NSIS QoS signaling and DiffServ SLSs: interfaces and requirements

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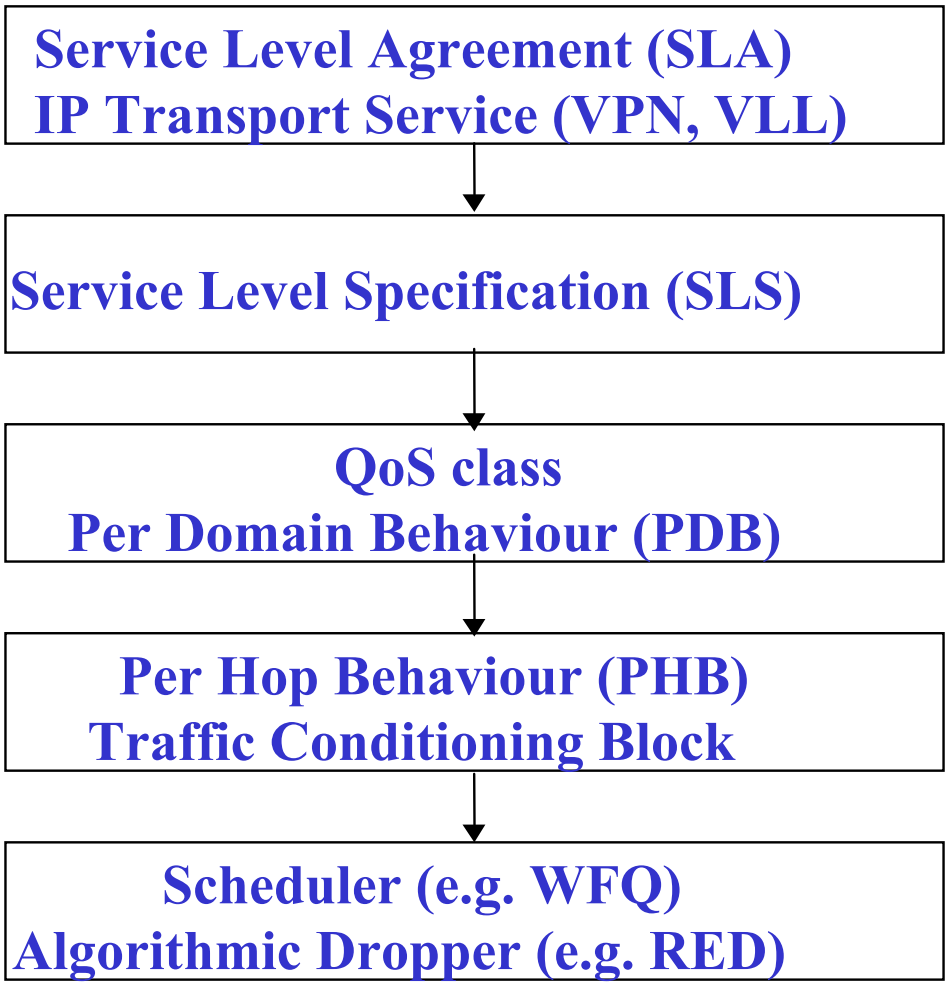
Outline

- TEQUILA SLSs and provisioning approach
- The IETF NSIS working group
- A proposal for a QoS signaling framework
- Conclusions

TEQUILA Key Concepts

	PSTN	*TEQUILA*
Technology	Circuit-switching	IP DiffServ
Granularity	64 kbps	DSCP, PHB
Service	Voice call	Service Level Specifications
Dimensioning	Erlang-B	Resource Provisioning Cycle
Allocation	CAC	2-level Admission Control

