PLMN: What is a Public Land Mobile Network ?

A public land mobile network (PLMN) is any wireless communications system intended for use by terrestrial subscribers in vehicles or on foot. Such a system can stand alone, but often it is interconnected with a fixed system such as the public switched telephone network (PSTN). The most familiar example of a Public Land Mobile Network end user is a person with a cell phone. However, mobile and portable Internet use is also becoming common.

PLMN code

A Public Land Mobile Network is identified by a globally unique PLMN code, which consists of a MCC (Mobile Country Code) and MNC (Mobile Network Code). Hence, it is a five- to six-digit number identifying a country, and a mobile network operator in that country, usually represented in the form 001-01 or 001-001.

A PLMN is part of a:

* Location Area Identity (LAI) ( Public Land Mobile Network and Location Area Code)
* Cell Global Identity (CGI) (LAI and Cell Identifier)
* IMSI (see PLMN code and IMSI)

PLMN code and IMSI

The IMSI, which identifies a SIM or USIM for one subscriber, typically starts with the Public Land Mobile Network code. For example, an IMSI belonging to the PLMN 262-33 would look like 262330000000001. Mobile phones use this to detect Roaming, so that a mobile phone subscribed on a network with a Public Land Mobile Network code that mismatches the start of the USIM’s IMSI will typically display an “R” on the icon that indicates connection strength.

PLMN services

A Public Land Mobile Network typically offers the following services to a mobile subscriber:

* Emergency calls to local Fire/Ambulance/Police stations.
* Voice calls to/from any other PLMN (“cellular network”) or [PSTN](https://en.wikipedia.org/wiki/PSTN) (“[landline](https://en.wikipedia.org/wiki/Landline)“/[VoIP](https://en.wikipedia.org/wiki/Voice_over_IP)).
* [Short Messaging Service](https://en.wikipedia.org/wiki/Short_Messaging_Service) (SMS) services to/from any other PLMN or [SIP](https://en.wikipedia.org/wiki/Session_Initiation_Protocol) service (the original form of [texting](https://en.wikipedia.org/wiki/Texting) on a mobile phone, now often replaced by [Messaging apps](https://en.wikipedia.org/wiki/Messaging_apps)).
* [Multimedia Messaging Service](https://en.wikipedia.org/wiki/Multimedia_Messaging_Service) (MMS) services to/from any other PLMN or SIP service.
* [Unstructured Supplementary Service Data](https://en.wikipedia.org/wiki/Unstructured_Supplementary_Service_Data) (USSD) for operator specific interactions (e.g. dialing “\*#100#” to indicate the current balance).
* Internet data connectivity for arbitrary services, e.g. via [GPRS](https://en.wikipedia.org/wiki/General_Packet_Radio_Service) in [GSM](https://en.wikipedia.org/wiki/GSM), [IuPS](https://en.wikipedia.org/w/index.php?title=IuPS&action=edit&redlink=1) in [UMTS](https://en.wikipedia.org/wiki/UMTS), or [LTE](https://en.wikipedia.org/wiki/LTE_(telecommunication)).

The availability, quality and bandwidth of these services strongly depends on the particular technology used to implement a Public Land Mobile Network.

Service delivery platform

From Wikipedia, the free encyclopedia

[Jump to navigation](https://en.wikipedia.org/wiki/Service_delivery_platform#mw-head)[Jump to search](https://en.wikipedia.org/wiki/Service_delivery_platform#searchInput)

|  |  |
| --- | --- |
|  | This article **needs additional citations for**[**verification**](https://en.wikipedia.org/wiki/Wikipedia:Verifiability). Please help [improve this article](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit) by [adding citations to reliable sources](https://en.wikipedia.org/wiki/Help:Referencing_for_beginners). Unsourced material may be challenged and removed. *Find sources:* ["Service delivery platform"](https://www.google.com/search?as_eq=wikipedia&q=%22Service+delivery+platform%22) – [news](https://www.google.com/search?tbm=nws&q=%22Service+delivery+platform%22+-wikipedia) **·** [newspapers](https://www.google.com/search?&q=%22Service+delivery+platform%22+site:news.google.com/newspapers&source=newspapers) **·** [books](https://www.google.com/search?tbs=bks:1&q=%22Service+delivery+platform%22+-wikipedia) **·** [scholar](https://scholar.google.com/scholar?q=%22Service+delivery+platform%22) **·** [JSTOR](https://www.jstor.org/action/doBasicSearch?Query=%22Service+delivery+platform%22&acc=on&wc=on) *(January 2016) (*[*Learn how and when to remove this template message*](https://en.wikipedia.org/wiki/Help:Maintenance_template_removal)*)* |

A **service delivery platform** (**SDP**) is a set of components that provides a service(s) delivery architecture (such as service creation, session control and protocols) for a type of service delivered to consumer, whether it be a customer or other system. Although it is commonly used in the context of [telecommunications](https://en.wikipedia.org/wiki/Telecommunications), it can apply to any system that provides a service (e.g. VOIP Telephone, Internet Protocol TV, Internet Service, or [SaaS](https://en.wikipedia.org/wiki/Software_as_a_service)). Although the [TM Forum](https://en.wikipedia.org/wiki/TM_Forum) (TMF) is working on defining specifications in this area, there is no standard definition of SDP in industry and different players define its components, breadth, and depth in slightly different ways.

SDPs often require integration of IT capabilities and the creation of services that cross technology and network boundaries. SDPs available today tend to be optimized for the delivery of a service in a given technological or network domain (e.g. in telecommunications this includes: web, [IMS](https://en.wikipedia.org/wiki/IP_Multimedia_Subsystem), IPTV, Mobile TV, etc.). They typically provide environments for service control, creation, and orchestration and execution. Again in telecommunications, this can include abstractions for media control, presence/location, integration, and other low-level communications capabilities. SDPs are applicable to both consumer and business applications.

In the context of telecommunications only, the business objective of implementing the SDP is to enable rapid development and deployment of new converged multimedia services, from basic [POTS](https://en.wikipedia.org/wiki/Plain_old_telephone_service) phone services to complex audio/video conferencing for [multiplayer video games](https://en.wikipedia.org/wiki/Multiplayer_video_game) (MPGs). In the context of SaaS, similar business objectives are achieved but in a context specific to the particular business domain.

The emergence of [Application Stores](https://en.wikipedia.org/wiki/Application_Store), to create, host, and deliver applications for devices such as Apple's [iPhone](https://en.wikipedia.org/wiki/IPhone) and Google [Android](https://en.wikipedia.org/wiki/Android_(operating_system)) smartphones, has focused on SDPs as a means for Communication Service Providers (CSPs) to generate revenue from data.[[1]](https://en.wikipedia.org/wiki/Service_delivery_platform#cite_note-1) Using the SDP to expose their network assets to both the internal and external development communities, including web 2.0 developers, CSPs can manage the lifecycles of thousands of applications and their developers.[[2]](https://en.wikipedia.org/wiki/Service_delivery_platform#cite_note-2)[[3]](https://en.wikipedia.org/wiki/Service_delivery_platform#cite_note-3)

Telecommunications companies including [Telcordia Technologies](https://en.wikipedia.org/wiki/Telcordia_Technologies), [Nokia Siemens Networks](https://en.wikipedia.org/wiki/Nokia_Siemens_Networks), [Nortel](https://en.wikipedia.org/wiki/Nortel), [Avaya](https://en.wikipedia.org/wiki/Avaya), [Ericsson](https://en.wikipedia.org/wiki/Ericsson) and [Alcatel-Lucent](https://en.wikipedia.org/wiki/Alcatel-Lucent) have provided communications integration interfaces and infrastructure since the early to mid 1990s. The cost-saving success of IP-based [VoIP](https://en.wikipedia.org/wiki/VoIP) systems as replacements for proprietary [private branch exchange (PBX)](https://en.wikipedia.org/wiki/Private_branch_exchange) systems and desktop phones has prompted a shift in industry focus from proprietary systems to open, standard technologies.

This change to open environments has drawn software focused telecommunication companies like [Teligent Telecom](https://en.wikipedia.org/wiki/Teligent_Telecom" \o "Teligent Telecom)[[4]](https://en.wikipedia.org/wiki/Service_delivery_platform#cite_note-4) and allowed systems integrators such as [Tieto](https://en.wikipedia.org/wiki/Tieto), [Accenture](https://en.wikipedia.org/wiki/Accenture), [IBM](https://en.wikipedia.org/wiki/IBM), [TCS](https://en.wikipedia.org/wiki/Tata_Consultancy_Services), [HP](https://en.wikipedia.org/wiki/Hewlett-Packard), [Alcatel-Lucent](https://en.wikipedia.org/wiki/Alcatel-Lucent), [Tech Mahindra](https://en.wikipedia.org/wiki/Tech_Mahindra), [Infosys](https://en.wikipedia.org/wiki/Infosys), [Wipro](https://en.wikipedia.org/wiki/Wipro), and [CGI](https://en.wikipedia.org/wiki/CGI_Group) to offer integration services. In addition, new consortia of telecommunications software product companies offer pre-integrated software products to create SDPs based on elements, such as value added services, convergent billing and content/partner relationship management.

Since SDPs are capable of crossing technology boundaries, a wide range of blended applications become possible, for example:

* Users can see incoming phone calls (Wireline or Wireless), IM buddies (PC) or the locations of friends (GPS Enabled Device) on their television screen
* Users can order VoD ([Video on demand](https://en.wikipedia.org/wiki/Video_on_demand)) services from their mobile phones or watch [streaming video](https://en.wikipedia.org/wiki/Streaming_video) that they have ordered as a video package for both home and mobile phone
* Airline customers receive a text message from an automated system regarding a [flight cancellation](https://en.wikipedia.org/wiki/Flight_cancellation), and can then opt to use a voice or interactive self-service interface to reschedule



**Contents**

* [1History](https://en.wikipedia.org/wiki/Service_delivery_platform#History)
  + [1.1Context](https://en.wikipedia.org/wiki/Service_delivery_platform#Context)
* [2Elements](https://en.wikipedia.org/wiki/Service_delivery_platform#Elements)
  + [2.1Service creation environment](https://en.wikipedia.org/wiki/Service_delivery_platform#Service_creation_environment)
  + [2.2Execution environment](https://en.wikipedia.org/wiki/Service_delivery_platform#Execution_environment)
  + [2.3Media Control](https://en.wikipedia.org/wiki/Service_delivery_platform#Media_Control)
  + [2.4Presence and location](https://en.wikipedia.org/wiki/Service_delivery_platform#Presence_and_location)
  + [2.5Integration](https://en.wikipedia.org/wiki/Service_delivery_platform#Integration)
* [3Relationship to SOA](https://en.wikipedia.org/wiki/Service_delivery_platform#Relationship_to_SOA)
* [4Implementing SDPs](https://en.wikipedia.org/wiki/Service_delivery_platform#Implementing_SDPs)
* [5See also](https://en.wikipedia.org/wiki/Service_delivery_platform#See_also)
* [6References](https://en.wikipedia.org/wiki/Service_delivery_platform#References)

History[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=1)]

The late 1990s saw a period of unprecedented change in [enterprise applications](https://en.wikipedia.org/wiki/Enterprise_application) as the grip of [client-server architectures](https://en.wikipedia.org/wiki/Client-server_architecture) gradually relaxed and allowed the entrance of n-tiered architectures. This represented the advent of the [application server](https://en.wikipedia.org/wiki/Application_server), a flexible compromise between the absolutes of the [dumb terminal](https://en.wikipedia.org/wiki/Dumb_terminal) and the logic-heavy client PC. Although entrants into the application server ring were many and varied, they shared common advantages: database vendor abstraction, open standard (mostly [object-oriented](https://en.wikipedia.org/wiki/Object-oriented)) programming models, high availability and scalability characteristics, and presentation frameworks, among others. These transformations were triggered by business forces including the rampaging tidal wave that was the [Internet boom](https://en.wikipedia.org/wiki/Internet_boom), but none of it would have been possible without the proliferation of standards such as the [TCP/IP](https://en.wikipedia.org/wiki/TCP/IP) protocol, the [Java](https://en.wikipedia.org/wiki/Java_(programming_language)) programming language, and the [Java EE](https://en.wikipedia.org/wiki/Java_EE) web application server architecture. It is against this backdrop of transformation that telecom's era of rapid change was set in motion.

