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Outline

- Introduction to QoS
- Metrics
- QoS Architectures
- IPv6 header & QoS
- Configuration Examples
- Conclusions

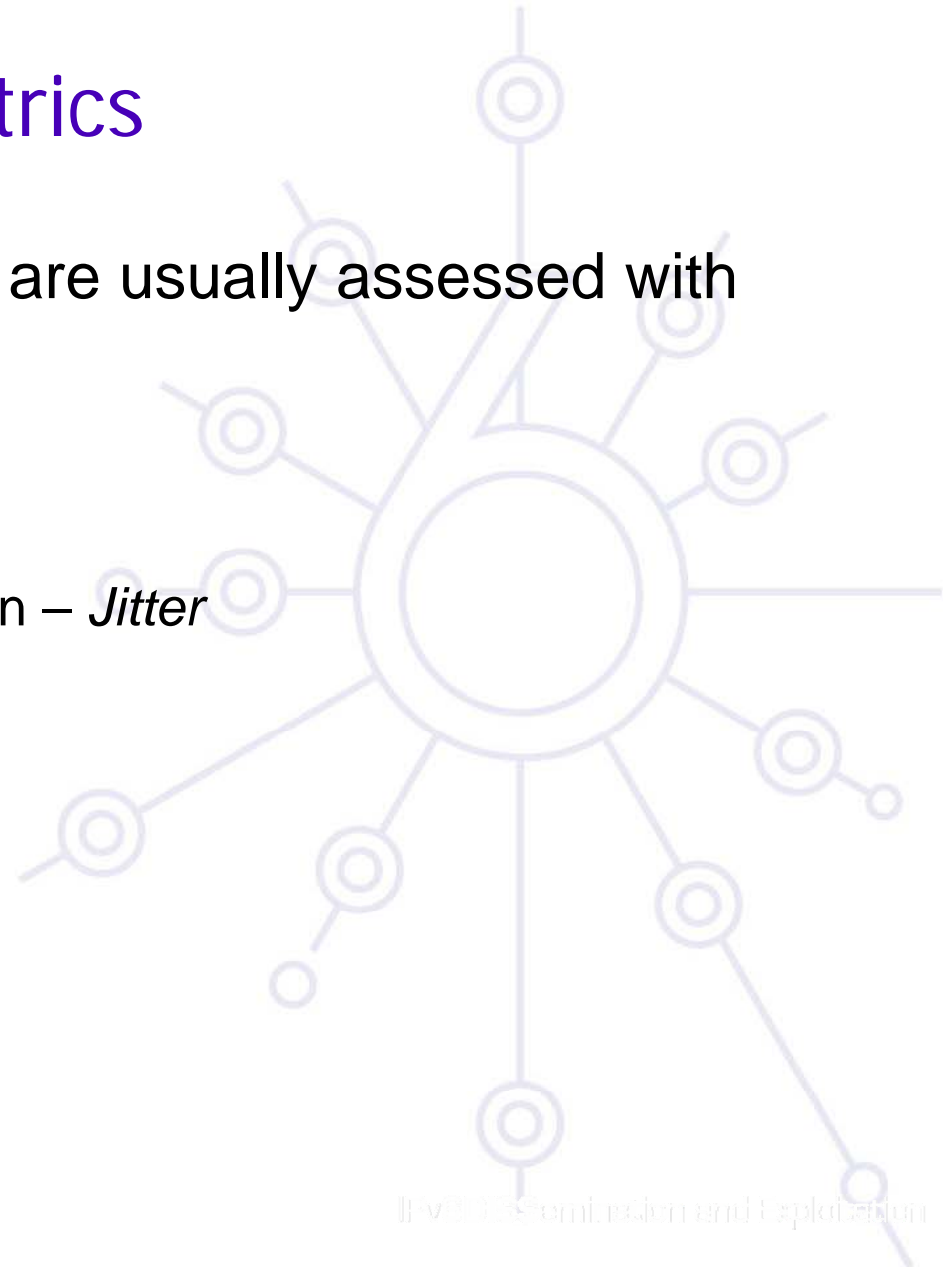


Introduction to QoS

- QoS developments in IP networks is inspired by new types of applications:
 - VoIP, audio/video streaming, networked virtual environments, interactive gaming, videoconferencing, video distribution, e-commerce, GRIDs & collaborative environments, etc.
- **Quality-of-Service (QoS)** is a set of service requirements (performance guarantees) to be met by the network while transporting a flow.

