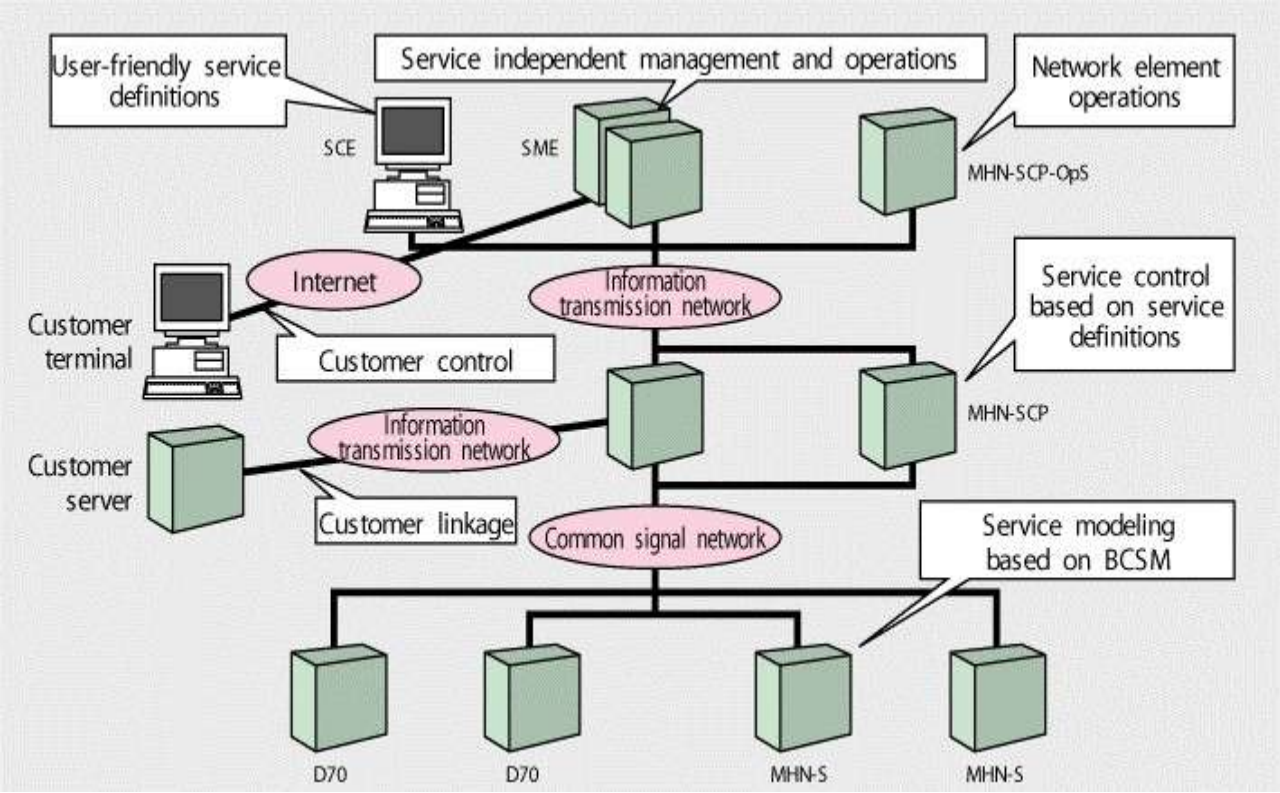
Advanced Intelligent Networks

Advanced intelligent networks can provide various advanced telecommunications services that meet user needs by allowing individual users to specify their own service requirements. Service control points (MHN-SCPs) and customer servers can be linked together to ensure the provision of the best possible services to fulfill the specific requirements of each customer. Service-specific functions are separated from the transport layer (which consists of D70, MHN-S, and other switching/transmission systems) and centralized into the intelligent network layer (which consists of MHN-SCPs, SMSs, and so on). This network architecture minimizes the cost of modifying switching systems when new services are introduced.



