



Bandwidth Managers in NGN/IMS

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Outline

- ▶ NGN drivers
- ▶ Why QoS Control ?
- ▶ Key functions of a Bandwidth Manager
- ▶ The role of Resource and Policy based Admission Control in standards (ETSI, ITU-T, 3GPP)
 - Architecture, interfaces & protocols standards
- ▶ Use cases, early deployments and future scenarios
 - Video
 - Bandwidth on demand
 - PSTN emulation
 - IMS
- ▶ Conclusions

NGN drivers

- ▶ Converged network
 - Fixed and mobile
- ▶ Multiple services
 - Conversational VoIP & video
 - IPTV and content streaming
 - Bandwidth on demand
 - Dynamic VPN
 - Gaming and other real-time applications
- ▶ Differentiated service offerings
 - Enterprise and residential services
 - Enable new revenue models

Capex & Opex savings!

Revenue drivers!



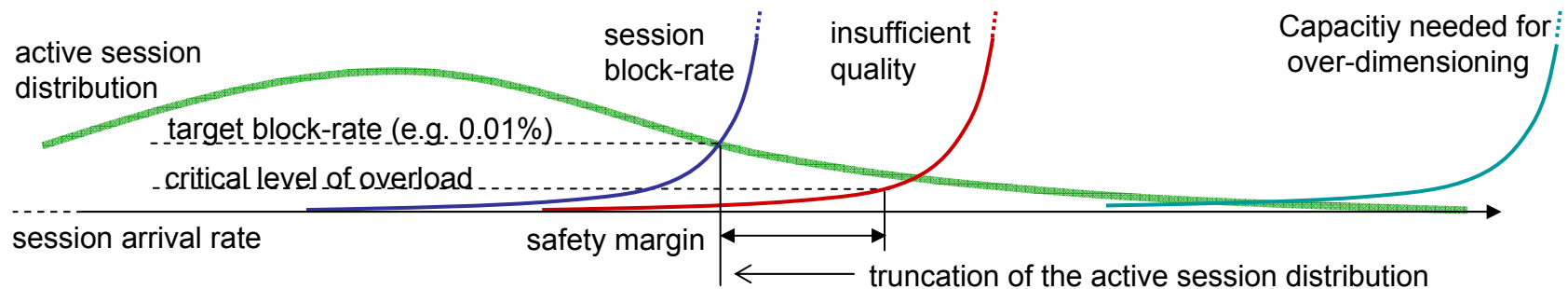
Why QoS Control ?

- ▶ NGNs can not compromise with risk of losing service quality
 - Must be better than legacy applications such as PSTN, leased line, high-quality video streaming/conferencing
- ▶ Worst case dimensioning end-to-end for inelastic and QoS demanding applications is expensive
 - Networks should be sufficiently dimensioned based on a calculated risk for temporary periods of overload
- ▶ Usage patterns have extremes, causing overload
 - New years eve/day, tele-voting, lotteries, premieres
 - Adverse weather or other disasters
- ▶ Random network failures and disasters, causing overload
 - Due to reduced network capacity
- ▶ At overload, networks without bandwidth control (non-blocking) deliver insufficient quality to all or many traffic sources
 - Affected users may keep trying, resulting in longer period of degraded quality
 - No differentiation of important sessions, emergency calls etc.

See also "QoS control vs generous dimensioning", D M Johnson, BT Tech Journal, April 2005

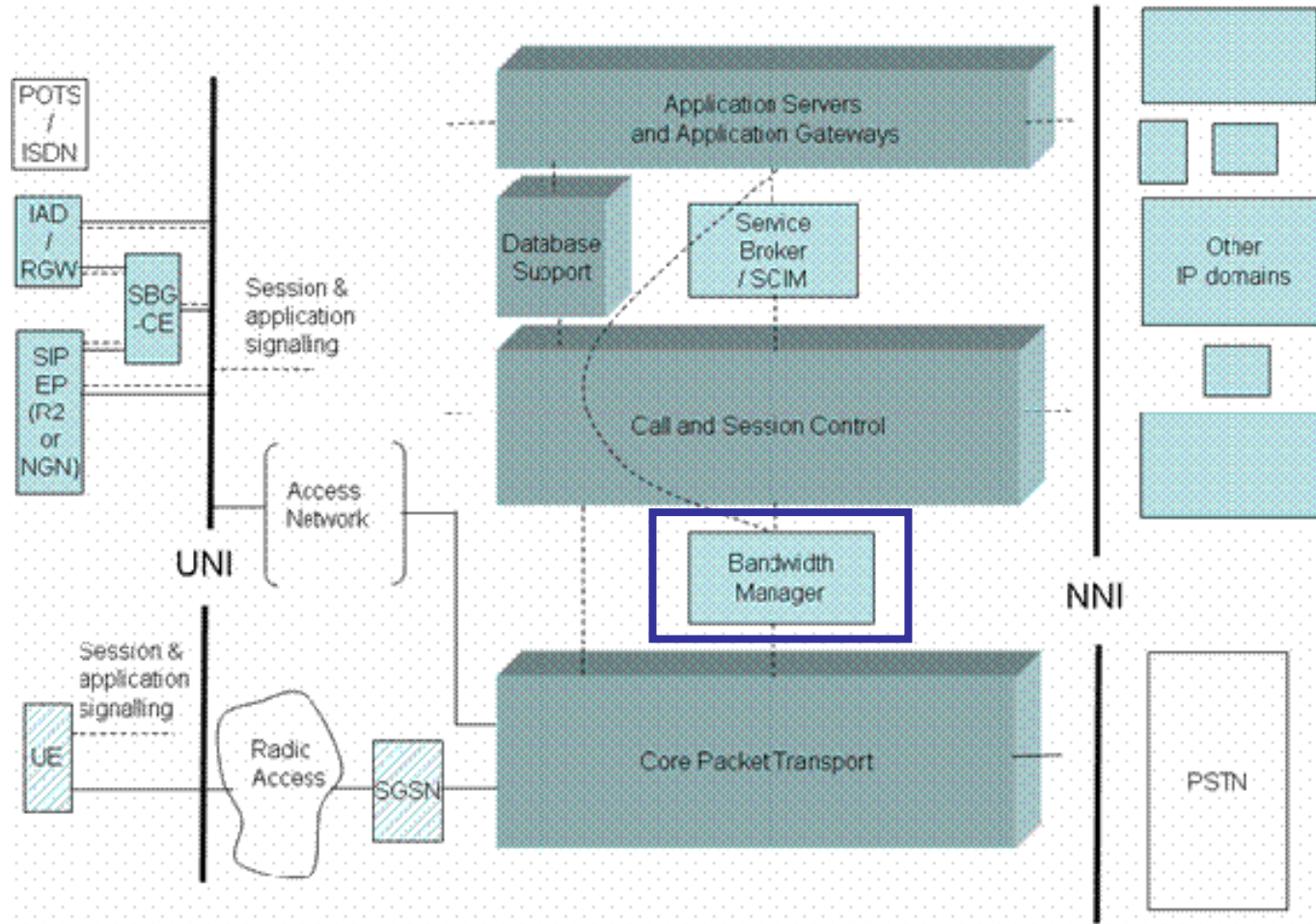
Bandwidth Manager Benefits

- ▶ Provides QoS control through real-time per-session admission control to multiple applications
- ▶ Easier and less critical network dimensioning and provisioning



