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

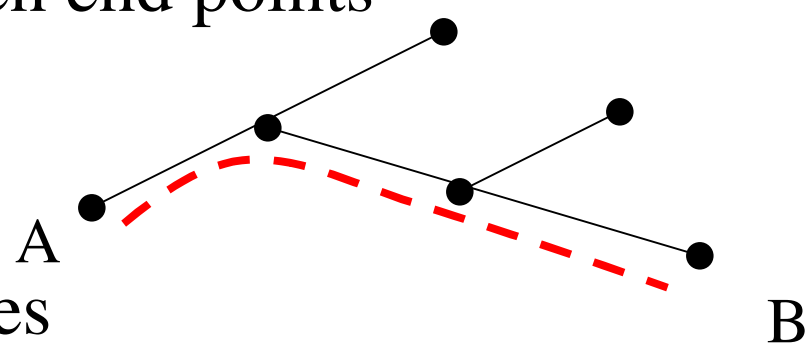
A FLEXIBLE MODEL FOR RESOURCE MANAGEMENT IN VIRTAL PRIVATE NETWORKS

N.Duffield, P.Goyal ….

Proc. of ACM SIGCOMM'99

What are Virtual Private Networks?

- Virtual network that allows secure association between end points



- Features

  -security

  -performance isolation

  -guaranteed bandwidth, loss, delay

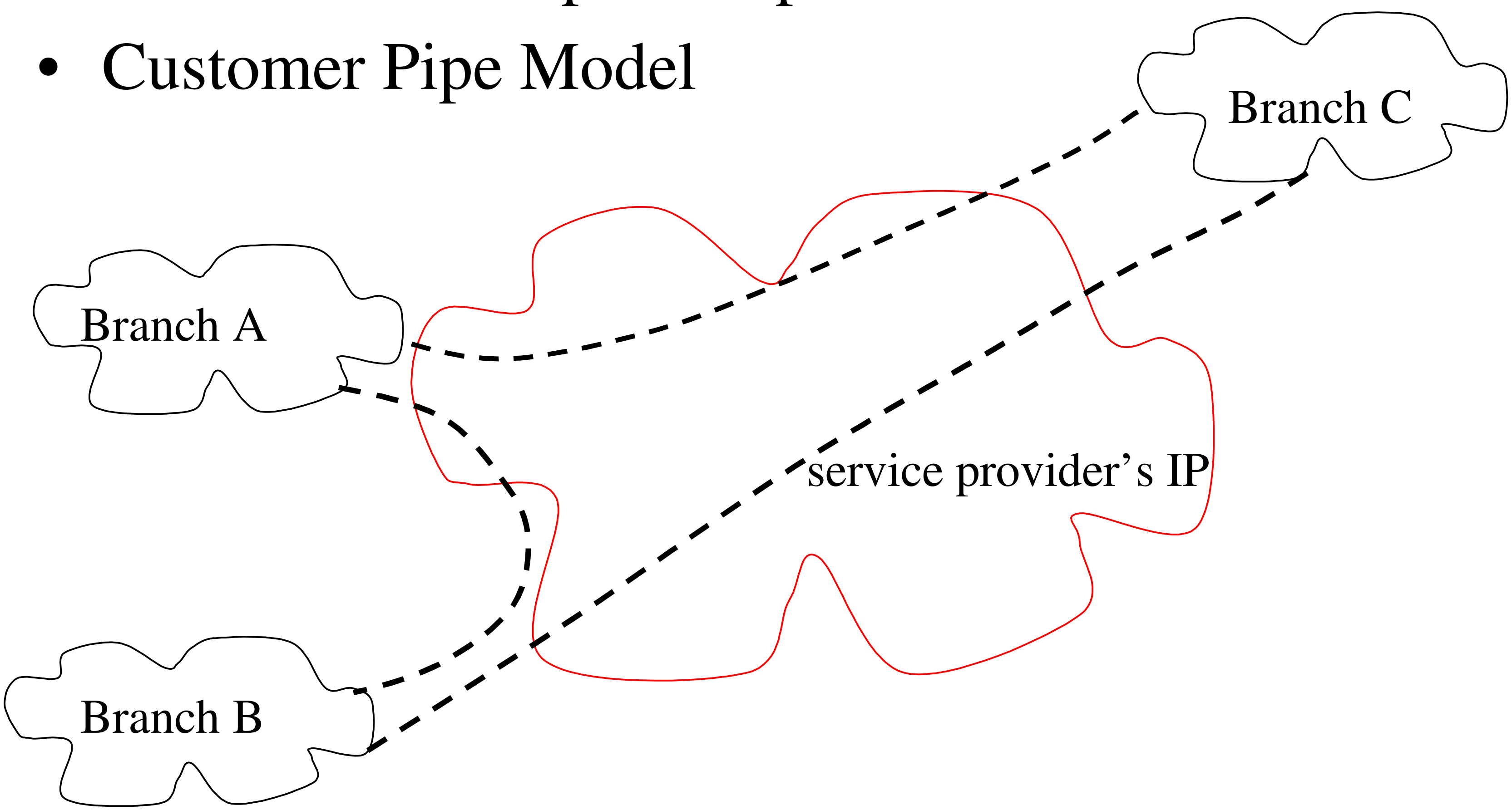
  =>logically similar to a private leased line.

