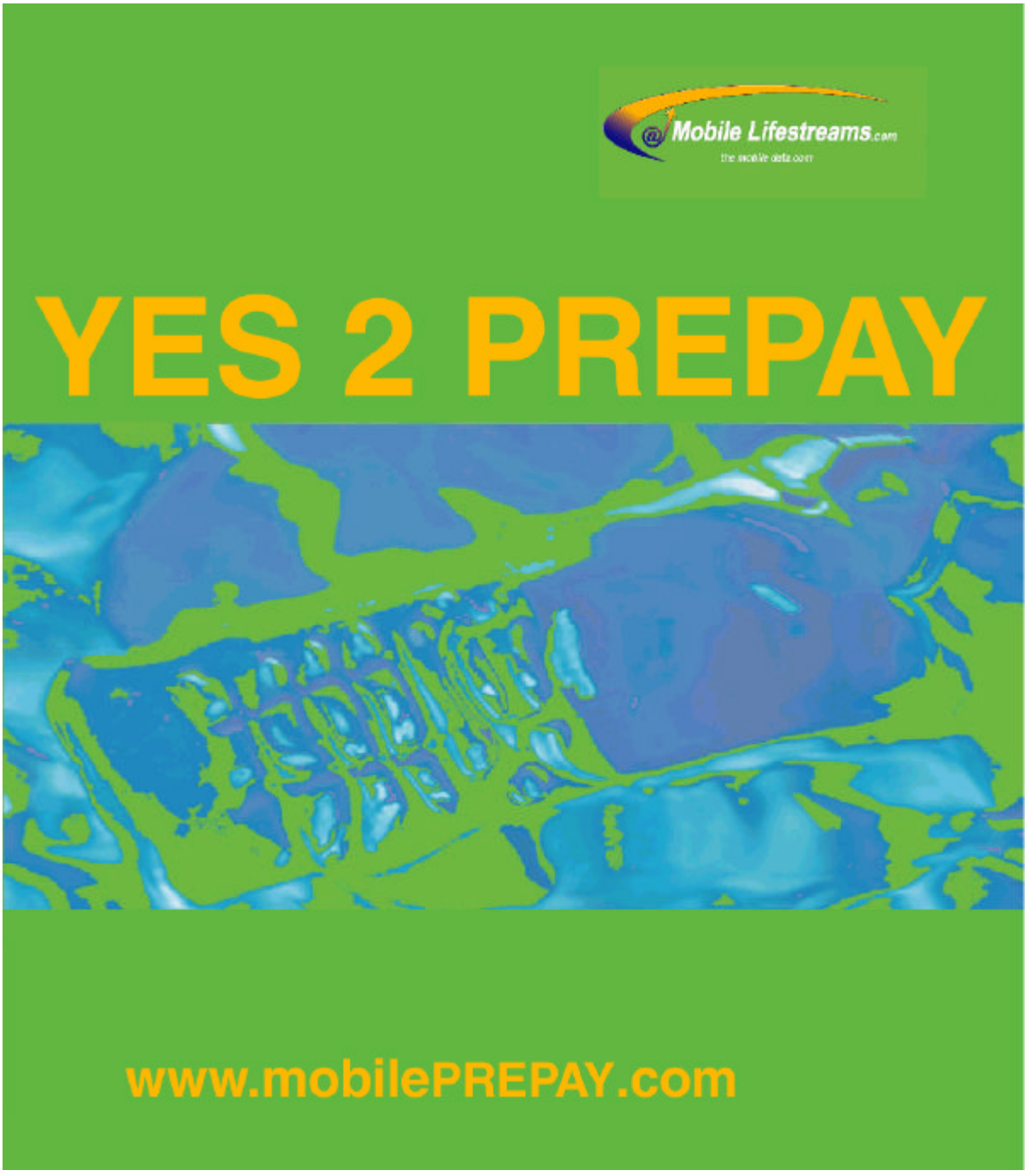
Mobile Lifestreams.com
YES 2 PREPAY
www.mobilePREPAY.com

CONTENTS

The full "Yes 2 Prepay" report, from which this whitepaper is taken, is divided into the following sections:

AUTHOR

Gerry Christensen has over twelve years experience in planning, engineering and product management for signaling, intelligent networks and mobile communications. His range of experience spans fixed and mobile network operators, service bureau and value-added application provider companies. He is also co-author of the book, "Wireless Intelligent Networking", (see www.mobilein.com) that provides additional information about mobile technology and applications pertinent to prepay and other services.

The author welcomes all comments, clarifications and discussions: gerryc@mobilelifestreams.com.

PUBLISHER

This report has been edited and published by Mobile Lifestreams Limited (www.mobilelifestreams.com), a Newbury based research company specializing in and focusing on nonvoice mobile services such as the Short Message Service (SMS), Circuit Switched Data, Unstructured Supplementary Services Data (USSD), Cell Broadcast and Universal Mobile Telephone System (UMTS).

Other publications published by Mobile Lifestreams include "Success 4 SMS", "Yes 2 GPRS", "Success 4 WAP", "Mobile Positioning" and "Yes 2 3G".

Mobile Lifestreams maintains a related web site at www.mobileprepay.com to keep readers up-to-date with the very latest developments in the world of mobile prepay communications. This site is intended to supplement the information in this report with updates including upcoming revisions of the report, news, and information.

PREFACE

Prepay or pay-in-advance services are a rapidly growing segment of the mobile communications industry, yet not many people have a good understanding of the underlying technology and/or business issues related to this service alternative.

The main purpose of the full Yes 2 Prepay report is to provide a working knowledge of the technical and business issues associated with formulating strategy, planning, deploying and operating mobile prepay communications solutions. The secondary goal of the full Yes 2 Prepay report is to prepare the reader for further study.

