IPv6-Only Data Centers

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Who Is Tore Anderson (@toreanderson)

- UNIX systems administrator and network engineer since 2001
- Infrastructure Manager at Redpill Linpro – open source focused Managed Services Provider operating in the Nordic countries
- Main responsibilities at work include:
  – Data centre and backbone network architecture and operations
  – RIPE LIR operations
  – Data centre design and site management (not just networking)
  – Server/blade infrastructure and automation
  – IP/FC networked block and file storage system
- Tech hobbies and affiliations:
  – IPv6 evangelist since 2008
  – Participant in RIPE, IETF, the Norwegian IPv6 Forum, and a bunch of other network operator and open-source communities * Living in Oslo, Norway

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Who Is Ivan Pepelnjak (@ioshints)

- Networking engineer since 1985
- Technical director, later Chief Technology Advisor @ NIL Data Communications
- Consultant, blogger (blog.ioshints.info), book and webinar author
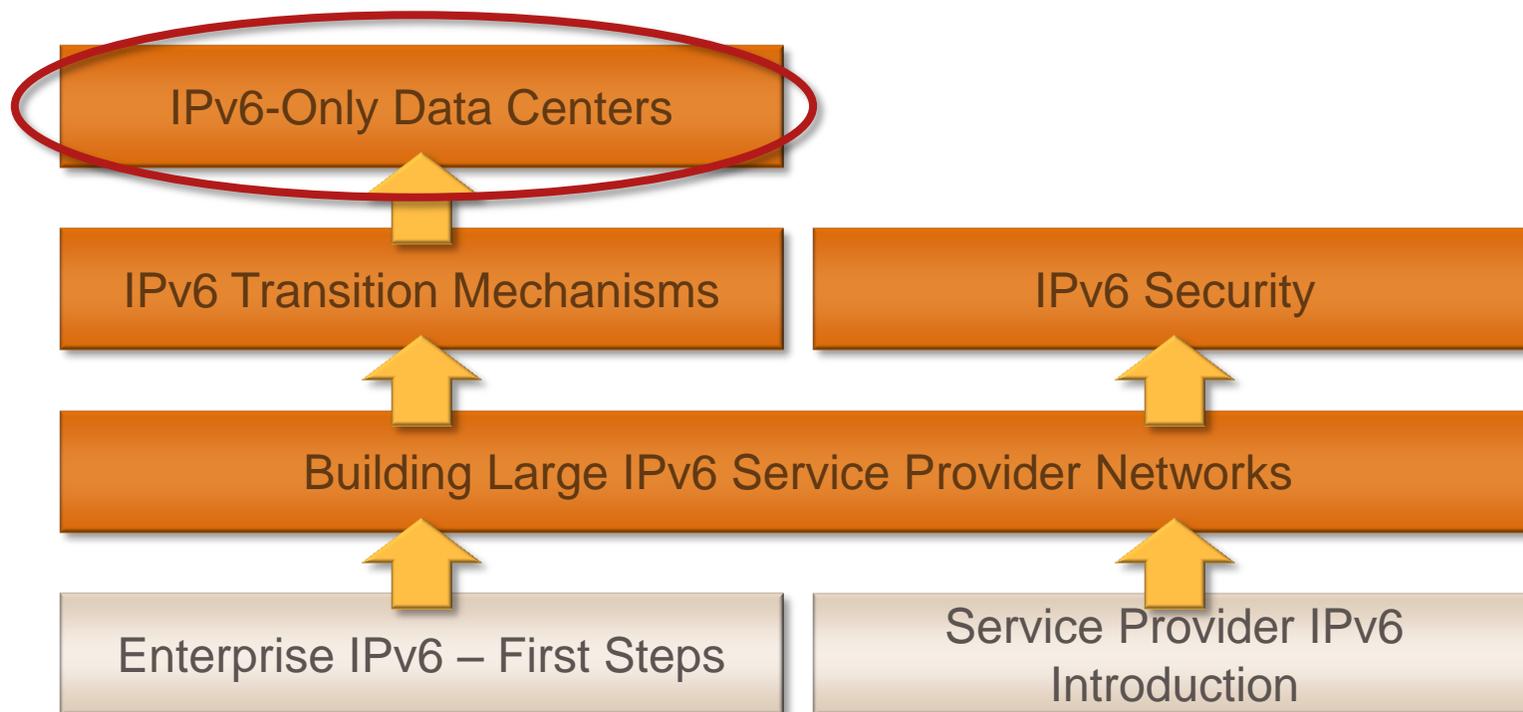- Currently teaching "Scalable Web Application Design" at University of Ljubljana

