THE TELECOMMUNICATIONS HANDBOOK

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- Deregulation and privatization
- Communication convergence
- Customer orientation

Growth of the Global Telecommunications Market

Explosive expansion driven by internal growth and acquisition is forcing telecommunications providers to increase the productivity of their current support systems. Growth and acquisition mean that the number of subscribers grows for existing services, new services are provisioned on existing intrastructures, and completely new services on new infrastructures are deployed or acquired. Several support systems vendors have worked to capitalize on this opportunity with solutions that reduce complexity. These support systems vendors do not usually replace existing systems, but add functionality to accommodate new services, such as:

- Internet, intranets, and extranet
- Special data services on top of voice networks
- Wireless services and fixed wireless services
- Cable and video services
- Voice services on top of data networks

Adding functionalities that interoperate with each other opens new business opportunities for support systems vendors. The coming years will experience a bitter competition between circuit- and packet-switched services. Tradition, stability, and quality of existing services will compete against new technologies with easier maintenance and reduced operating expenses. The transition from circuit-switched to packet-switched technologies may take decades.

Increasing Network Complexity

As a result of customer expectations, the time-to-market of new services is extremely short. Incumbent and new telecommunications service providers do not have the time to build all new infrastructure, but combine existing and new infrastructures, such as copper, fiber, and wireless. They deploy emerging services on the basis of a mixture of infrastructures as an overlay. New services use emerged and emerging technologies, such as:

- Emerged technologies: voice networks, ISDN, circuit switching, packet switching, message switching, frame relay, Fast Ethernet, Fast Token Ring, and FDDI/CDDI.
- Emerging technologies: ATM, mobile and wireless, SMDS, Sonet/SDH, cable, xDSL, and B-ISDN.

Each of these technologies has its own support system solutions. The only elements in Public Switched Telephone Networks (PSTN) that should be managed are the switches themselves. On average, the ratio of managed elements to subscriber lines is around 1:10,000. The advent of distributed, software-based switching and transmission has created a large number of additional managed elements, about one for each 500 subscriber lines. Moreover, multiple elements per subscriber in digital loop carrier systems, digital cellular networks, or hybrid fiber/coax systems may cause an explosion in terms of managed elements. As a result, the size of configuration databases and event messages generated by more intelligent network elements have grown exponentially over the last 20 years.

Growth in the number of network elements has been accompanied by an increase in the complexity of items to be managed. Sonet/SDH, ATM, and digital wireless are highly complex, with a high degree of interdependence among network elements. This in turn makes service activation and fault isolation a challenge, especially as the number of service providers increases. As networks shift from lower-speed, dedicated-rate, and inflexible services to mobile, fully configurable, bandwidth-on-demand, and high-speed services, support systems must adapt to this new situation.

When services are offered in combination, support systems should be modified, re-engineered, and connected to each other. This opens new business opportunities for support systems vendors.

The introduction of standards for support systems is accelerating the demand for third-party support systems. Legacy systems are primarily proprietary systems not integrated across functional areas. Service providers depend upon custom development by internal development staff and outside integrators to connect various support systems. The introduction of technology standards, such as Telecommunication Management Network (TMN), Distributed Communication Object Model (DCOM), Common Object Request Broker Architecture (COBRA), Telecommunications Information Networking Architecture (TINA), and Web-Based Enterprise Management (WBEM) have begun to gain critical support by new support systems vendors.

The implementation of standard gateways enables interaction between newer client/server solutions and existing legacy systems, easing interoperability among all support systems. In particular, TMN may help to streamline support system processes and to position support systems.

Deregulation and Privatization

Telecommunications service competition began in the 1980s in the U.S., led by MCI with three operating support systems playing a key role. The AT&T divestiture in 1984 marked a major breakthrough. The second significant milestone was the Telecom Act of 1996. As telecom deregulation continues, with Regional Bell Operating Companies (RBOCs) actively pursuing the long-distance market and long-distance carriers moving into local services, major support systems re-engineering efforts are expected.

Under the pressure of the European Commission (EC), Europe is in the process of deregulation and privatization. It is a much slower process than in the U.S., because multiple countries are involved with their own agenda. Interoperability of support systems is more difficult than in the U.S.; but at the same time, it offers opportunities for support systems vendors. It is assumed that Asia/Pacific, South America, Eastern Europe, and Africa will follow this deregulation and privatization trend.

