Policy Server and Policy Control Agent

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Location in the Big Picture

- Development environment overview
- Policy Server implementation
- Policy Control Agent implementation
- Measurements with the Agent
Policy Server

- Conventional PC hardware
- FreeBSD operating system
- MySQL database
- Databases
  - User database (profiles)
  - Network policy database (profile filters)
  - Class database
- Measurements ongoing

Edge Routers

Hardware
- AMD 1300 MHz processor
- 256 MB memory
- Four 1-port 3Com Ethernet network interface cards or one 4-port D-Link card

Software
- FreeBSD 4.5 operating system
- Alternate Queuing (ALTQ) 3.1
Alternate Queuing (ALTQ)

- Traffic management software
- Replaces the FreeBSD own queuing system
- Functionality can be enabled/disabled
- Implements different scheduling and queue management mechanisms
- Supports DiffServ and RSVP
- We have used CBQ and conditioners like token bucket and two-rate three colour marker (trTCM)

ALTQ implementation model

[K. Cho: The Design and Implementation of the ALTQ Traffic Management System]
Policy Control Agent

- Software that resides in every edge router
- Link between the Policy Server and ALTQ
- Configures ALTQ according to the parameters received from the Policy Server
- Maintains backup copies of the current ALTQ configuration parameters in a local database

Information Flow

- (filters)
- (profiles)
- (classes)

Policy Server

Policy Control Agent

Edge router

ALTQ
Architecture

- **Local Database Management Module**
- **Main Module**
- **ALTQ Communication Module**
- **Policy Server Communication Module**
- **Policy Server**
- **Maintenance Database**
- **Modification Database**

Local Databases

- External part of the Agent
- Modification database: new parameters
- Maintenance database: current parameters
Measurements

- Performance of the Policy Control Agent
  - Effects on throughput, packet delay and packet loss
  - Configuration modifications
- Test setup
  - One ALTQ router with the Agent
  - Spirent SmartBits 600 with SmartFlow software
  - 10 Mbps network

Throughput

- When ALTQ is running, every packet is examined
- Case 1: packet size 128 B
- Case 2: packet size 1024 B
- Variations
  - Green: no ALTQ
  - Blue: ALTQ with simple configuration
  - Brown: ALTQ with complex configuration
Packet Delay

- Green: packet size 128 bytes (solid)
- Blue: packet size 1024 bytes (dashed)

Variations
- no ALTQ
- ALTQ with simple configuration
- ALTQ with complex configuration

Profile Adding / Removing

are there profiles to be removed?
- NO
- YES

read parameters from the modification database
- remove profiles from ALTQ
- update local databases
- are there more profiles to be removed?
- NO
- YES
- continue *
Filter Adding / Removing

- **add** (dashed)
- **remove** (solid)

1. **examine one profile**
2. **are there filters to be removed?**
   - **NO**
   - **YES**
     - **read parameters from the modification database**
     - **remove filter from ALTQ**
     - **update local databases**
     - **are there more filters to be removed?**
       - **NO**
       - **YES**
         - **filter adding**
3. **are there more profiles?**
   - **NO**
   - **YES**
     - *continue*

Class Modification

- **Class modification time depends on the place of the class in the CBQ hierarchy**

1. **read one class from the modification database**
2. **take one interface**
3. **remove class and its child classes, if any**
4. **add modified class and its child classes**
5. **are there more interfaces?**
   - **NO**
   - **YES**
     - **update local databases**
6. **add class filters to all class interfaces**
7. **are there more classes to be modified?**
   - **NO**
   - **YES**
     - *continue*
Performance Times

- User time and system time (I/O operations) grow linearly
- I/O operations time consuming
- Wallclock time grows more rapidly
- Example: adding and removing filters

Conclusions

- "Brute force" solutions
- Scalability issues
  - Policy Server: number of edge routers
  - Policy Control Agent: number of profiles and filters, time consuming I/O operations
- Communication between Policy Server and Policy Control Agent
- Customer authentication
- Interoperability testing to come
Thank you!