

Satellite Earth Stations and Systems (SES); Broadband Satellite Multimedia (BSM); Services and architectures

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

Introduction

The present document has been prepared by the TC-SES Broadband Satellite Multimedia (BSM) working group based on the recommendations from the work of STF-126 [1].

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1 Scope

The present document defines the BSM services and architectures. It contains a set of definitions and reference models in the following main areas:

- BSM roles and actors;
- BSM reference architectures and models;
- BSM bearer services.

The present document is intended to define the possible roles that Broadband Satellite Multimedia systems may have, to define the main actors, to define a set of reference architectures and to define the services they can provide. These definitions are intended as a common set of definitions for BSM standardization.

The overall objectives of BSM standardization are:

- to enable users to access a wide range of telecommunications services, including many that are today undefined, with particular emphasis on IP-based multi-media services and high data rates;
- to provide an efficient means of using satellite network resources (particularly radio spectrum);
- to facilitate the provision of a high quality of service similar to that provided by fixed networks;
- to facilitate the provision of easy to use, low cost terminals.

2 References

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2.1 Informative references

- [1] ETSI TR 101 374-2: "Satellite Earth Stations and Systems (SES); Broadband satellite multimedia; Part 2: Scenario for standardization".
- [2] ETSI TS 122 101: "Universal Mobile Telecommunications System (UMTS); Service aspects; Service principles (3GPP TS 22.101 Release 7)".

[3] MFA Forum: "Technology: ATM Forum Specifications".

NOTE: Available at http://www.mfaforum.org/tech/atm_specs.shtml.

[4] ETSI TS 123 107: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Quality of Service (QoS) concept and architecture (3GPP TS 23.107 version 6.4.0 Release 6)".

[5] ETSI TR 101 865: "Satellite Earth Stations and Systems (SES); Satellite component of UMTS/IMT-2000; General aspects and principles".

[6] ETSI TR 102 353: "Satellite Earth Stations and Systems (SES); Broadband Satellite Multimedia (BSM); Guidelines for the Satellite Independent Service Access Point (SI-SAP);".

[7] ETSI TS 102 357: "Satellite Earth Stations and Systems (SES); Broadband Satellite Multimedia (BSM); Common Air interface specification; Satellite Independent Service Access Point SI-SAP".

[8] ETSI TS 102 295: "Satellite Earth Stations and Systems (SES); Broadband Satellite Multimedia (BSM) services and architectures; BSM Traffic Classes".

[9] ETSI TR 102 187: "Satellite Earth Stations and Systems (SES); Broadband Satellite Multimedia; Overview of BSM families".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

broadcast: communication capability which denotes unidirectional distribution to an unspecified number of access points connected to the network

NOTE: The communication may reach any or all access points and each terminal may select which broadcast information to receive.

BSM bearer service: user plane (U-plane) data transmission services provided by the BSM subnetwork at the SI-SAP interfaces.

NOTE 1: A BSM bearer service includes all QoS and other bearer service properties, as viewed at those SI-SAP interfaces.

NOTE 2: BSM bearer services are a specific form of layer 2 service access point services. BSM bearer services are therefore not the same as a Telecommunications bearer service as defined below.

BSM Network: a BSM subnetwork together with the BSM interworking and adaptation functions that are required to provide an interface into the attached networks

BSM Subnetwork: all the BSM network elements below the Satellite Independent Service Access Point (SI-SAP)

BSM System (BSMS): A BSM System corresponds to a BSM Network together with the NMC and NCC plus any additional elements that are required to provide the network services to the subscribers and their users.

channel: means of unidirectional transmission of signals between two points

NOTE: Channel is a generic term that can be used at different layers of the interface (e.g. physical channel, logical channel). Several channels may share a common transport mechanism.

connection oriented: communication method in which communication proceeds through three well-defined phases: connection establishment, data transfer, connection release

connectionless: communication method which allows the transfer of information between users without the need for connection establishment procedures

control plane (C-plane): plane which has a layered structure and performs control functions for the various services

NOTE: The C-plane deals with the signalling necessary to set up, maintain and release bearer services.

gateway (GW): network element that provides interworking between the BSM network and one or more external networks.

layer management functions: management functions (e.g. meta-signalling) relating to resources and parameters residing in its protocol entities

link: capability to exchange data between two points

NOTE 1: Link is a generic term that can be used at different layers of the interface. For example:

data link: capability of the data link layer to exchange data; and

physical link: capability of the physical layer to exchange data.

