Globalization of Intelligent Network Services

Jack S. Sykes
Eldred J. Visser

Many multinational companies have successfully used intelligent network services within a country to control costs and, at the same time, enhance network management control and feature functionality. As intelligent network services continue to evolve and prove their value on a national level, and as customers expand internationally, there is a natural demand to extend these telecommunications capabilities globally. This paper highlights issues that must be considered as we design and implement global intelligent network services. It also includes either a high-level or a conceptual view of four potential global intelligent network services: global virtual private network, global credit card validation, global Freephone, and global switched digital data.

Introduction

Many large, multinational customers are successfully using intelligent network services to control costs and, at the same time, enhance network management control (e.g., efficiency of operation) and feature functionality (i.e., the types of features that can be provided). Intelligent network services, such as AT&T's Software-Defined Network Service and 800 Service, use a database to screen calls, translate numbers, or perform other call-processing functions.

As intelligent network services continue to evolve and prove their value on a national level, and as customers expand internationally, there is a natural demand to extend these telecommunications capabilities globally. Customers also want "end-to-end" global services that incorporate the best available technology to improve efficiency, reliability, flexibility, and cost-effectiveness. Telecommunications equipment, services, and network capabilities (e.g., customer premises equipment, private networks, signaling technology) are becoming increasingly sophisticated. The increasing complexity makes it more difficult, if not impossible, to provide a truly end-to-end global service if each participating telecommunications administration plans, designs, and implements its own service and then "hopes for the best" when these services are interconnected.

Joint Planning and Design

Successful implementation of a global intelligent network service that, from the customer's perspective, functions as a single end-to-end service necessitates joint planning and design of the service by the telecommunications providers involved. For example, the telecommunications providers (hereafter referred to as administrations) must agree on the information to be exchanged between databases in the originating and terminating networks and must jointly implement it in a timely manner. Such information (e.g., existing/new signaling messages, message content/format) would be required to process calls properly and maintain the integrity of both networks.

The new global service must satisfy the varying conditions and market needs of each participating administration. Based on experience with an equivalent domestic service, one administration may expect many customers for its global service, significant traffic volumes, and the need for additional features. Another administration may expect fewer customers, moderate traffic volumes, and no need for additional features.

The business needs of participating administrations may differ. One administration may operate in a competitive environment, which requires it to introduce new services and features to attract and/or retain customers. Another administration may face less competitive pressure.

For some administrations, regulatory restrictions may dictate service or feature design (e.g., there may be limitations on how they can provide enhanced features, or certain applications may require private lines rather than public trunks). The technical sophistication of the participating administrations' networks may limit the architecture to be used and the features that can be provided. For example, to accommodate the needs and capabilities of other participating administrations' networks, it may be necessary to implement multiple service architectures having different levels of technical sophistication.

Joint planning and design considerations for global intelligent network services include:

- Proposing and evaluating technical alternatives (e.g., determining the information to be exchanged and the appropriate signaling messages/parameters/fields to transport that information)
- Defining numbering plans/dialing patterns
- Establishing performance objectives (e.g., call set-up time, reliability, capacity, transmission quality)
- Defining network management controls
- Determining end-to-end testing procedures
- Designing maintenance procedures
- Defining recording, billing, and settlements procedures
- Coordinating development, deployment, and testing schedules
- Establishing procedures for advertising, selling, ordering, and provisioning.

Global Intelligent Network Services Architecture

The architecture used by participating administrations for an international service generally evolves from the initial design through various phases. The first phase may be a basic service that does not need intelligent databases in either the originating or terminating network. As the service matures and customers demand more sophisticated features, at least one network may need a database to provide the required feature functionality. That database then must store and continually update information about the customers of each participating administration. As the number of participating administrations increases, the administrative burden associated with continual updates and changes in a single database becomes unmanageable and the database storage requirements for customer data increase rapidly. At some point, it may become more efficient for a global service to use intelligent databases in both the originating and terminating networks. Each administration then would maintain current customer information in its own database and exchange the necessary call-processing information through direct database-to-database communications.

