

IPv6 全面升級

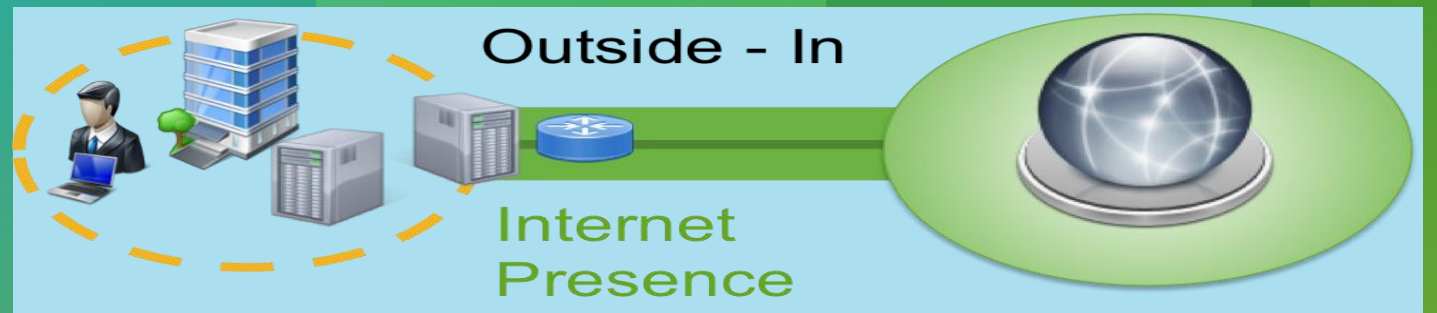
IPv6 Ready Internet Edge
IPv6 Connectivity
IPv6/IPv4 Co-Existence

Andy Chien (錢小山)

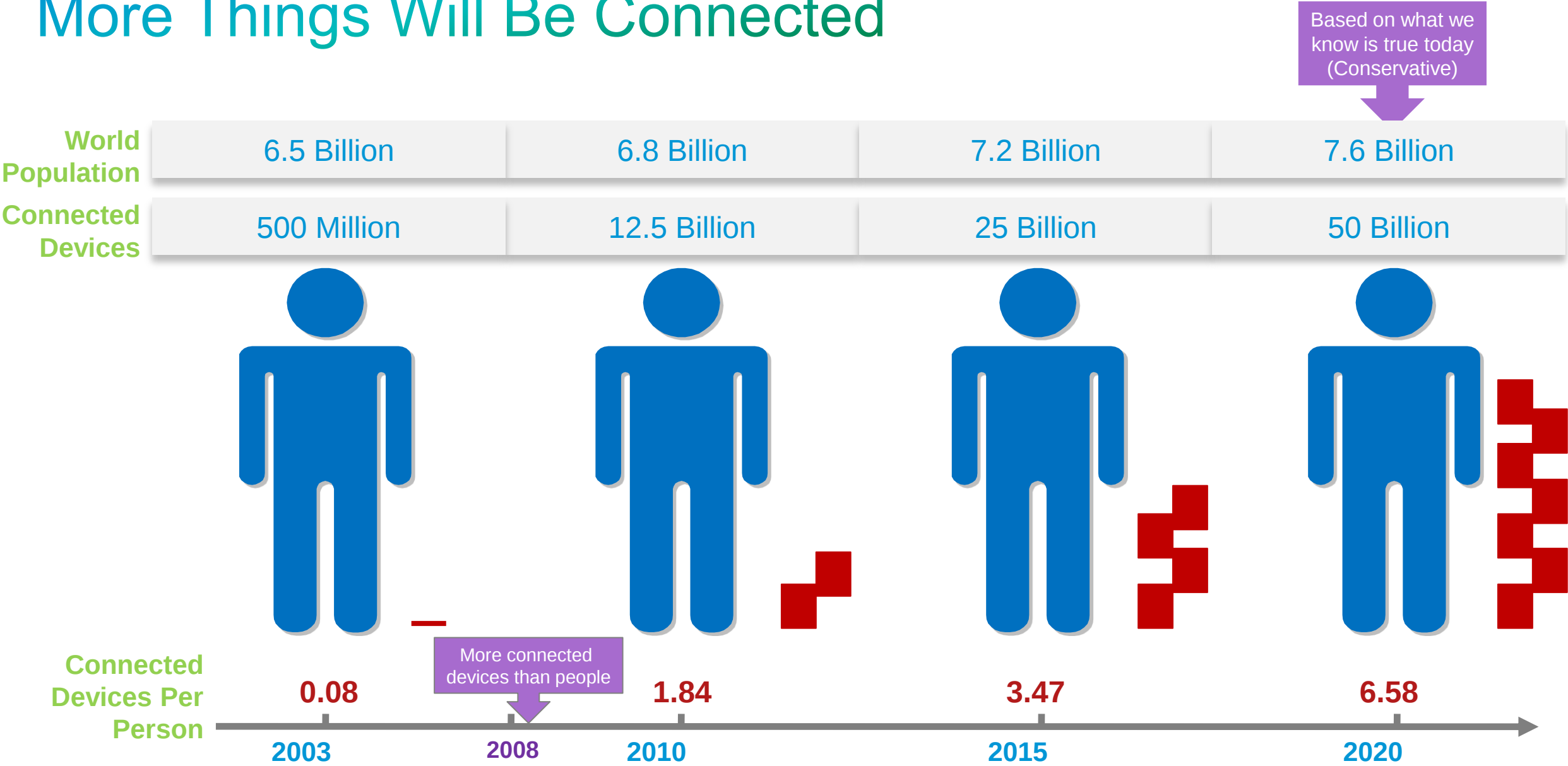
Customer Solutions Architect

Cisco Systems

Dec-07-2012



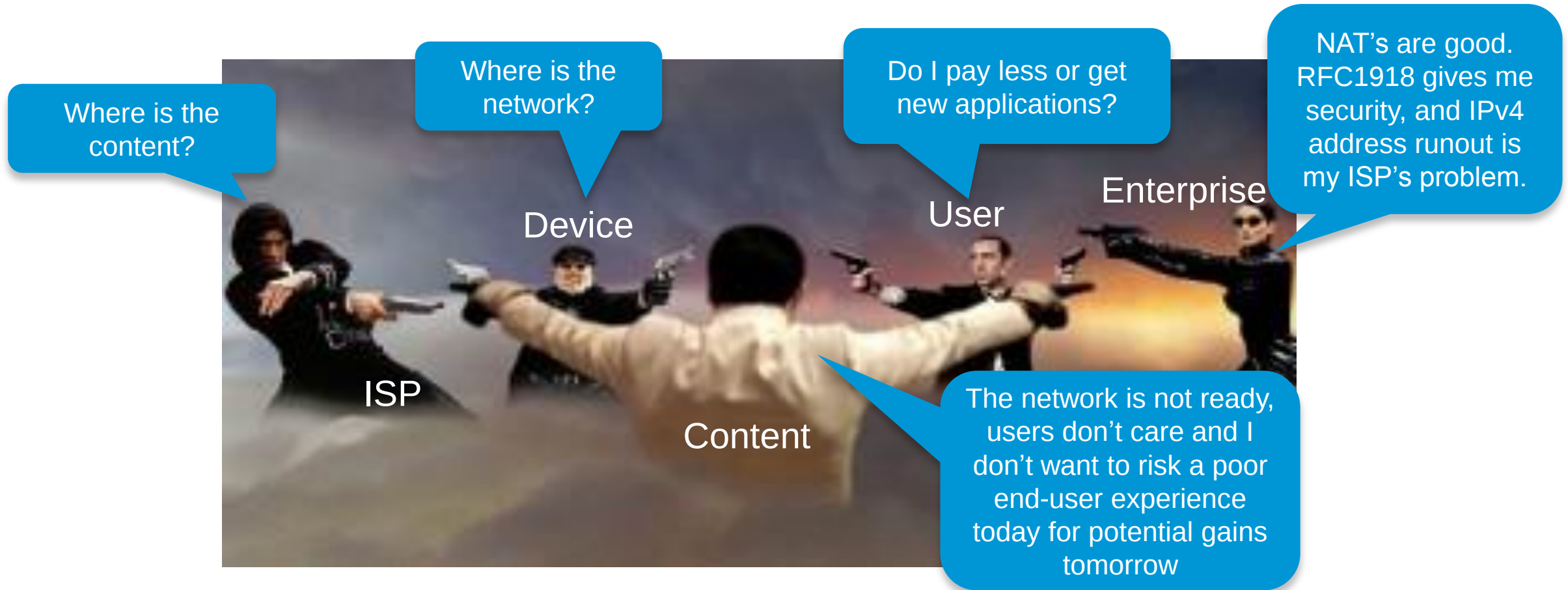
More Things Will Be Connected



Source: Cisco IBSG, 2010



Before : A Mexican Standoff



“A deadlock, stalemate, impasse; a roughly equal (frequently unsatisfactory) outcome to a conflict in which there is no clear winner or loser,”

Today : Threat? Danger? Crisis? – Fred Baker

<http://blogs.cisco.com/borderless/ipv4-depletion-threat-danger-crisis-turning-ipv6-up-and-ipv4-down/>

(1) as of 8 June 2012, over half of the world's **1000 largest ISPs have deployed** the technology, more are in the process, and the **roughly 7300 ISPs worldwide are taking steps in that direction.**

(2) **Residential access** networks including **NTT, Free, Orange, Comcast, and Time-Warner** are very public about their progress.

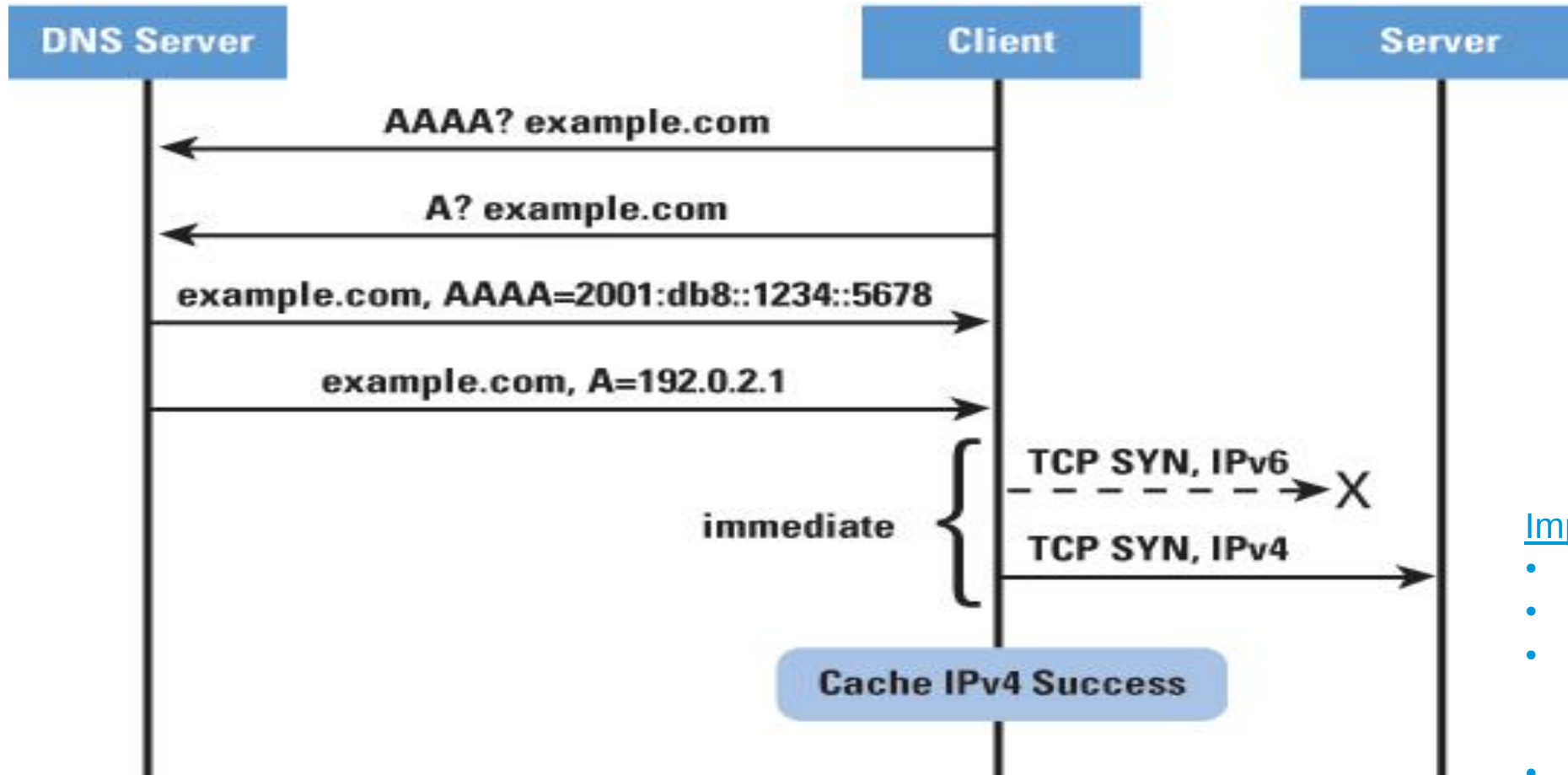
(3) **Large content providers** such as **Google and Facebook** have deployed it and run over IPv4 or IPv6 seamlessly and interchangeably.

(4) Mobile **telephone operators** such as **T-Mobile and China Mobile** are experimenting with **IPv6-only networks.**

(5) **Large enterprises** including **Bechtel, Cisco**, and others have deployments in progress.