DiffServ: From SLA to Packets



- Non-technical terms & conditions
- technical parameters :{SLS}-set

- IP service traffic characteristics
- offered network QoS guarantees

- Network QoS capabilities
- DiffServ edge-to-edge aggregates

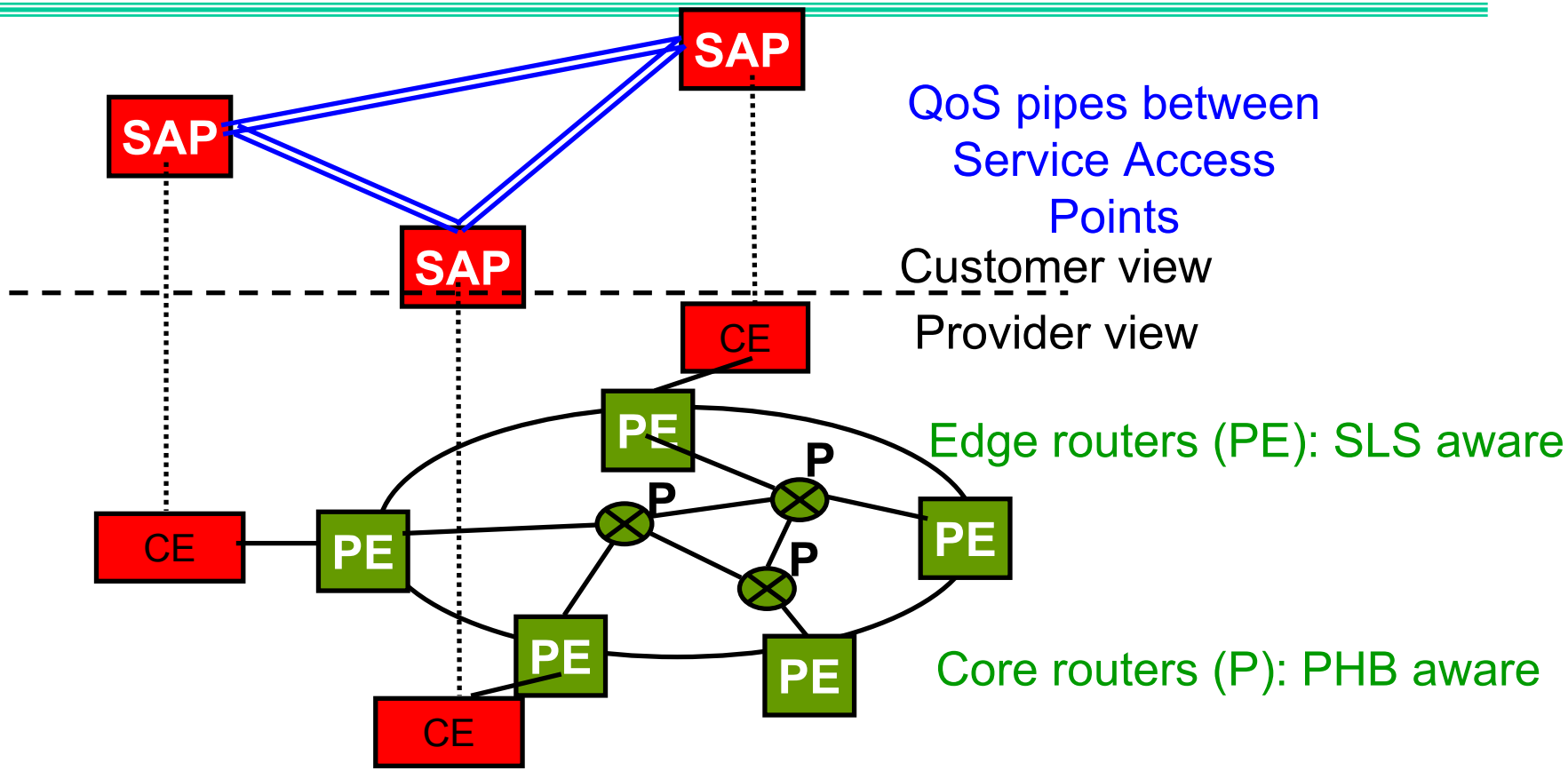
- Generic Router QoS capabilities
- DiffServ core & edge routers

- vendor & product specific implementation

TEQUILA SLSs defined

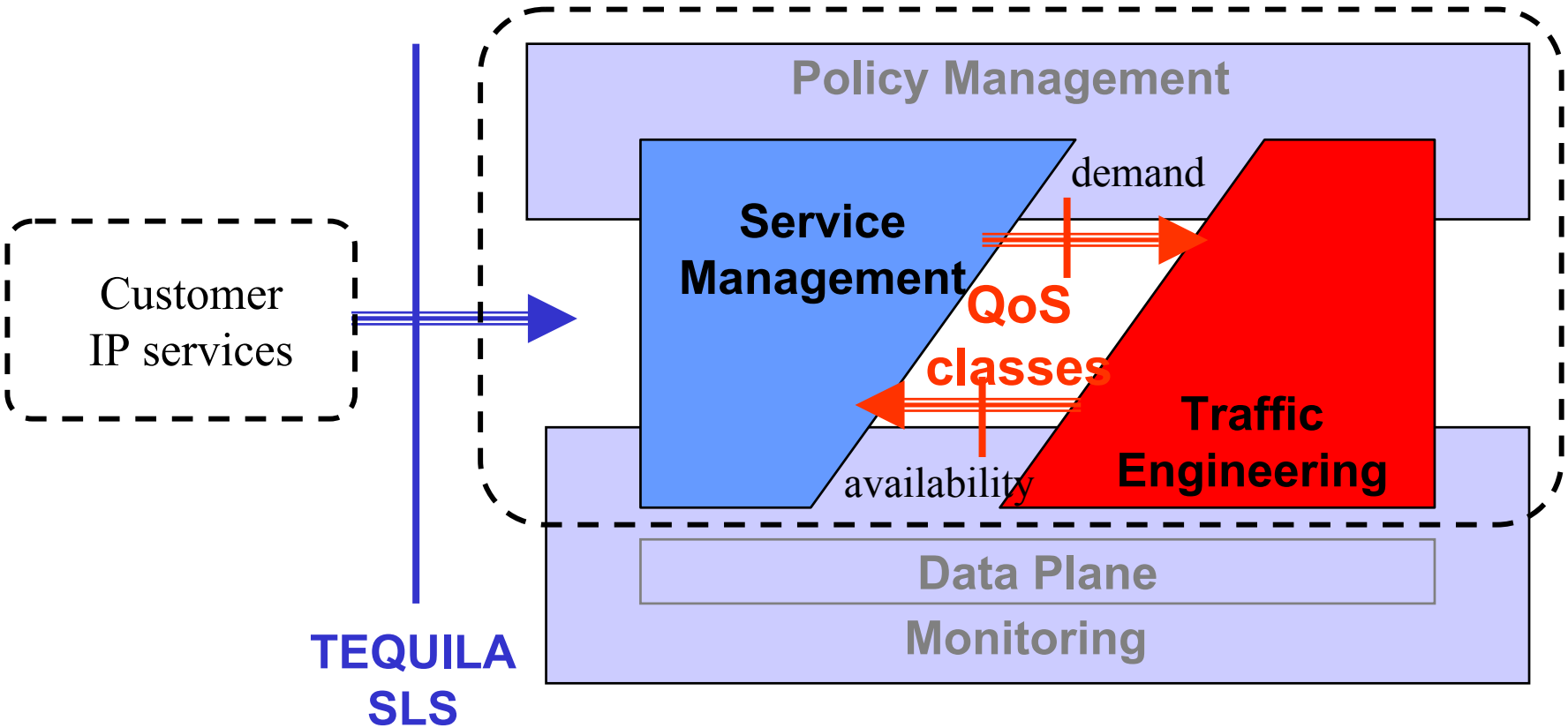
Parameter Group	Description
Customer-user Id	Identifies the *customer*
Flow descriptor	*Packet stream* (DSCP, IP addresses, etc)
Service Scope	*Geographical region* (ingress–egress)
Service Schedule	Specifies *when* the contract is applicable
Traffic descriptor	*Traffic envelop* (e.g. a token bucket)
QoS Parameters	*QoS guarantees* (delay, jitter, packet loss)
Excess Treatment	*Traffic conditioning* (dropping, remarking)

