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ENERGY SCIENCES NETWORK

Benefits of IPv6 For Software Development

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Overview

- ESnet and R&E Networks
- How v6 Can Help You
- Traps and Pitfalls
- Tips and Tricks
- Conclusions
- Q&A

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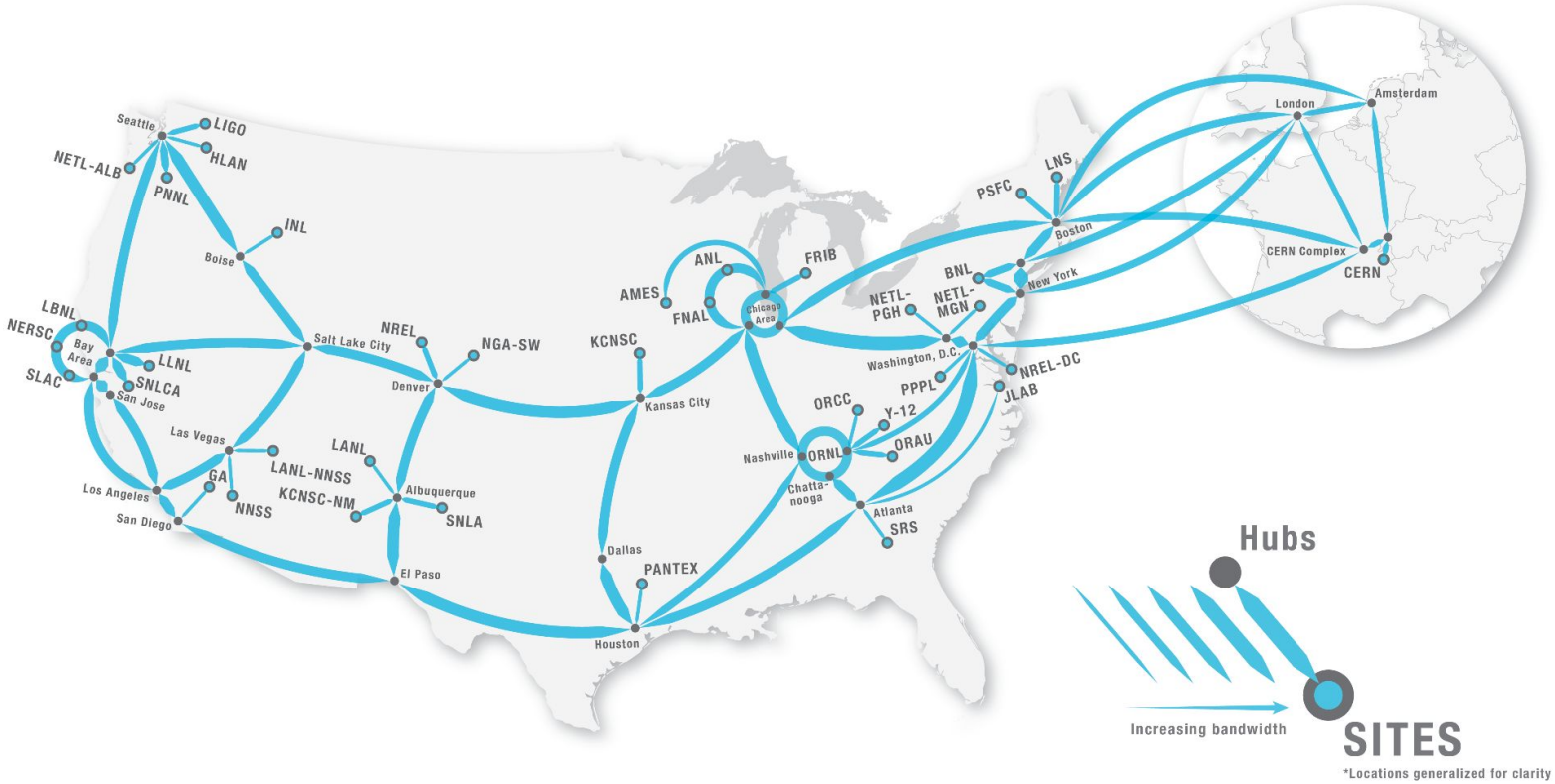
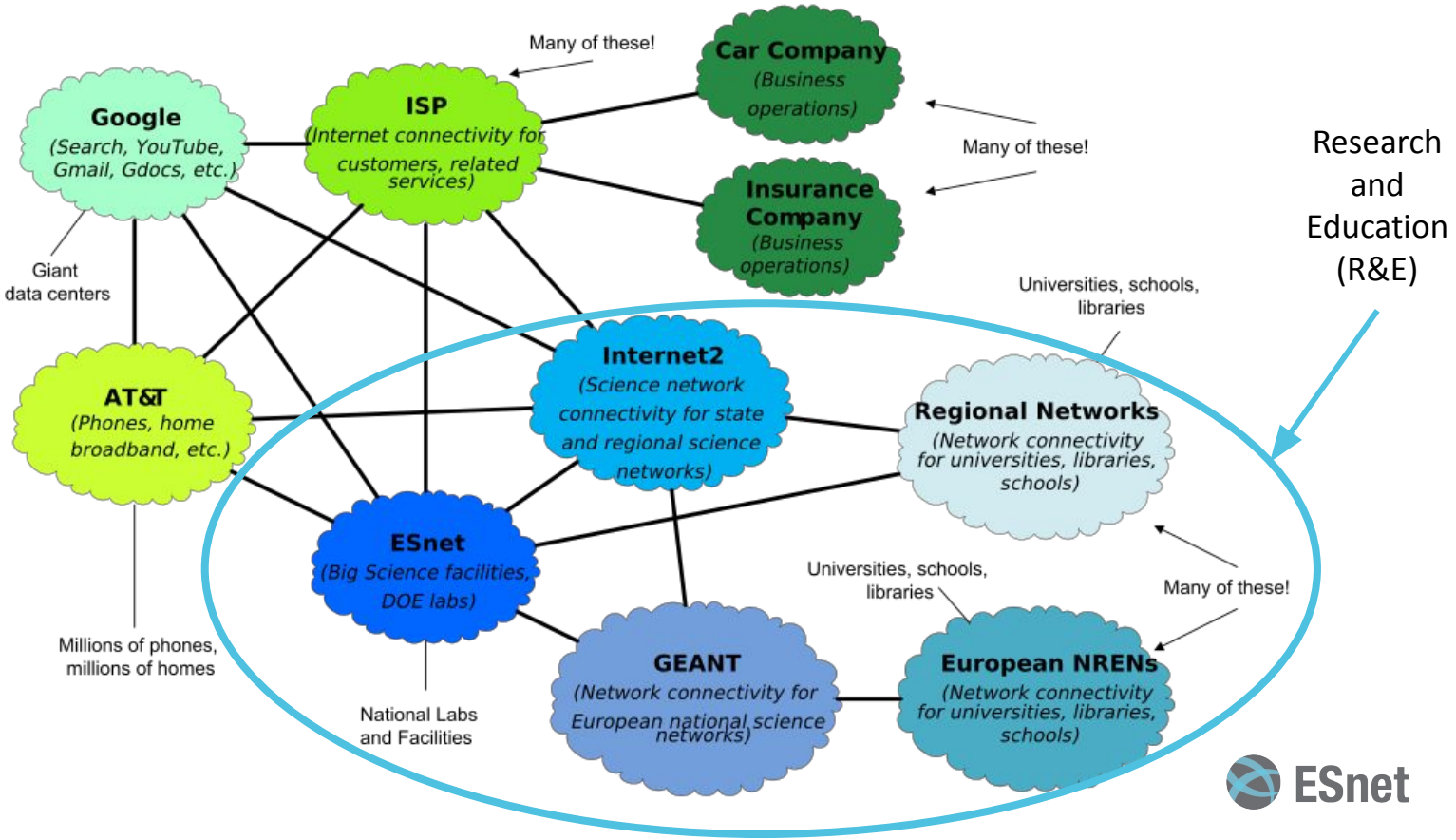
What is ESnet?



