

# Skip the Transitions, Jump Straight into IPv6

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NIL Data Communications

Presentation @ 7. Slovenian IPv6 Summit organized by go6.si



**NIL**

Podatkovne komunikacije  
Data Communications

## Who is Ivan Pepelnjak (@ioshints)

- Networking engineer since 1985
- Consultant, blogger ([blog.ioshints.info](http://blog.ioshints.info)), book and webinar author
- Currently teaching “Scalable Web Application Design” at University of Ljubljana

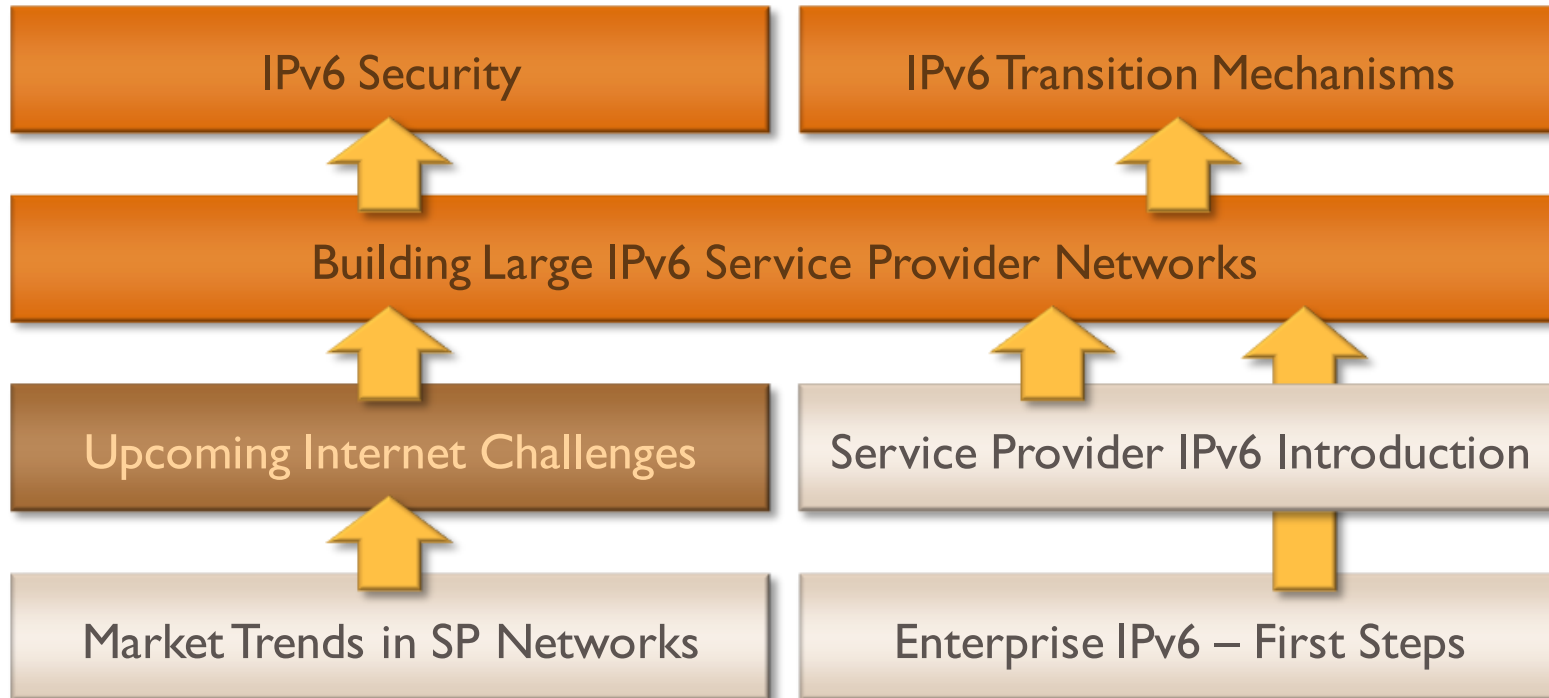


