Options for Reducing Level 3 EMV Certification Time for Retailer Systems using Electronic Payment Servers (EPS)

Version 1.0

Publication Date: October 2019

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1. Introduction

The goal of this white paper is to discuss solutions to help reduce the implementation time and effort required for the automatic fuel dispenser (AFD) community to meet the AFD October 2020 fraud liability shift deadline. The white paper proposes an approach that may (a) reduce the number of formal Level 3 (L3) certifications required, (b) reduce time lags when a solution is being certified, and (c) reduce wait time between submission, review and response. The approach uses a technical architecture in which the exact same version of a central component (the electronic payment server [EPS]) is used in the payment solutions, and the payment solutions are only differentiated from each other by the use of a variety of EMV terminals/PIN pads. These EMV terminals/PIN pads all behave exactly the same and are only a data source to the central component that handles the payment transaction. The central component is agnostic to which EMV terminal/PIN pad provides the data.

The approach outlined in the white paper is called the Redundancy Reduction Approach (RRA). The intent of the RRA solution is not to reduce the scope of testing, but to reduce the dependencies in the L3 end-to-end certification process and thereby shorten a solution's time to market.

This white paper only provides a high-level description of the RRA. Each payment network and acquirer processor that supports the RRA may do so differently, in accordance with its respective policies and procedures. Stakeholders interested in the RRA are encouraged to discuss the approach with their payment networks and acquirer processors prior to implementation.

Challenge / Problem Definition

The AFD community is facing challenges in addressing the high number of L3 end-to-end certifications (for both contact and contactless) with their acquirer processors. Certification guidelines require end-to-end[1] EMV message certification for each EMV device, or more specifically each EMV kernel version ("traditional L3 certification"). Solution providers in the petroleum market typically implement systems that manage up to eight EMV devices. The solution providers also market to multiple merchants who do not use the same acquirer processors. The combination of multiple POS solutions, multiple EMV devices and multiple acquirers can result in a multiplier effect that requires the solution provider to perform repeats of EMV certifications to fully certify a single version of software such that it can be offered as an unrestricted solution (supporting all possible kernel and acquirer combinations) to each customer. The recent trend to include contactless EMV with the product offerings has the potential to increase that number.

End-to-end testing currently can take weeks. The actual EMV test cases may be completed fairly quickly, but scheduling, reviews by the acquirers, and reviews by the payment networks (if required), along with receipt reviews, add to the calendar time.

> **Note:** Merchants should reach out to their payment networks and acquirer processors to determine which networks and processors support a self-certification program or the Redundancy Reduction Approach.

> **Note:** Merchants should reach to their payment networks to discuss the applicability of the RRA for other retail industries using electronic payment servers (EPS).

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[1] Some acquirers may self-certify with some payment networks, so the "end-to-end" test cases may not actually go all the way to the issuer.

2. Glossary

The Redundancy Reduction Approach (RRA) defined in this white paper uses several terms that are common in the payments industry, but which may not have exactly the same meaning in all contexts. The glossary in this section defines these terms in the context of the RRA.

- **EMV Terminal / Device**: The physical device (i.e., the Level 1 (L1) hardware) where the EMV chip data is read by insertion or tap. The device will contain the EMVCo contact Level 2 (L2) kernel and/or each supported payment network contactless L2 software. The device may contain an EMV chip kernel interface and/or an interface allowing "high level" control of the device from an external entity such as an EPS. Any payment or business logic, such as AID selection and CVM capabilities, must continue to be driven by the EPS; i.e., the EMV terminal serves as only an EMV chip data entry device.

- **Electronic Payment Server (EPS)**: A software payment application, usually present in a semi-integrated system, that gives point-of-sale (POS) systems a way to perform payment transactions in a standard way, independent of the payment networks providing authorization. The EPS separates payment from the POS system or outdoor sales processor (OSP). The EPS manages payment requests from the POS systems and OSP, card data acquisition from the EMV terminals, and payment authorizations for all POS systems and the OSP. Generally, all payment business logic is implemented within the EPS with the POS, OSP, and EMV terminals being relatively "dumb" devices programmed to implement only the interface to/from the EPS.

- **Integrated Payment System** (see also Semi-Integrated Payment System): A payment system where once the card is inserted/tapped, the card data travels from the EMV terminal, through the POS and into the merchant's processor infrastructure where the information is processed. Once the transaction is approved or rejected, the response will be sent back to the POS to complete the transaction. Any payment or business logic, such as AID selection and CVM capabilities, must continue to be driven by the EPS. Figure 1 illustrates an example integrated architecture.
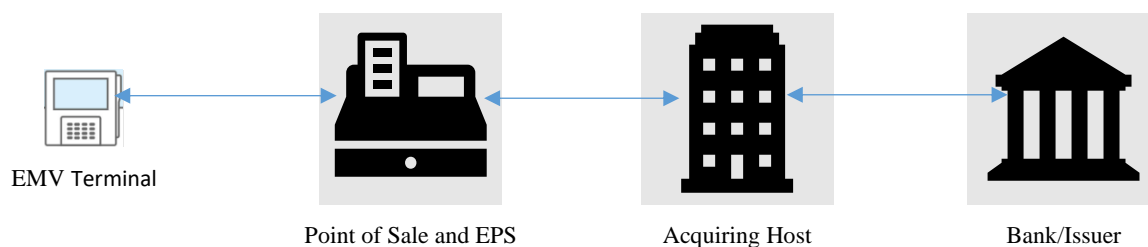

