



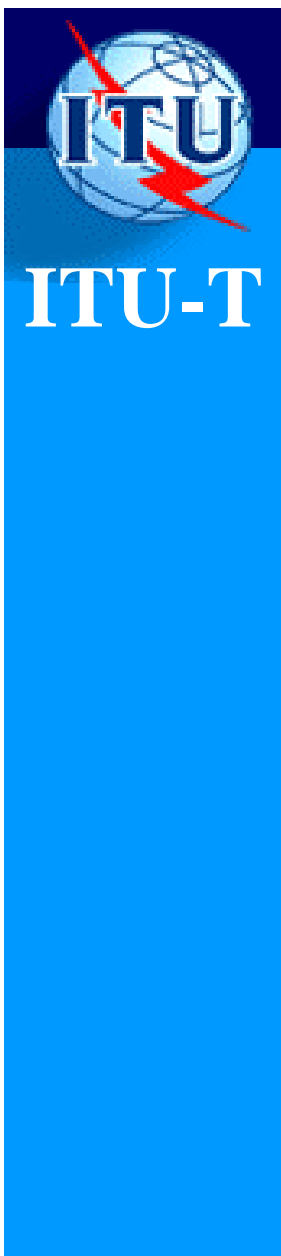
International Telecommunication Union



Quality of Service Standardization for Next Generation Networks

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ITU-T/IETF Workshop on NGN
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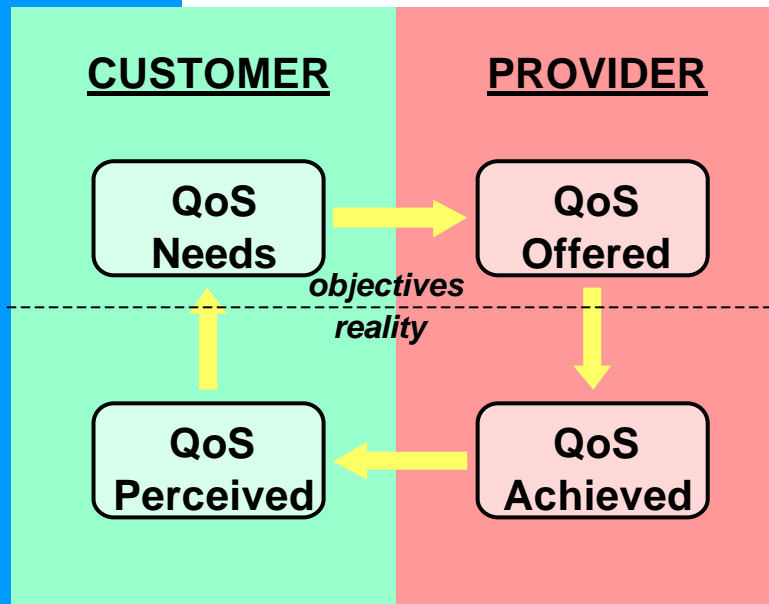
Outline

- QoS and NGN
- Key standardization areas
- Current FGNGN view on
 - Performance objectives and QoS classes
 - IP QoS signaling
 - Resource and admission control
 - Inter-domain performance measurement and management
- Summary

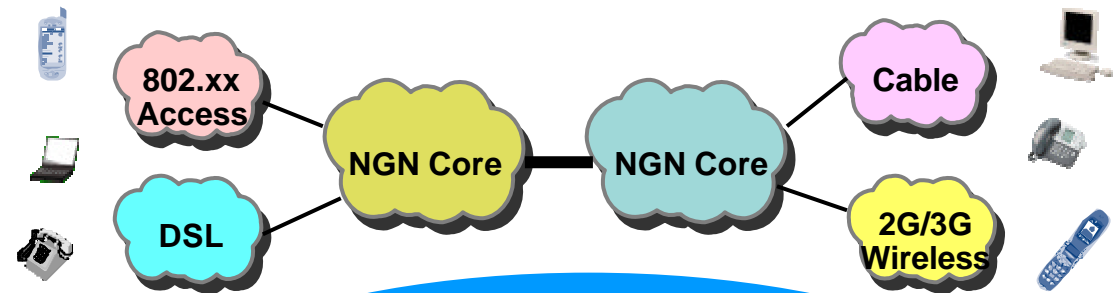


QoS and NGN

E.800 QoS: the collective effect of service performance which determines the degree of satisfaction of a user of the service

