

Navigating QoS Protocols

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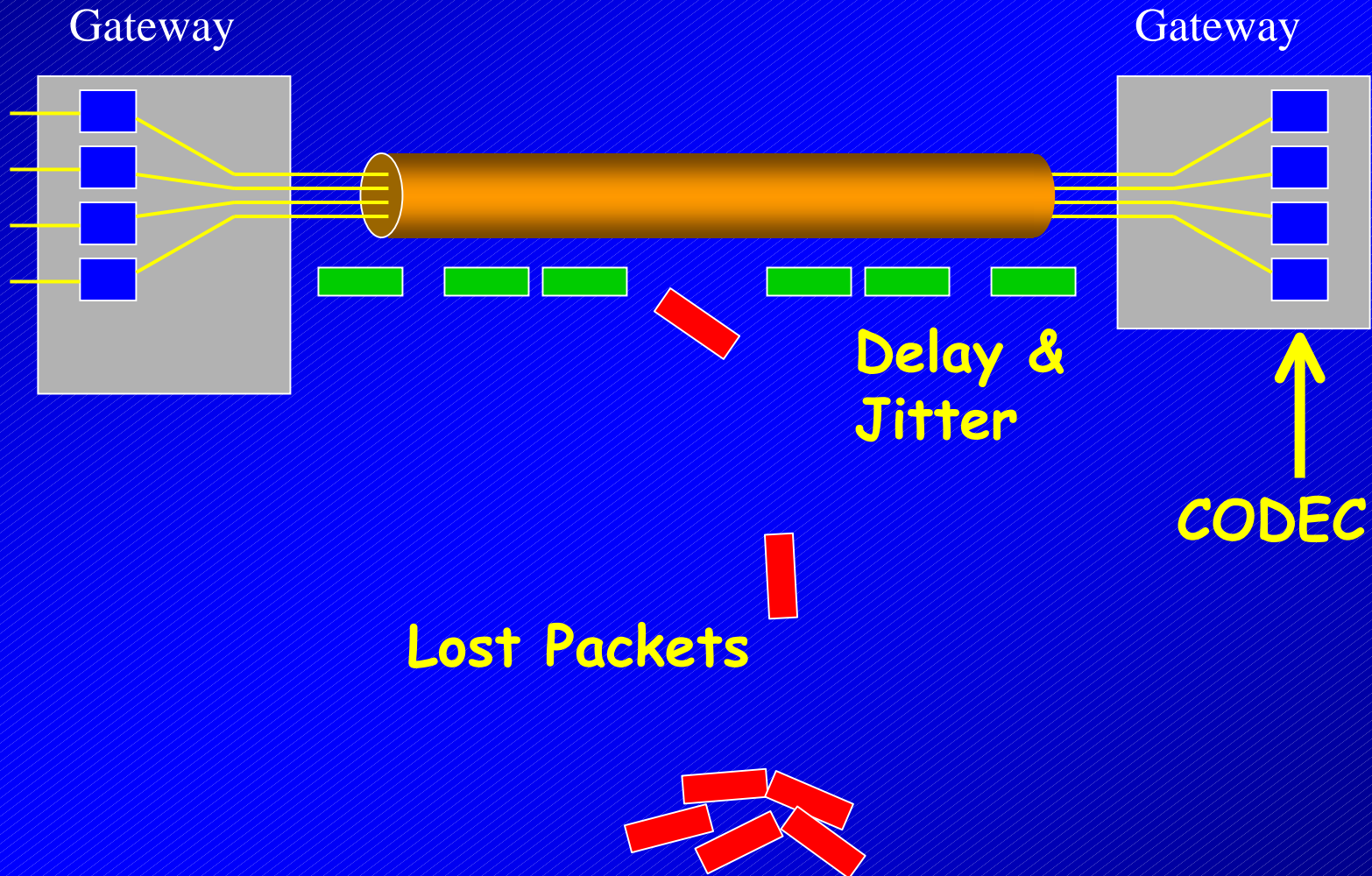
About Telchemy

- **Focus** - deliver end-user perceived QoS with minimum use of network resources
- **Approach** - open architecture, software based, integrate with any VoIP systems
- **First products** - lightweight call quality monitoring software for integration into VoIP Gateways, IP Phones and SLA monitors
- **Current development** - QoS Server, providing Call Admission Control, Bandwidth Management

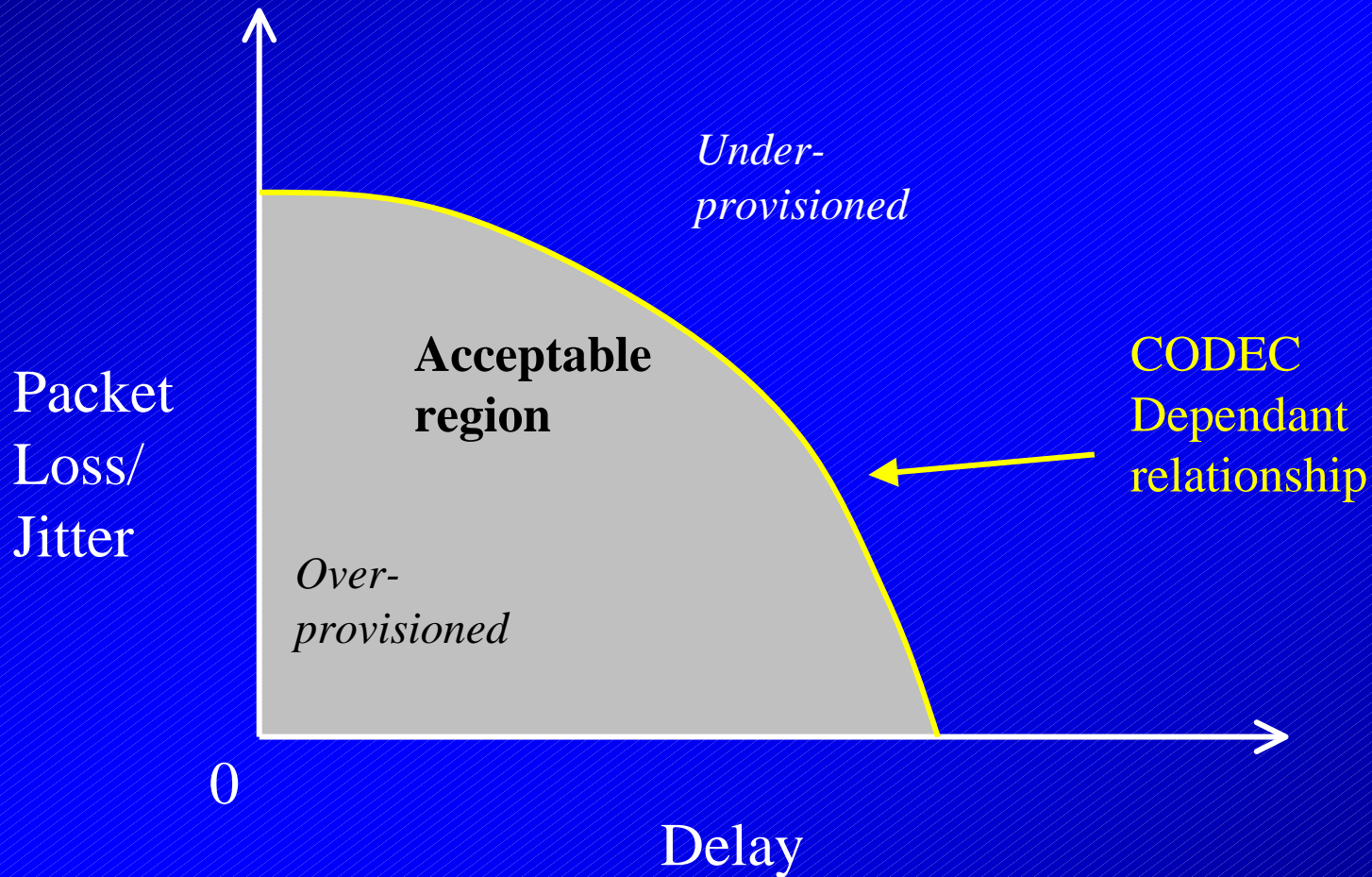
Why Manage QoS?

