Home Gateway Initiative Phase 1 QoS Architecture

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Home Gateway Initiative

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Why the Home Gateway Initiative?

- Unavailability of Home Gateways providing full support to the telecom operators' requirements for triple play services
- Unavailability of reliable, flexible, cost effective end-to-end solutions (access network + HG + home network architecture) for multiple-play services able to satisfy first of all the customers and, of course, the service providers and manufacturers as well
- The Home Gateway is not seen as a generic advanced modem-router, but a **service enabler device** and an **added value** for both the customer and the service provider

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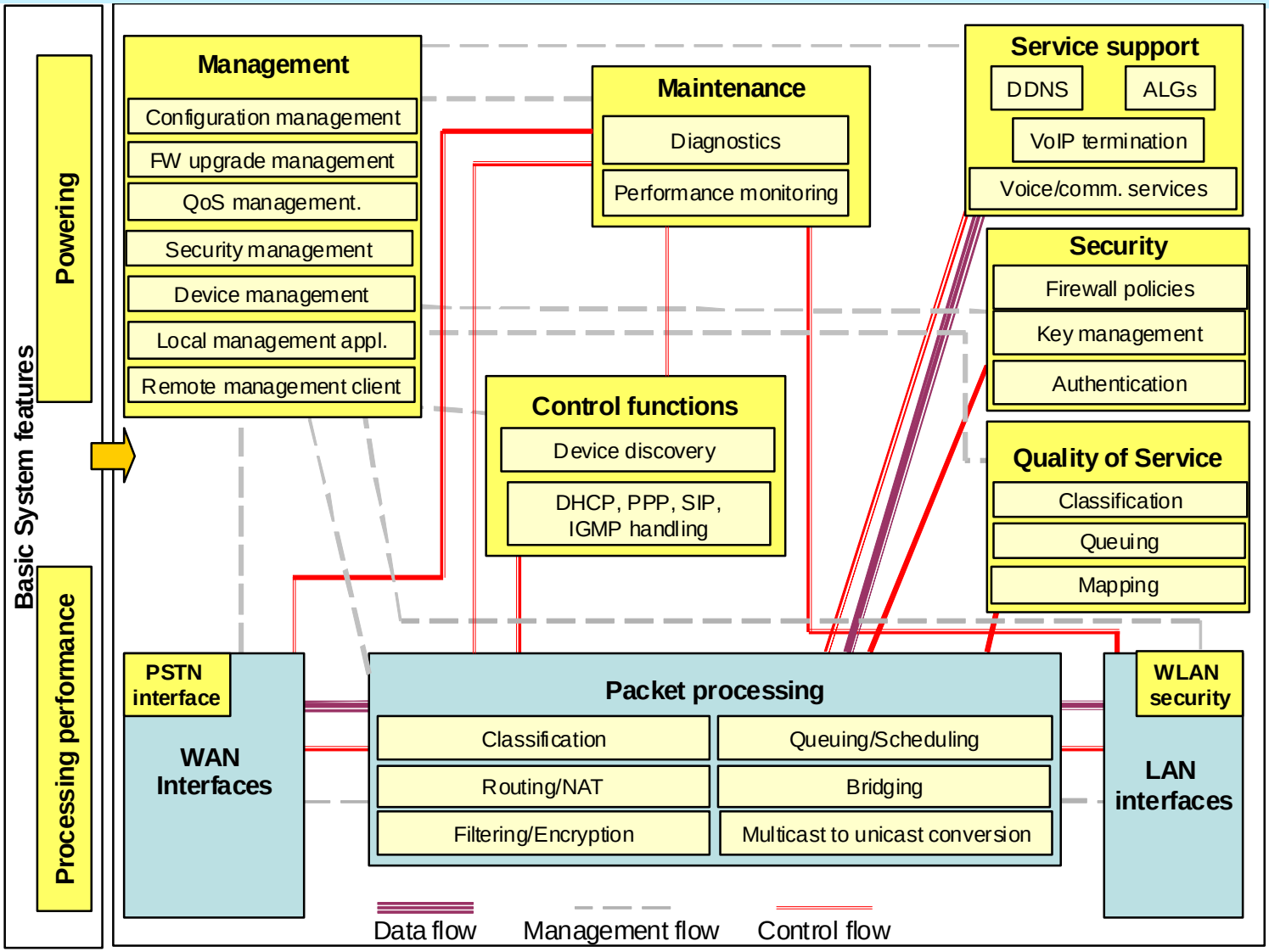
HGI Timeline

- December 15th 2004, founded by 9 members
- March 2nd 2005: official launch
- 69 members (1/4 Telcos) as of April 5th 2006
- July 3rd 2006, official publication of Rel.1 specs
- 1Q-2Q2007: Release 2

