Real World IPv6 Migration Solutions

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Agenda

➤ **Choosing the right solutions**

➤ **Design considerations**

➤ **IPv4 to IPv6 migration road map**

➤ **Consumer side considerations**

➤ **Network Service Provider side considerations**

➤ **Content Provider side considerations**

What do you have to think about?

- **Choosing the right technology.**
  - There are many LSN, NAT64, DS-Lite, SLB-PT, 6rd, …
  - More possible in the future

- **Why so many technologies?**
  - Every network is different
  - Application requirements
  - Service Level Agreements
  - Comfort level (i.e. stateful vs stateless, maturity of the IPv6 stack)
  - Subscriber base (mobile vs fixed landline)

- **After choosing the right technology**
  - How will it scale?
  - What are the performance metrics?
  - Budget considerations

Design Considerations

- ## Choosing the right network topology

  - Inline mode vs one armed mode
  - Placement of the solution (edge, core vs. aggregation)
  - Security considerations
  - Infrastructure considerations (DNS, DHCP, L2/L3 changes)

- ## Proof of Concept

  - Interoperability testing
  - Application testing
  - Performance testing and high availability testing

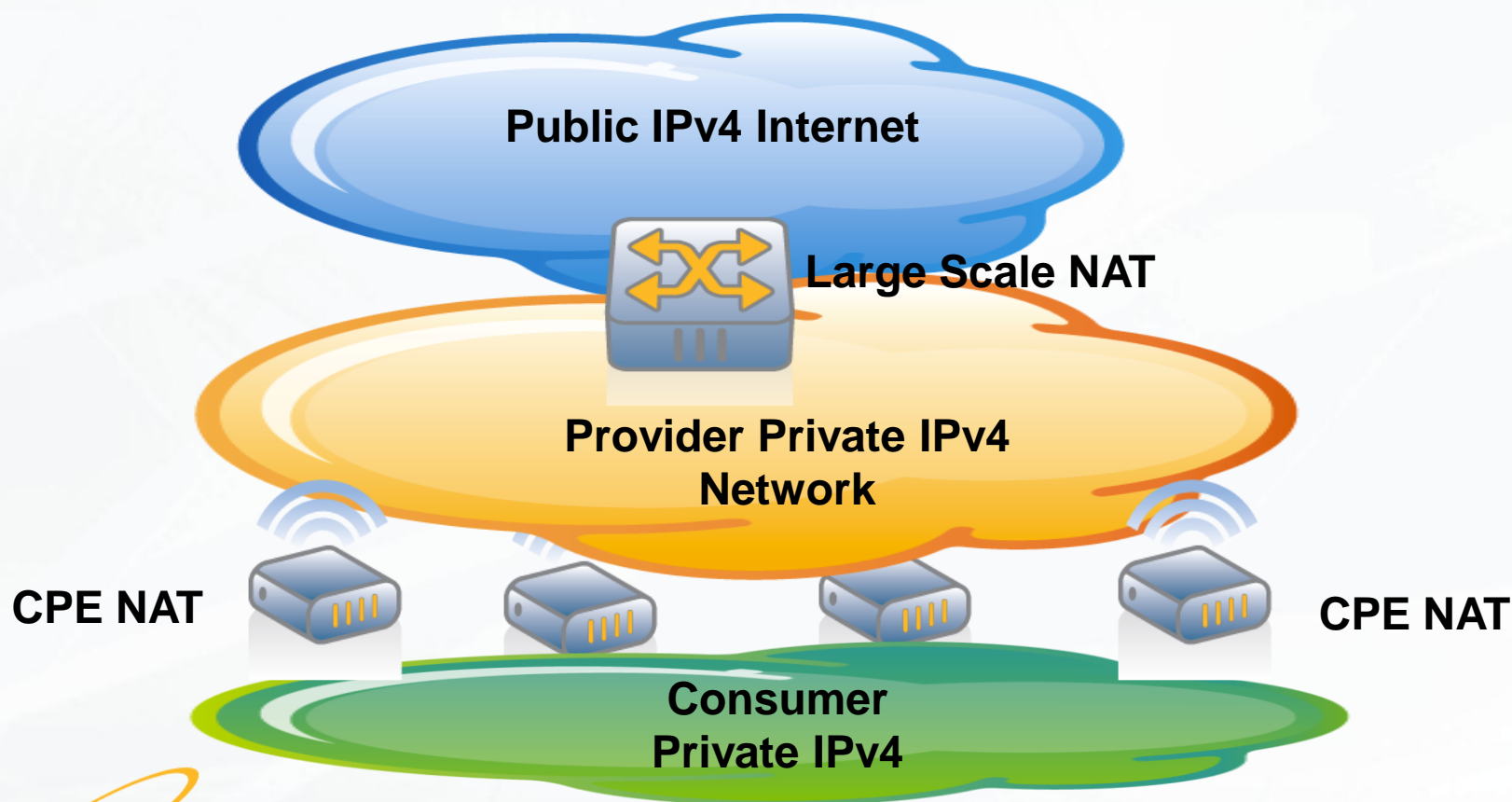- ## Field User Trials

  - Partial real world testing with friendly subscribers
  - Security assumptions validations
  - Observing application behavior
  - Verifying application requirements