NOTE 2: Physical link (radio link) names can be used to indicate the direction and/or the usage and/or the operating band. For example, "uplink", "feeder link" or "Ku-band link".

management plane (M-plane): plane which provides two types of functions, namely layer management functions and network management functions

multicast: communication capability which denotes unidirectional distribution from a single ingress service access point to a number of specified egress service access points

multipoint: communication configuration attribute which denotes that the communication involves more than two service access points

Network Control Centre (NCC): equipment that provides the central control functions for a satellite network.

Network Management Centre (NMC): equipment that provides the central management functions for a satellite network.

Satellite Independent Service Access Point (SI-SAP): the interface between the satellite dependent lower layers and the satellite independent upper layers of the Satellite Terminal air interface

Satellite Terminal (ST): network element that contains at least one satellite network interface.

NOTE: An ST normally contains at least one other network interface and two different types of ST can be defined:

User ST: that provides interworking between the satellite network and a premises network.

Gateway ST: that provides interworking between the satellite network and an external network.

service attribute: specified characteristic of a telecommunication service

NOTE: The value(s) assigned to one or more service attributes may be used to distinguish that telecommunication service from others.

telecommunication service: service offered by a network operator or service provider to its customers in order to satisfy a specific telecommunication requirement

NOTE: Telecommunication services are divided into two broad families: bearer services and teleservices:

telecommunications bearer service: type of telecommunication service that provides the capability of transmission of signals between user access points, typically the user-network interface (UNI);

teleservice: type of telecommunication service that provides the complete capability, including terminal equipment functions, for communication between users according to standardized protocols and transmission capabilities established by agreement between operators

traffic class (or service class): service offered to the users described by a set of performance parameters and their specified values, limits or ranges

NOTE: The set of parameters provides a comprehensive description of the service capability.

user plane (U-plane): plane which has a layered structure and provides for user data transfer

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ASP	Application Service Provider
AESA	ATM End System Addresses
ATM	Asynchronous Transfer Mode
BSM	Broadband Satellite Multimedia
BSMS	Broadband Satellite Multimedia System
CP	Customer Premises
CPE	Customer Premises Equipment
DAMA	Demand Assigned Multiple Access
Diffserv	Differentiated services
DL	DownLink
DLL	Data Link Layer
DVB-RCS	Digital Video Broadcast-Return Channel by Satellite
DVB-S	Digital Video Broadcast by Satellite
GSM	Global System for Mobile communication
GW	GateWay
IB	InBound
ID	IDentifier
IETF	Internet Engineering Task Force
Intserv	Integrated services
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
ITSP	Internet Telephony Service Provider
IWF	InterWorking Functions
LAN	Local Area Network
MAC	Medium Access Control
MM	MultiMedia
MSP	Multimedia Service Provider
MTM	Multipoint-To Multipoint
NAP	Network Access Provider
NCC	Network Control Centre
NMC	Network Management Centre
NOC	Network Operations Centre
NSP	Network Service Provider
OB	OutBound
OBP	On Board Processing
OSI	Open System Interconnection
PHY	PHYSical
PILC	Performance Implications of Link Characteristics
PSTN	Public Switched Telephone Network
QID	Queue IDentifier
QoS	Quality of Service
RSVP	Resource reSerVation Protocol
SAT	SATellite
SCC	Satellite Control Centre
SD	Satellite Dependent
SDAF	Satellite Dependent Adaptation Function
SI	Satellite Independent
SIAF	Satellite Independent Adaptation Function
SI-SAP	Satellite Independent Service Access Point
SLA	Service Level Agreements
SLC	Satellite Link Control
SMAC	Satellite Medium Access Control
SME	Small to Medium sized Enterprises
SNO	Satellite Network Operator

SO	Satellite Operator
SP	Service Provider
SPHY	Satellite PHYSical
ST	Satellite Terminal
TCP	Transmission Control Protocol
TM/TC	TeleMetry/TeleCommand
TOS	Type Of Service
UDP	User Datagram Protocol
UL	UpLink
UMTS	Universal Mobile Telecommunication System
UT	User Terminal
VCI	Virtual Connection Identifier
VPI	Virtual Path Identifier
VPN	Virtual Private Network
VSAT	Very Small Aperture Terminal (satellite)
EH	End Host
TSS	Transparent Satellite Star
TSM	Transparent Satellite Mesh

4 Overview of BSM

4.1 Satellite network scenarios

For the present document, we divide the BSM satellite networks into 3 different scenarios: Core network, Distribution network and Access network as illustrated in figure 4.1:

- Access network, providing services to end users.
- Distribution network, providing content distribution to the edge.
- Core network, providing trunk interconnect services.

