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United States
Department of
Agriculture

Food and
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Service

Office of
Analysis and
Evaluation

Technical and Cost Feasibility of EBT Equipage in Farmers' Markets and Mobile Food Retailers

Final Feasibility Report

August 1998

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Authors:
Woody Penn Wright
Maria Arminio
Paul Reimer
Chad Somers
Jason Darlington
Karen Kline

Submitted by:

AMA Systems, Inc.
208 North Washington Street
Alexandria, VA 22314

Project Manager: Woody Penn Wright

Submitted to:

Office of Analysis and Evaluation
USDA Food and Nutrition Service
3101 Park Center Drive, Rm. 214
Alexandria, VA 22302

Project Officer: Ken Offerman

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EXECUTIVE SUMMARY

This document constitutes the Final Report for the study of the Technical and Cost Feasibility of Electronic Benefit Transfer (EBT) Equipage in Farmers' Markets and Mobile Food Retailers. The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (Public Law 104-193) requires all states to implement FSP EBT systems before October, 2002 unless waivers are authorized by USDA. Farmers' market and mobile food retailers operate in environments where electric power and land-line telephone access is not readily available. This presents a challenge for EBT equipage.

USDA has a fundamental interest in ensuring that program participants have continued access to farmers' markets. Consequently, a solution – either through technological or non-technological means – is clearly needed.

The purpose of this report is to explore technological solutions to the challenge of EBT for farmers' markets. This report does not address non-technological solutions and is purposely limited to exploring the feasibility of wireless technologies for use in farmers' markets and mobile retailers. While this report concentrates on current technical solutions, non-technical fixes may be more appropriate for individual States and local markets.

It is hoped that the report can provide a useful basis for the continuing dialog with USDA's partners. The report inventories existing and anticipated alternative technological approaches to portable real-time authorization in on-line EBT systems and report on the technical feasibility, cost feasibility, advantages/disadvantages of each approach, and the potential impacts of implementing these new technologies.

Fundamental Questions to be Answered

Can procedures or hardware used or under development outside the food industry serve Food and Nutrition Service (FNS) retailers in locations without telecommunications or electricity, including non-stationary retail environments? What other alternatives are feasible? How would the feasible systems operate in an EBT context? What is required to make software and/or hardware compatible? What are the relative costs of the various approaches identified?

Methodology

With no definitive information available on what exists now and what is feasible in the near future, a comprehensive sampling frame was necessary to identify and select "technology experts". Technology Experts identified by FNS and literature search efforts were used to identify and assess potential wireless approaches. Technology Experts were selected to represent a variety of alternative telecommunications, electronic funds transfer, and transaction automation technologies. In addition, we employed a strategy of issuing a Commerce Business Daily (CBD) Potential Sources Sought Request for Information (RFI) solicitation to maximize the number of information sources.

Findings

The main findings of the study can be summarized quite simply. The "Inventory and Analysis Of Alternative Technologies, Equipment and Vendors" shows that EBT equipage in farmers' markets and mobile food retailers is technically feasible. The cost feasibility of EBT equipage in farmers' markets and mobile food retailers, however, presents a much more significant challenge since implementation costs must be budgeted and operating costs must be competitive with paper systems. The cost to outfit a farmer or mobile food retailer with a wireless EBT suite is 2-3 times more expensive than the nominal cost (e.g. $400) to outfit a traditional retailer stall for EBT.

INTRODUCTION

Background

The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (Public Law 104-193) requires all states to implement FSP EBT systems before October, 2002 unless waivers are authorized by USDA. Farmers' market and mobile food retailers operate in environments where electric power and land-line telephone access is not readily available. This presents a challenge for EBT equipage.

USDA has a fundamental interest in ensuring that program participants have continued access to farmers' markets. Consequently, a solution – either through technological or non-technological means – is clearly needed.

Purpose

The purpose of this report is to explore technological solutions to the challenge of EBT for farmers' markets. This report does not address non-technological solutions and is purposely limited to exploring the feasibility of wireless technologies for use in farmers' markets and mobile retailers. While this report concentrates on current technical solutions, non-technical fixes may be more appropriate for individual States and local markets.

It is hoped that the report can provide a useful basis for the continuing dialog with USDA's partners. This report inventories existing and anticipated alternative technological approaches to portable real-time authorization in on-line EBT systems and report on the technical feasibility, cost feasibility, advantages/disadvantages of each approach, and the potential impacts of implementing these new technologies.

The key audience for the study report is the USDA Food and Nutrition Service (FNS) Food Stamp Program (FSP) which will provide information and guidance to States. FNS will use the information to determine how to best advise States regarding the implementation of EBT

technologies in non-wired markets. Recognizing that very few systems have been implemented using this technology, and little is known about its impact on efficiency and customer service, this report will describe what technology exists, but will not draw conclusions about what is most effective.

Study Objectives

There are three primary objectives of the overall study:

1. List and access the factors that need to be considered in reviewing the advantages and disadvantages of particular technologies for EBT equipage of non-wired retailers in farmers' markets and other locations.
2. Inventory existing and anticipated alternative technological approaches to portable real-time authorization in on-line EBT systems and report on the technical feasibility, cost feasibility and advantages/disadvantages of each approach.
3. Prepare a feasibility report that describes 3-4 hypothetical approaches that could be deployed to routinely provide EBT equipage for non-wired retailers.

Research Methods

A number of data collection methods were used to address the objectives stated above. They included:

- **Review and Analysis of all Relevant Documentation.** - A detailed and comprehensive review of past studies pertaining to EBT implementations.
- **Literature Search.** - A comprehensive search of all available databases, web pages, material and industry specifications on EBT and EFT technologies, to develop a detailed updated inventory of relevant information.
- **EBT Stakeholder Interviews.** - Informal interviews to ascertain information and data from the appropriate Subject Matter Experts (SME) representing the following areas: EBT operations, State agencies administering EBT systems, representatives of farmers' markets, food retailers, and current EBT processors. The interviews focused on gaining a

detailed understanding of the EBT environment from different interest groups that have a stake in the overall concept of EBT systems but may have differing priorities, requirements or issues.

- **CBD Potential Sources Sought RFI.** - Commerce Business Daily (CBD) Potential Sources Sought Request for Information (RFI) notices were published to solicit information on mobile point of sale (POS), telecommunications, and EBT systems and equipments from commercial sources.
- **Technology Expert Interviews**. - Technology experts were selected to represent a variety of alternative telecommunications, electronic funds transfer, and transaction automation technologies.

This study is not controlled hypothesis testing research. Rather, mostly qualitative and some quantitative data on technical alternatives that are likely to be successful implementations of wireless EBT in the Food Stamp Program (FSP).

Presentation Approach and Report Organization

The need to identify approaches for the performance of wireless EBT transactions can be defined as a business problem which requires a retail Point of Sale (POS) perspective and a knowledge of telecommunications technologies. To help the reader assimilate the complexity of the alternative wireless EBT technology approaches presented herein, a presentation approach employing the following eight steps is used:

STEP 1: Orient the Reader to Technology Terms and Acronyms

Appendix A provides a glossary of terms and acronyms that are used throughout the report. The glossary contains retail, telecommunications, and information technology terms and acronyms that the reader will need to fully comprehend the report's technology sections.

STEP 2: Describe the Farmers' Market and Mobile Food Retailer Environment

This step describes the environment in which common types of farmers' markets and mobile food retailers operate. An understanding of the most common forms of mobile markets provides insight into which wireless POS approaches are best suited to meet the needs of a particular farmers' market or mobile food retailer.

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FARMERS' MARKET & MOBILE FOOD RETAILER ENVIRONMENT

The acceptance of EBT transactions for food and agricultural products at farmers' markets and mobile food retailers presents a challenge and an opportunity. Farmers' market and mobile food retailers operate in environments where electric power and land-line telephone access is not readily available. To fully appreciate the challenge, it is critical to understand the various types of farmers' markets and mobile food retailers that are currently in place as well as the environment (e.g., location, physical limitations) in which they operate.

Diverse Retailer Operating Models

Food retailers who participate in farmers' markets do business under a variety of different organizational structures. As a result, any wireless EBT POS approach must be able to accommodate the greatest number of farmers' market and mobile food retail operating models.

With the assistance of the Maryland Dept. of Agriculture, the following farmers' market operating models have been identified[1].

The Sole Proprietor

The most common farmers' market operation is a group of independent farmers, each of whom has to be individually authorized to process food stamp transactions. Each merchant sells their products during regularly scheduled times at a location that may be provided by: a local government authority or civic group (e.g. church), a major retailer (merchandise or food) with ample parking lot space, or the farmer's own land at a convenient intersection. The important aspect is that no collective entity manages or coordinates the farmers' market.

The Sole Proprietor model of mobile food retailer has the following characteristics for how they conduct business:

- Independent operation (unaligned).
- Sale of goods at single vendor locations (road side stands, route vendors).

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[1] Phone conversation between Woody Wright, AMA Systems, Inc. and Pat McMillian, Assistant to the Secretary Director of Intergovernmental Relations, Maryland Department of Agriculture, July 24, 1997.

- Sale of goods at group vendor locations (farmers' markets).
- EBT transactions are authorized individually (vendor is FSP authorized).
- Payment for EBT transactions are settled and received individually.

Mobile food retailers (door to door food retailers operating from a vehicle and route vendors) generally fit into the sole proprietor operating model.

The Coop[2]

A small percentage of farmers' markets are run by an entity for the benefit of the group (usually a cooperative). This model would allow for consolidation of certain EBT processing functions if the group agreed on the scope and allocation of cost to manage EBT processing resources.

Following are the various types of coop structures that are available to process EBT transactions:

- A group of proprietors who have a "formal" (i.e., written) agreement in place for EBT transaction processing services (authorization, capture and payment) with an EBT Processor. Allowing authorization of multi-transaction processing and receipt of single point reimbursements to the group for EBT transactions.
- A group of proprietors operating under an informal agreement amongst themselves, each with a separate transaction processing services agreement with an EBT processor.
- A group of proprietors who have formed a corporation or other legal entity for the purpose of consolidating market management and EBT processing resources.

State Run

A few states (e.g., California) run and control farmers' markets throughout the state. Under such circumstances, the state may find it economical to organize the markets in a fashion that optimizes EBT resources.

Following are several issues that may impact EBT at state run farmers' markets.

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[2] The use of the term "coop" is for the convenience of the reader. It is not intended to connote the same legal meaning as a "cooperative real-estate" entity.

- Methods for disbursement funding of recipient accounts.
- Methods for EBT transaction processing.
- Methods for payments to merchants.
- Methods for electronic direct merchant reconciliation/funds settlement.

Physical Operating Conditions

Farmers' markets and mobile food retailers operate under physical conditions that require the wireless POS EBT terminal equipment to be even more durable than its land-line brethren. Terminal abuse at farmers' markets will at least be as great as the abuse a stationary land-line terminal receives in a traditional setting. In many circumstances, the farmers' market terminal must be even more durable than a traditional land-line terminal, as it may be repeatedly dropped on the floor, crushed by boxes and otherwise abused. Therefore, the chosen approach must be engineered to withstand a more abusive market than the typical stationary POS terminal (Verifone 330 or Hypercom T7P).

In addition, the wireless POS EBT Terminal, should be able to withstand moderate extremes in temperature. The assumption is that these POS Terminals will be used by mobile food retailers for EBT in all but the winter season. Some farmers' markets, in moderate climates, operate year round. Therefore, all electrical and mechanical components of the POS terminal equipment must be able to continue to operate in moderate to extreme temperature ranges (32 -120 degrees Fahrenheit).

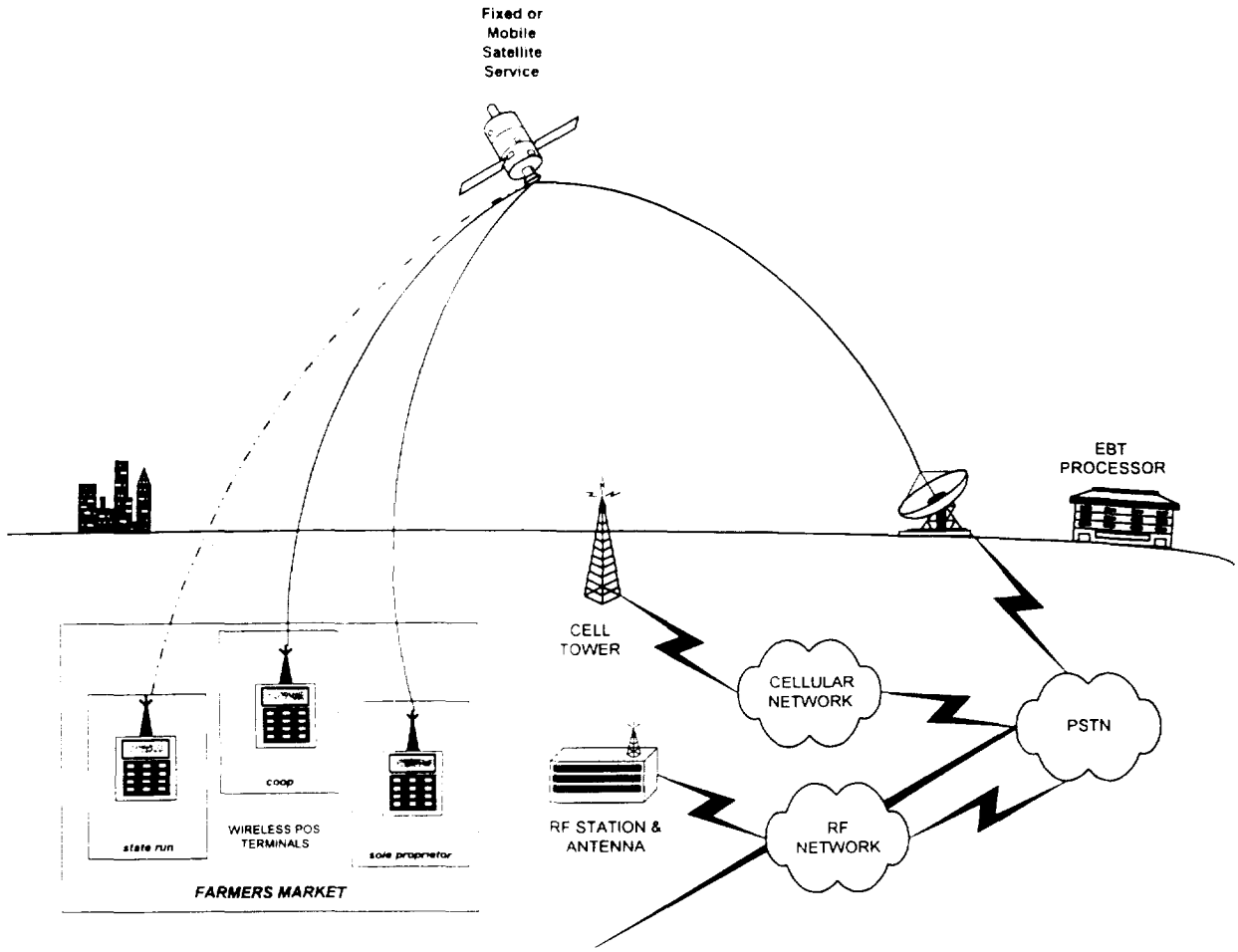
Wireless EBT POS terminals are also subject to more environmental extremes than land-line POS terminals in the area of exposure to moisture. Because farmers' markets typically operate out-of doors, the wireless POS EBT terminal equipment needs to be water and moisture resistant. This implies that the POS terminal needs to continue to operate under the moist conditions at a standard of performance expected of EBT POS transactions. Therefore POS terminal equipment should not be more likely to breakdown as a result of moisture accelerating the on-set of electrical or mechanical failure than its land-line equivalent.