Metrics

- Performance guarantees are usually assessed with the next metrics:
 - Bandwidth
 - Delay
 - Inter-packet Delay Variation – *Jitter*
 - Packet loss

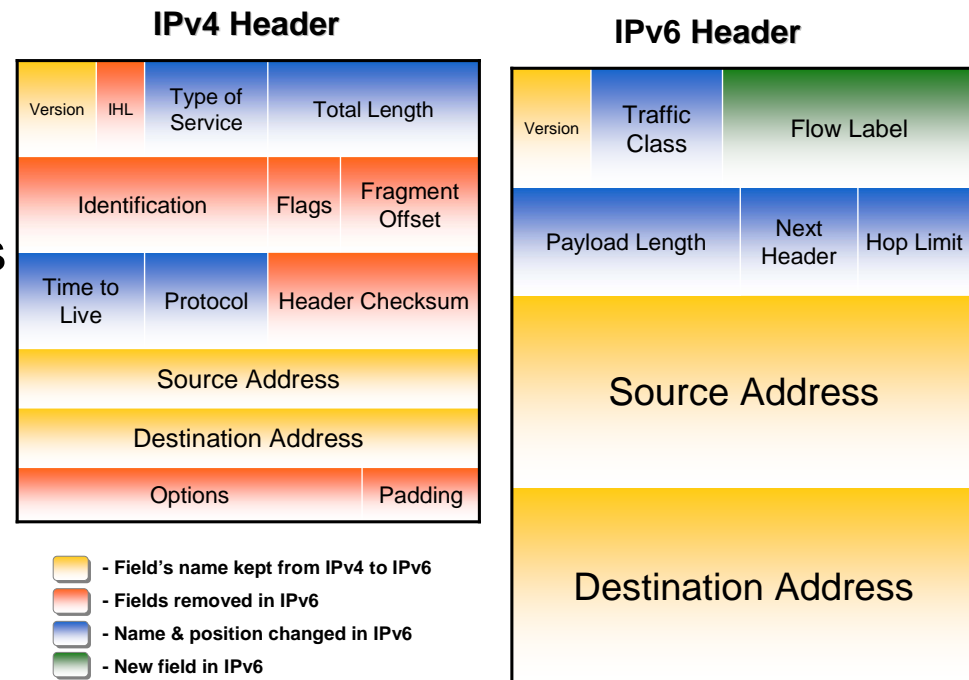


QoS Architectures

- Best Effort Internet
- Integrated Services
 - Performance guarantees to traffic and resource reservations are provided on **per-flow** basis.
 - Guaranteed & Controlled Load Service
 - Scaling issues (per flow state information)
- Differentiated Services
 - Performance guarantees are provided to **traffic aggregates** rather than to flows.
 - Per-Hop Behaviours (PHB): EF & AF
 - Lack of any signalling protocol for resource allocation (admission control) and QoS mechanisms control.
 - Example of services: Premium, “Silver”, LBE

IPv6 & IPv4 Header Comparison

- The IPv6 header is redesigned.
 - Minimize header overhead and reduce the header process for the majority of the packets.
 - Less essential and optional fields are moved to extension headers



IPv6 and IPv4 headers are not *interoperable*.

QoS fields in IPv6 Header

- Traffic Class
 - An *8-bit* field used to distinguish packets from *different classes or priorities*.
 - Provides the *same* functionality as the ***type of service*** field in the IPv4 header.
- Flow label
 - A *20-bit* field defining the packets of the flow.
 - Selected by the source and never modified in the network.
 - Fragmentation or encryption is not anymore problem, as in IPv4.

Configuration steps in MQC

- Define **Class Map**

- Separate traffic into classes based on access lists (ACLs), DSCP/ToS, MPLS EXP, protocol, etc. or combinations of those criteria

```
class-map [match-any | match-all] class-name
```

- Define **Policy Map (Service Policy)**

- Associate a class map with one or more QoS policies, e.g. bandwidth allocation, queue management, (re)-marking

```
policy-map policy-map-name
```

Configuration steps in MQC

- Apply a **Service Policy** to an interface
 - Associate a policy map to an physical or logical interface at input or output.

```
service-policy {input | output} policy-map-name
```

Configuration examples

```
class-map match-any ip_premium_out
  match ip dscp 46
  match ip dscp 47
  match ip dscp 40
  match mpls experimental 5
```

