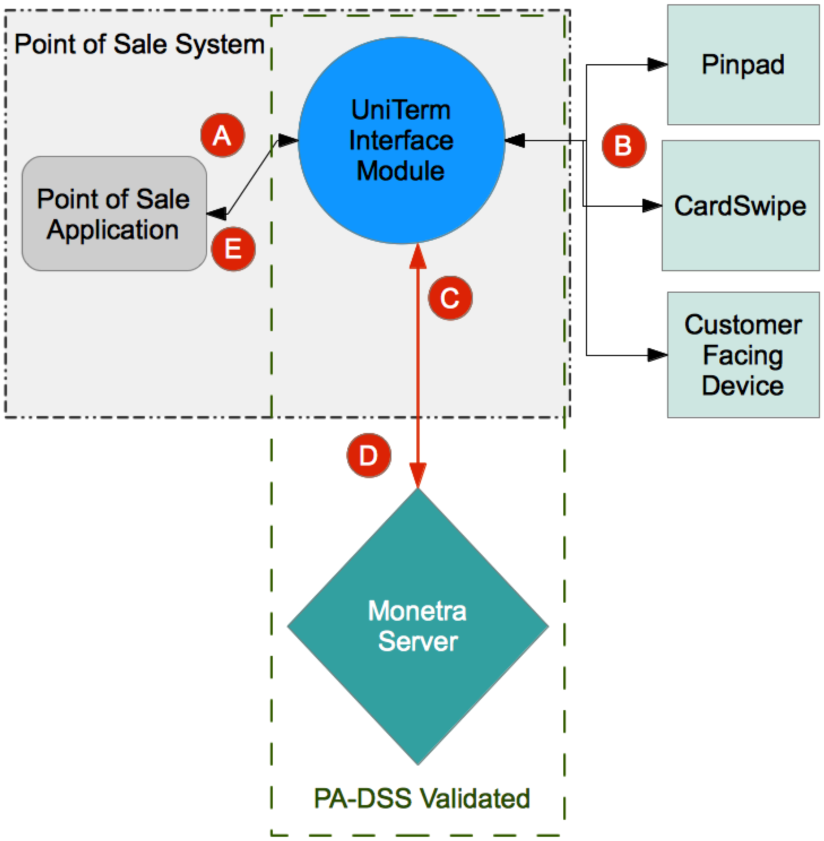
2 UniTerm System

2.1 Overview

UniTerm securely handles sensitive cardholder data independent of the merchants application software. In addition, UniTerm provides a simple consistent interface to multiple payment acceptance devices such as card readers, pinpads and terminals.

2.2 UniTerm Architecture

The UniTerm module is accessed via its 'Transaction Request' mode, as described below:



A	Point of sale application calls UniTerm for `txnrequest` (such as a sale transaction request) and includes basic information such as the amount of the sale and an order-number.
B	UniTerm communicates with devices (such as pinpads and card readers) to retrieve sensitive data, depending on request type (step A).
C	UniTerm sends the full transaction data-set to the Monetra server for further processing.
D	The Monetra server processes the transaction request (such as a sale) against the appropriate end point (for example TSYS) and then sends back the response it receives to the UniTerm module.
E	The UniTerm module then returns the transaction response back to the calling application.

2.3 Design Decisions

UniTerm is designed to run as an independent application running in a separate address space from any integrated applications. The design decisions behind this are due to the PCI PA-DSS and EMV certification requirements, where a clear line can be drawn between the certified application (UniTerm) and the POS without any ambiguity as to if the POS would fall into scope. If this clear line was not drawn, the POS may be required to undergo the extremely intensive and costly EMV Brand Certifications, not to mention fall into scope for PCI PA-DSS.

Note: Due to the nature of iOS, UniTerm is also available as a library under special exception from Visa, which has stated they will not require the POS vendor on iOS to undergo EMV Brand or PCI PA-DSS validations when using UniTerm.

2.4 Store and Forward/Stand-In processing

Store and Forward or Stand-In processing is a mechanism to locally approve a transaction under a configurable dollar amount if an unrecoverable connectivity failure to your processing institution has occurred. When connectivity is restored, the authorization will be automatically forwarded to the host for approval. This functionality is only applicable to Credit Card transactions, and only those that do not require Online PIN as the cardholder verification method.

Stand-In is primarily designed for short-term outages where real-time approvals are necessary to the operation of a business. It is disabled by default due to the liability/risk of use.

A stand-in approval puts liability for the transaction on the merchant. A stand-in approval does not provide any guarantee the merchant will receive the funds. The issuer may decline for a number of reasons such as, Insufficient Funds, or a closed card account being presented. Use stand-in processing at your own risk!

There are a number of configuration options that allow a merchant to specify criteria for which transaction can be stored. Options such as, number of transactions currently offline, transaction amount, aggregate approved amount. Please see the `uniterm.ini` Configuration File section for additional configuration parameters.

If stand-in approves a transaction when the host is offline, the returned TTID will be prefixed with a `'U'`. This indicates it is a UniTerm TTID and is associated with the UniTerm instance that returned the approval. This TTID cannot be used with any other system. The TTID can be used with UniTerm reports to determine the transaction response once forwarded. At which point the real TTID will be returned. A response key of `u_standin=yes` will also be returned if a transaction was a stand-in.

Stored transactions will automatically attempt to be sent online for authorization every 15 minutes. If successfully sent the response will be recorded and can be accessed later by referencing the UniTerm TTID. Responses will be stored for a configurable number of days before being purged.

Note: Store and Forward, or Stand-in processing was introduced as of UniTerm v9 as an optional feature.

2.4.1 Stand-In eligibility rules

Not all transactions qualify for stand-in processing. Below you will find a quick reference to assist in determining why a transaction may not be eligible.

Applicable to all methods of entry:

- Only cards able to be processed using credit card networks are eligible. E.g. not private label gift, EBT, or Pin-Debit
- Missing or malformed authorization data (does not pass local edit checks)

EMV-specific failure reasons:

- Online PIN was attempted
- ODA (Offline Data Authentication) was not performed
- ODA (Offline Data Authentication) static or dynamic failed
- Card on terminal exception file
- CDA (Offline combined dynamic data authentication with application cryptogram) failed
- SDA (Static data authentication) was selected
- Card application expired
- Card application not yet effective
- Cardholder verification was not successful
- Unrecognized Cardholder Verification Method
- PIN failures such as: limit try exceeded, pin entry device not present or inoperable, pin not entered
- Consecutive offline limit exceeded

2.5 ChipTab® - EMV Bar Tab support

Tabs are used to capture card data for later processing. This is for a single transaction and is not equivalent to tokenizing a card.

Typical use is at a bar where the customer opens a tab and as they order drinks or food the amount they're spending is added to the tab. Once they're finished and ready to leave the tab is closed and their card is charged.

This is commonly used in situations where payment is not taken at the same time as the product is given to the customer. And when there is the potential for the customer to leave without paying. Unlike a restaurant a bar can have a patron become intoxicated and forget to pay. In this situation the store has already captured the customer's card data and can close the tab against the card.

Tabs are intended to be opened and closed on the same day. Usually within a few hours. They are not intended for taking payment and shipping goods at a later time. Open tabs are auto purged if older than 14 days.

When closed the transaction data is sent to Monetra for authorization. If there is a communication error between UniTerm and Monetra or between Monetra and the processor tabs may be eligible for stand-in authorization. Stand-in authorization must be enabled and the transaction must be eligible for offline storage to take place. Tabs that are converted to offline authorizations will skip stand-in amount and count limits in order to prevent losing tabs.

Allowed card types that can be used for tabs:

- Credit
- Debit
- EBT Cash Benefits

These card types are specifically not allowed for tabs:

- Gift
- EBT Food Stamps

Note: ChipTab was introduced as of UniTerm v9.

2.5.1 ChipTab eligibility rules

Not all transactions qualify for ChipTab processing. Below you will find a quick reference to assist in determining why a transaction may not be eligible.

Applicable to all methods of entry:

- Private Label Gift cards are not allowed
- EBT Food Stamps are not allowed

EMV-specific failure reasons:

- ODA (Offline Data Authentication) static or dynamic failed
- Card on terminal exception file
- CDA (Offline combined dynamic data authentication with application cryptogram) failed
- SDA (Static data authentication) was selected
- Card application expired

- Card application not yet effective
- Cardholder verification was not successful
- Unrecognized Cardholder Verification Method
- PIN failures such as: limit try exceeded, pin entry device not present or inoperable, pin not entered
- Consecutive offline limit exceeded

3 UniTerm Integration and Deployment Overview

3.1 Deployment

UniTerm is provided to developers during the integration process as an OS-specific standalone installer available from https://download.monetra.com/other/uniterm/production.

For production deployments on platforms other than Android and iOS, UniTerm should be bundled and distributed with the POS system under a distribution license from Main Street Softworks, Inc. Integrators should package the UniTerm directory that is created after UniTerm installation, and distribute that directory packaged together with their own components (e.g. POS application software). The UniTerm directory is self-contained and can be relocated to any path the integrator sees fit, without any additional system dependencies as long as the paths for any sub-directories included with the UniTerm installation (if applicable) are kept in the same relative paths in relation to the UniTerm executable.

It is also acceptable to redistribute the standalone installation package.

For Android deployments, the UniTerm app is available via the Google Play Store, and it may be installed from there without a distribution license. Alternatively, by obtaining a distribution license, the UniTerm software can be provided as a standalone APK package for Android ARM devices running v4.1.2 or later, or it can be bundled with the application software as a Service component.

For Apple iOS deployments, there are two distribution methods. The first is a framework that can be embedded into an application. Note that for iOS apps using this framework to be accepted into the App Store, Apple as well as the device manufacturers must provide approval for each type of BlueTooth device that will be used with the application. The second distribution method involves installation of the UniTerm application from the iOS App Store and using URL schemes for Inter-Process communication. Those interested in the framework for iOS should contact their sales representative.

Please contact sales@monetra.com for guidance on distribution licensing and bundling.

Note: On Operating Systems that support package and/or executable signing, such as on Windows, MacOS, iOS and Android, the available packages are signed with an appropriate trusted distribution key by Main Street Softworks, Inc. Do NOT continue any installation if the package fails the automatic signature verification check. All downloads should also always be obtained from our secure HTTPS server at https://download.monetra.com/other/uniterm/production and should not be downloaded if the browser displays a warning that the site certificate cannot be verified.

Note: UniTerm, as of v9, requires connectivity to Monetra v8.7 or higher, such as provided by a private installation or a hosted gateway such as TranSafe.

Note: Notifications for new versions including feature, bugfix, and security release can always be found on the official Main Street Softworks RSS feed available at https://www.monetra.com/release-notes/rss. There is no built-in upgrade process, each new version is released as a full package that overwrites the existing installation.

3.2 Versioning

Note: UniTerm, as of v9, requires connectivity to Monetra v8.7 or higher, such as provided by a private installation or a hosted gateway such as TranSafe.

3.2.1 Version Scheme

The versioning scheme employed by UniTerm is formatted as `X.Y.Z`, where each `X`, `Y`, and `Z` components are numeric-only version indicators separated by a period. Each numeric component may be from one to three digits in length. All software distribution updates will result in at least one of the components being updated.

The `X` component of the version indicates the product major version number. The major version component only changes when there are significant feature changes, or the changes impact any part of a security standard, such as PCI PA-DSS.

The `Y` component of the version indicates a product minor version change. The minor version will change when there are minor feature enhancements that do not impact the part of any security standard such as PCI PA-DSS.

The `Z` component of the version indicates a bug-fix release. Bug-fix releases do not change the overall feature-set or functionality of UniTerm, but may include security related fixes such as updates to 3rd party libraries (e.g. cryptographic libraries) distributed with UniTerm.

3.2.2 Wildcard Versioning

PCI PA-DSS requires a specific wildcard versioning definition which corresponds to the release which is being validated for compliance. With this release of UniTerm, the official wildcard versioning is `9.Y.Z`. The major (`X`) version number component is fixed at `9`, which as per the versioning definition states there will be no major feature changes or changes which impact the PCI PA-DSS standard (e.g. all changes that do not affect the major version number are classified as "no impact" changes). The minor (`Y`) and bug-fix (`Z`) wildcard components comply with the descriptions in the previous section.

Any future change which results in a change to the major version number will have a corresponding PCI PA-DSS validation.

3.3 Licensing

All UniTerm licensing is managed at the server level by the Monetra system with which UniTerm is connected. Since licensing is administered at the server level, there is nothing unique that needs to be deployed with UniTerm on the client side (such as a license or certificate file).

3.3.1 Registration

UniTerm generates unique ids for each connected `device` in order to send to Monetra to track the number of UniTerm licenses in use.

When UniTerm is started, during the first transaction and every 24hrs thereafter, the unique device ID will be automatically registered with Monetra. If this device is already associated with a UniTerm license, the license meta-data will be updated. If the device is not currently associated with a UniTerm license, Monetra will register this unique device id if a UniTerm license slot is available, otherwise Monetra will reject the registration request and UniTerm will cancel the transaction.

3.3.2 Device Definition

A device is either a physical Point of Interaction device, or a Graphical User Interface of the computer in which UniTerm is running.

Each physical device will consume a UniTerm license, the license is tied to the device serial number. Since the license is tied to the device, the physical device may be transferred to different POS stations without consuming additional licensing.

The use of the GUI mode in UniTerm, whether used with keyboard emulation card readers, for acceptance of manually keyed card entry, will also consume a UniTerm license. This license will be generated based on the unique machine ID or the MAC address of the first NIC. However if a physical customer-facing card entry device is also present, passing the `device` and `devicetype` parameters along with a `u_flags` of `GUIONLY` will use the device's licensing rather than registering the workstation itself, thus saving on duplicate licensing for workstations that use both a physical device and GUI modes of operation.

Note: If a physical device is being used and GUI mode is also used, if care is not taken, this will consume 2 UniTerm licenses, one for the physical device and one for the GUI mode of operation. Please see the `u_flags` of `GUIONLY`.

3.3.3 Management

Since UniTerm licensing is managed at the Monetra server, all license administration (view licenses, delete licenses, etc) can be performed using either the Monetra Administrator GUI or via the Monetra API. To more easily help identify and manage licenses, additional data is available in the license list such as: initial creation timestamp, last used timestamp, last used username, device type, and device serial number.

Note: If a UniTerm license (device or GUI) is removed (de-registered) from Monetra, then the license slot is not eligible to be re-used for 7 days. However, if the same [deleted] device is re-presented, it can immediately re-consume the license slot.

3.4 Starting UniTerm

For Desktop based deployments, the UniTerm module must be launched by the POS application software and should not be started at startup. If the POS system does not start UniTerm, then it is possible UniTerm will not be able to obtain screen focus for on-screen prompts.

For Android deployments, UniTerm should be automatically started at Boot, and simply Binding to the already-running service is sufficient.

For iOS deployments, the application is bound to a URL Scheme during installation and will automatically load when the URL Scheme is called.

3.4.1 Command Line Options

When starting UniTerm for Desktop based deployments, there are a few command line options supported that control the behavior.

- `-c` - Full path to the `ini` file to read. If not specified, it searches for the `uniterm.ini` in the paths documented in Section 4.1.
- `-p` - Port for UniTerm to listen on for incoming connections. If not specified, the value in the `ini` file is used. The purpose of this configuration value is to aid in the ability to start multiple UniTerm instances on the same machine with the intention of using GUI mode for multiple user logins (e.g. Terminal Services).
- `-h` - Help options are displayed.

3.5 Multiple Instances

When running UniTerm in conjunction with `Citrix` or Terminal Services, with the intention of using GUI mode, it is necessary to start multiple instances of UniTerm on the same machine. This can be accomplished by using a different port for each UniTerm instance. The port can either be configured via the command line options or by specifying a different UniTerm `ini` file. The integrated application would then communicate with UniTerm on its own dedicated port to prevent interference with any other UniTerm instances. The dedicated UniTerm instance must still be started by the POS application in that user instance otherwise UniTerm will be unable to display information or prompts.

If using UniTerm in device-only mode, it is recommended to use only a single instance of UniTerm and not start multiple instances. UniTerm is designed to be able to handle multiple transactions across multiple devices without the need for additional instances.

3.6 Swapping Devices

From time to time it may be necessary to swap out devices, whether the device is malfunctioning, being updated to a new firmware load, or simply being relocated. When a device is swapped, UniTerm needs to be made aware of this, otherwise there could be unexpected behavior. In order to reduce transaction latency as much as possible, the first time a device is used after a fresh UniTerm start, UniTerm performs many queries against the device which may take many seconds to complete. These queries gather device information such as its type and capabilities and ensure the proper configuration parameters are loaded. In extreme cases this first transaction may detect a full device load is necessary which could extend this time to many minutes and result in a device reboot. On all subsequent transactions, these initial steps are stored in an in-memory cache and will not be repeated unless UniTerm is explicitly told to do so. When a device is swapped out, UniTerm may have no way to know this has occurred since it is operating on this cached data.

In order to tell UniTerm that a device has been swapped out, simply send a `u_action=deviceload` request or restart UniTerm. Either of these actions will force UniTerm to clear its in-memory cache and connect to the device as if it was the first transaction.

In some cases if the device itself isn't swapped (so the serial number has not changed), but instead the device has been manually cleared, such as when performing a firmware update, additional steps may need to be taken to ensure EMV parameters are loaded. There may be no way for UniTerm to determine if the device has the latest EMV parameters so UniTerm caches the `loadid` associated with the device serial number in the `uniterm.ini`. If this on-disk cache is incorrect because the device was manipulated outside of UniTerm, UniTerm must be informed of this by passing `u_forceload=yes` with the `u_action=deviceload` request. The `u_forceload` will tell UniTerm to ignore the `loadid` cache forcibly loading the EMV parameters into the device. In fact, it may be prudent to explicitly use `u_forceload` any time a device is swapped to ensure all data is loaded into the device.

3.7 Communication

The communication protocol for UniTerm is very similar to that of Monetra. At the heart of the protocol is a simple key/value pair message structure, very similar to the Monetra Client Interface Protocol Specification. In fact, some of these key/value pairs sent to UniTerm are simply passed-through to Monetra for processing.

When communicating with UniTerm, you use standard network communications in Desktop and Server environments (Windows, MacOSX, Linux). For Mobile applications, the communication method is specific to what the OS allows for Inter-Process communication.

3.7.1 Network Communication

UniTerm supports both raw SSL communication with key/value pair transport, or XML over HTTPS. The protocol being used is autodetected by UniTerm on the first message sent by the POS. The standard APIs used with Monetra are also able to be used with UniTerm as they simply facilitate the same key/value pair transport mechanisms as the raw protocols. For more information on the underlying communications protocols or APIs, please reference the communications documentation and API documentation for Monetra.

Normally, UniTerm listens on localhost on port 8123, and as of UniTerm v8.2, listens on both IPv4 and IPv6 if available. It is possible to make UniTerm accept connections from remote machines by configuring a '`sharedsecret=`' set to a desired value as well as '`localonly=no`' in the `uniterm.ini`. When a shared secret is configured, all requests to UniTerm must include the `u_sharedsecret` parameter set to this secret value in order to prevent malicious requests.

3.7.2 Android Service Communication

The Android Service communication option utilizes `AIDL` in order to transmit the key/value pairs for each request to the UniTerm Service. Please see our Android SDK available at https://www.monetra.com/developers for an example of how to utilize this communication option.

3.7.3 Apple iOS

There are 2 methods of communication for Apple iOS. The first is an embedded framework with all included dependencies that is linked directly into the iOS application. The framework is available under special distribution license, please contact your sales representative for more information. The second method is an official Apple iOS App Store application that can be installed free and uses URL Schemes for Inter-Process communication.

3.7.3.1 Framework

UniTerm on iOS can be provided bundled as a framework which allows private access to UniTerm's functionality. When building an application, the UniTerm framework itself along with the distributed dependencies (`libmonetra`, `openssl`, `zlib`), as well as the system-provided `ExternalAccessory` Framework and `libresolv.tbd` library must be added to the "Linked Frameworks and Libraries" for your project (In `XCode` under `Project->General`). The relevant frameworks and dependencies and a complete and working integration example will be provided with the UniTerm iOS Framework distribution.

Note: Both iOS device and simulator builds are provided for integrators. It should be noted, however, that simulator builds do not support External Accessories, so can only be used against IP/Ethernet-enabled devices. It is therefore recommended that developers have both Bluetooth and IP/Ethernet enabled devices for the various phases of development available.

A bundle with auxiliary files that will be installed is also provided. This bundle, called `uniterm.bundle`, must be added to your project in `XCode` under `Project -> Build Phases -> Copy Bundle Resources`. Within the bundle is a default `uniterm.ini`; this should be edited to reflect the Monetra location that should be used by the app. The `ssl_cadir` parameter should NOT be modified. The `port` parameter in the Uniterm section can be ignored or removed. When used as part of an iOS app connecting to UniTerm using a network connection is not supported. When a new build of UniTerm is distributed with the app, if there are differences in the `uniterm.ini` the new `uniterm.ini` will be merged with the old one. This only applies to the build number of the UniTerm library and not the build number of the app itself.

The app itself must be configured with the "Wireless Accessory Configuration" capability. Also, the `Info.plist` must list all external accessories it will be used with, along with other `MFi` protocols the device(s) supported advertise to prevent the user from being prompted to search the app store with a list of other applications that support this device. The current list of protocols is configured via Add "Supported external accessory protocols" with the below protocols (`UISupportedExternalAccessoryProtocols`):

- `com.ingenico.easypayemv.spm-transaction` - Actual used protocol
- `com.ingenico.easypayemv.spm-networkaccess`
- `com.ingenico.easypayemv.spm-pppchannel`
- `com.ingenico.easypayemv.barcodereader`
- `com.ingenico.easypayemv.spm-configuration`
- `com.ingenico.easypayemv.spm-sppchannel`
- `com.ingenico.easypayemv.printer`

The "Actual used protocol(s)" listed above will be part of the `u_device` in the key/value pairs sent to UniTerm (prefixed with `bt:` for bluetooth, which is used for `MFi`).

Note: For iOS apps using this framework to be accepted into the App Store, Apple as well as the device manufacturers must provide approval for each type of BlueTooth device that will be used with the application.

3.7.3.1.1 APIs

Function	Description
`BOOL uniterm_initialize( void );`	Initialize UniTerm. This must be called at app startup and before any other UniTerm functions are called. It is recommended to put it in the `AppDelegate`'s `init` function.
`BOOL uniterm_modify_config( NSDictionary *req );`	Modify Configuration. The `uniterm.ini` file should not be edited directly by the app after initialization. Instead the `uniterm_modify_config` should be used. This ensures that any UniTerm cached network connections are properly updated. This function must be used because `uniterm_run_trans` is explicitly blocked

	from modifying the configuration. Direct modification of the `uniterm.ini` is possible before `uniterm_initialize` is called. Both `uniterm.ini` and `uniterm-orig.ini` need to be changed. Specifically `uniterm-orig.ini` should be a copy of the `uniterm.ini`.
`NSDictionary *uniterm_run_trans( NSDictionary *req );`	Main interface for running transactions with UniTerm. It accepts UniTerm key value pairs and runs the request. It returns a dictionary of the key value pair responses. This is a blocking function and should be used with `dispatch_async`. When the call completes it should notify the app that it is finished so the app can take appropriate action with the response.

3.7.3.2 URL Schemes

Apple iOS communication relies on the use of URL Schemes for Inter-Process communication. Information on this communication method can be found at https://developer.apple.com/library/ios/documentation/iPhone/Conceptual/iPhoneOSProgrammingGuide/Inter-AppCommunication/Inter-AppCommunication.html.

When an application calls UniTerm's registered URL Scheme, the UniTerm application will present itself in the foreground and process the requested transaction(s). Data passed via the URL scheme is JSON-encoded, containing the key/value pairs that make up a transaction as per this documentation. Multiple requests may be passed in a single message. Part of the request message is a response URL scheme for delivery of the response to the integrated application.

Please see our iOS Demo source code available at https://www.monetra.com/developers for an example of how to utilize this communication option.

Please note that Apple does not support the concept of a background service or true inter-process communication in the same way as Android supports, therefore UniTerm must run in the foreground while processing transactions. If this is not acceptable, then please contact us about the Framework version of UniTerm for iOS.

3.7.3.2.1 URL Scheme messaging format

The JSON format is an object with strings for the keys and values. If multiple requests are to be sent at once, each request object may be encapsulated in an array, with each member in the array being a single request. When using request stacking, it is required that a unique `u_id` be passed with each request, which will be returned in the response and must be used for matching, never rely on the response array being in the same order as the request. If not using request stacking, `u_id` is not a required parameter.

Example JSON data:

```
[
 {
  "u_action": "devicetypes",
  "u_id": "1"
 },
 {
  "u_action": "bluetoothlist",
  "u_id": "2"
 },
 {
  "u_action": "version",
  "u_id": "3"
 }
]
```

For URL Schemes, UniTerm uses the `x-callback-url` (http://x-callback-url.com/) specification. All requests should be sent to "`uniterm://x-callback-url/transaction`" and must specify the following parameters:

- `x-source`: Textual name of the calling app.
- `x-success`: Return URL for successful requests. Will be used when UniTerm was able to process a request. This will be returned even when there was an error with the transaction itself such as a decline.
- `x-error`: Return URL on critical errors (such as parse failures). Will be used when there is an error in parsing the request. Such as malformed JSON data.
- `request`: The JSON request data, url-encoded.

Example Request:

```
uniterm://x-callback-url/transaction?
 x-source=MyApp&
 x-error=myapp://error&
 x-success=myapp://result&
 request=${URLENCODED-JSONDATA}
```

Example Critical Error:

```
myapp://error?
 errorCode=${CODE}&
 errorMessage=${MESSAGE}
```

Example Successful Response:

```
myapp://result?
 response=${URLENCODED-JSONDATA}
```

3.8 Shutting Down UniTerm

UniTerm should only be shut down if it was started by the POS, and does not apply to Android systems. On Windows, a standard Window shutdown message may be sent, or on Unix a

`SIGTERM` signal may be sent to the UniTerm process. Or universally UniTerm supports a shutdown message via its protocol.

3.9 User Setup Permissions and Requirements

All authentication is managed by Monetra on the remote Monetra server.

UniTerm requires that sensitive data never be returned from Monetra in order to ensure that the integrated POS is removed from PCI PA-DSS scope. In order to ensure this, UniTerm only allows merchant sub-users to authenticate. Sub users are unique usernames that can be tied to a merchant user with their own individual password, but provided only a subset of the permissions allowed. These unique usernames, when passed to UniTerm, are prefixed with the username of the merchant user and delimited with a colon (`:`). (e.g. `merchuser:subuser`).

UniTerm requires the sub user have the `obscure sensitive information` flag set, or it will generate a failure.

UniTerm also requires these permissions to operate:

- `CHKPWD`
- `CARDTYPE`
- `SALE`
- `VOID`
- `REVERSAL`
- `TERMLOAD` - Required if supporting EMV, Canadian Interac Debit, or `TransArmor`
- `EMVCOMPLETE` - Required only if supporting EMV
- `INTERACMAC` - Required only if supporting Canadian Interac Debit
- `ADMIN:MERCHINFO` - Used for populating receipt metadata and determining merchant card brands and capabilities in use
- `ADMIN:GETPERMS` - Used for verifying account setup.
- `ADMIN:IMAGEADD` - Only required if device support signature capture.

More permissions may be required based on the POS operations supported. Please consult with your integration and development team for the features used.

Note: Sub users may be created using the Monetra Client GUI after logging in, under `Admin -> SubUserManager`

3.10 Linux OS device access permissions

3.10.1 HID devices

Most Linux distributions, by default, do not allow non-root users to access HID devices. Since it is not desirable to run a POS or UniTerm as root, some system changes are required to grant access to normal users. In general, the `udev` subsystem controls device enumeration, so some rules must be added to tell it what permissions to grant for enumerated HID devices.

Before a `udev` rule can be added, a system administrator must determine what group to grant privileges to HID devices. On RedHat based systems, the most suitable pre-existing group name is probably `input`. For Debian based systems, the most suitable pre-existing group name is probably `plugdev`. If no suitable groups are pre-existing, the system administrator should create one with an appropriate name.

Next a file named `/etc/udev/rules.d/99-hid.rules` should be created with contents similar to:

```
KERNEL=="hidraw*", SUBSYSTEM=="hidraw", MODE="0660", GROUP="$group"
```

Of course, replacing `$group` with the desired group name.

Finally, the system administrator should add the user that wishes to run UniTerm to the group, a command to do that might look like:

```
usermod -a -G $group $user
```

Of course, replacing `$group` and `$user` as appropriate. If already logged in as the user being modified, it is necessary to log out and back in for the group membership to be updated.

Once these steps are performed, UniTerm should now be able to run as a non-root user and access HID devices

3.10.2 Serial devices

If the user that runs UniTerm is unable to open a serial device, most likely it is simply a group permissions issue. Both RedHat based and Debian systems use the `dialout` group for serial port access. A system administrator might need to do further research in to what group may be used on their system.

In order to add your user to the appropriate group, a command to do that might look like:

```
usermod -a -G $group $user
```

Of course, replacing `$group` and `$user` as appropriate. If already logged in as the user being modified, it is necessary to log out and back in for the group membership to be updated.

If your distribution is not setting group membership on serial devices during enumeration, it may be necessary to add specific `udev` rules to allow this. Please see the previous section for an example.

3.11 Deploying UniTerm in a public-facing environment

In some environments it may be beneficial to deploy UniTerm such that it is "public-facing", meaning that untrusted (e.g. internet) users can access UniTerm. This is mostly useful for web-based POS systems which may need to talk to UniTerm via the back-end host rather than the front-end machine (while utilizing IP-enabled terminals). In this case, UniTerm may be running anywhere in the world, rather than on the POS system as is typically done.

