

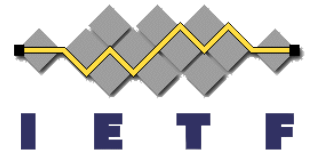
DetNet BoF

IETF #93

DetNet Problem Statement

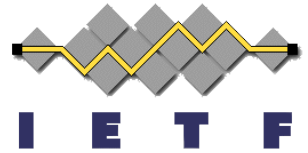
Monday, July 20th, 2015

Norman Finn



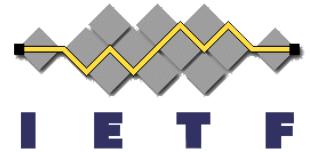
Contents

- What do the presented users' requirements have in common?
- Which of these are candidates for DetNet to solve?
- Mapping users' wants to existing technologies.
- Resource Reservation? Seriously?
- Problems for DetNet WG to solve



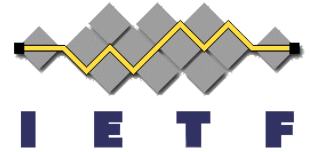
What do the presented user requirements have in common?

Characterizing the users' critical data streams

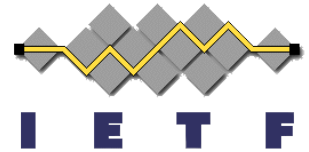


- Fixed bandwidth; back pressure is not an option
- Wide range of data rates
- Too much aggregate critical data to simply prioritize and overprovision
- Must replace scattered, ad hoc, and proprietary solutions with an open, standard, solution compatible with the rest of the world

What do the users want from the network?

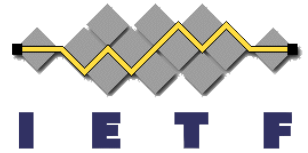


- Time synchronization
- Guaranteed worst-case latency, preferably low
- Low, sometimes extremely low, packet loss probability
- Convergence of critical streams and existing QoS mechanisms (not just “best effort”) on the same network



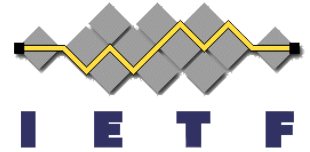
What kinds of networks?

- Bridged, routed, and mixed
- Wired, wireless, and mixed



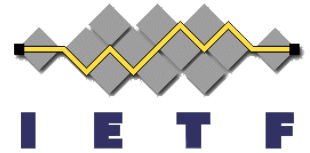
Which of these problems are candidates for Detnet to solve?

Which “wants” are DetNet’s problem space?

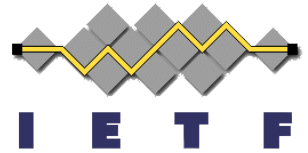


- ~~Time synchronization~~ is being handled by other WGs and other SDOs.
- **Guaranteed worst-case latency, preferably low** Yes!
- **Low, sometimes extremely low, packet loss probability** Yes!
- **Convergence of critical streams and existing QoS mechanisms (not just “best effort”)** on the same network Yes!

Which networks are DetNet's problem space?

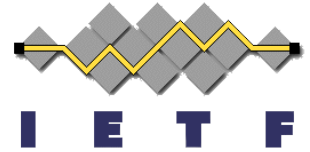


- **Bridged, routed, and mixed** Bridges are being handled in IEEE 802.1, so far. If the “mixed” case is to work, the IETF routed and IEEE bridged solutions must be coordinated.
- **Wired, wireless, and mixed** Each wireless medium is different, and all are very different from wired media. Wired/optical media are more similar to each other. A DetNet WG would concentrate on wired solutions, but be open to cooperation on wireless issues.



**Mapping users' wants to
existing technologies**

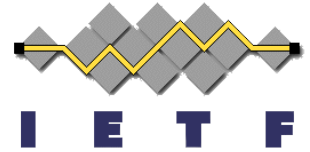
Mapping users' wants to DetNet



Users want: a) Guaranteed worst-case **latency** and b) very **low packet loss** rates for c) **fixed-bandwidth** streams, all d) **converged** with existing QoS mechanisms.

- Well, we **could** start from **Square One** and re-invent new ways to do this.

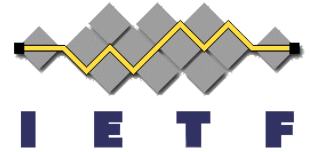
Mapping users' wants to DetNet



Users want: a) Guaranteed worst-case **latency** and b) very **low packet loss** rates for c) **fixed-bandwidth** streams, all d) **converged** with existing QoS mechanisms.

- It's easier and quicker to use **proven existing** technologies.

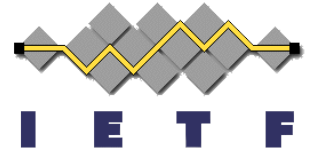
Mapping users' wants to DetNet



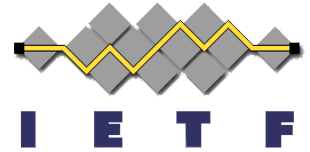
Users want: a) Guaranteed worst-case **latency** and b) very **low packet loss** rates for c) **fixed-bandwidth** streams, all d) **converged** with existing QoS mechanisms.

- So, our starting point is the **advance reservation of dedicated per-hop resources.**

Advance reservation of dedicated per-hop resources

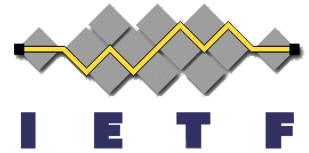


- Why? Because we know this can give us:
 - A computable **maximum buffer allocation** per stream (or class) per hop; which means
 - **Zero congestion loss**; and also delivers
 - A computable **guaranteed worst-case latency**.