HGI Phase 1 Gateway Architecture



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QoS Goals

- Management of key congestion points
  - Potential rate mismatches abound
- Traffic classification and prioritization
  - Goal is identification of Service Class
  - Telco-managed services vs unmanaged services
  - Special attention for voice/video
- Handle Diverse flows in the HG:
  - WAN→LAN (downstream)
  - LAN→WAN (upstream)
  - LAN-LAN (transit)
- Focus on QoS handling within the HG
  - With guidelines for LAN components

Congestion Points

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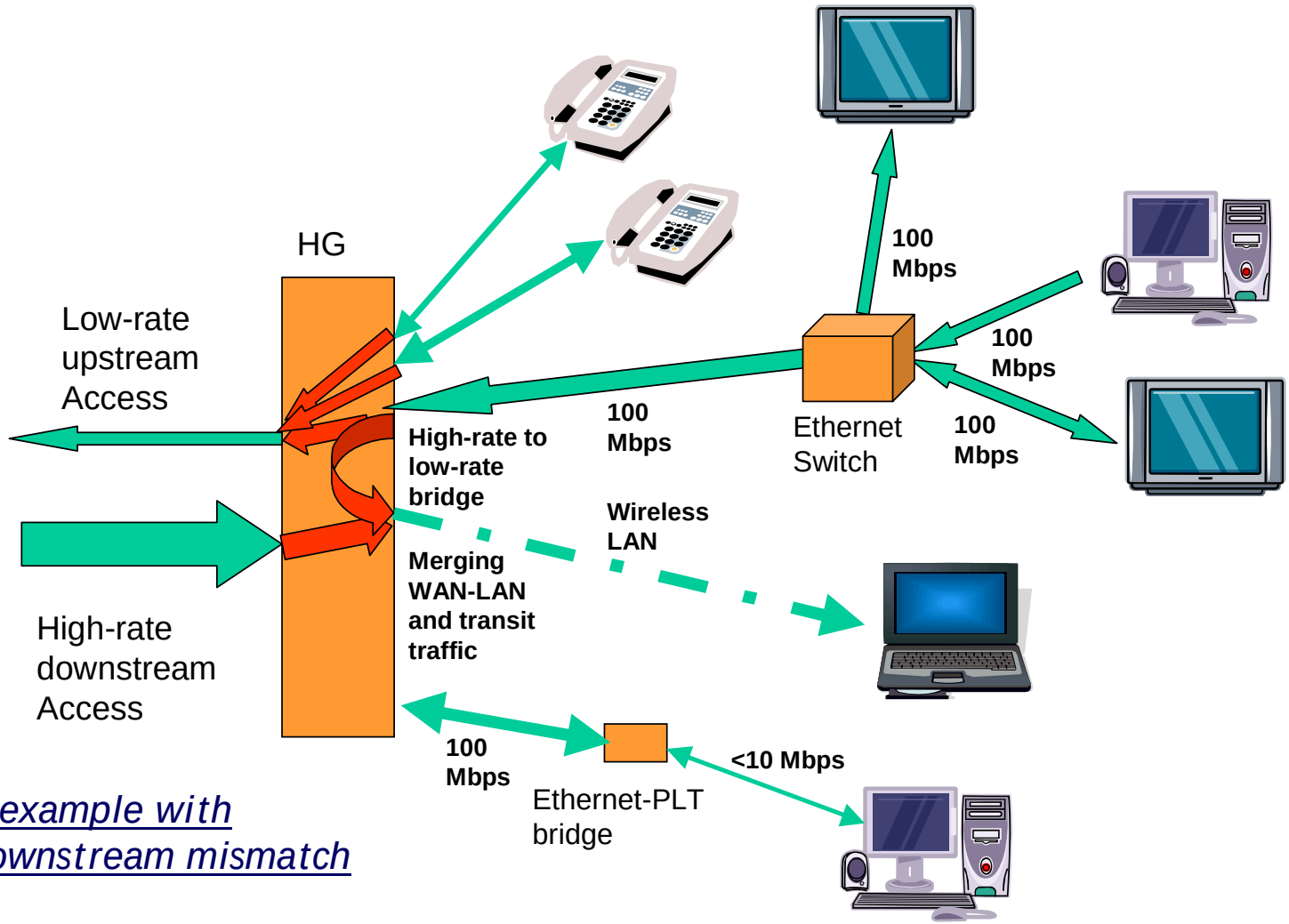

ADSL example with upstream/downstream mismatch

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Managed vs Unmanaged Services