There are a few requirements that must be followed to ensure UniTerm an sensitive data is protected and complies with the PCI-DSS requirements:

- Deploy UniTerm in a DMZ, behind a firewall with only specific ingress and egress ports allowed.
- Configure the use of external database, not the built-in default SQLite database.
- The database must reside within a different, private, system and security zone, and not be deployed in the DMZ with UniTerm.
- Ensure any terminals connecting via IP to UniTerm are using TLS v1.2 or higher, or are using P2PE encryption.
- The only egress ports that should be open for UniTerm are to the Monetra server (by default port 8665) restricted to that host, and a similar rule allowing access to the external database.
- The only ingress ports should be the API port (by default 8123), and if using IP-enabled terminals, the port configured in the `[device_server]` section of `uniterm.ini`

4 Configuration

4.1 Configuration Files

There is a single configuration file named `uniterm.ini` that must be configured before UniTerm can be used. Included with UniTerm is a file named `uniterm_example.ini` that can be used as a template.

The `uniterm.ini` file MUST be readable and writable by the UniTerm process.

The location of the `uniterm.ini` file may vary from system to system, and the default search paths, listed in priority order, are:

- Windows:
  - `%APPDATA%/UniTerm/uniterm.ini`
  - same path as the `uniterm.exe` executable
- Mac OS X:
  - `~/Library/Application Support/UniTerm/uniterm.ini`
- Linux/Unix:
  - `~/.uniterm/uniterm.ini`
  - same path as the `uniterm` executable
- iOS/Android: N/A - embedded into the application bundle, meant to be modified via GUI or `u_action=modifyconfig`

Note: If the `uniterm.ini` file cannot be located, or does not have proper read and write access, UniTerm will still start listening on the default port 8123 and return an `INI` related `u_errorcode` on all requests with a description of the issue. It should be noted that once the error has been corrected, UniTerm must be restarted to clear the error condition to force UniTerm to re-read its `INI` file.

4.2 Configuration Parameters

The parameters in this section are in standard `ini` format grouped by sections. Sections are in the format of "`[section]`". The settings for each section are in key/value pair format of "key=value". Each setting and section are delimited from each other using a new line, either Unix LF or Windows-style CRLF are acceptable.

Note: If editing the example ini file on Windows, using Notepad.exe is not advised. The example file uses Unix-style line endings that Notepad.exe cannot understand so it will make the entire file appear as a single line or otherwise not formatted correctly. It is known that Wordpad.exe does in fact understand Unix line endings and can be used successfully.

4.2.1 Section: [monetra]

- host: Required. Hostname/address where Monetra resides
- port: Required. Port to connect to Monetra on
- ssl_cert_validate: Optional. Controls validation of the Monetra SSL server certificate. Possible Values are:
  - full - validate server certificate signature and require the full domain matches the certificate
  - fuzzy - validate server certificate signature and only the base domain matches the certificate
  - validate - validate only the server certificate signature, do not validate the domain name in the certificate
  - none - perform no server certificate validation

  If no value is specified, defaults to full. Monetra, by default, deploys a self-signed SSL certificate. You must either explicitly deploy a signed certificate (signed by a trusted CA) with Monetra to be able to validate Monetra's certificate, or add Monetra's self-signed SSL certificate to the trust list (see ssl_cadir). It is required to use full if connecting to Monetra across the public internet.
- ssl_cadir: Optional. Path to a directory containing a list of the PEM-encoded trusted SSL Certificate Authority roots or individual server certificates to be added to the trust list. If available, the OS-provided trust list will be loaded first and any certificates in the provided directory will be appended. Only used when ssl_cert_validate is set to a value other than none.
- ssl_auth_key: Optional. Path to the SSL client certificate key used for two factor authentication. If not specified, the server will not be able to validate the authenticity of the client, however most deployments will not utilize this level of verification. Must be specified if ssl_auth_cert is specified.
- ssl_auth_cert: Optional. Path to the SSL client certificate used for two factor authentication. If not specified, the server will not be able to validate the authenticity of the client, however most deployments will not utilize this level of verification. Must be specified if ssl_auth_key is specified.
- persist_conn: Optional. Whether or not UniTerm should maintain persistent connections to Monetra, or if it should disconnect when there are no active transactions. If not specified, defaults to no.

4.2.2 Section: [uniterm]

4.2.2.1 Operating Parameters

- port: Required on all except Android. Port to listen on for incoming connections.

- sharedsecret: Optional. The value specified is the shared secret to use for the communication protocol as part of an HMAC-SHA256 authentication token sent with the request for otherwise unauthenticated actions. It is required to use a shared secret for remote connections (localonly=no) if unauthenticated requests need to be used. Authenticated requests such as u_action=txnrequest do not use the shared secret, even if originating outside the local machine. Please see the Shared Secret section for more information.

  Authenticated requests are those requests that do not take a username or password which is authenticated by the Monetra server.

Note: u_action=modifyconfig requests use the sharedsecret_mc secret instead.

- sharedsecret_mc: Optional. Same as sharedsecret but used specifically for u_action=modifyconfig requests.

- localonly: Optional. If not specified, defaults to yes. If set to no, a sharedsecret must be set to allow access to otherwise unauthenticated requests.

- ssl_cert: Optional. If not specified attempts to locate ssl.crt in the same path as uniterm.ini

- ssl_key: Optional. If not specified attempts to locate ssl.key in the same path as uniterm.ini

- ssl_cadir: Optional. Enables verification of certificate presented by a remote client connection. Specifies a directory containing PEM files used to validate all clients connecting to UniTerm.

Note: UniTerm is designed to keep the POS away from the cardholder data, most customers will not have a need for client certificate verification.

- ssl_protocols: Optional. Set the SSL/TLS protocols allowed for inbound connections to UniTerm.

  UniTerm defaults to secure settings, and this should not be changed unless necessary as it could have security and PCI implications.

  The value for this field is a space separated list of protocols. Valid protocols are: tlsv1.0, tlsv1.1, tlsv1.2 If the protocol is appended with a plus (+) sign, then it means that protocol version or higher, for instance, "tlsv1.1+" implies "tlsv1.1 tlsv1.2".

  The default value is tlsv1.0+

- `ssl_ciphers`: Optional. Set the SSL/TLS ciphers allowed for inbound connections to UniTerm.

  UniTerm defaults to a known secure cipher list, and this default list may change from release to release as the security environment changes. It is not recommended to set this parameter as it could have security and PCI implications.

  The value is a standard OpenSSL cipher string.

- `serialquirks`: Optional. Controls how serial connections are handled, some platforms may need special settings to operate reliably, but most systems should not configure these flags. This setting is controlled by a set of pipe (|) delimited flags as listed below:
  - `ignore_termios_failure` - Ignore errors while setting communications settings. This may be necessary on certain types of serial port emulators that do not allow this.
  - `no_flush_on_close` - Do not flush the serial port buffers on close.
  - `no_restore_on_close` - Do not restore the original configuration for the serial port on close.
  - `async_timeout` - When using asynchronous reads, allow the read operation to timeout rather than continue indefinitely, some serial port emulators may lock up without this flag. This flag is ignored when used with busy_polling. Windows Only.
  - `busy_polling` - Perform busy polling in a separate thread, rather than using asynchronous reads. This may be necessary for some serial port emulators that do not properly support Overlapped operations. Windows Only.

- `idle_conn_timeout`: Optional. Once a POS connection to UniTerm has been idle for the specified amount of time in seconds, it will be closed. Default value is 30, use 0 to disable.

- `req_receive_timeout`: Optional. The maximum amount of time in seconds between UniTerm receiving data and fully parsing the request. As soon as data is received the timer will start. Once a full request has been received the timer will stop. If the time is exceeded the connection is dropped. Default value is 4, use 0 to disable.

- `req_max_size`: Optional. Maximum number of bytes allowed for a single request. This is _not_ bytes allowed per connection. A single connection can send multiple requests but a single request cannot exceed this limit. Default is 20971520 (20MB).

Note: While the vast majority of requests will be very small, this needs be large enough to handle device firmware upgrades.

- `max_conns`: Optional. Maximum number of open connections. If the limit is exceeded new connects will not be accepted until the total number of open connections drop below the limit. High volume systems should increase this limit appropriately for the system's resources. Default value is 1000.

- `password_iterations`: Optional. Number of PBKDF2 iterations performed when hashing passwords. The larger this number the longer password verification will take. This can cause system slowdown when used with a default (SQLite) database. It is not recommended to exceed a count of 1,000,000 when using SQLite. Default value is 10000.

4.2.2.2 Feature Parameters

- idle_message: Optional. Set the default idle message displayed on any device when not processing a transaction. This can be overwritten on a per-device level using the u_deviceidlemessage parameter in the protocol. This is not supported on all devices.
- unsupportedcard: Optional. If not specified, defaults to not supported. Allowed values are txnreq, cardreq. The values may be specified in a pipe-delimited format to include more than one. For legacy configurations, a value of yes is an alias for txnreq|cardreq, and a value of no is the equivalent of blank or not set. txnreq allows the u_action=txnrequest to support non-financial cards, and cardreq allows the use of the cardrequest functionality.

  This allows trackdata to be returned to the caller for txnrequest and cardrequest only when the card type is confirmed to be non-financial. This is to allow in-store private-label gift (on txnrequest) as well as manager cards. The card must be returned unencrypted from the reader to be supported.
- nocvmfloor: Optional. If not specified, defaults to disabled, should be specified as a dollar amount. This configuration value will disable cardholder verification (e.g. PIN or Signature) when the transaction amount is less than this limit. For instance if the value is set to 50.00, and a 40.00 authorization is attempted as a swipe transaction, they will NOT be prompted to sign, however a 60.00 authorization would be prompted to sign. This feature works with EMV contact as well, however EMV Contactless has its own set of limits advertised by Monetra that UniTerm will honor. Applies only to Credit Card purchases.
- guimode: Valid options are normal and touchscreen. A modifier value of fullscreen can also be added to force the GUI to be rendered full screen rather than in a window, the modifier will be separated from the mode by a pipe (|), for example touchscreen|fullscreen. If no guimode is specified, it defaults to normal. TouchScreen mode enlarges all text in dialogs and provides an on-screen keypad to be used for manual card entry. Only numeric input is allowed in touchscreen mode, if an alpha-numeric Postal code needs to be entered (such as for Canada), a keyboard must be used. Normal mode is designed for use at a workstation with a keyboard and mouse.
- returnbin: Optional. Boolean, defaults to no. If set to yes, this allows UniTerm to return the first 6 digits of the card number as part of the response for txnstart. This data can then be used for BIN checking to determine additional card classification such as if it is a health benefits card or qualified Visa card for Debt Repayment.

Note: Only the last 4 digits of the PAN are allowed to be printed on receipts. It is the integrator's responsibility if using this feature to ensure the first 6 digits are masked on receipts.

- cardwait: Optional. Txnstart card presentation timeout in seconds. -1 uses internal timeout as determined by the device (default). 0 waits indefinitely. Any other value is the timeout specified in seconds.

  For devices that support specifying a card presentation timeout, this value will control how long until a timeout occurs. This is mostly useful in unattended/kiosk environments where you may want to prompt indefinitely waiting on an order. This is only applicable to the `txnstart` method when the order amount is not yet known. Not all devices support overriding their internal timeout, and it is up to the POS to handle this situation when an unexpected timeout occurs.

- `signaturetimeout`: Optional. Action to take when signature entry times out.

  If a customer does not sign, the transaction is in an undefined state. The customer could have refused to sign because they no longer want to continue with the transaction. Or they could have forgotten to sign.

  In the former it's ideal to treat this condition as a cancellation and automatically reverse the transaction. In the latter it is ideal to honor the auth and request that the customer sign the receipt.

  Choices:
  - reverse - Default. Will reverse the transaction.
  - ignore - Will ignore the timeout. `u_need_signature=yes` and `u_signature_timeout=yes` will be returned to the POS.

4.2.3 Section: `[device_server]`

UniTerm can function as a server with remote devices initiating inbound connections, some call this "client mode". Not all devices support such a feature. Connected devices are addressed via serial number rather than ip address.

- `ipserver=u_devicetype:port`: Start an unencrypted IP listening port for the specified device type and port. If multiple device types or multiple ports are desired, can be specified using a semi-colon separated list. Not all device types are supported.

  Example: `ipserver=ingenico_rba:6000;ingenico_rba:9000`

- `sslserver=u_devicetype:port`: Start a SSL/TLS listening port for the specified device type and port. If multiple device types or multiple ports are desired, can be specified using a semi-colon separated list. Not all device types are supported.

  Example: `sslserver=ingenico_rba:6000;ingenico_rba:9000`

- `ssl_cert=[filepath]`: Location of a SSL/TLS server certificate to present to client upon connection. Required when using `sslserver`

- `ssl_key=[filepath]`: Location of a SSL/TLS server private key associated with the `ssl_cert`. Required when using `sslserver`

- `ssl_cadir=[path]`: Optional. Client certification verification. Only clients connecting with a certificate signed by these Certificate Authorities will be allowed to connect. If a directory is not provided, will not attempt client certificate verification.

- `ssl_protocols`: Optional. Set the SSL/TLS protocols allowed for inbound connections to UniTerm from a device.

UniTerm defaults to secure settings, and this should not be changed unless necessary as it could have security and PCI implications.

The value for this field is a space separated list of protocols. Valid protocols are: `tlsv1.0, tlsv1.1, tlsv1.2` If the protocol is appended with a plus (+) sign, then it means that protocol version or higher, for instance, "`tlsv1.1+`" implies "`tlsv1.1 tlsv1.2`".

The default value is `tlsv1.0+`

- `ssl_ciphers`: Optional. Set the SSL/TLS ciphers allowed for inbound connections to UniTerm from a device.

  UniTerm defaults to a known secure cipher list, and this default list may change from release to release as the security environment changes. It is not recommended to set this parameter as it could have security and PCI implications.

  The value is a standard OpenSSL cipher string.

- `max_conns`: Optional. Maximum number of open connections for each server. If the limit is exceeded new connects will not be accepted until the total number of open connections drop below the limit.

  Each server is treated independently for the total count. For example, `ingenico_rba:6001;ingenico_rba:9001` port 6001 will allow up to `max_conns` and port 9001 will allow up to `max_conns`. Giving a total of `max_conns` * 2 allowed connections.

  High volume systems should increase this limit appropriately for the system's resources.

  If not set will default to UniTerm's `max_conns` config value. If neither are set default is 1000. This acts as an override.

4.2.4 Section: `[db]`

UniTerm uses a database to store state data. If no database is configured, it will automatically default to an `sqlite` database in the same directory as the `uniterm.ini`.

- `type`: Database type to use:
  - `sqlite` - Default, server-less.
  - `mysql`
  - `postgresql` - Linux/Unix only, use `ODBC` for Windows
  - `oracle` - Linux/Unix only, use `ODBC` for Windows
  - `odbc` - for Microsoft Windows, `iODBC`, or `UnixODBC`
  - `db2` - Linux/Unix only, for direct `DB2` connectivity

- `connection`: A DB-specific connection string or `DSN`. This string often configures the host/port, and available options for the driver in use. The connection strings are a set of key/value pairs, with keys separated from the values with an equal sign (=), and values separated by a semi-colon (;). If quoting is in use, a single-quote (') is recognized, and an escape character of a backslash (\\) can be used. E.g.: `host=10.130.40.5:3306;ssl=yes` `sqlite` options:

- `path`: Required. File system path to SQLite database.
- `journal_mode`: Optional. Defaults to `WAL` if not specified, other options include `DELETE`
- `analyze`: Optional. Defaults to "TRUE" if not specified. On first connect, automatically runs an analyze to update index statistics if set to "TRUE".
- `integrity_check`: Optional. Defaults to "FALSE" if not specified. On first connect, automatically runs an integrity check to verify the database integrity if set to "TRUE".
- `shared_cache`: Optional. Defaults to "FALSE" if not specified. Enables shared cache mode for multiple connections to the same database.
- `autocreate`: Optional. Defaults to "TRUE" if not specified. The default is to auto-create the database if not found, set this to "FALSE" to error if the database does not exist.

`mysql` options:

- `db`: Required. Database Name.
- `socketpath`: Conditional. If using Unix Domain Sockets to connect to MySQL, this is the path to the Unix Domain Socket. Use the keyword of 'search' to search for the socket based on standard known paths. Cannot be used with host.
- `host`: Conditional. If using IP or SSL/TLS to connect to MySQL, this is the hostname or IP address of the server. If not using the default port of 3306, may append a ":port#" to the end of the host. For specifying multiple hosts in a pool, hosts should be comma delimited. Cannot be used with `socketpath`. E.g: `host=10.40.30.2,10.50.30.2:13306`
- `engine`: Optional. Used during table creation, defaults to `INNODB`. The default data storage engine to use with mysql. Typically it is recommended to leave this at the default.
- `charset`: Optional. Used during table creation, defaults to `UTF8`.
- `max_isolation`: Optional. Sets the maximum isolation level used for transactions. This is used to overwrite requests for `SERIALIZABLE` isolation levels, useful with Galera-based clusters that do not truly support `Serializable` isolation. Should use "SELECT ... FOR UPDATE" type syntax for row locking. Available settings: `"REPEATABLE READ", READ COMMITTED"`

`postgresql` options:

- `db`: Required. Database Name.
- `host`: Required. This is the hostname or IP address of the server. If not using the default port of 5432, may append a ":port#" to the end of the host. For specifying multiple hosts in a pool, hosts should be comma delimited. E.g: `host=10.40.30.2,10.50.30.2:15432`
- `application_name`: Optional. Application name to register with the server for debugging purposes.

`oracle` options:

- `dsn`: Conditional. Data Source Name as specified in `tnsnames.ora`, or a fully qualified connection string. If not specified, both host and `service_name` must both be specified and a connection string will be dynamically generated. Use of this parameter negates the ability to use load balancing and failover logic, but facilitates the use of Oracle's equivalent functionality. An example of a fully qualified connection string would be:

```
(DESCRIPTION =
  (ADDRESS = (PROTOCOL = TCP)(Host = 10.100.10.168)(Port = 1521))
  (CONNECT_DATA = (SERVICE_NAME = orcl))
)
```

  - `host`: Conditional. If `dsn` is not specified, this parameter must be specified along with the `service_name` parameter. This is the hostname or IP address of the server. If not using the default port of 1521, may append a ":port#" to the end of the host. For specifying multiple hosts in a pool, hosts should be comma delimited. Cannot be used with `dsn`. E.g: `host=10.40.30.2,10.50.30.2:11521`
  - `service_name`: Conditional. If `dsn` is not specified, this parameter must be specified along with the host parameter. Cannot be used with `dsn`. E.g: `service_name=orcl`

  `odbc/db2` options:

  - `dsn`: Required. Database Source Name.
  - `mysql_engine`: Optional. Used during table creation when the underlying database is MySQL, defaults to `INNODB`. The default data storage engine to use with mysql. Typically it is recommended to leave this at the default.
  - `mysql_charset`: Optional. Used during table creation when the underlying database is MySQL, defaults to `UTF8`.

- `ro_connection`: Optional. Route read-only requests to a different database pool of nodes. Same configuration syntax as `connection`.

- `conn_flags`: Optional. These control how the connection is handled. Settings are a set of flags, delimited with pipes (|).
  - `prespawn`: Pre-spawn all connections, not just the first. Without this, the remaining connections are on-demand.
  - `no_autoretry_query`: If a non-transactional query is rolled back due to a deadlock or connectivity failure, the default behavior is to automatically retry the query, indefinitely. For queries executed as part of may be dependent on prior queries in the transaction. This flag will turn off the auto-retry logic. NOT RECOMMENDED.
  - `load_balance:` If there are multiple servers specified for the connection string, this will load balance requests across the servers instead of using them for failover.

  E.g.: `conn_flags=prespawn|load_balance`

- `num_conns`: Optional. Maximum number of SQL connections to attempt to create. Valid range 1-1000. Default 2.

- `num_ro_conns`: Optional. Maximum number of SQL connections to attempt to create for the read only pool. Valid range 1-1000. Default 2.

- `username`: Conditional. For databases which require authentication, the username.

- `password`: Conditional. For databases which require authentication, the password.

- `to_reconnect`: Optional. How many seconds to allow a connection to be used before a disconnection is forced. The connection will be terminated even if not idle, termination will occur when a connection is returned to the pool instead of prior to use to prevent unexpected delays. This can be used to either redistribute load after a node failure when load balancing, or to fall back to a prior host. Set to 0 for infinite. Default is 0.

- `to_idle`: Optional. Maximum amount of time a connection can have been idle to be used. Some firewalls may lose connection state after a given duration, so it may be advisable to set this to below that threshold so the connection will be forcibly terminated rather than use. The connection will be terminated before use and the consumer will attempt to grab a different connection from the pool, or start a new one if none are available. Set to 0 for infinite. Default is 0.

- `to_fallback`: Optional. Number of seconds when a connection error occurs to a host before it is eligible for "fallback". If this isn't set, the only time the first host will be re-used is if the secondary host(s) also fail. This should be used in conjunction with reconnect_time_s. Set to 0 to never fallback. Not relevant for load balancing, the host will always be in the attempt pool. Default is 0.

4.2.5 Section: `[logging]`

UniTerm v9 introduces logging support with user-definable levels. No levels on production builds can output any sensitive data. Available configuration parameters:

- `level`: Pipe delimited list of log levels that are used to determine the data written to the log file. Available levels are:
  - `error`: Errors
  - `warn`: Warnings
  - `info`: Informational Messages
  - `conn`: Inbound connection status
  - `tran_detail`: Request/Response parameters for inbound connections
  - `mon_detail`: Request/Response parameters outbound to Monetra

  The default value is: `info|error|conn|warn|tran_detail|mon_detail`

- `system`: Which logging infrastructure to use. Multiple infrastructures can be used simultaneously if specified as pipe delimited.
  - `syslog`: Local syslog, only available on Unix systems
  - `tcpsyslog`: TCP syslog, available on all systems to send to remote syslog server via TCP.
  - `file`: Log to local file.

  The default value is `file`.

- `time_prefix`: Timestamp prefix to add to each line of the log specified as a format string. Options:
  - `%t` - Unix Timestamp
  - `%M` - 2-digit Month
  - `%a` - abbreviated month (e.g. Jan)
  - `%D` - 2-digit day of month
  - `%d` - abbreviated day of week (e.g. Sun)
  - `%Y` - 4-digit year
  - `%y` - 2-digit year
  - `%H` - 2-digit hour
  - `%m` - 2-digit minute
  - `%s` - 2-digit second
  - `%u` - microseconds
  - `%z` - time zone offset

  The default is `%a %D %H:%m:%s.%u %z` which may generate a line such as:

```
Jan 11 09:19:11.426235 -0500 [INFO]:
```

- `syslog_facility`: The syslog facility to log to, used for both TCP syslog and system syslog. Defaults to `user` if not set. May also use `daemon` or `local0-7`
- `tcpsyslog_host`: Host or address of the TCP syslog server to log to.
- `tcpsyslog_port`: TCP port the TCP syslog server is listening on.
- `tcpsyslog_bufsize`: Maximum KB that the message queue will use when the remote server is offline. Use 0 for unlimited, use with caution. Default is 512.
- `file_directory`: Directory where log files should be kept when using file logging. Files will be called `uniterm.log[.#]`. The default is in a subdirectory named `log` in the same directory as the `uniterm.ini`.
- `file_keep`: Number of rotated log files to keep. Defaults to 10.
- `file_archive`: Command to be run against file on rotation. Default is nothing.
- `file_archive_ext`: If `file_archive` changes the file name, such as after compressing, adding a `.bz2` extension, it must be configured here so rotated files can be found.
- `file_rotate_autostart`: Boolean field for whether or not to automatically initiate a rotate on startup. Default is yes.
- `file_rotate_days`: Number of days after log creation that the log file should be rotated. Use 0 to disable. Defaults to 7.
- `file_rotate_size`: Size in KB to automatically rotate log file. Defaults is 10240 (10MB). Use 0 to disable.

4.2.6 Section: `[tab]`

UniTerm v9 introduces tab support for capturing a customers card before charging it such as is used by bars. Available configuration options:

- `only_standin`: Only allow the same cards that are allowed for stand-in/store-and-forward processing to be used for tabs. This should be used if also using stand-in processing to ensure only transactions that can be approved as stand-in will be used for tabs. Otherwise cards that cannot be used for stand-in processing will decline if there is a connectivity failure. Default value is no.

4.2.7 Section: `[standin]`

UniTerm v9 introduces stand-in/store-and-forward support for locally approving transactions when connectivity is unavailable. Available configuration options:

- `enabled`: Whether or not stand-in processing should be enabled. Default value is no.

- `auth_code`: Authorization code to send back for a stand-in approval. Default value is `SNF999`.
- `verbiage_approve`: Verbiage returned for stand-in approval. Default value is `STANDIN AUTH`.
- `verbiage_decline`: Verbiage returned for stand-in decline. Default value is `STANDIN DENY`.
- `max_trans`: The maximum number of transactions that can be stored at any given time. Applies to each individual user. Use 0 for unlimited. Default is 0.
- `max_tran_amount`: Maximum single transaction amount eligible for offline approval. Use 0.00 for unlimited. Default is 0.00.
- `max_aggregate_amount`: Maximum aggregate transaction amount eligible for storage. Applies to individual users. Use 0.00 for unlimited. Default is 0.00.
- `max_offline_time`: Maximum number of days UniTerm can be offline before it will reject offline approvals. There is a hard maximum of 8 days allowed. Default is 8.
- `upload_interval`: How often to attempt to upload stored transactions in minutes. Transactions are sent one at a time across all users. Transactions are only sent if the user is not currently processing any transactions. If the given user is processing transactions that users stored transactions will be skipped and will attempt to be sent during the next upload interval. Default is 15.
- `keep_response_days`: Number of days to keep responses to stored transactions. Stored transaction responses older than the configured number of days will be deleted. At which point there is no way to associate the UniTerm TTID returned with a stand-in approval to the actual TTID generated when the transaction is sent. Default is 30.

4.2.8 Section: `[blacklist]`

UniTerm v9 introduces automatic intrusion detection and prevention that is configurable to block potentially malicious requests. All events are tracked per originating IP address. Available configuration options:

- `time_span`: Time in minutes of the sliding window used to determine if successful events should cause a ban. Use 0 to disable. Default value is 2.

  `time_span_fail`: Time in minutes of the sliding window used to determine if failure events should cause a ban. Use 0 to disable. Default is 5.

  `ban_time`: Time in minutes the ban should remain in effect. Use 0 to disable. Default is 15.

  `ban_extend`: When a client connects after it's been banned the ban expiration time will be extended by this number of minutes. Use 0 to disable. Default is 10.

  `whitelist`: Comma delimited list of subnets that
  will never be banned. Default is all local subnets:
  `127.0.0.0/8,192.168.0.0/16,10.0.0.0/8,172.16.0.0/12,::1/128,fc00::/7`

max_connect: Maximum number of repeatedly open successful connections in time_span window. Use 0 to disable. Default is 40.

max_requests: Maximum number of successful requests, excluding ping and status in time_span window. Use 0 to disable. Default is 40.

max_failures: Maximum number of failure events (e.g. Invalid u_action, message parse failure, authentication failure) within the time_span_fail window. Use 0 to disable. Default is 5.

max_ping: Maximum number of successful protocol-level ping requests allowed within time_span window. Use 0 to disable. Default is 1500.

max_status: Maximum number of successful status requests allowed within time_span window. Use 0 to disable. Default is 1000.

max_action: Maximum number of a given action. This differs from max_requests in the fact that this is tracked per-action, rather than grouping all actions together. Use 0 to disable. Default is 20.

5 UniTerm Protocol

5.1 Overview

Application software communicates with UniTerm via the UniTerm protocol (which is intentionally similar to the Monetra Client Interface Protocol as they are meant to coexist). The protocol description documents only the key/value pairs that make up a transaction. These key/value pairs can then be transported using one of the supported communications protocols such as the standard Monetra SSL/TLS, possibly using one of our provided APIs to make communication easier, or XML over HTTPS. Usage of our Monetra SSL/TLS protocol is recommended as it allows asynchronous processing (multiple simultaneous, interleaved transactions) via a single connection (as of v8.2). Mobile devices may have their own specific method of transport.

UniTerm is self-contained and does not require any external operating system dependencies or third party dependencies, it is only reliant on the Operating System and supplied network infrastructure (it does not depend on any OS-provided cryptographic subsystems).

By default UniTerm listens on port 8123 and connects to the configured remote instance of Monetra on port 8665. These ingress and egress ports and hosts are configurable as per Section 4.2.2.1 and Section 4.2.1.

Note: When processing transactions (such as `u_action=txnstart` or `u_action=txnrequest`), UniTerm simply augments the requests made with cardholder data captured either via a device or on-screen, and passes them on to Monetra. A majority of the parameters to be sent are simply pass-through to Monetra and not interpreted by UniTerm in any way; Therefore this guide must be used in conjunction with the Monetra Client Interface Protocol Specification to come up with a complete list of parameters necessary to complete transactions.

Note: Referenced documentation available at https://www.monetra.com/developers:

- Monetra Client Interface Protocol Specification
- Monetra IP, SSL, and Drop File Specification (only TLS/SSL supported by UniTerm)
- Monetra XML Specification

5.2 UniTerm Request Parameters

The table below describes the parameters used within the UniTerm protocol.