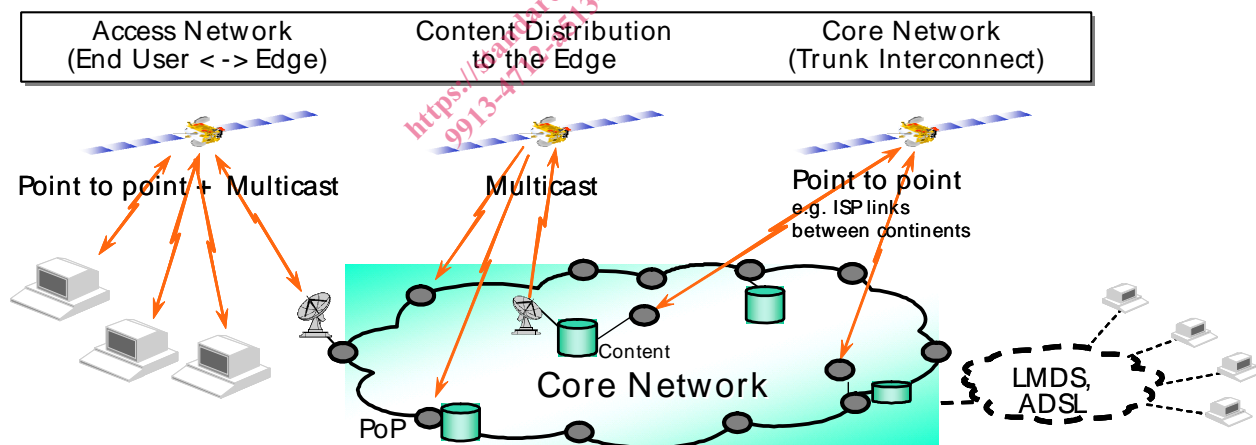


Figure 4.1: Core network, distribution network and access network

Telecommunication satellites can be used to provide broadcasting and multicasting services as well as point-to-point services as illustrated in figure 4.1. In addition to international or long haul communications, figure 4.1 shows satellites being used to provide regional backbone networks and access networks, including access to added value services such as Internet applications.

Due to their natural coverage of large mass of land or ocean satellites are also used to deliver broadcast broadband services such as Digital Video and in this case interactivity can be provided either by the satellite or through a terrestrial telecommunication infrastructure (e.g. PSTN, ISDN and GSM).

4.2 IP networking scenarios

In the global Internet, a BSM system (BSMS) acts as another IP subnetwork. Only a small percentage of IP hosts will be directly connected to that BSMS and it is unrealistic to require that any IP host (including both end hosts and intermediate hosts such as routers) whose traffic transits a BSMS (at some point) should modify its IP-layer protocols. Consequently, the main guideline for interworking IP services over a BSMS is that on the external (non-satellite) side of a Satellite Terminal (ST) all IETF internet protocols should be supported unchanged.

On the satellite side of an ST the IP layer protocols can, when applicable, be adapted to better respond to the specifics of the BSMS to accommodate a combination of the following differences relative to terrestrial wired and wireless networks:

- Longer delays and large delay-bandwidth product.
- High utilization and capacity restrictions of satellite networks.
- Natural multicasting capabilities.
- Large coverage.
- Multiple spot beams.
- On-board switching and routing.
- On-board bandwidth control.
- Independence from ground infrastructure.

This approach of constraining any adaptation of the IETF internet protocols to be fully contained within the boundary of the BSMS is not specific to BSM and can be found in many IP networks in the Next Generation Networks (NGN) such as Virtual Private Networks and Mobile IP. This ensures that the BSMS can be complementary to terrestrial infrastructure, reinforcing the inherent advantages of satellite systems for providing services to remote regions.

The different types of BSM IP networking scenarios are summarized in table 4.1.

Table 4.1: BSM IP networking scenarios

Access network scenarios	Point-to-point	Multicast	Broadcast
Corporate intranet	Corporate VSAT network, i.e. site interconnections	Corporate Multicast e.g. Data distribution e.g. Video conferencing	Datacasting TV broadcast (private)
Corporate internet	Internet Access via corporate ISP or via 3 rd party ISP	IP multicast RT streaming ISP caching	ISP caching
SME intranet	Small VSAT network	SME multicast	
SME internet	Internet Access via 3 rd party ISP	IP multicast RT streaming ISP caching	ISP caching
Soho	Internet Access via ISP Company access via VPN	IP multicast RT streaming ISP caching	ISP caching
Residential	Internet Access via ISP	IP multicast RT streaming ISP caching	ISP caching
Distribution network scenarios	Point-to-point	Multicast	Broadcast
Content to Edge	ISP to Backbone	IP multicast RT streaming Caching at ISP/Edge	TV broadcast (public)
Core network scenarios	Point-to-point	Multicast	Broadcast
ISP interconnect	Trunk interconnect	N/A	N/A