

# IPv6 @ LinkedIn<sup>®</sup>



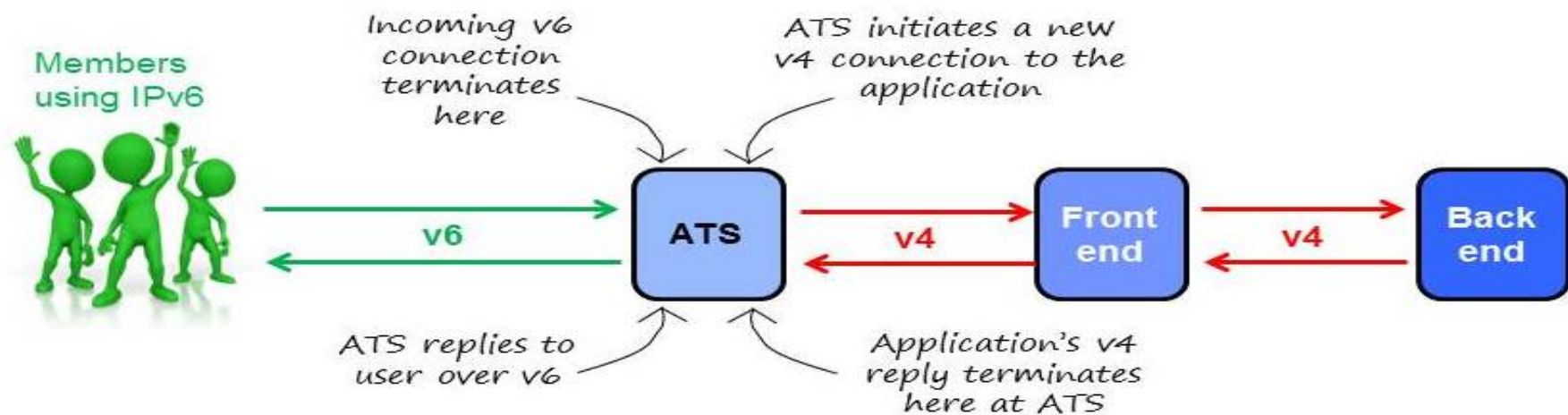
**Navneet Nagori**  
**Network Engineering**

## Why IPv6

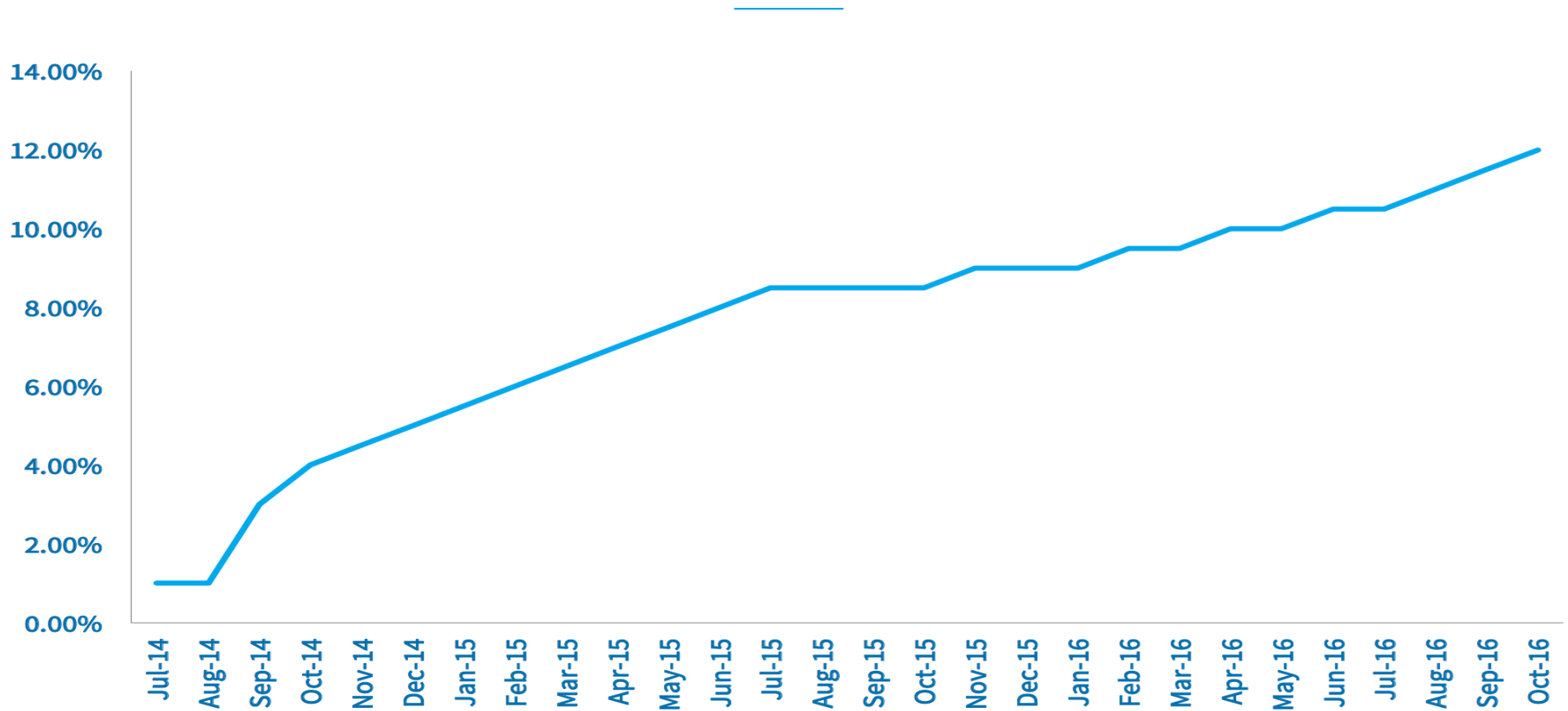
- IPv4 exhaustion
- Cost - Buying address costly , Provider supported NAT, Abuse Identification, Port exhaustion, User share address
- New Devices – IPTV, Mobile Network, home appliance
- New Application – Skype, Bittorent