Large Scale NAT Topology (NAT444)
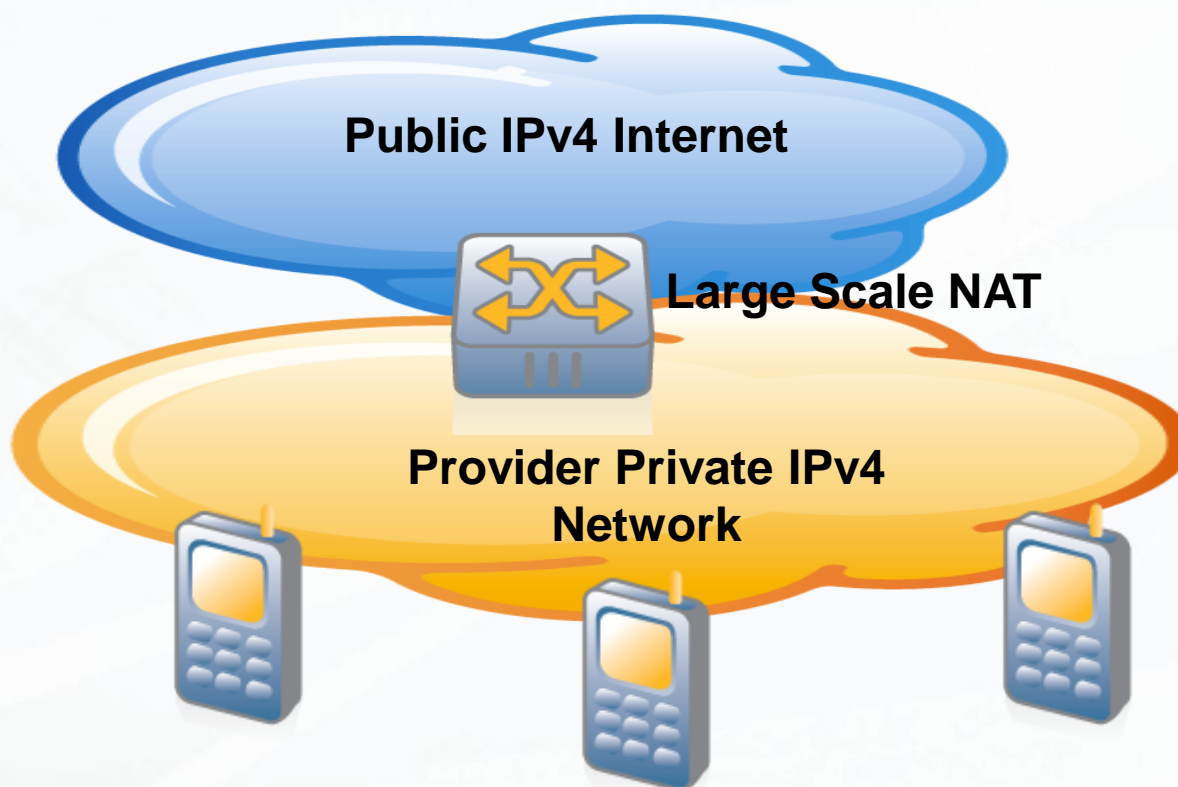
> **Two Layers of NAT**
