Why Your Network Should Go IPv6-Only

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Overview

- Early planning for IPv6 adoption
- Dual stack complexity and cost
- The argument for IPv6-only
- IPv6-only challenges
- How you can help IPv6 adoption by promoting IPv6-only

The Best Laid Plans

- Early planning for IPv6 adoption assumed
  - Gradual deployment
  - Deployment complete before IPv4 exhaustion
  - Operational experience would increase over a series of years
- Dual stack was the ideal method for IPv6 deployment…in 2001

2012 – The Reality

- IPv4 addresses depleted or nearly depleted
- Immature IPv6 ecosystem (think CPE routers)
- Limited operational experience with IPv6
- Doubled down on NAT to extend IPv4's lifetime

Dual Stack

Advantages

- Access IPv4 and IPv6 content without mechanisms for inter-operability
- Allows operators to gather experience with IPv6

Disadvantages

- Does not solve IPv4 address exhaustion
- Increased complexity and cost
- Unexpected interaction between protocols

Complexity of Dual Stack

- Double efforts
  - Configuration – ACLs, routing policy, QoS
  - Training
  - Management of two routing protocols (unless you use IS-IS)
- Troubleshooting challenges
  - Unforeseen interactions between IPv4/IPv6
  - Protocol selection pushed to application layer (e.g., Happy Eyeballs)

Costs of Dual Stack

- Staffing – workload increases, so do your costs
- Network components- control cards in wireless packet core, firewalls, service cards
- Software licensing

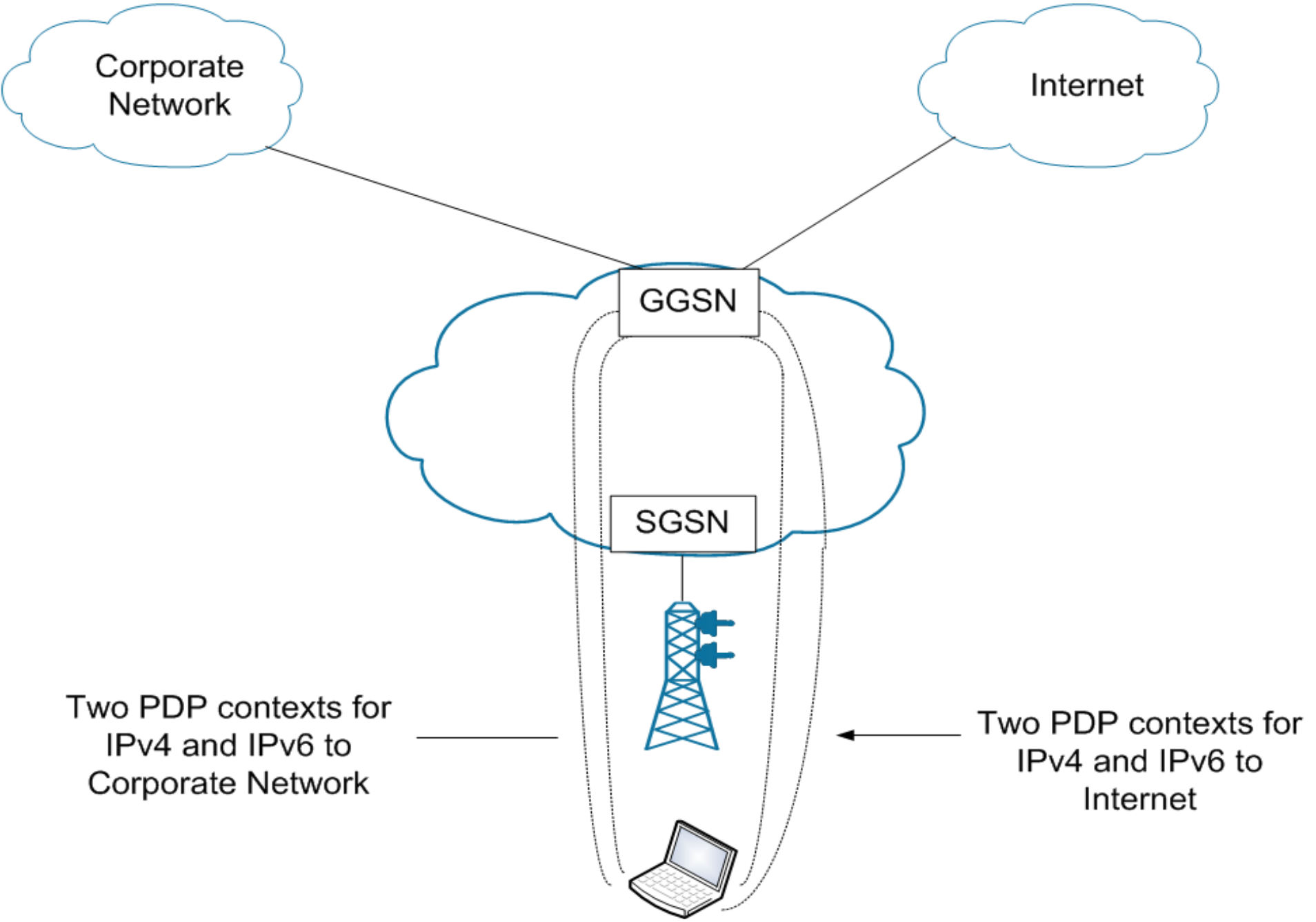
Example of Increased Cost for DS - 3GPP Licensing

- Packet Data Protocol (PDP) context—known as Evolved Packet System (EPS) bearer in LTE—contains information about the mobile session
- PDP contexts/EPS bearer types
  - Pre-Release 8 – IPv4, IPv6 for GPRS
  - Release 8 – IPv4, IPv6, IPv4v6 for EPS/LTE
  - Release 9 – IPv4v6* for GPRS

