PSTN/ISDN Emulation Architecture

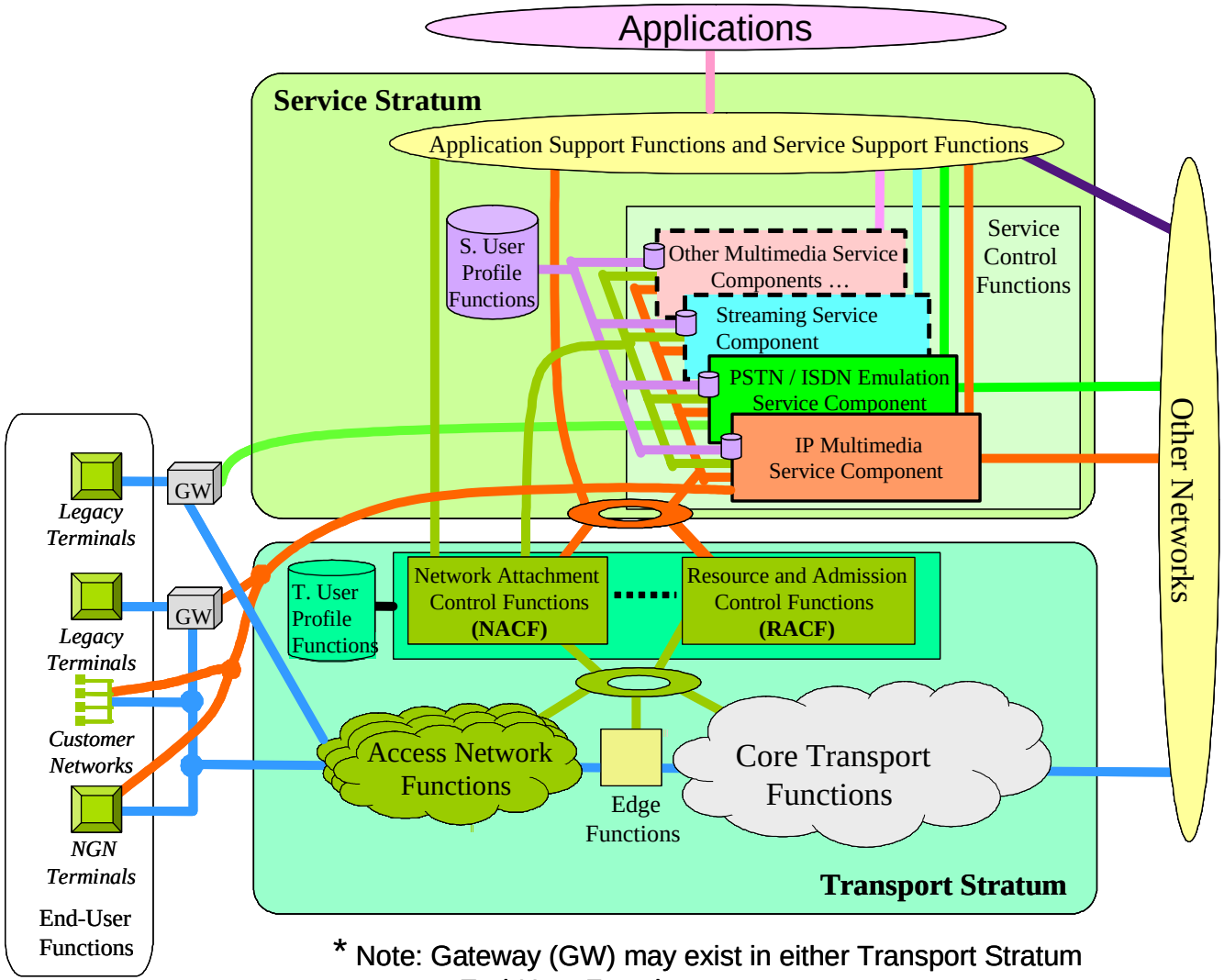
Dr. Ghassem Koleyni
Nortel Networks
Tel: +1 613 763 4154
Fax: +1 613 765 6295
ghassem@nortel.com

