Overview

For major transportation companies, where millions of packages move through their system each day, innovation through new technologies facilitates the task. They tend to measure everything from how long it takes a driver to park his vehicle to how long a shipment will take. Figure 1 illustrates the typical model of how they use their fleet of tractor-trailers to haul packages through their system. To track the drivers and the truckloads of boxes, the drivers use sophisticated wireless handheld devices referred to as "Delivery Information Acquisition Device" (DIAD). These handheld devices allow them to scan the barcode on each parcel, capture signatures and wirelessly transmit the information back to headquarters. The DIAD's keep a running tally of all pick-ups and deliveries as well as receive messages from headquarters. Through fully Automated Package Distribution Hubs, the packages are routed to their destination. Besides being scanned at the pick-up locations, the packages are also scanned at each Distribution Hub. The information is captured and transmitted to a central database.

Because transportation companies are among the largest users of mobile networks, this paper will also look into wireless data networks.

Intelligent Transportation Management System

Intelligent Transportation Management Systems (ITMS) is the model used within the transportation industry that allows them to track and incorporate the information into their overall strategy using advanced and emerging technologies. Figure 2 illustrates the networking infrastructure used by major transportation companies. It combines GPS (Global Positioning System) satellite navigation technology with wireless and terrestrial communication networks. For enterprise customers, ITMS provides instant access to real time information about their shipments.

Mobile networks have undergone significant enhancements from voice call based system to allow them to efficiently carry IP data traffic.