Today : Dual Stack

Happy Eyeballs (RFC6555) – improving end user experience



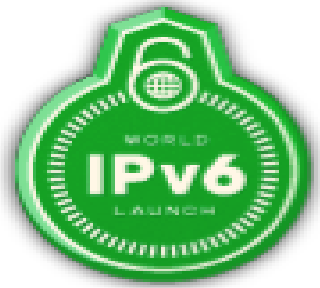
Implementations:

- Firefox 10
- Chrome (last stable)
- OSX 10.7 “Lion”
 - getaddrinfo()
 - Safari
- iPhone iOS 4.3.1

NOTE – this impacts CGN44:
high session setup rate [sps]

[draft-ietf-v6ops-happy-eyeballs](http://www.cisco.com/web/about/ac123/ac147/archived_issues/ipj_13-3/133_he.html)
http://www.cisco.com/web/about/ac123/ac147/archived_issues/ipj_13-3/133_he.html

Today : World IPv6 Launch – Begun



- What is it?

www.worldipv6launch.org ; coordinated by the Internet Society

- **W6L: Turn it on, leave it on.**

Since 6/6/12, IPv6 becomes part of a regular business!



- Who will turn on IPv6 AAAA forever?

[Google](#), [Facebook](#), [Yahoo!](#), [Akamai](#) , Microsoft...

CPE vendors – Cisco, D-Link

- Practical support: <http://www.internetsociety.org/deploy360/>

- 台灣 IPv6 全面升級活動 (Taiwan IPv6 Launch) , <http://ipv6launch.tw/about1.html>



V6 World
CONGRESS 2012

OPEN THE FLOODGATES
07/10 FEBRUARY 2012 MARRIOTT PARIS FRANCE

IPv6 全面升級

- 現況
- 部署 IPv6 的策略考量
- 第一步：IPv6 Ready Internet Edge (Before 2013)
- 第二步：IPv6 Intranet (Before 2015)
- 第三步：IPv4/IPv6 Co-existing (After 2016)
- 新的應用與商業模式
- 下一步
- 附件



現況

World IPv6 Launch – This time its for real!

- June 6th, 2012 it is!
- 2,500 + (and counting) Website Operators, Network Operators and Home Router Vendors will turn on IPv6 (and leave it on permanently!)
- 截至4日为止美国参加IPv6Launch的网站已有71%可在IPv6上存取，中国则为65%左右
- <http://www.worldipv6launch.org/>



政府 IPv6 全面升級發展時程

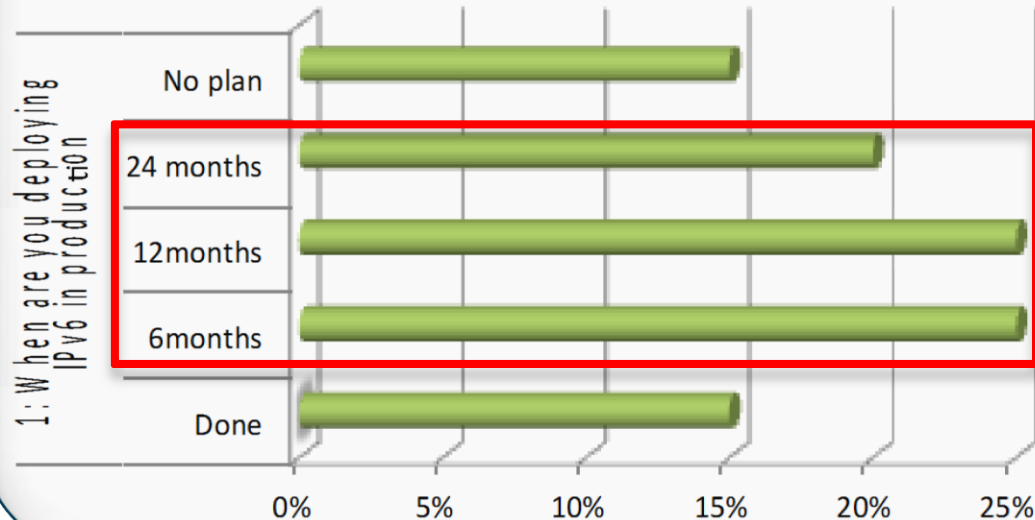
T0 : 政策聲明 宣示 IPv6 發展時程	Ta : 主要外部服務 第一期 主要對外服務網站 DNS, Email, 骨幹網路等	Tb : 次要外部服務 第二期 次要對外服務網站 DNS, Email, 各辦公室 機房接入電路等	Tc : 內部使用網路 第三期 內部接取網路, 內部 網站, 資料庫, 應用 系統, 個人電腦等
項目	建議時程	理由	說明
T0 : 政策聲明	啟動日 (2011/12/30)	IPv4 位址發罄, 行政院業於 2011 年 12 月 30 日核定 “網際網路通訊協定升級推動方案”, 並以 2011 年 12 月 30 日 訂為 IPv6 之啟動日	必要
Ta : 主要外部服務	> 2013/12/31	IPv6 Ready Internet Edge (Dual Stack + Translation)	必要
Tb : 次要外部服務	> 2015/12/31	IPv6 Connectivity (Intranet)	必要
Tc : 內部使用網路	2016 <	End to End (Dual Stack)	依需要及預算調整

ETAB 調查報告

IPv6 at the Internet Edge (維持業務的持續)

Recent ETAB Survey (03/24/12)

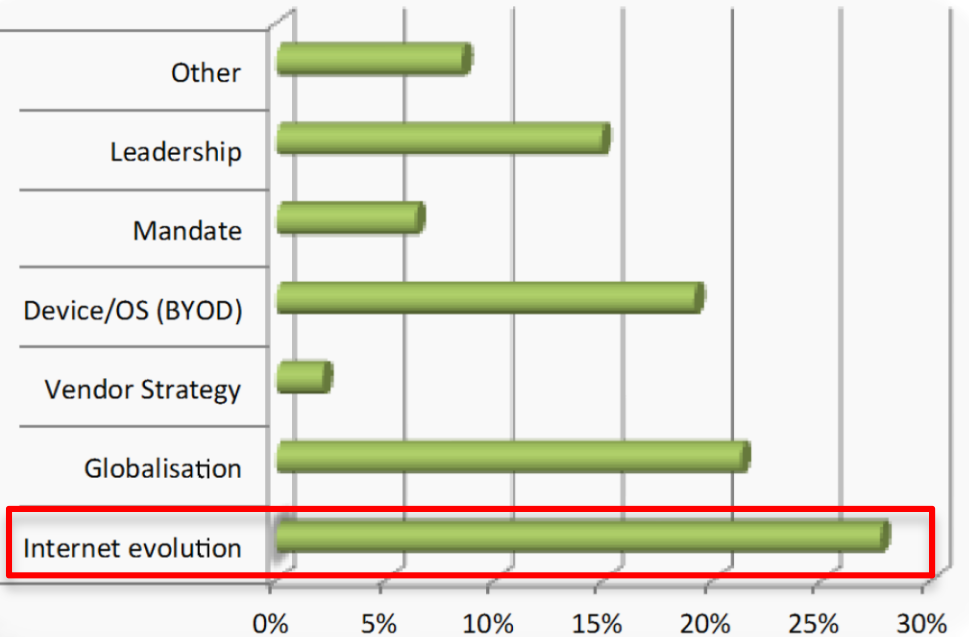
Internet Presence



Q1. When are you deploying IPv6 in production ?

70% of Customers deploying IPv6 at Internet Edge in next 24 month

2: What are Top 3 drivers ?



Q2. What are your MAIN drivers for IPv6?

> 25% of Customers consider IPv6 Internet Edge being the business driver

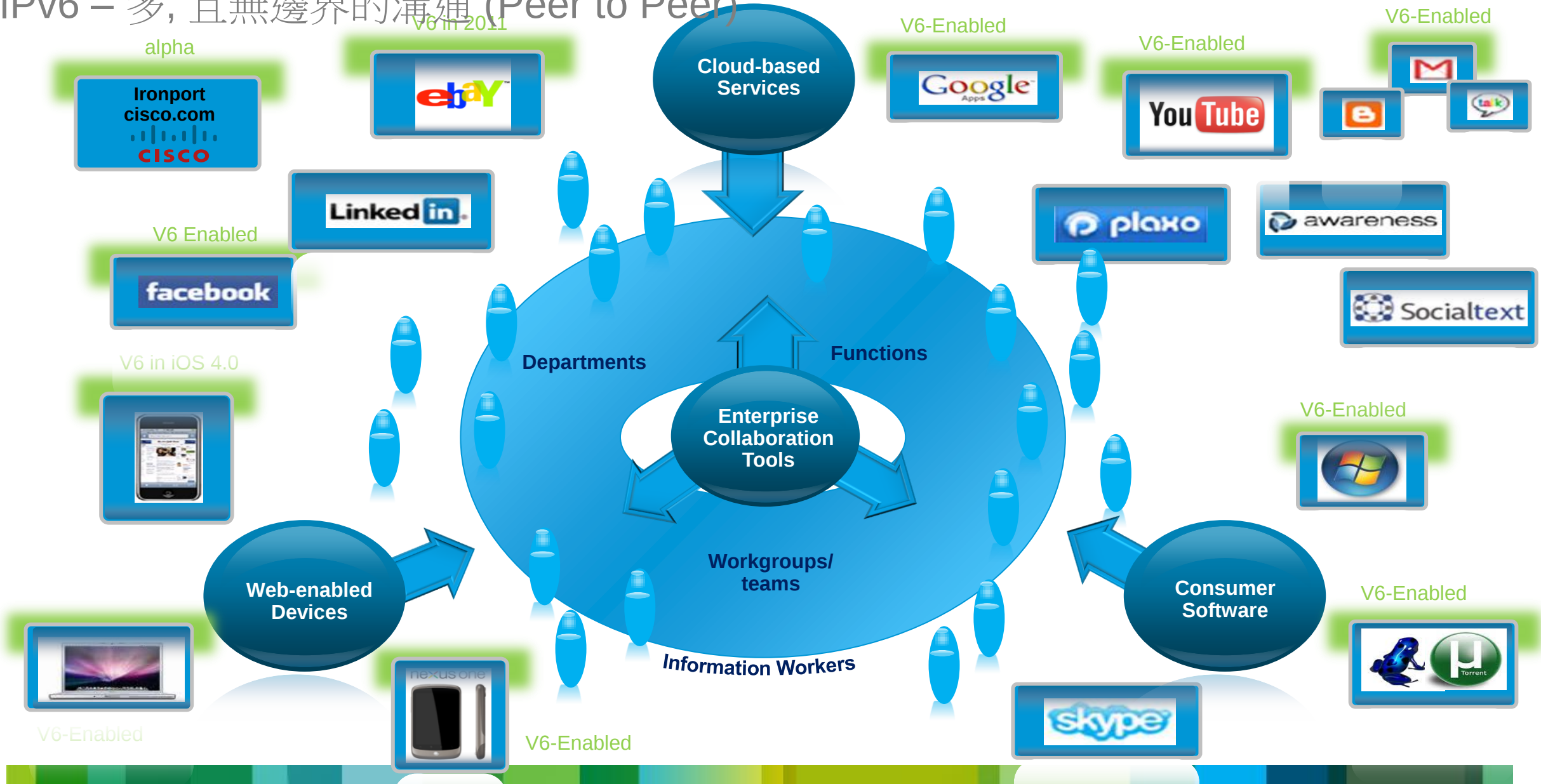
部署 IPv6 的策略考量

IPv6 部署策略上的需求

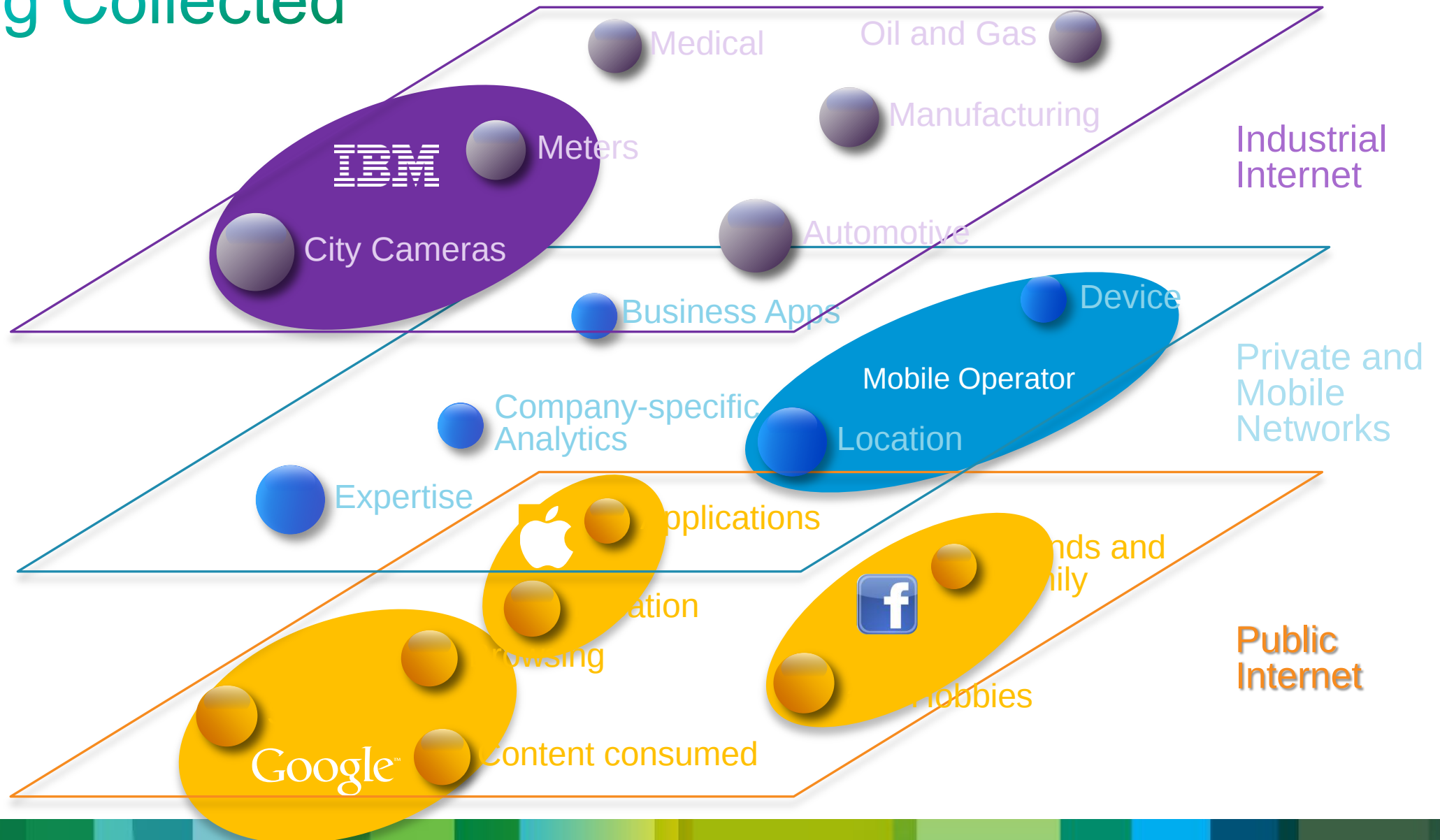
- Should be low-cost
- Must be low-risk
- Must co-exist with existing IPv4 infrastructure
- Must allow access to public Internet
- Must be incrementally deployable
- **Must understand the cost of adding a new service**
- Must not impact existing services
- End-user should not know the integration occurred (seamless)