- A managed service is a service for which the service provider provides preferential treatment (that can include QoS)
  - IPTV
  - Voice
  - Could also include classifiable LAN-LANflows
- Unmanaged services: an unmanaged service is a service for which the service provider has no commitment to the customer (specially in terms of QoS).
  - Could be: Internet access, peer-peer, general LAN flows….
- Distinguished via classification in the HG

Flow types - details

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- Managed Services are typically WAN →LAN or LAN → WAN
- LAN-LAN flows are a “grey zone”. Typically these are unmanaged, BUT
  - Service provider may wish to provide QoS assistance to some LAN-LAN flows
  - Example: VoD download to be streamed to STB at a later time across the home LAN.
- Means to prevent LAN-LAN flows from disrupting managed WAN → LAN flows
  - Fixed queue allocation scheme
  - Optional deep classification of LAN-LAN flows

QoS Datapath Functions (LAN Side Ingress)

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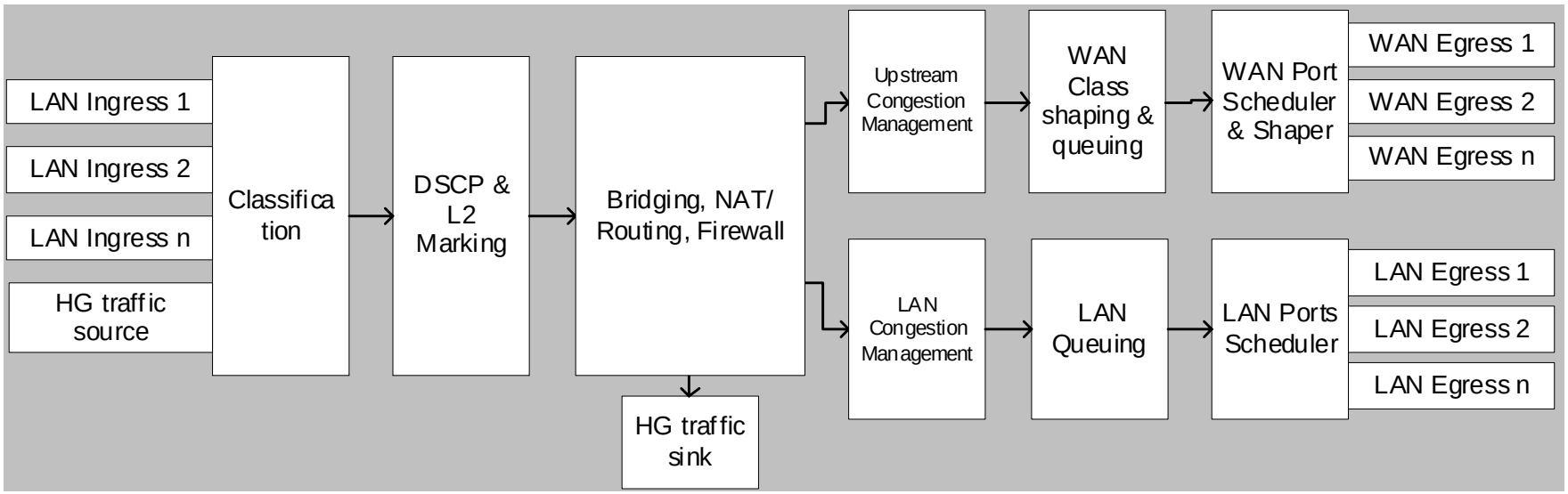

QoS Datapath Functions (WAN side Ingress)