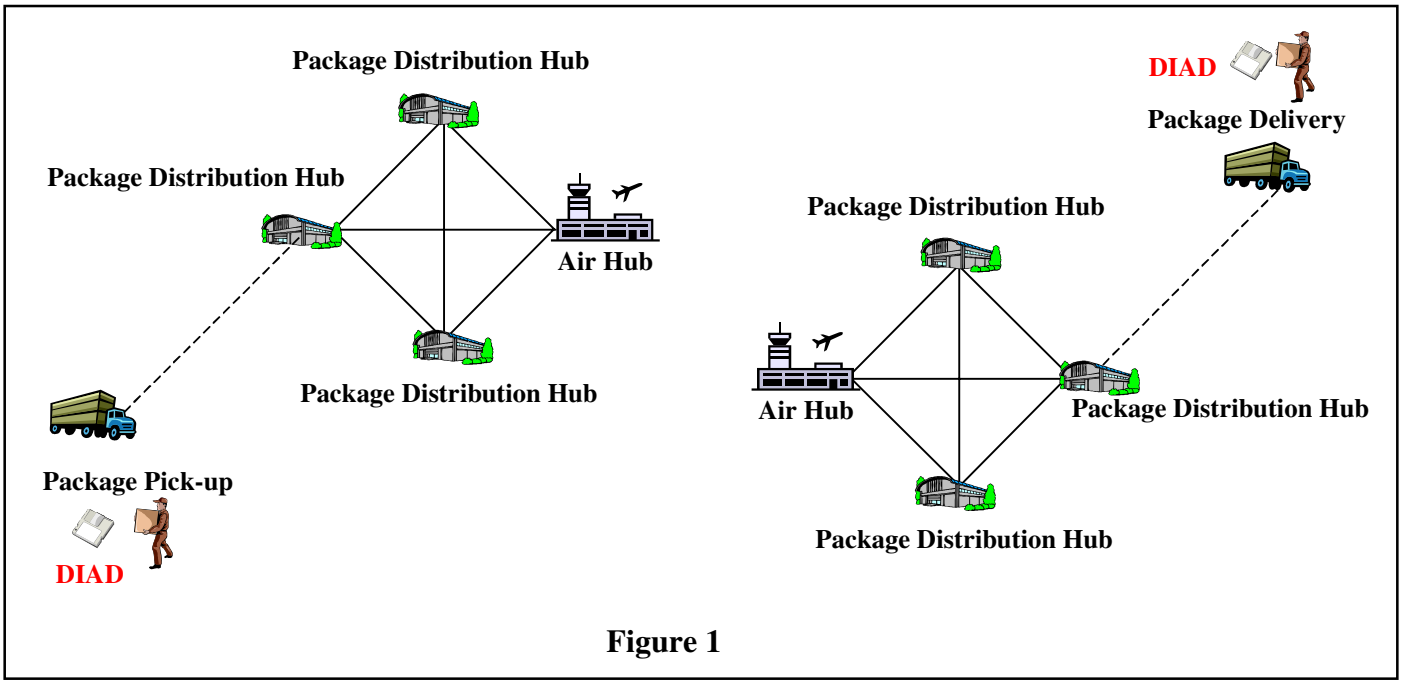

Figure 1

Mobitex is an international, open standard for dedicated wireless data that many transportation companies have selected. As shown in Figure 2, the basic functionality for a Mobitex network is provided by a number of radio base stations (BRU3) that connect to one or more switches (MX) organized in a hierarchy of local and regional switches. These switches are connected by fixed links. The entire network is supervised and managed from the Network Control Center (NCC). The NCC handles all operations and maintenance tasks including network configuration, alarm handling, subscriber administration and billing information.

GSM (Global System for Mobile communications) is the most widely adopted mobile standard in the world. GSM networks have been enhanced with GPRS (General Packet Radio Service) capabilities delivering "always-on" wireless packet data services and instantly connecting mobile terminals to the Internet or a corporate IP network. GPRS can provide packet data speeds of up to 115 Kbps using "General Packet" technology. Rather than sending information in a steady stream through a single channel, a GPRS enabled device breaks the information down into "packets" and sends them over multiple channels (up to eight). Each packet travels by the quickest available route to its destination where the information is reassembled into its original form. Implementing GPRS capability in a GSM network involves adding a PCU (Packet Control Unit) and two packet-data nodes: the Support Node (SGSN) and the Gateway Node (GGSN). The BTS's (Base Transceiver Stations) are physically connected via T1's to a drop-and-insert transmission system.

Initially a mobile terminal will make a request to the SGSN node to attach itself to the network. Once the request is received, authentication is made between the mobile terminal and the HLR (Home Location Register). The subscriber data is then inserted from the HLR into the SGSN and the MSC/VLR (Mobile

