IPv6 Issues on the AMS-IX Peering LAN

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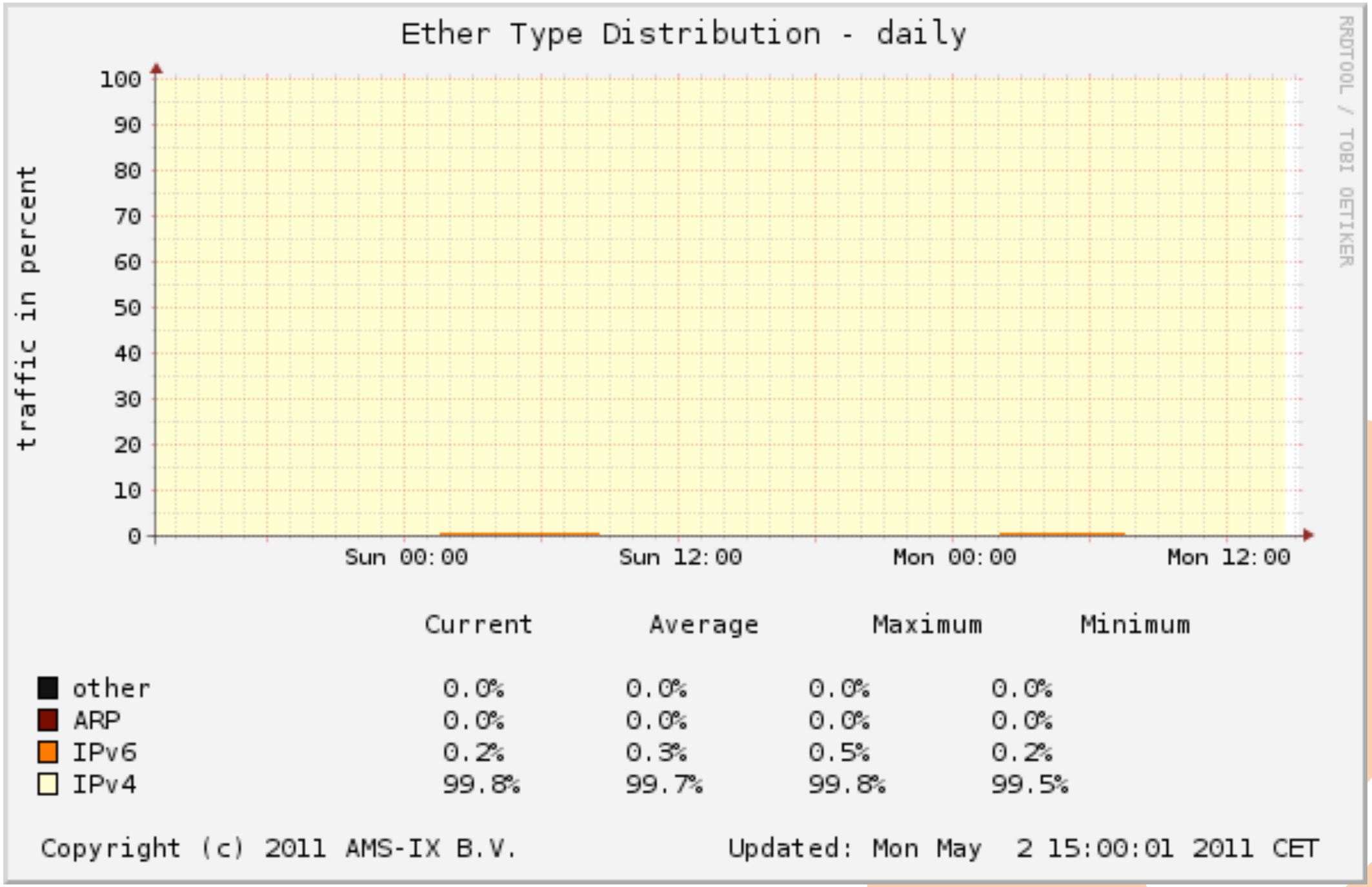
arien.vijn@ams-ix.net