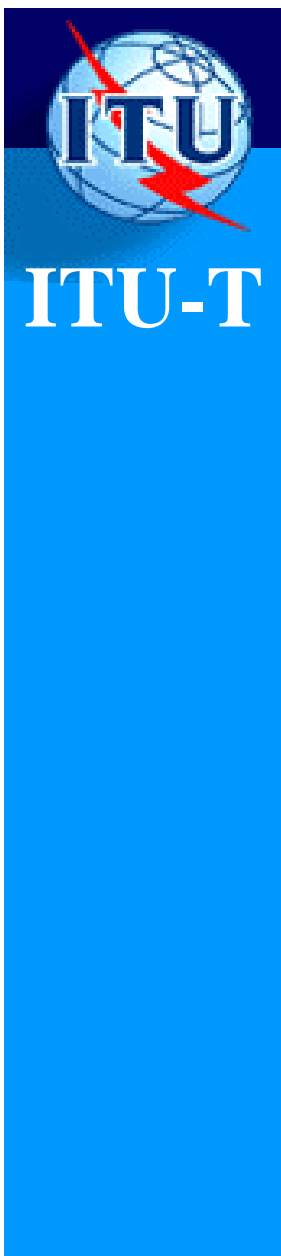


(Cf. G.1000)



- Next generation network are
- Packet based (IP, MPLS ...)
 - Without inbuilt QoS
 - Multi service
 - ...

- Customer perceived QoS is end to end, related to reliability and security
- QoS in NGN presents complex issues, including correlation with charging
- NGN QoS standards should allow for incremental deployment



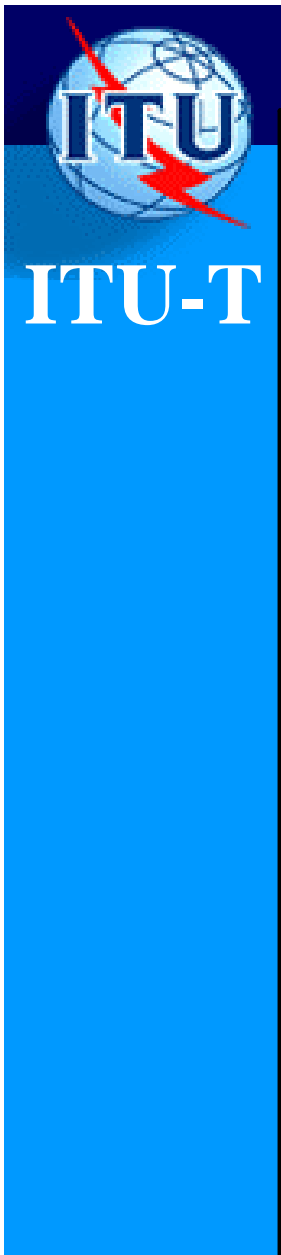
Key NGN QoS Standardization Areas in ITU-T

- 1. Performance objectives and classes
 - a. Application performance
 - b. Network performance
 - 2. Dynamic QoS controls, including
 - a. Signaling of performance requirements
 - b. Dynamic activation of QoS controls
 - c. Inter-provider QoS
 - d. Interworking of QoS mechanisms
 - e. Framework and guidelines
 - 3. Performance measurement and monitoring
 - 4. Performance assessment
- Diagrammatic connections to standardization groups:
- Group 1 (Application and Network performance): SG 12, SG 16
 - Group 2 (Dynamic QoS controls): SG 11, SG 13, FGNGN
 - Group 3 (Performance measurement and monitoring): SG 4, SG 13, FGNGN
 - Group 4 (Performance assessment): SG 12

A major goal is to define a standard toolkit for providing session QoS end to end independent of access technology