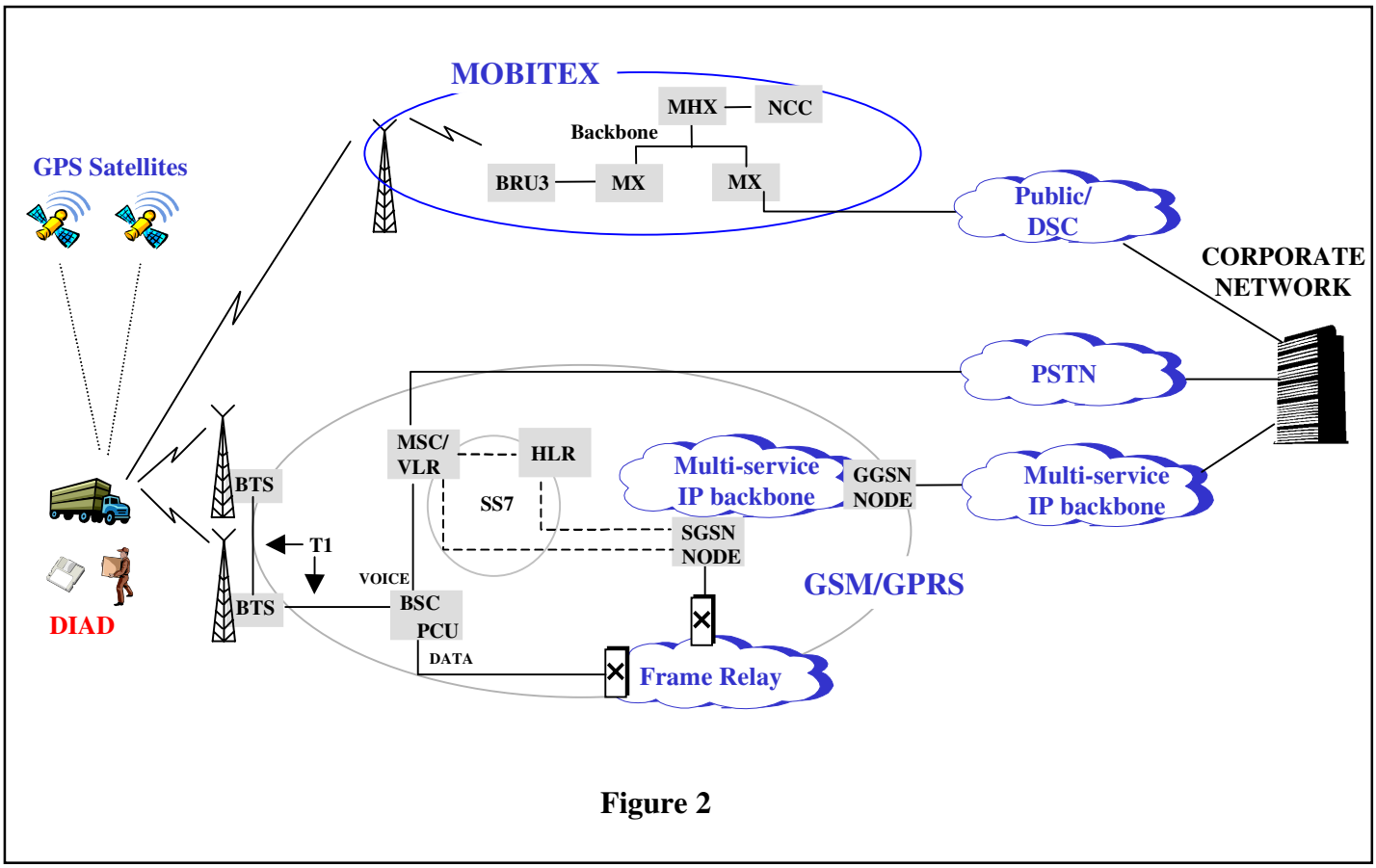

Figure 2

Switching Center/Visitor Location Register). The SGSN node will then inform the mobile terminal that it is attached to the network. Once the mobile terminal is attached to the network, it sends the Packet Data Protocol (PDP) context activation to the SGSN node. The SGSN node validates the request based on the subscription information received from the HLR. An APN (Access Point Name) is sent to the DNS within the SGSN node to find the IP address of the relevant GGSN node and a logical channel is created between the two nodes. The GGSN node will then assign an IP address to the mobile terminal.

New generation DIAD's will incorporate different types of radio communications links and will hook up to GPS to help dispatchers locate trucks and for drivers to verify customer locations. Each features built-in GPRS or WCDMA (Wideband Code Division Multiple Access) radio. It will also have an acoustic modem for dial-up access and 802.11b WI-FI capabilities.

Figure 3 illustrates the information flow from a mobile terminal to Corporate and vice versa through the GSM/GPRS network. At the edge of the GPRS network, the multi-service GGSN routers support IP over the convergence of Layer 2 services like ATM, Frame Relay, PPP and Ethernet. These routers also support services such as network address translation (NAT) and security.

Figure 3 also illustrates how the InnovX FastRoute and FastSwitch can be used to transport information from a Distribution Hub to a corporate office and vice versa. Employees who unload and load tractor-trailers have ring scanners that attach to a waist terminal via a cable. The packages are scanned and the information is transmitted wirelessly to a server in the facility. The ring scanners are now upgraded to make them Bluetooth compatible eliminating the wire and the waist terminal redesigned to WI-FI. Data from the waist terminal is now relayed to a central database using 802.11b technology.