The full Yes 2 Prepay report is the first of its type to provide all of the following:

- *Information about how mobile prepay communications works, including the technologies behind the scenes, technology deployment options specific to mobile prepay, and the basic business issues associated providing mobile prepay communications*
- *Information about more advanced technology issues associated with mobile prepay deployment options*
- *Evaluation of the technical and business aspects of various technologies used in conjunction with operation and support of mobile prepay services*
- *Discussion and evaluation of the marketing and business issues associated with successfully deploying mobile prepay*
- *Review of the major issues associated with deploying and operating mobile prepay communications*

My hope is that you will find this white paper helpful and the full Yes 2 Prepay report a valuable resource for your technical and business endeavors.

I appreciate and welcome your comments and feedback.

Gerry Christensen
gerryc@mobilelifestreams.com

MARKETING AND BUSINESS ISSUES

CONSUMER BEHAVIORS AND SERVICE EXPECTATIONS

Prepay customers are not unlike post-paid customers in the sense that they have certain basic needs and desires. Prepay service providers that meet these requirements will be in the best position to maintain and grow their customer base and unit profits. We will next explore customer behaviors and expectations.

- Need for mobility

The increasingly active lifestyle of today dictates the need for anytime, anywhere communications. This is no less true for prepay customers as they have the need to roam and have the same service as in their home market. Accordingly, service providers must provide seamless service at reasonable rates to prepay customers.

- Desire for increased control

Prepay service is a perfect illustration of people's desire to have more control over their lives - in this case, control over expenditures. A case in point would be the father who wants to have assurance that his daughter in college can call home when necessary but have only a limited discretionary calling "budget" thanks to mobile prepay communications. We will expand on this example in the Business Strategies for profitable Business section.

- Ready access to information

The Internet society we live in today has changed and will continue to change our expectations of how we share information. Mobile Internet will change our expectations further as we will no longer be tethered to a fixed network for access to information. Prepay service will play an important role as many people will find prepayment a convenient and in some cases required for transactions. A mobile operator does not want to send a bill to someone for pizza. However, they can establish a relationship with a financial settlement institution that would gladly clear the transaction for a fee.

- Expectations of greater value

The time of when consumers would accept whatever is offered is long gone. Customers are increasingly savvy of technology and its capabilities. Once exposed to technology in one area, it is easy for consumers to assume that it should be available via another medium. For example, why shouldn't instant messaging be available on mobile phones? Why shouldn't this leverage location technology to locate friends and co-workers? We will witness the mobile device increasingly become a device to make our lives not just easier but higher quality lives. Many of these services will be paid for in advance of use.

PREPAY TARGET MARKETS

There are four major market segments for prepay: credit challenged, temporary use, anonymity and cost control. Each of these segments has unique requirements.

MARKET SEGMENTATION LEADS TO PRODUCT SEGMENTATION

Based on the various target market segments and other factors, mobile prepay service providers can benefit greatly by segmenting their product offerings based on market segmentation.

MARKET DEMOGRAPHICS AND REGIONAL MARKETS

Europe

Europe leads the world in overall mobile penetration. Below is the penetration in a few select countries as of June 2000:

- Finland 76%
- Italy 62%
- Ireland 56%
- Spain 51%
- Belgium 39%

Prepay is growing at a brisk pace in Europe with some operator's prepay penetration over 70%. The overall average penetration is just above 50% in Western Europe as prepay overtook post-paid in 2000. Prepay is expected to overtake post-paid in Eastern Europe in the 2003 timeframe.

MARKETING STRATEGIES

CARRIERS/OPERATORS

Mobile operators are at the top of the value chain in terms of prepay service delivery and in the best position to fully realize the opportunity. Whereas resellers must buy airtime from the wireless carrier, the mobile operator has control over those costs, thereby allowing the carrier to focus on market segment differentiation and delivery of value-added services. Examples of some innovative mobile operator prepay programs are as follows:

- Teensafe programs - prepay service wherein the child can only call emergency number and home number
- Campus phone - prepay service wherein the student has unlimited campus calling at a prepay flat-rate, can make calls outside of campus at the prevailing rates, can call home anytime/anywhere at a flat rate, and can call emergency number anytime/anywhere
- Personal use of business mobile phone - many employees have a mobile phone. The mobile operator could offer a plan wherein the customer may have unlimited use of the phone while at the home zone.

RESELLERS

It is more difficult for resellers to create differentiation, as they do not have control over the enabling infrastructure. Furthermore, resellers do not have control over costs, as they must buy airtime from the wireless carrier. Resellers must therefore focus primarily on certain market segments and/or develop unique marketing programs.

REPLENISHMENT AND DISTRIBUTION STRATEGIES

CALL CENTER REPLENISHMENT

This method entails the use of customer care personnel accepting calls for replenishment. The customer care representative takes the request and processes the recharge within the prepay system.

- High "touch" of human interaction is perhaps the only acceptable method for some customers
- Chance to "up-sell" services to customer

HANDSET
This method entails a customer self-replenishing via the handset. Various options are available including over the air via SMS, WAP, or USSD or IVR via DTMF.

- Convenient for user
- Low cost replenishment system for service provider

RETAIL OUTLET
This method entails recharge at a retail point-of-sale (POS) location such as a convenience store or department store. The most common payment option is a disposable[1] debit card or voucher. However, an account card is a viable option for point-of-sale replenishment.

ATM
This method entails recharge at an automatic teller machine (ATM).

- Convenient for user
- Low cost replenishment system for service provider
- Extends "market presence" and distribution of service provider
- Helps promote spontaneous purchase prepay replenishment
- Prepay customer may recharge in non-standard amounts

INTERNET
This method entails recharge via the Internet. This will typically occur via a PC from a fixed network. As WAP and other non-voice technologies expand, however, Internet based replenishment will increasingly occur while mobile.

PAYMENT OPTIONS

CREDIT CARD
This entails the use of a charge or credit card such as American Express, Visa, or Mastercard.