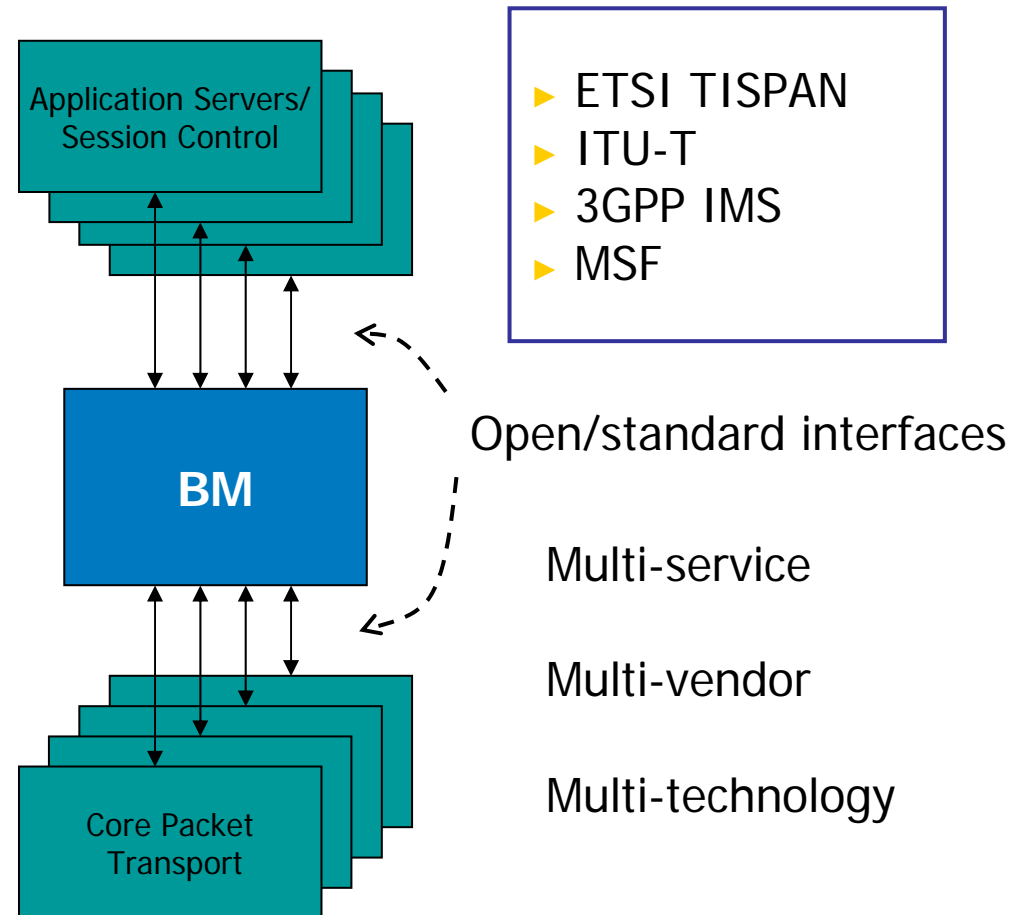
- ▶ Graceful handling of abnormal events – limited user dissatisfaction
 - Serving the largest possible number of sessions, with priority given to emergency calls and priority applications/customers
- ▶ Speed to market for new services
 - Over multiple network technologies
 - Cross service resource sharing

MSF Release 3 physical architecture

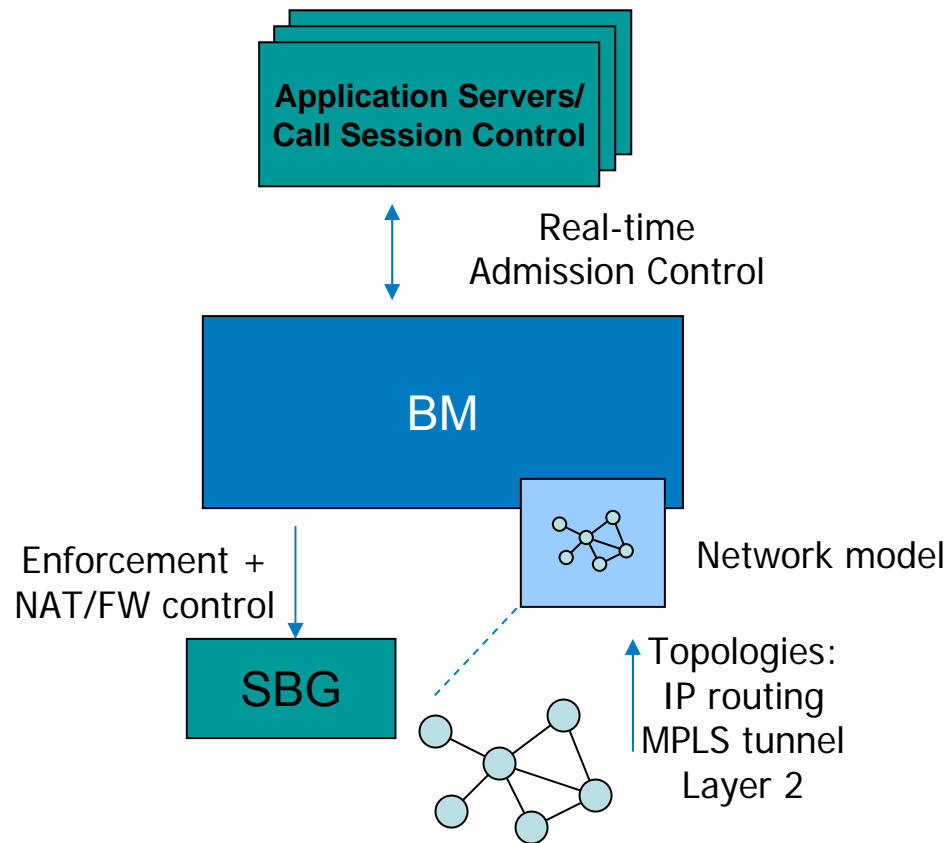


Independent Bandwidth Manager rationale

- ▶ **End-to-end QoS Control**
- ▶ **Application independent**
- ▶ **Wholesale/retail**
- ▶ **Network independent**
 - L2 and L3