EMV Terminal   Point of Sale and EPS   Acquiring Host   Bank/Issuer

Figure 1. Example Integrated Architecture

- **L2 Kernel Software**: The L2 kernel software consists of the EMVCo-certified kernel for contact and payment-network-certified or EMVCo-certified kernel for contactless.

- **POS**: For the purposes of the RRA, the POS serves as the entity where the cashier or consumer (in self-checkout) rings up items, tenders the transaction for payment, and generates the receipt. The POS does not have physical EMV card acquisition capabilities. Refer to the integrated and semi-integrated payment system definitions to determine the POS role in the transaction flow.

- **Self-certification**: The testing process that allows testing and validation of test results by the EPS vendor, without needing validation by a third party such as acquirer or other validation entity. For purposes of the RRA, the expectation is that the certification uses an approved L2 kernel configuration.

- **Semi-Integrated Payment System**: A semi-integrated payment system contains the same elements as a fully-integrated payment environment. However, the communication between these systems is limited to only non-sensitive commands between the payment terminal and the POS system. The most common semi-integrated architecture is shown in Figure 2. See Section 3 on EPS architectures for a detailed explanation of the messages numbered below.
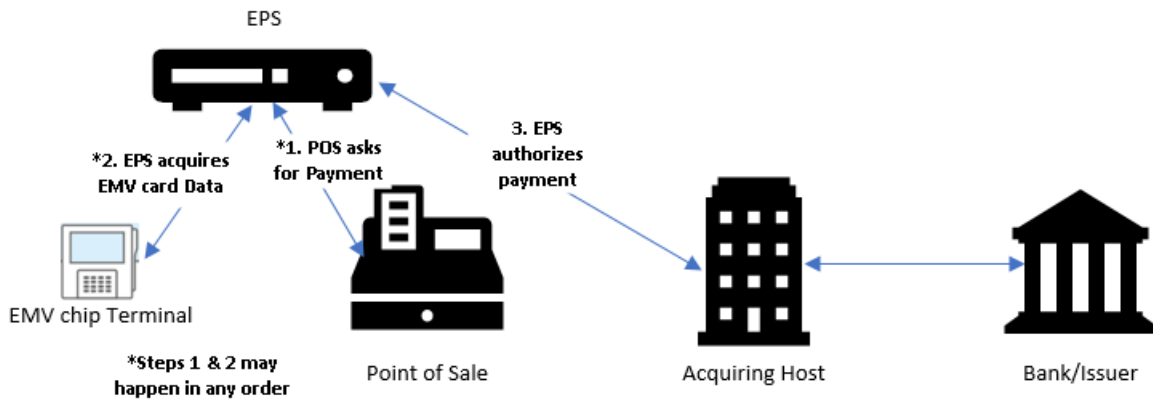

Figure 2. Indoor Semi-Integrated Payment System with EPS

- **Superset of Functionalities:** A term used to convey the "complete" set of functionalities configured in a given EMV solution. The "complete" functionality is typically defined by the intake forms submitted by the merchant prior to EMV certifications based on the chosen L2 letter of approval (LOA) for the terminal. For example, a merchant may have full-service cashier lanes and self-service checkout lanes with different EMV terminal families at each station. The full-service station offers cashback, but the self-checkout does not. The intake form for the full-service EMV device would reflect transaction types of "Goods," "Services," and "Cash Back" as indicated in the L2 LOA "Transaction Type Capability" section, whereas the self-service lane would not use an L2 configuration that stipulated "Cash Back." The full-service station EMV device would be used as the "superset" terminal and certified "end-to-end" as it supports the merchant's "complete" functionality. The self-service lane device would be self-certified as the EMV device with a "subset" of the complete functionality since its L2 LOA did not stipulate cashback. Note that this concept is not applicable to all of the payment network RRA solutions discussed in this white paper.

- **Terminal**: See EMV terminal.