### Focus:

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

# IPv6 Webinars on ipSpace.net

Coming in 2013



## Availability





- Live sessions
- Recordings of individual webinars
- **Yearly subscription**

## Other options

- Customized webinars
- ExpertExpress
- On-site workshops

More information @ <http://www.ipSpace.net/Webinars>

# Past Predictions

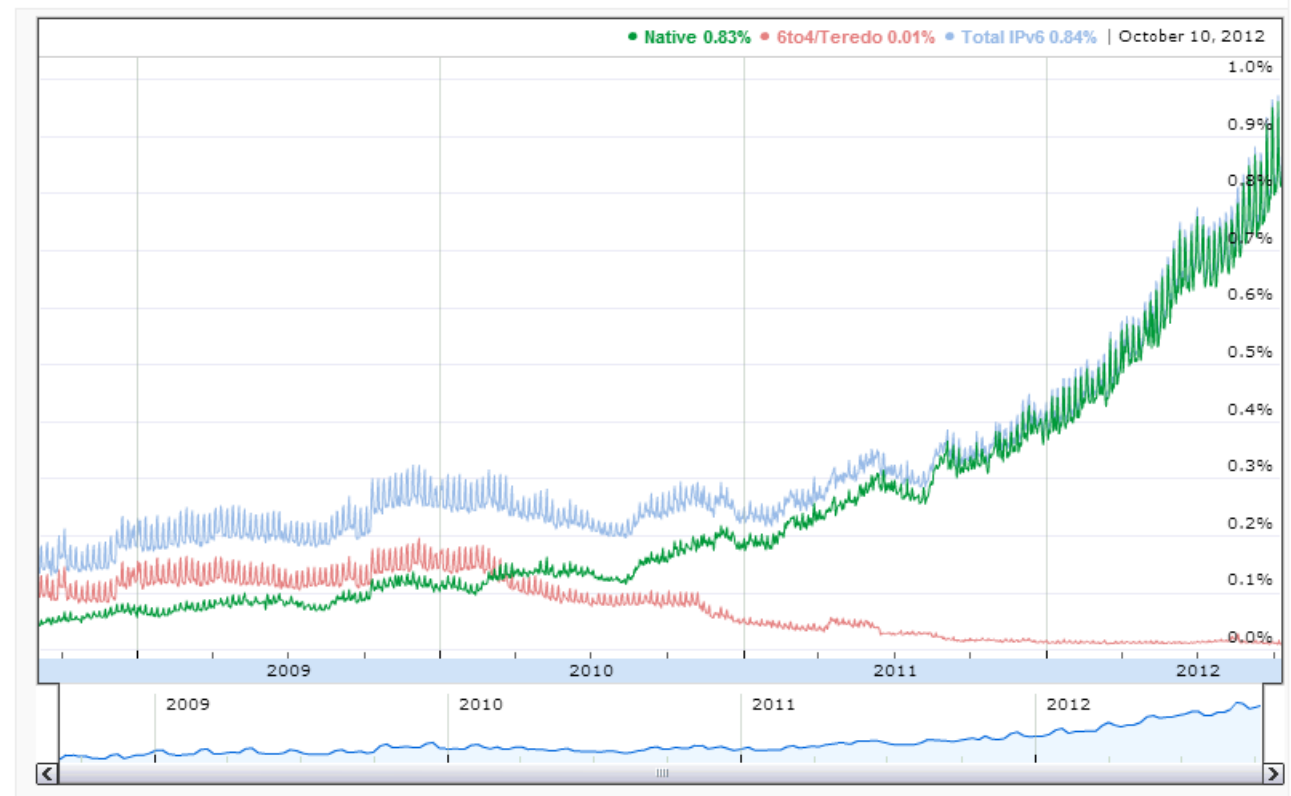
- We'll run out of IPv4 addresses 
- IPv6-only mobile devices 
- Majority of the content will be on IPv6 
- CGN will be expensive and thus avoided and/or neglected 