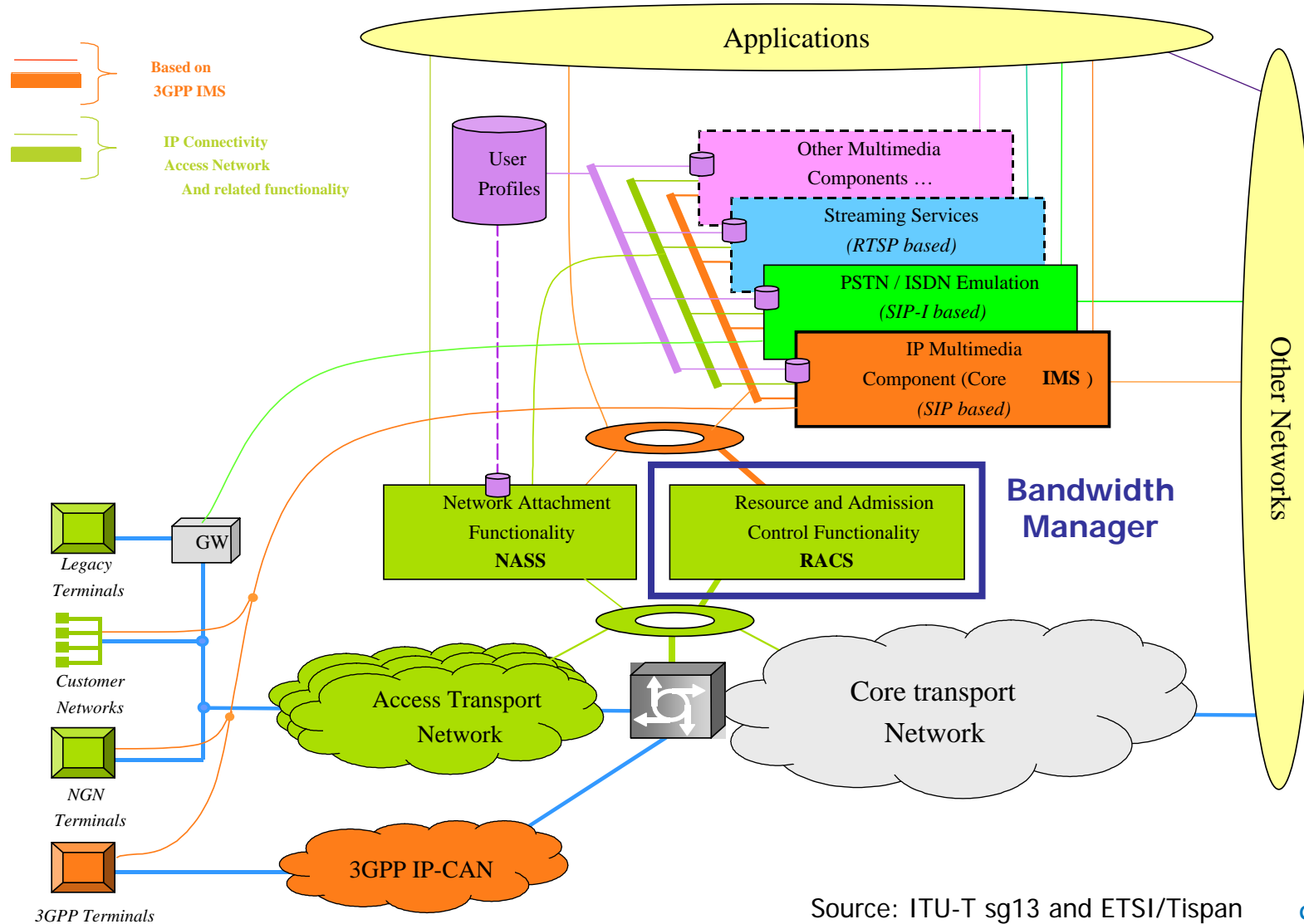


Bandwidth Manager key functions



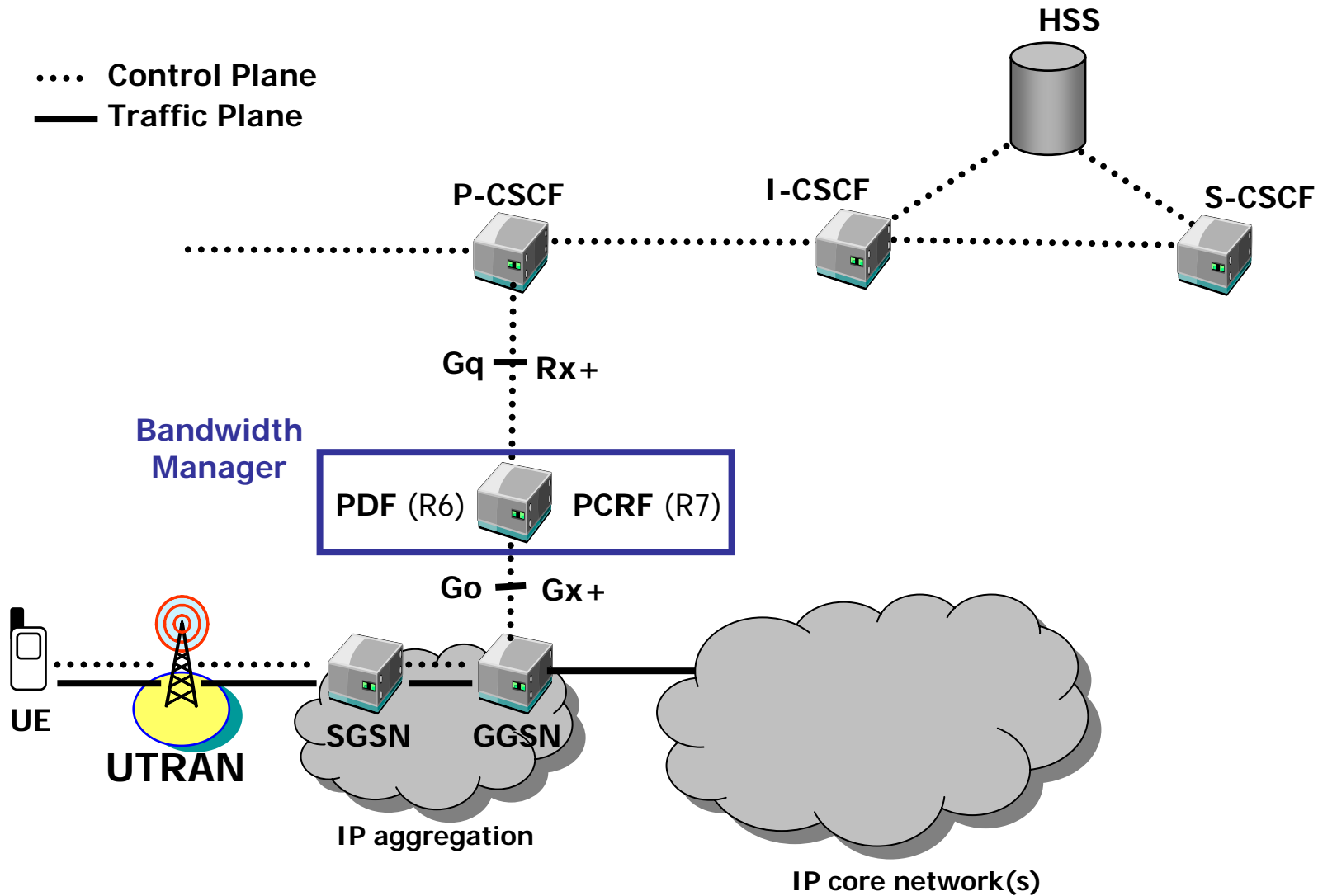
- ▶ **Real-time admission control**
 - Provides per-session admission decisions to applications and call session control
 - Resource-based & Policy-based
- ▶ **Enforcement control and NAT/FW control**
 - Controls gates and NAT/FW in session border gateways
- ▶ **Network model**
 - Keeps an internal topology model of resources/contention points of the network
 - Provides an abstraction of the network to session control
- ▶ **Data to OSS & BSS**
 - Booking levels, alarms, etc.