Geographic Diversity

Farmers' markets are located in a broad range of geographical areas, from densely populated urban areas to remote rural areas. Because no single wireless carrier provides ubiquitous, low cost coverage of the entire United States, it is anticipated that a variety of RF, Cellular and Satellite carriers would be necessary to provide a seamless wireless EBT approach to all authorized farmers' market and mobile retail merchants.

The following diagram provides a high-level construct for understanding the array of wireless connectivity alternatives that might exist in any geographic location.

Figure 1 Wireless EBT Connectivity Model



Source: Technical and Cost Feasibility of EBT Equipage in Farmers' Markets and Mobile Food Retailers, May 1998.

Due to the growth of wireless data transmission methods, a variety of technologies are in place which could potentially conduct wireless EBT transactions. However, there is a tradeoff between coverage and price. The lowest cost methods generally offer the least geographical coverage and the most costly methods generally offer the greatest geographical coverage. For example, Cellular Digital Packet Data (CDPD) is one of the least costly alternatives, but coverage is only available in limited cellular zones. Whereas satellite coverage is available virtually everywhere in the U.S., but its cost is greater than any other wireless method. Analog Cellular systems are ubiquitous in major metropolitan areas, but lack coverage in rural areas. While RF, Cellular and Satellite are the three primary wireless technologies, there are variants of each which have advantages and shortcomings regarding support of EBT debit transactions. The following matrix and diagrams identify the spectrum of wireless technologies available in the market today, comparing technology, service provision, geographic coverage, and illustrating the cost/geographical coverage dichotomy:

Table 1 Geographic Coverage Of Wireless Technologies

Wireless Method	Technology	Service	Geographic Coverage
Specialized Mobile Radio (SMR)	MOBITEX ARDIS	Point-to-Point Voice & Data	3,300 transmitter sites 93% urban
Two Way Paging/ Messaging Systems	TDMA CDMA Simulcast	Short Message Service	90% of total U.S. population
Analog Cellular Radio	D-AMPS TDMA	PCS N-PCS	20,000 transmitter sites 50% urban
Circuit Switched-Cellular Data (CSCD)	CDMA	PCS GSM	Unknown
Cellular Digital Packet Data (CDPD)	Packetized data using TCP-IP	19.2 KBPS HTTP, HDML (narrowband HTML)	Currently in test phase, roll-out
Wireless LAN Technology	Ethernet and TCP-IP	2 MBPS	Market currently in growth phase, limited deployment to date
FIXED SATELLITE Geosynchronous Earth Orbit (GEO)	point-to-multipoint multiple address service (MAS)	One way broadband data broadcast, mobile telephone service @ 4.8 KBPS	Full population
MOBILE SATELLITE Medium Earth Orbit (MEO) Low Earth Orbit (LEO)	TDMA, SDMA, ATDMA CDMA ATM	Capable of up to fiber light speed two way data with fixed line of site tracking antenna	Full population

Source: Technical and Cost Feasibility of EBT Equipage in Farmers' Markets and Mobile Food Retailers, May 1998.

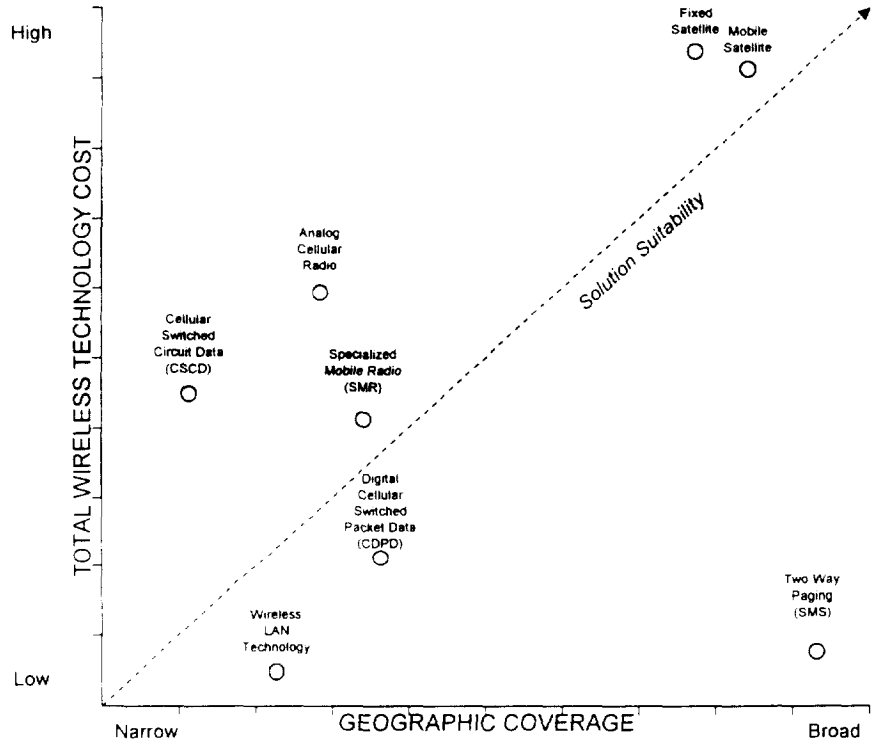
Other considerations are important in evaluating wireless technologies approaches for EBT:

- Is the wireless method broadly commercially exploited, as a mature technology?

- What are the geographic coverage vs. cost trade-offs?
- What is the credibility and scope of wireless carrier?
- Is wireless data in a transmission capability in a roll-out phase or fully implemented?

Although no single ideal approach exists today for wireless EBT many of the wireless approaches available in the market today could support wireless EBT. The "**ideal approach**" would be one that (1) meets all the functional requirements mandated for EBT, (2) is low cost, and (3) supports broad geographic coverage. To address these requirements, the diagram below begins with a comparison of the monthly ongoing cost of wireless technology against geographic coverage as it exists today.

Figure 2 Cost vs. Coverage Dynamics For Wireless EBT



Source: Technical and Cost Feasibility of EBT Equipage in Farmers' Markets and Mobile Food Retailers, May 1998.

A number of conclusions can be drawn from the above chart and an understanding of the cost verses coverage dichotomy:

- Analog Cellular Radio is widely available at a reasonable cost, but has some short comings relative to performance.
- Specialized Mobile Radio provides broad coverage at a medium-range cost.

- Cellular technology offers the best balance between cost and coverage in urban areas, but it lacks coverage in rural areas.
- Packet data switching technologies are the least costly for the areas in which they are deployed.
- Satellite technology offers broadest land mass coverage, but is the most costly option.
- Two-Way paging is the least expensive technology and has the broadest service coverage.

The feasibility of wireless technology cannot be evaluated on the basis of cost and coverage alone. Equally important is the functionality of the technology and level of sophistication in supporting data movement (e.g., as measured by data security, integrity, uptime, bandwidth requirements, etc.). Therefore, the following observations can be made about the various wireless technologies:

- Although Two-Way Paging offers the least costly approach, its data processing capability is inadequate and therefore it is not suitable to process EBT.
- Specialized Mobile Radio is the most mature of the wireless mediums. Although not the least costly, it may be the most reliable.
- Digital Cellular offers low cost service for data transmission built on a common standard, e.g., PCMCIA. Digital Cellular uses packet switching and supports a high-speed throughput. Although coverage is still sparse, the number of vendors supporting this medium is growing.
- Satellite offers the best possible data capacity but the technology is expensive and not yet fully deployed (LEOs, MEOs).

Electric Power and Land-Line Telephone Access

As stated earlier, farmers' market and mobile food retailers operate at locations where electric power and land-line telephone service is typically unavailable or inaccessible. Farmers' markets are frequently located in municipal, civic, or major merchandise retailer parking lots that lack electric power and telephone access. Other mobile food retailers (route vendors and door to door retailers) operate out of their truck or van. Though land-line telephone access is impractical, given the route vendors mode of operation, modest electric power, through the cigarette lighter receptacle, is available.

EBT Card Assumption

Given the congressional mandate to move paper payment mechanisms to electronic payment systems (viz. EFT 1999, FSP 2002 deadlines) a majority of states have implemented or are in the process of implementing EBT systems. Most of the state EBT systems are predicated on use of magnetic stripe card (magstripe) technology to leverage off the extensive commercial infrastructure in magstripe. Accordingly, this study assumes that magstripe will be the EBT card of choice for the foreseeable future (3-5 years). However, Smart Card technology is growing fast[3] and major commercial concerns (i.e. MasterCard International) are beginning to invest in it because of its programmable features and enhanced security capabilities. The USDA and the state of Wyoming recently completed a study[4] of Smart Card utilization in the Supplemental Food Programs for Women, Infants, and Children (WIC) and FSP programs that indicates technical feasibility of the system, although costs were not lower than comparable paper systems. "Caveats notwithstanding, the analyses suggests that the costs of off-line smartcard EBT systems can potentially reach the range that makes EBT a viable alternative to paper issuance systems[5]". "POS terminals that read smartcards as well as magnetic stripe cards are readily available, and their price is not much higher than the price for terminals reading stripe cards only[6] ". With these facts in mind it is easy to suggest that any wireless EBT approach should consider the alternative costs of off-line hybrid smartcard (cards that have both magstripe and smartcard capability) technology prior to any development decision.

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[3] Duffy, Francis, *et al.* 1997-1998 Guide to Smart Cards in Telecommunications. Chicago, IL: Faulkner & Gray, Inc., 1997

[4] Hamilton, Paul, *et al.* Costs and Impacts of the Wyoming Smartcard EBT System: Evaluation of the Wyoming EBT System for WIC and the Food Stamp Program. Cambridge, MA: Abt Associates Inc., 1997

[5] Ibid., Hamilton, Pg. 47

[6] Ibid., Hamilton, Pg. 41

WIRELESS EBT APPROACH REQUIREMENTS

A wireless EBT approach must meet all of the requirements found in a traditional land-line based EBT system. Thus, the wireless approach should be benchmarked against land-line requirements with regard to all aspects of the system. The most significant difference will be in the technology utilized to transmit data from merchant to processor and vice versa.

Stakeholder Considerations

The following is a list of general considerations that have been expressed by a cross section of EBT stakeholders of divergent interests including; FNS representatives; EBT system operators with current contracts with States; FSP Advocacy Groups; State Agency representatives; Farmers' Market retailers; and other Federal Agencies

- The system should be easy to use, compact, fast, uncomplicated, and limited in paperwork and bookkeeping.
- The equipment must be mobile, lightweight, easy to recharge, and have a long battery life.
- Since the equipment will be mobile the system should allow for the added physical security needed to deter theft and unauthorized use. The system should enhance the users ability to keep Personal Identification Numbers (PINs) private by limiting the capability for unauthorized PIN viewing.
- The system should be compatible with the existing EBT systems being implemented by States.
- The system should minimize the time required to complete a transaction and maximize system availability. The system should accommodate transaction volume fluctuations dependent on location, time of day, and day of month.
- Any costs associated with operation of the system must be reasonable for the farmer (i.e. manpower, physical security). The cost for operation and maintenance of the system should be no more than the paper system for the government.
- Consider the training necessary for retailers, how much should be provided, how often and to whom (e.g. owners and/or support personnel).

- The system should be able to provide real-time authorization. If real-time authorization is not feasible, then the system should provide timely processing in order to minimize vendor risk.

The stakeholder considerations should be used as a guide to FNS and state EBT agencies when defining the requirements for a specific wireless EBT implementation.

General Wireless EBT Requirements

The implementation of a wireless EBT approach should endure beyond a conceptual stage and deliver long term performance as articulated through a pre-defined set of requirements. The following sub-sections provide the minimum requirements for any approach to be viable over the long-term.

The following seven requirements should be addressed during system research and design activities:

- Retailer POS equipment.
- Ease of Implementation/Manageability.
- Reliability.
- Security of the transaction.
- Cost.
- POS software.
- Coverage.

Each of these topics is discussed in detail below:

Retailer POS Terminal Equipment

The retailer's POS terminal equipment configuration for performing wireless EBT transactions needs to support the following features:

- ❑ Can operate as standard common land-line based POS EBT terminal (e.g., Tranz 330).

- Supports integrated PIN Pad for portable configurations (i.e., retailer key-pad and beneficiary key-pad same).
- Land-line based phone circuit support (only for Desktop and WIRELESS LAN equipment).
- Portable configuration as either desktop or hand-held should be light-weight instead of bulky.
- Download of software programs from host processor to POS terminal via the wireless link should not be required. All software should be terminal resident.
- Terminal must be compatible with EBT processor standards (i.e. ISO-8583).
- Where applicable, the terminal must be certified by the EBT processor.
- Terminal must read Track 1 and 2 of Magnetic Stripe Card.
- Terminal must provide a printed receipt.
- Battery power should provide:

  Adequate level for continuous operation.
  Battery level monitoring (sound an alarm when the battery is low).
  A/C adapter operation mode.
  Rechargeable battery power packs.

Note: Farmers, who were interviewed to determine stakeholder considerations, expressed great consternation with the efficacy of rechargeable battery packs. In some cases, the packs did not last the 4-6 hours necessary for a nominal market session. Some farmers admitted that they often forget to recharge the battery pack. Most farmers experienced at least some frustration with battery pack usage. Although electric power alternatives are not the focus of this study, our research has identified some remote solar power sources that should be considered when implementing farmers' market approaches.

Ease of Implementation/Manageability

EBT Processors will be responsible for implementing any chosen wireless EBT approach. Therefore, EBT processors must provide farmers and mobile retailers with an "EBT only" capability (at no cost to the farmer) by October, 2002. Paper vouchers will remain part of the

system as a backup. In response to this mandate, it is imperative that any chosen approach be easy to implement, manageable and have relative longevity.

Retailers should be able to utilize a wireless approach with a limited number of problems. Any chosen approach must integrate easily with the existing EBT/POS infrastructure, which includes merchant and processor telephone numbers, merchant identification numbers and other requirements necessary to execute an EBT transaction.

The wireless POS equipment also needs to interface seamlessly with telecommunications providers. In addition, approaches must interface with existing EBT and wireless communication standards as well as existing POS terminal requirements.

The wireless EBT approaches ultimately chosen must also be easy to manage from an administrative standpoint. To best ensure this goal, the approaches should function in a manner that allows the administrators of land-line based POS terminals to administer wireless POS EBT terminals in a s similar if not identical fashion

Reliability

The wireless POS EBT approach must be able to perform over a pre-determined life span. The down-time for repair should be similar to that of land-line based POS terminals. At a minimum, any chosen approach should function as reliably as current land-line approaches.

Two options exist that will adequately meet the reliability standards of current land-line approaches:

- Use of standard (land-line) electronic POS equipment (e.g., Verifone Tranz 330, Hypercom T7P).
- Use of non-standard electronic POS equipment which is more durable than the standard device found in supermarkets.

Secure Transaction Platform

A secure environment for performing EBT transactions is extremely important when transmitting data over both wireless and land-line POS approaches. However, because many wireless technology approaches (such as RF and cellular) are less secure and more prone to compromise than land-line approaches, even greater attention to security is required.