IP Premium
classification
class-map

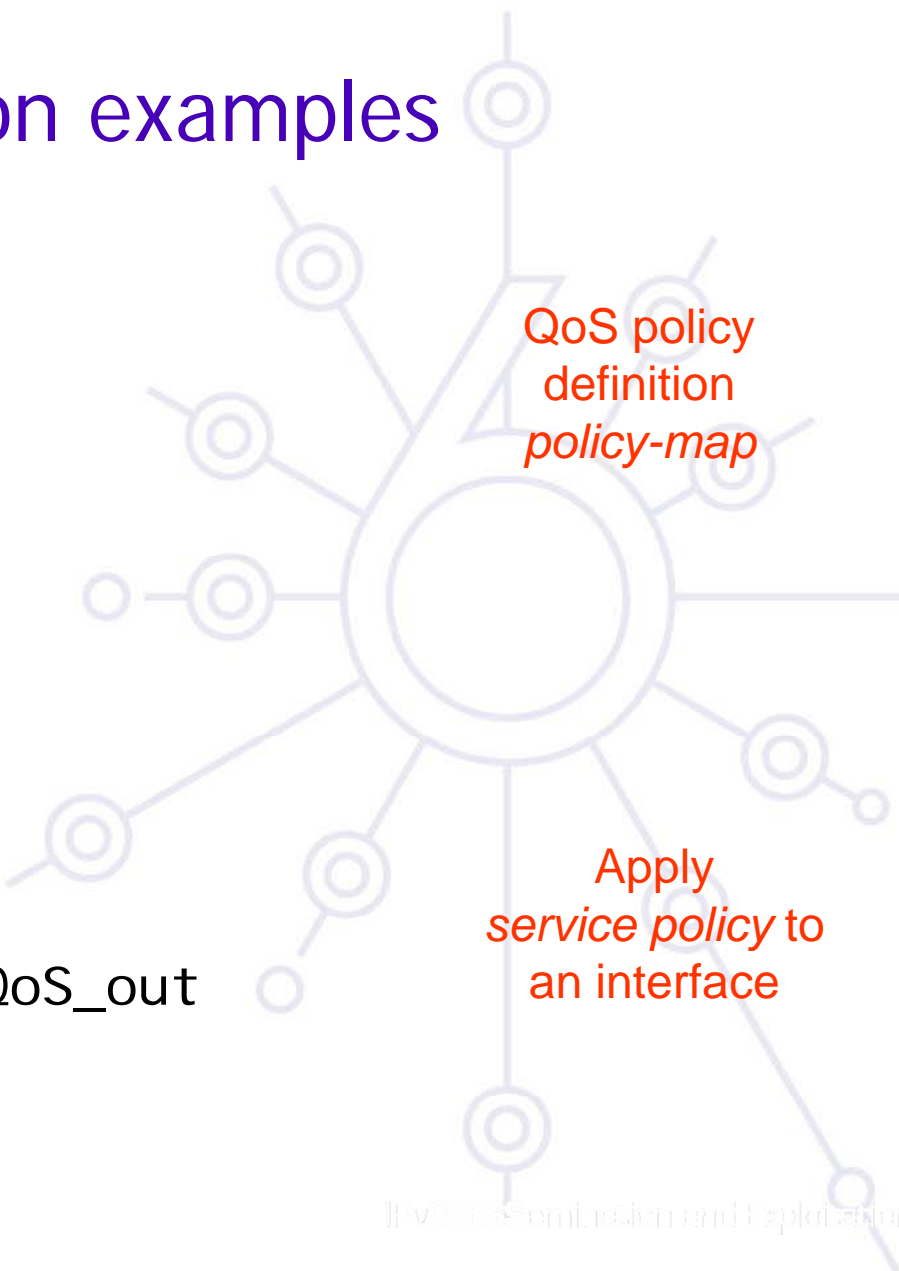
```
class-map match-any lbe_out
  match ip dscp 8
  match mpls experimental 1
```

LBE
classification
class-map

Configuration examples

```
policy-map QoS_out
  class ip_premium_out
    priority
  class lbe_out
    bandwidth percent 1
  class class-default
    exit
  exit

interface POS 0/1
  service-policy output QoS_out
```



QoS policy
definition
policy-map

Apply
service policy to
an interface

Conclusions

- The IPv6 protocol, in terms of QoS support, is **neither superior nor inferior** to IPv4 counterpart.
- The *flow label* field in the IPv6 header may ease provision of services in the future.
- There is no difference in the QoS configuration among IPv6 and IPv4 traffic.

Revision Questions!

- What are the difference related to QoS between the IPv6 and IPv4 headers? Is there any improvement in the IPv6 and why?
- Shall we expect different performance guarantees for IPv6 and IPv4 traffic? Under which conditions?