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(54) Title: SYSTEM AND METHOD FOR GATHERING DATA FROM WIRELESS COMMUNICATIONS NETWORKS (57) Abstract A system and method for gathering data from wireless communication networks, the wireless communication network including a plurality of cell sites, mobile subscriber units, and a mobile telephone switching office. The data gathering system comprises a plurality of data gathering nodes and a control center. Each data gathering node comprises multiple receivers, with each receiver gathering data from a different wireless communication network. Stored data at the control center is processed to generate marketing information on each wireless communication network.		

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SYSTEM AND METHOD FOR GATHERING DATA FROM WIRELESS COMMUNICATIONS NETWORKS

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RELATED U.S. APPLICATION DATA

5 Continuation-in-part of Ser. No. USSN 09/271,105, March 17, 1999.

BACKGROUND OF THE INVENTION

1. Field of the Invention

10 This invention relates generally to data gathering systems and, in particular, to systems and related methods for simultaneously gathering data from multiple wireless communication networks.

2. Description of the Related Art

The basic structure and operation of wireless communication networks, including cellular, paging, wireless local loop, and satellite communication networks are well known.

15 A typical cellular communication network essentially consists of a plurality of mobile subscriber units (MSUs), a plurality of cell sites with base station equipment, a plurality of base station controllers (BSCs), which may be associated with each base station, or may be centralized to provide control for a plurality of base stations, a mobile telephone switching office (MTSO or Mobile Switching Center (MSC)) and various local or networked

20 databases which may include a home location register (HLR), visitor location register (VLR), authentication center (AuC) and equipment identity register (EIR).

A typical cellular communication network is characterized by the concepts of frequency reuse and handoff. In some cellular systems, a frequency is reused at many sites which are geographically separated from each other by a distance sufficient to ensure that the interference from other sites utilizing the same frequency is low enough to permit a
5 quality signal from the primary serving site. Handoffs are the process of changing the serving site as a subscriber moves from the primary service area of one site to that of another.

Ordinarily, cellular systems are initially designed with a set of cell sites that provide partial overlapping RF coverage over a market area of interest. In order to provide
10 increased capacity, additional cell sites are constructed between the initial cell sites. The coverage area of each cell site is reduced through a combination of antenna system design and transmitter power reduction in order to provide limited overlap of individual coverage areas while maintaining contiguous coverage. In some cellular systems, capacity within each cell is limited by the available spectrum and the number of frequency assignments that
15 can be assigned for that cell without violating the interference constraints of the common air interface standard employed for the network. Capacity can also be reused through the use of "sectorized" sites, in which a single site is equipped with antenna systems and transceivers to permit multiple cells to be created from a single site. A common sectoring approach utilizes three sectors per site, each providing primary coverage in a different
20 120°-wide sector around the site, while partially overlapping with the other two sectors. Common frequency reuse patterns range from a reuse pattern of twenty-one, in which the frequency assignments are reused over a pattern of seven tri-sectorized sites in Frequency Division Multiple Access (FDMA) systems, to reuse patterns of one, in which the same

frequency assignment is reused in every cell in Code Division Multiple Access (CDMA) systems.

There are various common air interface (CAI) standards that are used in the radio communications link between the MSU and the cell site. The earliest type in common use is known as Frequency Division Multiple Access (FDMA), in which each communications channel consists of a single narrowband carrier, generally employing analog frequency modulation. Digital systems generally provide multiple communications channels within a single frequency assignment. In Time Division Multiple Access (TDMA) systems, a carrier is modulated with a binary signal, with channels cyclically assigned to unique timeslots. The number of channels available for a carrier frequency assignment varies with the particular TDMA standard, typically ranging from three to eight with current full rate vocoders. Another type of digital modulation in common use, Code Division Multiple Access (CDMA), typically differentiates up to sixty-four spread spectrum modulation channels using orthogonal spreading codes within a single wideband frequency assignment.

Channels that are transmitted from the base stations and received by MSUs are known as forward channels, while those that are transmitted from the MSU and received by the base station are known as reverse channels. Channels are further differentiated by their function. Those that are generally used for signaling between the MSU and the base station are known as control channels, while those that are generally used to carry voice or data signals are known as traffic channels. Generally, some limited forms of signaling are available when a call is in progress on a traffic channel to permit control of the call in progress or to support system requirements such as handoffs.

In certain cellular systems, when an MSU is in an idle mode, it may select a forward control channel (FCC) to monitor for signaling information. If the MSU is required to transmit information to the base station, it will do so on a corresponding reverse control channel (RCC). The protocols for the various common air interfaces determine which FCC-RCC pair is to be used. FCCs are used to send two types of messages. Overhead messages provide information to all MSU units monitoring the channel, and may include system and cell site identifiers, and information regarding the system configuration (e.g. neighbor lists). The FCC also provides information for specific users, including pages and short data messages. Absent any means of determining which cell is being monitored by a particular MSU, such messages would need to be broadcast over all the FCCs of all cells within a network in order to ensure that the MSU receives the message. This is practical in smaller systems, but in systems with more than a few tens of thousands of subscribers, it is desirable to subdivide the network into location areas (LAs) in order to avoid exceeding the data throughput capacity of the FCC. Subscriber messages can then be broadcast through the FCC of all the cells in the LA in which the MSU is monitoring a FCC.

Cellular systems ordinarily use a process known as registration in order to determine which LA serves a MSU. Generally, when an MSU is first turned on, it will initially monitor the strongest available FCC. It will then register in accordance with information contained within the FCC overhead data. This is accomplished by exchanging prescribed messages, including the subscriber identity, over the FCC-RCC pair. The VLR stores the information regarding the most current LA is then stored in the system VLR and the MSU. If the MSU later determines that the LA identifier included in the FCC no longer matches the data it has stored, it will initiate a location update that will repeat the

registration process with the new LA identifier. Re-registration may also occur in response to system requests. In systems in which LAs are utilized, subscriber messages are initially sent only to cells within the system which correspond to the LA information for the MSU that is stored in the VLR.

5 Generally, when a call is made to a registered MSU, the network sends a page from the base station to the MSU by broadcasting a paging message on the FCC of the cells within the LA. If received, the MSU responds by sending its identifying information once again to the network along with a message confirming that it received the page. The network then sends a traffic channel assignment to the MSU on the forward control
10 channel.

 Ordinarily, when an MSU originates a call, the MSU initiates a signaling sequence which includes its identity and the called number using the RCC that corresponds to the monitored FCC. After verifying that the MSU corresponds to a valid subscriber record, the MSU is assigned to a traffic channel and the MTSO completes the call to the called
15 number.

 For a given geographic area, there are typically several competing service providers operating wireless communication networks. Each will have certain licensed frequency assignments, or bands of licensed frequencies, that it is permitted to use within its network. Each will have a common air interface, generally an industry standard, but occasionally a
20 proprietary system developed by a particular vendor and not subjected to an industry standards process.

 In the past, equipment has been developed to test the operation of, and characterize the quality of, the individual networks. Test equipment has been developed that allow the

simultaneous testing of multiple networks at a single location. When coupled with navigation and data recording and analysis capabilities, they permit characterizing the comparative quality of various networks over a given set of geographical points, one location at a time (generally referred to as a drive route, since the test equipment is
5 ordinarily installed in a vehicle and driven throughout a market area.)

However, such equipment typically is limited to gathering information from the portions of the networks that are in the vicinity of the test equipment. In major cellular system market area, this may mean the equipment is limited to gathering information from a small subset of the active cells at any given moment in time. In addition, since a purpose
10 of the equipment is to test the operation and the quality of the wireless communication networks, the data processing capabilities of such equipment generally are not designed to gather data to make market share, usage comparisons, or user profiles for the different wireless communication networks.

Current methods of gathering information about subjects such as market share,
15 usage, and user profile data often have been limited to telephone surveys, generally conducted by telemarketing research firms. This type of information is critical to wireless communications operators, who may expend significant resources on advertising and promotions to attract customers and need metrics to judge the effectiveness of these expenditures. But the accuracy and reliability of such telephone surveys sometimes is
20 limited as they provide only anecdotal data and may use an insufficient statistical sample. Furthermore, in some cases these methods result in unsolicited charges to wireless customers. As a result, there has been a need for more comprehensive data gathering systems and related methods for gathering marketing information about wireless communication networks.

SUMMARY OF THE INVENTION

The present invention encompasses data gathering systems and related methods for gathering data from wireless communication networks. For a given geographic area, there may be several service providers operating wireless communication networks utilizing various types of common air interface standards. One data gathering system in accordance with the invention gathers data from each wireless communication network simultaneously. The system comprises a plurality of data gathering nodes deployed in a sampling network, and a control center that provides management of the data collection processes of each node, data collection from each of the nodes, error detection, management of the collected data, and overall administration of the network.

A data gathering node may comprise multiple receivers, a minimum of one for each wireless communication network. Each receiver employs a sampling algorithm to gather data from cell sites surrounding the data gathering node. The data gathered from each data gathering node is periodically sent to a control center. where it is stored.

Later, a data mining application may be run on the gathered data to generate marketing and usage information for each of the wireless communication networks.

The present invention is explained in more detail below with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an illustrative block diagram of a data gathering system for wireless communication networks in accordance with a presently preferred embodiment of the invention.

Figure 2 is a representation of a cell layout of a wireless communication network and shows the placement of data gathering nodes like the one in Figure 4.

Figure 3 is a representation of a group of cell sites comprising a cell group from which a data gathering node of Figure 4 samples to gather data.

5 Figure 4 is a block diagram of the presently preferred embodiment of one of the data gathering nodes of the system of Figure 1.

Figure 5 is a representation of storage of the gathered data in a relational database.

Figure 6 is a sample excerpt of a baselining period data file.

10 Figure 7 is a sample excerpt of a data file from which marketing and usage characterization information is to be generated.

Figure 8 is a comparison between actual subscribers and measured subscribers used in calculating the subscriber share gross-up coefficient.

Figure 9 is a sort of the data found in Figure 7 to count the number of measured subscribers.

15 Figure 10 shows the calculation of the subscriber share gross-up coefficients and the market share percentage of each wireless communication network.

Figure 11 is a sample report containing information on subscriber share.

Figure 12 is a sample excerpt of a second data file from which marketing and usage characterization information is to be generated.

Figure 13 is a comparison of different subscribers between the data file shown in Figure 7 and a second data file shown in Figure 12 used to determine new and churning subscribers.

5 Figure 14 shows the calculation of the new subscriber gross-up coefficients and the market share percentage of new subscribers for each wireless communication network.

Figure 15 shows the calculation of the churning subscriber gross-up coefficients and the market share percentage of churning subscribers for each wireless communication network.

Figure 16 is a sample report containing information on new subscribers.

10 Figure 17 is a sample report containing information on churning subscribers.

Figure 18 is a comparison of actual roamers to roamers measured during a baseline period used to calculate the roamer gross-up coefficient.

Figure 19 is a data sort of the data file of Figure 7 counting the number of roamers.

15 Figure 20 shows the calculation of the roamer gross-up coefficient and the share of roamers for each wireless communication network.

Figure 21 is a sample report containing information on roamer share.

Figure 22 is a comparison of actual calls and measured calls during a baseline period used to calculate the call share gross-up coefficient.

20 Figure 23 is a data sort of the file in Figure 7 counting the number of traffic channel assignments made for each wireless communication network.

Figure 24 shows the calculation of the call share gross-up coefficient and the call share for each wireless communication network.

Figure 25 is a sample report containing information on call share.

Figure 26 is a sample excerpt of a data file from which base subscriber profiling information is to be generated.

Figure 27 is a data sort of the file shown in Figure 26 to identify the number of traffic channel assignments made to different subscribers.

Figure 28 is a data sort of the file shown in Figure 27 arranging subscribers by number of traffic channel assignments.

Figure 29 is a data sort of the file shown in Figure 28 dividing the data into quartiles and counting the number of subscribers for each wireless communication network in each quartile.

Figure 30 shows the calculation of market share of base subscribers for each wireless communication network in each quartile.

Figures 31 and 32 are sample excerpts of data files from which new and churning subscriber profiling information is to be generated.

Figure 33 is a data sort of the files shown in Figures 31 and 32 identifying new and churning subscribers.

Figure 34 is a data sort of the file in Figure 31 counting the number of traffic channel assignments made to new subscribers.

Figure 35 is a data sort of Figure 34 arranging subscribers by number of traffic channel assignments.

5 Figure 36 is a data sort of the file shown in Figure 35 dividing the data into quartiles and counting the number of new subscribers for each wireless communication network in each quartile.

Figure 37 shows the calculation of market share of new subscribers for each wireless communication network for each quartile.

Figure 38 shows a data sort of Figure 31 counting the number of traffic channel assignments made to churning subscribers.

10 Figure 39 is a data sort of Figure 38 arranging churning subscribers by the number of traffic channel assignments made.

Figure 40 is a data sort of the file shown in Figure 39 dividing the data into quartiles and counting the number of churning subscribers for each wireless communication network in each quartile.

15 Figure 41 shows the calculation of market share of churning subscribers for each wireless communication network for each quartile.

Figure 42 is a sample excerpt of a data file from which peak and non-peak call share information is to be generated.

20 Figure 43 is a comparison between actual calls and measured calls during a baseline period used to calculate the peak/non-peak call share gross-up coefficient.

Figure 44 is a data sort of the file in Figure 42 counting the number of traffic channel assignments made during peak and non-peak hours for each wireless communication network.

5 Figure 45 shows the calculation of the peak/non-peak gross-up coefficient and the peak and non-peak call share for each wireless communication network.

Figure 46 is a sample excerpt of a data file from which incoming and outgoing call information is to be generated.

Figure 47 is a data sort of the file in Figure 46 identifying traffic channel assignments and pages for each wireless communication network.

10 Figure 48 shows the processing of the file shown in Figure 48 to identify and count incoming and outgoing calls.

Figure 49 shows the calculation of the ingoing/outgoing call share gross-up coefficient and the incoming and outgoing call share for each wireless communication network.

15 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

The present invention encompasses data gathering systems and related methods for gathering data from wireless communication networks. The following description is presented to enable any person skilled in the art to make and use the invention, and is provided in the context of a particular application and its requirements. Various
20 modifications to the preferred embodiment will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments and applications without departing from the spirit and scope of the invention. Thus, the present

invention is not intended to be limited to the embodiment shown, but is to be accorded the widest scope consistent with the principles and features disclosed herein.

A block diagram of a presently preferred embodiment of a data gathering system for wireless communication networks is shown in Figure 1. In a presently preferred
5 embodiment of the invention, the data gathering system comprises N data gathering nodes (110) placed at various locations in a geographic area served by wireless communication networks, where N is an integer greater than one and represents the number of data gathering nodes used to gather data from cell sites in the wireless communication networks. Each data gathering node is coupled to a control center (120).

10 Referring to Figure 2, a sample wireless communication network is represented by a distribution of cell sites (210) throughout a geographic area. The density of all sites (210) is greater in areas of high wireless communication traffic. The placement of each data gathering node (220) is dependent on the cell layouts of the wireless communication networks. A survey may be conducted prior to selecting monitoring locations in order to
15 provide useful information regarding the density of cell sites (210) and the approximate areas the cell sites serve. Data gathering nodes (220) are placed in locations that permit each data gathering node to monitor an approximately equal number of cell sites (210) in each network and, in aggregate, maximize the number of cell sites (210) of each network that are monitored. Typically, in areas with greater cell densities, data gathering nodes
20 (220) are spaced more closely together and locations are selected which have a smaller area in which they can effectively monitor cell sites.

Typically, cells within a wireless communication network are associated with location areas (230) which are defined by the network operator. In the preferred

embodiment, at least one data gathering node (220) is placed within each location area (230) of each wireless communication network to “sample” or gather data from the group of cell sites surrounding the data gathering node (a “cell group”). Data gathering nodes (220), either transportable or fixed, may also be deployed within each location area (230) to
5 gather data from additional cell sites (210) depending on the quantity and density of cell sites (210) within a particular location area (230) in order to gain sufficient samples of subscriber messages.

Factors affecting the cell sites (210) from which a data gathering node can gather data include the physical environment of the node (particularly its height above the local
10 terrain and the physical structures in the immediate vicinity of its antenna network), the relative locations and orientations of the local cell site antennas, the transmit power of the cells, and the terrain and morphology between the node and cell locations. The data gathering nodes (220) that are initially placed based on the cell layouts and location areas are meant to remain fixed for an extended period of time, although some initial adjustment
15 may be necessary to optimize the gathering of data from the most number of cell sites (210) by each data gathering node from each wireless communication network. Periodic adjustments may be required in response to ongoing changes in the monitored networks. When the data gathering nodes (220) are initially placed, particular attention is paid to ensure that data is gathered from all cell sites in high usage areas such as business centers,
20 high traffic areas, or airports and bridges.

As shown in Figure 4, each node may have multiple receivers, each configured to monitor control channels of base stations of one of multiple cellular networks. Prior to performing monitoring operations, each receiver is programmed to undertake an initialization process in which it scans all of the appropriate control channels of the wireless

communication network that it is monitoring. The local processor will create and maintain a record of all readable control channels, their corresponding cell identifiers (or other information that may permit distinguishing the control channel of one cell site from that of another), location area identifiers, and the approximate received signal strength of each.

5 This information will be uploaded to the control center (120), which then determines which data gathering nodes (220) are responsible for monitoring which cell sites (210).

The control center will develop a set of sampling plans based upon the system configuration data. In the preferred embodiment, groups of cells for each network will be designated as within the sampling plan of a data gathering node based upon the following

10 objectives and constraints: (1) all cells within a group will be within the same location area, (2) the number of cells in each group will be the same, (3) the levels of subscriber messages will be the same in each group, (4) the signal levels from each cell within the group will exceed a designated CAI-dependent threshold, and (5) the sampling plan will be consistent with the configuration of the data gathering node. The development of the sampling plan

15 may be performed manually, or may be accomplished automatically using an optimization program or process that provides a optimal solution using assigned weighting factors for each objectives, while maintaining location area and data gathering node configuration constraints.

Figure 3 shows a grouping of cell sites of one cellular system surrounding a data

20 gathering node (310) that is monitored by one of the receivers of node (310) in accordance with a presently preferred embodiment of the invention. Although a cell group for only one wireless communication network is shown, each data gathering node will sample from cell groups for each wireless communication network in a similar manner. The data gathering node (310) samples signals transmitted from a base station in cell site (320) for a time

period, and then samples signals transmitted from the base station in cell site (330) for a time period, followed by cell site (340), cell site (350), cell site (360), cell site (370), and finally cell site (380). The data gathering node (310) samples signals from base stations belonging to each wireless communication network.

5 Once all of the cell sites of a cellular system that are associated with the data gathering node have been sampled, the sampling process is then repeated again starting with cell site (320). The data gathering node monitors signals transmitted from the base station in a new cell by switching to the corresponding channel assignment of the base station in the new cell. In the preferred embodiment, a data gathering node will gather data
10 from several seconds to several minutes from each cell in the cell group (230). The time periods may be uniform for each cell, or may be weighted based upon historical rates of subscriber messages monitored from each cell site. Other factors affecting the sampling period include the wireless communication network from which data is being gathered, and the strength at the data gathering node of the signal from the cell being monitored. In an
15 alternative embodiment, each data gathering node does not sample each cell in the group of cell sites, but rather only a single cell site.

Referring to Figure 4, a block diagram of the presently preferred embodiment of the data gathering node of the system of Figure 1 is shown. Each data gathering node comprises an antenna network (410) that comprises one or more antennas and an RF
20 distribution network connecting the antenna(s) to the receivers (420), P receivers (420), where P is an integer greater than one and represents the number of forward control channels from which data is to be gathered, a local processor with capabilities similar to a personal computer (440), a local storage device such as a hard drive (445), and a modem (450). Currently there typically are between six and eight wireless communication

networks in each major market. Some common air interface standards utilize more than one forward control channel in a cell site, thus requiring more than one receiver per wireless communication network.

The antenna network (410) is coupled to each receiver (420) for signal reception, and each receiver (420) includes a corresponding controller (430). The combination of receivers at each data gathering node (110) is capable of receiving and decoding traffic from any common air interface standard on which a particular service provider may be operating, including N/AMPS (Narrowband/Advanced Mobile Phone Service), TDMA (Time Division Multiple Access), CDMA (Code Division Multiple Access), GSM (Global System for Mobile telephones), and iDEN in the cellular, SMR and PCS frequency bands. Each receiver (420) is coupled to the local processor (440). Each controller (430) allows the local processor (440) to control its corresponding receiver (420) functions, such as channel selection, decode mode, and cell sampling patterns. Each receiver is capable of receiving a forward control channel (FCC), forward traffic channel (FTC), reverse control channel (RCC), and reverse traffic channel (RTC) signals of a cellular communication network, determining the approximate received signal strength for the channel, and either decoding the signaling data or determining the presence of traffic.

It is the task of the receivers to process the incoming radio signals into useful information by demodulating the signals and decoding the raw data into useful information according to the particular cellular communication standard being used. In the presently preferred embodiment, each receiver (420) monitors the forward control channels of a different wireless communication network, observing all messages broadcast by the base station sent to all MSUs in the cell site associated with the service provider of interest. Different receivers can be configured to receive information compliant with N/AMPS

(Narrowband/Advanced Mobile Phone Service), TDMA (Time Division Multiple Access), CDMA (Code Division Multiple Access), GSM (Global System for Mobile telephones), and iDEN in the cellular, SMR and PCS frequency bands. In alternative embodiments, each receiver (420) may monitor a reverse control channel, forward traffic channel, or reverse traffic channel of a different wireless communication network. Messages decoded from the reverse control channel can be processed to generate subscriber calling pattern information as well as subscriber identity information, as further described below.

Demodulation and decoding of the forward control channel signal yields the messages transmitted over the forward control channel, as well as filler data, repeated messages, and checksum data. Filler data, repeated messages, and checksum data are generally filtered out and discarded by the receiver to facilitate data handling, leaving only formatted messages. In the presently preferred embodiment, each receiver (420) selects the following messages to save and discards all other messages: (1) certain overhead messages that provide system and cell site identification, network quality information (e.g. busy/idle bit), and registration instructions, (2) Registration Confirmations, which include the subscriber MIN being confirmed, time of day and date of the confirmation, base station identification, and frequency/carrier identifier, (3) Pages, which include the subscriber MIN being paged, and (4) Traffic channel assignments, which include the subscriber MIN for which a channel is being assigned.

The filtered messages are then sent to the local processor (440) which records the time of receipt of each message. The local processor (440) is comparable in capabilities to a desktop personal computer. The local processor (440) is equipped with a fault tolerant power supply of sufficient dimension and capabilities to assure immunity to short duration power interruptions and the ability to shut down and restart in the event of a prolonged

power outage. The local processor (440), based upon data processing commands received from the control center (120), may further filter messages. Messages are accumulated in temporary memory (RAM) in block files associated with the forward control channels associated with each receiver. Certain fields in the messages, such as portions of the subscriber MIN, are encrypted into unique subscriber identifier numbers that correlate to a specific subscriber using standard public/private key algorithms such as DES or MDS. Portions of the MIN corresponding to the area code are not encrypted into the unique subscriber identifier in order to gather data on roamers. Each data gathering node (110) will use the same public key to encrypt the MIN to simplify key management. The corresponding private key is held in escrow, and is unavailable to be used to decrypt the unique subscriber identifiers, thus protecting the privacy of subscribers. In an alternative embodiment, subscriber MINS are encrypted into unique subscriber identifiers at the receivers (440) rather than the local processor (440). At no time is an unencrypted MIN stored on a permanent media vulnerable to security breaches.

On a periodic basis, or whenever the forward control channel monitoring assignment is changed, the block file associated with the forward control channel is closed, compressed using a standard compression format such as ZIP to minimize storage and transmission requirements, and sent to a local storage device (445) such as a hard drive where it is appended to a file corresponding to its associated wireless communication network. A new block file is created which corresponds to the next block time period and forward control channel.

Alternatives exist to using MINs to generate unique subscriber identifiers. In one alternative embodiment, each receiver (420) monitors the reverse control channel as well as the forward control channel. Demodulation and decoding of the reverse control channel

signal yields a message corresponding to the ESN of the MSU. In this alternative embodiment, the ESN is encrypted to produce a unique subscriber identifier rather than the MIN gathered from the forward control channel. In another alternative embodiment, the unique RF wave pattern (RF fingerprint) transmitted by each MSU on the reverse control channel is used to assign a different unique subscriber identifier to each RF fingerprint. In these alternative embodiments, the messages pertaining to the MINs gathered from the forward control channel are filtered out with the extraneous information rather than encrypted.

On a scheduled basis, all files are closed and prepared for uploading to the control center (120). A file header is created for each wireless communication network file that summarizes the statistics of the corresponding file, including peg counts for each type of message recorded and a summary of any apparent alarm conditions or system outages detected during the reporting period. The control center (120) initiates a dialup routine to connect with the local processor (440), which sends the data file containing data gathered since the previous dialup. Alternatively, the local processor (440) may initiate the communications session based upon previously downloaded instructions and schedules from the control center (120). In alternative embodiments, the connection between the control center (120) and the local processor (440) can be made via the internet, an RF link, or a wide area network.

The control center (120) may also initiate a dialup routine to connect with the local processor (440) at other times to transmit any revised settings for the receivers to the local processor (440), such as frequency selection or sampling patterns. The local processor (440) will then transmit changes to the controller (430) at each receiver (420). In the preferred embodiment, the control center (120) initiates a dialup routine once a day, at

which time the local processor (440) sends the data file containing data gathered since the previous dialup and the control center (120) transmits any revised settings for the receivers to the local processor (440). In the preferred embodiment, the dialup linkage occurs landline via a standard telephone modem (450), but in an alternative embodiment the dialup linkage may be wireless.

At the control center (120), each data file received from a data gathering node is decompressed and the data file is error checked to ensure data integrity. This includes examining the timestamps of the first and last event in the data file and confirming that the data file is composed of data gathered during the expected time period since the previous data upload. Second, messages are sampled from the data file and compared to the messages in the corresponding positions in the previous day's data to confirm that the messages are not identical to the previous day's data. In an alternative embodiment, instead of error checking the data file against only the prior day's data file, the data file can be error checked against several previous days of data collected to ensure that new data has been collected. In the preferred embodiment, the first message, last message, and eight messages at equal intervals between the first and last messages are sampled, for a total of ten sampled messages.

The data file is also checked to ensure that receivers have been functioning properly and gathering data throughout the collection period. Data files collected from previous collection periods are used to generate a normal range of occurrences for each type of message over a given collection period. After the data file is downloaded, the control center (120) counts the number of occurrences of each type of message and ensures that the numbers fall within the expected normal range of each type of message.

After the uploaded data files from all the data gathering nodes (110) have been error checked, they are processed to generate a single file of messages. Since data is gathered from multiple data gathering nodes simultaneously, there may be undesired duplicate entries for the same event. This is particularly the case when multiple data gathering nodes are monitoring cells within the same location area. Since, for the purposes of the presently preferred embodiment, the desired data is that a particular MSU received a page at a particular time, redundant page signals attempting to locate the MSU are undesirable and eliminated. The elimination of redundant pages significantly reduces both the space required to store the gathered data and the query time required when aggregating and analyzing the data.

To eliminate redundant pages, the control center (120) sorts through all of the data files received from each data gathering node (110) and identifies pages to the same subscriber that were received at different data gathering nodes (110) within a pre-determined window of time and selects the page with the earliest time stamp. The control center (120) then eliminates all other pages to the same subscriber within the pre-determined window of time. The pre-determined window of time may vary depending on the wireless communication network standard from which the data is gathered, and may be refined from time to time based on prior data that has been gathered.

Once the data files from each data gathering node (110) are processed into a single file of overhead messages, pages, traffic channel assignments, and registration events, this file is processed for storage in a relational database at the control center (120). A representation of the storage format for gathered data is shown in Figure 5. A user information table (510) is created for each event containing fields on the event date and time, area code of the subscriber, cell site location, event type, market frequency band, and

carrier. Information pertaining to the event type, cell site location, market, frequency band, and carrier fields is represented in the userinformation table (510) by an indexed numerical value, with a corresponding relational table for cross-referencing each indexed numerical value with a text description of its meaning.

5 Each type of event is designated an index value in the userinformation table (510), with a related eventType table (520) cross-referencing the index value with the type of event (page, traffic channel assignment, registrations). Similarly, the cell site location of the event is designated an index value, with a relational cellinformation table (530) cross-referencing the index value with a text description of the cell site locations.

10 Market, carrier, and frequency band information is allocated a single field in the userinformation table (510) and is designated a single index value. This index value is designated by a marketFrequency table (540), which contains individual fields for market, carrier, and frequency band information. The market is designated an index value in the marketFrequency table (540), with a relational market table (550) cross-referencing each
15 index value with a text description of the corresponding market. Similarly, both the carrier and frequency band are each designated an index value in the marketFrequency table (540), with a relational Carrier table (550) and frequencyBand table (560) cross-referencing the index values with a text description of the corresponding carrier and frequency band.

20 All new data files received from all data gathering nodes (110) are backed up and archived on a regularly scheduled basis using the standard commercial features of a database management system. Standard archiving procedures are used to back up to an offline storage media such as magnetic tape or CD-ROM, which are then stored in a secure, fireproof safe.