Special thanks to



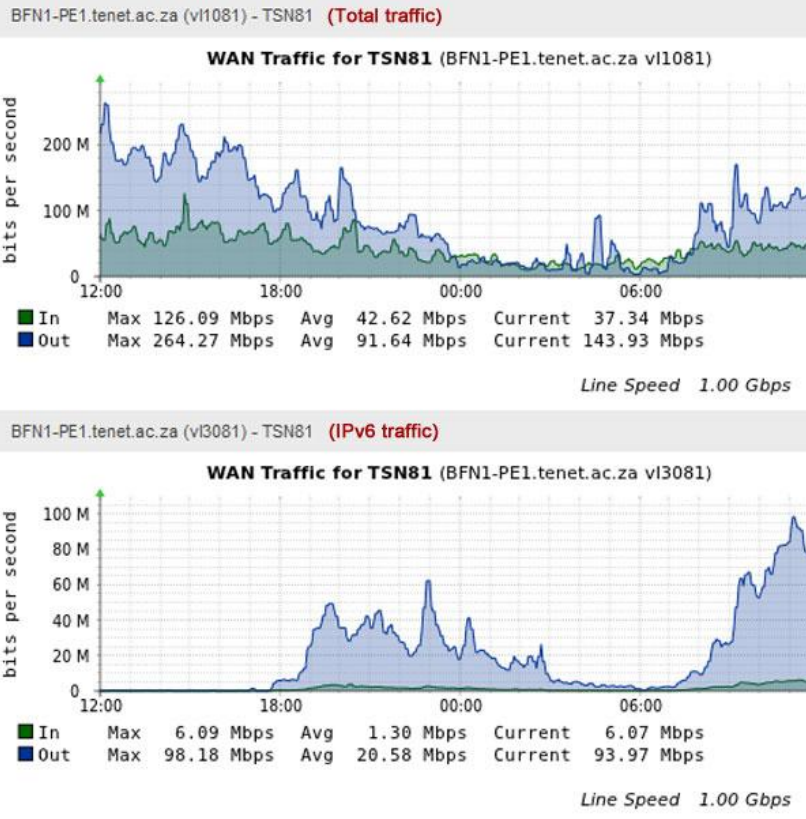
You must take control of your content

# Content/Clients Dichotomy

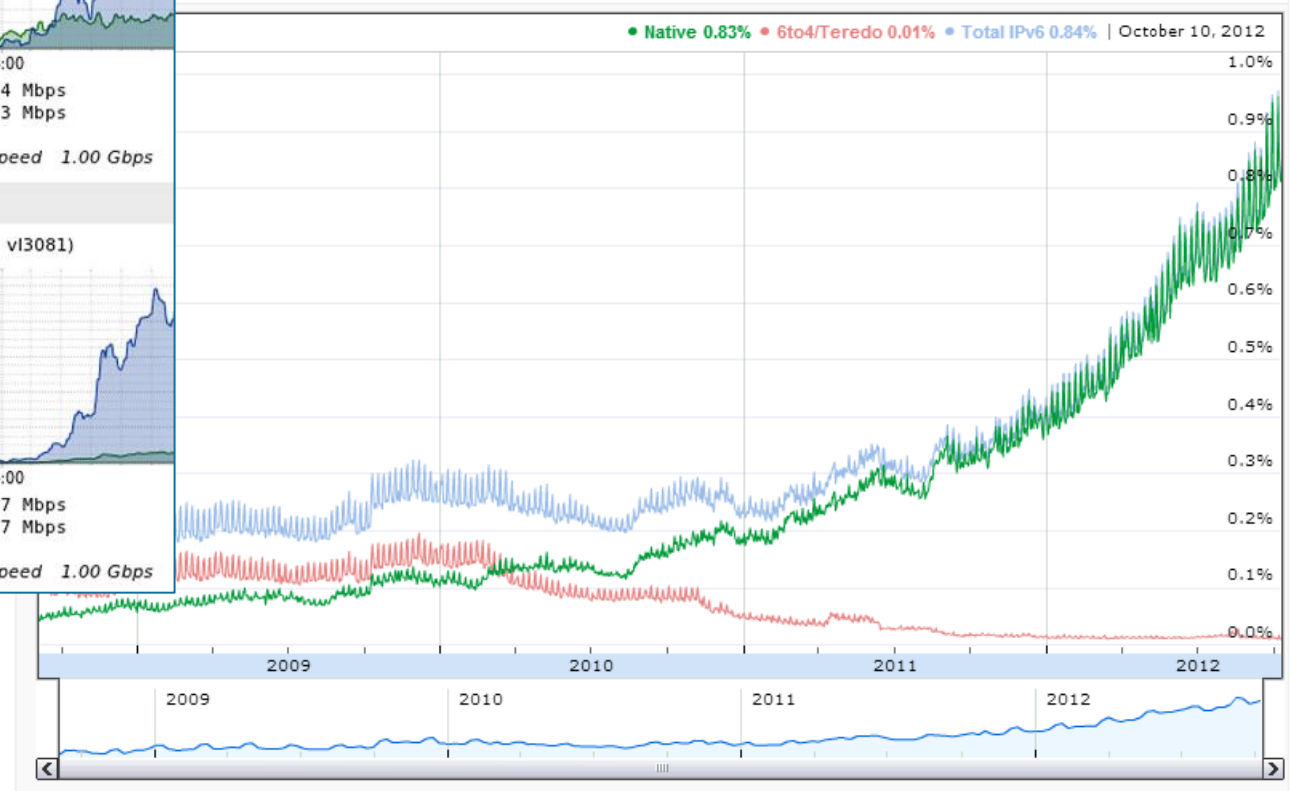


Source: [google.com/ipv6/statistics](http://google.com/ipv6/statistics)