Transfer from bank account
This entails transfer of monies from a bank account to a prepay account.

Disposable debit card or voucher
This is the typical purchase of a debit card/voucher that contains a PIN. Once used, the card is no longer valid.

[1] Use once and throw away.

Account card
This method utilizes a permanent card that is used to recharge a prepay account. The card has a magnetic strip for use at the point-of-sale. The card also has a serial number and PIN for replenishment via the Internet, ATM, handset, or call center.

BALANCE CHECK METHODS
The ability for a user to check prepay balance is crucial to maintaining cost-effective service and a high level of customer support. Accordingly, various balance check methods are provided below for reference. Some of these same methods may be employed for alerting the customer of low balance or non-replenishment (after a specified period of time).

- Call center
- IVR via DTMF
- Handset via SMS, WAP or USSD
- Internet (from PC)

ALERTING THE PREPAY CUSTOMER OF A LOW BALANCE
Experience indicates that prepay customers will invariably allow their balance to reach zero, possibly not recharging the account for days, weeks, or perhaps months. Some of these users may never recharge while others are simply on hiatus for some reason. It is imperative to have various mechanisms in place to deal with this situation such as churn prediction tools and loyalty programs. Low balance alert is the first line of defense in preventing slow or non-replenishment.

STRATEGIES FOR THE PREPAY PROGRAM IMPLEMENTATION

BUSINESS ISSUES

- **LOYALTY PROGRAMS**
- **SEGMENT STRATEGY IMPLEMENTATION**
- **OFFER VARIOUS FEATURE ADD-ON'S**
- **OFFER VARIOUS PROMOTIONS**
- **RESELLING AND OTHER DISTRIBUTION STRATEGIES**

All of these strategies are discussed in detail in the full report.

TECHNOLOGY ISSUES

- **ACCOUNT VS. DEBIT BASED SYSTEMS**
- **MOBILE IN**
- **DIGITAL PHONES**
- **LEVERAGE THE INTERNET**
- **BALANCE CHECK AND LOW BALANCE ALERT**

All of these strategies are discussed in detail in the full report.

MOBILE MARKET TRENDS AND THE FUTURE OF PREPAY

COMPETITIVE THREATS TO MOBILE PREPAY

While for certain market segments, prepay remains a convenience, one of future impetuses for migrating to post-paid service is simply cost. Particularly when mobile operators roll out 3G networks, new business models will emerge in which non-voice services garner higher fees and voice based services become more of a commodity. In this scenario, 3G based post-paid voice may be significantly cheaper than 2G based post or prepay service. While this again does not affect the operator (so long as they can keep the customers on their own network), it does affect the prepay industry. Accordingly, the ability to support prepaid 3G voice and data services will be particularly important.

Throwaway Phones

A currently small, yet grow threat to the prepay industry is the emerging throw away phone market segment. Companies like Dieceland (www.dtcproducts.com) are developing disposable mobile phones and computing devices. The notion is that people will buy a throwaway phone as a convenience, and perhaps because it is cheaper, rather than purchase a (normal, durable) phone and simply recharge when needed. Perhaps a good commercial example would be the success of disposable cameras.

It is important to note that this disposable technology for mobile communications has not yet been commercially proven. We shall watch developments here closely.

INCREASED ROAMING: SERVE THOSE BUSINESS TRAVELERS AND TOURISTS !
With international tourist arrivals growing from about 450 million in 1990 to about 650 million in 2000, and mobile phone user service expectations ever-increasing as well, the ability to offer prepay services to roamers is of the utmost importance. Mobile operators should strive to seamlessly serve inbound roamers into their networks from other networks.

While supplying temporary phones and vouchers is always an option, it is certainly not the best option in a world in which seamless service is expected. Despite the inherent challenges of weaving together disparate networks and prepay systems, mobile operators must strive to ensure seamless roaming among all major mobile network roaming partners.

NON-VOICE SERVICES
Leading mobile operators are beginning to deploy prepay non-voice services such as Wireless Application Protocol (WAP). This enables the wireless carrier to offer WAP services to a much broader customer base than if restricted to post-paid alone. While WAP services have been historically based on circuit switched connections and billing is based on access duration, WAP services that use GPRS as the bearer will be packet switched and billing will be based on amount of data accessed as well as content based pricing scenarios.

INTRODUCTION OF DATA ORIENTED VALUE-ADDED SERVICES FACILITATED BY WAP, GPRS, AND LOCATION BASED APPLICATIONS
It is fortunate that in Europe and other GSM territories, where prepay penetration is the highest, GSM is also the predominant technology. This is fortunate because the introduction of GPRS will enable GSM networks to more fully leverage WAP by providing a more efficient, packet-based bearer for communications.

MOBILE COMMERCE
Many mobile commerce services will be non-voice services, meaning that mobile commerce is expected to be mainly information and transaction oriented.

THE USE OF CARDS IN MOBILE COMMERCE
From reading this report you know that there are all types of cards. For review:

- Debit cards - These are typically throw-away or virtual cards whose only purpose is to recharge the prepay account. Often these cards are sold at merchant locations and must be activated at the point of sale wherein the prepay customer may immediately replenish the prepay account or wait until later.

- Account cards - These cards are sturdy, reusable cards and look just like typical consumer debit/credit cards, but are used to provide account information. The

mobile prepay user will typically use the magnetic strip on the card to replenish his account at a point of sale location.

- Smart cards - These are the cards that are embedded with a microchip and used to provide mobile prepay service with the handset. A Subscriber Identity Module (SIM) is a perfect example of a smart card.

Of the three types of cards, the last two best lend themselves towards mobile commerce as they are permanent cards that may be used for more than just the purpose of recharging the prepay account for minutes.