3. EPS Architectures

Figure 3 provides details on the messages and data exchanged between the various components in an EPS semi-integrated system during an indoor merchandise sale.
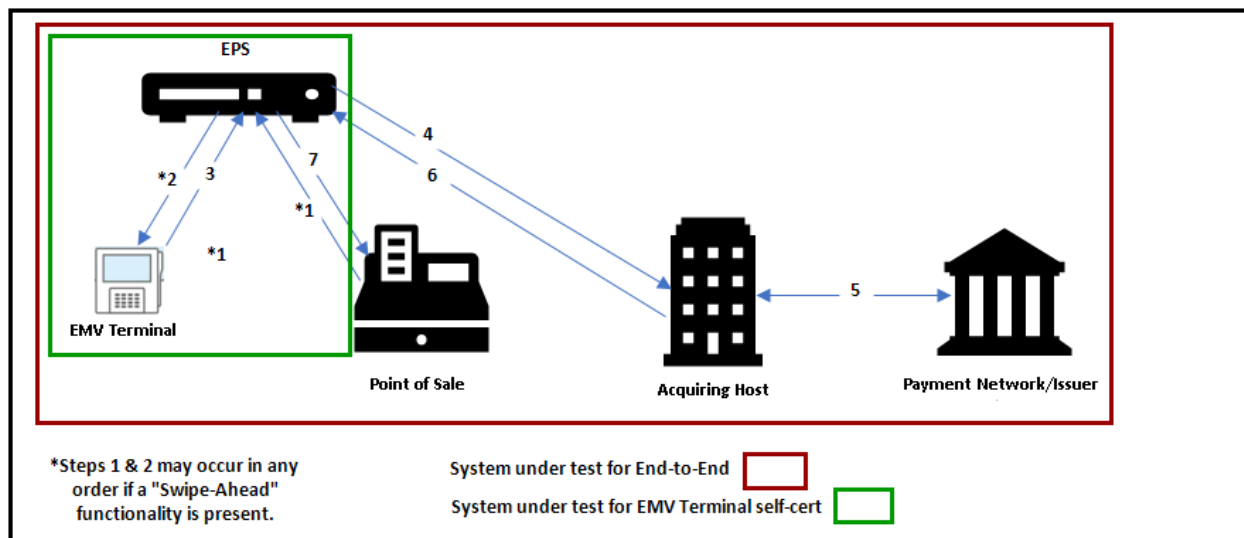

Figure 3. Messages and Data Exchanged in an EPS Semi-Integrated System

1. The POS rings up items and tenders the transaction for a network payment. This generates a (standard) Card Payment Request.

2. DeviceRequest(s): The EPS in a semi-integrated system uses a series of (standard) Device Request/Device Response messages to acquire the EMV chip data. Examples for device request responses are as follows:
   a. Read Card
   b. Start ICC Transaction
   c. Complete ICC Transaction
   d. Remove ICC Card

3. Device Response(s): EMV data (including the selected AID, 1stGenAC and other data) are returned to the EPS in a series of (standard) Device Response messages.

4. The EPS authorizes the transaction using proprietary host messaging containing the EMV chip data acquired from the EMV terminal.

5. The acquiring host authorizes transaction through the network. During end-to-end certifications this may be accomplished using a simulator.

6. The acquiring host responds with an approve/decline message. The acquiring host makes routing decisions based on the transaction type, chip data or other factor, and authorizes the transaction using the appropriate network. Figure 3 does not detail acquirer-to-issuer steps as they are out of scope for site operations.

7. The EPS responds to the POS CardPayment request with receipt data and a CardServiceResponse.

a. The EPS provides response details (e.g., Authorization Number, AID) to the POS for use on the receipt via (standard) DeviceRequest/Response.

b. The EPS provides the approval/decline response to the POS.

4. Redundancy Reduction Approach (RRA) – Generic Overview

Generally, most petroleum solutions for inside/outside (AFD) solutions use an EPS in a semi-integrated solution as defined in Section 3. This section describes an overview of the key aspects of the RRA.

- Under the RRA, the initial EMV solution must have satisfied the requirements for each payment network in order to leverage the corresponding time savings anticipated with the RRA.

- The RRA is agnostic to terminal type.

- The RRA is intended to allow implementers to work at their own speed without time-consuming multiple stops/starts.

- The initial certification is the end-to-end payment network certification for the system under test.

- Subsequent certifications must then be with a kernel with unexpired paperwork.

- For some payment networks, the RRA requires the next solution's features to be equal to or less than those included in initial certification. (See Sections 5 and 6.)

  - Example: less than or equal to initial functionality
    - Initial certification: All CVMs
    - Subsequent certification: Online PIN, No CVM
    - Conclusion: Acceptable for RRA

  - Example: greater than initial functionality
    - Initial certification: Signature, No CVM
    - Subsequent certification: Online PIN, No CVM
    - Conclusion: Unacceptable for RRA

- Payment network-based test plans are utilized for both initial and subsequent RRA certifications.

- RRA certification documentation should be provided as specified by the payment networks.

Before proceeding, merchants should check with their processors/acquirers to ensure they will be using this approach.

The use of RRA is voluntary.

Note: The RRA can apply to any terminal device types (e.g., ATM, AFD indoor and outdoor, POS, mPOS) that use an EPS architecture.

5. Global Payment Networks

This section summarizes the recommended solutions and options from the global payment networks to reduce time in L3 EMV certification testing.