PARAMETER	VALUE
`username`	The Monetra username to authenticate as. For security reasons this should be a restricted subuser account.
`password`	The Monetra password associated with username.
`u_action`	See UniTerm Actions (`u_action`) for a complete description of each action. • `deviceload` • `txnrequest` • `txnstart` • `txnfinish` • `devicepolemsg` • `cardrequest` • `passthrough` • `cancel` • `deviceupload` • `deviceprint` • `devicereboot` • `reqsignature` • `reqconfirm` • `reqinput` • `devicetypes` • `status` • `seriallist` • `bluetoothlist` • `mfilist` • `blelist` • `hidlist` • `shutdown` • `modifyconfig` • `version` • `deviceinfo` • `standin` • `tab`

	u_flags	Txnrequest, Txnstart, Txnfinish and Cardrequest only. Multiple flags may be sent per data ticket request. All flags are separated by a pipe (|) symbol. • ENCRYPTEDONLY - Permit encrypted reader data only. Not valid on cardrequest • DEVICEONLY - Suppresses display of clerk facing prompting and feedback, also known as GUI mode. For instance, on a swipe request, no swipe dialog would be presented nor would the clerk be informed of the status for customer-facing device interaction. Note: Setting this mode will prevent keyboard emulation readers from working, it will also prevent the ability for accepting clerk keyed input via a keyboard. On Android, iOS, and UniTerm launched in console mode, this flag is automatically implied as they do not support a GUI mode of operation. • GUIONLY - Suppresses use of a referenced physical device. This flag can be used to utilize the physical device's UniTerm license for a clerk-facing GUI request, without using the device itself for card input. Without this flag, the GUI would register an additional UniTerm license based on the machine's unique id. • KEY - Perform capture of manually keyed data. Not valid on cardrequest. If an account or expdate field is passed in on the request to UniTerm, the fields will be pre-populated in GUI mode. Note: If a manually keyed EBT card is to be entered for a Food Stamp (SNAP) transaction, pass the qualified food amount via u_foodamount in order to go through the EBT flow and PIN prompting. Do NOT pass u_foodamount if you are NOT intending to run a Food Stamp transaction as keyed. • AVS - Request AVS data. Only allowed on keyed transactions. If a street or zip field is passed in on the request to UniTerm, the fields will be pre-populated in GUI mode. • CVV - Request for CVV data. Only allowed on keyed transactions. • GIFTPIN - Request a PIN for gift cards, when a gift card is presented. Does nothing if a different card type is presented. • NOTIP - Disable tip prompting if enabled via [uniterm] tippercent configuration.

	• `NOCASHBACK` - Disable cash back prompting if enabled via `[uniterm] cashbackamount` configuration. • `NOCONFIRM` - When performing a QuickChip finalization via `txnfinish` do NOT prompt the cardholder to confirm the amount prior to running the authorization. • `NOSIGNATURE` - If using a signature-capable device, but an integrator does not want to use the auto-signature-capture capabilities in the UniTerm flow, this flag will treat the device as if it is not capable of accepting a signature. The `u_need_signature` response flag will be set appropriately for the transaction requirements. • `DELAYRESPONSE` - This flag will cause UniTerm to send the transaction response back to the caller after the device has been closed. The device can be used immediately for a subsequent transaction with this flag, otherwise device closing will happen in the background which will hold a lock on the device for at least 100ms, or possibly longer.
`u_device`	Requests: `Txnrequest, Txnstart, Cardrequest, DeviceInfo, DeviceLoad, DeviceUpload, DevicePrint, DeviceReboot, ReqSignature, ReqConfirm, ReqInput` This specifies the path of the card entry device. Required parameter unless performing a GUI-based action (such as manual keyed entry, or swiping via a keyboard emulation card reader). Required if `u_devicetype` is provided. • `HID[:serialnum]` - `HID` (such as `USB-HID`), takes an optional serial number • `SER:port` - Serial • `MFI:protocol,[serialnum]` - Made for iOS (MFi), as retrieved from `u_action=mfilist` • `BT:mac,[uuid]` - Bluetooth • `BLE:identifier` - Bluetooth LE using device identifier as retrieved from `u_action=blelist, u_blelist=scan` `BLESRV:service_uuid` - Bluetooth LE using the device service id as retrieved from `u_action=blelist` Note: Using the service id will connect to the first device connected exposing the service use the identifier method to use a specific device. • `IP:ipaddr:port` - IP • `IPCLIENT:serialnum` - IP Client Mode. Currently only supported for RBA devices support RBA client mode for ethernet connectivity. UniTerm will act as a server and the devices will connect to UniTerm and be referenced by their serial number.

`u_devicetype`	Requests: `Txnrequest, Txnstart, Cardrequest, DeviceInfo, DeviceLoad, DeviceUpload, DevicePrint, DeviceReboot, ReqSignature, ReqConfirm, ReqInput` The unique device type supported by UniTerm as found via a `devicelist` request. Required if `u_device` is provided.
`u_language`	`Txnrequest` and `Txnstart` only. Used to override terminal defaults for display of text prompts. Current choices are "en" or fr".
`u_currency`	`Txnrequest` and `Txnstart` only. The numeric ISO currency code for EMV transactions (e.g. 840 for USD, 124 for CAD). Defaults to the terminals configured currency. This parameter is used to override the terminals default currency.
`u_deviceidlemessage`	`Txnrequest`, `Txnstart`, or `deviceload` only. Sets a message that the terminal should display when idle, this will be persistently cached by UniTerm and associated with the device serial number.
`u_forceload`	`deviceload` only. Values allowed are `yes`, `no`, and `full`. If not specified defaults to `no`. A value of `yes` will force a reload of all EMV parameters even if UniTerm believes the device already has the latest set of parameters. A value of `full` will additionally force reloading of all other objects UniTerm maintains, including but not limited to, configuration values, forms, and images.
`u_id`	`Txnrequest`, `Txnstart`, `TxnFinish`, `Cardrequest`, `Status`, and `Cancel` only. A unique id (generated by the calling application) that identifies the transaction. This is used for checking the status or canceling the transaction. Without this id the transaction state cannot be queried.
`amount`	`Txnrequest` and `TxnFinish` only. Transaction amount. Required.
`u_b64data`	`Deviceupload` only. Base64-encoded file data to upload. Required.
`u_filename`	`Deviceupload` only. Filename of the file to write. Required.
`u_text`	`Deviceprint` only. ASCII pre-formatted text to print to receipt printer. Required.
`u_message`	`Reqconfirm, Devicepolemsg` only. Textual request message to prompt user for confirmation. Required.
`u_inputtype`	`Reqinput` only. Type of user input being requested. Required. Possible values:

	- PHONENUM - Request user to input a phone number. This may be useful for loyalty card prompting. - INVOICENUM - Request user to input an invoice/order/ticket number - ZIP - Request user to input a zip code
u_foodamount	Txnrequest, Txnstart, or Txnfinish only. Dollar amount indicating amount of qualified food purchases for EBT Food Stamps (SNAP). Or during an Txnstart the food amount may not yet be known, but to enable EBT prompting, a special value of maybe may be passed, followed by the the real amount in Txnfinish. If the amount passed in Txnfinish is zero, but EBT Food Stamps was selected by the card holder, the transaction will be aborted.
u_req_hmacsha256	Required on unauthenticated requests when the sharedsecret configuration parameter is set. Please see Section 5.2.5 for more information.
u_req_sequence	Used in conjunction with u_req_hmacsha256. Please see Section 5.2.5 for more information.
u_req_timestamp	Used in conjunction with u_req_timestamp. Please see Section 5.2.5 for more information.
u_blelist	Blelist only. The only valid value to be passed to this is scan, which will list all supported present devices instead of just known device services.
monetra.host	Modifyconfig only. Modify the [monetra] host configuration value.
monetra.port	Modifyconfig only. Modify the [monetra] port configuration value.
uniterm.idle_message	Modifyconfig only. Modify the [uniterm] idle_message configuration value.

5.2.1 UniTerm Actions (u_action)

The table below contains the descriptions of each possible UniTerm Action. The AUTH column indicates if the request requires authentication (username/password) or not.

u_action	AUTH?	description
deviceload	Yes	Load a device with EMV and/or Interac parameters. This request will start a terminal download of EMV and/or Interac parameters to load into the device being used. Requires username, password, u_device, and u_devicetype parameters. If the load for the device is identical to the previous load, the load will be skipped. Please note this process may take up to 3 or 4 minutes depending on the processing institution being used and the device being

		used. The Device may also reboot during this process. It is strongly recommended to call this function when a lane opens, however if it is not called, it will automatically be performed prior to the first transaction. If the device or merchant account does not support EMV or Interac, this command will simply return success. Optionally `u_deviceidlemessage` may be passed to this as well to set the device's default message if supported by the device.
`txnrequest`	Yes	Full Transaction Request for card holder data. Request a transaction be performed, all normal Monetra transaction parameters should be included in the request that may be required for processing or to comply with interchange requirements (e.g. `action`, `username`, `password`, `amount`, `nsf`, `ordernum`, etc). Sensitive data, explicitly, should not be sent (e.g. `trackdata`, `account`, `cvv2`, `pin`) as that data will be retrieved by UniTerm either via the GUI or via a card entry device and forwarded to the Monetra server as part of the transaction request. UniTerm will fully control the transaction flow and user prompting for such a transaction. This request should only be used when card data entry is required as part of the transaction, for other operations `passthrough` may be a more appropriate action.
`txnstart`	Yes	Transaction Start Request for card holder data. Request to start a QuickChip transaction, similar in function to a `txnrequest` message, but does not accept a transaction amount. Needs to be followed up with a `txnfinish` or `cancel` request. Once a card is presented and the cardholder has completed any necessary verification and removed their card, a response will be returned with card information metadata such as the card type, some basic EMV card parameters, and the last 4 digits of the card number. Though the purpose of this request is to support QuickChip, it still supports non-EMV transactions. A `u_id` unique parameter is required to be sent with this request for completing the transaction. See QuickChip for more information.
`txnfinish`	Yes	Transaction Finish Request. Request to finish a QuickChip transaction. Requires the integrator send the same `u_id` as was sent with the initial `txnstart` request. The integrator can choose to send additional parameters to pass through to Monetra with this request based on information returned from `txnstart`

		(e.g. card type). Will return the same response parameters as `txnrequest`. See QuickChip for more information.
`devicepolemsg`	Yes	Pole Display Update Message. Only valid after a Quick Chip (`txnstart`) message, before `txnfinish` is called. Requires the integrator send the same `u_id` as was sent with the initial `txnstart` request. Devices that support a pole display can have it updated until the transaction is completed. The message (`u_message`) must be pre-formatted for the proper width of the display.
`cardrequest`	Yes	Non-Financial Card Entry Request. UniTerm will prompt for card entry, and if it is determined the card is non-financial, it will return the card data. This can be used for manager cards and private label gift cards that are not processed through Monetra. The card must be swiped, and the reader must be configured to return the card in unencrypted form.
`passthrough`	Yes	This action performs a direct pass-through of parameters to the Monetra server. Only the `username`, `password`, and `u_action` parameters are required. This method will simply proxy requests to the Monetra server and can be used for transaction modifications (e.g. voids) or for pulling reports from Monetra. Do not use this request if cardholder data needs to be retrieved for the transaction. Users may wish to send their requests directly to Monetra rather than using this feature.
`cancel`	Yes	Will attempt to cancel an outstanding `txnrequest` or `txnstart`. Requires `username`, `password` and `u_id` fields which must match the pending request. If the transaction cannot be canceled, such as if it is ineligible (such as when waiting on a response from the Monetra server), or the device doesn't support canceling the outstanding request, `u_errorcode` will return `PENDING_TRAN`.
`status`	Yes	Requests the current status of a pending `TXNREQUEST` or `txnstart/txnfinish`. Requires `username`, `password` and `u_id` fields which must match the pending request. This will provide a textual verbiage response suitable for clerk display. Will normally return a `u_errorcode` of `SUCCESS` when either the transaction is still in-progress or UniTerm is in a cleanup phase after a transaction. Will return a value of `UID_NOT_FOUND` if the request is no longer being processed.
`deviceupload`	Yes	Requests uploading the given file to the device at the requested device path. Not all devices support the concept of file uploads. Required parameters are `u_b64data, u_filename`, and may

		return `u_needreboot=yes` to indicate that a device reboot is required for the change to take effect (an automatic reboot will not occur so that additional files that may also require reboot can be uploaded). The `u_filename` should contain a properly formatted path for the device in use. Some devices like `Ingenico RBA` just want the filename with no path component.
`deviceprint`	Yes	Requests printing the given text to a built-in receipt printer if available. The text provided must be formatted properly for the given device. Only plain text receipts are supported. Receipt data is provided via the `u_text` parameter.
`devicereboot`	Yes	Requests the device to reboot. Typically this should only be done when an `u_needreboot=yes` parameter is returned in response to a file upload request.
`reqsignature`	Yes	Requests the device to prompt for signature capture for non-financial requests. This should only be used outside of a transaction flow (e.g `txnrequest` or `txnstart/txnfinish`). For financial transactions, a signature will be automatically captured and stored within Monetra so there is no need to call this function. The signature data will be directly returned to the caller in the `u_signature` response parameter. Not supported in GUI mode
`reqconfirm`	Yes	Requests the user confirm a message presented on the screen. The message is supplied via the `u_message` request parameter, and the response is recorded in the `u_confirmed` response parameter. Not supported in GUI mode
`reqinput`	Yes	Requests the user enter the input type specified via `u_inputtype`. The response data is returned in the `u_input` response parameter. Supported in both GUI and device mode
`devicetypes`	No	Will return a comma separated list of device types supported by the UniTerm module. No authentication required. Headers: • `devicetype` - internal device name • `manufacturer` - textual description of device manufacturer • `model` - textual description of model • `connectivity` - pipe separated list of connectivity methods supported by the device, e.g. `SERIAL|HID|BLUETOOTH|IP` • `functionality` - pipe separated list of functionality supported by the device. Some devices are families and may list features available in the family but not necessarily the device being used:

		e.g. `EMV|MAC|E2E|KEY|SIGNATURE|UPLOAD|PRINT|REBOOT|CONFIRM|FREEFORM|POLEDISPLAY` (`FreeForm` is used by `reqinput`)
`seriallist`	No	Will return a comma separated list of all serial ports enumerated on the system. No authentication required. Headers: • `port` - The port path • `desc` - Description of port, if applicable
`bluetoothlist`	No	List all 'bluetooth' devices that have been paired with the machine UniTerm is running on. The device may or may not be present. Currently only supported on Android and MacOS. Headers: • `name` - The textual name of the device as registered with the operating system. • `mac` - The device bluetooth `MAC` address • `uuid` - The device bluetooth `UUID`
`blelist`	No	List all BlueTooth LE known devices. If the `u_blelist=scan` flag is set, it will list only currently present devices. When requesting a full scan, an `timeout` key/value pair may be sent, if not sent, it defaults to 30 seconds. Currently only supported on iOS and MacOS. Headers for `u_blelist=scan`: • `devicetype` - Device type as may be passed in `u_devicetype`. • `name` - Textual name as advertised by device. • `identifier` - Unique identifier of device to be passed as part of `u_device=BLE:` Headers when NOT using `u_blelist=scan`: • `devicetype` - Device type as may be passed in `u_devicetype`. • `name` - Textual name as advertised by device. • `service` - Common service exposed by devices of this type, to be passed as part of `u_device=BLESRV:`.
`mfilist`	No	List all supported Made For iOS paired devices. Headers: • `devicetype` - The devicetype (device internal name) associated with the HID entry • `name` - Textual name as advertised by device.

		• `protocol` - Protocol advertised by device. • `serialnum` - Serial number of device.
`hidlist`	No	List all supported HID (possibly USB-HID) devices that are currently attached to the machine UniTerm is running on. Headers: • `devicetype` - The devicetype (device internal name) associated with the HID entry • `manufacturer` - The manufacturer as advertised by the device. • `model` - The pretty name for the device type as it is known to UniTerm • `product` - The product as advertised by the device. • `serialnum` - The serial number as advertised by the device.
`shutdown`	Yes	Terminates execution of the UniTerm. This should be called when the application software terminates.
`modifyconfig`	Yes	Allows a select number of `ini` configuration settings to be set via the API. In order to activate the ability to use this feature, an integrator must enable the shared secret in the configuration and the connection must come from the local machine.
`version`	No	Requests the current version of UniTerm. The version information is output in human-readable format in the verbiage response field. The version information also contains the build number.
`deviceinfo`	Yes	Requests the information about the connected device. Returns response parameters of: `serialnum, device_manuf, device_model, device_app, device_appver, device_kernver`
`standin`	Yes	Perform an operation as specified by the `u_standin` key. For more information on stand in processing in general, see Section 2.4. Please reference the `u_standin` values in Section 5.2.2.
`tab`	Yes	Perform an operation as specified by the `u_tab` key. For more information on ChipTab processing in general, see Section 2.5. Please reference the `u_tab` values in Section 5.2.3.

5.2.2 Stand In Actions (`u_standin`)

The table below contains the descriptions of each possible Stand In action.

`u_standin`	description
`update`	Update metadata on file associated with a transaction. These fields can be updated: • `amount`

	• `cashbackamount` • `clerkid` • `comments` • `custref` • `examount` • `ordernum` • `ptrannum` • `stationid` • `tax`
`send`	Initiate sending stored transactions to Monetra. Transactions are sent on a configurable timer and can be triggered to start sooner with this sub action. Transactions will attempt to be sent but transactions may remain in a stored state if there are connectivity issues. Since this triggers the timer it applies to stored transactions of all users on the system. You cannot selectivity send transactions. This returns immediately and starts sending transactions as a background task within UniTerm. It does not return any indication about status of or number of transactions.
`void`	Remove a transaction that has not yet been sent online. Must pass the `ttid` returned from UniTerm.
`list`	List all stored transactions for the user returning a CSV result. These keys can be used to alter the query results (these should align with query parameters as accepted by Monetra): • `ttid` • `bdate` • `edate` • `timestamp` • `type` - (action) • `amount` • `examount` • `tax` • `card` - (cardtype) • `pclevel` • `account` - (last 4) • `expdate` • `cardholdername` • `ordernum` • `custref` • `ptrannum` • `clerkid` • `stationid` • `comments` The resulting CSV will contain these headers: `ttid,proc,type,entrymode,card,pclevel,account,amount,`

	`cardholdername,clerkid,comments,custref,expdate,`
	`examount,cashback,ordernum,ptrannum,stationid,tax,`
	`timestamp`

`totals`	Number of stored transactions and total stored amount for the requesting user. Will return these result keys: • `num_trans` - Number of transactions on file that have not yet been forwarded • `total_amount` - Total dollar amount (sum) of transactions on file, not yet forwarded
`listresp`	A CSV report with basic information about stored transaction that have been successfully sent online. The TTID returned by UniTerm when stored will appear in the `u_ttid` column and Monetra's TTID will appear in the `ttid` column. Follow up transactions, such as reversal, can continue to use the UniTerm TTID as long as the response is still on fine. It is highly recommended that the POS replace the UniTerm TTID with the Monetra TTID internally as soon as possible. The resulting CSV will contain these headers: `u_ttid,ttid,timestamp,code,verbiage`
`getresp`	Get the Monetra response for a stored transaction that was successfully sent online. This will return the full key value pair result returned by Monetra. May pass the `ttid` as either the UniTerm-returned ttid or the Monetra ttid as retrieved from `u_standin=listresp`
`delresp`	Purge the Monetra response for a stored transaction that was successfully sent online. May pass the `ttid` as either the UniTerm-returned ttid or the Monetra ttid as retrieved from `u_standin=listresp`

5.2.3 ChipTab Actions (`u_tab`)

The table below contains the descriptions of each possible ChipTab action.

`u_tab`	description
`open`	Open a tab and capture customer card data. A TTID will be returned on success which is used to reference the tab for follow up sub actions. The TTID will be prefixed by 'U' to indicate the TTID is associated with UniTerm. This takes the same parameters as a `txnstart` would take such as `u_device`, `u_devicetype` and so on. Note: An amount is NOT specified on open.
`close`	Close an existing tab. If a device (via `u_device` and `u_devicetype` is not specified this works the same as force closing a tab. When using a device the customer will be prompted to accept the amount and sign if necessary. Must specify the `ttid` returned during `open`.

	If an amount is not already associated with a tab (by updating the tab) it is required to pass the amount. An amount can be passed even if an amount is on file and will be used instead of what is on file. `u_up_amount` can be used when closing a tab.
`force_close`	The transaction is sent directly to Monetra without customer interaction. Useful when a customer leaves without explicitly closing their tab. See `close` for details about required and optional parameters.
`update`	Update metadata on file associated with a transaction by specifying the `ttid` associated with the tab. These fields can be updated: • `amount` • `cashbackamount` • `clerkid` • `comments` • `custref` • `examount` • `ordernum` • `ptrannum` • `stationid` • `tax` Additionally, tabs can have the stored amount increased or decreased using the `u_up_amount` key. Positive numbers will increase and negative will decrease. This is useful if the POS wants UniTerm to track the tab amount instead of tracking itself. For example, the current amount is $15.00. Sending `u_up_amount=2.00` will change the current amount that is stored to $17.00. Next, sending `u_up_amount=-3.00` will reduce the amount to $14.00. Note: `u_up_amount` is different than `amount`. Amount is the total and sending this key will replace the current value. `u_up_amount` modifies the current amount.
`void`	Deletes a tab. The tab is closed but never sent online for authorization. Must specify the `ttid` from the `open` request.
`list`	List all tabs for the user returning a CSV result. These keys can be used to alter the query results (these should align with query parameters as accepted by Monetra): • `ttid` • `bdate` • `edate` • `timestamp` • `type` - (action) • `amount` • `examount` • `tax` • `card` - (cardtype)

	• `pclevel` • `account` - (last 4) • `expdate` • `cardholdername` • `ordernum` • `custref` • `ptrannum` • `clerkid` • `stationid` • `comments` The resulting CSV will contain these headers: `ttid,proc,type,entrymode,card,pclevel,account,amount,cardholdername,clerkid,comments,custref,expdate,examount,cashback,ordernum,ptrannum,stationid,tax,timestamp`
`totals`	Total number of open tabs and total tracked amount of across all tabs. The total amount is only useful is using UniTerm to track the total for each tab by utilizing `u_up_amount`. If the POS is tracking amount itself and only sending the amount when closing the tab the aggregate total amount will most likely be $0.00 and not accurately reflect the outstanding total amount. Will return these result keys: • `num_trans` - Number of transactions on file that have not yet been forwarded • `total_amount` - Total dollar amount (sum) of transactions on file, not yet forwarded

5.2.4 Interchange/Rate Qualification Requirements

UniTerm cannot generate all the parameters necessary for proper interchange qualification. An integrator must ensure they are passing all the required parameters for their industry, card brand, or special processing requirements. In general, there are a few parameters of greater importance than others, those that will apply to all merchants that integrators need to ensure they are aware of. For a complete list of parameters accepted, please reference the Monetra Client Interface Protocol Specification.

The table below contains a list of the most important parameters, please keep in mind this is not a complete list:

Key	Required When	Description
`nsf`	Card Present	Required value: yes Approve transactions even if there are insufficient funds (`NSF`). Will result in a partial approval if there are insufficient funds, an `authamount` response parameter will be returned for partial authorizations. When a partial authorization is received, a merchant

		should request another payment method for the remaining funds. It is acceptable to request a reversal if no additional payment methods are possible. All card brands are requiring merchants support partial authorizations, merchants can be subjected to fines. Some issuers may return partial approvals even without this flag because of the requirements in place.
`laneid`	Card Present	The lane ID is a Mastercard requirement that each register or lane at a merchant's location be uniquely identified. This should be a numeric value no more than 8 digits in length, however some processors cannot support more than 2 or 4 digits. It should be sent on all transactions as it is not possible to know the card type prior to a request to UniTerm.
`ordernum`	Restaurant, Card Not Present, Level 2	A merchant order number is required on all card not present (mail order and ecommerce) transactions, Restaurant, and all Level2 cards such as purchase or corporate cards. Since it is not possible to know the card type prior to a request to UniTerm an Order Number should be sent on all transactions. An order number is normally alpha-numeric up to 25 characters, however for restaurant a 6 digit order number should be used
`examount`	Restaurant	Extra Amount - Tip Amount. If a tip amount is known at the time of sale it must be populated, if using UniTerm's built-in tip-prompting, this field should not be passed as UniTerm will populate it.
`zip`	Key Entered	All key entered transactions should include at least a billing zipcode for best rate qualification. Often this is best accomplished by passing a `u_flags` of `AVS`, however there may be cases where the billing zipcode is already on file and will be presented separately.
`healthcare`	`HSA, FSA, HRA`-qualified transactions	If attempting to perform a health care-qualified transaction, this must be indicated. Should also send `rxamount`, `dentalamount`, `transitamount`, `clinicamount`, `visionamount`, or `otheramount` if available.

5.2.5 Shared Secret/HMAC handling

A shared secret is used to authenticate commands that do not authenticate using a Monetra user. It is required to use a shared secret for remote connections (`localonly=no`) if unauthenticated requests need to be used. Authenticated requests such as `u_action=txnrequest` do not use the shared secret, even if originating outside the local machine.

The shared secret is used as the key to generate a transaction-specific `HMAC-SHA256` parameter sent with the requests to UniTerm. A u_id must be sent with transactions that require using the shared secret.

The following key value pairs are required when using a shared secret, their values are concatenated together for the `HMAC` calculation:

- `u_action`: UniTerm action being performed
- `u_id`: Unique identifier for this transaction
- `u_req_sequence`: A sequence number that should not repeat
- `u_req_timestamp`: Unix Timestamp. Must be within 1 minute of the UniTerm server's time.

The `u_req_hmacsha256` parameter is sent with the calculated `HMAC-SHA256` value from the above calculation.

For example, assuming a transaction with these fields:

```
u_action=version
u_id=1
u_req_sequence=1202
u_req_timestamp=1509043043
```

would use `version112021509043043` as the input to the `HMAC-SHA256`, and if the shared secret is `secret` the HMAC would calculate to:

```
C33AF5F85F28B2D0809F81493FE1192DFA3B5B86CFB34DB8C70F5504EB23BC33
```

For more information on HMAC calculation, please reference Appendix B.

Note: For `u_action=modifyconfig` requests, the `sharedsecret_mc` configuration value will be used instead.

5.3 UniTerm Response Parameters

The UniTerm module will return all standard response tags from the Monetra server such as `code=`, `cardtype=`, and so on. The additional tags listed below are for transaction flow handling, please see the EMV Receipt section for additional tags that may be returned specific to receipt formatting.

PARAMETER	VALUE
`u_emv_chip_malfunction`	(yes or not sent) = Indicates that there was a chip malfunction during EMV Complete. Note: Certain card brands require a note on the receipt stating there was a chip malfunction.
`u_need_signature`	(yes or not sent) = Monetra returns rcpt_emv_cvm which can have a value of "`sig`" saying signature is required. The u_need_signature means that a signature is required and it should be printed/obtained from the paper receipt. If an EMV requires a signature and one was not captured

	electronically, this flag indicates it should be obtained via a paper receipt.
u_errorcode	See section below.
u_cancelable	u_action=status only. Yes or No. Indicates if the current transaction state will allow a cancel to be sent. This is useful for showing and hiding a cancel button within an integration's GUI.
trackdata	u_action is txnrequest, txnstart, or cardrequest only. Also requires the ini configuration of unsupportedcard=yes. Will only be returned for non-financial cards that are returned unencrypted from the reader. Facilitates the use of manager cards as well as in-store private label gift systems that do not flow through Monetra. The u_errorcode returned with the response will always be NONFINANCIAL. Support during a txnrequest/txnstart is tailored to the use of private label gift cards and will only be returned when the cardholder selects GIFT from the payment type selection screen.
serialnum	u_action=deviceinfo only. Serial Number of connected device.
device_manuf	u_action=deviceinfo only. Device Manufacturer.
device_model	u_action=deviceinfo only. Device Model Name.
device_app	u_action=deviceinfo only. Application running on connected device.
device_appver	u_action=deviceinfo only. Version of the application running on the connected device.
device_kernver	u_action=deviceinfo only. EMV Level2 kernel version of the connected device.
device_encryption	u_action=deviceinfo only. Encryption type used by device, if any.
u_needreboot	u_action=deviceupload only. Will return "yes" when a device reboot is needed for the action performed to take effect.
u_signature	u_action=reqsignature only. Will return base64-encoded TIFF data representing the signature captured by the device.
u_confirmed	u_action=reqconfirm only. Will return "yes" or "no" depending on if the user confirmed the dialog.
u_input	u_action=reqinput only. Will return the user-entered data.
u_tip	u_action is txnrequest or txnfinish. Will return the tip amount chosen by the cardholder.

u_cashback	u_action is txnrequest or txnfinish. Will return the Cash Back amount chosen by the cardholder.
u_wasfood	u_action is txnrequest or txnfinish. Will return a boolean value indicating if the cardholder selected EBT Food Stamps (SNAP).
u_status	u_action is status. Machine readable status code. See UniTerm Status Codes.
u_represent	u_action is status. Machine readable reason code for why card representment is being requested. See UniTerm Representment Codes.
u_flowflags	u_action is txnrequest, txnstart, or txnfinish. Pipe-delimited flags to provide integrators more insight into possible actions UniTerm has taken. • SIGCAPTURED - Signature was captured • REVERSED - The transaction was approved but then reversed. This is typically due to the customer canceling the transaction, or the card declined the transaction.
u_standin	If transaction was the result of a Stand-in, this response parameter will be returned with a value of yes.

5.4 UniTerm Error Codes

Errors will be returned in the u_errorcode field. Each error code may be used for more than one error type. Please see the verbiage response for more details. Note: On a successful transaction the u_errorcode will be set to SUCCESS but that only indicates communications with the Monetra server were successful. It does not mean the transaction was approved.

u_errorcode	definition
FAILURE	Generic Failure
SUCCESS	UniTerm successfully processed the transaction. This does not, however, mean the transaction was approved.
MISSING_PARAM	A required parameter was missing.
INVALID_PARAM	A specified parameter was invalid
PENDING_TRAN	pending transaction already in progress
UID_NOT_FOUND	A u_id was specified on a status or cancel request and no such u_id is actively being processed.
NONFINANCIAL	The card presented is not a financial card. This code will be returned when requesting and returning trackdata for non-financial cards when the configuration of unsupportedcard=yes is set.
INVALID_USE	Typically means parameters specified should not have been specified together.
INTERNAL_ERROR	UniTerm has encountered an internal problem.