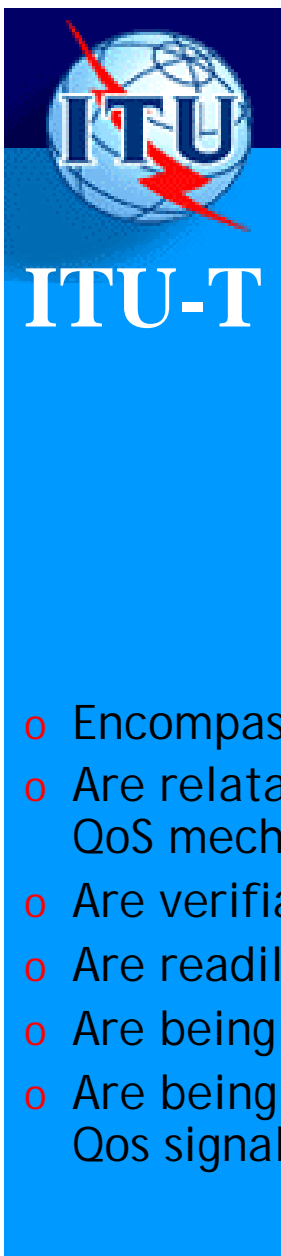


FGNGN QoS Deliverables

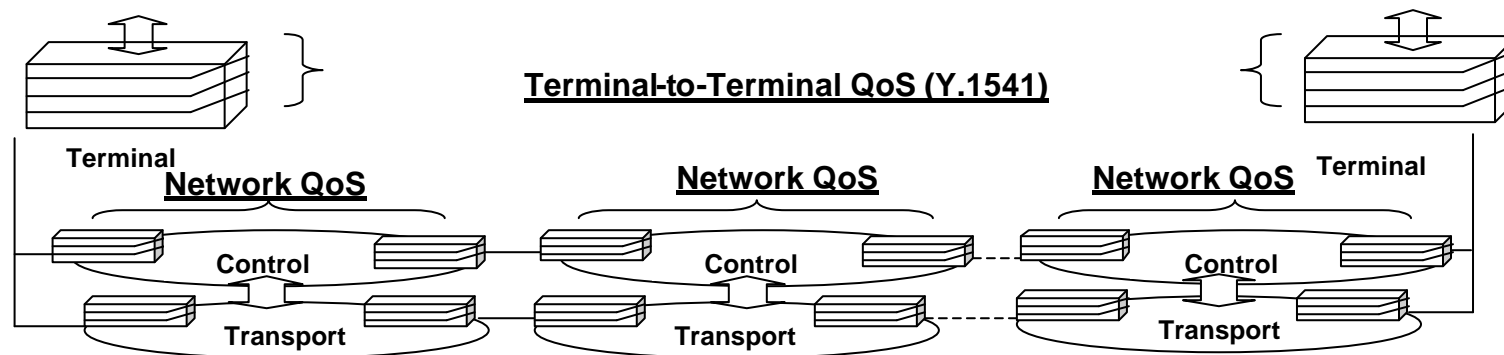


Title	Area	Latest Draft	Target Date	Status
Signalling requirements for IP QoS (TRQ.IPQoS.sig.cs1)	2.a	Q Series Supplement 51	Dec '04	A
A QoS control architecture for Ethernet-based IP access networks (TR-123.qos)	2.b	FGNGN-OD-00106	March '05	A
Multi Service Provider NNI for IP QoS (TR-msnniqos)	2.c	FGNGN-OD-00107	3Q '05	D
General aspects of QoS and network performance in NGN (TR-NGN.QoS)	1	FGNGN-OD-00129	3Q '05	D
Network perf. of non-homogeneous networks in NGN (TR-NGN.NHNperf)	1.b	FGNGN-OD-00130	3Q '05	D
Performance measurement and management for NGN (TR-pmm)	3	FGNGN-OD-00126	3Q '05	D
Resource and admission control functions (TR-RACF)	2.b-e	FGNGN-OD-00128	3Q '05	D
A QoS Framework for IP-based access networks (TR-ipaqos)	1, 2	FGNGN-OD-00113	4Q '05	D
Requirements and framework for end-to-end QoS in NGN (TR-e2eqos.1)	1, 2	FGNGN-OD-00127	4Q '05	D
A QoS architecture for Ethernet networks (TR-enet)	2.b, 2.d	FGNGN-OD-00131	4Q '05	D
Algorithms for Achieving End-to-End Performance Objectives (TR-apo)	1.b, 2.a	FGNGN-OD-00135	4Q '05	D