Focus:

- Large-scale data centers and network virtualization
- Networking solutions for cloud computing
- Scalable application design
- Core IP routing/MPLS, IPv6, VPN
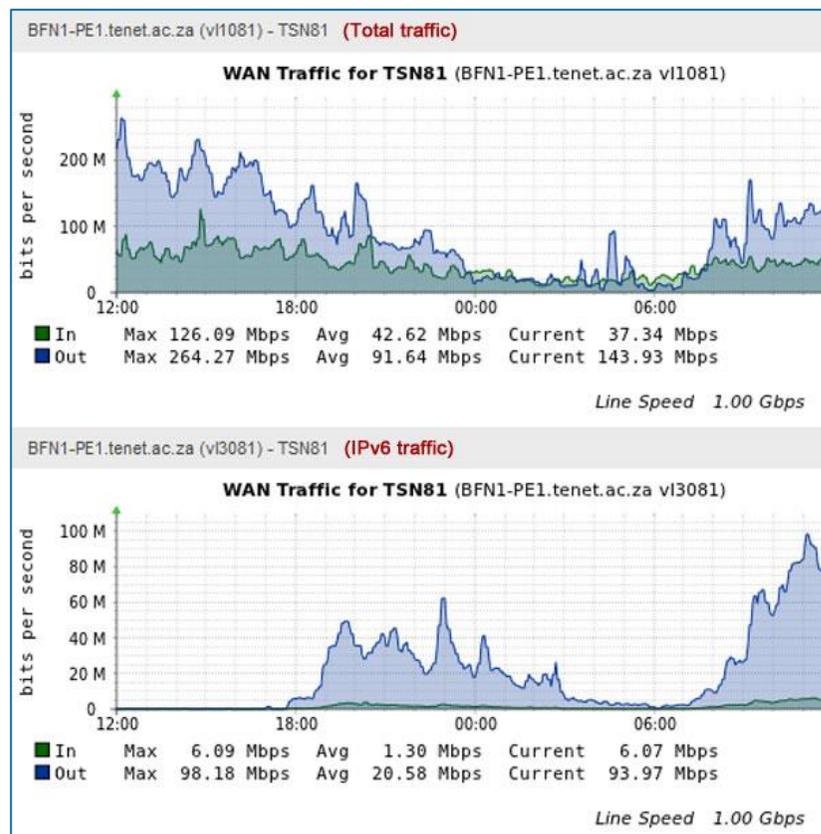
Past Predictions

