Broadband/Metro Network Architectures

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Metro Broadband OVERVIEW

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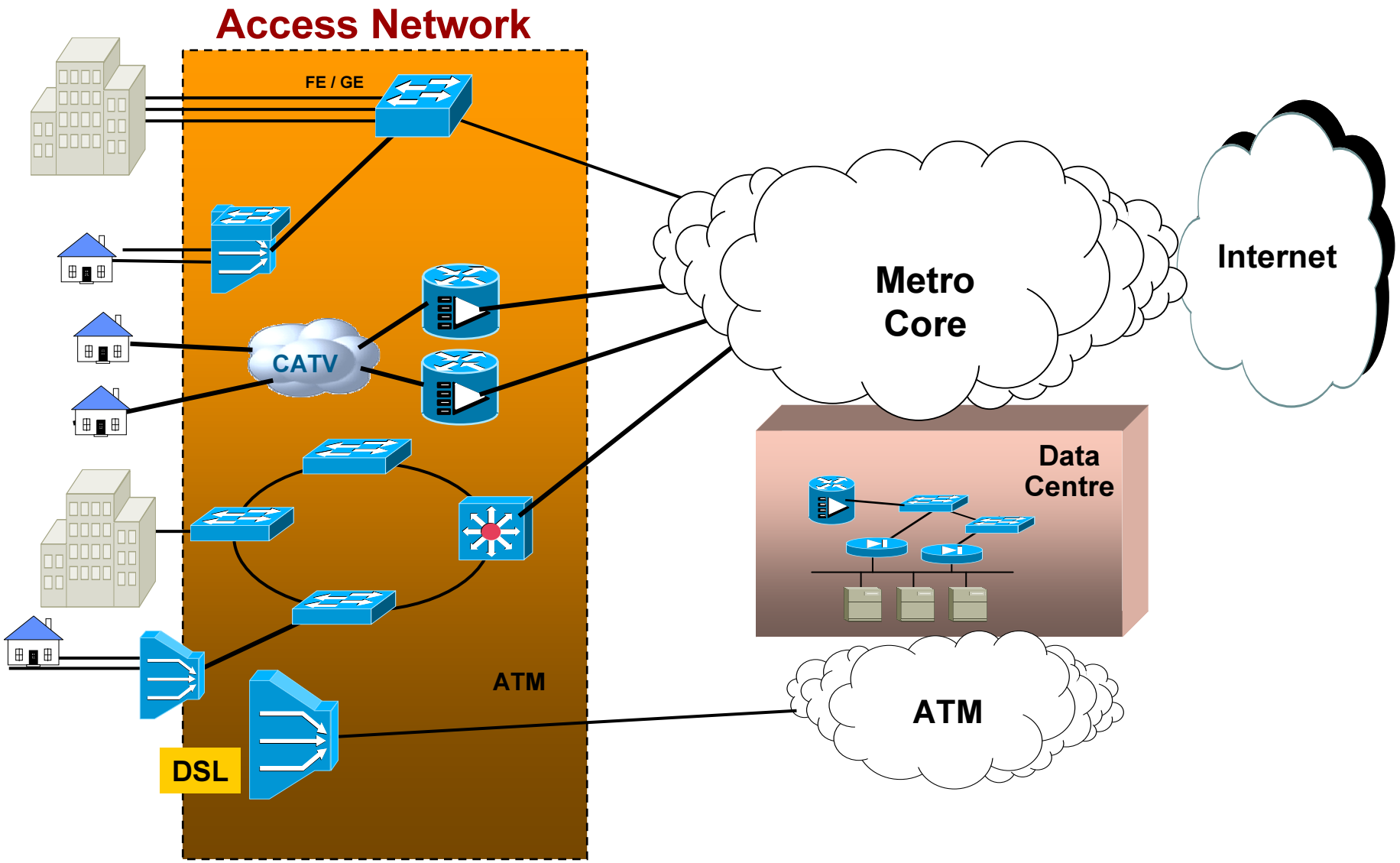
Broadband Network Architecture



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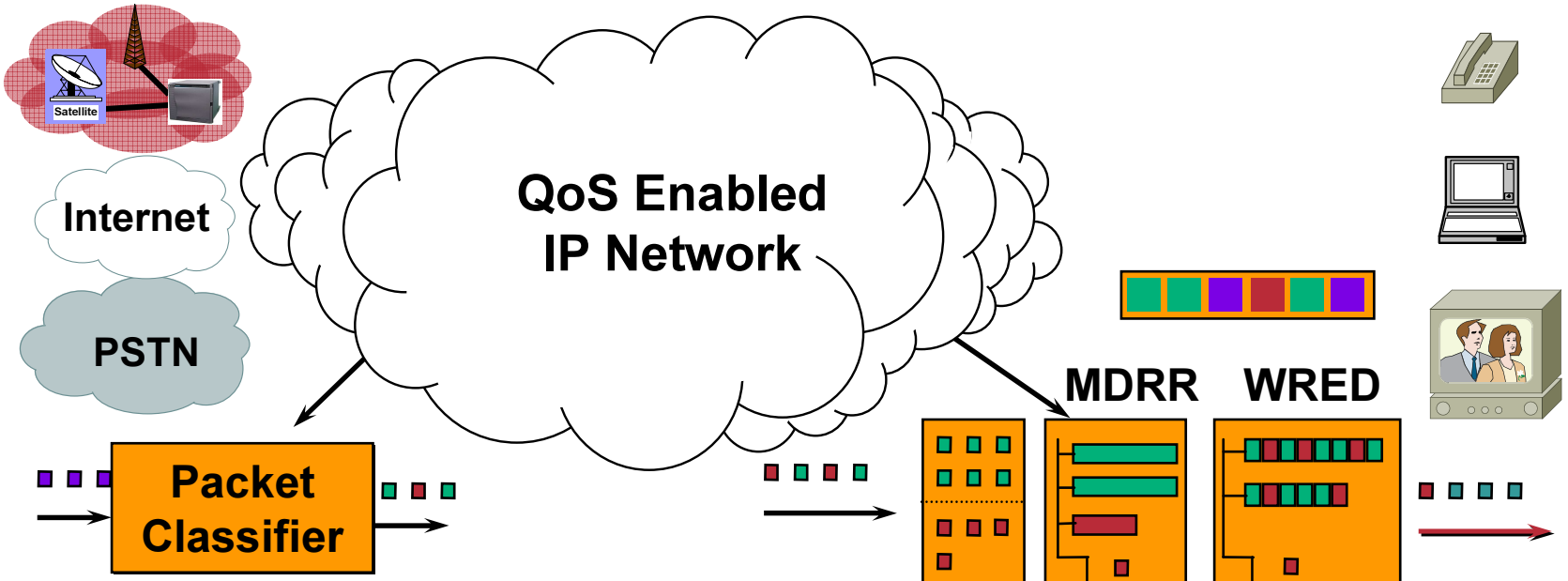
End-to-End QoS Mechanism



Edge

Ingress

- rate limit/traffic shaping
- Accept or override client precedence

Egress

- Congestion Avoidance (WRED)
- Scheduling – Strict priority & WRR

Backbone

Backbone bandwidth management per class by:
Weighted Random Early Detection (WRED)
(MDRR)

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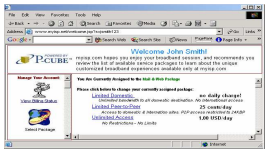
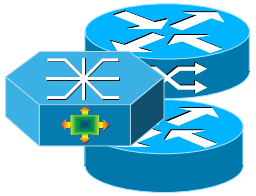
Service Control – The Intelligent Service Layer

Back Office		Service Provisioning OSS/BSS
Deep Packet Inspection		Service Control
Routing and Switching		

Service Control – an intelligent programmable layer that helps bring the application and user dimensions into the transport network