Up until the first few years of 2000, the markets for commercial and business telecommunication technologies were still saturated with proprietary hardware and software. Open standards started to become popular as IP technologies were introduced and with the rapid expansion of [Voice-over-IP](https://en.wikipedia.org/wiki/Voice-over-IP) (VoIP) for transmission of voice data over packet networks and the [Session Initiation Protocol](https://en.wikipedia.org/wiki/Session_Initiation_Protocol) (SIP) for standardized media control, especially regarding enterprise voice communication.

In this new standards-supported environment, convergence of the voice and data worlds has become less a moniker for disastrous telecom/IT integration attempts and more a true avenue for the production of new and better consumer and business services. The last few years have seen the introduction or proliferation of various SIP programming libraries ([reSIProcate](https://en.wikipedia.org/w/index.php?title=ReSIProcate&action=edit&redlink=1" \o "ReSIProcate (page does not exist)), [Aricent](https://en.wikipedia.org/wiki/Aricent), MjSip and its derived port by HSC) and products based on the relatively new SIP standard, and the [IP Multimedia Subsystem](https://en.wikipedia.org/wiki/IP_Multimedia_Subsystem) standard defined by the [3GPP](https://en.wikipedia.org/wiki/3GPP) has gained a huge following. The Service Delivery Platform, whose power comes in large part from the quality and acceptance of these supporting standards, is rapidly gaining acceptance as a widely applicable architectural pattern.

In industry today multiple definitions of Service Delivery Platform (SDP) are used with no established consensus as to a common meaning. Because of this, and the need for service providers to understand how to better manage SDPs, the [TM Forum](https://en.wikipedia.org/wiki/TM_Forum) (TMF) has started standardizing the concept of Service Delivery Framework (SDF) and SDF management. The SDF definition provides the terminology and concepts needed to reference the various components involved, such as applications and enablers, network and service exposure, and orchestration.

What is needed to deliver a blend of personalized services from multiple SDPs to end users is a means to inter-work those SDPs through common service enablers and network resources. Underpinning these service aspects though has been a fundamental concept that the user's attributes and the services they receive require a common repository and a common data model, such as those provided by a LDAP/X.500 directory or HSS database. Early SDP implementations of this nature started in the mid / late 1990s for ISP converged services. Larger and more complex SDPs have been implemented over the last 5 years in MSO type environments and for mobile operators.

**Context**[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=2)]

SDPs are commonly considered for the telco type environments as a core system which interconnects the customer's access and network infrastructure with the OSS systems and BSS systems. SDPs in this context are usually associated to a particular service regime such as mobile telephones or for converged services.

SDPs are also considered in the context of very large transformation, convergence and integration programs which require a considerable budget. The difficulty in such projects is that there may be hundreds of thousands of design and implementation decisions to be made - once the architecture is agreed. Naturally this issue alone dictates the need for software development and operational engineering skills. Probably the best way of reducing these design and integration issues is to simulate the SDP on a small scale system before the major project actually starts. This allows the architecture to be verified that it meets the operational, service delivery and business requirements.

SDPs should also be considered not just as a core function within an operator but as a number of interconnected, distributed service nodes (e.g.) for redundancy reasons and for different service profiles to different business and market sectors. Many operators provide commercial scale/grade products such as bundled voice, web hosting, VPNs, mail, conference and messaging facilities to government and corporate clients. The evolution of such bundled services could be from fragmented management systems to a "Virtual Private Service Environment" where the operator runs a dedicated SDP for each of its customers who require their services on demand and under their control.

SDPs can also be used to manage independent wireless enabled precincts such as shopping malls, airports, retirement villages, outcare centres.

Elements[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=3)]

**Service creation environment**[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=4)]

Often a telecom software developer's primary access point, the service creation environment (SCE, also application creation environment or [integrated development environment](https://en.wikipedia.org/wiki/Integrated_development_environment)) is used by the developer to create software, scripts, and resources representing the services to be exposed. These can range in complexity from basic Eclipse plug-ins to completely abstracted, metadata-driven telecom application modeling applications (like Avaya's discontinued CRM Central product).

The purpose of the SCE is to facilitate the rapid creation of new communication services. Ignoring factors like marketing for the moment, the easier it is for developers to create services for a given platform, the greater will be the number of available services, and thus the acceptance of the platform by the broader telecom market. Therefore, a telecom infrastructure provider can gain significant advantage with an SDP that provides for rapid service creation.

The leveraging of converged Java EE and SIP service creation environments accelerated the adoption of service delivery platforms. Java-based applications developers, traditionally focused on IT applications, develop real-time communications applications using Java EE and network connecting protocols like SIP and [Parlay X](https://en.wikipedia.org/wiki/Parlay_X) web services. Software vendors are combining these technologies (e.g., Oracle Jdeveloper and Oracle Communication and Mobility Server with basic Eclipse plug-in) to reach out to a broader developer base.

**Execution environment**[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=5)]

|  |  |
| --- | --- |
| [[icon]](https://en.wikipedia.org/wiki/File:Wiki_letter_w_cropped.svg) | **This section is empty.** You can help by [adding to it](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=4). *(July 2014)* |

Service Execution Environments (SEE) are used to execute the communication services developed in SCE. Execution environments are typically designed to mimic the hardware the particular service is expected to run on. SEE may be bundled with SCE as an IDE

**Media Control**[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=6)]

|  |  |
| --- | --- |
| [[icon]](https://en.wikipedia.org/wiki/File:Wiki_letter_w_cropped.svg) | **This section is empty.** You can help by [adding to it](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=5). *(July 2014)* |

**Presence and location**[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=7)]

One aspect of an SDP is that it must be centered on the new "[point of presence](https://en.wikipedia.org/wiki/Point_of_presence)". This is the point of user access to their converged services where their preferences and entitlements are evaluated in real time. Preference and entitlement processing ensures that the user's services in their device/location contexts are delivered correctly. As entitlements are related to the product and service management regimes of the operator, the core architecture of an SDP should define managed products, services, users, preference and entitlement processes.

The implementation of standards remains a critical factor in Presence applications. The implementation of standards such as SIP and SIMPLE (Session Initiation Protocol for Instant Messaging and Presence Leveraging Extensions) is becoming more prevalent. SIMPLE Presence provides a standard portable and secure interface to manipulate presence information between a SIMPLE client (watcher) and a presence server (presence agent). See JSR 164 for SIMPLE Presence. Providers of SIMPLE Presence servers include Oracle and Italtel.

**Integration**[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=8)]

The use of standards for exposure for interfaces across SDPs and within the SDP should minimize the need for integration in three main areas: (1) southbound to underlying network core components (2) between support application such as CRM, billing, and service activation (3) third party applications and services. The implementation of [service-oriented architecture](https://en.wikipedia.org/wiki/Service-oriented_architecture) (SOA) may use standard interfaces and web services.

Software vendors include HP, wwite, IBM, Oracle and Sun microsystems. Network equipment vendors also provide SDPs such as IMS, IPTV, Mobile TV, etc. and offer the evolution of these SDPs.

Relationship to SOA[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=9)]

Much has been made in recent years[[*when?*](https://en.wikipedia.org/wiki/Wikipedia:Manual_of_Style/Dates_and_numbers#Chronological_items)] of the [Service-oriented architecture](https://en.wikipedia.org/wiki/Service-oriented_architecture) (SOA) concept. Discussions that once centered on [enterprise application integration](https://en.wikipedia.org/wiki/Enterprise_application_integration) (EAI) technologies and concepts have shifted into the SOA domain, favoring ideas like service composition over simple message adaptation and [extract, transform, and load](https://en.wikipedia.org/wiki/Extract,_transform,_load) techniques.

SOAs can be used as an application integration technology within an SDP but are best served when used in the lower performance functions such as connections between the transactional [OSS](https://en.wikipedia.org/wiki/Operations_support_system) and [BSS](https://en.wikipedia.org/wiki/Business_support_system) applications and the SDP. SOAs need careful consideration if they are to meet the real time demands placed on the SDP by the converged event type services.

An analogue concept to SDP found in the realm of SOA is that of Web Service Ecosystem (also known as Web Service Marketplace) and the SaaS platform. A Web Service Ecosystem is a hosted environment in which participants expose their services using common Web technologies such as [HTTP](https://en.wikipedia.org/wiki/HTTP), [XML](https://en.wikipedia.org/wiki/XML), [SOAP](https://en.wikipedia.org/wiki/SOAP) and [REST](https://en.wikipedia.org/wiki/REST). This hosted environment provides a number of service delivery components covering aspects such as authentication, identity management, usage metering and analytics, content adaptation, data format conversion, charging and payment. This enables service providers to focus on their core functionality and to outsource the service delivery to third parties. Services deployed over Web Service Ecosystems may be business-critical, but they typically do not have the real-time and high-performance requirements associated to telecommunications services for which SDPs are traditionally conceived. They usually support common business functions such as quoting, order management, marketing campaign management or customer care. SOA can also be used to standardize operational processes and re-use them across SDPs.

Implementing SDPs[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=10)]

Considerable changes in IT and Network architecture are required when implementing real-world, real-time, converged services, operational SDPs. Many SDPs are designed as abstract frameworks with diagrams that use labels such as "Service Abstraction Layer", etc. Within real systems such "layers" do not actually exist. In addition it is difficult to realise from abstract diagrams what the real-world operational data model is and how many servers, databases or directories might be used or integrated to form converged services SDP and self care functions. Operators can be faced with annual multimillion-dollar electricity bills for their systems. It follows that multi-server/multi-database SDPs are not earth-friendly or cost-effective, if the same functions can be integrated and use much less power.