# Content/Clients Dichotomy

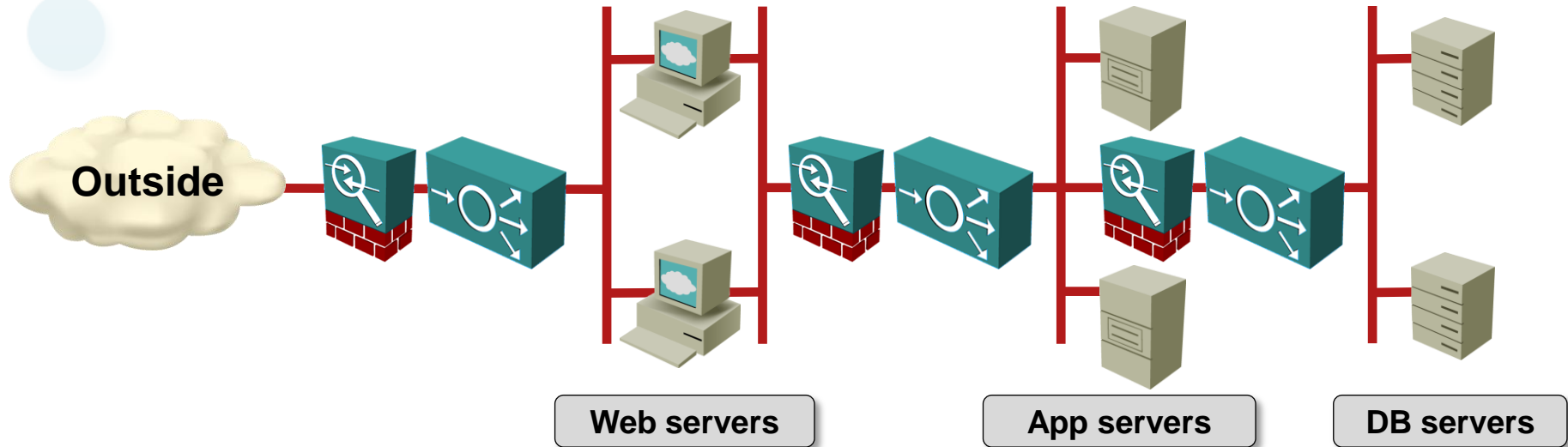


Source: <http://mybroadband.co.za/news/internet/56241-shocking-ipv6-revelation-in-south-africa.html>



Source: [google.com/ipv6/statistics](http://google.com/ipv6/statistics)

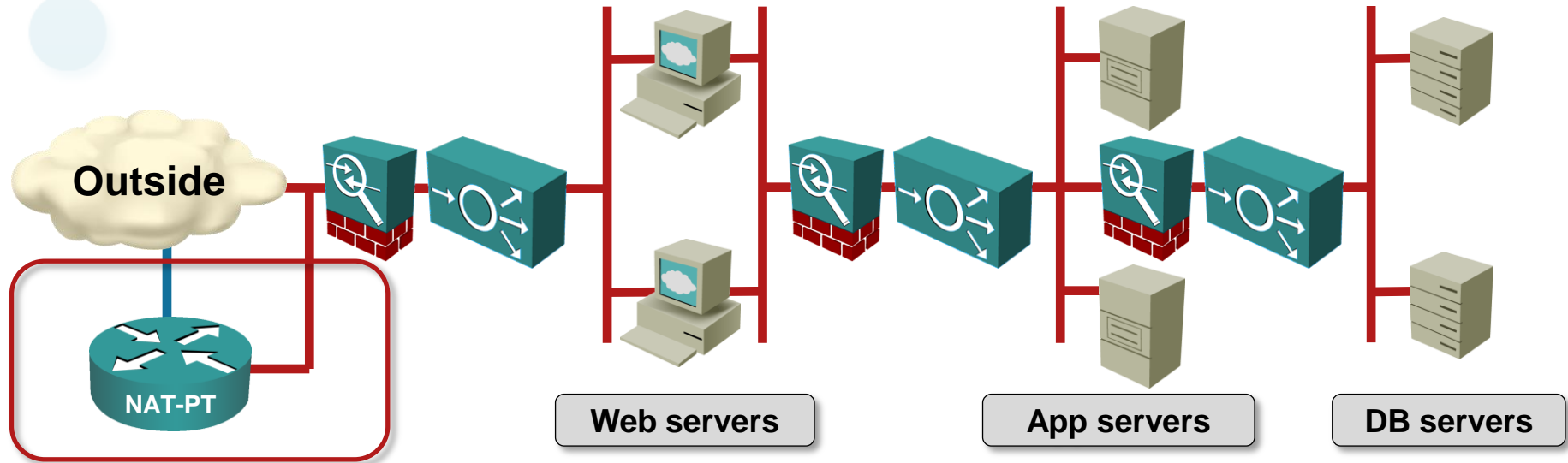
# IPv6-Enabling a “Typical” Application Stack