ITU-T

Content

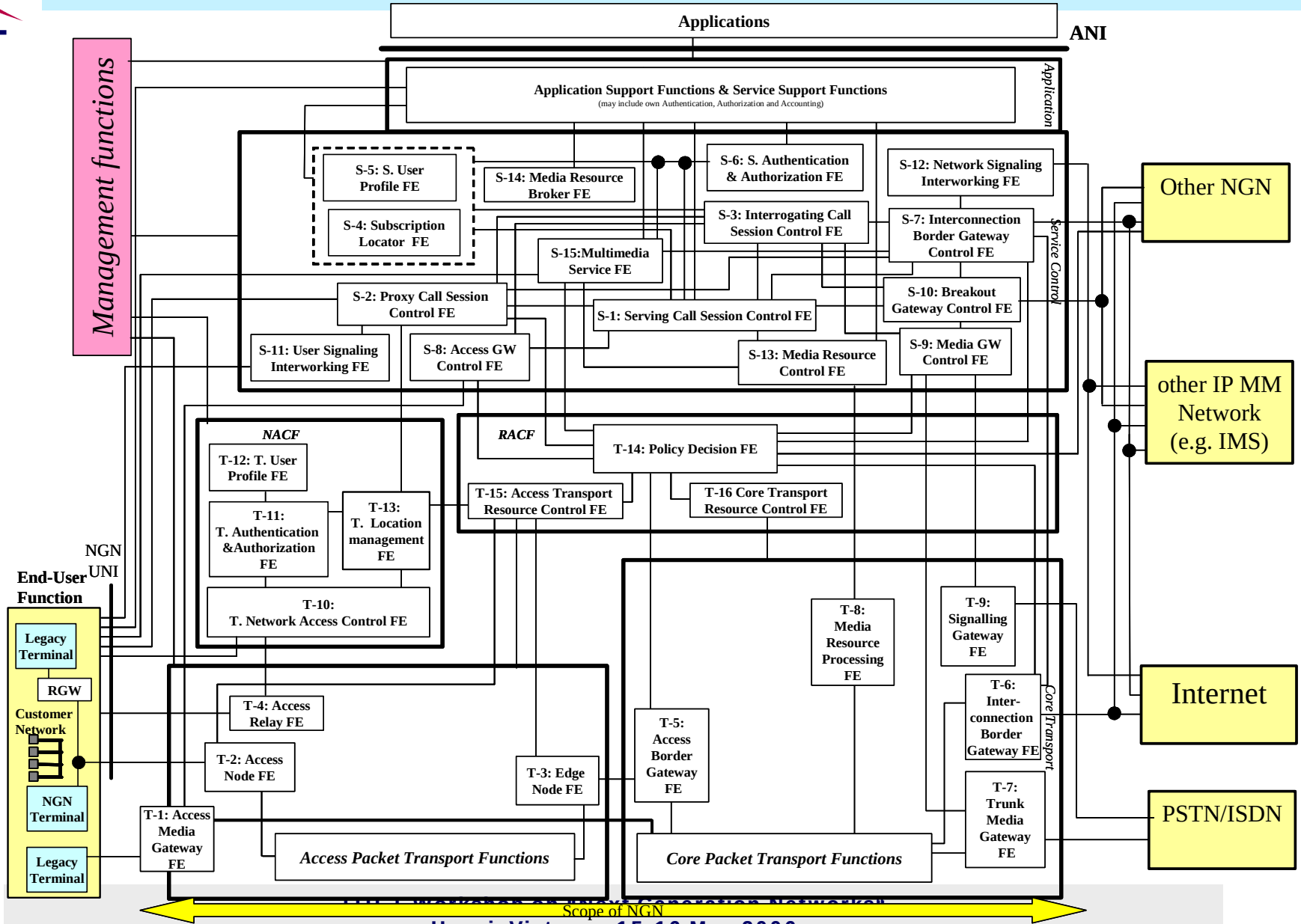
- Definition
- Transport and service configuration
- Functional architecture
- CS-based functional architecture
- IMS-based functional architecure
- Conclusion

Transport & service configuration for NGN



* Note: Gateway (GW) may exist in either Transport Stratum or End-User Functions.