What is an R&E Network?



R&E vs. Commercial ISPs:

Normal ISP:[1]

ESnet:[2]

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How v6 Can Help You

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Ease of Development and Management

- No NAT to worry about!
- NAT traversal is ***complicated***[3]
- End-to-End Connectivity reduces complexity
- Lower latency[4] means better customer satisfaction!
- IP addresses in logs aren't masked by NAT

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Cost Savings

- CSPs are starting to charge for IPv4[5]
- End-to-End makes troubleshooting easier
- You get to change on your own timeline

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Aligning with Rules and Regulations

- Apple now requires IPv6 only support![6]
- Working with the US Federal government? Better run v6!
- Many governing bodies have started making v6 a requirement

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Excuse for Fixing Tech Debt

- Now you can get rid of hardcoded IPs!
- A great chance to update your stale libraries!
- Fix that bad parsing engine!
- Move your DB schemas towards proper IP storage
- Fix misuse of sockets to support multiple IP layers (`AI_UNSPEC`)

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Traps and Pitfalls

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Development Environments

- Docker ***still*** has some issues.
- Kubernetes 3rd party applications seem to lag in v6 (core is fine)
- Many enterprise IT solutions still muck with v6
- Delay in infrastructure teams rolling out v6 to datacenters
- Github

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Impact of v6 Deployment Methods

- Source Address Selection can be tricky (ULA, ***cough***)
- IPv6 Only, IPv6 Mostly, Dual Stack, CLAT, XLAT… All behave differently
- Dealing with multiple IPs per device is a paradigm shift for some.
- Ships in the night—Potentially different datapaths!

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There Be Dragons

- IPv4 can be easily enumerated…IPv6, not so much!
- Hardcoding addresses will bite you.
- Don’t assume a single AF (until we disable v4!)
- Give both AFs equal attention!

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Tips and Tricks

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Tips

- Your inputs and validations must support both AFs!
- Displaying addresses might take up a bit more room now.
- Make sure your tests (you have those, right?) cover v6.
- When monitoring your application health, monitor both paths.
- Make sure your logging output contains the right information.
- IPv6 is BIG. Use it!

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Horley Math

"At a run rate of 10 million containers per second, a standard /48 that you would allocate to a data center for docker hosts it would take you 3.8 billion years to consume all the IPv6."

–

Ed Horley[7]

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Testing for IPv6

- Make sure you test in all v6 deployment scenarios!
- Coming Soon: Portable IPv6 Test Pods![8]
- Make sure security tools are looking at v6 too.

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Conclusions

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Conclusions

- Write your software for the future (it's here!)
- Why buy two protocols when you can have one for half the price!
- Translation mechanisms are mature—Ask IT to turn off v4!
- Be careful—But don't be scared
- Use v6 on your terms—Don't wait until you're forced to!

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Questions?

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References

- [1] Title: “High Five”, Author: austrini, Source: WikiMedia Commons, License: CC BY 2.0
- [2] Title: “Shinkansen N700 with Mount Fuji”, Author: tansaisuketti, Source: WikiMedia Commons, License: CC BY-SA 3.0
- [3] https://tailscale.com/blog/how-nat-traversal-works/
- [4] Scott Hogg on Infoblox Blog

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References

- [5] AWS Charging for IPv4
- [6] https://developer.apple.com/support/ipv6/
- [7] IPv6 and Docker — Ed Horley
- [8] ARIN IPv6 Test Pod Grant

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