Overview of Ericsson's GSM Systems

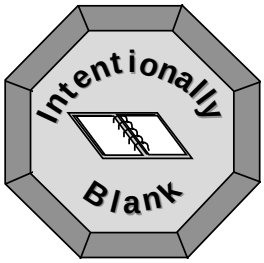
Chapter 2

This chapter is designed to provide the student with an overview of Ericsson's GSM systems: CME 20 and CMS 40

OBJECTIVES:

Upon completion of this chapter the student will be able to:

- List 3 network components, in Ericsson's GSM system, and briefly describe their functionality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2 Overview of Ericsson's GSM Systems

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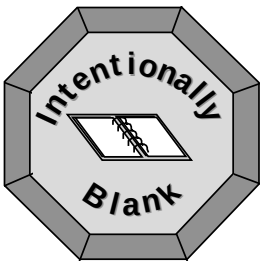
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ERICSSON IN GSM

Ericsson has been involved in GSM since its inception and took an active part in the GSM specification process.

Ericsson is the largest supplier of GSM equipment in the world with a market share of approximately 50%. Over 100 GSM networks worldwide are supplied by Ericsson.

Ericsson is also one of the world's largest suppliers of GSM mobile phones and has an estimated 24% share of the world market.

☞ Did you know?

Germany was the location for the first Ericsson GSM network.

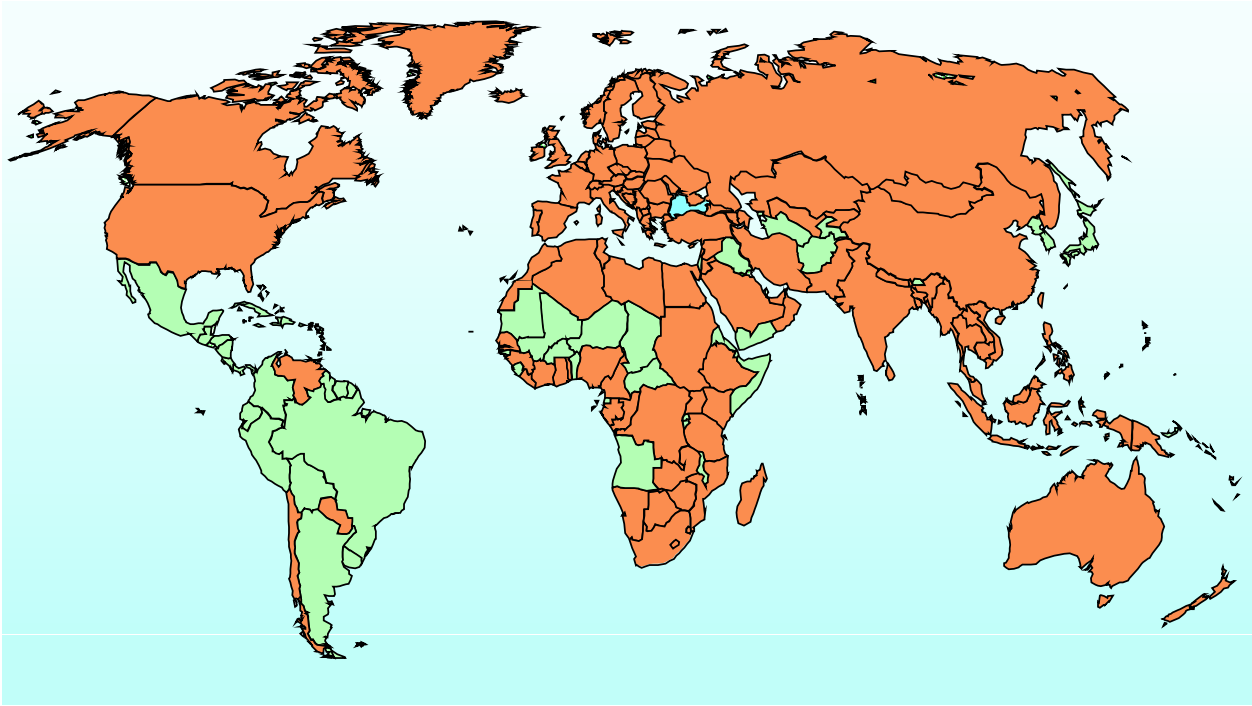


Figure 2-1 Ericsson GSM worldwide (indicated by darker areas)

ERICSSON'S GSM SYSTEM ARCHITECTURE

Ericsson provides two systems for GSM networks:

- Cellular Matra Ericsson (CME) 20: for GSM 900 and GSM 1800 networks
- Cellular Mobile System (CMS) 40: for GSM 1900 networks

☞ Did you know?

