Implications of Large IXP Failures
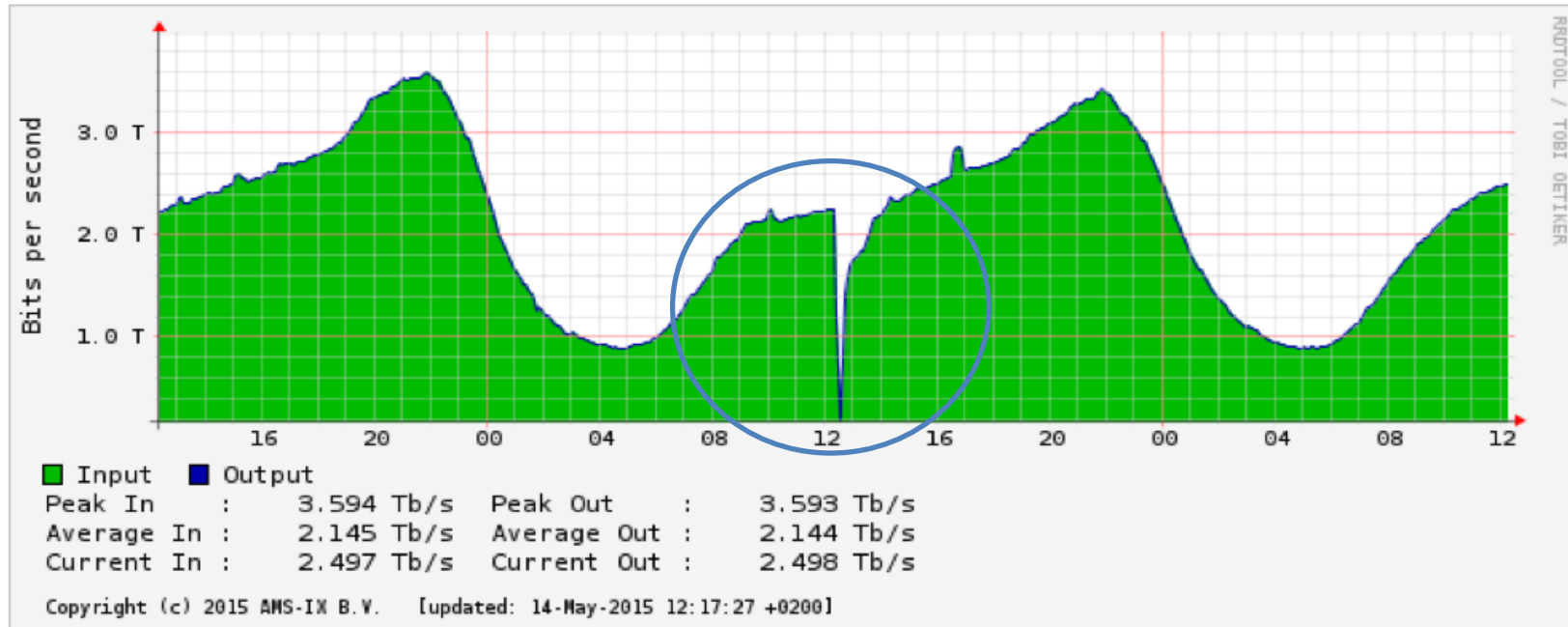
Christoph Dietzel, Georgios Smaragdakis, Vasileios Giotsas, Emile Aben

Introduction

» Robustness of IXP interconnection system?

  » Dependencies between IXPs?

  » Effect/impact on the Internet?

