Router Requirements for Integrated Services:

Fragments of a Very Preliminary Draft

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Revised Service Model Paradigm

- **Single service model (extensible)**
  - **made up of many constituent services**
- **Routers need not support all services**
  - **must be able to say no to a request for a service they don't offer**
- **Advantage: separates the task of defining services from the decision to deploy those services**
  - **definition: this WG**
  - **deployment: experience and the market**

Defining Services

- Services are designed to meet end-to-end service requirements of applications
  - These end-to-end service abstractions are not necessarily embodied in any standard
- Service is provided per-hop
  - These per-hop services must be standardized so that an arbitrary concatenation of routers can provide the desired end-to-end service
  - These standards are spelled out in the Router Requirements for Integrated Services(?) document
    - » Suggestions for better names welcome...
    - » e.g., Network element service specifications
    - » Winning suggestion gets an autographed 8x10 photo of the cochairs!

Nature of the RRIS Document

- **Fundamental output of this WG**
  - Services are <u>motivated</u> by their end-to-end characteristics
  - Services are <u>defined</u> in terms of the required per-hop behavior
- **Extensible**
  - A separate entry for each constituent service
  - Each entry goes through the standardization process
- **Each entry describes several different aspects of service**
  - Defines what it means to offer a particular service
  - Focus of this talk!
- **Also, must specify detailed nature of service module interface**
  - not part of service definitions
  - not drafted yet

What the RRIS document does not describe

- The reservation interface (host-network)
  - Depends on set-up protocol
    - » reservation styles
    - » receiver vs. sender initiated
    - » negotiation models supported
  - Questions about exactly where this should be documented, but definitely not in RRIS
- The application interface
  - e.g., the QM and the set-up protocol are in between the application and the routers

RRIS describes only one of the three natural interfaces

- Application to OS
- Host to network (set-up protocol)
- set-up protocol to router

Purpose of this Talk

- Provide some context [done]
- Describe template for service descriptions in RRIS document
  - list of aspects of service
- Present a few examples
  - predictive and guaranteed
  - not advocating these services, merely illustrating the template
- Gather feedback for next version
  - to be distributed to intserv list soon
  - first verify form, then start debate on substance

Aspects of Service (My Initial Proposal)

- **Motivation**
  - **Informational purposes only**

- **Per-hop Service**
  - **description of the required packet handling**
  - **performance criteria, not algorithm**
  - **e.g., minimal bandwidth shares or maximal packet delays**

- **Traffic Specification and Policing**
  - **specification: token bucket filter, etc.**
  - **policing: nonconforming dropped or delayed**
  - **where enforced: edge, source merge points, everywhere**

- **Invocation**
  - set of parameters handed to service module
    - » Traffic Specification: TSpec
    - » Service Request: RSpec
  - mapping from RSpec to service
    - » e.g. delay targets to per-hop service
  - bit layout of parameters (eventually)

- **Ordering Relations**
  - merging of reservations requires knowledge of ordering between service requests
  - Ordering of TSpec's and RSpec's

- **Advertisement**
  - General way to characterize service
  - Examples
    - » current delays
    - » delay bound
    - » bandwidth
  - Composition rule specified
    - » converting per-hop measures to end-to-end measures
  - Made available to set-up protocol, routing, etc.
    - » must specify query interface (not yet)
  - Can be mandatory or optional
- **Resulting End-to-End Service**
  - What service is provided by a series of routers offering this service.
  - Informational purposes only

- **Others?**
  - **interservice ordering relationships**
  - **default mappings**
    - » **if G is not available should we substitute P?**
  - **Request scripts: if not G then P, and if not P then ASAP, etc.**
    - » **part of interface, not part of service definition**
  - **??**

Level-of-Effort Predictive Service

- **Motivation**
  - **Let's not argue about this now....**
- **Per-hop service**
  - **5(?) logical levels of service**
  - **Delay is "controlled"**
  - **No quantitative characterization of delays is given**
- **Traffic specification and policing**
  - **specification: token bucket filter**
  - **nonconforming packets dropped**
  - **enforced at edges and source merge points**
- **Invocation**
  - **TSpec: (token bucket rate, token bucket depth)**
  - **RSpec:(target-delay) or (service level)**
  - **Mapping: any monotonic mapping of target-delay to service level**
- **Advertisements**
  - **Latency [optional] (additive)**
  - **Instantaneous delay [optional] (additive)**

Bounded Delay Predictive Service

- **Per-hop service**
  - 5(?) logical levels of service
  - Each level is associated with a delay bound
  - Violations of this delay bound are rare
- **Invocation**
  - TSpec: (token bucket rate, token bucket depth)
  - RSpec:(target-delay) or (service level)
  - Mapping: target-delay is mapped to service level with delay bound closest to target delay
- **Advertisements**
  - Latency [optional] (additive)
  - Instantaneous delay [optional] (additive)
  - Delay bound [mandatory] (additive)
  - "Rough" delay bound [optional] (?)

Guaranteed Service

- **Per-hop service**
  - Level of service is characterized by rate r
  - Service must match the “fluid model” to within error bounds of the form A/r+B
- **Invocation**
  - TSpec: (token bucket rate, token bucket depth)
  - RSpec:(rate)
- **Advertisements**
  - Latency [mandatory] (additive)
  - Error Terms A, B [mandatory] (additive)

Questions?   Comments?

- Motivation
- Per-hop service
- Traffic specification and policing
- Invocation
- Ordering relationships
- Advertising
- Resulting end-to-end service
- Others?