## 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

# IPv6-Enabling a “Typical” Application Stack



## 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
- Let’s insert a NAT64 or NAT-PT box in the outside network

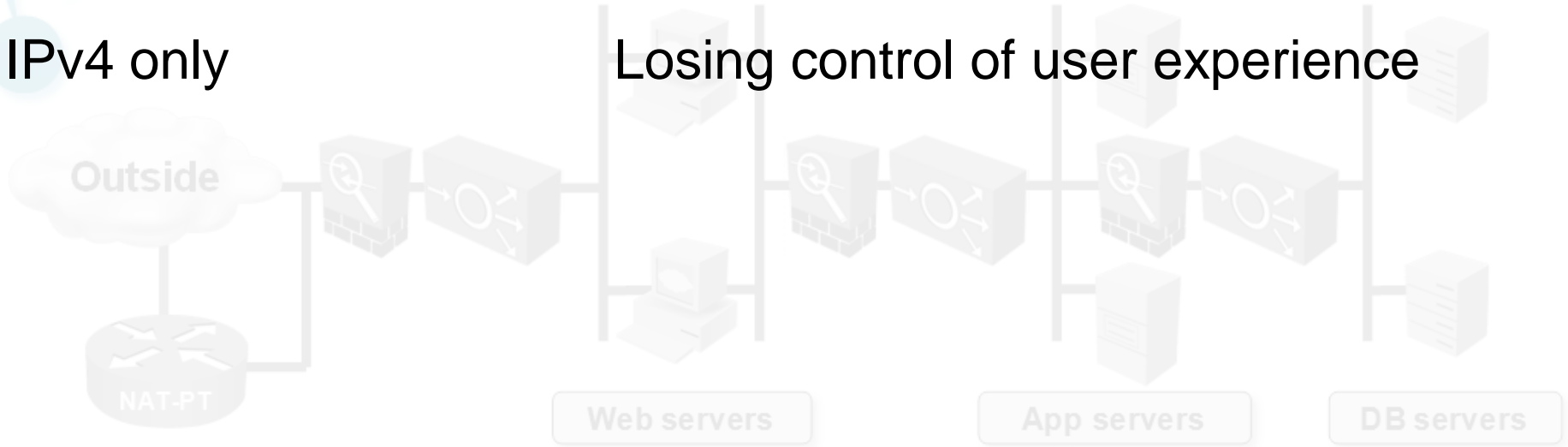
**Don’t even think about doing this!**



# Typical Steps

- IPv4 only

Losing control of user experience

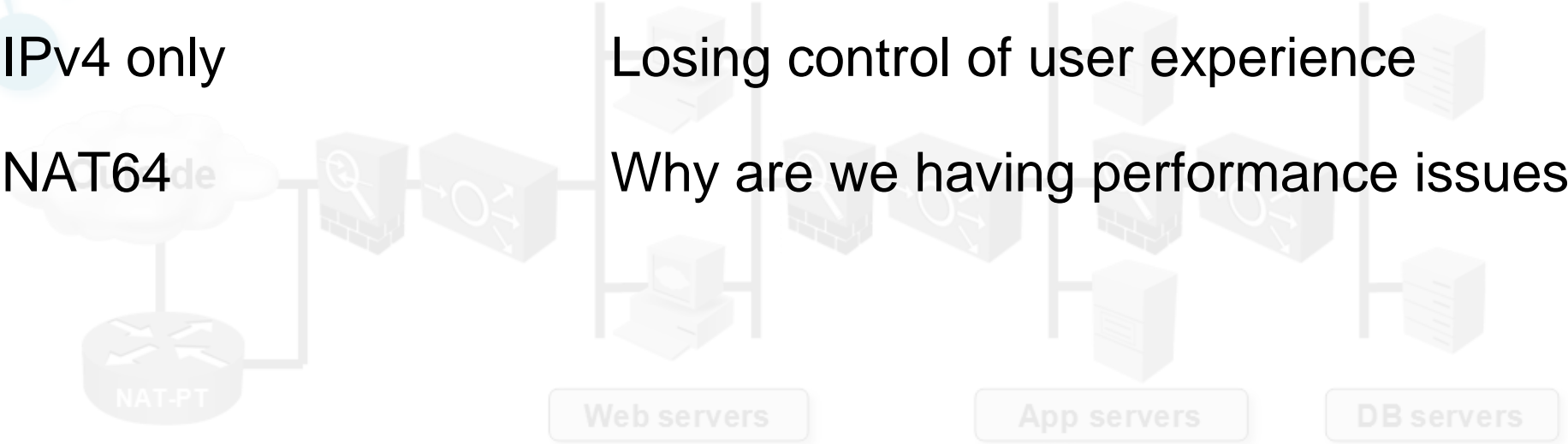


# Typical Steps

- IPv4 only
- NAT64