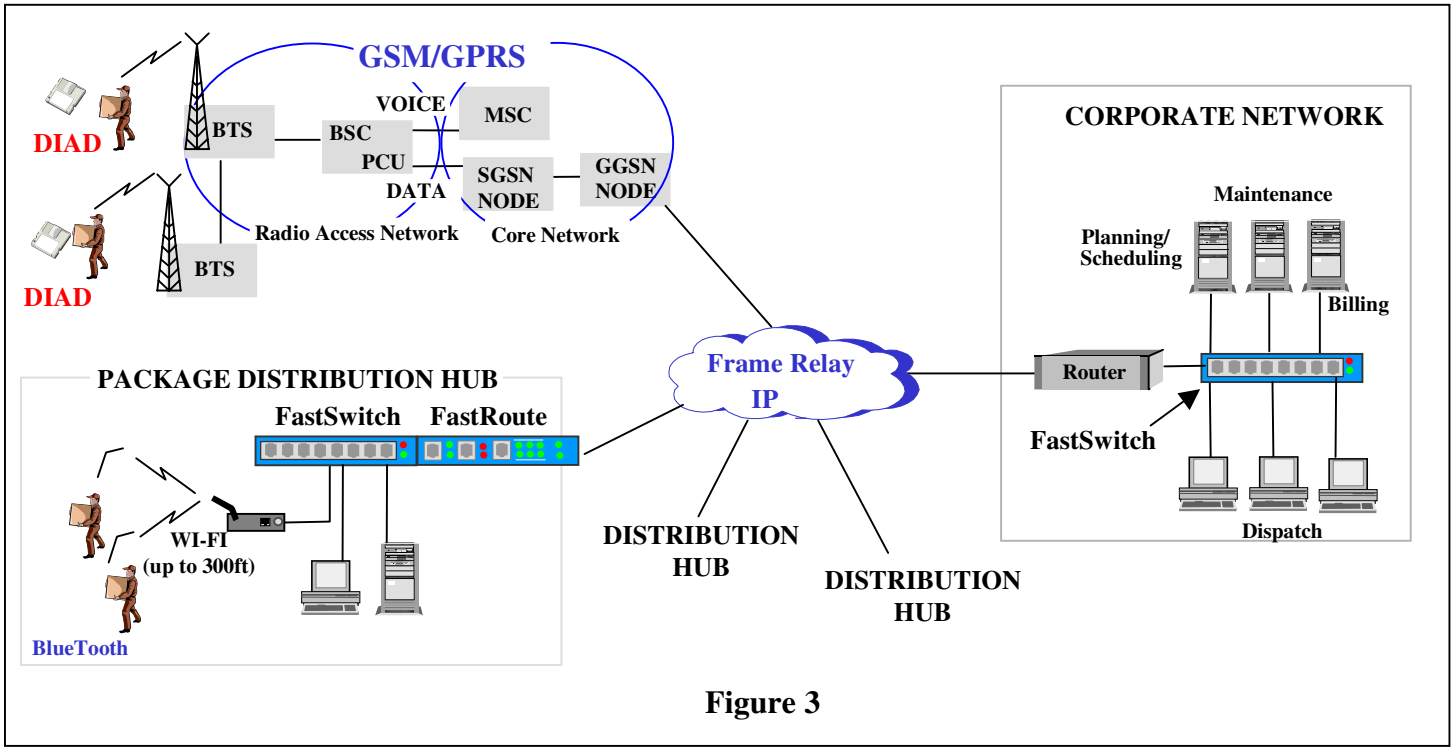

Figure 3

Mobitex Network

Figure 4 illustrates how General DataComm's access products could be deployed in the Mobitex network. The base station integrates the V.32/V.32 bis leased/dial modem and the link carrier protocol is X.25. The local switch serves as an area or main exchange unit and functions as a scalable packet-switching node routing traffic to and from the base station. In the standard network configuration, the switch provides an internal X.25 gateway port and a TCP/IP gateway for connectivity to the NCC. The local switch compiles and forwards billing information and statistics to the NCC. The local switch also holds subscription data for all subscribers currently roaming into its branch of the network. Figure 5 illustrates how General DataComm's SCIP and SCES could be used to transport information to and from the NCC.

Conclusion

Transportation companies are good examples of how wireless solutions contribute to business as well as global environment. Besides capturing information for tracking purposes, companies with large fleets save huge amounts of fuel by monitoring and communicating with their units wirelessly. They capture information on how trucks run in terms of fuel consumption to speed, mileage and brakes, which in turn is used for preventive maintenance. To assist customers achieve these objectives, General DataComm offers a full range of networking products through its SpectraComm and InnovX product lines. General DataComm's IP products ensure customers of full network protection offering Irongate and TACAC+. Irongate provides a comprehensive suite of security measures guarding against security breaches and TACAC+ provides robust authentication.

