

Overlay Networks

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6.829 Computer Networks

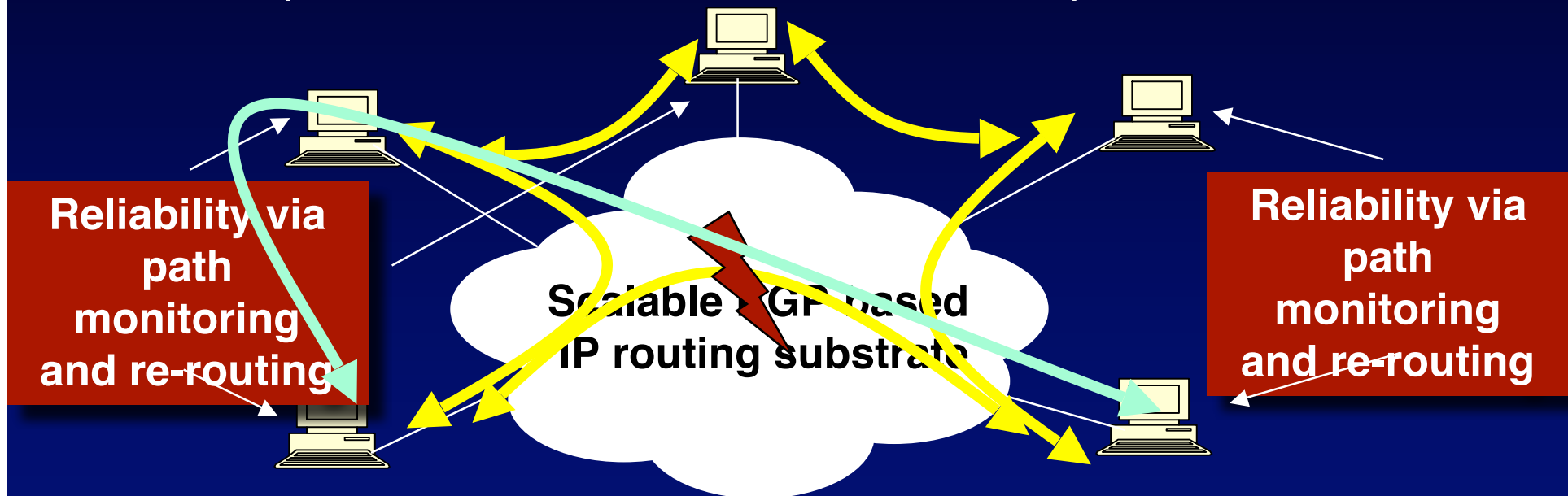
How Robust is Internet Routing?

Paxson 95-97	<ul style="list-style-type: none">• 3.3% of all routes had serious problems
Labovitz 97-00	<ul style="list-style-type: none">• 10% of routes available < 95% of the time• 65% of routes available < 99.9% of the time• 3-min minimum detection+recovery time; often 15 mins• 40% of outages took 30+ mins to repair
Chandra 01	<ul style="list-style-type: none">• 5% of faults last more than 2.75 hours

1. Slow outage detection and recovery
2. Inability to detect badly performing paths
3. Inability to efficiently leverage redundant paths
4. Inability to perform application-specific routing
5. Inability to express sophisticated routing policy