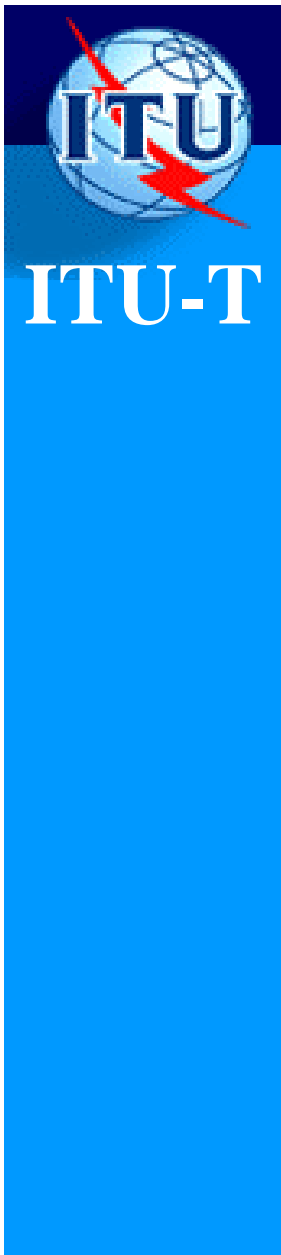
Adopt Y.1541 IP QoS Classes/Network Performance Objectives in NGN



- Encompass key IP application categories
- Are relatable to practical IP network QoS mechanisms
- Are verifiable at network boundaries
- Are readily applicable to NGN
- Are being enhanced in ITU-T SG 12
- Are being incorporated into IETF NSIS QoS signaling

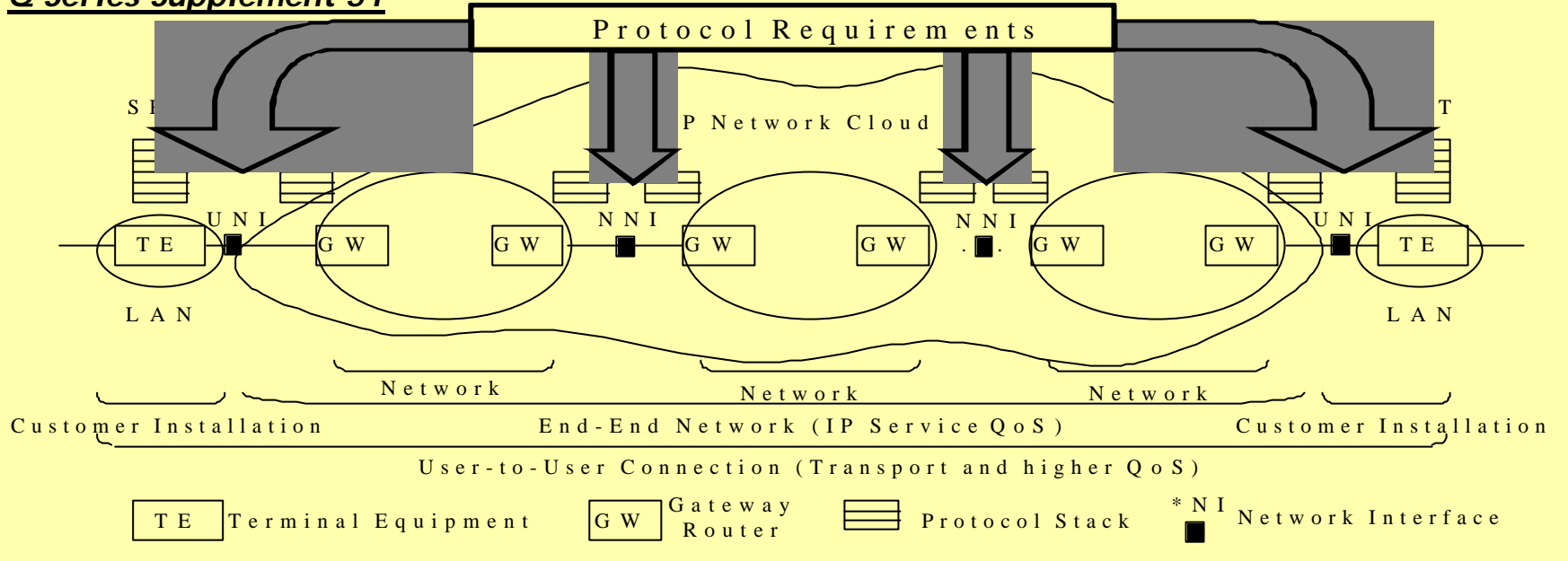
Network Performance Parameter	Nature of Network Performance Objective	Class 0 VoIP	Class 1 VoIP	Class 2 signaling	Class 3 Interactive data	Class 4 streaming	Class 5 (Unspecified)
IPTD	Upper bound on the mean IPTD	100 ms	400 ms	100 ms	400 ms	1 s	U
IPDV	Upper bound on the 1-10 ⁻³ quantile of IPTD minus the minimum IPTD	50 ms	50 ms	U	U	U	U
IPLR	Upper bound on the packet loss probability	1*10 ⁻³	1*10 ⁻³	1*10 ⁻³	1*10 ⁻³	1*10 ⁻³	U
IPER	Upper bound	1*10 ⁻⁴					U