CME stands for Cellular Matra Ericsson, because the French company Matra was involved in the initial development of Ericsson's GSM system.

Like the GSM system model itself, Ericsson's GSM systems are split into two primary systems: the Switching System (SS) and the Base Station System (BSS). However, depending on the requirements of a network operator, Ericsson's GSM systems can incorporate other functions and nodes, such as Mobile Intelligent Network (MIN) nodes and post processing systems.

Note: Ericsson's wide range of MSs are not considered to be part of either the CME 20 or CMS 40 product, due to the fact that an MS from any supplier can work with network equipment from any other supplier.

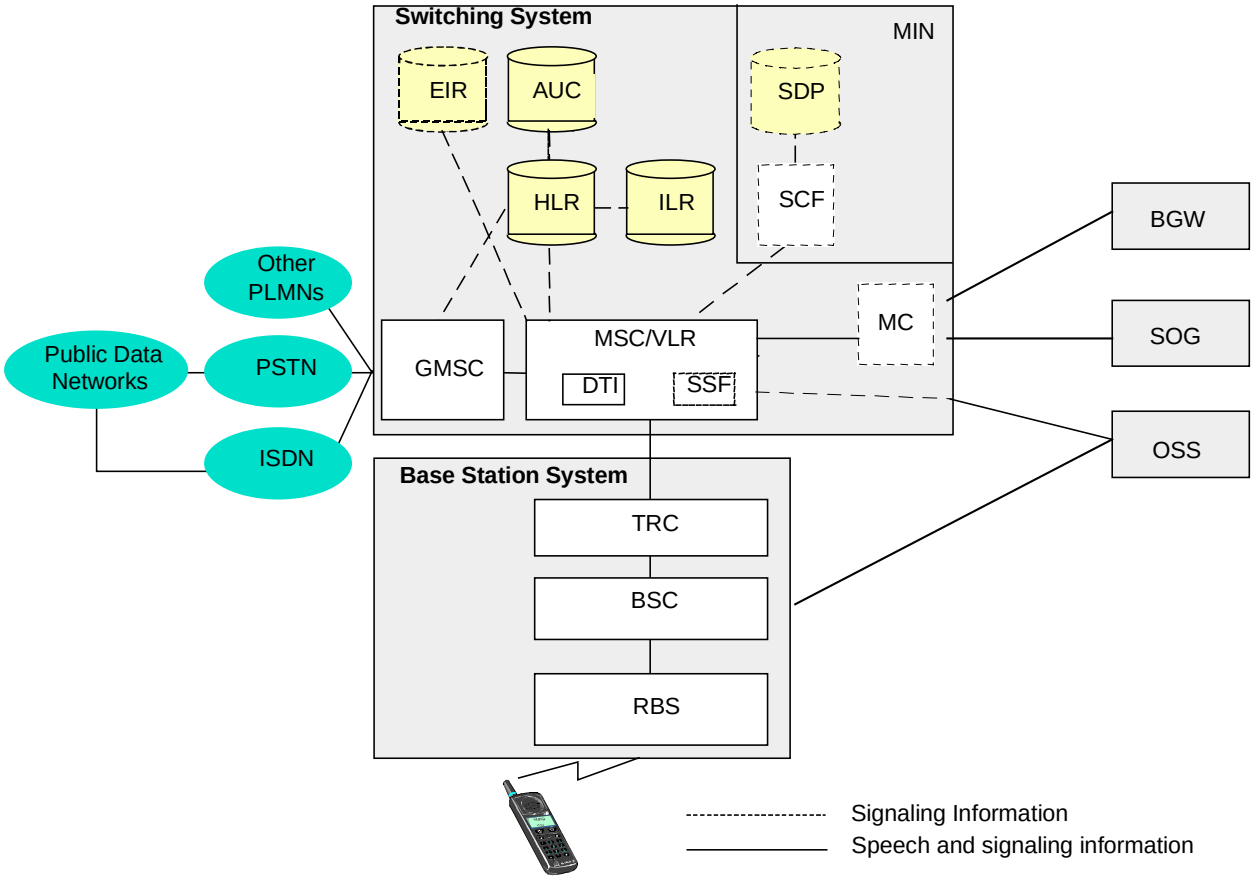


Figure 2-2 Ericsson GSM network system model

Basic or Additional	Abbrev.	System	Full component name	Platform
Basic	MSC/VLR	SS	Mobile services Switching Center/Visitor Location Register	AXE
Basic	GMSC	SS	Gateway MSC	AXE
Basic	HLR	SS	Home Location Register	AXE
Basic	ILR	SS	Interworking Location Register	AXE
Basic	AUC	SS	AUthentication Center	Unix/AXE
Basic	EIR	SS	Equipment Identity Register	Unix
Basic	DTI	SS	Data Transmission Interface	AXE
Basic	TRC	BSS	TRanscoder Controller	AXE
Basic	BSC	BSS	Base Station Controller	AXE
Basic	BTS	BSS	Base Transceiver Station	RBS
Basic	OMC	OSS	Operation and Maintenance Center	TMOS
Basic	NMC	OSS	Network Management Center	TMOS
Additional	MC	SS	Message Center	MXE
Additional	SSP	SS	Service Switching Point	AXE
Additional	SCP	SS	Service Control Point	AXE
Additional	SDP	SS	Service Data Point	Unix
Additional	SOG		Service Order Gateway	Unix
Additional	BGW		Billing GateWay	Unix

Table 2-1 Components of Ericsson network system

ERICSSON'S SS IMPLEMENTATION

Mobile services Switching Center/Visitor Location Register (MSC/VLR)

The MSCs in all Ericsson GSM networks are AXE exchanges. In all Ericsson GSM networks, the VLR is integrated into the MSC node. This means that signaling between the VLR and the MSC is done internally within the MSC/VLR network node and does not have to be carried over the rest of the network. This has the benefit of reducing the overall signaling load on the network.

Gateway Mobile services Switching Center (GMSC)

The GMSC is also implemented as an AXE exchange. In effect, it is an MSC with some additional software.

Home Location Register (HLR)

Ericsson's HLR is also based on AXE and can be implemented in the same node as the MSC/VLR or as a stand-alone node.

Interworking Location Register (ILR)

