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The Intelligent Network

A Joint Study by Bell Atlantic, IBM and Siemens

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Preface

This report examines the findings of a study by Bell Atlantic, IBM, and Siemens which investigated the role of the Intelligent Network in telecommunications. It considers current trends and future developments, on a national and international level.

This report defines and describes the concept of the Intelligent Network and considers the operating requirements (including the hardware and software) and the types of service a network user can expect.

Concepts, definitions, and terminology reflect the status of the Intelligent Network in 1988. Actual implementation may differ due to the constantly changing environment, new requirements, and experiences with existing solutions.

The report is divided into six parts:

Part 1 introduces the concept of the Intelligent Network, and describes elements common to all IN services. It considers the application program and network management requirements, and provides examples of the hardware and software proposed for implementing the network.

Parts 2 through 6 include detailed descriptions of specific IN services. In each part there is a functional service description and an application description.

The reader is expected to have a general knowledge and understanding of existing telecommunication networks.

A bibliography, glossary, and all appendices referred to in this report are contained in the back of the document.

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Introduction

In the short time since its creation, the Intelligent Network (IN) has captured the imagination of the telecommunications industry. This fascination has been inspired by the promises inherent in this network service control architecture. The current excitement is based on the IN's functional architecture, its benefits, and its evolution.

There is already considerable knowledge of these attributes, however, this knowledge is located in many evolving documents and is still incomplete. The body of knowledge needs to be, and is being enlarged. Therefore, the telecommunications industry is steadily and probingly ascending the IN learning curve.

The cause and effect relationship between curiosity (business and technical) and information acquisition in an atmosphere of worldwide technological advances is propelling the IN onward. The goal of the Bell Atlantic, IBM, and Siemens joint study is to contribute to the understanding and realization of the IN architecture and its benefits. In the process, all study participants have enriched their own understanding of the IN through the exchange of ideas that is intrinsic in study interaction. The collaborative effort involved three corporations with expertise in networking, information processing, and telecommunications and produced a unique synthesis of analysis, experience and perspective.

The results of the detailed studies have been integrated and streamlined into this report which focuses on the important aspects of the IN: the architecture, services, and solutions.

In both the study methodology and the consolidation of the results into this document, emphasis has been placed on the current IN factors. however, IN's evolutionary phases are also considered.

Based on their available resources, the study teams set out to establish:

- A consolidated common understanding (among the study participants) of the IN concept, and whether its architecture is applicable worldwide.
- A common technical ground among the different corporations, with respect to elements of the IN architecture.
- Implementation scenarios for the IN elements, to determine the types of solutions available with the IN, and the limitations on these solutions.
- A general functional understanding of the important IN service characteristics such as: a description of what each service provides, the functional distribution of a service among the IN elements, network and service user interaction, and

functional aspects common to the services selected for detailed investigation. These services are the Green Number Service (GNS), Emergency Response Service (ERS), Alternate Billing Service (ABS), Private Virtual Network (PVN), and Area Wide Centrex (AWC).

Bell Atlantic, IBM, and Siemens developed a methodology to determine the transaction rates and storage capacity requirements for IN elements. This is based on demographic data, interviews and knowledge of telecommunications markets worldwide.

An appreciation of the future of the Intelligent Network is extremely important to a complete understanding of the current IN. The IN is becoming increasingly sophisticated with respect to defining the software building blocks (functional components) from which the services of the future will be constructed. These functional components (FCs) will not only be standardized products among telecommunications manufacturers, but will also be combinable to produce new services flexibly and efficiently. The collection of functional components will be analogous to the standard instruction sets in microprocessors, in which individual instructions can be combined in unique ways to produce many new software programs.

Telecom service creation will then be possible by linking the required FCs. Thus, the opportunity to conceptualize and implement a service will be available to other parties in the telecom industry instead of (as is currently the case) only the equipment suppliers. One of these parties will be the PTTs themselves. Therefore, since the PTTs are customers from the suppliers' perspective, this new service creation capability has often been referred to as "customer programmability". The future will also bring new and universally accepted standards in the areas of the IN interface protocols and service definitions. The achievement of standards is essential to IN progress.

It is also important to realize that the IN service control architecture and the ISDN access architecture will synergistically bring added opportunities. New service attributes will be provided which benefit the user and enhance service value through the combination of IN and ISDN. It will be seen that these two network architectures are complementary and that the whole is much greater than the sum of the parts.

Part 1. Overview of the Intelligent Network

This part defines and describes the Intelligent Network.

Chapter 1, "The Intelligent Network" introduces the concept, explains the origins of the IN, and gives a technical overview of network and service implementation. It describes IN introduction and evolution scenarios, which include the following environments for IN introduction:

- Conventional (analog subscriber) networks
- High density ISDN networks
- IN growth coincident with ISDN
- Deployment and penetration of ISDN or CCS7[1].