The level of security required for wireless POS EBT transaction should comply with the following:

- Use of normal Data Encryption Standard (DES) encryption techniques that provide for the secure exchange of PINs between the POS terminal and the EBT processor, which is common practice in the industry today.
- The entire transaction should be encrypted by the wireless telecommunications provider through inherent carrier modulation or software add-on.

Fortunately, many wireless telecommunication mediums utilize digital techniques which provide the encryption necessary for a secure transaction.

Cost Effective Approach

This section addresses the equipment, development, transmission and support costs for wireless POS EBT.

An evaluation of costs will reveal that the costs for a wireless EBT approach are greatest in the following areas:

- Research, Design and Development (of a particular EBT approach).
- Equipment cost, or Net Present Value (NPV) if leased, as an up-front investment (fixed cost).
- Wireless communications cost as an on-going/recurring cost (variable cost).

All potential wireless approaches must be priced competitively with current land-line based approaches. The relative costs include both the purchase price of the POS terminal equipment

and the on-going communication costs. In order to balance the short and long-term risks and objectives, several questions need to be answered:

- When assessing the costs of a final approach, how much emphasis should be placed on up-front costs (e.g., hardware expenditures) versus long-term costs (e.g., on-going communication costs)?
- Can merchants provide their own wireless EBT approach to meet their unique business needs?
- Can floor limits be used for very low transaction amounts? When combined with a terminal capture (non-host) terminal, the need for most on-line authorizations may be unnecessary.
- How important (mandated) is the goal of providing connectivity to merchants at every farmers' market? The only option for the most remote locations may be satellite telephone (SKYCELL, ODYSSEY).

It appears as though a wireless approach will cost considerably more than traditional land-line approaches. However, the questions above, among others, need to be addressed in order to determine the cost of any chosen approach.

POS Software

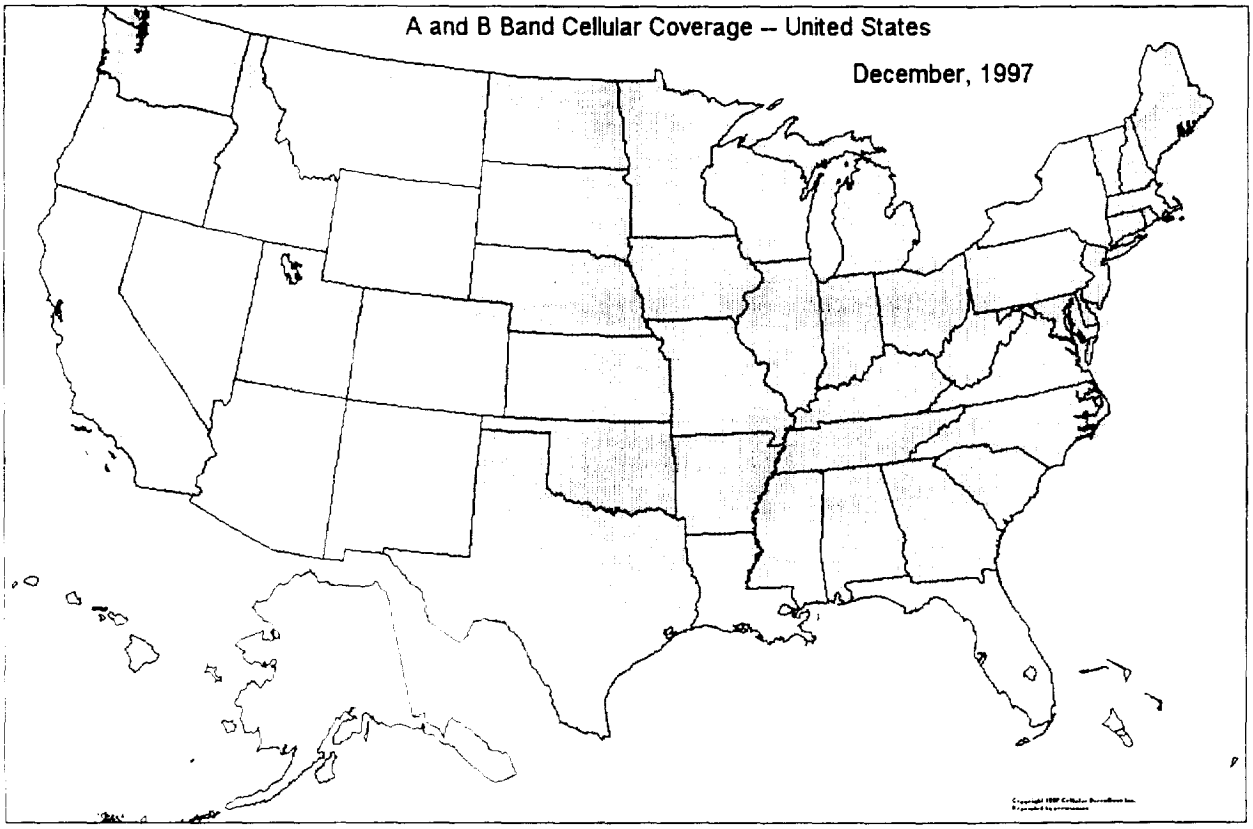
The software application for a wireless POS EBT terminal needs to perform in a similar manner to that of land-line based POS EBT terminals. Accordingly, the software must meet the following standards:

- Software needs to support EBT Processor standard interface formats and protocols.
- The authorization must occur "on-line".
- The POS EBT software must dial EBT processor upon card swipe.
- The POS EBT software must send a short authorization request message to the EBT

Geographic Coverage

Any wireless EBT approach's cost and configuration will be largely driven by the required geographic coverage. A number of RF and cellular wireless providers are already available in most urban areas. Figure 3 depicts the cellular coverage of the primary cellular carriers in the United States.

Figure 3



Source: Cellular Directions Inc., Copyright 1997. Reprinted by permission.

The largest 306 national markets are called Metropolitan Statistical Areas (MSAs). MSAs generally have fairly comprehensive RF and cellular coverage. The remaining 428 markets are smaller Rural Service Areas (RSAs), whose RF and cellular coverage varies from good to non-existent.

Obviously, if any wireless EBT approach is based in large part on standardized equipment and processes, the less costly it will be. If it is mandatory that a approach provides connectivity to all farmers' markets merchants regardless of location, a more costly approach is likely, both in terms of the initial outlay as well as on-going wireless charges.

Integration Resource Considerations

Because a wireless approach requires so many differing resources to work together, a number of challenges must be overcome before a wireless EBT transaction can occur. Implementation of a wireless POS EBT approach requires numerous resources (e.g. research, design, and development). Because EBT processors play such an integral role in all EBT approaches, this section is intended to identify that integration resources are required of such third parties.

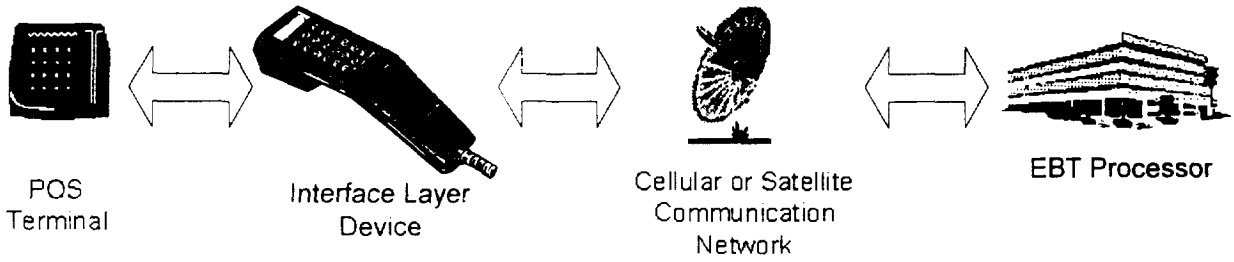
The following generalizations can be made about the extent of integration resources needed to implement a wireless POS EBT approach:

- The more the wireless POS EBT approach is based on "off-the-shelf" components, the less integration resources are necessary for implementation.
- The more the wireless POS EBT approach utilizes specialized custom built components, the greater the demands will be for integration resources.
- The more modular the wireless POS EBT approach is, the less the demand will be for integration resources.
- The volume of integration resources required to implement a wireless POS EBT approach is directly proportional to the number of alternative wireless technologies required for the wireless EBT approach.

SIMPLIFIED WIRELESS EBT MODEL

In an effort to simplify the discussion of wireless EBT technology alternatives this section describes what a model wireless EBT approach will look like by providing diagrams and descriptions of its various components. Figure 4 depicts a simplified view of a wireless EBT model.

Figure 4 Simplified Wireless EBT Model



Each component of the model represents hardware and/or software functionality required in a system. However, these component distinctions can be more arbitrary in their application when a specific approach is defined. An example of this dichotomy is explained in the section titled "Inventory and Analysis of Alternative Technologies, Equipment and Vendors".

POS Terminal

EBT transactions begin at POS terminals. Whether a transaction is via land-line, RF, cellular or satellite should be transparent to the terminal operator (i.e., the retailer), the POS terminal must be certified by the EBT processor, accept EBT transactions and interface with the chosen wireless platform.

Interface layer

In order to provide a modular wireless POS EBT approach for farmers' market and mobile food retailers, a recently developed device referred to here as an "interface layer" is used. The purpose of an interface layer is to provide a common interface between the POS terminal device (e.g., Verifone, Hypercom) and the wireless carrier (RF, Cellular, etc.). Thus, a terminal

which is manufactured as a land-line terminal can be converted into a wireless terminal through the use of interface layer components.

Communications Medium

Ideally, the communication medium of the model wireless EBT approach should be able to provide easy and inexpensive connectivity to any urban or rural geographic location in which a farmers' market may be based. Although complete (ubiquitous) geographic coverage can be attained, it can not be done with a single vendor or technology. Therefore, a multi-vendor technology environment is likely. However, it is not easy or inexpensive to interconnect competing vendor technology

EBT Processing Layer

Regardless of the technology utilized for the model wireless approach, it needs to interface into the existing EBT processor infrastructure (e.g. Deluxe Data, Citibank, Transactive) by conforming to existing standards. This means that the input of wireless EBT transactions to the EBT processor should be based upon the X.25 or similar protocol and use standard POS terminal message format standards (i.e., Visa I and II, ISO 8583).

INVENTORY AND ANALYSIS OF ALTERNATIVE TECHNOLOGIES, EQUIPMENT AND VENDORS

Any chosen wireless EBT approach needs to incorporate industry standards while meeting the needs for each of the farmers' market and mobile food retailer operating models. The approach must also strike a balance between meeting the needs of the various mobile merchants and controlling costs so that the wireless EBT approach is sustainable over the long run.

This section is organized into sub-sections based on the simplified wireless EBT model components discussed in the previous section. The features of alternative technologies, equipment components, and vendors are described and their suitability as a wireless EBT approach is analyzed.

POS Terminals

This section describes the various types of POS terminals which are available to farmers' markets and mobile food vendors. Several types of POS EBT terminal approaches exist that will meet the needs of farmers' markets. Each of the terminal approaches covered in this section have wireless capabilities.

A viable retail approach for farmers' market Wireless EBT is based upon a combination of technologies and vendors which provide a suitable wireless EBT POS configuration which meets the stated needs.

POS terminals are necessary components of all EBT programs. The POS terminal is the device that allows transactions to be authorized and settled, the two basic elements of all EBT programs. Authorization and settlement allow funds to be shifted between governmental entities, recipients and retailers.

The purpose of wireless POS terminals is to allow mobile vendors to authorize and settle transactions from remote locations where land-lines are inaccessible, impractical or otherwise unavailable. The basic processing requirements of a wireless transaction are the same as those of a traditional land-line transaction. As a result, the POS industry realizes that it must

leverage off of the existing POS infrastructure in order to ensure the successful implementation of wireless POS. Standards are currently being established by industry groups, hardware and software vendors, and credit card processors that allow traditional land-line POS protocols to apply to wireless POS transactions via a number of wireless communication platforms.

The communication platform that eventually captures the wireless POS market (e.g., analog cellular, satellite or CDPD) should not have any bearing on how EBT POS transactions are structured from a processing and user perspective. Terminal hardware vendors will continue to manufacture terminals which are operationally compatible with exiting EBT POS procedures. The communication interface will simply vary based on accepted wireless communication platforms. Thus, the internal communication technology may evolve over time, but the basic EBT POS transaction requirements will remain constant.

As previously mentioned, any wireless EBT program that is implemented must leverage off of the existing land-line based EBT POS infrastructure. Therefore, it is imperative that POS terminals implemented in a wireless setting offer the same features and functionality of land-line EBT terminals. The end-user must be able to utilize a wireless POS terminal in exactly the same manner as he or she would utilize a land-line terminal. The physical encasing, card reader, PIN pad and receipt printer of all wireless POS terminals must be equivalent to land-line terminals with respect to features and functionality. It should be noted that wireless POS terminals may need to be more rugged than land-line terminals for the simple reason that mobile terminals are likely to encounter greater physical abuse than land-line terminals.

The distinction between wireless and land-line terminals is seen in the communication platform each uses to transmit data. In simple terms, land-line terminals transmit data via traditional land-based telephone lines, while wireless terminals transmit data via any number of wireless communication platforms. The dichotomy between the two terminal types is found internal to the actual POS device. For wireless POS terminals, manufacturers simply configure their device to interface with any one of a number of wireless platforms. In fact, some manufacturers have configured their terminals to interact with multiple wireless platforms all through a single device. Such multi-platform devices allow the terminal to be used with whatever communication protocol is available in a particular market.

Most major terminal vendors are aware that a significant demand exists for wireless POS terminals. In response, many vendors have already developed functional terminals or are in the process of developing functional units. Most of the devices that are currently on the market are compatible with traditional analog cellular and RAM Mobile Data MOBITEX. Because those communication platforms have predominated over the past several years, terminal vendors were quick to enter the market where there was existing coverage and accepted technology. As a result, there are numerous wireless POS devices configured to interact with analog cellular and RAM Mobile Data MOBITEX platforms.

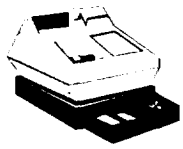
Recently, the trend has been to manufacture terminals that interface with wireless platforms which offer fast, price-friendly coverage, as well as platforms that offer expanded geographic coverage. For example, a growing number of manufacturers offer terminals that are compatible with CDPD technology. CDPD offers fast authorization response time as well as friendly pricing schemes that bill by bytes of information rather than amount of air time. The Hypercom T7PRA is one such example of a fully integrated POS terminal that interfaces with CDPD.

As wireless POS use increases and as more wireless communication platforms gain nation-wide coverage, a more versatile POS terminal will become commonplace. The POS terminal of the future will likely be a multi-platform wireless unit. The multi-platform wireless unit will be able to interface with any number of wireless platforms depending on the availability of service, cost of transaction and required speed of authorization. A device which allows the end-user to switch between various wireless platforms will allow retailers to be truly mobile through the use of the same terminal whether securing authorizations via satellite, analog cellular or CDPD. The most robust multi-platform terminal available is the SOLO made by Omega Digital. The SOLO is capable of interfacing with a number of wireless platforms, including RF Wan, ARDIS, Ram Mobile Data MOBITEX, CDPD, GSM, and PCS.