2.1 American Express Recommended Solution

The AFD community proposed a solution to the U.S. Payments Forum Testing and Certification Working Committee wherein, if an electronic payment server (EPS) is used which houses all payment business logic and the EMV terminal is reduced to only a 'dumb' device programmed to implement only the interface to/from the EPS, then the EPS is required to be certified only once for each acquirer processor using an EMV terminal that supports a superset of functionalities, thus reducing the number of certifications required for each subsequent EMV terminal – EPS – acquirer processor combination.

EPS Certification Process for American Express

At a high level, an EPS is defined as a server solution that manages messaging and updates to the attached EMV terminals.

Figure 4 illustrates the steps to follow to take advantage of the streamlined EPS certification process for American Express.
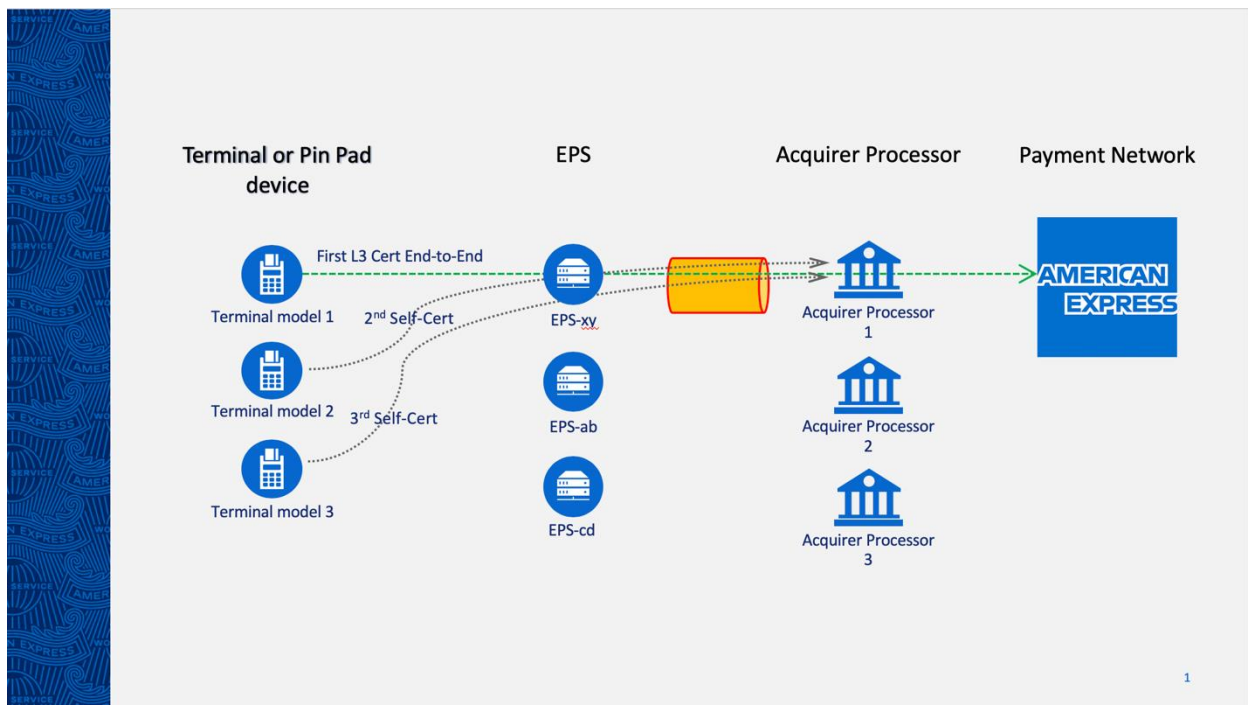

Figure 4. American Express Streamlined EPS Certification Process

Step 1: Perform one formal L3 certification (no changes to the acquirer processor L3 certification process) per acquirer processor's platform and/or message format between the EPS and acquirer processor.

- The testing must be performed using an EMV terminal that contains the **superset of functionalities** (i.e., catering for all the functionalities supported by the EPS—referred to as terminal model 1 in Figure 4).

- The payment network (American Express) test plan must be used for L3 testing.

- While registering this first terminal model (on the American Express Certification Participant Portal), the solution provider or acquirer processor must state clearly that this is the first certification with a superset of functionalities for an EPS solution deployed in an AFD environment so that the payment network can make note of it while providing the L3 LoA and review the registration appropriately.

Step 2: Any additional testing is performed based on the acquirer processor's requirements using terminal model 1.

Assumption: If the EPS certification has been successfully completed, the pipe between the EPS and the acquirer processor (illustrated in orange in Figure 4) would no longer change.

Step 3: Adding a terminal device (e.g., terminal model 2 or 3) to a certified EPS **with equal or less functionality**.