Data flows between LI and Its members has been **IPv6-enabled since 2014.**

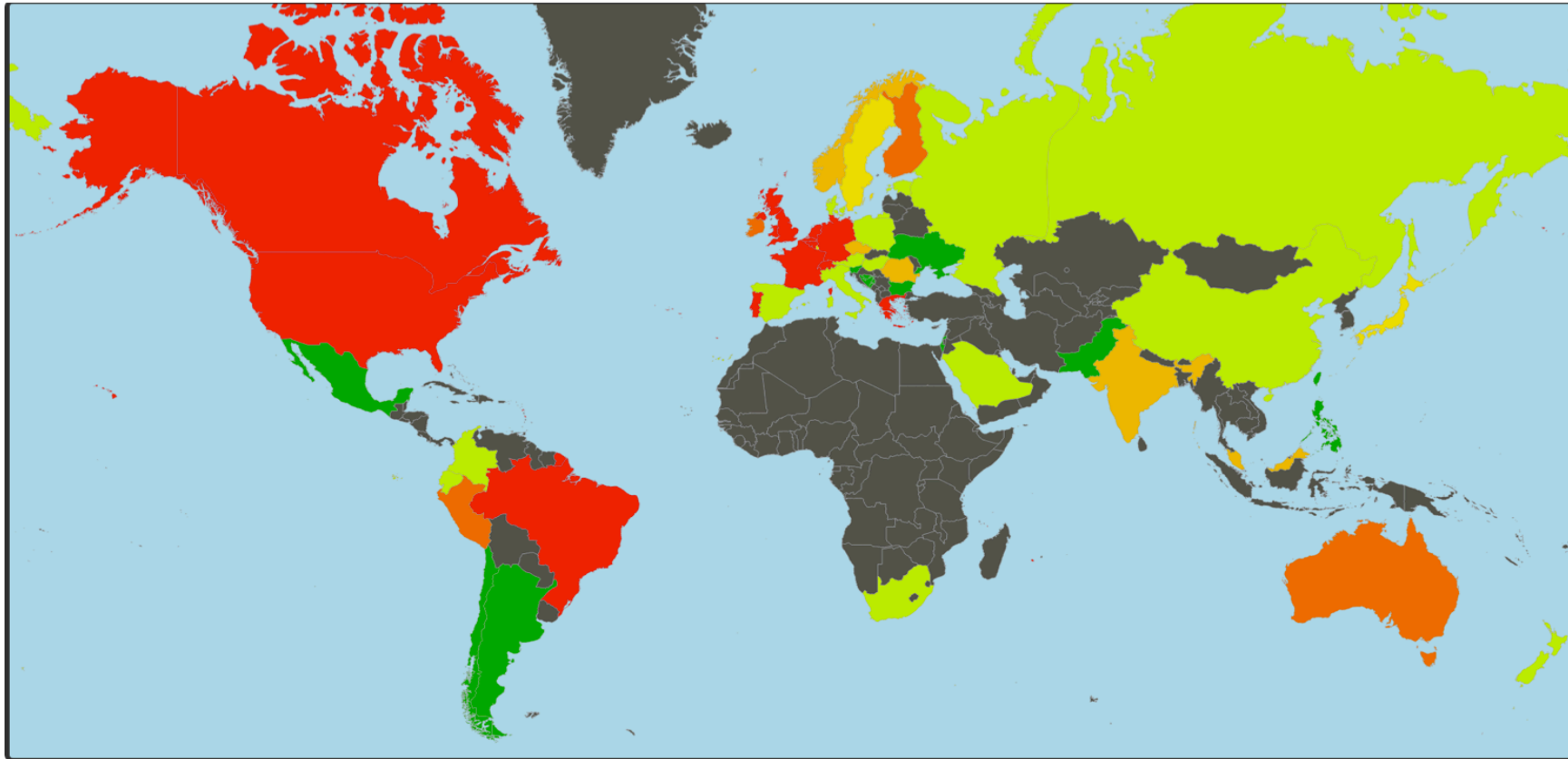
ATS listens on IPv6 and sends the internal request over IPv4, with the IPv6 address in a special field