`PERMISSION_ERROR`	The user account within Monetra was misconfigured.
`MONETRA_ERROR`	There was an error communicating with Monetra.
`MONETRA_PROC_ERROR`	The processor returned an error.
`MONETRA_DATA_MISMATCH`	Data received from Monetra is in wrong format or expected data is missing.
`MONETRA_CONNFAIL`	Connection to Monetra failed.
`MONETRA_TIMEOUT`	Monetra response timed out.
`DEVICE_INUSE`	The device specified is being used by another transaction.
`DEVICE_ERROR`	There was an error communicating with the card entry device.
`BAD_READ`	The device returned a card read error.
`MAC_FAILURE`	The transaction was rejected because the MAC returned from the processor did not match the expected value.
`EMV_CARD_DENY`	The card locally declined the transaction.
`EMV_CARD_REMOVED`	The card was removed before the end of the transaction.
`CARD_NOT_SUPPORTED`	The card presented was not supported.
`DEVICE_NOT_LOADED`	The device needs to be loaded before it can run EMV transactions.
`FALLBACK_NOTALLOWED`	There was an error reading the chip and the card brand rule does not allow the card to be re-presented via another means.
`CANCELED`	User canceled request
`TIMEOUT`	Timeout waiting for user input or device response.
`TRY_AGAIN`	Transaction cannot be completed at this time, retry.
`DBFAILURE`	Database has encountered an error.
`INI_CANNOT_FIND`	The `uniterm.ini` could not be found.
`INI_CANNOT_READ`	The `uniterm.ini` is not readable by the UniTerm process.
`INI_CANNOT_PARSE`	The `uniterm.ini` format is invalid.
`INI_CANNOT_WRITE`	The `uniterm.ini` is not writable by the UniTerm process.
`INI_INVALID_PARAM`	The `uniterm.ini` has an invalid configuration parameter.

5.5 UniTerm Status Codes

Status codes returned via the `u_status` response parameter. Each status code may be a generalization used for more than one phase of the transaction flow. Please refer to the `verbiage` response parameter for a more descriptive human-readable status message.

`u_status`	definition
`WORKING`	Generic status say UniTerm is processing.
`CARD_IST`	Waiting for card presentation (Insert, Swipe, or Tap). With an EMV card, the card could be inserted and waiting for customer to choose language.

`CARD_IT`	Waiting for card presentation (Insert or Tap). With an EMV card, the card could be inserted and waiting for customer to choose language.
`CARD_IS`	Waiting for card presentation (Insert or Swipe). With an EMV card, the card could be inserted and waiting for customer to choose language.
`CARD_ST`	Waiting for card presentation (Swipe or Tap), non-EMV.
`CARD_I`	Waiting for card presentation (Insert only). With an EMV card, the card could be inserted and waiting for customer to choose language.
`CARD_S`	Waiting for card presentation (Swipe only).
`CARD_T`	Waiting for card presentation (Tap only).
`EMVFLOW`	EMV processing. Typically waiting for customer to enter their PIN.
`KEYED`	Waiting for keyed account and related (zip, cvv).
`PIN`	Waiting for PIN entry. This may not be presented for EMV cards as the device may handle this internally.
`CARDCLASS`	Waiting for card class selection (Debit, EBT, Gift prompting)
`TIP`	Waiting for tip entry.
`CASHBACK`	Waiting for cash back entry.
`SIGNATURE`	Waiting for signature.
`EMVCOMPLETE`	EMV processing is completing.
`CONFIRM`	Waiting for user confirmation.
`CONFIRMAMOUNT`	Waiting for user to confirm the transaction amount.
`CONFIRMFOOD`	Waiting for user to confirm the food amount.
`CONFIRMRETRY`	Waiting for user to confirm to retry the transaction after a failure.
`INPUT`	Waiting on customer input (e.g. phone number).
`MONETRA`	Communication with Monetra. Typically waiting on a response from Monetra.
`REMOVECARD`	Waiting for card removal.
`REVERSAL`	Reversing transaction (typically due to card decline).
`DEVICEPRINT`	Printing receipt on device.
`DEVICEOPEN`	Waiting for device to open.
`DEVICECLOSE`	Waiting for device to close.
`DEVICEREBOOT`	Rebooting device.
`CANCEL`	Canceling transaction or operation.

5.6 UniTerm Representment Codes

Representment codes returned via the `u_represent` response parameter. This response parameter gives a reason that card representment is being requested.

`u_represent`	definition
`BAD_INSERT`	Chip Read Failure. Could be bad card, card inserted backwards or upside-down, or customer removed the card too early.
`BAD_SWIPE`	Failure reading Magnetic card data. Possibly damaged card or customer swiped too quickly.
`BAD_TAP`	Failure reading NFC card data. Possibly damaged card or customer did not hold the card close enough to reader for a long enough period of time.
`CHIP_CARD_SWIPED`	Customer attempted to swipe a chip card instead of inserting it.
`OVER_TRAN_LIMIT_TAP`	Transaction exceeds maximum dollar amount, tap is not allowed.
`RETRY`	Retry for some other generic failure reason.
`UNSUPPORTED_CARD`	Card presented is not usable. Try a different entry method or card.

5.7 Tip Prompting

UniTerm supports prompting the cardholder for a tip amount at the time of payment when the `[uniterm] tippercent` configuration setting is configured and the `NOTIP` `u_flags` parameter is NOT provided.

When a customer has chosen to add a tip amount to a transaction, the `amount` provided by the POS to UniTerm will be incremented to reflect the tip amount and the `examount` will be populated with the tip amount when the transaction is sent to Monetra.

In the response returned by UniTerm, the tip amount will be provided to the POS in the `u_tip` response parameter.

> Note: Special care should be taken to validate if the `authamount` response parameter is returned, indicating a partial authorization occurred, that split tender operations can occur. When prompting for a second payment method, an integrator should use the `NOTIP` `u_flags` in order to avoid tip prompting on the second method of payment, and respect the returned `u_tip` response for the chosen tip amount from the original response.

5.8 Cash Back Prompting

UniTerm supports prompting a cardholder if they would like to request Cash Back when presenting a Debit or EBT Cash Benefits card for payment. UniTerm will automatically perform such prompting if the `[uniterm] cashbackamount` configuration parameter is set and the `NOCASHBACK` `u_flags` parameter is NOT set. The `[uniterm] cashbackmax` configuration parameter can be used to limit the amount of Cash Back that can be requested.

When a customer has chosen to request Cash Back with a transaction, the amount provided by the POS to UniTerm will be incremented to reflect the Cash Back amount and the cashbackamount parameter will be populated with the Cash Back amount when the transaction is sent to Monetra.

In the response returned by UniTerm, the Cash Back amount will be provided to the POS in the u_cashback response parameter.

Note: Special care should be taken to validate if the authamount response parameter is returned, indicating a partial authorization occurred. If the returned amount is less than the requested amount plus u_cashback then the POS must decide on the proper course of action. For instance if the authamount is greater than requested, but less than the amount plus u_cashback then partial Cash Back would be provided to the cardholder. Otherwise if the authamount is less than the requested amount, then the u_cashback returned should be completely ignored and the POS would need to prompt the cardholder for another method of payment.

5.9 EBT Processing

UniTerm supports prompting if the card presented is an EBT card. If the u_foodamount parameter is populated with a non-zero dollar amount indicating the amount of the transaction that applies to qualified food purchases (or for txnstart with a value of maybe), then the customer will also be prompted if they would like to use Food Stamps (SNAP) or Cash Benefits to complete the transaction. When the cardholder makes the selection, UniTerm will internally rewrite the action=sale request parameter to action=ebtfssale or action=ebtcbsale as appropriate.

For txnstart transactions where u_foodamount=maybe, the integrator must send a valid u_foodamount value with txnfinish otherwise the transaction will be aborted.

If Food Stamps (SNAP) was selected, u_wasfood will be returned as yes/true to indicate this. If the requested amount is greater than u_foodamount, then a partial authorization will be returned (as indicated by the the authamount response parameter) indicating the amount of the authorization was less than the requested. This returned authamount may be less than the u_foodamount if there are insufficient funds, otherwise it will be equal to the u_foodamount requested.

If a partial authorization is performed, the merchant should perform a split-tender operation and prompt for another method of payment for the remainder, which may also be EBT. The requested amount and u_foodamount need to be adjusted accordingly on the next request based on the amounts previously authorized.

5.10 QuickChip

The card brands have coined the term QuickChip to refer to the modification of the EMV flow to reduce the amount of time a card must stay in the terminal, allowing the card to be presented as early as possible. The goal of QuickChip is to ensure no additional delay to the overall checkout process is incurred for EMV transactions when compared to an MSR transaction. It also is more similar to the existing MSR flow that customers may be acquainted with.

QuickChip is only available in the US Market, the card brands have not yet allowed this flow in other markets.

In order to use QuickChip with UniTerm, an integrator must use the `txnstart` and `txnfinish` messages rather than the `txnrequest` message. When the merchant opens the order to add items for purchase, they will immediately send the `txnstart` message, which will not contain an amount since the final amount is not yet known. Once the card holder has presented their card and completed any necessary cardholder verification, and removed their card, a response will be returned to the merchant. Once the final amount is known, the merchant will send a follow-up `txnfinish` message with the final amount and the transaction will go online for approval and the merchant will be returned all the receipt data just as if the request was a `txnrequest`.

If the amount is known at the time of the order, then the non-QuickChip `txnrequest` message should be used.

5.11 Pay at the Table

UniTerm provides all the tools needed for an integrator to support Pay at the Table. Though the method an integrator might choose can vary from system to system, we have outlined a suggested flow that should work for most environments when integrators choose to use a payment device specifically meant for pay at the table without necessitating the need for the use of an additional device such as a tablet. Those integrators that choose to use a tablet for pay at the table will not use the information contained in this section as the flow, in relation to UniTerm, would more closely resemble the standard Pay at the Counter flow.

The below flow assumes the customer will be entering their own invoice number, but a clerk may choose to perform that step on their behalf if there is only one ticket associated with the table.

- Print one or more detailed meal tickets for the table (split checks), and ensure a unique numeric order number for the day appears on the ticket. It is suggested these ticket numbers be 6 digits in length and randomly, not sequentially, generated to help prevent typos matching another open ticket. Deliver the tickets along with a payment device to the table, such as an `Ingenico IWL250` that is wireless and contains a built-in receipt printer.
- Send a `u_action=reqconfirm` request with a useful message/instruction to the user such as "`u_message=Enter ticket number from top of ticket on next screen.`", wait on a response. Ignore the actual response returned.
- Send a `u_action=reqinput` with `u_input=INVOICENUM` and wait on a response.
- Look up the requested Invoice, and assuming it is found and not already paid, request the user confirm it is the right ticket and amount using `u_action=reqconfirm`, when the user accepts the dialog, precede to the next step, if rejected, start over. If the invoice was not found, use `u_action=reqconfirm` to send back an error and restart the flow.
- Start the payment flow with `u_action=txnrequest` as you would in a normal clerk-attended environment. Tip prompting, etc will take place if UniTerm is configured to do so. On error or user cancellation, restart the flow, otherwise continue to the next step.

- If a signature is required, and the device does not support signature capture, format a receipt for the printer size on the device and send `u_action=deviceprint` with the `u_text` set to the plain text, pre-formatted, MERCHANT receipt data with a signature line.

- If a merchant receipt was printed, and the device being used does not have an automatic cutter, then you should prompt the user for how to tear the receipt then press enter to continue using the `u_action=reqconfirm`, and ignore the result of the request.

- Format a receipt for the printer size on the device and send `u_action=deviceprint` with the `u_text` set to the plain text, pre-formatted, CUSTOMER receipt data (no signature line).

- Start the flow over for more tickets.

5.12 Signature Capture

During a transaction, if UniTerm decides a signature is necessary to complete a transaction and the device is capable of capturing a signature, UniTerm will automatically prompt for signature and save it with the transaction. The signature will be kept on file for as long as the record of the transaction is kept on file. All signatures are stored in the `TIFF` image format within Monetra and may be retrieved via the `action=admin, admin=getimages` function call. Please see the "Protocol Addendum: Signature Capture/Storage" for Monetra for more information.

Note: Some devices, especially mobile devices, or web browsers may not natively support displaying the `TIFF` image format. It is recommended to use an open source library such as `ImageMagick` to assist in the conversion for display purposes.

6 EMV transactions with UniTerm

EMV transactions, by nature, are much more complex than traditional magnetic stripe transactions. UniTerm hides this complexity from the application software. In the case of magnetic stripe and EMV transaction, the application software will send the request to UniTerm. The device capabilities (EMV for example) will be determined by UniTerm, along with the merchant account configuration. From these UniTerm will handle the appropriate prompting and flow aspects related to the determined capabilities. The application software simply needs to send a `u_action=TXNREQUEST` and let UniTerm handle the rest.

6.1 Transaction Flow and Prompting

Integrators unfamiliar with EMV may notice some specific flow cases that seem counter-intuitive at first. This section is meant to address these EMV-specific cases.

6.1.1 Swipe prompts to insert

If a chip-enabled card is swiped on an EMV-capable terminal, it is mandated that the user be prompted to insert the card. This is an EMV certification requirement which cannot be lifted and it is meant to train consumers to insert their cards and to prevent fraud.

6.1.2 Tap prompts to insert

There are certain thresholds negotiated between the card and terminal which may request a chip-enabled card that is presented as a tap transaction be inserted instead. When this occurs, it can be due to a number of factors including fraud mitigation, or the card has determined it needs to be updated (for insert transactions, an issuer can choose to return issuer scripts to remotely reprogram cards).

6.1.3 Insert prompts to swipe

If a chip-enabled card is prompted to be swiped, this is usually an indication that there was a chip malfunction and the cardholder should have their card replaced, called a technical fallback. It is expected at some point in the future, technical fallback will be disallowed due to fraud concerns. The other possibility is if the application id in use by the card is not supported by the terminal.

6.1.4 PIN required on Credit Cards

The cardholder verification method is negotiated between the card and the terminal. If both the card and terminal support PIN entry, it may be chosen as the desired verification method. Consumers in the US may not expect to enter a PIN on their credit cards, but it is common among foreign cards.

6.1.5 Signature not requested

The cardholder verification method is negotiated between the card and the terminal. They may negotiate Signature, PIN, or what is called `NoCVM` which means no cardholder verification is required for the transaction. The decision is strictly made based on the terminal capabilities and card capabilities.

6.1.6 Tap transaction run as MSR on chip card, no insert requested

It is a requirement by the card brands that if a chip-capable card is presented as a tap that the card NOT be prompted for insertion. This can happen due to a terminal not being configured for contactless EMV support, or if a chip is malfunctioning.

6.1.7 Immediate decline without contacting the processor

EMV cards have the ability to make decisions about the transaction before it is even processed. From time to time a merchant may see a chip card presented that results in an immediate decline before requesting cardholder verification or connecting to a processing institution. This could happen because the card has exceeded some internal threshold, or the card has received a remote script on a previous transaction to explicitly block transactions, such as a card block or application block.

6.2 Common questions

6.2.1 How do I add a gratuity/tip to a transaction?

Tips are added to EMV authorizations just as they are with MSR authorizations, nothing has changed in the US rules. An integrator will simply send a `preauth` with the order amount, then when the tip amount is known, a `preauthcomplete` will be sent with the final order amount and `examount` will contain the tip amount. However, if the tip is greater than 20%, merchants should obtain a new authorization for the tip according to the card brand rules. Of course if the tip amount is known prior to the authorization, the tip amount should be included a part of the authorization request.

There is much confusion regarding tips in the US market with the introduction of EMV Chip and Pin, most of this is due to European rules which state the gratuity amount must be sent with the initial authorization request. This does note currently apply to the US market, however there is discussion that Mastercard may start disallowing tip modification in the future for Chip cards when using PIN verification (but, presumably, not when using Signature or NoCVM verification).

Please refer to the below card brand documentation for more information:

- http://www.mastercard.com/us/merchant/pdf/TPR-Entire_Manual_public.pdf (page 70)
- https://www.visa.com/chip/merchants/grow-your-business/payment-technologies/credit-card-chip/docs/Play_it_Smart_With_US_Chip_Payment_Transactions.pdf (page 3)

6.2.2 What industries are certified for EMV?

EMV doesn't define certifications by industry, the industry-specific data is outside of the EMV-relevant data. Instead EMV works on what they call Terminal Types.

In general, there are 2 relevant terminal types, and those are "Attended" and "Unattended". For "Attended" terminal types, this is where there is a clerk present such as a supermarket, normal retail location, or restaurant. "Unattended" terminal types are used in Self Serve terminals such as kiosks or fuel pumps.

Examples of "Attended" industries in Monetra are "Retail", "Restaurant" and "Lodging".

Examples of "Unattended" industries in Monetra are "Retail Self Serve" and "Automated Fueling".

Please see the Certifications section for what devices and processors are certified for "Attended" vs "Unattended" to see what is currently supported. As long as the industry you support falls into the "Attended" or "Unattended" category that has an EMV certification for the given device and processor you choose, and Monetra itself supports the desired industry for the given processor, then it is a supported configuration.

7 Storage, Key Management, and Logging

UniTerm v9 introduced a database backend for caching merchant and transaction data for offline processing, as well as logging facilities for monitoring and inspection of transaction processing.

7.1 Database Storage, Security, and Key Management

UniTerm supports data storage to just about any database backend, though the most commonly deployed is SQLite due to its zero-configuration nature. All sensitive data is encrypted prior to hitting the database layer using field-level encryption. Database functionality is facilitated by the `mstdlib` open-source library available at: https://github.com/Monetra/mstdlib. The location of data storage is defined in the database configuration Section 4.2.4.

The UniTerm database serves two purposes. The first purpose is as a caching front-end for all of the loading data necessary to operate a terminal. This includes, but is not limited to, merchant metadata (name, address), EMV terminal parameters (AIDs, CAPKs), and card BIN tables. The second purpose is for Stand-in authorizations and ChipTab support, where sensitive cardholder data is stored until authorization, as well as tracking of metadata after authorization.

Data is cached to disk from Monetra to limit necessary round-trips which may add latency, especially if UniTerm is frequently stopped and restarted (as is the case on Mobile devices to conserve power), as well as facilitating offline terminal loading. Cache refresh times vary, but in general merchant-specific settings are refreshed every 24hrs and Monetra-specific parameters such as large BIN tables may not be updated more than once per week. UniTerm will forcibly re-cache merchant data if a `u_action=deviceload` request is sent.

For Stand-in and ChipTab support, sensitive cardholder data is stored encrypted using `AES-256-CBC` in the `stored_trans` table per key/value pair. The `AES` key used is an ephemeral key generated for that specific transaction, and is stored in the same `stored_trans` table in the `e_id` key mapping which itself is encrypted using a merchant-specific `RSA` public key retrieved from Monetra (but not private key which is generated by and private to Monetra) utilizing its validated CardShield subsystem. Once the transaction is encrypted, all in-memory traces are wiped and UniTerm can no longer access the sensitive cardholder data which can now only be decrypted by the Remote Monetra instance holding the `RSA` private key. The merchant-specific `RSA` public keys are stored in the `stored_keys` table and are rotated automatically every 10-12 days. After authorization, all transaction request data is purged from the database. Data after authorization may be stored in Monetra and is up to the administrator of the remote Monetra system to configure retention periods as per customer requirements.

Note: Even when using an encrypting reader, the encrypted output will be re-encrypted using the above method before being stored to the database.

For offline operation, requests must still be authenticated, therefore the last successfully validated password for the merchant is recorded to the `user` table using the secure hashing mechanism `PBKDF2-SHA256` and the number of rounds as specified in the `password_iterations` configuration parameter (default is 10000). Once the password has been validated the first time, it is then cached in memory in an `AES-256-CBC` encrypted hash table to reduce the CPU load required in re-computing the hash for verification while still staying secure from common attack vectors such as memory scrapers.

Note: There is no ability to control this card storage or key rotation behavior, it is always implemented as per above. However if a forced key rotation is desired sooner than the normal 10-12 day period, then the merchant can delete the entire UniTerm database which will force a new key to be generated for the UniTerm instance within Monetra.

7.2 Logging

The UniTerm log is a multi-purpose log format. It provides insight into the operations of UniTerm as well as a detailed audit trail of every operation performed by an end user, including, but not limited to, IP address, request types along with request and response parameters, and duration of connection. UniTerm's logging does not exist to meet any PCI requirements since UniTerm does not provide any sort of access to cardholder data that would require authentication and is generally not relevant to PCI, but rather for debuggability and insight into system function.

The UniTerm log will never log sensitive merchant or cardholder data, any data that may be considered sensitive is completely masked in the logs.

UniTerm facilitates centralized logging via remote syslog facilities, either by using a system-provided syslog API, or by directly supporting Syslog over TCP. Please see Section 4.2.5 for more information on available logging configuration parameters.

PCI DSS mandates that logging of all modifications to system level objects is done on systems containing payment applications. It is required that merchants deploy a logging facility such as file integrity monitoring on such payment systems to comply with this requirement. UniTerm does not provide such a facility directly, and is an external requirement which must be implemented by the merchant.

Note: There is no ability to configure UniTerm to log in an insecure manner. The default logging levels are recommended and validated to be PCI compliant.

7.3 External Data Storage

If the merchant backs up the UniTerm database or otherwise stores sensitive data outside of the controls put in place by UniTerm or Monetra, it is the merchant's responsibility to do so in a PCI DSS compliant manner for the customer-defined retention period.

Note: Merchants must not back up any swap files as they may contain sensitive cardholder data meant to only exist in volatile memory.

8 UniTerm Protocol Examples

Several examples are provided below which describe how to use the UniTerm protocol.

8.1 EMV Transaction [device load]

8.1.1 UniTerm Request Data

PARAMETER	VALUE
password	test123
u_action	deviceload
u_device	USB
u_deviceidlemessage	WELCOME
u_devicetype	ingenico_cpx
u_flags	DEVICEONLY
u_id	1182112391
username	moneris_ipp320x:sub

8.1.2 UniTerm Response Data

PARAMETER	VALUE
addltermcaps	F000F0F001
addltermcaps_desired	6000F0F001
addltermcaps_loa	F000F0A001
altered_termload	yes
code	AUTH
loa_id	3C
termcaps	E0B8C8
termcaps_desired	E0B8C8

termcaps_loa	E0B8C8
termtype	22
termtype_desired	21
u_errorcode	SUCCESS
verbiage	Device loaded

8.2 EMV Transaction [Interac]

8.2.1 UniTerm Request Data

PARAMETER	VALUE
action	sale
amount	1.00
nsf	yes
ordernum	899065992
password	test123
u_action	txnrequest
u_device	USB
u_deviceidlemessage	WELCOME
u_devicetype	ingenico_cpx
u_flags	DEVICEONLY
u_id	899065992
username	moneris_ipp320x:sub

8.2.2 UniTerm Response Data

PARAMETER	VALUE
account	XXXXXXXXXXXXXXX2145
auth	221093
batch	1
cardholdername	Test Card 14
cardtype	INTERAC
code	AUTH
item	793
language	en
merch_addr1	123 STREET NAME
merch_addr2	CITY, STATE ZIP

merch_id	1625
merch_name	MERCHANT NAME
merch_phone	(888) 555-1234
msoft_code	INT_SUCCESS
pclevel	0
phard_code	SUCCESS
rcpt_acct_type	checking
rcpt_custom	refnum:660136000010017930
rcpt_emv_ac	882D8427A268E214
rcpt_emv_actype	TC
rcpt_emv_aid	A0000002771010
rcpt_emv_cvm	pin
rcpt_emv_name	Interac
rcpt_emv_tsi	7800
rcpt_emv_tvr	8000008000
rcpt_entry_mode	C
rcpt_host_ts	072315151022
rcpt_issuer_resp_code	00
rcpt_resp_code	001
timestamp	1437678622
ttid	992
u_errorcode	SUCCESS

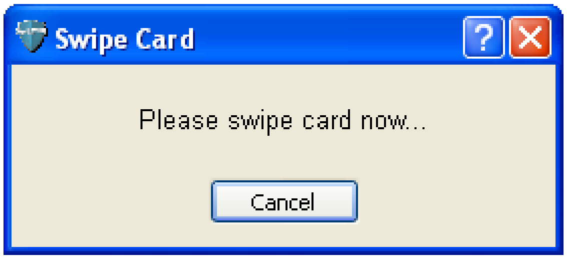
8.3 Transaction Request with EBT Food Stamp optional

8.3.1 UniTerm Request Data

PARAMETER	VALUE
action	sale
amount	10.00
u_foodamount	5.00
nsf	yes
ordernum	899065992
password	test123
u_action	txnrequest
u_device	HID
u_devicetype	ingenico_rba

u_id	899065992
username	transarmor_isc250:sub

8.3.2 GUI output



Please swipe card now...

8.3.3 UniTerm Response Data

PARAMETER	VALUE
account	XXXXXXXXXXXX0027
auth	412303
batch	15
cardtype	MCDEBIT
code	AUTH
item	139
merch_id	0993
msoft_code	INT_SUCCESS
pclevel	0
phard_code	SUCCESS
rcpt_entry_mode	S
timestamp	1437678765
ttid	200
u_errorcode	SUCCESS

9 UniTerm Test Application

Included with the UniTerm software distribution is a test application known as "UniTerm Tester". This test application is a simple graphical user interface which may be used to test the various functionality in UniTerm. This utility should be used by developers exploring the functionality of UniTerm as it will provide the request and response messages from UniTerm as well as generate sample receipts for each request. The test utility can be found in the same directory as the `uniterm` executable named `unitermtester`.

10 UniTerm Code Examples

Code examples are provided help you understand how easy it is to integrate your application with the UniTerm middleware. Please see Appendix D for complete code examples.

Examples are provided for the following languages:

- Microsoft C# using libmonetra
- Microsoft C# using XML and `HttpWebRequest`
- Java using libmonetra
- PHP using libmonetra
- Microsoft VB.Net using libmonetra
- Microsoft `VBScript` using XML and `MSXML2`
- Microsoft Visual Basic 6 using libmonetra

11 UniTerm Hardware Devices (Point of Interaction Devices)

Card data is captured at the point of sale via a magnetic swipe reader or, in some cases (such as for telephone-based transactions), by manual entry of the card number via a keyboard, touch screen, or key pad. The device where card data is captured is called the Point of Interaction (POI) device or also may be referred to as the "point of capture" or "point of entry" device.

Note: The UniTerm module supports both encrypting and non encrypting POI devices. Using the UniTerm module with non encrypting devices can remove the application software (such as a POS application) from scope for the PCI Payment Application (PA-DSS) standard. Using encrypting POI devices can also reduce or eliminate PCI requirements for merchants.

11.1 Supported POI Devices

The table below describes POI devices currently supported. The column marked ENCRYPTION indicates the type of encryption the device supports (if any). CardShield encryption can be performed by a Monetra server while other types of encryption must be preformed by the transaction processor. The column marked `EMV` are devices that UniTerm can work with to perform EMV/Chip based transactions.

Note: UniTerm is currently only supporting devices which support EMV. This list may be expanded in the future to support non-EMV devices. This list also does not include keyboard-emulation devices (both encrypting and non-encrypting) which are supported when running in GUI mode.

If you are using a previous version of UniTerm which supported additional non-EMV devices, do not upgrade your version of UniTerm as those devices are not currently supported.

Model	Device S/W	u_devicetype	Notes	Encryption	EMV
Ingenico					
`iPP320 CPX`	`CPX`	`ingenico_cpx`	Canada, UniTerm v8.0 only	NONE	x
`iUP250 uCPX`	`uCPX`	`ingenico_ucpx`	Canada, UniTerm v8.0 only	NONE	x

Model	Device S/W	u_devicetype	Notes	Encryption	EMV
Ingenico RBA family (iPP320, iSC Touch 250, etc)	RBA	ingenico_rba	USA	CardShield, First Data TransArmor RSA	x
Verifone					
vx805	XPI	verifone_vx	USA	NONE	x
BBPos/Anywhere Commerce					
Chipper 2X BT/Walker C2X BT	CROS	bbpos_cros	USA, EMV Coming 2018 Q3	CardShield	

11.1.1 Ingenico RBA information

The minimum version of the RBA software load supported is 14.0.6. There are two recommended versions depending on the EMV Certification being used, please cross-reference the kernel number of the certification in use with the kernel associated with the RBA version.

A list of recommended/supported versions past and present are below:

- 23.0.2 - 5.26 kernel - UniTerm 8.4.5+ (current)
- 23.0.4 - 5.26 kernel - UniTerm 8.4.5+ (current) - "Unattended" series
- 21.5.6 - 4.67 kernel - UniTerm 8.3+ (current)
- 21.7.2 - 5.26 kernel - UniTerm 8.4+
- 21.0.2 - 5.26 kernel - UniTerm 8.4+
- 19.0.8 - 4.67 kernel - UniTerm 8.2+
- 16.0.2 - 4.67 kernel - UniTerm 8+ - no longer recommended due to contactless MSD issues
- 15.0.6 - 4.67 kernel - UniTerm 8+
- 14.0.6 - 4.67 kernel - UniTerm 8+

Note: Use of any version of RBA not explicitly listed as recommended is at the users own risk and no guaranteed support can be provided. Some features might require newer versions of RBA so it is always recommended to run the latest recommended release.