>> ◆ Customer Premise Equipment NAT (Traditional NAT)
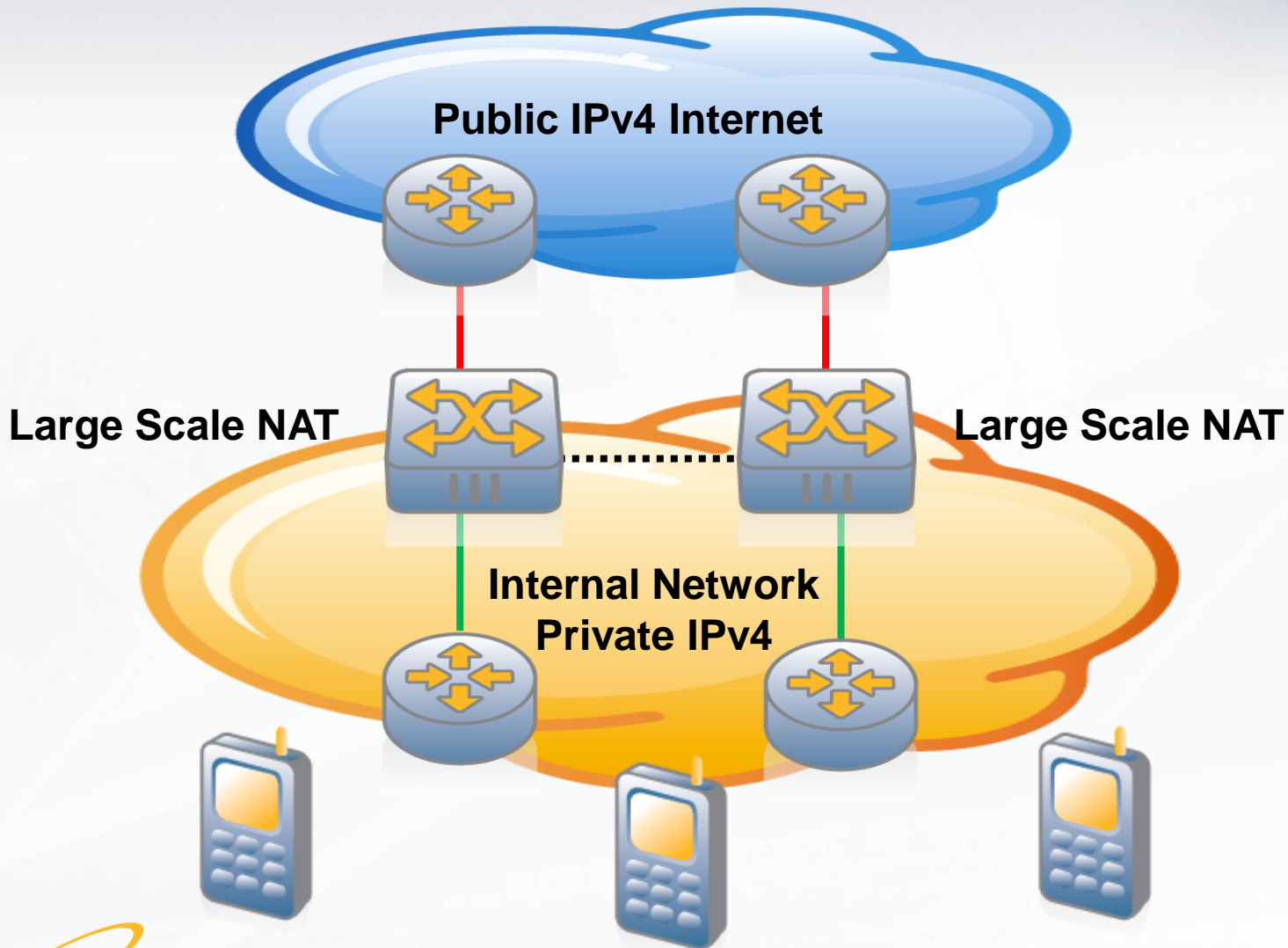>> ◆ Service Provider NAT (LSN)