Panel 1. Abbreviations, Acronyms, and Terms

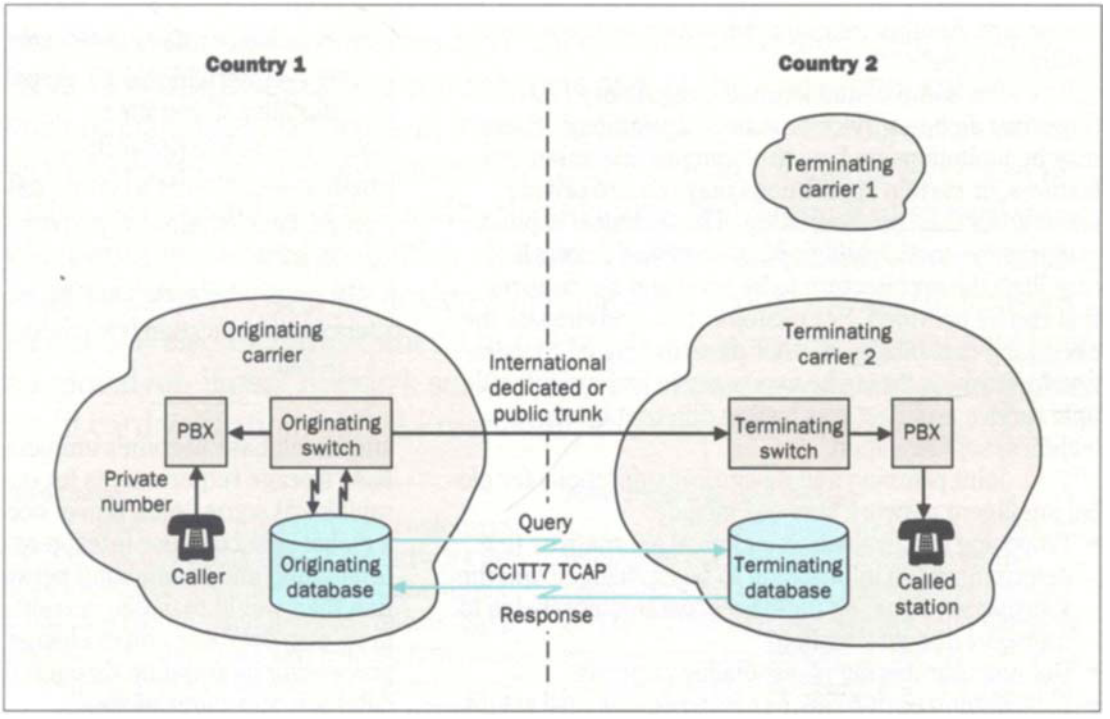
CCITT — International Telegraph and Telephone Consultative Committee
off-net — public network
on-net — customer's private network
originating location/switch/network — where a call originates
PBX — private branch exchange
terminating location/switch/network — destination of a call

The sections that follow describe some basic intelligent network capabilities. These capabilities are needed to support one or more phases during the evolution of a global intelligent network service architecture.

Call Processing Capabilities. The new call/transaction processing functions required with an interactive global intelligent network services architecture could be performed as follows:

- The originating database or switch could perform basic screening to determine if the call/transaction should proceed. The type of screening would depend on the specific service needs.
- If the call/transaction is allowed, the originating database or switch would query the terminating database to obtain information necessary to continue call processing.
- The terminating database could perform additional screening and then return the necessary call processing information to the originating database or switch. Such call processing information could include a destination routing number, calling card number validation, or final handling treatment indication.
- The physical connection then could be established and the call completed, or final handling treatment could be provided.

Figure 1. A conceptual view of a global virtual private network service that uses an interactive database architecture.