The Interworking Location Register (ILR) exists in CMS 40 networks only. An ILR makes inter-system roaming possible, meaning that a subscriber can roam from a GSM 1900 network to an AMPS network. The ILR consists of an AMPS HLR and a GSM 1900 VLR. In the near future the ILR will make intersystem roaming possible in both directions between all GSM/AMPS/TDMA networks.

Authentication Center (AUC) and Equipment Identity Register (EIR)

The AUC and EIR are implemented either as stand-alone nodes or as a combined AUC/EIR node. The UNIX-based AUC and the EIR are developed by Sema Group. The AUC may alternatively reside on an AXE, possibly integrated with a HLR.

Data Transmission Interface (DTI)

The DTI is a hardware platform which implements the GSM-defined InterWorking Function (IWF). It performs data handling functions such as data rate conversion. DTI is implemented on an AXE platform and is integrated in the MSC/VLR. By being integrated into the AXE platform, the DTI does not need separate operation and maintenance facilities.

ERICSSON'S BSS IMPLEMENTATION

Ericsson's BSS differs slightly from the GSM system model, in that a node called the Transcoder Controller (TRC) is added. However, this does not provide extra functionality - the functions of the TRC are part of the GSM model's BSC.

Transcoder Controller (TRC)

The purpose of a TRC is to multiplex network traffic channels from multiple BSCs onto one 64 Kbits/s PCM channel which reduces network transmission costs. The TRC can be combined with the BSC or exist as a stand-alone node.

Base Station Controller (BSC)

The BSC in all Ericsson GSM networks is based on AXE technology. It can be implemented as a stand-alone node or integrated with either an MSC/VLR or a TRC.

Base Transceiver Station (BTS)

In Ericsson's GSM systems the BTS is included as part of a product called RBS. The RBS also contains extra functionality which enables the support of several GSM-defined BTSs.

Ericsson offers a wide range of RBSs for use in GSM networks:

- RBS 2101
- RBS 2102
- RBS 2103
- RBS 2202
- RBS 2301
- RBS 2302
- RBS 2302 MAXITE
- RBS 2401

ERICSSON'S OMC AND NMC IMPLEMENTATION

Operation and Support System (OSS) is Ericsson's product to support the activities performed in an OMC and/or NMC. The network operator monitors and controls the network through OSS which offers cost effective support for centralized, regional and local operations and maintenance activities. OSS is based on Ericsson's Telecommunications Management and Operations Support (TMOS) platform.