Public IPv4 Internet

Large Scale NAT

Provider Private IPv4 Network

CPE NAT

CPE NAT

Consumer Private IPv4

Large Scale NAT Topology (NAT44)

> **Single Layer of NAT**
>
>   ◆ Provider provisioned end devices
>
>   ◆ Ideal for mobile handsets

Public IPv4 Internet

Large Scale NAT

Provider Private IPv4 Network

LSN Deployment Topology – Inline Mode
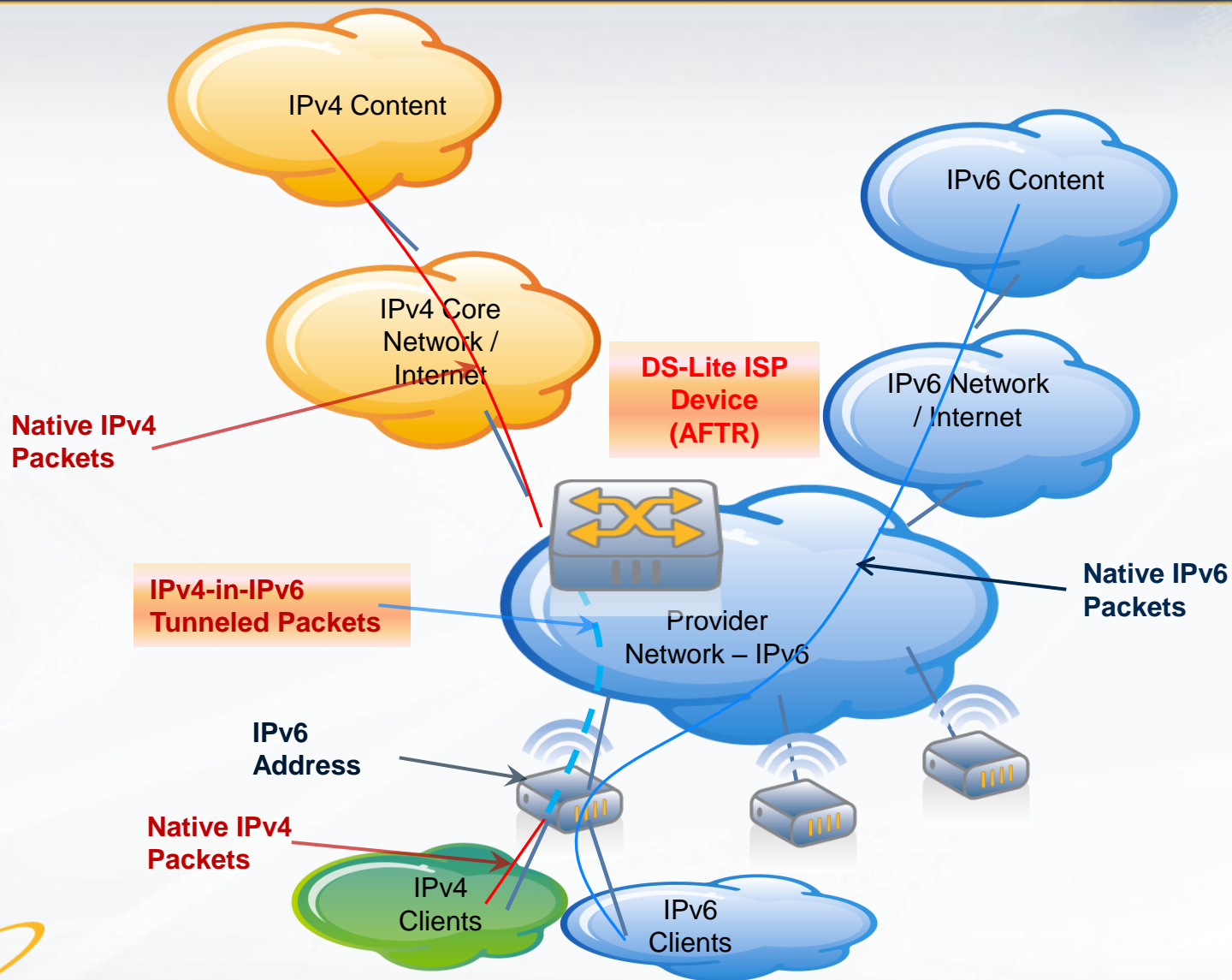

Public IPv4 Internet

Large Scale NAT

Large Scale NAT

Internal Network
Private IPv4

LSN Deployment Topology – One Armed Mode

Public IPv4 Internet

Large Scale NAT

Large Scale NAT

Internal Network
Private IPv4
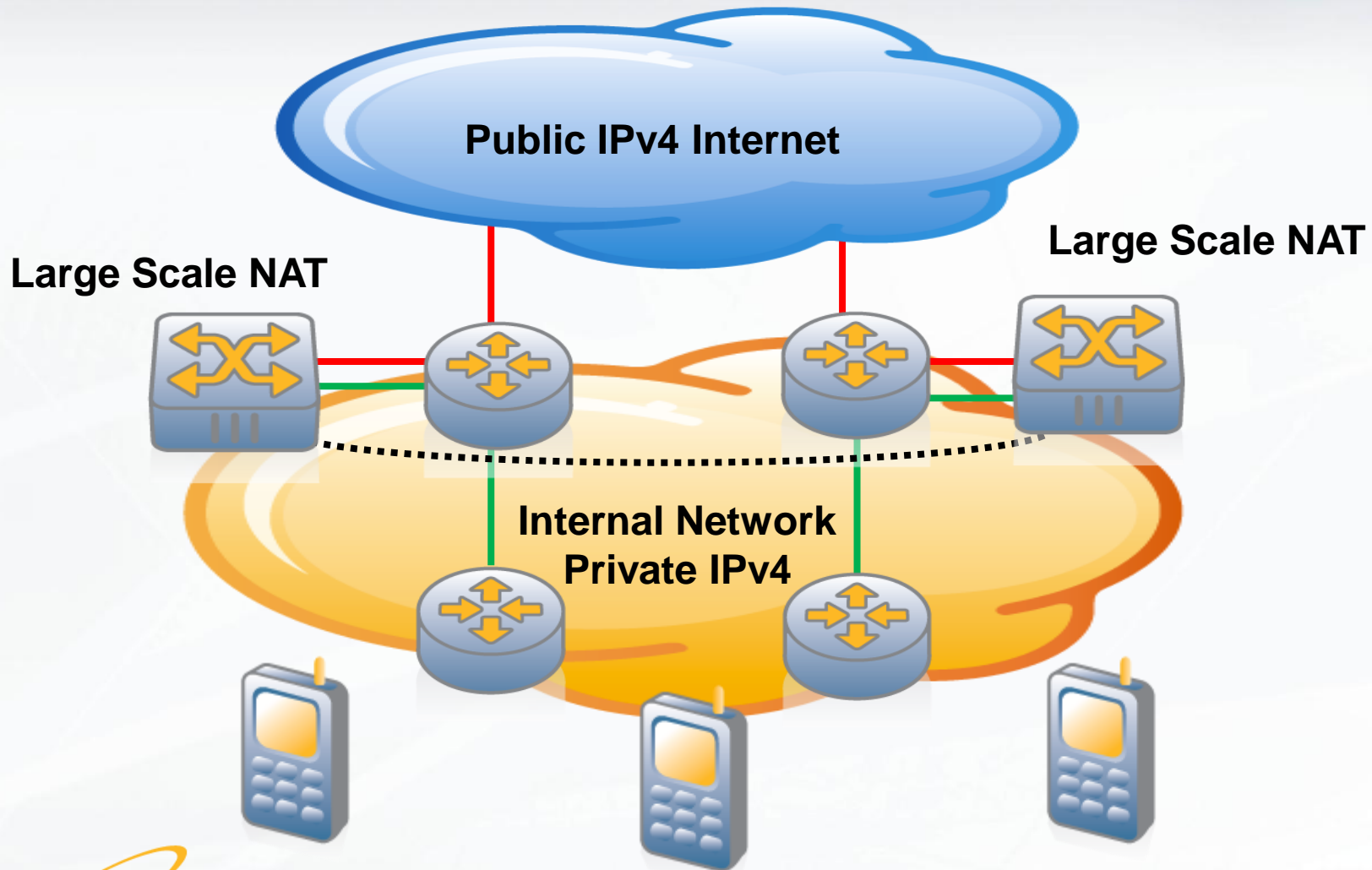
DS-Lite - Topology

