

ARP: Active Reservation Protocols

featuring

ACC: Active Congestion Control

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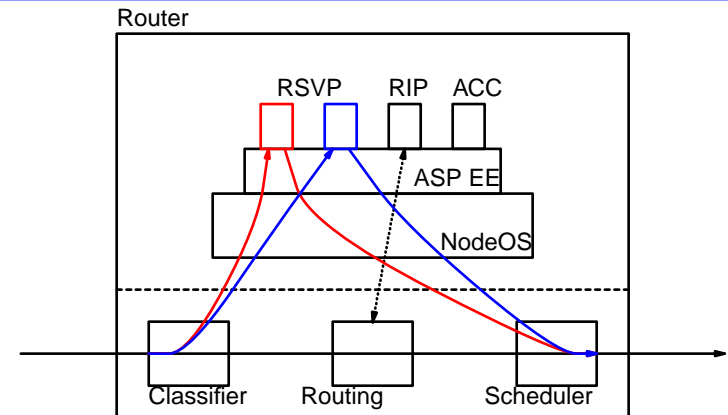
Active Signalling

- Signalling (state in routers), e.g. :
 - RSVP resource reservations
 - label switching paths
 - diffserv provisioning information
- Why should AN be used for signalling?
 - performance
 - distribution
 - customization

ARP Goals

- Apply Active Networking (AN) to signalling
 - control plane
- Support changing software
 - emerging protocols
 - customization
- Infrastructure
 - ASP EE design for protocol customizations
 - virtual networks
 - experiments (ABONE)

An Active Signalling Architecture





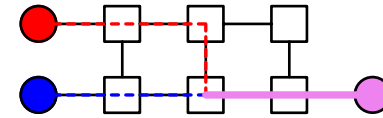
Active Signalling Applications

- Jrsvp
 - 90% complete RSVP implementation
 - tested in CAIRN w/legacy implementations
 - EE requirements:
 - soft state
 - access to routing system (RSRR)
- Jrip
 - RIP for our virtual network
 - same packet format & protocol as RIP

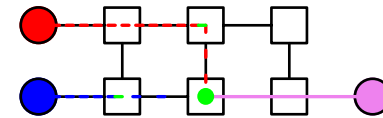


Feedback and Active Nets

- Passive (w/o ACC):



- Active (w/ACC):



ACC: Active Congestion Control

- Show that active networking techniques can improve feedback-based congestion control
- Expand the ASP framework to support congestion control
- Explore the design space of active feedback congestion control



ns Simulation Studies

- Simple TCP style algorithms
 - Notify host
 - Filter one window of traffic
- Results
 - As much as **18% throughput improvement** on high BW-delay paths with bursty traffic
 - Detailed discussion at <http://www.isi.edu/~faber/pubs/active.ps>



ACC and ARP

- ACC:
 - reacts to congestion events
 - installs filters
 - sends feedback
- Low per-packet CPU overhead
- CPU intensive work is signalling
- ACC fits in a signalling framework (ASP)

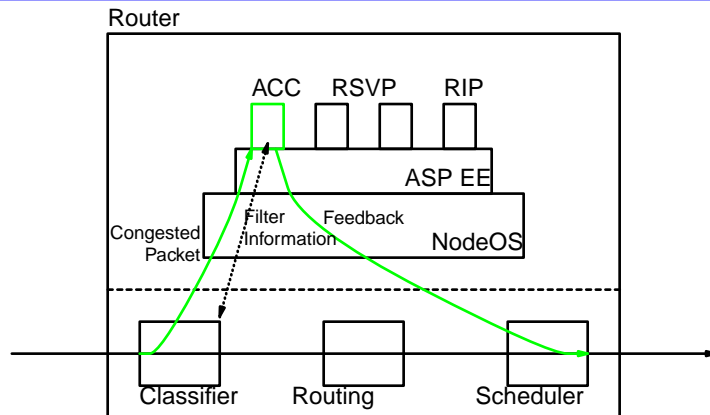


ACC Implementation

- Using ARP's internal classifier/scheduler
- Ported Partridge's RDP to Java
- Activating RDP



ACC Implementation



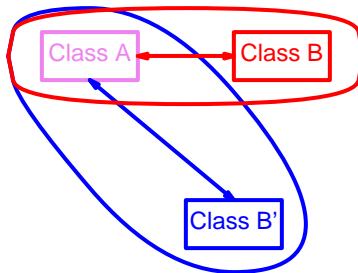
Protocol Customization

- Customize code for:
 - new feature sets
 - algorithm changes (authentication)
 - bug fixes
- Multiple customizations must **coexist**
- Active Signalling Protocol (ASP) EE



ARP Customizations

- AA :
 - set of classes working together
 - packet context → class bindings



ASP Design for Customization

- Dynamic binding
- Code sharing
- Resource protection between AAs
- (Virtual) network I/O
- Inter-AA communication
- Per-AA soft-state



Customized Implementations

- Three custom versions of RSVP on one router
 - base
 - base + SCOPE
 - base + CONFIRM

(SCOPE and CONFIRM are new features)
- Demonstrated at July PI meeting



Dynamic Binding

- Dynamic name binding
 - apparent → definite name (in the EE)
 - definite name → code (at remote servers)
- Transparent extension
 - first mapping: feature changes
 - second mapping: invisible changes
- Load each implementation once



Resource Protection

- ASP AAs should not interfere with each other
 - accident
 - malice
- ASP: AA-based protection
- Java: class-based protection
- Java → ASP:
 - generalize `static` data to per-AA data
 - prevent AA data exchange through ASP



Future Work

- AA resource limits
- Component mechanism
- Fleshing out dynamic loading
- Security and inter-AA communication
- Porting to a common NodeOS
- ACC implementation and testing



Virtual Networking

- VNet module abstracts network
 - addressing
 - end-to-end/hop-by-hop delivery
 - routing
 - management interface
- Same interface as native code