NGN functional architecture



ITU-T

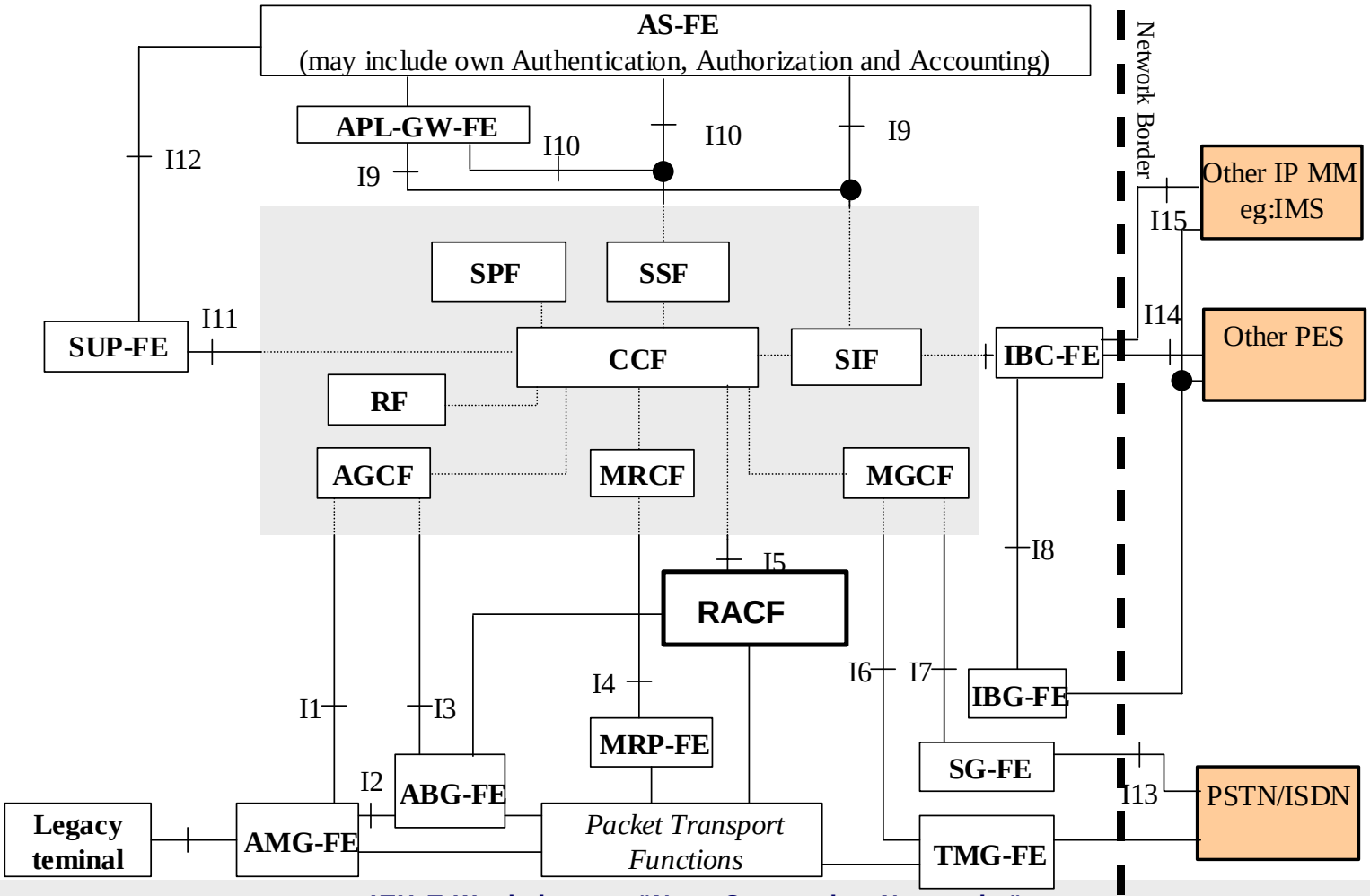
PSTN/ISDN Emulation

Provision of PSTN/ISDN service capabilities and interfaces using adaptation to an IP infrastructure.