- We'll run out of IPv4 addresses ✓

- IPv6-only mobile devices ✗

- Majority of the content will be on IPv6 ✓

- CGN will be expensive and thus avoided and/or neglected

Special thanks to

skype™

You must take control of your content

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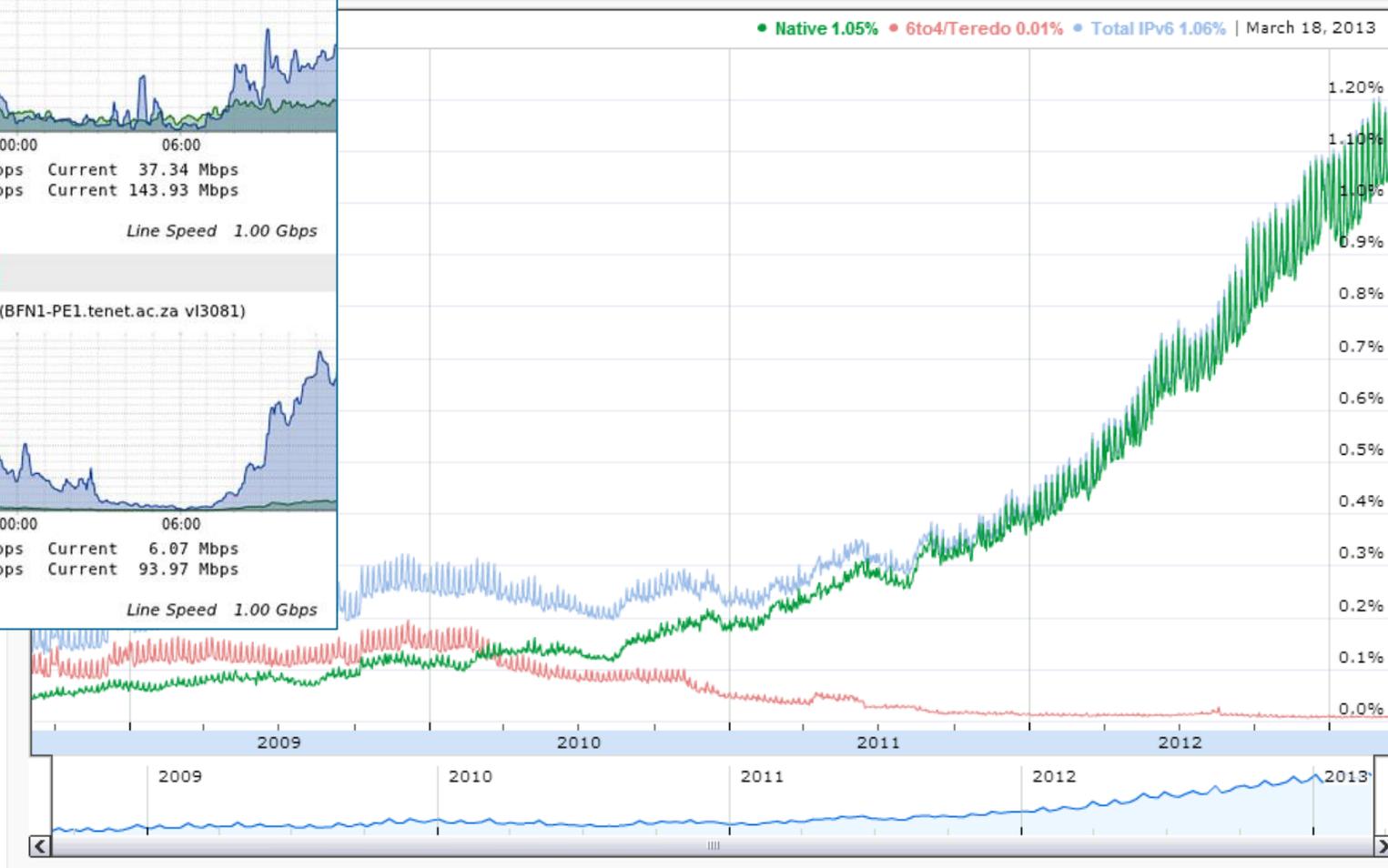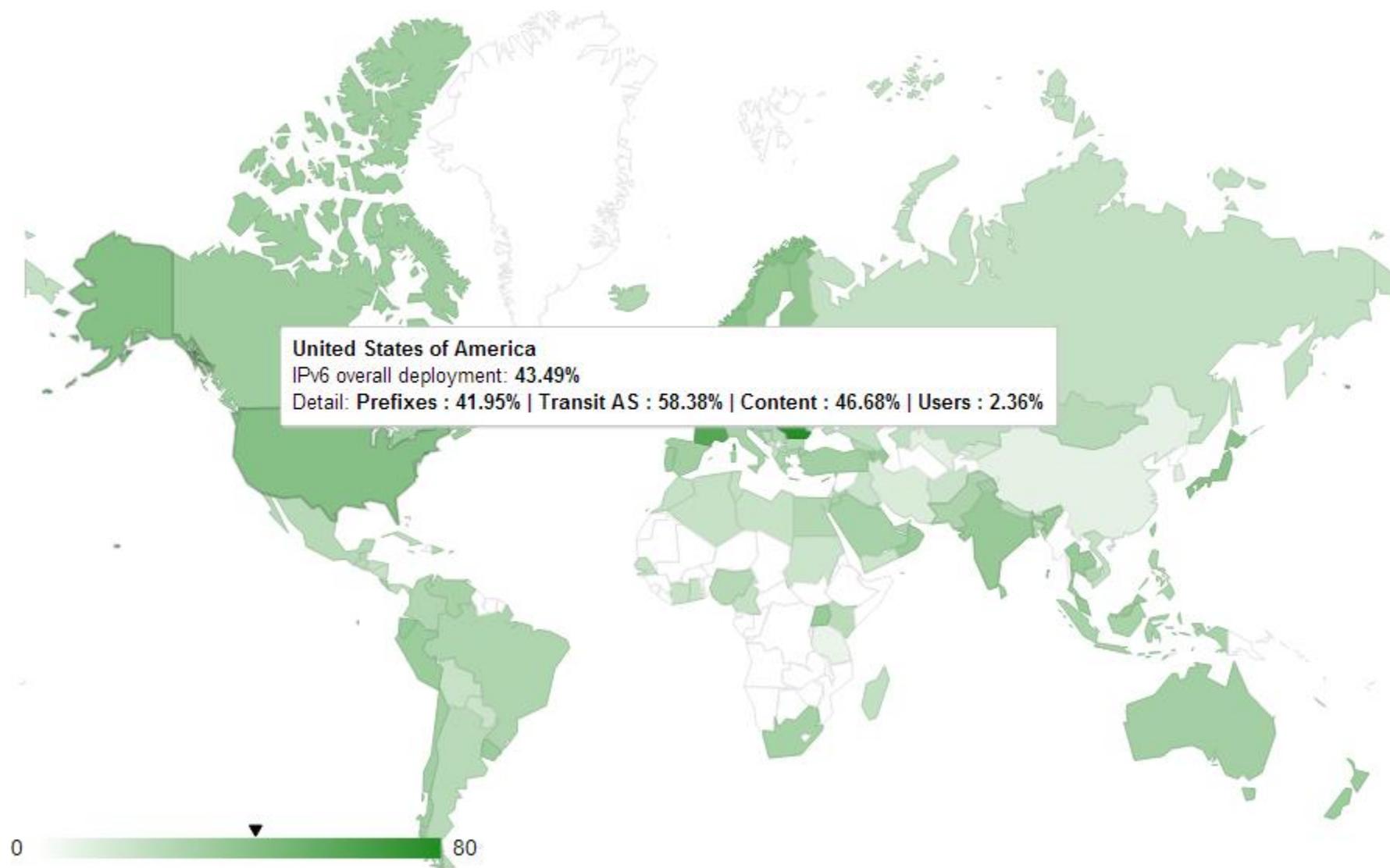
IPv6 Is Enticing for ISPs