The RBA family includes all Ingenico Telium2 devices that can run the RBA (Retail Base Application) software. This includes, but is not limited to:

- iCMP
- iSMP companion
- iSMP4
- iWL250
- iPP320 - PCI PTS v3.x+ version
- iPP350 - PCI PTS v3.x+ version

- iSC Touch 250
- iSC Touch 350
- iSC Touch 480
- iUN - iUP250, iUR250, iUC150
- iUC285

11.1.1.1 Communication Methods

UniTerm supports communicating with RBA via these communication methods (given the proper cables and add-on options from Ingenico):

- USB-HID - No drivers are necessary, select HID as the device connectivity in UniTerm
- USB<>Serial Conv - Requires Telium or Jungo drivers on Windows, will show up as a virtual COM port and be used as a Serial device in UniTerm (Linux and MacOSX do not need drivers, they will show up as serial ports).
- Serial - Settings: 115200 8N1 - No flow control
- Bluetooth - Android native, on Windows it should show up as a virtual COM port and be usable as a Serial device in UniTerm.
- MFI - iOS native, Made for iOS, via BlueTooth
- Ethernet - Settings: IP server mode

Note: Not all devices support BlueTooth or USB-HID even if the menu lists it as an available option.

11.1.1.2 Device configuration

RBA devices can be configured by entering the management menu during device boot in order to set up the communication method. When a device is shipped to you, it can often be left in a state which is not compatible with the cabling being used and must be reconfigured. Please ensure you only select one of the supported communication methods as documented in the previous section.

In order to reboot a device, you may either disconnect it from power, or use the reboot key sequence. The key sequence is either the yellow CLEAR button plus the "*.,#" key or the "-" key, depending on which device is being used.

While booting, wait until the RBA splash screen appears with the scroll bars and system information. Then quickly press the management password, which by default is 2 6 3 4 and then the green ENTER key. Follow the on-screen prompts.

The communication method configuration is available via TDA -> Configuration -> Communication.

11.1.1.2.1 Contactless Support

Some devices such as the iPP320 have contactless as an optional module. It is possible when such a device is shipped to you, the optional module is installed but not activated. If you are certain the device has the necessary hardware for contactless, but contactless is not working, you may need to activate it. For the `iPP320` this can be confirmed by observing the existence of a contactless chip behind the rear door of the device. Contactless must not be enabled if the device does not have the proper hardware.

In order to enable contactless, use the key sequence documented in the prior section to enter management mode. Then navigate to `Telium manager -> Initialization -> Parameters -> Contactless` and make sure it is set to `Yes -> Internal`.

11.1.1.3 Hardware Information

It is important to ensure the device being ordered is the latest hardware revision. Ingenico often introduces newer revisions without changing the model number, however their Part Numbers do in fact differ. The easiest way to request the most recent revision is to ensure you are requesting the `PCI PTS v3` or `v4` version of the devices. Older hardware revisions comply with `PCI PTS v2` and should not be used for new deployments as you may experience issues due to limitations in the hardware.

Note: There have been recent reports of customers receiving `iPP320` units that have been sent out as `PCI PTS v2` devices. These devices do NOT support `RBA12` and higher, even though they may come with a later `RBA` release. The part number on the supported devices will start with `11`, while the part number on unsupported devices will start with `01`. If you experience lockups or unexpected behavior, please verify your device is a `PCI PTS v3` or higher device.

11.1.1.4 Forms and Images

UniTerm depends on the stock forms and images that ship by default on terminals with `RBA`. In addition, UniTerm does require a few UniTerm-specific forms and images to be available on the device. These will be generated and uploaded automatically to the device if UniTerm can not find them.

UniTerm will check if it has all the necessary forms on the first transaction run by a device. It will then load any missing forms. When loading forms is required, a message is presented on the device and there is an additional delay until the upload is complete.

It is possible for integrators to fully customize the look and feel of the forms displayed on the device. Such integrators should contact Ingenico and sign up for the developer portal available at https://developer.ingenico.us/ in order to obtain the necessary form building tools. UniTerm provides the `u_action=deviceupload` function to assist integrators in uploading any custom forms and images they have created directly from their POS. Device distributors can also assist with pre-loading forms and images prior to shipping to end users if more convenient. When uploading forms and images, the `u_filename` should only contain the filename and does not need to reference the `HOST` path on the device.

The forms used and their requirements are listed below.

Forms and Images used by UniTerm:

- `UTAD.K3Z` - The form displayed when the device is idle, also known as the "ADs" screen. This form may be customized to present an image or a series of rotating images, but must not contain buttons. The default form loaded contains a single image, UTAD.PNG (or UTAD.BMP on iUP250/iUC285 devices). It is recommended that the images created be specific to the device for best appearance even though the device will scale the image if too small or large.

- UTCCOD.K3Z - Form used for card entry / selection. The form loaded is the same as the default Ingenico CCOD.K3Z form, with the exception that the cancelenabled='true' attribute has been added to allow the cardholder to press the physical cancel button to exit the request payment screen. Integrators wishing to modify this screen need to comply with the capabilities of the stock form.

- UTCSEL.K3Z - Form used for tender selection (credit, debit, etc). The form loaded is identical to the default Ingenico PAY1.K3Z form. It is duplicated due to an Ingenico limitation that does not allow the use of the stock form when using the "on demand" command mode. Integrators wishing to modify this form must comply with the capabilities of the stock form, especially the mapping of the button names available (e.g. Bbtna - debit, Bbtnb - credit, etc).

- MSG.K3Z - Form used to display single line messages. This is a stock form, any replacements should adhere to the capabilities of the stock form.

- MSGTHICK.K3Z - Form used to display double line messages. This is a stock form, any replacements should adhere to the capabilities of the stock form.

- AMTV.K3Z - Form used to display confirmation prompts, both for arbitrary prompts and amount confirmation. This is a stock form, any replacements should adhere to the capabilities of the stock form.

- UTASEL.K3Z - Form used to display tip and Cash Back prompts, based on the cashba.K3Z stock form. Button IDs must be:
  - O - Other
  - N - No (won't be shown on smaller devices)
  - A - Amount 1
  - B - Amount 2
  - C - Amount 3

- Ingenico may internally call additional forms during the EMV payment processing flow. For information on how to customize these screens, integrators should contact Ingenico.

11.1.1.5 First Data TransArmor RSA Encryption

The Ingenico devices support First Data's TransArmor RSA encryption. TransArmor is First Data's P2PE encryption solution along with tokenization which must be enabled on the account both within First Data's systems as well as within Monetra. When configuring a Monetra account for TransArmor encryption, set the Encryption merchant configuration value to IngenicoRSA.

As part of the device loading procedure, a key request will be made to Monetra which will request the current key to use from First Data's systems. Monetra will then send that key identifier to takeys.monetra.com:443 to look for an available signed package to load onto the Ingenico device. Due to limitations in the Ingenico `TransArmor` implementation it is not possible to directly load the key from First Data's systems into the device. If the requested key package is not yet available, the existing key will be continued to be used until which time the updated package is made available.

`TransArmor` keys typically expire after 2 years, and new keys will be provided 90 days prior to expiration. All terminals on a given merchant account will share the same RSA public key.

11.1.1.6 Updating RBA firmware with UniTerm

As of UniTerm v8.2, firmware updating is supported through UniTerm. As part of the `RBA` integration kit provided by Ingenico, there are firmware files provided for multiple upgrade options. The format supported by UniTerm is the `OGZ` format, which is a single-file firmware update. Each device in the `RBA` family has its own firmware file. For instance, an `iSC 250` cannot use the same firmware file as an `iPP320`.

Upgrading should take place via `USB<>Serial Conv` mode if possible. `USB-HID` mode will add significant time (20+ minutes) to the upgrade process. `Ethernet` mode is quick, but it is known that if a device is configured with a static IP address, the firmware update may reset the device to `DHCP`.

The firmware files are not currently provided by Main Street Softworks, and must be obtained directly from Ingenico. This may change in the future to further aid integrators with deployment updates.

Note: Upgrading the firmware can take several minutes and may wipe all custom settings (including encryption), forms, and images. Only firmware upgrading is tested and supported, downgrading is not recommended. It is also only recommended to update to firmware versions which have been approved for use by UniTerm to ensure compatibility. Please ensure power is not unplugged during an upgrade or the device could be required to be sent in for repair.

Provided below is the recommended steps to perform in order to upgrade the `RBA` firmware via UniTerm.

1. Request the current device model and `RBA` version via the `u_action=deviceinfo` command. Ensure the current firmware version needs to be updated before continuing, take note of any additional information returned such as the encryption type.

2. Locate the proper `OGZ` for the desired `RBA` version to load for the device model and send it to UniTerm via the `u_action=deviceupload` command. The upgrade process may take 5 minutes or more depending on the connectivity method used. The device will reboot and apply the update and UniTerm should return once the update is complete.

3. Perform a `u_action=deviceinfo` request to ensure the firmware was successfully updated to the desired version.

4. Perform a `u_action=deviceload` with the `u_forceload=yes` parameter to ensure UniTerm re-downloads all EMV settings to the device. The device will reboot after this process.

5. Upload any custom forms or images to the device using the `u_action=deviceupload` command. These forms or images may be uploaded one at a time, or in bulk by packaging them into a `TGZ` file.

6. Upload any security files such as encryption activation or BIN exclusion lists using the `u_action=deviceupload` command.

   If keys are loaded for Monetra/CardShield encryption, `RBA` includes a file known as `MONETRA.PGZ` or `MONXXYY.PGZ` where the `XXYY` corresponds to the `RBA` version. This file must be re-loaded in order to ensure the device outputs encrypted data otherwise all data will be output unencrypted. The encryption type loaded prior to the upgrade is returned via the `deviceinfo` request in the first step. It is important to ensure that the encryption file used is the one for the specific `RBA` version in use or the device may refuse to boot or otherwise behave in abnormal ways.

7. If any files were uploaded to the device after the `deviceload`, it is necessary to call `u_action=devicereboot` before the device is ready to be used.

11.1.1.7 SSL Client (Device -> UniTerm) Mode of operation

A `PGZ` with the client certificate needs to be loaded onto the device. Ingenico refers to the device as the server no matter how it's configured. So care must be taken with the files to ensure they're not mixed up between the device (client) and server (UniTerm). `RBA` must have a certificate signed by the same CA as the server. `RBA` does not do hostname validation and uses the CA loaded on the device for verification of the server. It is up to the integrator to generate a certificate for the device to use and the CA for verification and share this with Ingenico who will generate the `PGZ` file for the device.

If using self signed certificates, generate a CA certificate and private key. Generate a private key and certificate signing request for both the client and server. Sign each request with the CA to generate a certificate. Send the client certificate, client private key, and CA certificate to Ingenico. They will package these three files into a `PGZ` that will be loaded onto the device.

To enable SSL mode via the device menus, set:

- `TDA -> Configuration -> Communication -> Select Comm. Type -> Ethernet`
- `TDA -> Configuration -> Communication -> Ethernet Settings -> Connection Method -> Client`
- `TDA -> Configuration -> Communication -> Ethernet Settings -> DHCP` - Set Auto if using `DHCP`, or Static if not
- If using Static: `TDA -> Configuration -> Communication -> Ethernet Settings -> IP Address` - Enter IP address to use
- `TDA -> Configuration -> Communication -> Ethernet Settings -> Host IP Address` - Enter IP address of UniTerm server
- `TDA -> Configuration -> Communication -> Ethernet Settings -> Host IP Port` - Enter Port number UniTerm is configured to listen on
- `TDA -> Configuration -> Communication -> Ethernet Settings -> SSL -> Yes`

11.1.2 Verifone `VX XPI` information

The version of the `XPI` software load supported is v8.23a for running EMV transactions. Prior versions of `XPI` may work for non-EMV transactions, however this functionality has not been extensively tested. Newer versions are known to have issues which prevent them from properly functioning in some EMV test cases.

11.1.2.1 Communication Methods

UniTerm supports communicating with the Verifone `VX` via these communication methods (given the proper cables and add-on options from Verifone):

- `USB` - Requires `Vx USB Drivers` available from www.verifone.com on Windows, will show up as a virtual COM port and be used as a Serial device in UniTerm (MacOSX and Linux do not require a driver, will show up as a serial port).
- `Serial (COM1) - 9600`

When a device is shipped to you, it can often be left in a state which is not compatible with the cabling being used and must be reconfigured.

11.1.2.2 Device configuration

During device boot-up, it is possible to change the connectivity setting to match the cabling. When the `XPI` version is displayed during startup, press the `alpha` and `8` buttons simultaneously. You can then change the connectivity method by pressing the appropriate `F<n>` key.

11.1.3 Ingenico `CPX/uCPX` information

Ingenico `CPX` (attended) and `uCPX` (unattended) software loads are supported for Canadian merchants. These loads support both contact and contactless EMV processing for multiple card brands including Interac debit cards. The required software versions are `10.14` for `CPX` and `02.02` for `uCPX`.

Note: The MasterCard PayPass v2.1 kernel must be loaded into the device if supporting contactless MasterCard EMV. If the device is loaded with the PayPass v3.0 kernel, it will fail to accept PayPass transactions. Due to limitations in the Ingenico software, it is impossible for UniTerm to detect the version of the PayPass kernel in use, and the `CPX` and `uCPX` software versions are not tied to any PayPass kernel version.

11.1.3.1 Communication Methods

UniTerm supports communicating with `CPX/uCPX` via these communication methods (given the proper cables and add-on options from Ingenico):

- `USB->Serial` - Requires `Telium` or `Jungo` drivers on Windows, will show up as a virtual COM port.

- `Serial - 9600 7bits Even Parity - No flow control`
- `IP/Ethernet - Even Parity`

Note: Please contact Ingenico for assistance with configuring your device for proper communication. It is known that the on-screen menu system does NOT work when configuring Ethernet mode due to the inability to set the Parity to Even. The parity configuration is a crucial step in ensuring Ethernet connectivity is functional.

11.1.4 BBPos Chipper 2X BT/Anywhere Commerce Walker C2X BT information

The BBPos Chipper 2X BT device is supported on all platforms and is optimized for Mobile payments. The device does not have a pinpad or display. The minimum firmware version supported is 1.00.02.28.

Note: EMV certifications are currently underway and expected to be complete in Q3/Q4 2018.

11.1.4.1 Communication Methods

UniTerm supports communicating via these communication methods:

- `USB HID` - Linux/MacOS/Windows
- `Bluetooth Classic` - Android/MacOS
- `Bluetooth LE` - iOS/MacOS

11.2 Obtaining Devices

Obtaining the right device for use with UniTerm requires care to ensure a few major factors:

- Is the device supported by UniTerm?
  - Please see the prior section: Section 11.1
- Is the device certified for the Processing Institution being used?
  - Please see the next chapter: Section 12.1
- Does the device come preloaded with both the right software and version?
  - Please see section specific to the chosen device under Section 11.1 for supported software revisions running on the device.
- Is the vendor the device is sourced from able to load the appropriate keys (Pin Debit or Encryption) as required?
  - Please see the next section: Section 11.2.1

11.2.1 Where to source devices with appropriate loads and keys

Most providers of POS hardware also offer loading and injection services. It is recommended that you work with one or more providers that can offer these services to ensure smooth deployments and reduced shipping costs. When a device is ordered, other than the device model being ordered, you must also indicate the software load and version to be installed on the device. Most device manufacturers have multiple software loads available so it is essential that you adhere to any documented software requirements to ensure compatibility.

In addition to the software loads on the device, most devices will require a Pin Debit key be loaded into the device. In the US market this is a `3DES DUKPT` key used for encrypting pins. Though commonly referred to as a Pin Debit key, it is also required for EMV Credit Card Online PIN verification which uses the same infrastructure for verification of PINs. If EMV is being used, and the certification states Online PIN is used, you MUST have a PIN Debit key injected into your device. Unfortunately there are dozens of potential keys, and the correct one for the processing institution and acquirer being used must be injected into the device. You should contact your merchant account provider or acquiring bank to get the Key Serial ID needed for injecting into your device and work with your hardware provider to ensure they have that key available. Only secure key injection facilities can load PIN keys into a device, it is not possible for a merchant to load their own PIN keys.

> Note: A single processing institution may process transactions for more than one acquiring bank, and each acquiring bank may mandate their own PIN keys. It is absolutely necessary to not simply rely on obtaining a PIN key that works with your processing institution, but also one that works for the specific acquiring bank. Only your merchant account provider can assist you with identifying who your acquiring bank is and what PIN key identifier should be used.

If Point to Point Encryption is also desired, it is necessary to have your key injection facility also load that key into your device and enable the appropriate encryption support in the software to utilize the key before shipping the device. One notable exception is First Data's RSA `TransArmor` on `Ingenico RBA` devices does not need to be loaded as UniTerm can load the appropriate keys itself. If using CardShield encryption, it is necessary to have first shared a Base Derivation Key with your key injection facility from your instance of Monetra, in order for them to be able to load the key into your device and enable the support before shipping.

Some device distributors that provide loading and key injection facilities are listed below in alphabetical order:

- `JRs` POS Depot
- The Phoenix Group
- POS Portal
- Scan Source
- `TASQ`

12 Certifications and Device Configurations

12.1 Certification List

EMV Certifications are tied to specific device versions, device configurations, and software versions. During deployment, it is crucial that only certified configurations are used.

Device configurations are based on the EMV kernel version in the device. The available configurations are listed as part of the EMV LOA (Letter of Approval) for the Level 2 kernel for the device. The approval letters can be obtained from EMVCo: http://www.emvco.com/approvals.aspx?id=85

Device	EMVKern/Conf	UniTerm	Module Version	Config
Chase Paymentech				
Ingenico iPP320 CPX	4.66/3C	8.0 only (not supported on 8.2)	Paymentech Tampa 3.2.0 (Done Jan 2015)	Canada, Attended, OfflinePin, Sig
Verifone vx805	6.2.0/1C	8.0+	Paymentech Tampa 3.2.0 (Done Nov 2015)	USA, Attended, OnlinePin, OfflinePin, Sig
Ingenico RBA family	4.67/1C	8.0+	Paymentech Tampa 3.2.0 (Done Feb 2016)	USA, Attended, OnlinePin, OfflinePin, Sig
Ingenico RBA family	5.26/1C	8.4+	Paymentech Tampa 3.2.1 (Done Apr 2018)	USA, Attended, OnlinePin, OfflinePin, Sig, EMV Debit, EMV Contactless
Elavon				
Ingenico RBA family	5.26/1C	8.4+	Elavon Encompass 3.1.0 (Jan 2018)	USA, Attended, OnlinePin, OfflinePin, Sig, EMV Debit, EMV Contactless
First Data				
Ingenico RBA family	5.26/1C	8.4+	First Data Cardnet or	USA, Attended, OnlinePin,

Device	EMVKern/Conf	UniTerm	Module Version	Config
			Nashville EDC 4.1.1 (Done Dec 2017)	OfflinePin, Sig, EMV Debit, EMV Contactless
Ingenico RBA family	5.26/10C	8.4+	First Data Cardnet or Nashville EDC 4.1.1 (Done Dec 2017)	USA, Attended, Sig, EMV Debit, EMV Contactless
Ingenico RBA family	5.26/11C	8.4+	First Data Cardnet or Nashville EDC 4.1.1 (Done Jan 2018)	USA, Unattended, OnlinePin, OfflinePin, EMV Debit, EMV Contactless
Ingenico RBA family	5.26/3C	8.4+	First Data Cardnet or Nashville EDC 4.1.1 (Done Jan 2018)	USA, Unattended, NoCVM only, EMV Debit, EMV Contactless
Ingenico RBA family	4.67/1C	8.3+	First Data Cardnet or Nashville EDC 4.1.1 (Done Feb 2017)	USA, Attended, OnlinePin, OfflinePin, Sig, EMV Debit, EMV Contactless
Ingenico RBA family	4.67/1C	8.0+	First Data Cardnet or Nashville EDC 4.1.0 (Done Jan 2016)	USA, Attended, OnlinePin, OfflinePin, Sig
Verifone vx805	6.2.0/1C	8.0+	First Data Cardnet or Nashville EDC 4.1.0 (Done Feb 2016)	USA, Attended, OnlinePin, OfflinePin, Sig
Global Payments				
Ingenico RBA family	4.67/1C	8.0+	Global Payments East 3.0.0	USA, Attended, OnlinePin, OfflinePin, Sig

Device	EMVKern/Conf	UniTerm	Module Version	Config
			(Done Nov 2015)	
Verifone vx805	6.2.0/1C	8.0+	Global Payments East 3.0.0 (Done Nov 2015)	USA, Attended, OnlinePin, OfflinePin, Sig
Moneris				
Ingenico iPP320 CPX	4.66/3C	8.0 only (not supported on 8.2)	Moneris SPDH 2.0.0 (Done Oct 2015)	Canada, Attended, OfflinePin, Sig
Ingenico iUN uCPX	4.66/15C	8.0 only (not supported on 8.2)	Moneris SPDH 2.0.0 (Done Oct 2015)	Canada, Unattended, OfflinePin, NoSig
Tsys				
Ingenico RBA family	4.67/1C	8.0+	TSYS (aka Vital/VisaNet) 3.0.0 (Done Feb 2016)	USA, Attended, OnlinePin, OfflinePin, Sig
Vantiv				
Ingenico RBA family	5.26/1C	8.4+	Vantiv/ FifthThird 610 3.0.0 (Done August 2017)	USA, Attended, OnlinePin, OfflinePin, Sig, EMV Debit, EMV Contactless, PIN ByPass
Ingenico RBA family	4.67/1C	8.0+	Vantiv/ FifthThird 610 2.1.0 (Done Jan 2016)	USA, Attended, OnlinePin, OfflinePin, Sig
WorldPay				
Ingenico RBA family	5.26/1C	8.4+	RBS WorldPay TCMP 2.1.0 (Done August 2017)	USA, Attended, OnlinePin, OfflinePin, Sig, EMV Debit, EMV Contactless, PIN ByPass

Device	EMVKern/Conf	UniTerm	Module Version	Config
Ingenico RBA family	4.67/1C	8.0+	RBS WorldPay TCMP 2.0.0 (Done Feb 2016)	USA, Attended, OnlinePin, OfflinePin, Sig

12.2 Configuration Definitions

EMV configurations are strictly certified in an "all or nothing" manner. You must choose an explicit certification from the list in the prior section and all configuration parameters must be adhered to. For instance, if the certification lists both `OnlinePin` and `OfflinePin`, you cannot simply choose to support only `OfflinePin`.

The meanings of the various configurations listed in the prior section are below:

Key	Description
USA	Certified for use in the United States
Canada	Certified for use in Canada
Attended	The environment is monitored by a clerk such as Retail, Restaurant, or Lodging. Not usable in a Kiosk environment such as a parking meter or gas pump.
Unattended	The environment is NOT monitored by a clerk, for use in kiosk type environments.
OnlinePin	An encrypted PIN can be obtained from a cardholder and sent to the processor with the transaction. When supporting Online PIN it is required that the device be injected with a `3DES DUKPT` PIN key specific to the processing institution in use prior to deployment by a merchant. Note: `OnlinePin` may not be supported for all card brands of a given processing institution. UniTerm will automatically adjust support for the processor's card brand limitations where necessary.
OfflinePin	The terminal will negotiate the PIN directly with the chip embedded into the card without the need to send the PIN to the processing institution. A terminal does not need a Pin Debit key injected into it if only `OfflinePin` (and not `OnlinePin`) is supported.
Sig	Signature cardholder verification is supported. This may either be a signature capture capable device or a signature obtained via paper receipt.

A UniTerm Device Loading

When loading a device with UniTerm, UniTerm will send Monetra a list of terminal configurations from the Letter of Approval (LOA) as provided by device manufacturer for the device's EMV kernel. Monetra will compare this list to merchant defined settings. Monetra will then select a usable LOA configuration and return to UniTerm loading data which has been merged with the merchant's settings.

Some terminal loading data is mandatory and cannot deviate from a LOA configuration. Other data is merchant configurable and is allowed to be changed. Data that is configurable will be merged into an LOA configuration by Monetra based on the merchant's settings.

In the event no LOA configuration is valid for the merchant's settings then Monetra will respond with an error. Also, If the device's EMV kernel version is not certified for use with UniTerm loading will result in an error.

After a successful load the integration must check altered_termload. If it is "yes" then not all of the merchant's settings could be used and some of the values have been ignored. The integration can compare the selected values with the *_desired and *_loa values to determine what was ignored. It is the choice of the integration to either accept the load with the selected values or return an error if the merchant's setting have been altered due to being unsupported by the devices LOA configurations.

Note: If using implicit/auto device loading and not calling `u_action=deviceload` directly, an integrator will have no ability to retrieve the deviceload parameters.

PARAMETER	OVERVIEW
`altered_termload`	If no LOA configuration matches the merchant's settings a valid LOA will be used and the merchant's settings will be overridden. This indicates this has happened.
`termtype_desired`	The terminal type Monetra has determined fits the merchant's settings.
`termcaps_desired`	Terminal capabilities configured in Monetra. These are features that the merchant has selected for use.
`addltermcaps_desired`	Additional terminal capabilities configured in Monetra. These are features that the merchant has selected for use.
`termcaps_loa`	Terminal capabilities from the LOA configuration Monetra has selected.
`addltermcaps_loa`	Additional terminal capabilities from the LOA configuration Monetra has selected.
`loa_id`	The LOA configuration id Monetra has selected for use. This is the id in the device certification document for the kernel version located at: http://www.emvco.com/approvals.aspx?id=85
`termtype`	The terminal type from the LOA configuration that will be loaded into the device.

`termcaps`	Terminal capabilities from the merged LOA configuration and merchant's settings that will be loaded into the device. Note: mandatory LOA configuration data will not be changed.
`addltermcaps`	Additional terminal capabilities from the merged LOA configuration and merchant's settings that will be loaded into the device. Note: mandatory `LOA` configuration data will not be changed.

Example device load response:

```
u_errorcode = SUCCESS
code = AUTH
verbiage = Device loaded
altered_termload = no
termtype_desired = 21
termcaps_desired = E0B8C8
addltermcaps_desired = 6000F0F001
termcaps_loa = 60B8C8
addltermcaps_loa = 6000F0A001
loa_id = 18C
termtype = 22
termcaps = E0B8C8
addltermcaps = 6000F0F001
```

B HMAC Algorithm

Keyed-Hashing for Message Authentication as described by RFC-2104

HMAC provides a way to check the integrity of information transmitted over or stored in an unreliable medium, and is a prime necessity in the world of open computing and communications. Mechanisms that provide such an integrity check based on a secret key are usually called "message authentication codes" (MAC). Typically, message authentication codes are used between two parties that share a secret key in order to validate information transmitted between these parties.

Equation B.1. HMAC Mathmatical Definition

HMAC (K,m) = H ((K $\oplus$ opad) # H ((K $\oplus$ ipad) # m))

Where:

- `H` is a cryptographic hash function (SHA256 in UniTerm)
- `K` is a secret key padded to the right with extra zeros to the input block size of the hash function, or the hash of the original key if it's longer than that block size
- `m` is the message to be authenticated
- # denotes concatenation
- $\oplus$ denotes Exclusive OR (XOR)
- `opad` is the outer padding (0x5c5c5c...5c5c, one-block-long hexadecimal constant)
- `ipad` is the inner padding (0x363636...3636, one-block-long hexadecimal constant)

For more information please see RFC 2104: http://www.ietf.org/rfc/rfc2104.txt

Also, Wikipedia has a nice overview here: http://en.wikipedia.org/wiki/Hash-based_message_authentication_code

C EMV Receipt Requirements

The UniTerm application never generate receipts. It is the integrator's responsibility to generate all proper receipts for both customer and merchant retention. What constitutes a proper receipt is dependent on a number of factors such as industry, card present vs card not present, and card entry method (for card present).

The purpose of this section is to provide general information about the receipt data UniTerm will return and how to use it generate a receipt. This does not cover all aspects of receipt generation. It also does not cover processor specific formatting requirements. It is recommended to verify receipts and receipt formatting with your processor before going into production.

Also there are typically two types of receipts printed. A merchant and a customer copy. Each one will have most of the same information but there are slight differences between the two.

C.1 Receipt content

C.1.1 Base receipt content

Receipts should include the following blocks and data elements in roughly the order provided below. All data is required if returned by UniTerm, or otherwise available, unless otherwise noted.