A data mining application is run on the data file to aggregate and analyze the data to produce summary tables and reports. The format of a sample table is shown in Figure 5. A user table (570) identifies each unique subscriber identification number and keeps track of the date the unique subscriber identification number first appeared and the date it last appeared. The user table (570) is updated each time a new file is processed. In the preferred embodiment, the data mining application is run at the control center (120). In an alternative embodiment, the data mining application can access the control center remotely to aggregate and analyze the data file stored at the control center (120). The data mining application generates periodic reports (monthly in the preferred embodiment) containing marketing and usage characterization information useful to wireless communication network service providers, wireless equipment manufacturers, service retailers, consultants, and financial institutions. Reports and gathered data can be provided through web-based access (including real time displays of data being gathered), e-mail delivery, electronic data delivery, or hard print. In the presently preferred embodiment, such information comprises the share of subscribers relative to other wireless communication networks, the number of new subscribers, the number of churning subscribers (subscribers who have dropped their service), and the share of total calls made by subscribers of a wireless communication network relative to subscribers of other wireless communication networks, the number and share of roamers for each wireless communication network, profiling of the quality of new, existing, and churning subscribers for each wireless communication network based upon the share of subscriber calls made, share of calls during peak and non-peak hours for each wireless communication network, and share of incoming and outgoing calls for each wireless communication network.

In alternative embodiments, the data mining application may generate other types of marketing and usage characterization information, such as subscriber usage characteristics with respect to items such as number, time and location of calls made and received for each service provider, and use the number of gross adds for a wireless communication network following media advertising or special promotional pricing plans as a basis to track the impact and effectiveness of such advertising or special promotions. It is recognized that the data mining application can process the data files to generate many other types of marketing and usage characterization information similar to those described herein.

Figures 6 and 7 are sample excerpts of information contained in the data files stored at the control center (120) for illustration of how the data mining application generates information on market share of subscribers for each wireless communication network, the number and share of new subscribers and churning subscribers, the number and share of roamers, and share of total calls made by subscribers. Only data for two wireless communication networks is shown, but a complete file will have data for all wireless communication networks.

Figure 6 represents excerpts of data files containing data taken during a baseline period. This baseline period raw data is compared to actual data received from service providers for the time period corresponding to the baseline period to determine how much data was missed by the data gathering system. Figure 7 is a sample excerpt of a data file at the control center (120) that the data mining application is to analyze to generate marketing and usage characterization information.

The data mining application calculates the subscriber share for each wireless communication network by first generating a subscriber share gross-up coefficient that

accounts for data that is missed by the data gathering nodes (120). The data mining application sorts through the baselining period data and generates a list of different subscriber identifiers that are contained in the baselining period data. These different subscriber identifiers are compared to a list of actual subscriber identifiers generated from information received from service providers to determine how many subscribers the data gathering nodes missed. The comparison of these two lists is shown in Figure 8. Figure 10 shows one method for calculating the subscriber share gross-up coefficient for each wireless communication network. The actual number of subscribers during the baseline period is divided by the number of measured subscribers during the baseline period.

Alternatively, more comprehensive standard statistical methods can be used to calculate gross-up coefficients. The data gathering nodes will miss subscriber identifiers because not all of the cells in the wireless communication network are monitored simultaneously and continuously. As a result, for example, an event may have started and ended in a cell before being recorded. However, this base number of subscribers approximates the actual number of subscribers because as the number of recorded events increases, the number of unique subscriber identifier numbers grows asymptotically to the actual level. Although a particular event may be missed, the more data that is recorded in the future, the more likely future events involving the same unique subscriber identifiers may be recorded. Only one record is required to identify that a subscriber is active. Where the data collection period is a month, a sufficient number of events have been recorded to approach this asymptotic level. These additional factors may be taken into account when generating the gross-up coefficients for each wireless communication network.

To determine the share of subscribers for each wireless communication network, the data mining application sorts the data file and counts the number of different subscriber

identifiers for each wireless communication network. Figure 9 is the result of such a sort of the file shown in Figure 7. The number of subscribers counted for each wireless communication network is multiplied by the corresponding subscriber share gross-up coefficient to generate an extrapolated number of subscribers for each wireless communication network. The market share of each wireless communication network is then generated by dividing the extrapolated number of subscribers for each wireless communication network by the total number of extrapolated subscribers for all wireless communication networks. Figure 10 shows the extrapolation of the number of subscribers counted for each wireless communication network shown in Figure 9 and the calculation of the subscriber share for each wireless communication network. A sample report containing information on subscriber share over a monthly period is shown in Figure 11.

Figure 12 is a sample excerpt of data for a particular time period in which it is desired to determine the number of new and churning subscribers since a prior collection period. The data mining application calculates the number of new subscribers added by over a particular time period by each wireless communication network by comparing a list of unique subscriber identifiers of the particular time period to a list of unique subscriber identifiers of a prior time period and counting the number of unique subscriber identifiers that do not appear in the prior period. Similarly, the number of churning subscribers for each wireless communication network who discontinued their service at the end of a prior time period is calculated by comparing a list of the unique subscriber identifiers of the particular time period to a list of unique subscriber identifiers of the prior time period and counting the number of unique subscriber identifiers that appear in the prior time period, but not the particular time period. Figure 13 shows this process for a list of unique

subscriber identifiers sorted from a prior time period data file shown in Figure 7 and a list of unique subscriber identifiers from the particular time period shown in Figure 12.

The number of new subscribers for each wireless communication network counted in Figure 13 is multiplied by a corresponding new subscriber gross-up coefficient to generate an extrapolated number of new subscribers for each wireless communication network. The new subscriber gross-up coefficient can be calculated in many ways. In the presently preferred embodiment, the subscriber share gross-up coefficient calculated previously is used since the number of new subscribers missed by the data gathering nodes is proportional to the number of subscribers missed. The share of new subscribers for each wireless communication network is calculated by dividing the extrapolated number of new subscribers for each wireless communication network by the total number of extrapolated subscribers for all wireless communication networks. Figure 14 shows the extrapolation of the number of new subscribers counted for each wireless communication network shown in Figure 13 and the calculation of the new subscriber share for each wireless communication network.

Identifying the new subscribers for each wireless communication network can also be used to track subscribers who have left one service provider for another once Local Number Portability is mandated in the year 2001. Under Local Number Portability, subscribers can keep their MIN when switching from one service provider to another. To identify a subscriber who switched from one service provider to another, for each new subscriber, the data mining application sorts through the list of unique subscriber identifiers for each other service provider to see if the new unique subscriber identifier appears previously as a subscriber to a different service provider. If so, this subscriber is identified as a subscriber who has switched from another service provider. In this manner, the data

mining application can generate reports on the number of subscribers who switched from one service provider to another, and which service providers lost and gained subscribers from which other service providers.

The ability to track new subscribers and new subscribers coming from other service providers can also be used to quantify the effectiveness of media campaigns by service providers, such as tracking the increase in subscribers per advertising dollar spent, relative effectiveness of television, radio, and print medium advertisements, and effectiveness of particular types of promotional plans, such as free air time or lack of roaming charges.

The same process for calculating share of new subscribers for each wireless communication network is followed for calculating the share of churning subscribers counted in Figure 13. Figure 15 shows the extrapolation of the number of churning subscribers counted for each wireless communication network shown in Figure 13 and the calculation of the churning subscriber share for each wireless communication network. Figures 16 and 17 show sample reports containing information on new and churning subscribers over a monthly period.

The data mining application calculates the roamer share for each wireless communication network by first generating a roamer gross-up coefficient that accounts for data that is missed by the data gathering nodes (120). The data mining application sorts through the baseline period raw data shown in Figure 6 and generates a list of roamers by identifying area codes outside the wireless communication network for which data is being gathered. This list of roamers is compared to a list of actual roamers generated from information received from service providers to determine how many roamers the data gathering nodes missed. The comparison of these two lists is shown in Figure 18. A

roamer gross-up coefficient is calculated by dividing the number of actual roamers by the measured number of roamers. The calculation of the roamer gross-up coefficient from the data in Figure 18 is shown in Figure 20.

The data mining application calculates the number and share of roamers over a

5 particular period for each wireless communication network by sorting the data file for the particular period and counting the number of roamers. Figure 19 shows the result of such a data sort of the data file shown in Figure 7. The number of roamers counted for each wireless communication network is multiplied by the corresponding roamer gross-up coefficient for each wireless communication network to generate an extrapolated number of
10 roamers for each wireless communication network. The share of roamers for each wireless communication network is then generated by dividing the extrapolated number of subscribers for each wireless communication network by the total number of extrapolated roamers for all wireless communication networks. Figure 20 shows the extrapolation of the number of roamers counted for each wireless communication network shown in Figure 19
15 and the calculation of the roamer share for each wireless communication network. A sample report showing roamer activity over a monthly period is shown in Figure 21.

The data mining application calculates the call share for each wireless communication network by first generating a call share gross-up factor that accounts for data that is missed by the data gathering nodes (120). The data mining application sorts
20 through the baselining period raw data shown in Figure 6 and generates a list counting the number of traffic channel assignments made, which correspond to subscriber calls. This data sort is compared to a list of actual traffic channel assignments generated from data received from service providers to determine how many calls the data gathering nodes missed. The comparison of these two lists is shown in Figure 22. The call share gross-up

coefficient is calculated by dividing the number of actual traffic channel assignments made by the measured number of traffic channel assignments made.

The number of traffic channel assignments made for each wireless communication network is multiplied by the corresponding call share gross-up coefficient for each wireless communication network to generate an extrapolated number of traffic channel assignments for each wireless communication network. The share of calls made for each wireless communication network is generated by dividing the extrapolated number of traffic channel assignments made for each wireless communication network by the total number of extrapolated traffic channel assignments for all wireless communication networks. Figure 24 shows the extrapolation of the number of traffic channel assignments made for each wireless communication network and the calculation of call share for each wireless communication network. A sample report containing information on caller share over a monthly period is shown in Figure 25.

The data mining application also processes the data files to generate information on the quality of the base, new, and churning subscribers for each wireless communication network based upon the number of calls each subscriber of each wireless communication network makes. Since service provider revenues are directly tied to the number of calls made, information regarding quality in addition to number of subscribers is highly desirable. Figure 26 is a sample excerpt of a data file stored at the control center (120) for illustration of how the data mining application generates information on the quality of base subscribers for each wireless communication network. Only data for two wireless communication networks is shown, but a complete file will have data for all wireless communication network.

The data mining application calculates the quality of base subscribers over a particular period by sorting the data file for the particular period, identifying each different subscriber for each wireless communication network, and counting the number of traffic channel assignments made to each different subscriber. Figure 27 shows such a data sort of the file excerpt shown in Figure 26. This data is further sorted by number of traffic channel assignments to produce a list of subscribers with the highest number of traffic channel assignments listed first and the subscribers with the lowest number of traffic channel assignments listed last. Figure 28 shows such a data sort of the data found in Figure 27. In the presently preferred embodiment, this list is divided into quartiles based on the number of traffic channel assignments made. For each quartile, the number of subscribers for each wireless communication network is counted. Figure 29 shows such a data sort of the data found in Figure 28. For each quartile, the market share percentage of each wireless communication network is calculated by dividing the number of subscribers for each wireless communication network by the total number of subscribers for all wireless communication networks in the quartile. Figure 30 shows sample market share calculations for base subscribers for the data found in Figure 29.

Figures 31 and 32 are sample excerpts of data files stored at the control center (120) for illustration of how the data mining application generates information on the quality of new and churning subscribers of each wireless communication network. The data shown in Figure 32 is taken at a particular time period later than Figure 31. The data mining application first identifies which subscribers are new subscribers and which subscribers are churning using a similar process to that described earlier when determining the number and share of added and churning subscribers. The data mining application identifies the number of new subscribers added by over a particular time period by each wireless

communication network by comparing a list of unique subscriber identifiers of the particular time period to a prior time period and counting the number of unique subscriber identifiers that do not appear in the prior period. Similarly, the number of subscribers for each wireless communication network who discontinued their service at the end of a prior time period is approximated by comparing a list of the unique subscriber identifiers of the particular time period to the prior time period and counting the number of unique subscriber identifiers that appear in the prior time period, but not the present time period.

Sample data excerpted from a particular time period in which it is desired to calculate the number of new and dropped subscribers is shown in Figure 32. The data mining applications sorts through the raw data of Figure 32 and generates a list of different subscriber identifiers for each wireless communication network. The data mining application then sorts through the raw data of a prior time period, shown in Figure 31, and generates a list of different subscribers for each wireless communication network. These lists are compared to identify the new subscribers appearing in the particular time period but not the prior time period and to identify the churning subscribers appearing in the prior time period, but not the particular time period. The comparison of these two lists is shown in Figure 33.

To calculate the quality of new subscribers for each wireless communication network, the data mining application re-sorts the data in Figure 32, counting the number of traffic channel assignments made to the new subscribers identified from the data in Figure 33 for each wireless communication network. The results of this data sort are shown in Figure 34. This data is further sorted by number of traffic channel assignments to produce a list of new subscribers with the highest number of traffic channel assignments listed first and the new subscribers with the lowest number of traffic channel assignments listed last.

Figure 35 shows such a data sort of the data found in Figure 34. In the presently preferred embodiment, this list is divided into quartiles based on the number of traffic channel assignments made. For each quartile, the number of new subscribers for each wireless communication network is counted. Figure 36 shows such a data sort of the data found in Figure 35. For each quartile, the market share percentage of new subscribers for each wireless communication network is calculated by dividing the number of new subscribers for each wireless communication network by the total number of new subscribers for all wireless communication networks in the quartile. Figure 37 shows sample market share percentage calculations for new subscribers for the data found in Figure 36.

To calculate the quality of churning subscribers for each wireless communication network, the data mining application re-sorts the data in Figure 31, counting the number of traffic channel assignments made to the churning subscribers identified from the data in Figure 33 for each wireless communication network. The results of this data sort are shown in Figure 38. This data is further sorted by number of traffic channel assignments to produce a list of churning subscribers with the highest number of traffic channel assignments listed first and the new subscribers with the lowest number of traffic channel assignments listed last. Figure 39 shows such a data sort of the data found in Figure 38. In the presently preferred embodiment, this list is divided into quartiles based on the number of traffic channel assignments made. For each quartile, the number of churning subscribers for each wireless communication network is counted. Figure 40 shows such a data sort of the data found in Figure 39. For each quartile, the market share percentage of churning subscribers for each wireless communication network is calculated by dividing the number of churning subscribers for each wireless communication network by the total number of churning subscribers for all wireless communication networks in the quartile. Figure 41

shows sample market share percentage calculations for churning subscribers for the data found in Figure 40.

The data mining application calculates the peak and non-peak call share for each wireless communication network by first generating a peak/non-peak call share gross-up factor that accounts for data that is missed by the data gathering nodes (120). This process is the same as that performed in calculating the call share gross-up factor shown in Figure 24 since the proportion of calls missed during peak and non-peak periods is proportional to the number of calls missed. The data mining application sorts through the baselining period raw data shown in Figure 6 and generates a list counting the number of traffic channel assignments made, which correspond to subscriber calls. This data sort is compared to a list of actual traffic channel assignments generated from data received from service providers to determine how many calls the data gathering nodes missed. The comparison of these two lists is shown in Figure 43. The peak/non-peak call share gross-up coefficient is calculated by dividing the number of actual traffic channel assignments made by the measured number of traffic channel assignments made.

The number of traffic channel assignments made during peak and non-peak hours for each wireless communication network is multiplied by the corresponding peak/non-peak call share gross-up coefficient for each wireless communication network to generate an extrapolated number of traffic channel assignments during peak and non-peak hours for each wireless communication network. The share of calls made during peak and non-peak hours for each wireless communication network is generated by dividing the extrapolated number of peak and non-peak traffic channel assignments made for each wireless communication network by the total number of extrapolated peak and non-peak traffic channel assignments for all wireless communication networks. Figure 42 is a sample

excerpt of a data file from which peak and non-peak call information is to be generated.

Figure 44 shows the data sort of Figure 42 counting the number of peak and non-peak

traffic channel assignments made for each wireless communication network. Peak hours

are defined to be between the hours of 07:00 and 19:00 whereas non-peak hours are defined

to be between the hours of 19:00 and 07:00. Figure 45 shows the extrapolation of the

number of traffic channel assignments made during peak and non-peak hours for each

wireless communication network and the calculation of peak and non-peak call share for

each wireless communication network. Also shown in Figure 45 is the calculation of peak

and non-peak call share for each wireless communication network excluding all roamer

calls.

The data mining application calculates the incoming and outgoing call share for

each wireless communication network by first generating an incoming/outgoing call share

gross-up coefficient that accounts for data that is missed by the data gathering nodes (120).

This incoming/outgoing call share gross-up coefficient is equal to the value of the call share

and peak/non-peak call share gross-up coefficient.

Figure 46 is a sample excerpt of a data file from which incoming and outgoing call

share information is to be generated. The data mining application sorts the data file shown

in Figure 46 and identifies the traffic channel assignments and pages for each wireless

communication network. To identify which traffic channel assignments are incoming calls

and which are outgoing calls, the data mining application sorts the file shown in Figure 47,

identifying which traffic channel assignments are immediately preceded within 2 to 4

seconds by a page to the same subscriber. These traffic channel assignments are classified

as incoming calls, and all other traffic channel assignments are classified as outgoing. Any

traffic channel assignments during the first three seconds of the file data gathering period

are not considered because it is unknown whether there was a corresponding page to these traffic channel assignments. The results of this data sort identifying incoming and outgoing calls are shown in Figure 48.

The number of incoming and outgoing call traffic channel assignments made during peak and non-peak hours for each wireless communication network is multiplied by the corresponding incoming/outgoing call share gross-up coefficient for each wireless communication network to generate an extrapolated number of incoming and outgoing call traffic channel assignments for each wireless communication network. The share of incoming and outgoing calls for each wireless communication network is generated by dividing the extrapolated number of incoming and outgoing calls for each wireless communication network by the total number of incoming and outgoing calls for all wireless communication networks. Figure 49 shows the extrapolation of the number of incoming and outgoing call traffic channel assignments for each wireless communication network and the calculation of incoming and outgoing call share for each wireless communication network. Also shown in Figure 49 is the calculation of incoming and outgoing call share for each wireless communication network excluding all roamer calls.

In markets where a service provider operates both an analog wireless communication network and a digital wireless communication network, dual mode cell phones are often issued to subscribers which can operate on either the analog or digital networks. When either an incoming call is received or outgoing call is made, the forward control channel either assigns a digital or analog traffic channel, depending on network capacity at the time of the call. Dual mode users can be identified from the gathered data since traffic channel assignments for the same subscriber will be present in both the analog and digital wireless communication networks for a service provider. The data mining

application can determine the share of analog and digital traffic channel assignments made to a subscriber by counting the number of analog and digital traffic channel assignments made and dividing each by the total number of traffic channel assignments made.

5 The data gathered and the market share and usage characterization information generated by the data mining application of the present invention has many practical applications for wireless communication network service providers. The information allows service providers to (1) tailor their sales and marketing expenditures toward this customer base, (2) evaluate the success of pricing, promotions, and advertising programs introduced within a market, (3) quantitatively compare themselves to competitors, and (4) 10 better understand the utilization patterns of the customer base within a region, such as at new cell site locations. On a regional or national level, comparisons can be made between competing service providers on a broader geographic basis encompassing several cities, or to track usage in new PCS markets or high subscriber growth cities. The area code and first three digits of subscriber MINS can be correlated to zip codes, thus allowing the number of 15 existing, churning, and new subscribers in each zip code of a region for each service provider to be determined. This allows each service provider to identify areas in which they are weak and where additional sales and marketing efforts are required. Population demographics based on zip codes can be used to characterize and understand the demographics of the subscribers for each service provider, thus enabling service providers 20 to design their sales and marketing efforts with particular demographic groups in mind.

If the public key of the private/public key pair used to encrypt the subscriber MINS is provided to a service provider along with the unique subscriber identifiers for its own customers, the service provider can decrypt the unique subscriber identifiers into subscriber MINS. The data gathered by the present invention on a particular service provider can then

be utilized by that service provider in a variety of ways. A service provider can compare the gathered data to their internal records to verify proper billing and identify and track fraud. The present invention can also be used by service providers in conducting functionality tests of their systems, such as whether pages are being properly sent by a network. The data gathered from the present information can also be used by service providers to track individual subscriber usage patterns, such as time, day, and location of calls. Individual subscriber usage can also be tracked over a period of time to provide a profile and identify trends in usage. For example, usage can be tracked by season to identify seasonal trends, or drastic changes in usage by a subscriber can be identified. Tracking individual subscriber usage patterns allows service providers to identify or generate pricing plans most appropriate for an individual subscriber, thereby enhancing subscriber satisfaction and retention.

While the present invention has been particularly described with respect to the illustrated embodiments, it will be appreciated that various alterations, modifications and adaptations may be made based on the present disclosure, and are intended to be within the scope of the present invention. While the invention has been described in connection with what are presently considered to be the most practical and preferred embodiments, it is to be understood that the present invention is not limited to the disclosed embodiment but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the scope of the appended claims.

CLAIMS

1. A system for gathering data from a plurality of wireless communication networks, said system comprising:

5 a plurality of data gathering nodes, each data gathering node of said plurality of data gathering nodes comprising;

an antenna system; and

10 a plurality of receivers tuned to gather data from the plurality of wireless communication networks, each receiver of said plurality of receivers coupled to said antenna; and

a control center coupled to said plurality of data gathering nodes, said control center processing data received from said plurality of data gathering nodes.

- 15 2. The system of claim 1 wherein each data gathering node of said plurality of data gathering nodes further comprises a local processor and storage device, coupled to said plurality of receivers.

3. The system of claim 1 further comprising a network linkage coupled between said plurality of receivers and said control center, said network linkage sending stored data
20 from said plurality of receivers to said control center.

4. The system of claim 3 wherein said network linkage comprises a modem.

5. The system of claim 1 wherein said plurality of receivers comprise N receivers, where N is an integer greater than one and equal to the number of wireless communication networks from which data is being gathered, and wherein each receiver at a data
25 gathering node gathers data from a wireless communication network that is different from other wireless communication networks from which data is gathered by other receivers of said data gathering node.

6. The system of claim 1 wherein the control center further comprises a relational database for storing data gathered by said plurality of data gathering nodes.
7. The system of claim 6 wherein said relational database utilizes event type, cell location, market location, carrier location, and frequency band relational tables to cross-reference index value meanings in a user information table for each event.
8. The system of claim 1 further comprising an offline storage media for archiving and backup of the data gathered by said plurality of data gathering nodes.
9. The system of claim 1 further comprising a data mining application that processes the data gathered by said plurality of data gathering nodes to produce marketing and usage characterization information useful for wireless communication network service providers to determine their relative strengths and weaknesses to other wireless communication network service providers.
10. The system of claim 9 wherein said marketing and usage characterization information produced comprises information on subscriber share, call share, number of new subscribers, and number of churning subscribers for each wireless communication network of the plurality of wireless communication networks.
11. The system of claim 1, wherein said control center transmits instructions modifying receiver data gathering settings to each receiver of said plurality of receivers.
12. In a plurality of wireless communication networks, each wireless communication network of said plurality of wireless communication networks comprising a layout of cell sites divided into location areas that overlap the cell layout of each other wireless communication network in a given geographic area, the system of claim 1 wherein:
 - at least one data gathering node of said plurality of data gathering nodes is placed in a different location area of each wireless communication network of said plurality of wireless communication networks allowing it to gather data from a group of cell sites; and

each data gathering node gathers data for a time period from a first cell in a cell group of each wireless communication network, then gathers data for a time period from a second cell in a cell group of each wireless communication network, and then gathers data for a time period from each cell in a cell group of each wireless communication network until data has been gathered for all cells in a cell group of each wireless communication network.

13. The system of claim 1 wherein said data gathering nodes are fixed, transportable, or a combination of fixed and transportable.

14. The system of claim 1 wherein each receiver of said plurality of receivers encrypts portions of the data gathered by each receiver of said plurality of receivers into unique subscriber identifiers to protect subscriber identities.

15. The system of claim 1 wherein each receiver of said plurality of receivers generates a unique subscriber identifier for each different subscriber from the RF fingerprint of the signal received.

16. The system of claim 1 wherein each receiver of said plurality of receivers filters the data that said receiver has gathered to remove private or extraneous data before sending the data to said control center.

17. The system of claim 2 wherein said local processor encrypts portions of the data gathered by said plurality of receivers into unique subscriber identifiers prior to storage at said storage device.

18. A system for gathering data from a plurality of wireless communication networks, said system comprising:

A means for gathering data from a plurality of geographic locations in a plurality of wireless communication networks, said means comprising;

means for receiving electromagnetic energy at each cell group of said plurality of cell groups; and

means for gathering data from a plurality of wireless communication networks at each cell group of said plurality of cell groups; and

means for storing the data gathered from said plurality of geographic locations.

5 19. The system of claim 18 further comprising a means for processing the data gathered from said plurality of geographic locations to produce marketing and usage characterization information.

20. A method for gathering data from a plurality of wireless communication networks comprising the steps of:

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deploying a plurality of data gathering nodes at various geographic locations in a plurality of wireless communication networks;

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gathering data at said plurality of data gathering nodes from each wireless communication network of said plurality of wireless communication networks; and

processing the data at a control center.

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21. The method of claim 20, wherein said step of processing the data at a control center comprises eliminating redundant pages to the same subscriber to reduce storage space and analysis processing time.

22. The method of claim 21 wherein eliminating redundant pages to the same subscriber comprises the steps:

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sorting through the gathered data from said plurality of data gathering nodes;

identifying pages to a same subscriber occurring within a pre-determined time period from each other; and

30

eliminating all of said pages except one.

23. The method of claim 20 further comprising the step of using a data mining application to process the data gathered by said plurality of data gathering nodes to produce marketing and usage characterization information.

24. The method of claim 20, wherein said step of deploying a plurality of data gathering nodes at various geographic locations in a plurality of wireless communication networks comprises the steps of placing at least one data gathering node of said plurality of data gathering nodes in each location area of each wireless communication network of said plurality of wireless communication networks.

25. The method of claim 24, wherein said step of gathering data at said plurality of data gathering nodes comprises the step of at each data gathering node of said plurality of data gathering nodes, simultaneously gathering data from each location area of each wireless communication network of said plurality of wireless communication networks.

26. The method of claim 24, wherein said step of gathering data at said plurality of data gathering nodes comprises the steps of:

at each data gathering node of said plurality of data gathering nodes, employing a sampling algorithm to gather data from a cell group of each wireless communication network of said plurality of wireless communication networks; and

simultaneously employing said sampling algorithm at all data gathering nodes of said plurality of data gathering nodes to gather data from each location area of said plurality of wireless communication networks.

27. The method of claim 26, wherein said sampling algorithm to gather data from a cell group of each wireless communication network, comprising the steps of:

monitoring the channel assignment of a first cell base station for a time period for each wireless communication network;

changing the monitoring frequency to monitor the channel assignment of a second cell base station for a time period for each wireless communication network; and

changing the monitoring frequency to monitor the channel assignment of the base station of each of N cells for a time period for each wireless communication network, where N equals the number of cells in each cell group of the data gathering node and is not necessarily equal for each wireless communication network.

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28. The method of claim 20, wherein all of the cells of said plurality of wireless communication networks is sampled.

29. The method of claim 23, wherein said step of processing the data at said control center to produce marketing information on each wireless communication network of said plurality of wireless communication networks comprises calculating the share of subscribers for each wireless communication network for a given time period.

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30. The method of claim 29, wherein said method of calculating the share of subscribers for each wireless communication network of said plurality of wireless communication networks for a given time period comprises:

15

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and counting a base number of different unique subscriber identifiers for each wireless communication network of said plurality of wireless communication networks;

20

extrapolating the base number of different unique subscriber identifiers for each wireless communication network to an adjusted number of unique subscriber identifiers;

25

summing the number of adjusted unique subscriber identifiers counted for each wireless communication network of said plurality of wireless communication networks to produce a total number of subscribers for said plurality of wireless communication networks; and

30

dividing the number of adjusted unique subscriber identifiers for each wireless communication network of said plurality of wireless communication networks by

said total number of subscribers for said plurality of wireless communication networks.

31. The method of claim 23, wherein said step of processing the data at said control center to produce marketing information on each wireless communication network of said plurality of wireless communication networks comprises calculating the number of new subscribers each wireless communication network added during a given time period.

32. The method of claim 31, wherein said step of calculating the number of new subscribers for each wireless communication network added during a given time period comprises:

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and generating a list of unique subscriber identifiers;

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during a prior time period and generating a list of unique subscriber identifiers;

comparing the list of unique subscriber identifiers for the given time period to the prior time period and counting the number of new unique subscriber identifiers that appear in the given time period but not the prior time period; and

extrapolating said number of new unique subscriber identifiers to an adjusted number of new unique subscriber identifiers.

33. The method of claim 23, wherein said step of processing the data at said control center to produce marketing information on each wireless communication network of said plurality of wireless communication networks comprises calculating the number of churning subscribers who canceled service for each wireless communication network during a given time period.

34. The method of claim 33, wherein said step of calculating the number of churning subscribers who canceled service for each wireless communication network during a given time period comprises:

5 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during a prior time period and generating a list of unique subscriber identifiers;

10 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and generating a list of unique subscriber identifiers;

15 comparing the list of unique subscriber identifiers for the prior time period to the given time period and counting the number of churning unique subscriber identifiers that appear in the prior time period but not the given time period; and

extrapolating said number of churning subscribers to an adjusted number of churning subscribers.

20 35. The method of claim 23, wherein said step of processing the data at said control center to produce marketing information on each wireless communication network of said plurality of wireless communication networks comprises calculating the share of calls made by subscribers of each wireless communication network for a given time period.

25 36. The method of claim 35, wherein said step of calculating the share of subscriber calls made for each wireless communication network for a given time period comprises:

30 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and counting the number of traffic channel assignments made by each wireless communication network of said plurality of wireless communication networks;

extrapolating said number of counted traffic channel assignments to a total number of subscriber calls for the given time period for each wireless communication network;

5

summing the total number of subscriber calls extrapolated for the given time period for each wireless communication network of said plurality of wireless communication networks to produce a total number of subscribers calls for said plurality of wireless communication networks; and

10

dividing said total number of subscriber calls for each wireless communication network of said plurality of wireless communication networks by said total number of calls for said plurality of wireless communication networks.

15

37. The method of claim 36 wherein the number of traffic channel assignments counted does not include traffic channel assignments made to roaming subscribers.