ETSI and ITU-T NGN Architecture

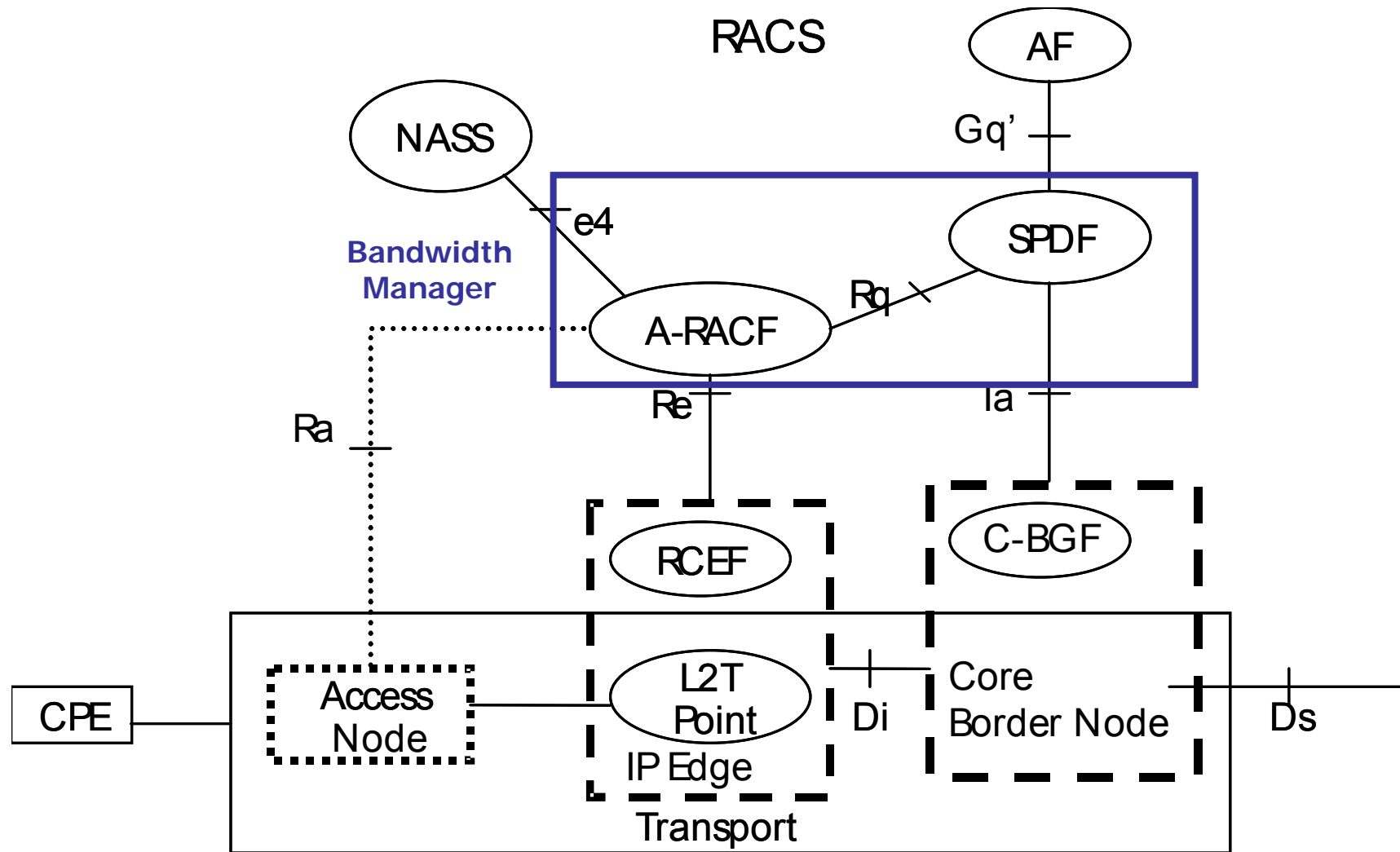


Source: ITU-T sg13 and ETSI/Tispan

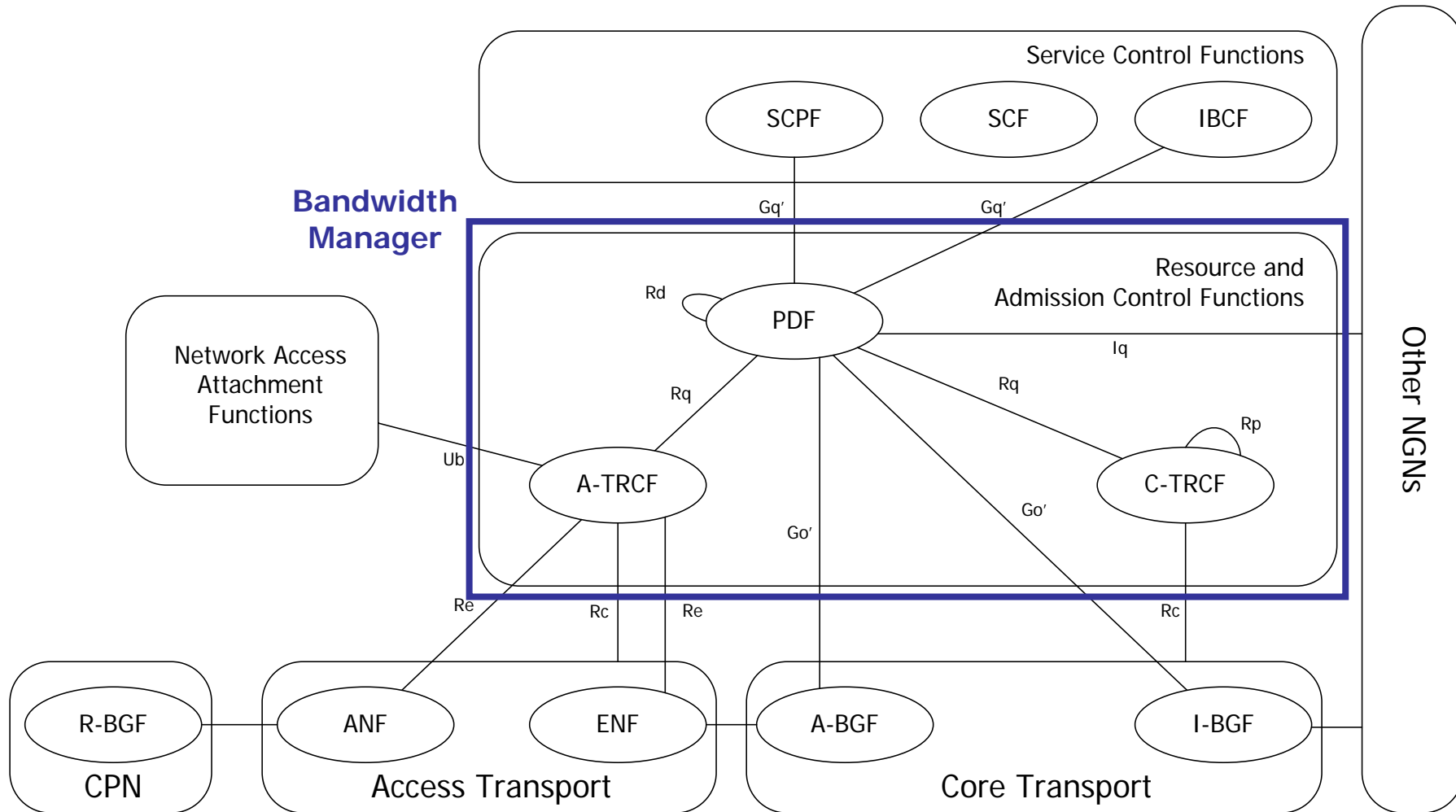
3GPP IMS (R6 & R7)