- If the EPS certification is successfully completed, then self-testing may be performed for any additional terminal devices (with equal or less functionality) added to the EPS. The terminal models may come from different terminal vendors. A formal L3 testing/certification with the acquirer processor is not required but American Express requires that any such additional terminal device (terminal model 2 or 3), before it is deployed, is registered with American Express by creating a registration on the Certification Participant Portal and clearly providing all the required details (e.g., device approvals - L1 approval number, L2 approval number, device capabilities - CVMs, device details) and linking it with terminal model 1 certification.

- The payment network L3 test plan should be used to perform L3 self-testing in the U.S. region, and logs must be retained for a minimum of two years. If the applicable test cases are successfully completed, then, from the payment network's point of view, L3 testing is completed.

- Proprietary test cases (outside the scope of payment network L3 self-testing) may be added to testing between the terminal and EPS.

Note: As a reminder, acquirer processor host testing is to be performed once for each platform. Testing with each global payment network was required to be completed by April 2013, as per global payment network mandates. Any new acquirer processor endpoints would be required to perform host testing that includes chip data.

Limitations from American Express:

(a) The above elaborated certification process (which reduces the number of end-to-end certifications in an AFD environment) is limited to the 'online only' environment – where an EMV terminal and EPS always go online for each transaction to get an approval from the issuer.

(b) This proposal is not effective retrospectively. If a solution provider tested/certified a terminal device in the past (prior to 31st Aug 2019) and installed it indoor at a merchant location, then the solution provider still needs to now certify the first terminal model under the new streamlined EPS certification process for American Express. This proposal is dependent on the solution provider certifying the first terminal model along with EPS as described in Step 1 above.

5.2   Discover Recommended Solution

Discover Global Network is working with petroleum merchants to upgrade their point-of-sale systems to EMV technology ahead of the U.S. fraud liability shift in October 2020.

Discover is actively listening to industry stakeholders as they work to upgrade their systems and are exploring enhancements to the Discover certification process for the petroleum segment.

Enablers should contact their Discover account executive to discuss the applicability of the process.

5.3   Mastercard Recommended Solution

Optimizing EMV and Contactless Terminal Testing for Mastercard Acceptance

As the automated fuel dispenser systems liability shift is approaching, certification activities for these systems are happening at full speed. In order to assist with L3 certification optimization, Mastercard is reminding the U.S. payments industry of its existing RRA testing options. These options have been developed by Mastercard to ensure high quality acceptance while minimizing the efforts needed to complete Mastercard Terminal Integration Process (M-TIP) validations.

M-TIP is the Mastercard implementation of Level 3 testing of EMV and contactless terminals. M-TIP is an important step in ensuring readiness of terminals for production use, and is one of the last steps in getting terminal-ready for deployment. M-TIP is optimized for ensuring compliance with Mastercard rules and requirements, and its scope is limited to this goal. In addition to performing M-TIP, merchants and solution providers are expected to perform thorough functional testing of their full terminal features.

The "Modular M-TIP" and "Delegated L3" programs detailed below are intended to help minimize testing cost and effort.

Modular M-TIP

Today's payment landscape often involves many entities. For instance, it is common for multi-location merchants to process transactions through multiple acquirer connections (transaction paths), and to use a variety of terminal models.

By standard M-TIP rules, each terminal is required to be certified through every connection path. However, the Modular M-TIP program removes redundancy from this certification process, by implementing a simple principle: every terminal configuration and every path must be certified at least once, instead of every terminal configuration having to be certified through every path.

In the example and Figure 5 below, a merchant is shown having three terminal configurations and processing transactions through two acquirer connections. In this environment, under the Modular M-TIP program a merchant needs to complete three M-TIPs only, instead of six based on standard M-TIP rules:

- A first M-TIP session tests the combination of terminal 1, merchant gateway, and acquirer 1.

- A second M-TIP session tests the combination of terminal 2, merchant gateway, and acquirer 2.

- At that stage both terminal 1 and terminal 2 are certified. Assuming that both terminals implement all features that other, additional terminals will support, there is sufficient evidence that the merchant gateway operates correctly with both acquirer 1 and acquirer 2.

- Therefore, any terminal subsequently added, e.g., terminal 3, can be tested in a third, single session with either acquirer 1 or acquirer 2.