- Maintain end-user perceived quality
 - *Subscriber retention/ satisfaction*
- Minimize network operating costs
 - *Avoid over provisioning*
- Enforce Service Level Agreements
- Support differentiated service levels
- Identify performance problems/
trends

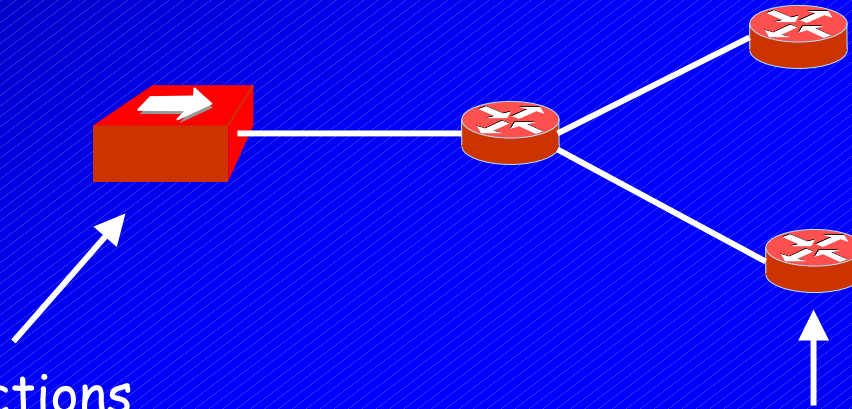
Factors impacting quality



Factors affecting VoIP QoS



QoS Control - *router functions*



Edge router functions

- *allocate traffic to diff-serv classes*
- *separate queues for each class:-*
 - *admission control*
 - *traffic shaping*

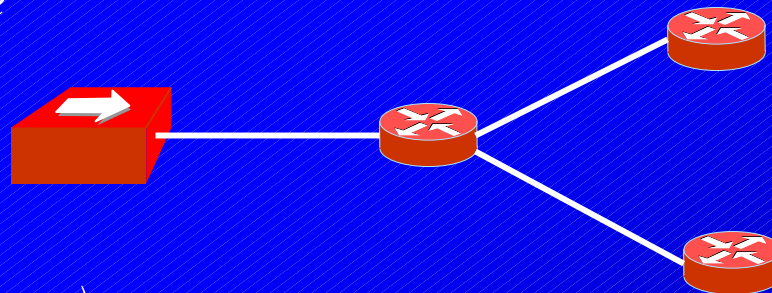
Core Router functions

- *Class dependant queueing*
- *Bandwidth reservation*
- *Congestion mitigation (RED)*

QoS Control .. *x-serv*

Int-serv

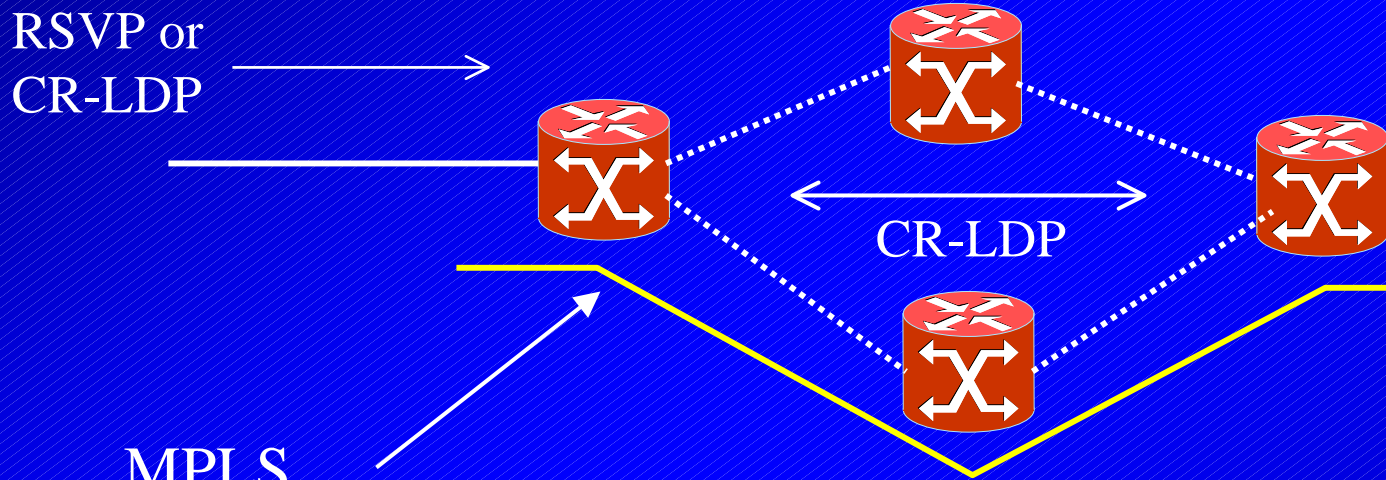
- *Bandwidth reservation using RSVP (microflows)*
- *Service Classes*
 - *Guaranteed service*
 - *Controlled Load service*
 - *Best Efforts service*



Diff-serv

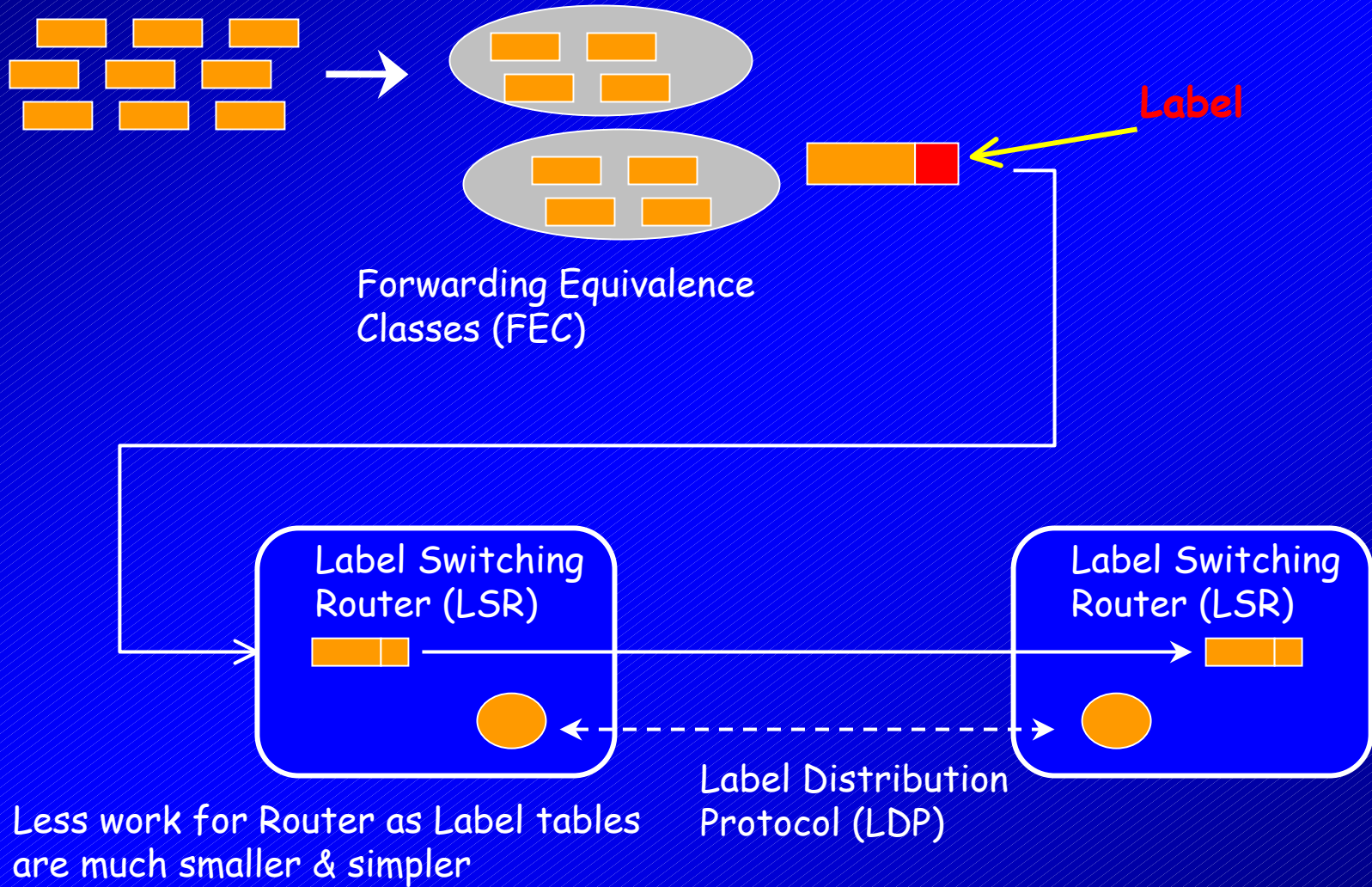
- *Maps traffic onto Classes (flows)*
- *Per-Hop-Behaviour*
 - *Expedited Forwarding*
 - *Assured Forwarding*
 - *Default (Best effort)*