Hypercom's CDPD compatible terminal is demonstrative of current trends in the wireless POS terminal industry while Omega Digital's SOLO provides the most provocative glimpse into the future of wireless POS terminals. Both Hypercom and Omega Digital demonstrate that wireless POS is not driven by terminal manufacturers, but by the communication platforms that support wireless data transmission. Operational terminal performance will remain constant from the end-users perspective but will continually be updated from a communications perspective.

EBT transactions begin at POS terminals. Whether a transaction is land-line, cellular or satellite should be transparent to the terminal operator (i.e., the retailer). The POS terminal must be certified by the EBT processor, accept EBT transactions and interface with the chosen wireless platform. A discussion of the various POS Terminal configurations and representative examples follow. Appendix A contains a more detailed breakdown of specific POS Terminal capabilities by vendor and Appendix B contains specific vendor product literature for the readers perusal.

Desktop POS Terminal



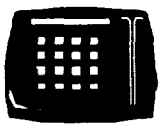
Desktop

A desktop POS terminal can be either land-line based or wireless. A desktop terminal is generally heavier than portable POS terminals and often are part of a full-functionality electronic cash register, or stationed adjacent to the merchant's cash register. A desktop terminal would likely be affixed to the merchant's table, which would help prevent theft of the device.

Examples of desktop POS terminals include:

COMPANY	PRODUCTS OFFERED	COMMENTS
Hypercom	T7P	Desktop POS terminal with built in printer.
Ultimate Technology	PDM3500 Compact Point-of-Sale Terminal	Desktop POS Terminal.
Verifone	Omni 2650	Built-in printer and PIN pad. Infrared or tethered to docking station.

Portable POS Terminal



Portable

Portable POS terminals will always utilize some form of wireless connectivity to send data to the card processor. Portable terminals can be carried by a merchant as they conduct business with their customers. Portable POS terminals are single-user units that do not require any interface with another device (e.g., a docking station or an electronic cash register). For many retailers in farmers' markets, the best approach for wireless EBT will be a stand-alone single-user POS terminal (either Desktop or Portable).

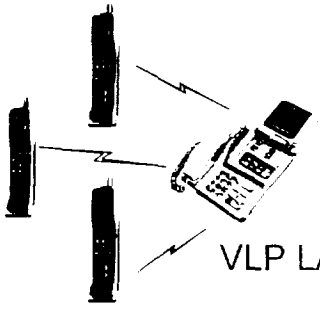
The portable POS Terminal must meet the following performance requirements:

- Dial via RF or cellular to the EBT Host Processor directly through a wireless carrier.
- Can be carried by merchants as they conduct business with clients (i.e., the terminal is easily transported during business use).
- Integrated PIN pad is preferred, but acceptable to have a separate PIN pad if it is compact and it is the only ancillary device to the POS terminal.
- Has a built in printer.

Examples of this type of POS terminals include:

COMPANY	PRODUCTS OFFERED	COMMENTS
Hypercom	T7 PRA T7 PRC	Portable POS terminal with battery, radio, and built-in printer. CDPD version.
Omega Digital Data	Glider POS Transaction Terminal	Portable POS Terminal.
Verifone	Omni 3000	Attached printer, integrated PIN pad, PC modem card with antenna, CDPD packet data.

Very Low Power (VLP) Wireless LAN Terminal



New wireless approaches have begun to emerge which look like potential approaches for the farmers' market EBT environment. Recent developments in the "wireless ethernet" and "wireless token-ring" categories have made this category worthy of consideration.

One such emerging technology is the WIRELESS LAN. A Very Low Power Local Area Network is used for short range connectivity between one or more POS terminals and a PC based host (file server). The wireless POS LAN terminal has a range of up to 3000 feet away from the base station. Base-station to base-station can achieve ranges of 25 miles.

Channel security does not inherently exist for this type of technology. Therefore, there is a need to implement encryption for each transaction. Robust error correction is required to overcome ambient signal noise (ghost) between POS and LAN controller

Examples of this type of equipment include:

COMPANY	PRODUCTS OFFERED	COMMENTS
OTC Telecom	AurEZY2400 wireless Ethernet	300 foot range.
Symbol Technologies	Spectrum24_ Wireless LAN	2 MBPS per second.

The wireless LAN is an example of the arbitrary component distinction dichotomy discussed in the "Simplified Wireless EBT Model" section. The wireless LAN and the "Base Station Controller" are elements of the same functional device. The device functionality encompasses aspects of two model components, namely POS Terminal and Interface Layer.

Interface Layer

In order to provide a modular wireless POS EBT approach for farmers' market and mobile food retailers, a category of recently developed devices, referred to here as the "interface layer", is used. The purpose of an interface layer is to provide a common interface between the POS terminal device and the wireless carrier. Thus, a terminal which is manufactured as a land-line terminal can be converted into a wireless terminal through the use of the interface layer.

By using this technology, a number of benefits may be realized by stakeholders. Benefits include:

- Cost savings and reliability through use of traditional land-line POS terminals.
- A flexible communications environment, since any wireless carrier could be used with a common POS terminal set-up.
- Maximization of wireless coverage through use of various wireless platforms.

There are two types of hardware technology that fit the interface layer model, "PCMCIA Plug In Cards" and an "Ancillary Module". Specialized software is required with each technology to provide a translation between standard EBT POS transactions (Visa 2 format or HDLC 8583).

PCMCIA Plug In Card

The Personal Computer Memory Card International Association (PCMCIA) card is a common interface in laptop computers and is beginning to be used in a wireless mode for Personal

Digital Assistants (PDAs). PCMCIA boards are available for both cellular and RF applications. The PCMCIA card is generally a type III or a type II card with a belt-attached cellular phone connection.

The advantage of PCMCIA is that it is not specific to any one terminal, as the card is a standard interface. Therefore, the same POS terminal can support one or all wireless carriers.

Providers of these products include:

COMPANY	PRODUCTS OFFERED	COMMENTS
U.S. Robotics	AllPoints Wireless PC Card	$499 list.
Aironet Wireless Communications	ARLAN PCMCIA Wireless LAN Adapter	$695 list.

The PCMCIA Plug In Card appears to be ideally suited for wireless POS EBT. The downside is that none of the largest POS terminal vendors (Verifone and Hypercom) are currently supporting this standard.

Ancillary Module

The Ancillary Module typically is an add-on to a base POS terminal which provides access to a specific communications carrier. Ancillary Modules have traditionally been developed for RF applications, such as RAM Mobile Data network.

As an interface layer device, the ancillary module is less desirable than PCMCIA because it must be engineered for each specific terminal.

Providers of these products include:

COMPANY	PRODUCTS OFFERED
Mobiterm AB	MicroSYSTER
Verifone	Backpack

Base Station Controller

The technology of short range wireless LAN communications has been rapidly evolving over the

last couple of years. This technology explosion is especially true for PCMCIA wireless ethernet approaches, which provide connectivity up to 3000 feet in range between a base station and the POS terminal.

The new devices offer numerous advantages, such as:

- SNMP (simple network management protocol) management.
- Easy connectivity to LAN environment.
- High-speed connectivity (3-Mbps).

Vendors of this type of wireless approach are:

COMPANY	PRODUCTS OFFERED
BLACK BOX	PCMCIA Adapter
BLACK BOX	Wireless Access Point

Communications Medium/Wireless Carriers

Ideally, the communication medium of the model wireless EBT approach should be able to provide easy and inexpensive connectivity to any urban or rural geographic location in which a farmers' market may operate. However, although complete geographic coverage can be attained, it can not be done with a single vendor or technology. Therefore, a multi-vendor technology environment is the reality.

A variety of communication platforms may be suitable to meet the needs of a wireless POS EBT approach. A number of factors must be considered when determining which communication media that will be used.

The following matrix illustrates many of the factors that will determine which approach works best for the farmers' market. Each of the potential approaches is reviewed and critiqued in the following sections.

Table 2 Potentially Suitable Wireless Carrier Data Transmission Mediums For EBT:

Wireless Method	Technology	Service	Thru-Put	Interface
Specialized Mobile Radio (SMR)	MOBITEX ARDIS	Point-to-Point Voice & Data	4.8k to 19.2 k BPS	PCMCIA Attachable module
Two Way Paging/ Messaging Systems	TDMA CDMA Simulcast	Short Message Service	160 - 500 characters per message	PCMCIA
Analog Cellular Radio	D-AMPS TDMA	PCS N-PCS	8k BPS	Analog cellular modems & cable to phone port
Circuit Switched-Cellular Data (CSCD)	CDMA	PCS GSM	14.4 KBPS	Serial cable & phone port for cellular modem
Cellular Digital Packet Data (CDPD)	Packetized data using TCP-IP	19.2 KBPS HTTP, HDML (narrowband HTML)	19.2k BPS	PCMCIA or built in to device
FIXED SATELLITE Geosynchronous Earth Orbit (GEO)	point-to-multipoint multiple address service (MAS)	One way broadband data broadcast, mobile telephone service @ 4.8 KBPS	36 MBPS, or 1200 voice channels	Transceiver antenna satellite handset and cable
MOBILE SATELLITE Medium Earth Orbit (MEO) Low Earth Orbit (LEO)	TDMA, SDMA, ATDMA CDMA ATM	Fiber light speed two way data with fixed line of site tracking antenna	155.52 MBPS, or 100K 16 KBPS channels.	Beam steering antenna tracking mechanism

Source: Technical and Cost Feasibility of EBT Equipage in Farmers' Markets and Mobile Food Retailers, May 1998.

Radio Frequency Technologies

Specialized Mobile Radio (SMR)

SMR is one of the oldest commercially exploited wireless technologies. SMR technology takes a radio frequency used for dispatching trucks and taxis and digitizes it. Its range is 25 times that of analog cellular. Call handling capacity is large and costs are projected to be 10%-15% less than cellular. There are two major vendors who compete in this market:

COMPANY	PRODUCTS OFFERED	COMMENTS

RAM Mobile Data MOBITEX is a partnership between RAM Broadcasting Corporation and BellSouth. The RAM Mobile Network operates throughout the United States, covering more than 93 percent of the urban business population. RAM's core technology is MOBITEX, an open systems wireless mobile data architecture that provides wireless data connectivity.

RAM has 1,000 multi channel base station sites with 1,300 channels. Over the next four years, RAM will be deploying another 500 base stations increasing coverage to 96% of the urban business population.

Advanced Radio Data Information Services (ARDIS) is the nation's first and largest two-way wireless data network, covering the top 400 metropolitan areas of the U.S., Puerto Rico, and the Virgin Islands, which accounts for more than 90% of the business activity and 80% of the nation's population.

The ARDIS' network is deployed through base stations that are connected back to network controllers in hub cities via dedicated leased telephone lines. ARDIS currently has about 1,400 channel base stations occupying 1,100 cell sites. The ARDIS' base stations are single cell channel units.

Two Way Paging / Messaging Systems

Direct broadcast satellites are being used by paging systems as the data communications link between paging terminals and paging transmitters. After processing the signal, the transmitters beam the signal toward a satellite in a geo-stationary orbit, 22,000 miles above the earth. The satellite receives the transmission, processes it and sends it back to earth where a small satellite dish at each transmission site receives the signal. Ground transmitters then simulcast the paging signal within a specific geographic area.

There are two types of paging systems:

- *One-way paging*

  One way paging provides users with the ability to be notified/alerted with a phone number to call back, or notified/alerted by a short message. Data is transmitted one way at 2400 BPS and one 160-character display per second.

- *Two-way paging*

  Two way paging provides users with the capability to receive messages/pages and respond to such messages/pages. Because the service uses two networks (one for sending and another one for receiving), there is a delay in receiving the two-way user's response. Size of message sent is 500 bytes; the return is 95 to 200 bytes.

Short Messaging Service (SMS) services the high end paging market, which is where cellular and paging begin to overlap. SMS is a bundled paging and messaging service which supports voice communication through a single pager device. It is a text based messages service. SMS messages are 160 characters in length. When the message exceeds 160 characters, it is automatically dispatched as several short messages (packets).

Some enhancements to the current paging systems are:

- **SMS CDMA.** -- 255 character messages at 9600 BPS to the mobile receiver and 4800 BPS from the mobile receiver.
- **TDMA SMS.** will be available in 1997 and is capable of transmitting a 256 byte text message to and from the subscriber device.
- **Narrowband PCS (N-PCS).** is a new two-way paging and messaging protocol, designed for complex paging, telemetry, vehicle tracking and short messaging. The message center lets customers communicate with GSM, CDPD and TDMA users.

Two-way paging service in which the pager device is a full alphanumeric keyboard, message can be initiated by either pager device or base station.

Some examples of service providers in this area include:

COMPANY	PRODUCTS OFFERED	COMMENTS
PageMart Wireless, Inc.	Provides wireless messaging services to over 2 million people in all 50 states	The industry's most extensive nationwide network.
RAMfirst	Interactive Paging Service	Two-way paging service in which the pager device is a full alphanumeric keyboard, message can be initiated by either pager device or base station.
Ericsson	GSM Data Card, GC25	PCMCIA Type III Data Card and Short Message Services (SMS).
Ericsson	personal Air Communications *Technology (pACT)*	This service is being replaced by N-PCS due to decision by AT&T, major backer of pACT.

SMS appears to be an attractive approach for wireless POS EBT due to the low cost of equipment and communication. However, the technology appears to be unsuitable for EBT because messages are sent and received between the base station and the device at pre-set timed intervals which far exceed EBT standards for real-time authorization in 15 seconds or less.

Cellular Radio Technologies

By most estimates, more than 90 percent of traffic on the U.S. cellular phone network is voice, but data transmission is growing rapidly. Analog cellular systems based upon the Advanced Mobile Phone Service (AMPS) standard has been the technology that has proliferated to date. However, this is increasingly being replaced by digital techniques and systems.

Traditional analog cellular systems have the capability to transmit data using specialized analog modems. Some enhancements to the analog cellular radio which enable this to occur are:

TDMA (Time Domain Multiple Access)

TDMA is a circuit-switched data transmission modulation technique used for digital/analog cellular networks. Currently, the cost and performance of TDMA does not appear to meet customer expectations, presumably due to limited data through-put handling capacity.

TDMA is currently predominantly a voice-only digital cellular option. However, data services are in the process of being implemented. TDMA promises a threefold increase in capacity over traditional analog cellular service. TDMA was designed to coexist with the current AMPS network so that base stations can support both analog and digital services. Providers are combining Cellular Digital Packet Data services with TDMA, an approach that delivers data and faxes at 9.6 KBPS to 14.4 KBPS.

Some pros and cons with this technology include:

Pros:

Future data services (potential use of CDPD for data).

Data encryption inherent in modulation technique.

Cons:

Inferior voice quality.

Limited coverage.

Some analog cellular vendors who support TDMA based data transmission include:

COMPANY	PRODUCTS OFFERED
GTE Wireless	TDMA Analog Cellular Radios
AT&T Wireless	TDMA Analog Cellular Radios

NOTE: AT&T is the largest cellular carrier in the United States. Its service area covers 40 percent of the United States population and it provides cellular phone service to over six million users. In 1995, AT&T obtained 21 additional licenses which, when fully constructed, will increase their coverage to over 80 percent of the United States population.

The Wireless Data Division of AT&T Wireless Services offers a wireless data service based upon TDMA, CDPD and CSCD. However, although analog cellular has the greatest coverage in the U.S. at the current time, it is considered to be unreliable from a data standpoint and difficult to set-up.