  » Lessons learned?
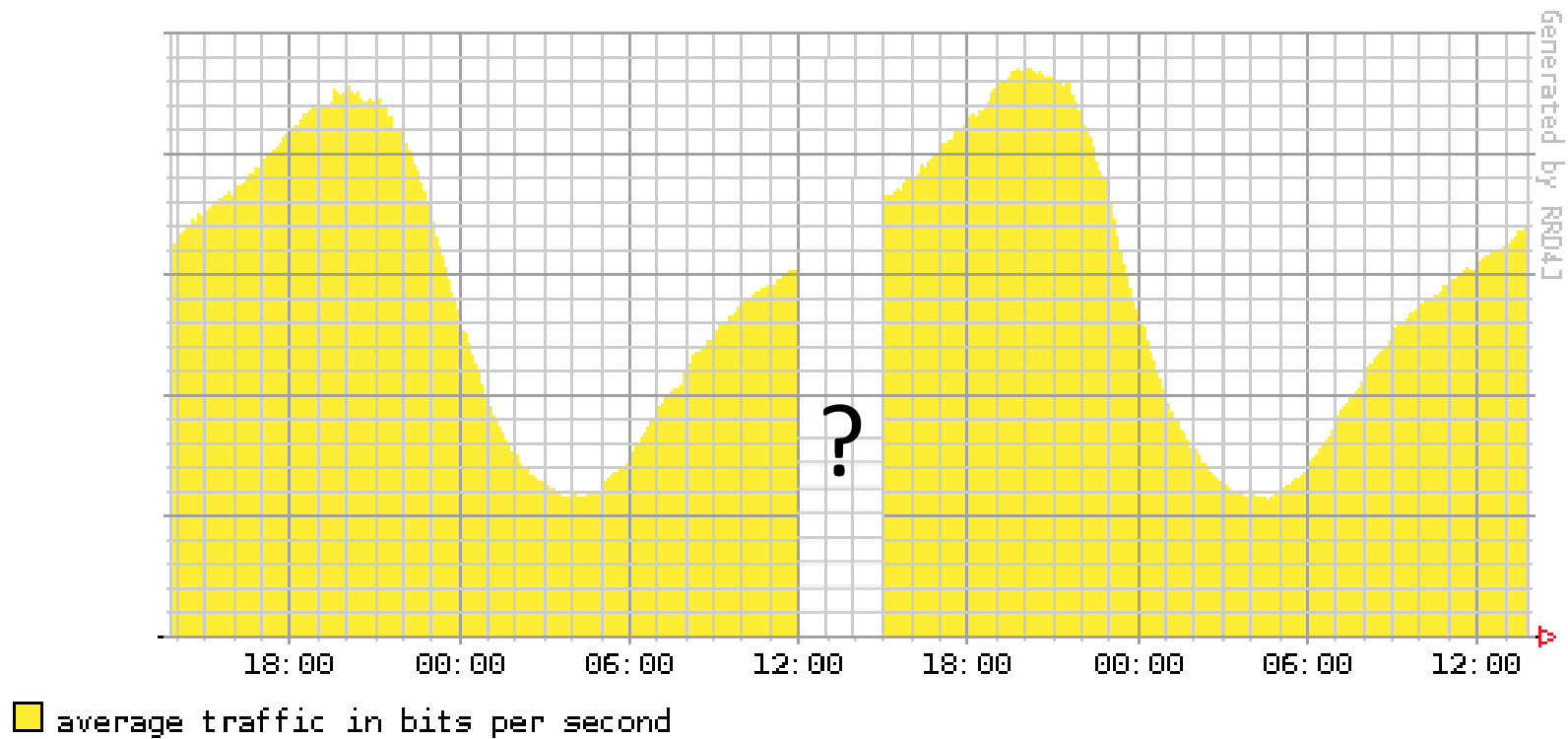
» Investigated large IXP outage