Next 20+ Years Business

IPv6 – 多, 且無邊界的溝通 (Peer to Peer)



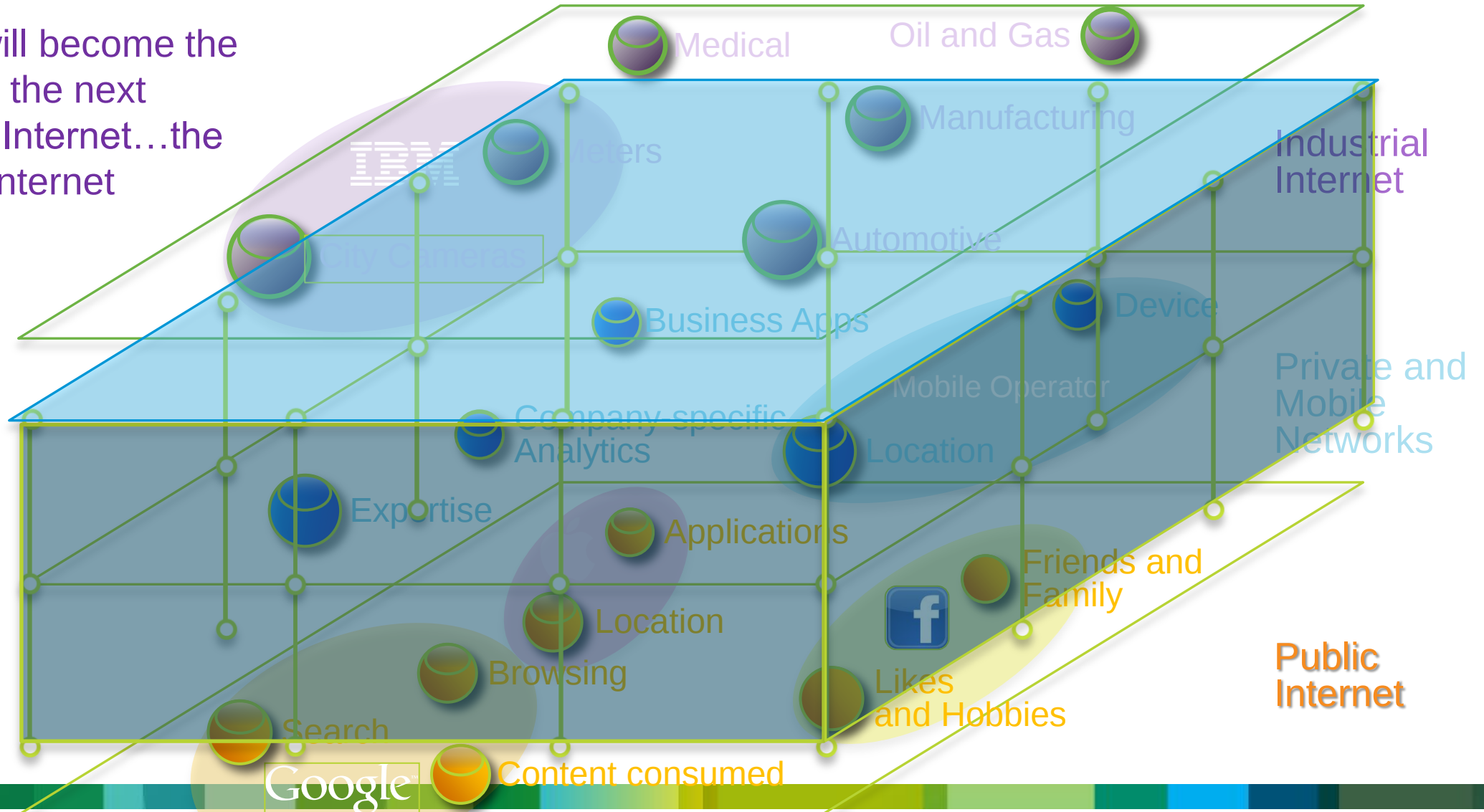
Today, Networks Stand Apart....Scattered Analytics Getting Collected



Tomorrow, Internet of Everything

Network can Become the Most Insightful Analytics Engine!

Analytics will become the currency of the next generation Internet...the Intelligent Internet



良好的 IPv6 策略規劃

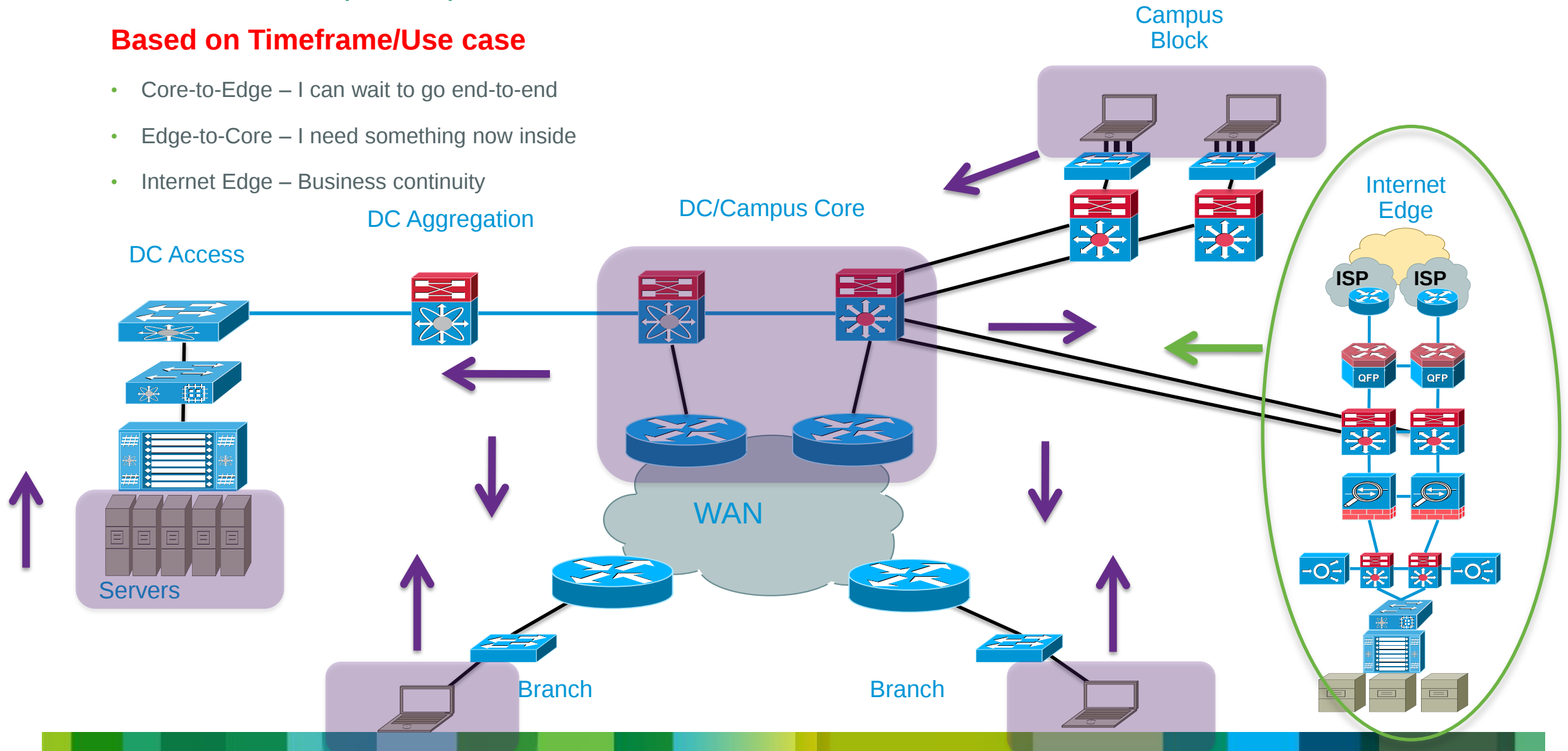


從那裡開始

不同的策略 (需求) 跟隨不同的解決方案

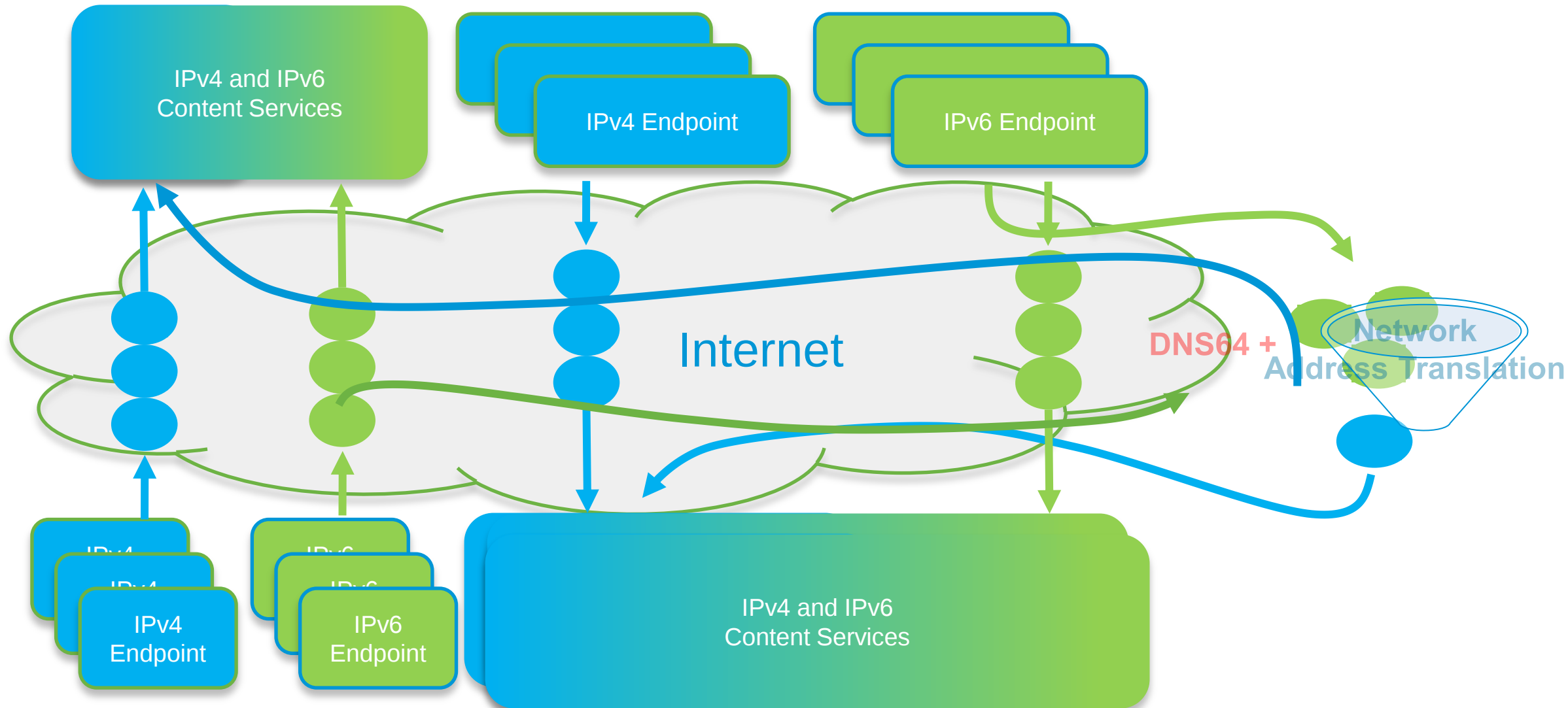
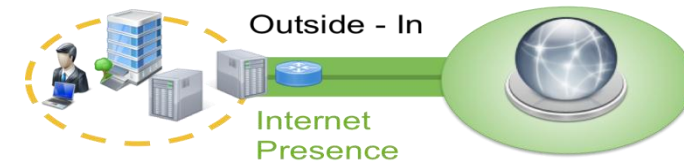
Based on Timeframe/Use case

- Core-to-Edge – I can wait to go end-to-end
- Edge-to-Core – I need something now inside
- Internet Edge – Business continuity