Source: http://mybroadband.co.za/news/internet/
56241-shocking-ipv6-revelation-in-south-africa.html

Source: google.com/ipv6/statistics

Major Content Providers Are Ready

United States of America
IPv6 overall deployment: 43.49%
Detail: **Prefixes : 41.95%** | **Transit AS : 58.38%** | **Content : 46.68%** | **Users : 2.36%**

0   80

Source: http://6lab.cisco.com/stats/

Content: weighted readiness (by pageviews) of top-500 Alexa web sites

The Harsh Reality

Content and CDN providers are ready

- Google, Facebook, Yahoo, Wikipedia, Netflix [1]
- Akamai, Limelight, Edgecast, Cloudflare [2]

NAT will break things

- Limited number of connections per client
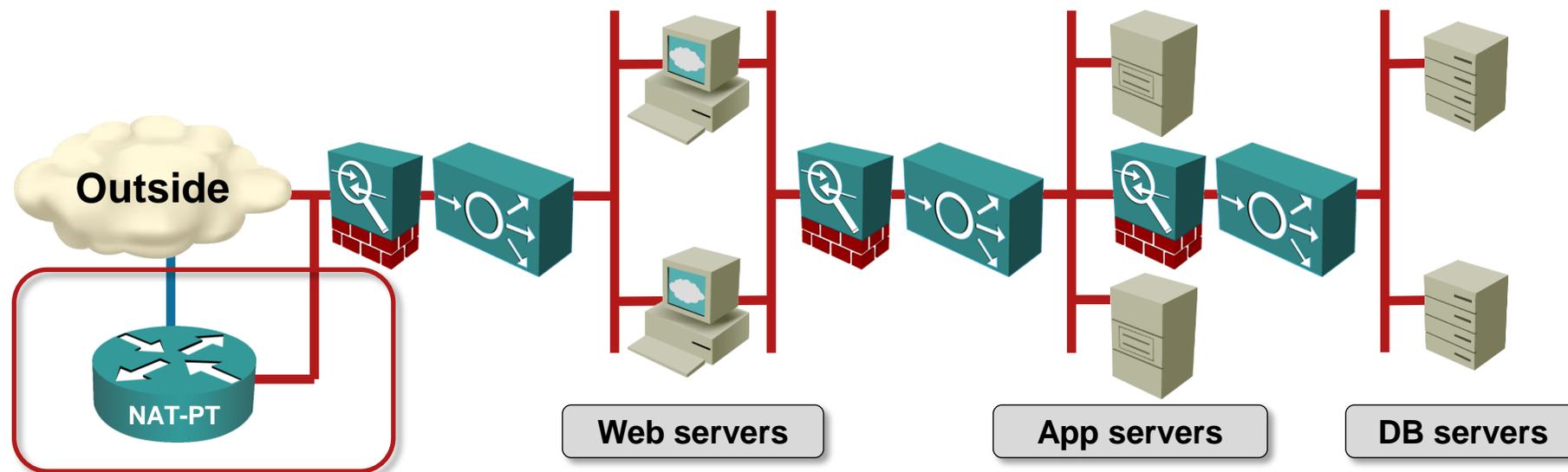- NAT64 breaks IPv4 URL literals
- uPnP and peer-to-peer applications have problems with NAT444

Customers will not tolerate broken content, they will move on to content that works.

T-mobile USA

[1] Source: http://www.vyncke.org/ipv6status/detailed.php?country=us

[2] http://www.cdn-advisor.com/tag/ipv6/

It's in your best interest to make your content available on IPv6

IPv6-Enabling a "Typical" Application Stack

Outside

NAT-PT

Web servers

App servers

DB servers

Typical "reasoning"

- Someone high enough asked us to make content available on IPv6
- We don't know a thing about this new protocol
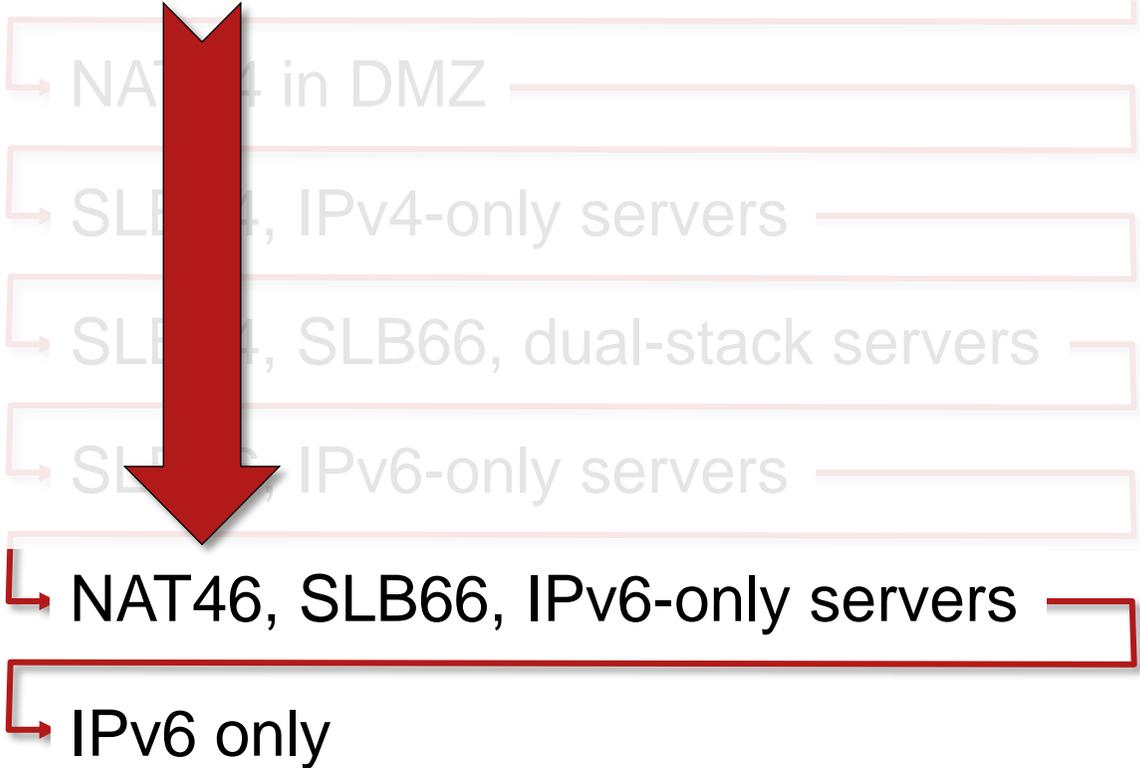- Deploying IPv6 on load balancers or firewalls is too risky