QoS Control - MPLS

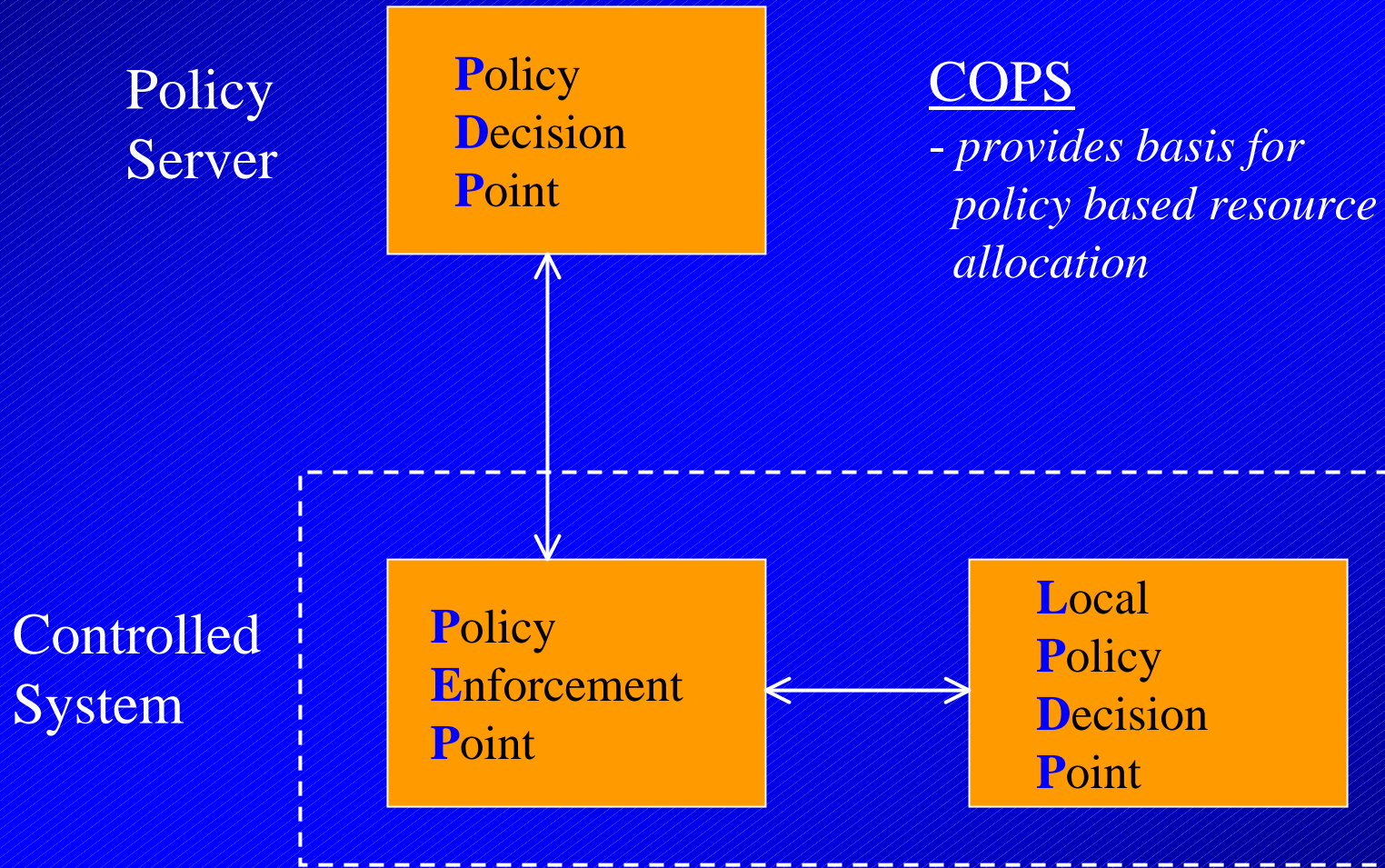


- *Creates “pipes” through network which have defined QoS characteristics*
- *Can support int-serv and diff-serv*
- *Supports QoS based path establishment using CR-LDP*