**Identity and Information Management:** In order to specify or design a SDP we must determine what the customer and device service dimension is. If the SDP design needs to accommodate, say, 1m users as well as manage their devices and each identitified item requires 5 to 10 information objects, the core SDP is probably dealing 20m objects in real time. As the management of these objects dictate the core identity management processes of the platform, critical attention should be applied to the way in which they are implemented. Experience has shown that a single user on a converged services SDP may require 100 objects of information with some objects such as preferences containing 100 attributes. Capacity requirements for 10m users would indicate the platform needs to support 1 billion objects and up to 50 billion attributes.

**Group Identity and Entitlement:** Traditionally we have dealt with Identity Management as a single user or device logging on with a name and password and have assumed that an Identity Server holding names and passwords solves the issue. Practically though in the MSO world, we have account holders, secondary account holders (the children of the family), guests, gifts, content, devices, preferences which must all link together in order to receive a managed service. The services the grouped identity receives might be authorized via name and passwords, but should only be enabled through entitlements that relate to product provisioning. SDP architectures need to accommodate group identity management and product/service entitlement functions.

**Presence and Events:** Presence is the status management of all online assets. But what does this mean to system architectures? Traditionally we have applied a "transactional" paradigm where for example a user logs on and creates a transaction onto a network switch, a web server or database application. Presence services means we are managing status events at rates much, much higher than our traditional transactional systems. The question is: how are millions if not billions of events managed in fragmented systems, multiple database architectures or in fact frameworks? SDP architectures should also have a coherent, highly integrated event management system as a core function.

**Converged Identities:** An operational issue emerges with 3G IMS and SIP and converged services. SIP can apply IP addresses (IPv4 or v6), SIP URIs (email addresses) and SIP TEL URIs (telephone numbers) in its message To, From, Via and Contact fields. Such identifiers can point to a telephone device, a fridge door, a content farm, a single piece of content, a user or even a group of users. This flexibility means that a SIP call can be made from just about anything to any other thing providing it is entitled to do so. As SIP can apply a mixture of these Internet and Telephone system identifiers in the call process, it follows that the SDP must tightly couple its SIP processing with the DHCP/DNS system, the HSS mobile database, the User authorization system, the presence event system, the user's address book, telephone call feature processing and the operator's service/product management with its entitlement system - all in real time. It follows that such functionality would be very difficult to apply across many interconnected functions and fragmented databases using "SOAs".

SDP technologies and tool kits should address three fundamental issues:[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)]

1. What are the goods and services being offered and managed in a real time fashion by the operator and by the customer self care systems - and this includes the management of presence based services (the world of the event driven internet) and how realtime user entitlements are processed.
2. What is the converged services information model used in the SDP design that represents the online business of the operator that has subscribers, devices, phone calls, preferences, entitlements, address books etc. to deal with. In many cases MSOs with just 10 million customers require an SDP with 500 million information items - and for these items to be accessed many thousands of times a second by many different SDP functions.
3. What is the event / presence management architecture used in the SDP design that handles the velocity of the online business events. The situation might be that the population of a city arriving home at night might generate billions of online status events. How will these be processed by the SDP?

These three major system requirements actually dictate the architecture of a real world operational SDP regardless of the "abstract labels" one applies to its logical models, SOAs, message bus protocols and server interconnects. If these fundamental requirements are omitted from the SDP design it leaves the operator with many business, service management and operational problems to address, such as:

* identity management (of all the information in the SDP representing the operators online assets),
* the SDP's service agility (that is the product and services being offered are hard coded into the SDP so that new services cause code upgrades) and;
* hard wired self care facilities (no flexibility or consideration of the SDPs users such as language, age, sighted, preferences, etc.).

In some situations MSOs have millions of lines of hard coded product and service management flows in their systems and are unable to move to the newer converged service dimensions easily.

A quick test of an SDP design is to evaluate its information model and see if that is based on the user environments of converged services, and see how that model is used and managed by all the systems that need to including its presence and event management functions.

In support of SDP development and the evolution to real time, agile services-delivery, next-generation systems should[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)] be considered.

See also[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=11)]

* Directory services play a critical role within an SDP. See [Directory service](https://en.wikipedia.org/wiki/Directory_service) and [Identity management](https://en.wikipedia.org/wiki/Identity_management).
* [IP Multimedia Subsystem](https://en.wikipedia.org/wiki/IP_Multimedia_Subsystem)
* [Next Generation Networking](https://en.wikipedia.org/wiki/Next_Generation_Networking)
* [Enterprise Service Bus](https://en.wikipedia.org/wiki/Enterprise_Service_Bus) Integration platform commonly used for [Enterprise Application Integration](https://en.wikipedia.org/wiki/Enterprise_Application_Integration)
* [Java Business Integration](https://en.wikipedia.org/wiki/Java_Business_Integration) Standardisation of the Enterprise Service Bus in the Java world
* [3GPP](https://en.wikipedia.org/wiki/3GPP) Standards
* [Open Mobile Alliance](https://en.wikipedia.org/wiki/Open_Mobile_Alliance) Standards concerning integration of network elements, [operations support systems](https://en.wikipedia.org/wiki/Operations_support_system) and [Business Support Systems](https://en.wikipedia.org/wiki/Business_Support_System)
* [Parlay Group](https://en.wikipedia.org/wiki/Parlay_Group), [Parlay X](https://en.wikipedia.org/wiki/Parlay_X) Standards concerning integration of network elements, operations support systems and business support systems
* [JSLEE](https://en.wikipedia.org/wiki/JSLEE), Java Service Logic Execution Environment, the Java standard for event-driven application servers used in Service Delivery Platforms
* [Session Initiation Protocol](https://en.wikipedia.org/wiki/Session_Initiation_Protocol) Standard protocol for IP-communication
* [Java Specification Requests](https://en.wikipedia.org/wiki/Java_Specification_Request) (JSR) for operations support systems
* [Service delivery framework](https://en.wikipedia.org/wiki/Service_delivery_framework)

References[[edit](https://en.wikipedia.org/w/index.php?title=Service_delivery_platform&action=edit&section=12)]

* 1. [**^**](https://en.wikipedia.org/wiki/Service_delivery_platform#cite_ref-1) [Connected Planet Online: “Solving the SDP puzzle.” Rich Karpinski. June 2008. Retrieved 2010-03-17.](http://connectedplanetonline.com/software/news/telecom_solving_sdp_puzzle/index.html) [Archived](https://web.archive.org/web/20100513021719/http:/connectedplanetonline.com/software/news/telecom_solving_sdp_puzzle/index.html) 2010-05-13 at the [Wayback Machine](https://en.wikipedia.org/wiki/Wayback_Machine" \o "Wayback Machine)
  2. [**^**](https://en.wikipedia.org/wiki/Service_delivery_platform#cite_ref-2) [TechTarget: SOA News. “Chasing Apple, HP targets telecoms with app store pack.” Rob Berry. Sept. 2009. Retrieved 2010-03-17](http://searchsoa.techtarget.com/news/article/0,289142,sid26_gci1369057,00.html)
  3. [**^**](https://en.wikipedia.org/wiki/Service_delivery_platform#cite_ref-3) [March 8,2010. “Service delivery platform market to hit $4.6 billion by 2014, driven by mobile ads, app stores](https://finance.yahoo.com/news/Infonetics-Research-Service-iw-1643320907.html?x=0&.v=1)
  4. [**^**](https://en.wikipedia.org/wiki/Service_delivery_platform#cite_ref-4) [Infonetics press release. “Telecom carriers spent $57B on outsourced services in 2007.” May. 2008. Retrieved 2010-03-18.](http://www.infonetics.com/pr/2008/ms08.esp.nr.asp)

Service control point

From Wikipedia, the free encyclopedia

[Jump to navigation](https://en.wikipedia.org/wiki/Service_control_point#mw-head)[Jump to search](https://en.wikipedia.org/wiki/Service_control_point#searchInput)

|  |  |  |  |
| --- | --- | --- | --- |
|  | hide**This article has multiple issues.** Please help [**improve it**](https://en.wikipedia.org/w/index.php?title=Service_control_point&action=edit) or discuss these issues on the [**talk page**](https://en.wikipedia.org/wiki/Talk:Service_control_point). *(*[*Learn how and when to remove these template messages*](https://en.wikipedia.org/wiki/Help:Maintenance_template_removal)*)*   |  | | --- | | This article or section may be written in a style that is **too abstract** to be readily understandable by [general audiences](https://en.wikipedia.org/wiki/Wikipedia:MTAA). *(September 2011)* |  |  | | --- | | This article **does not**[**cite**](https://en.wikipedia.org/wiki/Wikipedia:Citing_sources)**any**[**sources**](https://en.wikipedia.org/wiki/Wikipedia:Verifiability). *(January 2011)* | |

A **service control point** (SCP) is a standard component of the [Intelligent Network](https://en.wikipedia.org/wiki/Intelligent_Network) (IN) telephone system which is used to control the service. Standard SCPs in the telecom industry today are deployed using [SS7](https://en.wikipedia.org/wiki/Signalling_System_No._7), [SIGTRAN](https://en.wikipedia.org/wiki/SIGTRAN) or [SIP](https://en.wikipedia.org/wiki/Session_Initiation_Protocol) technologies. The SCP queries the [service data point](https://en.wikipedia.org/wiki/Service_data_point) (SDP) which holds the actual database and directory. SCP, using the database from the SDP, identifies the geographical number to which the call is to be routed. This is the same mechanism that is used to route [800 numbers](https://en.wikipedia.org/wiki/800_number).

SCP may also communicate with an intelligent peripheral (IP) to play voice messages, or prompt for information to the user, such as prepaid long distance using account codes. This is done by implementing [telephone feature codes](https://en.wikipedia.org/wiki/Telephone_feature_code) like "#", which can be used to terminate the input for a user name or password or can be used for [call forwarding](https://en.wikipedia.org/wiki/Call_forwarding). These are realized using [Intelligent Network Application Part](https://en.wikipedia.org/wiki/INAP) (INAP) that sits above [Transaction Capabilities Application Part](https://en.wikipedia.org/wiki/Transaction_Capabilities_Application_Part) (TCAP) on the SS7 protocol stack. The TCAP is part of the top or 7th layer of the OSI layer breakdown.

SCPs are connected with either [SSPs](https://en.wikipedia.org/wiki/Service_switching_point) or [STPs](https://en.wikipedia.org/wiki/Signal_transfer_point). This is dependent upon the network architecture that the network service provider wants. The most common implementation uses STPs.

SCP and SDP split is becoming a common industry practice. This is known generally in the industry by split architecture. Reason is that operators want to decouple the dependency between the two functionality to facilitate upgrades and possibly rely on different vendors.