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Triple Play Over DSL

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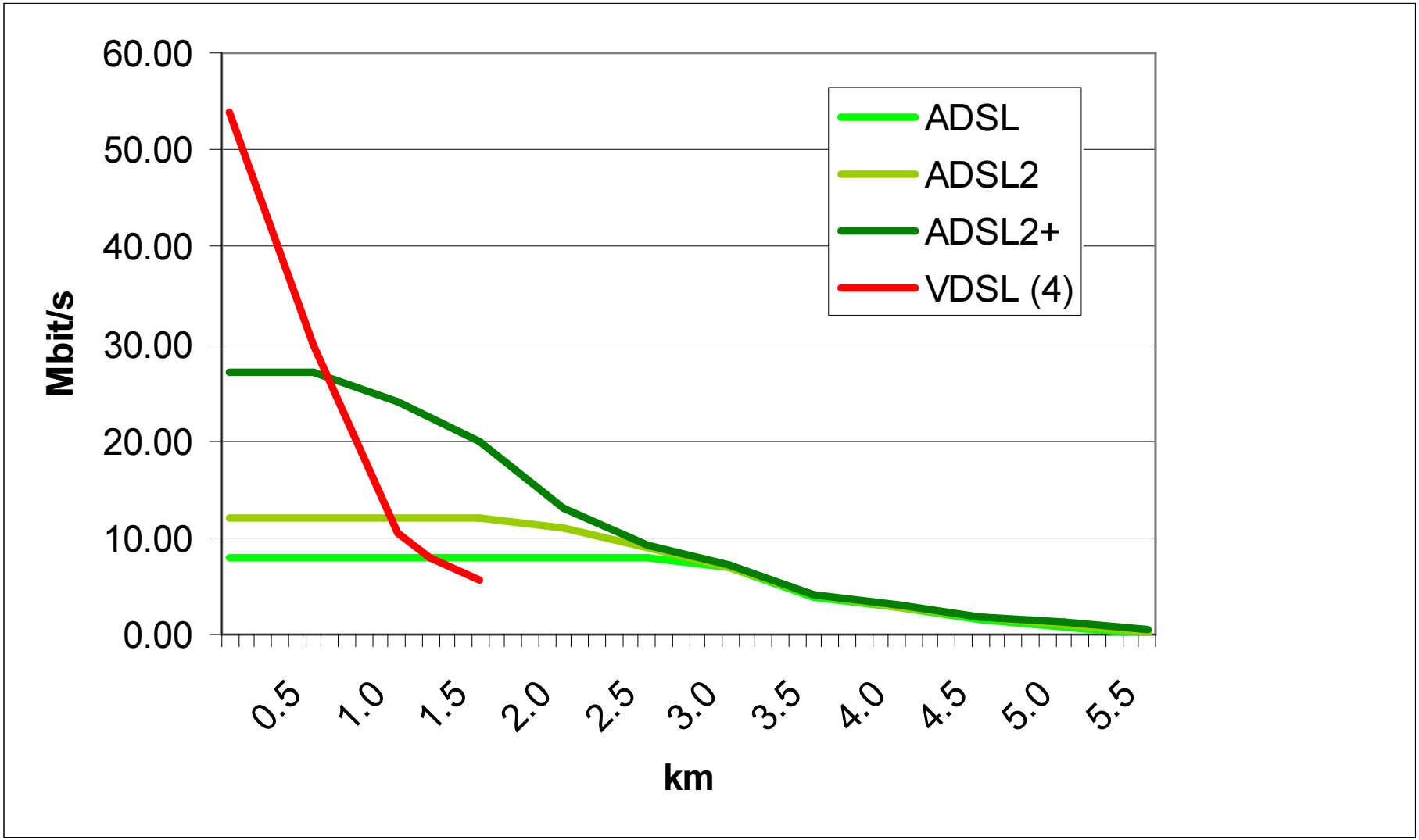
xDSL subscriber line



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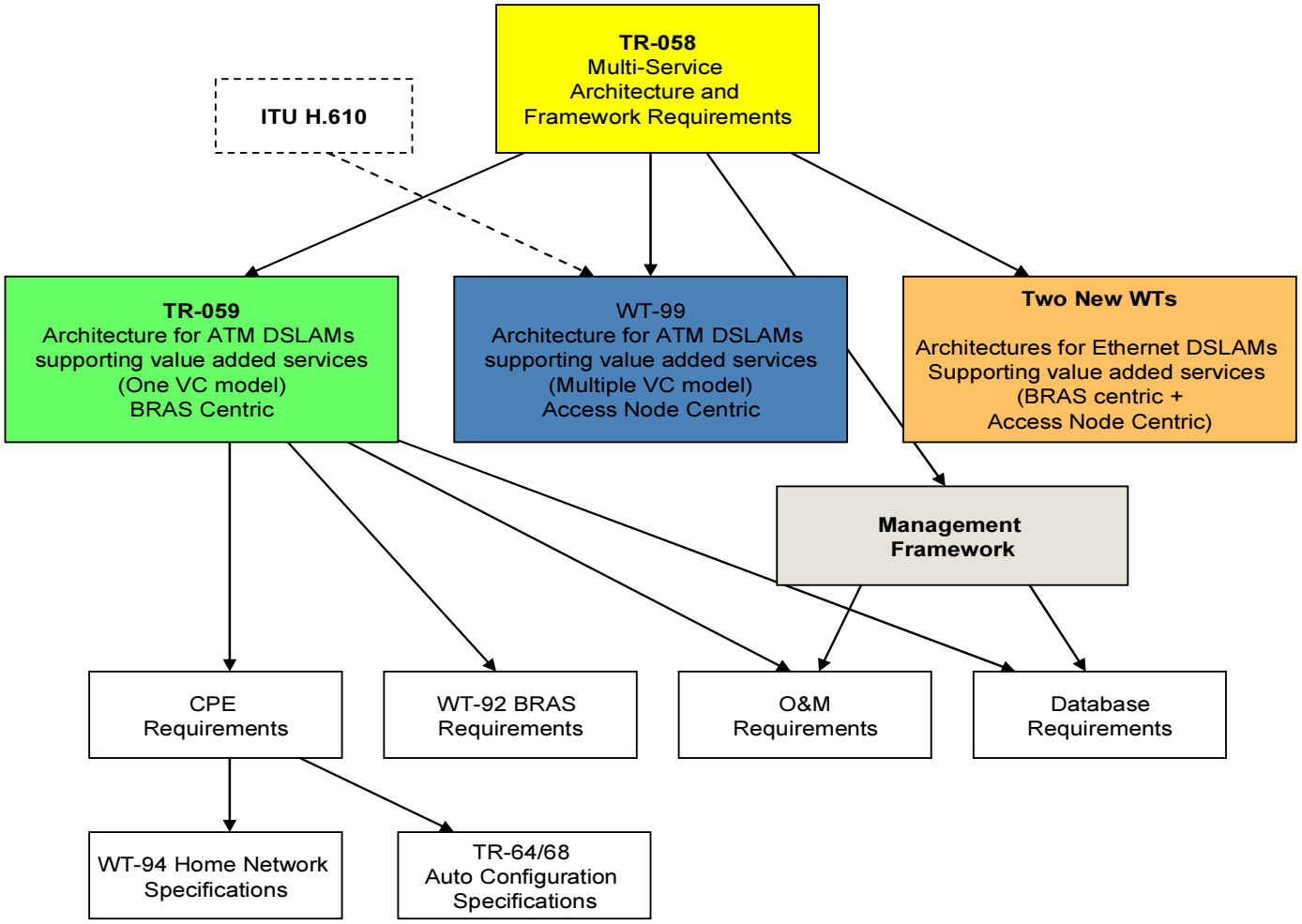
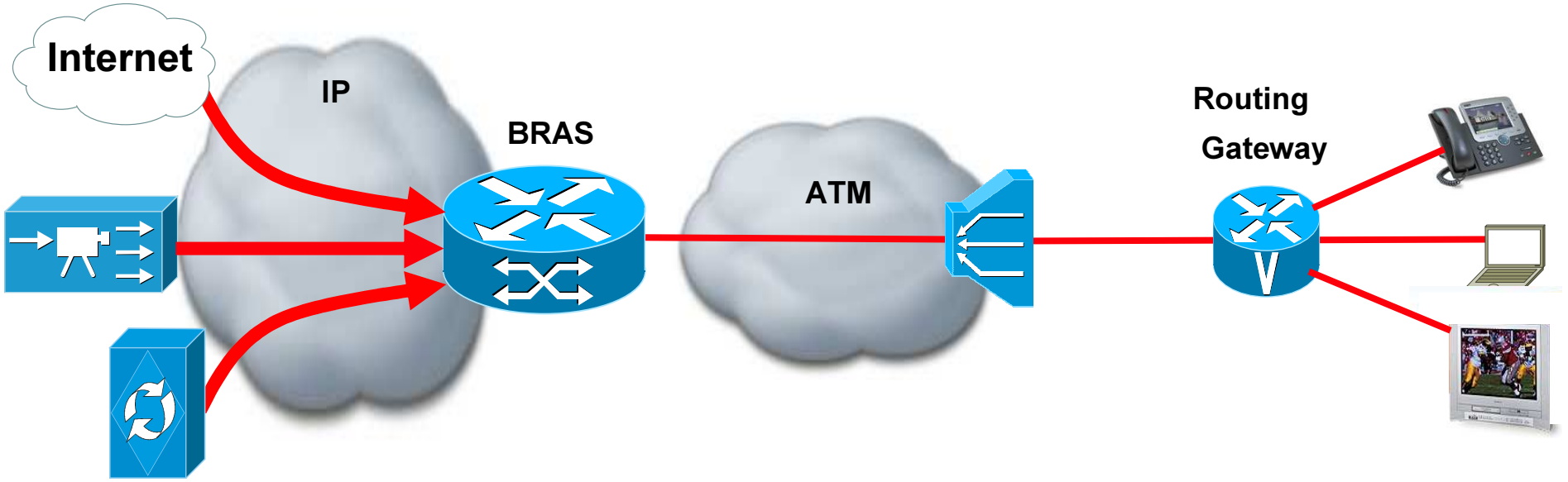
DSL Forum Multi-service Initiatives



TR-59 Single injection point



- **Multi-services capabilities**
- **Single injection point to BRAS**
- **Single VC into the home**
- **Multiple users per home**

