

Equivalent Differentiated Services for AODVng

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Outline

- IP QoS & service differentiation
- Standard diffserv models
- Equivalent Differentiated Services
 - Principles
 - Illustration
- EDS for AODVng
- Conclusion and Future Work

IP QoS

- To provide more than the traditional IP best-effort service the following have been developed:
- Integrated Services (IntServ) [rfc1633]
 - per flow basis
 - provides absolute guarantees
 - does not scale well
 - the intense state-building mechanism does not lend itself to a fluid and dynamic environment of ad hoc networks (hands already full with basic route acquisition)
- Differentiated Services (DiffServ) [rfc2474]

Diffserv model

- QoS is provided at the *class* level instead of the flow level,
- Services are described as Per-Hop Behaviors (PHBs),
- It is more coarse-grained than IntServ
- DiffServ is a scalable architecture

Comments on the models

- In Expedited Forwarding, *premium* is a low-delay service
- In Assured Forwarding, *assured* classes provide low-loss services,
- Absolute guarantees → Need for admission control,
- Pricing differentiation → No intrinsic improvement of the IP network layer
- Open issues on an ad hoc network:
 - Nodes must agree on a set of Diffserv codepoints and per-hop behaviors (PHB's)
 - Need for admission control, traffic marking and policing
 - Proposed answer: Equivalent Differentiated Services (EDS)

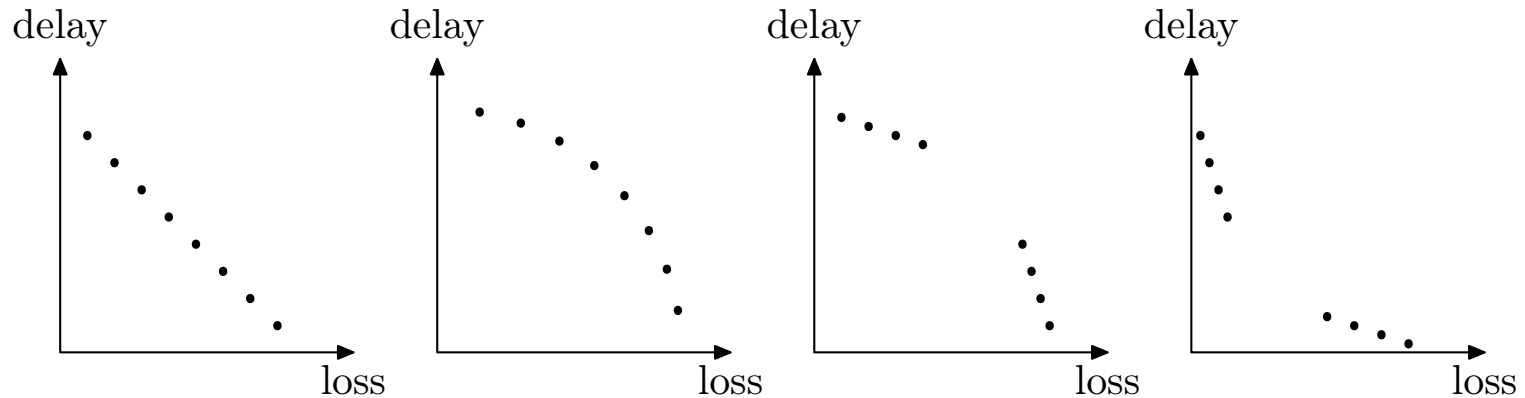
Equivalent Differentiated Services

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- Start with best-effort but allow departure from it
- Some services obtain:
 - better delay characteristics (tradeoff: worse loss rate)
 - better loss rate characteristics (tradeoff: worse delay)
- Weak guarantees (relative, proportional)
- no pricing differentiation, no admission control.
- Gain on one side \leftrightarrow Loss on the other (see also Alternative Best-Effort (ABE) and Best-Effort Differentiated Services (BEDS))