Functional Architecture of PSTN / ISDN emulation

- Two different architectures
  - CS-based
  - IMS-based

Functional Architecture of CS-based PSTN / ISDN emulation



ITU-T

CS-based PES functional entities - 1

- **Call Control Function (CCF)**
  - provides two party and multi-party call control function
  - Provides trigger mechanisms to access IN functionality (e.g. passes events to the SSF)
- **Access Gateway Control Function (AGCF)**
  - Controls one or more AMG-FEs to access PSTN or ISDN users
  - Is in charge of the registration, authentication to AMG-FE
  - Recognizes the main events such as off-hook, dialling of digits, end of dialling and on-hook
  - Can control AMG-FE to send signalling indications for voice services to users, e.g. dial-up tone, ringing tone and ringing back tone, busy tone, etc.
  - It ensures the transparent data transport between ISDN user side and IP side from the control level in media negotiation process

CS-based PES functional entities - 2

- **Media Resource Control Function (MRCF)**
  - Controls MRP-FE and allocates resources which are needed for services such as streaming, announcements, and IVR (Interactive Voice Response) support
  - Together with MRP-FE may also provide multi-party conference bridges and media trans-coding.
- **Media Gateway Control Function (MGCF)**
  - Controls the TMG-FE to inter-work with PSTN/ISDN.
  - Allocates and releases resources of the TMG-FE, as well as modifies of the usage of the resources
  - In ISDN N*64Kbit/s unrestricted service scenario, it ensures the transparent data transport between TDM side and IP side from the control level in media negotiation process

ITU-T

CS-based PES functional entities - 3

- **Routing Function (RF)**
  - RF may be implemented as part of CS. If external to CS, it may be shared between and accessed by different CSs
  - Analyses user characteristics (such as called number, service profile) and chooses the route to destination user.
  - It may include routing policy function (such as routing depends on average load sharing, routing depends on time, etc.) and routing database
- **Service provider function (SPF)**
  - It may provide the PSTN/ISDN supplementary services to user also the services logic about PSTN/ISDN supplementary services
  - Doesn't provide the function about Application specific authorization and authentication

CS-based PES functional entities - 4

- **Service Switching Function (SSF)**
  - Enables access to IN service logic programs hosted in legacy SCPs
  - Interacts between the CCF and SCF
- **Signalling Interworking Function (SIF)**
  - Provides protocol adaptation function and connection with other NGN through IBC-FE
  - If it interworking with IMS network it sends/receives SIP message
  - If it interworking with other Call Server based PES network, it may send/receive SIP-I or BICC message

ITU-T

CS-based emulation reference points - 1

- **I1: Reference point between AGCF and AMG-FE**
  - Allows flow of register and event messages such as telephone on-hook, off-hook, and dial-up, etc. also messages for control of the resources of AMG-FE
- **I2: Reference point between AMG-FE and ABG-FE**
  - Allows flow of register and event messages such as telephone on-hook, off-hook, and dial-up, etc. also transfer of control messages from AGCF
- **I3: Reference point between ABG-FE and AGCF**
  - Allows transfer of messages such as register and event from AMG-FE and those controlling the resources of AMG-FE
- **I4: Reference point between the MRC-FE and MRP-FE**
  - The information flows at this reference point are used to carry the message for controlling the media resource in MRCF