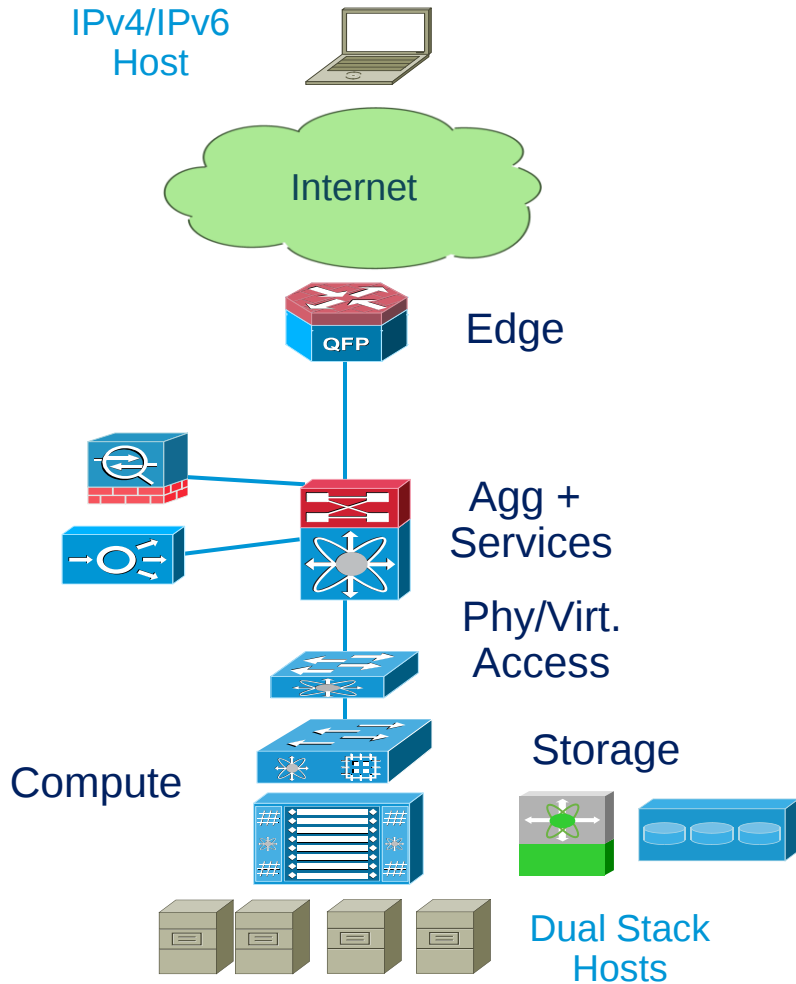
第一步 : IPv6 Ready Internet Edge (Before 2013)

IPv6 Internet Edge 的需求 (Ingress + Egress)

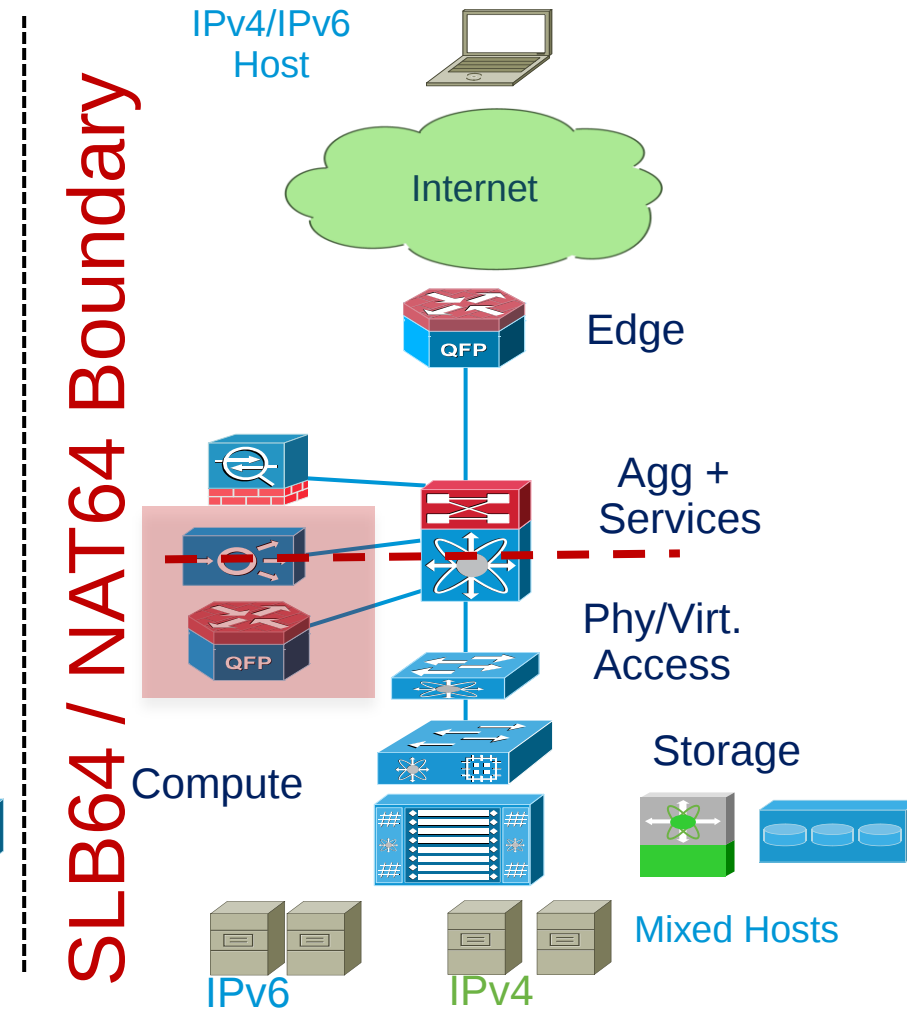


IPv6 Internet edge 的部署模式

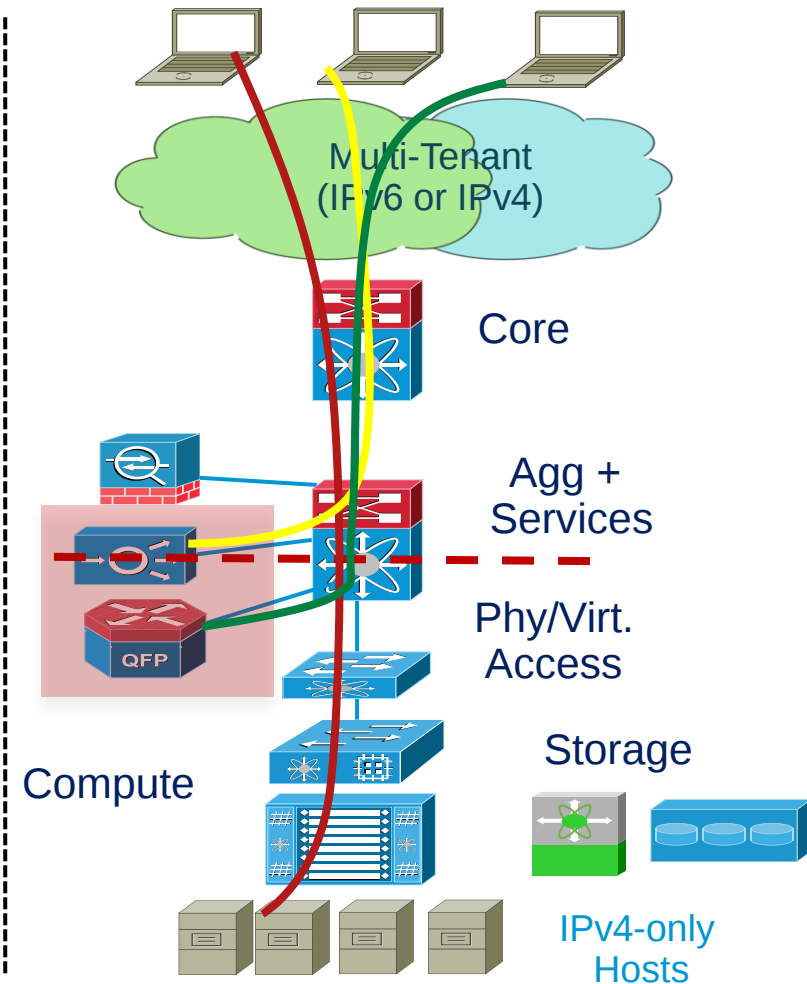
Pure Dual Stack



Conditional Dual Stack

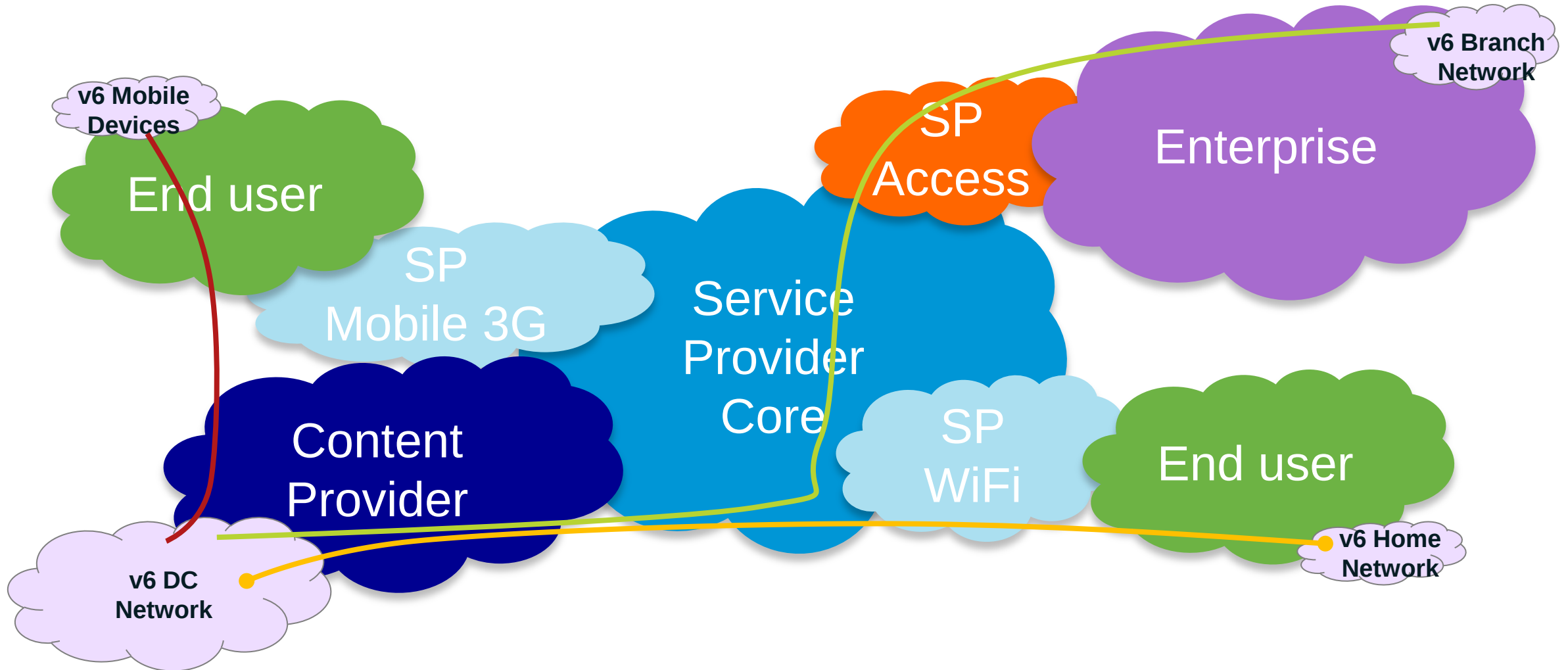


Translation as a Service



第二步：IPv6 Intranet (Before 2015)