Ether Type Distribution - daily
RRDTOOL / TOBI OETIKER
traffic in percent
100
90
80
70
60
50
40
30
20
10
0
Sun 00:00
Sun 12:00
Mon 00:00
Mon 12:00
Current
Average
Maximum
Minimum
other 0.0% 0.0% 0.0% 0.0%
ARP 0.0% 0.0% 0.0% 0.0%
IPv6 0.2% 0.3% 0.5% 0.2%
IPv4 99.8% 99.7% 99.8% 99.5%
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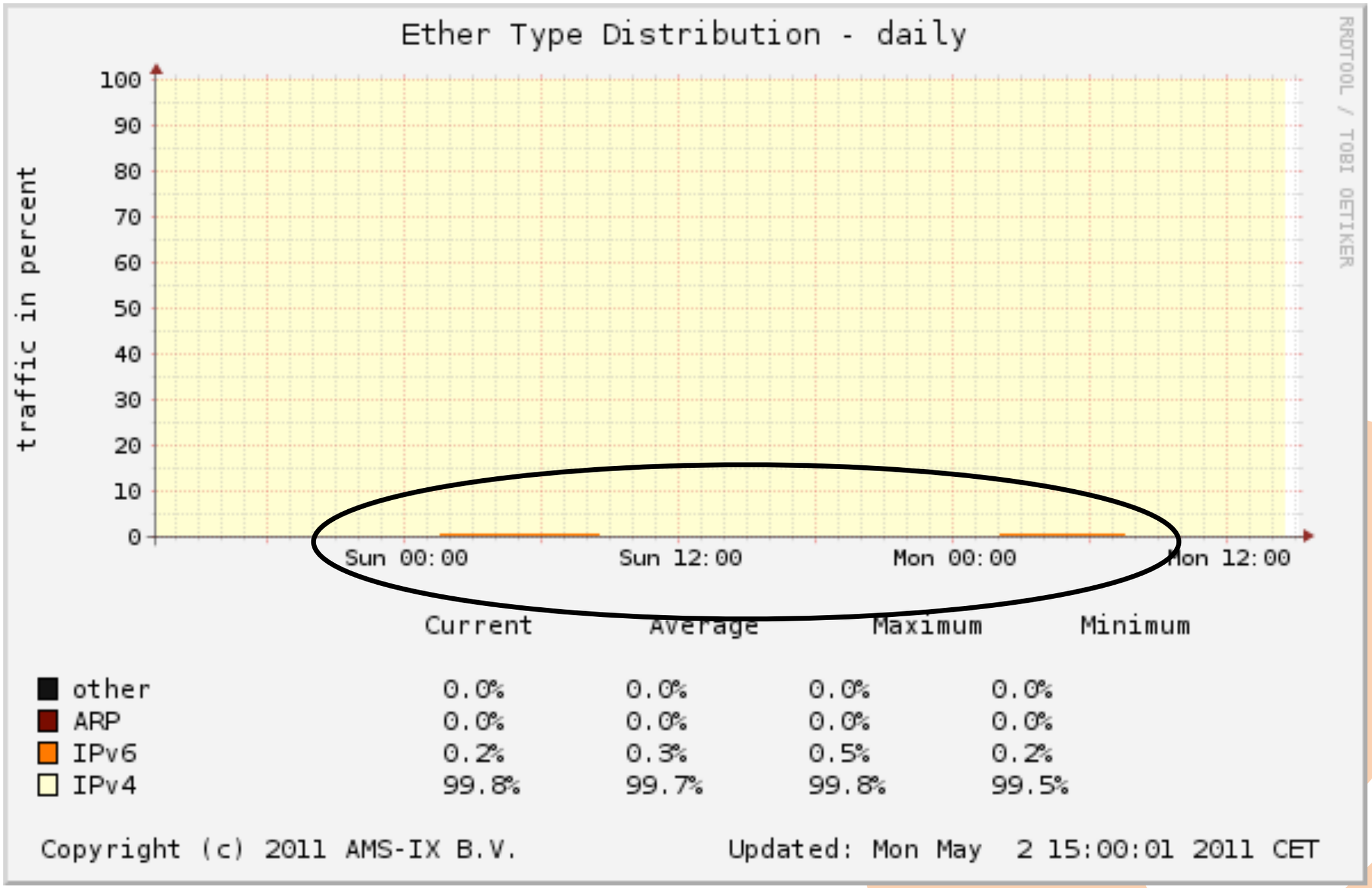
Updated: Mon May 2 15:00:01 2011 CET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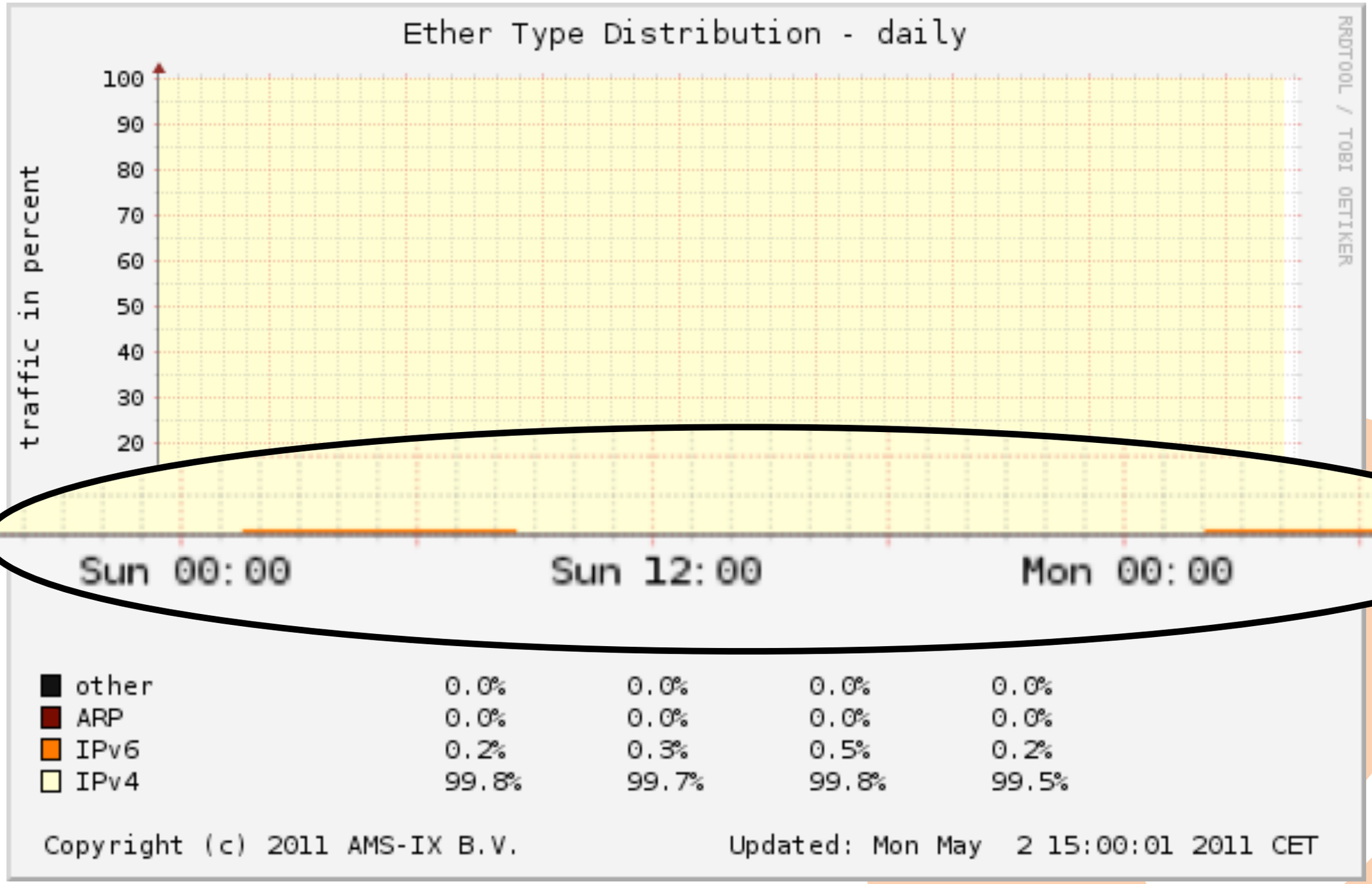