SLS Usage: overlay networking

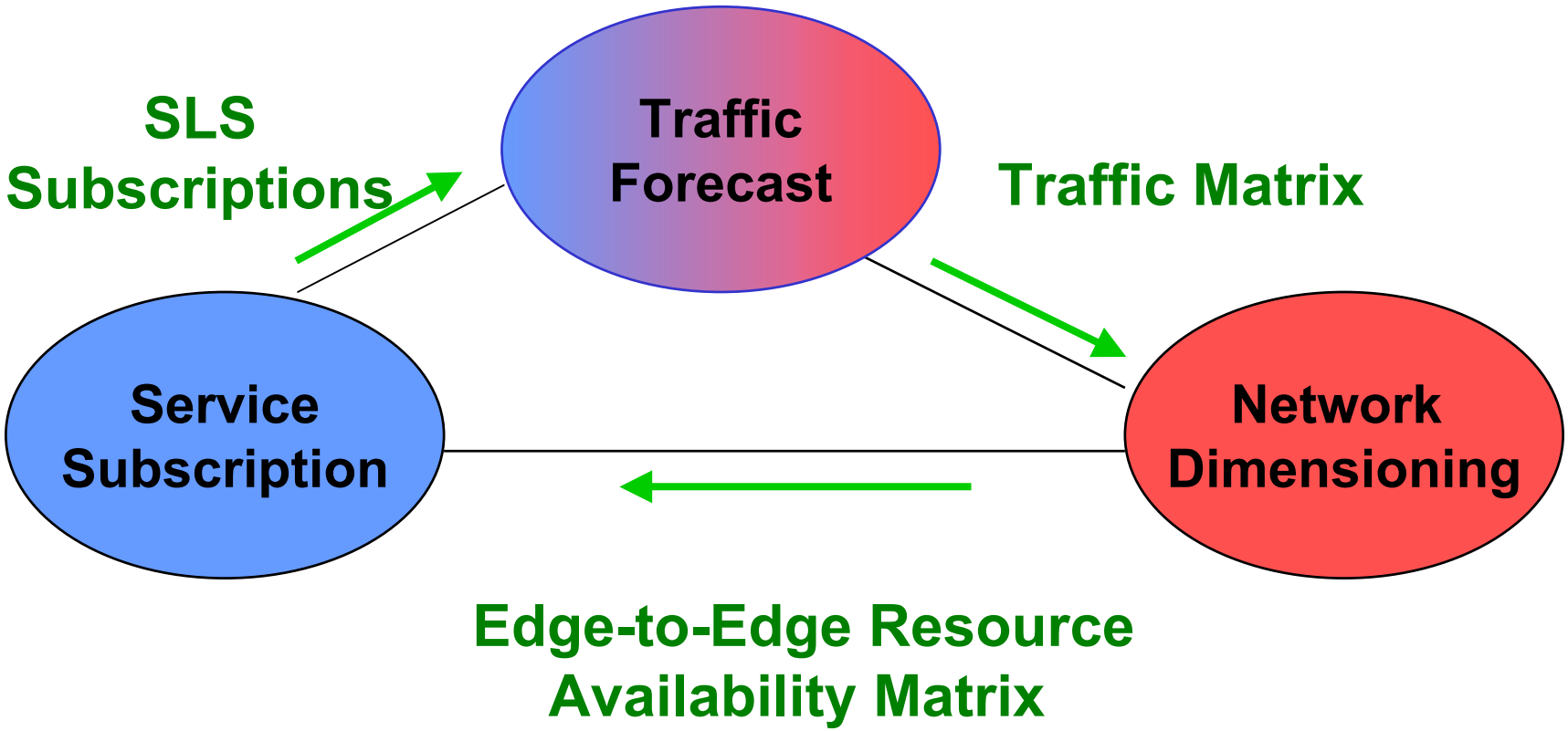


- SLS = components for e.g. IP QoS VPNs
  - Kick-off of QoS VPNs editing group in the IETF PP-VPN working group

Tequila Approach for IP QoS Delivery

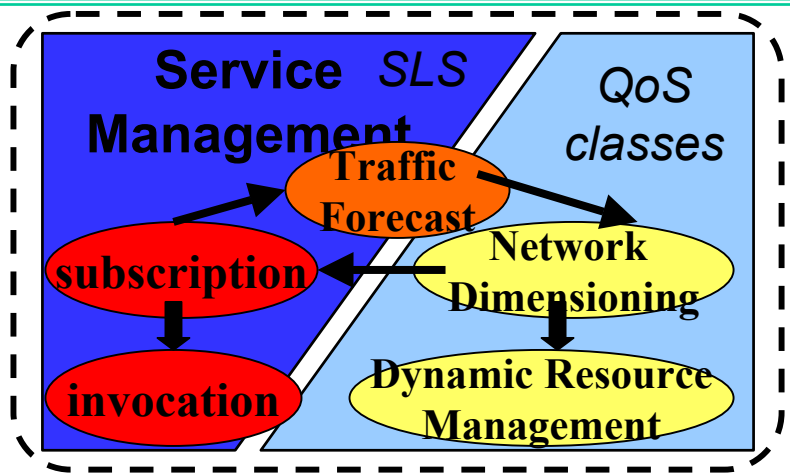


TEQUILA Provisioning concept
Resource Provisioning Cycle



- SLS-driven traffic engineering

TEQUILA main principles



- Clear separation of service & resource management
  - service system: only *edge-to-edge* view on the network
  - resource system: only QoS class aware (*no SLS-awareness*)
- Two-level approach for resource management
  - long-term IP aggregates: based on *Resource Provisioning Cycle*
  - short-term flows: invocations within guidelines set by RPC

NSIS/Tequila - conclusions

- What will TEQUILA be remembered for ?
  - TEQUILA SLSs -> IP QoS VPNs (IETF PP-VPN WG)
  - Resource Provisioning Cycle - SLS-driven Traffic Engineering
  - Two-phase approach: subscription & invocation
- State of the Art beyond TEQUILA...