38. The method of claim 23, wherein said step of processing the data at said control center to produce marketing information on each wireless communication network of said plurality of wireless communication networks comprises calculating the share of roamers of each wireless communication network for a given time period.

20

39. The method of claim 38, wherein said step of calculating the share of roamers for each wireless communication network for a given time period comprises:

25

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and counting a base number of roamers for each wireless communication network of said plurality of wireless communication networks;

30

extrapolating the base number of roamers for each wireless communication network to an adjusted number of roamers;

summing the number of adjusted roamers for each wireless communication network of said plurality of wireless communication networks to produce a total number of roamers for said plurality of wireless communication networks; and

5

dividing the adjusted number of roamers for each wireless communication network of said plurality of wireless communication networks by said total number of subscribers for said plurality of wireless communication networks.

10

40. The method of claim 23, wherein said step of processing the data at said control center to produce marketing information on each wireless communication network of said plurality of wireless communication networks comprises profiling the quality of subscribers for each wireless communication network.

15

41. The method of claim 40 wherein said type of subscribers comprise new, churning, and base subscribers.

42. The method of claim 40, wherein said step of profiling the quality of subscribers for each wireless communication network for a given time period comprises:

20

sorting through the data gathered from each data gathering node and identifying the different unique subscriber identifiers corresponding to the type of subscriber to be profiled for each wireless communication network;

25

counting the number of traffic channel assignments made to each said unique subscriber identifier;

counting the total number of said different unique subscriber identifiers for all wireless communication networks;

dividing said total number for all wireless communication networks into subunits according to the number of traffic channel assignments made; and

for each subunit, calculating the market share percentage of number of subscribers for each wireless communication network in the subunit.

43. The method of claim 23, wherein said step of processing the data at said control center to produce marketing information on each wireless communication network of said plurality of wireless communication networks comprises calculating the share of calls for each wireless communication network during a given time period.

44. The method of claim 43, wherein said step of calculating the share of calls for each wireless communication network during a given time period comprises:

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and counting a base number of traffic channel assignments made for each wireless communication network of said plurality of wireless communication networks during a given time period;

extrapolating the base number of traffic channel assignments for each wireless communication network during said time period to an adjusted number traffic channel assignments;

summing the number of adjusted traffic channel assignments during said time period for each wireless communication network of said plurality of wireless communication networks to produce a total number of traffic channel assignments during said period for said plurality of wireless communication networks; and

dividing the adjusted number of traffic channel assignments during said time period for each wireless communication network of said plurality of wireless communication networks by said total number of traffic channel assignments for said plurality of wireless communication networks.

45. The method of claim 23, wherein said step of processing the data at said control center to produce marketing information on each wireless communication network of said plurality of wireless communication networks comprises calculating the share of incoming and outgoing calls for each wireless communication network.

5 46. The method of claim 45, wherein said step of calculating the share of incoming and outgoing calls for each wireless communication network during a given time period comprises:

10 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes and identifying each traffic channel assignment for each wireless communication network of said plurality of wireless communication networks;

15 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes and identifying each page for each wireless communication network of said plurality of wireless communication networks;

20 identifying which traffic channel assignments are incoming calls by sorting through said traffic channel assignments and pages and identifying which traffic channel assignments are immediately preceded by a page to the same subscriber.

25 counting a base number of incoming calls for each wireless communication network of said plurality of wireless communication networks by counting the number of traffic channel assignments immediately preceded by a page to the same subscriber;

counting a base number of outgoing calls for each wireless communication network of said plurality of wireless communication networks by counting the number of traffic channel assignments not immediately preceded by a page to the same subscriber

30 extrapolating the base number of incoming and outgoing calls for each wireless communication network to an adjusted number of incoming and outgoing calls;

summing the number of incoming calls for each wireless communication network of said plurality of wireless communication networks to produce a total number of incoming calls for said plurality of wireless communication networks;

5

dividing the adjusted number of incoming calls for each wireless communication network of said plurality of wireless communication networks by said total number of incoming calls for said plurality of wireless communication networks.

10

summing the number of outgoing calls for each wireless communication network of said plurality of wireless communication networks to produce a total number of outgoing calls for said plurality of wireless communication networks;

15

dividing the adjusted number of outgoing calls for each wireless communication network of said plurality of wireless communication networks by said total number of outgoing calls for said plurality of wireless communication networks.

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47. The method of claim 23, wherein said step of processing the data at said control center to produce marketing information on each wireless communication network of said plurality of wireless communication networks comprises identifying dual mode subscribers of analog and wireless communication networks operated by the same service provider.

25

48. The method of claim 47, wherein said step of identifying dual mode subscribers of analog and wireless communication networks operated by the same service provider comprises:

sorting through the data gathered from a service provider analog wireless communication network and identifying traffic channel assignments;

30

sorting through the data gathered from said service provider digital wireless communication network and identifying traffic channel assignments; and

identifying traffic channel assignments made to the same subscriber appearing in both the analog and digital wireless communication networks.

49. The method of claim 23, wherein said step of processing the data at said control center to produce marketing information on each wireless communication network of said plurality of wireless communication networks comprises identifying new subscribers of a wireless communication network who are churning subscribers from a different wireless communication network.

50. The method of claim 49, wherein said step of identifying new subscribers of a wireless communication network who are churning subscribers from a different wireless communication network comprises:

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and generating a list of unique subscriber identifiers;

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during a prior time period and generating a list of unique subscriber identifiers;

comparing the list of unique subscriber identifiers for the given time period to the prior time period and identifying the new unique subscriber identifiers that appear in the given time period but not the prior time period; and

comparing said new unique subscriber identifiers to a list of unique subscriber identifiers for each different wireless communication network and identifying which said unique subscriber identifiers appear on said list of unique subscriber identifiers of a different wireless communication network.

51. A method for gathering data at a data gathering node comprising the steps of:

scanning readable control channels and their corresponding cell site identification;

measuring the approximate signal strength of each control channel;

deciding which channels of said readable control channels data will be gathered from; and

5

gathering data from said channels.

52. A method for processing a data file gathered from a plurality of wireless communication networks to calculate the share of subscribers for each wireless communication network for a given time period, said method comprising the steps of:

10 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and counting a base number of different unique subscriber identifiers for each wireless communication network of said plurality of wireless communication networks;

15 extrapolating the base number of different unique subscriber identifiers for each wireless communication network to an adjusted number of unique subscriber identifiers;

20 summing the number of adjusted unique subscriber identifiers counted for each wireless communication network of said plurality of wireless communication networks to produce a total number of subscribers for said plurality of wireless communication networks; and

25 dividing the number of adjusted unique subscriber identifiers for each wireless communication network of said plurality of wireless communication networks by said total number of subscribers for said plurality of wireless communication networks.

53. A method for processing a data file gathered from a plurality of wireless communication networks to calculate the number of new subscribers each wireless

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communication network added during a given time period, said method comprising the steps of:

5 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and generating a list of unique subscriber identifiers;

10 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during a prior time period and generating a list of unique subscriber identifiers;

15 comparing the list of unique subscriber identifiers for the given time period to the prior time period and counting the number of new unique subscriber identifiers that appear in the given time period but not the prior time period; and

20 extrapolating said number of new unique subscriber identifiers to an adjusted number of new unique subscriber identifiers.

54. A method for processing a data file gathered from a plurality of wireless communication networks to calculate the number of churning subscribers who canceled service for each wireless communication network during a given time period, said method comprising the steps of:

25 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during a prior time period and generating a list of unique subscriber identifiers;

30 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and generating a list of unique subscriber identifiers;

35 comparing the list of unique subscriber identifiers for the prior time period to the given time period and counting the number of churning unique subscriber identifiers that appear in the prior time period but not the given time period; and

extrapolating said number of churning subscribers to an adjusted number of churning subscribers.

5 55. A method for processing a data file gathered from a plurality of wireless communication networks to calculate the share of subscriber calls made for each wireless communication network for a given time period, said method comprising the steps of:

10 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and counting the number of traffic channel assignments made by each wireless communication network of said plurality of wireless communication networks;

15 extrapolating said number of counted traffic channel assignments to a total number of subscriber calls for the given time period for each wireless communication network;

20 summing the total number of subscriber calls extrapolated for the given time period for each wireless communication network of said plurality of wireless communication networks to produce a total number of subscribers calls for said plurality of wireless communication networks; and

25 dividing said total number of subscriber calls for each wireless communication network of said plurality of wireless communication networks by said total number of calls for said plurality of wireless communication networks.

56. A method for processing a data file gathered from a plurality of wireless communication networks to calculate the share of roamers for each wireless communication network for a given time period, said method comprising the steps of:

30 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and counting a base number of

roamers for each wireless communication network of said plurality of wireless communication networks;

extrapolating the base number of roamers for each wireless communication network to an adjusted number of roamers;

summing the number of adjusted roamers for each wireless communication network of said plurality of wireless communication networks to produce a total number of roamers for said plurality of wireless communication networks; and

dividing the adjusted number of roamers for each wireless communication network of said plurality of wireless communication networks by said total number of subscribers for said plurality of wireless communication networks.

57. A method for processing a data file gathered from a plurality of wireless communication networks to profile the quality of subscribers for each wireless communication network for a given time period, said method comprising the steps of:
- sorting through the data gathered from each data gathering node and identifying the different unique subscriber identifiers corresponding to the type of subscriber to be profiled for each wireless communication network;
- counting the number of traffic channel assignments made to each said unique subscriber identifier;
- counting the total number of said different unique subscriber identifiers for all wireless communication networks;
- dividing said total number for all wireless communication networks into subunits according to the number of traffic channel assignments made; and
- for each subunit, calculating the market share percentage of number of subscribers for each wireless communication network in the subunit.

58. The method of claim 57 wherein said type of subscribers comprise new, churning, and base subscribers.

59. A method for processing a data file gathered from a plurality of wireless communication networks to calculate the share of calls for each wireless communication network during a given time period, said method comprising the steps of:

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sorting through the data gathered from each data gathering node of said plurality of data gathering nodes and counting a base number of traffic channel assignments made for each wireless communication network of said plurality of wireless communication networks during a given time period;

15

extrapolating the base number of traffic channel assignments for each wireless communication network during said time period to an adjusted number traffic channel assignments;

20

summing the number of adjusted traffic channel assignments during said time period for each wireless communication network of said plurality of wireless communication networks to produce a total number of traffic channel assignments during said period for said plurality of wireless communication networks; and

25

dividing the adjusted number of traffic channel assignments during said time period for each wireless communication network of said plurality of wireless communication networks by said total number of traffic channel assignments for said plurality of wireless communication networks.

60. A method for processing a data file gathered from a plurality of wireless communication networks to determine whether traffic channel assignments correspond to incoming or outgoing calls, said method comprising the steps of:

30

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes and identifying each traffic channel assignment for each wireless communication network of said plurality of wireless communication networks;

5

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes and identifying each page for each wireless communication network of said plurality of wireless communication networks; and

10

identifying which traffic channel assignments are incoming calls by sorting through said traffic channel assignments and pages and identifying which traffic channel assignments are immediately preceded by a page to the same subscriber.

61. A method for processing a data file gathered from a plurality of wireless

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communication networks to calculate the share of incoming and outgoing calls for each wireless communication network, said method comprising the steps of:

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes and identifying each traffic channel assignment for each wireless communication network of said plurality of wireless communication networks;

20

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes and identifying each page for each wireless communication network of said plurality of wireless communication networks;

25

identifying which traffic channel assignments are incoming calls by sorting through said traffic channel assignments and pages and identifying which traffic channel assignments are immediately preceded by a page to the same subscriber;

30

counting a base number of incoming calls for each wireless communication network of said plurality of wireless communication networks by counting the number of traffic channel assignments immediately preceded by a page to the same subscriber;

5 counting a base number of outgoing calls for each wireless communication network of said plurality of wireless communication networks by counting the number of traffic channel assignments not immediately preceded by a page to the same subscriber;

extrapolating the base number of incoming and outgoing calls for each wireless communication network to an adjusted number of incoming and outgoing calls;

10 summing the number of incoming calls for each wireless communication network of said plurality of wireless communication networks to produce a total number of incoming calls for said plurality of wireless communication networks;

dividing the adjusted number of incoming calls for each wireless communication network of said plurality of wireless communication networks by said total number of incoming calls for said plurality of wireless communication networks;

15

summing the number of outgoing calls for each wireless communication network of said plurality of wireless communication networks to produce a total number of outgoing calls for said plurality of wireless communication networks; and

20

dividing the adjusted number of outgoing calls for each wireless communication network of said plurality of wireless communication networks by said total number of outgoing calls for said plurality of wireless communication networks.

25

62. A method for identifying new subscribers of a wireless communication network who are churning subscribers from a different wireless communication network, said method comprising the steps of:

30 sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during the given time period and generating a list of unique subscriber identifiers;

sorting through the data gathered from each data gathering node of said plurality of data gathering nodes during a prior time period and generating a list of unique subscriber identifiers;

5

comparing the list of unique subscriber identifiers for the given time period to the prior time period and identifying the new unique subscriber identifiers that appear in the given time period but not the prior time period; and

10

comparing said new unique subscriber identifiers to a list of unique subscriber identifiers for each different wireless communication network and identifying which said unique subscriber identifiers appear on said list of unique subscriber identifiers of a different wireless communication network.

15

63. A method for identifying dual mode subscribers of analog and wireless communication networks operated by the same service provider, comprising the steps of:

20

sorting through the data gathered from a service provider analog wireless communication network and identifying traffic channel assignments;

sorting through the data gathered from said service provider digital wireless communication network and identifying traffic channel assignments; and

25

identifying traffic channel assignments made to a same subscriber appearing in both the analog and digital wireless communication networks.

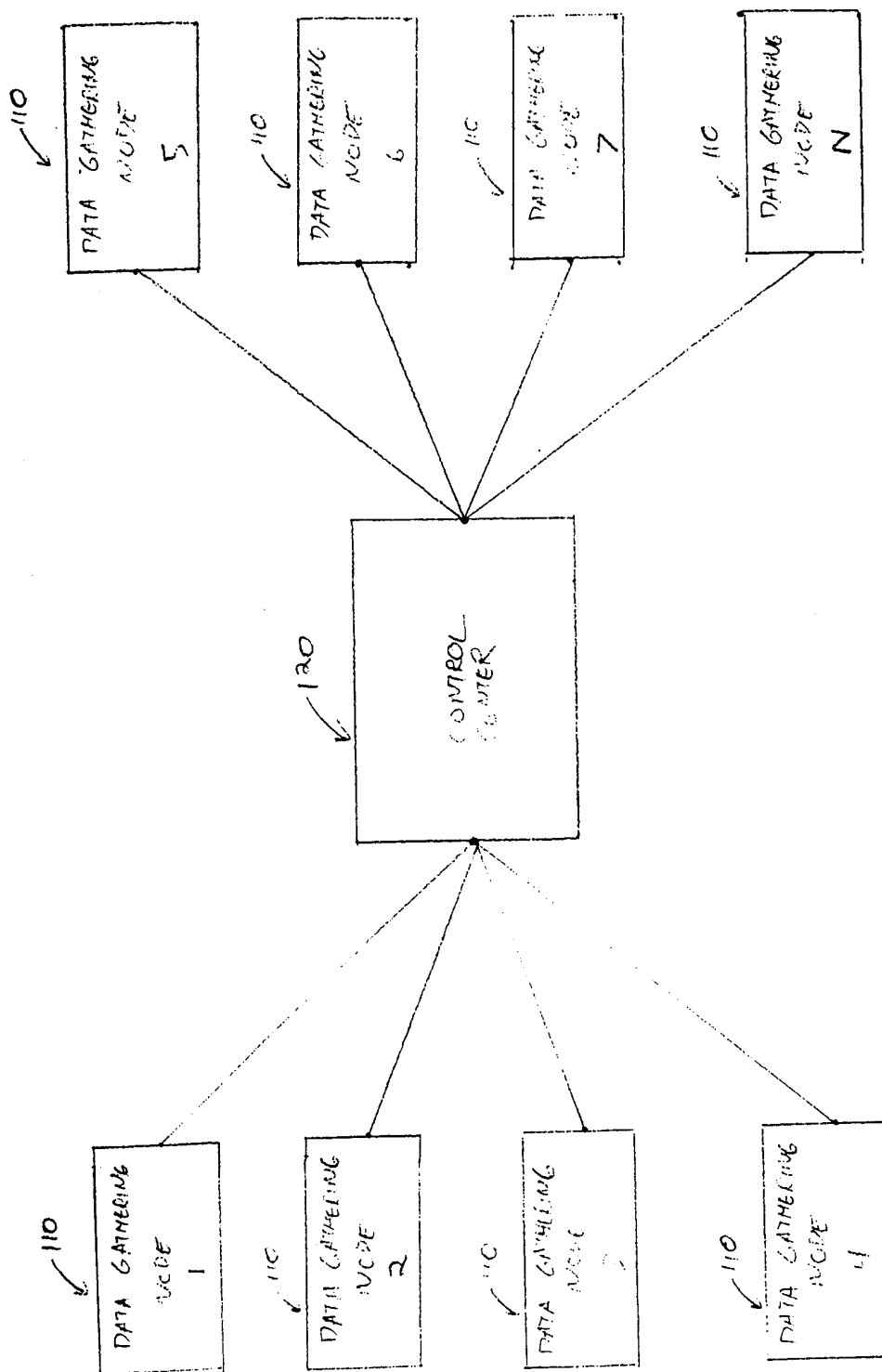


FIGURE 1.

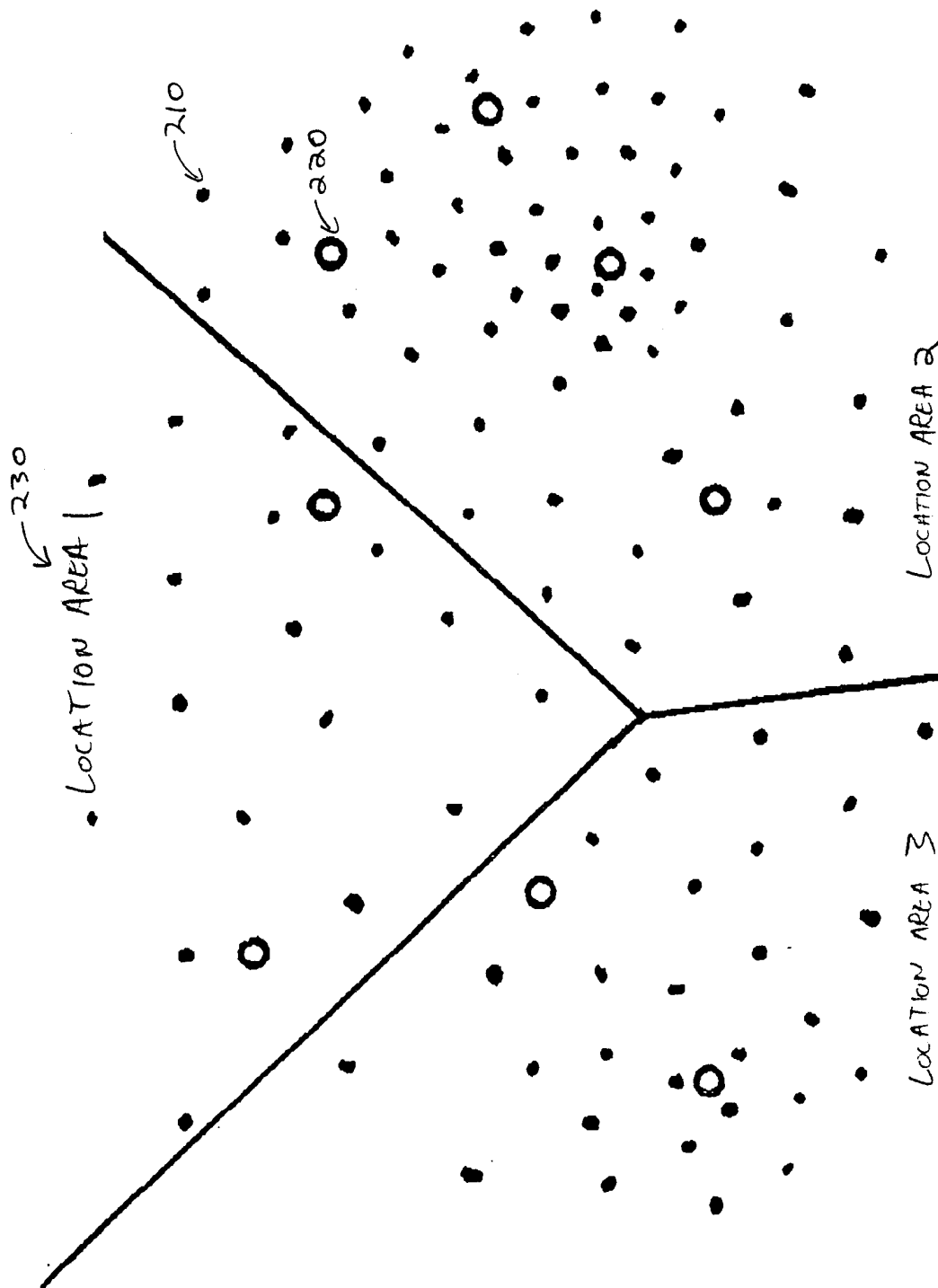


FIGURE 2.

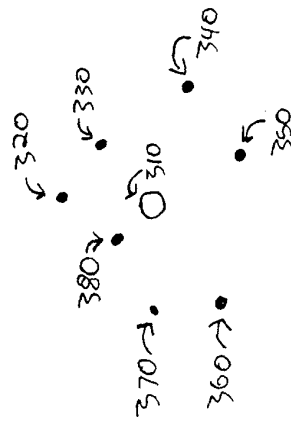


FIGURE 3

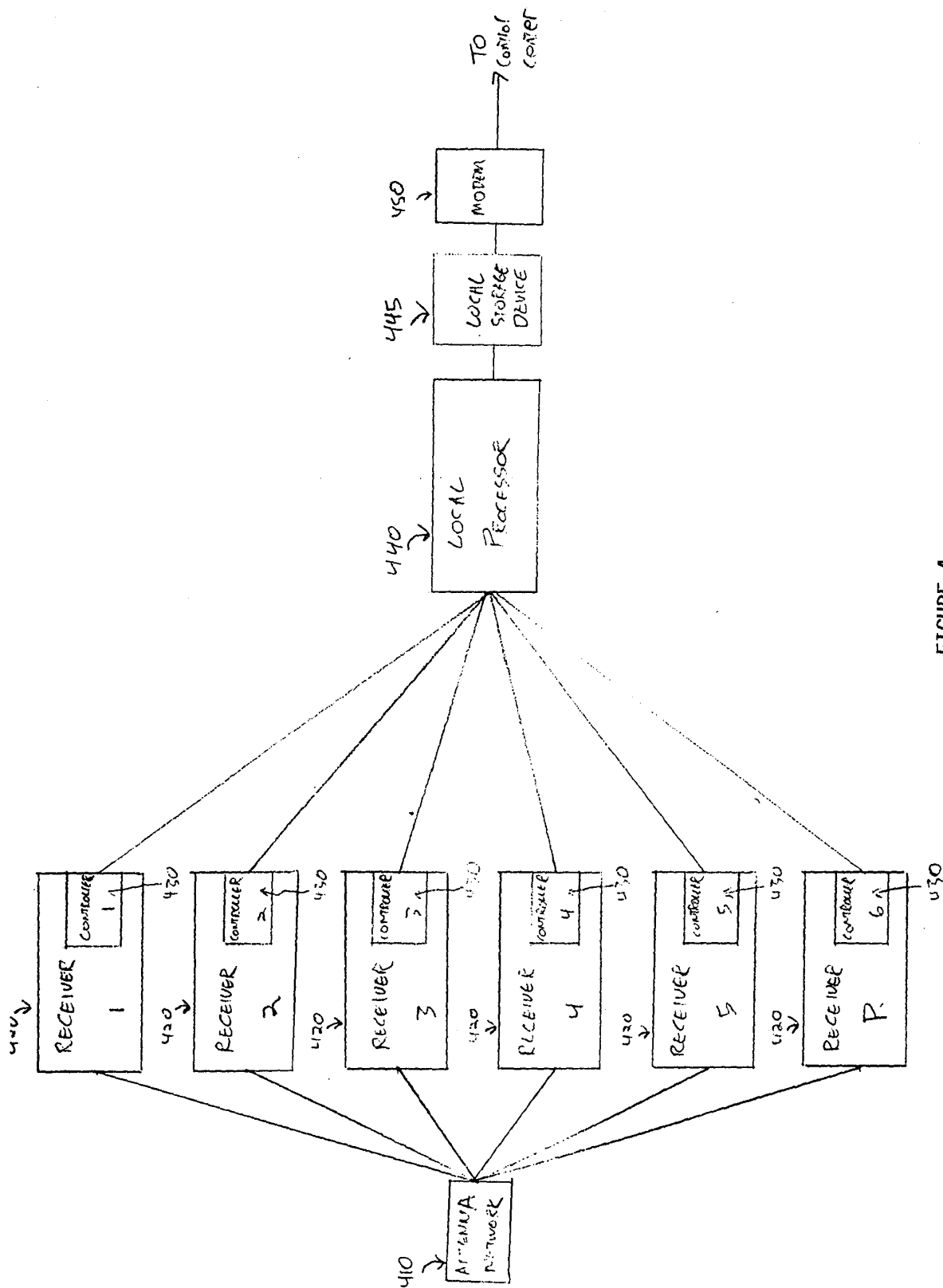


FIGURE 4

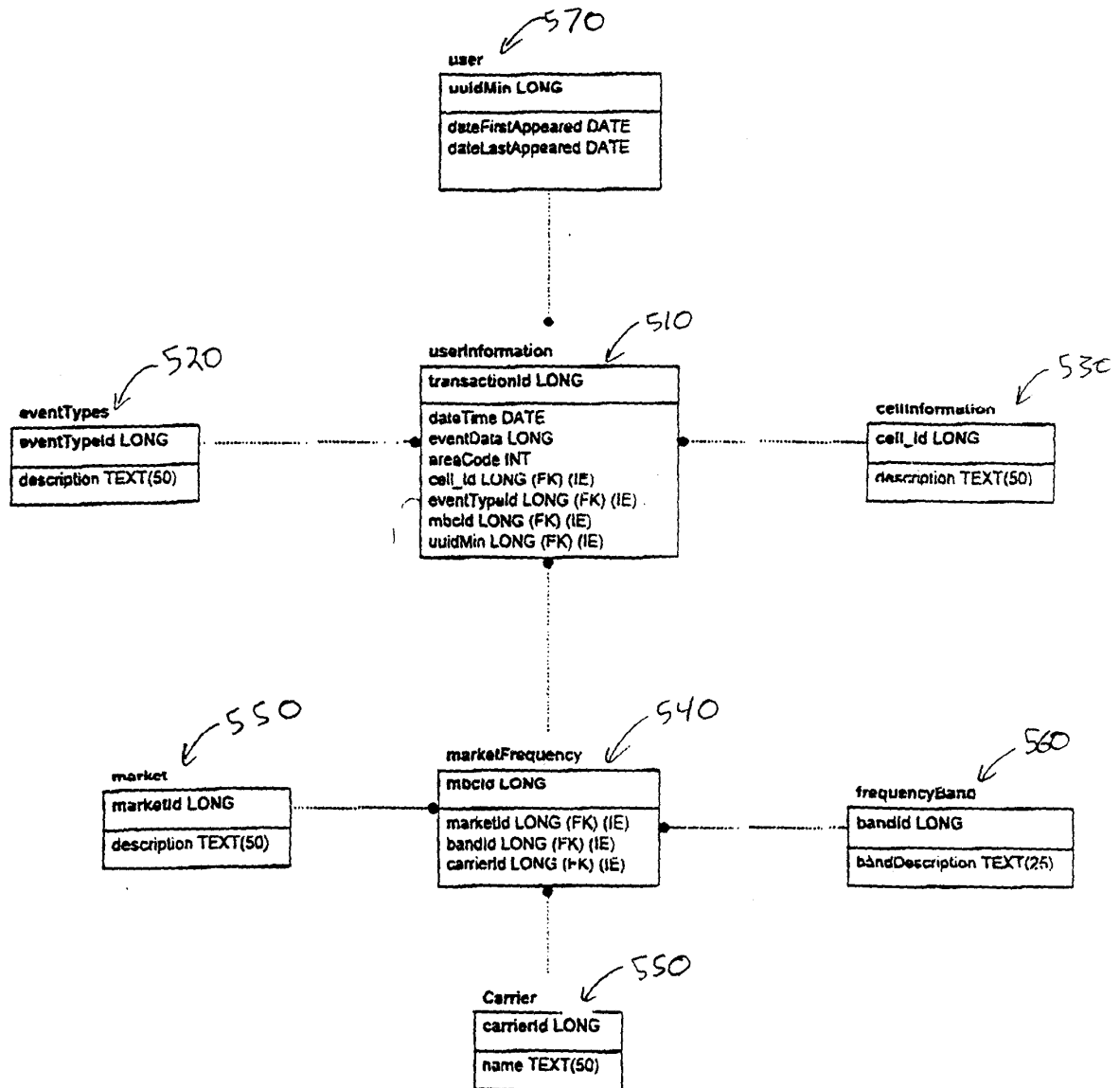


FIGURE 5

BASELINING PERIOD RAW DATA

Date	Time	Area code	User ID	Cell site	Carrier	City	Type
3/4/1999	12:10:53	415	2719321	33	Carrier B	San Francisco	TC Assignment
3/4/1999	12:10:53	415	3201813	33	Carrier A	San Francisco	Registration
3/4/1999	12:10:54	415	8043821	33	Carrier B	San Francisco	Registration
3/4/1999	12:10:54	408	6322327	33	Carrier A	San Francisco	TC Assignment
3/4/1999	12:10:54	650	3290201	33	Carrier A	San Francisco	Page
3/4/1999	12:10:54	213	4929087	33	Carrier A	San Francisco	Page
3/4/1999	12:10:55	650	5105341	33	Carrier B	San Francisco	Page
3/4/1999	12:10:55	650	8917483	33	Carrier B	San Francisco	Page
3/4/1999	12:10:55	510	5312381	33	Carrier A	San Francisco	TC Assignment
3/4/1999	12:10:55	510	4075781	33	Carrier A	San Francisco	TC Assignment
3/4/1999	12:10:56	925	6022825	33	Carrier B	San Francisco	Page
3/4/1999	12:10:56	925	7202077	33	Carrier A	San Francisco	Page
3/4/1999	12:10:56	925	4799759	33	Carrier B	San Francisco	Page
3/4/1999	12:10:56	917	8393984	33	Carrier B	San Francisco	Registration
3/4/1999	12:10:57	408	3216877	33	Carrier B	San Francisco	Registration
3/4/1999	12:10:57	415	6912099	33	Carrier A	San Francisco	TC Assignment
3/4/1999	12:10:57	415	8839323	33	Carrier A	San Francisco	Page
3/4/1999	12:10:57	415	9719867	33	Carrier B	San Francisco	Registration
3/4/1999	12:10:58	408	5318627	33	Carrier B	San Francisco	Registration
3/4/1999	12:10:58	650	7203431	33	Carrier A	San Francisco	Page
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3/4/1999	12:10:59	925	3086351	33	Carrier B	San Francisco	Page
3/4/1999	12:11:00	925	4946649	33	Carrier A	San Francisco	Registration
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3/4/1999	12:11:03	925	8289139	33	Carrier A	San Francisco	Page
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3/4/1999	12:11:07	408	7070091	33	Carrier A	San Francisco	Page
3/4/1999	12:11:08	415	7203431	33	Carrier B	San Francisco	Registration
3/4/1999	12:11:08	415	9718063	33	Carrier A	San Francisco	TC Assignment
3/4/1999	12:11:08	415	9080547	33	Carrier B	San Francisco	Page
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3/4/1999	12:11:09	650	8282141	33	Carrier B	San Francisco	Page
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3/4/1999	12:11:09	510	6728701	33	Carrier A	San Francisco	TC Assignment
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3/4/1999	12:11:10	925	4074175	33	Carrier B	San Francisco	Registration
3/4/1999	12:11:11	925	2649681	33	Carrier B	San Francisco	Page
3/4/1999	12:11:11	408	4949717	33	Carrier B	San Francisco	Registration
3/4/1999	12:11:11	415	7220981	33	Carrier B	San Francisco	TC Assignment
3/4/1999	12:11:11	415	4720249	33	Carrier B	San Francisco	Page
3/4/1999	12:11:12	415	2719321	33	Carrier B	San Francisco	Registration
3/4/1999	12:11:12	408	9140825	33	Carrier A	San Francisco	Registration
3/4/1999	12:11:12	650	4659877	33	Carrier B	San Francisco	Page
3/4/1999	12:11:12	412	3458569	33	Carrier B	San Francisco	Registration
3/4/1999	12:11:13	650	8040589	33	Carrier A	San Francisco	Registration
3/4/1999	12:11:13	650	4075813	33	Carrier B	San Francisco	Page
3/4/1999	12:11:13	510	8927489	33	Carrier A	San Francisco	Page
3/4/1999	12:11:13	510	9088217	33	Carrier A	San Francisco	Page
3/4/1999	12:11:14	925	5108465	33	Carrier B	San Francisco	Page
3/4/1999	12:11:14	925	7202069	33	Carrier B	San Francisco	Page
3/4/1999	12:11:14	925	8134855	33	Carrier B	San Francisco	Page
3/4/1999	12:11:15	408	5075719	33	Carrier A	San Francisco	Page

