Multipath Transport

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Traditional single path approach

- requestor uses one path from content source
- congestion control (TCP) provides "some" robustness to traffic changes
- does not handle faults, mobility, attacks
Multi-source data transport

- provide requestor “set” of sources (NAs)
- network provides paths
- requestor balances load across sources/paths
- exhibits desirable load balancing properties
- robust to failures, mobility, attacks
- responsive to prices
Approaches

- independent path/source control (independent TCP connections)
  - BitTorrent model
- coordinated/path source control
  - better load balancing
  - fairness to single path sessions
  - controller designs exist based on fluid models
  - capacity increases as #paths/sources increases
Path reselection

- the more paths/sources the better but ... do we need to use them all?
  - 2 per session
  - periodically add new path/source at random
  - drop worst one

**Theorem:** Under random path/source reselection, coordinated multi-transport achieves same capacity as when using “all” paths/sources
Performance under multi-transport

- capacity increases with number of paths/sources per session
- two + random resampling achieves same capacity as using all paths/sources

(Key, et al. 2007, 2011)
Recent work

- controller design: issues
  - small # flows => low utilization
  - path/source flappiness

- proper choice of increase/decrease rules

- receiver-based control
  - needed for multiple sources
Future directions

- true multi-source transport
  - coordinated receiver control
- short flows vs. long flows
- integration with GNRS
- increase robustness to path breaks
- experimentation on multi-homed systems