  - NSIS: scalable invocation means for QoS signaling, bandwidth on demand and admission control
  - NSIS: Inter-domain QoS ?

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NSIS IETF working group

- Chairman: John Loughney (Nokia)
- Chartered in November 2001
- NSIS main goals
  - QoS signaling requirements
  - framework for QoS signaling architecture
  - analysis of existing signaling protocols
- Drafts
  - Number of draft contributions so far: 14
  - NSIS WG draft: "Requirements for QoS Signaling Protocols", `draft-ietf-nsis-req-01.txt`, M. Brunner, April 2002.
  - Alcatel: "QoS signaling requirements, interfaces and architecture", `draft-buchli-nsis-req-00.txt`, February 2002.

Where are we ?

- Trying to better define...
  - the Scope of NSIS,
  - the list of QoS signaling requirements
  - the fundamental NSIS QoS entities

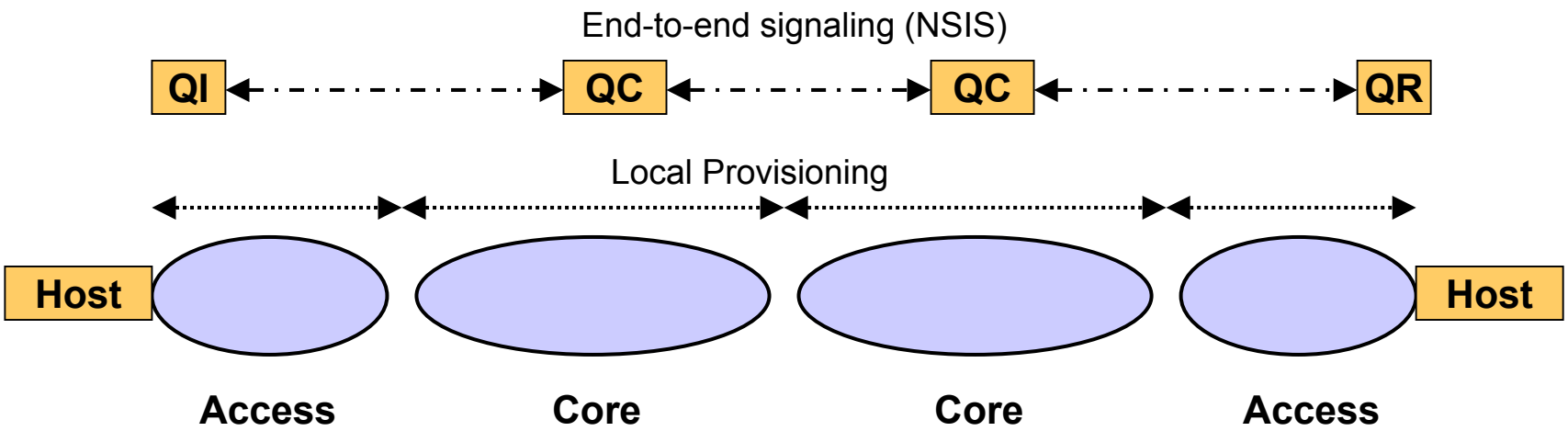
- Trying to avoid as much work as possible...
  - Re-use of existing QoS technologies when possible
  - No development of new resource allocation protocol
  - Use existing signaling (i.e. RSVP) as the basis