IPv6 Connectivity 在連接上的需求



IPv6 Connectivity 在連接上的需求

IE Edge Router

IE Outer Switch

IE Firewall Tier

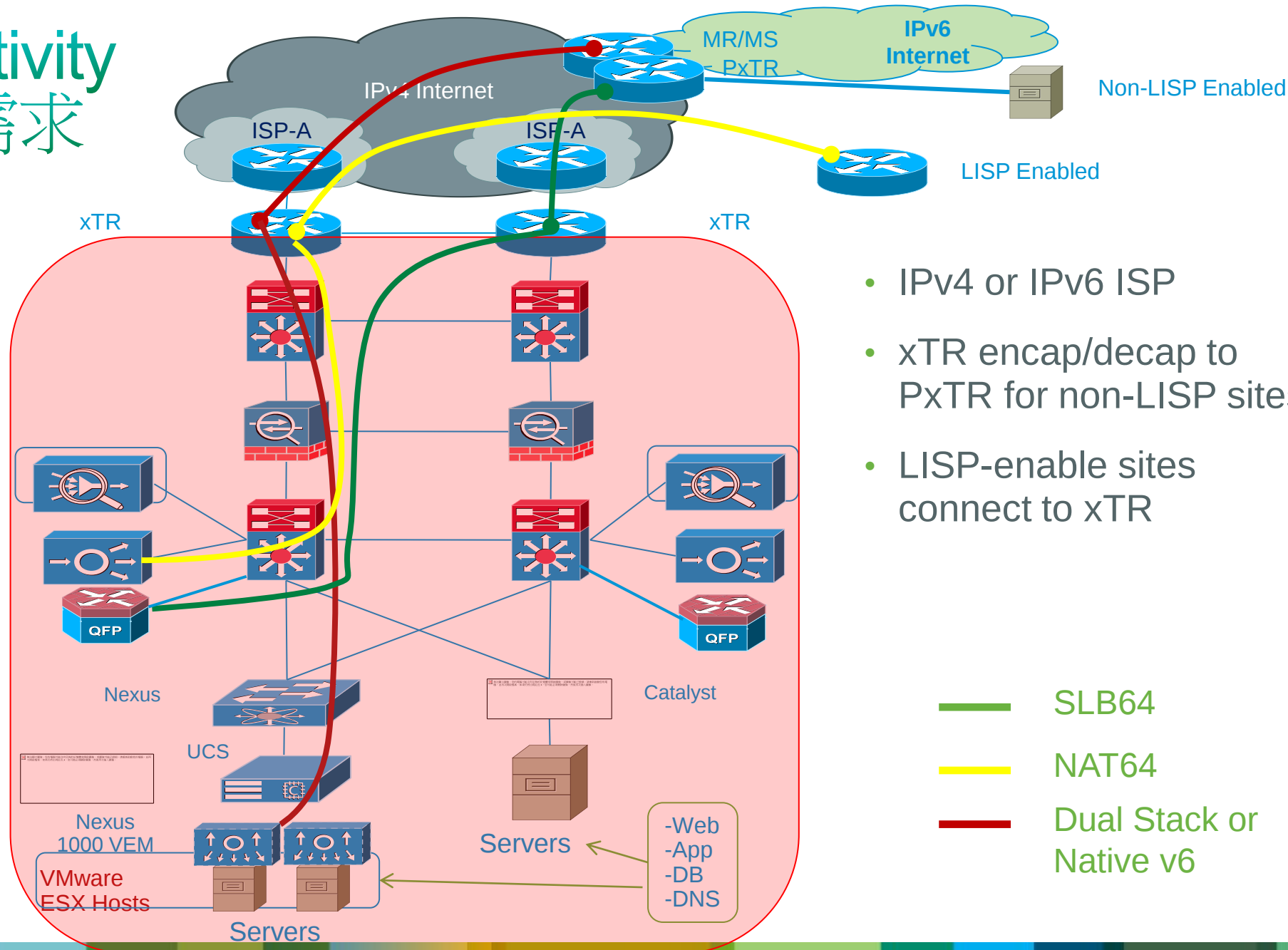
IE Inner Switch

IE Access Layer

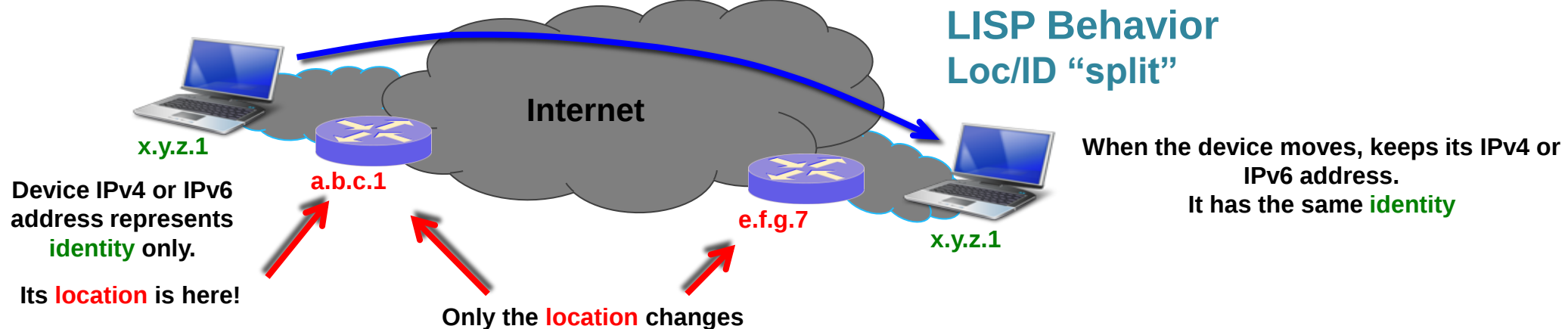
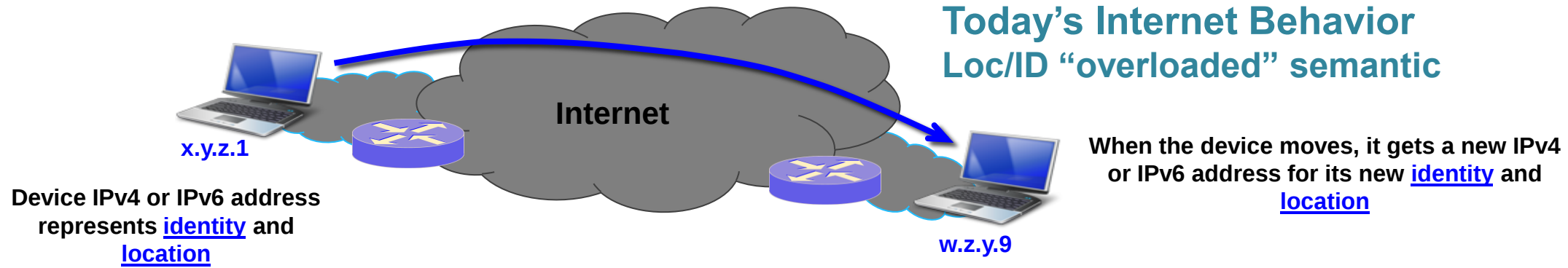
Services
(IPS, ACE)

Nexus
1000 VSM

IPv6 behind xTRs



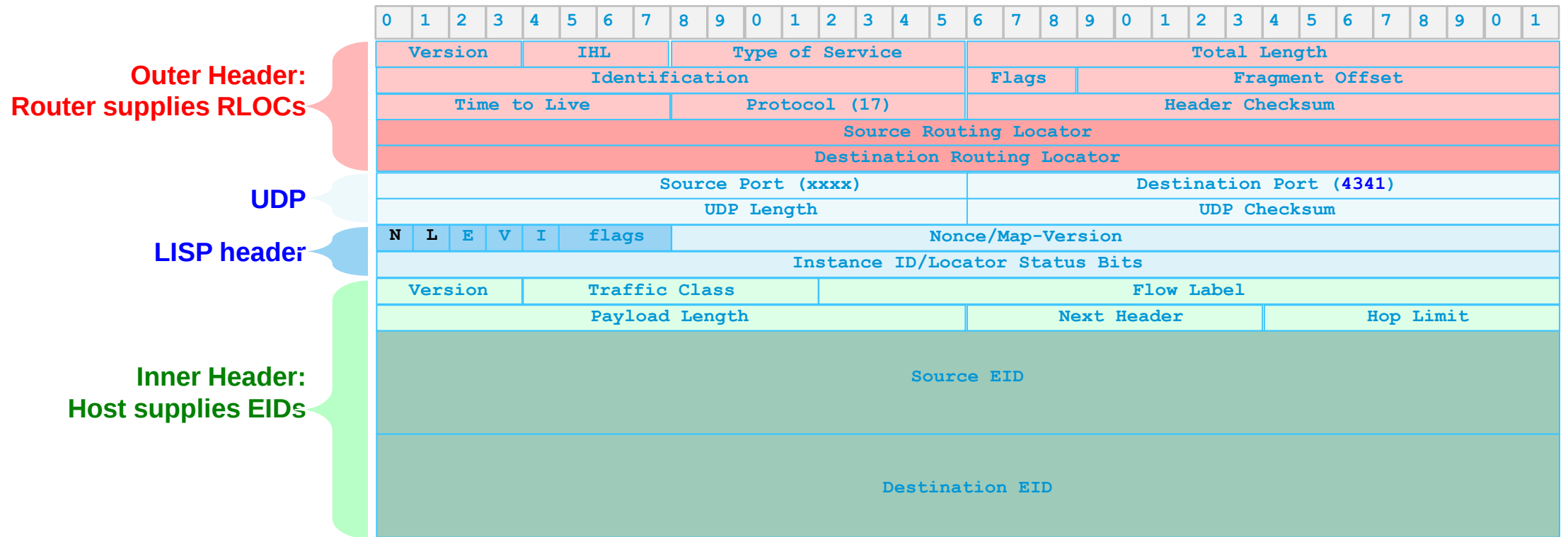
LISP Overview (Draft-ietf-lisp-22)



LISP For IPv6 Transition

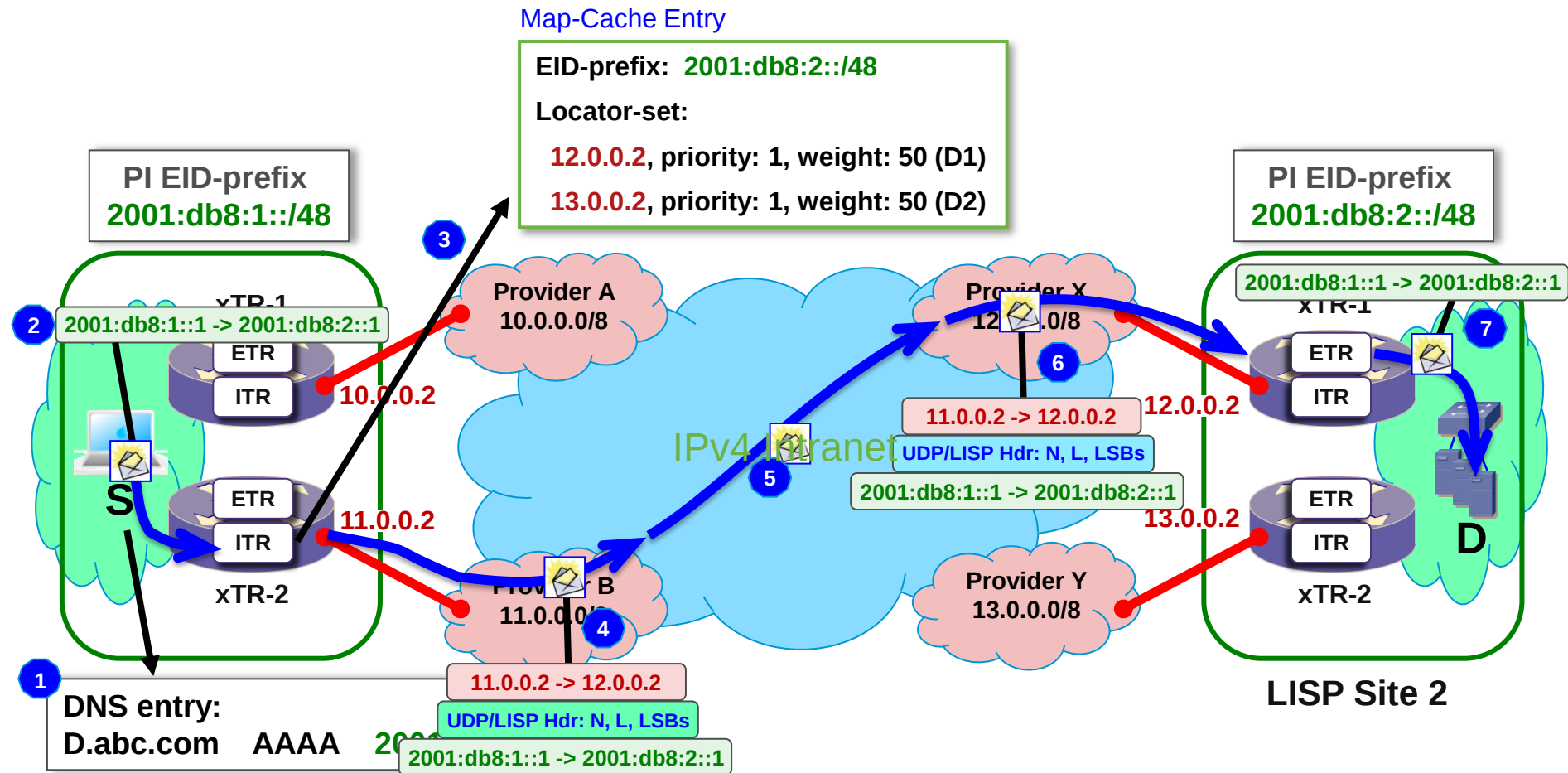
LISP and IPv6 Transition – Protocol Details

