Intradomain Overlays

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Intradomain Overlays (Application-layer Unicast)

- Main idea: maintain a overlay network
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- Application: Overlays can monitor routers/net. traffic...
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• ... and efficiently report information back to selected node(s)
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- Monitoring info. useful for policy routing, intrusion detection, ...
How can re-routing be used within a domain?

- “Automatic” load balancing (as new resources are added)
- Flash congestion relief
- Provide QoS for premium flows, say VoIP
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All incrementally deployable, globally transparent, and without changing underlying IP infrastructure
Monitoring Protocol

- Assumes central monitoring data repository (NMS) can be replicated

- Overlay nodes
  - assigned routers to monitor (using base SNMP)
  - form a spanning tree to report monitoring data back to NMS

- Overlay (and NMS) failures detected
  - routers reassigned
  - tree re-formed

- Publish-subscribe protocol between NMS and overlay nodes
Overlay node software architecture

Path Calculator
Domain Policy Manager

Overlay Module
Monitoring
SNMP

Communication
Logging
Reporting
Bootup

User Space
Kernel

TCP STACK

IP Layer
NMS-overlay node protocol overview

- Subscription
- Polling
- Response
- Publish
Experimental Results

- Input data for overlay monitoring simulations from OIT network (438 routers, 29 backbone routers)
- Data for 7 days; 1–5 minute granularity
- For backbone routers and ethernet switches connect to backbone routers:
  - Octets, no. of packets, discarded packets, errors
- For BDF/IDF switches:
  - Octets, errors
Overlay monitoring benefits: total bandwidth

Total Bandwidth-Hops vs Percent of Overlay Nodes

- Centralized
- Quant. factor = 0%
- Quant. factor = 1%
Overlay monitoring benefits: no. of messages

![Graph showing overlay monitoring benefits with respect to the number of messages and the percentage of overlay nodes. The graph compares centralized and quantized factors at 0% and 1%.]
Current work

- More experiments with UMD network
  - finer-grained monitoring of 400+ routers to use as input to our simulations
- Deployment of overlay nodes on OIT network
  - Current impl. on GNU/Linux (kernel version 2.4.x)
- Plans for high-speed overlay node implementation using intel ixp28xx network processors
- Manuscript in preparation for INFOCOM 2004