Terminal Architecture for PSAM Applications (TAPA)

Overview

Version 2.0

April 2000

TABLE OF CONTENTS

LIST OF FIGURES

1. Revision Log

Version	Date	Affects	Brief Description of Change
2.0	04/00	All pages	Initial Publication

2. Document Overview

2.1 Purpose

The purpose of this document is to provide the information necessary to gain a high level understanding of the Terminal Architecture for PSAM Applications (TAPA), its benefits, and intended purpose.

2.2 Intended Audience

This document is intended for persons wishing to gain an understanding of the business rationale for developing TAPA. It is assumed that the reader already possesses some knowledge of electronic transaction processing and service payment terminals.

2.3 Included in this Document

- Description of the rationale behind developing TAPA.
- Description of the specific goals of TAPA.
- High-level overview of TAPA, its structural components, and how they function.

2.4 Not Included in this Document

- Information contained in other specifications such as ISO, EMV, and CEPS.
- Specific TAPA implementation requirements.
- Implementation details for loyalty and other proprietary applications.

2.5 Related Documents

1. The TAPA documentation currently consists of three documents: Terminal Architecture for PSAM Applications, Overview, Version 2.0, April 2000 (this document).
2. Terminal Architecture for PSAM Applications, Application

Architecture Specification, Version 2.0 , April 2000.

3. TAPA Common Electronic Purse Application, Version 2.0, April 2000.

In the future, specifications for other applications may be added. Additionally, proprietary TAPA application specifications may be used in various implementations.

3. TAPA Overview

3.1 Rationale for TAPA

Currently, terminal application development is unnecessarily complicated and expensive largely due to a lack of application standardization and the existence of numerous brand or regional architectures. The inability to effectively control and manage the application development process has resulted in increased costs for development, certification and maintenance. In addition, the lack of standardization has resulted in unnecessary delays in the delivery of terminal applications and PSAMs to market.

The increasing complexity and differentiation of terminal applications has revealed the need for both standardization and simplification of terminal applications.

With the emergence of industry technical standards and open architectures such as ISO, EMV, Global Platform's Open Platform Terminal Framework (OPTF), and Europay's Open Terminal Architecture (OTA), it is now possible to establish standards related to application operability. However, compliance with open architectures does not ensure that resulting applications will be terminal-independent or define how the terminal application software should be structured. TAPA is designed to deliver such independence by establishing a standardized terminal architecture-independent structure for implementing applications that use PSAMs.

3.2 Intent of TAPA

The TAPA model shall serve to relieve these inefficiencies of application development and deployment through the establishment of application interoperability standards. The modular design approach of the TAPA model allows for standardization of functional components of the terminal application without dictating details of the terminal hardware design or mandating the operating system to be used.

The TAPA model shall be compatible with existing industry standards such as ISO 7816, EMV, and Common Electronic Purse Specifications (CEPS).

The TAPA model shall be capable of supporting multiple applications and payment services including, but not limited to, magnetic stripe, electronic purse, credit & debit, and other proprietary services such as loyalty programs.

The functional components defined within the TAPA model are narrowly defined by function such that they may be developed to be device-independent. This modular approach allows application developers to more effectively isolate the software responsible for performing specific application functions and thus allowing these modules to be more easily ported to a wide range of terminal devices including service payment terminals, payphones, vending machines, or distributed internet client/payment server implementations. This should allow for application developers to improve upon their economies-of-scale margin.

In addition, applications developed to the TAPA model shall function consistently regardless of the type or manufacturer of the PSAM.

The result of implementing the TAPA model should be a reduction in the time and costs associated with developing and releasing terminal applications to market.

3.3 Benefits of TAPA

<u>Lower cost of the payment terminal infrastructure</u> through standardized terminal software.

The use of TAPA allows the development of a common standardized terminal that can accommodate multiple applications and PSAM configurations, built to different requirements by different vendors and still sharing a common terminal structure. The wide use of TAPA terminals will reduce the costs of developing and upgrading the payment terminal infrastructure through increased market acceptance by multiple payment schemes and acquirers.

<u>Faster time to market of new applications</u> through more effective application development and certification.

TAPA allows new application development to be localized in the PSAM and Multi-Application Driver modules. This modular approach frees the developer of complex application structures and speeds the total time for delivering new applications to the marketplace.

<u>Increased performance, stronger security and enhanced integrity of</u>

applications through the standardized use of PSAMs.

The use of TAPA makes the use of PSAMs and the associated benefits of faster hardware performance of cryptographic functions and enhanced security of data more feasible through a multi-application architecture. It will be easier to share PSAM functions among different payment and proprietary applications, increasing the value and strength of the terminal offering.

Enhanced control and migration of terminal software through the use of PSAMs as an application software carrier.

