Overlay Networks

Bernardo Toninho

Computer Science Department
Carneggie Mellon University

October 27, 2010

Readings

The readings for today were:

- Active Network Vision and Reality
- Resilient Overlay Networks

Active Network Vision and Reality: Contributions

The main idea of active networking is to allow packets to dynamically change the operation of the network.

Contributions of the paper:

- The study of the viability of *capsules* in active networks.
- Allowing untrusted users to customize the network:
  - Safe evaluation for executing service code (sandboxing).
  - Fingerprint-based capsule types (MD5 hashes).
  - Access to shared state is guarded (code cannot manipulate other code).
- Use capsules to implement network-layer service evolution
  - Can introduce many different variations of a service.
  - Deploy processing along network paths independently of the path itself.

Readings

Active Network Vision and Reality: Issues

These were the most common issues/questions that came up in the discussion board:

1. Service code certification being used to protect the network.
2. Misbehaving applications may starve well-behaved applications by injecting a large number of capsules in the network.
3. Impact of the actual implementation of mobile code on performance.

Active Network Vision and Reality: Issues

Service code certification being used to protect the network:

- Who runs the certification authority?
- What properties must the code have to be certified? How do we measure "reasonable" usage of resources?
- Certification by a trusted third-party is usually long term. This seems incompatible with the dynamic nature (short-lived, rapidly changing) of this work.
- Trusted third-parties are a common device in security.

Misbehaving applications may starve well-behaved applications by injecting a large number of capsules in the network:

- This is a (mainly unaddressed) problem in the Internet as well.
- Worse than in the Internet, since this is actual code executing in routers!
- Fingerprint-based capsule types can contribute to this since checking digests isn't computationally cheap.
- As a paper that promotes the discussion on active networks, one can't really expect them to solve this (very hard) problem.

Readings

Active Network Vision and Reality: Issues

Impact of the actual implementation of mobile code on performance:

- Code is passed by reference to minimize network overhead.
- Code is provided to edge nodes by end-user SW and fetched from other active nodes
- Additional latency in processing capsules (but code is required to be fairly small).
- The actual impacts on performance of these mechanisms warrants a deeper study.
- Impact of different (perhaps more aggressive) caching techniques.

Readings

Resilient Overlay Networks

An architecture that allows Internet applications to detect and recover from path outages and bad links.

Contributions:

- An overlay network that monitors quality of links between its nodes.
- Uses the information to choose to route packets directly over the overlay network for performance.
- Quickly identifies and recovers from link faults.
- Able to overcome a high percentage of link outages.

Challenges:

- Nodes have to be deployed in different routing domains.
- Allows for violation of BGP transit policies.
- Widespread deployment may decrease performance due to contention.
- Interaction with NAT (false link outages, non-globally reachable addresses).