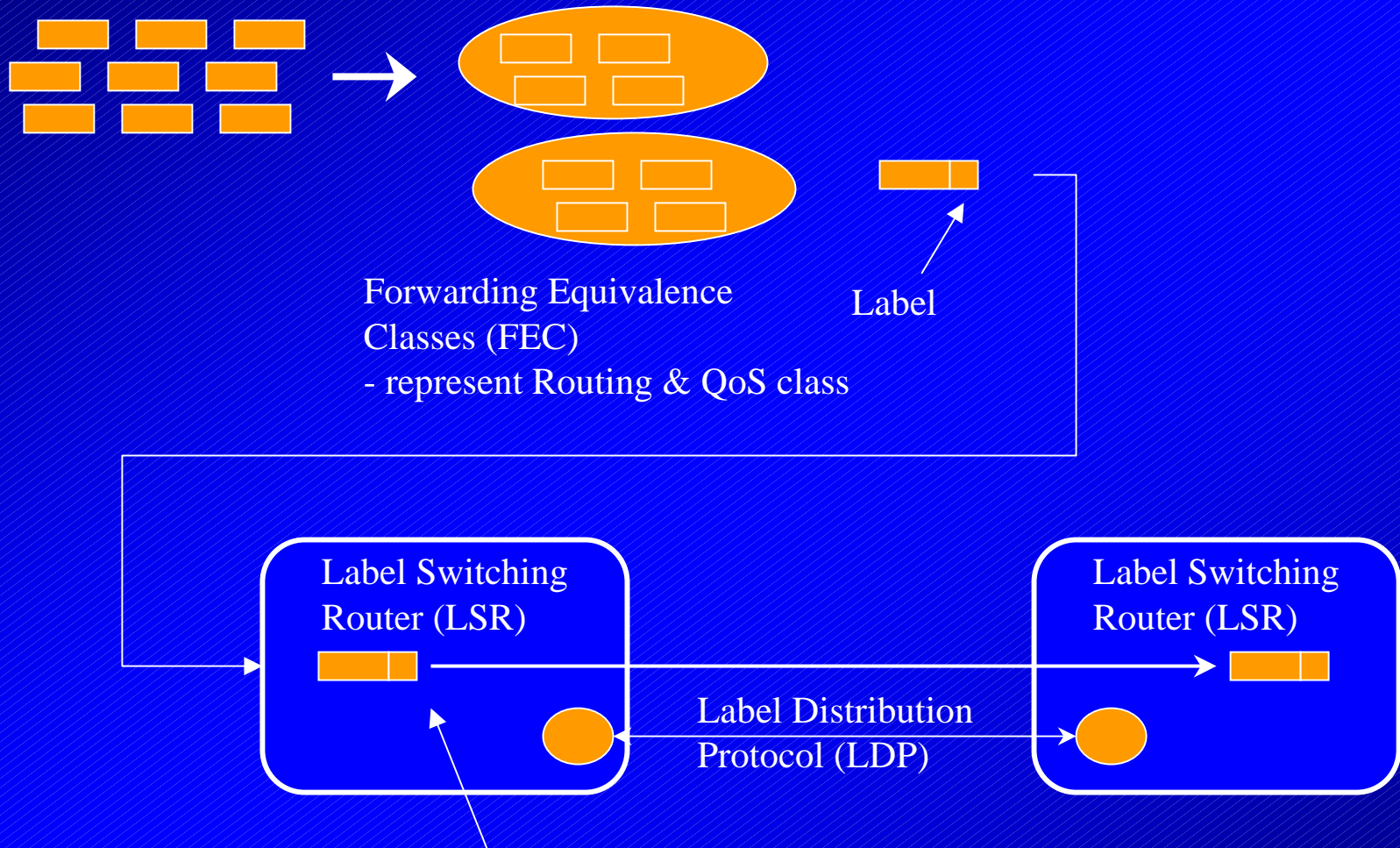
MPLS



QoS Control - *COPS*

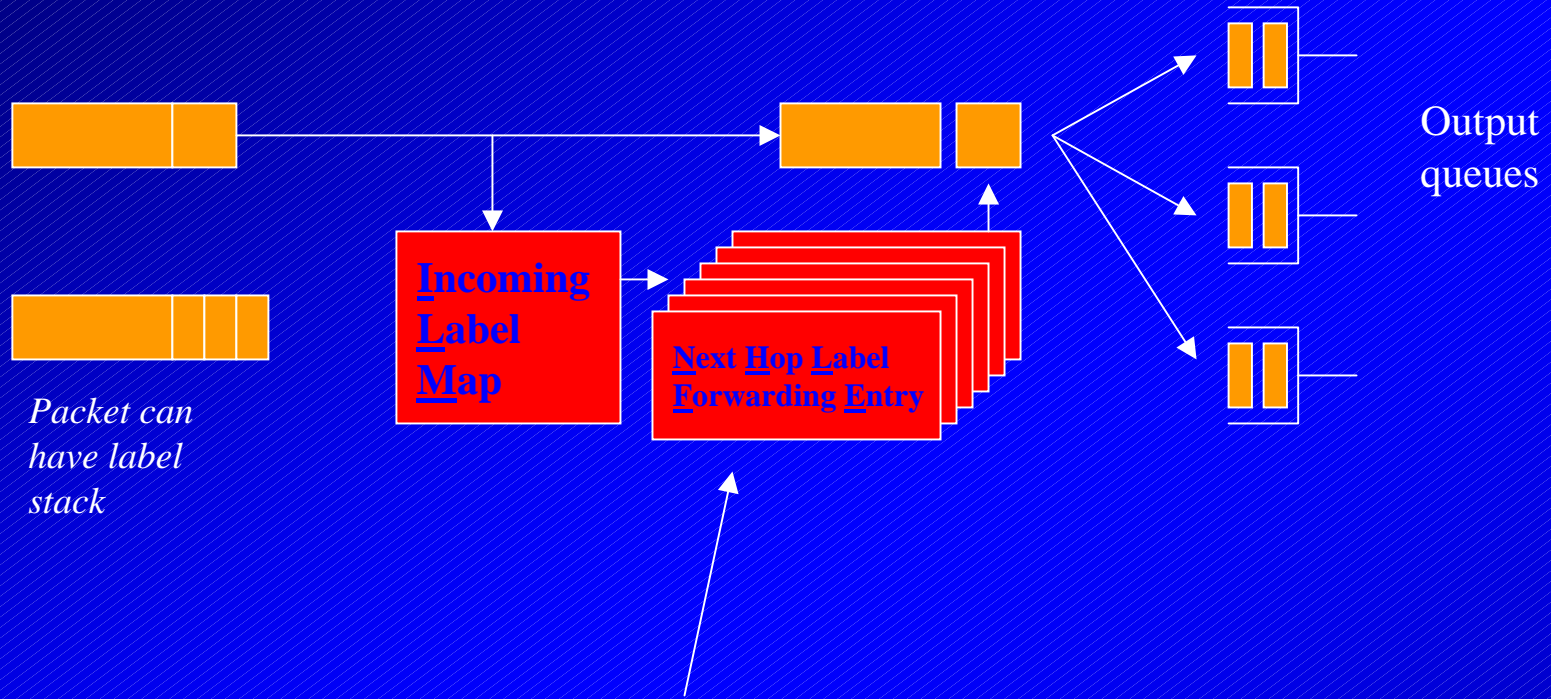


Basic MPLS Architecture



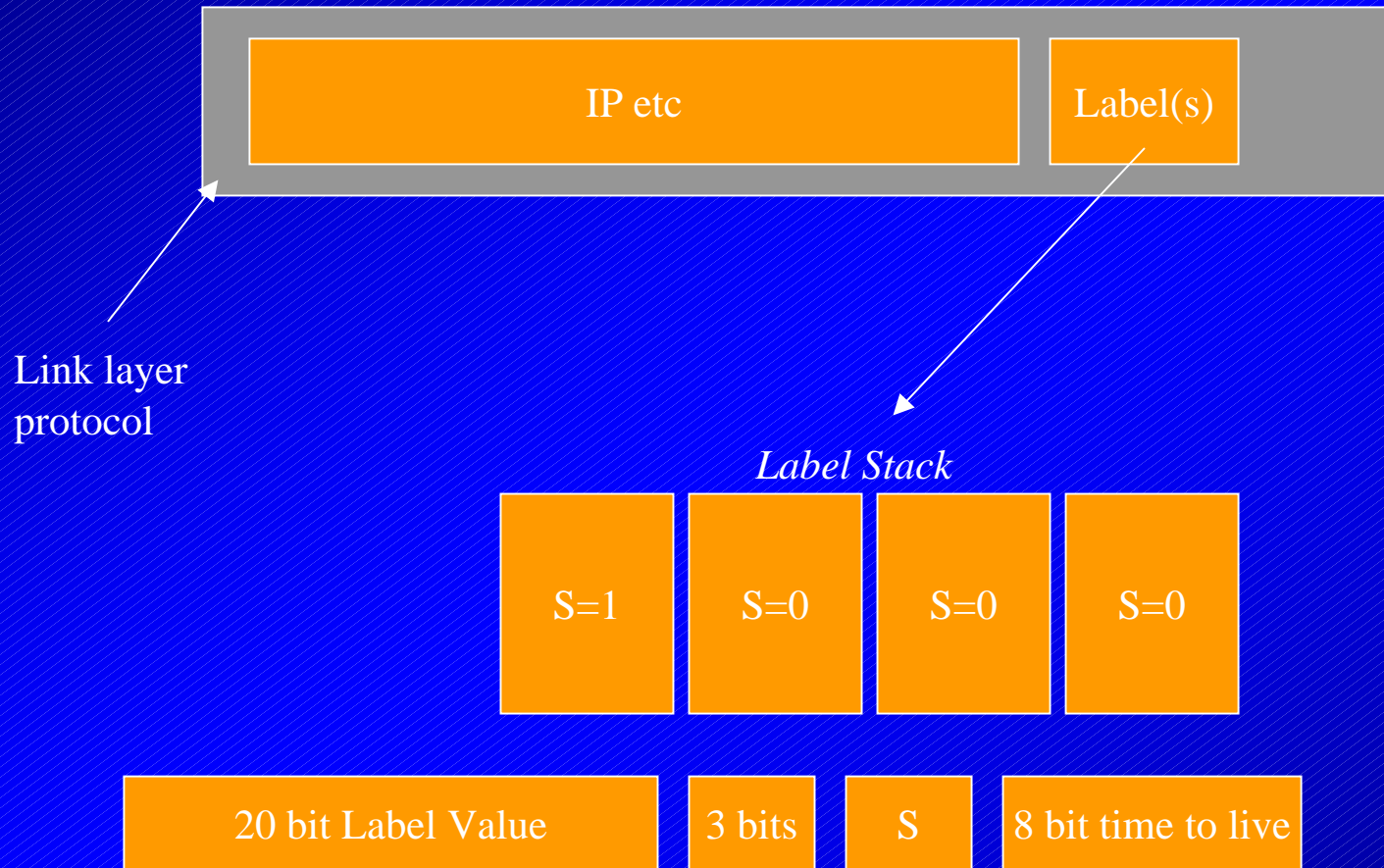
Less work for Router as Label tables are much smaller & simpler

LSR - Router Architecture

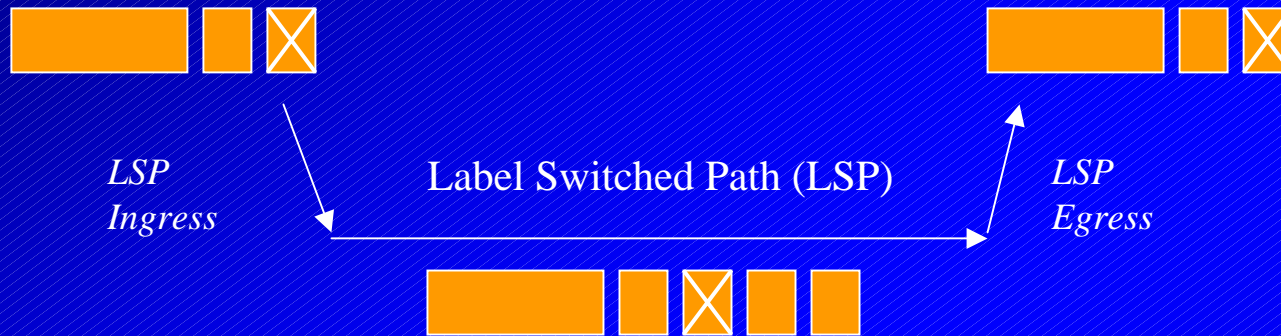


NHLFE defines how incoming packet is treated - label swapped, route, queue priority etc.