FIGURE 6

ACTUAL PERIOD RAW DATA

Date	Time	Area code	User ID	Cell site	Carrier	City	Type
3/7/1999	22:13:53	415	2719319	33	Carrier B	San Francisco	TC Assignment
3/7/1999	22:13:53	415	3201811	33	Carrier A	San Francisco	Registration
3/7/1999	22:13:54	415	8043619	33	Carrier B	San Francisco	Registration
3/7/1999	22:13:54	408	6322325	33	Carrier A	San Francisco	TC Assignment
3/7/1999	22:13:54	650	3290199	33	Carrier A	San Francisco	Page
3/7/1999	22:13:54	650	5105339	33	Carrier B	San Francisco	Page
3/7/1999	22:13:55	650	8917481	33	Carrier B	San Francisco	Page
3/7/1999	22:13:55	510	5312379	33	Carrier A	San Francisco	TC Assignment
3/7/1999	22:13:55	510	4075789	33	Carrier A	San Francisco	TC Assignment
3/7/1999	22:13:55	925	6022623	33	Carrier B	San Francisco	Page
3/7/1999	22:13:56	925	7202075	33	Carrier A	San Francisco	Page
3/7/1999	22:13:56	925	4799757	33	Carrier B	San Francisco	Page
3/7/1999	22:13:56	408	3216875	33	Carrier B	San Francisco	Registration
3/7/1999	22:13:56	415	6912097	33	Carrier A	San Francisco	TC Assignment
3/7/1999	22:13:57	415	8839321	33	Carrier A	San Francisco	Page
3/7/1999	22:13:57	415	9719865	33	Carrier B	San Francisco	Registration
3/7/1999	22:13:57	408	5318625	33	Carrier B	San Francisco	Registration
3/7/1999	22:13:57	650	7203429	33	Carrier A	San Francisco	Page
3/7/1999	22:13:58	650	1099977	33	Carrier B	San Francisco	Registration
3/7/1999	22:13:58	650	8180865	33	Carrier A	San Francisco	TC Assignment
3/7/1999	22:13:58	510	3086349	33	Carrier B	San Francisco	Page
3/7/1999	22:13:58	510	4792791	33	Carrier A	San Francisco	Registration
3/7/1999	22:13:59	925	9837732	33	Carrier A	San Francisco	Registration
3/7/1999	22:13:59	925	3086349	33	Carrier B	San Francisco	Page
3/7/1999	22:13:59	925	4946847	33	Carrier A	San Francisco	Registration
3/7/1999	22:13:59	408	3081097	33	Carrier A	San Francisco	TC Assignment
3/7/1999	22:14:00	415	7070089	33	Carrier B	San Francisco	Page
3/7/1999	22:14:00	415	9718061	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:00	415	9157919	33	Carrier A	San Francisco	Registration
3/7/1999	22:14:01	408	3260181	33	Carrier B	San Francisco	Page
3/7/1999	22:14:01	650	9727753	33	Carrier A	San Francisco	Registration
3/7/1999	22:14:01	650	3165223	33	Carrier B	San Francisco	TC Assignment
3/7/1999	22:14:01	650	7600201	33	Carrier A	San Francisco	Page
3/7/1999	22:14:02	510	2719319	33	Carrier A	San Francisco	Registration
3/7/1999	22:14:02	510	4140375	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:02	925	8289137	33	Carrier A	San Francisco	Page
3/7/1999	22:14:02	925	8722861	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:03	925	5312379	33	Carrier A	San Francisco	TC Assignment
3/7/1999	22:14:03	408	4075789	33	Carrier B	San Francisco	Page
3/7/1999	22:14:03	415	4651179	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:03	415	7202075	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:04	415	4995675	33	Carrier A	San Francisco	Page
3/7/1999	22:14:04	408	5048155	33	Carrier A	San Francisco	Registration
3/7/1999	22:14:04	650	4720247	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:04	617	8493200	33	Carrier A	San Francisco	Page
3/7/1999	22:14:05	650	2086801	33	Carrier B	San Francisco	Page
3/7/1999	22:14:05	510	4072267	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:05	510	9718433	33	Carrier B	San Francisco	TC Assignment
3/7/1999	22:14:05	925	5318221	33	Carrier B	San Francisco	Page
3/7/1999	22:14:06	925	3972081	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:06	925	8372832	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:06	408	7070089	33	Carrier A	San Francisco	Page
3/7/1999	22:14:06	415	7203429	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:07	415	9718061	33	Carrier A	San Francisco	TC Assignment
3/7/1999	22:14:07	415	9080545	33	Carrier B	San Francisco	Page
3/7/1999	22:14:07	408	9727753	33	Carrier A	San Francisco	Registration
3/7/1999	22:14:08	650	4140375	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:08	213	4929087	33	Carrier A	San Francisco	Page
3/7/1999	22:14:08	650	8282139	33	Carrier B	San Francisco	Page
3/7/1999	22:14:08	650	8722861	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:09	510	8728699	33	Carrier A	San Francisco	TC Assignment
3/7/1999	22:14:09	510	3283685	33	Carrier B	San Francisco	Page
3/7/1999	22:14:09	925	9120419	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:09	206	8473934	33	Carrier A	San Francisco	TC Assignment
3/7/1999	22:14:10	925	4074173	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:10	925	2649679	33	Carrier B	San Francisco	Page
3/7/1999	22:14:10	408	4949715	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:10	415	7220979	33	Carrier B	San Francisco	TC Assignment
3/7/1999	22:14:11	415	4720247	33	Carrier B	San Francisco	Page
3/7/1999	22:14:11	415	2719319	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:11	408	4792791	33	Carrier A	San Francisco	Registration
3/7/1999	22:14:11	917	8393984	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:12	650	9837732	33	Carrier A	San Francisco	Page
3/7/1999	22:14:12	650	3086349	33	Carrier B	San Francisco	Registration
3/7/1999	22:14:12	650	4946847	33	Carrier A	San Francisco	Page
3/7/1999	22:14:12	510	3081097	33	Carrier A	San Francisco	Page
3/7/1999	22:14:13	510	7070089	33	Carrier B	San Francisco	Page
3/7/1999	22:14:13	925	9157919	33	Carrier A	San Francisco	Page
3/7/1999	22:14:13	925	3260181	33	Carrier B	San Francisco	Page
3/7/1999	22:14:13	408	7070089	33	Carrier B	San Francisco	Page
3/7/1999	22:14:14	412	3458569	33	Carrier B	San Francisco	Registration

FIGURE 7

MARKET SHARE MEASUREMENT
ACTUAL SUBSCRIBERS VS. MEASURED SUBSCRIBERS DURING A BASELINE PERIOD

Actual Subs	Measured Subs
408 3218877 Carrier B	408 3218877 Carrier B
408 3260183 Carrier B	408 3260183 Carrier B
408 4075791 Carrier B	408 4075791 Carrier B
408 4078789 Carrier B	
408 4949717 Carrier B	408 4949717 Carrier B
408 5318627 Carrier B	408 5318627 Carrier B
415 2719321 Carrier B	415 2719321 Carrier B
415 4651181 Carrier B	415 4651181 Carrier B
415 4720249 Carrier B	415 4720249 Carrier B
415 7070091 Carrier B	415 7070091 Carrier B
415 7202077 Carrier B	415 7202077 Carrier B
415 7203431 Carrier B	415 7203431 Carrier B
415 7203436 Carrier B	
415 7220981 Carrier B	415 7220981 Carrier B
415 8043621 Carrier B	415 8043621 Carrier B
415 9060547 Carrier B	415 9060547 Carrier B
415 9718063 Carrier B	415 9718063 Carrier B
415 9719867 Carrier B	415 9719867 Carrier B
510 3086351 Carrier B	510 3086351 Carrier B
510 3283687 Carrier B	510 3283687 Carrier B
510 4072269 Carrier B	510 4072269 Carrier B
510 4140377 Carrier B	510 4140377 Carrier B
510 9719435 Carrier B	510 9719435 Carrier B
510 9719439 Carrier B	
650 1099979 Carrier B	650 1099979 Carrier B
650 2086803 Carrier B	650 2086803 Carrier B
650 3165225 Carrier B	650 3165225 Carrier B
650 4075813 Carrier B	650 4075813 Carrier B
650 4140377 Carrier B	650 4140377 Carrier B
650 4659877 Carrier B	650 4659877 Carrier B
650 4720249 Carrier B	650 4720249 Carrier B
650 5105341 Carrier B	650 5105341 Carrier B
650 8282141 Carrier B	650 8282141 Carrier B
650 8722863 Carrier B	650 8722863 Carrier B
650 8917483 Carrier B	650 8917483 Carrier B
925 2649681 Carrier B	925 2649681 Carrier B
925 3086351 Carrier B	925 3086351 Carrier B
925 3086354 Carrier B	
925 3972083 Carrier B	925 3972083 Carrier B
925 4074175 Carrier B	925 4074175 Carrier B
925 4799759 Carrier B	925 4799759 Carrier B
925 5108465 Carrier B	925 5108465 Carrier B
925 5318223 Carrier B	925 5318223 Carrier B
925 6022625 Carrier B	925 6022625 Carrier B
925 7202099 Carrier B	925 7202099 Carrier B
925 7202199 Carrier B	
925 8134855 Carrier B	925 8134855 Carrier B
925 8372834 Carrier B	925 8372834 Carrier B
925 8722863 Carrier B	925 8722863 Carrier B
925 9120421 Carrier B	925 9120421 Carrier B
Total # 50 Carrier B	Total # 46 Carrier B
408 3081099 Carrier A	408 3081099 Carrier A
408 5048157 Carrier A	408 5048157 Carrier A
408 5075719 Carrier A	408 5075719 Carrier A
408 6322327 Carrier A	408 6322327 Carrier A
408 7070091 Carrier A	408 7070091 Carrier A
408 9140825 Carrier A	408 9140825 Carrier A
408 9140827 Carrier A	
408 9727755 Carrier A	408 9727755 Carrier A
415 3201813 Carrier A	415 3201813 Carrier A
415 4995677 Carrier A	415 4995677 Carrier A
415 6912099 Carrier A	415 6912099 Carrier A
415 6912199 Carrier A	
415 8839323 Carrier A	415 8839323 Carrier A
415 9157921 Carrier A	415 9157921 Carrier A
510 2719321 Carrier A	510 2719321 Carrier A
510 4075791 Carrier A	510 4075791 Carrier A
510 4782793 Carrier A	510 4782793 Carrier A
510 5312381 Carrier A	510 5312381 Carrier A
510 5312383 Carrier A	
510 6728701 Carrier A	510 6728701 Carrier A
510 8927489 Carrier A	510 8927489 Carrier A
510 9088217 Carrier A	510 9088217 Carrier A
650 3290201 Carrier A	650 3290201 Carrier A
650 3290221 Carrier A	
650 7203431 Carrier A	650 7203431 Carrier A
650 7600203 Carrier A	650 7600203 Carrier A
650 8040589 Carrier A	650 8040589 Carrier A
650 8160887 Carrier A	650 8160887 Carrier A
650 9727755 Carrier A	650 9727755 Carrier A
650 9727785 Carrier A	
925 4949649 Carrier A	925 4949649 Carrier A
925 5312381 Carrier A	925 5312381 Carrier A
925 5312385 Carrier A	
925 7202077 Carrier A	925 7202077 Carrier A
925 8289139 Carrier A	925 8289139 Carrier A
925 9837734 Carrier A	925 9837734 Carrier A
Total # 38 Carrier A	Total # 30 Carrier A
Total # 88 Both	Total # 76 Both

FIGURE 8

WO 00/56098

MARKET SHARE MEASUREMENT
SORTED DATA TO COUNT MEASURED SUBS FOR ACTUAL PERIOD

Measured Subs

408	3218875	Carrier B
408	3282181	Carrier B
408	4075788	Carrier B
408	4848718	Carrier B
408	5318625	Carrier B
408	7070088	Carrier B
415	2718318	Carrier B
415	4881178	Carrier B
415	4722247	Carrier B
415	7070088	Carrier B
415	7202075	Carrier B
415	7203428	Carrier B
415	7220678	Carrier B
415	8043618	Carrier B
415	8080545	Carrier B
415	8718081	Carrier B
415	8718885	Carrier B
510	3086348	Carrier B
510	3283885	Carrier B
510	4072287	Carrier B
510	4140378	Carrier B
510	7070088	Carrier B
510	8718433	Carrier B
650	2088801	Carrier B
650	3086348	Carrier B
650	3185223	Carrier B
650	4140378	Carrier B
650	4720247	Carrier B
650	5105338	Carrier B
650	6282138	Carrier B
650	6722881	Carrier B
650	8817481	Carrier B
825	2848878	Carrier B
825	3086348	Carrier B
825	3282181	Carrier B
825	3872081	Carrier B
825	4074173	Carrier B
825	4788757	Carrier B
825	5318221	Carrier B
825	6322821	Carrier B
825	8372832	Carrier B
825	8722881	Carrier B
825	9120418	Carrier B

Measured Carriers 43

408	3081087	Carrier A
408	4782791	Carrier A
408	8048185	Carrier A
408	8322325	Carrier A
408	7070088	Carrier A
408	8727753	Carrier A
415	3201811	Carrier A
415	4880675	Carrier A
415	8813087	Carrier A
415	8838321	Carrier A
415	8187918	Carrier A
415	8718381	Carrier A
510	2718318	Carrier A
510	3081087	Carrier A
510	4075788	Carrier A
510	4782791	Carrier A
510	5312378	Carrier A
510	6728888	Carrier A
650	3280188	Carrier A
650	4848847	Carrier A
650	7203428	Carrier A
650	7800001	Carrier A
650	8180885	Carrier A
650	8727753	Carrier A
650	8837732	Carrier A
825	4848847	Carrier A
825	5312378	Carrier A
825	7203075	Carrier A
825	8388137	Carrier A
825	8187918	Carrier A
825	8837732	Carrier A

Measured Carrier A 31

FIGURE 9

**MARKET SHARE MEASUREMENT
ALGORITHM FOR CALCULATING MARKET SHARE****Baseline period**

Count the total number of Measured subscribers for each carrier during a baseline period (roamers excluded)

Carrier A	30
Carrier B	45

Compare to the Actual number of subscribers during baseline period

Carrier A	36
Carrier B	50

Calculate the gross up coefficient for each carrier for baseline period

Carrier A	"=36/30"	1.2000
Carrier B	"=50/45"	1.1111

Actual measurement period

Count the total number of Measured subscribers for each carrier during the actual period

Carrier A	31
Carrier B	43

Calculate the total number of subscribers using the gross up coefficients

Tot # subs = $31 * 1.2000 + 43 * 1.1111 = 84.9773$

Calculate the market share of each carrier for actual data

Carrier A	"=31*1.2000/84.9773 = 43.78%
Carrier B	"=43*1.1111/84.9773 = 56.22%

FIGURE 10

EXAMPLE

inTeleShare - Subscriber share
December 1999 & trailing 12 months
Portland, Oregon

	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Trailing 12 months
AirTouch														
Subscribers	218,813	221,124	225,835	227,435	230,377	235,688	237,889	241,234	245,678	243,678	241,345	240,657	245,678	Net Adds 28,765
Net Additions	N/A	2,211	4,511	1,800	2,942	5,311	2,211	3,335	4,444	(0.9%)	(1.0%)	(0.3%)	5,021	CAGR 12.2%
% Change	N/A	1.0%	2.0%	0.8%	1.3%	2.3%	0.9%	1.4%	1.8%	(0.8%)	(1.0%)	(0.3%)	2.1%	Share Gain (2.8%)
Market share	43.8%	43.8%	43.7%	43.1%	43.0%	43.3%	43.3%	43.2%	43.0%	42.1%	41.1%	40.4%	40.1%	
AT&T Wireless														
Subscribers	222,404	224,650	228,438	235,567	237,843	238,809	239,978	241,908	248,951	253,000	258,192	263,530	273,352	Net Adds 50,949
Net Additions	N/A	2,247	3,788	7,131	2,278	1,068	1,067	1,932	5,043	6,049	8,192	6,338	7,822	CAGR 22.9%
% Change	N/A	1.0%	1.7%	3.1%	1.0%	0.4%	0.4%	0.8%	2.1%	2.4%	2.4%	2.4%	4.4%	Share Gain (0.0%)
Market share	44.5%	44.6%	44.2%	44.8%	44.4%	43.8%	43.8%	43.3%	43.2%	43.7%	44.2%	44.8%	44.8%	
Nextel														
Subscribers	6,481	6,546	7,345	7,890	8,079	8,160	8,458	8,545	8,575	8,834	9,101	9,378	9,707	Net Adds 3,228
Net Additions	N/A	65	798	545	189	81	286	89	30	259	287	276	331	CAGR 48.8%
% Change	N/A	1.0%	12.2%	7.4%	2.4%	1.0%	3.6%	1.1%	0.4%	3.0%	3.0%	3.0%	3.5%	Share Gain 8.3%
Market share	1.3%	1.3%	1.4%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	
Sprint PCS														
Subscribers	26,515	27,678	30,045	31,650	32,510	33,437	35,640	37,690	39,654	40,124	42,360	43,545	44,235	Net Adds 17,881
Net Additions	N/A	1,133	2,367	1,005	1,480	947	2,163	2,250	1,344	890	2,178	1,045	891	CAGR 66.6%
% Change	N/A	4.3%	8.0%	3.3%	4.8%	2.5%	6.4%	6.3%	2.3%	2.3%	5.4%	2.5%	2.1%	Share Gain 1.8%
Market share	6.3%	6.8%	6.8%	8.9%	8.1%	8.2%	8.8%	8.8%	8.8%	8.9%	7.2%	7.3%	7.2%	
USWest														
Subscribers	15,521	15,878	16,344	16,890	17,065	17,567	17,756	17,978	18,032	18,139	18,187	18,245	18,342	Net Adds 2,827
Net Additions	N/A	157	668	648	175	502	189	222	54	107	48	58	97	CAGR 18.2%
% Change	N/A	1.0%	4.2%	3.3%	1.0%	2.9%	1.1%	1.3%	0.3%	0.6%	0.3%	0.3%	0.6%	Share Gain (0.1%)
Market share	3.1%	3.1%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.1%	3.1%	3.1%	3.0%	
Western Wireless														
Subscribers	7,811	7,890	8,450	9,334	9,769	9,899	10,124	11,490	13,327	14,860	16,695	18,472	21,882	Net Adds 14,081
Net Additions	N/A	79	560	884	455	210	125	1,366	1,837	1,853	1,715	1,777	3,420	CAGR 150.3%
% Change	N/A	1.0%	7.1%	10.5%	4.8%	2.1%	1.3%	13.5%	18.0%	12.4%	11.4%	10.6%	18.5%	Share Gain 2.6%
Market share	1.6%	1.6%	1.6%	1.5%	1.5%	1.6%	1.6%	2.1%	2.3%	2.5%	2.6%	3.1%	3.6%	
TOTAL														
Subscribers	493,530	503,668	516,255	523,163	533,633	543,810	549,651	559,025	571,707	578,765	585,870	592,975	603,207	Net Adds 11,677
Net Additions	N/A	5,098	12,639	11,911	7,527	9,117	5,041	9,194	12,762	9,559	9,065	8,065	17,532	CAGR 23.0%
% Change	N/A	1.0%	2.5%	2.5%	1.4%	1.5%	1.1%	1.7%	2.3%	1.2%	1.4%	1.5%	3.0%	

FIGURE 11

ACTUAL PERIOD #2 RAW DATA

Date	Time	Area code	User ID	Cell site	Carrier	City	Type
3/10/1999	22:13:53	415	9718865	33	Carrier B	San Francisco	Page
3/10/1999	22:13:53	408	5318625	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:13:54	650	7203429	33	Carrier A	San Francisco	Registration
3/10/1999	22:13:54	650	1099977	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:13:54	510	4075789	33	Carrier A	San Francisco	Page
3/10/1999	22:13:54	650	3290199	33	Carrier A	San Francisco	Page
3/10/1999	22:13:55	510	5312379	33	Carrier A	San Francisco	Page
3/10/1999	22:13:55	650	8917481	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:13:55	650	8160865	33	Carrier A	San Francisco	Page
3/10/1999	22:13:55	925	9837732	33	Carrier A	San Francisco	Page
3/10/1999	22:13:56	925	8022623	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:13:56	925	7202075	33	Carrier A	San Francisco	Registration
3/10/1999	22:13:56	925	4799757	33	Carrier B	San Francisco	Registration
3/10/1999	22:13:56	415	4405900	33	Carrier B	San Francisco	Registration
3/10/1999	22:13:57	510	1385683	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:13:57	925	4946647	33	Carrier A	San Francisco	Page
3/10/1999	22:13:57	415	6912067	33	Carrier A	San Francisco	Registration
3/10/1999	22:13:57	415	8839321	33	Carrier A	San Francisco	TC Assignment
3/10/1999	22:13:58	650	3165223	33	Carrier B	San Francisco	Page
3/10/1999	22:13:58	650	7600201	33	Carrier A	San Francisco	Registration
3/10/1999	22:13:58	510	2719319	33	Carrier A	San Francisco	Registration
3/10/1999	22:13:58	650	9727753	33	Carrier A	San Francisco	Page
3/10/1999	22:13:59	408	4075789	33	Carrier B	San Francisco	Registration
3/10/1999	22:13:59	408	2224892	33	Carrier A	San Francisco	Registration
3/10/1999	22:13:59	510	4792791	33	Carrier A	San Francisco	TC Assignment
3/10/1999	22:13:59	415	4995675	33	Carrier A	San Francisco	Page
3/10/1999	22:14:00	925	3086349	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:00	415	8392034	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:14:00	408	3081097	33	Carrier A	San Francisco	Page
3/10/1999	22:14:01	415	7070089	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:01	415	9718061	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:01	415	9157919	33	Carrier A	San Francisco	Page
3/10/1999	22:14:01	408	3260181	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:02	510	8492034	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:14:02	650	4720247	33	Carrier B	San Francisco	Page
3/10/1999	22:14:02	925	5318221	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:02	415	8374852	33	Carrier A	San Francisco	Registration
3/10/1999	22:14:03	510	4140375	33	Carrier B	San Francisco	Page
3/10/1999	22:14:03	925	8289137	33	Carrier A	San Francisco	Registration
3/10/1999	22:14:03	925	8722861	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:14:03	925	5312379	33	Carrier A	San Francisco	Page
3/10/1999	22:14:04	925	3840234	33	Carrier A	San Francisco	Registration
3/10/1999	22:14:04	415	4651179	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:04	415	7202075	33	Carrier B	San Francisco	Page
3/10/1999	22:14:04	510	8494532	33	Carrier A	San Francisco	Registration
3/10/1999	22:14:05	408	5048155	33	Carrier A	San Francisco	Registration
3/10/1999	22:14:05	408	8475892	33	Carrier B	San Francisco	Page
3/10/1999	22:14:05	510	8349523	33	Carrier B	San Francisco	Page
3/10/1999	22:14:05	650	2086801	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:06	510	4072267	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:14:06	510	9719433	33	Carrier B	San Francisco	Page
3/10/1999	22:14:06	415	4934094	33	Carrier A	San Francisco	Registration
3/10/1999	22:14:06	925	3972081	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:07	925	8372832	33	Carrier B	San Francisco	Page
3/10/1999	22:14:07	408	7070089	33	Carrier A	San Francisco	Registration
3/10/1999	22:14:07	415	7203429	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:08	415	9718061	33	Carrier A	San Francisco	Page
3/10/1999	22:14:08	415	9080545	33	Carrier B	San Francisco	Page
3/10/1999	22:14:08	408	9727753	33	Carrier A	San Francisco	Registration
3/10/1999	22:14:08	650	4140375	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:14:09	415	2719319	33	Carrier B	San Francisco	Page
3/10/1999	22:14:09	212	3495063	33	Carrier A	San Francisco	Registration
3/10/1999	22:14:09	415	8043619	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:14:09	408	6322325	33	Carrier A	San Francisco	Page
3/10/1999	22:14:10	510	3283685	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:10	925	9120419	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:10	925	8394842	33	Carrier B	San Francisco	Page
3/10/1999	22:14:10	925	4074173	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:11	925	2649679	33	Carrier B	San Francisco	Page
3/10/1999	22:14:11	408	4948715	33	Carrier B	San Francisco	Page
3/10/1999	22:14:11	415	7220979	33	Carrier B	San Francisco	Page
3/10/1999	22:14:11	415	4720247	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:12	415	2719319	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:12	408	4792791	33	Carrier A	San Francisco	Page
3/10/1999	22:14:12	917	8393984	33	Carrier B	San Francisco	Page
3/10/1999	22:14:12	650	9837732	33	Carrier A	San Francisco	Page
3/10/1999	22:14:13	703	8495056	33	Carrier B	San Francisco	Page
3/10/1999	22:14:13	650	4946647	33	Carrier A	San Francisco	Registration
3/10/1999	22:14:13	408	7070089	33	Carrier B	San Francisco	TC Assignment
3/10/1999	22:14:13	412	3458569	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:14	925	9157919	33	Carrier A	San Francisco	Page
3/10/1999	22:14:14	925	3260181	33	Carrier B	San Francisco	Registration
3/10/1999	22:14:14	510	8439482	33	Carrier A	San Francisco	TC Assignment