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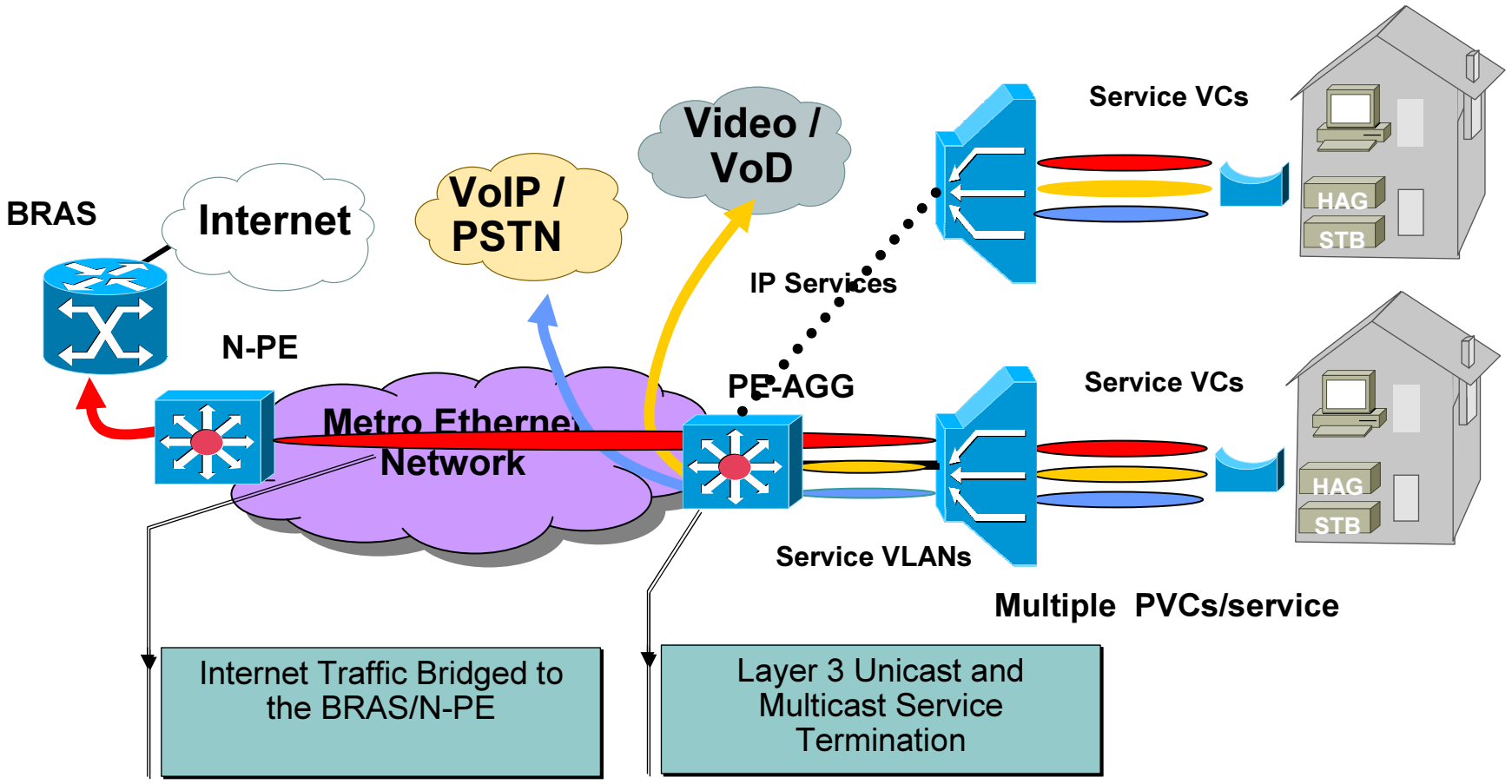
WT-101 Architecture



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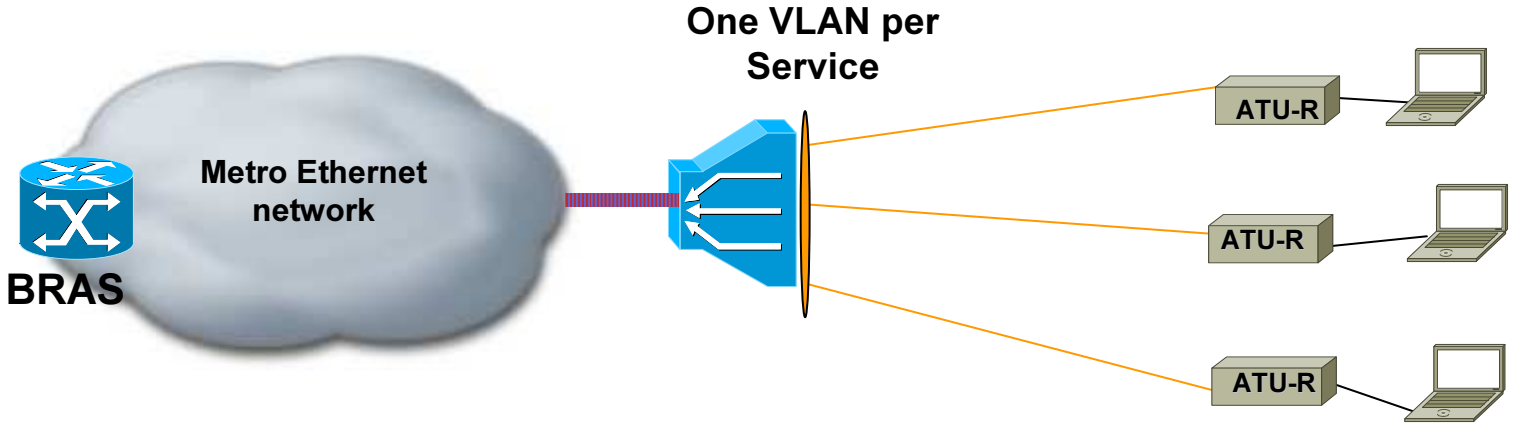
Multi-VC model
One VLAN per Service model – Internet



- DSLAM needs to support
  - Private VLAN for user isolation
  - 802.1Q trunk
  - Limit number of MAC address per subscriber
  - Virtual MAC, DHCP Option 82, PPP Tag

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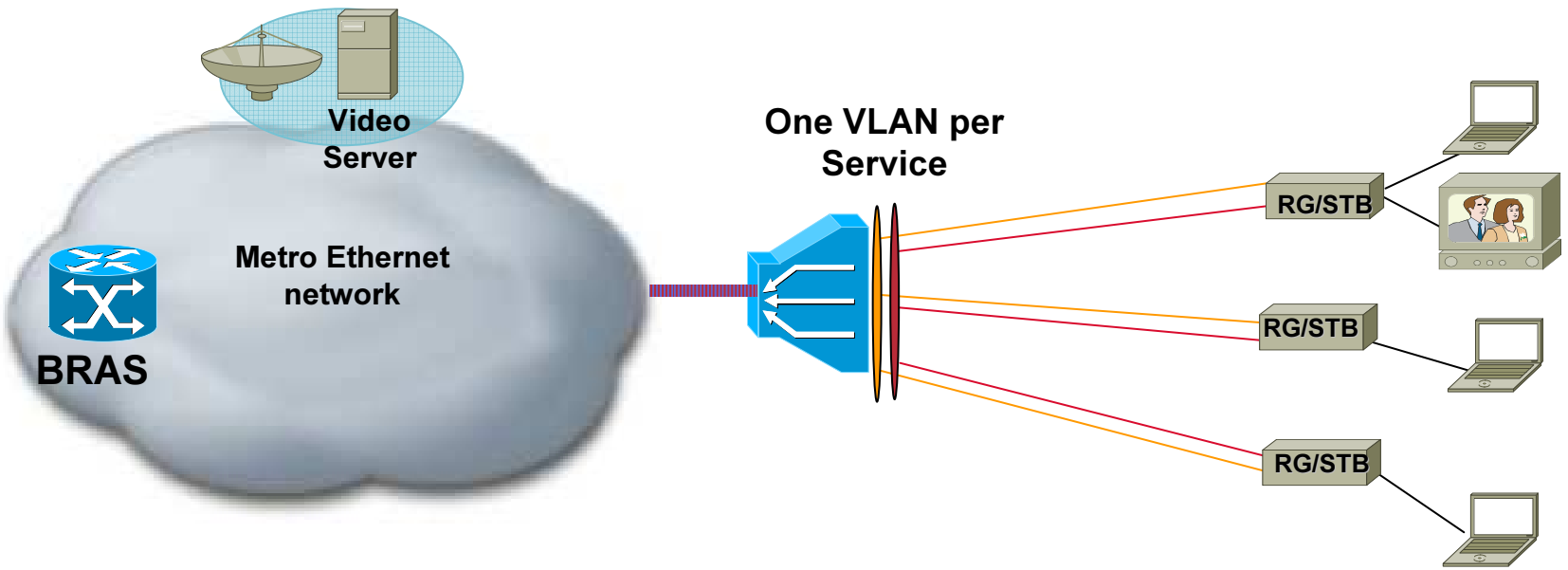
Multi-VC model
One VLAN per Service model – Internet + Video



- DSLAM needs to support
  - Multicast replication
  - Hardware Based IGMP snooping
  - IGMP filter/profile
  - Video DOS prevention mechanism
  - Limit number of Video stream per subscriber