- LISP Data Packet Header Format – IPv6 EID, IPv4 RLOC



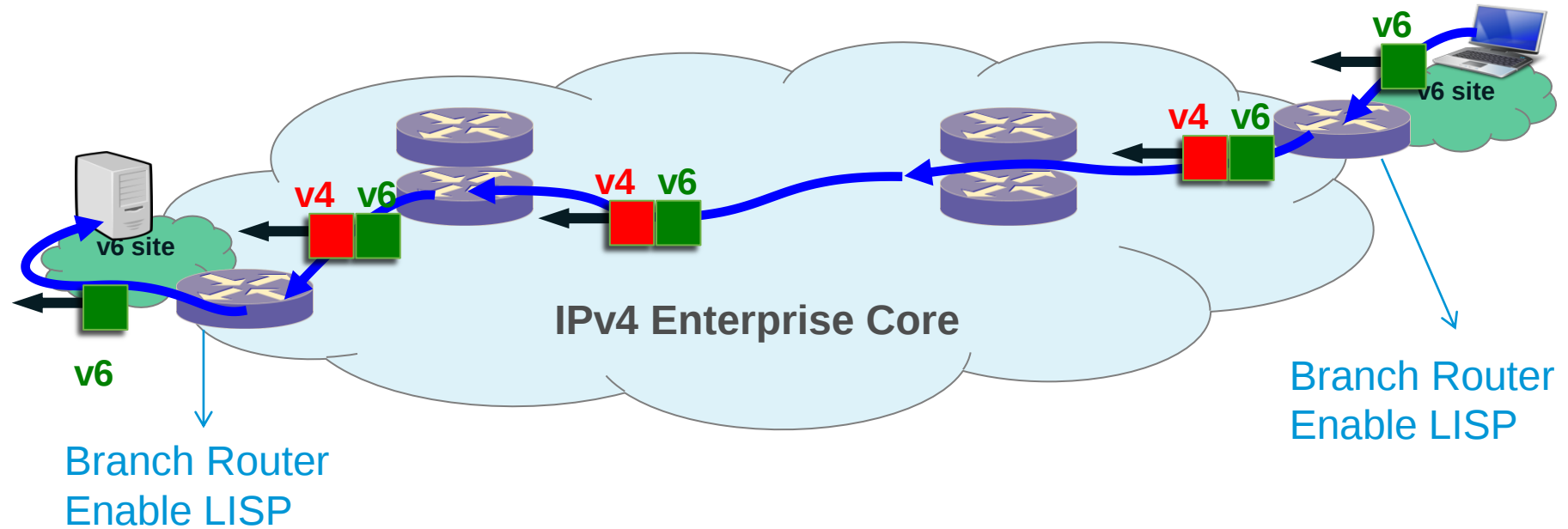
LISP For IPv6 Transition

- LISP Unicast Data Packet Forwarding – IPv6 EIDs, IPv4 RLOCs



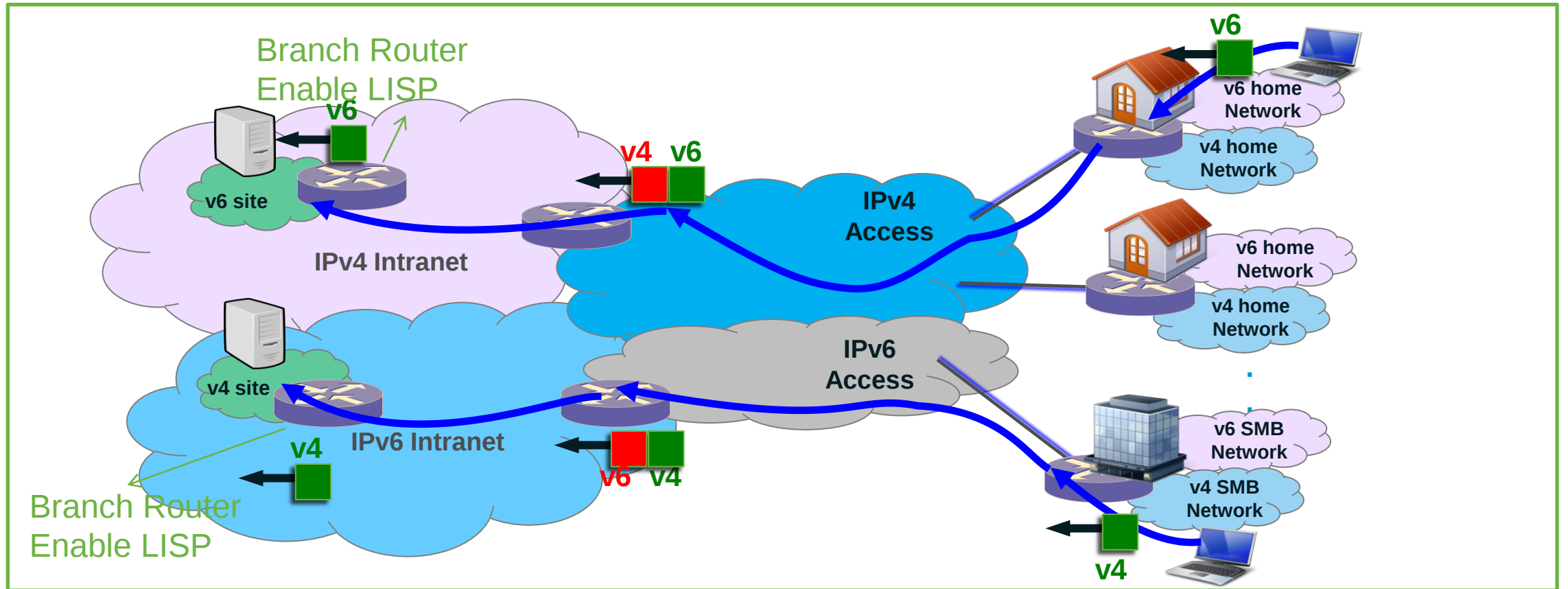
LISP For IPv6 Transition

Connect IPv6 Branch With IPv4 Backbone



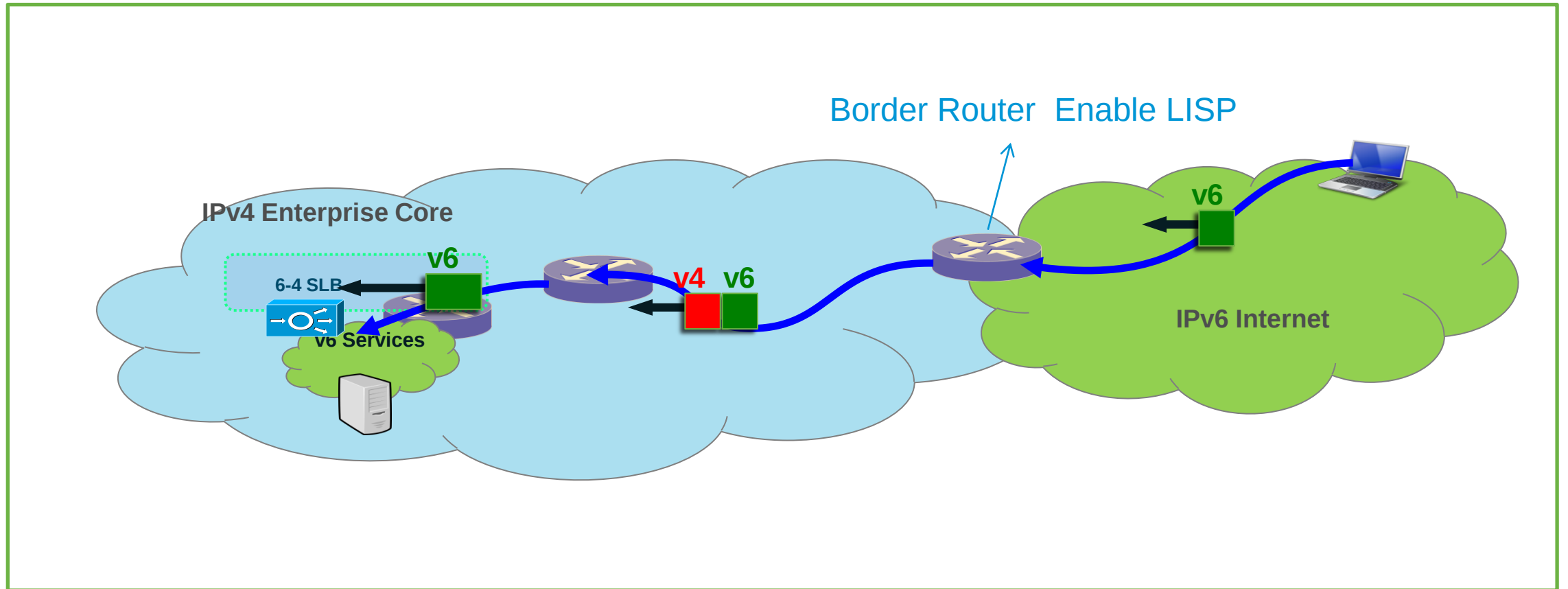
LISP For IPv6 Transition

Connect IPv6 Home with IPv4 Only SP



LISP For IPv6 Transition

Connect IPv6 Internet User to IPv4 Only Intranet Data Center



LISP Mobile-Node

A LISP-MN Phone is a LISP Site!



What can a LISP-MN Device do?

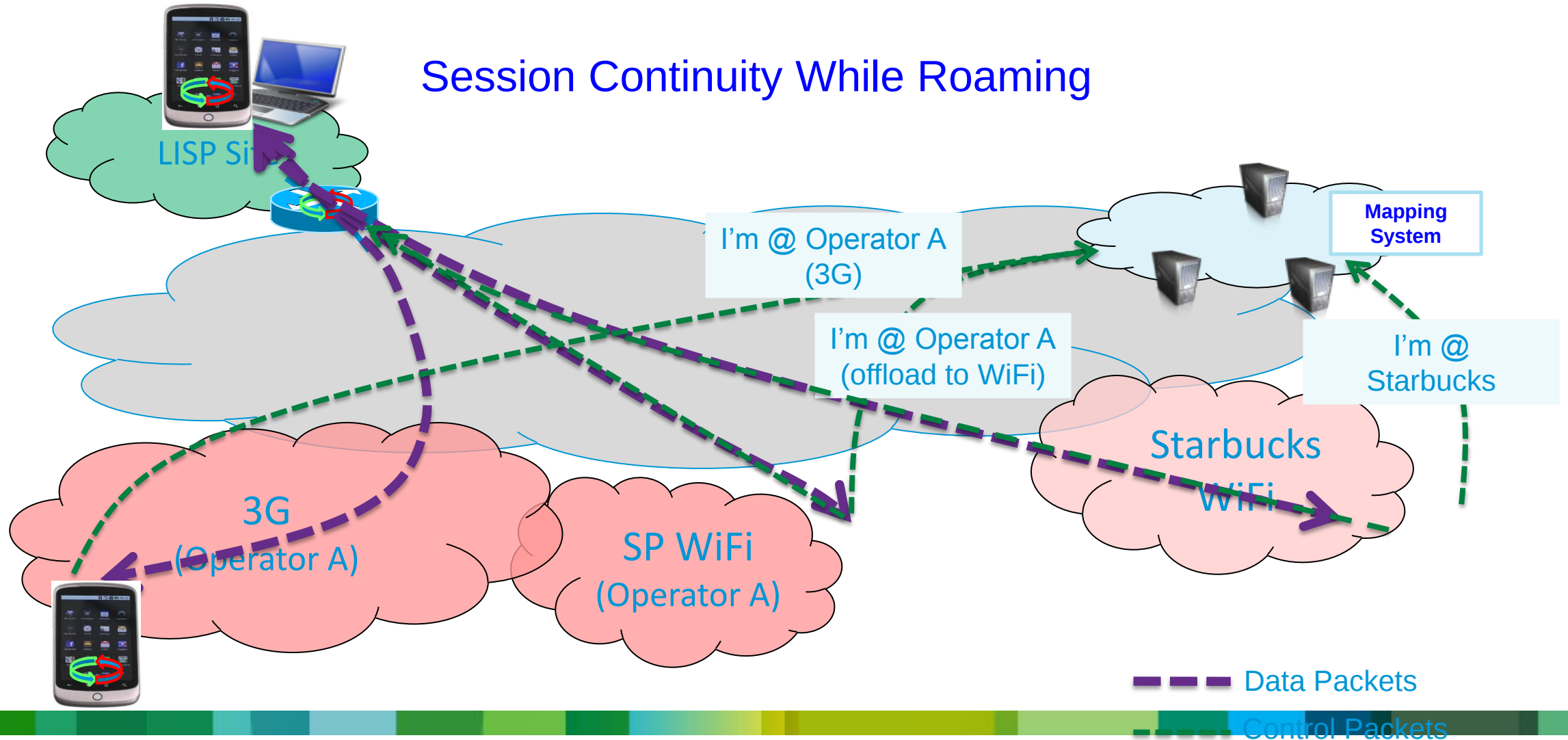
- Two MNs can roam and stay connected
- MNs can be servers
- MNs roam without changing DNS entries
- MNs can use multiple interfaces
- MNs can control ingress packet policy
- Faster hand-offs
- Low battery use by MS proxy-replying
- And most importantly, packets have stretch of 1 so latency is best for delay sensitive applications

LISP-MN can scale to 1 billion hand-sets!

LISP For IPv6 Transition

Mobile-Node Connection with IPv4 only Intranet/Internet

LISP-MN Mobility: Any Network, Anytime, Anywhere



LISP Mobile-Node

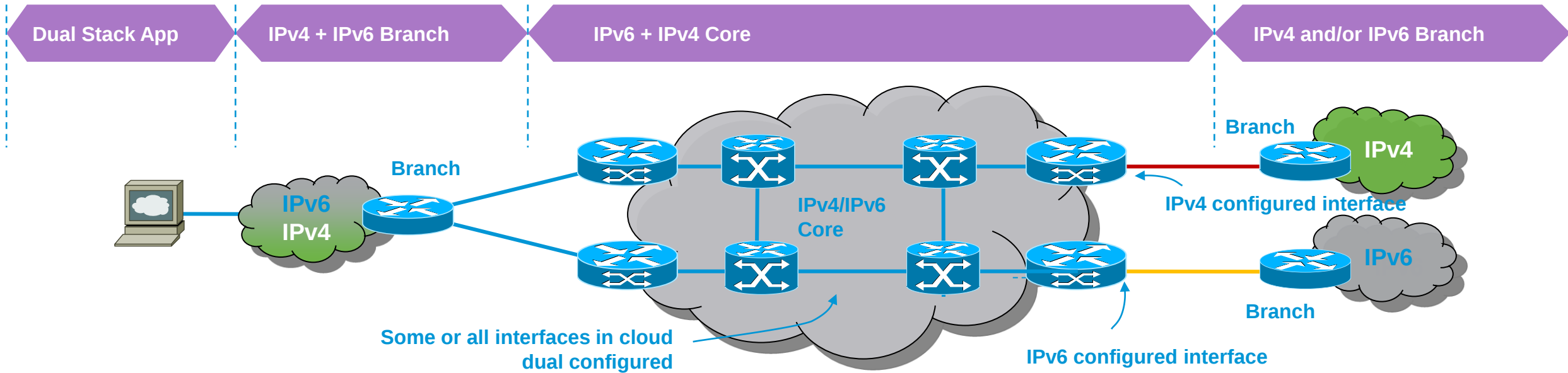
LISP-MN Implementations

- LISPmob.org
Open Source Linux LISP-MN distribution
Hosted by Universitat Politecnica de Catalunya (Spain)
- Android LISP-MN stack
For Android Cyanogenmod aftermarket firmware distribution (rooted phones)