CS-based emulation reference points - 2

ITU-T

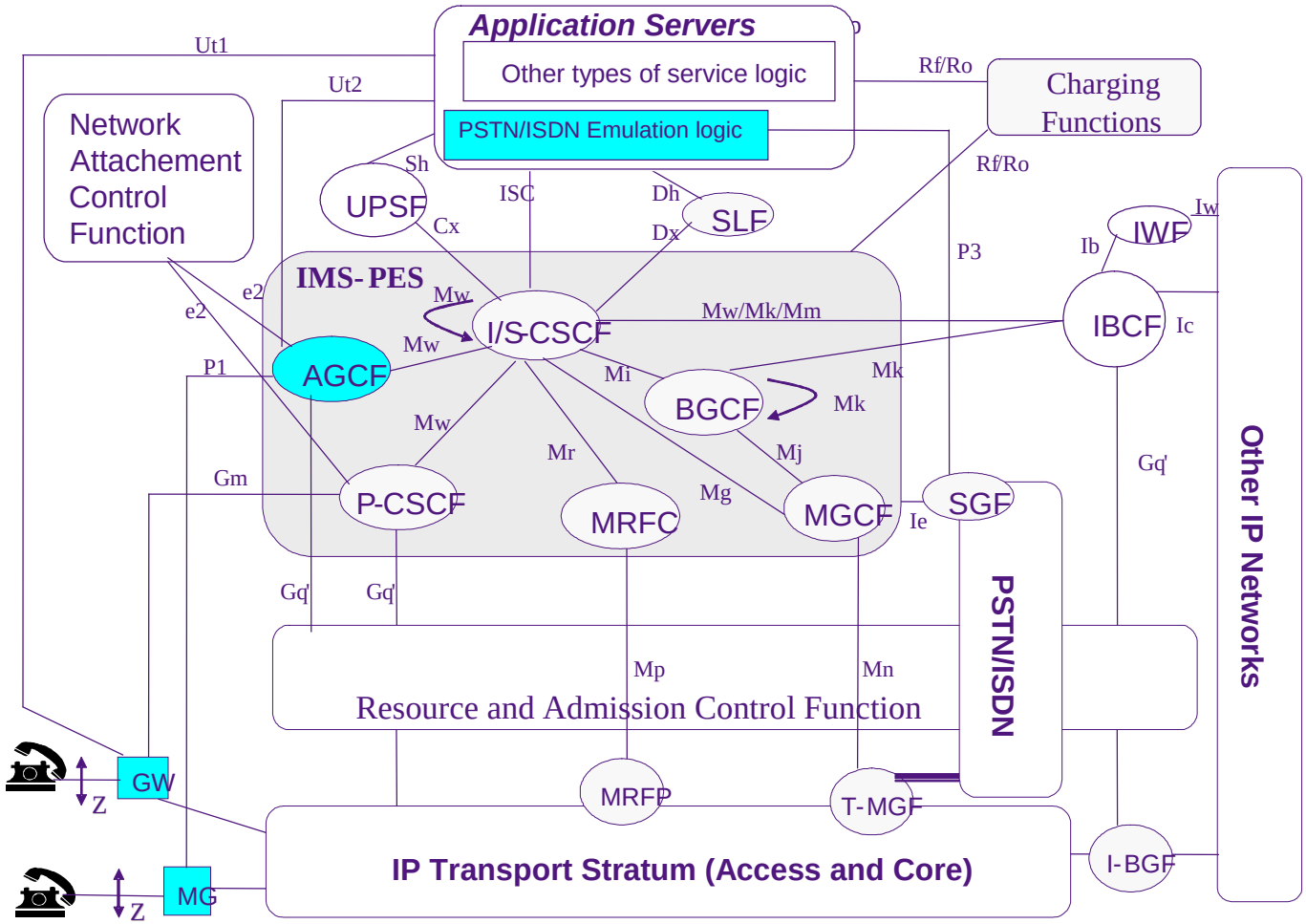
- **I5: Reference point between the CCF and RACF**
  - Allows flow of messages to request the capacity to create, modify and release resources for the media flow. When the call is set up, CCF will request the RACF to create resources for the medial flow of the call. When the call is released, CCF will be requested to withdraw the arranged resource
- **I6: Reference point between the MGCF and TMG-FE**
  - Allows flow of the register message and state notify message from TMG-FE and control message from MGCF which are used to allocate the resource such as trunk circuits, and codec resource
- **I7: Reference point between the MGCF and SG-FE**
  - Allows flow of messages for call and supplementary services control to facilitate CS-based PES interworking with PSTN
- **I8: Reference point between the IBC-FE and IBG-FE**
  - Allows flow of messages to control the IBG-FE to facilitate media codec conversion function