Circuit Switched- Cellular Data (CSCD)

CSCD creates a dedicated connection or circuit over the analog cellular network for the duration of the call, with cellular transfer rates up to 14.4 KBPS. Transferring data with CSCD requires a data-capable cellular phone, a connector cable and a cellular modem (preferably a PCMCIA Card). As with voice, charges are determined by call duration. The cost of a CSCD call ranges from $.30 to $.60 per minute depending on location. CSCD is billed the same way as a voice call. The CSCD technique is based upon use of CDMA (code division multiple access) over AMPS, or GSM technologies. Some pros and cons of this technology include:

Pros:

Good for large file transfer/on-line data.

Voice and data capabilities.

Low-cost devices.

Nationwide coverage.

Easy to use.

Extensive applications software.
Good developer support.

Cons:
Problems with reliability, as transmissions can drop when moving between cells.
Security (data encryption is an add-on).
Call billed by the duration of the call and not the amount of information transmitted.

Some emerging digital technologies for wireless data transmission include:

Code Division Multiple Access (CDMA)

CDMA is available on a limited basis and promises as much as ten-times more capacity than traditional analog cellular service. It is designed to coexist with the current AMPS network national infrastructure so that base stations can support both analog and digital services. Performance for wireless data service is between 9.6 KBPS to 14.4 KBPS.

Pros:
Good for short messages.
Data encryption inherent in modulation technique.
Potential for higher data rates than TDMA.

Cons:
Limited coverage, not nationwide.
Expensive communications tariff (for voice calls there is a 1 minute minimum call duration and a minimum of $0.20 per call).
The digital handset is expensive.
Limited data applications availability.

Global System for Mobile Communications (GSM)

This global platform for digital wireless communications is the digital cellular telephone standard in Europe and Japan with deployment planned in more than 70 countries. There is *currently* only a limited roll-out of GSM in the U.S., yet GSM could become the global digital standard in the distant future.

GSM also supports enhanced data service functions. Subscribers access services by inserting a subscriber identity module (SIM) or smart card into their cellular phone or potentially into any terminal device across multiple networks.

The GSM 1.9 GHz phones use a variant of TDMA designed to run over analog wireless phone networks.

Pros:

Built in encryption from digital modulation.
Short message services for text and numeric messaging.
Low-cost devices.

Cons:

Very limited coverage in U.S. (coverage in Washington, D.C. and Honolulu).

This type of service is offered by:

COMPANY	PRODUCTS OFFERED
Nokia	9000 Communicator for GSM Networks
Aerial Communications	Targeting GSM Network Services
Primeco Communications	GSM Cellular Network

Personal Communications Service (PCS)

PCS networks transmit at higher radio frequencies than current cellular systems - in the range of 1,850 to 2,200 megahertz (MHz) compared to about 800 MHz used by conventional cellular networks. In addition, PCS networks are 100% digital and offer consumers more choice and new services. Because of PCS' greater capacity and digital technology, PCS calls are superior in quality to traditional cellular. Secure communications are also provided by CDMA digital encoding.

PCS can be provided on AMPS based cellular networks as well as GSM networks under a service known as "general packet radio" services.

There are two types of PCS systems:

- Broadband PCS is in the 2 GHz band of the electromagnetic spectrum from 1850 to 1990 MHz. The spectrum allocated for Broadband PCS totals 140 MHz; 20 MHz in that block is reserved for unlicensed applications that could include both data and voice services.

- Narrowband PCS is defined as a family of mobile or portable radio services used to provide wireless telephony, data, advanced paging services such as voice message paging, two-way acknowledgment paging, and other text-based services. Narrowband PCS uses a smaller portion of the spectrum than Broadband PCS, in the 900 MHz band of the electromagnetic spectrum.

Providers of PCS services include:

COMPANY	PRODUCTS OFFERED	COMMENTS
QUALCOMM	Q Phone	Developer of original PCS phone concept.
GTE Wireless	PCS Service, Broadband, Narrowband	Very extensive service offering.
Aerial Communications	GSM Network Services	Service rolling-out in select cities.
Cyclelogic	Voltaire GSM/PCS	Specialized when GSM needed.
Ericsson	GSM Data Card GC25	PCMCIA TYPE III data card.

Cellular Digital Packet Data (CDPD)

CDPD is a new type of digital transmission using the existing analog cellular network that offers low-cost access using Transmission Control Protocol/Internet Protocol (TCP/IP). CDPD folds data into packets and transmits them at high speeds (19.2 KBPS) over idle channels of existing (but upgraded) cellular voice networks. This option routes data packets, eliminating the need to establish an end-to-end connection. Therefore, users and network operators can take full advantage of Internet developments as they come to market.

CDPD uses the temporarily idle channels in the cellular telephones systems to transmit data. CDPD is intended to provide national service, but will be operated by regional carriers. Once the systems are deployed, each of the service providers intends to host subscribers from other systems in order to give the appearance of a single seamless national service. The union of

operators, however, has not yet developed the technology required to offer a single point of contact for national subscribers (i.e., roaming between operators and consolidated invoicing).

With CDPD, users are charged on a per-packet basis, which means they pay for only the data that is actually transmitted. This allows CDPD users to save when sending and receiving short messages while still enjoying the benefits of being mobile.

Pros:

- Good for short data messages and Internet access.
- Fast transmission times (19.2 KBPS).
- Good security (data encryption provided by carrier).
- Reliable because it is designed for data.
- PCMCIA cards are available.
- Has embedded TCP/IP standard.

Cons:

- Under the CDPD platform, data communication is subordinate to voice, exposing critical data applications to potential delays and congestion.
- Limited coverage/new service.
- Difficult to configure.
- Limited software and vendors applications.

Since CDPD incorporates the TCP/IP protocol, it acts as a switch method for wireless networks to be tied to the Internet. An innovative application of CDPD gaining support as a result of this Internet connectivity is HDML.

Handheld Device Markup Language (HDML)

HDML (Handheld Device Markup Language) is a markup language similar in structure and syntax to HTML (Hyper Text Markup Language). In the tradition of the World Wide Web, HDML sits alongside HTML. Its main innovation is its compactness and its optimization of space for devices which have small screens, constrained user interface, little or no pointing device, and limited keyboard input. HDML preserves the programming model of the Web and HTML applications.

Initially targeted at GSM-technology networks, HDML aims to align industry efforts to bring Internet applications, content, and technologies to digital cellular phones. A common standard

means that cellular phone manufacturers have the potential of benefiting from economies of scale. The draft protocol has been made available to cellular phone manufacturers and operators around the world and published on the World Wide Web.

The following are examples of providers of this type of technology:

COMPANY	PRODUCTS OFFERED
Alcatel	One TouchTM PRO GSM Phone.
AT&T Wireless Services	AT&T PocketNet.
Unwired Planet	HDML, Wireless Application Protocol (WAP).
Ericsson	HDML compatible phases.
Motorola	HDML compatible phases.
Nokia	HDML compatible phases.

The future of CDPD seems bright since the network is owned by cellular carriers with significant financial assets who are willing to promote it.

Satellite Technologies

Fixed Satellite

Fixed satellite technology is known as GEOs (Geostationary Earth Orbit Satellites). They orbit the earth at a fixed point at approximately 22,300 miles above the equator, stationed in geo-synchronous orbit, thereby continually holding the same position over Earth at all times. These Geostationary satellites use spot beams that cover the entire continental United States, Alaska, Hawaii and the Caribbean.

A broad range of voice, dispatch, data, fax and positioning services are available throughout North American through terminals equipped with compact masts or dome antennas.

Geostationary satellite systems are best suited for high-speed data, television transmission, and any other wideband applications. Nonetheless, GEOs are used for telephone/data transmission.

A prominent provider of this type of service is:

COMPANY	PRODUCTS OFFERED	COMMENTS
American Mobile Satellite	SKYCELL OMNIQUEST SATELLITE TELEPHONE	GEOs

The AMSC-1 satellite was launched in April 1995 and a twin satellite MSAT-1 was launched in April 1996. Each satellite backs up the other. The SKYCELL telephone costs approximately $2,000 and can communicate with AMSC-1 or MSAT-1 for $1.40 per minute.

Fixed satellite appears to be an attractive approach for wireless POS EBT. However, it is one of the most costly approaches, and the telephone services are subject to atmospheric disturbances.

Mobile Satellite

There are two types of mobile satellite systems:

- MEOs (medium earth orbit satellites) - 5,600 mile orbit.
- LEOs (low earth orbit satellites) - 300 to 750 mile orbit.

Medium Earth Orbit Satellite (MEOs)

MEOs orbit at an altitude of approximately 6,000 miles which is high enough to let each satellite "see" about one-quarter of the Earth, yet avoids the signal delays inherent to satellites in geo-synchronous orbit. All processing takes place in earth stations, where upgrades, maintenance and repair are easy.

MEOs have not been utilized extensively for commercial data transmission applications to date, but some new systems are starting to be rolled out which will offer vast new data services. One such satellite based system which transmit data via MEOs is:

COMPANY	PRODUCTS OFFERED	COMMENTS
Odyssey	Satellite based wireless telephone connectivity	MEOs Satellite Constellation.

Odyssey is intended to provide worldwide high-quality satellite-based wireless telephone connectivity and other personal communications services. The Odyssey configuration will eventually have 12 satellites circling the globe in medium-Earth orbit. TRW Inc. and Teleglobe Inc. are founding shareholders in Odyssey Telecommunications International Inc. (OTI), which will implement and operate the Odyssey system. Seven Earth stations, connected by leased fiber optic cables, form a global wide-area network (WAN). This system is highly automated, which permits easy upgrades and maintenance of processing functions. Gateways link the Odyssey global WAN to Public Service Telephone Networks (PSTNs). Odyssey has one system operations center and a back-up center. Odyssey satellite telephone will be handheld or fixed dual-mode (compatible with local cellular).

Low Earth Orbit Satellite (LEOs)

LEOs satellite systems offer significant advantages over geo-synchronous satellites for the delivery of satellite data services due to their orbit which allows signals to be picked-up by low-power mobile hand-held equipment.

Some providers of LEO service include:

COMPANY	PRODUCTS OFFERED	COMMENTS
GLOBALSTAR	LEOs satellite network 48 x 750 mi.	Send/receive calls via cell phone.
IRIDIUM	LEOs satellite web 66x.	MAJOR IMPACT wireless landscape.
TELEDESIC	LEOs satellite constellation 840x	Broadband fiber speed direct to homes - interactive video target.

Globalstar

Globalstar is a satellite-based constellation of 48 satellites in a 750 nautical mile orbit above the Earth. The wireless telecommunications system is designed to provide voice, data, fax, and other telecommunications services to users worldwide.

Users of Globalstar will make or receive calls using hand-held terminals similar to today's cellular phones. Calls will be relayed through the Globalstar satellite constellation, to groundstations, and then through local terrestrial wirelines and wireless systems to their end destinations.

The first four (4) of 48 satellites in Globalstar's worldwide network were launched on February 14, 1998.

IRIDIUM

Motorola's Satellite Communications Group is the prime contractor for the Iridium system, which includes an international consortium of 17 investor organizations representing leading telecommunications and industrial companies worldwide.

The IRIDIUM project will employ 66 low earth orbit satellites for mobile phone, voice, character, and data communication. IRIDIUM satellites talk to handsets, ground stations, and each other, forming a network aloft, passing along conversations and handing them off when they drift out of range. The IRIDIUM system will be able to handle calls by routing the signal from handset straight to an Iridium satellite, as no ground stations are needed.

IRIDIUM phones will have a standard RS232 interface port built into each handset to support data and facsimile transmissions. Batteries will yield at least 1 hour of talk time capability and 24 hours of standby time. A smart card will also be available for IRIDIUM telephones.

The IRIDIUM system is expected to go into service in September 1998.

Teledesic

Backed by telecommunications pioneer Craig McCaw and Microsoft Chairman Bill Gates, the Teledesic Network is scheduled to begin service in 2002. It will provide two-way, broadband connections for applications such as voice, data, videoconferencing and high-performance Internet access.

A constellation of 840 satellites will orbit the planet at low altitude, transmitting signals from any point on the planet to any other with the speed of fiber optic cable.

EBT Processing Layer

The EBT processing Layer refers to a standard interface into the EBT processor for an EBT program. This includes all pieces of a possible approach, especially in the areas of communications protocols and message formats.

Regardless of the technology utilized for the model wireless approach, it needs to interface into the existing EBT processor infrastructure (i.e. Deluxe Data, Citibank, Transactive[7], Lockheed/Martin IMS) by utilizing existing standards. This means that the input of wireless EBT transactions to the EBT processor should be based upon the X.25 or similar protocol and use standard POS terminal message format standards (Visa I and II, ISO 8583).

Communications Medium

Although the wireless carrier options under consideration utilize a wide variety of standard and exotic protocols and data transmission methods, it is necessary that the selected carrier have the capability to provide a leased-line interface to the EBT processor utilizing a standard protocol such as X.25. This will allow the interfacing of wireless EBT POS terminals to be completely transparent to the EBT processor. The interfacing of wireless POS credit card transactions follow this same approach today with very little difficulty.

Message Formats

In addition to the requirement that the wireless carrier interface in a standard method to the EBT processor, the same is true of any potential POS terminal approaches. This means that the POS terminal equipment should be able to produce EBT transaction messages (e.g., authorization requests, purchases, etc.) to the EBT processor in the standard format supported for POS terminals by the EBT processor. Examples of this would be the Visa I and II formats and ISO 8583.

[7] GTECH, the parent company of Transactive, announced the sale of Transactive and its associated EBT contracts to CitiCorp on February 27, 1998.

HYPOTHETICAL EBT APPROACHES FOR FARMERS MARKETS

The purpose of this section is to present several hypothetical EBT approaches for Farmers Market Retailers and to compare high-level costs for those approaches.

APPROACH TO COSTING SURVEY

1. Multiple vendors were contacted and interviewed.
2. Those interviewed included, Hypercom, Mondex, Omega Digital, Symbol Technologies and Verifone.
3. Interviewees were assured that this was not a formal cost inquiry, rather an initial

APPROACHES CONSIDERED

Three approaches were analyzed for purposes of developing this high level costing analysis:

1. Sole Proprietor (including portable and desktop approaches)
2. Co-Op Model (wireless LAN)
3. Smart Card

THE SOLE PROPRIETOR APPROACH

With this approach, all necessary equipment is provided to the individual Farmers Market Retailer so that the Retailer can individually accept food-stamp transactions as a stand-alone merchant. Some of the basic configuration guidelines and requirements for this approach include:

- Utilizing a terrestrial radio technology for wireless connectivity for performing on-line authorizations. Because there is not a vast difference between data handling capacity of the most common wireless techniques, any of the following are acceptable:
    - ARDIS (was Motorola, now American Mobile Satellite Corp.).
    - RAM Mobile Data.
    - CDPD.
- Using either an integrated or separate PIN Pad, depending upon the sub-configuration (portable or desktop).
- Using an Interface Layer consisting of an integrated modem or a connection to an external cell-phone or other communications device.
- Consider price differentials between "Portable POS Terminal" and "Desktop POS Terminal" approaches.

Portable Approach

The portable wireless POS approaches analyzed all had secure PIN Pads, thermal printers, displays and batteries incorporated in the base price. Certain models had additional serial ports that could be employed for bar code readers or other devices, and most units could read both magnetic stripe and integrated circuit chip cards. The base offerings did not include spare batteries or battery chargers. However, these are available for a nominal price from the POS terminal hardware vendors.