- Merchant Info Header
  - Name - `merch_name`
  - Address - `merch_addr1, merch_addr2, merch_addr3`
  - Phone (optional) - `merch_phone`
  - Email (optional) - `merch_email`
  - Website (optional) - `merch_url`
  - Merchant ID - required by some processors. Recommended to omit or truncate, see `merch_id` response documentation for more information.
  - Lane ID (optional) - `laneid` or `stationid` request parameter.
- Transaction type - request parameter `action` or equivalent text
- Card information
  - Type - `cardtype`
  - Entry mode - `rcpt_entry_mode` - or equivalent text, some processors may have explicit mappings they require.
  - Interac Account Type - `rcpt_acct_type` or for Interac Flash (contactless) transactions, must display `INTERAC FLASH DEFAULT`. Integrators must convert the UniTerm-returned value of `checking` to `chequing` to comply with Interac requirements.
  - Masked Account Number - `account` - If using the `returnbin` feature, the first 6 digits may also be returned in the clear. It is the integrator's responsibility to ensure only the last 4 digits of the account number are provided in the clear.
- Transaction reference info
  - Date and time - `rcpt_host_ts` or `timestamp`
  - Identifier - request parameters `ordernum` or `ptrannum`
  - Additional identifiers (optional) - request parameters such as `custref`

  - `ttid` (optional) - either request or response `ttid`
  - Batch number - `batch`
  - Auth number (if authorized) - `auth`
  - Trace information - `stan`
  - Processor response code (some processors may require this) - `rcpt_resp_code`
  - Issuer response code (some processors may require this) - `rcpt_issuer_resp_code`
- Processor specific custom data - see `rcpt_custom`
- Monetary amounts
  - Tip - Request parameter `examount`
  - Tax - Request parameter `tax`
  - Cash back - Request parameter `cashbackamount`
  - Authorized Amount - `authamount` if returned, otherwise request parameter `amount`
  - Balance - `balance`
- Transaction disposition
  - Card disposition - See Card Disposition documentation
  - Partial Approval Indicator - if `authamount` returned
  - Overall disposition (approved/declined) - `code`
- Additional Print Data - `printdata`, Additional data meant to be printed on the receipt as provided by the processor. Often used for gift/loyalty programs.
- Cardholder Verification
  - Signature line (if necessary) - `u_need_signature=yes`
  - Cardholder Name, centered under signature line if a signature line is shown (optional) - `cardholdername`
  - PIN Entry - Verified by PIN or PIN Bypassed if appropriate
- EMV data
  - Application name - `rcpt_emv_name`
  - `AID` - `rcpt_emv_aid`
  - `TVR` - `rcpt_emv_tvr`
  - `TSI` - `rcpt_emv_tsi`
  - Application Cryptogram Type and Cryptogram Value (optional) - `rcpt_emv_actype` and `rcpt_emv_ac`
- Cardholder Notice (such as stating merchant vs customer copy) (optional) - see receipt examples

C.2 Receipt Data Returned by UniTerm

PARAMETER	OVERVIEW
`timestamp`	Unix timestamp representing the time and date the transaction took place, this should be used to derive the transaction date if `rcpt_host_ts` is not returned.
`rcpt_host_ts`	(REQUIRED): The time and date recorded from the processor the transaction took place. `MMDDYYHHMMSS` format. Use `timestamp` if this value is not present in the response.
`rcpt_entry_mode`	(REQUIRED): Indicates how the card data was captured. Possible values are:

	• `G:` Keyed entry (EMV Fallback) • `M:` Keyed entry • `T:` EMV Contactless • `C:` EMV Contact • `F:` Swipe (EMV Fallback) • `R:` `MSD (RFID)` Contactless • `S:` Swipe • `I:` `MICR` Check Read
`rcpt_acct_type`	Interac specific account type chosen by the customer.
`rcpt_emv_cvm`	For EMV transactions this is the cardholder verification method performed. Possible values are: • `none` • `sig` • `pin` • `pinsig` • `skipped` - Used for some contactless transactions below the `CVM` floor. • `cdcvm` - Card Holder Device verification. The user's device (usually smart phone) validated the user's identity. • `unknown` For `"pin"` and `"pinsig"` the receipt should say "VERIFIED BY PIN". For `"sig"` a signature should be captured.
`rcpt_emv_pinbypass`	Returned as true if the cardholder explicitly requested the pin to be bypassed, false or not provided at all otherwise. Receipt should say "PIN BYPASSED".
`rcpt_resp_code`	Response code returned from the processing institution.
`rcpt_issuer_resp_code`	Response code returned from the issuer.
`language`	Cardholder's language preference. The receipt should be created using this language if possible and shall contain the 2 character ISO language code.
`batch`	The batch number associated with the transaction.
`cardtype`	Monetra cardtype value. This is the value that would have been configured in supported card types for the account. Use this to take card specific action in receipt generation.

`balance`	Current balance on the card after the transaction.
`rcpt_emv_aid`	Card Application ID (AID) used
`rcpt_emv_name`	Textual name of card application used.
`rcpt_emv_tvr`	Transaction verification results.
`rcpt_emv_tsi`	Transaction status information.
`rcpt_emv_actype`	(optional). Application Cryptogram type. • `AAC` - Application Authentication Cryptogram (decline) • `ARQC` - Application Request Cryptogram (intermediate or contactless) • `TC` - Transaction Certificate (offline or final approval)
`rcpt_emv_ac`	(optional). Application Cryptogram.
`code`	Used to determine if the transaction was approved or declined.
`account`	Masked account number.
`cardholdername`	Customers name as encoded on the card.
`auth`	Authorization code.
`stan`	Processor system trace information (mainly used for pin-debit transactions).
`authamount`	If the amount authorized is different than the requested amount this is the amount that must show on the receipt. It is possible that the integration could pool multiple transactions on one receipt and in that case the `authamount` needs to be present for each card along with other card specific receipt data. Note that some processors do not allow pooling card data onto one receipt and require separate receipts per card.
`rcpt_custom`	List of comma separated key:value pairs with additional processor specific data that needs to appear on the receipt.
`u_errorcode`	On failure this will provide some information about the failure. Specifically important to receipt processing are the `EMV_CARD_REMOVED` and `EMV_CARD_DENY` values.
`u_need_signature`	Used to determine if a signature line is required.
`printdata`	Additional processor-provided data returned by some processors that is intended to be

	printed on receipts. Often used for Gift/Loyalty programs. Please consult with your processor for more information.
`issuer_decline`	Boolean (yes/no). Currently this value is only returned by `Moneris`, and is used to indicate if a decline was due to an issuer decline or a local processor decline. The purpose of this response parameter is that `Moneris` has different receipt messaging requirements based on who declined the transaction.
`merch_name`	Merchant Name if configured in merchant profile. Cached by UniTerm from `merchinfo` request and sent on every transaction response.
`merch_addr1`	Merchant Address Line 1 if configured in merchant profile. Cached by UniTerm from `merchinfo` request and sent on every transaction response.
`merch_addr2`	Merchant Address Line 2 if configured in merchant profile. Cached by UniTerm from `merchinfo` request and sent on every transaction response.
`merch_addr3`	Merchant Address Line 3 if configured in merchant profile. Cached by UniTerm from `merchinfo` request and sent on every transaction response.
`merch_phone`	Merchant Phone Number if configured in merchant profile. Cached by UniTerm from `merchinfo` request and sent on every transaction response.
`merch_email`	Merchant Contact Email if configured in merchant profile. Cached by UniTerm from `merchinfo` request and sent on every transaction response.
`merch_url`	Merchant URL or Website if configured in merchant profile. Cached by UniTerm from `merchinfo` request and sent on every transaction response.
`merch_id`	Merchant ID truncated to only the last 4 digits if available. Cached by UniTerm from `merchinfo` request and sent on every transaction response. The Merchant ID is required by some processors for EMV, though due to rampant "return fraud", we strongly discourage integrators from providing the full Merchant ID on receipts. Instead, if you choose to display the merchant id, it should display

	only the last 4 digits. This field can be used for that purpose.
merch_proc	Merchant Processing Institution (internal name) used. Cached by UniTerm from merchinfo request and sent on every transaction response. This may be used to trigger different receipt formats based on processor-specific requirements.

C.3 Receipt Data NOT Returned by UniTerm

This is information is data that may have been sent to UniTerm on the request that should be on the receipt.

PARAMETER	OVERVIEW
Transaction Type	The initiating application should know which transaction type is being preformed (Sale, Refund etc.).
Transaction Identifier	ordernum or ptrannum if present.
Additional Identifier	custref if present.
ttid	When performing a transaction such as return by ttid the referenced ttid should be present on the receipt. This will aid in tracking the original transaction that was returned.
Amount Information	• Tip - Tip amount for order as provided in the examount field in request. • Tax - Tax amount for order • Amount - Authorized amount, either the amount passed in or the partially approved amount provided in the authamount field. • Cash Back Amount - Amount of Cash Back
Card Disposition	• When u_errorcode is EMV_CARD_REMOVED, should say: "CARD REMOVED" • When u_errorcode is EMV_CARD_DENY, should say: "DECLINED BY CARD" • When rcpt_emv_cvm is pin or pinsig, should say: "VERIFIED BY PIN" • When rcpt_entry_mode is F or G, should say: "CHIP CARD SWIPED" • When authamount is returned and is not equal to requested amount, should say: "TRANSACTION PARTIALLY APPROVED" • When code is CALL, should say: "CALL ISSUER"

C.4 Signature Line Requirements

The only time a signature line is necessary when using UniTerm is when u_need_signature=yes. Internally UniTerm will handle logic to determine if the signature line is needed on the paper receipt.

When set to yes this indicates that a signature line is required on the receipt. If possible UniTerm will attempt to capture the signature thought the device. If this fails or is not possible then this value will indicate that signature is still required.

C.5 Merchant vs Customer Copy

For the most part merchant and customer receipt requirements are identical, though there are a couple of minor exceptions.

Merchant receipts must NOT contain a balance line

Customer receipt must not contain a signature line

C.6 `Moneris` Requirements

`Moneris` has additional receipt requirements that are not covered by this section due to direct contradictions with requirements as provided by other processing institutions and the card brands themselves. The receipt requirements documented are insufficient to comply with `Moneris` requirements but do comply with the card brand requirements. The additional requirements imposed are specific to `Moneris` and appear to be arbitrary, a large enough merchant might be able to negotiate different receipt formats since there is no industry regulation being followed.

If intending to work with `Moneris`, it is required that integrators create a custom receipt template specific to `Moneris` that is used only on `Moneris`, and a separate template that is used for all other processors. Integrators must contact `Moneris` directly to receive their receipt formatting requirements. UniTerm does return sufficient data to format the `Moneris`-specific receipts, it simply may require some data to be manipulated, formatted, or translated to different languages to comply with their requirements.

C.7 Receipt Examples

Main Street successfully certified EMV, across several processors, using the examples provided below. Note these examples were designed to format properly on a common 25 character receipt printer.

Note: Receipt requirements required for the card brands for EMV and various processors tend to be very strict. We strongly recommend integrators make their receipts resemble those of the examples as closely as possible. Any divergence from the receipt examples provided below may require you seek validation of such receipts from your processor.

C.7.1 EMV Insert, Signature Required

C.7.1.1 UniTerm Response Data

PARAMETER	VALUE
account	XXXXXXXXXXXX0119
auth	152013
batch	1
cardholdername	VISA ACQUIRER TEST/CARD 01
cardlevel	VISA_TRADITIONAL
cardtype	VISA
code	AUTH
item	27
language	en
merch_addr1	123 STREET NAME
merch_addr2	CITY, STATE ZIP
merch_id	1834
merch_name	MERCHANT NAME
merch_phone	(888) 555-1234
merch_proc	GLOBALPAY
msoft_code	INT_SUCCESS
pclevel	0
phard_code	SUCCESS
rcpt_custom	REC #:000027,TRN REF #:355724280069888,VAL CODE:BBCD
rcpt_emv_ac	8F73ED36C8F2C099
rcpt_emv_actype	TC
rcpt_emv_aid	A0000000031010
rcpt_emv_cvm	sig
rcpt_emv_name	CREDITO DE VISA
rcpt_emv_tsi	F800
rcpt_emv_tvr	0280008000
rcpt_entry_mode	C
rcpt_host_ts	092215174640
rcpt_issuer_resp_code	00
rcpt_resp_code	000
stan	378222
timestamp	1442944083
ttid	29

u_errorcode	SUCCESS
u_need_signature	yes
verbiage	AP

C.7.1.2 Example Receipt

```
      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 1834         Lane: 1
VISA                    C
Card:    XXXXXXXXXXXX0119
Time:   09/22/15 17:46:40
Order #:             1842
TTID:                  29
RespCode:          00/000
Auth: 152013     Batch: 1
STAN:              378222
REC #:             000027
TRN REF #:355724280069888
VAL CODE:            BBCD

AMOUNT:              1.00

        APPROVED

SIGNATURE

X________________________
 VISA ACQUIRER TEST/CARD
           01

CARDHOLDER WILL PAY CARD
   ISSUER ABOVE AMOUNT
 PURSUANT TO CARDHOLDER
        AGREEMENT

CREDITO DE VISA
AID A0000000031010
TVR 0280008000
TSI F800
TC 8F73ED36C8F2C099

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      MERCHANT COPY

------

      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE
```

```
MID: 1834         Lane: 1
VISA                    C
Card:    XXXXXXXXXXXX0119
Time:   09/22/15 17:46:40
Order #:             1842
TTID:                  29
RespCode:          00/000
Auth: 152013     Batch: 1
STAN:              378222
REC #:             000027
TRN REF #:355724280069888
VAL CODE:            BBCD

AMOUNT:              1.00

        APPROVED

CREDITO DE VISA
AID A0000000031010
TVR 0280008000
TSI F800
TC 8F73ED36C8F2C099

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      CUSTOMER COPY
```

C.7.2 EMV Insert, PIN Verified

C.7.2.1 UniTerm Response Data

PARAMETER	VALUE
account	XXXXXXXXXXXX0036
auth	602664
batch	1
cardholdername	VISA ACQUIRER TEST/CARD 03
cardlevel	VISA_TRADITIONAL
cardtype	VISA
code	AUTH
item	7
language	en
merch_addr1	123 STREET NAME
merch_addr2	CITY, STATE ZIP
merch_id	1834
merch_name	MERCHANT NAME
merch_phone	(888) 555-1234
merch_proc	GLOBALPAY
msoft_code	INT_SUCCESS
pclevel	0
phard_code	SUCCESS
rcpt_custom	REC #:000007,TRN REF #:638114437174992,VAL CODE:BBCD
rcpt_emv_ac	2F0346EBCA494BF4
rcpt_emv_actype	TC
rcpt_emv_aid	A0000000031010
rcpt_emv_cvm	pin
rcpt_emv_name	CREDITO DE VISA
rcpt_emv_tsi	F800
rcpt_emv_tvr	0080008000
rcpt_entry_mode	C
rcpt_host_ts	092215172258
rcpt_issuer_resp_code	00
rcpt_resp_code	000
stan	563536

timestamp	1442942662
ttid	7
u_errorcode	SUCCESS
verbiage	AP

C.7.2.2 Example Receipt

```
      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 1834         Lane: 1
VISA                    C
Card:    XXXXXXXXXXXX0036
Time:   09/22/15 17:22:58
Order #:             5705
TTID:                   7
RespCode:          00/000
Auth: 602664     Batch: 1
STAN:              563536
REC #:             000007
TRN REF #:638114437174992
VAL CODE:            BBCD

AMOUNT:            337.00

     VERIFIED BY PIN

        APPROVED

CREDITO DE VISA
AID A0000000031010
TVR 0080008000
TSI F800
TC 2F0346EBCA494BF4

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      MERCHANT COPY

------

      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 1834         Lane: 1
VISA                    C
Card:    XXXXXXXXXXXX0036
Time:   09/22/15 17:22:58
Order #:             5705
TTID:                   7
RespCode:          00/000
```

```
Auth: 602664     Batch: 1
STAN:              563536
REC #:             000007
TRN REF #:638114437174992
VAL CODE:            BBCD

AMOUNT:            337.00

     VERIFIED BY PIN

        APPROVED

CREDITO DE VISA
AID A0000000031010
TVR 0080008000
TSI F800
TC 2F0346EBCA494BF4

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      CUSTOMER COPY
```

C.7.3 EMV Insert, No CVM

C.7.3.1 UniTerm Response Data

PARAMETER	VALUE
account	XXXXXXXXXXX1005
auth	232508
batch	1
cardholdername	AEIPS 32/VER 1.0
cardtype	AMEX
code	AUTH
item	2
language	en
merch_addr1	123 STREET NAME
merch_addr2	CITY, STATE ZIP
merch_id	1836
merch_name	MERCHANT NAME
merch_phone	(888) 555-1234
merch_proc	GLOBALPAY
msoft_code	INT_SUCCESS
pclevel	0
phard_code	SUCCESS
rcpt_custom	REC #:000002,TRN REF #:416237190201752
rcpt_emv_ac	5C221DC28EB72FCF
rcpt_emv_actype	TC
rcpt_emv_aid	A000000025010801
rcpt_emv_cvm	none
rcpt_emv_name	AMERICAN EXPRESS
rcpt_emv_tsi	F800
rcpt_emv_tvr	0000008000
rcpt_entry_mode	C
rcpt_host_ts	092515194045
rcpt_issuer_resp_code	000
rcpt_resp_code	000
stan	000514
timestamp	1443210133

ttid	79
u_errorcode	SUCCESS
verbiage	AP

C.7.3.2 Example Receipt

```
      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 1836         Lane: 1
AMEX                    C
Card:     XXXXXXXXXXX1005
Time:   09/25/15 19:40:45
Order #:               41
TTID:                  79
RespCode:         000/000
Auth: 232508     Batch: 1
STAN:              000514
REC #:             000002
TRN REF #:416237190201752

AMOUNT:             62.00

        APPROVED

AMERICAN EXPRESS
AID A000000025010801
TVR 0000008000
TSI F800
TC 5C221DC28EB72FCF

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      MERCHANT COPY

------

      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 1836         Lane: 1
AMEX                    C
Card:     XXXXXXXXXXX1005
Time:   09/25/15 19:40:45
Order #:               41
TTID:                  79
RespCode:         000/000
Auth: 232508     Batch: 1
STAN:              000514
REC #:             000002
TRN REF #:416237190201752
```

```
AMOUNT:             62.00

        APPROVED

AMERICAN EXPRESS
AID A000000025010801
TVR 0000008000
TSI F800
TC 5C221DC28EB72FCF

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      CUSTOMER COPY
```

C.7.4 EMV Insert, Card Decline

C.7.4.1 UniTerm Response Data

PARAMETER	VALUE
account	XXXXXXXXXXXX0010
cardtype	VISA
code	DENY
merch_addr1	123 STREET NAME
merch_addr2	CITY, STATE ZIP
merch_id	1834
merch_name	MERCHANT NAME
merch_phone	(888) 555-1234
merch_proc	GLOBALPAY
rcpt_emv_ac	BA9BD3FAC8ADD6C7
rcpt_emv_actype	AAC
rcpt_emv_aid	A0000000031010
rcpt_emv_cvm	pin
rcpt_emv_name	CREDITO DE VISA
rcpt_emv_tsi	E800
rcpt_emv_tvr	0280A08000
rcpt_entry_mode	C
rcpt_host_ts	092215134154
u_errorcode	EMV_CARD_DENY
verbiage	Transaction aborted - declined by card

C.7.4.2 Example Receipt

```
      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 1834         Lane: 1
VISA                    C
Card:    XXXXXXXXXXXX0010
Time:   09/22/15 13:41:54
Order #:            17421

AMOUNT:             22.00
```

```
    DECLINED BY CARD
     VERIFIED BY PIN

        DECLINED

CREDITO DE VISA
AID A0000000031010
TVR 0280A08000
TSI E800
AAC BA9BD3FAC8ADD6C7

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      MERCHANT COPY

------

      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 1834         Lane: 1
VISA                    C
Card:    XXXXXXXXXXXX0010
Time:   09/22/15 13:41:54
Order #:            17421

AMOUNT:             22.00

    DECLINED BY CARD
     VERIFIED BY PIN

        DECLINED

CREDITO DE VISA
AID A0000000031010
TVR 0280A08000
TSI E800
AAC BA9BD3FAC8ADD6C7

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      CUSTOMER COPY
```

C.7.5 EMV Insert, Card Removed (Decline)

C.7.5.1 UniTerm Response Data

PARAMETER	VALUE
code	DENY
merch_addr1	123 STREET NAME
merch_addr2	CITY, STATE ZIP
merch_id	1818
merch_name	MERCHANT NAME
merch_phone	(888) 555-1234
merch_proc	GLOBALPAY
u_errorcode	EMV_CARD_REMOVED
verbiage	Card Removed

C.7.5.2 Example Receipt

```
      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 1818         Lane: 1
Time:   09/24/15 14:43:46
Order #:             6224

AMOUNT:              1.00

      CARD REMOVED

        DECLINED


 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      MERCHANT COPY

------

      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 1818         Lane: 1
Time:   09/24/15 14:43:46
Order #:             6224
```

```
AMOUNT:              1.00

      CARD REMOVED

        DECLINED


 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      CUSTOMER COPY
```

C.7.6 EMV Insert, Interac

C.7.6.1 UniTerm Response Data

PARAMETER	VALUE
account	XXXXXXXXXXXX1933
auth	175180
avs	UNKNOWN
batch	1
cardholdername	Test Card 1
cardtype	INTERAC
code	AUTH
item	10
language	en
merch_addr1	123 STREET NAME
merch_addr2	CITY, STATE ZIP
merch_id	3636
merch_name	MERCHANT NAME
merch_phone	(888) 555-1234
merch_proc	PAYMENTECH
msoft_code	INT_SUCCESS
pclevel	0
phard_code	SUCCESS
rcpt_acct_type	checking
rcpt_emv_ac	882D8427A268E214
rcpt_emv_actype	TC
rcpt_emv_aid	A0000002771010
rcpt_emv_cvm	pin
rcpt_emv_name	Interac
rcpt_emv_tsi	7800
rcpt_emv_tvr	8000008000
rcpt_entry_mode	C
rcpt_host_ts	092515155118
rcpt_resp_code	A
stan	00298722
timestamp	1443210676

ttid	10
u_errorcode	SUCCESS
verbiage	APPROVED

C.7.6.2 Example Receipt

```
      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 3636         Lane: 1
INTERAC                 C
Acct Type:       CHEQUING
Card:    XXXXXXXXXXXX1933
Time:   09/25/15 15:51:18
Order #:        899065992
TTID:                  10
RespCode:               A
Auth: 175180     Batch: 1
STAN:            00298722

AMOUNT:              5.01

     VERIFIED BY PIN

        APPROVED

Interac
AID A0000002771010
TVR 8000008000
TSI 7800
TC 882D8427A268E214

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      MERCHANT COPY

------

      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 3636         Lane: 1
INTERAC                 C
Acct Type:       CHEQUING
Card:    XXXXXXXXXXXX1933
Time:   09/25/15 15:51:18
Order #:        899065992
TTID:                  10
RespCode:               A
Auth: 175180     Batch: 1
STAN:            00298722
```

```
AMOUNT:              5.01

     VERIFIED BY PIN

        APPROVED

Interac
AID A0000002771010
TVR 8000008000
TSI 7800
TC 882D8427A268E214

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

      CUSTOMER COPY
```

C.7.7 EMV Contactless, Interac Flash Decline

C.7.7.1 UniTerm Response Data

PARAMETER	VALUE
account	XXXXXXXXXXXXXXX1311
cardtype	INTERAC
code	DENY
issuer_decline	yes
language	en
merch_addr1	123 STREET NAME
merch_addr2	CITY, STATE ZIP
merch_id	1625
merch_name	MERCHANT NAME
merch_phone	(888) 555-1234
msoft_code	INT_SUCCESS
phard_code	GENERICFAIL
printdata	CARD CANCELLED*REFER TO BRANCH
rcpt_acct_type	flash
rcpt_custom	refnum:660136000010016710
rcpt_emv_ac	ED538D29D3390729
rcpt_emv_actype	ARQC
rcpt_emv_aid	A0000002771010
rcpt_emv_cvm	unknown
rcpt_emv_name	Interac
rcpt_emv_tvr	0080008000
rcpt_entry_mode	T
rcpt_host_ts	072015180303
rcpt_issuer_resp_code	05
rcpt_resp_code	058
sequenceid	671
timestamp	1437429783
ttid	861
u_errorcode	MONETRA_ERROR
verbiage	DECLINED * CARD CANCELLED

C.7.7.2 Example Receipt

```
      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234

          SALE

MID: 1625         Lane: 1
INTERAC                 T
Acct Type:  FLASH DEFAULT
Card: XXXXXXXXXXXXXXX1311
Date/Time:   072015180303
Order #:        899065992
TTID:                 861
refnum:660136000010016710

AMOUNT:              1.09

        DECLINED

Interac
AID A0000002771010
TVR 0080008000
ARQC ED538D29D3390729

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

 MERCHANT/CUSTOMER COPY
```

C.7.8 EMV Contactless, Decline

C.7.8.1 UniTerm Response Data

PARAMETER	VALUE
account	XXXXXXXXXXXX0010
cardholdername	ETEC/PAYPASS
cardtype	MC
code	DENY
language	en
merch_addr1	123 STREET NAME
merch_addr2	CITY, STATE ZIP
merch_id	1625
merch_name	MERCHANT NAME
merch_phone	(888) 555-1234
msoft_code	INT_SUCCESS
phard_code	GENERICFAIL
rcpt_custom	refnum:660136000010016700
rcpt_emv_ac	16D1284D85A29DF2
rcpt_emv_actype	ARQC
rcpt_emv_aid	A0000000041010
rcpt_emv_cvm	none
rcpt_emv_name	PPC MCD 01 v2 2
rcpt_emv_tvr	0000008000
rcpt_entry_mode	T
rcpt_issuer_resp_code	51
rcpt_resp_code	481
sequenceid	670
timestamp	1437429662
ttid	860
u_errorcode	MONETRA_ERROR
verbiage	DECLINED *

C.7.8.2 Example Receipt

```
      MERCHANT NAME
     123 STREET NAME
     CITY, STATE ZIP
     (888) 555-1234
```

```
          SALE

MID: 1625         Lane: 1
MC                      T
Card:    XXXXXXXXXXXX0010
Date/Time:   072015180102
Order #:        899065992
TTID:                 860
refnum:660136000010016700

AMOUNT:             10.51

        DECLINED

PPC MCD 01 v2 2
AID A0000000041010
TVR 0000008000
ARQC 16D1284D85A29DF2

 IMPORTANT - RETAIN THIS
  COPY FOR YOUR RECORDS

 MERCHANT/CUSTOMER COPY
```

D UniTerm Code Examples

D.1 Microsoft C# using libmonetra

```
/* UniTerm example program in C#
 *
 * Depends on the libmonetra C# .Net native API
 *
 * Implemented based on the UniTerm Guide in conjunction with the
 * Monetra Client Interface Protocol Specification
 *
 * Please contact support@monetra.com with any questions
 */
using System;
using System.Collections;
using System.Diagnostics;
using System.IO;
using System.Text;
using System.Threading;
using libmonetra;

/* NOTE: if compiling with Mono, you can use
 *        gmcs /unsafe utest.cs libmonetra.cs
 */

class UTest {
 /* Uniterm Connectivity Information
  * NOTE: this is the default, it is possible to change, but 99%
  *       of deployments will probably use this Uniterm information
  *       as-is
  */
 private const string uniterm_host     = "localhost";
 private const int    uniterm_port     = 8123;

 /* Authentication information
  * NOTE: This information corresponds with the public test server
  *       at testbox.monetra.com:8665 */
 private const string monetra_user     = "test_retail:public";
 private const string monetra_pass     = "publ1ct3st";


 static string uniterm_path()
 {
  switch (Environment.OSVersion.Platform) {
   case PlatformID.Win32NT:
   case PlatformID.Win32S:
   case PlatformID.Win32Windows:
   case PlatformID.WinCE:
    return "C:\\Program Files\\Main Street Softworks\\UniTerm\\uniterm.exe";
   default:
    return "/usr/local/uniterm/bin/uniterm";
  }
 }

 /*! Function to launch the Uniterm from the current process.
  *  If we don't launch it from the current process, it won't be given
  *  focus! (at least on Windows this is true, until the first
  *  manual focus is performed by an end-user) */
 static void uniterm_launch()
 {
  Process uniterm                  = new Process();
  uniterm.StartInfo.FileName       = uniterm_path();
  uniterm.StartInfo.CreateNoWindow = true;

  uniterm.Start();

  /* Make sure Uniterm is ready before returning,
   * Sleep 1000ms (1s) */
  System.Threading.Thread.Sleep(1000);
 }


 /*! Function to connect to an endpoint which uses the standard 'monetra'
  * style protocol (so either Monetra itself, or Uniterm)
  * \param[in]  host     Resolvable hostname or IP address to connect to
  * \param[in]  port     Port associated with hostname to establish an SSL
  *                      connection to
  * \param[out] errorstr Textual error message if returns null
  * \return Initialized connection class on success. null on failure
  */
 static Monetra uniterm_connect_host(string host, int port, ref string errorstr)
 {
  /* Initialize the Class */
  Monetra conn = new Monetra();

  errorstr = "";

  /* We always want to use an SSL connection to Monetra and Uniterm */
  conn.SetSSL(host, port);

  /* Do not verify the SSL certificate, Monetra and the Uniterm
   * use self-signed certificates by default which cannot be validated.
   * The connection is still encrypted, the endpoint just isn't strictly
   * validated */
  conn.VerifySSLCert(false);

  /* This makes it so TransSend() will block until a response is
   * received from Monetra.  Simplifies the API since we will never
   * have more than one outstanding transaction per connection in
   * this application */
  conn.SetBlocking(true);

  /* Connect! */
  if (!conn.Connect()) {
   errorstr = conn.ConnectionError();
   return null;
  }

  return conn;
 }


 /*! Wrapper function to connect to Uniterm
```

```
 * \param[out] errorstr Textual error message if returns null
 * \return Initialized connection class on success. null on failure
 */
static Monetra uniterm_connect(ref string errorstr)
{
 Monetra conn;
 string myerror = "";
 conn = uniterm_connect_host(uniterm_host, uniterm_port, ref myerror);
 if (conn == null) {
  errorstr = "Connection to Uniterm Failed: " + myerror;
 }
 return conn;
}


/*! Request a transaction from Uniterm as documented in the Uniterm Guide.
 *  The Key/Value pair params are a combination of the Parameters as
 *  documented in the Uniterm Guide and the Monetra Client Interface
 *  Protocol Spec.
 * \param[in] uniterm_conn  Initialized connection to Uniterm
 *                          as returned by uniterm_connect()
 * \param[in] mparams      Array of key/value parameters to send to
 *                         Uniterm
 * \return Hashtable of string key/value pairs from response.  Please refer
 *         to the Uniterm Guide and Monetra Client Interface Protocol
 *         specification for the applicable list based on the action being
 *         performed.  "code" and "u_errorcode" are always guaranteed to
 *         be returned.
 */
static Hashtable uniterm_sendrequest(Monetra uniterm_conn, Hashtable mparams)
{
 int id;

 Hashtable response = new Hashtable();

 /* Request a new transaction from libmonetra */
 id = uniterm_conn.TransNew();

 /* For each item in the params hashtable, add it to the transaction */
 foreach (DictionaryEntry kv in mparams) {
  uniterm_conn.TransKeyVal(id, (String)kv.Key, (String)kv.Value);
 }

 /* Send the request to the Uniterm.  It will not return until
  * a response is available, or a disconnect is detected */
 if (!uniterm_conn.TransSend(id)) {
  /* Disconnect detected, return an appropriate error condition!
   * This should really never happen though... */
  response["code"]        = "DENY";
  response["u_errorcode"] = "CONN_ERROR";
  response["verbiage"]    = "Connection to Uniterm failed: "
                            + uniterm_conn.ConnectionError();
  return response;
 }

 /* Save the response parameters from the Uniterm into a
  * HashTable as our function prototype states. */
 string[] keys = uniterm_conn.ResponseKeys(id);
 for (int i=0; i < keys.Length; i++) {
  response[keys[i]] = uniterm_conn.ResponseParam(id, keys[i]);
 }

 /* Free up some memory by purging unneeded data */
 uniterm_conn.DeleteTrans(id);

 return response;
}


/*! Tell Uniterm to shutdown.  Since we start it up, we should make sure
 *  we turn it off prior to exiting otherwise the user will be prompted
 *  with an error message stating the Uniterm is already running on the
 *  next execution of this application!
 * \param[in] uniterm_conn Initialized connection to the Uniterm
 *                         as returned by uniterm_connect()
 */
static void uniterm_shutdown(Monetra uniterm_conn)
{
 Hashtable mparams = new Hashtable();
 mparams["u_action"] = "shutdown";
 uniterm_sendrequest(uniterm_conn, mparams);
}


/*! Main entry point to this application to be executed */
static void Main()
{
 Monetra   uniterm_conn;
 string    errorstr = "";
 Hashtable response;

 /* Step1: Launch the Uniterm */
 uniterm_launch();
 Console.WriteLine("Uniterm Launched");

 /* Step2: Connect to the Uniterm */
 uniterm_conn = uniterm_connect(ref errorstr);
 if (uniterm_conn == null) {
  Console.WriteLine("Failure: " + errorstr);
  return;
 }
 Console.WriteLine("Connected to Uniterm");


 /* Step3: Send txnrequest to Uniterm */
 Hashtable mparams = new Hashtable();
 /* Append the parameters for the txnrequest */
 mparams["username"]     = monetra_user;
 mparams["password"]     = monetra_pass;
 mparams["u_action"]     = "txnrequest";
 mparams["u_devicetype"] = "ingenico_rba";
 mparams["u_device"]     = "HID";

 /* Append the parameters for the transaction that will also get passed
  * to Monetra such as the 'action', 'amount', etc. as described in the
  * Monetra Client Interface Protocol Specification */
 mparams["action"]   = "sale";
 mparams["amount"]   = "12.00";
 mparams["ordernum"] = "123456";
 mparams["comments"] = "u_txnrequest";

 response = uniterm_sendrequest(uniterm_conn, mparams);
 if (String.Compare((string)response["code"], "AUTH", true) != 0) {
  Console.WriteLine("Transaction failed.");
 } else {
  Console.WriteLine("Transaction SUCCESSFUL!");
 }

 /* Print out all the response key/value pairs ... */
 foreach (DictionaryEntry kv in response) {
  Console.WriteLine("\t" + (string)kv.Key + " = " + (string)kv.Value);
 }

 /* NOTE: No real reason to exit here ... we could just keep running
  *       Step 3 all day long as long as you keep the uniterm_conn handle.
  *       No reason to keep disconnecting and reconnecting, or
  *       starting/stopping the Uniterm.
  */

 /* Step4: Cleanup */
 uniterm_shutdown(uniterm_conn);

 /* Connections will be automatically closed when the uniterm_conn
  * initialized class is closed by the destructor/garbage
  * collector */
}

}