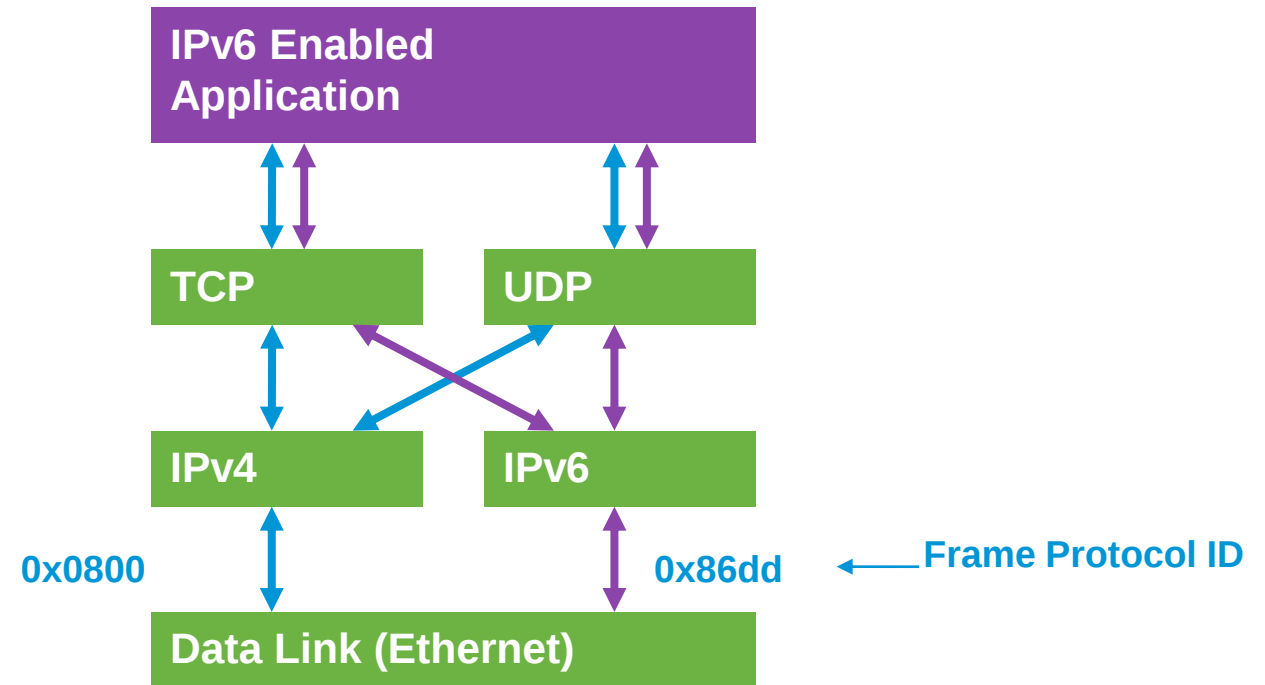
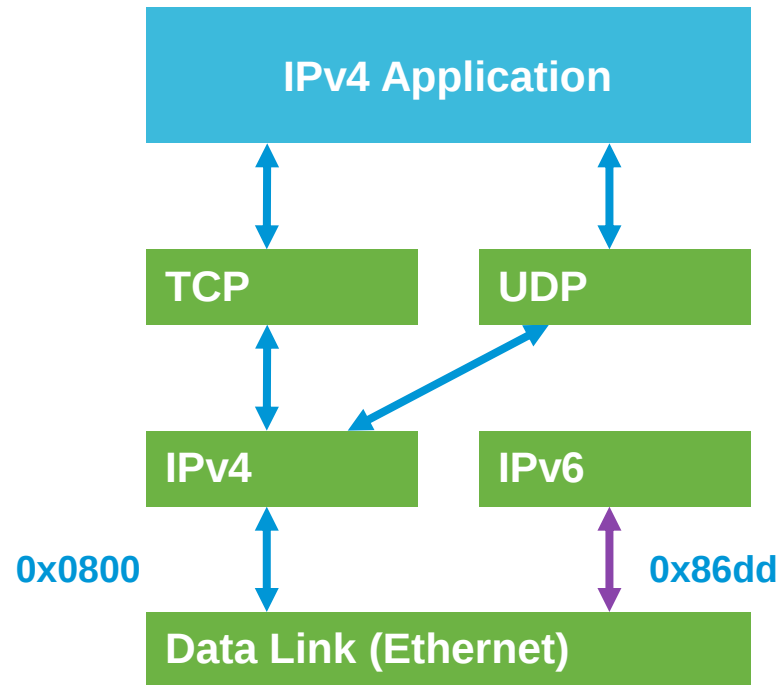
第三步 : IPv4/IPv6 Co-existence (After 2016)

Dual Stack Backbone



- Two IGPs supporting IPv4 and IPv6
- Memory considerations for larger routing tables
- Native IPv6 multicast support
- All IPv6 traffic routed in global space
- Good for content distribution and global services (Internet)

Application Dual Stack Approach

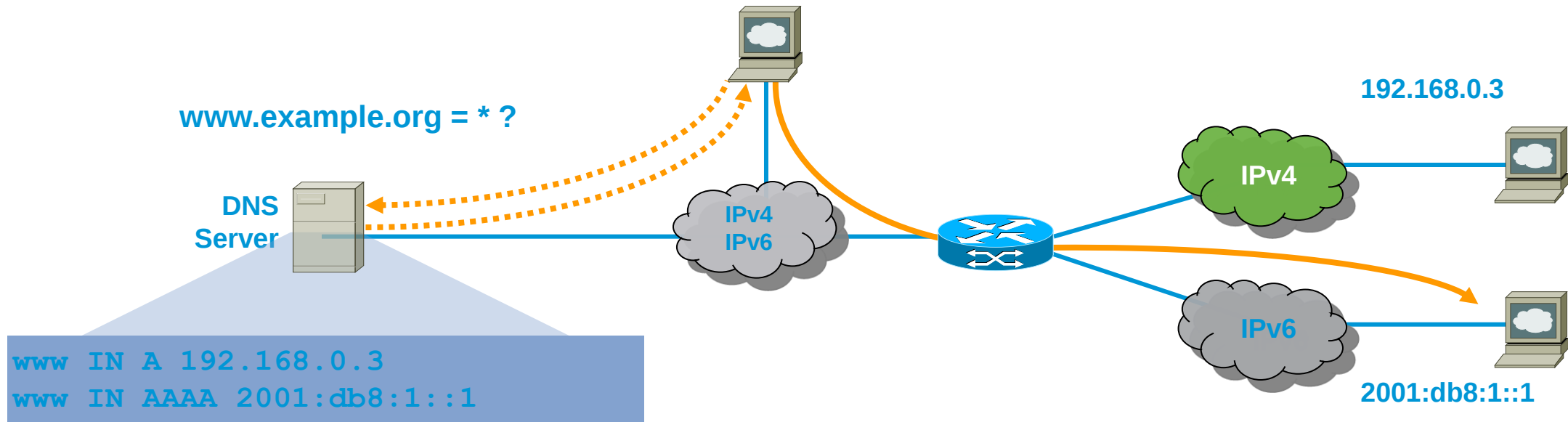


- Dual stack in a device means
 - Both IPv4 and IPv6 stacks enabled
 - Applications can talk to both
 - Choice of the IP version is based on DNS and application preference
- Dual stack at edge does not necessarily mean dual stack backbone

RFC 4038 Application Aspects of IPv6 Transition

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Dual Stack Approach & DNS

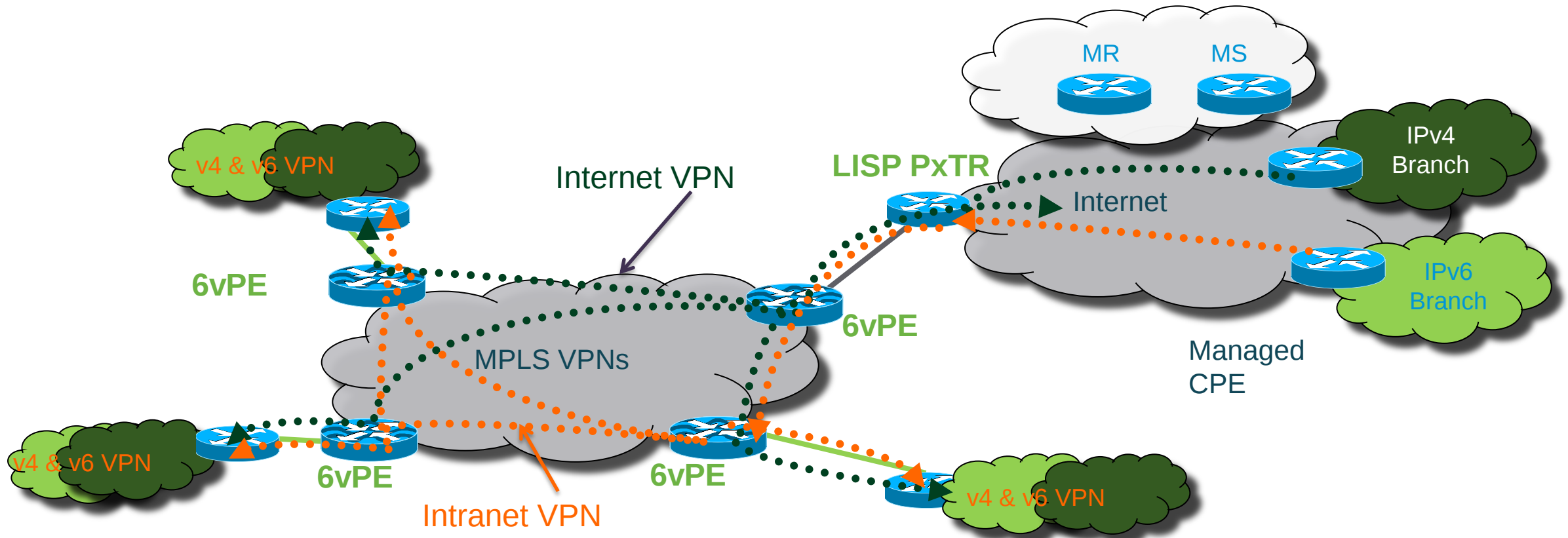


- In a dual stack network an application that is IPv4 and IPv6-enabled:
 - Can query the DNS for **IPv4** records (A) and/or **IPv6** (AAAA) records
 - The transport used for the lookup is not related to the resource record required. e.g. Use IPv4 transport to ask for AAAA records
 - Chooses one address and, for example, connects to the IPv6 address