Generally, the portable POS units without modem range in price from $625 to $1,000 per unit, based upon the quantity of POS terminals purchased. This price includes display, PIN pad, thermal printer and one battery. Additional batteries are $30-45 each and the battery chargers cost $120-140. Both of these accessories are recommended, if not mandatory.

The interface layer or modem is typically incorporated into the POS terminal by the hardware vendor, and included in the overall POS terminal pricing quoted by the vendors. Vendors offer three different types of communication protocols (e.g., CDPD, ARDIS, and RAM) by employing different modems in the terminal. However, each has a slightly different cost structure. The price of the wireless modem costs the POS terminal vendor in the $250 to $400 range, based upon the wireless communications protocol employed. The POS terminal vendor then typically has another $100 of cost to integrate the modem into the POS terminal (support hardware, engineering, etc.).

Below is the table of costs for wireless POS terminals including the various modems. The prices listed are for bundled approaches, that is, prices include all hardware and software minus additional batteries and battery chargers. This can be seen visually in the summary diagrams at the end of this section . The range in price generally reflects the cost differential if units are purchased in bulk. For most vendors bulk pricing begins at 2,500 units.

Table 3 Range of Costs for Portable Wireless POS Terminals

Modem Type	Cost Range
CDPD	$1,100-$1,400
ARDIS	$975-$1,175
RAM	$1,100-$1,300

Source: Technical and Cost Feasibility of EBT Equipage in Farmers' Markets and Mobile Food Retailers, May 1998.

Most terminal vendors can offer turn-key approaches and can sell bundled offerings. However, often the vendors are not particularly well equipped or interested in providing for the POS terminal software application. A software development company was contacted, that provides the software applications for wireless POS approaches, to gain an estimate on what the scope and cost of providing a wireless EBT approach would be. The vendor estimates are based upon beginning the development of the software application from a functional specifications document. An EBT processor document, which provides for the specifications of the standard POS land-line EBT application, may be adequate for this purpose. If not, additional expense would be incurred to develop the POS terminal EBT application functional specifications by either the software vendor or a third party firm.

Representative cost for developing the POS terminal EBT software application are approximately $64,000, plus or minus several thousand dollars, depending upon the complexity of the EBT application.

Desktop Approach

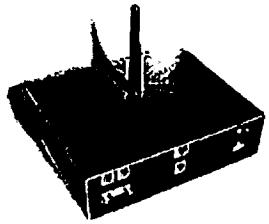
The desktop approaches were very similar to the portable offerings from a price perspective. These devices include magnetic stripe and integrated circuit chip card readers (smartcard), displays, key pads (both integrated and stand-alone), printers (again, both integrated and stand-alone) and battery. Serial ports are available for printers and other devices (such as bar code readers), and additional batteries and battery chargers are also offered separately.

Typical non-wireless desktop POS devices use standard telephone lines for communication. In order to provide for a low-end wireless approach, vendor offerings require an additional communication module. This communication device can convert standard dial frequencies out of the POS terminals to CDPD, and vice versa.

The low-end POS devices retail for roughly $350-$500 and the communication converter is an additional $750 to $1,000. Newer generation remote POS devices combine both components into one offering. These desktop POS devices retail for $1,000 to $1,500, depending upon wireless modem (CDPD, RAM) and quantity purchased.

Additional batteries and a battery charger are recommended for the units. Batteries retail for $30-45 each and the battery charger costs $120-140.

THE CO-OP MODEL APPROACH



The Co-Op model is a group approach that is provided for all Retailers in the Farmers Market. This approach allows individual retailers to accept electronic food-stamp transactions. Some of the basic configuration characteristics of this approach are as follows:

- This configuration utilizes a controller/concentrator to provide wireless communications access for multiple POS terminals to one or more land telephone line(s) in a shared fashion.
- The controller/concentrator needs to provide for a POS terminal environment for EFT authorization messaging, multi-threading of transactions, queuing of transactions to available lines, proper handling of time-outs and reversal handling, etc. which is compatible with the Operating Rules of the EBT program.
- The configuration of the controller/concentrator for the Co-Op model consists of two possible configurations, 1) a separate wireless LAN controller and separate POS controller connected together by a RJ11 or RJ45 connection, and 2) a single integrated controller which provides both wireless LAN and POS terminal controller functionality.
- The wireless connectivity from the POS terminals to the controller/concentrator can be provided by licensed or unlicensed[8] wireless communications techniques as long as the maximum range of about 300 meters can be supported between the hand-held unit (POS terminal) and the base-station (controller/concentrator).
- The POS terminal Interface Layer that provides wireless connectivity to the controller/concentrator is either integrated into the terminal or is a separate, external, ancillary module device.

[8] Does not require the granting of a license by the Federal Communications Commission to utilize the wireless frequencies.

- The POS terminal equipment can use an integrated or separate PIN Pad.
- The POS terminal equipment can utilize either a "Portable POS Terminal" or a "Desktop POS Terminal" approach.

POS Terminal Equipment

The wireless LAN approach has two components: 1) the remote POS terminal and 2) the controller/concentrator central dial device. The POS terminal is either a portable or desktop device which merchants use to execute EBT transactions. The controller/concentrator receives authorization queries from the POS terminal and routes them to the processor over standard dial telephone lines.

The POS terminal typically has all the functionality of a portable or desktop POS device. That is, it has a secure PIN pad, thermal printer, battery and display, either integrated or as separate units. It is also capable of being configured to handle both magnetic stripe and integrated circuit cards. Each controller/concentrator can typically handle 32 or more POS terminals.

POS terminals retail in the range of $710 to $850 per unit and the controller/concentrator retails for $550 to $650. The controller/concentrator can also be retrofitted with a high powered antenna for an additional $50. This allows the terminals additional range.

Additional batteries and a battery charger are recommended for the units. Batteries retail for $30-45 each and the battery charger costs $120-140. Most terminals utilize a single nickel-cadmium battery.

With respect to the controller/concentrator, the devices that we reviewed for this study typically support only one J11 dial telephone line port. This means that in order to get performance that is within the guidelines established in the EBT Operating Rules, from the perspective of POS terminal authorization response times, it may be necessary for the controller/concentrator to "multi-thread" outbound and incoming authorization messages over that single telephone line. Otherwise, the more wireless POS terminals that are supported by a single controller/concentrator, the longer the authorization response delays will tend to be, and the

greater the likelihood that the EBT authorization response times from these wireless POS units will exceed the guidelines. The rational for this is:

1. 'Multi-threading' is when POS terminal transactions from multiple POS terminals are allowed to be interleaved on a single communications line at the same time with other POS terminal transactions. Multi-threading allows EBT authorization requests to occur simultaneously with other POS terminals because it interleaves messages from multiple messages over the line, and is able to redirect responses back to the originating POS terminals.

2. 'Single-threading' is when only one POS terminal transaction can utilize the controller/concentrator telephone line connection to the EBT Processor at a time. Single-threading allows only one EBT authorization request / response to be sent and received with an EBT Processor before the next EBT authorization request from a POS terminal can be sent and received with the EBT Processor.

Because multiple POS terminals can be in the process of performing transactions at any given time, the controller/concentrator needs to be able to route the proper response message from the EBT processor to the correct POS terminal. This is generally accomplished by putting a unique electronic identification 'tag' on the outbound message to identify the POS terminal who originated the message. This tag is then returned in the authorization response by the EBT processor to the controller/concentrator. The controller/concentrator utilizes this tag to know which POS terminal to send the response back to. The Visa II message set does not support message tags as a standard as does the ISO 8583 message set. None of the current major EBT processors (Citibank, Transactive, Deluxe) are known to provide a Visa II or ISO 8583 EBT message set that supports electronic message tagging.

Vendors who manufacture the controller/concentrators do not typically support multi-threading as a standard feature in their current offerings. However, multi-threading can be supported by the vendor with additional software enhancements to the controller/concentrator. However, because of the expense to do this, a more cost-effective approach may be to limit the number of wireless POS terminals connected to each controller/concentrator.

Because of limited EBT Processor support for multi-threading EBT POS terminals, significant work and investment will likely be needed for EBT Processors to support multi-threading (estimates are 3 months of software work at a cost exceeding $50K).

POS Terminal Controller/Concentrator Equipment

The wireless POS terminal controller/concentrator equipment is provided by manufacturers in two different possible configuration options. The controller provides EFT messaging logic for routing POS terminal transactions to and from the EBT processor. The concentrator provides for communications with the wireless POS terminals and with a common telephone line. There are two types of configurations for this equipment as described below:

1. **Discrete**

   For this configuration, the controller is a unique piece of equipment, and the concentrator is also a unique piece of equipment. These two devices are connected together by some sort of cable (e.g., serial or LAN), and work together, each performing its individual task. An example of this type of configuration is the Verifone Transceiver Concentrator and the 1200C Controller.

2. **Integrated**

   With this configuration, the controller and concentrator are integrated into one device. An example of this type of device is the OmegaBEACON RF Terminal LAN Controller.

The pros of an integrated controller/concentrator are that it is simple, easy to set-up and use, and perhaps most importantly, less expensive. The con is that you have to accept that the POS terminal (capabilities, functionality, application software language, etc.) of the integrated approach may be inferior to a highly standard POS terminal like a Verifone Omni 380. The pros of a discrete approach are that you can mix common, popular POS terminals (e.g.,. Verifone Omni 380) with the concentrator and therefore have commonality with your landline POS terminals. The con is that it is more expensive, and it is more cumbersome to set-up and support.

Because quality integrated devices are readily available, and tend to be less expensive than discreet controllers and concentrators, the integrated device should be considered to be the

appropriate type of unit for a Co-op Farmers Market. Furthermore, vendors seem to be phasing out discreet component configurations of controller/concentrator devices.

THE HYBRID SMART CARD READER/PRINTER/PIN PAD MODEL APPROACH

The Hybrid Smart Card Reader/Printer/PIN Pad POS terminal is equipped to be able to provide each farmer with the capability to perform both on-line and off-line authorizations and the uploading of stored-value transactions on a regular land-line based telephone line. Some of the configuration requirements for this approach are:

- The Hybrid Smart Card terminal needs to be able to read a chip card, and support an EBT stored-value application.
- This approach needs to be able to dial an EBT processor on a standard telephone line to perform authorizations and to upload stored-value transactions.
- The Hybrid Smart Card terminal needs to be able to print a receipt.
- The Hybrid Smart Card terminal needs to be able to support a PIN Pad and perform PIN validation against either the PIN stored in encrypted format on the smart card, or at the EBT processor (mag-stripe).

Smart Card Approach - Terminal Equipment

Any of the three proceeding modules (portable, desktop or wireless LAN) can also accommodate smart card readers as a standard product option by retrofitting the base units to accept smart cards.

In order to accept IC cards based upon open standards (Visa Cash, Mondex, Proton), a PSAM drawer needs to be added to the terminal. The addition of the PSAM drawer costs approximately $200. The PSAM drawer can accommodate up top five different cards, each card representing a different smart card platform. Apart from the hardware cost for the drawer, each PSAM card costs roughly $10.

The advantage of having multiple PSAM capability is that the merchant can accept multiple smart card systems (Mondex, Visa Cash, Proton, etc.) in addition to debit and credit cards. If the EBT program in which the Farmers' Market operates was a closed environment, multiple

PSAM capability is not needed. In this case, the average, single platform smart card POS terminal without the multiple PSAM capability cost under $500. This unit would have printer's, pin pad, and display incorporated. This option is not a hybrid terminal, meaning that only the government issued smart cards would be accepted and not credit or debit cards. Software costs are dependent on the application and platform chosen.

Smart Card Approach - EBT Processor

The EBT Processor needs to be able to support the EBT stored-value software application whose functionality includes:

- Downloading benefits to cards monthly (provided with ATMs).
- Uploading purchases from the Hybrid Smart Card terminal from retailers daily.
- Reconciliation of downloaded benefits to uploaded transactions daily.
- Support for balance inquiry functions for the card (at ATMs and POS terminals).

The EBT processor can support the stored value application either as an integrated component of their core-processing platform, or as a stand-beside platform with some degree of integration to their core-processing platform.

COMMUNICATION COSTS

Depending on which type of communication protocol is employed, the price per average transaction varies in the wireless environment. Below is a table outlining the different cost structures for analog and digital cellular communications.

Table 4 Cost Structure of Analog and Digital Cellular Communications

Number of Minutes per Month	Price for Analog Cellular (per minute)	Price for Digital Cellular (per minute)
60	60¢	50¢
100	50¢	39¢
250	33¢	26¢
500	28¢	20¢

Source: The Yankee Group, PC Week, December 8, 1997.

Average on-line time has been estimated at five to six seconds per transaction. Those figures equate to communication costs of approximately 5¢ to 6¢ a transaction for an analog based cellular system with a merchant averaging less than 60 total airtime minutes a month. However, as of now, analog carriers charge in a minimum of 30-second intervals, making analog unattractive. Digital is now beginning to charge in smaller intervals, but these providers are concentrating on the more lucrative voice services in the large metropolitan areas, and have had little time (digital was only introduced in 1995) to concentrate on expanding and marketing data services.

The CDPD option might be more attractive; it costs between 3¢ to 6¢ per transaction, based upon several factors:

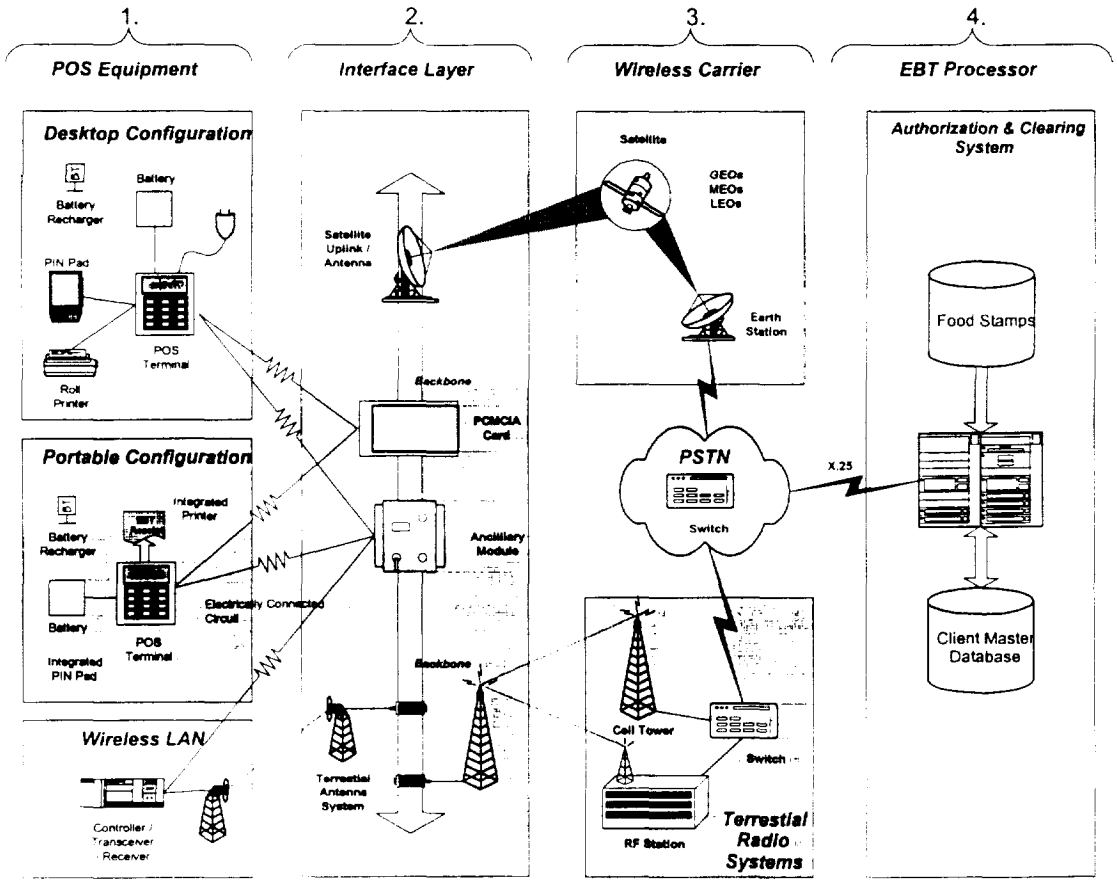
- Time of Day
  - "Premium" is during the day, and is more expensive.
  - "Non-Premium" is off-hours (night) and is less expensive.
- Volume
  - Pricing is at the merchant level by the carrier, but billing is at the processor level.
  - It is unusual that CDPD merchants use up the mandatory base allotment of data that they get for the flat $12 fee that they pay.