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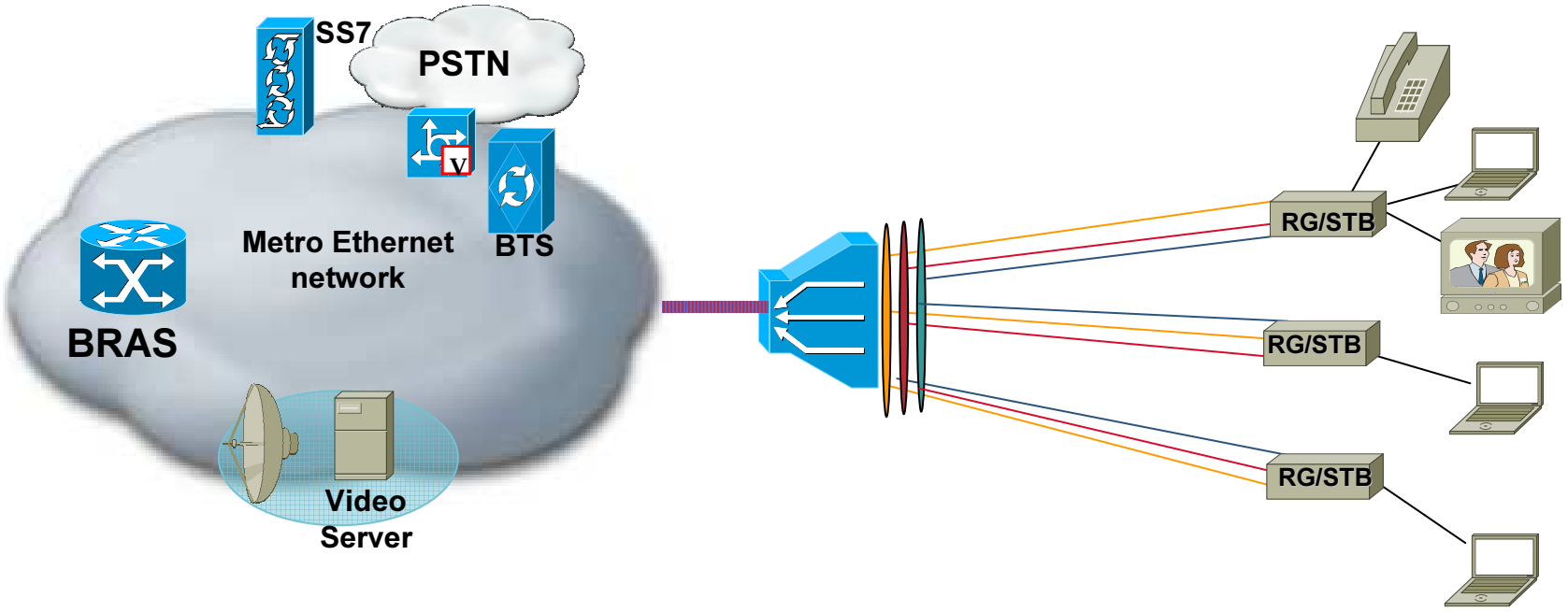
Multi-VC model
One VLAN per Service model – Triple Play



- Multi-VC model – ATM hardware to provide QoS
- Voice – CBR
- Video – VBR-RT
- Internet – UBR

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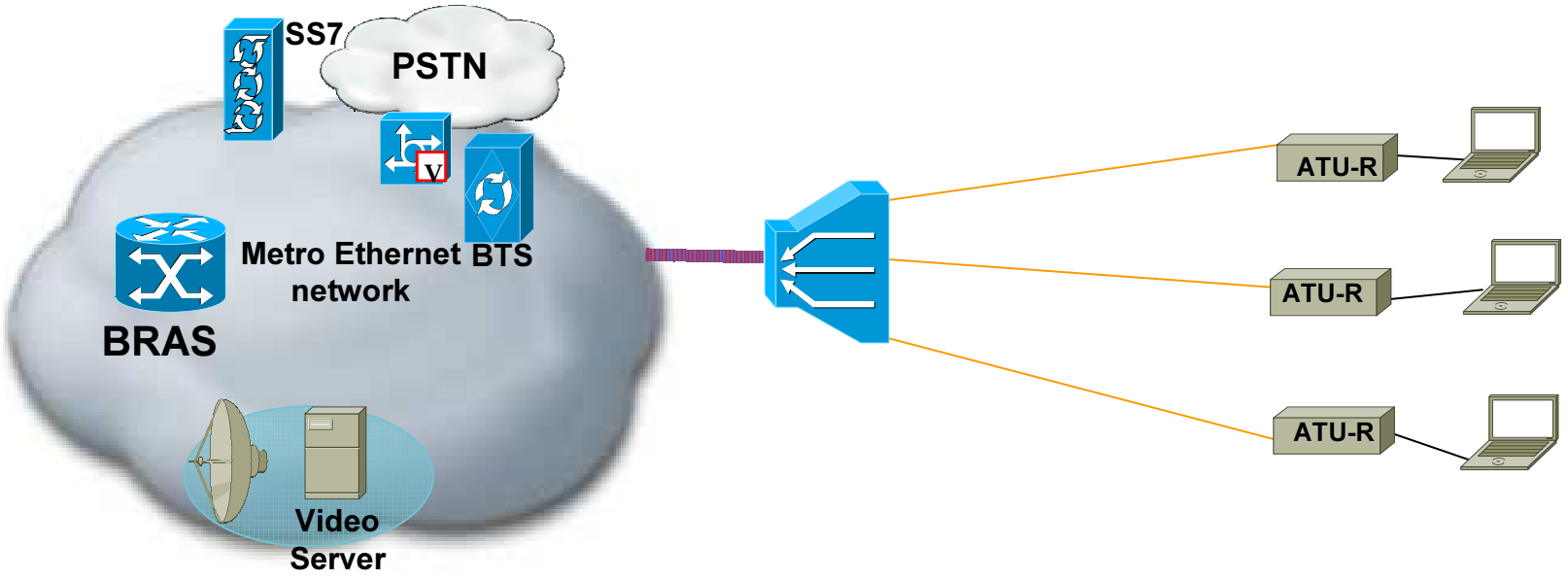
Single VC model – Triple Play



- DSLAM needs to support
  - ALL features on the Multi-VC model
  - IEEE 802.1P based Queuing mechanism

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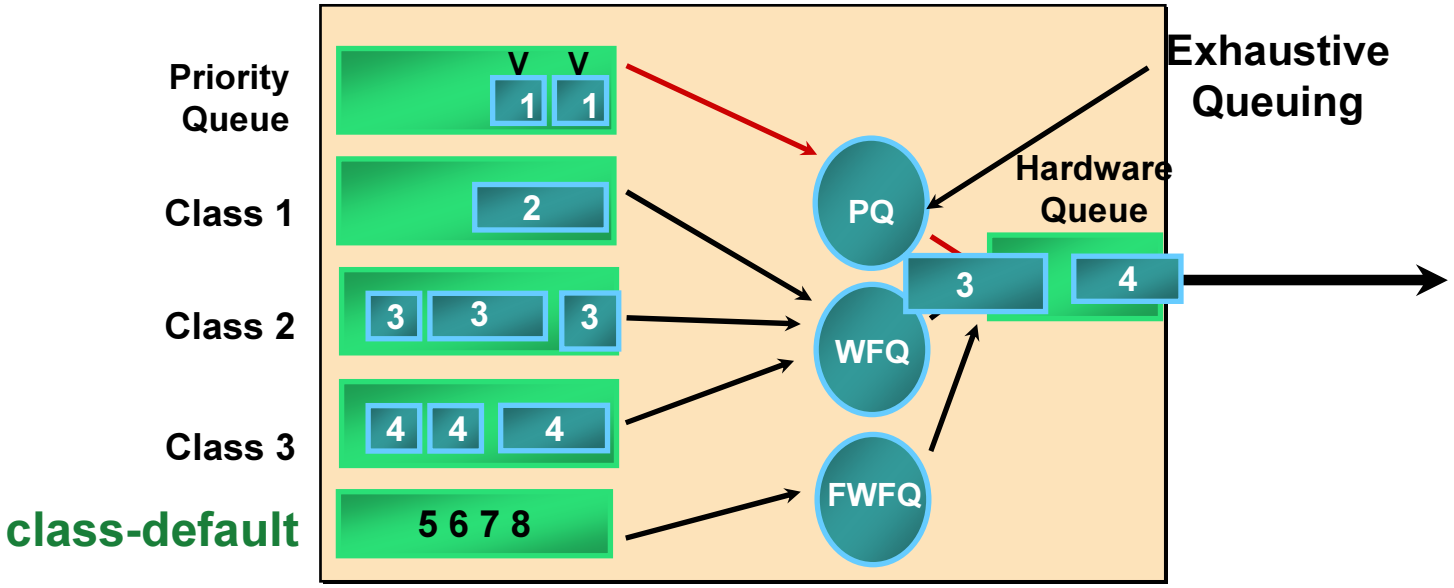
Low Latency Queuing