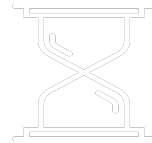


# IPv6 Growth to access LinkedIn (worldwide)



# LinkedIn IPv6 Heat Map



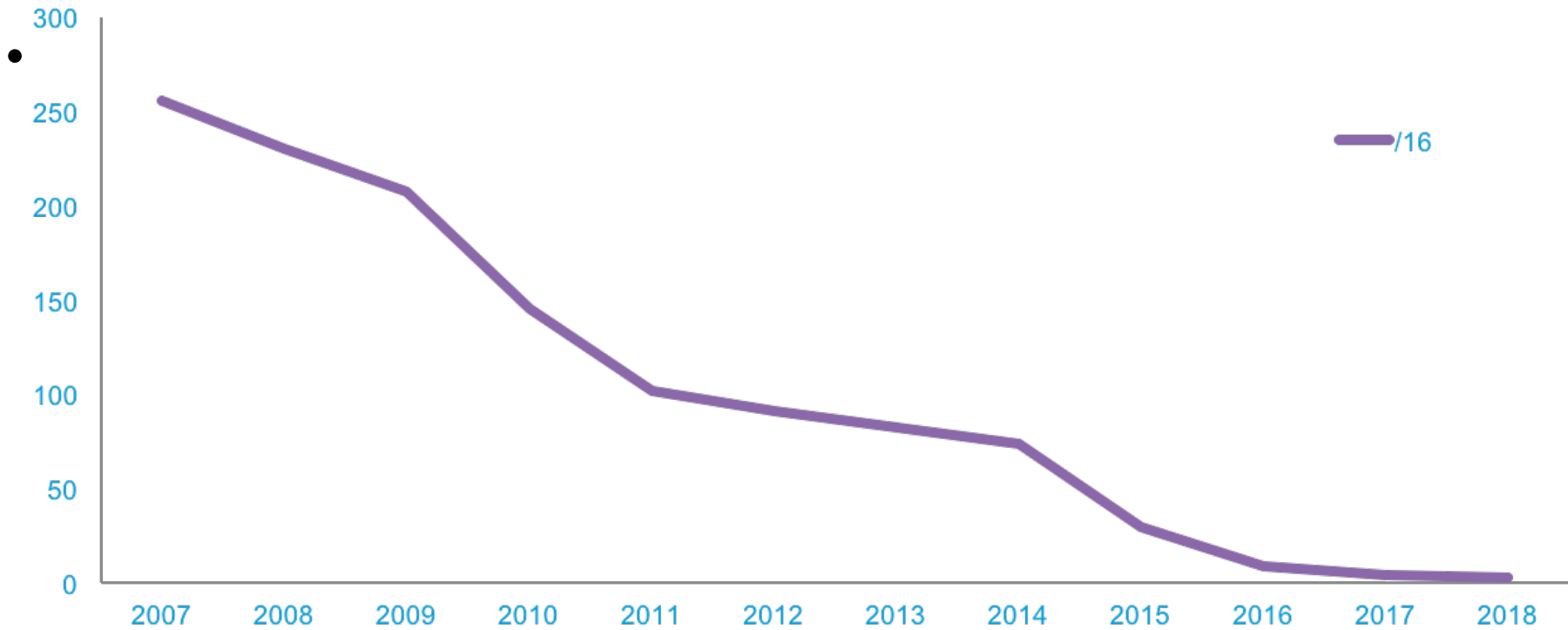


**15% India LinkedIn web traffic on IPv6 and majority increase from mobile users**



**We are going to run out of RFC1918 (Internal) in  
couple of Years**

# RFC1918 /16 exhaustion @ LinkedIn







**2015**

**IPv6-DC-WG established**  
**Build Oregon DC Dual Stack with no AAAA**  
**Lets build next DC with Native IPv6**

# IPv6 in the Data Center: Oregon Dual Stack

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## IPv6 in the DC

- Scale – From dense (x10) to virtual commute (x100)
- Opportunities - New technical solution not constrained by limited address
- End to End connectivity – No NAT between DC or office



## **For traffic to go on IPv6:**

*Client: IPv6 global address → Server: IPv6 global address + DNS AAAA*

# 3 Pillars

## Network

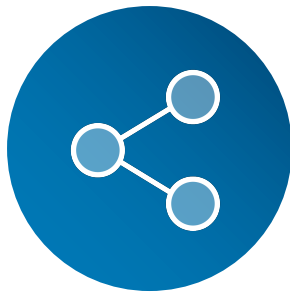
- Static vs Dynamic
- ACL and Security rule
- VIP and Anycast
- Edge Network
- No more NAT

## Hardware

- UEFI network boot over IPv6
- BMC and IPMI over IPv6
- Auto-build

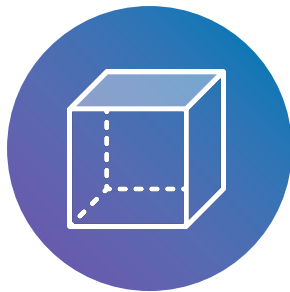
## Software

- Listening over IPv6
- Discovering Services
- Connect Strategy
- Support IPv4 legacy software



## Network

- **Static** – IPv6 address decided at build time
- **Gateway** – FE80::1
- **Tools** – Convert IPv4 configuration to IPv6 automatically
- **Mapping** – IPv6 can be deduced from IPv4 for dual stack machines but without technical debt – Each IPv4 network has a paired IPv6 network