Beyond allotment of a flat $12 fee for data, pricing is 6¢ to 8¢ per 1,000 bytes of data transmitted.

Also, RAM costs approximately 5¢ a transaction according to vendors surveyed. Costing information for ARDIS was not available.

SUMMARY OF APPROACHES

Sole Proprietor-Portable Approach



$625-$1,000 — POS Equipment
$30-$45 — Spare Battery *(optional)*
$120-$140 — Battery Charger *(optional)*

$250-$400 — Modem
$100 — Integration Cost of Modem into POS Device

3¢-6¢/ trx. — CDPD
5¢/ trx. — RAM

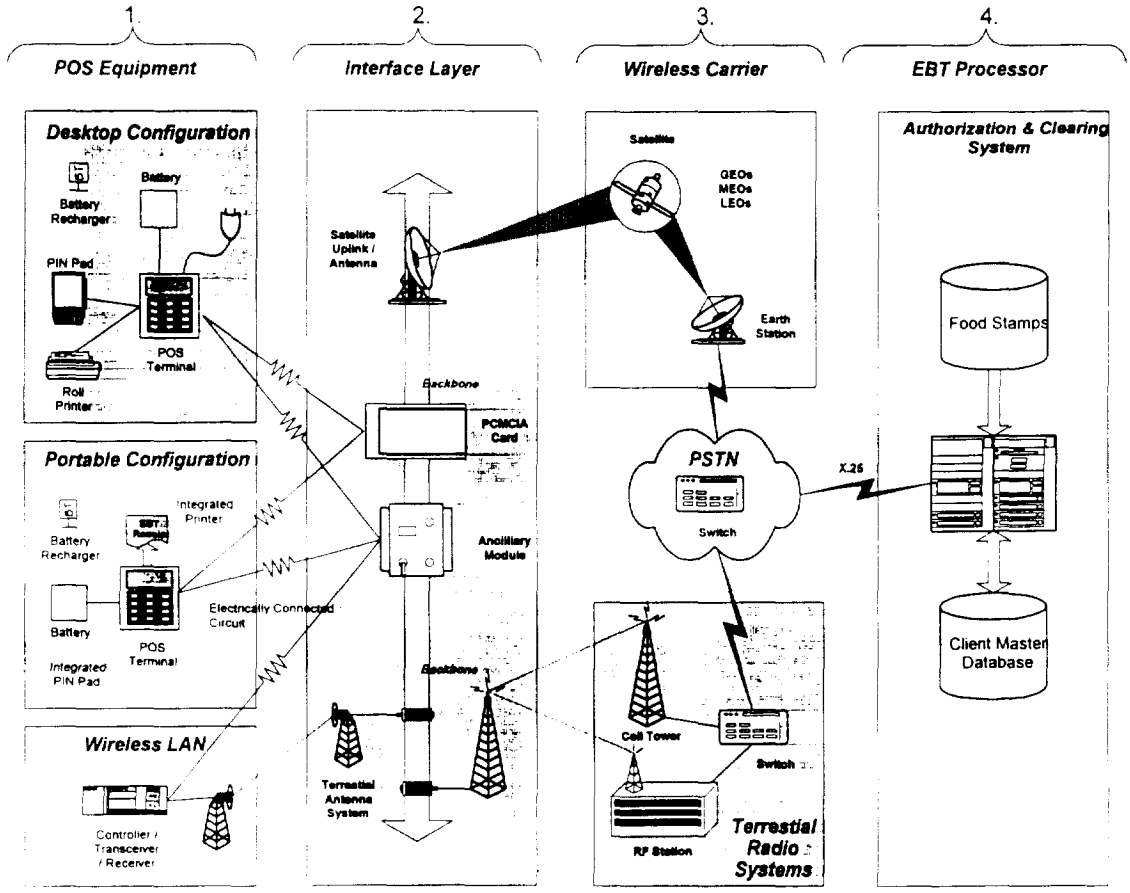
Not Applicable to Survey

Bundled Prices (for POS unit, Modem, and Integration):

CDPD Protocal	— $1,100-$1,400
ARDIS Protocal	— $975-$1,175
RAM Protocal	— $1,100-$1,300

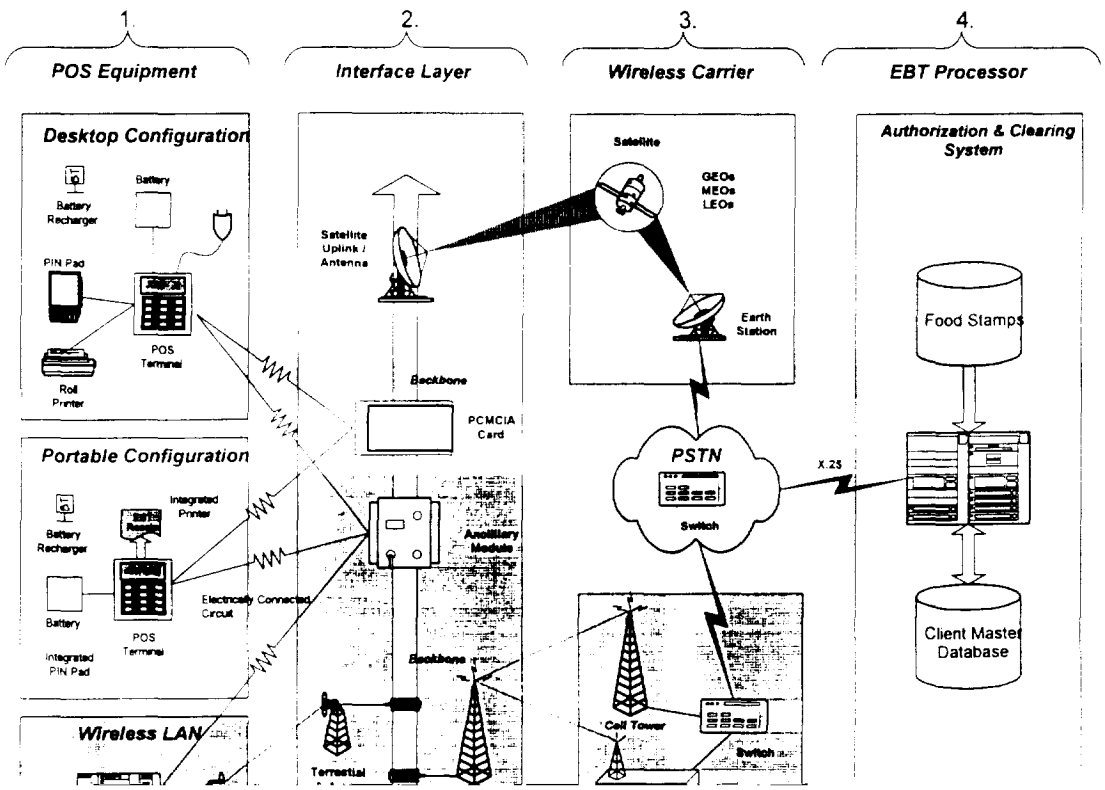
Source: Technical and Cost Feasibility of EBT Equipage in Farmers' Markets and Mobile Food Retailers. May 1998.

Sole Proprietor-Desktop Approach



Source: Technical and Cost Feasibility of EBT Equipage in Farmers' Markets and Mobile Food Retailers, May 1998.

Co-Op Model-Wireless LAN



POTENTIAL IMPACTS OF NEW TECHNOLOGY

Introduction

This Chapter presents the study findings on the potential impacts new technology will have on government, EBT operators, and farmers' markets and mobile food retailers. The chapter contains anecdotal information from informal interviews with EBT stakeholders. We begin this section by explaining the interview methodology and the types of questions that were addressed, how we collected the information, and then presenting the potential impacts grouped into conceptual, operational, organizational and budgetary categories.

Methodology

Informal interviews of EBT stakeholders representing federal government staff, State agency staff, farmers' market and other mobile food retailers, EBT operators, and FSP advocacy groups were employed to document the range of issues that may have an impact on government, EBT operators, and farmers' markets and mobile food retailers.

As preparation for the conduct of stakeholder interviews, a synopsis of the Technology Inventory chapters of this report (Chapters 1 through 4) was prepared and distributed to all of the stakeholders. The interviews were conducted during November and December 1997 and consisted of 21 interviews with individuals who represented a cross section of EBT stakeholders of divergent interests including:

Federal Agency EBT representatives (3)
EBT system operators with current contracts with states (5)
FSP Advocacy Groups (3)
State Agency representatives (6)
Farmers' Market retailers (4)

The following informal interview protocol was used by the interview team to guide the interview process:

Our overall requirement for the stakeholder interviews is to determine what impacts will new technology (i.e. the alternatives we have presented in our Technology Inventory Report) have on:

Government (Federal and State)

EBT Operators (Processors and Third Parties)

Food Retailers (Farmers, Mobile merchants, Farmers Market Managers)

The kinds of questions we should be asking start with their assessment of the technology alternatives that we have come up with:

Are there technologies that we have missed?
Have we expressed all the alternatives for the technologies presented?
Are there other farmers' market models?
What is their opinion of the alternatives presented?
Which alternatives are the most promising from their point of view? Why?
Which alternatives are the least promising from their point of view? Why?

We should follow the above questions with some discussion of how the implementation of these alternatives:

Would affect their business (admin., technical, and cost)?
Would affect their customers(admin., technical, and cost)?
Would affect other parties(admin., technical, and cost)?

Finally, we should determine if they have any efforts (startup or on-going) to either implement or begin research on implementing wireless EBT technology for their customers.

Source: Technical and Cost Feasibility of EBT Equipage in Farmers' Markets and Mobile Food Retailers, May 1998.

This interview protocol was not meant to be a structured interview guide, but rather a list of topics to be covered and confirmed during the interview with questions directed to appropriate respondents. This exploratory approach is especially valuable for a study of a relatively unknown and technical subject. To the extent that documents and records were not available, interviewees were asked to provide their best judgment of the information requested.

This study is not controlled, hypothesis testing research. Rather, mostly qualitative and some quantitative data on a rich array of factors are to be woven together into technical alternatives

that describe likely relationships associated with successful implementation of EBT in the Food Stamp Program.

A definitive determination of the degree of impact of technology on the Food Stamp Program is not feasible, because it is not be possible to factor out the influence of other causal factors that occur simultaneously. As many of the potential causal factors as possible have been identified in this report. The weight of the evidence is presented in sufficient detail so that a reader can draw his/her own independent conclusions.

Presentation Of Interview Results

The following presentation of Interview results contains the top considerations expressed by the stakeholders interviewed. The considerations are grouped into conceptual, operational, organizational and budgetary categories for each of the three impact areas.

Potential Impacts On Government

CONCEPTUAL

On states' implementation of EBT

- States will be looking to add functionality to existing EBT systems by supporting other programs (i.e. Medicare, WIC, Tanf). Remaining states will be looking at new technology (smartcard) as alternative to magstripe.
- Federal and State agencies should make sure that recipients do not lose farmers markets/route vendors as an option. It has taken lots of effort to get farmers into FSP now they are going away.
- States have a chance to correct problems with contract renewal/renegotiations.
- States should look at cost tradeoff for running telephone lines into non-traditional sites.

On the effects of other government EBT programs

- Other government programs (i.e. WIC, TANF) may dictate choice of technology for FSP. The Department of Defense is already using "Mark", a hybrid smartcard, at commissaries.

OPERATIONAL

On the recipient base

- As the number of recipients goes down, due to welfare reform, the impact on states will be smaller EBT budgets. This may adversely affect states' ability to provide non-traditional retailers with EBT capability.

On the non-traditional retailer base

- The primary issue at hand is whether the approaches offered by wireless technology are warranted for such a small population of vendors. Many vendors can operate successfully in an off-line mode. The cost associated with indemnifying retailer risk in off-line mode is less than the cost to equip these retailers with wireless technology and to build the underlying infrastructure.

ORGANIZATIONAL

On states' EBT priorities

- As states implement EBT statewide their emphasis is on traditional retailers first, which causes a lag in addressing farmers problems, and therefore farmers drop out of the program. There is no political will to solve the problem now!

BUDGETARY

On risks/costs of implementing wireless EBT

- The cost of identification and management of the risk may be less than cost to fit out non-traditional retailers with wireless systems.
- It may cost to fit out last 10% of vendor population as much as first 90%!
- Given the small number of mobile merchants in the states, it does not appear that the cost to equip these retailers with wireless capability is particularly prohibitive.

Potential Impacts on EBT Operators

CONCEPTUAL

On states' estimation of the non-traditional vendor population

- What percentage of EBT vendors requires wireless technology? The ability to accurately estimate the number of vendors needing this technology has not been good. Virginia's RFP had a requirement for only 19 non-traditional vendors out of 4992. States ask for ideas (biometrics, smartcard, wireless) when they issue RFP's and EBT contractors spend significant resources proposing these capabilities as options, but none of these options are ever funded. Ultimately, no one wants to pay for the cost of the technology. The tenets of cost neutrality are a constant struggle to meet.
- The number of non-traditional merchants in any program area ranges from 1-5 percent of the total EBT merchant population. For example:

  Alabama: 91 of 3900 FNS certified merchants are non-traditional

  Louisiana: 171 or 4300 FNS certified merchants are non traditional

On EBT implementation

- It is easier to include farmers at the beginning rather than to retro-fit later.

On supporting wireless POS

- All mobile retailers are supported with a manual (paper) process, which will continue until the end of the waiver period in 2002. It is anticipated that EBT processors will be required to propose approaches for the mobile vendors at the time EBT contracts are renewed or rebid.

On the use of wireless terminals as backup

- While the use of wireless terminals does eliminate the need for wiring in a LAN configuration, we do not see significant strides or interest among retailers regarding the use of a wireless system in the store environment as backup. There appears to be no significant demand for wireless terminals in the retail industry.
- To date, we do not support any applications for EBT mobile vendors. Only one grocery store has inquired about using a wireless POS device as backup to a leased line configuration in the stores. Accordingly, there has been no expressed interest in moving to wireless among the retail community. Furthermore, there have been no internal discussions about leveraging the existing relationship with wireless service carriers to support EBT merchants.