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90
80
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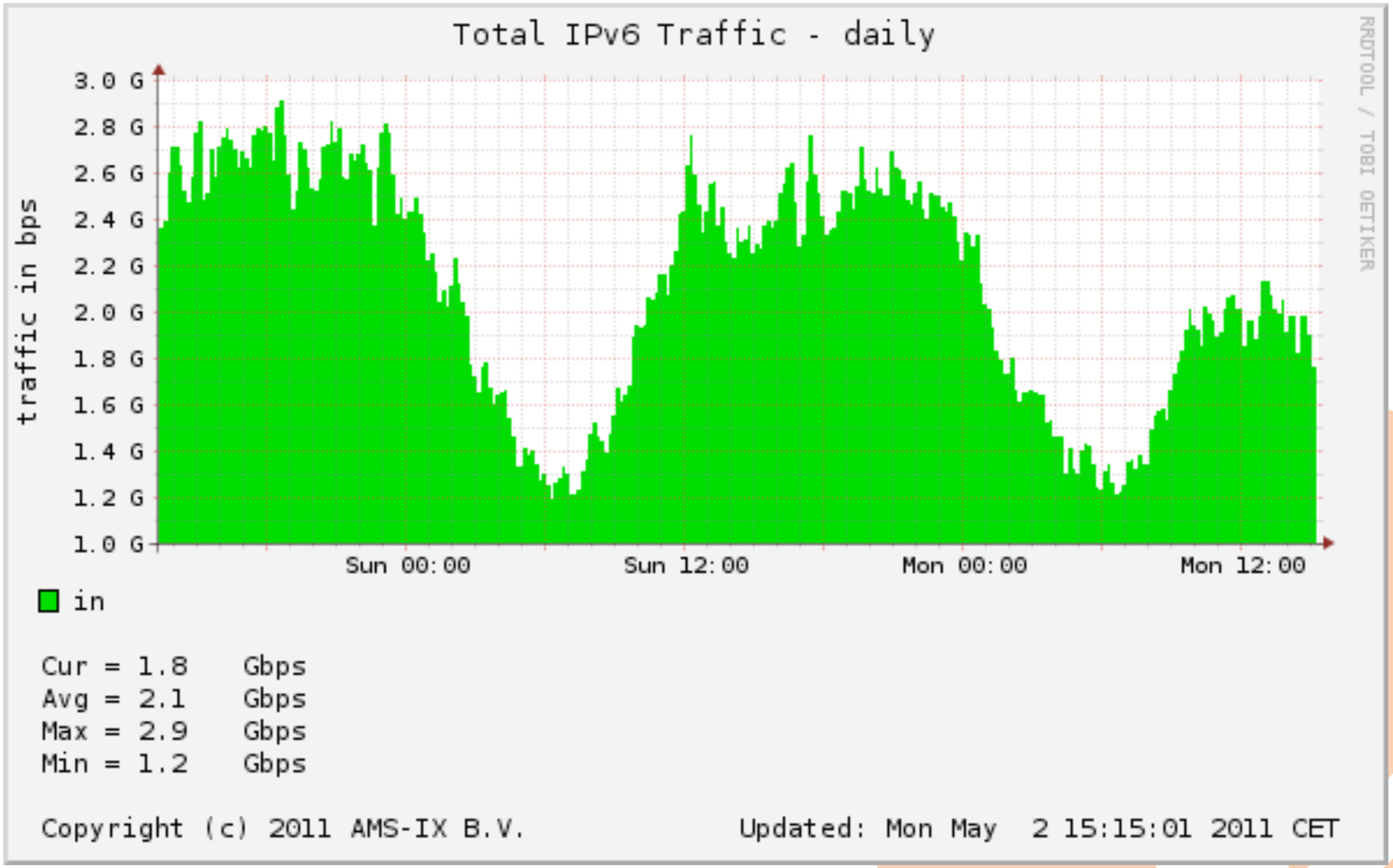
Total IPv6 Traffic - daily
traffic in bps
3.0 G
2.8 G
2.6 G
2.4 G
2.2 G
2.0 G
1.8 G
1.6 G
1.4 G
1.2 G
1.0 G
Sun 00:00
Sun 12:00
Mon 00:00
Mon 12:00
RRDTOOL / TOBI OETIKER
in
Cur = 1.8 Gbps
Avg = 2.1 Gbps
Max = 2.9 Gbps
Min = 1.2 Gbps
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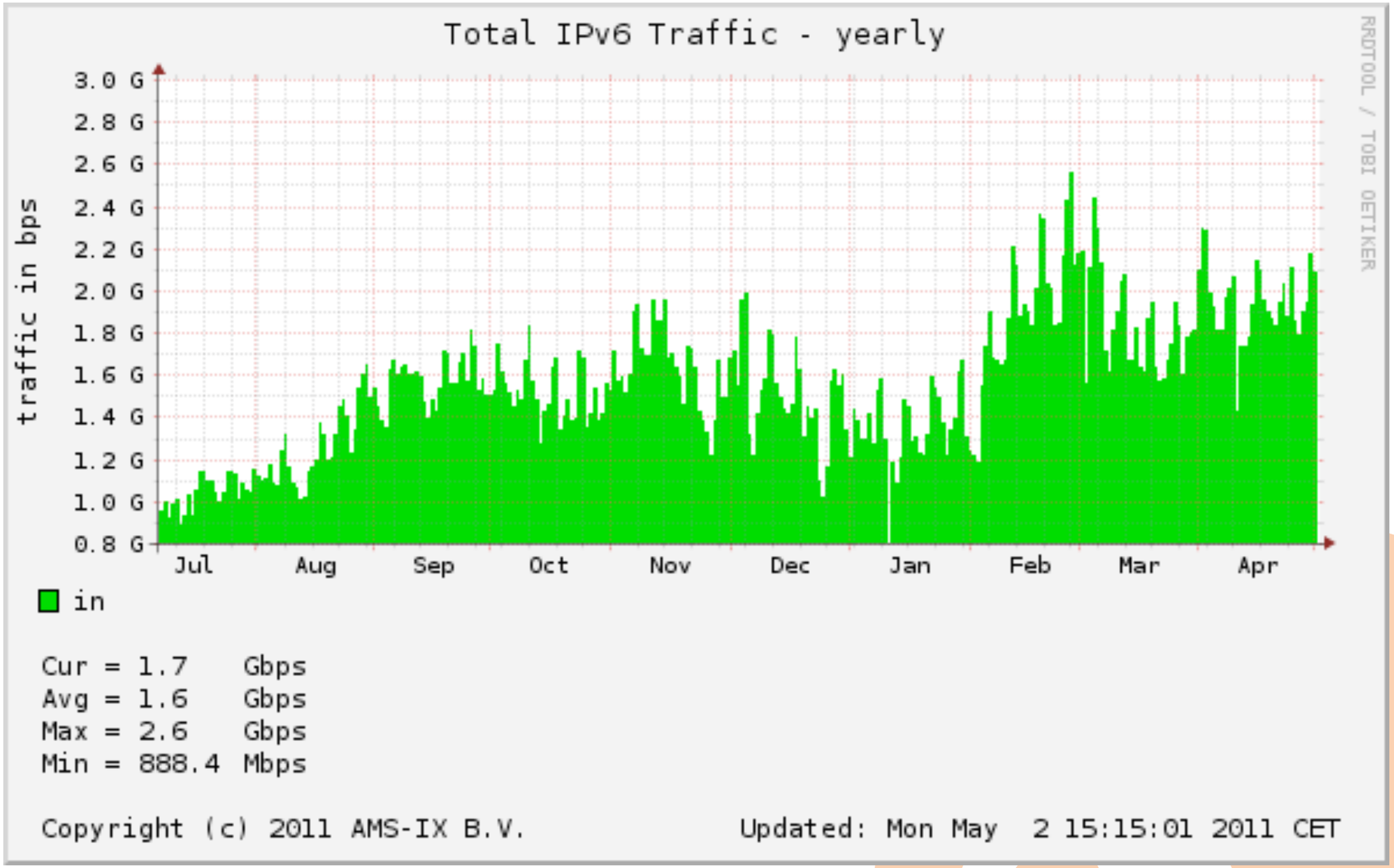