» Preliminary research

Incident AMS-IX Amsterdam
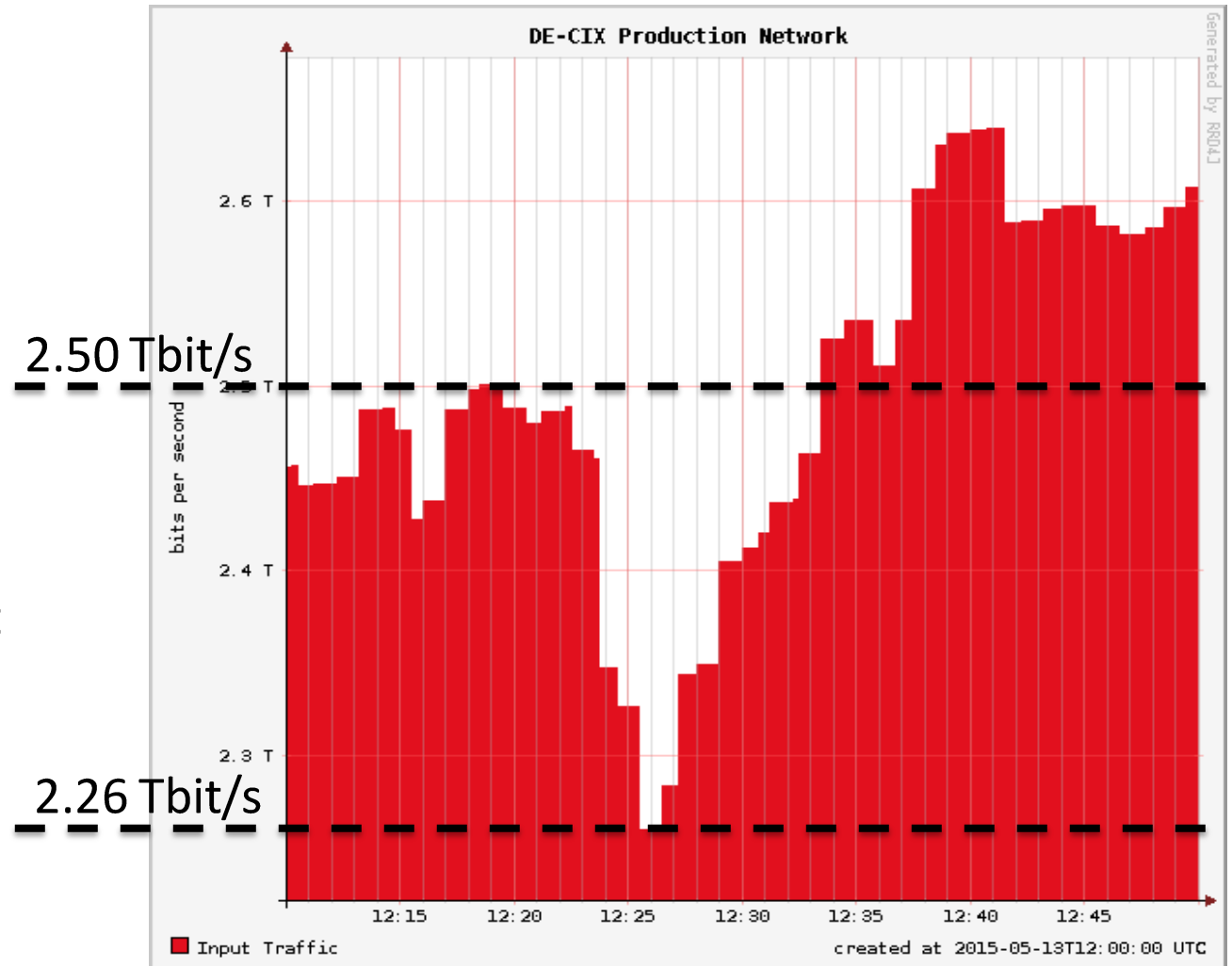

» 13th May 2015 at 12:22 pm

» Loop with 4 x 100GE in a core switch, most traffic dropped

» About 500 of 600 BGP sessions at the route servers dropped

Impact on other IXPs, i.e., DE-CIX?