External links[[edit](https://en.wikipedia.org/w/index.php?title=Service_control_point&action=edit&section=1)]

* See Telcordia [GR-1299-CORE](http://telecom-info.telcordia.com/site-cgi/ido/docs.cgi?ID=SEARCH&DOCUMENT=GR-1299&), for Service Control Point/Adjunct Interface generic requirements.

Short Message service center

From Wikipedia, the free encyclopedia

[Jump to navigation](https://en.wikipedia.org/wiki/Short_Message_service_center#mw-head)[Jump to search](https://en.wikipedia.org/wiki/Short_Message_service_center#searchInput)

|  |  |  |  |
| --- | --- | --- | --- |
|  | hide**This article has multiple issues.** Please help [**improve it**](https://en.wikipedia.org/w/index.php?title=Short_Message_service_center&action=edit) or discuss these issues on the [**talk page**](https://en.wikipedia.org/wiki/Talk:Short_Message_service_center). *(*[*Learn how and when to remove these template messages*](https://en.wikipedia.org/wiki/Help:Maintenance_template_removal)*)*   |  | | --- | | This article **does not**[**cite**](https://en.wikipedia.org/wiki/Wikipedia:Citing_sources)**any**[**sources**](https://en.wikipedia.org/wiki/Wikipedia:Verifiability). *(June 2018)* |  |  | | --- | | This section may **require [cleanup](https://en.wikipedia.org/wiki/Wikipedia:Cleanup" \o "Wikipedia:Cleanup)** to meet Wikipedia's [quality standards](https://en.wikipedia.org/wiki/Wikipedia:Manual_of_Style). *(December 2009)* | |

*"SMS-C" redirects here. For the weather satellite, see*[*GOES-1*](https://en.wikipedia.org/wiki/GOES-1)*.*

A **Short Message Service Center** (**SMSC**) is a network element in the [mobile](https://en.wikipedia.org/wiki/Mobile_phone) telephone network. Its purpose is to store, forward, convert and deliver [Short Message Service](https://en.wikipedia.org/wiki/Short_Message_Service) (SMS) messages.

The full designation of an SMSC according to 3GPP is *Short Message Service - Service Center (SMS-SC).*



**Contents**

* [1Basic trajectories](https://en.wikipedia.org/wiki/Short_Message_service_center#Basic_trajectories)
* [2Operation](https://en.wikipedia.org/wiki/Short_Message_service_center#Operation)
  + [2.1Validity period of an SMS message](https://en.wikipedia.org/wiki/Short_Message_service_center#Validity_period_of_an_SMS_message)
  + [2.2Message status reports](https://en.wikipedia.org/wiki/Short_Message_service_center#Message_status_reports)
* [3See also](https://en.wikipedia.org/wiki/Short_Message_service_center#See_also)

Basic trajectories[[edit](https://en.wikipedia.org/w/index.php?title=Short_Message_service_center&action=edit&section=1)]

SMS can be directed in several ways:

1. From mobile to another mobile - referred to as MO-MT (Mobile Originated - Mobile Terminated)
2. From mobile to a content provider (also known as Large Account / ESME) - referred to as MO-AT (Mobile Originated - Application Terminated)
3. From application to a mobile - referred to as AO-MT (Application Originated - Mobile Terminated)

Operation[[edit](https://en.wikipedia.org/w/index.php?title=Short_Message_service_center&action=edit&section=2)]

The tasks of an SMSC can be described as

1. Reception of text messages (SMS) from wireless network users
2. Storage of text messages
3. Forwarding of text messages
4. Delivery of text messages (SMS) to wireless network users
5. Maintenance of unique time stamps in text messages

When a user *sends* a text message (SMS message) to another user, the message gets stored in the SMSC (short message service centre), which delivers it to the destination user when they are available. This is a [store and forward](https://en.wikipedia.org/wiki/Store-and-forward_switching_center) option.

An SMS centre (SMSC) is responsible for handling the SMS operations of a wireless network.

1. When an SMS message is sent from a mobile phone, it will first reach an SMS centre.
2. The SMS centre then forwards the SMS message towards the destination.
3. The main duty of an SMSC is to route SMS messages and regulate the process. If the recipient is unavailable (for example, when the mobile phone is switched off), the SMSC will store the SMS message.
4. It will forward the SMS message when the recipient is available and the message's expiry period is not exceeded.

SMSCs can be used to interface with other applications, for example a spreadsheet can interface with the SMSC allowing messages to be sent SMS from an [Excel spreadsheet](https://en.wikipedia.org/wiki/Microsoft_Excel), or to send an SMS from Excel. Inbound messages to a long number or short code can also be passed through the SMSC allowing m2m communications or Telematics.

**Validity period of an SMS message**[[edit](https://en.wikipedia.org/w/index.php?title=Short_Message_service_center&action=edit&section=3)]

An SMS message is stored temporarily in the SMS center if the recipient mobile phone is unavailable. It is possible on most mobile handsets to specify an expiry period after which the SMS message will be deleted from the SMS center. Once deleted, the SMS message will no longer be available for dispatch to the recipient mobile phone (even if it comes on line). The validity period should be regarded by the handset user as a request, as the SMSC itself can be configured to ignore or otherwise handle message delivery schedules.

**Message status reports**[[edit](https://en.wikipedia.org/w/index.php?title=Short_Message_service_center&action=edit&section=4)]

The SMS sender needs to set a flag in the SMS message to notify the SMS centre that they want the status report about the delivery of this SMS message. This is usually done by changing a Setting on the mobile handset.

See also[[edit](https://en.wikipedia.org/w/index.php?title=Short_Message_service_center&action=edit&section=5)]

* [Short Message Service technical realisation (GSM)](https://en.wikipedia.org/wiki/Short_Message_Service_technical_realisation_(GSM))
* [IS-41](https://en.wikipedia.org/wiki/IS-41)
* [SMPP](https://en.wikipedia.org/wiki/Short_Message_Peer-to-Peer)
* [UCP/EMI](https://en.wikipedia.org/wiki/Universal_Computer_Protocol)
* [CIMD](https://en.wikipedia.org/wiki/CIMD)

|  |  |
| --- | --- |
| * AUC |  |

The ***Authentication Centre*** (AUC) is a function in a [GSM](http://www.telecomabc.com/g/gsm.html) network used for the authentication a mobile subscriber that wants to be connected to the network. Authentication is done by identification and verification of the validity of the [SIM](http://www.telecomabc.com/s/sim.html).

Once the subscriber is authenticated, the AUC is responsible for the generation of the parameters used for the privacy and the ciphering of the radio link. To ensure the privacy of the mobile subscriber a Temporary Mobile Subscriber Identity ([TMSI](http://www.telecomabc.com/t/tmsi.html)) is assigned for the duration that the subscriber is under control of the specific Mobile Switching Centre ([MSC](http://www.telecomabc.com/m/msc.html)) associated with the AUC.

Network switching subsystem

From Wikipedia, the free encyclopedia

[Jump to navigation](https://en.wikipedia.org/wiki/Network_switching_subsystem#mw-head)[Jump to search](https://en.wikipedia.org/wiki/Network_switching_subsystem#searchInput)

|  |  |
| --- | --- |
|  | This article includes a [list of references](https://en.wikipedia.org/wiki/Wikipedia:Citing_sources), related reading or [external links](https://en.wikipedia.org/wiki/Wikipedia:External_links), **but its sources remain unclear because it lacks**[**inline citations**](https://en.wikipedia.org/wiki/Wikipedia:Citing_sources#Inline_citations). Please help to [improve](https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Fact_and_Reference_Check) this article by [introducing](https://en.wikipedia.org/wiki/Wikipedia:When_to_cite) more precise citations. *(March 2019) (*[*Learn how and when to remove this template message*](https://en.wikipedia.org/wiki/Help:Maintenance_template_removal)*)* |

|  |  |
| --- | --- |
|  | This article **needs additional citations for**[**verification**](https://en.wikipedia.org/wiki/Wikipedia:Verifiability). Please help [improve this article](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit) by [adding citations to reliable sources](https://en.wikipedia.org/wiki/Help:Referencing_for_beginners). Unsourced material may be challenged and removed. *Find sources:* ["Network switching subsystem"](https://www.google.com/search?as_eq=wikipedia&q=%22Network+switching+subsystem%22) – [news](https://www.google.com/search?tbm=nws&q=%22Network+switching+subsystem%22+-wikipedia) **·** [newspapers](https://www.google.com/search?&q=%22Network+switching+subsystem%22+site:news.google.com/newspapers&source=newspapers) **·** [books](https://www.google.com/search?tbs=bks:1&q=%22Network+switching+subsystem%22+-wikipedia) **·** [scholar](https://scholar.google.com/scholar?q=%22Network+switching+subsystem%22) **·** [JSTOR](https://www.jstor.org/action/doBasicSearch?Query=%22Network+switching+subsystem%22&acc=on&wc=on) *(March 2009) (*[*Learn how and when to remove this template message*](https://en.wikipedia.org/wiki/Help:Maintenance_template_removal)*)* |

**Network switching subsystem** (**NSS**) (or **GSM core network**) is the component of a [GSM](https://en.wikipedia.org/wiki/GSM) system that carries out [call out](https://en.wikipedia.org/wiki/Telephone_exchange) and [mobility management](https://en.wikipedia.org/wiki/Mobility_management) functions for [mobile phones](https://en.wikipedia.org/wiki/Mobile_phones) [roaming](https://en.wikipedia.org/wiki/Roaming) on the [network of base stations](https://en.wikipedia.org/wiki/Base_Station_subsystem). It is owned and deployed by [mobile phone operators](https://en.wikipedia.org/wiki/Mobile_phone_operator) and allows mobile devices to communicate with each other and [telephones](https://en.wikipedia.org/wiki/Telephone) in the wider [public switched telephone network](https://en.wikipedia.org/wiki/Public_switched_telephone_network) (PSTN). The architecture contains specific features and functions which are needed because the phones are not fixed in one location.

The NSS originally consisted of the circuit-switched [core network](https://en.wikipedia.org/wiki/Core_network), used for traditional [GSM services](https://en.wikipedia.org/wiki/GSM_services) such as voice calls, [SMS](https://en.wikipedia.org/wiki/Short_message_service), and [circuit switched data](https://en.wikipedia.org/wiki/Circuit_Switched_Data) calls. It was extended with an overlay architecture to provide packet-switched data services known as the [GPRS core network](https://en.wikipedia.org/wiki/GPRS_core_network). This allows mobile phones to have access to services such as [WAP](https://en.wikipedia.org/wiki/Wireless_Application_Protocol), [MMS](https://en.wikipedia.org/wiki/Multimedia_Messaging_Service) and the [Internet](https://en.wikipedia.org/wiki/Internet).