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traffic in bps
3.0 G
2.8 G
2.6 G
2.4 G
2.2 G
2.0 G
1.8 G
1.6 G
1.4 G
1.2 G
1.0 G
0.8 G
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
RRDTOOL / TOBI OETIKER
in
Cur = 1.7 Gbps
Avg = 1.6 Gbps
Max = 2.6 Gbps
Min = 888.4 Mbps
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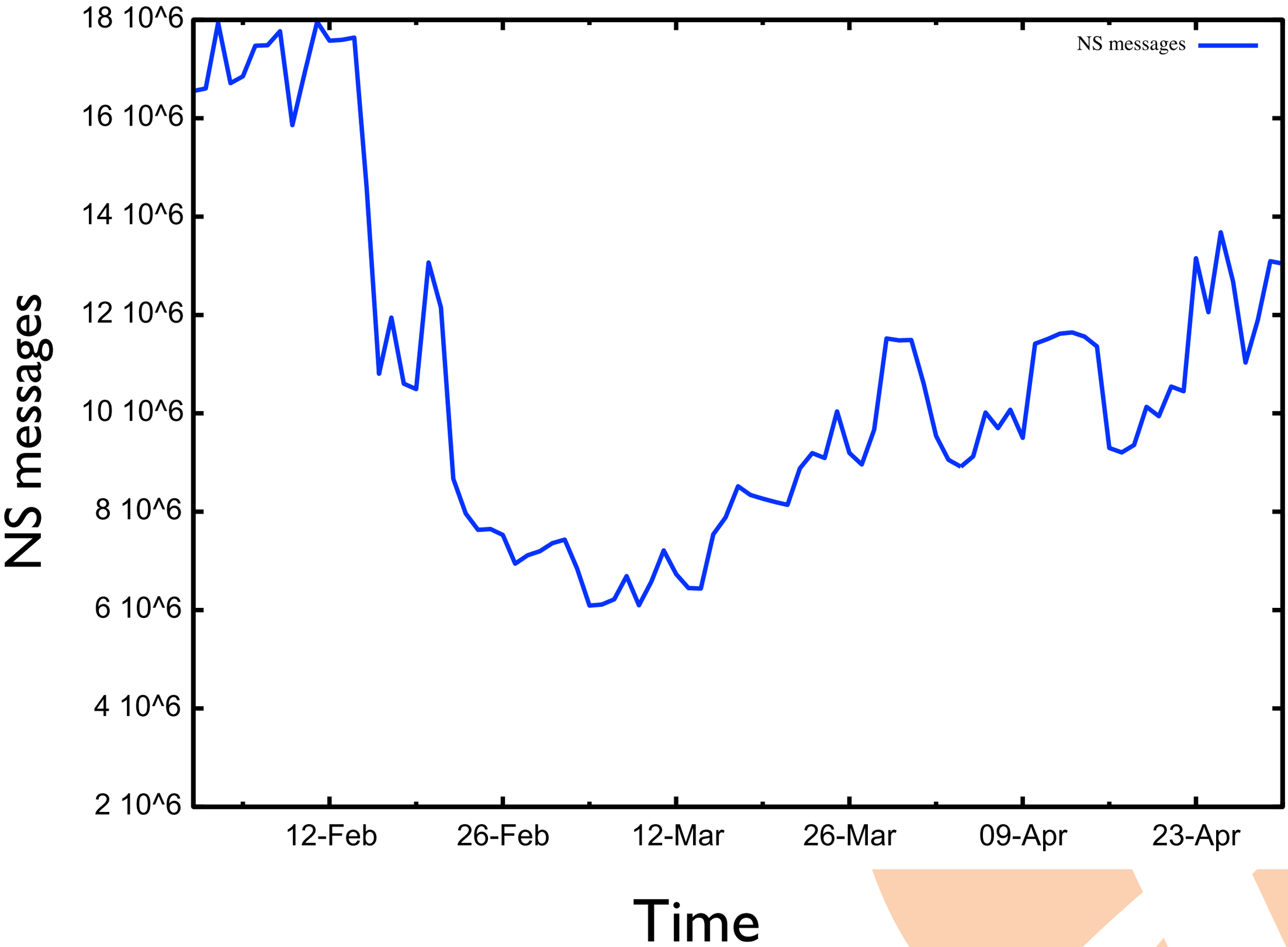
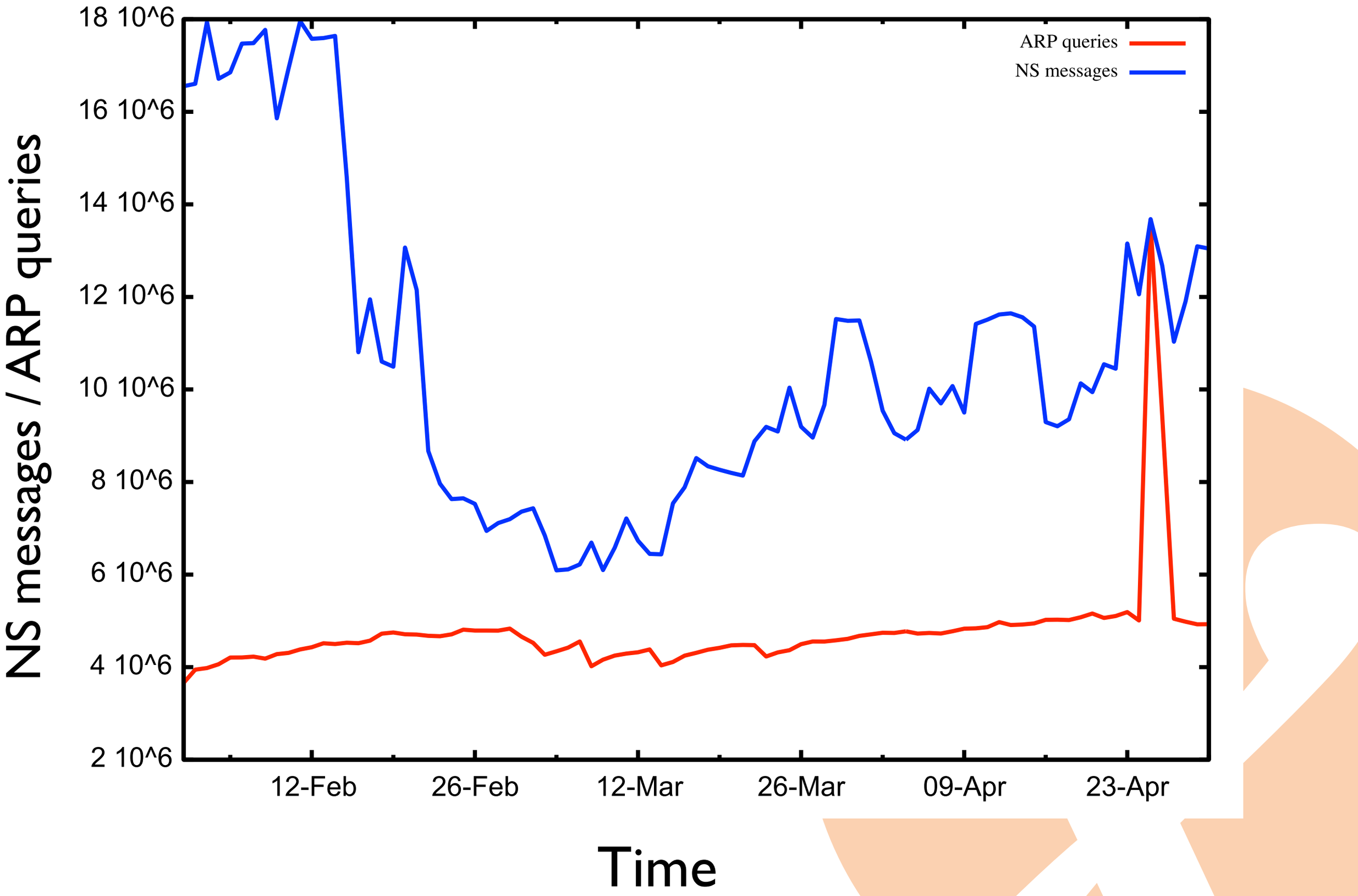
Updated: Mon May 2 15:15:01 2011 CET