Accommodation of flexible models of terminal and PSAM interaction through a standardized terminal-PSAM interface.

3.4 Definition of TAPA

TAPA is a terminal application architecture that defines an application model logically separated into distinct functional components. These functional components are defined as the Router, Device Handler(s), Multi-Application Driver Handler, and PSAM(s). The TAPA model also defines basic message formats, command sets, and a transport-addressing scheme by which an individual component may interact and communicate with other components within the application. TAPA does not attempt to provide a comprehensive list of command sets or device handlers as it is acknowledged that many features will be application specific and dependent upon the actual operating environment.

While TAPA defines the basic operational details necessary to create a payment application that can support magnetic stripe, EMV, and CEP stored-value applications, it does not extend this definition to other payment options such as loyalty or other proprietary programs. Although loyalty or other proprietary applications may be implemented with the TAPA model, the processing requirements necessary to support these applications are anticipated to range widely and are therefore considered impractical to document. For this reason, the TAPA model defines a range of commands and device handlers that may be assigned and used at the discretion of the application developer.

The TAPA model also provides flexibility with respect to the division and degree of operational control exhibited or shared between the terminal application and resident PSAM(s). Application control may be maintained by either the terminal application, PSAM, or in combination between the two to any degree deemed appropriate by the application developer.

A PSAM may initiate and conduct communication with other components within the application -- making it possible to execute the complete application from the PSAM. While the TAPA model allows for the storing of executable applications within a PSAM, it imposes no restrictions on the type of PSAM used, provided it is shareable between various terminal models and was developed in accordance with the TAPA specifications. Reliance on the application software resident in the PSAM will shift operational control from the terminal application to the owner of the PSAM (probably the merchant acquirer).

The TAPA model allows for the delivery of PSAM software or parameter updates to be implemented without affecting the software residing on other components in the terminal.

The complete structure of the TAPA model is specified in a series of generic and implementation-specific documents. These documents are intended for use by terminal application designers wishing to create multi-function applications based on the standards established therein. However, this does not preclude application developers from creating their own implementation-specific documents based on the TAPA model when different or enhanced functionality is desired.

Terminal Application for PSAM Applications (TAPA), Application Architecture Specification

The TAPA Application Architecture Specification provides a terminal application developer a detailed description of the TAPA model and functional components. This specification provides a description of the message formats, component address assignments, and basic command sets necessary to develop a TAPA compliant application. This specification must be used in conjunction with at least one TAPA-compliant PSAM application specification in order to produce a terminal application.

An example of a PSAM application specification is the CEP application defined in reference 3, TAPA Common Electronic Purse Application.

The TAPA CEP PSAM Application Specification provides the terminal and PSAM developers with a detailed description of how to implement a CEPS-compliant application. The PSAM application implementation specifications do not impose only one model for acquirer processing. For the CEP implementation specifications, recommendations which are CEPS-compliant are provided to guide the implementer. The acquirer or its vendor may add additional functionality, and is free to develop the acquirer specific processing as desired.

Regardless of the manufacturer, all PSAMs that support a particular implementation specification will inter-operate with all terminals that support the same implementation specification.

4. Architectural Overview

4.1 Introduction

This section provides an overview of the TAPA specifications and outlines the general functional and processing requirements which this architecture is intended to fulfill. This section will additionally identify and describe the various structural components comprising the overall TAPA architecture.

4.2 General Requirements

The TAPA application architecture defines a generic Terminal-to-PSAM interface such that a terminal application may function using PSAMs produced by different manufacturers.

The TAPA application architecture supports a multi-function point-of-sale terminal application which can support both EMV and CEP payment applications as well as additional proprietary applications such as loyalty programs.

TAPA is designed to be independent of the implementation strategy chosen and is independent of the terminal operating system or device architecture.

TAPA does not impose restrictions on the type of transmission protocol used to exchange messages between structural components.

TAPA does not restrict the physical configuration of the terminal. The terminal may exist as either a complete unit of fully integrated components (such as a conventional payment terminal) or may exist to varying degrees as a distributed system using shared components such as an Internet payment server.

4.3 Terminal Application Architecture

The terminal application architecture consists of a set of logical components. These include a Router, a set of Device Handlers, a Multi-Application Driver (MAD) Handler, and one or more Purchase Secure Application Modules (PSAMs). TAPA also defines a set of messages to communicate between the different logical components. Figure 1 provides an illustration of the various components, their relative location, and a relational hierarchy within the TAPA architecture.