**Contents**

* [1Mobile switching center (MSC)](https://en.wikipedia.org/wiki/Network_switching_subsystem#Mobile_switching_center_(MSC))
  + [1.1Description](https://en.wikipedia.org/wiki/Network_switching_subsystem#Description)
  + [1.2Mobile switching center server (MSC-Server, MSCS or MSS)](https://en.wikipedia.org/wiki/Network_switching_subsystem#Mobile_switching_center_server_(MSC-Server,_MSCS_or_MSS))
  + [1.3Other GSM core network elements connected to the MSC](https://en.wikipedia.org/wiki/Network_switching_subsystem#Other_GSM_core_network_elements_connected_to_the_MSC)
  + [1.4Procedures implemented](https://en.wikipedia.org/wiki/Network_switching_subsystem#Procedures_implemented)
* [2Home location register (HLR)](https://en.wikipedia.org/wiki/Network_switching_subsystem#Home_location_register_(HLR))
  + [2.1Other GSM core network elements connected to the HLR](https://en.wikipedia.org/wiki/Network_switching_subsystem#Other_GSM_core_network_elements_connected_to_the_HLR)
  + [2.2Procedures implemented](https://en.wikipedia.org/wiki/Network_switching_subsystem#Procedures_implemented_2)
* [3Authentication center (AuC)](https://en.wikipedia.org/wiki/Network_switching_subsystem#Authentication_center_(AuC))
  + [3.1Description](https://en.wikipedia.org/wiki/Network_switching_subsystem#Description_2)
  + [3.2Other GSM core network elements connected to the AuC](https://en.wikipedia.org/wiki/Network_switching_subsystem#Other_GSM_core_network_elements_connected_to_the_AuC)
  + [3.3Procedures implemented](https://en.wikipedia.org/wiki/Network_switching_subsystem#Procedures_implemented_3)
* [4Visitor location register (VLR)](https://en.wikipedia.org/wiki/Network_switching_subsystem#Visitor_location_register_(VLR))
  + [4.1Description](https://en.wikipedia.org/wiki/Network_switching_subsystem#Description_3)
  + [4.2Procedures implemented](https://en.wikipedia.org/wiki/Network_switching_subsystem#Procedures_implemented_4)
* [5Equipment identity register (EIR)](https://en.wikipedia.org/wiki/Network_switching_subsystem#Equipment_identity_register_(EIR))
* [6Other support functions](https://en.wikipedia.org/wiki/Network_switching_subsystem#Other_support_functions)
  + [6.1Billing center (BC)](https://en.wikipedia.org/wiki/Network_switching_subsystem#Billing_center_(BC))
  + [6.2Multimedia messaging service center (MMSC)](https://en.wikipedia.org/wiki/Network_switching_subsystem#Multimedia_messaging_service_center_(MMSC))
  + [6.3Voicemail system (VMS)](https://en.wikipedia.org/wiki/Network_switching_subsystem#Voicemail_system_(VMS))
  + [6.4Lawful interception functions](https://en.wikipedia.org/wiki/Network_switching_subsystem#Lawful_interception_functions)
* [7See also](https://en.wikipedia.org/wiki/Network_switching_subsystem#See_also)
* [8References](https://en.wikipedia.org/wiki/Network_switching_subsystem#References)
* [9External links](https://en.wikipedia.org/wiki/Network_switching_subsystem#External_links)

Mobile switching center (MSC)[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=1)]

**Description**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=2)]

The **mobile switching center** (MSC) is the primary service delivery node for GSM/CDMA, responsible for [routing](https://en.wikipedia.org/wiki/Routing_in_the_PSTN) voice calls and SMS as well as other services (such as conference calls, FAX, and circuit-switched data).

The MSC sets up and releases the **end-to-end connection**, handles mobility and hand-over requirements during the call and takes care of charging and real-time prepaid account monitoring.

In the GSM mobile phone system, in contrast with earlier analogue services, fax and data information is sent digitally encoded directly to the MSC. Only at the MSC is this re-coded into an "analogue" signal (although actually this will almost certainly mean sound is encoded digitally as a [pulse-code modulation](https://en.wikipedia.org/wiki/Pulse-code_modulation) (PCM) signal in a 64-kbit/s timeslot, known as a [DS0](https://en.wikipedia.org/wiki/DS0) in America).

There are various different names for MSCs in different contexts which reflects their complex role in the network, all of these terms though could refer to the same MSC, but doing different things at different times.

The **gateway MSC** (G-MSC) is the MSC that determines which "visited MSC" (V-MSC) the subscriber who is being called is currently located at. It also interfaces with the PSTN. All mobile to mobile calls and PSTN to mobile calls are routed through a G-MSC. The term is only valid in the context of one call, since any MSC may provide both the gateway function and the visited MSC function. However, some manufacturers design dedicated high capacity MSCs which do not have any [base station subsystems](https://en.wikipedia.org/wiki/Base_station_subsystem) (BSS) connected to them. These MSCs will then be the gateway MSC for many of the calls they handle.

The **visited MSC** (V-MSC) is the MSC where a customer is currently located. The [visitor location register](https://en.wikipedia.org/wiki/Network_switching_subsystem#Visitor_location_register_(VLR)) (VLR) associated with this MSC will have the subscriber's data in it.

The **anchor MSC** is the MSC from which a [handover](https://en.wikipedia.org/wiki/Handover) has been initiated. The **target MSC** is the MSC toward which a handover should take place. A [mobile switching center server](https://en.wikipedia.org/wiki/Mobile_switching_center_server) is a part of the redesigned MSC concept starting from [3GPP Release 4](https://en.wikipedia.org/wiki/3GPP#Standards).

**Mobile switching center server (MSC-Server, MSCS or MSS)**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=3)]

*Main article:*[*Mobile switching centre server*](https://en.wikipedia.org/wiki/Mobile_switching_centre_server)

The **mobile switching center server** is a soft-switch variant (therefore it may be referred to as mobile soft switch, MSS) of the mobile switching center, which provides circuit-switched calling mobility management, and GSM services to the mobile phones [roaming](https://en.wikipedia.org/wiki/Roaming) within the area that it serves. The functionality enables split control between (signaling ) and user plane (bearer in network element called as media gateway/MG), which guarantees better placement of network elements within the network.

MSS and [media gateway](https://en.wikipedia.org/wiki/Media_Gateway) (MGW) makes it possible to cross-connect circuit-switched calls switched by using IP, ATM AAL2 as well as [TDM](https://en.wikipedia.org/wiki/Time-division_multiplexing). More information is available in 3GPP TS 23.205.

The term [Circuit switching](https://en.wikipedia.org/wiki/Circuit_switching) (CS) used here originates from traditional telecommunications systems. However, modern MSS and MGW devices mostly use generic [Internet](https://en.wikipedia.org/wiki/Internet) technologies and form [next-generation telecommunication networks](https://en.wikipedia.org/wiki/Next-generation_network). MSS software may run on generic computers or [virtual machines](https://en.wikipedia.org/wiki/Virtual_machine) in [cloud](https://en.wikipedia.org/wiki/Cloud_computing) environment.

**Other GSM core network elements connected to the MSC**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=4)]

The MSC connects to the following elements:

* The [home location register](https://en.wikipedia.org/wiki/Network_switching_subsystem#Home_location_register_(HLR)) (HLR) for obtaining data about the [SIM](https://en.wikipedia.org/wiki/Subscriber_Identity_Module) and [mobile services ISDN](https://en.wikipedia.org/wiki/MSISDN) number (MSISDN; i.e., the telephone number).
* The [base station subsystems](https://en.wikipedia.org/wiki/Base_Station_Subsystem) (BSS) which handles the radio communication with [2G](https://en.wikipedia.org/wiki/2G) and [2.5G](https://en.wikipedia.org/wiki/2.5G) mobile phones.
* The [UMTS terrestrial radio access network](https://en.wikipedia.org/wiki/UTRAN) (UTRAN) which handles the radio communication with [3G](https://en.wikipedia.org/wiki/3G) mobile phones.
* The [visitor location register](https://en.wikipedia.org/wiki/Network_switching_subsystem#Visitor_location_register_(VLR)) (VLR) provides subscriber information when the subscriber is outside its home network.
* Other MSCs for procedures such as [hand over](https://en.wikipedia.org/wiki/Handoff).

**Procedures implemented**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=5)]

Tasks of the MSC include:

* [Delivering calls to subscribers](https://en.wikipedia.org/wiki/GSM_services#Call_set_up_process_for_incoming_calls) as they arrive based on information from the VLR.
* Connecting outgoing calls to other mobile subscribers or the PSTN.
* Delivering SMSs from subscribers to the [short message service center](https://en.wikipedia.org/wiki/Short_message_service_center) (SMSC) and vice versa.
* Arranging handovers from BSC to BSC.
* Carrying out handovers from this MSC to another.
* Supporting [supplementary services](https://en.wikipedia.org/w/index.php?title=Supplementary_services&action=edit&redlink=1) such as conference calls or call hold.
* Generating billing information.

Home location register (HLR) [[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=6)]

The **home location register** (HLR) is a central database that contains details of each mobile phone subscriber that is authorized to use the GSM core network. There can be several logical, and physical, HLRs per [public land mobile network](https://en.wikipedia.org/wiki/Public_Land_Mobile_Network) (PLMN), though one [international mobile subscriber identity](https://en.wikipedia.org/wiki/International_mobile_subscriber_identity) (IMSI)/MSISDN pair can be associated with only one logical HLR (which can span several physical nodes) at a time.

The HLRs store details of every [SIM card](https://en.wikipedia.org/wiki/SIM_card) issued by the mobile phone operator. Each SIM has a unique identifier called an IMSI which is the [primary key](https://en.wikipedia.org/wiki/Primary_key) to each HLR record.

Another important item of data associated with the SIM are the MSISDNs, which are the [telephone numbers](https://en.wikipedia.org/wiki/Telephone_number) used by mobile phones to make and receive calls. The primary MSISDN is the number used for making and receiving voice calls and SMS, but it is possible for a SIM to have other secondary MSISDNs associated with it for [fax](https://en.wikipedia.org/wiki/Fax) and data calls. Each MSISDN is also a [unique key](https://en.wikipedia.org/wiki/Unique_key) to the HLR record. The HLR data is stored for as long as a subscriber remains with the mobile phone operator.

Examples of other data stored in the HLR against an IMSI record is:

* GSM services that the subscriber has requested or been given.
* [General Packet Radio Service](https://en.wikipedia.org/wiki/General_Packet_Radio_Service) (GPRS) settings to allow the subscriber to access packet services.
* Current location of subscriber (VLR and [serving GPRS support node](https://en.wikipedia.org/wiki/SGSN)/SGSN).
* [Call divert](https://en.wikipedia.org/wiki/Call_forwarding) settings applicable for each associated MSISDN.

The HLR is a system which directly receives and processes [MAP](https://en.wikipedia.org/wiki/Mobile_Application_Part) transactions and messages from elements in the GSM network, for example, the location update messages received as mobile phones roam around.