ETSI Tispan RACS R1 Architecture

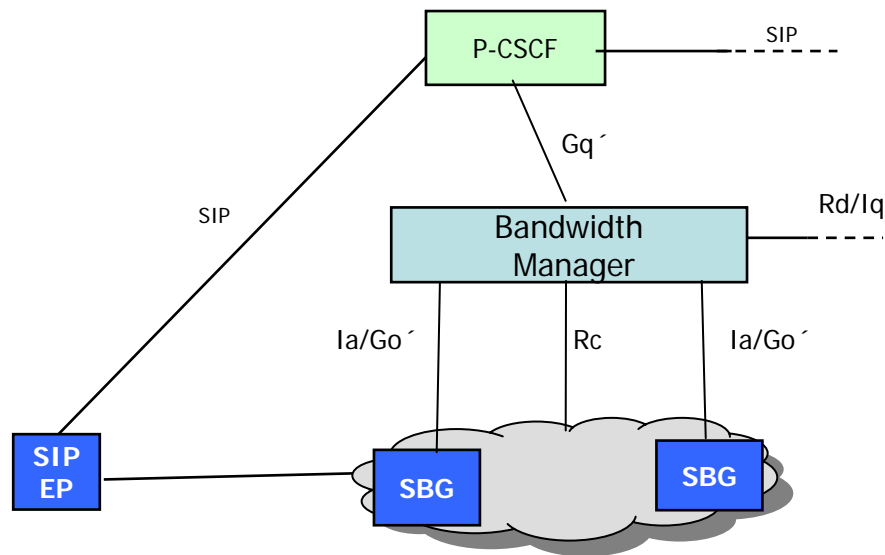


ITU-T NGN functional Architecture

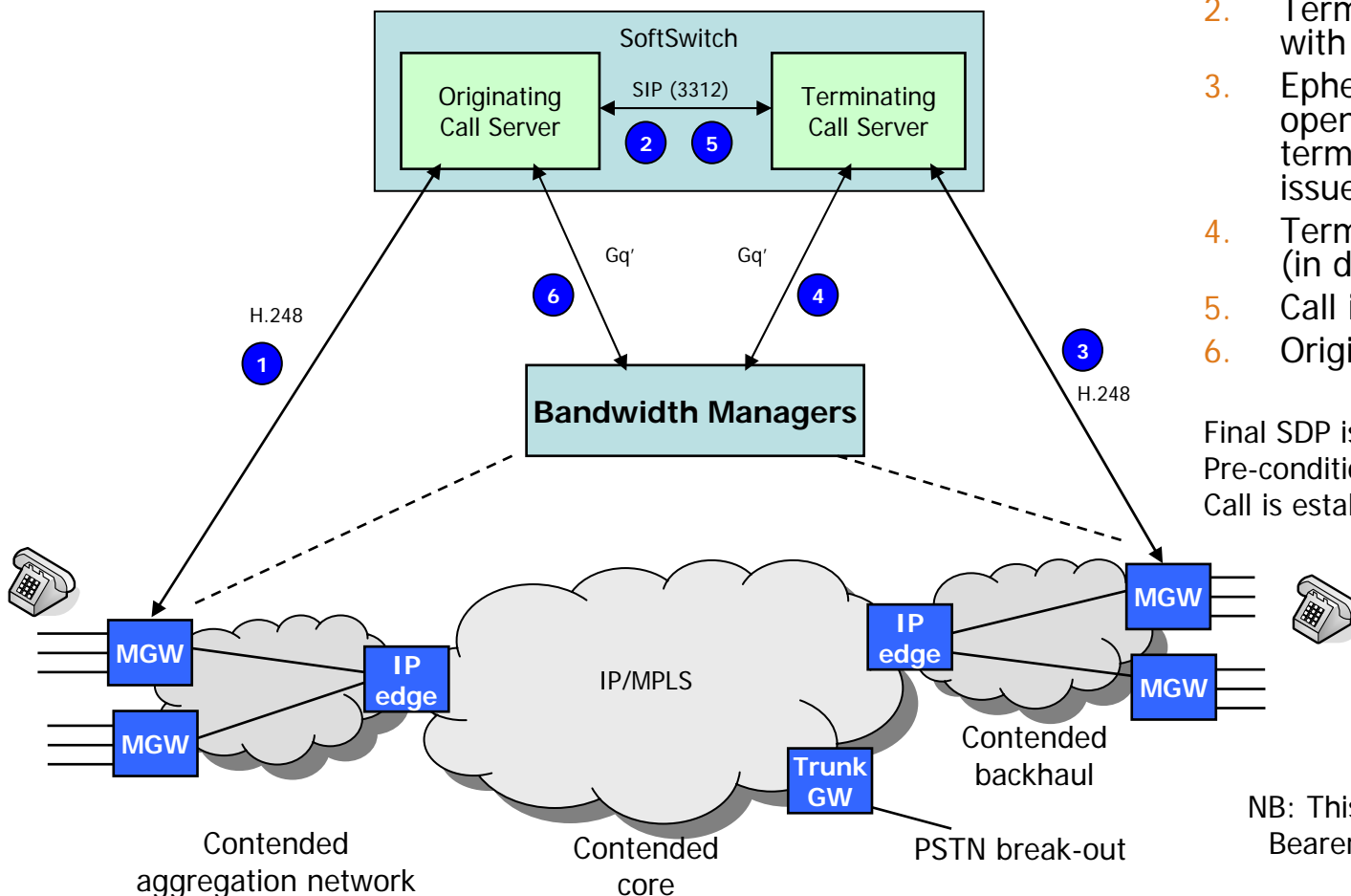


Standard interfaces

Functionality	MSF R3	ETSI Tispan R1	ITU-T	3GPP	Base Protocols
Admission ctrl	TC-0	Gq´	Gq´	Gq/Rx+	Diameter
Enforcement ctrl	TC-1	Ia + Re	Go´ + Re	Go/Gx+	H.248, COPS, Diameter
Network model	TC-2	Rc	Rc	-	SNMP, XML, IS-IS, OSPF, BGP
Inter BM	TC-3	-	Rd + Iq	-	Diameter