Configuring the EDS Coefficients

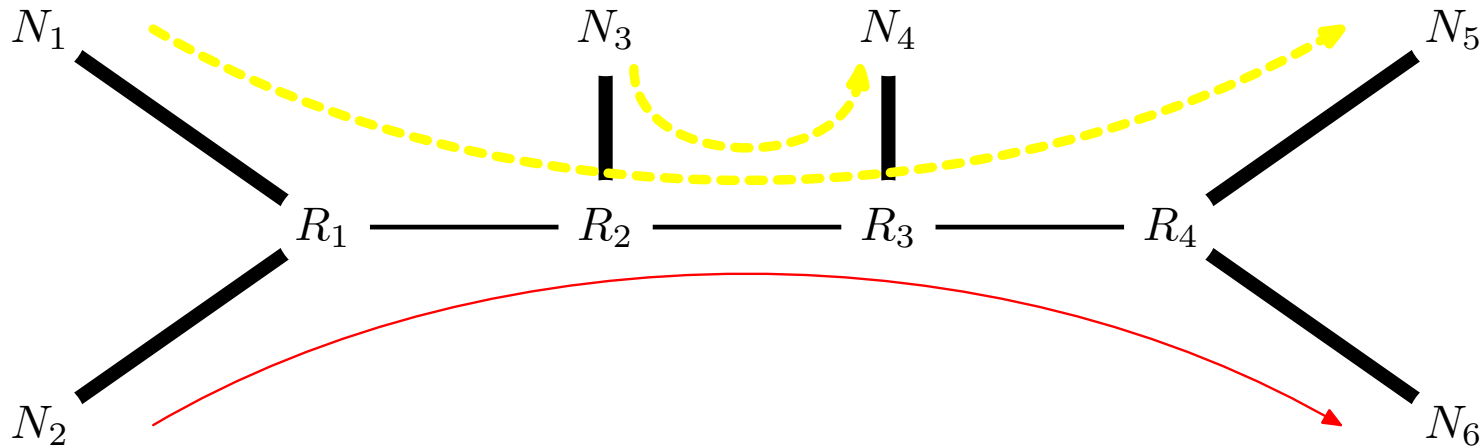
- N differentiated classes are available,
- Expected to be independent of the transport layer (unlike ABE and BEDS),



- However, protocols have to be *ported* on top of EDS,
- The transport protocol is free to choose a class according to its needs
- Dynamic selection of the class

EDS illustration

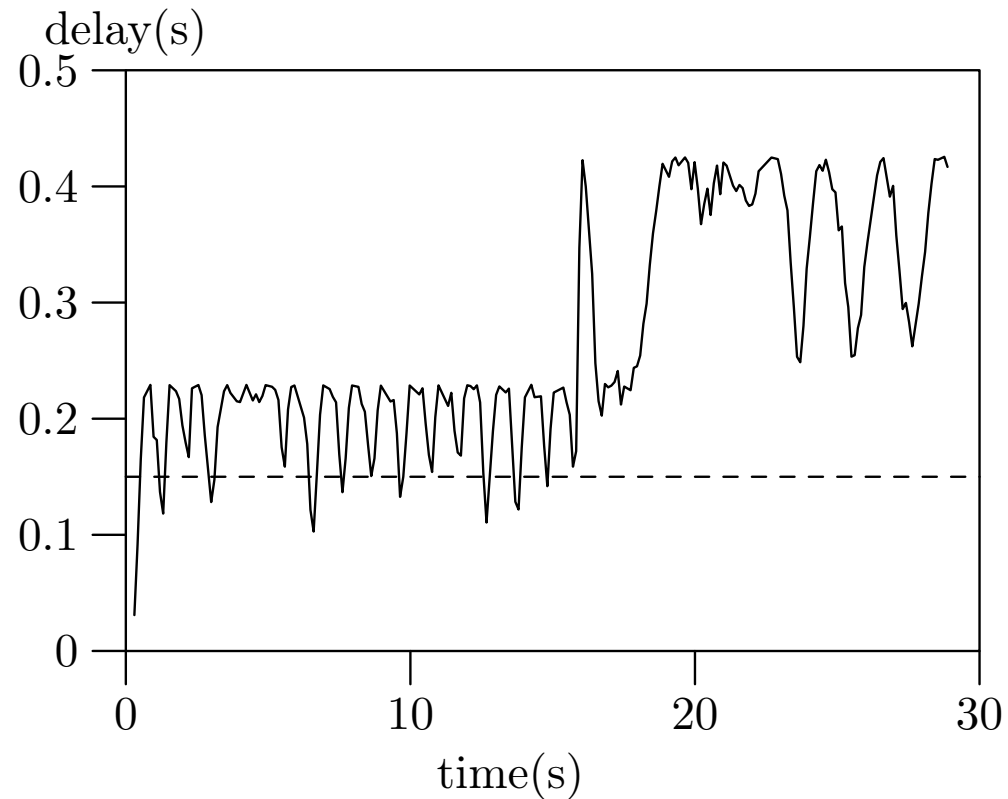
- Case of an application with delay constraints