**Other GSM core network elements connected to the HLR**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=7)]

The HLR connects to the following elements:

* The G-MSC for handling incoming calls
* The VLR for handling requests from mobile phones to attach to the network
* The SMSC for handling incoming SMSs
* The [voice mail](https://en.wikipedia.org/wiki/Voice_mail) system for delivering notifications to the mobile phone that a message is waiting
* The AuC for authentication and ciphering and exchange of data (triplets)

**Procedures implemented**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=8)]

The main function of the HLR is to manage the fact that SIMs and phones move around a lot. The following procedures are implemented to deal with this:

* Manage the mobility of subscribers by means of updating their position in administrative areas called 'location areas', which are identified with a LAC. The action of a user of moving from one LA to another is followed by the HLR with a Location area update procedure.
* Send the subscriber data to a VLR or SGSN when a subscriber first roams there.
* Broker between the G-MSC or SMSC and the subscriber's current VLR in order to allow [incoming calls or text messages to be delivered](https://en.wikipedia.org/wiki/GSM_services#Call_set_up_process_for_incoming_calls).
* Remove subscriber data from the previous VLR when a subscriber has roamed away from it.
* Responsible for all SRI related queries (i.e. for invoke SRI, HLR should give sack SRI or SRI reply).

Authentication center (AuC)[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=9)]

**Description**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=10)]

The **authentication center** (AuC) is a function to [authenticate](https://en.wikipedia.org/wiki/Authentication) each [SIM card](https://en.wikipedia.org/wiki/SIM_card) that attempts to connect to the **gsm** core network (typically when the phone is powered on). Once the authentication is successful, the HLR is allowed to manage the SIM and services described above. An [encryption key](https://en.wikipedia.org/wiki/Encryption_key) is also generated that is subsequently used to encrypt all wireless communications (voice, SMS, etc.) between the mobile phone and the GSM core network.

If the authentication fails, then no services are possible from that particular combination of SIM card and mobile phone operator attempted. There is an additional form of identification check performed on the serial number of the mobile phone described in the EIR section below, but this is not relevant to the AuC processing.

Proper implementation of security in and around the AuC is a key part of an operator's strategy to avoid [SIM cloning](https://en.wikipedia.org/wiki/SIM_cloning).

The AuC does not engage directly in the authentication process, but instead generates data known as *triplets* for the MSC to use during the procedure. The security of the process depends upon a [shared secret](https://en.wikipedia.org/wiki/Shared_secret) between the AuC and the SIM called the *Ki*. The *Ki* is securely burned into the SIM during manufacture and is also securely replicated onto the AuC. This *Ki* is never transmitted between the AuC and SIM, but is combined with the IMSI to produce a [challenge/response](https://en.wikipedia.org/wiki/Challenge%E2%80%93response_authentication) for identification purposes and an encryption key called *Kc* for use in over the air communications.

**Other GSM core network elements connected to the AuC**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=11)]

The AuC connects to the following elements:

* The MSC which requests a new batch of triplet data for an IMSI after the previous data have been used. This ensures that same keys and challenge responses are not used twice for a particular mobile.

**Procedures implemented**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=12)]

The AuC stores the following data for each IMSI:

* the *Ki*
* Algorithm id. (the standard algorithms are called A3 or A8, but an operator may choose a proprietary one).

When the MSC asks the AuC for a new set of triplets for a particular IMSI, the AuC first generates a random number known as *RAND*. This *RAND* is then combined with the *Ki* to produce two numbers as follows:

* The *Ki* and *RAND* are fed into the A3 algorithm and the signed response (SRES) is calculated.
* The *Ki* and *RAND* are fed into the A8 algorithm and a session key called *Kc* is calculated.

The numbers (*RAND*, SRES, *Kc*) form the triplet sent back to the MSC. When a particular IMSI requests access to the GSM core network, the MSC sends the *RAND* part of the triplet to the SIM. The SIM then feeds this number and the *Ki* (which is burned onto the SIM) into the A3 algorithm as appropriate and an SRES is calculated and sent back to the MSC. If this SRES matches with the SRES in the triplet (which it should if it is a valid SIM), then the mobile is allowed to attach and proceed with GSM services.

After successful authentication, the MSC sends the encryption key *Kc* to the [base station controller](https://en.wikipedia.org/wiki/Base_Station_Subsystem#Base_station_controller) (BSC) so that all communications can be encrypted and decrypted. Of course, the mobile phone can generate the *Kc* itself by feeding the same RAND supplied during authentication and the *Ki* into the A8 algorithm.

The AuC is usually collocated with the HLR, although this is not necessary. Whilst the procedure is secure for most everyday use, it is by no means hack proof. Therefore, a new set of security methods was designed for 3G phones.

In practice, A3 and A8 algorithms are generally implemented together (known as A3/A8, see [COMP128](https://en.wikipedia.org/wiki/COMP128)). An A3/A8 algorithm is implemented in Subscriber Identity Module (SIM) cards and in GSM network Authentication Centers. It is used to authenticate the customer and generate a key for encrypting voice and data traffic, as defined in 3GPP TS 43.020 (03.20 before Rel-4). Development of A3 and A8 algorithms is considered a matter for individual GSM network operators, although example implementations are available. To encrypt Global System for Mobile Communications (GSM) cellular communications A5 algorithm is used.[[1]](https://en.wikipedia.org/wiki/Network_switching_subsystem#cite_note-1)

Visitor location register (VLR)[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=13)]

**Description**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=14)]

The **Visitor Location Register (VLR)** is a database of the MSs ([Mobile stations](https://en.wikipedia.org/wiki/Mobile_station)) that have roamed into the jurisdiction of the Mobile Switching Center (MSC) which it serves. Each main [base transceiver station](https://en.wikipedia.org/wiki/Base_Transceiver_Station) in the network is served by exactly one VLR (one [BTS](https://en.wikipedia.org/wiki/Base_transceiver_station) may be served by many MSCs in case of MSC in pool), hence a subscriber cannot be present in more than one VLR at a time.

The data stored in the VLR has either been received from the [**Home Location Register (HLR)**](https://en.wikipedia.org/wiki/Network_switching_subsystem#Home_location_register_.28HLR.29), or collected from the MS. In practice, for performance reasons, most vendors integrate the VLR directly to the V-MSC and, where this is not done, the VLR is very tightly linked with the MSC via a proprietary interface. Whenever an MSC detects a new MS in its network, in addition to creating a new record in the VLR, it also updates the HLR of the mobile subscriber, apprising it of the new location of that MS. If VLR data is corrupted it can lead to serious issues with text messaging and call services.

Data stored include:

* [IMSI](https://en.wikipedia.org/wiki/International_mobile_subscriber_identity) (the subscriber's identity number).
* Authentication data.
* MSISDN (the subscriber's phone number).
* GSM services that the subscriber is allowed to access.
* [access point (GPRS)](https://en.wikipedia.org/w/index.php?title=GPRS_Access_Points&action=edit&redlink=1) subscribed.
* The HLR address of the subscriber.
* SCP Address(For Prepaid Subscriber).

**Procedures implemented**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=15)]

The primary functions of the VLR are:

* To inform the HLR that a subscriber has arrived in the particular area covered by the VLR.
* To track where the subscriber is within the VLR area (location area) when no call is ongoing.
* To allow or disallow which services the subscriber may use.
* To allocate roaming numbers during the processing of incoming calls.
* To purge the subscriber record if a subscriber becomes inactive whilst in the area of a VLR. The VLR deletes the subscriber's data after a fixed time period of inactivity and informs the HLR (e.g., when the phone has been switched off and left off or when the subscriber has moved to an area with no coverage for a long time).
* To delete the subscriber record when a subscriber explicitly moves to another, as instructed by the HLR.

Equipment identity register (EIR)[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=16)]

The [**equipment identity register**](https://en.wikipedia.org/wiki/Central_Equipment_Identity_Register) is often integrated to the HLR. The EIR keeps a list of mobile phones (identified by their [IMEI](https://en.wikipedia.org/wiki/IMEI)) which are to be banned from the network or monitored. This is designed to allow tracking of stolen mobile phones. In theory all data about all stolen mobile phones should be distributed to all EIRs in the world through a Central EIR. It is clear, however, that there are some countries where this is not in operation. The EIR data does not have to change in real time, which means that this function can be less distributed than the function of the HLR. The EIR is a database that contains information about the identity of the mobile equipment that prevents calls from stolen, unauthorized or defective mobile stations. Some EIR also have the capability to log Handset attempts and store it in a log file.

Other support functions[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=17)]

Connected more or less directly to the GSM core network are many other functions.

**Billing center (BC)**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=18)]

The **billing center** is responsible for processing the toll tickets generated by the VLRs and HLRs and generating a bill for each subscriber. It is also responsible for generating billing data of roaming subscriber.

**Multimedia messaging service center (MMSC)**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=19)]

The [**multimedia messaging service**](https://en.wikipedia.org/wiki/Multimedia_messaging_service)**center** supports the sending of multimedia messages (e.g., images, [audio](https://en.wikipedia.org/wiki/Sound), [video](https://en.wikipedia.org/wiki/Video) and their combinations) to (or from) MMS-bluetooth.

**Voicemail system (VMS)**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=20)]

The [**voicemail**](https://en.wikipedia.org/wiki/Voicemail)**system** records and stores voicemail. which may have to pay

**Lawful interception functions**[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=21)]

*Main article:*[*Lawful interception*](https://en.wikipedia.org/wiki/Lawful_interception)

According to U.S. law, which has also been copied into many other countries, especially in Europe, all telecommunications equipment must provide facilities for monitoring the calls of selected users. There must be some level of support for this built into any of the different elements. The concept of *lawful interception* is also known, following the relevant U.S. law, as [CALEA](https://en.wikipedia.org/wiki/Communications_Assistance_for_Law_Enforcement_Act). Generally, lawful Interception implementation is similar to the implementation of conference call. While A and B are talking with each other, C can join the call and listen silently.

See also[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=22)]

* The GSM core network.
* Base station subsystem
* COM 128
* 4GLET

References[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=23)]

* 1. [**^**](https://en.wikipedia.org/wiki/Network_switching_subsystem#cite_ref-1) *Shahabuddin, Shahria; Rahaman, Sadiqur; Rehman, Faisal; Ahmad, Ijaz; Khan, Zaheer (2018). A Comprehensive Guide to 5G Security. John Wiley & Sons Ltd. p. 12.*

External links[[edit](https://en.wikipedia.org/w/index.php?title=Network_switching_subsystem&action=edit&section=24)]

* 4GLET - the standardisation body for GSM and UMTS
* [UMTS Networks: Protocols, Terminology and Implementation](http://www.elektroda.pl/rtvforum/download.php?id=338749) - a PDF eBook by Gunnar Heine

Flexible Numbering Register

Flexible Numbering Register (FNR) is a real time mobile telecommunication node for the Ericsson GSM/WCDMA, CDMA/TDMA and PDC systems, fulfilling specifications in GSM 900/1800/1900, 3GPP, ANSI-41 and PDC.