MPLS Label Structure

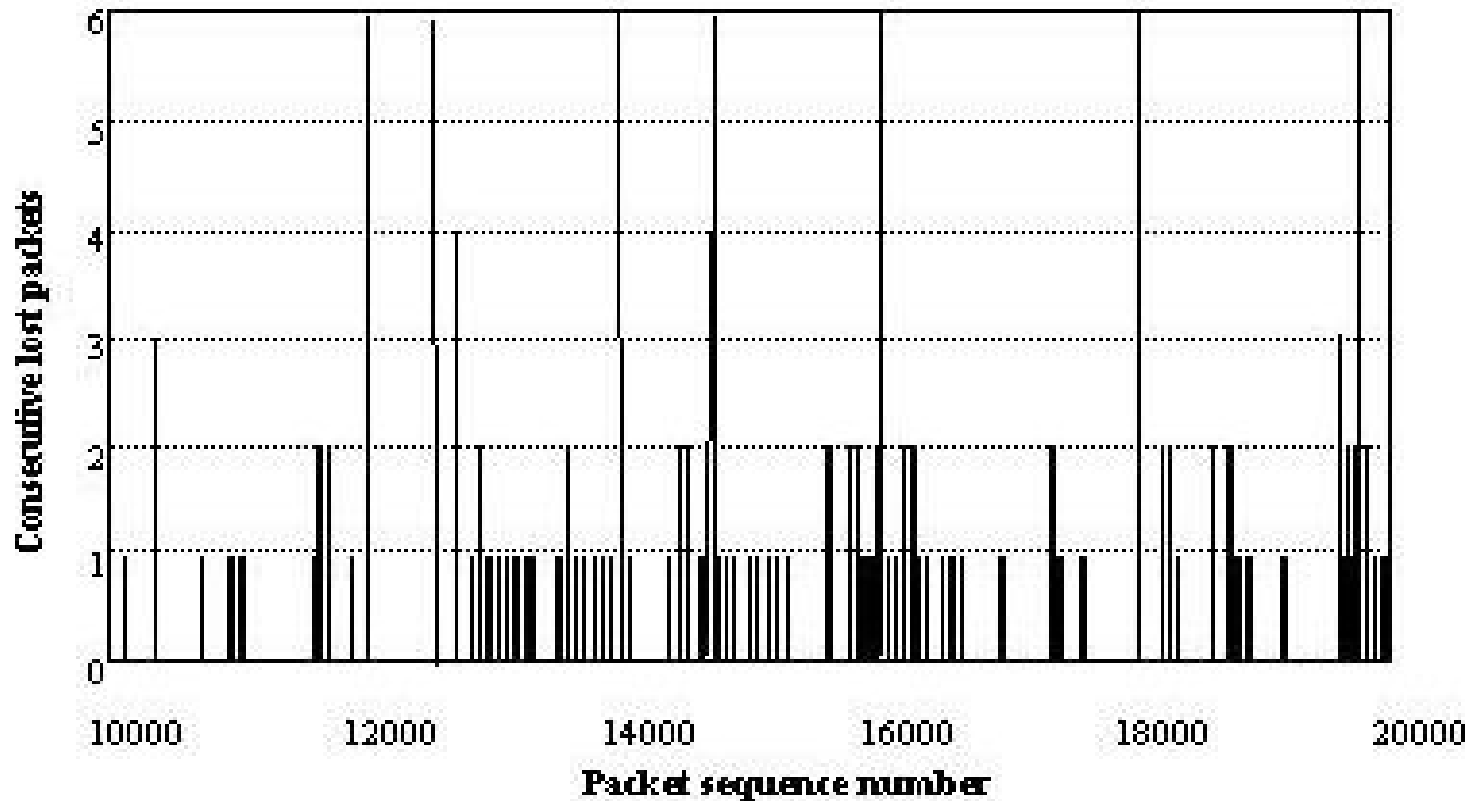


Label Switched Path

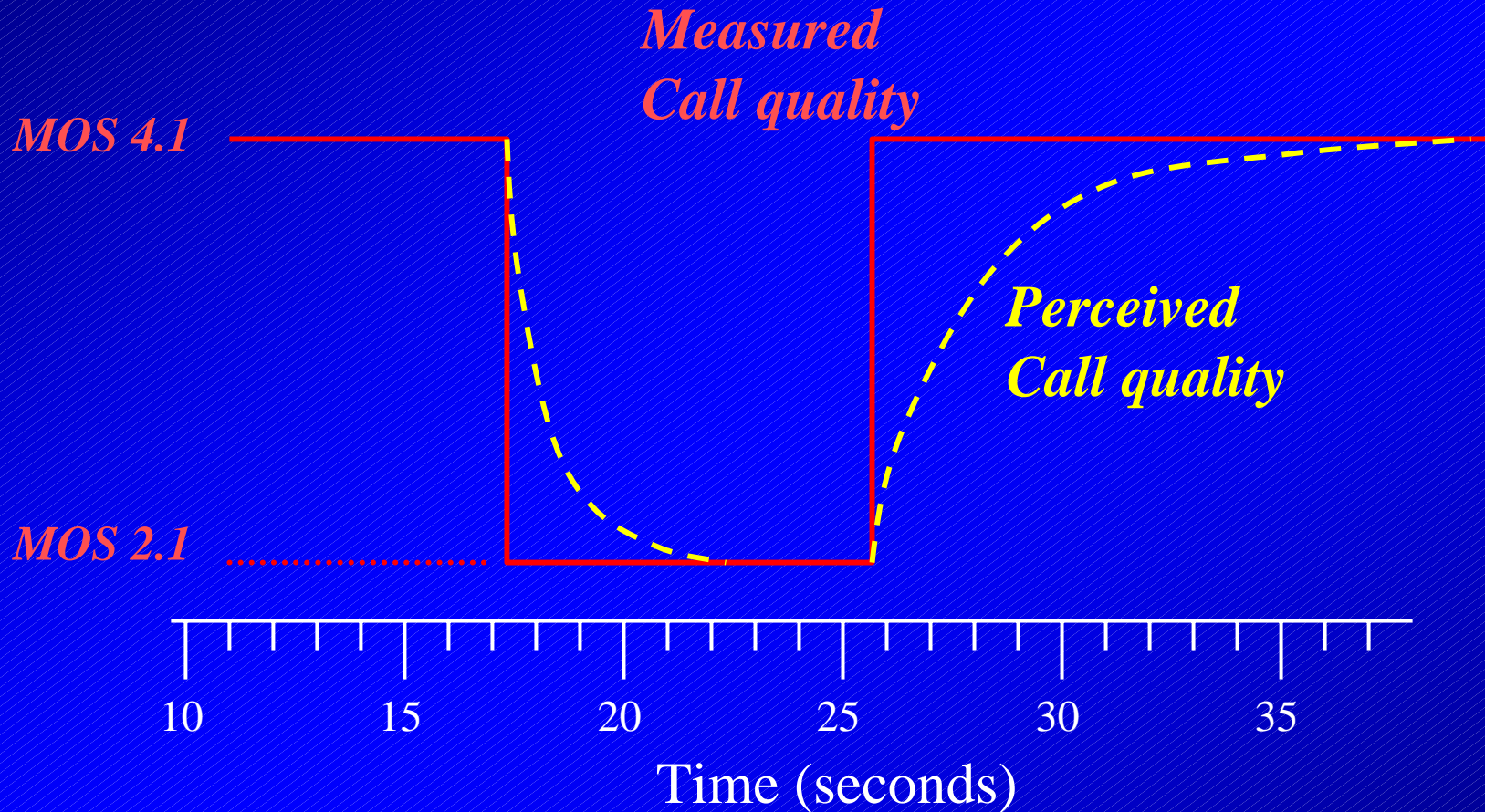


- 1 - Adds at least one Label to the label stack
- 2 - All LSRs on the LSP route using the same label