STORED VALUE AND UNIVERSAL CARDS IN MOBILE COMMERCE

The concept of stored-value is one in which an account and/or card may have value stored in which may be other than simply minutes of airtime on a mobile phone network. In consumer terms, this is the debit card concept, however, unlike consumer debit cards that are usually limited to the recharge/disbursement means allowed by the financial institution, stored-value accounts/cards may be used and replenished in a variety of manners.

AD HOC NETWORKING, SMART CARDS, AND MOBILE COMMERCE

Payment Scenario: The prepay customer walks up to a refreshment dispenser and gets a beverage. This is facilitated by Bluetooth communication between the mobile unit and the beverage machine. Bluetooth provides a communications link to the beverage machine. The SIM Toolkit (STK) provides an API to the SIM so that the SIM may acknowledge available funds, decrement the funds appropriately, and send a message through the STK to the beverage machine that it is OK to provide the beverage.

Recharge Scenario: The mobile prepay customer approaches a kiosk that is advertising a certain consumer product. The kiosk indicates that if the consumer watches and listens to an advertisement and answers a couple of questions, she will get some airtime as credit and a discount at the store. The prepay customer decides to listen to the advertisement and is instructed to point and click at the Bluetooth-enabled kiosk. After listening to the advertisement, the prepay customer has ten seconds to point and click at the kiosk again to receive the credit and discount. The customer is then given the option to engage in a survey in which the phone is used to make choices. The reward for this is actual store credit, provided to the customer's account via Bluetooth, STK, and the SIM.

MOBILE PREPAY AND MICROPAYMENTS

Most mobile commerce will involve opportunistic and/or spontaneous payments of monies. Not many people will buy a car while when they drive past a automotive dealership (but they may be interested in knowing about sale prices). However, many people would buy a beverage from a vending machine while in a shopping mall.

PREPAID MOBILE COMMERCE AND FINANCIAL CLEARING
Mobile commerce based on mobile prepay will require clearing just as will post-paid service. The model is one in which their is a financial institution that handles financial clearing between the mobile communications company collecting the funds/credits and the merchant that requires crediting for purchase of goods and services.

WHICH MOBILE COMMERCE SERVICES WILL BE POPULAR?
While financial transactions and micro-payments will eventually catch on to the mainstream user, mobile operators will enjoy success in this area for primarily the large youth market and a few other more niche market segments.

So from where shall prepay commerce come from?

Two of the biggest areas for mobile commerce will be mobile entertainment and messaging.

Mobile entertainment includes:

- Mobile gaming
- Mobile music
- Jokes, virtual pets, photo images and horoscopes
- Movie trailers
- Ringtones

Mobile messaging includes:

- Basic messaging via SMS
- Mobile chat
- Find a friend/date service
- Other presence and availability services such as an alert when a friend to enters a zone, comes into the proximity of the user, or logs onto her ISP

Mobile Entertainment

Mobile entertainment is already huge in Japan with NTT DoCoMo's iMode service in which customers play various games and have content such as "virtual pets" automatically downloaded to their phones. While some of this may be cultural, and also be influenced

by other issues such as long commute time (e.g. need to kill time) to get to work, entertainment is something that everyone can relate to and embrace. Entertainment also captures the massive youth market, which tends to have a lot of disposable income - because young people generally dispose of what income they do have on fun.

BUSINESS ISSUES

MARKETING DICTATES CUSTOMER PERCEPTION

The way that a mobile operator positions a prepay offering dictates the way its customers perceive its value. While this seems like a simple concept, if is very profound in its implications. This has proven itself in the United States wherein must people consider prepay to be a poor person's service. Prepay should be positioned as a valuable payment alternative. One of the areas for value realization is in the area of universal prepay account usage. We will discuss this concept in the Business Strategies for Profitable Business section.

CALLING PARTY PAYS

The lack of calling party pays (CPP) in the United States is arguably a major inhibitor of prepay service, especially for the cost control and credit challenged segments. These prepay customers would leave their phone power-on more frequently as a result of CPP. Consequently, the mobile user could receive short messages and other means of notification to recharge when necessary.

FREEPHONE (TOLL-FREE WIRELESS CALLING)

This is another area in which a service capability can stimulate additional prepay service implementation and usage. The United States does not yet have Freephone - the ability to make completely free (airtime and long distance) calls - capability, but will soon with the implementation of Wireless Intelligent Network capabilities. Freephone will enable mobile users to place calls without decrementing the prepay account. Service providers make money from the reverse charging effect of Freephone and from the indirect result of customers utilizing their phones more. The more they use it, the more they are apt to place chargeable calls and subsequently recharge the account.

BUSINESS STRATEGIES FOR PROFITABLE BUSINESS

- **PREPAY AS AN ALTERNATIVE TO TRADITIONAL BILLING**
- **EBPP AS AN ALTERNATIVE TO TRADITIONAL BILLING OR PREPAY**
- **ACCOUNT SPENDING LIMIT**

- **UNIVERSAL PREPAY ACCOUNT**
- **DEVELOP NEW BUSINESS MODELS**
- **FOCUS ON MARKETING AND REPLENISHMENT**
- **OFFER VALUE-ADDED SERVICES**
- **LEVERAGE A CONVERGED SERVICE OPPORTUNITY**

Each of these strategies is discussed in detail in the full report.

TECHNICAL INTRODUCTION

THE TECHNOLOGY BEHIND PREPAY

SIGNALING

Signaling is the ability to provide messaging between mobile switching systems and prepay systems for purposes of call control and administration. In more advanced or robust solutions, signaling consists of common channel signaling systems such as SS7 or C7 that provides the inter-network element messaging necessary for intelligent network call control. Less robust systems such as “point solutions” will often rely solely on in-band, direct trunk implementations to facilitate call control.