Agenda

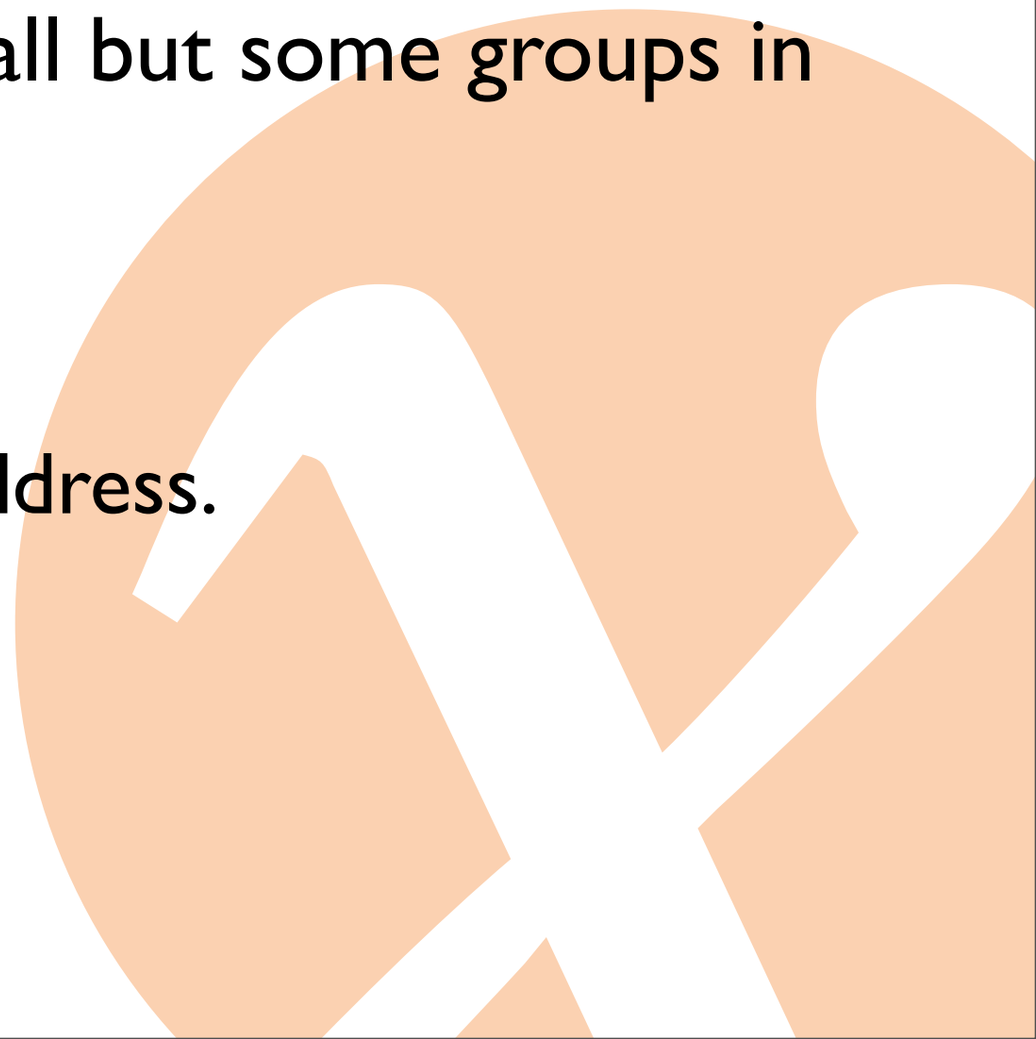
- Operational issues
  - Statistics on NS messages
    - Analysis
  - Router bugs
  - Conclusion


NS messages
18 10^6
16 10^6
14 10^6
12 10^6
10 10^6
8 10^6
6 10^6
4 10^6
2 10^6
NS messages
12-Feb
26-Feb
12-Mar
26-Mar
09-Apr
23-Apr
Time


ARP queries
NS messages
NS messages / ARP queries
18 10^6
16 10^6
14 10^6
12 10^6
10 10^6
8 10^6
6 10^6
4 10^6
2 10^6
12-Feb
26-Feb
12-Mar
26-Mar
09-Apr
23-Apr
Time

NS messages

- Is this really a lot?
  - Divided in ~400 multicast groups.
- Routers should be able to ignore all but some groups in hardware.
  - 1 group for the link local address.
  - 1 group for the globally unicast address.
  - All nodes multicast addresses.



NS messages

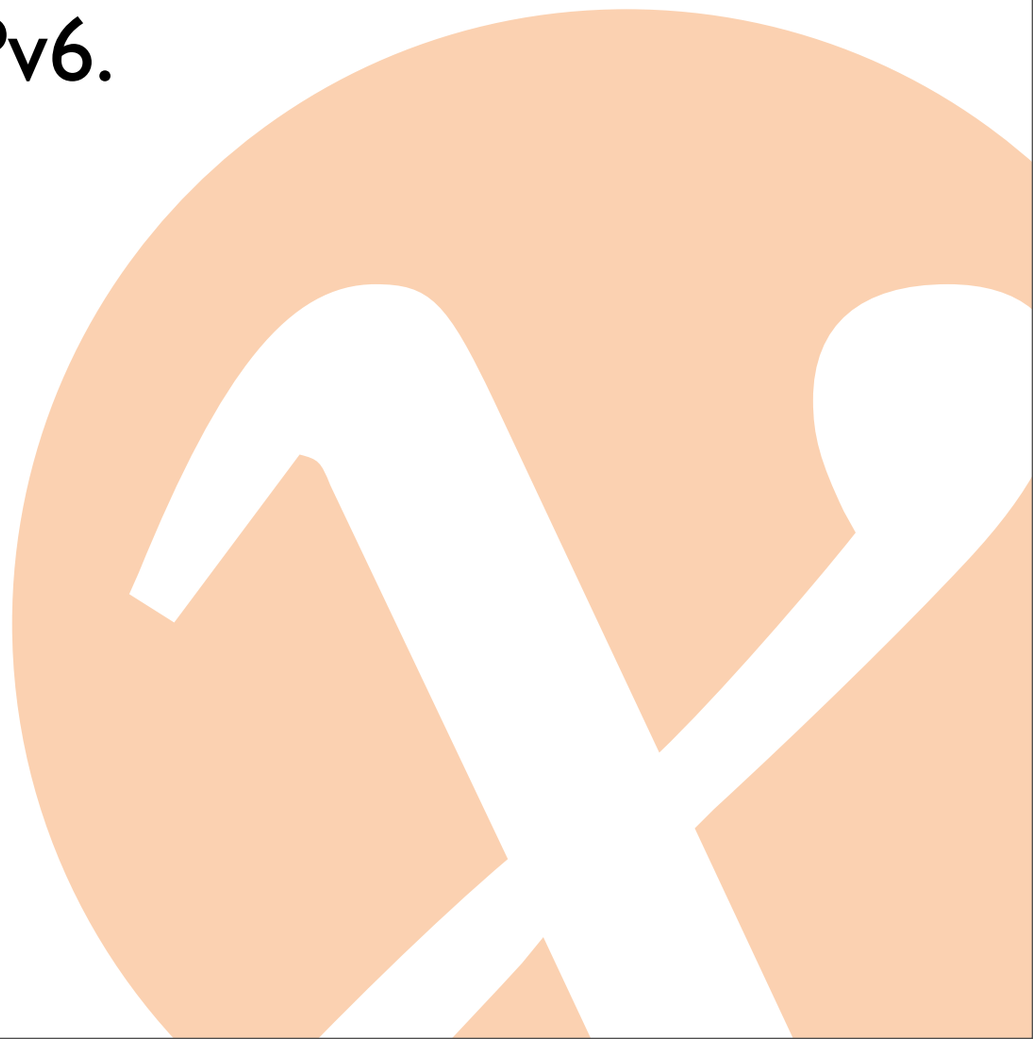
- Cisco GSR user complaint.
  - Under IOS, all ND/NS messages are processes by the routing processor.
  - This even caused BGP drops!
- Solution:
  - IPv6 filter.

NS messages

- Statistics showed significant more NS for certain addresses.
- These addresses did not react on NS messages.
  - Multicasted
- Address is reachable after setting a static entry in neighbor cache.
  - Unicast only.

ICMPv6 filtering

- Too restrictive incoming ICMPv6 filtering.
  - ICMP filtering tradition that comes from IPv4.
- IPv6 does not work without ICMPv6.