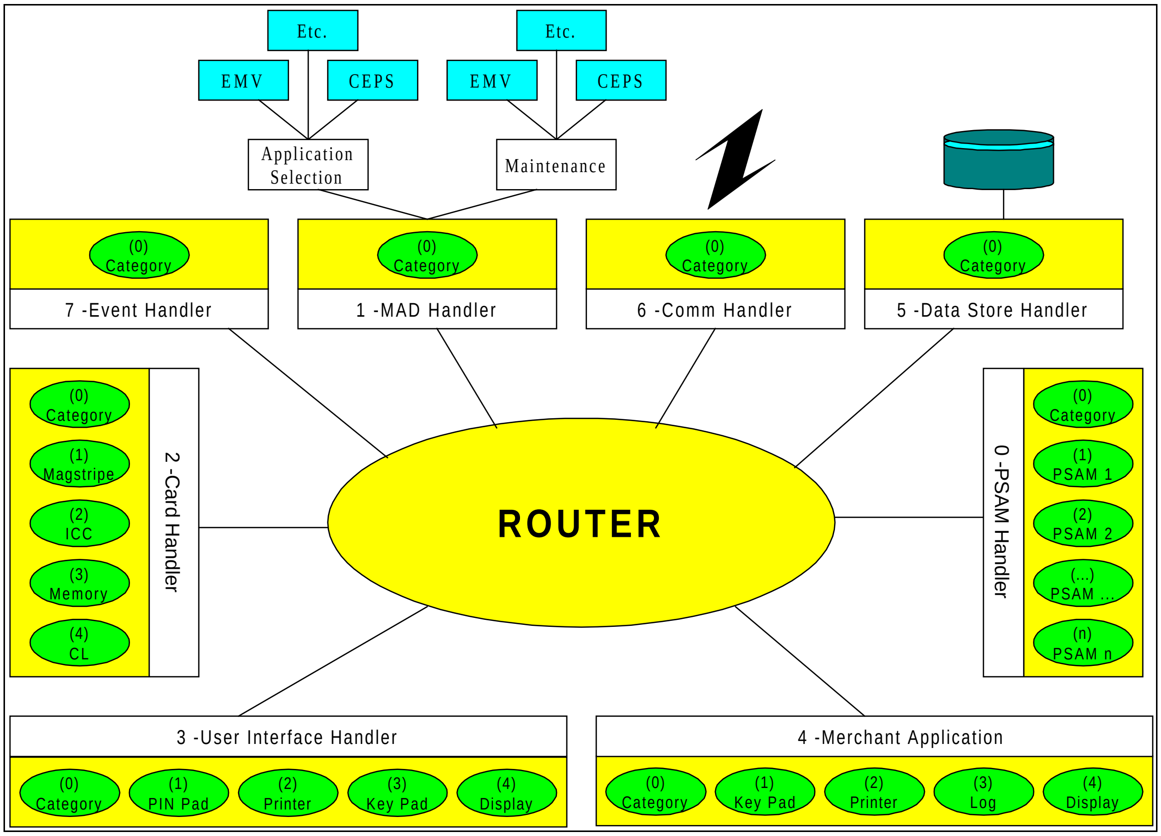

Figure 1 - Logical Components of TAPA

The Router and Handlers make it possible to write application software in a terminal-independent way. The Router is a central component that holds the terminal together as one logical entity. The Router is a pure transport mechanism that is completely independent of the application and underlying terminal software. The Handlers are the published interfaces to devices. An application never communicates with a device directly, but instead communicates with the Device Handler via the Router. The device may be located anywhere. If necessary, the Router sends messages over a telephone line or serial line between physically distributed components.

The MAD Handler is the controller software of the terminal. It is the master of the terminal when no application is active. It is also the software that decides the general way which an application will be executed. The MAD Handler conducts the application selection process. After an application under control of the MAD Handler is selected(for instance, the CEP application) that application controls operation of the terminal until completion. In distributed environments, where the MAD Handler functions are split between a server and multiple remote terminals, the messaging between the distributed and centralized parts of the MAD Handler is proprietary to the device developer and is not handled by the Router component.

The TAPA architecture allows applications to be partly in the terminal under the MAD Handler and partly in the PSAM. There are no restrictions on the type of PSAM used; however, it must be possible to use the PSAM in a terminal that is programmed according to this specification. As mentioned above, the TAPA architecture allows for a wide range of PSAM implementations as to the degree of application control that is shared between the PSAM and the application software controlled by the Multi-Application Driver modules. It is possible to execute the complete application from the PSAM because the PSAM Handler can communicate with all other handlers by means of the Router. However, a different PSAM implementation might assign less application control to the PSAM, or the PSAM might be used only for purposes of performing cryptographic functions. The TAPA architecture allows a full range of implementation options, including those specifically mentioned above.

Putting application software on the PSAM shifts the control of application software from the terminal vendor to the owner of the PSAM (probably the acquirer for payment transactions). Software updates in the PSAM can be done completely independent of the software residing on other components in the terminal. These software updates can be performed without requiring a service visit to the terminal, thus helping control the costs of application maintenance and service.