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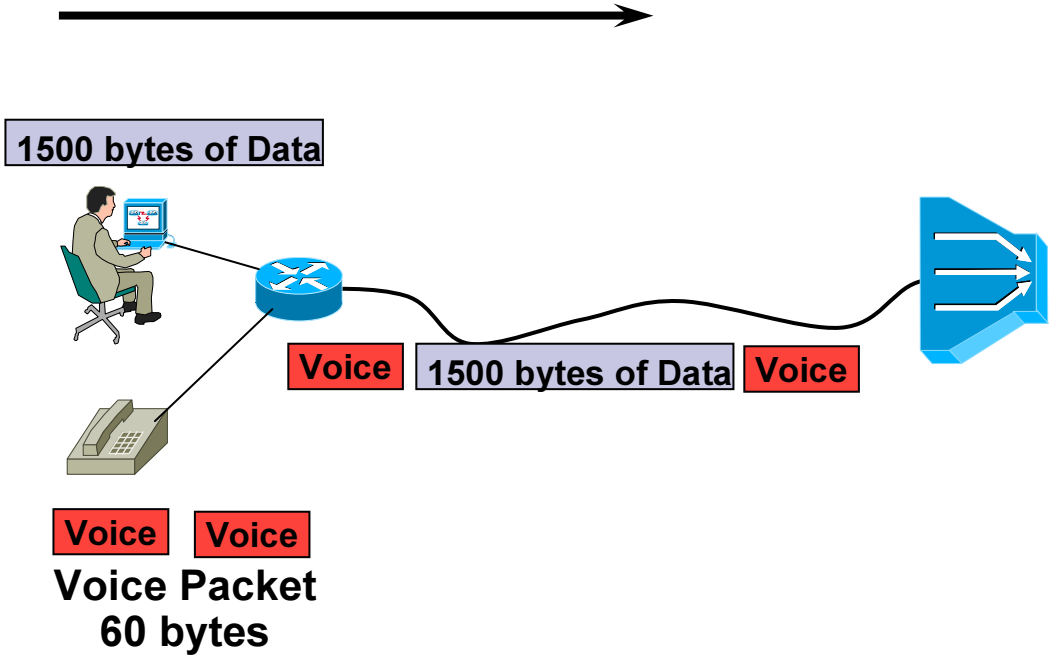
Large Packets “Freeze Out” Voice



- **Max. Uplink Bandwidth 800kb/s**
- **Max. Downlink Bandwidth 8Mb/s**

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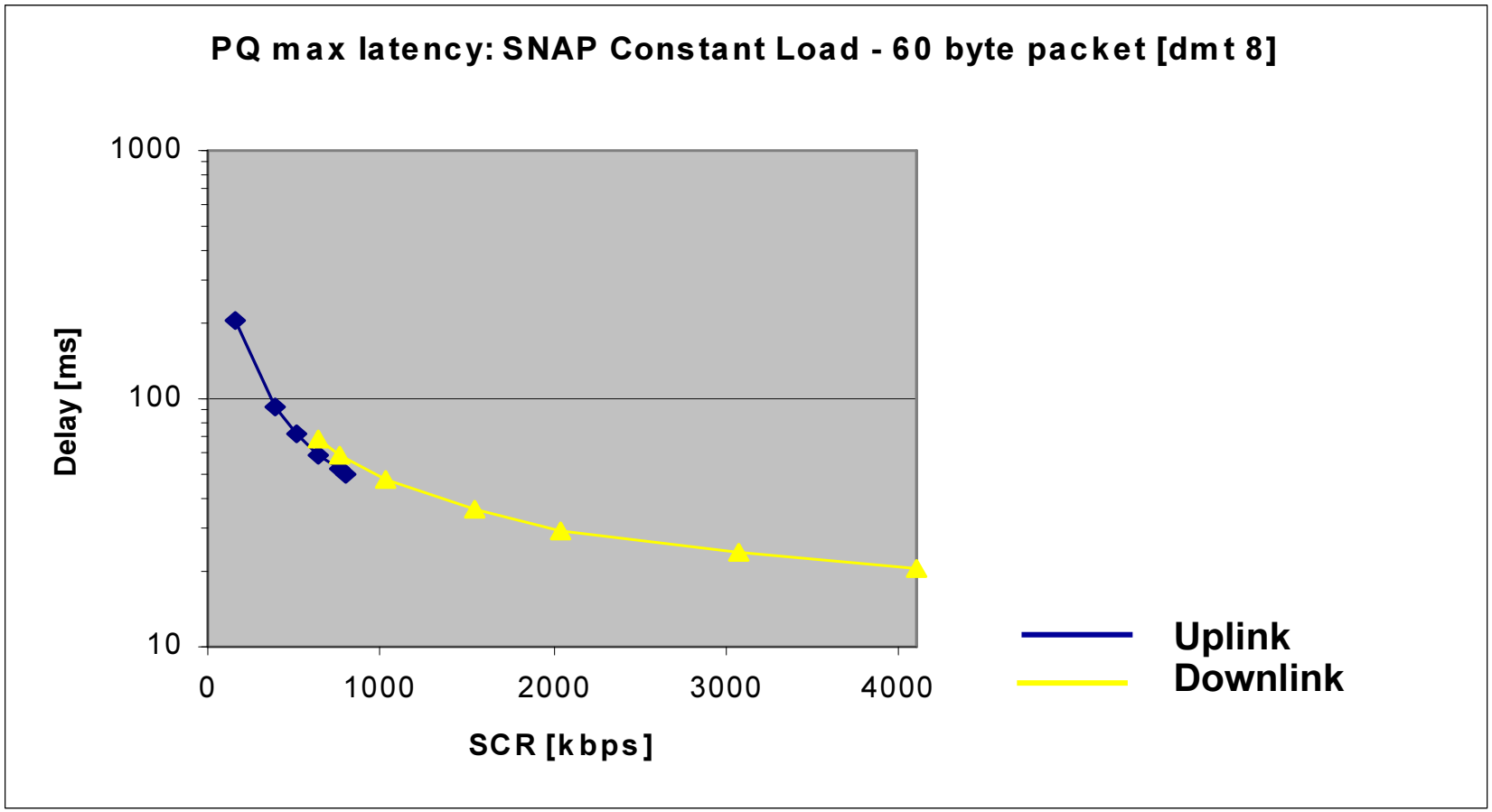
Worst case delay – LLQ

- **Fragmentation scheme is needed to mitigate serialisation delay**



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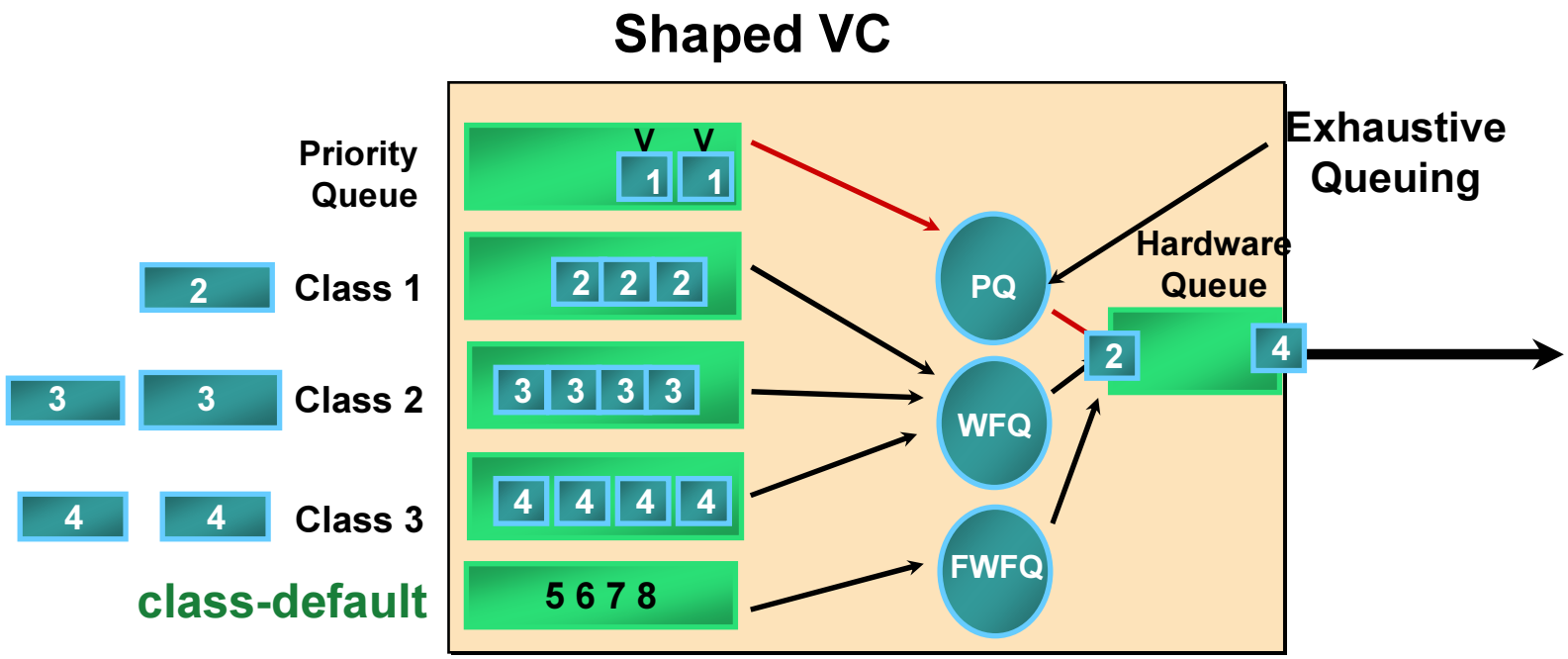
Low Latency Queuing + MLP/LFI