Losing control of user experience

Why are we having performance issues?



# Typical Steps

- IPv4 only
- NAT64
- SLB64

Losing control of user experience

Why are we having performance issues?

Darn, we lost client IP addresses

Web servers

App servers

DB servers

# Typical Steps

- IPv4 only
- NAT64
- SLB64
- Dual-stack servers

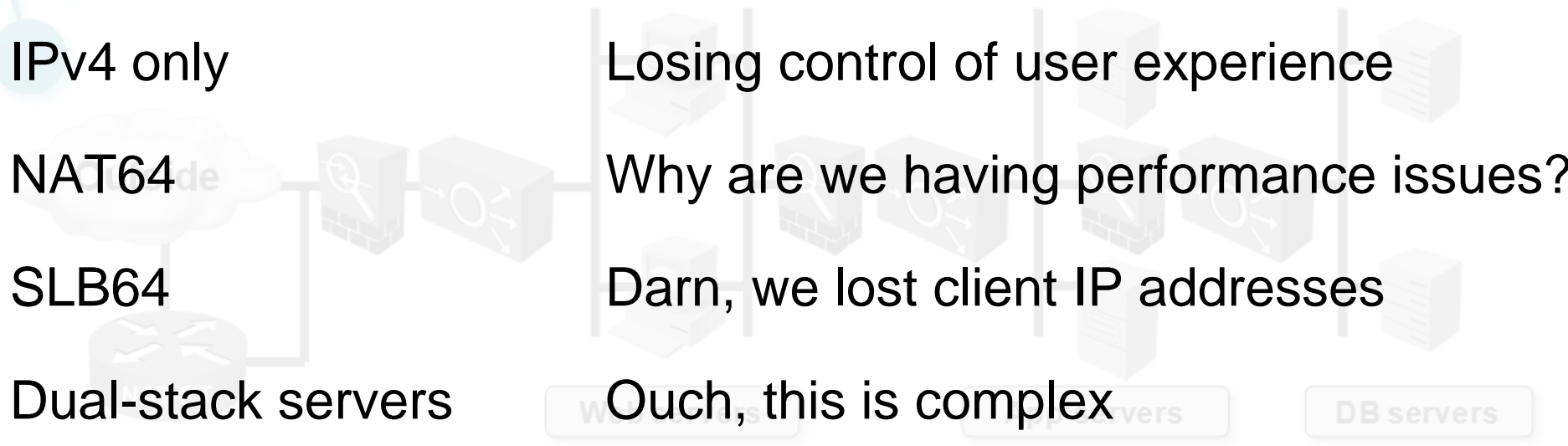
Losing control of user experience

Why are we having performance issues?