OSS is designed as a complete network management system which can be used to control all the main network elements such as MSC/VLRs, HLRs, ILRs, TRCs, BSCs, EIRs, AUCs and Mobile Intelligent Network (MIN) nodes. OSS can also control BTSs through the BSCs.

OSS uses a Graphical User Interface (GUI) enabling easier system use and network management.

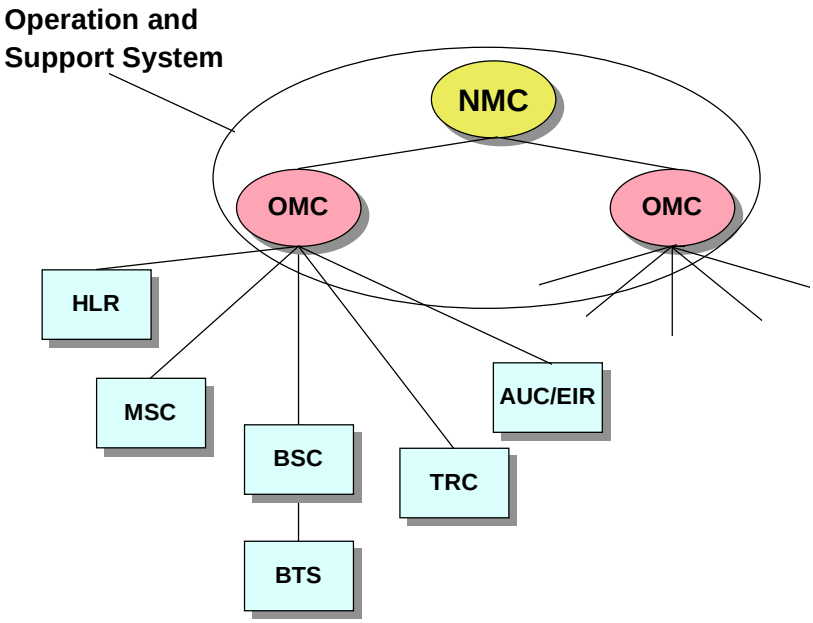


Figure 2-3 OSS provides central supervision of all network elements

Telecommunication Management Network (TMN)

OSS and TMOS are based on the international Telecommunication Management Network (TMN) standard. TMN is a model for the management of telecommunication networks. The most important areas of network management identified by TMN are:

- Configuration Management
- Fault Management
- Performance Management

Configuration Management

In OSS, the cellular network can be displayed on screen using a Graphical Cell Configuration (GCC). GCC gives a graphical view of the entire network and allows the operation and maintenance staff to zoom in on specific regions of the network to get a more detailed picture of particular cells.

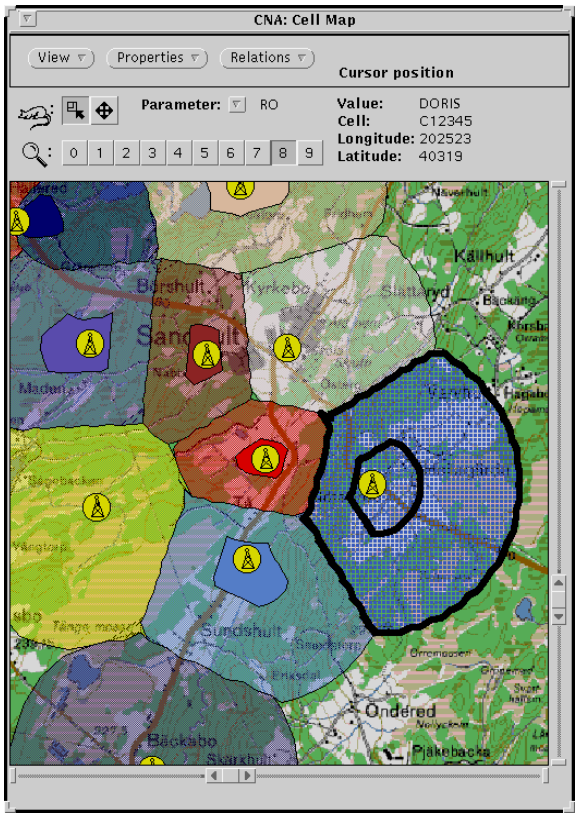


Figure 2-4 Graphical Cell Configuration

Fault Management

The operator can monitor the status of the network by using Network Alarm Status Presentation. If a failure occurs in the network, one or more alarms are activated and forwarded to the OMC. Different icons are depicted on screen to indicate the severity of the alarm. One icon is used to show critical situations while another icon is used to show warnings.