As this third session is independent of any acquirer, it does not need to be run through an actual acquirer infrastructure. It can be run through a suitable emulated, generic acquiring environment connected to the merchant gateway. This further simplifies the organization of test sessions.
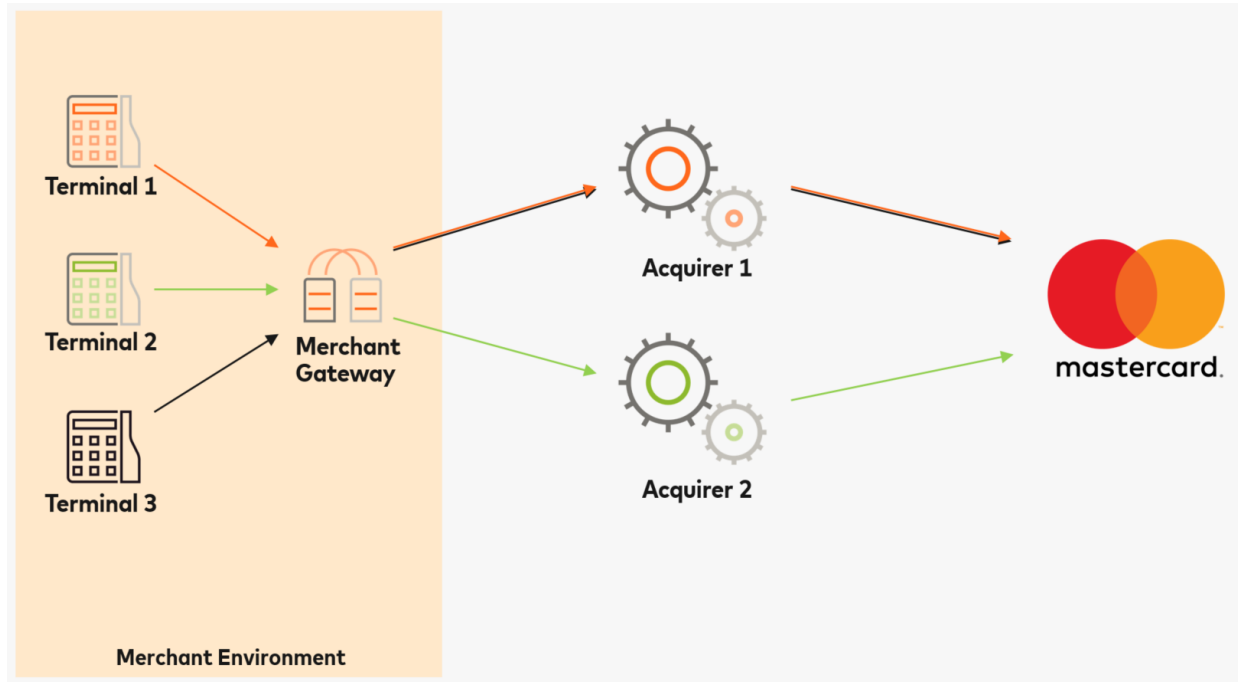

Figure 5. MasterCard M-Tip Certification Example

Delegated L3 Testing Program

The Delegated L3 Testing Program (shown in Figure 6) is a free-of-charge program, which grants self-certification rights to U.S. merchants and solution providers (including gateways, acquirer processors, value-added resellers (VARs), independent software vendors (ISVs)), who are sufficiently experienced in M-TIP testing and have the necessary technical and organizational skill. Program participants are not required to have the results of their M-TIP test sessions validated by an accredited M-TIP service provider, as is normally required with regular M-TIP.

Prerequisites for enrolling in the Delegated L3 Testing Program include the successful, iteration-free completion of two regular M-TIP services with an M-TIP service provider, and the availability of the necessary tools and processes for performing self-certification.

Delegated L3 Testing entities register with Mastercard by providing information on their testing organizational structure, processes and tools. Upon Mastercard's approval of program registration, the registrants may perform self-testing and directly report their testing results to Mastercard.
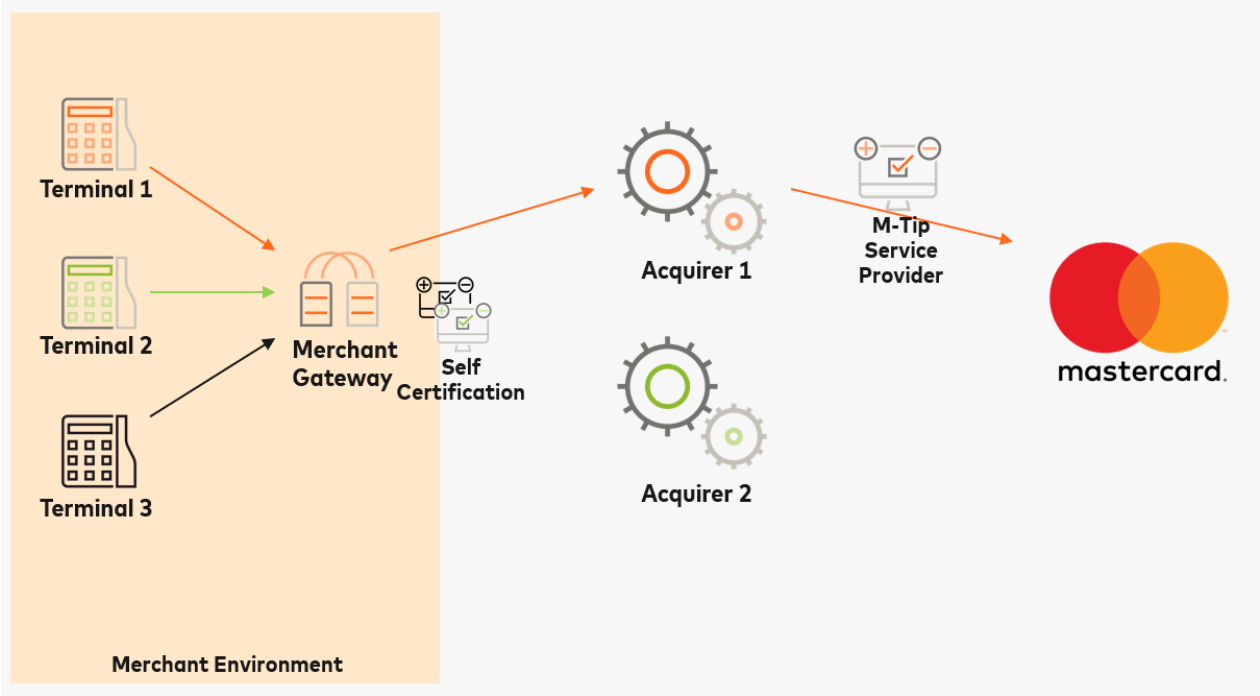
Figure 6. Mastercard Delegated L3 Testing Program