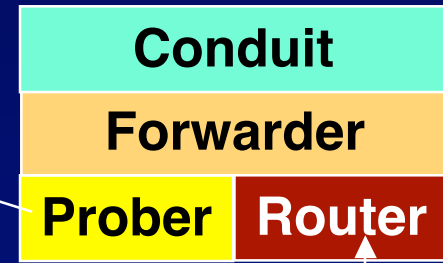
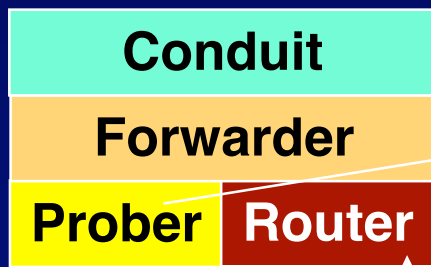
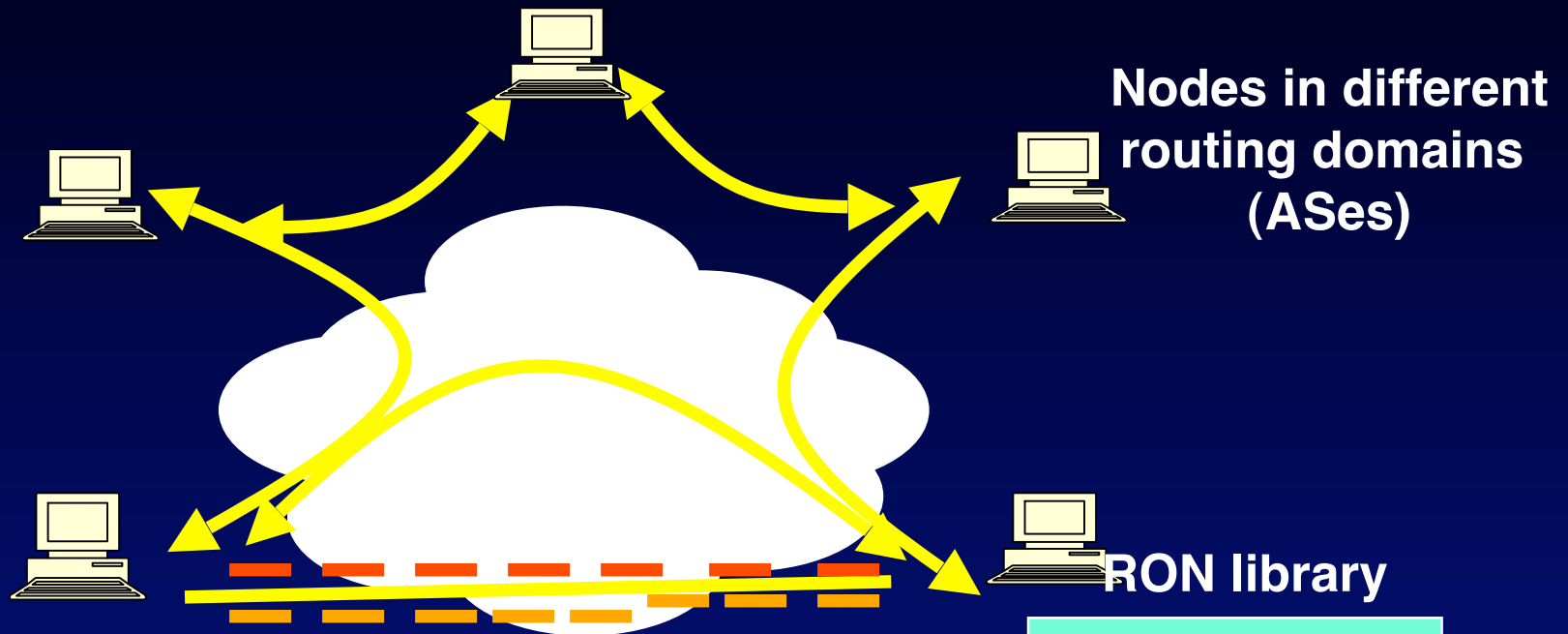
RON: Routing Using Overlays

- Cooperating end-systems in different routing domains can conspire to do better than scalable wide-area protocols



- Types of failures
 - Outages: Configuration/op errors, software errors, backhoes, etc.
 - Performance failures: Severe congestion, DoS attacks, etc.

RON Design



Application-specific routing tables
Policy routing module

Link-state routing protocol, disseminates info using RON!