On wireless technology

- Wireless EBT looks like an expensive approach for a small population. Hybrid smartcard seems like a better alternative.
- We have some customers using wireless as a backup to landlines. One major route vendor is the only significant example of retailer moving to wireless as a primary mode of operation.
- The ultimate approach is a combination of smartcard and wireless technology.
- CDPD seems like the best telecommunications choice.
- Of the wireless options available, we believe that coop and state run farmers markets conducted in fixed warehouse locations are best served with wireless LAN technology provided the cost to the merchant is manageable and the delivery system is dependable.
- We believes that satellite technology may be cost prohibitive, particularly related to set up and security. The technology also has some shortcomings in that it is better suited for receiving than sending transmissions. Wireless LAN may be a good approach for the mall concept in urban locations where power lines and telephones already exist. In this scenario, however, the merchants would all need to operate EBT processor issued terminals which are all connected to a single controller.
- Our opinion of the alternatives presented is that cellular may not work in remote locations and that satisfaction and acceptance of the technology will depend on the convenience to the farmer.

On processing options

- Batch processing of transactions received in store and forward mode may be the best option for the mobile vendors.
- Third party operators are concerned about two issues: (1) that any wireless device deployed must be certified to its system, and (2) that whatever technology deployed can be tied in with settlement for other payment types, e.g., debit, credit, etc.

OPERATIONAL

On interstate interoperability

- There is a need to have a gateway for interstate transactions (i.e. interoperability between all state systems not just bordering states).
- The question of program interoperability needs to be considered, that is, the technology used should be compatible between border states so that redundancy in equipment and carrier costs can be avoided. Considering that some of the mobile merchants operate in multiple state and regional programs, there may be an opportunity for the states to consider equipping these merchants with wireless mobile terminals and sharing the cost of the terminal between and among EBT service providers in those areas.

On EBT processor capacity

- Do EBT processors have the infrastructure to support these kinds of programs (i.e. going from 100 transactions a month to 8000 transactions a month).

ORGANIZATIONAL

None

BUDGETARY

On cost per case month pricing

- Maryland is the first statewide renewal (RFP in 98). We will see if states are willing to use historical data on usage to change from cost per case month to cost per transaction pricing. We can control costs much better if its cost per transaction.
- The EBT processor bids EBT programs on a cost per case month basis. The cost for supporting non-traditional merchants is significantly higher than for traditional merchants.

On costs for mobile POS

- While the number of mobile retailers is small in any program area, we question the economic feasibility of wireless POS, particularly relating to the cost of the terminal and telecommunications. We are also concerned about the types of mechanisms that might be used to monitor or prohibit non-business related calls made by the merchant on the telecommunications equipment.
- It is difficult to estimate the incremental transaction volume that mobile vendors might incur if wireless technology of any type were implemented to support EBT. Until now, the government has not wanted to fund the cost of specialized EBT terminals, nor has it provided the merchant with any added incentive to spend their own money to do so.

Potential Impacts on Mobile Food Retailers

CONCEPTUAL

On farmers concerns about technology

- Farmers are inherently apprehensive about wireless transactions (i.e. are they fast enough)?
- New York City (NYC) farmers prefer Farmers' Market Nutrition Program (FMNP) $2 check/coupon (currently piloted in 30 states). People/volume in NYC can't wait for real time authorization. We need something like FMNP coupons. I would probably leave the program if EBT is implemented because of the time involved. I redeem $2000-3000 per day in FSP.
- Based on a recent visit to farmers' markets by New York State Dept. of Social Services farmers indicated that they might drop out of the program if it were based on wireless technology because of their high volume and the time it would take for a transaction to be completed.
- The impact of wireless EBT will mean that farmers will drop out of the program. This will cause an interruption in trade not fraud.
- Some farmers would not want to have personal EBT units (because of the perceived complexity of the technology). They would rather have the market manager handle it.
- Our main concern is that farmers will drop out of the system because of the extra work/time required to perform a transaction as opposed to the coupon system.
- Some small mom and pop retailers say they're considering dropping out of the program because of connection problems and false rejections. This may be due to of a lack of training.
- The complexity of technology is a turnoff to retailers. Language problems (non english speaking) make expenditure of time not worth the transaction.
- There is a great concern that farmers are dropping out of the FSP while states get there EBT systems in place. Our state processed $44 in FSP benefits at farmers' markets by mid 1997 compared to $9600 in 1996.
- Voice authorization takes too long compared to coupons in time and money. Many farmers have actually dropped their certification.

OPERATIONAL

On current use of EBT

- Volume at our market is not high. The use of EBT is not affecting our operation or customers.
- Current problem is that New Mexico does not have EBT at their farmers' markets and they can't process out of state (border) recipients.

- Why not let those merchants that are equipped with wireless terminals operate against a floor limit where the State assumes the liability for transaction authorizations below a fixed amount (e.g. $5). Since most of the merchants are fresh produce vendors, the average transaction amount is most likely small, and as such merchants may be willing to assume some of the risk for off-line transactions.
- Cross border transaction activity is still fairly low volume. We estimate that the number of merchants that operate in multiple program areas is negligible.
- There has been a discernible drop in the number of non-traditional merchants participating in EBT programs, e.g., Alabama has experienced a 20 percent drop in certified merchant participation. Deluxe is uncertain what might be causing this attrition.
- Farmers don't know computers.
- Retailer training is the key to understanding and acceptance of this level of technology complexity.

ORGANIZATIONAL

On merchant training

- Non-traditional merchants may need to be educated on the value to them to promote usage of the new technology.
- It is up to merchant to continue training.

On types of mobile merchants

- The percentage of mobile merchants to the total number of merchants varies among the program areas in which we operate. The type of mobile merchant varies by program area also. For example Florida and Maryland have more seafood merchants, whereas route vendors selling milk and bread from trucks are more common in Pennsylvania.

On other types of farmers' markets

- The key is the use of a single point settler, it could be chamber of commerce, city government, private non-profit, environmental group, economic development group, quasi government, public authority, coop farmers, un-incorporated association, or individual sponsor (private).

BUDGETARY

On farmers' investment in EBT

- If farmers do not have an investment in the EBT systems (i.e. that its totally free to them) then they will not treat equipment with respect.

On the cost of wireless telecommunications

- We believe that the EBT processor would fund the cost of supporting wireless technology to non-traditional vendors as part of the RFP process.
- The cost of the wireless terminals used in the Maryland EBT demonstration program ranged between $1500-$1800 per unit. When merchants were offered the opportunity to purchase these terminals outright at $700 per unit, only five merchants elected to do so. During the demonstration program, the telecommunication carrier absorbed the telecommunications costs.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The main findings of the study can be summarized quite simply. The "Inventory and Analysis Of Alternative Technologies, Equipment and Vendors" shows that EBT equipage in farmers' markets and mobile food retailers is technically feasible. The cost feasibility of EBT equipage in farmers' markets and mobile food retailers, however, presents a much more significant challenge since implementation costs must be budgeted and operating costs must be competitive with paper systems.

Recommendations

It is recommended that any chosen wireless EBT solution be based upon a modular approach as outlined in the section "Simplified Wireless EBT Model" using standard equipment as much as possible, plus add on equipment as necessary, to provide connectivity to all geographic locations. The objective should be to achieve an acceptable balance between coverage, flexibility and cost.

A wireless EBT model which is based upon a variety of carriers and POS equipment is the recommended approach. This will provide solutions with maximum utility and optimized cost.

With respect to the wireless medium employed, the general approach should be to utilize a common standard interface (PCMCIA) to access whatever is the lowest cost and most reliable service available, whether that is RF, Cellular or Satellite based. This approach applies across-the-board to all mobile food retailers in all farmers' market operating models.

The likely solutions that will emerge for wireless EBT will undoubtedly vary by the organizational structure under which the farmers' market and mobile food retailer operate. The following discussion of those solutions should be viewed based on the applicability of the various alternatives to the food retailer, within each merchant operating model, the components of the solution and its suitability and/or constraints in that particular retailer environment.

Sole Proprietor

Appropriate solutions for the sole proprietor will typically be either Desktop POS Terminal or Portable POS Terminal configurations, based upon the needs and preferences of the retailers. Ideally, the POS terminal equipment should have a PCMCIA slot in order to allow a modem device to be inserted. This would provide flexibility to utilize any viable wireless medium as needed and as available.

The Wireless LAN POS terminal configuration does not appear to be viable for the sole proprietor unless it is explicitly used for accessing satellite based data communication services. This is due to the fact that sole proprietors typically operate as a stand-alone EBT retailer. The complexity of a Wireless LAN is therefore typically not needed unless the retailer is very remote, in which case satellite technology may be the only viable option.

Coop

For the coop mobile food retailer environment, Desktop POS Terminal, Portable POS Terminal and Wireless LAN configurations may all be appropriate, depending upon the common operating practices of that coop. Typically, the Desktop POS Terminal or Portable POS Terminal configurations will be the most common.

The Wireless LAN configuration may be useful to the coop in several possible ways:

- If the coop provides single point settlement with the EBT processor, the Wireless LAN solution may provide an integrated environment which facilitates this process.
- As a measure to save on communications costs, the Wireless LAN may provide for more efficient EBT processing for the retailers than would otherwise be obtained in the stand-alone configuration.
- If the coop operates in a remote area, the Wireless LAN may provide the ability to utilize satellite based data communications services not otherwise accessible through RF or cellular systems, due to lack of coverage.

State Run

For the state run farmers' markets, again the options that are potentially viable appear to be the Desktop POS Terminal, the Portable POS Terminal and the Wireless LAN configurations. As is

true with the coop, the chosen solution will depend upon the common operating practices of the state run farmers' market.

For the state run farmers' market, there appears to be a greater fit with the Wireless LAN set-up. This should provide the state run farmers' market with flexibility and ease of operations (single-point settlement) and reduced costs through multi-threading transactions over the same wireless channel simultaneously.

The coop and state run operating models present an opportunity to use economies of scale to reduce overall EBT operating costs. Consolidation of scarce or expensive resources (i.e. electric power and telephone access) is a strategy that can have a significant impact on costs. Use of remote solar electric generators to provide power for consolidated resources is an example of this strategy.

APPENDIX A - GLOSSARY

Advanced Mobile Phone System (AMPS) -- AMPS is the term used by AT&T to refer to its cellular technology. AMPS is an analog system which typically utilizes TDMA or CDMA as its modulation technique.

Analog -- In communications, transmission employing variable and continuous waveforms to represent information values where interpretation by the receiver is a quantifiable approximation of encoded values. This is what the switched telephone network is based on. Telephone lines are typically referred to as analog lines used for communications.

ANSI -- Acronym for American National Standards Institute.

Automated Clearing House (ACH) Network -- A network run by the Federal Reserve to electronically process funds transfers between member financial institutions. Typically used in

information into small packets. These packets are reassembled at the receiving end. The system uses the temporarily idle channels in the cellular telephone systems to transmit data. With CDPD, users are charged on a per packet basis, which means they pay only for data that is sent.

Circuit Switched Cellular Data (CSCD) -- Connection oriented, two way wireless data connectivity on cellular telephone systems.

Code Division Multiple Access (CDMA) -- CDMA is a "spread spectrum" technology, which means that is spreads the information contained in a particular signal of interest over a much greater bandwidth than the original signal. Increased privacy is inherent in CDMA technology.

Data Encryption Standard (DES) -- Standard for encrypting data to allow secure transmission of data between two points. In the EBT context,

[redacted]

from the concentrator bank to financial institutions holding retailer accounts.

Bandwidth -- The measure of information carrying capacity of a transmission medium. The greater the bandwidth, the greater the volume of

using a Data Encryption Algorithm.

Debit Transaction -- Approval by the cardholder of the debit to his or her account. At the same time, it provides a claim of funds made by the acquirer (or card acceptor) against the card

cellular communications standard. This digital technology has been converted for use on North American PCS frequencies.

Handheld Device Markup Language (HDML) -- HDML is a language specification optimized for wireless Internet access from devices with small displays and mouseless interfaces, such as PDAs.

Host -- A computer, usually a mainframe, that receives on-line debit transactions from a retailer. Transactions are relayed by the host to the network switch, which routes them to the card-issuing bank or EBT processor for authorization.

International Standards Organization (ISO) -- Americanized term for the International Organization for Standardization.

Low Earth Orbit (LEO) -- Class of satellites with 300-750 mile orbits.

Magnetic Stripe Card -- Benefit access card that contains encoded information on a magnetic strip. The strip may contain three information tracks. Track 2 is used for payments and benefits.

Medium Earth Orbit (MEO) -- Class of satellites with 5600 mile orbits.

Modem -- Modulator/Demodulator. Used to transmit and receive data.

Personal Communications Services (PCS) -- PCS is a band of new digital cellular service frequencies allocated by the FCC. PCS networks transmit at higher radio frequencies than analog cellular systems. PCS calls are superior in quality and security than analog cellular systems.

Personal Computer Memory Card International Association (PCMCIA) -- PCMCIA refers to the specification standards for laptop PC cards.

Personal Digital Assistant (PDA) -- PDAs are a class of microcomputer based handheld devices that perform personal organization functions (i.e. phonebook, appointments, and calculator).

Personal Identification Number (PIN) -- An alphanumeric string, typically four characters or longer, used to verify the identity of a cardholder when performing an on-line transaction.

Protocol -- A formal set of rules governing the format, timing, sequencing and error control of exchanged messages on a data network.

Point of Sale (POS) Terminal -- An electronic device used to support the authorization function in a merchant location. At a minimum, the device includes a card reading mechanism and dial up telecommunications capability to operate in a payments system infrastructure.

Radio Frequency (RF) – Any of the electromagnetic wave frequencies that lie in the range extending from below 3 kilohertz to above 300 gigahertz and that include frequencies used for radio, tv, and communications transmission.

Settlement -- The transfer of funds among entities in the EFT/EBT environment based on the transactions processed up to a specified time.

Short Message Service (SMS) -- Allows users to send and receive short point to point alphanumeric messages. Each of the three broadband PCS technologies (GSM, CDMA, and TDMA) have defined services based on SMS.

Simple Message Transfer Protocol (SMTP) -- One of many protocols considered a part of the TCP/IP suite. SMTP uses the transport layer of TCP to send and receive messages.

Specialized Mobile Radio (SMR) -- Analog vehicular wireless services traditionally used for voice dispatch, fleet management and public safety applications.

Spread Spectrum -- Highly secure transmission technology that scatters data packets across randomly selected channels.

Telephony -- Telephony is the technology associated with the electronic transmission of voice, fax, or other information between distant parties using systems historically associated with the telephone, a handheld device containing both a speaker or transmitter and a receiver.

The term is used frequently to refer to computer hardware and software that performs functions traditionally performed by telephone equipment. For example, telephony software can combine with your modem to turn your computer into a sophisticated answering service. With the arrival of computers and the transmittal of digital information over telephone systems and the use of radio to transmit telephone signals, the distinction between telephony and telecommunication has become difficult to make.

Time Division Multiple Access (TDMA) -- is a data transmission modulation technique where calls are cut into time-slices and intermixed so that multiple calls can travel over the same radio channel.

Transaction Authorization -- The process by which approval is given to permit a card or account to be used in a transaction on behalf of the card issuer. An authorization begins as a request that flows through the payment system between the retailer and card issuer, who approves or denies the request. An authorization approval from an issuer represents a promise to pay the retailer, contingent upon compliance with the rules and procedures for the transaction.

X.25 -- A packet switching standard.