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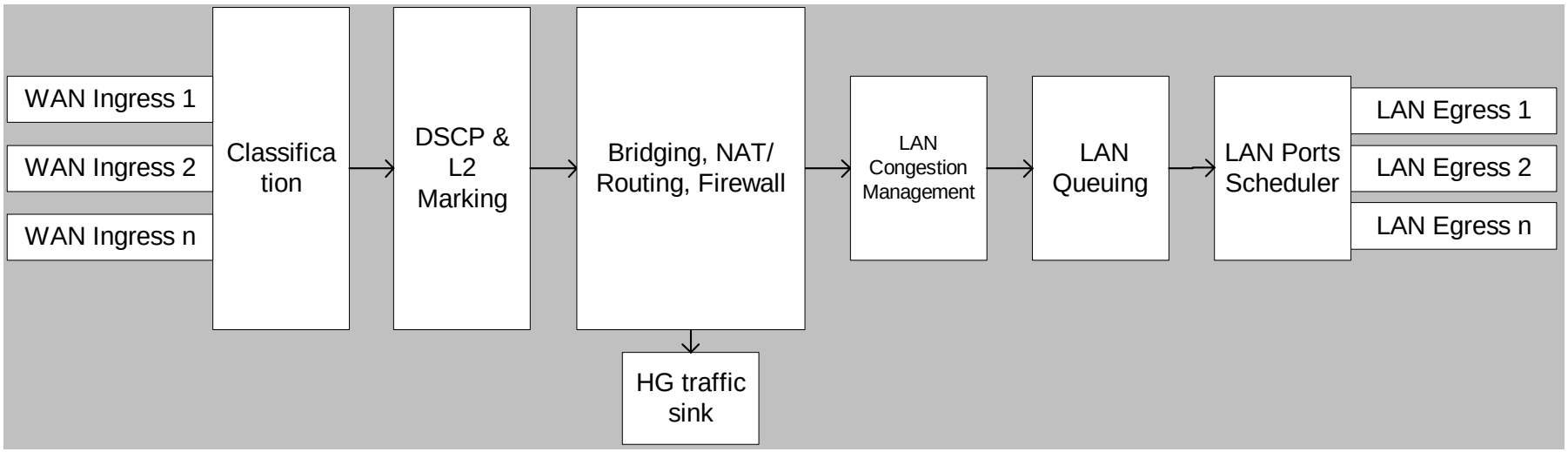

Use of DSCP and Layer 2 Markings

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- The HG provides capabilities of classification and marking at layer 3 (DSCP)
- Layer 2 classification in the HG may also be supported
- Generally, layer 3 markings (DSCP) are preferred within the LAN
  - We do not wish to encourage use of VLAN/p-bit tags within the LAN due to concern about ability of already installed equipment to handle them
    - Must recognize, though, that these tags may be encountered
  - DSCP is our preferred mechanism to transmit priority information to wifi, powerline, etc.
  - Recommended DSCP markings consistent with DLNA usage

Classification

- Classification requirements well delineated
  - WAN ingress
    - Multifield classification upon layer 4, IP and ethernet fields
  - LAN ingress/WAN egress
    - Multifield classification upon layer 4, IP and ethernet fields
  - LAN ingress/LAN egress
    - Typically, simpler classification based only on MAC SA/DA
    - Exception handling (multifield classification) for traffic destined to specified LAN ports

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Queuing

- Egress queuing model
- Packets are slotted into egress queues depending on classification and forwarding decisions
- Queue requirements
  - WAN egress – min 5 queues, 8 suggested
    - strict priority and WRR scheduling
      - Allows lowest latency to be accorded to voice and flexible allocation to other services
    - shaping at class and port levels
  - LAN egress ports – min 4 queues
    - strict priority and WRR scheduling

Queuing Configuration Example

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Direction	Purpose	Scheduling into Port
Upstream	Voice	Strict Priority (highest)
Upstream	Video	Strict Priority (next)
Upstream	Temporary Voice	W1 Weighted Round Robin
Upstream	Premium Data, GPRS Data, Game Data	W2 Weighted Round Robin
Upstream	Best Effort Data	W3 Weighted Round Robin
Downstream	Value Added Services	Strict Priority (highest)
Transit	Value Added Services	Strict Priority (next)
Downstream	Best Effort Data	W2 Weighted Round Robin

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Overload Protection

- An optional mechanism is defined aimed at preserving QoS of managed service flows in the upstream
- Requires identification of flow instance using classification
- Before admitting a new managed service flows to the premium queue, performance is first tested in a lower priority queue
- This mechanism ensures that already identified flows will not be adversely impacted by newly admitted flows

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Congestion Management

- Congestion management is a required configurable capability on all queues
  - Random Early Discard
- The purpose is to improve performance of TCP oriented traffic in the presence of congestion
  - Particularly applicable to upstream link

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Management of QoS Functions

- Phase 1 release of HGI builds upon DSL Forum protocols for managing HG QoS capabilities
- Management from a service provider's Auto-Configuration Server (ACS)
- TR-069 (CWMP) protocol
- TR-098 Data Model
- HGI specific QoS profile for TR-098

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What We Did NOT Cover

- Connection Admission Control
  - No full CAC, although we have a simplified CAC and some flow awareness (in the overload protection scheme)
  - Full CAC requires generalised flow awareness + parameterisation of bandwidth and this is a topic for Phase 2 study
- Interaction with LAN QoS signaling, e.g. UPnP QoS

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Phase 2 Goals

- HGI Phase 2 goals are just being developed
- Increased focus on services such as fixed-mobile convergence
- Initial QoS study areas
  - Revisiting VLAN support in LAN
  - CAC
  - UPnP QoS
  - User control over QoS policy

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THANKYOU

Questions?