VPNs for Multiple Endpoints

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

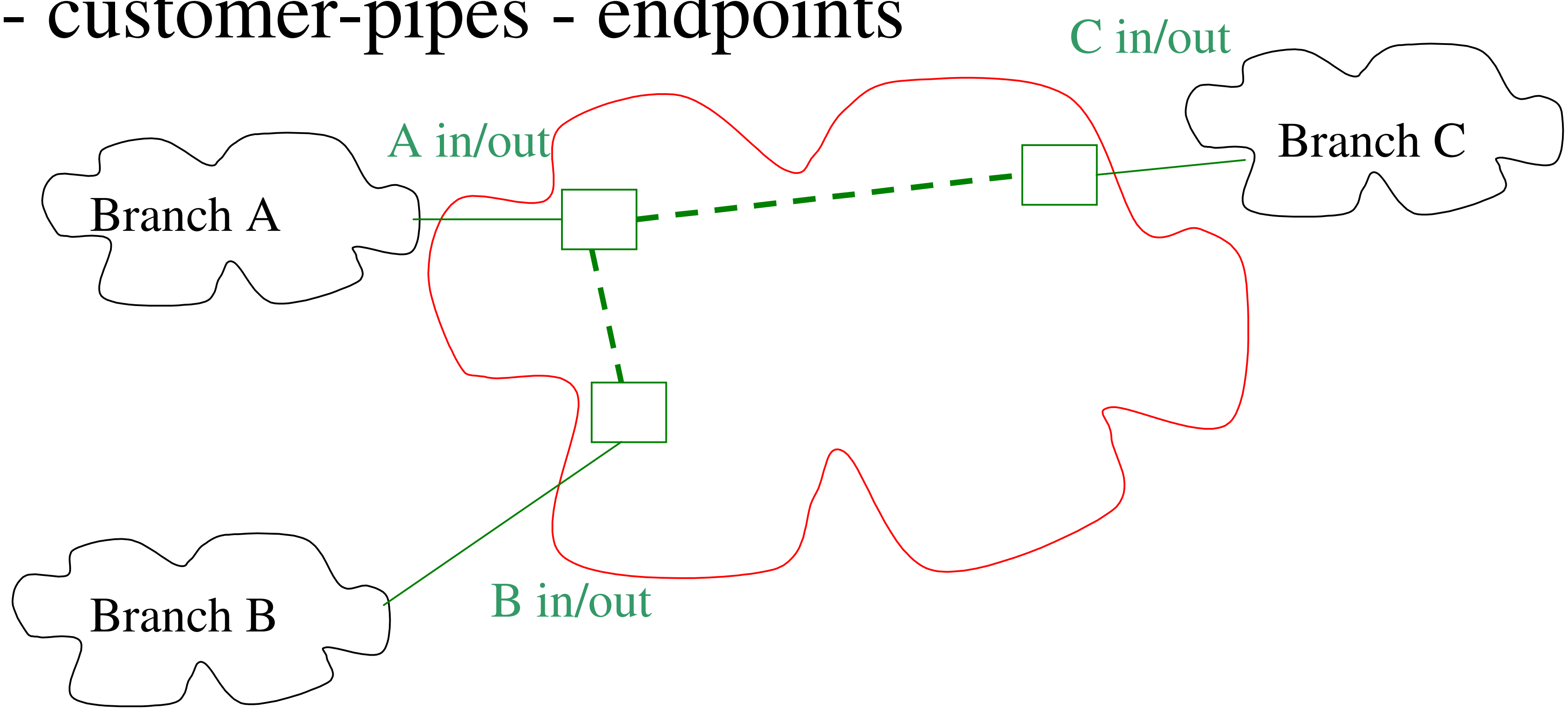
VPNs with Multiple Endpoints

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



VPNs with the Hose Model

- customer-pipes - endpoints



Hose Model Advantages

-Ease of specification

-Flexibility

-Multiplexing gain

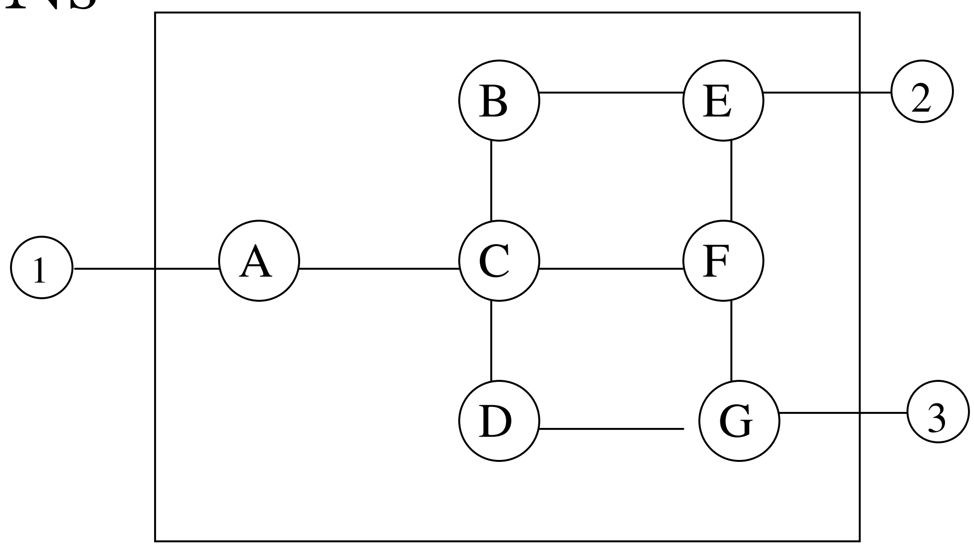
-Characterization

-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

Proc. Of SIGCOM 2000, Stockholm, Sweden