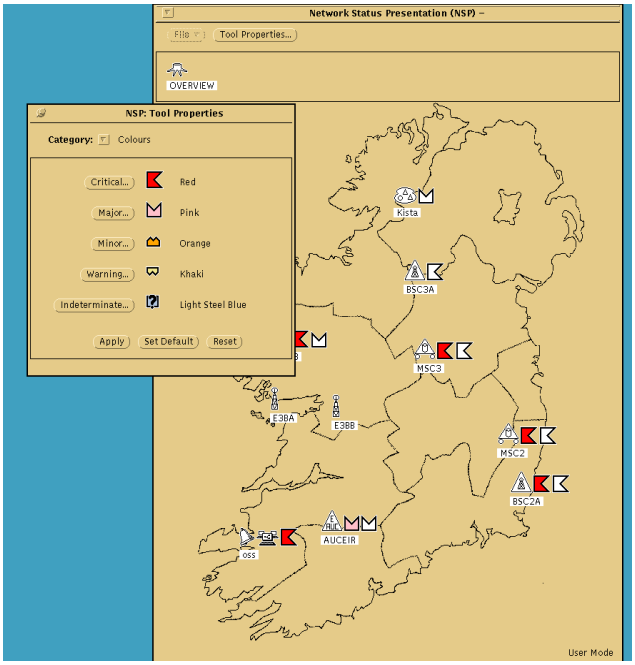


Figure 2-5 Network Alarm Status Presentation map showing icons for different types of alarms

Performance Management

In order to plan for future use of the cellular network, each operator must check the performance of the network. With performance management it is possible for an operator to collect and receive statistics based on both short-term and long-term measurements.

ADDITIONAL ERICSSON NETWORK COMPONENTS

A basic GSM network can be enhanced by the addition of some or all of the following functions.

Additional Nodes

Message Center (MC)

A Message Center (MC) may be added to a GSM network to provide voice/fax mail and handling of the Short Message Service (SMS) and SMS Cell Broadcast (SMSCB) text messages. These services can generate considerable revenue for a network operator, as they are becoming increasingly popular.

In the Ericsson GSM system the MC is implemented by Ericsson's MXE product. Like other network nodes, the MXE can also be controlled by OSS.

Mobile Intelligent Network (MIN) nodes

Mobile Intelligent Network (MIN) nodes can be added to a basic GSM network to provide value-added services to subscribers.

☞ Did you know?

Examples of MIN services include:
- *freephone*
- *premium rate*
- *personal number*
- *televoting*
- *cellular virtual private network*

Ericsson's MIN nodes include:

- **Service Switching Point (SSP):** an SSP acts as an interface between the call control functions of the mobile network and the service control functions of a Service Control Point (SCP). Ericsson's SSP is AXE-based and may be integrated within an MSC/VLR (recommended) or stand-alone.
- **Service Control Point (SCP):** an SCP contains the intelligence of a MIN service or services. This intelligence is realized in software programs and data. Ericsson's SCP is also AXE-based and the recommended configuration is as a stand-alone node, accessible by all MSC/SSPs.
- **Service Data Point (SDP):** an SDP manages the data which is used by an MIN service. Ericsson's SDP is a stand-alone node based on UNIX.

Post Processing Systems

Post processing systems are used by network operators to handle and analyze the large amounts of information which is generated by calls in the network.

Service Order Gateway (SOG)

A network operator requires administrative systems to analyze and manage network information such as customer subscriptions, billing information and for fraud detection. An operator's administrative systems are normally called Customer Administration Systems (CAS). They are complex systems which are often inflexible and costly to adapt to the specific needs of individual network operators.

The Service Order Gateway (SOG) is an Ericsson product which enables CASs to exchange information with network elements which contain service information, such as the HLR.