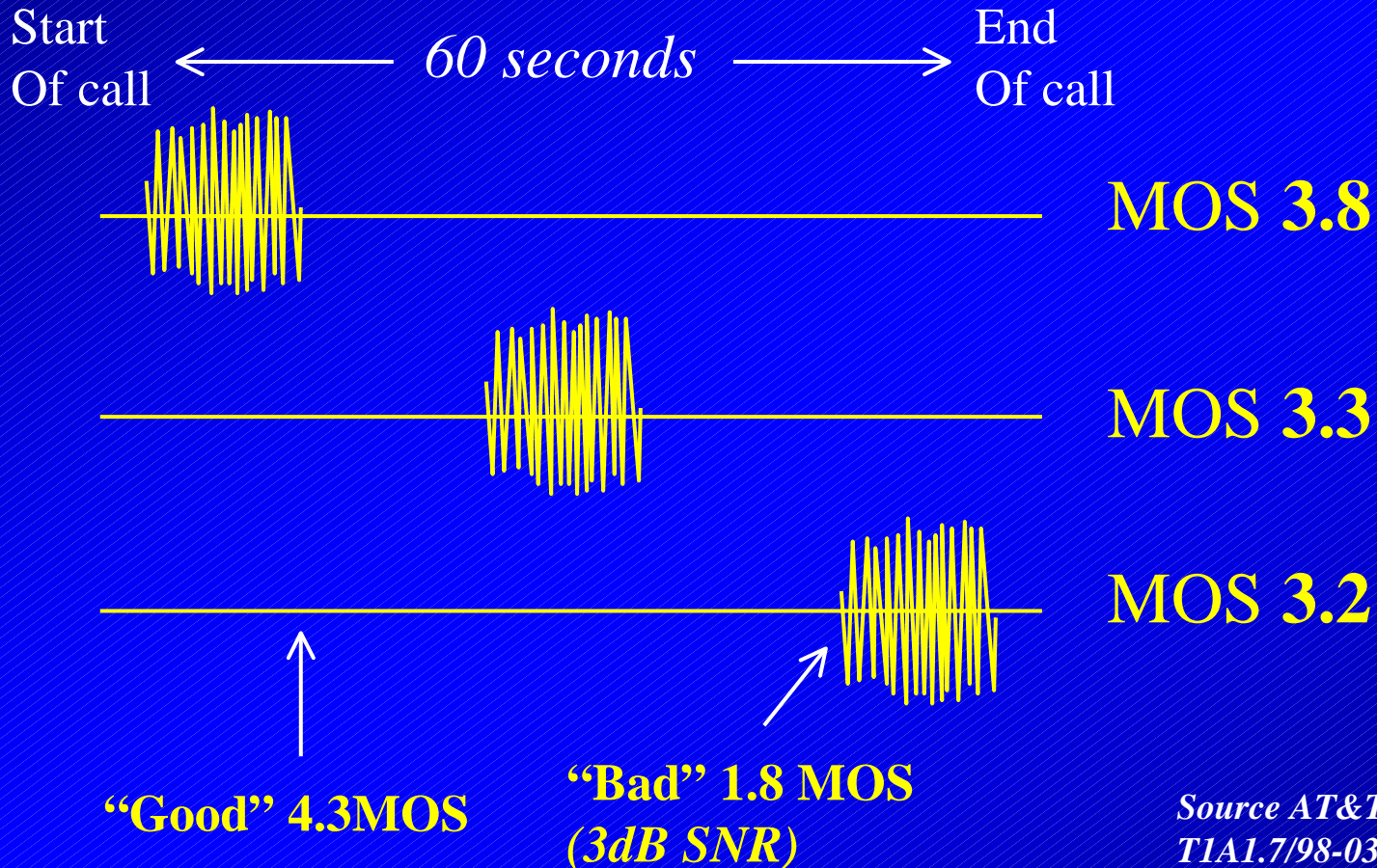
Packet Loss is *Bursty*



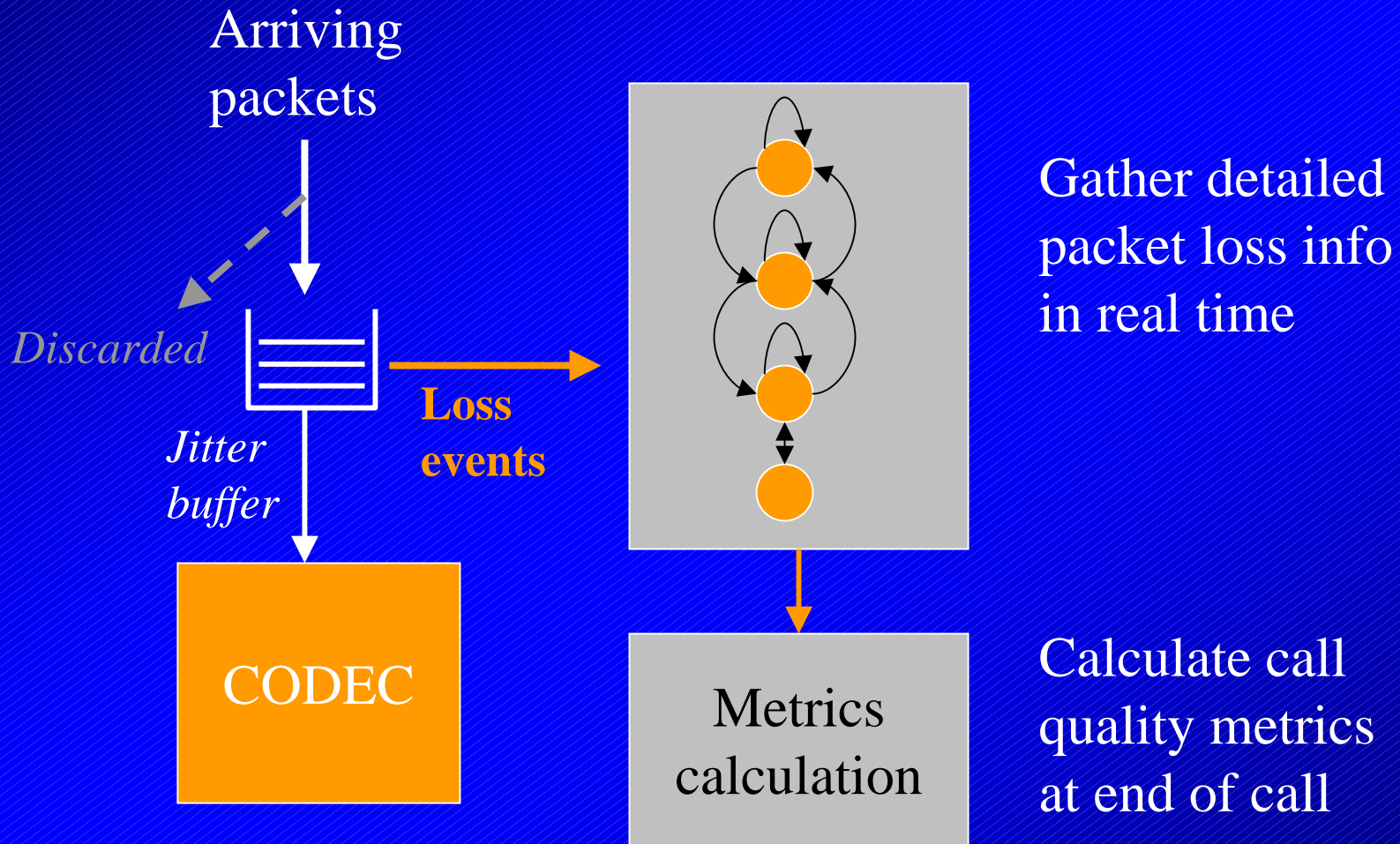
Call quality varies with time



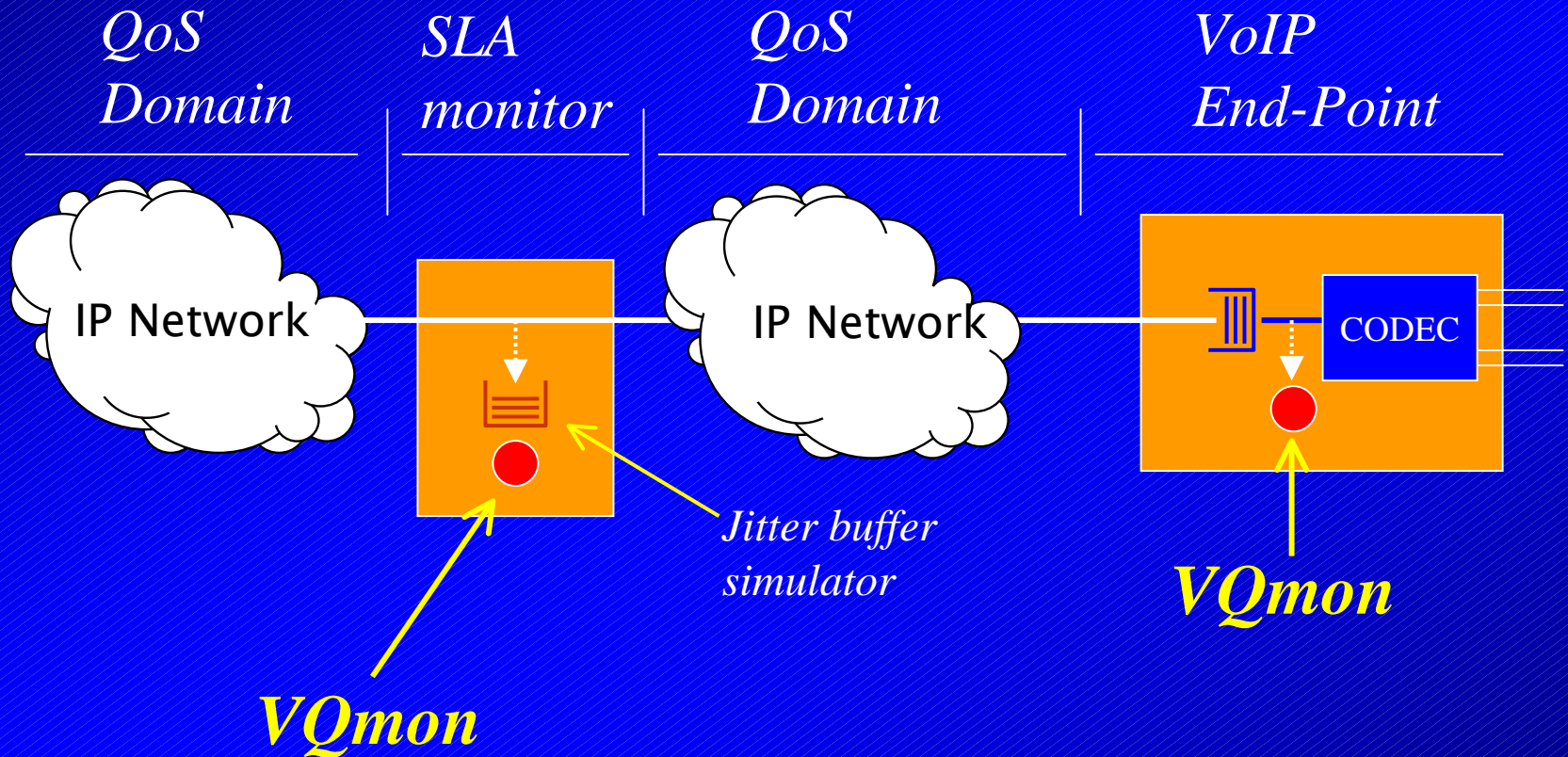
"Recency" effect



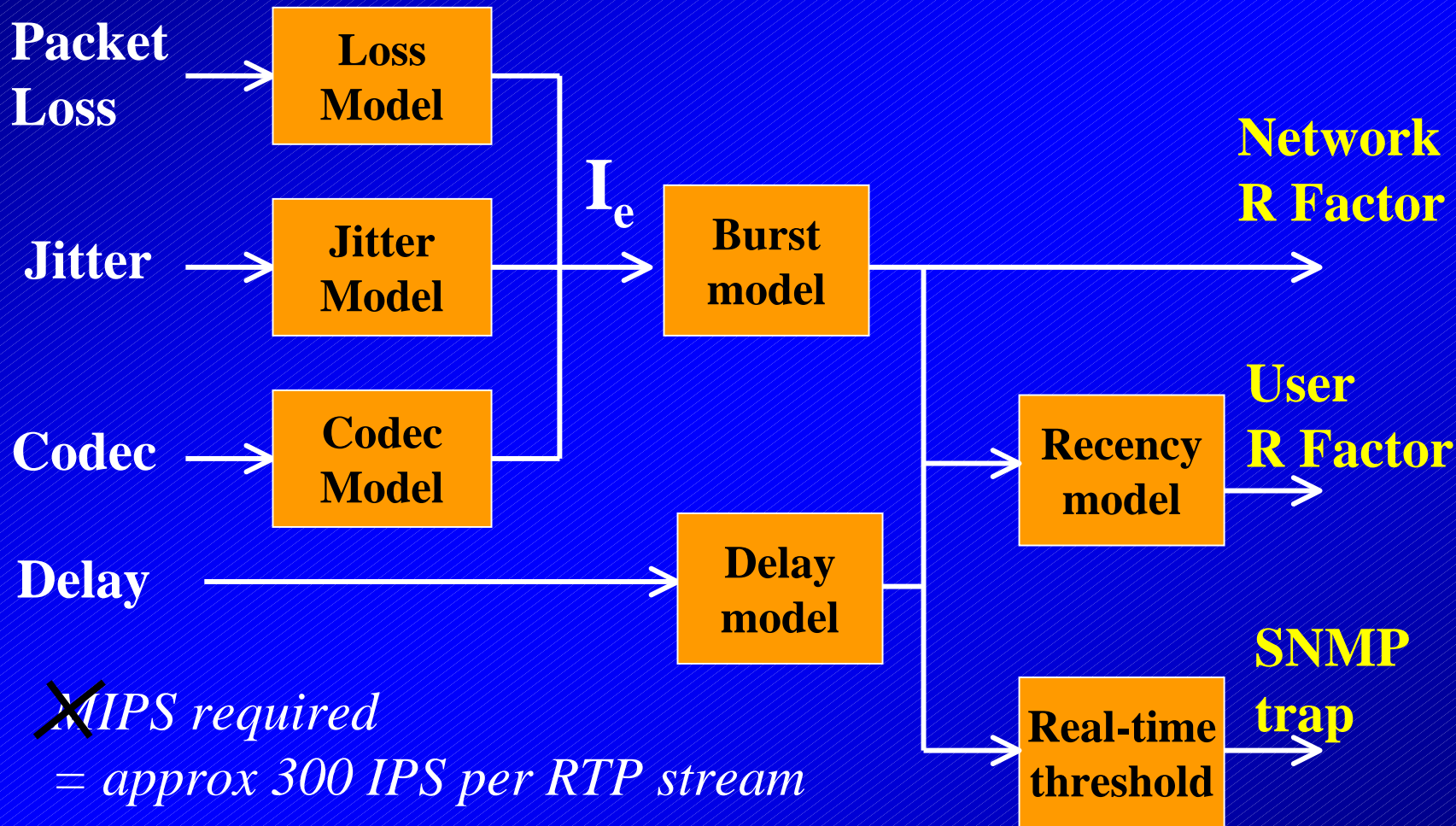
How VQmon works



Gateway or SLA?

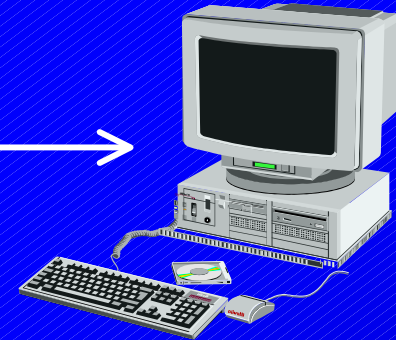


Extended E Model



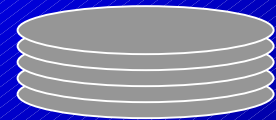
Call Quality Metrics

→ **SNMP**
Network R Factor
History - Min, Max, Avge, Groups
Events – R Factor, (src, dest) IP address