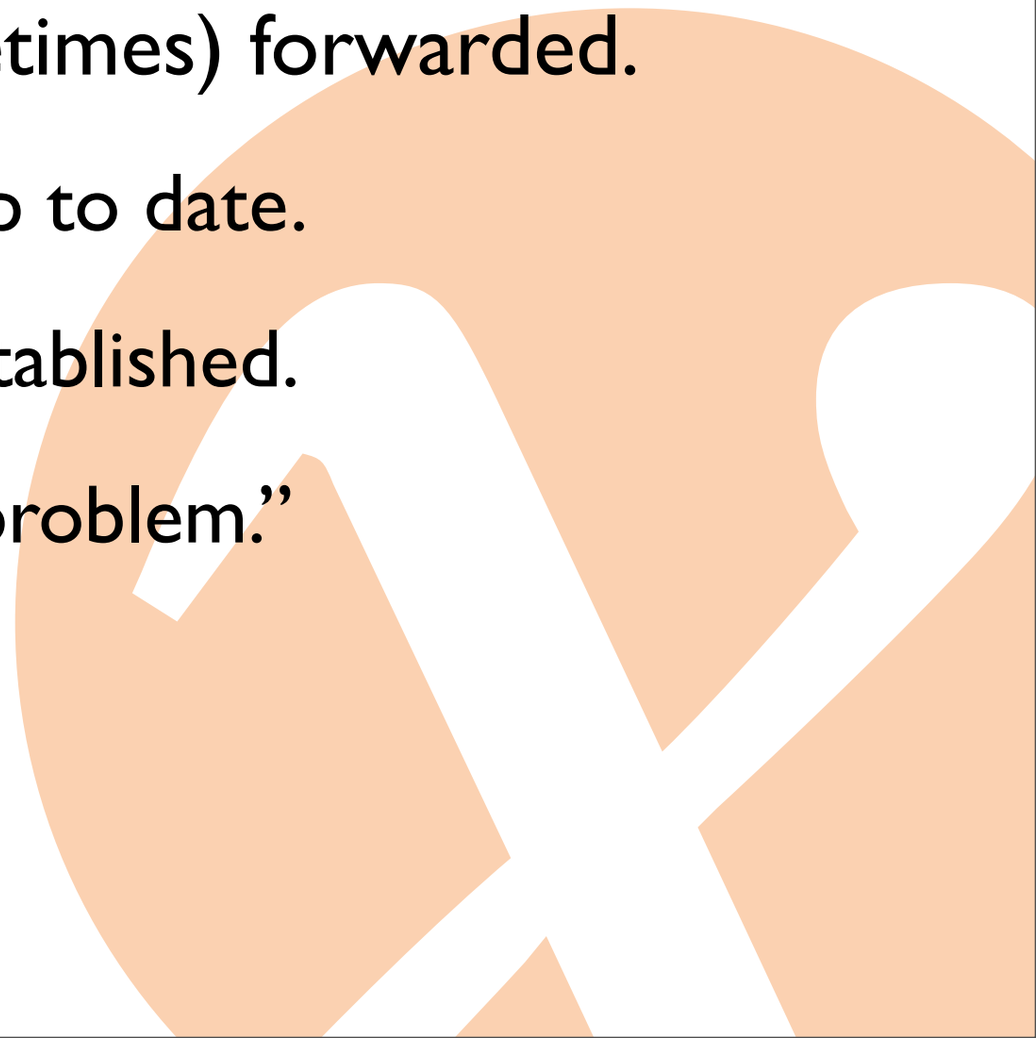


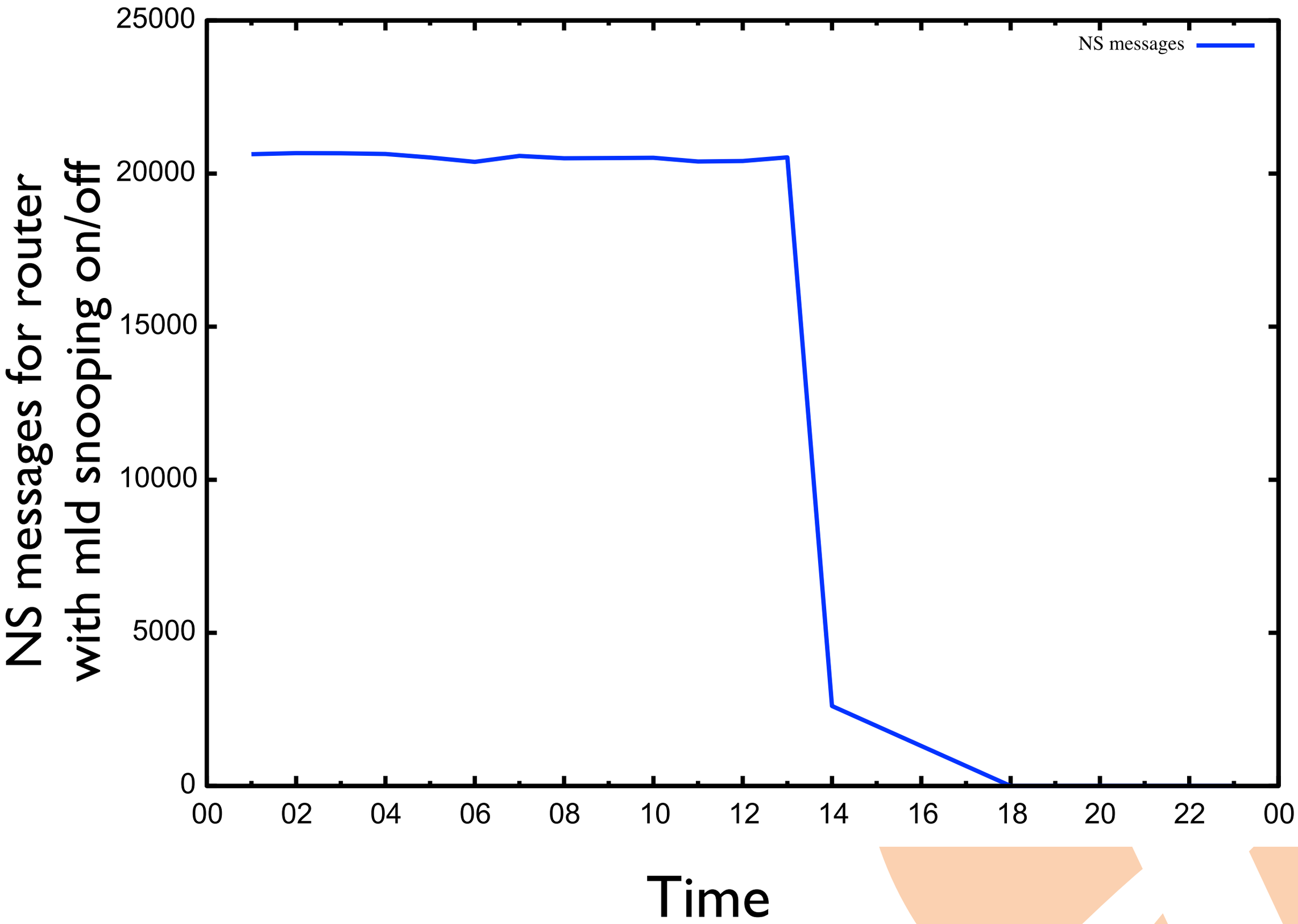
MLD

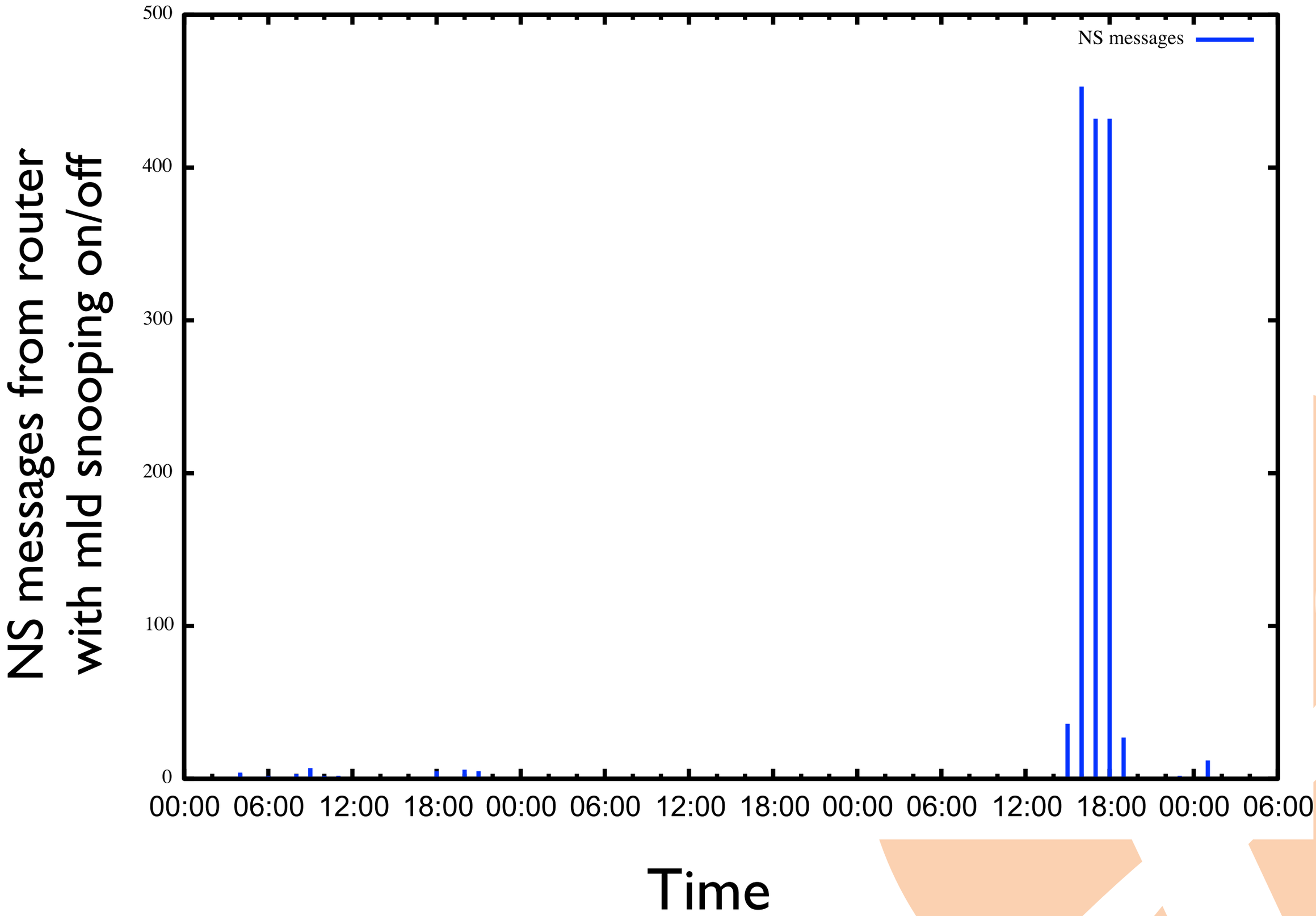
- One MLD query leads to many MLD listener reports.
  - The latter can't always be switched off.
- Default on:
  - Cisco
  - Linux kernels 2.6.26 and up
    - no sysctl to switch it off
    - ip6tables

MLD snooping

- Cisco 7600/6500 MLD snooping block NS messages.
  - Multicast groups not in listener reports.
  - Outgoing NS messages are (sometimes) forwarded.
    - Unicast keeps neighbor caches up to date.
    - BGP session gets and remains established.
    - “All sessions are up, there is no problem.”
- Route server peers