The FNR node provides several solutions for:

* Operator-Provider Portability (both in wireline and wireless domains)
* Service-Provider Portability
* Flexible allocation of subscriptions to HLRs

FNR is designed to be a flexible application, enabling features in the network to meet the demand of existing and future converging networks, as well as providing ad-hoc customer solutions. With FNR operators enjoy real-time performance based on a telecom-grade platform.

The scalability offered by the platform gives operators the possibility to dimension the FNR to match both subscriber and traffic levels within their mobile network.

FNR can be configured as a stand-alone node or integrated with other nodes like Signaling Transfer Point (STP), Home Location Register (HLR), Mobile Switching Center (MSC), and Authentication Center (AUC). This flexibility provides means for the operator to optimize its network depending on its present and future needs, making it a very cost-effective solution. This enables much more efficient network design through optimized equipment location, improved scalability and simplified O&M. Flexible support for new technologies powers ongoing network evolution and hardware modernization, it also complements IMS to provide a smooth and cost effective migration to the future "All-IP" network, enabling a convergent Number Portability architecture.

Using the Ericsson FNR provides a number of benefits for the operator in the form of cost savings and the optimized use of hardware resources.

Ericsson FNR provides:

* Exceptional capacity
* High Performance
* Scalability
* Support of multiple technologies
* Seamless integration and interoperability
* Telecom-grade reliability
* Support for multivendor networks
* Integration with other applications, e.g. HLR, MSC, STP
* Feature richness

Base station subsystem

From Wikipedia, the free encyclopedia

[Jump to navigation](https://en.wikipedia.org/wiki/Base_station_subsystem#mw-head)[Jump to search](https://en.wikipedia.org/wiki/Base_station_subsystem#searchInput)

|  |  |
| --- | --- |
|  | This article **needs additional citations for**[**verification**](https://en.wikipedia.org/wiki/Wikipedia:Verifiability). Please help [improve this article](https://en.wikipedia.org/w/index.php?title=Base_station_subsystem&action=edit) by [adding citations to reliable sources](https://en.wikipedia.org/wiki/Help:Referencing_for_beginners). Unsourced material may be challenged and removed. *Find sources:* ["Base station subsystem"](https://www.google.com/search?as_eq=wikipedia&q=%22Base+station+subsystem%22) – [news](https://www.google.com/search?tbm=nws&q=%22Base+station+subsystem%22+-wikipedia) **·** [newspapers](https://www.google.com/search?&q=%22Base+station+subsystem%22+site:news.google.com/newspapers&source=newspapers) **·** [books](https://www.google.com/search?tbs=bks:1&q=%22Base+station+subsystem%22+-wikipedia) **·** [scholar](https://scholar.google.com/scholar?q=%22Base+station+subsystem%22) **·** [JSTOR](https://www.jstor.org/action/doBasicSearch?Query=%22Base+station+subsystem%22&acc=on&wc=on) *(January 2017) (*[*Learn how and when to remove this template message*](https://en.wikipedia.org/wiki/Help:Maintenance_template_removal)*)* |

[](https://en.wikipedia.org/wiki/File:Deutsches_Museum_-_The_guts_of_a_GSM_cell_site.jpg)

The hardware of [GSM](https://en.wikipedia.org/wiki/GSM) base station displayed in [Deutsches Museum](https://en.wikipedia.org/wiki/Deutsches_Museum" \o "Deutsches Museum)

The **base station subsystem** (**BSS**) is the section of a traditional [cellular telephone network](https://en.wikipedia.org/wiki/Cellular_network) which is responsible for handling traffic and signaling between a [mobile phone](https://en.wikipedia.org/wiki/Mobile_phone) and the [network switching subsystem](https://en.wikipedia.org/wiki/Network_switching_subsystem). The BSS carries out [transcoding](https://en.wikipedia.org/wiki/Transcoding) of speech channels, allocation of radio channels to mobile phones, [paging](https://en.wikipedia.org/wiki/Paging_(telecommunications)), [transmission](https://en.wikipedia.org/wiki/Transmission_(telecommunications)) and [reception](https://en.wikipedia.org/w/index.php?title=Reception_(telecommunications)&action=edit&redlink=1) over the [air interface](https://en.wikipedia.org/wiki/Air_interface) and many other tasks related to the radio network.



**Contents**

* [1Base transceiver station](https://en.wikipedia.org/wiki/Base_station_subsystem#Base_transceiver_station)
  + [1.1Sectorization](https://en.wikipedia.org/wiki/Base_station_subsystem#Sectorization)
* [2Base station controller](https://en.wikipedia.org/wiki/Base_station_subsystem#Base_station_controller)
  + [2.1Transcoder](https://en.wikipedia.org/wiki/Base_station_subsystem#Transcoder)
* [3Packet control unit](https://en.wikipedia.org/wiki/Base_station_subsystem#Packet_control_unit)
* [4BSS interfaces](https://en.wikipedia.org/wiki/Base_station_subsystem#BSS_interfaces)
* [5See also](https://en.wikipedia.org/wiki/Base_station_subsystem#See_also)
* [6References](https://en.wikipedia.org/wiki/Base_station_subsystem#References)
* [7External links](https://en.wikipedia.org/wiki/Base_station_subsystem#External_links)

Base transceiver station[[edit](https://en.wikipedia.org/w/index.php?title=Base_station_subsystem&action=edit&section=1)]

[](https://en.wikipedia.org/wiki/File:BaseStationsBlorg.jpg)

Two GSM base station antennas disguised as trees in [Dublin](https://en.wikipedia.org/wiki/Dublin), [Ireland](https://en.wikipedia.org/wiki/Ireland).

[](https://en.wikipedia.org/wiki/File:GSM_base_station_with_solar_panel_in_Sokosti_Finland.JPG)

A solar-powered GSM base station on top of a mountain in the wilderness of [Lapland](https://en.wikipedia.org/wiki/Lapland_(Finland))

*Main article:*[*Base transceiver station*](https://en.wikipedia.org/wiki/Base_transceiver_station)

The [base transceiver station](https://en.wikipedia.org/wiki/Base_transceiver_station), or BTS, contains the equipment for transmitting and receiving radio signals ([transceivers](https://en.wikipedia.org/wiki/Transceivers)), [antennas](https://en.wikipedia.org/wiki/Antenna_(radio)), and equipment for [encrypting](https://en.wikipedia.org/wiki/Encryption) and decrypting communications with the [base station controller](https://en.wikipedia.org/wiki/Base_station_subsystem#Base_station_controller) (BSC). Typically a BTS for anything other than a [picocell](https://en.wikipedia.org/wiki/Picocell) will have several transceivers (TRXs) which allow it to serve several different [frequencies](https://en.wikipedia.org/wiki/Frequency) and different sectors of the cell (in the case of sectorised base stations).

A BTS is controlled by a parent BSC via the "base station control function" (BCF). The BCF is implemented as a discrete unit or even incorporated in a TRX in compact base stations. The BCF provides an operations and maintenance (O&M) connection to the network management system (NMS), and manages operational states of each TRX, as well as software handling and alarm collection.

The functions of a BTS vary depending on the cellular technology used and the cellular telephone provider. There are vendors in which the BTS is a plain transceiver which receives information from the MS (mobile station) through the [Um air interface](https://en.wikipedia.org/wiki/Um_air_interface) and then converts it to a TDM (PCM) based interface, the Abis interface, and sends it towards the BSC. There are vendors which build their BTSs so the information is preprocessed, target cell lists are generated and even intracell handover (HO) can be fully handled. The advantage in this case is less load on the expensive Abis interface.

The BTSs are equipped with radios that are able to modulate layer 1 of interface Um; for GSM 2G+ the modulation type is [Gaussian minimum-shift keying](https://en.wikipedia.org/wiki/Gaussian_minimum-shift_keying) (GMSK), while for [EDGE](https://en.wikipedia.org/wiki/Enhanced_Data_Rates_for_GSM_Evolution)-enabled networks it is GMSK and [8-PSK](https://en.wikipedia.org/wiki/8-PSK). This modulation is a kind of continuous-phase [frequency shift keying](https://en.wikipedia.org/wiki/Frequency_shift_keying). In GMSK, the signal to be modulated onto the carrier is first smoothed with a [Gaussian](https://en.wikipedia.org/wiki/Gaussian_filter) [low-pass filter](https://en.wikipedia.org/wiki/Low-pass_filter) prior to being fed to a [frequency modulator](https://en.wikipedia.org/wiki/Frequency_modulation), which greatly reduces the interference to neighboring channels ([adjacent-channel interference](https://en.wikipedia.org/wiki/Adjacent-channel_interference)).

Antenna combiners are implemented to use the same antenna for several TRXs (carriers), the more TRXs are combined the greater the combiner loss will be. Up to 8:1 combiners are found in micro and pico cells only.

[Frequency hopping](https://en.wikipedia.org/wiki/Frequency_hopping) is often used to increase overall BTS performance; this involves the rapid switching of voice traffic between TRXs in a sector. A hopping sequence is followed by the TRXs and handsets using the sector. Several hopping sequences are available, and the sequence in use for a particular cell is continually broadcast by that cell so that it is known to the handsets.

A TRX transmits and receives according to the [GSM](https://en.wikipedia.org/wiki/GSM) standards, which specify eight [TDMA](https://en.wikipedia.org/wiki/Time_division_multiple_access) timeslots per radio frequency. A TRX may lose some of this capacity as some information is required to be [broadcast](https://en.wikipedia.org/wiki/Broadcasting) to handsets in the area that the BTS serves. This information allows the handsets to identify the network and gain access to it. This signalling makes use of a channel known as the [Broadcast Control Channel](https://en.wikipedia.org/wiki/Broadcast_Control_Channel) (BCCH).