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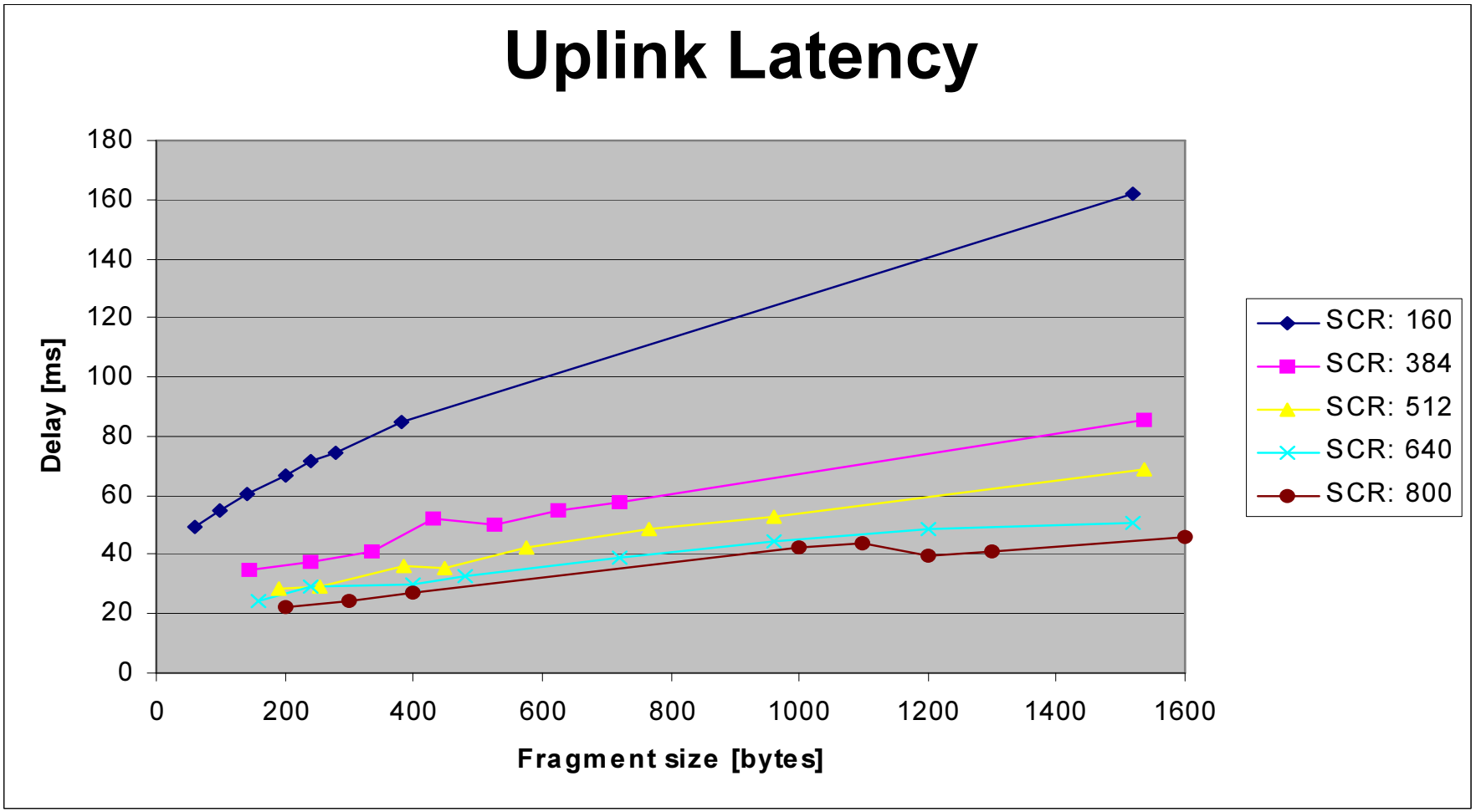
Worst case delay – LLQ + Fragmentation/Interleaving



Home Gateway to BRAS

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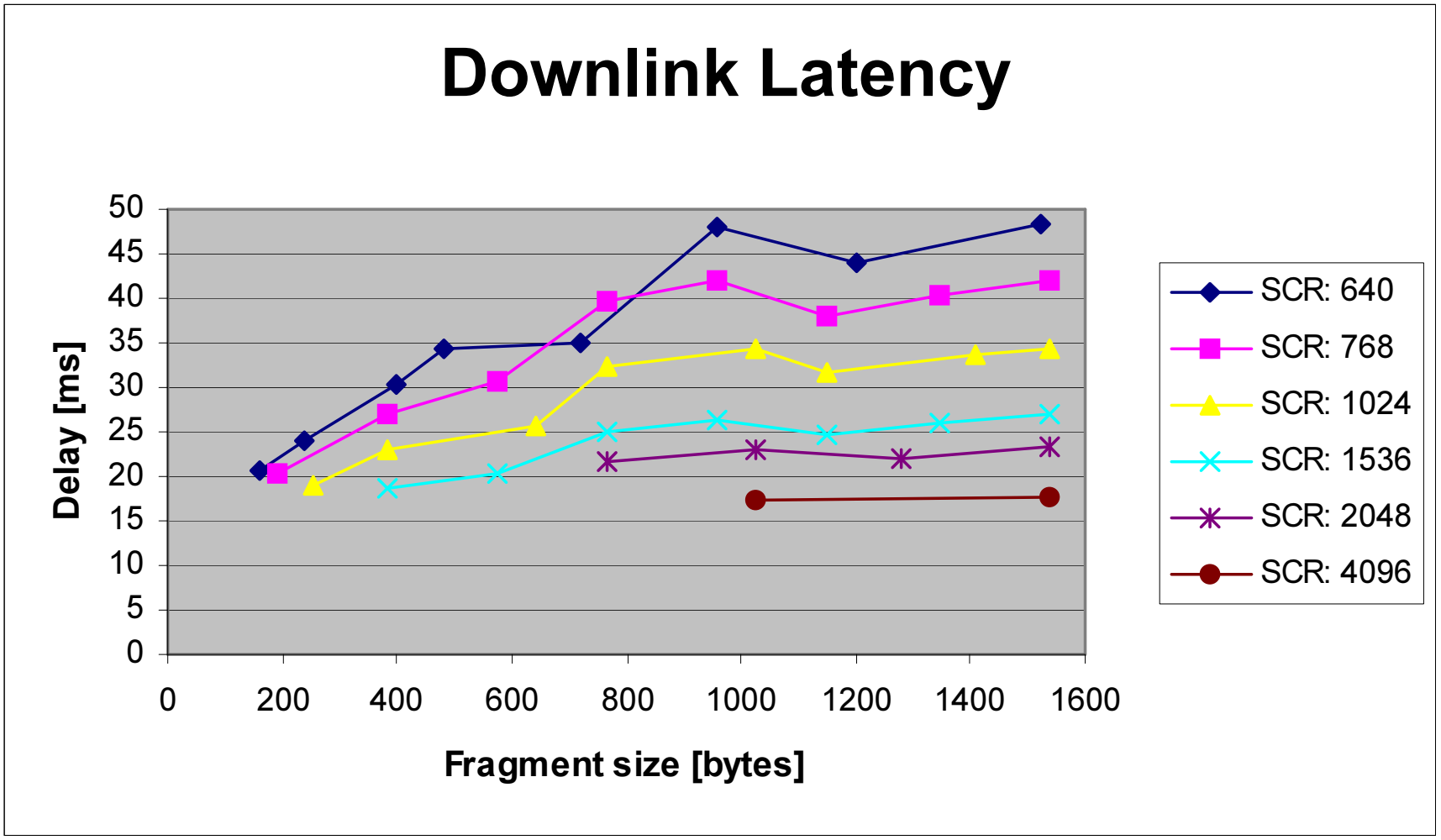
Worst case delay – LLQ + Fragmentation/Interleaving



BRAS to Home Gateway

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Triple Play Over Metro Ethernet