Achieving the Optimized Terminal Certification Environment

Merchants and solution providers willing to operate in an optimized certification environment may do so by combining both programs. Participation in the Delegated L3 Testing Program allows reducing certification costs and optimizing time-to-market. Use of the Modular M-TIP model allows minimizing the number of M-TIP test sessions that need to be completed.

U.S. merchants and solution providers interested in creating their optimized certification environment are invited to reach out to Mastercard via chipservicesmanagement@mastercard.com to enroll in these programs.

5.4   UnionPay International Recommended Solution

UnionPay International supports the Redundancy Reduction Approach (RRA) as outlined in Section 4 of this document. Please note that the acquirer processor must be approved to perform the self-certification program, which is managed at the regional level by UnionPay. While the support for RRA is global, acquirer processors will need register with each UnionPay region. U.S. acquirer processors will need a guarantee letter from the China UnionPay U.S. office concerning transaction interoperability.

In the U.S., UnionPay RRA support is only for acquirer processors who have a direct connection to UnionPay. Acquirer processors who connect to Discover for UnionPay transactions will need to follow Discover certification rules.

UnionPay support of RRA is not limited to the petroleum industry. For UnionPay, any approved self-certifying acquirer processor can apply the same RRA rules to any EPS regardless of industry.

5.5   Visa Recommended Solution

From a high-level point of view, if using an EPS architecture, then the Visa recommended RRA solution is to formally L3 certify only one terminal with each acquirer processor per platform/message format with the superset of test cases (comprising all the different functionalities supported by the EPS). Once successfully performed, the pipe between the EPS and the acquirer processor will not change, meaning any additional terminal with the superset or less functionality added to the EPS would be self-tested using the test cases provided by the global payment networks and include proprietary testing. This solution also aims to remove redundant testing. In addition, this solution applies to all the terminal device types (e.g., ATM, AFD indoor and outdoor, POS, mPOS) that use an EPS architecture.

EPS Certification Process

At a high level, an EPS is defined as a server solution that manages messaging and updates to the attached EMV terminals. The EPS (which may be a local or cloud-based server) manages, for example, the set of commands and scripts that configure, initiate and control payment transactions sent to the attached thin-client terminals. This includes passing commands and data (usually via a proprietary or scripting language) to configure, control and manage EMV transactions. The EPS provides an abstraction layer between the EPS and the EMV kernel and a uniform interface between the EPS and the acquirer host or gateway. In addition, where a gateway uses a uniform proprietary message format for every single POS/PIN pad endpoint, the gateway may fall under the definition of an EPS.
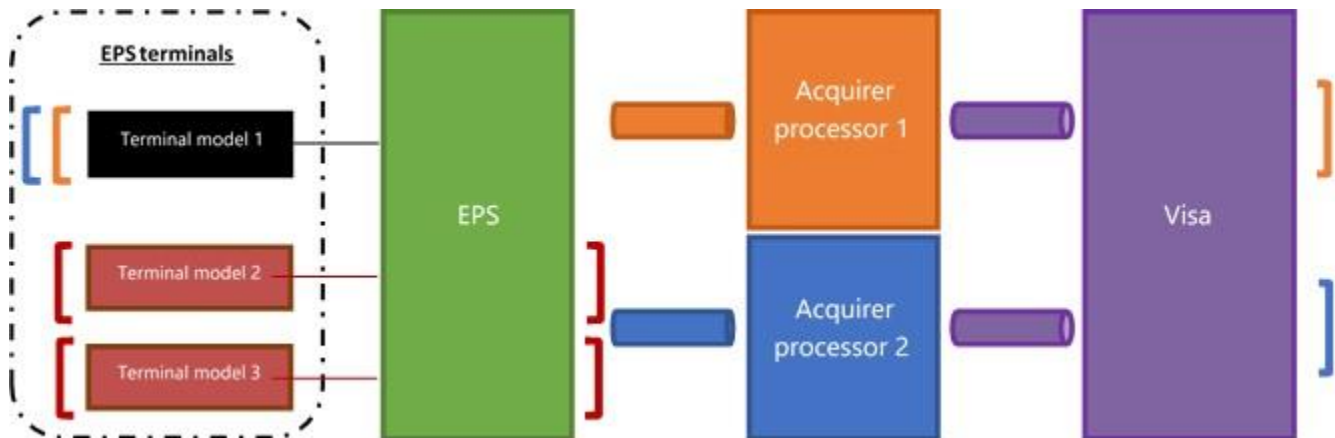

