DDOS Mitigation

Strategies for Large ISPs

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Large ISPs and DDOS

- A large ISP will have a different view of DDOS attacks than any other net entity
  - Floods are currently a process problem, not an engineering one
  - Floods quickly become non-scary with foreseeable engineering efforts
  - Scary DDOSes exist, and threaten the entire industry

Flood attacks

- Pure flood-based attacks are highly disruptive but are becoming extinct
  - Mitigation: minimize disruption to targets and topologically nearby non-targets alike
  - Flood-recovery techniques are improving
  - Preventing floods or making them undisruptive is computationally feasible

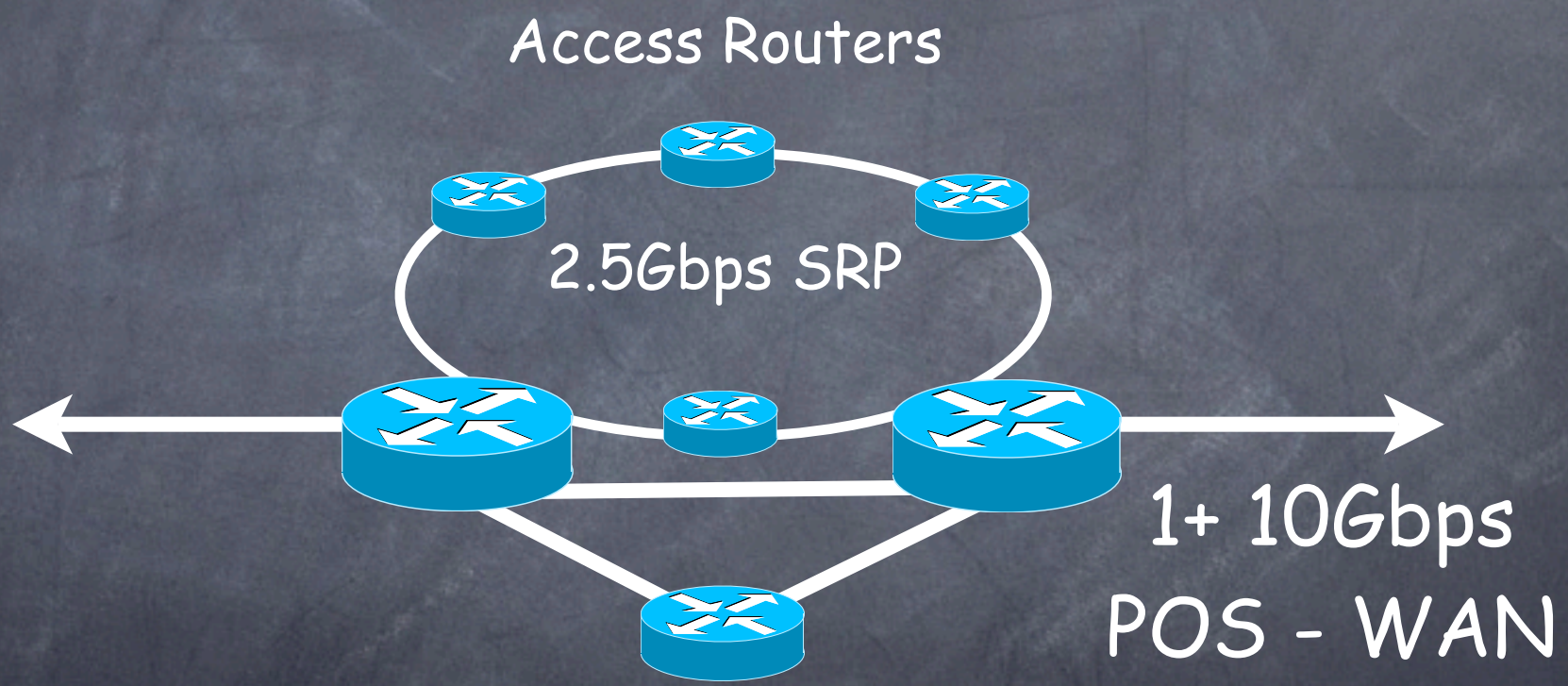
Worse than floods...