FIGURE 12

ADD & CHURN MEASUREMENT -
SORTED DATA TO COUNT MEASURED SUBS FOR ACTUAL PERIOD #1 and #2

Measured sube period #1			Measured sube period #2			Sube			Adds	Churns
408	3218678	Carrier B	1				0		0	1
408	3260181	Carrier B	1	408	3260181	Carrier B	1	0	0	0
408	4075788	Carrier B	1	408	4075788	Carrier B	1	0	0	0
408	4848715	Carrier B	1	408	4848715	Carrier B	1	0	0	0
408	5318625	Carrier B	1	408	5318625	Carrier B	1	0	0	0
408	7070088	Carrier B	1	408	7070088	Carrier B	1	0	0	0
			0	408	8467892	Carrier B	1	0	1	0
415	2719319	Carrier B	0	415	2719319	Carrier B	1	0	0	0
			0	415	4468806	Carrier B	1	1	1	0
415	4651178	Carrier B	1	415	4651178	Carrier B	1	0	0	0
415	4720247	Carrier B	1	415	4720247	Carrier B	1	0	0	0
415	7070088	Carrier B	1	415	7070088	Carrier B	1	0	0	0
415	7202075	Carrier B	1	415	7202075	Carrier B	1	0	0	0
415	7203428	Carrier B	1	415	7203428	Carrier B	1	0	0	0
415	7220878	Carrier B	1	415	7220878	Carrier B	1	0	0	0
415	8043618	Carrier B	1	415	8043618	Carrier B	1	0	0	0
			0	415	8392034	Carrier B	1	1	0	0
415	8080545	Carrier B	1	415	8080545	Carrier B	1	0	0	0
415	9718081	Carrier B	1	415	9718081	Carrier B	1	0	0	0
415	9718085	Carrier B	1	415	9718085	Carrier B	1	0	0	0
			0	810	1348682	Carrier B	1	1	0	0
810	3086348	Carrier B	1				0	0	0	1
810	3283685	Carrier B	1	810	3283685	Carrier B	1	0	0	0
810	4072267	Carrier B	1	810	4072267	Carrier B	1	0	0	0
810	4140375	Carrier B	1	810	4140375	Carrier B	1	0	0	0
810	7070088	Carrier B	1				0	0	0	1
			0	810	8349623	Carrier B	1	1	1	0
			0	810	8492034	Carrier B	1	1	1	0
810	9719433	Carrier B	1	810	9719433	Carrier B	1	0	0	0
			0	860	1689877	Carrier B	1	1	0	0
860	2066801	Carrier B	1	860	2066801	Carrier B	1	0	0	0
860	3086348	Carrier B	1				0	0	0	1
860	3185223	Carrier B	1	860	3185223	Carrier B	1	0	0	0
860	4140375	Carrier B	1	860	4140375	Carrier B	1	0	0	0
860	4720247	Carrier B	1	860	4720247	Carrier B	1	0	0	0
860	8106338	Carrier B	1				0	0	0	1
860	8382138	Carrier B	1				0	0	0	1
860	8722881	Carrier B	1				0	0	0	1
860	8617481	Carrier B	1	860	8617481	Carrier B	1	0	0	0
925	2649878	Carrier B	1	925	2649878	Carrier B	1	0	0	0
925	3086348	Carrier B	1	925	3086348	Carrier B	1	0	0	0
925	3280181	Carrier B	1	925	3280181	Carrier B	1	0	0	0
925	3672061	Carrier B	1	925	3672061	Carrier B	1	0	0	0
925	40741173	Carrier B	1	925	40741173	Carrier B	1	0	0	0
925	4799757	Carrier B	1	925	4799757	Carrier B	1	0	0	0
925	5318221	Carrier B	1	925	5318221	Carrier B	1	0	0	0
925	6022623	Carrier B	1	925	6022623	Carrier B	1	0	0	0
925	6372832	Carrier B	1	925	6372832	Carrier B	1	0	0	0
			0	925	8349462	Carrier B	1	0	0	0
925	8722881	Carrier B	1	925	8722881	Carrier B	1	1	0	0
925	8722881	Carrier B	1	925	8722881	Carrier B	1	0	0	0
925	9120419	Carrier B	1	925	9120419	Carrier B	1	0	0	0
Measured Period 81 Carrier B			43	Measured Period 82 Carrier B			44	8	7	
	Sube		0		Sube		Adds	Churns		
408	3081007	Carrier A	1	408	3081007	Carrier A	1	0	0	0
408	4782781	Carrier A	1	408	4782781	Carrier A	1	0	0	0
408	5048155	Carrier A	1	408	5048155	Carrier A	1	0	0	0
408	6322325	Carrier A	1	408	6322325	Carrier A	1	0	0	0
408	7070088	Carrier A	1	408	7070088	Carrier A	1	0	0	0
408	9727753	Carrier A	1	408	9727753	Carrier A	1	0	0	0
415	3281811	Carrier A	1				0	0	0	1
			0	415	4834094	Carrier A	1	1	0	0
415	4895875	Carrier A	1	415	4905675	Carrier A	1	0	0	0
415	8612067	Carrier A	1	415	8912067	Carrier A	1	0	0	0
			0	415	8374882	Carrier A	1	1	0	0
415	8638321	Carrier A	1	415	8638321	Carrier A	1	0	0	0
415	9157919	Carrier A	1	415	9157919	Carrier A	1	0	0	0
415	9718081	Carrier A	1	415	9718081	Carrier A	1	0	0	0
510	2719319	Carrier A	1	510	2719319	Carrier A	1	0	0	0
810	3081007	Carrier A	1				0	0	0	1
510	4075788	Carrier A	1	510	4075788	Carrier A	1	0	0	0
510	4782781	Carrier A	1	510	4782791	Carrier A	1	0	0	0
510	5312378	Carrier A	1	510	5312378	Carrier A	1	0	0	0
810	6728688	Carrier A	1				0	0	0	1
			0	810	8439482	Carrier A	1	1	0	0
860	3280190	Carrier A	1	810	8484832	Carrier A	1	1	0	0
860	4048847	Carrier A	1	860	3280190	Carrier A	1	0	0	0
860	7203428	Carrier A	1	860	4048847	Carrier A	1	0	0	0
860	7600201	Carrier A	1	860	7203428	Carrier A	1	0	0	0
860	9180865	Carrier A	1	860	7600201	Carrier A	1	0	0	0
860	9727753	Carrier A	1	860	9180865	Carrier A	1	0	0	0
860	9637732	Carrier A	1	860	9727753	Carrier A	1	0	0	0
			0	860	9637732	Carrier A	1	0	0	0
825	4848847	Carrier A	1	825	3849234	Carrier A	1	1	0	0
825	5312378	Carrier A	1	825	4848847	Carrier A	1	0	0	0
825	7202075	Carrier A	1	825	5312378	Carrier A	1	0	0	0
825	8280137	Carrier A	1	825	7202075	Carrier A	1	0	0	0
825	9157818	Carrier A	1	825	8280137	Carrier A	1	0	0	0
825	9637732	Carrier A	1	825	9157818	Carrier A	1	0	0	0
			0	825	9637732	Carrier A	1	0	0	0
Measured Carrier A			31	Measured Carrier A			34	8		

ALGORITHM FOR CALCULATING ADDS AND ADD SHARE**Baseline period**

Count the total number of Measured subscribers for each carrier during a baseline period (roamers excluded)

Carrier A	30
Carrier B	45

Compare to the Actual number of subscribers during baseline period

Carrier A	36
Carrier B	50

Calculate the gross up coefficient for each carrier for baseline period

Carrier A	"=36/30"	1.2000
Carrier B	"=50/45"	1.1111

Measurement period #1

Count the total number of Measured subscribers for each carrier during the actual period #1

Carrier A	31
Carrier B	43

Measurement period 2

Count the total number of Measured subscribers for each carrier during the actual period #2

Carrier A	34
Carrier B	44

Calculate new added subscribers for each carrier

Sort and list the number of unique User IDs

Count the number of ID's for each carrier in period #2 that are new and did not exist in period #1

Carrier A	6
Carrier B	8

Adjust numbers using baseline coefficients previously calculated

Multiply measured adds for each carrier by the baseline coefficients for each carrier

Carrier A	"6x1.2000"	7.2000
Carrier B	"8x1.1111"	8.8889
Total		16.0889

Calculate share of new adds

Divide adjusted numbers for each carrier by the adjusted total

Carrier A	7.2000 /16.0889=	44.8%
Carrier B	8.8889 /16.0889=	55.2%

FIGURE 14

ALGORITHM FOR CALCULATING CHURN AND CHURN SHARE**Baseline period**

Count the total number of Measured subscribers for each carrier during a baseline period (roamers excluded)

Carrier A	30
Carrier B	45

Compare to the Actual number of subscribers during baseline period

Carrier A	36
Carrier B	50

Calculate the gross up coefficient for each carrier for baseline period

Carrier A	"=36/30"	1.2000
Carrier B	"=50/45"	1.1111

Measurement period #1

Count the total number of Measured subscribers for each carrier during the actual period #1

Carrier A	31
Carrier B	43

Measurement period 2

Count the total number of Measured subscribers for each carrier during the actual period #2

Carrier A	34
Carrier B	44

Calculate churned subscribers for each carrier

Sort and list the number of unique User IDs

Count the number of ID's for each carrier in period #1 that do not exist in period #2

Carrier A	3
Carrier B	7

Adjust numbers using baseline coefficients previously calculated

Multiply measured churns for each carrier by the baseline coefficients for each carrier

Carrier A	"3x1.2000"	3.6000
Carrier B	7x1.1111	7.7778
Total		11.3778

Calculate share of churns

Divide adjusted numbers for each carrier by the adjusted total

Carrier A	3.6000 /11.3778=	31.6%
Carrier B	7.7778 /11.3778=	68.4%

FIGURE 15

InTeleShare - Gross Additions Subscriber share December 1999 & trailing 12 months Portland, Oregon												
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
	Trailing 12 months											
ARTech												
Gross Additions	2,008	3,022	8,319	3,723	3,723	8,878	4,707	3,458	4,878	5,004	4,764	5,023
% Change	N/A	42.5%	56.1%	(20.0%)	(20.0%)	73.0%	(27.3%)	(27.3%)	41.7%	3.2%	(4.0%)	4.9%
Gross Additions Share	27.3%	31.4%	34.3%	31.4%	31.4%	34.3%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%
Call/Added Subscriber*	27.3	31.4	34.3	31.4	31.4	34.3	31.4	31.4	31.4	31.4	31.4	31.4
Retention Rate**	91.7%	91.4%	91.4%	90.2%	91.4%	92.1%	91.4%	91.4%	91.4%	91.4%	91.4%	91.4%
AT&T Wireless												
Gross Additions	3,004	3,378	6,450	4,234	4,234	3,378	3,028	3,750	5,345	7,577	6,973	8,004
% Change	N/A	27.0%	40.7%	60.4%	60.4%	(20.3%)	8.9%	2.1%	74.3%	20.4%	13.1%	2.1%
Gross Additions Share	34.4%	41.6%	44.0%	44.1%	44.1%	27.3%	34.3%	29.0%	42.3%	48.2%	40.2%	41.6%
Call/Added Subscriber*	34.4	41.6	44.0	44.1	44.1	27.3	34.3	29.0	42.3	48.2	40.2	41.6
Retention Rate**	90.8%	91.7%	91.0%	91.4%	91.7%	91.0%	92.4%	91.0%	91.4%	91.4%	91.4%	91.4%
Nextel												
Gross Additions	71	85	820	250	250	125	349	218	193	235	294	303
% Change	N/A	32.3%	763.2%	(20.0%)	(20.0%)	(11.2%)	211.2%	(44.0%)	(10.7%)	48.3%	3.1%	3.0%
Gross Additions Share	8.2%	1.1%	8.3%	8.4%	8.4%	1.0%	8.2%	1.2%	1.3%	1.7%	1.7%	1.9%
Call/Added Subscriber*	8.2	1.1	8.3	8.4	8.4	1.0	8.2	1.2	1.3	1.7	1.7	1.9
Retention Rate**	93.3%	93.4%	93.4%	93.3%	93.3%	93.3%	93.3%	93.3%	93.3%	93.3%	93.3%	93.3%
Sprint PCS												
Gross Additions	1,234	1,240	2,804	1,108	2,720	1,042	2,368	2,807	1,478	970	2,394	1,150
% Change	N/A	1.0%	180.4%	(77.3%)	167.3%	(22.0%)	127.3%	8.4%	(42.4%)	(31.9%)	144.9%	(82.0%)
Gross Additions Share	14.0%	14.0%	16.7%	12.7%	21.7%	8.4%	16.2%	18.5%	8.4%	6.4%	14.2%	7.2%
Call/Added Subscriber*	14.0	14.0	16.7	12.7	21.7	8.4	16.2	18.5	8.4	6.4	14.2	7.2
Retention Rate**	88.1%	88.1%	88.1%	88.1%	88.1%	88.1%	88.1%	88.1%	88.1%	88.1%	88.1%	88.1%
USWest												
Gross Additions	171	172	733	801	193	562	185	1,075	350	354	941	800
% Change	N/A	1.0%	324.8%	(18.0%)	(67.9%)	180.4%	(53.5%)	480.6%	(28.6%)	(0.0%)	81.2%	2.8%
Gross Additions Share	1.9%	1.9%	4.7%	9.1%	1.8%	4.7%	1.5%	8.2%	2.3%	2.7%	3.2%	4.1%
Call/Added Subscriber*	1.9	1.9	4.7	9.1	1.8	4.7	1.5	8.2	2.3	2.7	3.2	4.1
Retention Rate**	91.4%	91.4%	91.4%	91.4%	91.4%	91.4%	91.4%	91.4%	91.4%	91.4%	91.4%	91.4%
Western Wireless												
Gross Additions	80	80	816	872	885	875	785	1,075	2,021	1,318	1,847	1,935
% Change	N/A	14.1%	528.0%	6.2%	1.4%	(11.0%)	(22.0%)	120.3%	7.8%	(10.0%)	2.8%	3.8%
Gross Additions Share	1.9%	1.9%	4.7%	9.1%	9.1%	7.3%	6.8%	14.6%	11.1%	11.1%	11.2%	12.2%
Call/Added Subscriber*	1.9	1.9	4.7	9.1	9.1	7.3	6.8	14.6	11.1	11.1	11.2	12.2
Retention Rate**	87.3%	87.3%	87.3%	87.3%	87.3%	87.3%	87.3%	87.3%	87.3%	87.3%	87.3%	87.3%
TOTAL												
Gross Additions	8,820	8,910	18,674	16,277	12,078	12,340	12,142	12,340	19,274	16,317	18,815	17,222
% Change	N/A	1.0%	74.7%	(11.9%)	(21.0%)	2.2%	(1.8%)	6.6%	15.0%	6.6%	2.9%	(4.8%)
Call/Added Subscriber*	8.8	8.9	18.7	16.3	12.1	12.3	12.1	12.3	19.3	16.3	18.8	17.2
Retention Rate**	91.5%	91.5%	91.5%	91.5%	91.5%	91.5%	91.5%	91.5%	91.5%	91.5%	91.5%	91.5%

* Rolling calculation based on aggregate monthly data, beginning with the subscriber's fourth month of service
 ** Rolling percentage of gross subscribers added in that month that continue to receive wireless service from that carrier (calculation requires at least four months of service)

Note: Italic represents audited (non-standard) report features

FIGURE 16

EXAMPLE

InTeleShare - Dropped Subscriber share
December 1999 (Data through September 1999 & trailing 9 months)
Portland, Oregon

	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Trailing 9 months
AT&T														
Dropped Subscribers	1,024	1,214	1,336	1,863	2,417	3,043	2,750	1,21	438	7,034	N/A	N/A	N/A	Gross Drops
% Change	N/A	18.5%	31.2%	10.3%	28.6%	48.4%	102.1%	(8.3%)	288.0%	157.0%	N/A	N/A	N/A	Share
Dropped Share	34.3%	40.3%	38.3%	39.3%	39.3%	39.3%	39.3%	39.3%	39.3%	39.3%	N/A	N/A	N/A	Calls/Dropped Sub
Calls/Dropped Subscriber	33.4	34.2	35.2	36.4	37.0	38.8	40.3	41.4	44.0	48.0	N/A	N/A	N/A	Annualized Churn Rat
Churn Rate	0.5%	0.5%	0.4%	0.5%	0.4%	0.5%	0.5%	0.5%	0.5%	0.5%	N/A	N/A	N/A	Share
AT&T Wireless														
Dropped Subscribers	1,684	1,822	1,970	1,993	1,993	2,310	2,811	1,824	1,502	1,823	N/A	N/A	N/A	Gross Drops
% Change	N/A	4.3%	2.4%	34.0%	34.0%	13.0%	13.0%	(30.1%)	(17.7%)	21.7%	N/A	N/A	N/A	Share
Dropped Share	82.3%	84.3%	87.3%	83.3%	83.3%	84.3%	84.3%	84.3%	84.3%	84.3%	N/A	N/A	N/A	Calls/Dropped Sub
Calls/Dropped Subscriber	36.3	38.1	40.4	41.3	41.3	42.0	42.0	43.1	43.4	43.4	N/A	N/A	N/A	Annualized Churn Rat
Churn Rate	0.7%	0.7%	0.7%	0.5%	0.5%	0.5%	0.5%	0.6%	0.6%	0.7%	N/A	N/A	N/A	Share
Nextel														
Dropped Subscribers	13	30	21	56	67	41	93	128	105	28	N/A	N/A	N/A	Gross Drops
% Change	N/A	64.1%	(30.3%)	126.6%	22.9%	(34.3%)	111.4%	36.7%	27.7%	(64.3%)	N/A	N/A	N/A	Share
Dropped Share	0.4%	1.4%	0.7%	1.4%	1.4%	0.9%	1.4%	1.4%	1.4%	0.5%	N/A	N/A	N/A	Calls/Dropped Sub
Calls/Dropped Subscriber	36.0	33.3	35.4	39.2	38.8	41.3	42.0	44.4	44.3	44.0	N/A	N/A	N/A	Annualized Churn Rat
Churn Rate	0.3%	0.3%	0.3%	0.7%	0.6%	0.6%	0.6%	0.6%	0.6%	0.3%	N/A	N/A	N/A	Share
Sprint PCS														
Dropped Subscribers	106	113	237	101	1,249	85	218	317	134	18	N/A	N/A	N/A	Gross Drops
% Change	N/A	6.6%	103.9%	(77.9%)	142.2%	(62.4%)	127.3%	47.2%	(87.8%)	(31.9%)	N/A	N/A	N/A	Share
Dropped Share	3.5%	3.7%	3.3%	3.3%	3.7%	3.3%	3.3%	3.3%	3.3%	3.3%	N/A	N/A	N/A	Calls/Dropped Sub
Calls/Dropped Subscriber	33.7	34.6	35.3	36.8	36.9	38.2	40.4	41.8	42.4	42.1	N/A	N/A	N/A	Annualized Churn Rat
Churn Rate	0.4%	0.4%	0.4%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.2%	N/A	N/A	N/A	Share
USWest														
Dropped Subscribers	32	16	67	85	18	60	27	831	302	247	N/A	N/A	N/A	Gross Drops
% Change	N/A	(50.0%)	324.8%	19.0%	(77.9%)	126.5%	(46.2%)	303.0%	(64.3%)	(18.2%)	N/A	N/A	N/A	Share
Dropped Share	1.1%	0.5%	1.1%	1.1%	0.5%	0.5%	0.5%	22.7%	11.2%	2.1%	N/A	N/A	N/A	Calls/Dropped Sub
Calls/Dropped Subscriber	34.3	34.4	37.8	38.2	38.2	38.7	41.2	43.0	43.3	43.1	N/A	N/A	N/A	Annualized Churn Rat
Churn Rate	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.7%	0.7%	0.5%	N/A	N/A	N/A	Share
Western Wireless														
Dropped Subscribers	28	19	58	84	410	483	940	812	184	103	N/A	N/A	N/A	Gross Drops
% Change	N/A	(20.0%)	193.2%	87.9%	302.9%	13.4%	37.6%	(20.0%)	(64.1%)	(10.0%)	N/A	N/A	N/A	Share
Dropped Share	9.3%	8.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	N/A	N/A	N/A	Calls/Dropped Sub
Calls/Dropped Subscriber	34.2	35.3	36.8	36.7	37.8	38.0	40.3	42.3	42.8	42.8	N/A	N/A	N/A	Annualized Churn Rat
Churn Rate	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	N/A	N/A	N/A	Share
TOTAL														
Dropped Subscribers	2,893	3,373	3,848	3,998	4,549	4,778	5,142	3,764	2,722	8,388	N/A	N/A	N/A	Gross Drops
% Change	N/A	1.6%	14.5%	3.7%	13.3%	4.7%	7.0%	(24.0%)	(27.5%)	245.0%	N/A	N/A	N/A	Share
Dropped Share	34.8	36.4	37.4	37.8	38.0	38.8	41.2	42.8	43.4	43.8	N/A	N/A	N/A	Calls/Dropped Sub
Calls/Dropped Subscriber	34.8	36.4	37.4	37.8	38.0	38.8	41.2	42.8	43.4	43.8	N/A	N/A	N/A	Annualized Churn Rat
Churn Rate	0.4%	0.4%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	N/A	N/A	N/A	Share

• Rolling calculation based on aggregate monthly data, beginning with the subscriber's fourth month of service
 ** Percentage of gross drops vs. total installed subscriber base for that month (calculation of gross drops requires at least four months of non-service)
 Note: Italics represent added (non-standard) report features

FIGURE 17

ROAMER MEASUREMENT**ACTUAL ROAMERS VS. MEASURED ROAMERS DURING A BASELINE PERIOD****Actual Roamers**

214 8495065 Carrier B
212 **4563453 Carrier B**
412 3458569 Carrier B
917 8393984 Carrier B
202 **3450902 Carrier A**
206 8473934 Carrier A
213 4929087 Carrier A
916 9485023 Carrier A

Total # 8 Both

Measured Roamers

214 8495065 Carrier B

412 3458569 Carrier B
917 8393984 Carrier B

206 8473934 Carrier A
213 4929087 Carrier A
916 9485023 Carrier A

Total # 6 Both

FIGURE 18

ROAMER MEASUREMENT
SORTED DATA TO COUNT MEASURED SUBS FOR ACTUAL PERIOD

Roamers

617	8493200	Carrier A
206	8473934	Carrier A
213	4929087	Carrier A
412	3458569	Carrier B
917	8393984	Carrier B

Measured	5
----------	---

FIGURE 19

**ROAMER MEASUREMENT
ALGORITHM FOR CALCULATING ROAMING SHARE****Baseline period**

Count the total number of Measured roamers for each carrier during a baseline period

Carrier A	3
Carrier B	3

Compare to the Actual number of roamers during baseline period

Carrier A	4
Carrier B	4

Calculate the gross up coefficient for each carrier for baseline period

Carrier A	"=4/3=	1.3333
Carrier B	"=4/3=	1.3333

Actual measurement period

Count the total number of Measured roamers for each carrier during the actual period

Carrier A	3
Carrier B	2

Calculate the total number of roamers using the gross up coefficients

Carrier A	"=3*1.3333	4.0000
Carrier B	"=2*1.3333	2.6667
Tot # roamers = 3*1.3333+2*1.3333 = 6.6667		

Calculate the roamer share of each carrier for actual data

Carrier A	"=3*1.3333/6.6667 =	60.0%
Carrier B	"=2*1.3333/6.6667 =	40.0%

FIGURE 20

InTeleShare - Roamer Activity Report
December 1999 & trailing 12 months
Portland, Oregon

EXAMPLE

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Trailing 12 months
Roamers	37,218	37,221	38,308	38,084	40,087	40,443	41,010	41,765	41,425	41,026	40,912	41,765	Roamers CAOR
% Change	N/A	1.0%	2.0%	0.6%	2.3%	0.9%	1.4%	1.8%	0.8%	1.0%	0.3%	1.8%	Roamers Share Gain
Share of Roamers	41.4%	41.9%	40.8%	40.1%	40.6%	40.5%	40.5%	40.5%	39.1%	38.1%	37.4%	37.0%	Roamers CAOR
Roamer Cals (000s)	518	524	578	663	724	741	744	782	817	803	800	868	Roamers Share Gain
% Change	N/A	1.0%	10.3%	7.0%	7.8%	2.3%	1.0%	4.8%	4.0%	0.0%	0.0%	8.0%	Roamers Call CAOR
Share of Roaming Calls	42.5%	43.3%	43.2%	44.2%	44.3%	43.0%	42.5%	42.1%	41.8%	41.8%	41.8%	42.1%	Roamers Call Share Gain
Roaming Calls/Roamer	13.3	13.9	16.1	17.2	18.1	18.3	18.2	18.7	18.7	20.0	22.0	23.1	Roamers Calls/Roamer
Roamer Statistics By Home Location													
Seattle Roamers	8,522	10,100	9,438	10,820	10,183	12,942	13,553	14,463	14,085	11,078	12,883	13,712	Seattle Roamer CAOR
% Change	N/A	19.0%	-6.6%	14.6%	-5.9%	26.4%	4.6%	6.4%	-2.7%	-21.3%	14.8%	8.7%	Seattle Roamer Share Gain
Seattle Roamer Share	41.8%	42.3%	37.8%	40.8%	39.0%	40.8%	44.3%	44.9%	42.8%	38.8%	34.9%	40.8%	Seattle Roamer Share Gain
All Other Roamers	28,696	27,441	28,768	27,263	29,904	27,501	27,457	27,302	27,340	29,948	28,029	27,853	All Other Roamer CAOR
% Change	N/A	-4.4%	4.8%	-5.1%	9.8%	-4.7%	0.1%	-0.5%	0.1%	9.0%	-6.7%	-0.3%	All Other Roamer Share Gain
Share of Roaming Calls	46.7%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	All Other Roamer Call CAOR
Roaming Calls/Roamer	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	All Other Roamer Call Share Gain
Roamer Statistics By Home Location													
Seattle Roamers	8,874	9,817	11,718	9,842	10,384	12,287	11,850	14,078	13,400	13,208	17,183	14,023	Seattle Roamer CAOR
% Change	N/A	10.6%	10.4%	-8.3%	5.3%	17.2%	-3.4%	17.8%	-4.4%	15.4%	24.4%	22.4%	Seattle Roamer Share Gain
Seattle Roamer Share	41.8%	46.3%	48.2%	41.8%	46.1%	42.3%	39.4%	39.5%	39.5%	48.1%	42.4%	41.2%	Seattle Roamer Share Gain
All Other Roamers	33,343	31,601	30,359	32,248	34,468	32,258	34,012	32,684	34,810	33,820	33,729	37,814	All Other Roamer CAOR
% Change	N/A	-5.3%	-3.8%	5.6%	6.2%	-6.1%	3.6%	-3.8%	6.4%	-2.9%	-0.3%	10.8%	All Other Roamer Share Gain
Share of Roaming Calls	46.7%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	All Other Roamer Call CAOR
Roaming Calls/Roamer	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	All Other Roamer Call Share Gain
Roamer Statistics By Home Location													
Seattle Roamers	8,874	9,817	11,718	9,842	10,384	12,287	11,850	14,078	13,400	13,208	17,183	14,023	Seattle Roamer CAOR
% Change	N/A	10.6%	10.4%	-8.3%	5.3%	17.2%	-3.4%	17.8%	-4.4%	15.4%	24.4%	22.4%	Seattle Roamer Share Gain
Seattle Roamer Share	41.8%	46.3%	48.2%	41.8%	46.1%	42.3%	39.4%	39.5%	39.5%	48.1%	42.4%	41.2%	Seattle Roamer Share Gain
All Other Roamers	33,343	31,601	30,359	32,248	34,468	32,258	34,012	32,684	34,810	33,820	33,729	37,814	All Other Roamer CAOR
% Change	N/A	-5.3%	-3.8%	5.6%	6.2%	-6.1%	3.6%	-3.8%	6.4%	-2.9%	-0.3%	10.8%	All Other Roamer Share Gain
Share of Roaming Calls	46.7%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	All Other Roamer Call CAOR
Roaming Calls/Roamer	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	All Other Roamer Call Share Gain
Roamer Statistics By Home Location													
Seattle Roamers	8,874	9,817	11,718	9,842	10,384	12,287	11,850	14,078	13,400	13,208	17,183	14,023	Seattle Roamer CAOR
% Change	N/A	10.6%	10.4%	-8.3%	5.3%	17.2%	-3.4%	17.8%	-4.4%	15.4%	24.4%	22.4%	Seattle Roamer Share Gain
Seattle Roamer Share	41.8%	46.3%	48.2%	41.8%	46.1%	42.3%	39.4%	39.5%	39.5%	48.1%	42.4%	41.2%	Seattle Roamer Share Gain
All Other Roamers	33,343	31,601	30,359	32,248	34,468	32,258	34,012	32,684	34,810	33,820	33,729	37,814	All Other Roamer CAOR
% Change	N/A	-5.3%	-3.8%	5.6%	6.2%	-6.1%	3.6%	-3.8%	6.4%	-2.9%	-0.3%	10.8%	All Other Roamer Share Gain
Share of Roaming Calls	46.7%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	All Other Roamer Call CAOR
Roaming Calls/Roamer	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	All Other Roamer Call Share Gain
Roamer Statistics By Home Location													
Seattle Roamers	8,874	9,817	11,718	9,842	10,384	12,287	11,850	14,078	13,400	13,208	17,183	14,023	Seattle Roamer CAOR
% Change	N/A	10.6%	10.4%	-8.3%	5.3%	17.2%	-3.4%	17.8%	-4.4%	15.4%	24.4%	22.4%	Seattle Roamer Share Gain
Seattle Roamer Share	41.8%	46.3%	48.2%	41.8%	46.1%	42.3%	39.4%	39.5%	39.5%	48.1%	42.4%	41.2%	Seattle Roamer Share Gain
All Other Roamers	33,343	31,601	30,359	32,248	34,468	32,258	34,012	32,684	34,810	33,820	33,729	37,814	All Other Roamer CAOR
% Change	N/A	-5.3%	-3.8%	5.6%	6.2%	-6.1%	3.6%	-3.8%	6.4%	-2.9%	-0.3%	10.8%	All Other Roamer Share Gain
Share of Roaming Calls	46.7%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	46.8%	All Other Roamer Call CAOR
Roaming Calls/Roamer	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	All Other Roamer Call Share Gain