## Hardware

- **UEFI** – Supports IPv6 boot (SLAAC vs DHCPv6, TFTP vs HTTP)
- **Grub** – IPv6 support is weak
- **BMC/IPMI** – Redfish standard but IPMI tools are lagging
- **Firmware**– Always dangerous to flash at scale



## Software

- **Listener** – Listens on IPv4 and IPv6 – every language is special
- **Connect strategy** – hardfail, fallback, Happy Eyeballs
- **Java** – control in java settings
- **Deploy** – and redeploy till right
- **IPv6 ready** – “should work” or limited support – Test, don’t believe.





## Lesson Learned

- **Addressing** – Aligned it to silicon limitation  
build consensus across the team ?
- **Testing** – In-depth of Hardware/Software feature and interoperability. TCAM Carving ,Max Prefix Support
- **Administration** - Ensure that TACACS, NTP, Syslog, SNMP and sFlow
- **Tooling** - Support for building ACL , Virtual IP ,Configuration Management (Zero Touch Provisioning, templating)
- **Security** - Build robust IPv6 security plan, perimeter security, DDoS, Internal zones.
- **Peering** – Talk to your peers on Max prefix limit, Bogon list is reliable?

# Key Takeaways

## Where are we ?



- Staging environment entirely on Dual stack with A and AAAA record
- Retrofitting production environment
- Working on building IPv6 only Servers
- All offices are IPv6 enabled

# IPv6 Takeaways



- Know all the unknowns very early
- Engage vendors straight away
- Engage Top level Management
- Need software engineer more then Network engineer
- Build AAAA team

# Thank You

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