CS-based emulation reference points - 3

ITU-T

- **I9: Reference point between the SIF and APL-GW-FE**
  - Allows flow of information related to service request and response
- **I10: Reference point between the SSF and APL-GW -FE**
  - Allows transmission or reception of call related information to AS-FE
- **I11: Reference point between the SUP-FE and CCF**
  - Allows flow of user subscription information, such as user service characters
- **I12: Reference point between the SUP-FE and AS-FE**
  - Allows flow of user or service information to AS-FE
- **I13: Reference point between the SG-FE and PSTN/ISDN**
  - Allows flow of call control information for interworking with PSTN/ISDN
- **I14: Reference point between the IBC-FE and other PES**
  - This is an NNI with other PES, and the information flows are used to carry the call control information between PESs

Functional Architecture of IMS-based PSTN / ISDN emulation



IMS-based PES functional entities

- **Access Gateway Control Function (AGCF)**
  - Acts as an MGC for controlling media gateways functions located in residential and access gateways.
  - Interacts with the resource and admission control function (RACF)
  - Interacts with the network attachment Control Function (NACF) to retrieve line profile information.
  - Performs signalling inter-working between SIP and analogue signalling

Other functional entities which are the same as in IMS are:

- **Multimedia Resource Function Controller (MRFC)**
- **Media Gateway Control Function (MGCF)**
- **Proxy Call Session Control Function (P-CSCF)**
- **Service Call Session Control Function (S-CSCF)**
- **Interrogating Call Session Control Function (I-CSCF)**
- **Breakout Gateway Control Function (BGCF)**

IMS-based emulation reference points

- Reference points are mainly those identified for IMS

ITU-T

Future work

- Completion of activities on finalizing PSTN/ISDN emulation functional architecture
- Addressing OAM, management and control & signalling aspects

ITU-T

Conclusion

- Substantial progress has been made in defining PSTN/ISDN functional architecture as part of NGN
- Work is in progress for PSTN/ISDN emulation requirements and framework
- More works needs to be done to identify protocols at each reference point

List of Acronyms

ITU-T

ABG-FE	Access Border Gateway Functional Entity
AGC-FE	Access Gateway Control Functional Entity
AMG-FE	Access Media Gateway Functional Entity
AS-FE	Application Server Functional Entity
BGC-FE	Breakout Gateway Control Functional Entity
CCF	Charging Collection Function
CDR	Call Detail Record
CS	Call Server
CTF	Charging Trigger Function
FE	Functional Entity
IBC-FE	Interconnection Border Gateway Control Functional Entity
IBG-FE	Interconnection Border Gateway Functional Entity
ICMP	Internet Control Message Protocol
IMS	IP Multimedia Subsystem
ISDN	Integrated Services Digital Network
MGC-FE	Media Gateway Control Functional Entity
MRC-FE	Media Resource Control Functional Entity
MRP-FE	Media Resource Processing Functional Entity
PSTN	Public Switched Telephone Network
RACF	Resource and Admission Control Functions
RAN	Radio Access Network
RF	Routing Function
SIP	Session Initiation Protocol
SS-FE	Service Switching Functional Entity
SUP-FE	Service User Profile Functional Entity
TMG-FE	Trunk Media Gateway Functional Entity

ITU-T

Thank you for your attention