average traffic in bits per second

Impact on DE-CIX Frankfurt

» Decreased traffic volume

» Drop of about 240 Gbit/s within 5 minutes

» Recovering after about 10 minutes

DE-CIX Production Network

2.50 Tbit/s

2.26 Tbit/s

bits per second

2.6 T
2.5 T
2.4 T
2.3 T

12:15   12:20   12:25   12:30   12:35   12:40   12:45

■ Input Traffic   created at 2015-05-13T12:00:00 UTC
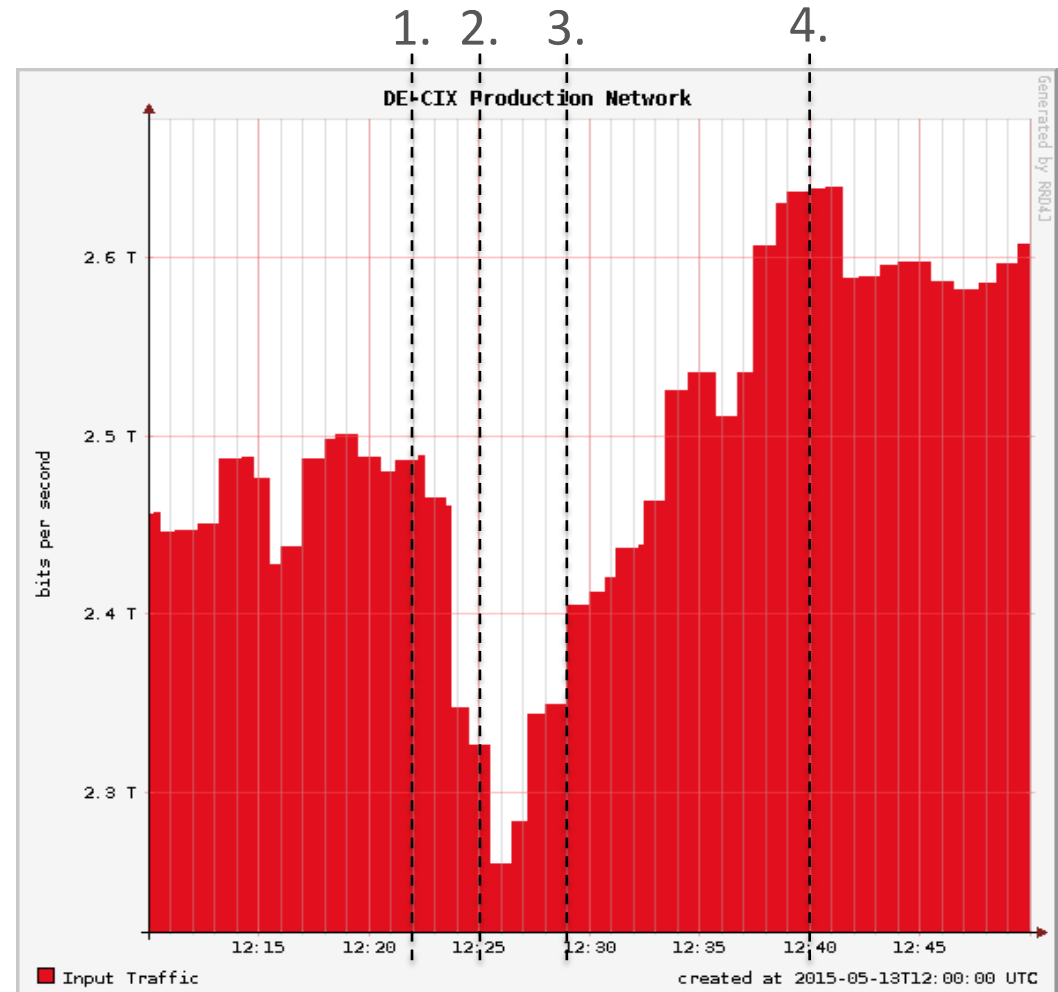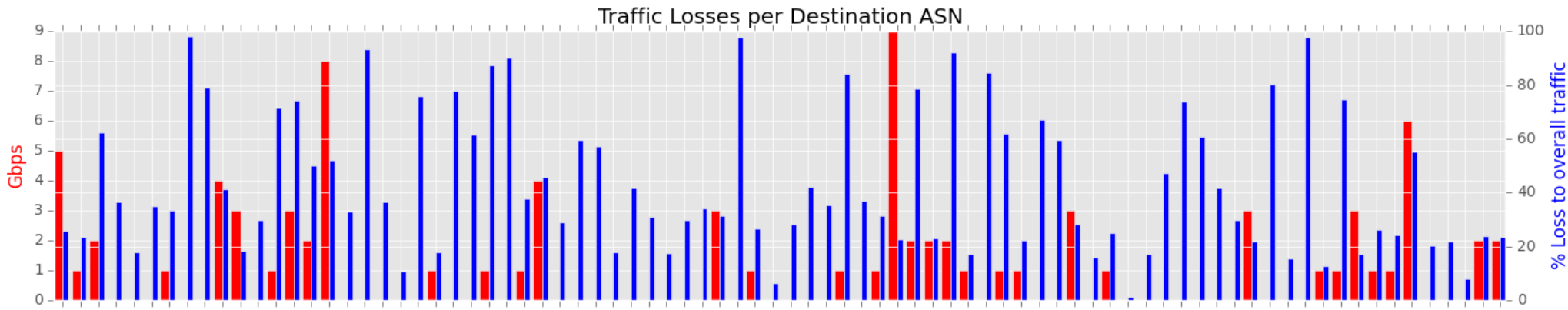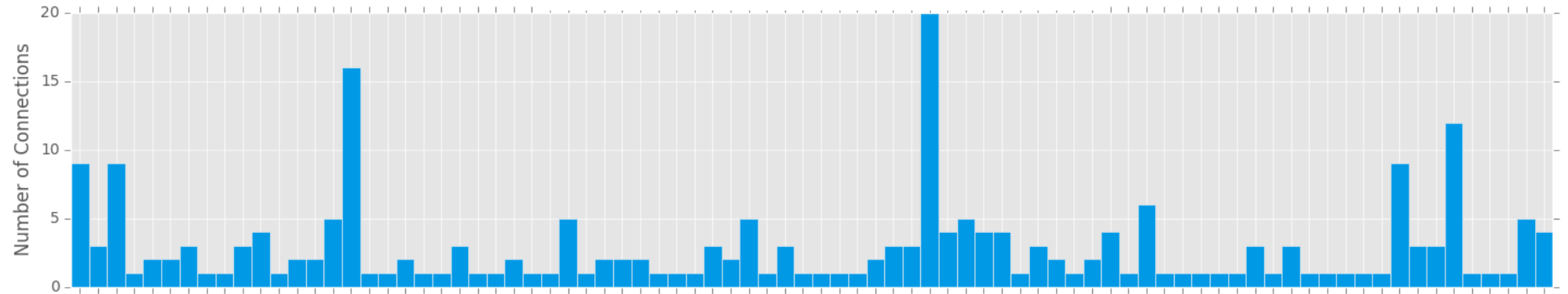
Time Flow