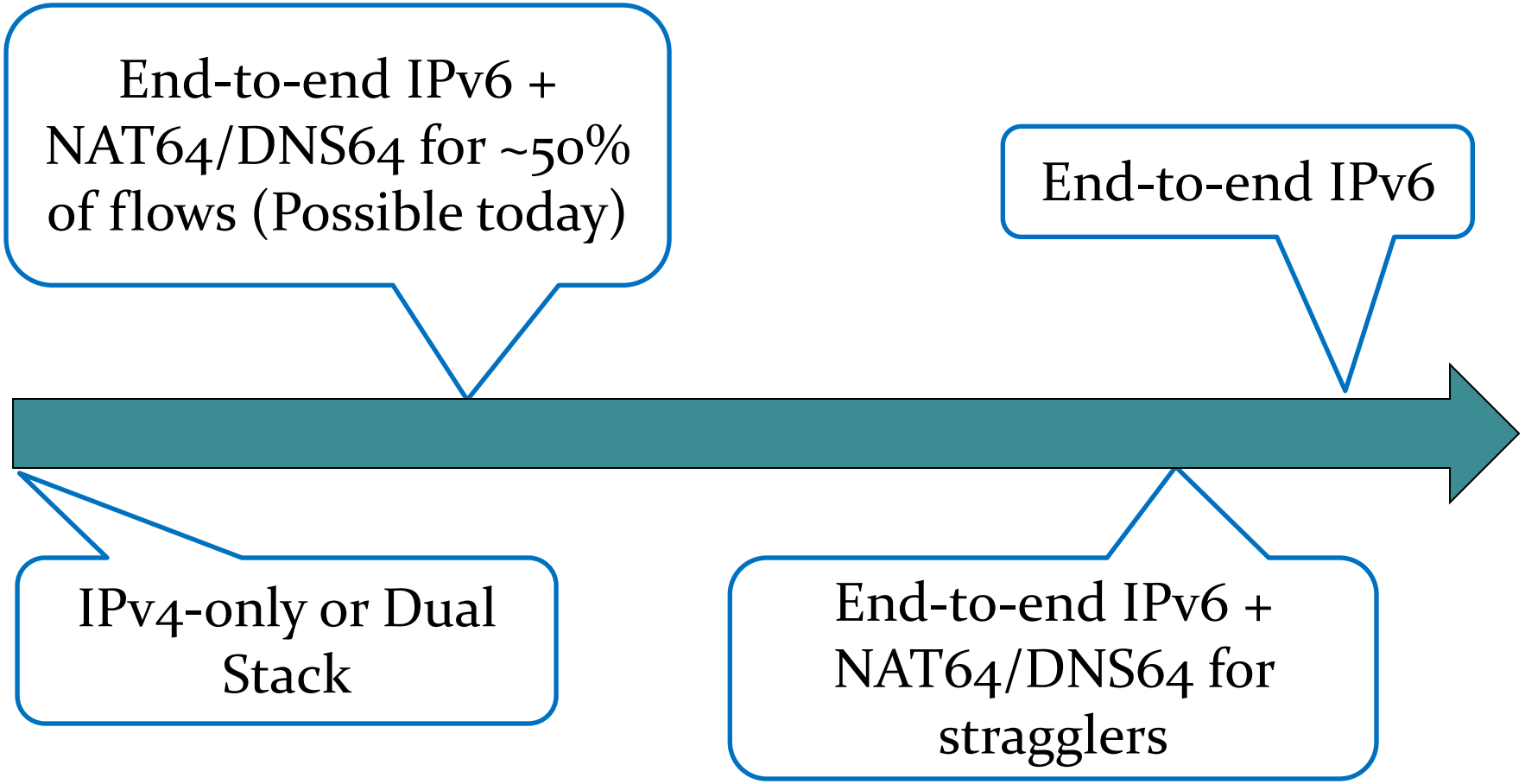
* Not widely deployed

Costs to the Operator Increase

- Mobile network operators pay licensing fees based on the number of activated PDP contexts or PDN connections
- Dual stack increases number of PDP contexts, thus increasing costs


Corporate Network
Internet
GGSN
SGSN
Two PDP contexts for IPv4 and IPv6 to Corporate Network
Two PDP contexts for IPv4 and IPv6 to Internet

Working Backwards from End State



Why IPv6-Only?

- Going IPv6-only puts you closer to the Internet's planned future state
- Avoids additional IPv4 address consumption and business risk of being tied to IPv4 address availability
- Avoids expensive intermediate steps, especially in the data center

More Benefits of IPv6-Only

- Illuminates IPv6 bugs and feature gaps otherwise hidden by dual stack
- Allows you to address these issues prior to widespread deployment
- Drives down the cost of NAT as IPv6 content increases
- Enables growth of cloud, M2M, mobile

IPv6-Only Challenges

- No ideal method for IPv4-IPv6 translation
- IPv4 literals passed in application data or binding directly to IPv4 addresses breaks any translation
- Problematic apps – VoIP apps and gaming

Corner cases should not delay the progress of IPv6-only. We can't wait for an ideal solution.

How You Can Help IPv6 Adoption by Promoting IPv6-Only

- Gather production IPv6-only experience and share with the community
- Drive the OS and application developers to fix bugs and add needed features
- Ensure your services work for IPv6-only hosts

Conclusion

- Dual stack is not the answer
- IPv6-only is our target end-state
- Deploying IPv6 end systems has technology, risk avoidance, and cost benefits

Challenge: Deploy IPv6-only end systems in at least a segment of your network

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