

Migration Strategies from IPv4-only to IPv6-only

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About Me

- Long term Unix, TCP/IP, Internet, architecture, operations, major cleanup guy
- Got serious with IPv6 in 2003
- Wrote a book about it in 2006
- Co-authored a study on secure IPv6 deployment for the German Federal Office for IT Security (BSI) in 2010
- Became a RIPE IPv6 WG (co-)chair in 2014
- Currently introducing IPv6 to the Deutsche Bahn (German Railroad) ICE fleet

How to do “IPv6-only”

- Understand your goals
- Understand your options
- Define your initial target architecture
- Then define your transition path
 - ... which is where the real work hides
 - Many small steps get you a long way
 - Keep updating your target architecture and transition path along the way
- **At all times, minimize the amount of dual-stacking**
 - To minimize the additional operational workload
 - To avoid carrying legacy designs into the IPv6 era

How: Target Architectures I/III

- Fundamental strategies
 - Eliminate IPv4
 - Minimize IPv4
 - Isolate IPv4
 - Put a price to IPv4
 - Expire IPv4 over time

How: Target Architectures II/III

- Router-only networks
 - Disable IPv4 wherever/whenever possible
 - Separate IPv4 from IPv6 where pragmatically feasible
- Server networks
 - Consider separate subnets for IPv4 and IPv6
 - Consider using VLAN trunks to servers

How: Target Architectures III/III

- Client networks
 - This is where large scale dual-stacking really hurts
 - Separate subnets for IPv4 and IPv6 don't work with single-NIC hardware
 - Multiple VLANs on a single NIC are often not an option
 - Consider (ab-)using (already installed?) VPN software for IPv4 as a service
 - Consider providing dual-stacking only on a strictly as-needed basis
 - Deploy IPv6/discontinue IPv4 in many small increments
- Applications and services
 - Upgrading applications
 - Replacing applications
 - Providing applications through terminal services
 - Continue to use IPv4 if nothing else works

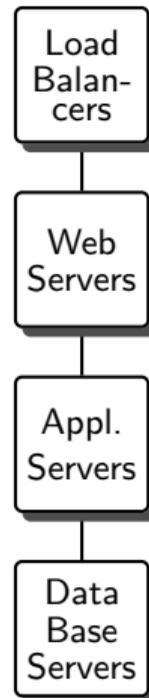
How: Migration Paths

- Prepare the basis
 - Prepare your people and organization
 - DNS
 - Firewalls/security infrastructure
 - Monitoring
 - Networks for these
- Iterate through your applications/services
 - Focus on individual applications/services
 - Pick easy, small subsystems to migrate
 - Build hand-on experience with functionally different subsystems
 - Use a backlog of temporary dual-stack setups to eliminate ASAP
- Iterate through your clients
 - Find and migrate the easy targets first
 - Use the “cheapest” workarounds possible