  - Next-hop does not get resolved.




NS messages
NS messages for router with mld snooping on/off
25000
20000
15000
10000
5000
0
00
02
04
06
08
10
12
14
16
18
20
22
00
Time


NS messages from router with mld snooping on/off
NS messages
500
400
300
200
100
0
00:00
06:00
12:00
18:00
00:00
06:00
12:00
18:00
00:00
06:00
12:00
18:00
00:00
06:00
Time

Agenda

- Operational issues
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  - **Router bugs**
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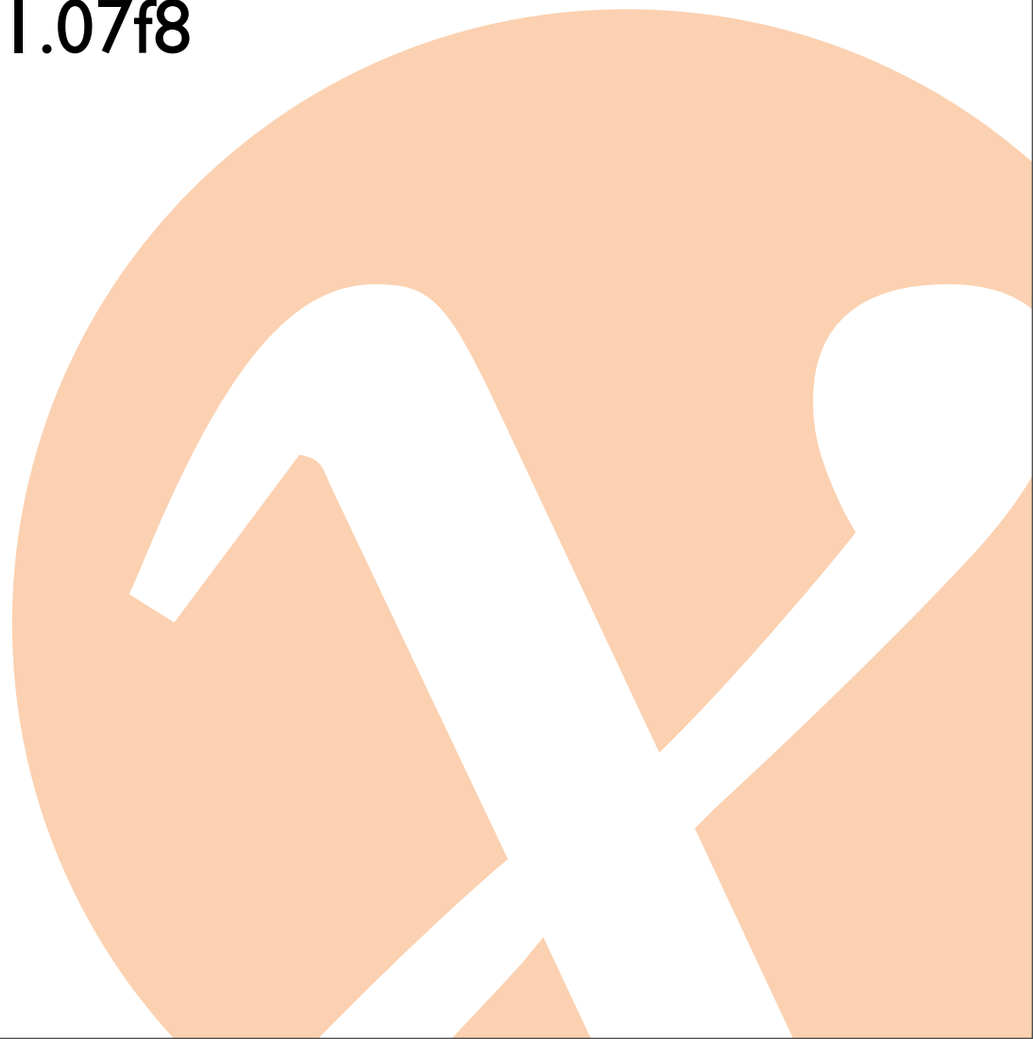
Mostly Harmless?

- Garbage frames when IPv6 is enabled.
  - Cisco GSR.
    - CSCta73585
    - Corrupted NS messages.

Mostly Harmless?