Current NSIS debates

- Different opinions
  - QoS signaling only needed in access networks
  - end-to-end QoS signaling needed
  - nothing new is needed: use RSVP

- Alcatel position
  - The first QoS bottleneck is of course in access, but…
    - access: re-use existing (L2) QoS as much as possible
  - … QoS is definitely an end-to-end feature
    - core: how to keep things scalable ? How to avoid the *chicken and egg* deployment problem with router (QoS) upgrades ?

NSIS entities



- QoS Initiator (QI) & QoS Receiver (QR) may be outside end-host
- QoS Controller (QC) may be in-band or out-of-band
- QoS provisioning approach may differ per domain

NSIS entities

- QoS Initiator
  - initiates NSIS signaling
  - does not need to be located in the end-host
- QoS Controller
  - does per-flow admission control
  - has view on pre-provisioned resources
  - may be implemented outside the router (out-of-band)
- QoS Receiver
  - acknowledges a successful reservation setup
  - does not need to be located in the end-host

A jungle of requirements...

- Requirements are grouped by
  - architecture and design goals
  - signaling flows
  - additional information beyond signaling of QoS information
  - layering
  - QoS control information
  - performance
  - flexibility
  - security
  - mobility
  - interworking with other protocols and techniques
  - operational

So, focus on key core requirements

- Gradual Deployment
  - deployment on existing networks, equipped with QoS provisioning mechanisms
- Scalability
  - number of signaling messages
  - amount of reservation state in QoS Controller
  - CPU use
- Decouple QoS signaling and provisioning
  - Re-use existing (local) QoS provisioning if possible...
  - … and buy the TEQUILA system