- Distributed computation -> smarter DDOS
  - Protocol-specific attacks which use massive parallel computations can out-scale any computational response
  - These can take place without triggering "out-of-profile" alarms near a diffuse number of non-concealed sources

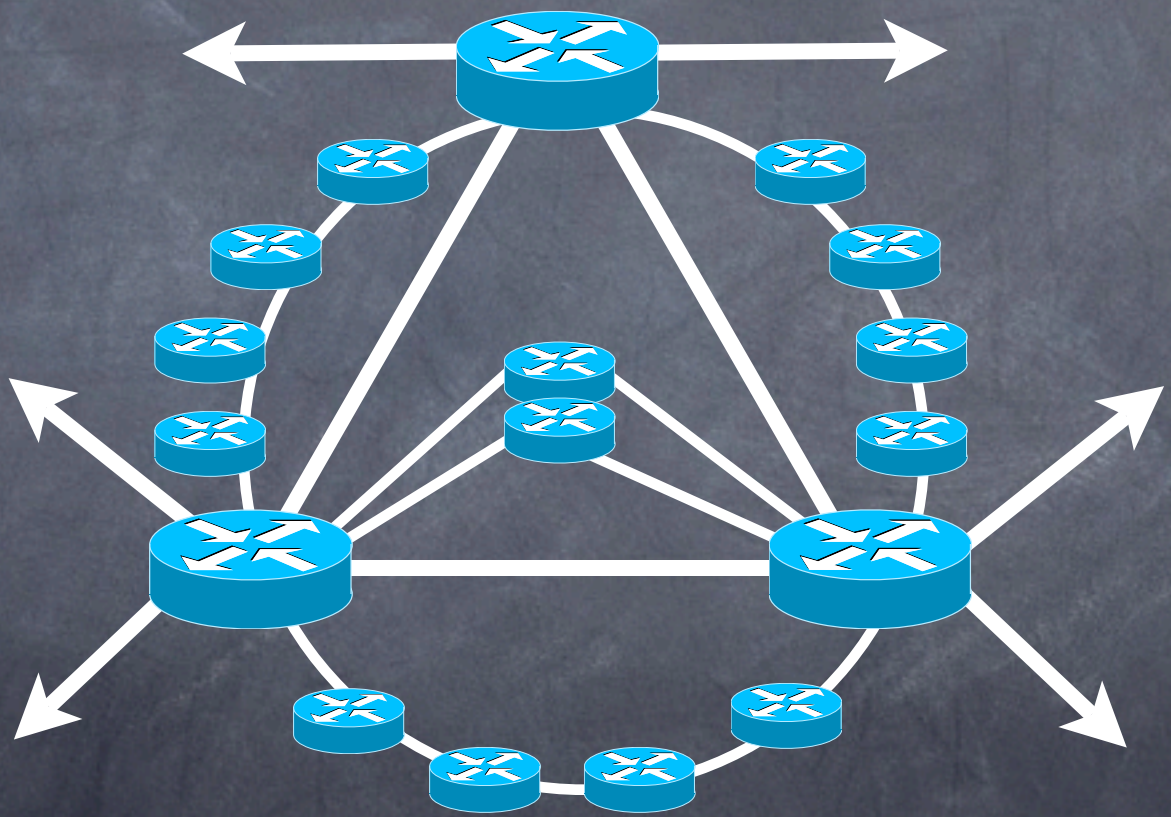
What's a large ISP?

- Consider a defintion of large as: a network which can "just deliver" feasible traffic floods towards a customer for sustained periods, with minimal effect on other customers
- People often laugh at me here, so a quick overview of Sprintlink follows...