Figure 7. Visa Streamlined EPS Certification Process

The steps to follow to take advantage of Visa's streamlined EPS certification process are illustrated in Figure 7 and discussed below.

Step 1: Perform one formal L3 certification (no changes to the acquirer processor L3 certification process) per acquirer processor's platform/message format.

- The testing must be performed using a terminal that contains the **superset of functionalities** (i.e., catering for all the functionalities supported by the EPS—referred to as terminal model 1 in this Figure 7).

- The latest version of the U.S. Quick Chip Minimum Terminal Configuration ADVT/CDET Use Cases document should be used in the U.S. region. The document is available on Visa Online (VOL) or Visa Technology Partner (VTP).

Step 2: Any additional testing is performed based on the acquirer processor's requirements using terminal model 1.

Note: If the EPS certification has been successfully completed, the pipe between the EPS and the acquirer processor (illustrated in blue and orange in the diagram above) would no longer change.

Step 3: Adding a terminal device (e.g., terminal model 2 or 3) to a certified EPS **with equal or less functionality**.

- L3 certification for the EPS can be performed independently of the acquirer processor for any terminal **with equal or less functionality** than terminal model 1 (in Figure 7 referred to as terminal model 2, terminal model 3). Terminal models may come from different terminal vendors. If the EPS certification is successfully completed, then self-certification may be performed for any additional terminal devices added to the EPS. In that case, formal end-to-end L3 certification with the acquirer processor is not required.

- The latest version of the U.S. Quick Chip and Minimum Terminal Configuration ADVT/CDET document (available on VTP or VOL) should be used to perform L3 self-certification in the U.S. region, and logs must be retained for a minimum of five years. If the applicable test cases are successfully completed, then from the payment network's point of view, L3 testing is completed.

- Proprietary test cases (outside the scope of payment network L3 self-certification) may be added to test between the terminal and EPS.

Note: As a reminder, acquirer processor host testing is to be performed once for each platform. Testing with each global payment network was required to be completed by April 2013, as per global payment network mandates. Any new acquirer processor endpoints are required to perform host testing that includes chip data.

6. Domestic Payment Networks

This section summarizes the recommended solutions from the U.S. domestic payment networks noted below regarding using the RRA. Contact the domestic payment networks for additional information.

6.1 DNA Shared Debit AID Recommended Solution

- For each terminal type, certification is required.

- DNA-supported applications comply with the EMV Common Core Definition (CCD) specification.

  o All terminals are required to go online for transaction authorization and card authentication.

  o Terminals may support online PIN, no card verification method (No CVM), and/or signature.

  o Offline transactions are not supported at this time.

- Please contact DNA for online test scripts, Info@DebitNetworkAlliance.com.

6.2 NYCE/CULIANCE/AFFN Payment Network Recommended Solution

NYCE/CULIANCE/AFFN support RRA with the following requirements:

- Prerequisite: Level 3 (L3) certifications of each global payment network.

  o Certification must include the U.S. Common Debit AID for each network.

- Certification between the merchant acquiring platform and the network (NYCE, CULIANCE, and AFFN).

  o Once this certification is completed, terminals can acquire debit transactions.

6.3 SHAZAM Payment Network Recommended Solution

- In addition to Level 3 (L3) certification of each global payment network, the certification of U.S. Common Debit AID acceptance for each debit network should be included.

- Certification between the merchant acquiring platform and the SHAZAM network based on current certification guidelines.

7. Conclusion

This white paper proposes the Redundancy Reduction Approach (RRA), a streamlined EPS certification process intended to help reduce the implementation time and effort required for the automatic fuel dispenser (AFD) community to meet the AFD October 2020 fraud liability shift deadline, by helping to expedite and minimize payment network certifications. The white paper and the RRA are not intended to cut any corners in testing and certifying EMV implementations, and the necessary and applicable test cases for each payment network are preserved. The approach achieves its goals by, among other things, helping to empower ISVs, solution providers and merchants to test on their own, rely on card log results, and reduce time between testing and reviewing results.

8. Legal Notice

As noted above, each payment network and acquirer processor that supports the RRA may do so differently, in accordance with its respective policies and procedures. Stakeholders interested in the RRA and/or EMV more generally are strongly encouraged to consult with their respective payment networks, acquirer processors, and appropriate professional and legal advisors regarding all aspects of implementation, prior to implementation.

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