- The class is chosen dynamically according to the end-to-end delay

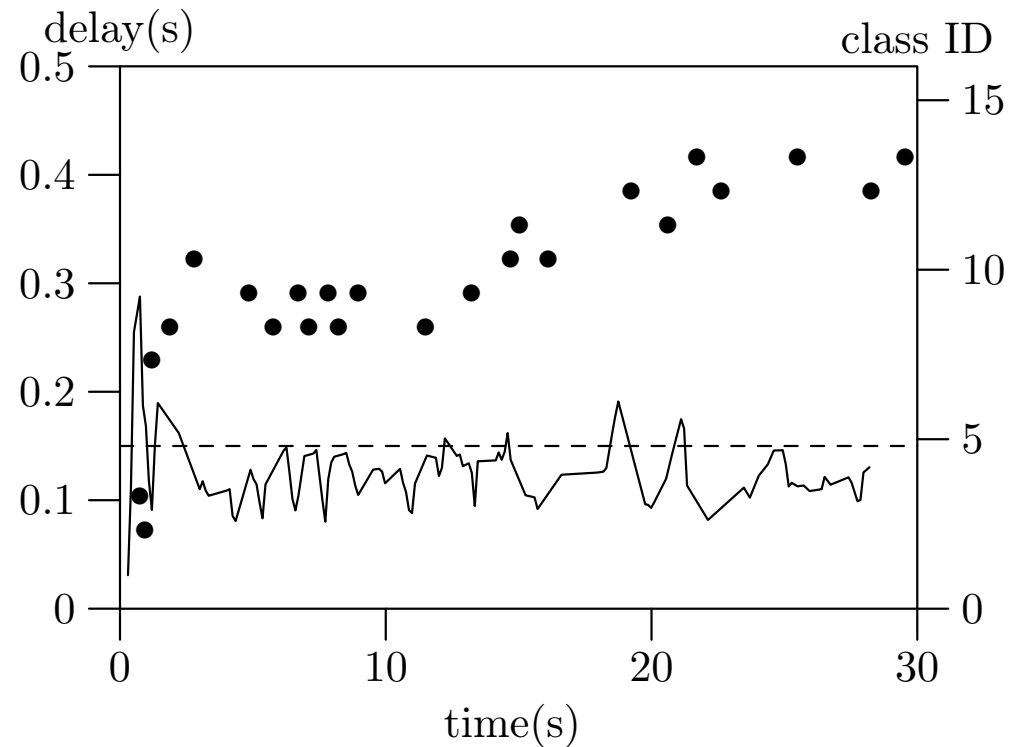
Simulation of the protocol (best-effort)

- Concurrent flows make the end-to-end delay increase



Simulation of the protocol (EDS)

- The protocol chooses the best class



- No guarantee in terms of loss, delay
- The protocol may not give an acceptable performance

Reliable transport

- TODO.
- a large set of directions:
 - running TCP on the best class in EDS,
 - using proxies that have a persistent knowledge of the network performance,
 - patching TCP to dynamically choose a class (ACKs, according to window size, etc.),
 - implementing TCP-like protocols specific to interactive applications, batch file transfer, web, etc.

EDS for AODVng

- A specific EDS coefficient configuration could be agreed upon for AODVng
- This eliminates dynamic configuration
- Provides built-in, simple scheme for service differentiation in ad hoc networks
- Source marks the packets, each one potentially different (i.e. requested QoS is not a route characteristic)
- Marking not modified on transit, unlike current AODV QoS
- Restores compatibility with IPsec
- Incrementally deployable

Conclusions and Future Work

- Really, in an ad hoc network, not generally possible to expect hard QoS guarantees
- QoS via EDS remains close to the simple IP model
- EDS can provide a very simple built-in QoS model for AODVng
- Scheduler (WTP+PLR) was implemented in NS and Linux
- A “real-time” application illustrates the model
- A TCP-like protocol can be created to run over EDS,
- However, TCP static marking may have a meaning.