Intelligent Networks

Still in the 1960's service logic was hard-wired in the switching systems. If a phone company wanted to offer any additional services, it had to be implemented at the local switch. This, of course, lead to tremendous strains at the switch. In the mid-60's a new concept called SPC (Stored Program Control) was introduced. This meant that service logic now was programmable. But it lead to problems later when the number of SPC- stations in the network increased and it became complicated to add new services because of dependencies between the service itself and the logic. To solve this problem, centralizing the services in special nodes in the network was started. For this a new signaling system, called SS7, was designed. These types of networks using this technique, are called Intelligent Networks.

An intelligent network is a service-independent telecommunications network where the intelligence is taken out of the switch and placed in computer nodes that are distributed throughout the network. The original IN networks were introduced by BELLCORE organization in the US in the mid 80's. The concept was a success over there and manufacturers all over the world - especially in Europe - began to develop it. There are two types of INs in the world today. One has been developed by ITU and is called IN CS-1 (Capability Set 1). This is an international IN standard. The second one is the Advanced Intelligent Network, AIN which has been standardized over the past 15 years by Bellcore in the United States. This essay will from here on mostly discuss AINs.

Advanced Intelligent Networks are built in such a manner that it uses SS7 signaling. All the

different computers, servers etc. use it to signal to each other. There are two types of stand-alone, high capacity computers that contain all the applications and data used to provide information to switching systems on how to handle calls requiring special treatment. These are called SCPs (Service Control Points) and APs (Adjunct Processors). The SCP signals using the STP (Signaling Transfer Point) which provides reliable SS7 network links and ensures reliability. There are also SSPs (Service Switching Points) that allow interaction between the subscriber and the service that is contained in the SCP or AP. The Local Exchange (LE) is hooked up to an SSP (which interacts with the SCP) or AP and is the exchange to which the subscribers are connected to. The difference between the AP and SCP is that the AP supports services associated with the LE like automatic callback/recall, call forwarding, caller ID etc. The SCP is associated more with long distance and interexchange services like 800-numbers, area number calling etc. There is also an IP (Intelligent Peripheral) conncected to the SSPs which controls and manages the different resources (e.g. voice synthesis, announcements etc.). The interface between the SSP and IP is ISDN, PRI or BRI.

An important aspect of Intelligent Networks in general is that the network can be realized in analog or digital technology and with circuit or packet switching techniques, and subscribers can be connected through radio or physical circuits. To add new services quickly and easily, so-called service scripts are written.

Let's take an example of how a phone call is routed through an Advanced Intelligent Network. This example uses Ericsson's IN operations protocol: The operation names that exist are 'Provide Instructions' (which goes from the SSP to the SCP), 'Activate Resource' (which goes from the SCP to SSP), 'Monitor' (from SCP to SSP), 'Event' (from SSP to SCP), 'Create' (from SCP to SSP), 'Charging Information' (same as previous) and 'Transfer control' (same). This is how the signaling procedure in a Freephone call (the definition of Freephone is found later in the essay) go. Subscriber A initiates a freephone call. The SSF recieves the call containing a trigger for an IN service. This is indicated by the first few numbers of the telephone numbers (e.g.800). The number is analyzed and it is found that it is a freephone call where after SSF sends a 'Provide Instructions' operation to the SCF. SCF analyzes the query and decides to set up a connection to a C-subscriber by sending a 'Create' operation with that C-number back to the SSF. This is to clarify the handling of the procedure. The 'Create' operation initiates a connection of the calling party to the recieving party based on what is stated by the service logic in the SCF. Also, if the SCF wants to know when the C-subscriber has answered the call, it is indicated in the 'Monitor' operation that the SCF sends to the SSF. As soon as the C-subscriber has answered the call, SSF reports this by sending an 'Event' operation to the SCF which states that the connection between the A-subscriber and the C-subscriber has been set up. The SCF will at this time decide that the SSF can take over the control of the call and it is indicated by the 'Transfer Control' operation that is sent to the SSF by the SCF. This means that the SSF will handle the rest of the call and the dialog between the two nodes ceases.