This chapter also presents a validation of the IN architecture and its capabilities by applying it to a specific service.

Chapter 2, "Functional Characteristics Common to Selected IN Services" describes the functional characteristics common to selected IN services. The information in this chapter applies to all selected services, and service-specific details are included in the individual service descriptions (Parts 2 through 6).

This chapter examines the standards to be applied to each service and how the service will be used. The functional characteristics described include billing, service logic, databases, traffic measurement, and performance requirements.

Chapter 3, "Network and Service Management" considers aspects of network and service management. It considers the basic Operations, Administration, and Management (OA&M) functions, and the architectural requirements of such functions. The Switching and Signaling networks are also examined, as is the future of Operations Architecture.

Chapter 4, "Network Components" looks at the physical elements that comprise the Intelligent Network. There is a general overview of network topology and a detailed examination of the main components: the Service Control Point (SCP), the Signaling Transfer Point (STP), the Service Switching Point (SSP), and the service user and service subscriber interfaces. These elements are described in

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[1] **This report uses "CCS7" to refer to both the Signaling System Number Seven (the term used in the United States) and the Common Channel Signaling Number Seven, which is the CCITT term.**

terms of the hardware and software that is currently proposed to implement the network and services.

This chapter also considers the future of the IN elements: how IN/1 components can be designed for the transition to IN/2, and areas for further standardization.

Chapter 1. The Intelligent Network

1.1 IN Architecture and Capabilities

The Intelligent Network (IN) is a telecommunications network services control architecture.

The goal of this services control architecture is to provide a framework so that the Network Operator can introduce, control and manage services more effectively, economically and rapidly than the current network architecture allows.

The main benefit of the IN architecture is the possibility to improve the quantity, and to develop new sources, of revenue. This is particularly desirable in an environment with a high penetration of available services per capita. For most environments, the IN will be a stimulation or basis for revenue generation, in both the short and long term.

In a competitive environment the IN will maintain and enhance existing revenues by providing IN-based services which offer competitive alternatives to Bypass and Private Networks. The USA is currently experiencing a level of competition unmatched elsewhere in the world. Similarly, many other countries have or are preparing to enact deregulatory policies which will create and expose their PTTs to competition. Thus, the importance of IN architecture (and competitive countermeasures, in general) is increasing worldwide.

The technical features that the IN architecture must provide are:

- Network connection control intelligence at centralized nodes. This node is known as the Service Control Point (SCP).
- Network nodes which switch connections under the direction of the SCP. These nodes are Service Switching Points (SSPs).
- Standard Network interfaces (for example, CCS7 and ISDN) at points such as the SCP and SSP. These interfaces facilitate competition between suppliers of network and service products, and thus stimulate multiple vendor environments.
- Rapid and economic **service creation** capabilities (such as customer programmability and program portability), for example, a function by which the network operator can identify a need, create or acquire a corresponding service, and deploy it within a market opportunity window, while maintaining the integrity of the network.

1.1.1 IN Goals

In February 1985, a Regional Bell Operating Company (RBOC) submitted a Request for Information (RFI) for a Feature Node concept (see Feature Node/Service Interface Concept, SR-NPL-000108) with the following objectives:

- Support the rapid introduction of new services in the network.
- Help establish equipment and interface standards to give the RBOCs the widest possible choice of vendor products.
- Create opportunities for non-RBOC service vendors to offer services that stimulate network usage.

This Feature Node concept was later adopted by Bellcore, and enhanced to become the **Intelligent Network concept**.

At the direction of Bell Atlantic and the other RBOCs, Bellcore has since published a number of documents and held seminars describing the IN concept. Their IN objectives have been stated as providing:

- Flexible network architecture
  - Adaptable to rapidly changing technical, regulatory, and marketing environments
  - Independent of specific services or capabilities
  - Greater customer (PTT) control of service features and functions
  - Efficient network control and administration
  - Telecommunication infrastructure supportive of national needs.
- Standard network interfaces
  - Promoting a competitive environment
  - Consistent with regulations
  - Stimulating use of the network
  - Standards
    - Signaling network (CCS7 and Transaction Capability Application Part--TCAP)
    - Application messages (Functional Components)
    - Standard capabilities and procedures (for example, ISDN).
- Rapid service introduction
  - PTT programmable
  - Ability to meet market window
  - Services independent of network transport mechanism (for example, the same Closed User Group structures for Packet Switching, Centrex, ISDN)
  - Potential for ubiquitous services
  - Multiple suppliers
  - Ability to service niche markets and individual customers.

The following example illustrates the RBOC's interest in those objectives:

> The 800 service in the USA generates several billion dollars in revenue per year, the number of subscribers grows by 10% per annum, and revenue increases by 20% per annum.

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