DATA COMMUNICATIONS

The ability to transport data is crucial for prepay system operation and administration. For example, common channel signaling can provide the data communications medium for call control and/or administration of customer information via other technologies such as Short Messaging Service (SMS). Another example is the automatic transportation of data between customer provisioning interface points, customer data databases and call processing systems.

CALL CONTROL AND PROCESSING

Prepay customer requests (attempting to place a call) for service must be processed in order to provide prepay communications. Before these requests for service can be processed, a request for prepay service must first be detected and control must be handed over to the call processing function.

Call processing is the function concerned with user authentication, account management, call rating, and call management and administrative intervention. When a prepay user initiates a prepay service, the call control function will hand the request over to the call processing function. At that point, the next step is to authenticate the user. The call processing logic verifies the user as genuine based on the mobile terminal's mobile directory (dialable) number (MDN) and other information uniquely identifying the mobile equipment and other information assigned to the user for purposes of roaming facilitation. The mobile system may also employ other forms of fraud control to authenticate the user, in many cases prior to the user actually attempting to place a call.

DATA ADMINISTRATION, STORING AND RETRIEVAL

Prepay customer data administration, storing and retrieval represent additional critical components of an overall prepay system. In many cases, the customer data resides in a database that is co-resident with the call processing function. In other cases, a "client-server" approach is taken whereby the call processing function acts as the "server" caching data from a subtending "client" database containing the customer data. In either case, data administration is accomplished through accessing databases via remote provisioning interfaces. These interfaces are used to activate accounts, replenish account balances, change customer parameters and preferences as necessary. This requirement for communications between remote interfaces and in some cases between client-server operations, again underscores the importance of data communications in prepay systems.

SS7 / C7

Although there are other variants throughout the world, Signaling System number Seven (SS7) and C7 are the two predominant telecommunications signaling protocols utilized primarily in United States and Europe respectively. Telcordia (then Bellcore) and the International Telecommunications Union (then CCITT) standardized SS7 and C7 respectively.

For more information about SS7 and its applications, read the Mobile Lifestreams report: SS7 Technology and Applications (www.mobileSS7.net)

SHORT MESSAGING AND OVER-THE-AIR ACTIVATION / REPLENISHMENT

Short Message Service (SMS) is a capability whereby small amounts of text data are delivered to a mobile terminal by way of the SS7/C7 signaling network. SMS may be used to perform over-the-air activation and/or replenishment. A consumer may purchase a mobile phone without activating it at the point-of-sale, only to have the mobile unit activated for service automatically via SMS. All of the programming information necessary to prepare the unit for service is encapsulated in the SMS messaging and accepted by the mobile unit over the air. This same process may be employed with handset-based prepay solutions to replenish a prepay account, eliminating the need for the mobile user to replenish only at specific retail locations.

For more information about SMS and its applications, we recommend that you read the Mobile Lifestreams report: Success 4 SMS (www.mobilesms.com)

SUBSCRIBER IDENTITY MODULE

The SIM is an integral part of certain mobile prepay systems, providing storage of user data used in conjunction with mobile prepay servers to provide the overall service.

SIM TOOLKIT
The SIM Tookit (STK) is an API that allows for secure communication between the SIM and network-based servers for various applications such as prepay. For more information see www.mobileSIMTookit.com.

FRAME RELAY OR IP
Frame relay and Internet Protocol (IP) represent a data transport mechanism and communications protocol (respectively), commonly used for data communications in prepay systems. IP is typically used to communicate between remote provisioning/replenishment sites and prepay customer databases. For instance, a mobile carrier customer care representative may provision requests for establishment of prepay service via a terminal connected to a database via IP. In addition, a prepay customer may use an IP connection via the Internet to replenish his account. This is in contrast to some of the point-of-sale configurations at merchant locations that may, based on volume and cost effectiveness, alternatively use a dial-up-connection to replenish a customer account. IP may also be employed over frame relay for intra-system communications between prepay customer databases in a client-server type architecture.

DATABASE
At the heart of any prepay system is a database used to store, administer, process and retrieve customer information. As discussed earlier, this database may simply act as a repository for customer data in a client-server type arrangement, or fully integrate with the actual call processing functions such as rating and call intervention.

MOBILE IN
Mobile intelligent network (IN) pertains to the concept of network intelligence. While the notion of network intelligence is evolving beyond the traditional model of centralized control and processing, and expanding to network edge devices such as mobile terminals and servers, the use of the term mobile IN will be used throughout this report to refer to more traditional centralized network intelligence.

The two recognized global standards for mobile IN are Wireless Intelligent Network (WIN) and Customized Applications for Mobile Enhanced Logic (CAMEL). WIN and CAMEL are the standards used to provide network intelligence in ANSI-41 and GSM networks respectively. As WIN standards are introduced, accepted and evolve, they will become part of the core ANSI-41 standards. In contrast, the GSM CAMEL Application Part (CAP) represents that portion of the GSM standard that uses CAMEL, and will remain a separate yet associated standard to the core GSM networking standard, GSM MAP.

For more information about mobile IN, see www.mobilein.com.

FUNCTIONAL CHARACTERISTICS OF A MOBILE PREPAY APPLICATION

A mobile prepay application typically resides in either a service node or service control point. While the overall functions and systems-level interactions will vary according to which type of node and architecture is deployed, all prepay applications have the same things in common in terms of functionality:

- A database used to determine if a customer is a valid user and how much credit (typically measured in currency value, but may also be in airtime, number of bytes for prepay mobile data, and/or number of messages for SMS) they have on their account

- A rating engine used to determine the rating of a call based on a combination of various factors such as incoming or outgoing call, destination number, destination location, calling party location, time of day, day of week, customer's prepay plan, promotions, whether the call/session is voice or data oriented, and other factors

- A mechanism for decrementing the customer's prepay account based on the rating of the call

- An event alerting mechanism for signaling to the mobile network that a pre-determined account threshold has been reached (note: this is problematic in CDR based systems – thus the problems with fraud/uncollectable revenue). This would allow the user to be alerted during a call (to avoid an unexpected disconnection) and to alert the customer regarding the need to recharge prior to making a call (so as to avoid the first situation).