FIGURE 21

CALL SHARE MEASUREMENT

ACTUAL SUBSCRIBERS VS. MEASURED SUBSCRIBERS DURING A BASELINE PERIOD

Actual Calls - Carrier B

408	3216877	Carrier B	TC Assignment
408	5048157	Carrier B	TC Assignment
408	5048157	Carrier B	TC Assignment
415	2719321	Carrier B	TC Assignment
415	2719321	Carrier B	TC Assignment
415	4651181	Carrier B	TC Assignment
415	4995677	Carrier B	TC Assignment
415	4995677	Carrier B	TC Assignment
415	7202077	Carrier B	TC Assignment
415	7220981	Carrier B	TC Assignment
510	9719435	Carrier B	TC Assignment
510	9719435	Carrier B	TC Assignment
650	2088803	Carrier B	TC Assignment
650	3165225	Carrier B	TC Assignment
650	4720249	Carrier B	TC Assignment
917	8393984	Carrier B	TC Assignment
925	4799759	Carrier B	TC Assignment
925	4799759	Carrier B	TC Assignment
925	7202077	Carrier B	TC Assignment

Total # 19 Carrier B
Total non roamers # 18

Measured Calls - Carrier B

415	2719321	Carrier B	TC Assignment
415	7220981	Carrier B	TC Assignment
510	9719435	Carrier B	TC Assignment
510	9719435	Carrier B	TC Assignment
650	3165225	Carrier B	TC Assignment

Total # 5 Carrier B
5

Actual Calls - Carrier A

206	8473934	Carrier A	TC Assignment
213	4929087	Carrier A	TC Assignment
408	3081099	Carrier A	TC Assignment
408	3260181	Carrier A	TC Assignment
408	5048155	Carrier A	TC Assignment
408	6322327	Carrier A	TC Assignment
408	9727753	Carrier A	TC Assignment
415	4651179	Carrier A	TC Assignment
415	4995675	Carrier A	TC Assignment
415	6912099	Carrier A	TC Assignment
415	7070089	Carrier A	TC Assignment
415	7202075	Carrier A	TC Assignment
415	9157919	Carrier A	TC Assignment
415	9718061	Carrier A	TC Assignment
415	9718063	Carrier A	TC Assignment
510	2719319	Carrier A	TC Assignment
510	4072267	Carrier A	TC Assignment
510	4072267	Carrier A	TC Assignment
510	4072267	Carrier A	TC Assignment
510	4075791	Carrier A	TC Assignment
510	4140375	Carrier A	TC Assignment
510	4792791	Carrier A	TC Assignment
510	5312381	Carrier A	TC Assignment
510	5312381	Carrier A	TC Assignment
510	6728701	Carrier A	TC Assignment
617	8493200	Carrier A	TC Assignment
650	2086801	Carrier A	TC Assignment
650	4140375	Carrier A	TC Assignment
650	4720247	Carrier A	TC Assignment
650	7600201	Carrier A	TC Assignment
650	8160867	Carrier A	TC Assignment
650	8160867	Carrier A	TC Assignment
650	8282139	Carrier A	TC Assignment
650	8282139	Carrier A	TC Assignment
650	8722861	Carrier A	TC Assignment
650	9727753	Carrier A	TC Assignment
916	9485023	Carrier A	TC Assignment
925	3086349	Carrier A	TC Assignment
925	4946647	Carrier A	TC Assignment
925	5312381	Carrier A	TC Assignment
925	8289137	Carrier A	TC Assignment
925	8722861	Carrier A	TC Assignment
925	9837732	Carrier A	TC Assignment

Total # 43 Carrier A
Total non roamers # 39

Measured Calls - Carrier A

206	8473934	Carrier A	TC Assignment
408	3081099	Carrier A	TC Assignment
408	6322327	Carrier A	TC Assignment
415	6912099	Carrier A	TC Assignment
415	9718063	Carrier A	TC Assignment
510	4075791	Carrier A	TC Assignment
510	5312381	Carrier A	TC Assignment
510	6728701	Carrier A	TC Assignment
650	8160867	Carrier A	TC Assignment
916	9485023	Carrier A	TC Assignment
925	5312381	Carrier A	TC Assignment

Total # 11 Carrier A
10

Total # 62 Both

Total # 16 Both

FIGURE 22

CALL SHARE MEASUREMENT**SORTED DATA TO COUNT MEASURED CALLS FOR ACTUAL PERIOD (SHOWS TC ASSIGNMENTS ONLY)****Measured TC Assignments - Carrier B**

415	2719319	Carrier B	TC Assignment
415	7220979	Carrier B	TC Assignment
510	9719433	Carrier B	TC Assignment
650	3165223	Carrier B	TC Assignment
Measured Carrier B			4
Non-roaming			4

Measured TC Assignments - Carrier A

206	8473934	Carrier A	TC Assignment
408	6322325	Carrier A	TC Assignment
408	3081097	Carrier A	TC Assignment
415	6912097	Carrier A	TC Assignment
415	9718061	Carrier A	TC Assignment
510	5312379	Carrier A	TC Assignment
510	4075789	Carrier A	TC Assignment
510	6728699	Carrier A	TC Assignment
650	8160865	Carrier A	TC Assignment
925	5312379	Carrier A	TC Assignment
Measured Carrier A			10
Non-roaming			9

FIGURE 23

**CALL SHARE MEASUREMENT
ALGORITHM FOR CALCULATING CALL SHARE**

Baseline period

Count the total number of Measured calls for each carrier during a baseline period (roamers excluded)

Carrier A	11
Carrier B	5

Compare to the Actual number of calls during baseline period

Carrier A	43
Carrier B	19

Calculate the gross up coefficient for each carrier for baseline period

Carrier A	"=43/11"	3.9091
Carrier B	"=19/5"	3.8000

Actual measurement period

Count the total number of Measured calls for each carrier during the actual period

Carrier A	10
Carrier B	4

Calculate estimate of actual number of calls

Calculate the estimate of actual number of calls for each carrier during the actual period using gross up coefficients

Carrier A	"=10*3.9091"	39.0909
Carrier B	"=4*3.8000"	15.2000

Calculate caller share

Calculate the total number of calls using the gross up coefficients

Tot # calls = $10 \times 3.9091 + 4 \times 3.8000 = 54.2909$

Calculate the market share of each carrier for actual data

Carrier A	$=39.0909/54.2909=$	72.0%
Carrier B	$=15.2000/54.2909=$	28.0%

CALCULATE THE SAME EXCLUDING ROAMING CALLS

Baseline period

Count the total number of Measured calls for each carrier during a baseline period (roamers excluded)

Carrier A	10
Carrier B	5

Compare to the Actual number of calls during baseline period

Carrier A	39
Carrier B	18

Calculate the gross up coefficient for each carrier for baseline period

Carrier A	"=39/10"	3.9000
Carrier B	"=18/5"	3.6000

Actual measurement period

Count the total number of Measured calls for each carrier during the actual period

Carrier A	9
Carrier B	4

Calculate estimate of actual number of calls

Calculate the estimate of actual number of calls for each carrier during the actual period using gross up coefficients

Carrier A	"=9*3.9091"	35.1000
Carrier B	"=4*3.6000"	14.4000

Calculate caller share

Calculate the total number of calls using the gross up coefficients

Tot # calls = $9 \times 3.9091 + 4 \times 3.6000 = 49.5000$

Calculate the market share of each carrier for actual data

Carrier A	$=35.1000/49.5000=$	70.9%
Carrier B	$=14.4000/49.5000=$	29.1%

FIGURE 24

InTeleShare - Call share
December 1999 & trailing 12 months
Portland, Oregon

EXAMPLE

	Dec	Jan	Feb	March	April	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Trailing 12 months
AirTouch														
Number of Calls (000's)	5,188.2	5,240.8	5,778.3	6,231.7	6,727.0	7,240.1	7,408.7	7,481.0	7,822.4	8,173.4	8,582.6	8,903.5	8,864.2	CAGR 88.8%
% Change	N/A	1.0%	10.2%	7.8%	7.8%	2.3%	2.3%	1.0%	4.8%	4.5%	5.0%	4.9%	9.8%	Share Gain (0.1%)
Share of calls	42.2%	42.2%	43.5%	43.7%	44.3%	45.0%	45.0%	43.2%	42.1%	41.8%	41.8%	41.8%	42.1%	Net Share Gain 15.7
Share of calls net gain (loss)	N/A	0.0%	1.3%	0.1%	0.8%	0.8%	(0.3%)	(1.8%)	(1.1%)	(0.5%)	0.2%	0.1%	0.1%	CallSub Gain 15.7
CallSub Gain	23.7	23.7	23.6	27.4	29.2	31.5	32.3	32.7	33.6	34.5	35.6	36.7	39.4	
AT&T Wireless														
Number of Calls (000's)	5,738.0	5,756.0	5,918.5	6,268.1	6,518.9	6,865.6	7,520.5	7,820.5	8,248.2	8,804.4	9,067.8	9,428.3	10,327.7	CAGR 78.3%
% Change	N/A	1.0%	2.1%	6.9%	4.0%	2.3%	3.3%	8.2%	9.7%	8.7%	3.3%	3.6%	9.8%	Share Gain (2.7%)
Share of calls	46.7%	46.7%	44.6%	43.9%	43.1%	41.7%	41.8%	43.4%	44.4%	44.8%	44.4%	43.9%	44.0%	Net Share Gain 12.0
Share of calls net gain (loss)	N/A	0.0%	(2.1%)	(0.7%)	(0.8%)	(1.4%)	0.1%	1.6%	0.8%	0.6%	(0.5%)	(0.4%)	0.1%	CallSub Gain 12.0
CallSub Gain	28.8	28.8	28.9	26.8	27.4	27.8	28.7	31.2	33.4	34.8	35.1	35.6	37.8	
Nextel														
Number of Calls (000's)	182.8	194.4	238.4	288.7	273.9	328.7	350.3	355.4	382.4	409.9	428.7	443.6	453.0	CAGR 138.2%
% Change	N/A	1.0%	23.2%	11.4%	2.7%	20.4%	6.3%	1.5%	7.6%	7.2%	4.8%	3.6%	4.4%	Share Gain 0.4%
Share of calls	1.6%	1.6%	1.8%	1.9%	1.8%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.0%	Net Share Gain 10.0
Share of calls net gain (loss)	N/A	0.0%	0.2%	0.1%	(0.1%)	0.3%	0.1%	(0.1%)	0.0%	0.0%	0.0%	(0.0%)	(0.1%)	CallSub Gain 10.0
CallSub Gain	29.7	29.7	32.6	33.8	33.9	40.4	42.5	42.7	44.8	46.4	47.1	47.3	47.7	
Sprint PCS														
Number of Calls (000's)	648.5	653.0	711.3	802.2	850.4	878.5	1,048.1	1,154.7	1,246.8	1,308.5	1,350.2	1,458.4	1,623.7	CAGR 139.5%
% Change	N/A	1.0%	8.9%	12.6%	5.8%	15.2%	7.0%	10.2%	8.0%	4.8%	4.1%	7.3%	4.6%	Share Gain 1.2%
Share of calls	5.3%	5.3%	5.4%	5.6%	5.6%	6.1%	6.4%	6.7%	6.7%	6.7%	6.8%	6.8%	6.6%	Net Share Gain 10.8
Share of calls net gain (loss)	N/A	0.0%	0.1%	0.3%	0.0%	0.5%	0.2%	0.3%	0.0%	(0.1%)	(0.0%)	0.2%	(0.3%)	CallSub Gain 10.8
CallSub Gain	24.6	24.6	25.7	28.7	28.3	30.1	31.3	32.4	32.9	33.3	33.9	34.5	35.2	
USWest														
Number of Calls (000's)	353.9	357.5	407.0	457.7	484.8	498.0	502.3	491.8	502.6	500.3	522.8	558.2	589.6	CAGR 67.6%
% Change	N/A	1.0%	13.8%	12.6%	5.9%	2.3%	1.3%	(2.1%)	2.2%	(0.4%)	4.5%	6.8%	7.0%	Share Gain (0.3%)
Share of calls	2.9%	2.9%	3.1%	3.2%	3.2%	3.1%	3.0%	2.8%	2.7%	2.5%	2.5%	2.8%	2.6%	Net Share Gain 12.7
Share of calls net gain (loss)	N/A	0.0%	0.2%	0.1%	(0.0%)	(0.1%)	(0.1%)	(0.2%)	(0.1%)	(0.2%)	0.0%	0.1%	(0.1%)	CallSub Gain 12.7
CallSub Gain	22.8	22.8	24.9	27.1	28.4	30.0	31.4	31.8	33.0	33.4	33.6	34.6	35.6	
Western Wireless														
Number of Calls (000's)	178.5	176.3	217.2	245.6	263.4	272.9	269.8	320.3	391.8	448.4	518.2	576.8	621.8	CAGR 203.6%
% Change	N/A	1.4%	21.4%	13.0%	7.3%	3.5%	3.2%	14.4%	22.2%	13.5%	13.5%	11.5%	15.5%	Share Gain 1.6%
Share of calls	1.4%	1.4%	1.6%	1.7%	1.7%	1.7%	1.7%	1.8%	2.1%	2.3%	2.3%	2.7%	2.8%	Net Share Gain 9.9
Share of calls net gain (loss)	N/A	(0.0%)	0.2%	0.1%	0.0%	(0.0%)	(0.0%)	0.1%	0.3%	0.2%	0.3%	0.2%	0.3%	CallSub Gain 9.9
CallSub Gain	22.9	22.8	25.7	29.3	28.7	28.9	27.0	27.3	28.4	28.8	31.1	31.2	31.9	
TOTAL														
Number of Calls (000's)	12,225.8	12,419.8	13,267.7	14,289.9	15,119.3	15,983.3	16,473.9	17,323.8	18,584.8	19,840.9	20,511.2	21,480.6	23,480.1	CAGR 59.2%
% Change	N/A	1.6%	6.6%	7.6%	5.4%	5.7%	3.1%	6.1%	7.3%	5.8%	4.4%	4.7%	8.4%	Share Gain 13.7
CallSub Gain	24.5	24.7	25.3	27.1	28.3	29.0	30.7	32.0	33.5	34.8	35.3	36.0	38.1	

FIGURE 25

BASE SUBSCRIBER PROFILING
Actual raw data

Date	Time	Area code	User ID	Cell site	Carrier	City	Type
2/1/1999	12:00:00	415	2719321	33	Carrier B	San Francisco	TC Assignment
2/1/1999	12:00:00	415	3201813	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:00	415	8043821	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:01	408	8322327	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:01	650	3290201	33	Carrier A	San Francisco	Page
2/1/1999	12:00:01	213	4929087	33	Carrier A	San Francisco	Page
2/1/1999	12:00:01	650	5105341	33	Carrier B	San Francisco	Page
2/1/1999	12:00:02	650	8917483	33	Carrier B	San Francisco	Page
2/1/1999	12:00:02	510	5312381	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:02	510	4075791	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:02	925	8022825	33	Carrier B	San Francisco	Page
2/1/1999	12:00:03	925	7202077	33	Carrier A	San Francisco	Page
2/1/1999	12:00:03	925	4799759	33	Carrier B	San Francisco	Page
2/1/1999	12:00:03	917	8393984	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:03	408	3216877	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:04	415	6912099	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:04	415	8839323	33	Carrier A	San Francisco	Page
2/1/1999	12:00:04	415	9719867	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:04	408	5318627	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:05	650	7203431	33	Carrier A	San Francisco	Page
2/1/1999	12:00:05	650	1099979	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:05	650	8160867	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:06	510	3086351	33	Carrier B	San Francisco	Page
2/1/1999	12:00:06	510	4782793	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:06	925	9837734	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:06	925	3086351	33	Carrier B	San Francisco	Page
2/1/1999	12:00:07	925	4946649	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:07	208	8473934	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:07	408	3081099	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:07	415	7070091	33	Carrier B	San Francisco	Page
2/1/1999	12:00:08	415	9718063	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:08	415	9157921	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:08	408	3260183	33	Carrier B	San Francisco	Page
2/1/1999	12:00:08	650	9727755	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:09	650	3185225	33	Carrier B	San Francisco	TC Assignment
2/1/1999	12:00:09	650	7600203	33	Carrier A	San Francisco	Page
2/1/1999	12:00:09	510	2719321	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:09	510	4140377	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:10	925	8289139	33	Carrier A	San Francisco	Page
2/1/1999	12:00:10	925	8722863	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:10	925	5312381	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:10	408	4075791	33	Carrier B	San Francisco	Page
2/1/1999	12:00:11	415	4651181	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:11	415	7202077	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:11	415	4995677	33	Carrier A	San Francisco	Page
2/1/1999	12:00:11	408	5048157	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:12	650	4720249	33	Carrier B	San Francisco	Registration

Thousands of records, but abbreviated for space

2/28/1999	11:59:50	918	9485023	33	Carrier A	San Francisco	TC Assignment
2/28/1999	11:59:51	650	1099979	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:51	650	2086803	33	Carrier B	San Francisco	Page
2/28/1999	11:59:51	510	4072269	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:52	510	9719435	33	Carrier B	San Francisco	TC Assignment
2/28/1999	11:59:52	925	5318223	33	Carrier B	San Francisco	Page
2/28/1999	11:59:52	925	3972083	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:52	925	8372834	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:53	408	7070091	33	Carrier A	San Francisco	Page
2/28/1999	11:59:53	415	7203431	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:53	415	9718063	33	Carrier A	San Francisco	TC Assignment
2/28/1999	11:59:53	415	9080547	33	Carrier B	San Francisco	Page
2/28/1999	11:59:54	408	9727755	33	Carrier A	San Francisco	Registration
2/28/1999	11:59:54	650	4140377	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:54	650	8282141	33	Carrier B	San Francisco	Page
2/28/1999	11:59:54	650	8722863	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:55	510	6728701	33	Carrier A	San Francisco	TC Assignment
2/28/1999	11:59:55	510	3283687	33	Carrier B	San Francisco	Page
2/28/1999	11:59:55	925	9120421	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:55	214	8495065	33	Carrier B	San Francisco	Page
2/28/1999	11:59:56	925	4074175	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:56	925	2849681	33	Carrier B	San Francisco	Page
2/28/1999	11:59:56	408	4949717	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:56	415	7220981	33	Carrier B	San Francisco	TC Assignment
2/28/1999	11:59:57	415	4720249	33	Carrier B	San Francisco	Page
2/28/1999	11:59:57	415	2719321	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:57	408	9140825	33	Carrier A	San Francisco	Registration
2/28/1999	11:59:57	650	4659877	33	Carrier B	San Francisco	Page
2/28/1999	11:59:58	412	3458569	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:58	650	8040589	33	Carrier A	San Francisco	Registration
2/28/1999	11:59:58	650	4075813	33	Carrier B	San Francisco	Page
2/28/1999	11:59:59	510	8927489	33	Carrier A	San Francisco	Page
2/28/1999	11:59:59	510	9088217	33	Carrier A	San Francisco	Page
2/28/1999	11:59:59	925	5108465	33	Carrier B	San Francisco	Page
2/28/1999	11:59:59	925	7202099	33	Carrier B	San Francisco	Page
3/1/1999	12:00:00	925	8134855	33	Carrier B	San Francisco	Page
3/1/1999	12:00:00	408	5075719	33	Carrier A	San Francisco	Page

FIGURE 26

BASE SUBSCRIBER PROFILING
SORTED DATA TO COUNT MEASURED SUBS FOR ACTUAL PERIOD

Measured subs

Area code	User ID	Carrier	Number of TG Assignments
408	2456872	Carrier B	186
408	3218876	Carrier B	0
408	3290181	Carrier B	4
408	4076749	Carrier B	28
408	4949715	Carrier B	18
408	5318625	Carrier B	15
408	5598825	Carrier B	0
408	5726342	Carrier B	85
408	7070089	Carrier B	82
408	8263069	Carrier B	4
415	2718319	Carrier B	38
415	3954234	Carrier B	72
415	4651179	Carrier B	2
415	4720247	Carrier B	24
415	7070089	Carrier B	74
415	7202075	Carrier B	17
415	7203429	Carrier B	134
415	7229979	Carrier B	69
415	8043819	Carrier B	102
415	9080545	Carrier B	85
415	9718081	Carrier B	110
415	9719865	Carrier B	88
510	3086349	Carrier B	4
510	3283685	Carrier B	68
510	4072287	Carrier B	10
510	4140375	Carrier B	50
510	4759234	Carrier B	18
510	5083474	Carrier B	63
510	5763484	Carrier B	38
510	5833453	Carrier B	73
510	7070089	Carrier B	28
510	8374527	Carrier B	9
510	8719433	Carrier B	88
650	2086401	Carrier B	0
650	3086349	Carrier B	0
650	3185223	Carrier B	5
650	4140375	Carrier B	20
650	4720247	Carrier B	33
650	5105339	Carrier B	82
650	6739423	Carrier B	1
650	7923734	Carrier B	10
650	8137454	Carrier B	65
650	8282130	Carrier B	160
650	8722861	Carrier B	61
650	8917481	Carrier B	166
925	2649679	Carrier B	20
925	3086349	Carrier B	26
925	3280181	Carrier B	92
925	3672081	Carrier B	42
925	4074173	Carrier B	0
925	4799757	Carrier B	0
925	5318221	Carrier B	10
925	6022823	Carrier B	0
925	6372832	Carrier B	82
925	6722861	Carrier B	136
925	9120419	Carrier B	60
Measured CallOne			64
			2717

408	2104583	Carrier A	2
408	2568344	Carrier A	84
408	3023844	Carrier A	36
408	3045823	Carrier A	26
408	3081087	Carrier A	70
408	3433683	Carrier A	2
408	4782791	Carrier A	12
408	5048155	Carrier A	0
408	5680234	Carrier A	168
408	6322325	Carrier A	4
408	6834212	Carrier A	130
408	7070089	Carrier A	11
408	8727753	Carrier A	106
415	2834056	Carrier A	24
415	3201811	Carrier A	24
415	4895875	Carrier A	0
415	6812087	Carrier A	68
415	8438321	Carrier A	3
415	9157919	Carrier A	110
415	9718081	Carrier A	38
510	2718318	Carrier A	2
510	2868345	Carrier A	1
510	3081097	Carrier A	2
510	4075789	Carrier A	30
510	4782791	Carrier A	2
510	5128340	Carrier A	5
510	5312379	Carrier A	26
510	6728699	Carrier A	8
650	3280186	Carrier A	12
650	4848647	Carrier A	2
650	5869302	Carrier A	54
650	7203429	Carrier A	32
650	7800201	Carrier A	76
650	8180865	Carrier A	49
650	9727753	Carrier A	176
650	9778330	Carrier A	81
650	9837732	Carrier A	52
925	4848647	Carrier A	8
925	5312379	Carrier A	0
925	6574832	Carrier A	4
925	7202075	Carrier A	118
925	8280137	Carrier A	46
925	9157919	Carrier A	24
925	9837732	Carrier A	26
Measured Carrier A			64
			1763

FIGURE 27

BASE SUBSCRIBER PROFILING
SORTED DATA TO COUNT MEASURED SUBS FOR ACTUAL PERIOD

Measured subs

Serial #	Area code	User ID	Carrier	Number of		
				TC Assignments	Carrier A count	Carrier B count
1	408	2450872	Carrier A	186	1	0
2	650	9727753	Carrier B	179	0	1
3	408	5680234	Carrier B	168	0	1
4	650	9817481	Carrier A	166	1	0
5	650	8232130	Carrier A	160	1	0
6	825	8722861	Carrier A	136	1	0
7	415	7203420	Carrier A	134	1	0
8	408	6834212	Carrier B	130	0	1
9	825	7202075	Carrier B	118	0	1
10	415	9718061	Carrier A	110	1	0
11	415	9157919	Carrier B	110	0	1
12	408	9727753	Carrier B	108	0	1
13	415	8043619	Carrier A	102	1	0
14	825	3290181	Carrier A	92	1	0
15	415	9718865	Carrier A	88	1	0
16	510	9718453	Carrier A	88	1	0
17	408	8720342	Carrier A	85	1	0
18	408	2568344	Carrier B	84	0	1
19	408	7070080	Carrier A	82	1	0
20	650	5105330	Carrier A	82	1	0
21	650	8778330	Carrier B	81	0	1
22	650	7600201	Carrier B	78	0	1
23	415	7070080	Carrier A	74	1	0
24	510	5833453	Carrier A	73	1	0
25	415	3854234	Carrier A	72	1	0
26	408	3061097	Carrier B	70	0	1
27	415	7220679	Carrier A	69	1	0
28	510	3263685	Carrier A	68	1	0
29	415	8812097	Carrier B	68	0	1
30	415	9080545	Carrier A	65	1	0
31	650	8137454	Carrier A	65	1	0
32	510	5083474	Carrier A	63	1	0
33	825	8372832	Carrier A	62	1	0
34	650	9837732	Carrier B	62	0	1
35	650	8722861	Carrier A	61	1	0
36	825	9120419	Carrier A	60	1	0
37	650	5869302	Carrier B	54	0	1
38	510	4140375	Carrier A	50	1	0
39	650	8160865	Carrier B	49	0	1
40	825	8289137	Carrier B	46	0	1
41	825	3872081	Carrier A	42	1	0
42	415	2718319	Carrier A	38	1	0
43	510	5783484	Carrier A	38	1	0
44	415	9718061	Carrier B	38	0	1
45	408	3023844	Carrier B	36	0	1
46	650	4720247	Carrier A	33	1	0
47	650	7203420	Carrier B	32	0	1
48	510	4075780	Carrier B	30	0	1
49	408	4075788	Carrier A	28	1	0
50	510	7070098	Carrier A	28	1	0
51	825	3086349	Carrier A	26	1	0
52	408	3045823	Carrier B	26	0	1
53	510	5312379	Carrier B	26	0	1
54	825	9837732	Carrier B	26	0	1
55	415	4720247	Carrier A	24	1	0
56	415	2834055	Carrier B	24	0	1
57	415	3201811	Carrier B	24	0	1
58	825	9157919	Carrier B	24	0	1
59	650	4140375	Carrier A	20	1	0
60	825	2848678	Carrier A	20	1	0
61	408	4848715	Carrier A	18	1	0
62	510	4758234	Carrier A	18	1	0
63	415	7202075	Carrier A	17	1	0
64	408	5318825	Carrier A	15	1	0
65	408	4782781	Carrier B	12	0	1
66	650	3280190	Carrier B	12	0	1
67	408	7070080	Carrier B	11	0	1
68	510	4072287	Carrier A	10	1	0
69	650	7823734	Carrier A	10	1	0
70	825	5318221	Carrier A	10	1	0
71	510	8374527	Carrier A	9	1	0
72	825	4848647	Carrier B	8	0	1
73	650	3185223	Carrier A	5	1	0
74	510	5128340	Carrier B	5	0	1
75	510	8728690	Carrier B	5	0	1
76	408	3280181	Carrier A	4	1	0
77	408	8283080	Carrier A	4	1	0
78	510	3086349	Carrier A	4	1	0
79	408	6322325	Carrier B	4	0	1
80	825	6574932	Carrier B	4	0	1
81	415	8838321	Carrier B	3	0	1
82	415	4851178	Carrier A	2	1	0
83	408	2104583	Carrier B	2	0	1
84	408	3435863	Carrier B	2	0	1
85	510	2718319	Carrier B	2	0	1
86	510	3081097	Carrier B	2	0	1
87	510	4782781	Carrier B	2	0	1
88	650	4848647	Carrier B	2	0	1
89	650	8736423	Carrier A	1	1	0
90	510	2858345	Carrier B	1	0	1
91	408	3218875	Carrier A	0	1	0
92	408	5588825	Carrier A	0	1	0
93	650	2088801	Carrier A	0	1	0
94	650	3086349	Carrier A	0	1	0
95	825	4074173	Carrier A	0	1	0
96	825	4786787	Carrier A	0	1	0
97	825	6022823	Carrier A	0	1	0
98	408	5048155	Carrier B	0	0	1
99	415	4905675	Carrier B	0	0	1
100	825	5312379	Carrier B	0	0	1

