FINAL EXAM

TUE 5/16 MRST 132
  10:30 - 12:30
- open book/open notes
- 25% of final grade
- off campus students will receive exam by postal mail
A FLEXIBLE MODEL FOR RESOURCE MANAGEMENT IN VIRTUAL PRIVATE NETWORKS
What are Virtual Private Networks?

• Virtual network that allows secure association between end points

• Features
  - security
  - performance isolation
  - guaranteed bandwidth, loss, delay

=> logically similar to a private leased line.
VPNs for Multiple Endpoints

- Large customers => multiple end points
- Users are unwilling to specify point-to-point bandwidth matrix.
- No multiplexing gains.
VPNs with Multiple Endpoints

- Organizations with multiple branch offices need VPNs with multiple end points
- Customer Pipe Model
VPNs with the Hose Model

- customer-pipes - endpoints

Branch A

A in/out

Branch B

B in/out

Branch C

C in/out
Hose Model Advantages

- Ease of specification
- Flexibility
- Multiplexing gain
- Characterization
- Statistical Multiplexing gains
- Resizing
Implementation scenarios

- Provisioned VPNs

-Dynamically Resized VPNs
  - study workload
  - resize
AN EXPERIMENTAL STUDY OF

INTERNET ROUTING CONVERGENCE

C. Labovitz, A Ahuja, A. Bose, F. Jahanian

Motivation

- Study impact of path failures, failovers and repairs on inter-domain routing convergence
- Telephone network: failover takes milliseconds
- Internet: failover takes several minutes
- Why does convergence take this long?
Methodology

- Fault injection at probe points
- Monitor (passively) major exchange points

Fault = routing failures, repairs, multihome failures
Key Results
-BGP uses path vectors => eliminate count to infinite problem. BUT increases possibility of oscillations
-Avg failover time ≈ 3 mm (15 min in some cases)
-theoretical upper bound on convergence # of states explored $O(e(n-1)!); n = \#\text{AS}$
-Lower bound $\Omega((n-3)*30)\text{sec}, O(n)$ states.
-Reason interactions of protocol timers
-Impact: loss rate increases by factor of 30, latency by factor of 4
-Minor implementation changes can reduce bounds