```

D.2 Microsoft C# using XML and `HttpWebRequest`

```
/* UniTerm example program in C# using XML and HttpWebRequest
 *
 * Works with .Net Compact Framework v2
 *
 * Implemented based on the UniTerm Guide in conjunction with the
 * Monetra Client Interface Protocol Specification
 *
 * Please contact support@monetra.com with any questions
 */
using System;
using System.Diagnostics;
using System.Collections.Generic;
using System.Text;
using System.IO;
using System.Threading;
using System.Collections;
using System.Net;
using System.Xml;
using System.ComponentModel;
using System.Windows.Forms;
using System.Security.Cryptography.X509Certificates;

/* NOTE: if compiling with Mono, you can use
 *        gmcs -r:System.Windows.Forms.dll utest_xml.cs
 */

class utest_xml
{
 /* Uniterm Connectivity Information
 * NOTE: this is the default, it is possible to change, but 99%
 *       of deployments will probably use this Uniterm information
 *       as-is
 */
 private const string uniterm_host = "localhost";
 private const int    uniterm_port = 8123;

 /* Authentication information
  * NOTE: This information corresponds with the public test server
  *       at testbox.monetra.com:8665 */
 private const string monetra_user = "test_retail:public";
 private const string monetra_pass = "publ1ct3st";


 static string uniterm_path()
 {
  switch (Environment.OSVersion.Platform) {
   case PlatformID.Win32NT:
   case PlatformID.Win32S:
   case PlatformID.Win32Windows:
   case PlatformID.WinCE:
    return "C:\\Program Files\\Main Street Softworks\\UniTerm\\uniterm.exe";
   default:
    return "/usr/local/uniterm/bin/uniterm";
  }
 }


 /*! Function to launch Uniterm from the current process.
  *  If we don't launch it from the current process, it won't be given
  *  focus! (at least on Windows this is true, until the first
  *  manual focus is performed by an end-user) */
 static void uniterm_launch()
 {
  Process uniterm = new Process();
  uniterm.StartInfo.FileName = uniterm_path();
  /* Not supported on CE
   * uniterm.StartInfo.CreateNoWindow = true;
   */

  uniterm.Start();

  /* Make sure Uniterm is ready before returning,
  * Sleep 1000ms (1s) */
  System.Threading.Thread.Sleep(1000);
 }


```

```
/*! Trust all SSL server certificates */
internal class AcceptAllCertificatePolicy : ICertificatePolicy
{
 public AcceptAllCertificatePolicy()
 {
 }
 public bool CheckValidationResult(ServicePoint sPoint,
                                   X509Certificate cert,
                                   WebRequest wRequest, int certProb)
 {
  // *** Always accept
  return true;
 }
}


/*! Function to POST and XML message to a Monetra-like entity
*  (Monetra or Uniterm) via HTTPS.  It will return
*  the key/value pairs from the XML response
* \param[in]  host        Host to connect to
* \param[in]  port        Port to connect to (via SSL/HTTPS)
* \param[in]  xml         String-form XML to post
* \return True on successful communication, False if communication failed.
*         Note: True doesn't mean the transaction itself was successful.
*/
static Hashtable uniterm_https_post(string host, int port, string xml)
{
 Hashtable       response = new Hashtable();
 string          url      = "https://" + host + ":" + port.ToString();
 HttpWebRequest  req      = (HttpWebRequest)WebRequest.Create(url);
 string          xmlout;

 try {
  /* POST Request */

  /* Disable SSL Server Certificate Checking */
  System.Net.ServicePointManager.CertificatePolicy =
   new AcceptAllCertificatePolicy();

  byte[] bytes;
  bytes                  = System.Text.Encoding.ASCII.GetBytes(xml);
  req.Method             = "POST";
  req.ContentType        = "text/xml";
  req.ContentLength      = bytes.Length;
  Stream reqStream       = req.GetRequestStream();
  reqStream.Write(bytes, 0, bytes.Length);
  reqStream.Close();

  /* Read Response */
  /* Note issues with .Net CF v2 as per below:
   *   http://blogs.msdn.com/b/andrewarnottms/archive/2007/11/19/why-net-compact-framework-fa
   *   http://support.microsoft.com/kb/970549
   * If the Server is OpenSSL, this can be worked around by setting
   * SSL_OP_DONT_INSERT_EMPTY_FRAGMENTS
   */
  HttpWebResponse resp   = (HttpWebResponse)req.GetResponse();
  Stream respStream      = resp.GetResponseStream();
  StreamReader rdr       = new StreamReader(respStream);
  xmlout                 = rdr.ReadToEnd();
  rdr.Close();
 } catch (System.Net.WebException e)  {
  response["code"]        = "DENY";
  response["u_errorcode"] = "CONN_ERROR";
  response["verbiage"]    = "Connection to " + url + " failed: " +
                           e.Message;
  return response;
 }
 XmlDocument     xmldoc     = new XmlDocument();
 xmldoc.LoadXml(xmlout);

 XmlNodeList     trans      = xmldoc.DocumentElement.
                              SelectSingleNode("Resp").ChildNodes;
 foreach (XmlNode kv in trans) {
  response[kv.Name] = kv.InnerText;
 }
 return response;
}


/*! Request a ttransaction from Uniterm as documented in the Monetra
 *  Uniterm Guide.  The Key/Value pair params are a combination of the
 *  Parameters as documented in the Uniterm Guide and the Monetra Client
 *  Interface Protocol Spec.
 * \param[in] mparams   Array of key/value parameters to send to Uniterm
 * \return Hashtable of string key/value pairs from response.  Please refer
 *        to the Uniterm Guide and Monetra Client Interface Protocol
 *        specification for the applicable list based on the action being
 *        performed.  "code" and "u_errorcode" are always guaranteed to
 *        be returned.
 */
static Hashtable uniterm_sendrequest(Hashtable mparams)
{
 string XML;

 XML = "<MonetraTrans>" +
         "<Trans identifier='1'>";

 /* For each item in the params hashtable, add it to the transaction */
 foreach (DictionaryEntry kv in mparams) {
  XML = XML + "<" + (String)kv.Key + ">" + (String)kv.Value + "</" +
        (string)kv.Key + ">";
 }

 XML = XML + "</Trans></MonetraTrans>";

 return uniterm_https_post(uniterm_host, uniterm_port, XML);
}


/*! Tell Uniterm to shutdown.  Since we start it up,
 *  we should make sure we turn it off prior to exiting otherwise
 *  the user will be prompted with an error message stating
 *  Uniterm is already running on the next execution
 *  of this application!
 */
static void uniterm_shutdown()
```

```
{
 Hashtable mparams = new Hashtable();
 mparams["u_action"] = "shutdown";
 uniterm_sendrequest(mparams);
}


/*! Main entry point to this application to be executed */
static void Main()
{
 Hashtable response;

 /* Step1: Launch Uniterm */
 uniterm_launch();
 MessageBox.Show("Uniterm Launched");


 /* Step2: Send txnrequest to Uniterm */
 Hashtable mparams = new Hashtable();
 /* Append the parameters for the ticket request as per the Monetra
  * Uniterm Guide, section 4 */
 mparams["username"]     = monetra_user;
 mparams["password"]     = monetra_pass;
 mparams["u_action"]     = "txnrequest";
 mparams["u_devicetype"] = "ingenico_rba";
 mparams["u_device"]     = "HID";

 /* Append the parameters for the transaction that will also get passed
  * to Monetra such as the 'action', 'amount', etc. as described in the
  * Monetra Client Interface Protocol Specification */
 mparams["action"]   = "sale";
 mparams["amount"]   = "12.00";
 mparams["ordernum"] = "123456";
 mparams["comments"] = "u_txnrequest";

 response = uniterm_sendrequest(mparams);
 string resultMsg = "";
 if (String.Compare((string)response["code"], "AUTH", true) != 0) {
  resultMsg = "Transaction failed.\r\n";
 } else {
  resultMsg = "Transaction SUCCESSFUL!\r\n";
 }

 /* Print out all the response key/value pairs ... */
 foreach (DictionaryEntry kv in response) {
  resultMsg = resultMsg + (string)kv.Key + " = " + (string)kv.Value +
              "\r\n";
 }

 MessageBox.Show(resultMsg);

 /* NOTE: No real reason to exit here ... we could just keep running
  *       Step 2 all day long as long.
  *       No reason to keep starting/stopping Uniterm.
  */

 /* Step3: Cleanup */
 uniterm_shutdown();
```

```

  /* Connections will be automatically closed when the uniterm_conn
   * initialized class is closed by the destructor/garbage
   * collector */
 }
}

```

D.3 Java using libmonetra

```
/* Uniterm example program in Java
 *
 * Depends on the libmonetra Java native API
 *
 * Implemented based on the UniTerm Guide in conjunction with the
 * Monetra Client Interface Protocol Specification
 *
 * Please contact support@monetra.com with any questions
 */
import java.util.Hashtable;
import java.util.Enumeration;
import com.mainstreetsoftworks.MONETRA;

/* Compile/run with:
 *   javac -classpath MONETRA.jar utest.java
 *   java -cp "./MONETRA.jar:." utest
 */

class utest {
 /* Uniterm Connectivity Information
  * NOTE: this is the default, it is possible to change, but 99%
  *       of deployments will probably use this uniterm information
  *       as-is
  */
 private static String uniterm_host     = "localhost";
 private static int    uniterm_port     = 8123;

 /* Authentication information
  * NOTE: This information corresponds with the public test server
  *       at testbox.monetra.com:8665 */
 private static String monetra_user     = "test_retail:public";
 private static String monetra_pass     = "publ1ct3st";


 static String uniterm_path()
 {
  if (System.getProperty("os.name").startsWith("Windows")) {
   return "C:\\Program Files\\Main Street Softworks\\UniTerm\\uniterm.exe";
  } else {
   return "/usr/local/uniterm/bin/uniterm";
  }
 }


 /*! Function to launch Uniterm from the current process. If we don't
  *  launch it from the current process, it won't be given focus!
  *  (at least on Windows this is true, until the first manual focus is
  *  performed by an end-user) */
 static void uniterm_launch()
 {
  try {
   Process p = new ProcessBuilder(uniterm_path()).start();
  } catch (java.io.IOException e) {
   System.out.println(e.getMessage());
   System.exit(1);
  }
  /* Make sure Uniterm is ready before returning,
   * Sleep 1000ms (1s) */
  try {
   Thread.sleep(1000);
  } catch (InterruptedException e) {
  }
 }


 /*! Function to connect to an endpoint which uses the standard 'monetra'
  * style protocol (so either Monetra itself, or Uniterm)
  * \param[in]  host     Resolvable hostname or IP address to connect to
  * \param[in]  port     Port associated with hostname to establish an SSL
  *                      connection to
  * \param[out] errorstr Textual error message if returns null
  * \return Initialized connection class on success. null on failure
  */
 static MONETRA uniterm_connect_host(String host, int port,
                                     StringBuilder errorstr)
 {
  /* Initialize the Class */
  MONETRA conn = new MONETRA("");

  errorstr.setLength(0);

  /* We always want to use an SSL connection to Monetra and Uniterm */
  conn.SetSSL(host, port);

  /* Do not verify the SSL certificate, Monetra and Uniterm
   * use self-signed certificates by default which cannot be validated.
   * The connection is still encrypted, the endpoint just isn't strictly
   * validated */
  conn.VerifySSLCert(0);

  /* This makes it so TransSend() will block until a response is
   * received from Monetra.  Simplifies the API since we will never
   * have more than one outstanding transaction per connection in
   * this application */
  conn.SetBlocking(1);

  /* Connect! */
  if (conn.Connect() == 0) {
   errorstr.append(conn.ConnectionError());
   return null;
  }

  return conn;
 }
```

```


/*! Wrapper function to connect to Uniterm
 * \param[out] errorstr Textual error message if returns null
 * \return Initialized connection class on success. null on failure
 */
static MONETRA uniterm_connect(StringBuilder errorstr)
{
 MONETRA conn;
 StringBuilder myerror = new StringBuilder();
 conn = uniterm_connect_host(uniterm_host, uniterm_port, myerror);
 if (conn == null) {
  errorstr.setLength(0);
  errorstr.append("Connection to Uniterm Failed: " +
                  myerror.toString());
 }
 return conn;
}


/*! Request a transaction from Uniterm as documented in the Monetra
 *  Uniterm Guide.  The Key/Value pair params are a combination of the
 *  Parameters as documented in the Uniterm Guide and the Monetra Client
 *  Interface Protocol Spec.
 * \param[in] uniterm_conn  Initialized connection to Uniterm
 *                          as returned by uniterm_connect()
 * \param[in] mparams       Array of key/value parameters to send to
 *                          Uniterm
 * \return Hashtable of string key/value pairs from response.  Please refer
 *         to the Uniterm Guide and Monetra Client Interface Protocol
 *         specification for the applicable list based on the action being
 *         performed.  "code" and "u_errorcode" are always guaranteed to
 *         be returned.
 */
static Hashtable<String,String> uniterm_sendrequest(MONETRA uniterm_conn,
       Hashtable<String,String> mparams)
{
 long id;

 Hashtable response = new Hashtable<String,String>();

 /* Request a new transaction from libmonetra */
 id = uniterm_conn.TransNew();

 /* For each item in the params hashtable, add it to the transaction */
 for (String key : mparams.keySet()) {
  String value = mparams.get(key);
  uniterm_conn.TransKeyVal(id, key, value);
 }

 /* Send the request to the Uniterm.  It will not return until
  * a response is available, or a disconnect is detected */
 if (uniterm_conn.TransSend(id) == 0) {
  /* Disconnect detected, return an appropriate error condition!
   * This should really never happen though... */
  response.put("code",        "DENY");
  response.put("u_errorcode", "CONN_ERROR");
  response.put("verbiage",    "Connection to Uniterm failed:"
                              + uniterm_conn.ConnectionError());
  return response;
 }

 /* Save the response parameters from the Uniterm into a
  * HashTable as our function prototype states. */
 String[] keys = uniterm_conn.ResponseKeys(id);
 for (int i=0; i < keys.length; i++) {
  response.put(keys[i], uniterm_conn.ResponseParam(id, keys[i]));
 }

 /* Free up some memory by purging unneeded data */
 uniterm_conn.DeleteTrans(id);

 return response;
}


/*! Tell Uniterm to shutdown.  Since we start it up,
 *  we should make sure we turn it off prior to exiting otherwise
 *  the user will be prompted with an error message stating the
 *  Uniterm is already running on the next execution
 *  of this application!
 * \param[in] uniterm_conn Initialized connection to Uniterm
 *                         as returned by uniterm_connect()
 */
static void uniterm_shutdown(MONETRA uniterm_conn)
{
 Hashtable mparams = new Hashtable<String,String>();
 mparams.put("u_action", "shutdown");
 uniterm_sendrequest(uniterm_conn, mparams);
}


/*! Main entry point to this application to be executed */
public static void main(String[] args)
{
 MONETRA                  uniterm_conn;
 StringBuilder            errorstr = new StringBuilder();
 Hashtable<String,String> response;
 String                   ticket;

 /* Step1: Launch Uniterm */
 uniterm_launch();
 System.out.println("Uniterm Launched");

 /* Step2: Connect to Uniterm */
 uniterm_conn = uniterm_connect(errorstr);
 if (uniterm_conn == null) {
  System.out.println("Failure: " + errorstr.toString());
  return;
 }
 System.out.println("Connected to Uniterm");

 /* Step3: Send a txnrequest to Uniterm */
 Hashtable<String,String> mparams = new Hashtable<String,String>();
 /* Append the parameters for the txnrequest */
 mparams.put("username",     monetra_user);
```

```
  mparams.put("password",     monetra_pass);
  mparams.put("u_action",     "txnrequest");

  mparams.put("u_devicetype", "ingenico_rba");
  mparams.put("u_device",     "HID");

  /* Append the parameters for the transaction that will also get passed
   * to Monetra such as the 'action', 'amount', etc. as described in the
   * Monetra Client Interface Protocol Specification */
  mparams.put("action",   "sale");
  mparams.put("amount",   "12.00");
  mparams.put("ordernum", "123456");
  mparams.put("comments", "u_txnrequest");

  response = uniterm_sendrequest(uniterm_conn, mparams);
  if (!response.get("code").equalsIgnoreCase("AUTH")) {
   System.out.println("Transasction failed.");
  } else {
   System.out.println("Transasction SUCCESSFUL!");
  }

  /* Print out all the response key/value pairs ... */
  for (String key : response.keySet()) {
   String value = response.get(key);
   System.out.println("\t" + key + " = " + value);
  }

  /* NOTE: No real reason to exit here ... we could just keep running
   *       Step 3 all day long as long as you keep the uniterm_conn handle.
   *       No reason to keep disconnecting and reconnecting, or
   *       starting/stopping the Uniterm.
   */

  /* Step4: Cleanup */
  uniterm_shutdown(uniterm_conn);

  /* Connections will be automatically closed when the uniterm_conn
   * initialized classe is closed by the destructor/garbage
   * collector */
 }

}
```

D.4 PHP using libmonetra

```
<?php
/* UniTerm example program in PHP
 *
 * Depends on the libmonetra PHP native API
 *
 * Implemented based on the UniTerm Guide in conjunction with the
 * Monetra Client Interface Protocol Specification
 *
 * Please contact support@monetra.com with any questions
 */
error_reporting(E_ALL);
require_once("libmonetra.php");



/* Uniterm Connectivity Information
 * NOTE: this is the default, it is possible to change, but 99%
 *       of deployments will probably use this uniterm information
 *       as-is
 */
$uniterm_host         = "localhost";
$uniterm_port         = 8123;

/* Authentication information
 * NOTE: This information corresponds with the public test server
 *       at testbox.monetra.com:8665 */
$monetra_user     = "test_retail:public";
$monetra_pass     = "publ1ct3st";


/* Sets the path of the Uniterm executable.  Currently using
 * the default locations */
if (strtoupper(substr(PHP_OS, 0, 3)) === 'WIN') {
 /* Windows path */
 $uniterm_path         = "C:\\Program Files\\Main Street Softworks\\UniTerm\\uniterm.exe";
} else {
 /* Unix path */
 $uniterm_path         = "/usr/local/uniterm/bin/uniterm";
}


/*! Function to launch Uniterm from the current process.
 *  If we don't launch it from the current process, it won't be given
 *  focus! (at least on Windows this is true, until the first
 *  manual focus is performed by an end-user) */
function uniterm_launch()
{
 global $uniterm_path;
 if (class_exists("COM")) {
  /* Must be running windows */
  $WshShell = new COM("WScript.Shell");
  $oExec    = $WshShell->Run('"' . $uniterm_path . '"', 10, false);
 } else {
  /* Must be on a Unix system */
  system("'" . $uniterm_path . "'" . " > /dev/null 2>&1 &");
 }

 /* Make sure Uniterm is ready before returning,
  * sleep 2s */
 sleep(2);
}


/*! Function to connect to an endpoint which uses the standard 'monetra'
 * style protocol (so either Monetra itself, or Uniterm)
 * \param[in]  host     Resolvable hostname or IP address to connect to
 * \param[in]  port     Port associated with hostname to establish an SSL
 *                      connection to
 * \param[out] errorstr Textual error message if returns null
 * \return Initialized connection on success. null on failure
 */
function uniterm_connect_host($host, $port, &$errorstr)
{
 /* Initialize the Connection */
 $conn = M_InitConn();

 $errorstr = "";

 /* We always want to use an SSL connection to Monetra and Uniterm */
 M_SetSSL($conn, $host, $port);

 /* Do not verify the SSL certificate, Monetra and Uniterm
  * use self-signed certificates by default which cannot be validated.
  * The connection is still encrypted, the endpoint just isn't strictly
  * validated */
 M_VerifySSLCert($conn, false);

 /* This makes it so TransSend() will block until a response is
  * received from Monetra.  Simplifies the API since we will never
  * have more than one outstanding transaction per connection in
  * this application */
 M_SetBlocking($conn, true);

 /* Connect! */
 if (!M_Connect($conn)) {
  $errorstr = M_ConnectionError($conn);
  return null;
 }

 return $conn;
}


/*! Wrapper function to connect to Uniterm
 * \param[out] errorstr Textual error message if returns null
 * \return Initialized connection on success. null on failure
 */
function uniterm_connect(&$errorstr)
{
 global $uniterm_host, $uniterm_port;

 $myerror = "";
 $conn = uniterm_connect_host($uniterm_host, $uniterm_port, &$myerror);
 if ($conn == null) {
  $errorstr = "Connection to Uniterm Failed: " . $myerror;
 }
 return $conn;
}


/*! Request a transaction from Uniterm as documented in the Uniterm Guide.
 *  The Key/Value pair params are a combination of the Parameters as
 *  documented in the Uniterm Guide and the Monetra Client Interface Protocol
 *  Spec.
 * \param[in] uniterm_conn  Initialized connection to Uniterm as returned by
 *                           uniterm_connect()
 * \param[in] params          Array of key/value parameters to send to Uniterm
 *
 * \return Array of string key/value pairs from response.  Please refer to the
 *         Uniterm Guide and Monetra Client Interface Protocol specification
 *         for the applicable list based on the action being performed.
 *         "code" and "u_errorcode" are always guaranteed to be returned.
 */
function uniterm_sendrequest($uniterm_conn, $params)
{
 $response = array();

 /* Request a new transaction from libmonetra */
 $id = M_TransNew($uniterm_conn);

 /* For each item in the params array, add it to the transaction */
 foreach ($params as $key => $value) {
  M_TransKeyVal($uniterm_conn, $id, $key, $value);
 }

 /* Send the request to the Uniterm.  It will not return until a
  * response is available, or a disconnect is detected */
 if (!M_TransSend($uniterm_conn, $id)) {
  /* Disconnect detected, return an appropriate error condition!
   * This should really never happen though... */
  $response["code"]        = "DENY";
  $response["u_errorcode"] = "CONN_ERROR";
  $response["verbiage"]    = "Connection to Uniterm failed: " .
                             M_ConnectionError($uniterm_conn);
  return $response;
 }

 /* Save the response parameters from the Uniterm into a HashTable
  * as our function prototype states. */
 $keys = M_ResponseKeys($uniterm_conn, $id);
 foreach ($keys as $value) {
  $response[$value]      = M_ResponseParam($uniterm_conn, $id, $value);
 }

 /* Free up some memory by purging unneeded data */
 M_DeleteTrans($uniterm_conn, $id);

 return $response;
}


/*! Tell Uniterm to shutdown.  Since we start it up,
 *  we should make sure we turn it off prior to exiting otherwise
 *  the user will be prompted with an error message stating the
 *  Uniterm is already running on the next execution
 *  of this application!
 * \param[in] uniterm_conn Initialized connection to Uniterm
 *                         as returned by uniterm_connect()
 */
function uniterm_shutdown($uniterm_conn)
{
 uniterm_sendrequest($uniterm_conn, array("u_action" => "shutdown"));
}
```

```
/* CODE TO EXECUTE ... */

$errorstr = "";

/* Step1: Launch Uniterm */
uniterm_launch();
echo "Uniterm Launched\r\n";

/* Step2: Connect to Uniterm */
$uniterm_conn = uniterm_connect(&$errorstr);
if ($uniterm_conn == null) {
 echo "Failure: " . $errorstr . "\r\n";
 return;
}

echo "Connected to Uniterm\r\n";


/* Step3: Send a txnrequest to the Uniterm */
$params  = array();

/* Append the parameters for the txnrequest */
$params["username"]     = $monetra_user;
$params["password"]     = $monetra_pass;
$params["u_action"]     = "txnrequest";
$params["u_devicetype"] = "ingenico_rba";
$params["u_device"]     = "HID";

/* Append the parameters for the transaction that will also get passed to
 * Monetra such as the 'action', 'amount', etc. as described in the Monetra
 * Client Interface Protocol Specification */
$params['action']   = 'sale';
$params['amount']   = '12.00';
$params['ordernum'] = '123456';
$params['comments'] = 'u_txnrequest';

$response = uniterm_sendrequest($uniterm_conn, $params);
if (strcasecmp($response["code"], "AUTH") != 0) {
 echo "Transaction Failed.\r\n";
} else {
 echo "Transaction SUCCESSFUL!\r\n";
}

/* Print out all the response key/value pairs ... */
foreach ($response as $key => $value) {
 echo "\t" . $key . " = " . $value . "\r\n";
}

/* NOTE: No real reason to exit here ... we could just keep running
 *       Step 3 all day long as long as you keep the uniterm_conn handle.
 *       No reason to keep disconnecting and reconnecting, or
 *       starting/stopping Uniterm.
 */

/* Step4: Cleanup */
```

```
uniterm_shutdown($uniterm_conn);

/* Connections will be automatically closed when the uniterm_conn
 * initialized connection is closed by the destructor/garbage collector */

?>