Don't even think about doing this!

Typical Steps

- IPv4 only   Losing control of user experience

- NAT64   Why are we having performance issues?

- SLB64   Darn, we lost client IP addresses

- Dual-stack servers   Ouch, this is complex

- IPv6-only servers with SLB46

- IPv6-only data center with NAT46

- No IPv4   ... in a universe far far away

IPv6-Only Data Centers

Let Me Recap

IPv4 only

NAT64 in DMZ

SLB64, IPv4-only servers

SLB64, SLB66, dual-stack servers

SLB66, IPv6-only servers

NAT46, SLB66, IPv6-only servers

IPv6 only

How many migrations do you want to do in the next 5 years?

　　　　IPv6-Only Data Centers

Skip the Migrations: IPv6-Only Data Center
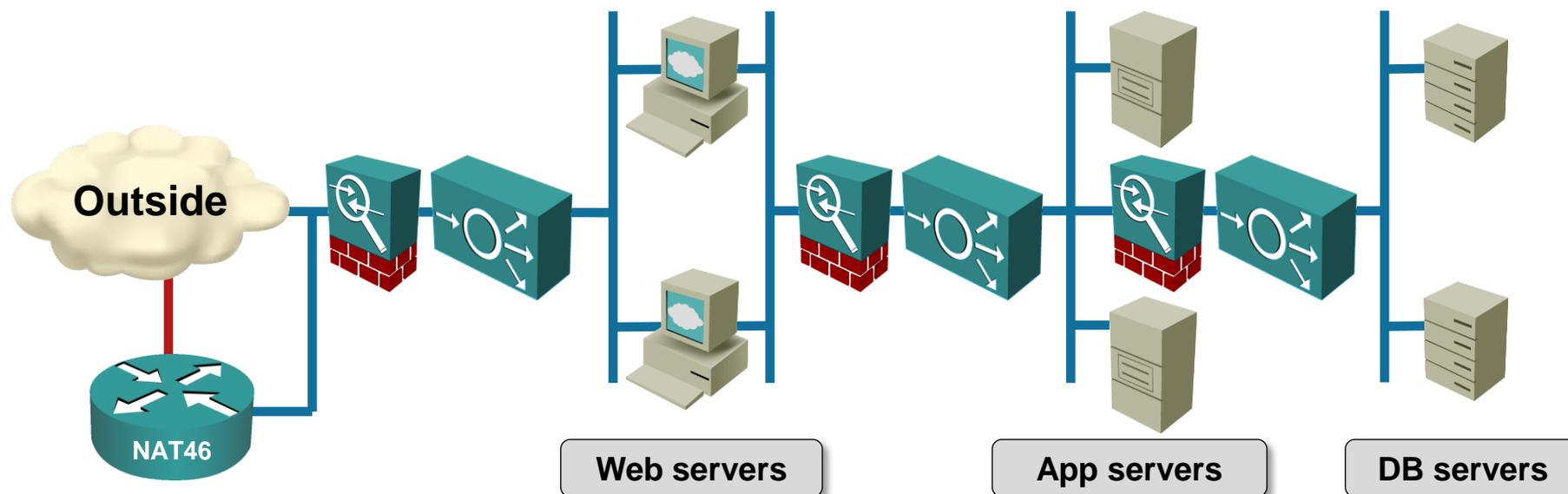
- IPv6-only data center, NAT46 on the edge
- Source IPv4 address mapped into source IPv6 address
- Stateless L3-only translation (easy scaling and redundancy)
- End-to-end visibility is retained, no problems with SSL termination

Can we do it?