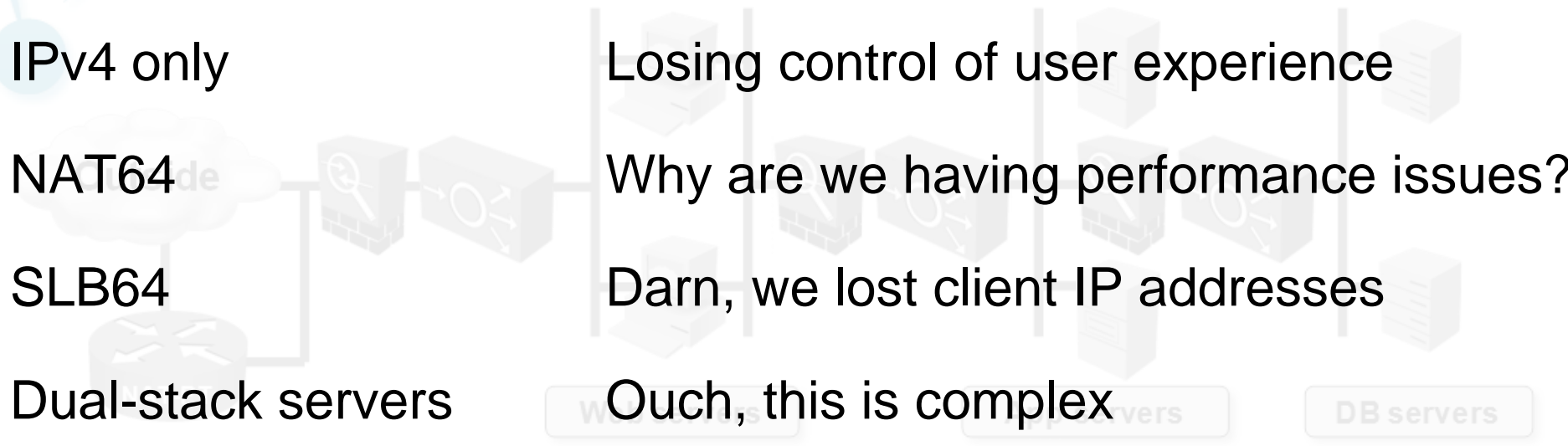
Darn, we lost client IP addresses

Ouch, this is complex

# Typical Steps

- IPv4 only
  - NAT64
  - SLB64
  - Dual-stack servers
  - IPv6-only servers with SLB46
- Losing control of user experience
- Why are we having performance issues?
- Darn, we lost client IP addresses
- Ouch, this is complex
- 
- A network diagram showing a cloud on the left connected to a series of servers. The servers are labeled 'Web servers', 'App servers', and 'DB servers'. The diagram includes various network components like routers and switches, and is overlaid with semi-transparent text boxes containing the text from the list items.

# Typical Steps

- IPv4 only
  - NAT64
  - SLB64
  - Dual-stack servers
  - IPv6-only servers with SLB46
  - IPv6-only data center with NAT46
- Losing control of user experience
- Why are we having performance issues?
- Darn, we lost client IP addresses
- Ouch, this is complex
- 
- A faint background diagram shows a network architecture. On the left, a cloud labeled 'data' is connected to a server rack icon. This rack is linked to a central router icon. To the right of the router are three server racks, each labeled in a rounded box: 'www servers', 'app servers', and 'DB servers'. The diagram is overlaid with semi-transparent text boxes containing the phrases from the list.

# 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

# Let Me Recap

IPv4 only

→ NAT64 in DMZ

→ SLB64, IPv4-only servers

→ SLB44, SLB66, dual-stack servers

→ SLB46, IPv6-only servers

→ NAT46, SLB66, IPv6-only servers

→ IPv6 only

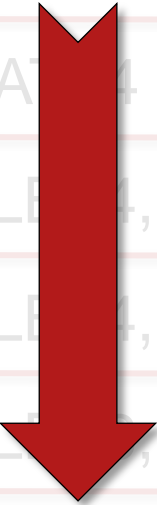
How many migrations do you want to do in the next 5 years?