Is that enough?

- For many users, **yes**, reserved resources is enough.
 - This allows the network to carry much more critical traffic than a prioritized over-provisioned network can carry.
 - Simple topologies (e.g. rings) give fast enough connectivity restoration that pre-reserved fail-over resources will carry the application over a failure.

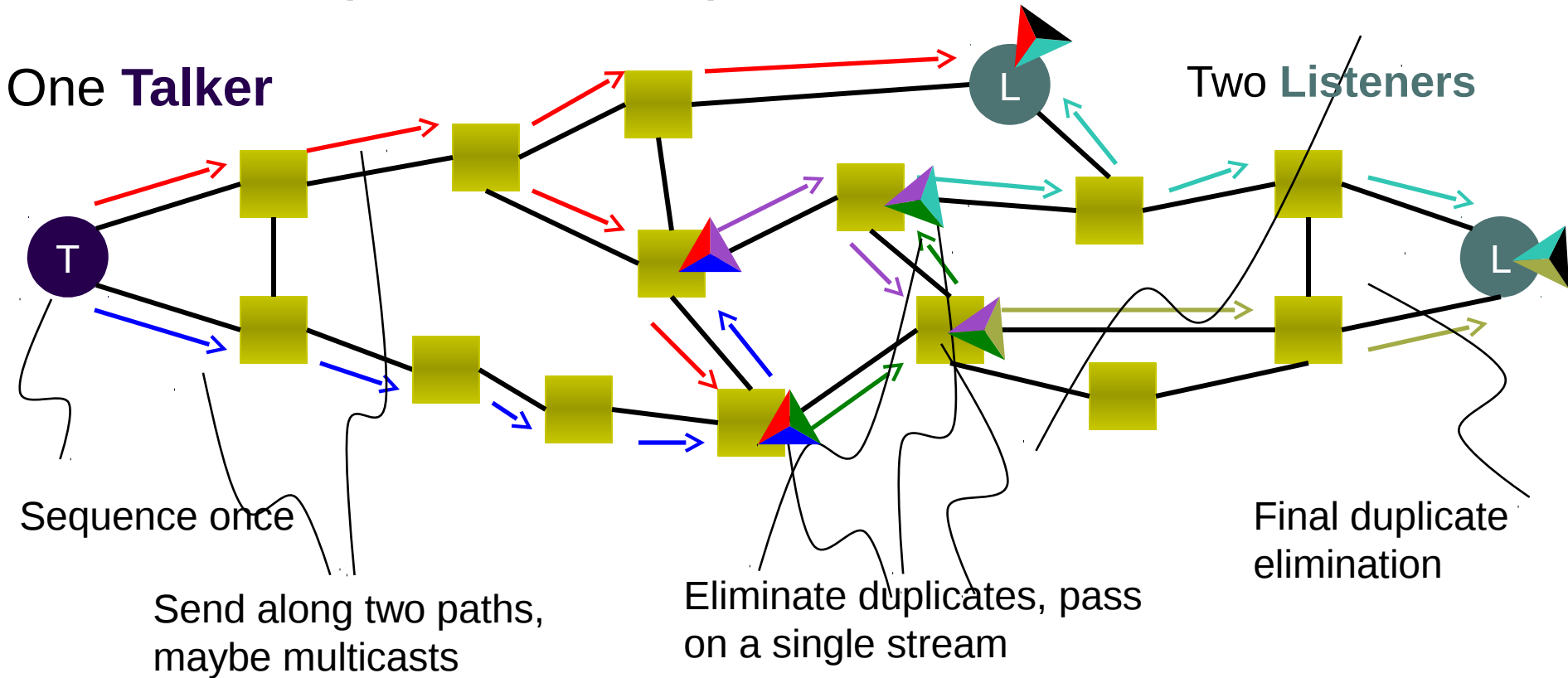


Is that enough?

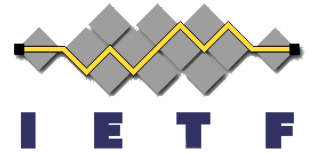
- For many users, **no**, reserved resources is not enough.
 - Bigger, more complex networks take longer to converge after failures.
 - Sharing resources with IT means that failures (e.g. bonehead ACLs) are complex; failure detection/restoration can't depend just on routing/bridging protocols.

Seamless Redundancy

- DetNet will need to support this well-known technique that completes the users' needs.

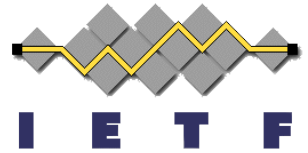


Several failures can be tolerated without a single packet loss

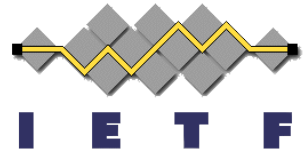


Seamless Redundancy

- (Granted, that's a concocted example.)
- Paths are typically fixed, and are unaffected by network topology changes; they either work, or they don't.
- Listeners never miss a packet.
- **Bulk streams:** (audio/video) Many packets in flight, one stream arrives offset by n packets from the other stream.
- **Intermittent streams:** (process control)
 $n == 0$.



Problems for detnet wg to solve



Problems to solve

- Figure out how to configure DetNet Streams:
 - By static configuration
 - Using network controller (bridges AND routers)
 - From Talker/Listener-initiated requests (B and R)
 - To take advantage of various data-plane shapers
- Select a data encapsulation that:
 - Can traverse bridges and routers
 - Makes it easy to identify a stream
 - Sequences packets for Seamless Redundancy
 - Aggregates streams to achieve scalability