Agree on IP QoS Signalling Requirements

Q Series Supplement 51

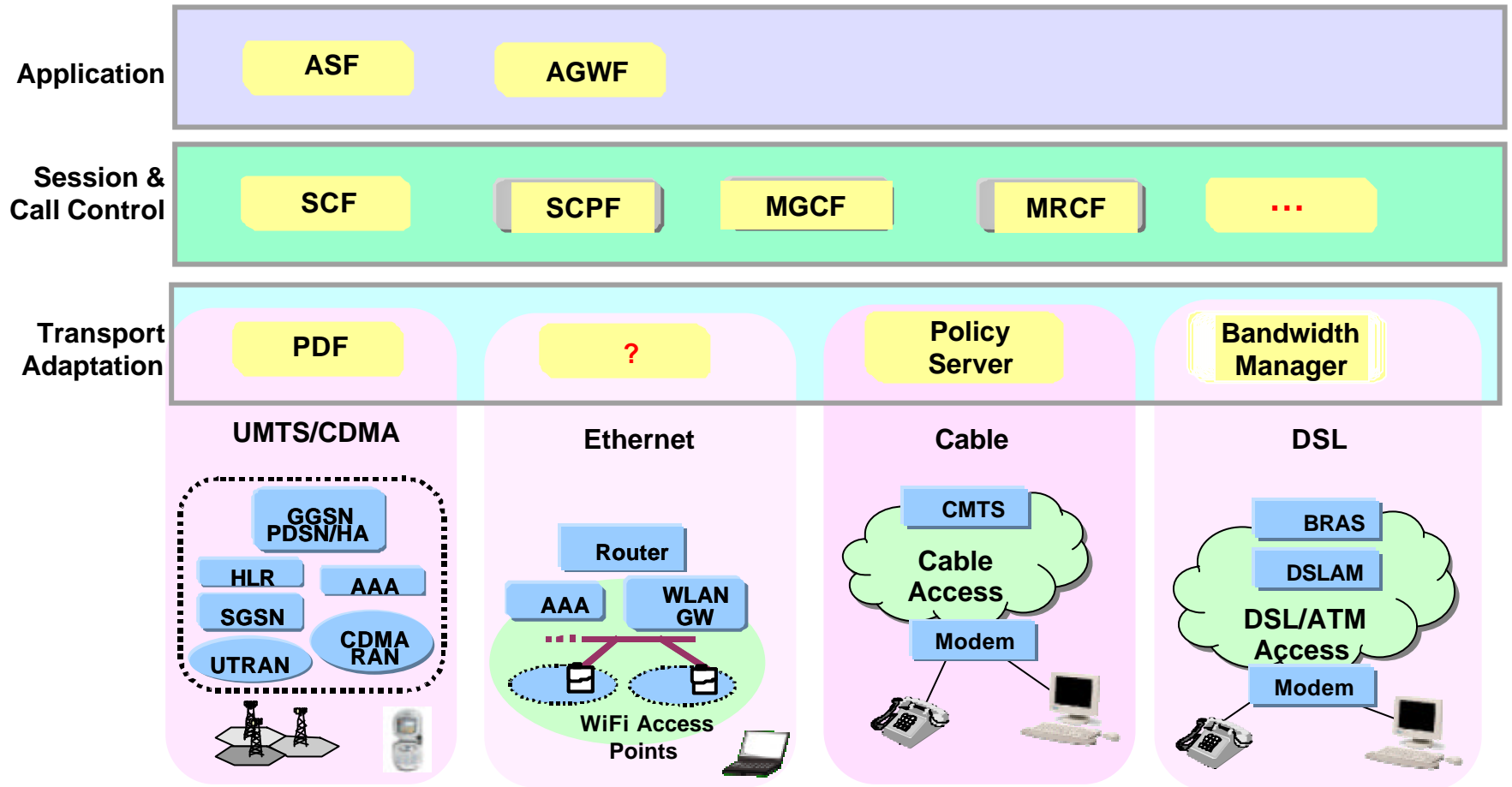


- Attributes of a QoS request
 - Y.1541, network capacity, reliability/priority
- Flow control for QoS (re-)requests, congestion aware
- Support for request-offer-answer exchanges
 - Expected performance, QoS parameter negotiation
- Parameters and values for transport connections
 - IP 5 tuple, IP DSCP
- Expressive of accumulated performance
 - Forwarded request containing achieved values, or
 - Each network communicating its contribution
- Support for release of resources
- Support for symmetric information transfer capability
- Contention resolution for resource allocation