AMS-IX

13th May 2015:
(information from public sources)

1. 12:22 pm – Loop with 4 x 100GE created. Traffic was blackholed.

2. 12:25 pm – About 500 of 600 BGP sessions at the route servers dropped

3. 12:29 pm – NOC reacted and deactivated ports responsible for loop

4. 12:40 pm – BGP sessions to route server are back online
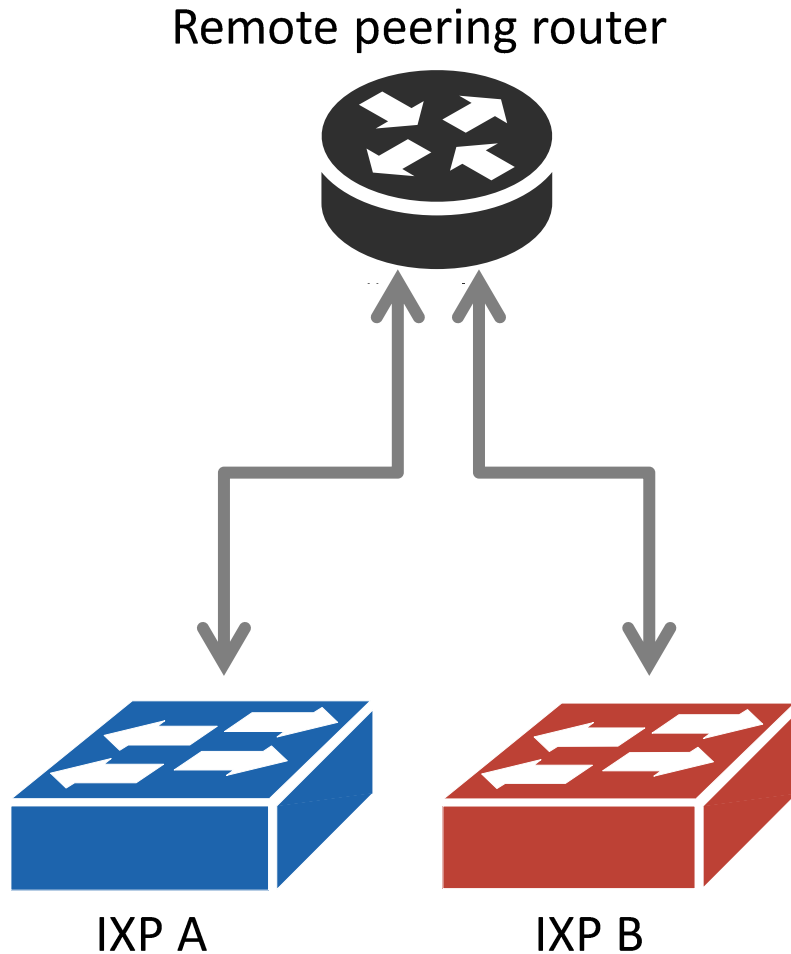
DE-CIX