How: A Server Side Application Example

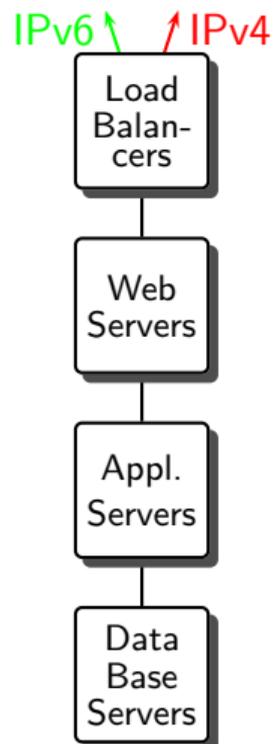
How: A Server Side Application Example

1. Identify the application components



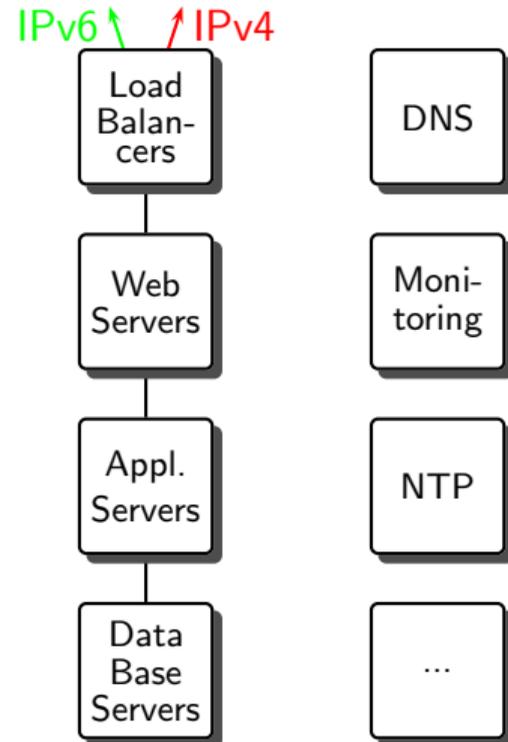
How: A Server Side Application Example

1. Identify the application components
2. Pick **one** place to do the dual stacking, if needed



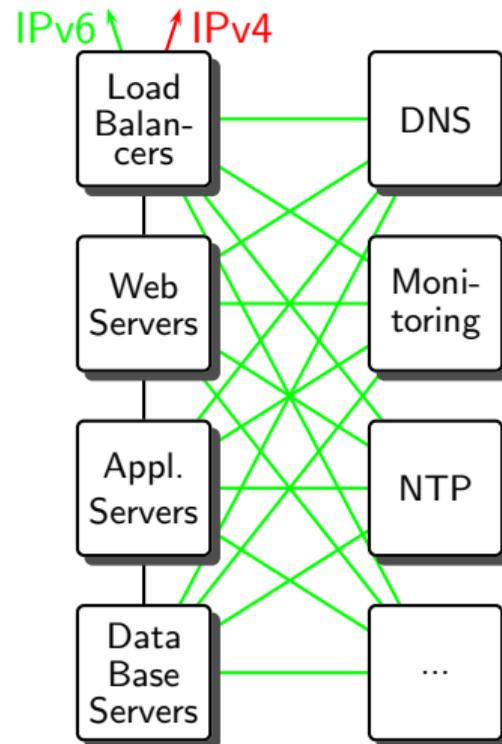
How: A Server Side Application Example

1. Identify the application components
2. Pick **one** place to do the dual stacking, if needed
3. Identify the used infrastructure



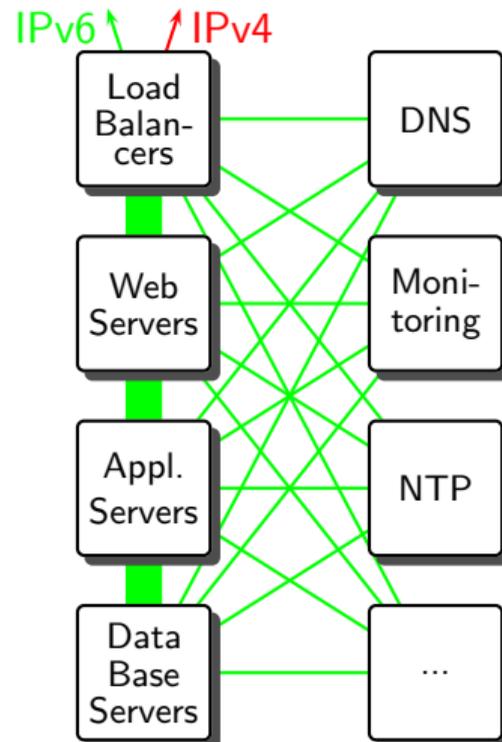
How: A Server Side Application Example

1. Identify the application components
2. Pick **one** place to do the dual stacking, if needed
3. Identify the used infrastructure
4. Connect to the necessary infrastructure via IPv6



How: A Server Side Application Example

1. Identify the application components
2. Pick **one** place to do the dual stacking, if needed
3. Identify the used infrastructure
4. Connect to the necessary infrastructure via IPv6
5. Migrate the application connections
 - Database ↔ application server
 - Application server ↔ web server
 - Web server ↔ load balancer



Contact Information



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