Signaling Capabilities. Global intelligent network services rely on signaling messages to transport information between the originating and terminating networks. This information may include the dialed number, routing number, customer identification, calling party number, and billing information. Signaling protocol enhancements may be required to transport this information. Any signaling enhancements should be standardized through the appropriate International Telegraph and Telephone Consultative Committee (CCITT) study groups to facilitate the service development/deployment process. (See Panel 1 for definitions of abbreviations, acronyms, and terms.)

Routing Capabilities. Some of AT&T's major overseas markets (e.g., United Kingdom and Japan) have more than one international carrier. In countries that have competing carriers, AT&T must be able to route international calls to the appropriate carrier in order to access the total market for global intelligent network services.

Network Management Capabilities. As part of the long-term architecture for global intelligent network services, AT&T envisions direct communication between databases in the originating and terminating networks. For example, when a terminating database becomes overloaded, network management controls can be used to optimize throughput by transmitting the appropriate network management information to the originating database. The originating database then would invoke network management control to reduce traffic by enforcing a minimum time interval between queries to the overloaded terminating database.

Global Intelligent Services

The sections that follow present a high-level or conceptual view of four potential global intelligent services: global virtual private network, global credit card validation, global Freephone, and global switched digital data.

Global Virtual Private Network Service. A virtual private network service enables the customer to establish a cost-effective telecommunications network (one whose resources are shared among customers) with the advantages of a private network (one whose resources are dedicated to a single customer). Each customer can specify the locations/stations that comprise the virtual private network (i.e., on-net locations) and use a customer-specific private numbering plan to reach those locations. Customers that have significant calling volumes to more than one country want to extend their virtual private network service globally.