- Error reporting
- Emergency service supported through reliability/priority
- Performance requirements for QoS requests
 - Signalling transport supporting Y.1541 QoS Class 2
 - Average delay < 800 ms
 - Max delay < 1500 ms
- Minimal number of messages for a QoS transaction
- Recovery from failures at TE, network entities
- Forward and backward compatibility



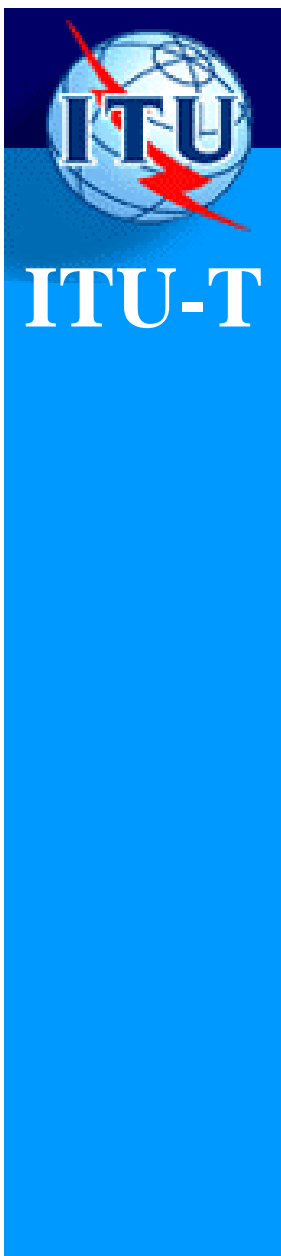


Converging Resource and Admission Control for Access and Core Networks



- o Build on the IETF policy-based admission control framework (RFC 2753) and IMS "bearer" control to support session QoS end to end
- o Include transport resource control for NAPT and firewalls