SLB-PT – Topology
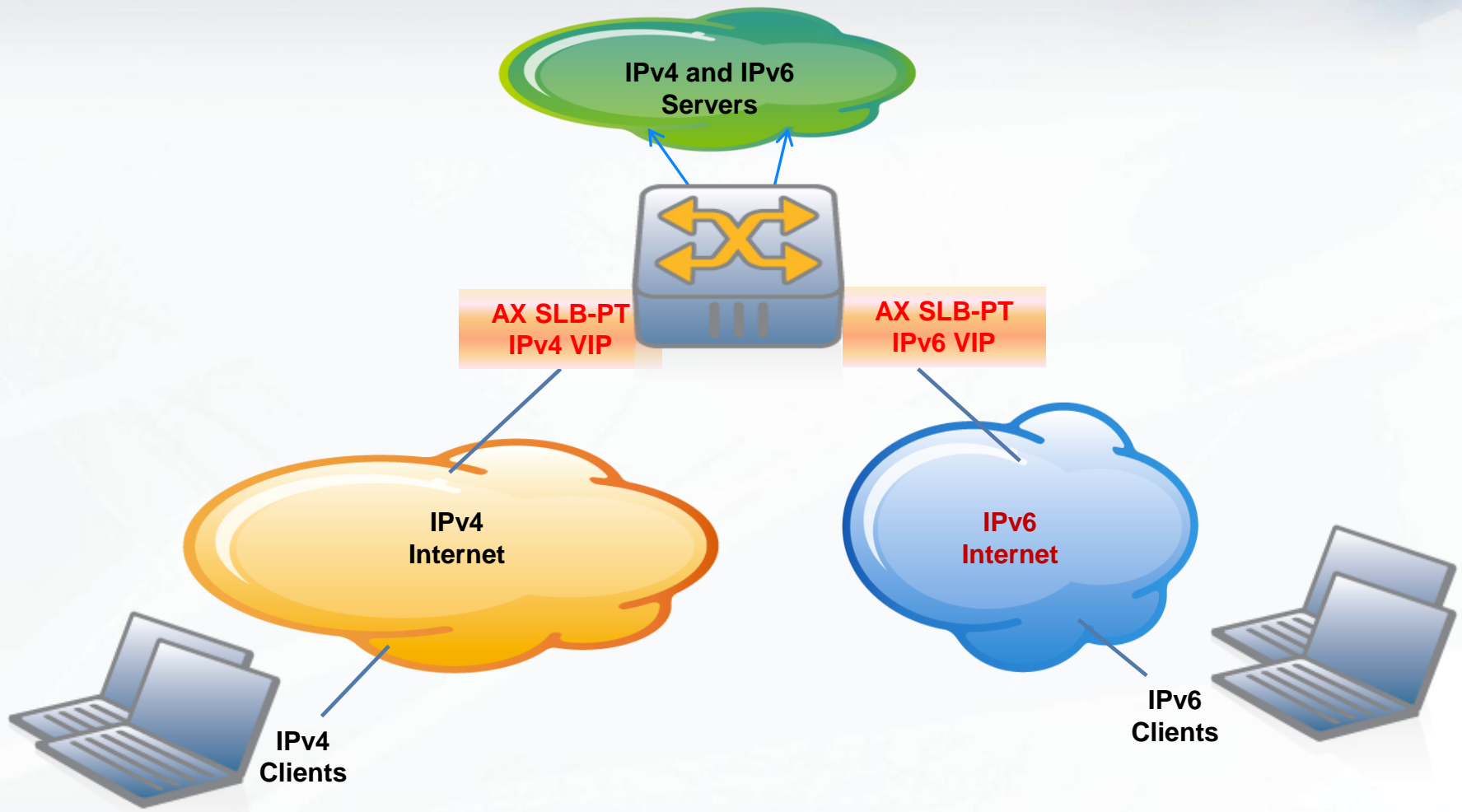
NAT64/DNS64 Deployment Topology