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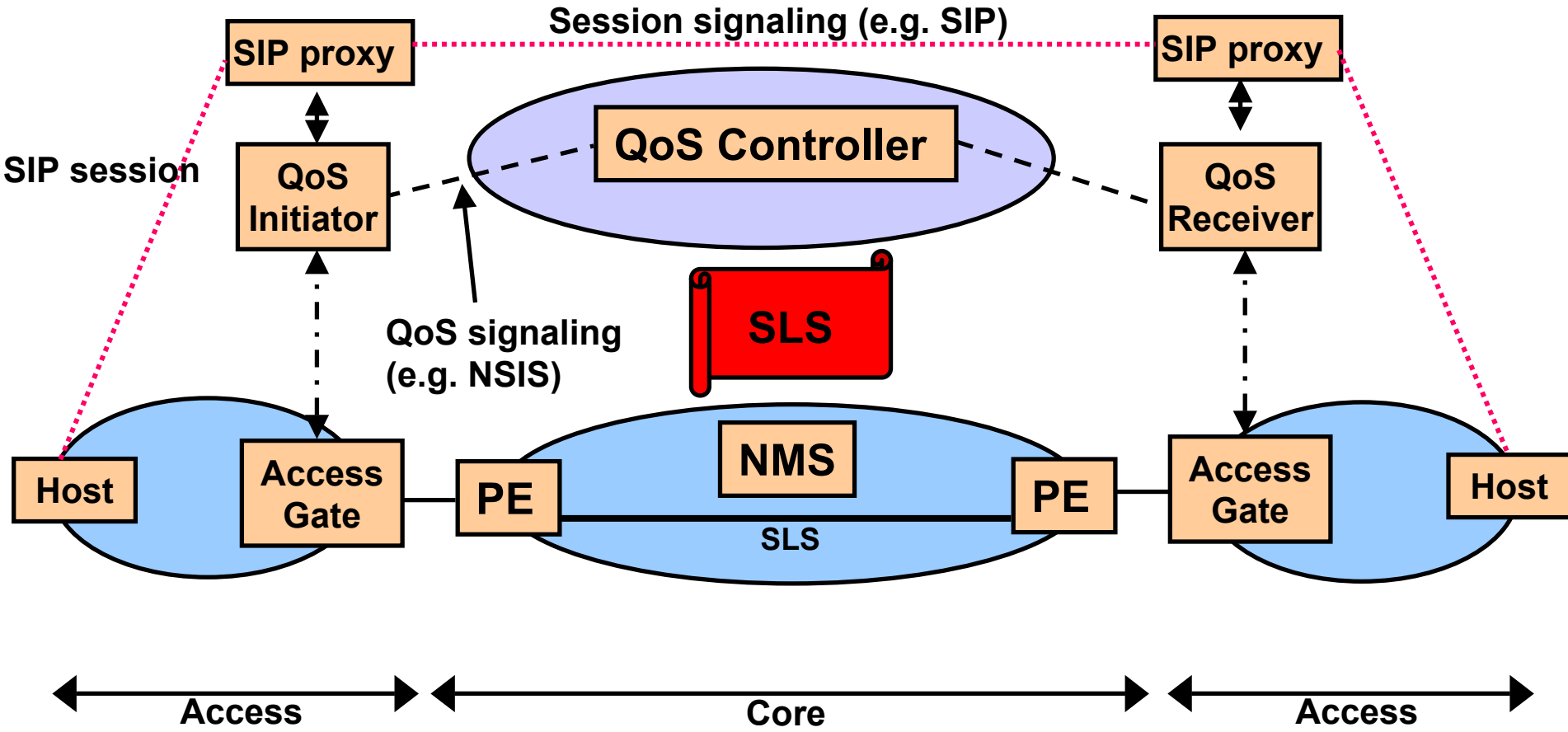