Use-case: PSTN emulation

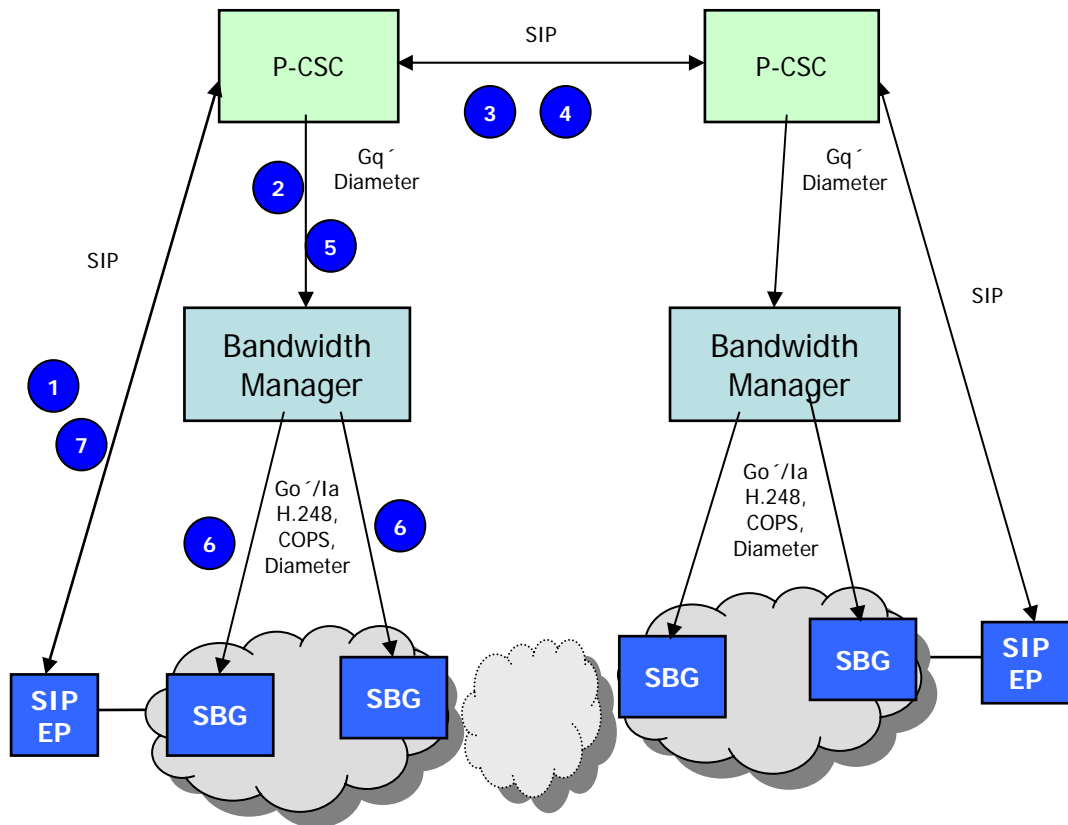


1. Caller off hook. ephemeral connection is opened in gateway. Terminating call server is located.
2. Terminating end is invited with SIP/SDP
3. Ephemeral connection is opened in gateway and terminating end SDP is issued.
4. Terminating end CAC request (in dual dip case)
5. Call is progressed
6. Originating end CAC request

Final SDP is delivered to originating GW. Pre-conditions are acknowledged. Call is established.

NB: This case is similar to GSM with Bearer Independent Core network

Use case: IMS/NGN SIP call e2e

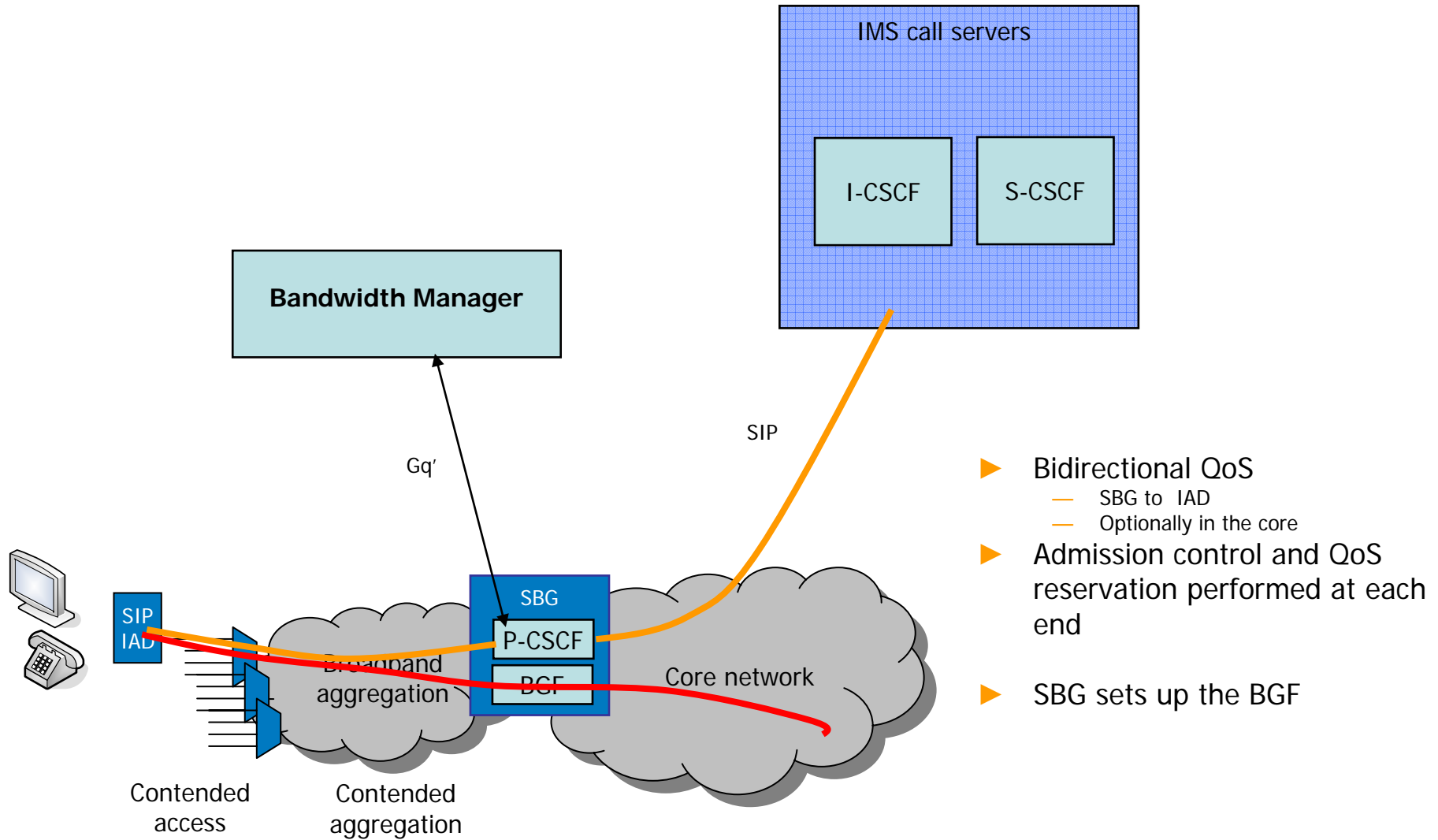


1. SIP Invite (orig. media addr defined)
2. NAT request-response
3. Invite forwarded (with NATed media address)
4. SIP OK (with term. Media addr NATed)
5. Resource Request
6. NAT + bw conf
7. SIP OK

