Residential Ethernet Objectives, Status and Questions

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Agenda

• Objectives summary
• Outline of current consensus approach
• Future work
Simplified 802.1-based objectives

- Guaranteed QoS attributes for streams over small diameter (home-sized) network with 7 Ethernet hops max
  - smaller number of hops for MACs with more inherent latency
- QoS attributes are:
  - latency less than 2ms
  - guaranteed bandwidth (assignable per stream)
  - packets are not dropped
  - once a stream is established, its performance is guaranteed
- Timing synchronization between DTEs with low jitter and approaching zero wander
  - specs TBD
Background

- All proposed mechanisms need bridging support for a full solution
  - “consensus” approach can be fully implemented within 802.1 bridges
    - Worst case is communication of frame start or end TX/RX timing information from MAC to “higher layers”

- May 2005 SG interim in Austin, voted 14-0 to start work on how this might be done … within the 802.1D structures and architecture
  - This should be done within 802.1, so … here we are!
Current consensus approach

- NOT a standard, NOT complete, NOT ready for prime time
  - Part of a detailed investigation of methods and objectives
  - Tries to use existing services (or built on top of existing services) as much as possible

- Precise timing services
- “DiffServ-like” admission control and QOS
Provide network-wide precise timing information

- For streaming media time stamping -- provide low jitter delivery services to higher layers
- For coordination of multiple streams and user control
- Can be done with higher layers (e.g., IEEE 1588) but at the cost of higher costs and complexity
  - Simplified version optimized for 802.3 using unique Ethertype under investigation
  - Still needs MAC-layer *specification* support
    - Or we can continue to use the 1588 hack
Guaranteed low-latency data service

• Expedited / rate controlled traffic
  – Guaranteed high priority for streams
    • Enforced limits on use of high priority (e.g., no more than 75% of available link bandwidth)
  – Rate controlled traffic
    • Endpoints need to pace traffic
    • Bridges may also need to shape traffic

• Admission control to guarantee QOS
  – Developing solution uses new GARP application “GSRP” and corresponding reservation protocol
    • All soft-state, quite simple
    • Enforcement of reservations only at endpoints
Future work

• Integrate more of existing and planned bridge capabilities
  – E.g., learn more about how to use the mechanisms that Paul suggested (egress min/max, for example)

• Learn how to get what we want for minimum cost and complexity within 802.1 architecture
  – More work within 802.1, more cooperation with 802.1 developments

• Start “trademarking organization”
  – Select and enforce profiles/options of 802.3/802.1/etc and give them enforceable labels
Thank you!

(backup slides attached)
Original Objectives with edits for possible 802.1 work

- Auto-configuration of MAC/PHY, e.g., auto-negotiation, Auto MDI-X
- A mechanism to request/grant/assign resources and the default rule(s) for managing the resources (e.g., 802.3ah MPCP)
- Support both time-sensitive and best-effort traffic simultaneously, with some bandwidth reserved for best-effort traffic.
- Time-sensitive traffic only supported over 100Mb or greater full-duplex
- Time-sensitive traffic is not disrupted when any station/session is added or removed from the network
- Bounded maximum delay time-sensitive traffic (2ms end-to-end through network; 250us maximum through 1 hop; values to be validated in TF)
- Low jitter and approaching zero wander
- Network provides “house” clock for application synchronization within 5us.
- Needs to be specified by “trademarking” organization

- Based on existing 802.3 PHY(s)
- Supports IEEE 802.3 Power Over Ethernet
Additional objectives which were out of scope for 802.3

• Bridging between 802.3, 802.11 and 802.15.3 (and other 802 MACs) preserving QoS
• Compatible with 802.1q
• No streaming frames dropped, bandwidth is reserved
• Default policy is first-come, first-served by request
• Network will automatically reclaim allocated but unused resources
• Support arbitrary topologies within reasonable limits (802.1d)
Assumptions

• Not intended to be used in provider networks
  – Really for the endpoint “subnets” of the provider networks
• Control path to assign resources/establish timing hierarchy/etc uses existing 802 services
• Default policy for resource assignment is first-come, first-served
• Network will automatically reclaim allocated but unused resources
• Some bandwidth will always be available for best-effort traffic
• Latency guarantee of 2ms means that delivery jitter is no more than 2ms as well