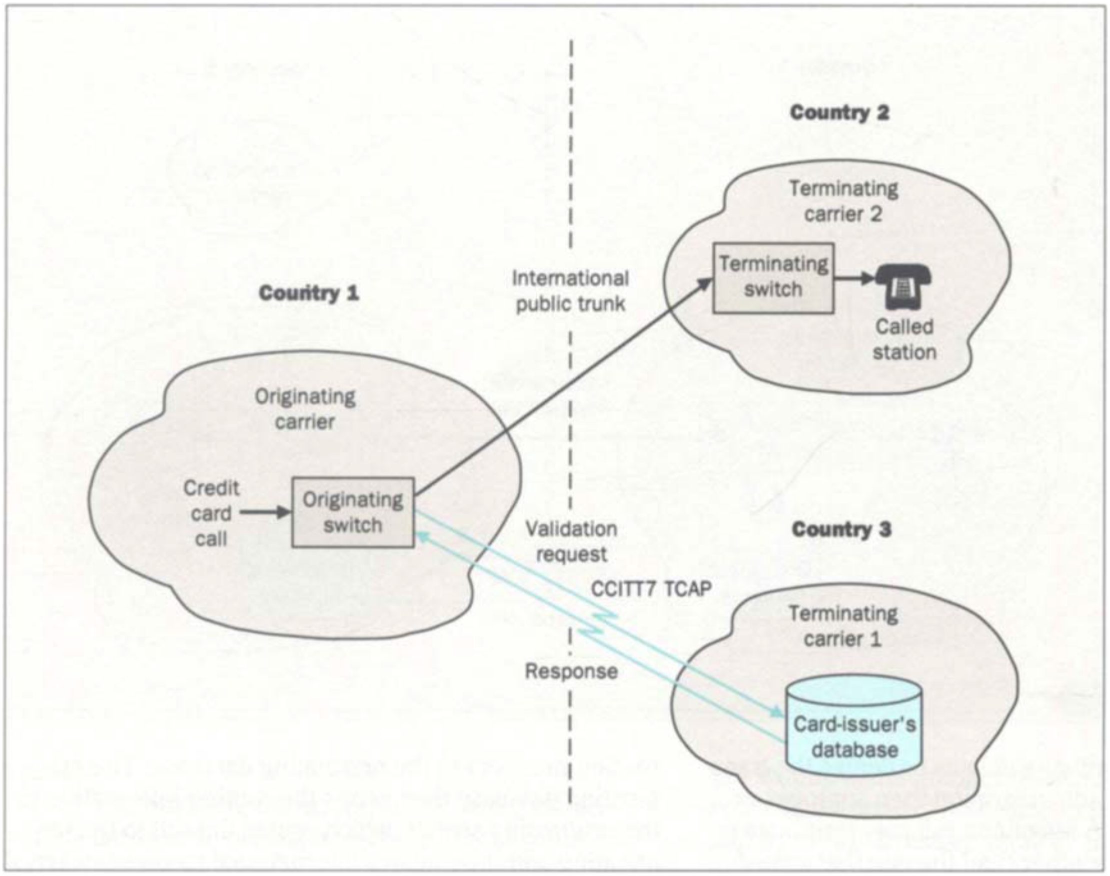


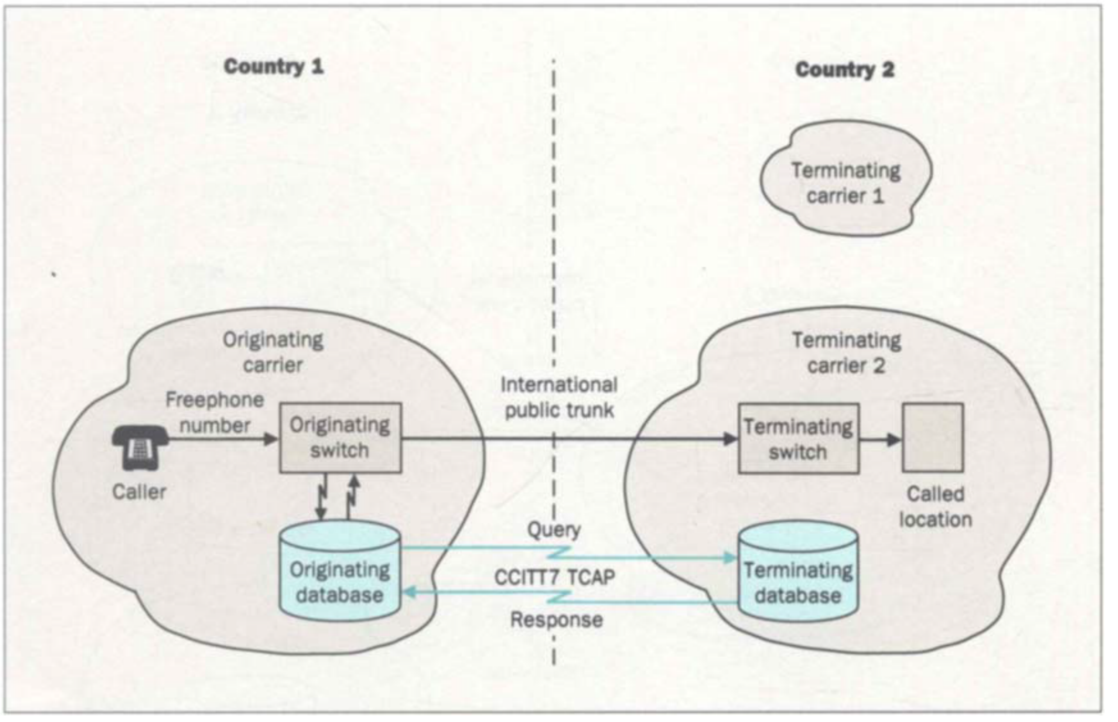
Figure 2. A high-level view of global credit card validation service.