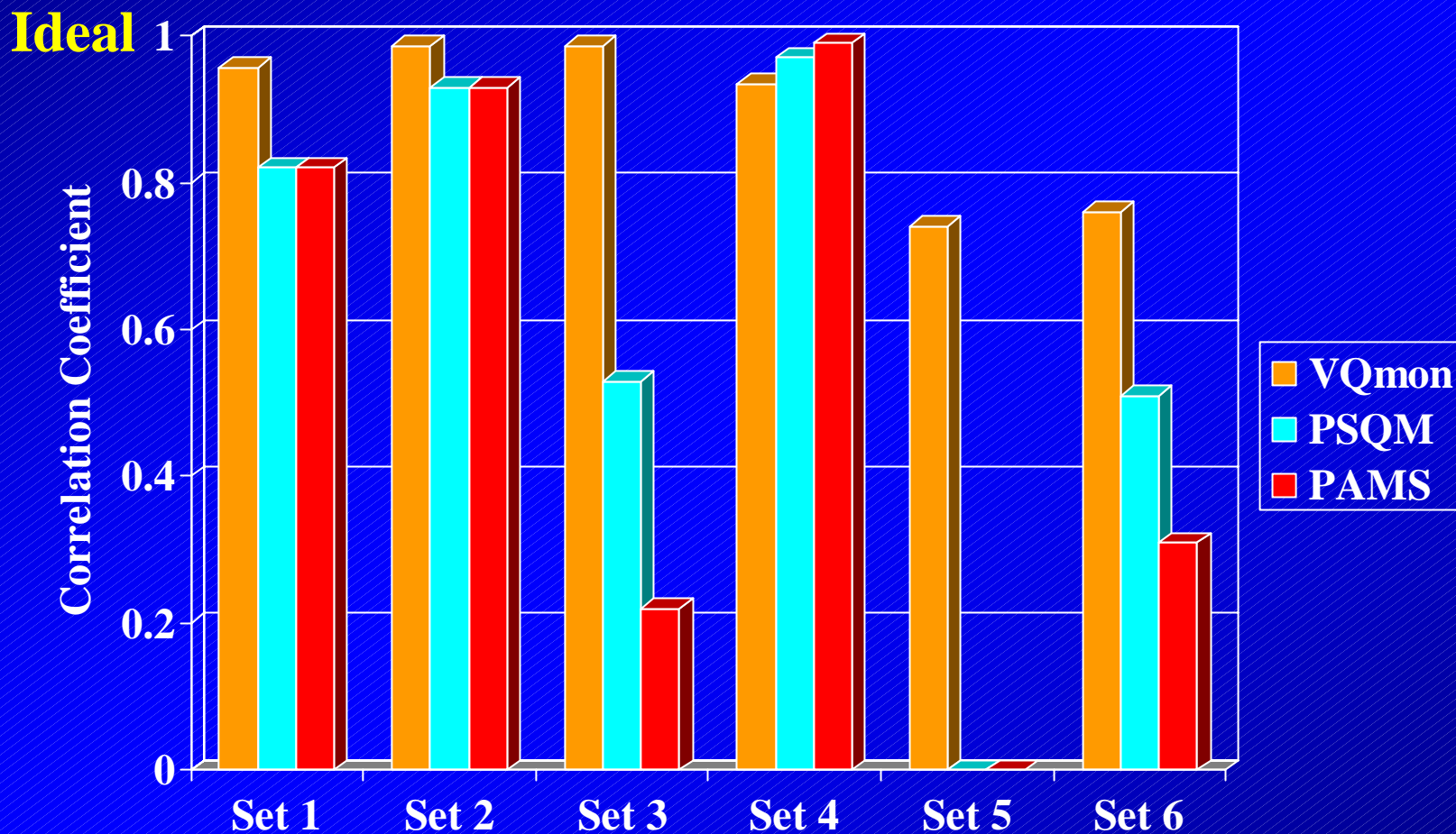
Net Management System

→ **Signaling System**
User R Factor & estimated MOS

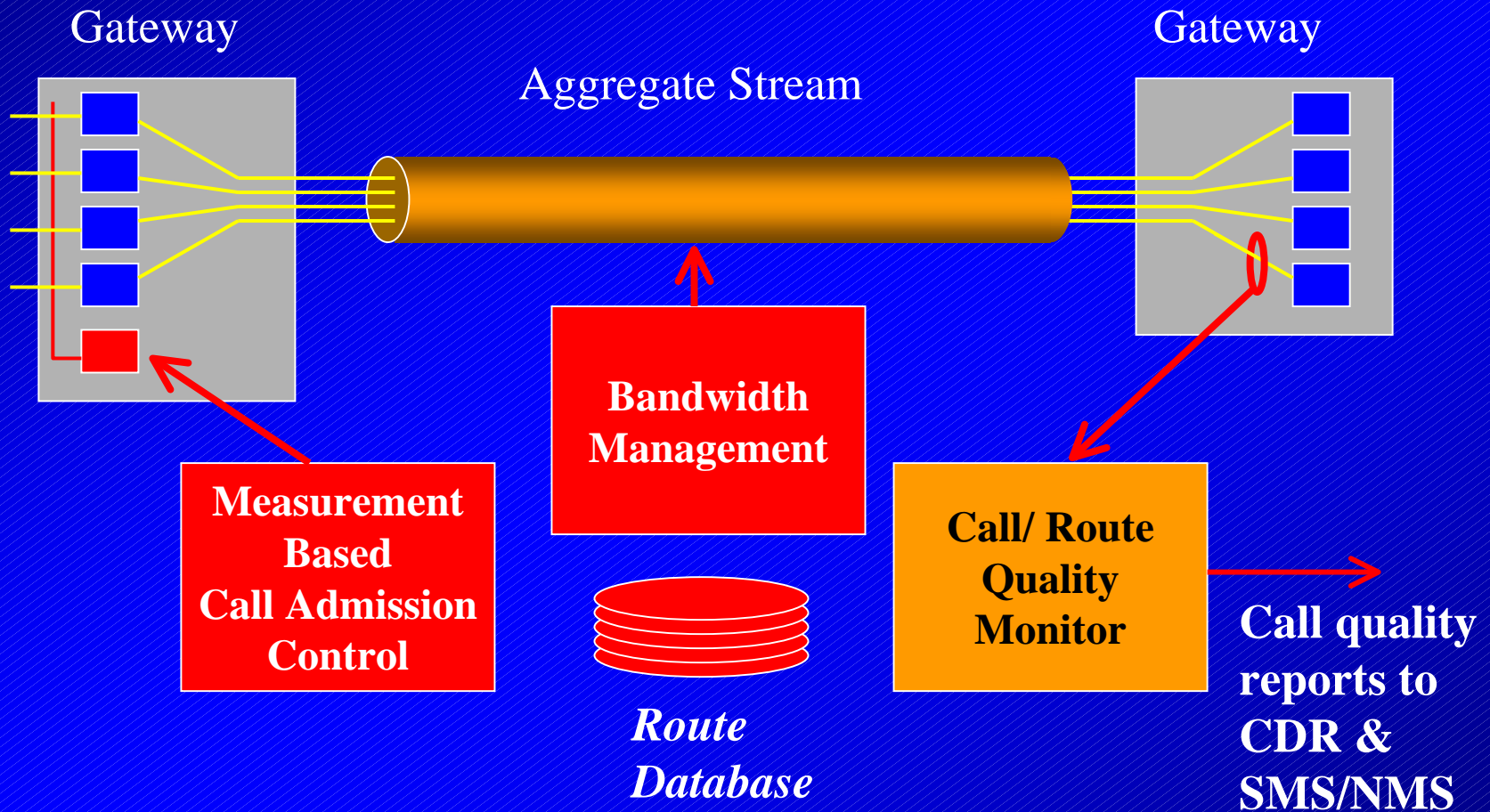


Billing System

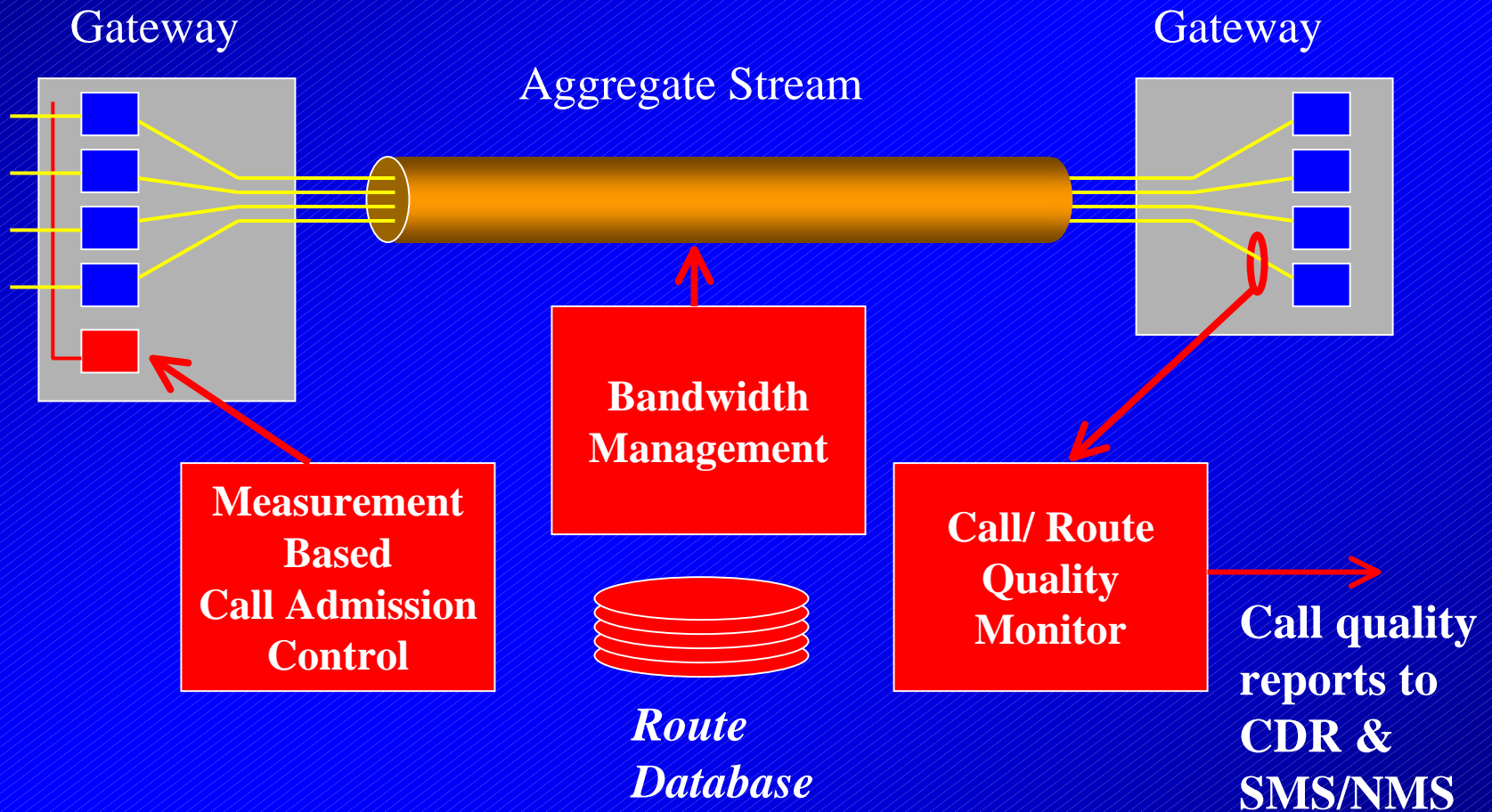
VQmon vs PSQM & PAMS



VoIP QoS Architecture



Telchemy QoS Architecture



VQmon

Accurate

Fast

Monitors ALL Calls

Real Time

Supports needs of
Billing AND OSS/NMS

Minimal resources
-Can add to existing HW

Add to Gateways, IP Phones, Test Eqpt, SLA monitors,
Edge Routers, Prequalification tools, probes.....