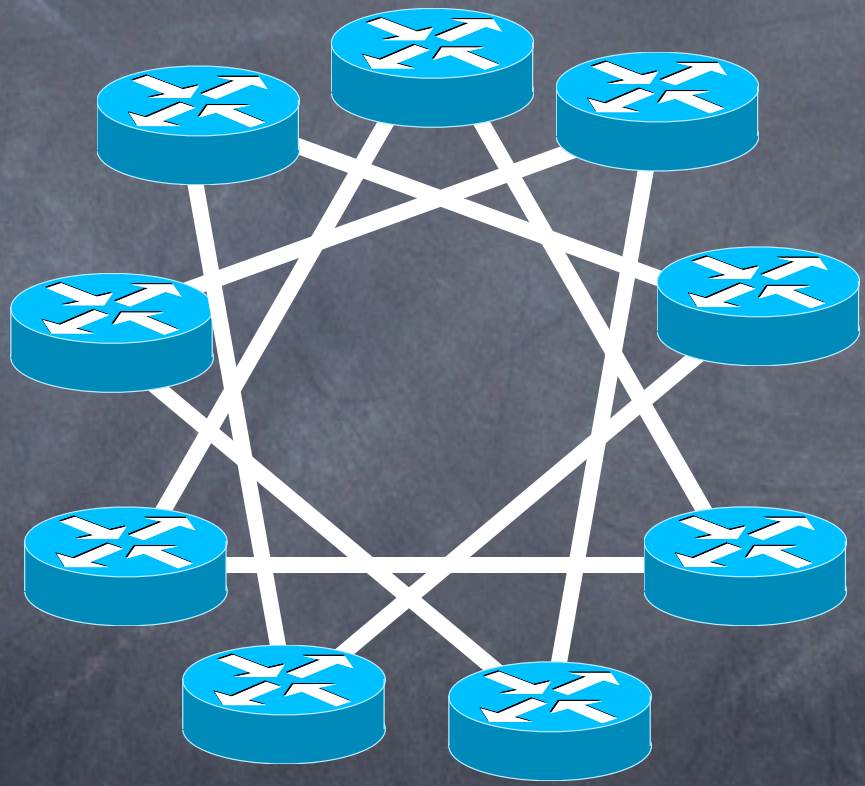
Small Sprintlink POP



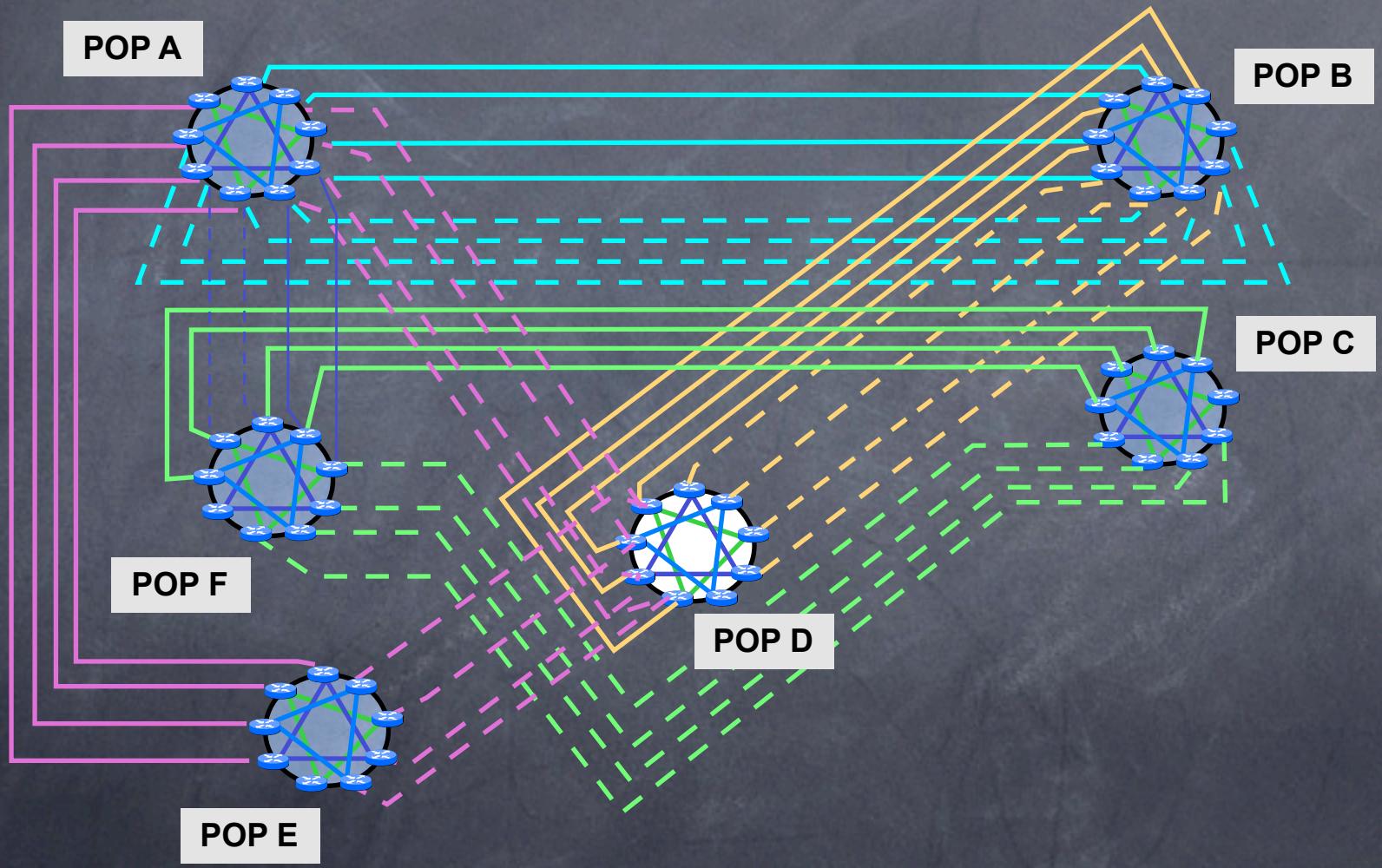
One-layer, Sprintlink Rosette

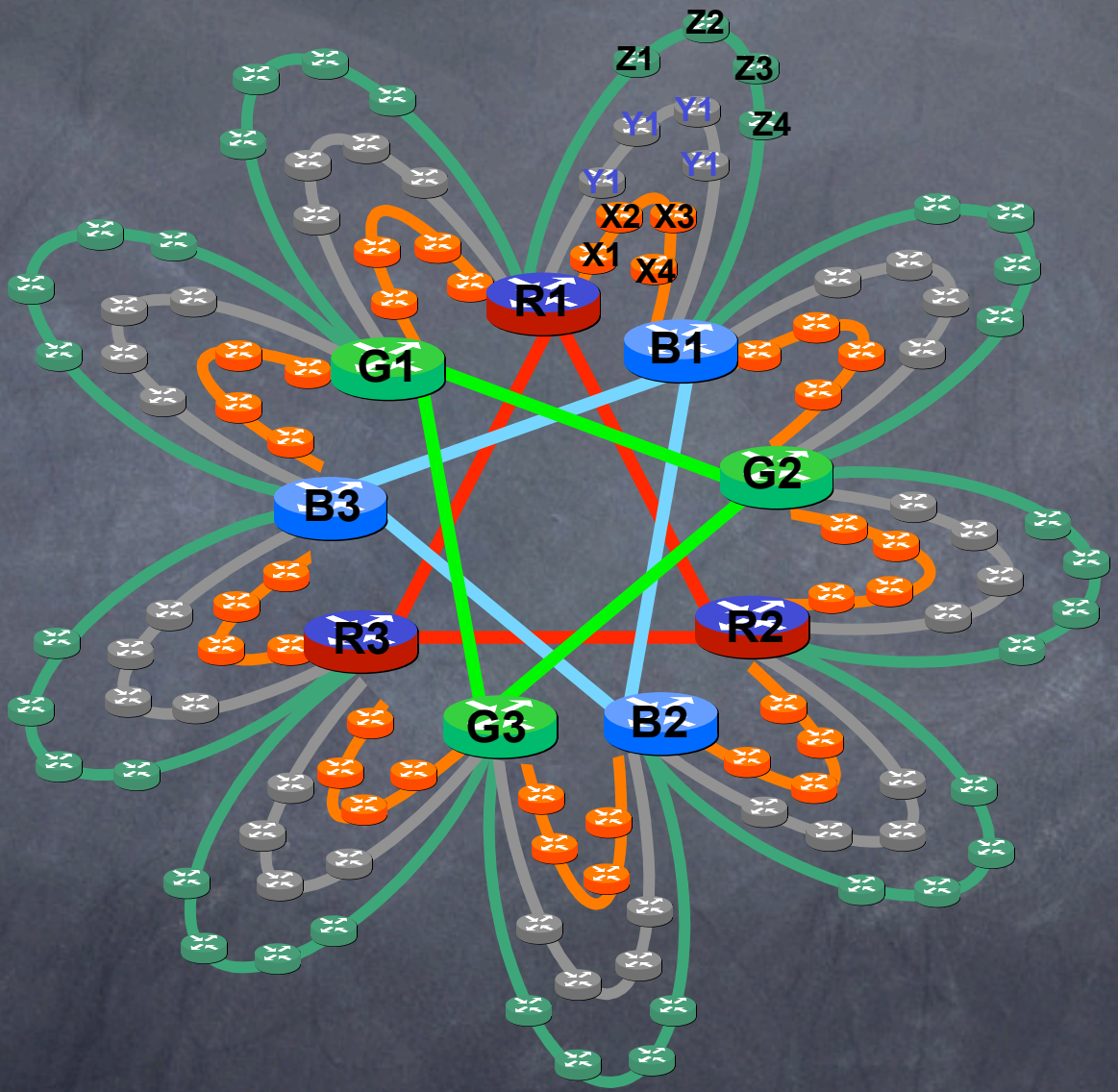


Three-layer Rosette Core