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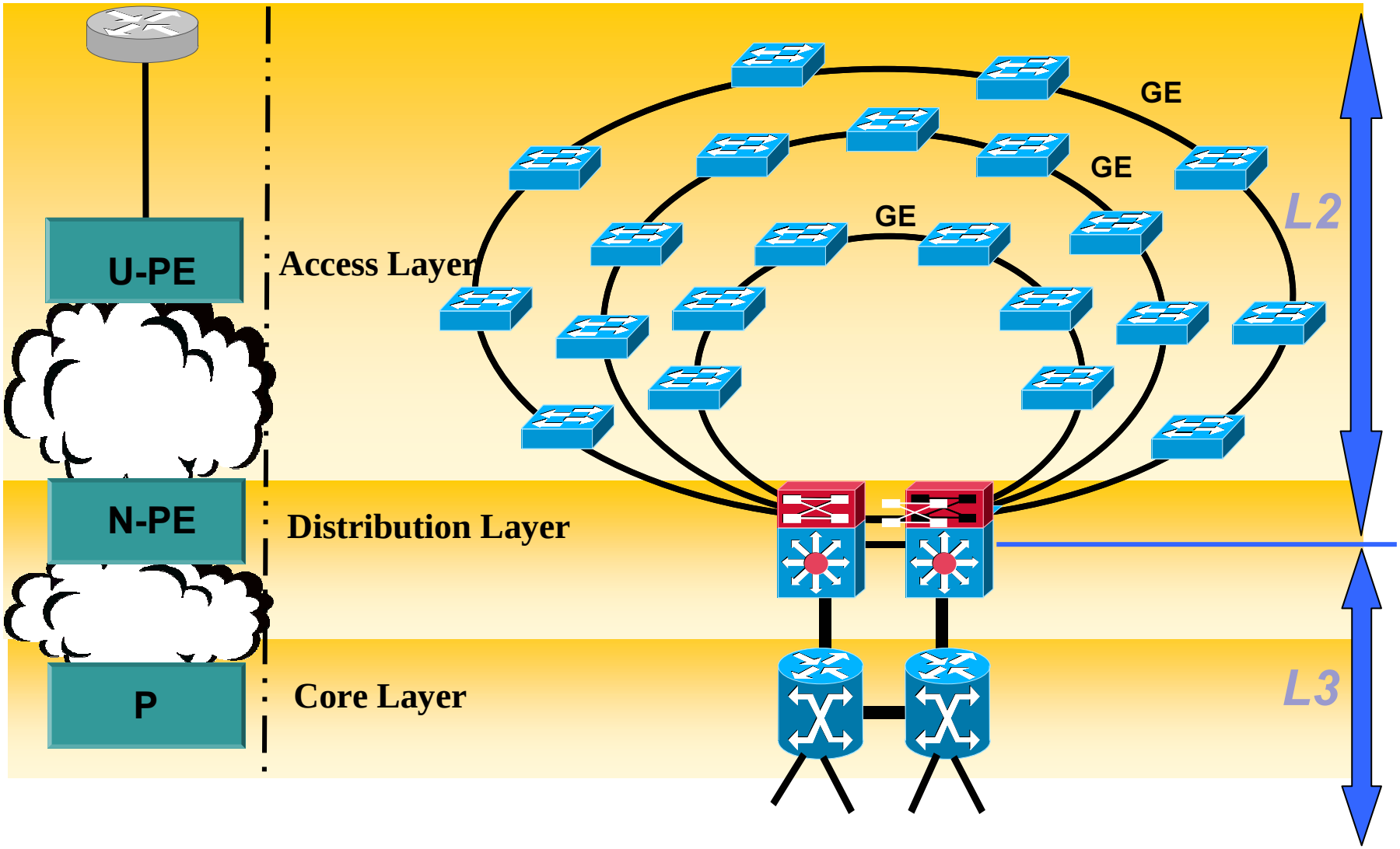
Residential Layer 2 Ring Architecture



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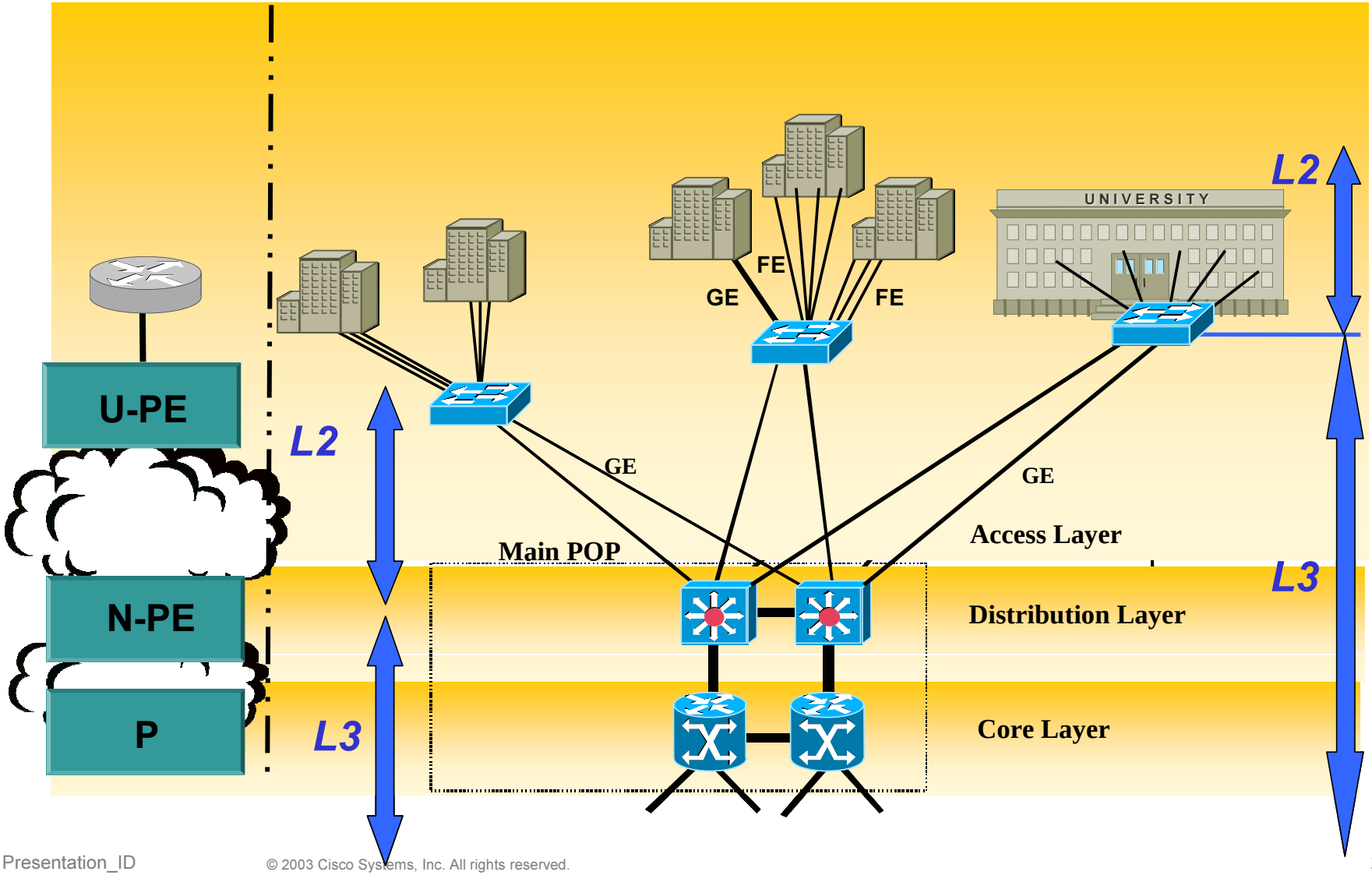
Residential Star Architecture



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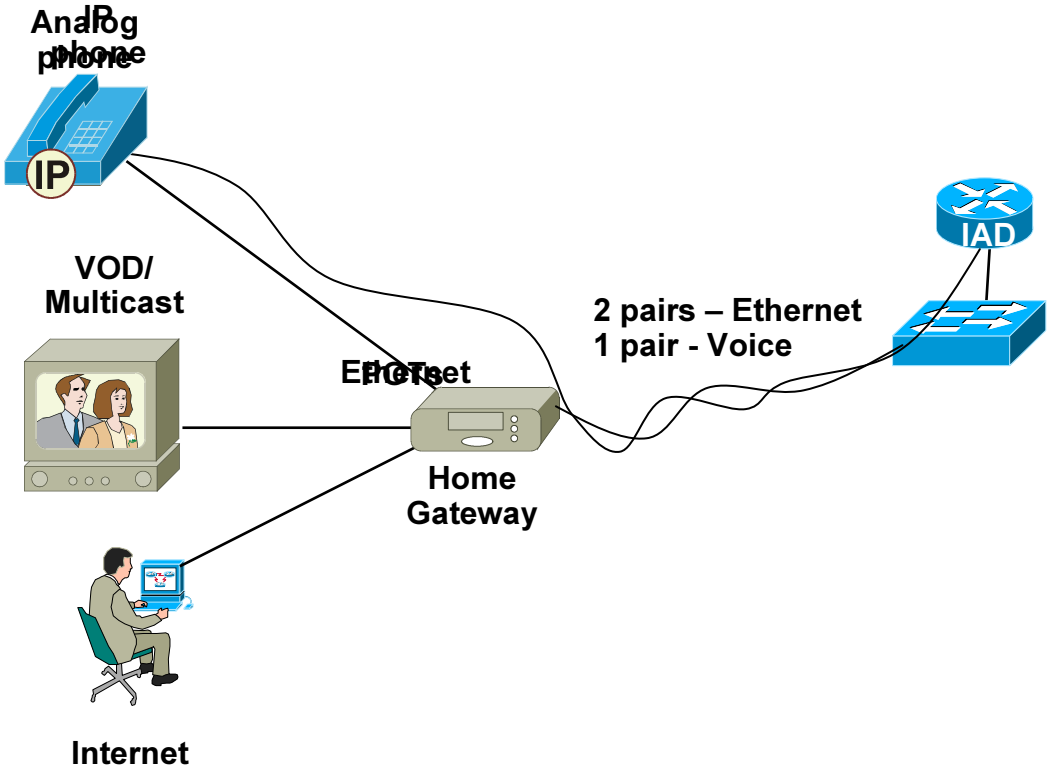
Residential Triple play Architecture