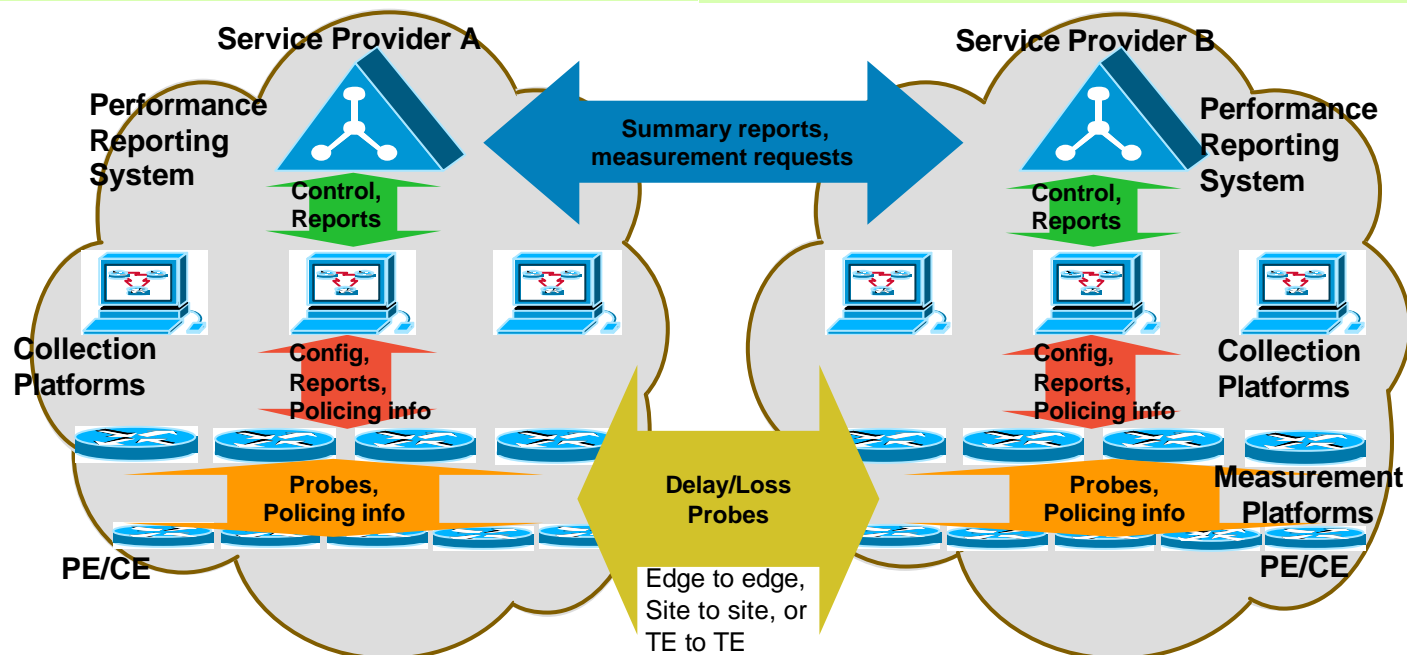


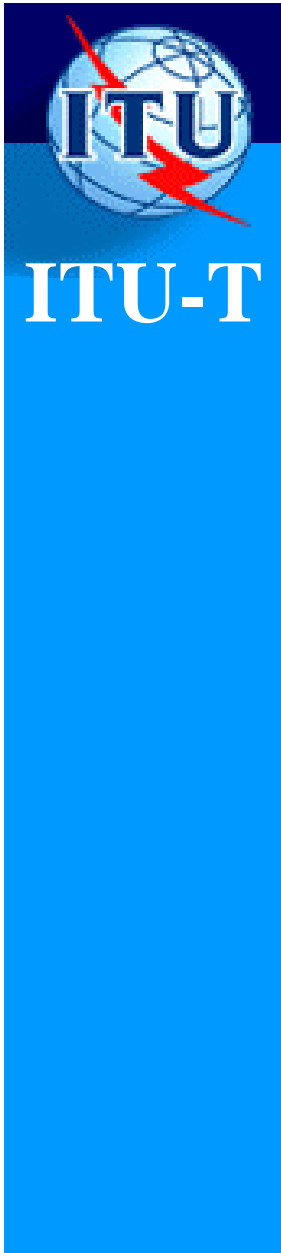


Filling Gaps in Inter-Domain Performance Measurement and Management

- Unspecified options, parameters
- Concatenation of performance over multiple network segments
- Accuracy
- Data handling
- Define attributes to be measured
 - Mean delay, **delay variation**, packet loss, **unavailability**

- Specify how attributes are measured
 - Proposed default rollup period one hour
 - Active probes tailored to service classes (telephony, multimedia streaming, low latency data)
 - Default probe transmission period 1 sec.
 - Clock synchronization to Coordinated Universal Time through GPS
 - Algorithms for computing performance
- Specify the inter-PRS interface





Summary/Next Steps

- Multiple drafts under development address various QoS issues with different levels of maturity
 - Continuing rationalization
 - Synergistic cooperation with relevant standards development organizations
- Y.1541 QoS classes/performance objectives and Y.1221 traffic descriptors have been adopted for use in NGN
 - Interworking and harmonization with other QoS classification schemes
 - Apportionment of performance values across networks
- Approved IP QoS signaling requirements provides a basis for developing needed protocols
 - Making use of existing or emerging standard protocols?
 - In-band versus out-of-band signaling
 - Path-coupled versus path-decoupled signaling
- A consistent approach to resource and admission control in access, core and at interconnects is emerging
 - Checking against requirements and alignment with the overall architecture
 - Completion of information flows and interface requirements
 - Selection or development of the protocols for the interfaces
- A standard approach for inter-domain performance measurement and management is emerging
 - Agreement on the specifics of active probes and protocols for discovery of and performance data exchange between performance reporting systems
 - Tuning of parameter values and alignment with Y.1541