Competition is everywhere — long distance, local exchange, ISP, cable, and wireless. In many cases, support systems are the differentiators. The best opportunities are seen with Competitive Local Exchange Carriers (CLECs). Support systems requirements vary quite substantially from carrier to carrier. As a result, CLECs support system strategies are ranging from internal development, to outsourcing, to systems integrators, and to third-party software/service providers. CLECs could be small or medium sized, with or without facilities. In all cases, they must interoperate with Incumbent Local Exchange Carriers (ILECs) by opening the support systems to permit access by CLECs in various phases of provisioning and order processing and service activation. Key issues are:

- Local Number Portability (LNP): This allows customers to retain their telephone numbers even if they change service providers. It is not only the telephone number that is important; customers also typically want to retain access to advanced features they have come to expect from an intelligent network.
- Extranets connecting support systems of ILECs and CLECs: ILECs are required to provide access to information on five classes of support systems. They are preordering, ordering, provisioning, repair, and maintenance.
- Directory services: Real-time service processing requires additional customer-related data. The expanded directory role includes end-user authorization and authentication. It also includes the real-time allocation of network resources according to a user's class of service and other policy-based variables. Directory Enabled Networks (DEN) promise to increase momentum for directory services by bringing physical infrastructures under the directory umbrella and tackling the standardization of directory information.
- Fraud management: Offering multiple services that are accessible by user-friendly interfaces increases the risks of penetration. Service providers agree that up to 5% of their revenues is lost as a result of fraud. Real-time surveillance systems combined with customer analysis features of billing systems may help reduce fraud risks to a reasonable minimum.

In reality, there may be multiple parties (and supplier–customer relationships) at each layer of the service value model. Also, some regulatory environments in countries use the term *enhanced services*, rather than value-added services. What exactly is meant by enhanced services depends on the country. Since the regulatory environments for enhanced services are often more relaxed than for basic data transfer services, there is an incentive for suppliers of telecommunications services to try to categorize as many services as possible in the enhanced services category. That way the regulation for providing that service would be much less strict. An example of such a loophole in the legislation is the use of different protocols, such as Internet Protocol, to send voice over a private line. The resulting voice-connection service looks exactly the same to the end users, but the transmission protocol is different. Some regulatory environments see the translation of a circuit-oriented connection into packets, giving each of the packets its own path for transport, as an enhancement and therefore call it (e.g., in the U.S.) "enhanced service."

1.1.1.4 Examples of Services

The service value model already shows several examples of services in the rightmost column. Some services are addressed here in more detail as they are often used in industry. First of all, the standard telephone service is addressed. A more precise name for that service is Public Switched Telephone Network (PSTN). The PSTN is the most extensive in the world and allows people with a telephone set to speak with each other. In recent years, the PSTN has also been used for transmission of faxes (images from paper converted into data) and data (via modems). But, in essence, the PSTN service still transmits sounds between PSTN connections in the world. These connections are highly standardized and various kinds of telephone sets can be used in almost all parts of the world. In the service value model, we regard PSTN as a basic data transfer service.

Integrated Services Digital Network (ISDN) is a service that is less ubiquitous, and one that has become popular in recent years. The most important difference is that the circuit between the parties that are connected is digital rather than analog. It can therefore transmit more than just sounds and is much more efficient in transporting data signals. In one view it replaces the existing PSTN service, but in other views it adds a series of services to PSTN, which are quite different from anything that PSTN can offer. The new services are based on transport of data. Not only can data be transported very fast (basic rate ISDN is 144 kb/s), but data can also be sent while the ISDN circuits are in use, and therefore additional end-user services can be performed, such as call waiting, calling line identification, and transmittal of packet-oriented data (such as Internet traffic). Most regulatory environments still do not characterize ISDN as a value-added service and therefore it fits in the "basic data transfer service" category of our model.

An example of a value-added service would be the virtual private network service, which connects users in different locations with each other, so that they seem to work in a "closed user group." Working in a closed user group, they can call each other with short extension numbers and they can use different features of telephones, that are usually available for the users of phone extensions in businesses connected to a private branch exchange (PBX). There is also a "data version" of the virtual private network, which, just like that described in the voice example, forms a closed user group exchanging data.

Other examples of basic data transfer services are the services meant for the transport of pure data, such as leased lines (supplying a permanent circuit) or packet-switched service (supplying transport of packets of information).

An example of an infrastructure service is dark fiber service. This service is not yet widely offered, but gives operators the capability of completely controlling the transmission technology on both ends of a fiber and also reaches efficiencies by using types of equipment that make maximum use of the fibers.

Figure 1.3 shows an example of actual supplier–customer relationships, mapped on the service value model. Chosen is an example of a multiple country situation, to make it clear that operators can operate across borders. Infrastructure operators are most often active across international borders, as they have, for a long time, formed an actual bottleneck for communication and had to supply service across borders

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