56 44

FIGURE 28

BASE SUBSCRIBER PROFILES
SORTED DATA TO COUNT MEASURED SUBS FOR ACTUAL PERIOD

Measured subs

Act.#	Area code	User ID	Carrier	Number of TC Assignments	Carrier A count	Carrier B count
First Quartile						
1	408	3460872	Carrier A	188	1	0
2	880	8727753	Carrier B	178	0	1
3	408	5880234	Carrier B	188	0	1
4	880	8817481	Carrier A	188	1	0
5	880	8282138	Carrier A	180	1	0
6	825	8722861	Carrier A	136	1	0
7	415	7203428	Carrier A	134	1	0
8	408	8834212	Carrier B	130	0	1
9	825	7202075	Carrier B	118	0	1
10	415	9718081	Carrier A	110	1	0
11	415	9187818	Carrier B	110	0	1
12	408	8727753	Carrier B	108	0	1
13	415	8043819	Carrier A	102	1	0
14	825	3380181	Carrier A	92	1	0
15	415	9718085	Carrier A	88	1	0
16	810	9718433	Carrier A	84	1	0
17	408	8728342	Carrier A	85	1	0
18	408	2588344	Carrier B	84	0	1
19	408	7070088	Carrier A	82	1	0
20	880	9185338	Carrier B	81	0	1
21	880	9778330	Carrier B	78	0	1
22	880	7803201	Carrier B	76	0	1
23	415	7070088	Carrier A	74	1	0
24	810	8833483	Carrier A	73	1	0
25	415	3854234	Carrier A	72	1	0
First quartile totals					14	9
Second Quartile						
26	408	3081087	Carrier B	70	0	1
27	415	7202878	Carrier A	68	1	0
28	810	3383885	Carrier A	68	1	0
29	415	8813087	Carrier B	68	0	1
30	415	8080545	Carrier A	65	1	0
31	880	8137484	Carrier A	65	1	0
32	810	8083474	Carrier A	63	1	0
33	825	8372832	Carrier A	62	1	0
34	880	8837732	Carrier B	62	0	1
35	880	8722861	Carrier A	61	1	0
36	825	9120419	Carrier A	60	1	0
37	880	5880302	Carrier B	54	0	1
38	810	4140378	Carrier A	50	1	0
39	880	9180885	Carrier B	49	0	1
40	825	8289137	Carrier B	46	0	1
41	825	3872081	Carrier A	42	1	0
42	415	2718318	Carrier A	38	1	0
43	810	8763484	Carrier A	38	1	0
44	415	9718081	Carrier B	38	0	1
45	408	3023844	Carrier B	36	0	1
46	880	4720347	Carrier A	33	1	0
47	880	7203428	Carrier B	32	0	1
48	810	4078788	Carrier B	30	0	1
49	408	4078788	Carrier A	28	1	0
50	810	7070088	Carrier A	28	1	0
Second quartile totals					16	19
Third Quartile						
51	825	3085348	Carrier A	28	1	0
52	408	3045823	Carrier B	28	0	1
53	810	8312378	Carrier B	28	0	1
54	825	8837732	Carrier B	26	0	1
55	415	4720347	Carrier A	24	1	0
56	415	2834255	Carrier B	24	0	1
57	415	3301811	Carrier B	24	0	1
58	825	9187818	Carrier B	24	0	1
59	880	4140378	Carrier A	20	1	0
60	825	2848788	Carrier A	20	1	0
61	408	4848715	Carrier A	18	1	0
62	810	4738234	Carrier A	18	1	0
63	415	7202075	Carrier A	17	1	0
64	408	8318825	Carrier A	15	1	0
65	408	4782781	Carrier B	12	0	1
66	880	3380188	Carrier B	12	0	1
67	408	7070088	Carrier B	11	0	1
68	810	4072287	Carrier A	10	1	0
69	880	7802734	Carrier A	10	1	0
70	825	8318221	Carrier A	10	1	0
71	810	8374527	Carrier A	9	1	0
72	825	4848647	Carrier B	8	0	1
73	880	3185223	Carrier A	5	1	0
74	810	8138340	Carrier B	5	0	1
75	810	8720880	Carrier B	5	0	1
Third quartile totals					13	12
Fourth Quartile						
76	408	3380181	Carrier A	4	1	0
77	408	8083088	Carrier A	4	1	0
78	810	3083488	Carrier A	4	1	0
79	408	8322325	Carrier B	4	0	1
80	825	8874832	Carrier B	4	0	1
81	415	8838321	Carrier B	3	0	1
82	415	4881179	Carrier A	2	1	0
83	408	2164883	Carrier B	2	0	1
84	408	3435883	Carrier B	2	0	1
85	810	2718318	Carrier B	2	0	1
86	810	3081087	Carrier B	2	0	1
87	810	4782781	Carrier B	2	0	1
88	880	4848647	Carrier B	2	0	1
89	880	8738423	Carrier A	1	1	0
90	810	2888345	Carrier B	1	0	1
91	408	3218875	Carrier A	0	1	0
92	408	8888825	Carrier A	0	1	0
93	880	3088801	Carrier A	0	1	0
94	880	3088348	Carrier A	0	1	0
95	825	4074173	Carrier A	0	1	0
96	825	4788787	Carrier A	0	1	0
97	825	8022823	Carrier A	0	1	0
98	408	8048185	Carrier B	0	0	1
99	415	4885875	Carrier B	0	0	1
100	825	5312378	Carrier B	0	0	1
Fourth quartile totals					12	13

FIGURE 29

BASE SUBSCRIBER PROFILING
ALGORITHM FOR PROFILING BASE SUBSCRIBERS

	<u>Carrier A</u>	<u>Carrier B</u>
First quartile	16	9
Second quartile	15	10
Third quartile	13	12
Fourth quartile	12	13

Calculate the market share of each quartile using the following formulas

First quartile	Carrier A	$=16/(16+9)$	64.0%
	Carrier B	$=9/(16+9)$	36.0%
Second quartile	Carrier A	$=15/(15+10)$	60.0%
	Carrier B	$=10/(15+10)$	40.0%
Third quartile	Carrier A	$=13/(13+12)$	52.0%
	Carrier B	$=12/(13+12)$	48.0%
Fourth quartile	Carrier A	$=12/(13+12)$	48.0%
	Carrier B	$=13/(13+12)$	52.0%

FIGURE 30

ADDED-SUBSCRIBER PROFILING
Actual raw data period #1

Date	Time	Area code	User ID	Cell site	Carrier	City	Type
1/1/1999	12:00:00	650	3290201	33	Carrier B	San Francisco	Page
1/1/1999	12:00:00	650	8917483	33	Carrier A	San Francisco	Page
1/1/1999	12:00:00	510	5312381	33	Carrier B	San Francisco	Page
1/1/1999	12:00:01	415	2719321	33	Carrier A	San Francisco	Registration
1/1/1999	12:00:01	415	3201813	33	Carrier A	San Francisco	Registration
1/1/1999	12:00:01	415	8043621	33	Carrier A	San Francisco	TC Assignment
1/1/1999	12:00:01	408	6322327	33	Carrier B	San Francisco	Page
1/1/1999	12:00:02	925	7202077	33	Carrier B	San Francisco	Page
1/1/1999	12:00:02	213	4929087	33	Carrier A	San Francisco	Page
1/1/1999	12:00:02	650	5105341	33	Carrier A	San Francisco	Page
1/1/1999	12:00:02	650	4075813	33	Carrier B	San Francisco	TC Assignment
1/1/1999	12:00:03	510	8927489	33	Carrier A	San Francisco	Registration
1/1/1999	12:00:03	510	9088217	33	Carrier B	San Francisco	Registration
1/1/1999	12:00:03	925	5108465	33	Carrier B	San Francisco	TC Assignment
1/1/1999	12:00:03	925	7202099	33	Carrier B	San Francisco	TC Assignment
1/1/1999	12:00:04	925	8134855	33	Carrier A	San Francisco	TC Assignment
1/1/1999	12:00:04	510	3086351	33	Carrier A	San Francisco	Page
1/1/1999	12:00:04	510	4782783	33	Carrier B	San Francisco	Registration
1/1/1999	12:00:04	925	9837734	33	Carrier B	San Francisco	Registration
1/1/1999	12:00:05	925	3086351	33	Carrier A	San Francisco	Page
1/1/1999	12:00:05	925	4946649	33	Carrier B	San Francisco	Registration
1/1/1999	12:00:05	206	8473934	33	Carrier A	San Francisco	TC Assignment
1/1/1999	12:00:06	408	3081099	33	Carrier B	San Francisco	Page
1/1/1999	12:00:06	415	7070091	33	Carrier A	San Francisco	Registration
1/1/1999	12:00:06	415	9718063	33	Carrier A	San Francisco	Registration
1/1/1999	12:00:06	415	9157921	33	Carrier B	San Francisco	Page
1/1/1999	12:00:07	408	3260183	33	Carrier A	San Francisco	Registration
1/1/1999	12:00:07	408	5318627	33	Carrier A	San Francisco	TC Assignment
1/1/1999	12:00:07	650	7203431	33	Carrier A	San Francisco	TC Assignment
1/1/1999	12:00:07	650	1099979	33	Carrier B	San Francisco	Page
1/1/1999	12:00:08	650	8160667	33	Carrier B	San Francisco	Registration
1/1/1999	12:00:08	650	9727755	33	Carrier A	San Francisco	Registration
1/1/1999	12:00:08	650	3165225	33	Carrier B	San Francisco	Page
1/1/1999	12:00:08	650	7600203	33	Carrier A	San Francisco	Registration
1/1/1999	12:00:09	510	4075791	33	Carrier B	San Francisco	TC Assignment
1/1/1999	12:00:09	925	6022625	33	Carrier A	San Francisco	Page
1/1/1999	12:00:09	415	6912099	33	Carrier A	San Francisco	Registration
1/1/1999	12:00:09	925	4799759	33	Carrier B	San Francisco	Registration
1/1/1999	12:00:10	917	8393984	33	Carrier A	San Francisco	Page
1/1/1999	12:00:10	408	3216677	33	Carrier B	San Francisco	Registration
1/1/1999	12:00:10	925	8722863	33	Carrier A	San Francisco	Registration
1/1/1999	12:00:10	415	8839323	33	Carrier B	San Francisco	Page
1/1/1999	12:00:11	415	9719667	33	Carrier B	San Francisco	Registration
1/1/1999	12:00:11	510	2719321	33	Carrier B	San Francisco	Registration
1/1/1999	12:00:11	510	4140377	33	Carrier A	San Francisco	Page
1/1/1999	12:00:11	925	8289139	33	Carrier A	San Francisco	Registration
1/1/1999	12:00:12	510	4072289	33	Carrier B	San Francisco	TC Assignment

Thousands of records, but abbreviated for space

1/31/1999	11:59:50	925	5312381	33	Carrier A	San Francisco	Page
1/31/1999	11:59:51	408	4075791	33	Carrier B	San Francisco	Registration
1/31/1999	11:59:51	415	4651181	33	Carrier B	San Francisco	Registration
1/31/1999	11:59:51	415	7202077	33	Carrier B	San Francisco	Page
1/31/1999	11:59:52	415	4995677	33	Carrier B	San Francisco	Registration
1/31/1999	11:59:52	408	5048157	33	Carrier B	San Francisco	TC Assignment
1/31/1999	11:59:52	650	4720249	33	Carrier B	San Francisco	TC Assignment
1/31/1999	11:59:52	916	9485023	33	Carrier B	San Francisco	Registration
1/31/1999	11:59:53	650	1099979	33	Carrier A	San Francisco	Page
1/31/1999	11:59:53	650	2086803	33	Carrier B	San Francisco	Registration
1/31/1999	11:59:53	415	2719321	33	Carrier A	San Francisco	TC Assignment
1/31/1999	11:59:53	408	9140825	33	Carrier B	San Francisco	Page
1/31/1999	11:59:54	650	4659877	33	Carrier A	San Francisco	Registration
1/31/1999	11:59:54	412	3458569	33	Carrier B	San Francisco	Registration
1/31/1999	11:59:54	650	8040589	33	Carrier B	San Francisco	TC Assignment
1/31/1999	11:59:54	408	9727755	33	Carrier B	San Francisco	Page
1/31/1999	11:59:55	650	4140377	33	Carrier A	San Francisco	Registration
1/31/1999	11:59:55	650	8282141	33	Carrier B	San Francisco	Page
1/31/1999	11:59:55	650	8722863	33	Carrier B	San Francisco	Registration
1/31/1999	11:59:55	510	6728701	33	Carrier B	San Francisco	Page
1/31/1999	11:59:56	925	8372834	33	Carrier B	San Francisco	Registration
1/31/1999	11:59:56	408	7070091	33	Carrier B	San Francisco	Page
1/31/1999	11:59:56	415	7203431	33	Carrier B	San Francisco	Registration
1/31/1999	11:59:56	415	9718063	33	Carrier B	San Francisco	Page
1/31/1999	11:59:57	415	9080547	33	Carrier B	San Francisco	Registration
1/31/1999	11:59:57	925	4074175	33	Carrier B	San Francisco	TC Assignment
1/31/1999	11:59:57	925	2649681	33	Carrier A	San Francisco	Registration
1/31/1999	11:59:57	408	4949717	33	Carrier B	San Francisco	Page
1/31/1999	11:59:58	415	7220961	33	Carrier B	San Francisco	Registration
1/31/1999	11:59:58	510	3283687	33	Carrier A	San Francisco	TC Assignment
1/31/1999	11:59:58	925	9120421	33	Carrier B	San Francisco	Page
1/31/1999	11:59:59	214	8465065	33	Carrier A	San Francisco	Page
1/31/1999	11:59:59	415	4720249	33	Carrier A	San Francisco	Registration
1/31/1999	11:59:59	925	5108465	33	Carrier B	San Francisco	Page
1/31/1999	11:59:59	925	7202099	33	Carrier B	San Francisco	Page
2/1/1999	12:00:00	925	8134855	33	Carrier B	San Francisco	TC Assignment
2/1/1999	12:00:00	408	5075719	33	Carrier A	San Francisco	TC Assignment

FIGURE 31

ADDED SUBSCRIBER PROFILING
Actual raw data period #2

Date	Time	Area code	User ID	Cell site	Carrier	City	Type
2/1/1999	12:00:00	415	2719321	33	Carrier B	San Francisco	TC Assignment
2/1/1999	12:00:00	415	3201813	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:00	415	8043621	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:01	408	6322327	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:01	650	3290201	33	Carrier A	San Francisco	Page
2/1/1999	12:00:01	213	4929087	33	Carrier A	San Francisco	Page
2/1/1999	12:00:01	650	5105341	33	Carrier B	San Francisco	Page
2/1/1999	12:00:02	650	8917483	33	Carrier B	San Francisco	Page
2/1/1999	12:00:02	510	5312381	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:02	510	4075791	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:02	925	6022625	33	Carrier B	San Francisco	Page
2/1/1999	12:00:03	925	7202077	33	Carrier A	San Francisco	Page
2/1/1999	12:00:03	925	4799759	33	Carrier B	San Francisco	Page
2/1/1999	12:00:03	917	8393984	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:03	408	3216877	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:04	415	6912099	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:04	415	8839323	33	Carrier A	San Francisco	Page
2/1/1999	12:00:04	415	9719867	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:04	408	5318627	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:05	650	7203431	33	Carrier A	San Francisco	Page
2/1/1999	12:00:05	650	1099979	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:05	650	8160667	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:06	510	3066351	33	Carrier B	San Francisco	Page
2/1/1999	12:00:06	510	4762793	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:06	925	9837734	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:06	925	3066351	33	Carrier B	San Francisco	Page
2/1/1999	12:00:07	925	4946649	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:07	206	8473834	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:07	408	3081099	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:07	415	7070091	33	Carrier B	San Francisco	Page
2/1/1999	12:00:08	415	9718063	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:08	415	9157921	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:08	408	3260183	33	Carrier B	San Francisco	Page
2/1/1999	12:00:08	650	9727755	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:09	650	3165225	33	Carrier B	San Francisco	TC Assignment
2/1/1999	12:00:09	650	7600203	33	Carrier A	San Francisco	Page
2/1/1999	12:00:09	510	2719321	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:09	510	4140377	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:10	925	8289139	33	Carrier A	San Francisco	Page
2/1/1999	12:00:10	925	8722863	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:10	925	5312381	33	Carrier A	San Francisco	TC Assignment
2/1/1999	12:00:10	408	4075791	33	Carrier B	San Francisco	Page
2/1/1999	12:00:11	415	4851181	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:11	415	7202077	33	Carrier B	San Francisco	Registration
2/1/1999	12:00:11	415	4995677	33	Carrier A	San Francisco	Page
2/1/1999	12:00:11	408	5048157	33	Carrier A	San Francisco	Registration
2/1/1999	12:00:12	650	4720249	33	Carrier B	San Francisco	Registration

Thousands of records, but abbreviated for space

2/28/1999	11:59:50	916	9485023	33	Carrier A	San Francisco	TC Assignment
2/28/1999	11:59:51	650	1099979	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:51	650	2066803	33	Carrier B	San Francisco	Page
2/28/1999	11:59:51	510	4072269	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:52	510	9719435	33	Carrier B	San Francisco	TC Assignment
2/28/1999	11:59:52	925	5318223	33	Carrier B	San Francisco	Page
2/28/1999	11:59:52	925	3972083	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:52	925	8372834	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:53	408	7070091	33	Carrier A	San Francisco	Page
2/28/1999	11:59:53	415	7203431	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:53	415	9718063	33	Carrier A	San Francisco	TC Assignment
2/28/1999	11:59:53	415	9080547	33	Carrier B	San Francisco	Page
2/28/1999	11:59:54	408	9727755	33	Carrier A	San Francisco	Registration
2/28/1999	11:59:54	650	4140377	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:54	650	8282141	33	Carrier B	San Francisco	Page
2/28/1999	11:59:54	650	8722863	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:55	510	6728701	33	Carrier A	San Francisco	TC Assignment
2/28/1999	11:59:55	510	3283687	33	Carrier B	San Francisco	Page
2/28/1999	11:59:55	925	9120421	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:55	214	8495065	33	Carrier B	San Francisco	Page
2/28/1999	11:59:56	925	4074175	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:56	925	2649681	33	Carrier B	San Francisco	Page
2/28/1999	11:59:56	408	4949717	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:56	415	7220981	33	Carrier B	San Francisco	TC Assignment
2/28/1999	11:59:57	415	4720249	33	Carrier B	San Francisco	Page
2/28/1999	11:59:57	415	2719321	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:57	408	9140825	33	Carrier A	San Francisco	Registration
2/28/1999	11:59:57	650	4659877	33	Carrier B	San Francisco	Page
2/28/1999	11:59:58	412	3458569	33	Carrier B	San Francisco	Registration
2/28/1999	11:59:58	650	8040589	33	Carrier A	San Francisco	Registration
2/28/1999	11:59:58	650	4075813	33	Carrier B	San Francisco	Page
2/28/1999	11:59:59	510	8927489	33	Carrier A	San Francisco	Page
2/28/1999	11:59:59	510	9088217	33	Carrier A	San Francisco	Page
2/28/1999	11:59:59	925	6108465	33	Carrier B	San Francisco	Page
2/28/1999	11:59:59	925	7202099	33	Carrier B	San Francisco	Page
3/1/1999	12:00:00	925	8134855	33	Carrier B	San Francisco	Page
3/1/1999	12:00:00	408	5075719	33	Carrier A	San Francisco	Page

F16UPC 32

ADDED SUBSCRIBER PROFILING**SORTED DATA TO COUNT MEASURED SUBS FOR ACTUAL PERIOD****Added subs**

<u>Count</u>	<u>Area code</u>	<u>User ID</u>	<u>Carrier</u>	<u>Number of TC Assignments</u>
1	408	2459999	Carrier A	186
2	408	3125342	Carrier A	0
3	408	4284754	Carrier A	4
4	408	5234565	Carrier A	28
5	408	6456834	Carrier A	18
6	408	6834125	Carrier A	15
7	408	9837234	Carrier A	0
8	415	3459759	Carrier A	85
9	415	4712845	Carrier A	82
10	415	7074832	Carrier A	4
11	415	7218473	Carrier A	38
12	415	7219473	Carrier A	72
13	415	7237453	Carrier A	2
14	415	9718753	Carrier A	24
15	415	3184477	Carrier A	74
16	510	4405853	Carrier A	17
17	510	5818450	Carrier A	134
18	510	8569023	Carrier A	69
19	650	3129384	Carrier A	102
20	650	4859603	Carrier A	65
21	650	8028449	Carrier A	110
22	650	8147586	Carrier A	88
23	650	8839475	Carrier A	4
24	925	2784753	Carrier A	68
25	925	3346573	Carrier A	10
26	925	4796784	Carrier A	50
27	925	5473842	Carrier A	18
28	925	8574534	Carrier A	63
29	408	2158949	Carrier B	38
30	408	3048865	Carrier B	73
31	408	4858694	Carrier B	28
32	408	5689483	Carrier B	9
33	408	7071234	Carrier B	88
34	415	3203845	Carrier B	0
35	415	9158934	Carrier B	0
36	510	3093849	Carrier B	5
37	510	4798694	Carrier B	20
38	510	5495834	Carrier B	33
39	510	5504853	Carrier B	82
40	650	5873844	Carrier B	1
41	650	8178934	Carrier B	10
42	650	9938445	Carrier B	65
43	925	8129345	Carrier B	160
44	925	8129903	Carrier B	3
44				2045

FIGURE 34

ADDED SUBSCRIBER PROFILING

SORTED DATA TO COUNT MEASURED ADDED SUBS FOR ACTUAL PERIOD

Measured subs

<u>Sort #</u>	<u>Area code</u>	<u>User ID</u>	<u>Carrier</u>	<u>Number of</u>		
				<u>TC Assignments</u>	<u>Carrier A count</u>	<u>Carrier B count</u>
1	408	2459999	Carrier A	186	1	0
2	925	8129345	Carrier B	160	0	1
3	510	5818450	Carrier A	134	1	0
4	650	8028449	Carrier A	110	1	0
5	650	3129384	Carrier A	102	1	0
6	650	8147586	Carrier A	88	1	0
7	408	7071234	Carrier B	88	0	1
8	415	3459759	Carrier A	85	1	0
9	415	4712845	Carrier A	82	1	0
10	510	5504853	Carrier B	82	0	1
11	415	3184477	Carrier A	74	1	0
12	408	3048865	Carrier B	73	0	1
13	415	7219473	Carrier A	72	1	0
14	510	8569023	Carrier A	69	1	0
15	925	2784753	Carrier A	68	1	0
16	650	4859603	Carrier A	65	1	0
17	650	9938445	Carrier B	65	0	1
18	925	8574534	Carrier A	63	1	0
19	925	4796784	Carrier A	50	1	0
20	415	7218473	Carrier A	38	1	0
21	408	2158949	Carrier B	38	0	1
22	510	5495834	Carrier B	33	0	1
23	408	5234565	Carrier A	28	1	0
24	408	4858694	Carrier B	28	0	1
25	415	9718753	Carrier A	24	1	0
26	510	4798694	Carrier B	20	0	1
27	408	6456834	Carrier A	18	1	0
28	925	5473842	Carrier A	18	1	0
29	510	4405853	Carrier A	17	1	0
30	408	6834125	Carrier A	15	1	0
31	925	3346573	Carrier A	10	1	0
32	650	8178934	Carrier B	10	0	1
33	408	5689483	Carrier B	9	0	1
34	510	3093849	Carrier B	5	0	1
35	408	4284754	Carrier A	4	1	0
36	415	7074832	Carrier A	4	1	0
37	650	8839475	Carrier A	4	1	0
38	925	8129903	Carrier B	3	0	1
39	415	7237453	Carrier A	2	1	0
40	650	5873844	Carrier B	1	0	1
41	408	3125342	Carrier A	0	1	0
42	408	9837234	Carrier A	0	1	0
43	415	3203845	Carrier B	0	0	1
44	415	9158934	Carrier B	0	0	1
				28	16	

FIGURE 35

Measured subs

<u>Sort #</u>	<u>Area code</u>	<u>User ID</u>	<u>Carrier</u>	<u>Number of TC Assignments</u>	<u>Carrier A count</u>	<u>Carrier B count</u>
First Quartile						
1	408	2459999	Carrier A	186	1	0
2	925	8129345	Carrier B	160	0	1
3	510	5818450	Carrier A	134	1	0
4	650	8028449	Carrier A	110	1	0
5	650	3129384	Carrier A	102	1	0
6	650	8147586	Carrier A	88	1	0
7	408	7071234	Carrier B	88	0	1
8	415	3459759	Carrier A	85	1	0
9	415	4712845	Carrier A	82	1	0
10	510	5504853	Carrier B	82	0	1
11	415	3184477	Carrier A	74	1	0
First quartile totals					8	3
Second Quartile						
12	408	3048865	Carrier B	73	0	1
13	415	7219473	Carrier A	72	1	0
14	510	8569023	Carrier A	69	1	0
15	925	2784753	Carrier A	68	1	0
16	650	4859603	Carrier A	65	1	0
17	650	9938445	Carrier B	65	0	1
18	925	8574534	Carrier A	63	1	0
19	925	4796784	Carrier A	50	1	0
20	415	7218473	Carrier A	38	1	0
21	408	2158949	Carrier B	38	0	1
22	510	5495834	Carrier B	33	0	1
Second quartile totals					7	4
Third Quartile						
23	408	5234565	Carrier A	28	1	0
24	408	4858694	Carrier B	28	0	1
25	415	9718753	Carrier A	24	1	0
26	510	4798694	Carrier B	20	0	1
27	408	6456834	Carrier A	18	1	0
28	925	5473842	Carrier A	18	1	0
29	510	4405853	Carrier A	17	1	0
30	408	6834125	Carrier A	15	1	0
31	925	3346573	Carrier A	10	1	0
32	650	8178934	Carrier B	10	0	1
33	408	5689483	Carrier B	9	0	1
Third quartile totals					7	4
Fourth Quartile						
34	510	3093849	Carrier B	5	0	1
35	408	4284754	Carrier A	4	1	0
36	415	7074832	Carrier A	4	1	0
37	650	8839475	Carrier A	4	1	0
38	925	8129903	Carrier B	3	0	1
39	415	7237453	Carrier A	2	1	0
40	650	5873844	Carrier B	1	0	1
41	408	3125342	Carrier A	0	1	0
42	408	9837234	Carrier A	0	1	0
43	415	3203845	Carrier B	0	0	1
44	415	9158934	Carrier B	0	0	1
Fourth quartile totals					6	5

FIGURE 36

ADDED SUBSCRIBER PROFILING
ALGORITHM FOR PROFILING ADDED SUBSCRIBERS

	<u>Carrier A</u>	<u>Carrier B</u>
First quartile	8	3
Second quartile	7	4
Third quartile	7	4
Fourth quartile	6	5

Calculate the market share of each quartile using the following formulas

First quartile	Carrier A	$=8/(8+3)$	72.7%
	Carrier B	$=3/(8+3)$	27.3%
Second quartile	Carrier A	$=7/(7+4)$	63.6%
	Carrier B	$=4/(7+4)$	36.4%
Third quartile	Carrier A	$=7/(7+4)$	63.6%
	Carrier B	$=4/(7+4)$	36.4%
Fourth quartile	Carrier A	$=6/(6+5)$	54.5%
	Carrier B	$=5/(6+5)$	45.5%

FIGURE 37

CHURNED SUBSCRIBER PROFILING
SORTED DATA TO COUNT MEASURED SUBS FOR ACTUAL PERIOD

Churned subs

<u>Count</u>	<u>Area code</u>	<u>User ID</u>	<u>Carrier</u>	<u>Number of TC Assignments</u>
1	408	4075789	Carrier A	186
2	408	5598825	Carrier A	0
3	415	3954234	Carrier A	4
4	415	9080545	Carrier A	28
5	510	4140375	Carrier A	18
6	510	8374527	Carrier A	15
7	650	4140375	Carrier A	0
8	650	8282139	Carrier A	85
9	925	4074173	Carrier A	82
10	925	8372832	Carrier A	4
11	408	3023844	Carrier B	38
12	408	3435863	Carrier B	72
13	408	5680234	Carrier B	2
14	415	2834055	Carrier B	24
15	415	6912097	Carrier B	74
16	510	2719319	Carrier B	17
17	510	4792791	Carrier B	134
18	650	4946647	Carrier B	69
19	650	7600201	Carrier B	102
20	650	9778330	Carrier B	65
21	925	7202075	Carrier B	110
22	925	8289137	Carrier B	0
23	925	9157919	Carrier B	22
24	925	9837732	Carrier B	333
24				1484

FIGURE 38

CHURNED SUBSCRIBER PROFILING
SORTED DATA TO COUNT MEASURED SUBS FOR ACTUAL PERIOD

Measured subs

<u>Sort #</u>	<u>Area code</u>	<u>User ID</u>	<u>Carrier</u>	<u>Number of</u>		
				<u>TC Assignments</u>	<u>Carrier A count</u>	<u>Carrier B count</u>
1	925	9837732	Carrier B	333	0	1
2	408	4075789	Carrier A	186	1	0
3	510	4792791	Carrier B	134	0	1
4	925	7202075	Carrier B	110	0	1
5	650	7600201	Carrier B	102	0	1
6	650	8282139	Carrier A	85	1	0
7	925	4074173	Carrier A	82	1	0
8	415	6912097	Carrier B	74	0	1
9	408	3435863	Carrier B	72	0	1
10	650	4946647	Carrier B	69	0	1
11	650	9778330	Carrier B	65	0	1
12	408	3023844	Carrier B	38	0	1
13	415	9080545	Carrier A	28	1	0
14	415	2834055	Carrier B	24	0	1
15	925	9157919	Carrier B	22	0	1
16	510	4140375	Carrier A	18	1	0
17	510	2719319	Carrier B	17	0	1
18	510	8374527	Carrier A	15	1	0
19	415	3954234	Carrier A	4	1	0
20	925	8372832	Carrier A	4	1	0
21	408	5680234	Carrier B	2	0	1
22	408	5598825	Carrier A	0	1	0
23	650	4140375	Carrier A	0	1	0
24	925	8289137	Carrier B	0	0	1
					10	14

FIGURE 39

CHURNED SUBSCRIBER PROFILING**SORTED DATA TO COUNT MEASURED ADDED SUBS FOR ACTUAL PERIOD**Measured subs

<u>Sort #</u>	<u>Area code</u>	<u>User ID</u>	<u>Carrier</u>	<u>Number of TC Assignments</u>	<u>Carrier A count</u>	<u>Carrier B count</u>
First Quartile						
1	925	9837732	Carrier B	333	0	1
2	408	4075789	Carrier A	186	1	0
3	510	4792791	Carrier B	134	0	1
4	925	7202075	Carrier B	110	0	1
5	650	7600201	Carrier B	102	0	1
6	650	8282139	Carrier A	85	1	0
First quartile totals					2	4
Second Quartile						
7	925	4074173	Carrier A	82	1	0
8	415	6912097	Carrier B	74	0	1
9	408	3435863	Carrier B	72	0	1
10	650	4946647	Carrier B	69	0	1
11	650	9778330	Carrier B	65	0	1
12	408	3023844	Carrier B	38	0	1
Second quartile totals					1	5
Third Quartile						
13	415	9080545	Carrier A	28	1	0
14	415	2834055	Carrier B	24	0	1
15	925	9157919	Carrier B	22	0	1
16	510	4140375	Carrier A	18	1	0
17	510	2719319	Carrier B	17	0	1
18	510	8374527	Carrier A	15	1	0
Third quartile totals					3	3
Fourth Quartile						
19	415	3954234	Carrier A	4	1	0
20	925	8372832	Carrier A	4	1	0
21	408	5680234	Carrier B	2	0	1
22	408	5598825	Carrier A	0	1	0
23	650	4140375	Carrier A	0	1	0
24	925	8289137	Carrier B	0	0	1
Fourth quartile totals					4	2

FIGURE 40

**CHURNED SUBSCRIBER PROFILING
ALGORITHM FOR PROFILING ADDED SUBSCRIBERS**

	<u>Carrier A</u>	<u>Carrier B</u>
First quartile	2	4
Second quartile	1	5
Third quartile	3	3
Fourth quartile	4	2