Motivation

-Study impact of path failures, failovers and repairs on inter-domain routing convergence

-Telephone network: failover takes milliseconds

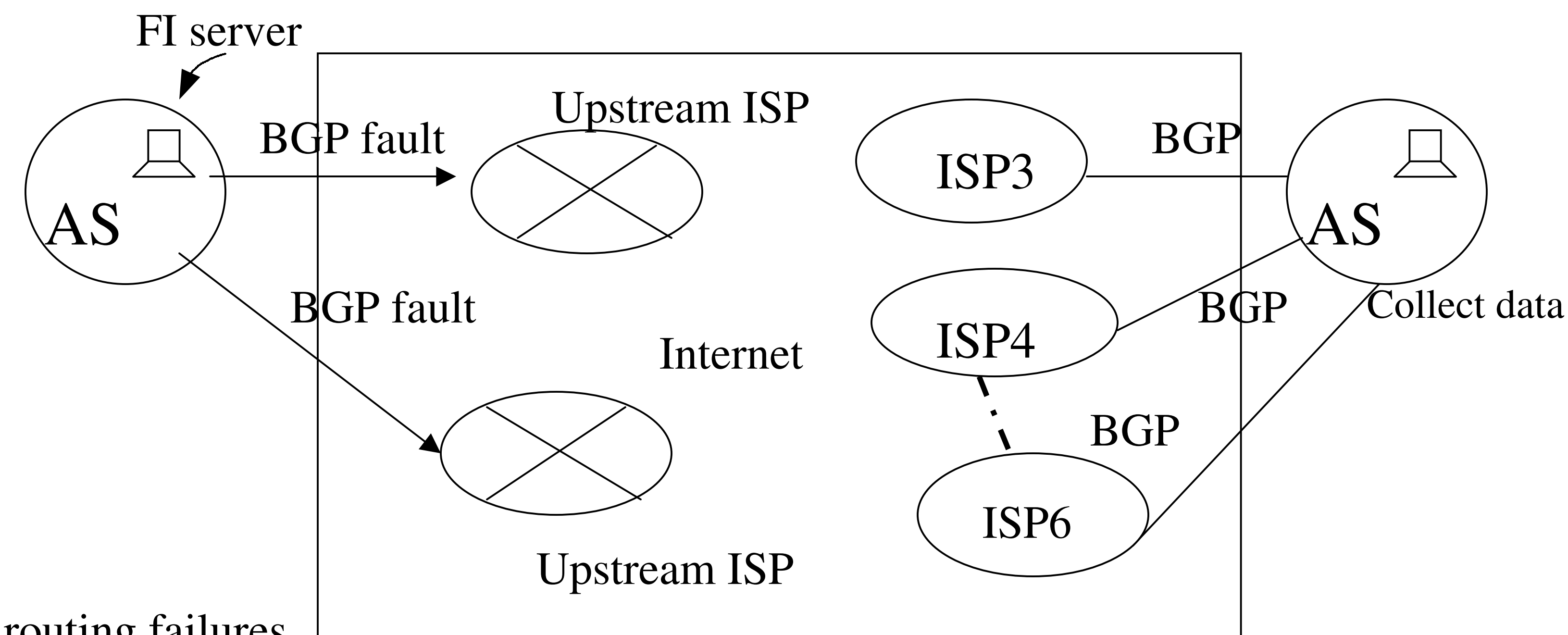
-Internet: failover takes several minutes

-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 $\approx$ 3 mm(15 min in some cases)

-theoretical upper bound on convergence # of states explored O(e(n-1)!); n = #AS

-Lower bound Ω((n-3)*30)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