**Sectorization**[[edit](https://en.wikipedia.org/w/index.php?title=Base_station_subsystem&action=edit&section=2)]

*Further information:*[*Sector antenna*](https://en.wikipedia.org/wiki/Sector_antenna)

By using directional antennas on a base station, each pointing in different directions, it is possible to sectorise the base station so that several different cells are served from the same location. Typically these [directional antennas](https://en.wikipedia.org/wiki/Directional_antenna) have a beamwidth of 65 to 85 degrees. This increases the traffic capacity of the base station (each frequency can carry eight voice channels) whilst not greatly increasing the [interference](https://en.wikipedia.org/wiki/Co-channel_interference) caused to neighboring cells (in any given direction, only a small number of frequencies are being broadcast). Typically two antennas are used per sector, at spacing of ten or more [wavelengths](https://en.wikipedia.org/wiki/Wavelength) apart. This allows the operator to overcome the effects of [fading](https://en.wikipedia.org/wiki/Fading) due to physical phenomena such as [multipath reception](https://en.wikipedia.org/wiki/Multipath_reception). Some [amplification](https://en.wikipedia.org/wiki/Amplifier) of the received signal as it leaves the antenna is often used to preserve the balance between uplink and downlink signal.[[1]](https://en.wikipedia.org/wiki/Base_station_subsystem#cite_note-1)

Base station controller[[edit](https://en.wikipedia.org/w/index.php?title=Base_station_subsystem&action=edit&section=3)]

The base station controller (BSC) provides, classically, the *intelligence* behind the BTSs. Typically a BSC has tens or even hundreds of BTSs under its control. The BSC handles allocation of radio channels, receives measurements from the mobile phones, and controls handovers from BTS to BTS (except in the case of an inter-BSC handover in which case control is in part the responsibility of the [anchor MSC](https://en.wikipedia.org/wiki/Network_and_Switching_Subsystem#Description)). A key function of the BSC is to act as a [concentrator](https://en.wikipedia.org/wiki/Concentrator) where many different low capacity connections to BTSs (with relatively low utilisation) become reduced to a smaller number of connections towards the [mobile switching center](https://en.wikipedia.org/wiki/Network_Switching_Subsystem#Mobile_services_Switching_Centre_(MSC)) (MSC) (with a high level of utilisation). Overall, this means that networks are often structured to have many BSCs distributed into regions near their BTSs which are then connected to large centralised MSC sites.

The BSC is undoubtedly the most robust element in the BSS as it is not only a BTS controller but, for some vendors, a full switching center, as well as an [SS7](https://en.wikipedia.org/wiki/Signalling_System_7) node with connections to the MSC and [serving GPRS support node](https://en.wikipedia.org/wiki/SGSN) (SGSN) (when using [GPRS](https://en.wikipedia.org/wiki/General_Packet_Radio_Service)). It also provides all the required data to the operation support subsystem (OSS) as well as to the performance measuring centers.

A BSC is often based on a distributed computing architecture, with redundancy applied to critical functional units to ensure availability in the event of fault conditions. Redundancy often extends beyond the BSC equipment itself and is commonly used in the power supplies and in the transmission equipment providing the A-ter interface to PCU.

The databases for all the sites, including information such as [carrier frequencies](https://en.wikipedia.org/wiki/Carrier_wave), frequency hopping lists, power reduction levels, receiving levels for cell border calculation, are stored in the BSC. This data is obtained directly from radio planning engineering which involves modelling of the [signal propagation](https://en.wikipedia.org/wiki/Radio_propagation) as well as traffic projections.

**Transcoder**[[edit](https://en.wikipedia.org/w/index.php?title=Base_station_subsystem&action=edit&section=4)]

The transcoder is responsible for [transcoding](https://en.wikipedia.org/wiki/Transcoding) the voice channel coding between the coding used in the mobile network, and the coding used by the world's terrestrial circuit-switched network, the [Public Switched Telephone Network](https://en.wikipedia.org/wiki/Public_Switched_Telephone_Network). Specifically, GSM uses a [regular pulse excited-long term prediction](https://en.wikipedia.org/wiki/Regular_Pulse_Excited-Long_Term_Prediction) (RPE-LTP) coder for voice data between the mobile device and the BSS, but [pulse code modulation](https://en.wikipedia.org/wiki/Pulse_code_modulation) ([A-law](https://en.wikipedia.org/wiki/A-law) or [μ-law](https://en.wikipedia.org/wiki/%CE%9C-law) standardized in [ITU G.711](https://en.wikipedia.org/wiki/G.711)) upstream of the BSS. RPE-LPC coding results in a data rate for voice of 13 kbit/s where standard PCM coding results in 64 kbit/s. Because of this change in data rate *for the same voice call*, the transcoder also has a buffering function so that PCM 8-bit words can be recoded to construct GSM 20 ms traffic blocks.

Although transcoding (compressing/decompressing) functionality is defined as a base station function by the relevant standards, there are several vendors which have implemented the solution outside of the BSC. Some vendors have implemented it in a stand-alone rack using a proprietary interface. In [Siemens](https://en.wikipedia.org/wiki/Siemens)' and [Nokia](https://en.wikipedia.org/wiki/Nokia)'s architecture, the transcoder is an identifiable separate sub-system which will normally be co-located with the MSC. In some of [Ericsson](https://en.wikipedia.org/wiki/Ericsson)'s systems it is integrated to the MSC rather than the BSC. The reason for these designs is that if the compression of voice channels is done at the site of the MSC, the number of fixed transmission links between the BSS and MSC can be reduced, decreasing network infrastructure costs.

This subsystem is also referred to as the *transcoder and rate adaptation unit* ([TRAU](https://en.wikipedia.org/wiki/TRAU)). Some networks use 32 kbit/s [ADPCM](https://en.wikipedia.org/wiki/ADPCM) on the terrestrial side of the network instead of 64 kbit/s [PCM](https://en.wikipedia.org/wiki/Pulse-code_modulation) and the TRAU converts accordingly. When the traffic is not voice but data such as fax or email, the TRAU enables its rate adaptation unit function to give compatibility between the BSS and MSC data rates.

Packet control unit[[edit](https://en.wikipedia.org/w/index.php?title=Base_station_subsystem&action=edit&section=5)]

The packet control unit (PCU) is a late addition to the GSM standard. It performs some of the processing tasks of the BSC, but for packet data. The allocation of channels between voice and data is controlled by the base station, but once a channel is allocated to the PCU, the PCU takes full control over that channel.

The PCU can be built into the base station, built into the BSC or even, in some proposed architectures, it can be at the SGSN site. In most of the cases, the PCU is a separate node communicating extensively with the BSC on the radio side and the SGSN on the Gb side.

BSS interfaces[[edit](https://en.wikipedia.org/w/index.php?title=Base_station_subsystem&action=edit&section=6)]

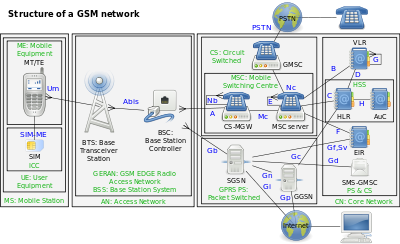
[](https://en.wikipedia.org/wiki/File:Gsm_structures.svg)

Image of the GSM network, showing the BSS interfaces to the MS, NSS and GPRS Core Network

[**Um**](https://en.wikipedia.org/wiki/Um_interface)

The air interface between the [mobile station](https://en.wikipedia.org/wiki/Mobile_station) (MS) and the BTS. This interface uses [LAPDm](https://en.wikipedia.org/wiki/LAPDm" \o "LAPDm) protocol for signaling, to conduct call control, measurement reporting, [handover](https://en.wikipedia.org/wiki/Handoff), [power control](https://en.wikipedia.org/wiki/Power_control), [authentication](https://en.wikipedia.org/wiki/Authentication), [authorization](https://en.wikipedia.org/wiki/Authorization), location update and so on. Traffic and signaling are sent in bursts of 0.577 ms at intervals of 4.615 ms, to form data blocks each 20 ms.

**Abis**

The interface between the BTS and BSC. Generally carried by a DS-1, ES-1, or E1 [TDM](https://en.wikipedia.org/wiki/Time-division_multiplexing) circuit. Uses TDM subchannels for traffic (TCH), LAPD protocol for BTS supervision and telecom signaling, and carries synchronization from the BSC to the BTS and MS.

**A**

The interface between the BSC and MSC. It is used for carrying traffic channels and the BSSAP user part of the [SS7](https://en.wikipedia.org/wiki/Signalling_System_7) stack. Although there are usually transcoding units between BSC and MSC, the signaling communication takes place between these two ending points and the transcoder unit doesn't touch the SS7 information, only the voice or CS data are transcoded or rate adapted.

**Ater**

The interface between the BSC and transcoder. It is a proprietary interface whose name depends on the vendor (for example Ater by Nokia), it carries the A interface information from the BSC leaving it untouched.

**Gb**

Connects the BSS to the SGSN in the [GPRS core network](https://en.wikipedia.org/wiki/GPRS_core_network).

See also[[edit](https://en.wikipedia.org/w/index.php?title=Base_station_subsystem&action=edit&section=7)]

* [Network switching subsystem](https://en.wikipedia.org/wiki/Network_switching_subsystem)
* [GPRS core network](https://en.wikipedia.org/wiki/GPRS_core_network)
* [Cell site](https://en.wikipedia.org/wiki/Cell_site)
* U.S. [Federal Communications Commission](https://en.wikipedia.org/wiki/Federal_Communications_Commission) (FCC)
* [Base station](https://en.wikipedia.org/wiki/Base_station)
* [Cellular repeater](https://en.wikipedia.org/wiki/Cellular_repeater)
* [Telecom infrastructure sharing](https://en.wikipedia.org/wiki/Telecom_infrastructure_sharing)
* [OpenBTS](https://en.wikipedia.org/wiki/OpenBTS)

References[[edit](https://en.wikipedia.org/w/index.php?title=Base_station_subsystem&action=edit&section=8)]

* 1. [**^**](https://en.wikipedia.org/wiki/Base_station_subsystem#cite_ref-1) *Networks, Editor ABC of.*[*"4 Things you need to Improve Coverage and Capacity in cellular system"*](https://www.abcofnetworks.com/2019/03/4-things-you-need-to-improve-coverage-and-Capacity-in-cellular-system.html)*. ABC of Networks. Retrieved 2019-10-09.*

External links[[edit](https://en.wikipedia.org/w/index.php?title=Base_station_subsystem&action=edit&section=9)]

* [Osmocom OpenBSC](http://openbsc.osmocom.org/trac/wiki/OpenBSC) - open source Base Station Controller implementation

|  |  |
| --- | --- |
| GMSC | [Nederlands](http://www.telecomabc.nl/g/gmsc.html) |

The **Gateway Mobile Switching Centre** (GMSC) is a special kind of [MSC](http://www.telecomabc.com/m/msc.html) that is used to route calls outside the mobile network. Whenever a call for a mobile subscriber comes from outside the mobile network, or the subscriber wants to make a call to somebody outside the mobile network the call is routed through the GMSC.

In practice, the GMSC is just a function that can be part of a MSC.

A visitor location register (VLR) is a database that contains information about the subscribers roaming within a mobile switching center’s (MSC) location area. The primary role of the VLR is to minimize the number of queries that MSCs have to make to the home location register (HLR), which holds permanent data regarding the cellular network’s subscribers.  
  
Ideally, there should be only one visitor location register per MSC, but it is also possible for a single VLR to serve multiple MSCs.

A mobile switching center (MSC) is the centerpiece of a network switching subsystem (NSS). The MSC is mostly associated with communications switching functions, such as call set-up, release, and routing. However, it also performs a host of other duties, including routing SMS messages, conference calls, fax, and service billing as well as interfacing with other networks, such as the public switched telephone network (PSTN).  
  
The MSC is structured so that base stations connect to it, while it connects to the PSTN. Because cellphones connect to these base stations, all forms of communication, whether between two cell phones or between a cell phone and a landline telephone, travel through the MSC.