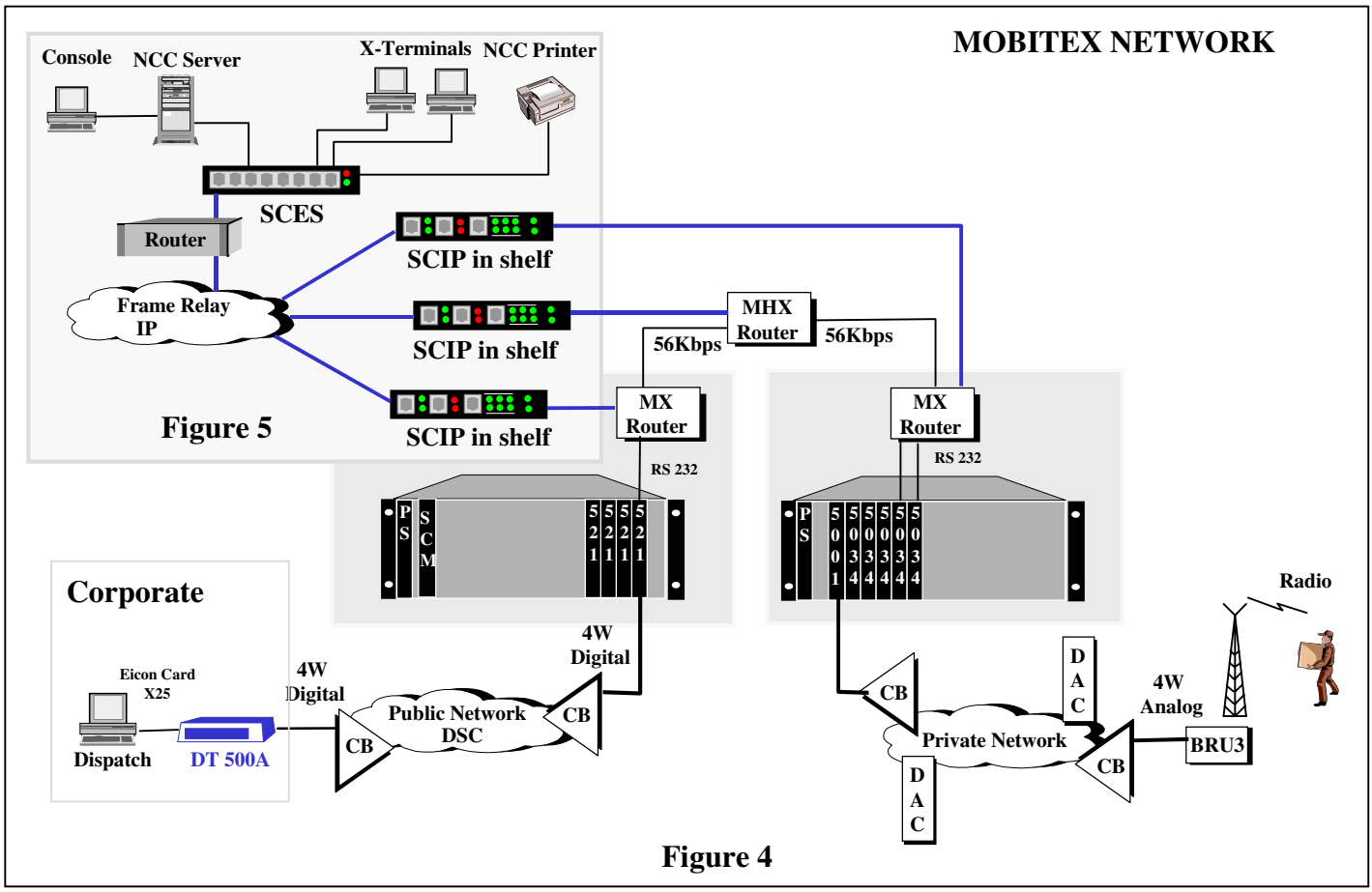

Figure 4