Inter-city connectivity driven by rosette + fibre paths




Z2
Z1
Z3
Y1
Y1
Z4
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R1
B1
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B3
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R2
G3
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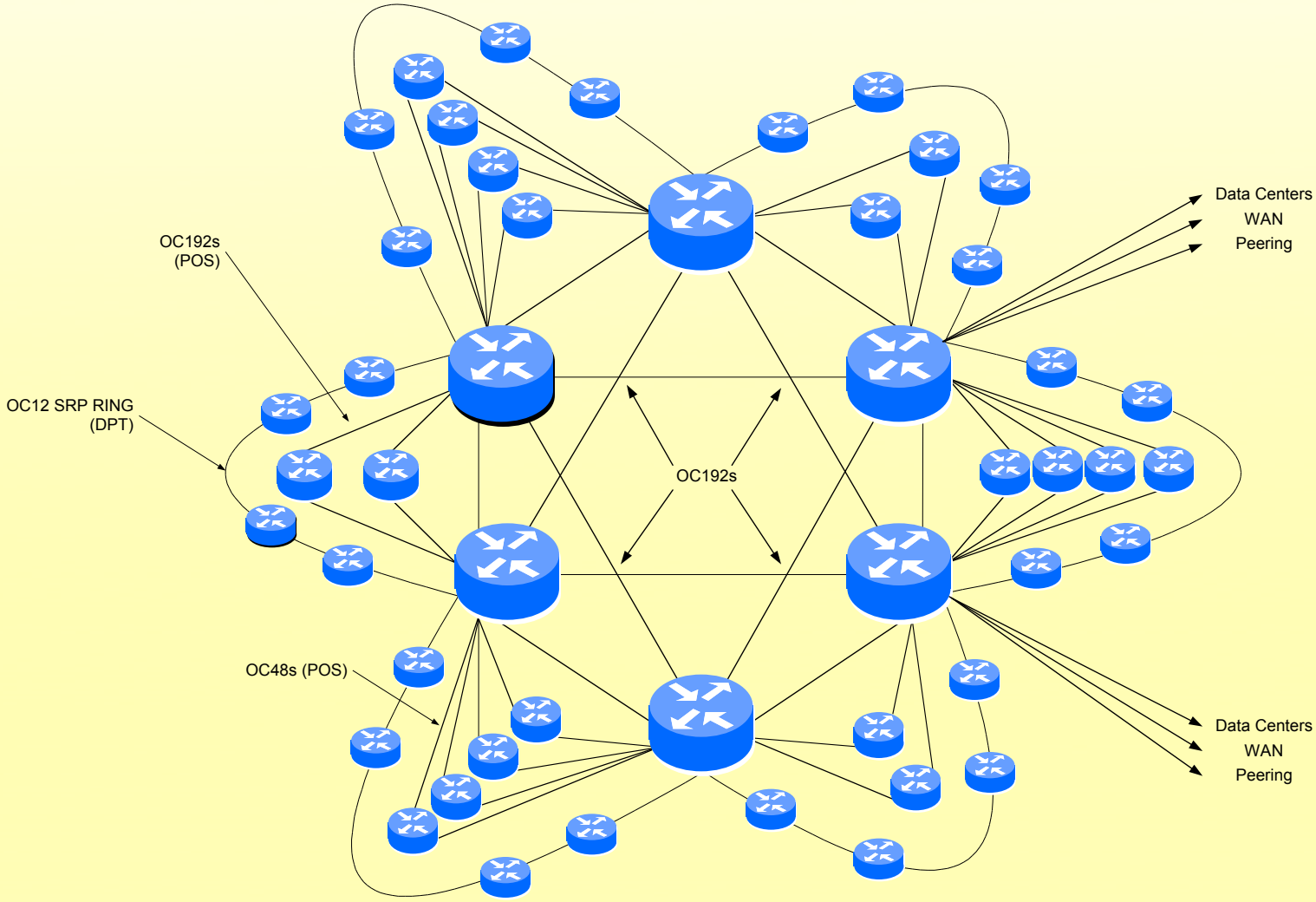
OC192s
(POS)
OC12 SRP RING
(DPT)
OC48s (POS)
OC192s
Data Centers
WAN
Peering
Data Centers
WAN
Peering