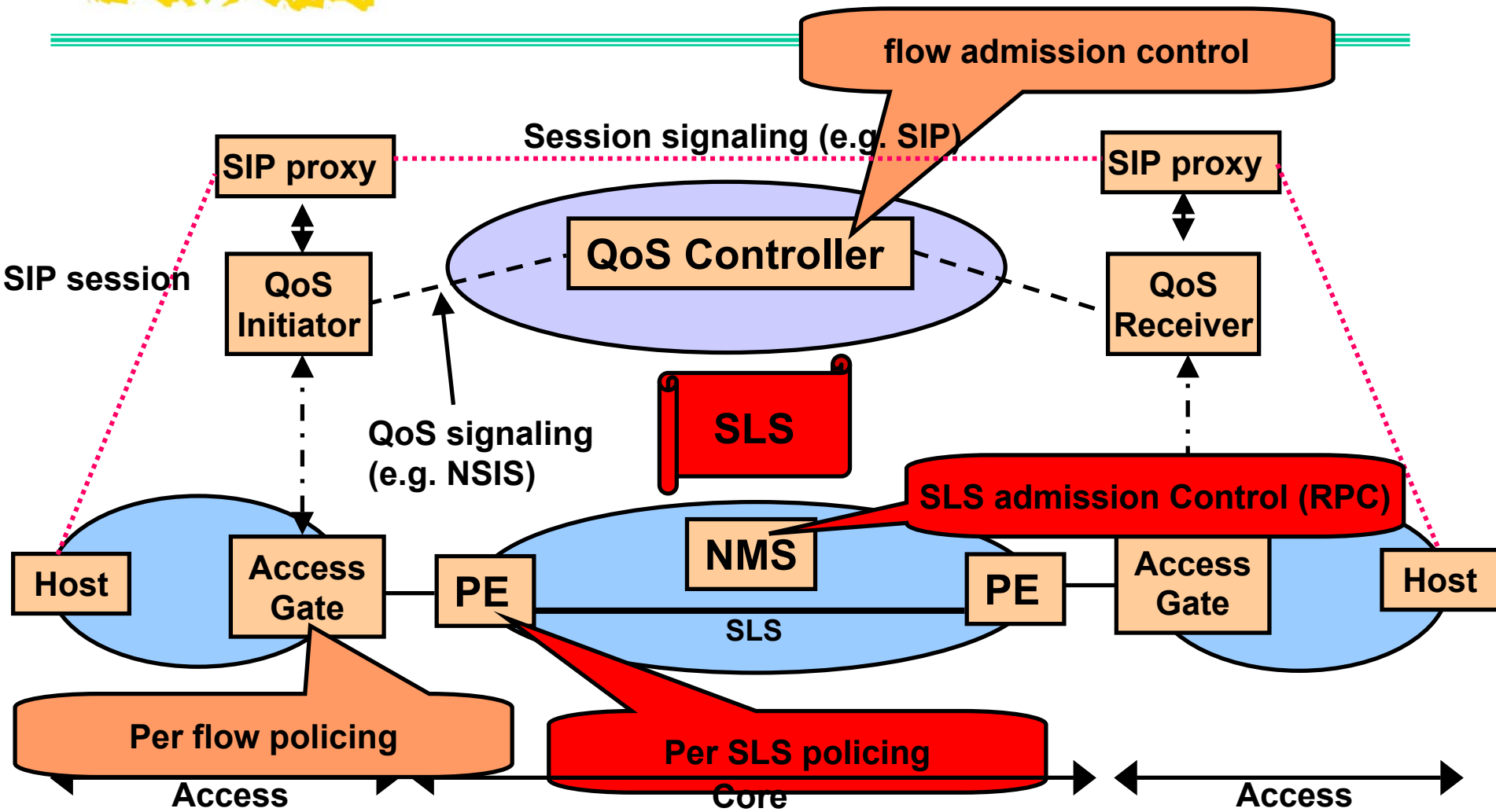
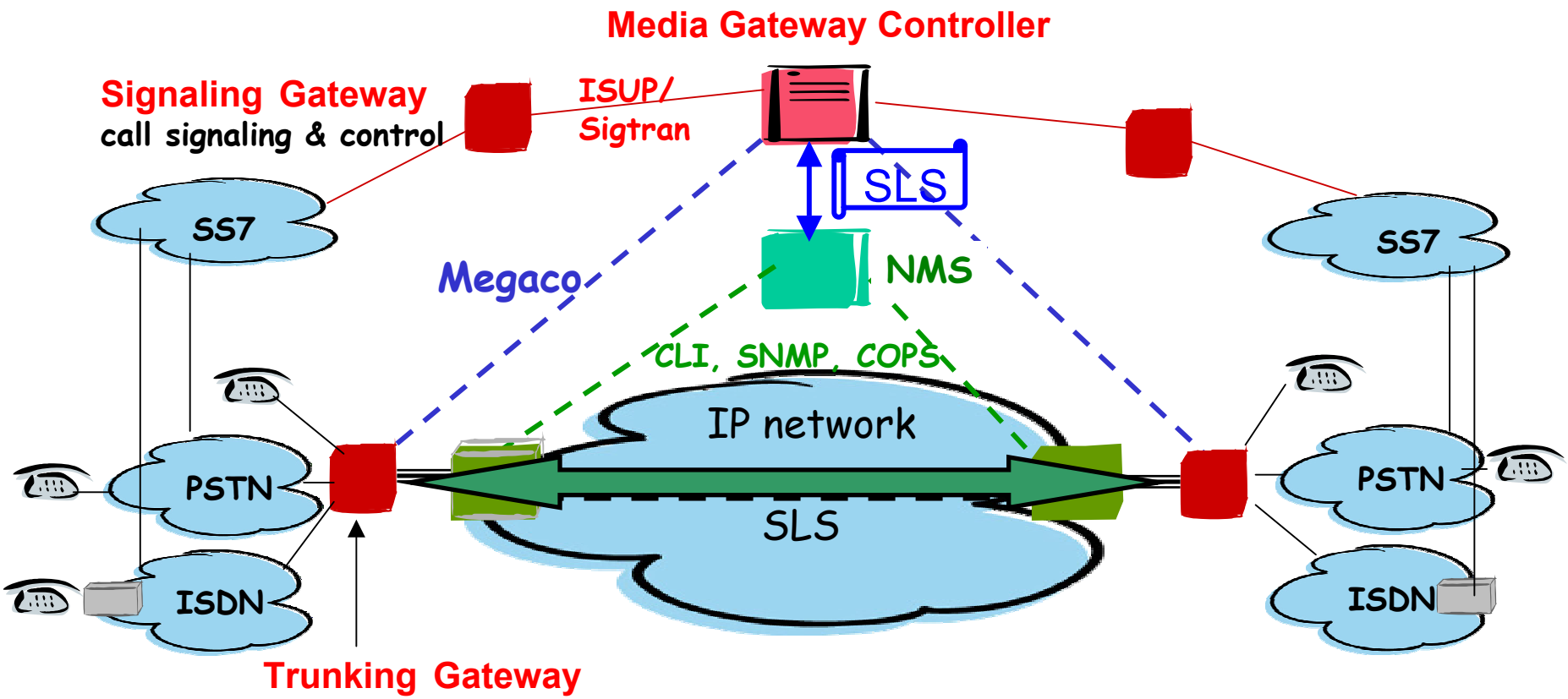
A QoS signaling framework



