Router Requirements for Integrated Services:

Fragments of a Very Preliminary Draft

Scott Shenker
Xerox PARC

IETF, San Jose
12/5/94

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 motivated by their end-to-end characteristics**
  - **Services are defined 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?**