DNS Server Farm

IPv6/v4

IPv6 Provider

IPv6 Client

IPv6 Internet

IPv6 Servers

IPv4 Internet

IPv4 Servers

NAT64 + DNS64 Synthesis
Address Family Translation
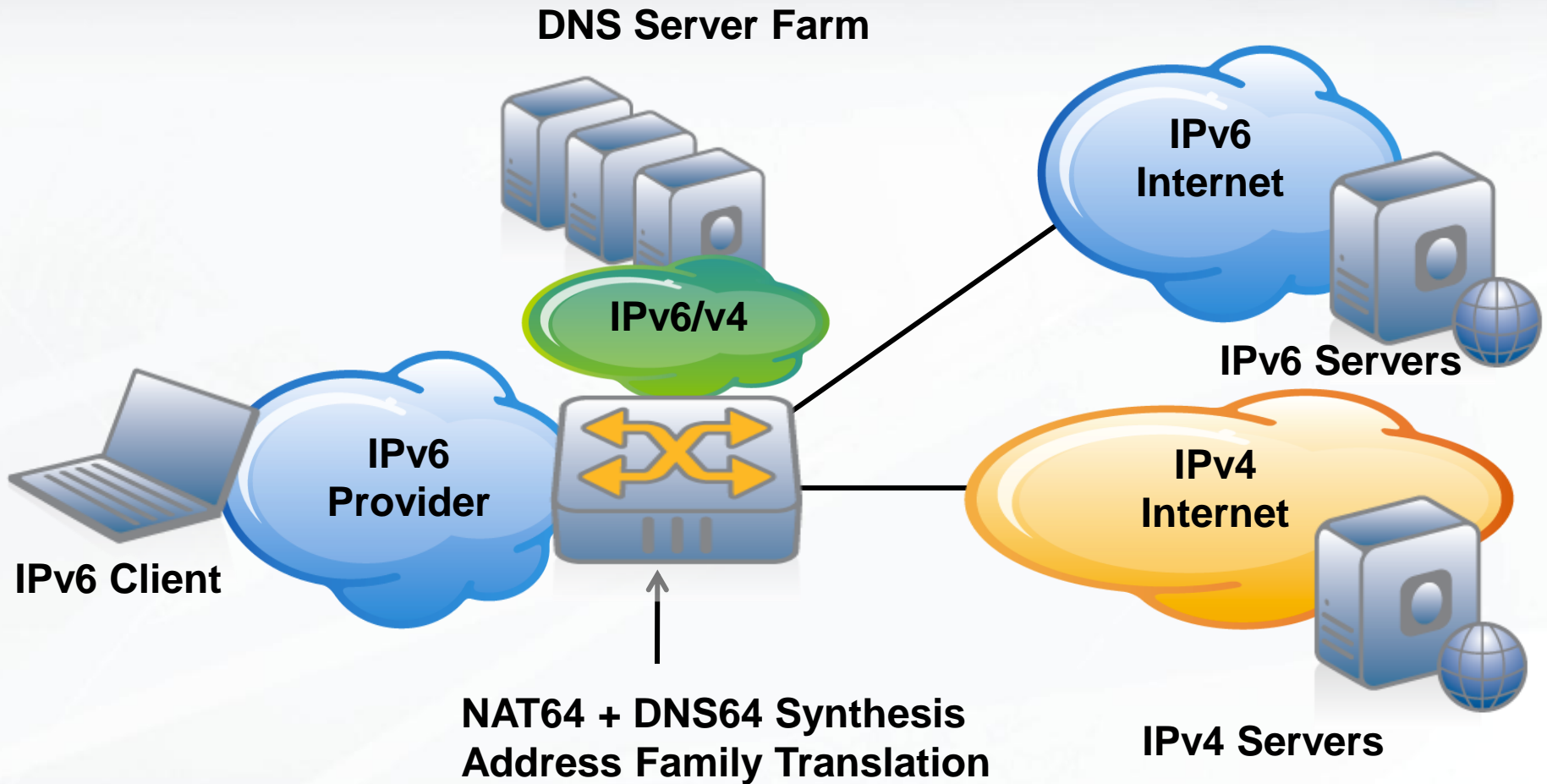
Security Considerations