Most Applications Are Ready For IPv6

- Some applications will never be IPv6-ready (ex: SNA applications in COBOL)
- Check back-end use of IP addresses
- Make sure you're using DNS names not IP addresses in your code
- Check IPv4 literals in your URLs

Component	IPv6-ready?
Operating system	✓
Web servers	✓
Programming languages	✓
Databases	✓
Clusters	✓
Proxy servers	✓
Caching servers	✓
Load balancers	✓

You're running out of excuses ;)

State of Data Center Infrastructure

Component	Cisco	Juniper	HP	Arista	Brocade	F5
Firewalls	✓	✓	✓			
Load balancers	✓				✓	✓
Core switches	✓	✓	✓	✓	Not on VDX	
ToR switches	✓	✓	✓	✓	✗	

Don't trust me (or the vendors) – do your own performance tests

Big offenders: major virtualization vendors

- Juniper's vGW has full IPv6 support in release 5.5
- Hyper-V 3.0 Network Virtualization has full IPv6 support
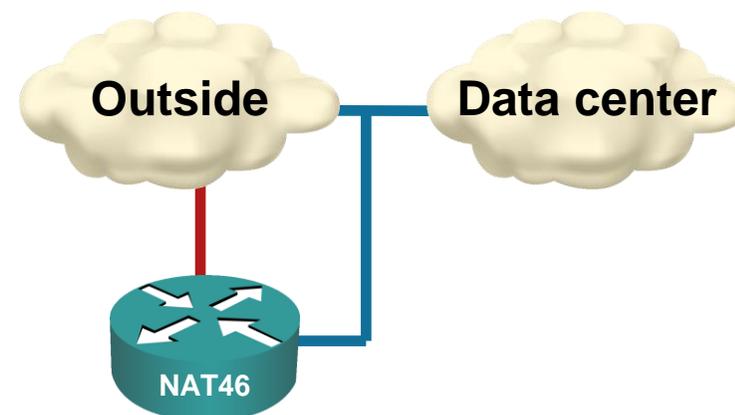- No IPv6 support in VMware's or Cisco's virtual security products

Hint: Microsoft warns against disabling IPv6 on Windows 2008 servers

Do We Have the Magic NAT46 Box?

Short answer: not yet

Implementation options:

- Stateless NAT64 ➜ routing challenges
- SLB46 with custom NAT rules ➜ per-session state
- TAYGA on Linux

Sample IPv6-Only Web Site

← → C ⌂ 🗋 www.fud.no

🗋 Suggested Sites 🩺 Web Slice Gallery

This is Tore Anderson's personal home page (or rather a sorry excuse for one).

I've worked quite a bit with IPv6 in recent years. You can find an archive of all talks/presentations I've done on

My Curriculum Vitae / Resume (Norwegian).

Me in social media:

- Facebook
- Google+
- LinkedIn
- Twitter

You can get in touch with me by sending an e-mail to tore@fud.no, or by calling/texting my mobile at +47 9593

Some rather technical info about your HTTP request follows:

```
Remote addr:  2a02:c0::46:0:5fb0:b30d (translated from IPv4 address 95.176.179.13)
Remote host:  2a02:c0::46:0:5fb0:b30d
Local addr:   2a02:c0:1001:100:216:3eff:feaf:f94f
User-Agent:   Mozilla/5.0 (Windows NT 6.1) AppleWebKit/537.4 (KHTML, like Gecko) Chro
Random ID:    1981243760
```

Questions?

Paperwork issues

- **Follow-up email**

- **Please fill in the evaluation form (waiting in your browser)**

- **Recording available within 24 hours**

- **PDF materials always available for download**

- **Please spread the word!**

Send them to ip@ipSpace.net or @ioshints