RON greatly improves loss-rate

30-min average loss rate on Internet



30-min average loss rate with RON

An order-of-magnitude fewer failures

30-minute average loss rates

Loss Rate	RON Better	No Change	RON Worse
10%	479	57	47
20%	127	4	15
30%	32	0	0
50%	20	0	0
80%	14	0	0
100%	10	0	0

6,825 “path hours” represented here

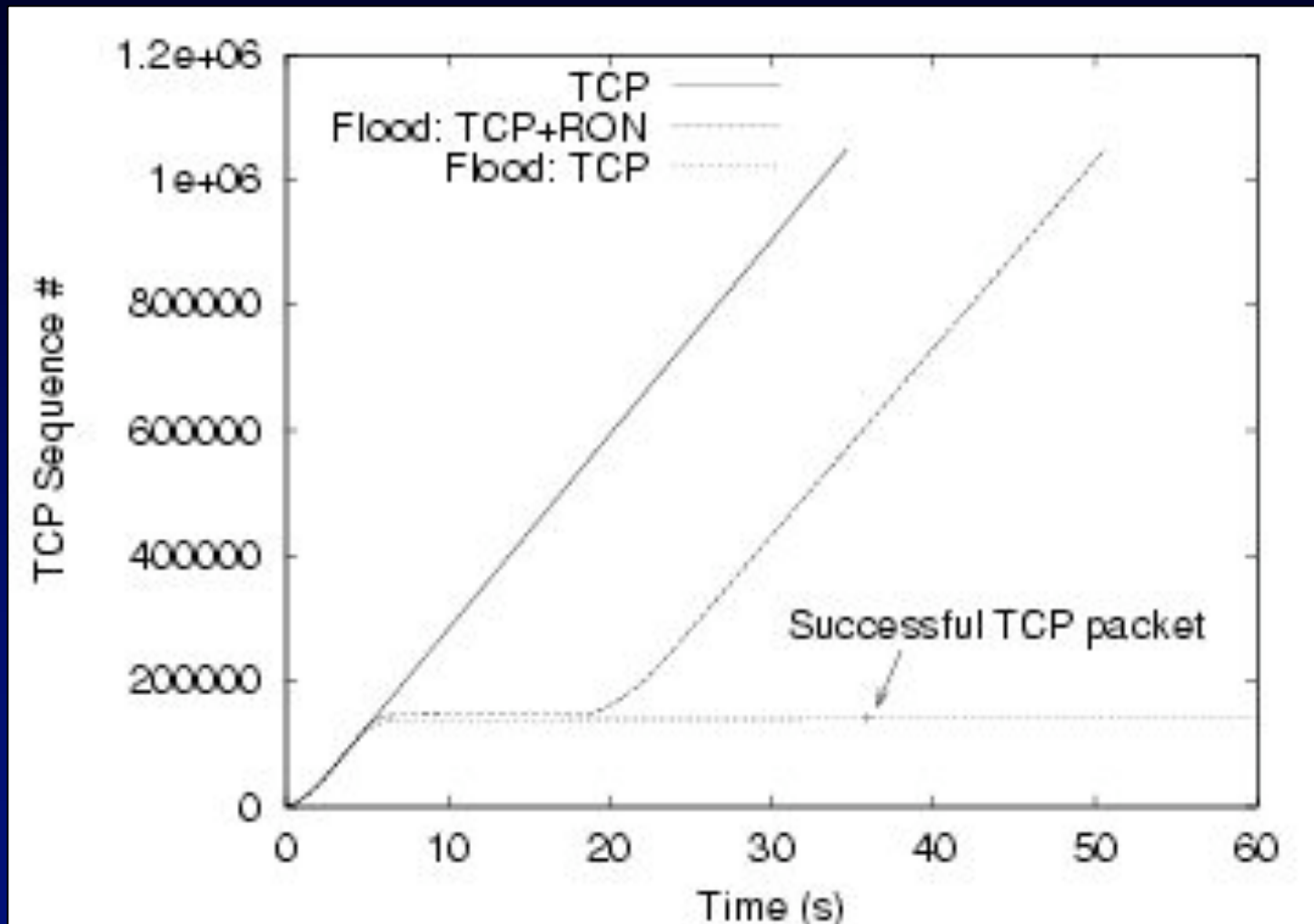
12 “path hours” of essentially complete outage

76 “path hours” of TCP outage

RON routed around all of these!

One indirection hop provides almost all the benefit!

Resilience Against DoS Attacks



Throughput Improvement