Calculate the market share of each quartile using the following formulas

First quartile	Carrier A	$=2/(2+4)$	33.3%
	Carrier B	$=4/(2+4)$	66.7%
Second quartile	Carrier A	$=1/(1+5)$	16.7%
	Carrier B	$=5/(1+5)$	83.3%
Third quartile	Carrier A	$=3/(3+3)$	50.0%
	Carrier B	$=3/(3+3)$	50.0%
Fourth quartile	Carrier A	$=4/(4+2)$	66.7%
	Carrier B	$=2/(4+2)$	33.3%

FIGURE 41

PEAK/NON-PEAK CALL SHARE MEASUREMENT
ACTUAL PERIOD RAW DATA

Date	Time	Area code	User ID	Cell site	Carrier	City	Type
3/7/1999	18:59:50	415	2719319	33	Carrier B	San Francisco	TC Assignment
3/7/1999	18:59:50	415	3201811	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:51	415	8043619	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:51	408	6322325	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:51	650	3290199	33	Carrier A	San Francisco	Page
3/7/1999	18:59:51	650	5105339	33	Carrier B	San Francisco	Page
3/7/1999	18:59:52	650	8917481	33	Carrier B	San Francisco	Page
3/7/1999	18:59:52	510	5312379	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:52	510	4075789	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:52	925	6022623	33	Carrier B	San Francisco	Page
3/7/1999	18:59:53	925	7202075	33	Carrier A	San Francisco	Page
3/7/1999	18:59:53	925	4799757	33	Carrier B	San Francisco	Page
3/7/1999	18:59:53	408	3216875	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:53	415	6912097	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:54	415	8839321	33	Carrier A	San Francisco	Page
3/7/1999	18:59:54	415	9719865	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:54	408	5318625	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:54	650	7203429	33	Carrier A	San Francisco	Page
3/7/1999	18:59:55	650	1099977	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:55	650	8160865	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:55	510	3086349	33	Carrier B	San Francisco	Page
3/7/1999	18:59:55	510	4792791	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:56	925	9837732	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:56	925	3086349	33	Carrier B	San Francisco	Page
3/7/1999	18:59:56	925	4946647	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:56	408	3081097	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:57	415	7070089	33	Carrier B	San Francisco	Page
3/7/1999	18:59:57	415	9718061	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:57	415	9157919	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:58	408	3260181	33	Carrier B	San Francisco	Page
3/7/1999	18:59:58	650	9727753	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:58	650	3165223	33	Carrier B	San Francisco	TC Assignment
3/7/1999	18:59:58	650	7600201	33	Carrier A	San Francisco	Page
3/7/1999	18:59:59	510	2719319	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:59	510	4140375	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:59	925	8289137	33	Carrier A	San Francisco	Page
3/7/1999	18:59:59	925	8722861	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:00	925	5312379	33	Carrier A	San Francisco	TC Assignment
3/7/1999	19:00:00	408	4075789	33	Carrier B	San Francisco	Page
3/7/1999	19:00:00	415	4651179	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:00	415	7202075	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:01	415	4995675	33	Carrier A	San Francisco	Page
3/7/1999	19:00:01	408	5048155	33	Carrier A	San Francisco	Registration
3/7/1999	19:00:01	650	4720247	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:01	617	8493200	33	Carrier A	San Francisco	Page
3/7/1999	19:00:02	650	2086801	33	Carrier B	San Francisco	Page
3/7/1999	19:00:02	510	4072267	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:02	510	9719433	33	Carrier B	San Francisco	TC Assignment
3/7/1999	19:00:02	925	5318221	33	Carrier B	San Francisco	Page
3/7/1999	19:00:03	925	3972081	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:03	925	8372832	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:03	408	7070089	33	Carrier A	San Francisco	Page
3/7/1999	19:00:03	415	7203429	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:04	415	9718061	33	Carrier A	San Francisco	TC Assignment
3/7/1999	19:00:04	415	9080545	33	Carrier B	San Francisco	Page
3/7/1999	19:00:04	408	9727753	33	Carrier A	San Francisco	Registration
3/7/1999	19:00:05	650	4140375	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:05	213	4929087	33	Carrier A	San Francisco	Page
3/7/1999	19:00:05	650	8282139	33	Carrier B	San Francisco	Page
3/7/1999	19:00:05	650	8722861	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:06	510	6728699	33	Carrier A	San Francisco	TC Assignment
3/7/1999	19:00:06	510	3283685	33	Carrier B	San Francisco	Page
3/7/1999	19:00:06	925	9120419	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:06	206	8473934	33	Carrier A	San Francisco	TC Assignment
3/7/1999	19:00:07	925	4074173	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:07	925	2649679	33	Carrier B	San Francisco	Page
3/7/1999	19:00:07	408	4949715	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:07	415	7220979	33	Carrier B	San Francisco	TC Assignment
3/7/1999	19:00:08	415	4720247	33	Carrier B	San Francisco	Page
3/7/1999	19:00:08	415	2719319	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:08	408	4792791	33	Carrier A	San Francisco	Registration
3/7/1999	19:00:08	917	8393984	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:09	650	9837732	33	Carrier A	San Francisco	Page
3/7/1999	19:00:09	650	3086349	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:09	650	4946647	33	Carrier A	San Francisco	Page
3/7/1999	19:00:09	510	3081097	33	Carrier A	San Francisco	Page
3/7/1999	19:00:10	510	7070089	33	Carrier B	San Francisco	Page
3/7/1999	19:00:10	925	9157919	33	Carrier A	San Francisco	Page
3/7/1999	19:00:10	925	3260181	33	Carrier B	San Francisco	Page
3/7/1999	19:00:10	408	7070089	33	Carrier B	San Francisco	Page
3/7/1999	19:00:11	412	3458569	33	Carrier B	San Francisco	Registration

FIGURE L12

PEAK/NON-PEAK CALL SHARE MEASUREMENT
ACTUAL SUBSCRIBERS VS. MEASURED SUBSCRIBERS DURING A BASELINE PERIOD
 (FOR PURPOSE OF EXAMPLE USERS DURING THIS TIME ARE SUBS)

<u>Actual Calls - Carrier B</u>			<u>Measured Calls - Carrier B</u>		
408	3216877	Carrier B TC Assignment			
408	5048157	Carrier B TC Assignment			
408	5048157	Carrier B TC Assignment			
415	2719321	Carrier B TC Assignment			
415	2719321	Carrier B TC Assignment	415	2719321	Carrier B TC Assignment
415	4651181	Carrier B TC Assignment			
415	4995677	Carrier B TC Assignment			
415	4995677	Carrier B TC Assignment			
415	7202077	Carrier B TC Assignment			
415	7220981	Carrier B TC Assignment	415	7220981	Carrier B TC Assignment
510	9719435	Carrier B TC Assignment	510	9719435	Carrier B TC Assignment
510	9719435	Carrier B TC Assignment	510	9719435	Carrier B TC Assignment
650	2086803	Carrier B TC Assignment			
650	3165225	Carrier B TC Assignment	650	3165225	Carrier B TC Assignment
650	4720249	Carrier B TC Assignment			
917	8393984	Carrier B TC Assignment			
925	4799759	Carrier B TC Assignment			
925	4799759	Carrier B TC Assignment			
925	7202077	Carrier B TC Assignment			
Total #	19	Carrier B	Total #	5	Carrier B
Total non roamers #	18			5	
<u>Actual Calls - Carrier A</u>			<u>Measured Calls - Carrier A</u>		
206	8473934	Carrier A TC Assignment	206	8473934	Carrier A TC Assignment
213	4929087	Carrier A TC Assignment			
408	3081099	Carrier A TC Assignment	408	3081099	Carrier A TC Assignment
408	3260181	Carrier A TC Assignment			
408	5048155	Carrier A TC Assignment			
408	6322327	Carrier A TC Assignment	408	6322327	Carrier A TC Assignment
408	9727753	Carrier A TC Assignment			
415	4651179	Carrier A TC Assignment			
415	4995675	Carrier A TC Assignment			
415	6912099	Carrier A TC Assignment	415	6912099	Carrier A TC Assignment
415	7070089	Carrier A TC Assignment			
415	7202075	Carrier A TC Assignment			
415	9157919	Carrier A TC Assignment			
415	9718061	Carrier A TC Assignment			
415	9718063	Carrier A TC Assignment	415	9718063	Carrier A TC Assignment
510	2719319	Carrier A TC Assignment			
510	4072267	Carrier A TC Assignment			
510	4072267	Carrier A TC Assignment			
510	4072267	Carrier A TC Assignment			
510	4075791	Carrier A TC Assignment	510	4075791	Carrier A TC Assignment
510	4140375	Carrier A TC Assignment			
510	4792791	Carrier A TC Assignment			
510	5312381	Carrier A TC Assignment	510	5312381	Carrier A TC Assignment
510	5312381	Carrier A TC Assignment			
510	6728701	Carrier A TC Assignment	510	6728701	Carrier A TC Assignment
617	8493200	Carrier A TC Assignment			
650	2086801	Carrier A TC Assignment			
650	4140375	Carrier A TC Assignment			
650	4720247	Carrier A TC Assignment			
650	7800201	Carrier A TC Assignment			
650	8160867	Carrier A TC Assignment	650	8160867	Carrier A TC Assignment
650	8160867	Carrier A TC Assignment			
650	8282139	Carrier A TC Assignment			
650	8282139	Carrier A TC Assignment			
650	8722861	Carrier A TC Assignment			
650	9727753	Carrier A TC Assignment			
916	9485023	Carrier A TC Assignment	916	9485023	Carrier A TC Assignment
925	3086349	Carrier A TC Assignment			
925	4946647	Carrier A TC Assignment			
925	5312381	Carrier A TC Assignment	925	5312381	Carrier A TC Assignment
925	8289137	Carrier A TC Assignment			
925	8722861	Carrier A TC Assignment			
925	9837732	Carrier A TC Assignment			
Total #	43	Carrier A	Total #	11	Carrier A
Total non roamers #	39			10	
Total #	62	Both	Total #	16	Both

FIGURE 43

PEAK/NON-PEAK CALL SHARE MEASUREMENT

SORTED DATA TO COUNT MEASURED CALLS FOR ACTUAL PERIOD (SHOWS TC ASSIGNMENTS ONLY)

Measured TC Assignments - Carrier B

18:59:50	415	2719319	Carrier B	TC Assignment
19:00:07	415	7220979	Carrier B	TC Assignment
19:00:02	510	9719433	Carrier B	TC Assignment
18:59:58	650	3165223	Carrier B	TC Assignment

Including Roamers**Measured Carrier B** 4**Peak** 2**Non-Peak** 2**Excluding Roamers****Measured Carrier B** 4**Peak** 2**Non-Peak** 2**Measured TC Assignments - Carrier A**

19:00:06	206	8473934	Carrier A	TC Assignment
18:59:51	408	6322325	Carrier A	TC Assignment
18:59:56	408	3081097	Carrier A	TC Assignment
18:59:53	415	6912097	Carrier A	TC Assignment
19:00:04	415	9718061	Carrier A	TC Assignment
18:59:52	510	5312379	Carrier A	TC Assignment
18:59:52	510	4075789	Carrier A	TC Assignment
19:00:06	510	6728699	Carrier A	TC Assignment
18:59:55	650	8160865	Carrier A	TC Assignment
19:00:00	925	5312379	Carrier A	TC Assignment

Including Roamers**Measured Carrier A** 10**Peak** 6**Non-Peak** 4**Excluding Roamers****Measured Carrier A** 9**Peak** 6**Non-Peak** 3

FIGURE 44

**PEAK/NON-PEAK CALL SHARE MEASUREMENT
ALGORITHM FOR CALCULATING CALL SHARE**

Baseline period

Count the total number of Measured calls for each carrier during a baseline period (roamers included)

Carrier A	11
Carrier B	5

Compare to the Actual number of calls during baseline period

Carrier A	43
Carrier B	19

Calculate the gross up coefficient for each carrier for baseline period

Carrier A	$\approx 43/11 =$	3.9091
Carrier B	$\approx 19/5 =$	3.8000

Actual measurement period

Count the total number of Measured calls for each carrier during the actual period, by time

	Peak	Non-Peak	Total
Carrier A	6	4	10
Carrier B	2	2	4
Total	8	6	14

Calculate estimate of actual number of calls

Calculate the estimate of actual number of calls for each carrier during the actual period using gross up coefficients

Multiply Carrier A by 3.9091, Carrier B by 3.8000

	Peak	Non-Peak	Total
Carrier A	23.4545	15.6364	39.0909
Carrier B	7.6000	7.6000	15.2000
Total	31.0545	23.2364	54.2909

Calculate % of peak/non-peak calls for each carrier

Calculate the percentage of each carriers' calls that are peak vs. non-peak

Carrier A Peak calls as a percentage of total calls = $23.4545 / 39.0909 =$	60.0%
Carrier A Non-Peak calls as a percentage of total calls = $15.6364 / 39.0909 =$	40.0%
Carrier B Peak calls as a percentage of total calls = $7.6000 / 15.2000 =$	50.0%
Carrier B Non-Peak calls as a percentage of total calls = $7.6000 / 15.2000 =$	50.0%

Calculate share of peak and non-peak calls by carrier

Calculate the share of peak calls for each carrier for actual data

Carrier A	$= 23.4545 / 31.0545 =$	75.5%
Carrier B	$= 7.6000 / 31.0545 =$	24.5%

Calculate the share of non-peak calls for each carrier for actual data

Carrier A	$= 15.6364 / 23.2364 =$	67.3%
Carrier B	$= 7.6000 / 23.2364 =$	32.7%

CALCULATE THE SAME EXCLUDING ROAMING CALLS

Baseline period

Count the total number of Measured calls for each carrier during a baseline period (roamers excluded)

Carrier A	10
Carrier B	5

Compare to the Actual number of calls during baseline period

Carrier A	39
Carrier B	18

Calculate the gross up coefficient for each carrier for baseline period

Carrier A	$\approx 39/10 =$	3.9000
Carrier B	$\approx 18/5 =$	3.6000

Actual measurement period

Count the total number of Measured calls for each carrier during the actual period, by time

	Peak	Non-Peak	Total
Carrier A	6	3	9
Carrier B	2	2	4
Total	8	5	13

Calculate estimate of actual number of calls

Calculate the estimate of actual number of calls for each carrier during the actual period using gross up coefficients

Multiply Carrier A by 3.9000, Carrier B by 3.6000

	Peak	Non-Peak	Total
Carrier A	23.4000	11.7000	35.1000
Carrier B	7.2000	7.2000	14.4000
Total	30.6000	18.9000	49.5000

Calculate % of peak/non-peak calls for each carrier

Calculate the percentage of each carriers' calls that are peak vs. non-peak

Carrier A Peak calls as a percentage of total calls = $23.4000 / 35.1000 =$	66.7%
Carrier A Non-Peak calls as a percentage of total calls = $11.7000 / 35.1000 =$	33.3%
Carrier B Peak calls as a percentage of total calls = $7.2000 / 14.4000 =$	50.0%
Carrier B Non-Peak calls as a percentage of total calls = $7.2000 / 14.4000 =$	50.0%

Calculate share of peak and non-peak calls by carrier

Calculate the share of peak calls for each carrier for actual data

Carrier A	$= 23.4000 / 30.6000 =$	76.5%
Carrier B	$= 7.2000 / 30.6000 =$	23.5%

Calculate the share of non-peak calls for each carrier for actual data

Carrier A	$= 11.7000 / 18.9000 =$	61.9%
Carrier B	$= 7.2000 / 18.9000 =$	38.1%

FIGURE 4C

INCOMING/OUTGOING CALL MEASUREMENT
ACTUAL PERIOD RAW DATA

Date	Time	Area code	User ID	Cell site	Carrier	City	Type
3/7/1999	18:59:50	415	2719319	33	Carrier B	San Francisco	TC Assignment
3/7/1999	18:59:50	415	3201811	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:51	415	8043619	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:51	408	6322325	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:51	650	3290199	33	Carrier A	San Francisco	Page
3/7/1999	18:59:51	650	5105339	33	Carrier B	San Francisco	Page
3/7/1999	18:59:52	650	8917481	33	Carrier B	San Francisco	Page
3/7/1999	18:59:52	510	5312379	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:52	510	4075789	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:52	925	6022623	33	Carrier B	San Francisco	Page
3/7/1999	18:59:53	925	7202075	33	Carrier A	San Francisco	Page
3/7/1999	18:59:53	925	4799757	33	Carrier B	San Francisco	Page
3/7/1999	18:59:53	408	3216875	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:53	415	6912097	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:54	415	8839321	33	Carrier A	San Francisco	Page
3/7/1999	18:59:54	415	9719865	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:54	408	5318625	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:54	650	7203429	33	Carrier A	San Francisco	Page
3/7/1999	18:59:55	650	1099977	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:55	650	8160865	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:55	650	3165223	33	Carrier B	San Francisco	Page
3/7/1999	18:59:55	510	4792791	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:56	925	9837732	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:56	925	3086349	33	Carrier B	San Francisco	Page
3/7/1999	18:59:56	925	4946647	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:56	408	3081097	33	Carrier A	San Francisco	TC Assignment
3/7/1999	18:59:57	415	7070089	33	Carrier B	San Francisco	Page
3/7/1999	18:59:57	415	9718061	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:57	415	9157919	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:58	408	3260181	33	Carrier B	San Francisco	Page
3/7/1999	18:59:58	650	9727753	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:58	650	3165223	33	Carrier B	San Francisco	TC Assignment
3/7/1999	18:59:58	650	7600201	33	Carrier A	San Francisco	Page
3/7/1999	18:59:59	510	2719319	33	Carrier A	San Francisco	Registration
3/7/1999	18:59:59	510	4140375	33	Carrier B	San Francisco	Registration
3/7/1999	18:59:59	925	8289137	33	Carrier A	San Francisco	Page
3/7/1999	18:59:59	925	8722861	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:00	925	5312379	33	Carrier A	San Francisco	TC Assignment
3/7/1999	19:00:00	408	4075789	33	Carrier B	San Francisco	Page
3/7/1999	19:00:00	415	4651179	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:00	415	7202075	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:01	415	4995675	33	Carrier A	San Francisco	Page
3/7/1999	19:00:01	408	5048155	33	Carrier A	San Francisco	Registration
3/7/1999	19:00:01	650	4720247	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:01	617	8493200	33	Carrier A	San Francisco	Page
3/7/1999	19:00:02	650	2086801	33	Carrier B	San Francisco	Page
3/7/1999	19:00:02	510	4072267	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:02	510	9719433	33	Carrier B	San Francisco	TC Assignment
3/7/1999	19:00:02	925	5318221	33	Carrier B	San Francisco	Page
3/7/1999	19:00:03	925	3972081	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:03	925	8372832	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:03	510	6728699	33	Carrier A	San Francisco	Page
3/7/1999	19:00:03	415	7203429	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:04	415	9718061	33	Carrier A	San Francisco	TC Assignment
3/7/1999	19:00:04	415	9080545	33	Carrier B	San Francisco	Page
3/7/1999	19:00:04	408	9727753	33	Carrier A	San Francisco	Registration
3/7/1999	19:00:05	650	4140375	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:05	213	4929087	33	Carrier A	San Francisco	Page
3/7/1999	19:00:05	650	8282139	33	Carrier B	San Francisco	Page
3/7/1999	19:00:05	650	8722861	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:06	510	6728699	33	Carrier A	San Francisco	TC Assignment
3/7/1999	19:00:06	510	3283685	33	Carrier B	San Francisco	Page
3/7/1999	19:00:06	925	9120419	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:06	206	8473934	33	Carrier A	San Francisco	TC Assignment
3/7/1999	19:00:07	925	4074173	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:07	925	2649679	33	Carrier B	San Francisco	Page
3/7/1999	19:00:07	408	4949715	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:07	415	7220979	33	Carrier B	San Francisco	TC Assignment
3/7/1999	19:00:08	415	4720247	33	Carrier B	San Francisco	Page
3/7/1999	19:00:08	415	2719319	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:08	408	4792791	33	Carrier A	San Francisco	Registration
3/7/1999	19:00:08	917	8393984	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:09	650	9837732	33	Carrier A	San Francisco	Page
3/7/1999	19:00:09	650	3086349	33	Carrier B	San Francisco	Registration
3/7/1999	19:00:09	650	4946647	33	Carrier A	San Francisco	Page
3/7/1999	19:00:09	510	3081097	33	Carrier A	San Francisco	Page
3/7/1999	19:00:10	510	7070089	33	Carrier B	San Francisco	Page
3/7/1999	19:00:10	925	9157919	33	Carrier A	San Francisco	Page
3/7/1999	19:00:10	925	3260181	33	Carrier B	San Francisco	Page
3/7/1999	19:00:10	408	7070089	33	Carrier B	San Francisco	Page
3/7/1999	19:00:11	412	3458569	33	Carrier B	San Francisco	Registration

FIGURE 46

INCOMING/OUTGOING CALL MEASUREMENT**SORTED DATA TO COUNT MEASURED CALLS FOR ACTUAL PERIOD (SHOWS TC ASSIGNMENTS/PAGES)****Measured TC Assignments - Carrier B**

18:59:50	415	2719319 Carrier B	TC Assignment
19:00:07	415	7220979 Carrier B	TC Assignment
19:00:02	510	9719433 Carrier B	TC Assignment
19:00:02	650	3165223 Carrier B	Page
18:59:58	650	3165223 Carrier B	TC Assignment

Measured Carrier B TC Assigns 4**Pages corresponding to TC** 1**Measured TC Assignments - Carrier A**

19:00:06	206	8473934 Carrier A	TC Assignment
18:59:51	408	6322325 Carrier A	TC Assignment
18:59:56	408	3081097 Carrier A	TC Assignment
18:59:53	415	6912097 Carrier A	TC Assignment
19:00:04	415	9718061 Carrier A	TC Assignment
18:59:52	510	5312379 Carrier A	TC Assignment
18:59:52	510	4075789 Carrier A	TC Assignment
18:59:52	510	6728699 Carrier A	Page
19:00:06	510	6728699 Carrier A	TC Assignment
18:59:55	650	8160865 Carrier A	TC Assignment
19:00:00	925	5312379 Carrier A	TC Assignment

Measured Carrier A TC Assigns 10**Pages corresponding to TC** 1

FIGURE 47

**INCOMING/OUTGOING CALL MEASUREMENT
ANALYSIS TO CLASSIFY CALLS AS INCOMING OR OUTGOING FOR ACTUAL PERIOD**

A TC Assignment preceeded by a page to the same number within 2-4 seconds is classified as an incoming call.

Otherwise the TC Assignment is classified as an outgoing call.

X = ignore the call because it is in the first three seconds of the measurement period, so we are not able to see any preceeding page that would tell us it is an incoming call or not

O = outgoing call. There is no page to the same user ID during the preceeding four seconds

I = incoming call. There is a page to the same user ID during the preceeding four seconds

Measured TC Assignments - Carrier B

18:59:50	415	2719319 Carrier B	TC Assignment	X = ignore
19:00:07	415	7220979 Carrier B	TC Assignment	O = outgoing call
19:00:02	510	9719433 Carrier B	TC Assignment	O = outgoing call
18:59:58	650	3165223 Carrier B	Page	<- page indicates incoming call
19:00:02	650	3165223 Carrier B	TC Assignment	I = incoming
Measured Carrier B outgoing calls			2	
Measured Carrier B incoming calls			1	

Measured TC Assignments - Carrier A

19:00:06	206	8473934 Carrier A	TC Assignment	O = outgoing call
18:59:54	408	6322325 Carrier A	TC Assignment	X = ignore
18:59:56	408	3081097 Carrier A	TC Assignment	O = outgoing call
18:59:53	415	6912097 Carrier A	TC Assignment	O = outgoing call
19:00:04	415	9718061 Carrier A	TC Assignment	O = outgoing call
18:59:52	510	5312379 Carrier A	TC Assignment	X = ignore
18:59:52	510	4075789 Carrier A	TC Assignment	X = ignore
19:00:02	510	6728699 Carrier A	Page	<- page indicates incoming call
19:00:06	510	6728699 Carrier A	TC Assignment	I = incoming
18:59:55	650	8160865 Carrier A	TC Assignment	O = outgoing call
19:00:00	925	5312379 Carrier A	TC Assignment	O = outgoing call
Measured Carrier A outgoing calls			6	
Measured Carrier A incoming calls			1	

FIGURE 48

INCOMING/OUTGOING CALL MEASUREMENT ALGORITHM FOR CALCULATING INCOMING/OUTGOING CALL SHARE

Baseline period

Count the total number of Measured calls for each carrier during a baseline period (roamers included)

Carrier A	11
Carrier B	5

Compare to the Actual number of calls during baseline period

Carrier A	43
Carrier B	19

Calculate the gross up coefficient for each carrier for baseline period

Carrier A	"=43/11"	3.9091
Carrier B	"=19/5"	3.8000

Actual measurement period

Count the total number of Measured calls for each carrier during the actual period, by incoming/outgoing

	Outgoing	Incoming	Total
Carrier A	6	1	7
Carrier B	2	1	3
Total	8	2	10

Calculate estimate of actual number of calls

Calculate the estimate of actual number of calls for each carrier during the actual period using gross up coefficients

Multiply Carrier A by 3.9091, Carrier B by 3.8000

	Outgoing	Incoming	Total
Carrier A	23.4545	3.9091	27.3636
Carrier B	7.6000	3.8000	11.4000
Total	31.0545	7.7091	38.7636

Calculate % of incoming/outgoing calls for each carrier

Calculate the percentage of each carriers' calls that are outgoing vs. incoming

Carrier A Outgoing calls as a percentage of total calls = $23.4545 / 27.3636 =$	85.7%
Carrier A Incoming calls as a percentage of total calls = $3.9091 / 27.3636 =$	14.3%
Carrier B Outgoing calls as a percentage of total calls = $7.6000 / 11.4000 =$	66.7%
Carrier B Incoming calls as a percentage of total calls = $3.8000 / 11.4000 =$	33.3%

Calculate share of incoming and outgoing calls by carrier

Calculate the share of outgoing calls for each carrier for actual data

Carrier A	= $23.4545/31.0545=$	75.5%
Carrier B	= $7.6000/31.0545=$	24.5%

Calculate the share of non-peak calls for each carrier for actual data

Carrier A	= $3.9091/7.7091=$	50.7%
Carrier B	= $3.8000/7.7091=$	49.3%

CALCULATE THE SAME EXCLUDING ROAMING CALLS

Baseline period

Count the total number of Measured calls for each carrier during a baseline period (roamers excluded)

Carrier A	10
Carrier B	5

Compare to the Actual number of calls during baseline period

Carrier A	39
Carrier B	18

Calculate the gross up coefficient for each carrier for baseline period

Carrier A	= $39/10=$	3.9000
Carrier B	= $18/5=$	3.6000

Actual measurement period

Count the total number of Measured calls for each carrier during the actual period, by incoming/outgoing

	Outgoing	Incoming	Total
Carrier A	6	1	7
Carrier B	2	1	3
Total	8	2	10

Calculate estimate of actual number of calls

Calculate the estimate of actual number of calls for each carrier during the actual period using gross up coefficients

Multiply Carrier A by 3.9000, Carrier B by 3.6000

	Outgoing	Incoming	Total
Carrier A	23.4000	3.9000	27.3000
Carrier B	7.2000	3.6000	10.8000
Total	30.6000	7.5000	38.1000

Calculate % of incoming/outgoing calls for each carrier

Calculate the percentage of each carriers' calls that are outgoing vs. incoming

Carrier A Outgoing calls as a percentage of total calls = $23.4000 / 27.3000 =$	85.7%
Carrier A Incoming calls as a percentage of total calls = $3.9000 / 27.3000 =$	14.3%
Carrier B Outgoing calls as a percentage of total calls = $7.2000 / 10.8000 =$	66.7%
Carrier B Incoming calls as a percentage of total calls = $3.6000 / 10.8000 =$	33.3%

Calculate share of incoming and outgoing calls by carrier

Calculate the share of outgoing calls for each carrier for actual data

Carrier A	= $23.4000/30.6000=$	76.5%
Carrier B	= $7.2000/30.6000=$	23.5%

Calculate the share of non-peak calls for each carrier for actual data

Carrier A	= $3.9000/7.5000=$	52.0%
Carrier B	= $3.6000/7.5000=$	48.0%

FIGURE 49

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/06652

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04Q7/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q H04M H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98 37724 A (TELEFONAKTIEBOLAGET LM ERICSSON) 27 August 1998 (1998-08-27) abstract; claim 1; figures 2,5 page 11, line 11 -page 12, line 14 page 13, line 1 - line 17 ---	1, 18, 30, 32-34, 39, 44, 52, 54-56, 59, 61, 62
A	WO 96 41492 A (CORAL SYSTEMS INC.) 19 December 1996 (1996-12-19) abstract; figures 1,2,4,5 page 3, line 3 -page 5, line 2 page 15, line 8 -page 17, line 3 page 18, line 7 - line 21 --- -/--	9, 10, 12, 20, 23, 29, 33, 34, 50



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

3 July 2000

Date of mailing of the international search report

11/07/2000

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/06652

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 822 410 A (MCCAUSLAND ET AL.) 13 October 1998 (1998-10-13) abstract column 5, line 55 -column 6, line 40 column 8, line 55 -column 10, line 22 -----	33,40,42
A	WO 95 33352 A (ERICSSON A/S.) 7 December 1995 (1995-12-07) abstract; figure 1 ----	1
A	WO 98 33344 A (SINGAPORE TELECOM MOBILE PTE LTD.) 30 July 1998 (1998-07-30) abstract page 3, line 10 - line 34 -----	1
A	US 5 546 444 A (ROACH, JR. ET AL.) 13 August 1996 (1996-08-13) figure 1 column 8, line 63 -column 9, line 38 -----	1

INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/US 00/06652

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