Advantages of AINs:
AINs expand the INs. For the subscriber, the visible services he/she sees are today, for instance, fax routing and e-mail sending. You can have your phone calls transferred to wherever you are at the moment. You can dial free telephone numbers, use telephone calling cards, use purchased services like call forwarding, caller ID or a specialized ringing. Even the much talked-about VOD (Video-on-Demand) uses Advanced Intelligent Networks. The main point with AINs in general is that the services are customized to meet the individual customer's needs. If you want call forwarding in your phone but not caller ID, you can do that. The customer can tailor himself/herself a service group that satisfies his/her needs, demands and requirements.

A more detailed list of what types of services that have been developed for the use within AINs is here. These are some typical examples:

- **Freephone:** This was the first type of IN service offered and is usually used by companies who want to advertise their services by offering their customers the advantage of calling for free. In practice this means that the costs are paid by the receving company. An important

feature of this service is the 'voice prompt' which means that a recorded message asks the customer to (by pushing a tone button on the telephone) choose to which department he/she wants to become connected. This simplifies and speeds up the handling of calls. Another feature is the possibility of queing calls if all lines are busy.

- **Universal Access Number:** With this service customers who dial this number are automatically routed to the nearest open office or to an office with free lines. The difference between this service and the previous one is that the customer pays for the call.
- **Premium Rate Service:** The calls are charged at a rate higher than for normal calls. This service is used in connection with information services offered by service providers and could be for example, sports results, dating services, weather forecasts, horoscopes, etc.
- **Credit or Account Card Service:** The user pays for the call using a normal credit card in a public telephone instead of using coins.
- **Universal Personal Telecommunication (UPT):** This service makes it possible for a subscriber to be reached on any telephone via the same number wherever he/she is located. Also, the subscriber can be charged on his/her own account from ANY phone he/she uses.
- **Televoting:** This is a service where e.g. TV-viewers are asked to call in and register their opinion on an issue by calling to either one of two numbers (where one can mean 'YES' and the other one 'NO').
- **Virtual Private Network (VPN):**VPN allows Private Network services to be provided in the public network. As an example, a company can define and manage its own private numbering plan.

Other services that have been created and might be on the more curious side are, for example, Calling Party Pays (where the calling party is notified that it is trying to reach a cellular number), Inmate Service (routes prisoners' calls, tracks the call information, blocks certain numbers etc.), Work-at-Home (where an individual can be reached at home by dialing an office number as well as allowing the employee to have calls billed and tracked to a business phone number), Advertising Effectiveness Service (which collects information on incoming calls which is then used by advertisers to determine the demographics of their customers) and Inbound Call Restriction (which allows a customer to restrict some calls from coming into his location and is able to restrict calls by area code or particular phone numbers).

There are some other benefits with Advanced Intelligent Networks also that might not be as visible for the subscriber/customer. Some main points are that with this technology, the operator is able to introduce new services rapidly. It is very easy to add new services to the network and then it's easy to satisfy the customer. Main benefits with AINs are also that it establishes vendor independence and creates open interfaces. With this is meant that the switching system vendors don't have to be as dependent on software development anymore since the service providers themselves have more freedom to create and customize the services. This is achieved by the fact that AINs have separated the service-specific functions from other network resources. Economically AINs mean that services can be created in a more cost-effective manner beacuse the service provider (and not the vendor) control the service logic. And more competition in this market is generated with this "openess".

Future of AINs

What things will a customer be able to do with the AIN? Probably, anything you can imagine. You could do interactive home shopping, have music on demand, have the Internet on TV, have video links that allow complex images to be displayed hundreds of kilometers away. What is very probable is that SS7 together with IN functions will take over more and more of the service and traffic handling in the whole telecommuncations network.