Impact Details

Traffic Losses per Destination ASN

ASes with drops of more than 200 Mbit/s

What could be the reason for this behavior?

What could be the traffic dependency?

We found two answers... so far...

1. Remote Peering Routers Overloaded
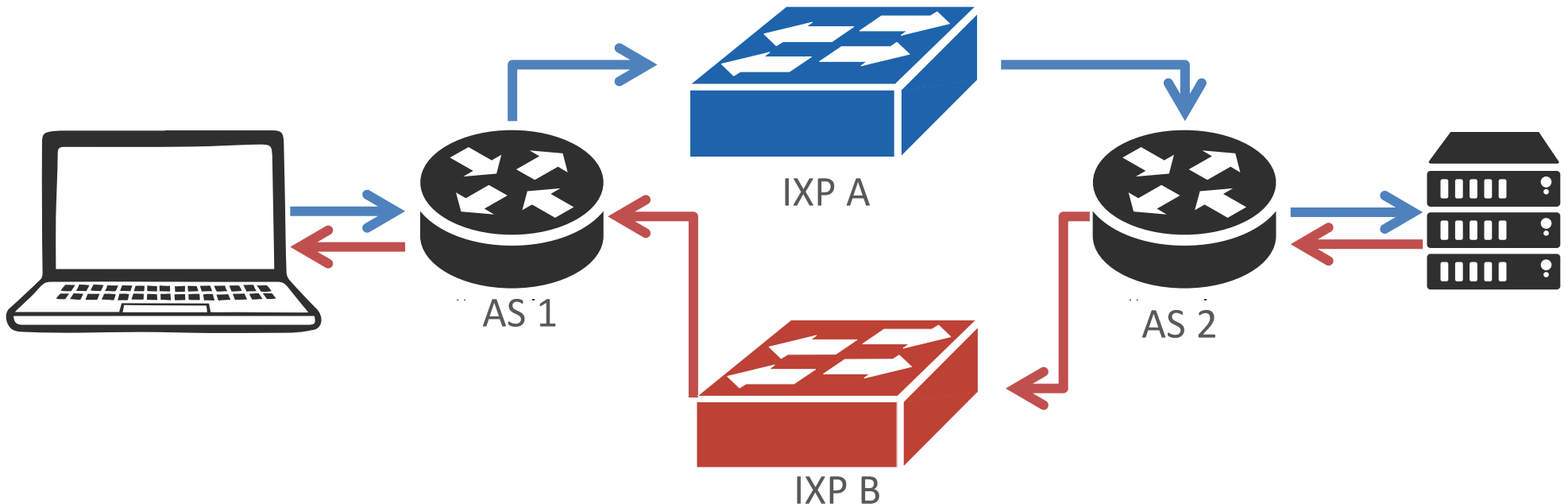
Remote peering router

IXP A   IXP B

» Overloaded remote peering router drops all BGP sessions

» Four customers at DE-CIX Frankfurt affected with a traffic volume drop of 0.92 Gbit/s

2. Asymmetric Routing Paths

Is there a significant number of asymmetric paths traversing both IXPs?