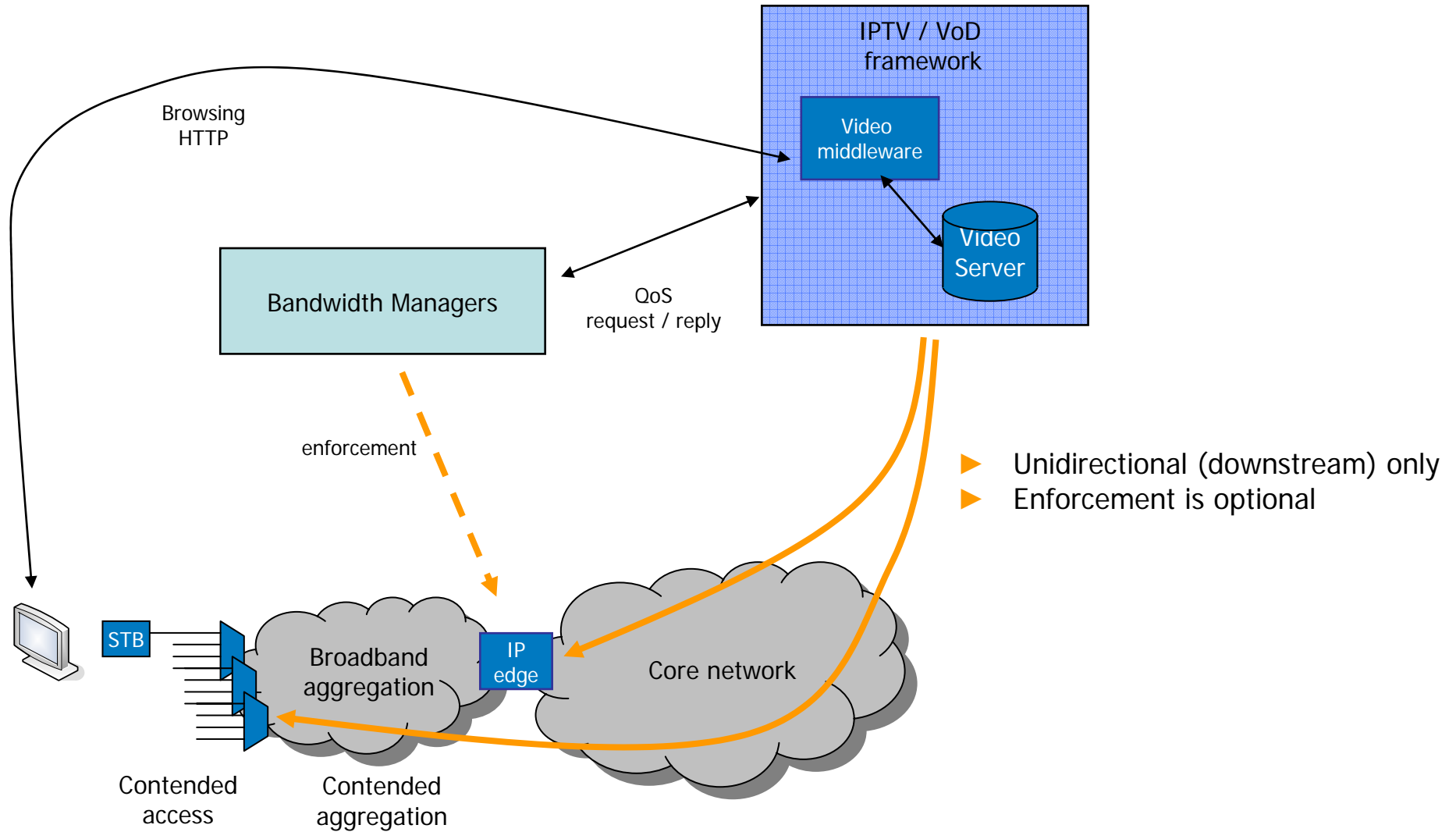
NB: Call flow at the receiving side is analogous

- ▶ Bidirectional admission control
 - In access/aggregation, SBG to SIP EP (IAD)
 - In core network
- ▶ Admission control and QoS reservation initiated at each end

Use-case, early deployment: IMS SIP call when SBG contains P-CSCF



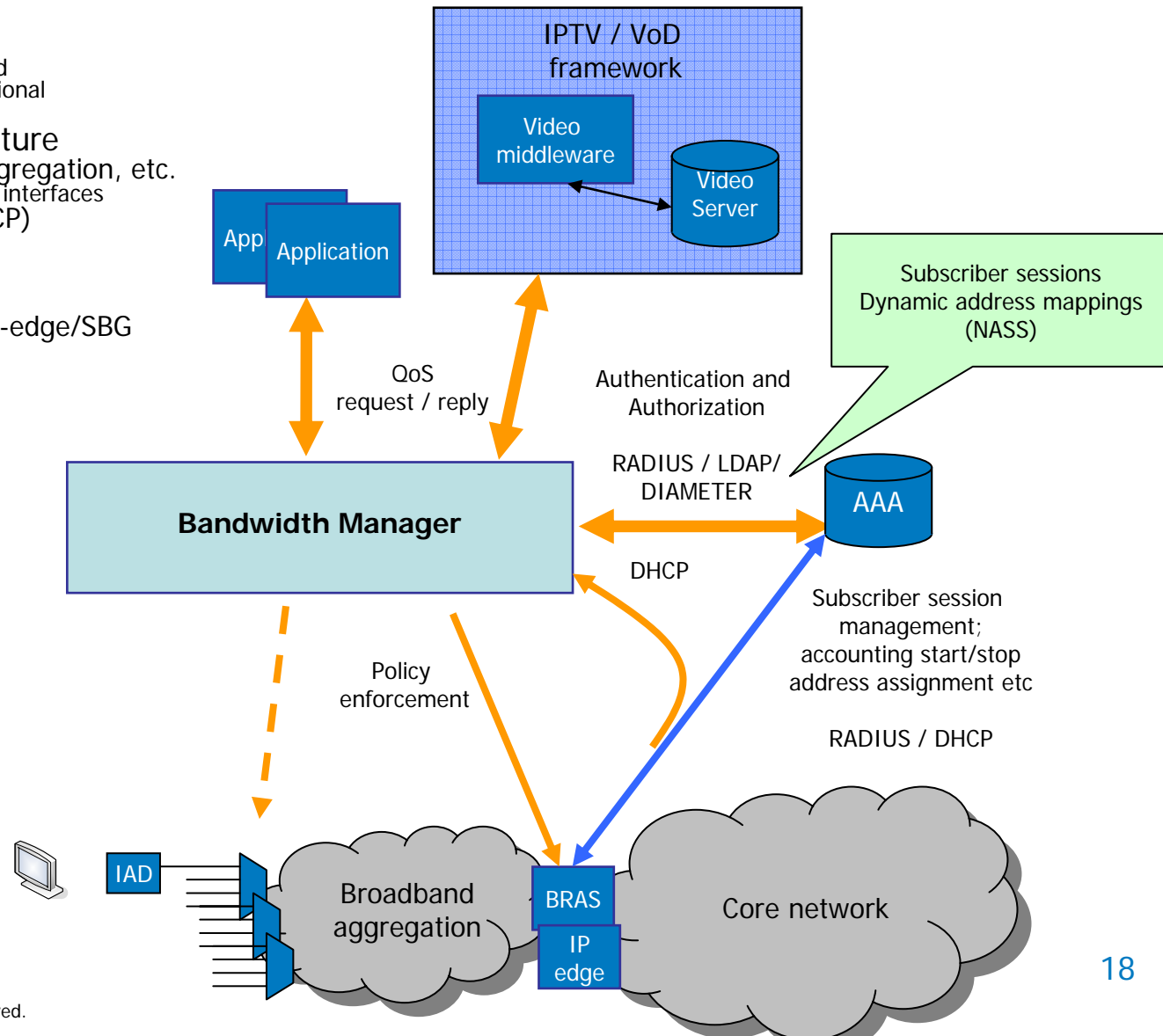
Use-case, early deployment: IPTV/VoD service