- A mechanism for terminating the call/session if/when necessary

Other functions and system differences will be a factor of which type of mobile prepay is deployed, network characteristics, vendor and operator deployment, and the type and extent to which value-added services are deployed in conjunction with and/or for prepay customers.

PREPAY TECHNOLOGY SOLUTIONS

POINT SOLUTIONS

Point solutions involve an adjunct piece of equipment that is used to provide call control, database functions, administrative functions and call processing. These are called "point" solutions as all calls must traverse a single network element or "point".

HANDSET SOLUTIONS
These methods involve the placement of intelligence in a mobile terminal to determine the capabilities and account status of the prepay subscriber. Handset solutions fall into two broad categories based largely on mobile network standards: Subscriber Identity Module (SIM) solutions based on GSM and proprietary handset based solutions.

SIM based Solutions

SIM based solutions utilize logic programmed into the SIM to determine prepay subscriber capabilities and account status. The benefit of a SIM based solution is that it may be used wherever the GSM customer may otherwise roam. However, when roaming outsides one's own country, the customer is typically required to dial a short code (string of predetermined digits) prior to every call for security and authentication purposes.

Proprietary based Handset Solutions

Proprietary based mobile phones are employed as a handset-based solution for ANSI-41 networks. These solutions maintain the same overall advantages and disadvantages of the SIM based solution. From the perspective of the ANSI-41 network, the proprietary prepay user is just another (post-paid) customer. No amendments to existing inter-carrier roaming agreements are necessary. Proprietary handset based prepay users are allowed to register while roaming and make calls at will. The proprietary based logic in the phone limits calling based on the customer account status.

NETWORK BASED SOLUTIONS
Network based prepay solutions leverage the use of signaling networks for data capture, transmission and processing. Network based solutions can be broken up into three categories: ISUP based non-standard, TCAP based non-standard, and TCAP based standard.

ISUP BASED NON-STANDARD
ISUP based non-standard prepay solutions typically utilize an innovative network kluge known as ISUP-loop back.

TCAP BASED NON-STANDARD
Unlike the ISUP loop-back or the point solution, there are no dedicated resource requirements with the TCAP based non-standard solution. This solution uses proprietary mobile IN MSC and SCP logic for call processing.

The only major limitation of the TCAP based non-standard method is that, due to its proprietary (vendor specific) nature, roaming is problematic. Roaming can only occur between like switch types that have the same software logic and triggers armed. This

includes implementations that utilize proprietary extensions of the INAP standard. Roaming agreements also have to be in place between carriers to support the messaging interactions between serving and home systems.

TCAP BASED STANDARD
WIN and CAMEL provide capabilities for TCAP based standard prepay deployment. They provide a major improvement over proprietary TCAP solutions by allowing roaming to take place wherever serving carriers support the necessary triggers and software logic. This means that, in order to provide service to prepay callers, the serving system must support WIN/CAMEL standards, even if the serving market does not support WIN/CAMEL based prepay for its own (home) customers.

HYBRID SOLUTIONS
A hybrid solution example would be exemplified by a SIM based solution for basic prepay call processing with a TCAP based IN complement for value-added services such as location sensitive billing. It is likely that many GSM operators will adopt this approach as they migrate to a full CAMEL based IN architecture over time.

CALL DETAIL RECORD (CDR) BASED SOLUTIONS
CDR based solutions utilize a near real-time based process to track mobile usage by prepay customers. As CDRs are monitored after a call is placed, this solution can sometimes allow unbillable usage on the last call (prior to the system detecting a zero account balance and initiating a disconnection).

PREPAY SUPPORT AND BUSINESS PROCESSES

DISTRIBUTION
The establishment and support of effective sales channels and points of distribution is very important to success in the prepay business. This relates to both initial sales for new prepay customers as well as ongoing customer support including support for customer account replenishment.

POINT-OF-SALE SUPPORT
Merchant point-of-sale locations require support in terms of advertising, communications terminals (for activation and replenishment), equipment returns, and technical assistance. One of the most important items is the point-of-sale activation and replenishment device. Depending on the type of prepay system these devices will consist of either a simple electronic keyboard or modem (in the case of a debit card based system), or also include a magnetic strip reader (if the system is account based). These devices, ranging in price from a few hundred dollars up to one thousand dollars, must be judiciously located in merchant locations where it is expected that users will replenish often.

CUSTOMER CARE

While mobile prepay service providers continuously strive to automate their operations to the extent possible, it is likely that there will always be a need for customer care personnel. Many operators employ automated equipment such as an interactive voice response unit (IVRU) to handle many routine announcements and customer interactions. In some cases IVRUs are used for the acceptance of payment for replenishment, or at least account replenishment based on user input of information from a previously purchased prepay card or voucher.

REPLENISHMENT

There are many physical means of accomplishing replenishment, but not all of them are available to each user. A user who has good credit (perhaps whose motivation for use is cost control) may desire an option to replenish via credit card, either via a customer care representative or an IVRU. Someone in this market segment may even desire automatic replenishment up to a certain limit.

ADMINISTRATION

All prepay systems require a certain level of administration including provisioning customer data, handling replenishment requests or system maintenance. Some prepay platforms may only be accessed via proprietary interfaces for administration. Other systems employ open interfaces that allow legacy wireless operator customer care systems to interface with prepay databases. Regardless of the system deployed, improved administrative efficiency should be the goal as this is an area where the wireless operator can reduce operating costs through effective automation.