- Juniper various JunOS
  - Raw packets.
    - DA:6c05.6ccc.0014 SA:0601.2001.07f8

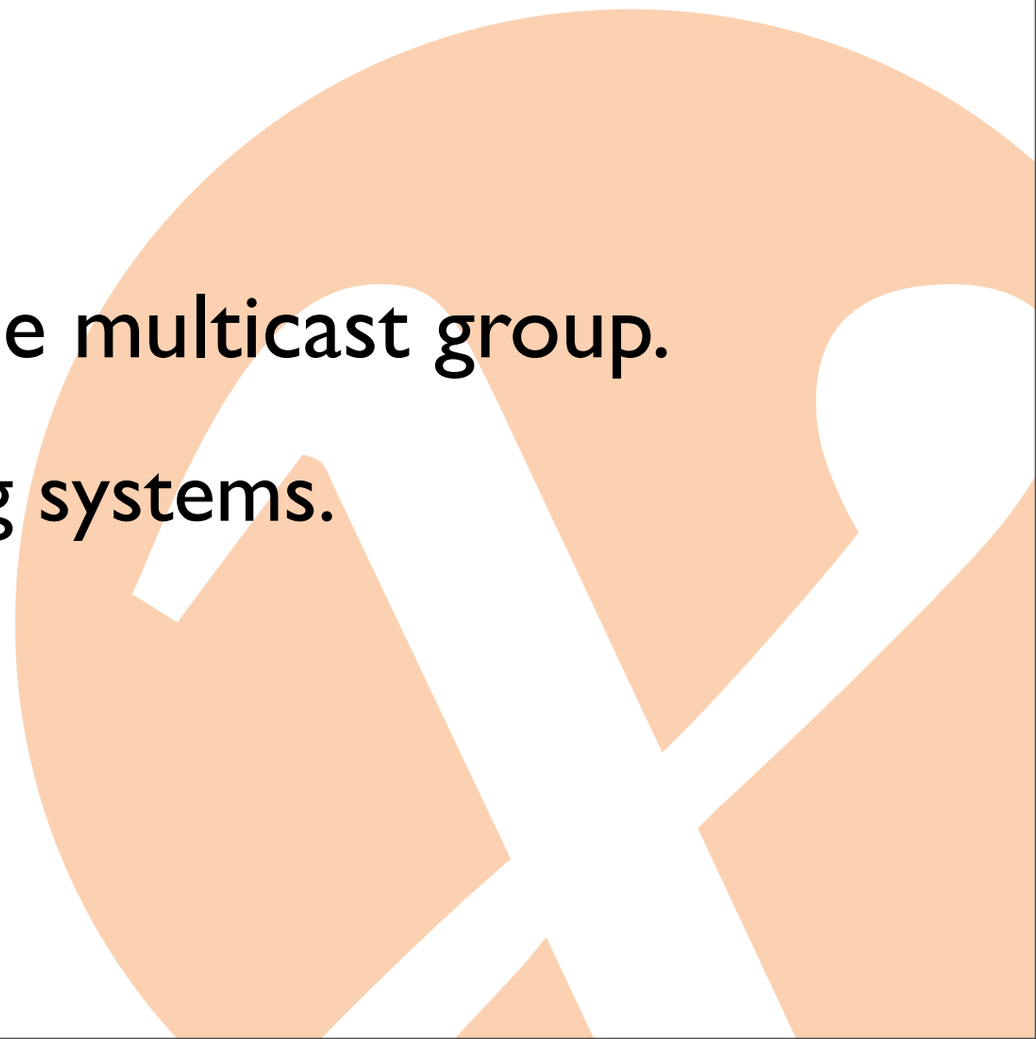
      Version: 6,
      Traffic class: c0,
      Flowlabel: 56ccc,
      Payload Length: 14,
      Next header: 6 (TCP),
      Hop Limit: 1
      Source address: 2001.07f8...



Mostly Harmless?

Harmful

- JunOS 10.4 (R1 to R3), 11.1
- Answers any NS message that it receives, when the target address is in its neighbor cache.
  - ND spoofer.
- Target address must be in the same multicast group.
  - The case for many IXP numbering systems.



Agenda

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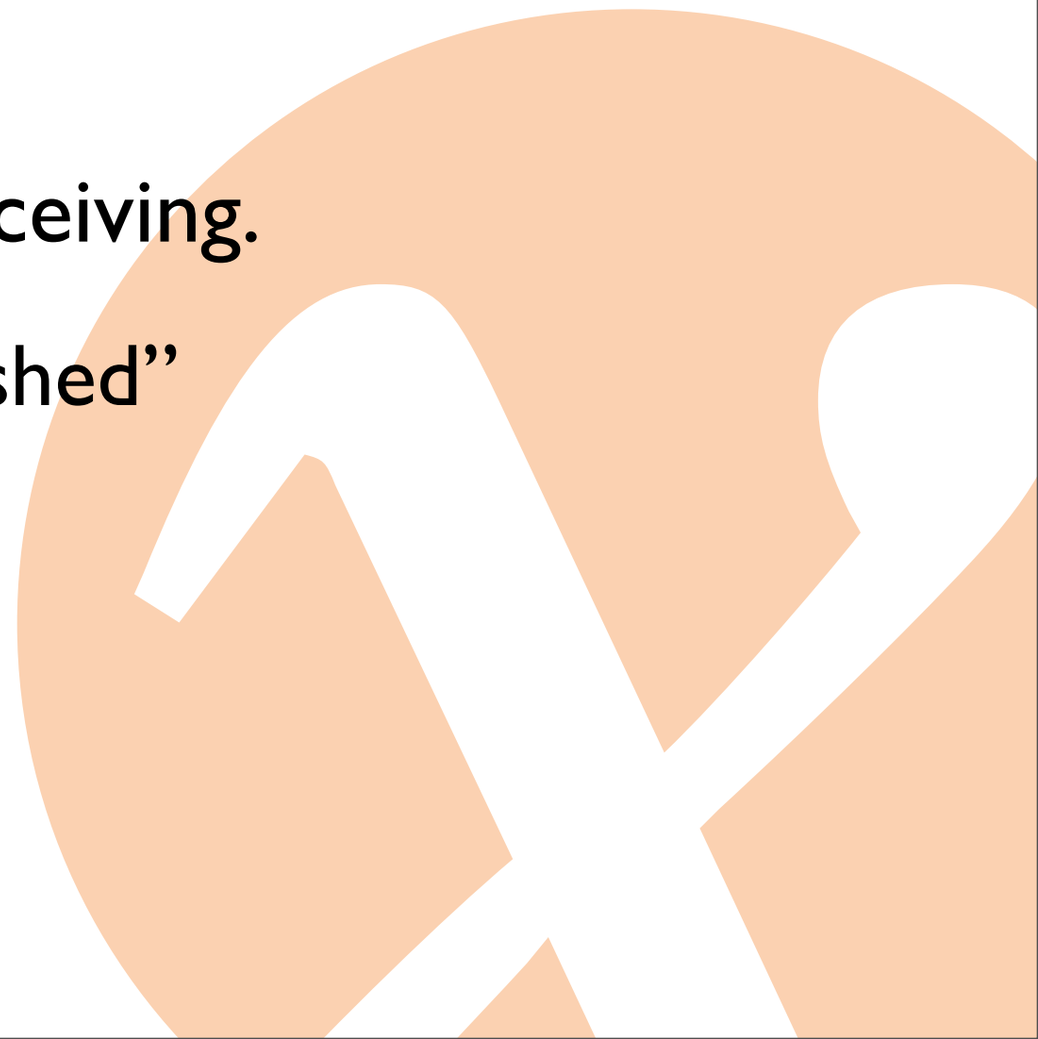
  - Router bugs
  - **Conclusion**

Conclusion

- ND/NS messages can be blocked.
  - ICMPv6 filtering.
  - MLD snooping.
- Robustness of protocol can be deceiving.
  - “All our BGP sessions are established”
- Still bugs.
  - Not so harmless.



JUST DO IT.