Use-case, early deployment: Multi-service in IP broadband access

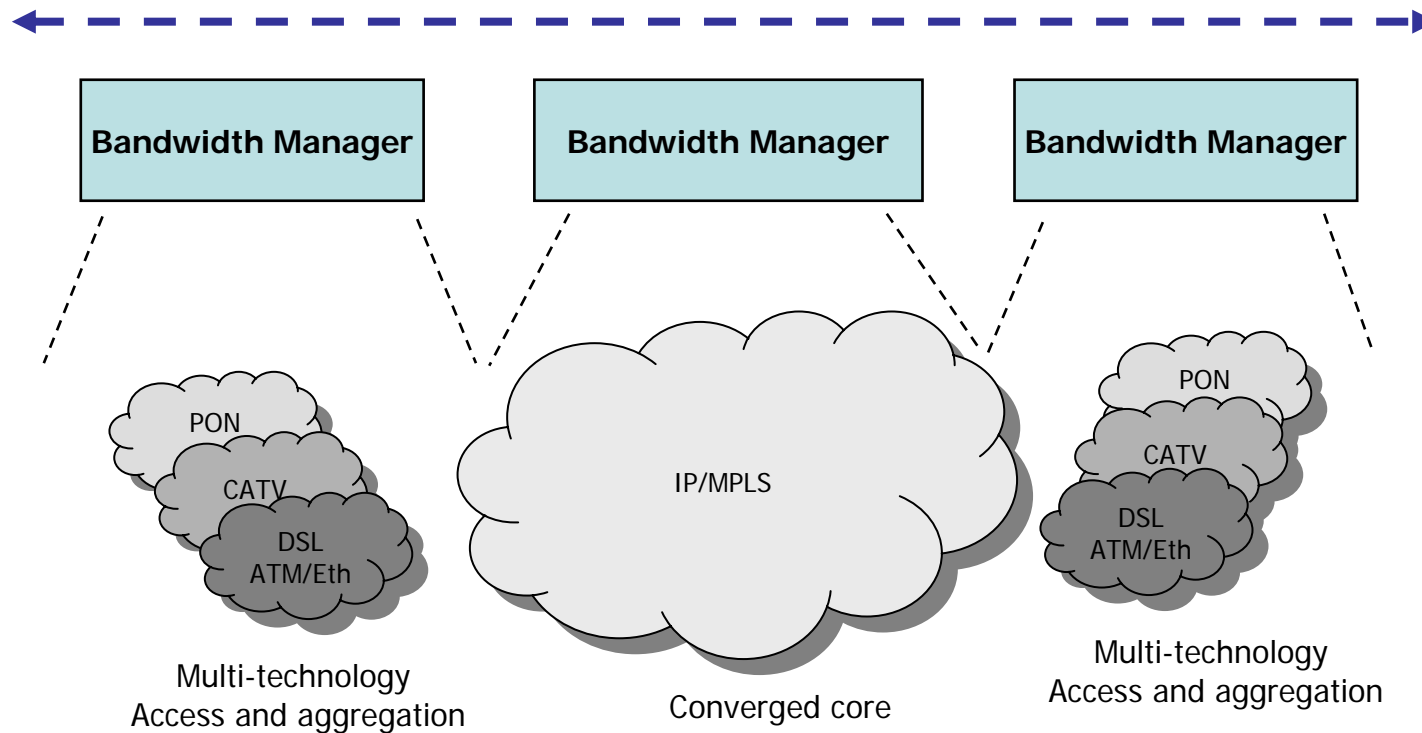


- ▶ **Services**
 - IPTV/VoD
 - Bandwidth on demand
 - VoIP/Video conversational
- ▶ **Traditional infrastructure**
 - AAA, BRAS, L2 aggregation, etc.
 - State of the art BRAS interfaces
 - PPP/RADIUS (DHCP)
- ▶ **Migration to**
 - Ethernet
 - Enforcement in IP-edge/SBG and DSLAM
 - DHCP only



Distributed Bandwidth Managers

End-to-end QoS Control



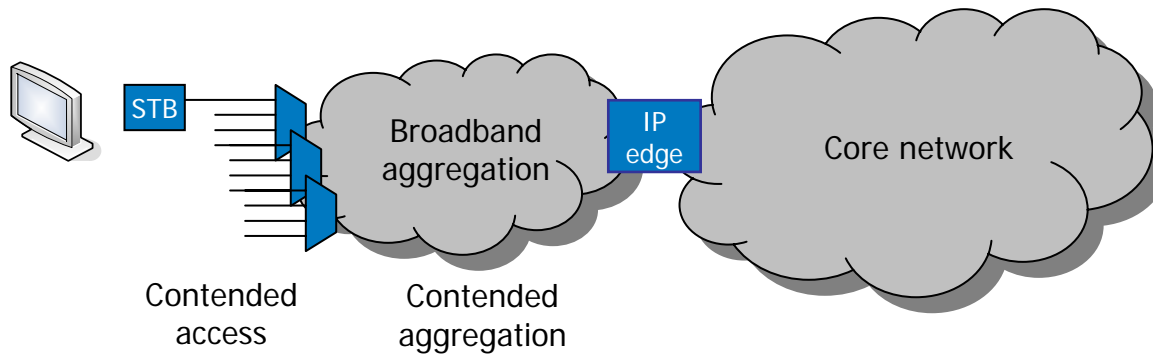
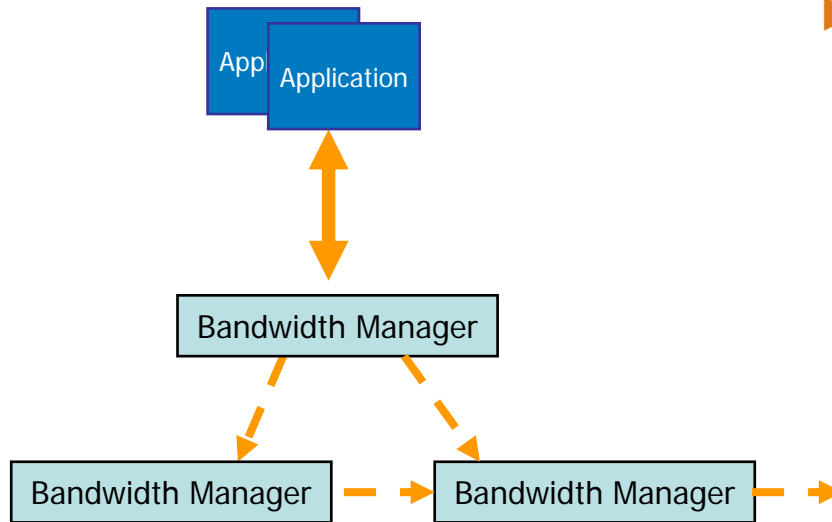
Deploy incrementally in current and future IP networks

- ▶ Network domain by network domain
- ▶ Service by service

BM intercommunication

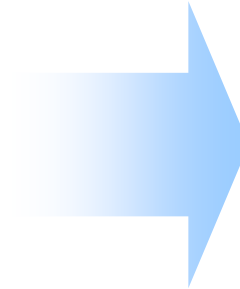
► Inter BM

- Scaling to large networks
- Distributed & hierarchical deployment
- Single point of contact for applications
- TC-3 in the MSF architecture
- Maps to inter-PDF interfaces in ITU-T
 - Intra-domain (Rd)
 - Inter-domain (Iq)



Bandwidth Manager values

- ▶ New services and business models
 - Speed to market (voice, video, data, etc)
- ▶ Increased network efficiency
 - Flexible cross-service resource sharing
 - QoS across contention points
- ▶ Increased operational efficiency
 - Reduced MPLS provisioning
 - Feedback to provisioning process
- ▶ And of course - End-to-end QoS
 - Gradual deployment possible



Maximized network utilization

Increased return on made investments

Increased revenues

Reduced operational overhead

Reduced capital expenditure