PREPAY ISSUES

COST OF ACQUISITION

The cost of acquiring a prepay customer is generally much lower than acquiring a post-paid customer. A large portion of the acquisition cost for post-pay is sales, dealer, and agent commissions. On the other hand, prepay is typically distributed in a more cost-effective manner. Sales assistance is minimal or non-existent as there is little or no customer information required including no credit check. Prepay phones and cards can be found in low overhead retail locations such as department and convenience stores.

ROAMING

The ability to roam with prepay service is problematic. As we have discussed earlier, handset based solutions allow roaming, but they are besieged with other problems such as difficult replenishment and little differentiation capability. Point solutions can enable roaming by looping calls from the serving switch back to the home system prepay platform and then back out to the called area (perhaps the serving area), causing network inefficiencies and higher costs. Proprietary IN solutions do not allow roaming except between like switches that have the same software logic. Even standards based

IN solutions are not the answer, as it is likely to be four to five years before there is ubiquitous deployment of WIN and CAMEL based triggers. When ubiquitously deployed, however, mobile IN capabilities will offer the best long-term roaming solution.

CHURN AND REPLENISHMENT

Customer turnover is referred to as churn. In prepay, a customer who has not replenished (re-charged their account) within a certain period of time is considered to have churned. The problem with prepay churn (as with post-paid churn) is trying to understand why customers churn. This situation is even worse with prepay than with post-paid. With post-paid, there are at least some statistics that can be gathered about the customer at the point-of-sale. Due to the anonymous nature of prepay (no credit checks and little or no personal information required), gathering information about the customer base is very difficult if not impossible.

SERVICES AND DIFFERENTIATION

As discussed earlier, non-IN based solutions provide little in the way of differentiation. With prepay penetration growing, and consumer expectations changing, prepay is becoming increasingly mainstream. As prepay becomes more mainstream, churn will become more of a factor if wireless operators are forced to compete on the basis of price alone. The good news, however, is that they do not have to compete based only on price.

Mobile IN will allow the deployment of feature enhancements and value-added services. For instance, IN based location technology offers two examples. IN enabled location querying can enable a voice response system to direct the prepay user to the closest point-of-sale for replenishment when a pre-determined threshold is reached. Another example involves Location Sensitive Billing (LSB). Establishing lower priced usage “zones” through LSB technology can allow a mobile operator to provide incentives for additional prepay usage.

ADVANCED CONCEPTS AND APPLICATIONS

ROAMING WITH MOBILE PREPAY

CALL-BACK BASED ROAMING

Some SIM card based solutions involve the customer dialing a prefix or short code via Unstructured Supplementary Services Data (USSD) connection (step 1). The prefix is verified by the HLR and a credit check is made by the prepay system server (step 2). The MSC then initiates a call-back to the subscriber while simultaneously connecting to the dialed number through the PSTN (step 3). The SMSC then sends a short message back to the customer indicating the amount of time remaining for the call (step 4). Mobile terminated calls do not require the prepay customer to dial a feature code. SMS can alternatively be used as the method for initiating the feature code dialog.

Service Node based Roaming

Earlier we discussed the issue of service node (SN) based solutions being a point solution. As such, service node solutions will in most cases require either the call and/or messaging to route back to the home network service node. Unless the roaming is within the same mobile operator's network, routing the call back to the home system SN is problematic due to the exposure to lost revenue as a result of non-revenue producing calls to the service node. The more typical implementation will therefore involve messaging between two different SN and cooperation between the serving and home mobile network operators.

Roaming in this solution requires signaling between the SN in the visited network and the service node in the home network. First the mobile prepay customer (that is roaming into the visited network) places a call, which is routed to the visited network SN (step 1). Next, the visited network SN uses (typically an IP based network) to signal to the home network service node for instructions for call handling (step 2). Once the home network SN provides instructions back to the visited network SN, the visited network SN routes the call back to the visited MSC for routing to the intended destination via the PSTN.

MOBILE IN BASED PREPAY

While there are other methods of providing for roaming as discussed earlier, standards based mobile IN technologies such as CAMEL and WIN provide for a completely seamless roaming experience for the customer. The customer no longer has to input feature codes and/or initiate call-back in order for roaming to occur. Mobile IN supports the virtual home environment concept in which the customer experiences service as if she were in her own market.

With a mobile IN based solution, triggers are armed in the visiting switch that allow it to launch a message to the home network SCP, which contains the mobile prepay call logic. When the mobile prepay customer places a call, the MSC in the visited network launches a mobile IN message to the SCP (step 1) via the SS7 network. The SCP processes the request and send a call handling instruction message back to the MSC (step 2). The MSC then uses that instruction to handle the call (step 3), which is illustrated above as routing to the PSTN for delivery either to the destination number, or in the event that the prepay account has diminished, to a voice response unit for notification and/or recharge.

PRE-CAMEL SOLUTIONS

USSD and SMS call-back based solutions represent one approach as an interim step toward CAMEL for GSM prepay roaming. Several mobile operators have adopted SMS as an interim step because it is relatively simple, compatible with existing handsets, and available now. There is also an agreed international billing standard for SMS (unlike USSD). However, the interface can be somewhat cumbersome as the customer must use a particular menu and there can be delay in processing due to the store-and-forward nature of SMS.

MOBILE IN CAPABILITIES

MID-CALL CONTROL CAPABILITIES

The ability to control a call in progress is key to applying value-added features and services. As discussed in the previous section, the SCP can launch messages to alert the mobile switch (to play a low balance warning) and/or terminate a call upon account balance depletion. However, mid-call capabilities can also be utilized to enable replenishment and value-added services.

MOBILE IN SUPPORT OF GPRS

While providing prepay GPRS services can be accomplished based on CDR based prepay methods, mobile IN is the preferred mechanism as it provides for increased call control and does not expose the network provider to fraud or uncollectable revenues.