- **Mandating and maintaining the existing security policies**

- **How does the migration technology effect security?**

- **Standards based approaches**
  - IETF Behave TCP
  - IETF Behave UDP

- **How flexible and adaptable is my implementation?**
  - What options are available to adjust parameters, for example:
    - End Point Independent Filtering
    - End Point Independent Mapping
    - User quota
    - Address selection mechanisms
  - Various application timers and behaviors
    - Long lived vs short lived (Ex. VPN vs DNS)
    - Peer to peer applications vs client server applications

IPv6 Migration Road Map

➤ **Roadmaps are specific to type of deployments**
  - Consumer space
    - Home networks
    - Mobile subscribers
  - Network Service Providers
    - Dual Stack (IPv4 and IPv6)
    - NAT64
    - Tunneling
  - Content Providers and Enterprises
    - SLB-PT or NAT-PT

IPv4 → IPv4 6to4 → IPv4 LSN 6rd SLB-PT → IPv4 IPv6 LSN DS-Lite SLB-PT NAT64 6rd → IPv6 IPv4 NAT64 → IPv6

Migration Considerations

- ## Home Networks
  - Organic upgrades to IPv6 capable systems
    - Wireless Routers, set-top boxes, handsets, laptops, gaming consoles
  - Application availability
  - Customer-premises equipment (DSL, Cable Modems)

- ## Service Provider Networks
  - Upgrading the plumbing to support IPv6
  - Service Provider support infrastructure (provisioning tools)
  - Scalability and performance
  - Dedicated translation technologies

- ## Content Provider and Enterprise Side Considerations
  - Number of administrative domains
  - Production grade IPv6 content
  - Service Level Agreements

IPv6 in the Enterprise

➤ **Infrastructure Costs**

- Servers, firewall, routers, switches, and load balancer upgrades
- Application accessibility and vendor readiness
- End user requirements – new laptops, handsets

➤ **Business Continuity**

- Seamless migration strategies
- Minimizing downtime

➤ **Economics**

- Additional Expenses
- Return on investment

➤ **Migration Technologies**

- Dual Stack
- SLB-PT
- NAT-PT with DNS ALG

Summary

- **Moving to IPv6 is no longer an option**

- **Many challenges**

- **Many approaches**

- **Many different technologies and considerations**

- **Progress is happening on many fronts**
  - Infrastructure Vendors
  - Service Providers
  - Content Providers
  - Application Vendors

- **Need more commitment and coordination**

How is A10 involved?

➤ **Working with many different parties in the transition process**

➤ **Support for many different technologies**
- LSN
- DS-Lite
- NAT64/DNS64
- SLB-PT
- 6rd /6to4 PMT
- Full IPv6 feature parity with IPv4 SLB features

➤ **Capability to support all these technologies concurrently**

➤ **Flexible, feature-rich, scalable, high performing and adaptable implementation**

Questions ?