Figure 1 illustrates a conceptual view of a global virtual private network service using an interactive database architecture. To place a global virtual private network call, the caller dials the number that identifies the called station in the destination country. The called station may be on the customer's private network (i.e., an on-net call) or on the public network (i.e., an off-net call). The originating administration's switch sends a query to the originating database, which locates the customer's record and determines whether the caller is authorized to call the destination country. If the call is allowed, the originating database either provides the appropriate routing number or sends a query to a database in the terminating network to obtain the routing number. The terminating database may perform additional screening before it returns the necessary call-processing information (e.g., routing number) to the originating database, which in turn sends the billing and routing information to the originating switch. The originating administration's switch creates a billing record and routes the call to the terminating administration's international gateway switch. The terminating network routes the call to the appropriate on-net or off-net destination.

Global Credit Card Validation. Credit card validation service enables the entity responsible for validating a credit card to query the card-issuer's database before completing a transaction (e.g., telephone call or purchase). The number of transactions initiated with credit cards issued by entities in other countries is increasing. Therefore, the ability to validate credit cards globally has become more critical.

Figure 2 illustrates a high-level view of a global credit card validation service. The need to validate a credit card globally arises when the credit card holder initiates a transaction (e.g., a telephone call) in an administration other than the credit-card-issuing administration. The administration where the transaction originates sends a validation request to the card-issuing administra-

Figure 3. A conceptual view of global Freephone service that uses an interactive database architecture.



tion's database, which either validates or denies the transaction. The originating administration then approves or denies the transaction. A telephone call may terminate to a country and/or carrier other than the one that issued or validated the caller's card, as illustrated in Figure 2.

Global Freephone. Freephone (i.e., toll-free) service enables a caller to reach the called Freephone customer without incurring a toll charge (i.e., the called Freephone customer is billed for the call). Customers that have significant markets in more than one country want the capability to extend their Freephone service globally.

Figure 3 illustrates a conceptual view of a global Freephone service using an interactive database architecture. The caller dials the global Freephone customer's number (i.e., an 800 number in the United States). The originating switch sends a query for call-processing information to the originating database, which locates the customer's record and determines if the caller is authorized to call the destination country. If the call is allowed, the originating database either provides the appropriate routing number or sends a query to a database in the terminating network to obtain the routing number. The terminating database may perform additional screening before it returns the call-processing information (e.g., routing number) to the originating database. The originating database then sends the routing information to the originating switch, which routes the call to the terminating administration's international gateway switch. A switching center in the Freephone customer's network creates a record to bill the called Freephone customer and routes the call to the destination.

Global Switched Digital Data Service. Switched digital data services allow the customer to transmit and/or receive high-speed data over facilities conditioned to accommodate that type of traffic. Customers that transmit and/or receive such data to/from locations in more than one country want to extend their switched digital data capability globally.

Figure 4 illustrates a high-level view of a global switched digital data service. To place such a call, a caller dials the number of the customer subscribing to global switched digital data service in the destination country. The originating administration's switch obtains the necessary routing information from the originating database. The originating switch then creates a billing record and routes the call to the terminating administration's international gateway switch. The terminating network routes the data call to the destination.