However, deploying prepay GPRS services with mobile IN is not without challenges. CAMEL Application Part (CAP) phase 3, which has worked its way through the standards process, but has not yet been commercially deployed. CAP3 provides for messaging between the interface of the Serving GPRS Support Node (SGSN) and the SCP. More specifically, these functions are known as the GPRS Service Switching Function (gprsSSF) and the GSM Service Control Function (gprsSCF). The gprsSCF is where the applications reside – in this case, the mobile prepay application. The gprsSSF is where the triggers reside – in this case, the mobile IN trigger for launching the CAP3 message from the SGSN to the SCP.

Hybrid Mobile IN and Smart Card based Prepay

While mobile IN is required for network control of prepay GPRS, its deployment does not preclude deployment of smart card based prepay. This is one of the reasons why it is likely that hybrid mobile IN/smart card based prepay systems will emerge. A likely deployment example is one in which the mobile IN system handles the SCF function while the smart card handles the Service Data Function (SDF). The SDF includes functions such as amount of credit on the account, rate plan, and other factors. The SCP would handle SCF functions such as call/session rating, account decrementing, and other functions. Communication between the SCP and the smart card would happen by way of SMS and/or GPRS. This application would require SIM Toolkit or some other secure API to ensure secure transactions.

Summary

Mobile prepay is an integral part of a successful mobile operator portfolio. Those operators and suppliers that exploit the emerging technologies and business trends will continue to enjoy success for many years to come. The purpose of the full "Yes 2 Prepay" report is to provide an edge to operators and suppliers who want to optimize their business potential for the development and delivery of mobile prepay products and services.

This white paper is a cut down version of a book called "Yes 2 Prepay" which has over 160 pages and contains detailed mobile prepay vendor profiles, application profiles, technical comparison of various prepay technologies, discussion of the future of prepay, and more. The full "Yes 2 Prepay" report costs just 495 US dollars. To order, contact Mobile Lifestreams by any of the methods listed below:

Internet Site: http://www.mobileprepay.com

Email: prepay@mobilelifestreams.com

Telephone: +44 7000 366366

Fax: +44 7000 366367

Postal Address: 9 The Broadway
Newbury
Berkshire
RG14 1AS
England

ALSO PUBLISHED BY MOBILE LIFESTREAMS

Next Messaging: From SMS to EMS to MMS – Simon Buckingham

Published: December 2000 (275 pages)

Messaging is evolving beyond text to enhanced text and simple pictures to full multimedia messages. This report plots this evolution path and is an essential resource for those working with SMS who are looking to maintain their position in the future. The transition from text messaging to multimedia messaging is as important for mobile phones as the transition from DOS to Windows was for the PC.

For more information visit: http://www.NextMessaging.com
Price: 495$US
ISBN: 1929105258

Messaging Metrics: – Simon Buckingham

Published: March 2001 (163 pages)

The intention of this report, "Messaging Metrics", is to satisfy the large number of requests that Mobile Lifestreams receives from customers such as infrastructure vendors, investment banks, research companies, journalists and the like for detailed quantitative and qualitative information on the growth of mobile messaging services such as text messaging (SMS), enhanced messaging (EMS) and multimedia messaging (MMS).

For more information visit: http://www.mobileSMS.com
Price: 495$US
ISBN: 1929105258

Yes 2 GPRS – Simon Buckingham

Published: August 2000 (218 pages)

This report shows how to make mobile data a success by maximizing the use of, and therefore the revenue from, the General Packet Radio Service (GPRS). Education is the principle means of achieving this objective- by providing the first and only single source for accurate and comprehensive information about the development and deployment of GPRS around the world. "YES 2 GPRS" explains and interprets both the existing and future aspects of GPRS. It provides both an explanation of these developments, and analysis to help interpret them. The idea is to identify the critical success factors for the General Packet Radio Service- now and in the future

For more information visit: http://www.mobileGPRS.com

Price: 495$US
ISBN: 1929105258

Yes 2 Prepay – Gerald T. Christensen

Published: August 2000 (163 pages)

Written by Mobile Lifestreams' Prepaid expert, Gerry Christensen, this 163 page report has been designed to help product and service providers and those investing in systems/solutions to make more informed business decisions.

For more information visit: http://www.mobilePREPAY.com
Price: 495$US
ISBN: 1929105428

Success 4 WAP – Simon Buckingham

Published: February 2001 (200 pages)

The Wireless Application Protocol (WAP) is a hot topic that has been widely hyped in the mobile industry and outside of it. Mobile Lifestreams originally produced its first WAP report, "Data on WAP", in July 1999. Due to rapid changes and developments this report was reissued as "Yes 2 WAP" in May 2000 and as "Success 4 WAP" in February 20001.

For more information visit: http://www.yes2WAP.com
Price: 495$US
ISBN: 1929105215

YES 2 3G – Simon Buckingham

Published: February 2001 (283 pages)

"YES 2 3G" presents an optimistic look at tremendously exciting possibilities that Third Generation / UMTS technologies and applications enable. Timescales, profiles of all the major infrastructure vendors including the Japanese vendors, every mobile multimedia application, "At home with your futurephone"- mobile communications in the next few years, 3G Talking Points, all the 3G contracts awarded, the standards, handset alliances and partnership opportunities and much, much more are included in this report.

For more information visit: http://www.mobile3G.com
Price: 495$US
ISBN: 1929105150

Mobile Positioning – Stephen M Dye and Dr Frank Baylin

Published: May 2001 (300 pages)

"Mobile Positioning" is a report about mobile positioning systems- in particular, the Global Positioning System (GPS), non-GPS location techniques and Cell Broadcast. Although the report focuses primarily on the Global Positioning System (GPS), appendixes cover other non-GPS location schemes and Cell Broadcast in considerable detail.

For more information visit: http://www.MobilePositioning.com
Price: 495$US
ISBN: 1929105398

NOTE: To order any of the above publications, please visit our secure online ordering form at https://www.mobilesms.com/ordering.asp