Example:
  » Upstream traverses IXP A
  » Downstream traverses IXP B
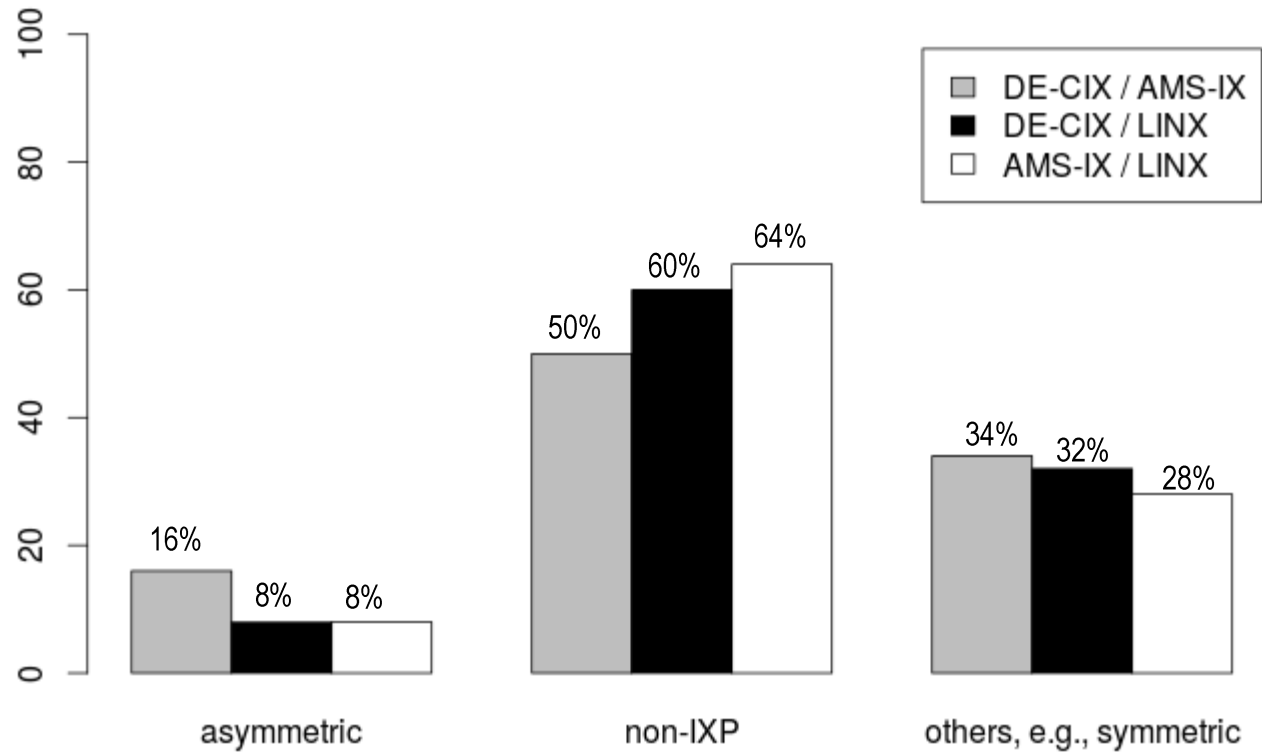
2. Asymmetric Routing Paths II

RIPE Atlas measurements:

» ASes connected to DE-CIX Frankfurt and AMS-IX Amsterdam: *323 (40-50%)*

» "Peerings" with a traffic drop > 200Mbit/s at DE-CIX Frankfurt: *183*

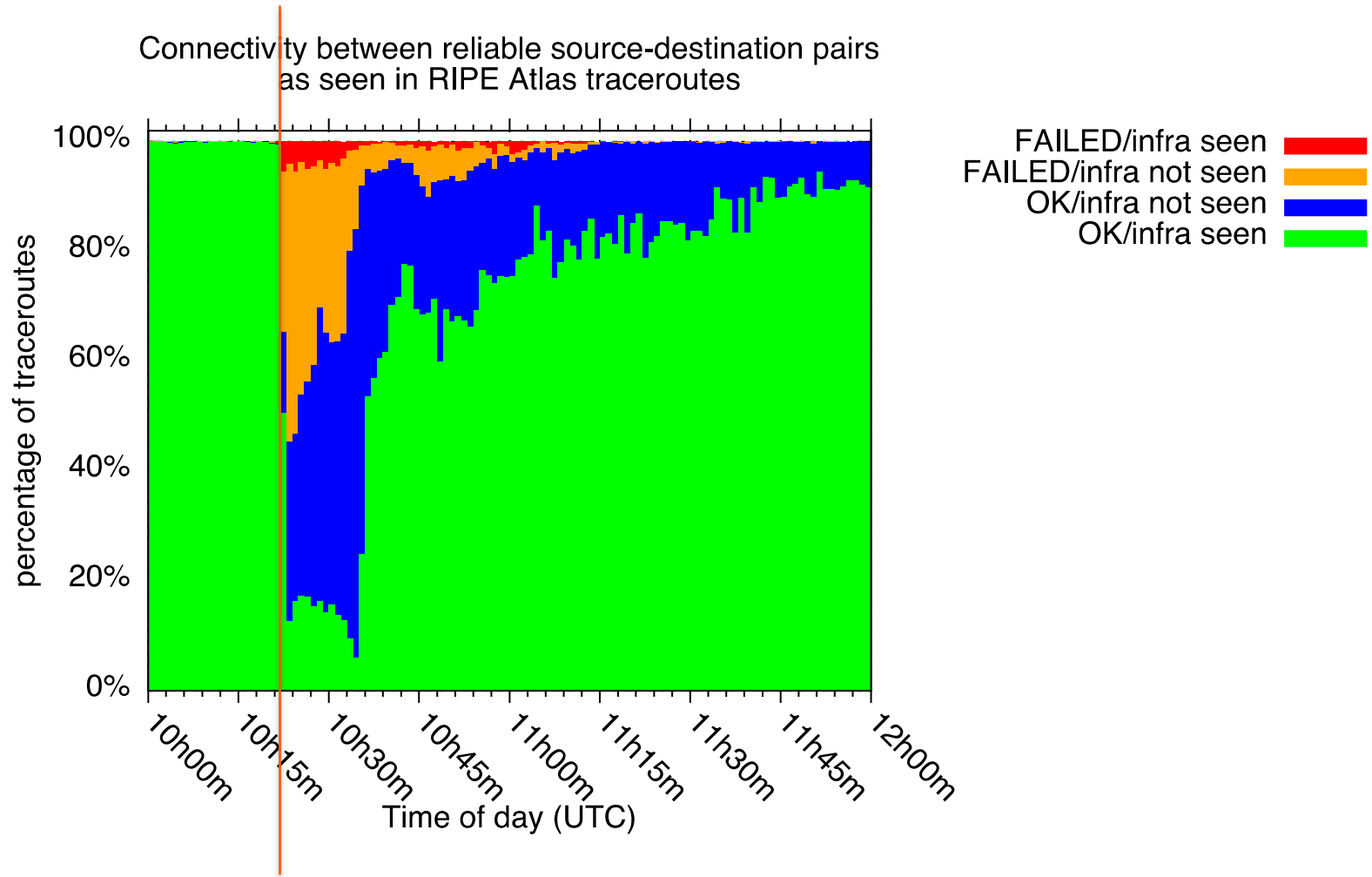» ASes hosting (at least one) RIPE Atlas probe: *171*

» Intersection: 50 ASes

Measurement results of full mesh traceroutes:

» 38% of all "connections" are asymmetric

» 8% of all connections traversed no IXP

2. Asymmetric Routing Paths "Validation"

Active Measurement

Connectivity between reliable source-destination pairs as seen in RIPE Atlas traceroutes

Legend:
- FAILED/infra seen (red)
- FAILED/infra not seen (orange)
- OK/infra not seen (blue)
- OK/infra seen (green)

Y-axis: percentage of traceroutes (0% to 100%)
X-axis: Time of day (UTC) — 10h00m to 12h00m

https://labs.ripe.net/Members/emileaben/does-the-internet-route-around-damage