```

D.5 Microsoft VB.Net using libmonetra

```
' UniTerm example program in VB.Net
'
' Depends on the libmonetra C# .Net native API (DLL)
'
' Implemented based on the UniTerm Guide in conjunction with the
' Monetra Client Interface Protocol Specification
'
' Please contact support@monetra.com with any questions

Option Explicit On
Option Strict On

Imports System
Imports System.Collections
Imports System.Diagnostics
Imports System.Threading
Imports libmonetra

' On unix, compile using:
'   gmcs /target:library /unsafe libmonetra.cs
'   vbnc2 -r:libmonetra.dll utest.vb

Module Module1
 ' Uniterm Connectivity Information
 ' NOTE: this is the default, it is possible to change, but 99%
 '       of deployments will probably use this Uniterm information
 '       as-is
 Private Const uniterm_host As String = "localhost"
 Private Const uniterm_port As Integer = 8123

 ' Authentication information
 '  NOTE: This information corresponds with the public test server
 '        at testbox.monetra.com:8665
 Private Const monetra_user As String = "test_retail:public"
 Private Const monetra_pass As String = "publ1ct3st"

 Private Function uniterm_path As String
  Select Case Environment.OSVersion.Platform
   Case PlatformID.Win32NT, PlatformID.Win32S, _
        PlatformID.Win32Windows, PlatformID.WinCE
    Return "C:\\Program Files\\Main Street Softworks\\UniTerm\\uniterm.exe"
   Case Else
    Return "/usr/local/uniterm/bin/uniterm"
  End Select
 End Function
```

```


'! Function to launch Uniterm from the current process.
'  If we don't launch it from the current process, it won't be given
'  focus! (at least on Windows this is true, until the first
'  manual focus is performed by an end-user)
Private Sub uniterm_launch()
 Dim uniterm As New Process()
 uniterm.StartInfo.FileName = uniterm_path
 uniterm.StartInfo.CreateNoWindow = True

 uniterm.Start()

 ' Make sure Uniterm is ready before returning,
 ' Sleep 1000ms (1s)
 System.Threading.Thread.Sleep(1000)
End Sub


'! Function to connect to an endpoint which uses the standard 'monetra'
'  style protocol (so either Monetra itself, or Uniterm)
' \param[in]  host     Resolvable hostname or IP address to connect to
' \param[in]  port     Port associated with hostname to establish an SSL
'                      connection to
' \param[out] errorstr Textual error message if returns null
' \return Initialized connection class on success. null on failure
Private Function uniterm_connect_host(ByVal host As String, ByVal port _
                                  As Integer, ByRef errorstr As String) _
                                  As Monetra
 ' Initialize the Class
 Dim conn As New Monetra

 errorstr = ""

 ' We always want to use an SSL connection to Monetra and Uniterm
 conn.SetSSL(host, port)

 ' Do not verify the SSL certificate, Monetra and Uniterm
 ' use self-signed certificates by default which cannot be validated.
 ' The connection is still encrypted, the endpoint just isn't strictly
 ' validated
 conn.VerifySSLCert(False)

 ' This makes it so TransSend() will block until a response is
 ' received from Monetra.  Simplifies the API since we will never
 ' have more than one outstanding transaction per connection in
 ' this application
 conn.SetBlocking(True)

 ' Connect!
 If Not conn.Connect() Then
  errorstr = conn.ConnectionError()
  Return Nothing
 End If

 Return conn
End Function

```

```

'! Wrapper function to connect to the Uniterm
' \param[out] errorstr Textual error message if returns null
' \return Initialized connection class on success. null on failure
Private Function uniterm_connect(ByRef errorstr As String) As Monetra
 Dim conn As Monetra
 Dim myerror As String = ""
 conn = uniterm_connect_host(uniterm_host, uniterm_port, myerror)
 If conn Is Nothing Then
  errorstr = "Connection to Uniterm Failed: " + myerror
 End If

 Return conn
End Function

' Request a transaction from Uniterm as documented in the Uniterm Guide.
' The Key/Value pair params are a combination of the Parameters as
' documented in the Uniterm Guide and the Monetra Client Interface
' Protocol Spec.
' \param[in] uniterm_conn  Initialized connection to the Uniterm
'                          as returned by uniterm_connect()
' \param[in] mparams      Array of key/value parameters to send to Uniterm
' \return Hashtable of string key/value pairs from response.  Please refer
'         to the Uniterm Guide and Monetra Client Interface Protocol
'         specification for the applicable list based on the action being
'         performed.  "code" and "u_errorcode" are always guaranteed to
'         be returned.
Private Function uniterm_sendrequest(ByVal uniterm_conn As Monetra, ByVal _
                                     mparams As Hashtable) As Hashtable
 Dim id As Integer
 Dim response As New Hashtable

 ' Request a new transaction from libmonetra
 id = uniterm_conn.TransNew()

 ' For each item in the params hashtable, add it to the transaction
 Dim kv As DictionaryEntry
 For Each kv In mparams
  uniterm_conn.TransKeyVal(id, CType(kv.Key, String), _
                           CType(kv.Value, String))
 Next kv

 ' Send the request to the Uniterm.  It will not return until a
 ' response is available, or a disconnect is detected
 If Not uniterm_conn.TransSend(id) Then
  ' Disconnect detected, return an appropriate error condition!
  ' This should really never happen though...
  response("code")        = "DENY"
  response("u_errorcode") = "CONN_ERROR"
  response("verbiage")    = "Connection to Uniterm failed:" _
                            + uniterm_conn.ConnectionError()
  Return response
 End If

 ' Save the response parameters from Uniterm into a
 ' HashTable as our function prototype states. */
 Dim keys() As String = uniterm_conn.ResponseKeys(id)
 Dim i As Integer
 For i = 0 To keys.Length - 1
  response(keys(i)) = uniterm_conn.ResponseParam(id, keys(i))
 Next i

 ' Free up some memory by purging unneeded data
 uniterm_conn.DeleteTrans(id)

 Return response
End Function


'! Tell Uniterm to shutdown.  Since we start it up,
'  we should make sure we turn it off prior to exiting otherwise
'  the user will be prompted with an error message stating the
'  Uniterm is already running on the next execution
'  of this application!
' \param[in] uniterm_conn Initialized connection to Uniterm
'                         as returned by uniterm_connect()
Private Sub uniterm_shutdown(ByVal uniterm_conn As Monetra)
 Dim mparams As New Hashtable

 mparams("u_action") = "shutdown"
 uniterm_sendrequest(uniterm_conn, mparams)
End Sub

'! Main entry point to this application to be executed
Public Sub Main()
 Dim uniterm_conn As Monetra
 Dim errorstr As String = ""
 Dim response As Hashtable
 Dim ticket As String

 ' Step1: Launch Uniterm
 uniterm_launch()
 Console.WriteLine("Uniterm Launched")

 ' Step2: Connect to Uniterm
 uniterm_conn = uniterm_connect(errorstr)
 If uniterm_conn Is Nothing Then
  Console.WriteLine("Failure: " + errorstr)
  Return
 End If
 Console.WriteLine("Connected to Uniterm")

 ' Step3: Send a txnrequest to Uniterm
 Dim mparams As New Hashtable
 ' Append the parameters for the ticket request as per the Monetra
 ' Uniterm Guide
 mparams("username")       = monetra_user
 mparams("password")       = monetra_pass
 mparams("u_action")     = "txnrequest"
 mparams("u_devicetype") = "ingenico_rba"
 mparams("u_device")     = "HID"

 ' Append the parameters for the transaction that will also get passed
 ' to Monetra such as the 'action', 'amount', etc. as described in the
 ' Monetra Client Interface Protocol Specification
 mparams("action")   = "sale"
```

```
  mparams("amount")   = "12.00"
  mparams("ordernum") = "123456"
  mparams("comments") = "u_txnrequest"

  response = uniterm_sendrequest(uniterm_conn, mparams)
  If StrComp(CType(response("code"), String), "AUTH", _
                   vbTextCompare) <> 0 Then
   Console.WriteLine("Transaction failed.")
  Else
   Console.WriteLine("Transaction SUCCESSFUL!")
  End If

  ' Print out all the response key/value pairs ...
  Dim kv As DictionaryEntry
  For Each kv In response
   Console.WriteLine("  " + CType(kv.Key, String) + " = " + _
                     CType(kv.Value, String))
  Next kv

  ' NOTE: No real reason to exit here ... we could just keep running
  '       Step 3 all day long as long as you keep the uniterm_conn handle.
  '       No reason to keep disconnecting and reconnecting, or
  '       starting/stopping Uniterm.

  ' Step4: Cleanup
  uniterm_shutdown(uniterm_conn)

  ' Connections will be automatically closed when the uniterm_conn
  ' initialized class is closed by the destructor/garbage
  ' collector
 End Sub

End Module


```

D.6 Microsoft `VBScript` using XML and `MSXML2`

```
' UniTerm example program in VBScript
'
' Depends on the MSXML, and Microsoft Scripting Runtime
'
' Implemented based on the UniTerm Guide in conjunction with the
' Monetra Client Interface Protocol Specification
'
' Please contact support@monetra.com with any questions

Option Explicit

' Monetra Connectivity Information
Dim monetra_user
Dim monetra_pass

' Uniterm Connectivity Information
Dim uniterm_host
Dim uniterm_port
Dim uniterm_path


'! Function to launch Uniterm from the current process.
'  If we don't launch it from the current process, it won't be given
'  focus! (at least on Windows this is true, until the first
'  manual focus is performed by an end-user)
Sub uniterm_launch()
 Dim objShell
 Dim res
 Set objShell = CreateObject("Wscript.Shell")
 res = objShell.Run("""" & uniterm_path & """", 10, FALSE)

 ' Make sure Uniterm is ready before returning,
 ' Sleep 1000ms (1s)
 WScript.Sleep 1000
End Sub


'! Function to POST and XML message to a Monetra-like entity
'  (Monetra or the Uniterm) via HTTPS.  It will return
'  the key/value pairs from the XML response
'\param[in]  host        Host to connect to
'\param[in]  port        Port to connect to (via SSL/HTTPS)
'\param[in]  xml         String-form XML to post
'\param[out] errorstr    If returning False, the error message, typically comms
'                        error
'\param[out] myresponse  Dictionary of string key/value pairs from the response.
'\return True on successful communication, False if communication failed.
'        Note: True doesn't mean the transaction itself was successful.
Function uniterm_https_post(ByVal host, ByVal port, ByVal xml, ByRef errorstr, _
                        ByRef myresponse)
 Dim xmlhttp
 Dim xmldoc

 Set xmlhttp = CreateObject("MSXML2.ServerXMLHTTP")

 xmlhttp.open             "POST", "https://" & host & ":" & port, False
 xmlhttp.setOption        2, 13056
 ' Set Timeouts (in milliseconds)
 '   DNS: 5s, Connect: 5s, Send: 30s, Receive: 120s
 xmlhttp.setTimeouts      5000, 5000, 30000, 120000
 xmlhttp.setRequestHeader "Content-Type", "text/xml"

 On Error Resume Next
 xmlhttp.send             xml

 If Not Err.Number = 0 Then
  errorstr = "HTTPS POST Failed to https://" & host & ":" & port & _
             ": " & Err.Description
  uniterm_https_post = False
  Exit Function
 End If

 Set xmldoc   = CreateObject("Microsoft.XMLDOM")

 xmldoc.async = "false"
 xmldoc.loadxml(xmlhttp.responseText)

 Dim Trans
 Set Trans = xmldoc.documentElement.selectSingleNode("Resp").childNodes

 Dim kv
 For Each kv In Trans
  myresponse(kv.nodeName) = kv.text
 Next

 uniterm_https_post = True
End Function


'! Request a transaction from Uniterm as documented in the Uniterm Guide.
'  The Key/Value pair params are a combination of the Parameters as documented
'  the Uniterm Guide and the Monetra Client Interface Protocol Spec.
' \param[in]  mparams    Dictionary of key/value parameters to send to the
'                        Uniterm
' \param[out] errorstr   If returning False, the error message, typically comms
'                        error
' \param[out] myresponse Dictionary of string key/value pairs from response.
'                        Please refer to the Uniterm Guide and Monetra Client
'                        Interface Protocol specification for the applicable
'                        list based on the action being performed.  "code" and
'                        "u_errorcode" are always guaranteed to be returned.
' \return True on successful communication, False if communication failed.
'         Note: True doesn't mean the transaction itself was successful.
Function uniterm_sendrequest(ByVal mparams, ByRef errorstr, ByRef myresponse)
 Dim xml

 xml = "<MonetraTrans><Trans identifier='1'>"

 ' For each item in the params dictionary, add it to the transaction
 Dim key
 For Each key In mparams
  xml = xml & "<" & key & ">" & mparams(key) & "</" & key & ">"
 Next

 xml = xml & "</Trans></MonetraTrans>"

 uniterm_sendrequest = uniterm_https_post(uniterm_host, uniterm_port, xml, _
                                          errorstr, myresponse)
End Function


'! Tell Uniterm to shutdown.  Since we start it up,
'  we should make sure we turn it off prior to exiting otherwise
'  the user will be prompted with an error message stating the
'  Uniterm is already running on the next execution
'  of this application!
Sub uniterm_shutdown()
 Dim myresponse
 Dim errorstr
 Dim mparams

 Set mparams = CreateObject("Scripting.Dictionary")
 mparams("u_action") = "shutdown"

 uniterm_sendrequest mparams, errorstr, myresponse
 ' No need for error checking in this function as we don't
 ' care if this fails
End Sub


'! Main entry point to this application to be executed

' Uniterm Connectivity Information
' NOTE: this is the default, it is possible to change, but 99%
'       of deployments will probably use this Uniterm information
'       as-is
uniterm_host = "localhost"
uniterm_port = 8123
uniterm_path = "C:\\Program Files\\Main Street Softworks\\UniTerm\\uniterm.exe"

' Authentication information
' NOTE: This information corresponds with the public test server
'       at testbox.monetra.com:8665
monetra_user = "test_retail:public"
monetra_pass = "publ1ct3st"


Dim errorstr
Dim mparams
Dim myresp
Dim msg

errorstr = ""

' Step1: Launch Uniterm
uniterm_launch
MsgBox("Uniterm Launched")


' Step2: Send txnrequest to Uniterm

Set myresp  = CreateObject("Scripting.Dictionary")
Set mparams = CreateObject("Scripting.Dictionary")
' Append the parameters for the txnrequest
mparams("username")     = monetra_user
mparams("password")     = monetra_pass
mparams("u_action")     = "txnrequest"
mparams("u_devicetype") = "ingenico_rba"
mparams("u_device")     = "HID"

' Append the parameters for the transaction that will also get passed
' to Monetra such as the 'action', 'amount', etc. as described in the
' Monetra Client Interface Protocol Specification
mparams("action")   = "sale"
mparams("amount")   = "12.00"
mparams("ordernum") = "123456"
mparams("comments") = "u_txnrequest"

If Not uniterm_sendrequest(mparams, errorstr, myresp) Then
 MsgBox errorstr
 WScript.Quit 1
End If
```

```

If StrComp(myresp("code"), "AUTH", vbTextCompare) <> 0 Then
 msg = "Transaction failed." & vbNewLine
Else
 msg = "Transaction SUCCESSFUL!" & vbNewLine
End If

' Print out all the response key/value pairs ...
Dim key
For Each key In myresp
 msg = msg & "  " & key & " = " & myresp(key) & vbNewLine
Next

MsgBox (msg)


' NOTE: No real reason to exit here ... we could just keep running
'       Step 2 all day long.  No reason to keep starting/stopping the
'       Uniterm.

' Step3: Cleanup
uniterm_shutdown
```

D.7 Microsoft Visual Basic 6 using libmonetra

```
Attribute VB_Name = "Module1"
' UniTerm example program in VB6
'
' Depends on the libmonetra C# .Net native API (DLL) (has COM hooks)
'
' Must add reference to libmonetra and Microsoft Scripting Runtime
'
' Implemented based on the UniTerm Guide in conjunction with the
' Monetra Client Interface Protocol Specification
'
' Please contact support@monetra.com with any questions

Option Explicit

' MonetraInformation
Dim monetra_user As String
Dim monetra_pass As String

' Uniterm Connectivity Information
Dim uniterm_host As String
Dim uniterm_port As Integer
Dim uniterm_path As String

Private Declare Sub Sleep Lib "kernel32.dll" (ByVal dwMilliseconds As Long)

'! Function to launch Uniterm from the current process.
```

```
'  If we don't launch it from the current process, it won't be given
'  focus! (at least on Windows this is true, until the first
'  manual focus is performed by an end-user)
Sub uniterm_launch()
 Dim id As Double
 id = Shell("""" & uniterm_path & """", vbNormalFocus)

 ' Make sure Uniterm is ready before returning,
 ' Sleep 1000ms (1s)
 Sleep (1000)
End Sub


'! Function to connect to an endpoint which uses the standard 'monetra'
' style protocol (so either Monetra itself, or Uniterm)
' \param[in]  host     Resolvable hostname or IP address to connect to
' \param[in]  port     Port associated with hostname to establish an SSL
'       connection to
' \param[out] errorstr Textual error message if returns null
' \return Initialized connection class on success. null on failure
Function uniterm_connect_host(ByVal host As String, ByVal port As Integer, _
    ByRef errorstr As String) As IMonetra
 ' Initialize the Class
 Dim conn As IMonetra
 Set conn = New Monetra

 errorstr = ""

 ' We always want to use an SSL connection to Monetra and Uniterm
 conn.SetSSL host, port

 ' Do not verify the SSL certificate, Monetra and Uniterm
 ' use self-signed certificates by default which cannot be validated.
 ' The connection is still encrypted, the endpoint just isn't strictly
 ' validated
 conn.VerifySSLCert False

 ' This makes it so TransSend() will block until a response is
 ' received from Monetra.  Simplifies the API since we will never
 ' have more than one outstanding transaction per connection in
 ' this application
 conn.SetBlocking True

 ' Connect!
 If Not conn.Connect() Then
  errorstr = conn.ConnectionError()
  Set uniterm_connect_host = Nothing
  Exit Function
 End If

 Set uniterm_connect_host = conn
End Function


'! Wrapper function to connect to Uniterm
' \param[out] errorstr Textual error message if returns null
' \return Initialized connection class on success. null on failure
Function uniterm_connect(ByRef errorstr As String) As IMonetra
```

```
 Dim conn As IMonetra
 Dim myerror As String

 myerror = ""
 Set conn = uniterm_connect_host(uniterm_host, uniterm_port, myerror)
 If conn Is Nothing Then
  errorstr = "Connection to Uniterm Failed: " & myerror
 End If
 Set uniterm_connect = conn
End Function


' Request a transaction from Uniterm as documented in the UniTerm
' Guide.  The Key/Value pair params are a combination of the Parameters as
' Uniterm Guide and the Monetra Client Interface Protocol Spec.
' \param[in] uniterm_conn  Initialized connection to Unitermas returned by
'                          connect_to_uniterm()
' \param[in] mparams       Dictionary of key/value parameters to send to
'                          Uniterm
' \return Dictionary of string key/value pairs from response.  Please refer
'  to the Uniterm Guide and Monetra Client Interface Protocol
'  specification for the applicable list based on the action being
'  performed.  "code" and "u_errorcode" are always guaranteed to
'  be returned.
Function uniterm_sendrequest(ByVal uniterm_conn As IMonetra, _
    ByVal mparams As Dictionary) _
    As Dictionary
 Dim id As Integer
 Dim myresponse As New Dictionary

 ' Request a new transaction from libmonetra
 id = uniterm_conn.TransNew()

 ' For each item in the params dictionary, add it to the transaction
 Dim key
 For Each key In mparams
  uniterm_conn.TransKeyVal id, key, mparams(key)
 Next key

 ' Send the request to the Uniterm.  It will not return until a
 ' response is available, or a disconnect is detected
 If Not uniterm_conn.TransSend(id) Then
  ' Disconnect detected, return an appropriate error condition!
  ' This should really never happen though...
  myresponse("code") = "DENY"
  myresponse("u_errorcode") = "CONN_ERROR"
  myresponse("verbiage") = "Connection to Uniterm failed: " _
      & uniterm_conn.ConnectionError()
  Set uniterm_sendrequest = myresponse
  Exit Function
 End If

 ' Save the response parameters from the Uniterm into a HashTable
 ' as our function prototype states.
 Dim keys() As String
 keys = uniterm_conn.ResponseKeys(id)
 Dim i As Integer
 For i = LBound(keys) To UBound(keys)
```

```
  myresponse(keys(i)) = uniterm_conn.ResponseParam(id, keys(i))
 Next i

 ' Free up some memory by purging unneeded data
 uniterm_conn.DeleteTrans (id)

 Set uniterm_sendrequest = myresponse
End Function


'! Tell Uniterm to shutdown.  Since we start it up, we should make sure we
'  turn it off prior to exiting otherwise the user will be prompted with an
'  error message stating Uniterm is already running on the next execution
'  of this application!
' \param[in] uniterm_conn Initialized connection to Uniterm as returned by
'            connect_to_uniterm()
Sub uniterm_shutdown(ByVal uniterm_conn As IMonetra)
 Dim mparams As New Dictionary

 mparams("u_action") = "shutdown"
 uniterm_sendrequest uniterm_conn, mparams
End Sub


'! Main entry point to this application to be executed
Sub Main()
 ' Uniterm Connectivity Information
 ' NOTE: this is the default, it is possible to change, but 99%
 '       of deployments will probably use this Uniterm information
 '       as-is
 uniterm_host = "localhost"
 uniterm_port = 8123
 uniterm_path = "C:\\Program Files\\Main Street Softworks\\UniTerm\\uniterm.exe"

 ' Authentication information
 ' NOTE: This information corresponds with the public test server
 '       at testbox.monetra.com:8665
 monetra_user = "test_retail:public"
 monetra_pass = "publ1ct3st"

 Dim uniterm_conn As IMonetra
 Dim errorstr As String
 Dim myresp As Dictionary
 Dim msg As String

 errorstr = ""

 ' Step1: Launch Uniterm
 uniterm_launch
 MsgBox ("Uniterm Launched")

 ' Step2: Connect to Uniterm
 Set uniterm_conn = uniterm_connect(errorstr)
 If uniterm_conn Is Nothing Then
  MsgBox ("Failure: " & errorstr)
  Exit Sub
 End If

 MsgBox ("Connected to the Uniterm")

 ' Step3: Send a txnrequest to Uniterm
 Dim mparams As New Dictionary
 ' Append the parameters for the ticket request as per the Uniterm Guide
 mparams("username")     = monetra_user
 mparams("password")     = monetra_pass
 mparams("u_action")     = "txnrequest"
 mparams("u_devicetype") = "ingenico_rba"
 mparams("u_device")     = "HID"

 ' Append the parameters for the transaction that will also get passed
 ' to Monetra such as the 'action', 'amount', etc. as described in the
 ' Monetra Client Interface Protocol Specification
 mparams("action")       = "sale"
 mparams("amount")       = "12.00"
 mparams("ordernum")     = "123456"
 mparams("comments")     = "u_txnrequest"

 Set myresp = uniterm_sendrequest(uniterm_conn, mparams)
 If StrComp(myresp("code"), "AUTH", vbTextCompare) <> 0 Then
  msg = "Transaction failed." & vbNewLine
 Else
  msg = "Transaction SUCCESSFUL!" & vbNewLine
 End If

 ' Print out all the response key/value pairs ...
 Dim key
 For Each key In myresp
  msg = msg & "  " & key & " = " & myresp(key) & vbNewLine
 Next key
 MsgBox (msg)

 ' NOTE: No real reason to exit here ... we could just keep running
 '       Step 3 all day long as long as you keep the uniterm_conn handle.
 '       No reason to keep disconnecting and reconnecting, or
 '       starting/stopping Uniterm.

 ' Step4: Cleanup
 uniterm_shutdown uniterm_conn

 ' Connections will be automatically closed when the uniterm_conn initialized
 ' class is cleaned up by the destructor/garbage collector
End Sub
```

E PCI Security and Implementation

The below details the various security and PCI requirements and how deployments may be impacted. Integrators and distributors should read this section prior to any production deployments. UniTerm is designed to be compliant with all PCI PA-DSS requirements and cannot be configured to be non-compliant.

UniTerm depends on an instance of Monetra v8.y.z being accessible. Monetra may run on customer-hosted equipment or be provided as a service or gateway via a third party.

Note: Please use this section along with the official PCI DSS v3.2 specification available at https://www.pcisecuritystandards.org/documents/PCI_DSS_v3-2.pdf

TOPIC	DISCUSSION
Delete sensitive authentication data stored by previous payment application versions.	UniTerm has never stored any sensitive authentication data in a non-secured or non-approved manner.
Delete any sensitive authentication data (pre-authorization) gathered as a result of troubleshooting the payment application.	UniTerm does not have the ability to store sensitive authentication data for troubleshooting purposes.
Securely delete cardholder data after customer-defined retention period.	UniTerm never stores cardholder data after authorization and prior to authorization is stored as per Section 7.1, and Section 7.3.
Mask PAN when displayed so only personnel with a business need can see the full PAN.	UniTerm mandates the use of users with the `obscured` flag, therefore it is not possible that the full PAN can ever be returned. There is no ability to configure UniTerm to return the PAN.
Render PAN unreadable anywhere it is stored (including data on portable digital media, backup media, and in logs).	Sensitive cardholder data is always unreadable as per Section 7.1 and Section 7.2, this is always true, there is no configuration option that controls this behavior.
Protect keys used to secure cardholder data against disclosure and misuse.	UniTerm does not have the keys to decrypt any stored cardholder data as per Section 7.1
Implement key-management processes and procedures for cryptographic keys used for encryption of cardholder data.	Only ephemeral keys are used to store cardholder data, and those are protected by RSA Public keys rotated ever 10-12 days as per Section 7.1. There is no configuration option to control this behavior, it is always implemented as documented.
Implement secure key-management functions.	UniTerm requests RSA public keys from Monetra, Monetra handles management of the RSA private keys in its

	validated CardShield subsystem. See Section 7.1, there is no configuration option to control this behavior, it is always implemented as documented.
Provide a mechanism to render irretrievable cryptographic key material or cryptograms stored by the payment application.	UniTerm never has the keys to decrypt sensitive cardholder data as per Section 7.1. There is no configuration option to control this behavior, it is always implemented as documented.
Use unique user IDs and secure authentication for administrative access and access to cardholder data.	UniTerm does not provide or facilitate administrative access, all access controls are provided by the remote Monetra instance.
Use unique user IDs and secure authentication for access to PCs, servers, and databases with payment applications.	UniTerm does not provide or facilitate administrative or remote access. UniTerm utilizes the validated Monetra authentication subsystem for access to UniTerm and its connected devices in conjunction with the policies as described in Section 7.1 All access controls to cardholder data are provided by the remote Monetra instance. Note: It is the integrator's responsibility to ensure unique user names and secure authentication are used to access any PCs, servers, and databases with payment applications and/or cardholder data. This is requirement is external to UniTerm and not something that can be provided by UniTerm on behalf of the merchant or integrator.
Implement automated audit trails.	Audit trails are provided by both logging on the Monetra side of all end-user transactions as well as UniTerm's built-in logging mechanisms as described in Section 7.2
Facilitate centralized logging.	Centralized logging is facilitated by the syslog subsystem provided by UniTerm as described in Section 7.2
Implement and communicate application versioning methodology.	Please see the Versioning section.
Securely implement wireless technology.	UniTerm is not designed facilitate the use of wireless technologies, however merchants may deploy UniTerm in environments where wireless technologies are in use. UniTerm always uses secure communications channels protected by TLS v1.2 or higher, which are designed for use in public/untrusted networks, to protect sensitive cardholder data while in transit so requiring additional security mechanisms on any wireless technology in use is not a requirement as per PCI, however it is always a recommended best practice.

Secure transmissions of cardholder data over wireless networks.	UniTerm is not designed facilitate the use of wireless technologies, however merchants may deploy UniTerm in environments where wireless technologies are in use. UniTerm always uses secure communications channels protected by TLS v1.2 or higher, which are designed for use in public/untrusted networks, to protect sensitive cardholder data while in transit so requiring additional security mechanisms on any wireless technology in use is not a requirement as per PCI, however it is always a recommended best practice.
Provide instructions for secure use of wireless technology.	UniTerm is not designed facilitate the use of wireless technologies, however merchants may deploy UniTerm in environments where wireless technologies are in use. UniTerm always uses secure communications channels protected by TLS v1.2 or higher, which are designed for use in public/untrusted networks, to protect sensitive cardholder data while in transit so requiring additional security mechanisms on any wireless technology in use is not a requirement as per PCI, however it is always a recommended best practice. Integrators should ensure they secure any wireless technologies in use are in compliance with the requirements in PA-DSS Requirement 6.3 for other applications that may not deploy UniTerm's secure practices.
Use only necessary and secure services, protocols, components and dependent software and hardware, including those provided by third parties.	UniTerm communicates only via TLS using proprietary protocols to a Monetra server (hosted or customer-owned) across an intranet or the Internet. A customer may choose to deploy UniTerm with one or more hardware card entry devices or terminals directly attached to the System via USB, Serial, BlueTooth, or Ethernet It is the integrator's responsibility to ensure only necessary and secure protocols, services, etc., are used on the system.
Store cardholder data only on servers not connected to the Internet	Cardholder data is only stored within UniTerm prior to authorization with no ability to retrieve it in plain-text form as per Section 7.1
Implement two-factor authentication for all remote access to payment application that originates from outside the customer environment.	UniTerm does not facilitate remote access, therefore integrators or merchants choosing to provide an external means of remote access must ensure that all remote access originating from outside the customer's network to a payment application must use two-factor authentication. Two-factor means two separate types of authentication, a username and password is one factor, a second password would not be considered a second factor, it should instead be something external such as a token.
Securely deliver remote payment application updates.	Integrators or merchants must securely deliver updates to UniTerm in compliance with the Deployment section. Deployments must be done in accordance with the PCI PA-DSS requirement 10.3.

Securely implement remote-access software.	Main Street Softworks will never reach out to a remote customer network. If an integrator or merchant chooses to support remote access for management they must do so in compliance with PCI DSS requirements, specifically section 8.
Secure transmissions of cardholder data over public networks.	UniTerm communicates only via TLS to Monetra using proprietary protocols. UniTerm communicates using the PCI DSS required protocols and cipher suites automatically (`TLSv1.2 TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384`). No configuration is required of UniTerm to comply, nor is it possible to reconfigure UniTerm to a less secure protocol or cipher suite. Future versions may implement new protocols and cipher suites as they become available. UniTerm, by default performs full validation of the remote Monetra's certificate. This must not be disabled if connecting to Monetra over the public internet as per Section 4.2.1's' `ssl_cert_validate`.
Encrypt cardholder data sent over end-user messaging technologies.	UniTerm does not facilitate or support the use of end-user messaging technologies.
Encrypt non-console administrative access.	UniTerm does not provide or facilitate administrative access.