# Let Me Recap

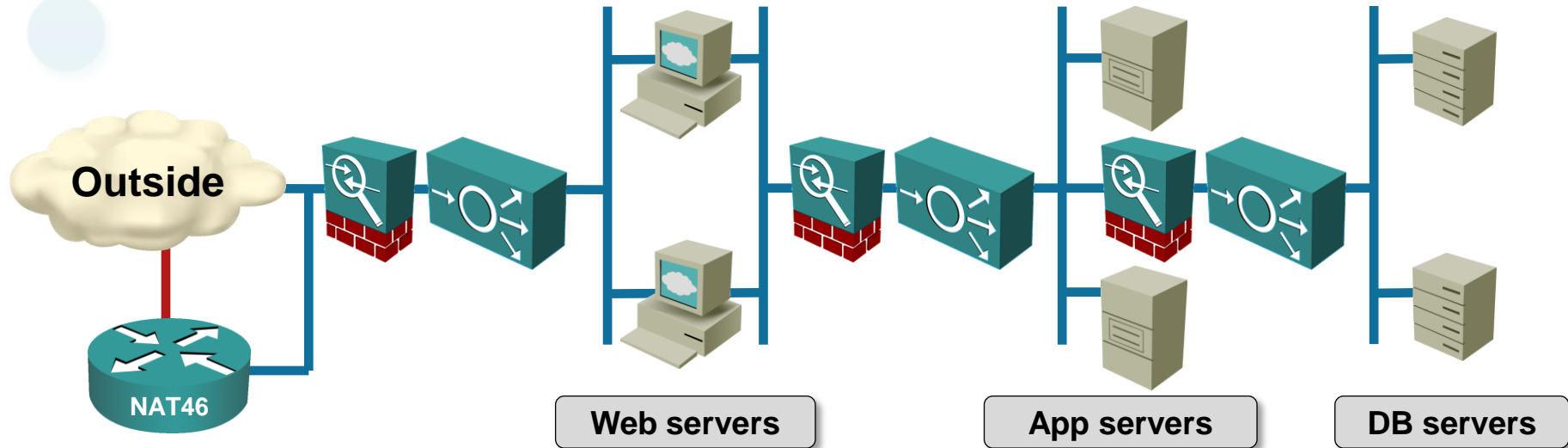
IPv4 only

- NAT44 in DMZ
- SLB44, IPv4-only servers
- SLB44, 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?

# 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?

# IPv6-only Applications

- 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

- No IPv6-enabled virtual firewall (apart from iptables and VM appliances)
- No IPv6 support in VMware vShield or vCloud Director

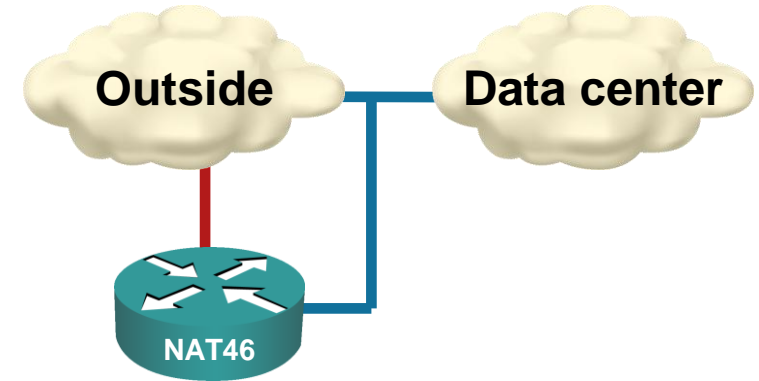
Hint: Microsoft warns against disabling IPv6 on Windows 2008 servers

# 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

← → ↻ ⬆ 📄 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](mailto: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) Chrome
Random ID: 1981243760
```

# Conclusions

- The path to IPv6-only data center is usually long and winding
- Reduce the number of migration steps
- Aim for early deployment of IPv6-only data center
- We're not there yet ... but you'll never be unless you start moving

## Special Thanks to



Tore Anderson, the original author of the IPv6-only DC concept

- [toreanderson.no/talks/](http://toreanderson.no/talks/)
- [ripe64.ripe.net/archives/video/37/](http://ripe64.ripe.net/archives/video/37/)
- [ripe64.ripe.net/presentations/67-20120417-RIPE64-The\\_Case\\_for\\_IPv6\\_Only\\_Data\\_Centres.pdf](http://ripe64.ripe.net/presentations/67-20120417-RIPE64-The_Case_for_IPv6_Only_Data_Centres.pdf)



# Questions?

Send them to [ip@ipspace.net](mailto:ip@ipspace.net) or [@ioshints](https://twitter.com/ioshints)