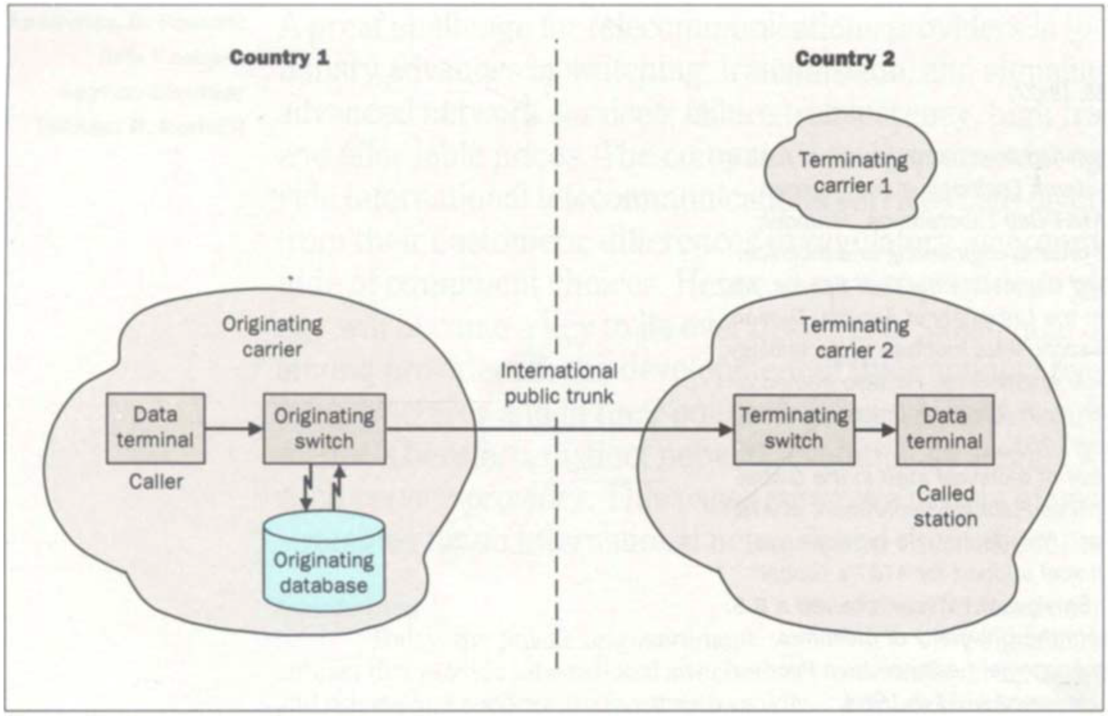


Figure 4. A high-level view of global switched digital data service.

Benefits

The following paragraphs summarize the primary benefits of an intelligent network architecture for global services.

Multinational customers can globalize their domestic services (i.e., obtain a global end-to-end service that, from the customer's perspective, works the same way at each location). The interactive nature of the long-term architecture envisioned for global intelligent network services makes it possible for the originating and terminating databases to exchange information as needed to provide the same feature functionality at each of the multinational customer's locations.

The interactive database architecture can provide some features that otherwise would not be available (e.g., caller-entered information can be forwarded independent of the type of international trunk used to carry the call). Other features can operate more efficiently (e.g., the administration requesting credit card validation can interact directly with the card-issuing administration's database).

Performance and efficiency of the originating, terminating, and international networks will be improved (i.e., utilization of network resources will be maximized). For example, the number of ineffective attempts will be reduced because of screening in the originating network and by network management or final handling treatment information sent from the terminating database before the voice/data path is established.

Each administration will maintain current customer information only in its own database. This will minimize the administrative burden of duplicating customer information in many databases and, therefore, the time required for updates and changes.

Conclusion

Successful planning, implementation, maintenance, and evolution of a global intelligent network service that, from the customer's perspective, functions as a single end-to-end service requires an ongoing working relationship among the participating telecommunications administrations. It is essential that this working relationship be established well in advance of the desired service date because of the time required to evaluate alternative service/feature arrangements, resolve issues, document the preferred service arrangement, complete development, deploy the capability, and complete service testing.

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Jack S. Sykes *is a distinguished member of technical staff in the Outbound Services Systems Engineering and Program Management Division of AT&T Bell Laboratories, Holmdel, New Jersey. He provides systems engineering and technical support for AT&T's Switched Digital International Service. Mr. Sykes received a B.S. from the University of Arizona, Tucson, and an S.M. from the Massachusetts Institute of Technology, Cambridge, both in electrical engineering. He also earned an M.S. in operations research from New York University, New York City. He joined AT&T in 1961.*

Eldred J. Visser *is a member of technical staff in the Global Network and Switched Services Planning Department at AT&T Bell Laboratories in Holmdel, New Jersey. He provides systems engineering and technical support for AT&T's Global Software Defined Network Service. Mr. Visser received a B.S. in electrical engineering from the University of California, Berkeley, and an M.S. in management science from Pace University, New York City. He joined AT&T in 1964.*