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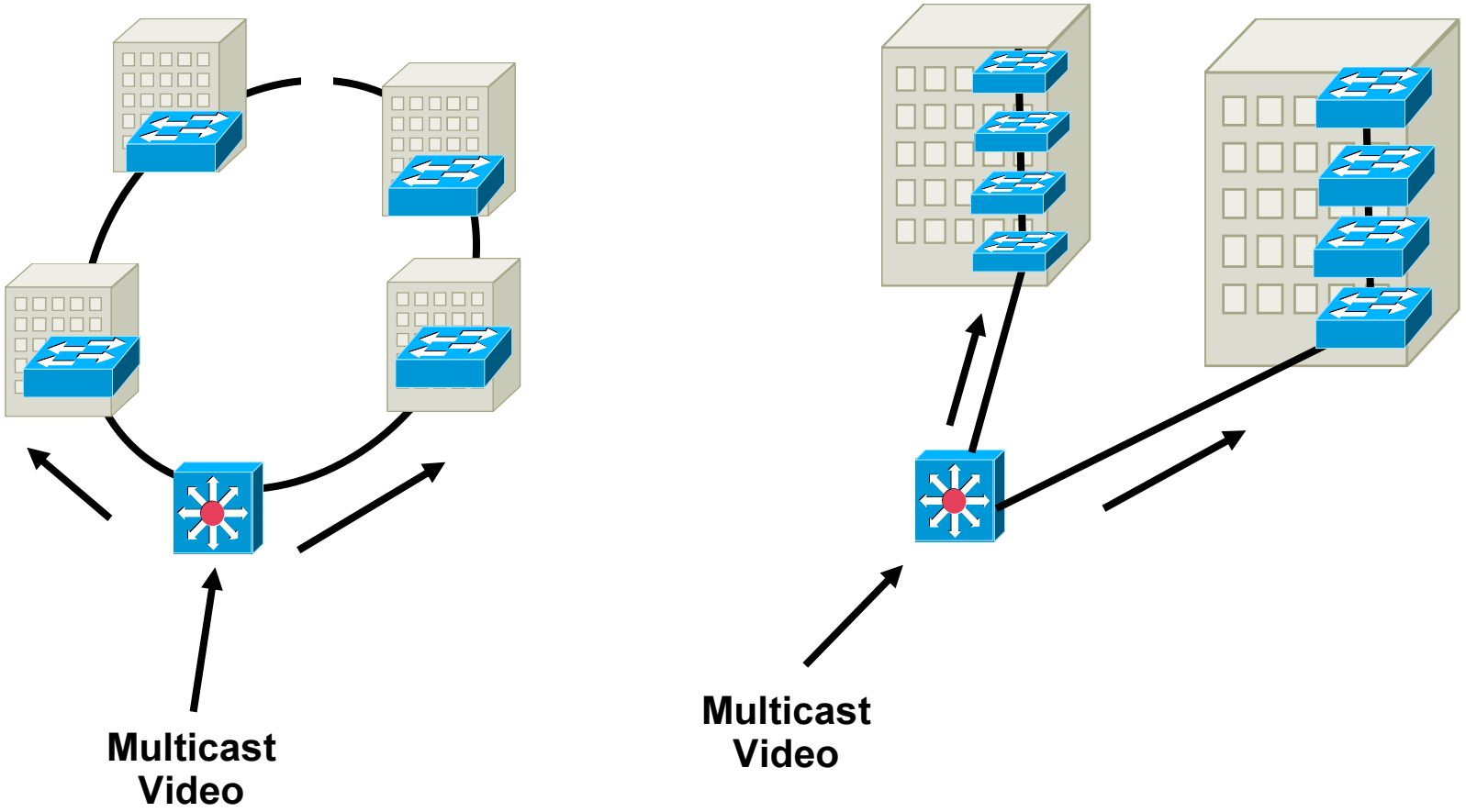
Scalable Multicast Video Delivery Mechanism



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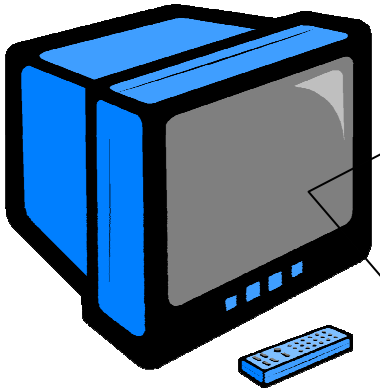
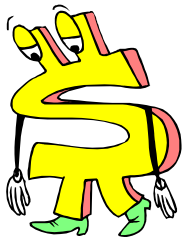
IGMP Filtering- Service Benefit

Broadcast Video Service Without IGMP Filtering



Single Service Plan

Identical Set of Video Channels for all Customers

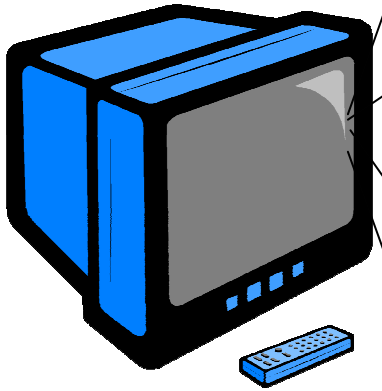


Limited Service Offerings

Limited customer choice/value

Limited Parental Controls

Broadcast Video Service With IGMP Filtering



Gold Service Package

Basic Channels
Premium Movies
Sports Channels

Silver Service Package

Basic Channels
Premium Movies

Basic Service Package

Basic Channels

Parental Control Options

Multiple Service Bundles

Increased customer choice/value

Parental Controls

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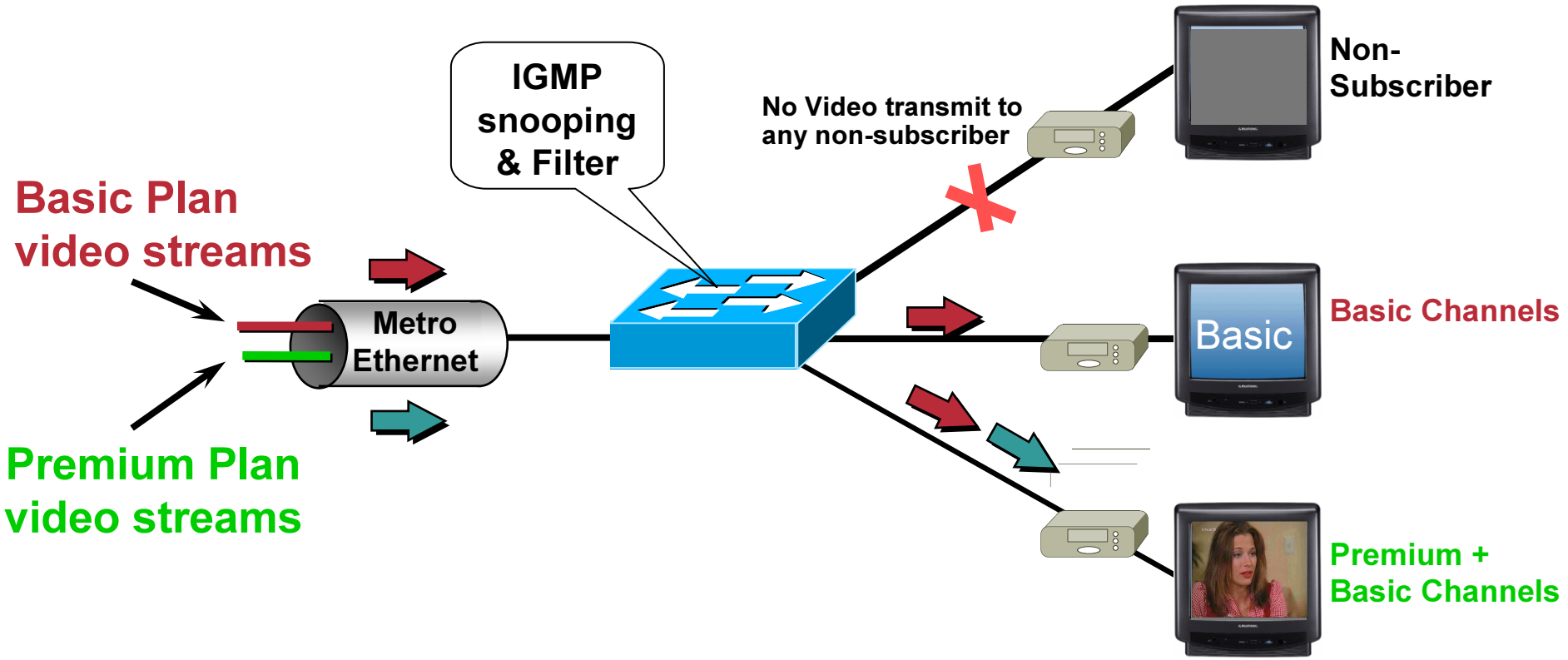
Intelligent IP Video Network



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Summary

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Key Elements for Triple Plays

- End-to-end QoS
- Security
- Scalable Multicast Video delivery mechanism
- Provisioning and billing system
- Service Control and Policy

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