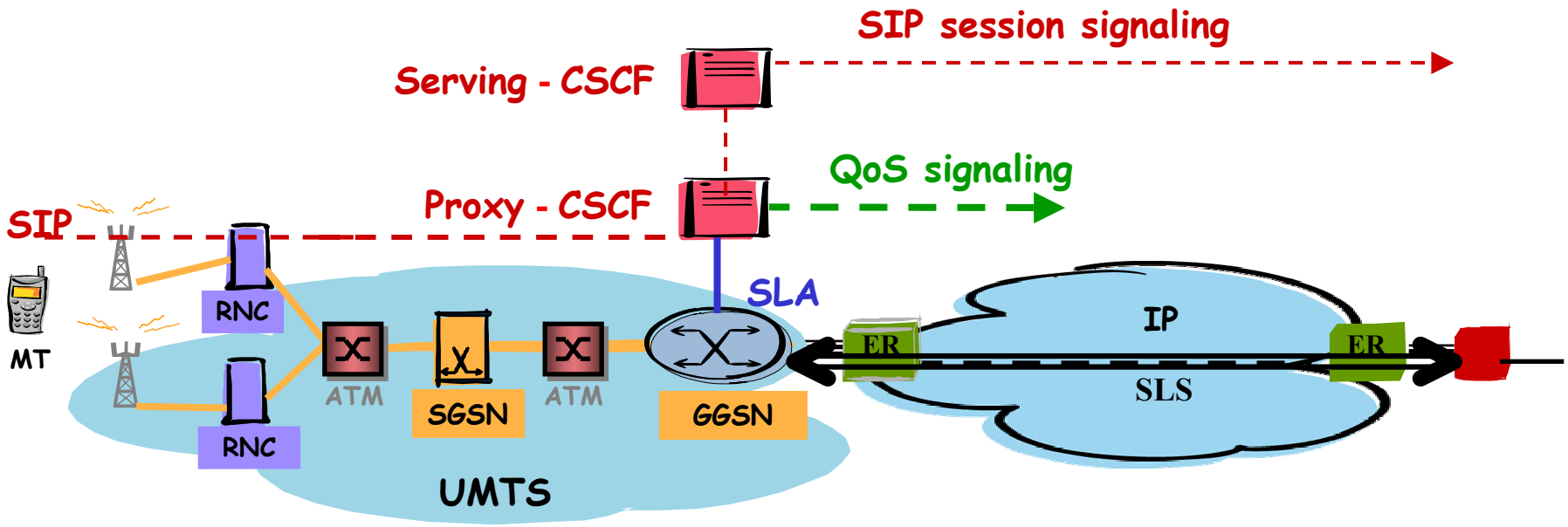
A QoS signaling framework

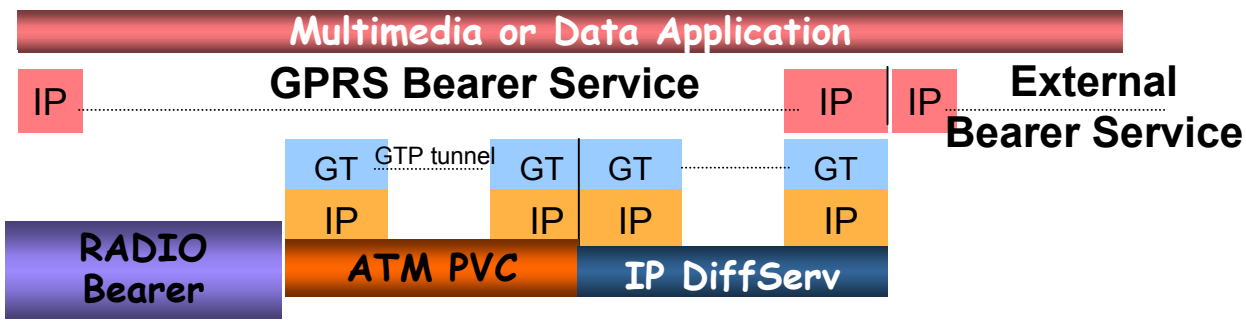


Example scenario 1
PSTN Trunking Gateways



Example scenario 2
UMTS access





CSCF: Call State Control Function
GPRS: General Packet Radio Service
GGSN: Gateway GPRS Support Node
SGSN: Serving GPRS Support Node
RNC: Radio Network Controller
MT: Mobile Terminal

Tackling scalability...

- Two level approach for QoS provisioning
  - Step 1: provisioning of SLSs by Network Management System (NMS) yielding QoS highways for traffic aggregates (DiffServ)
  - Step 2: per-flow admission control within the SLSs
    - ***No interaction with the routers in the IP network***

- QoS Controller has knowledge of
  - established SLSs (bandwidth, QoS guarantees)
  - current utilization of the bandwidth pipes

Tackling deployment issues...

- Re-use of QoS technology in access
  - no need for changing access equipment
- Out-of-band signaling in core networks
  - no need for router upgrades with a QoS signaling protocol

Standardization needs

- Per-flow QoS signaling protocol (NSIS)
  - mandatory for end-to-end QoS
  - can be kept simple based on two-step approach
- DiffServ SLS signaling protocol
  - semi-dynamic renegotiations of bandwidth pipes
  - providing monitoring feedback

Conclusions

- Decouple provisioning and signaling
- Two phases
  - Provisioning of traffic trunks (e.g. Tequila SLSs)
  - Per-flow QoS signaling (e.g. NSIS) and admission control into pre-provisioned traffic trunks
- Two issues to keep in mind
  - scalability
    - two-step approach for offering per-flow QoS
  - deployment
    - re-use of access QoS signaling and mechanisms
    - out-of-band signaling in core networks (no per-flow interaction with the routers)

Relevant IETF drafts

- NSIS:http://www.ietf.org/html.charters/nsis-charter.html

- "Requirements for QoS Signaling Protocols", `draft-ietf-nsis-req-01.txt`, M. Brunner, April 2002.
- "QoS signaling requirements, interfaces and architecture", `draft-buchli-nsis-req-00.txt`, M. Buchli et al., February 2002.
- "Service level specifications parameters and semantics", `draft-tequila-sls-02.txt`, D. Goderis et al., February 2002.
- "A framework for end-to-end user perceived quality of service negotiation", `draft-bos-mmusic-sdpqos-framework-00.txt`", L. Bos et al., November 2001