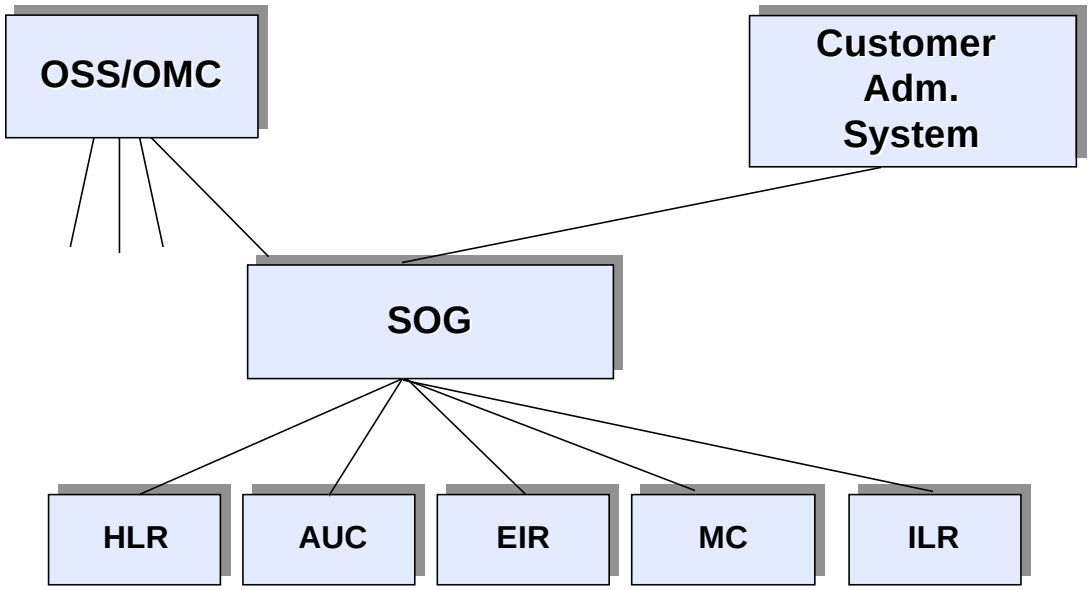


Figure 2-6 Service Order Gateway (SOG)

Billing GateWay (BGW)

A Billing GateWay (BGW) collects billing information or Call Data Record (CDR) files from network elements such as MSCs and forwards them to post-processing systems that use the files as input. A BGW acts as a billing interface to the network elements in an Ericsson network and its flexible interface supports adaptation to any new types of network elements. Any internal BGW alarms are forwarded to OSS at an OMC.

A BGW is usually connected to the customer administration and billing systems and is handled by the administrative organization.

The figure below shows some of the possible billing information required when analyzing a specific call.

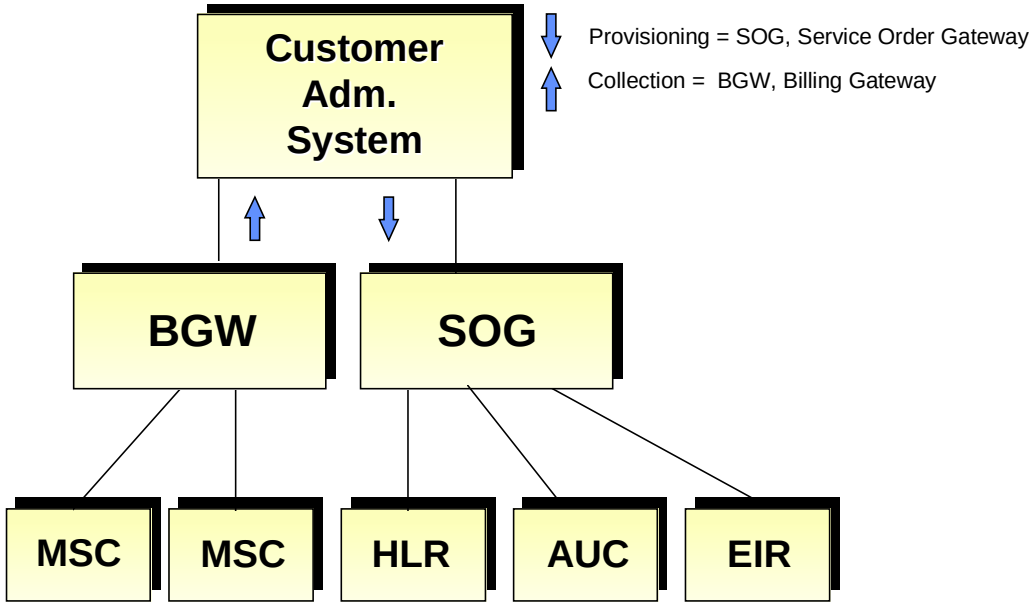
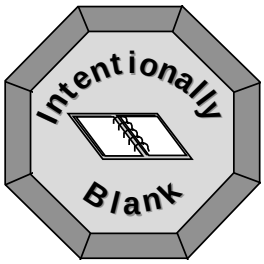


Figure 2-7 Billing information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