2003 POP Max. Scale

- 9 Core Routers, 108 Access
- Trunk capacity 45 x 10Gbps
- 2.5:1 overbooking between small access router rings (mostly lightly-aggregating customers like corporate end users) and core routers
- Customer capacity eqiv. of 3456 STM-1

Traffic floods

- We observe brute-force flooding rates of several hundred Mbps today.
- The bottlenecks attacked are (in order of decreasing probability):
  - Small customer connection to Sprintlink
  - Something downstream of large customer
  - SRP ring segment / netwk infrastructure

What does this mean to us?

- When they are not the target itself, most customers are unaffected by even enormous flood attacks
- Mitigation is an edge problem:
  - Increasingly fine-grained filters can be applied on a customer access router
  - "Sealing all borders" likely unnecessary

A reactive SLA

- In principle we could frame an SLA with time intervals between events:
  - T0: ticket opened by report or detection
  - T1: initial "coarse-grained" filter
  - T2...Tn-4: report on filter activity, traffic composition, and any steps taken to "narrow" the filter

- Tn-3: observation that the attack has ceased
- Tn-2: notification to customer
- Tn-1: removal of filter
- Tn: normal service

Some cleverer attacks

- Protocol-specific attacking is growing, thanks to the increasing prevalence of Own3d h0st3z
- A million scattrered hosts generating what looks to an observer near them like ordinary, legitimate traffic, but which clogs things up at or near the victim, is very scary

Mitigation technology:
Distributed Recovery of Service systems

- Riverhead and other companies have been evolving "washing-machine" devices which effectively narrow filters as algorithms declare specific traffic flows "good"
- This is a useful evolutionary direction, because attacks are getting to be smarter than brute-force flooding

Problems with DROSs

- However, all of these devices need to touch real traffic destined for the victim, so using them poses problems:
  - moving traffic through them can be awkward
  - they usually only handle a few hundred Mbps at most... and may not be able to distribute nearly as well as attacks

A market?

- These platforms are also not without cost
- Some risk too: they may be out-evolved by attackers
- In short: limited proactivity

Conclusions

- Attacks keep coming, and are evolving
- Defenses evolve too; mostly procedural, but some analytical tools are getting greater use
- Brute force floods are amenable to in-router proactive prevention but
- Owned hosts are the next obvious worry, and there is no obvious defence

Thanks for listening!

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