新的應用與商業模式

Example : IPv6/IPv4 私有網路的延展

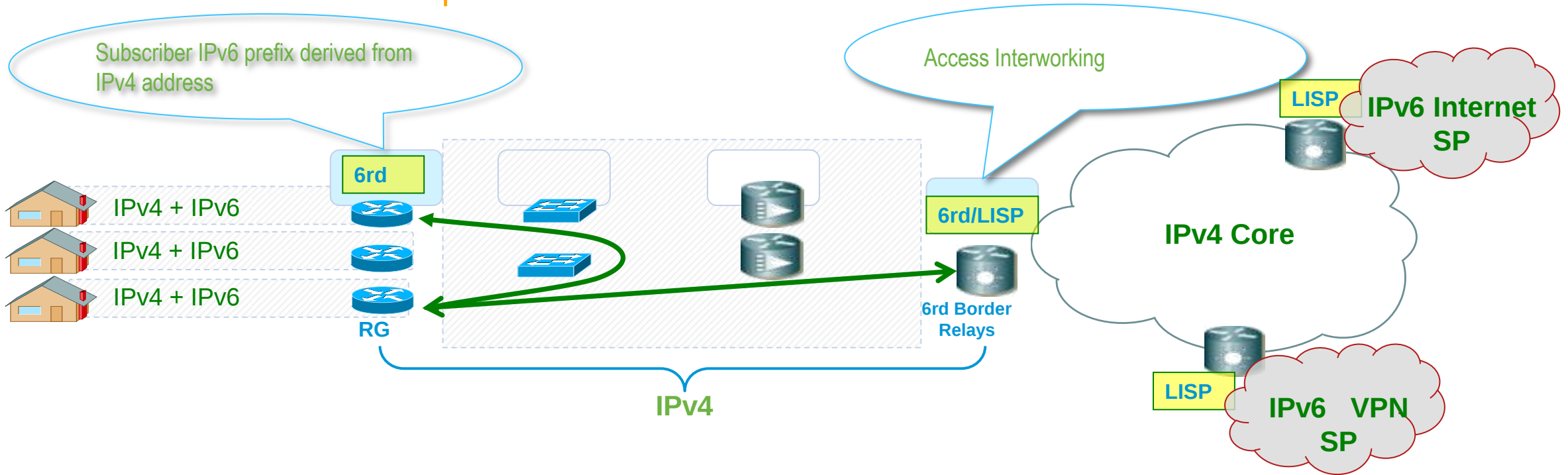
LISP VPN to MPLS VPN Interworking



Example : 家用 IPv6 網路的轉移

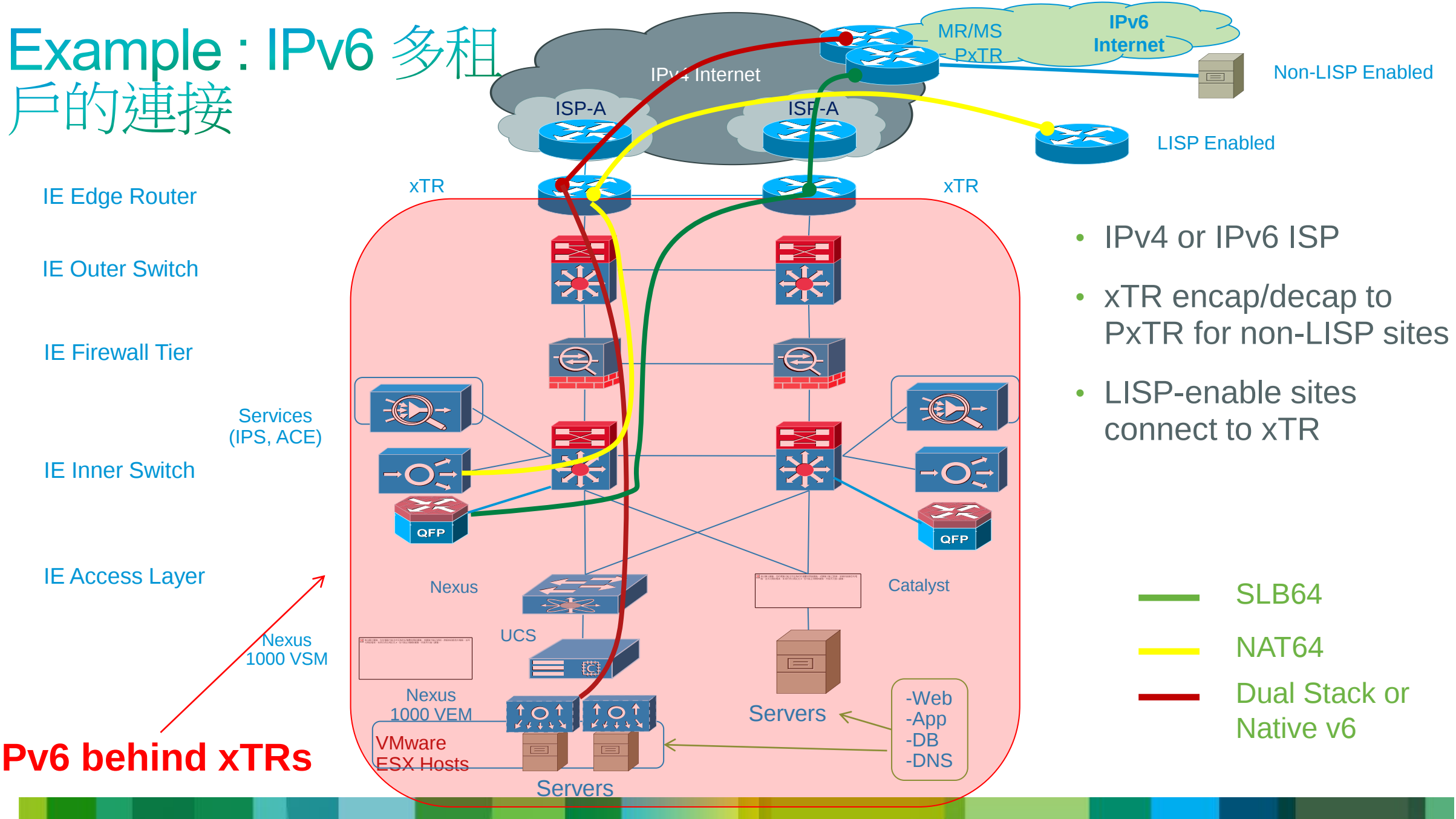
6rd to LISP Interworking

LISP IPv6 Transition Examples – LISP and 6rd...



- Connect Home User to Backend Service Provider

Example : IPv6 多租戶的连接



- IPv4 or IPv6 ISP
- xTR encap/decap to PxTR for non-LISP sites
- LISP-enable sites connect to xTR

- SLB64
- NAT64
- Dual Stack or Native v6

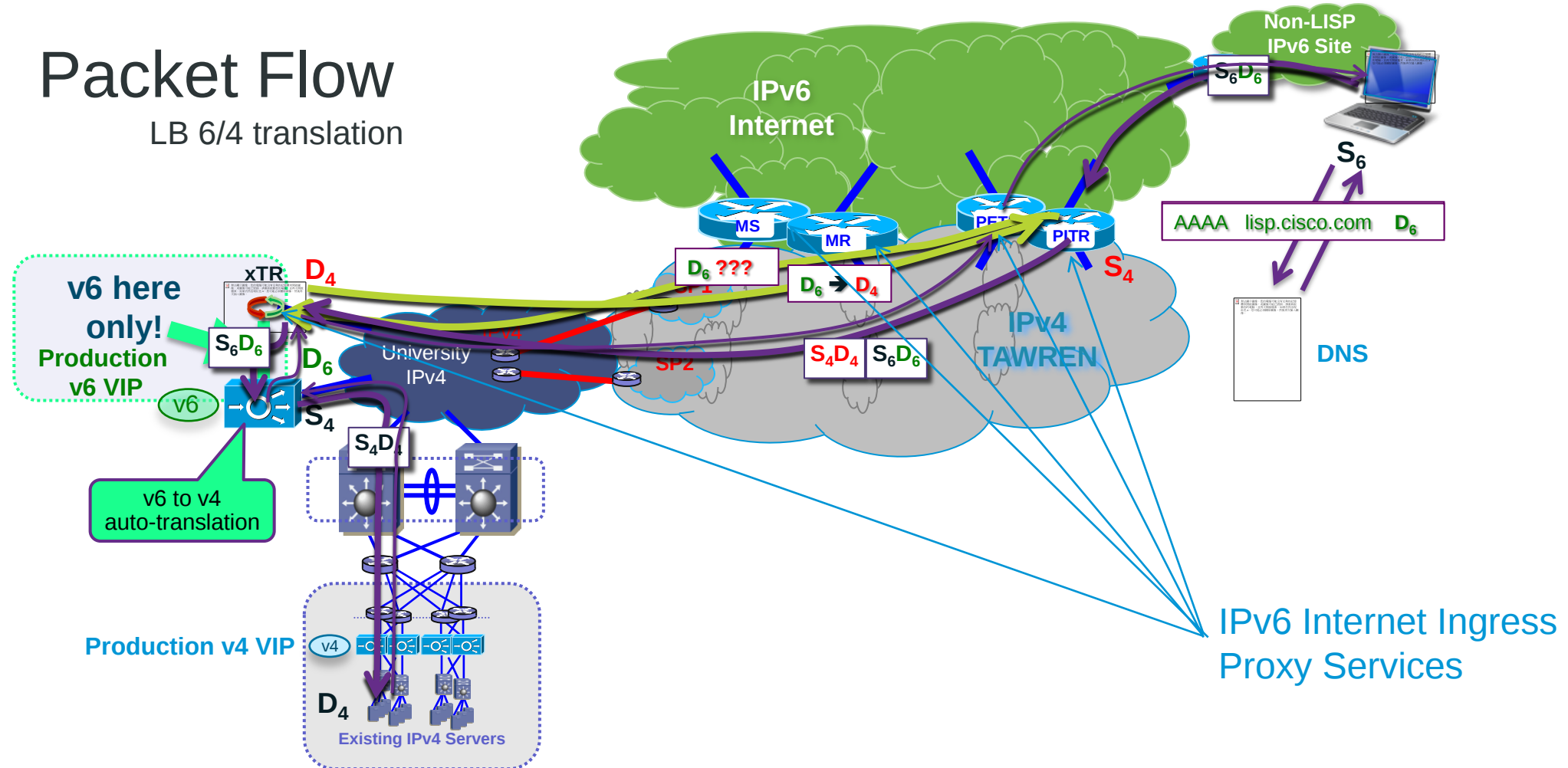
IPv6 behind xTRs

Example : IPv6 Proxy Services

IPv6 Transition – High Level Example: Web Site Access

Packet Flow

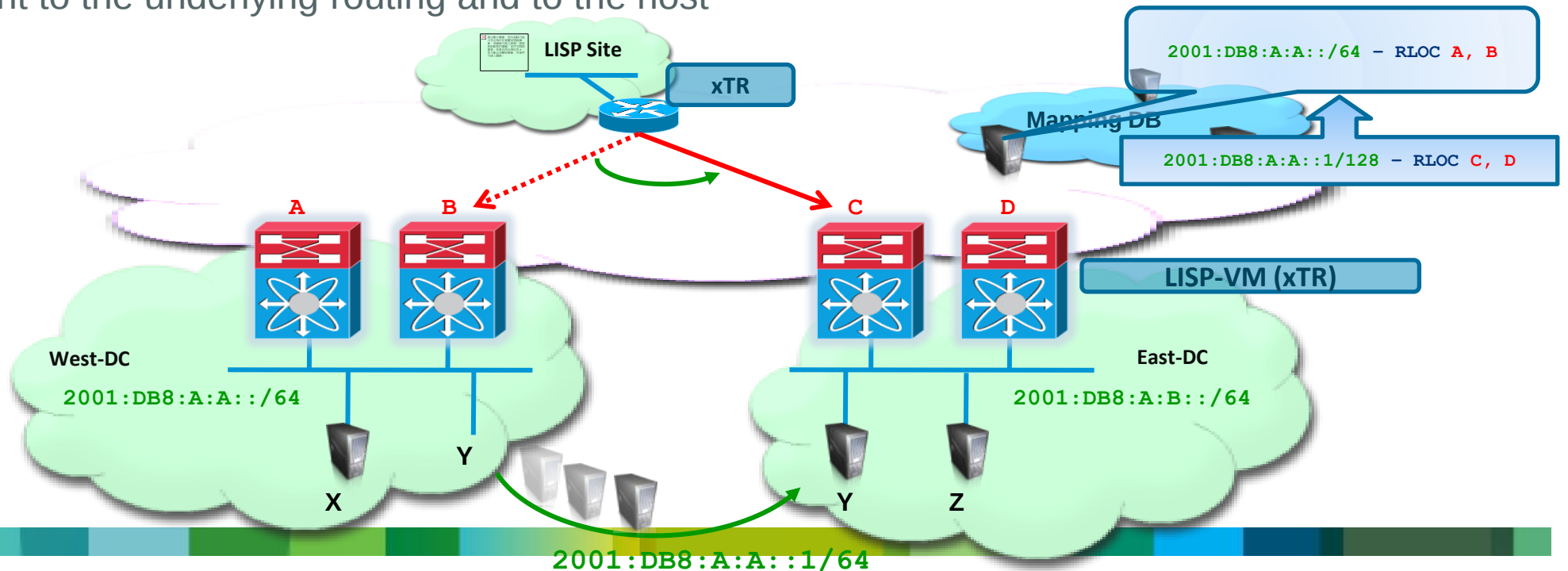
LB 6/4 translation



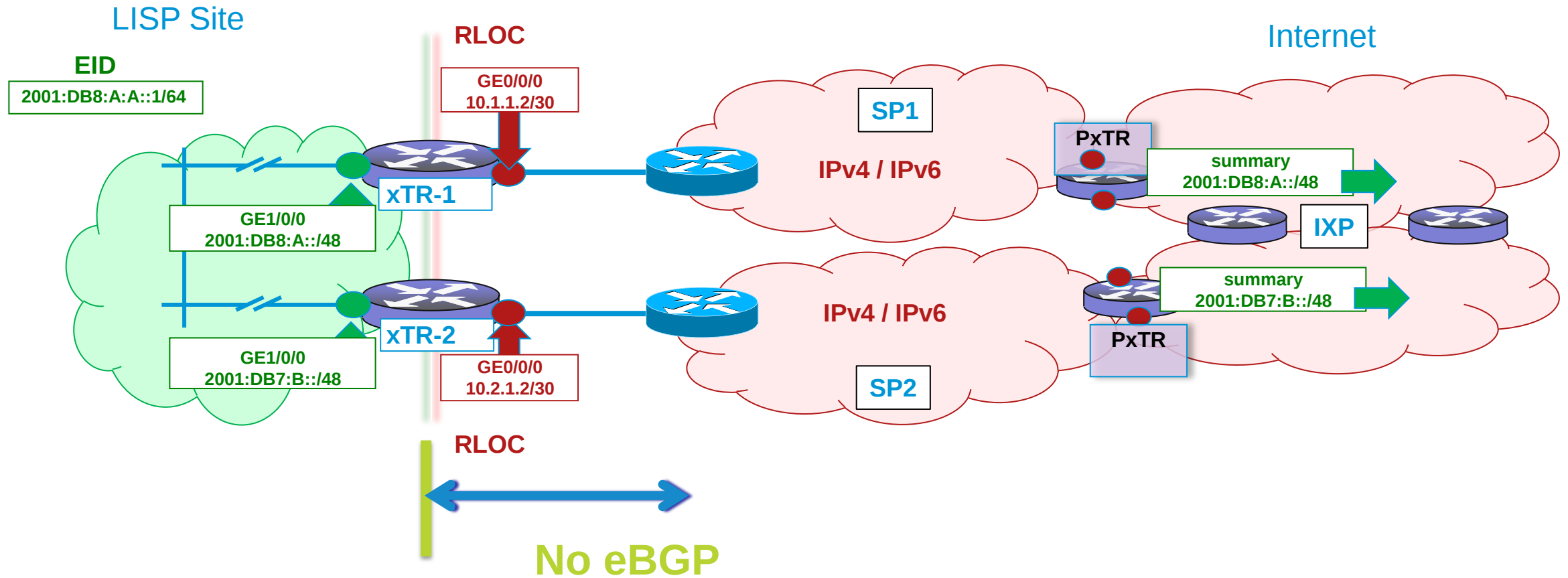
Example : IPv6 在雲端運算環境的應用

Cloud Burst Services (Data Center Host Mobility)

- When a host move is detected, updates are triggered:
 - The host-to-location mapping in the Database is updated to reflect the new location
 - The old ETR is notified of the move
 - ITRs are notified to update their Map-caches
- Ingress routers (ITRs or PITRs) now send traffic to the new location
- Transparent to the underlying routing and to the host



Example : Efficient Multi-homing Without BGP



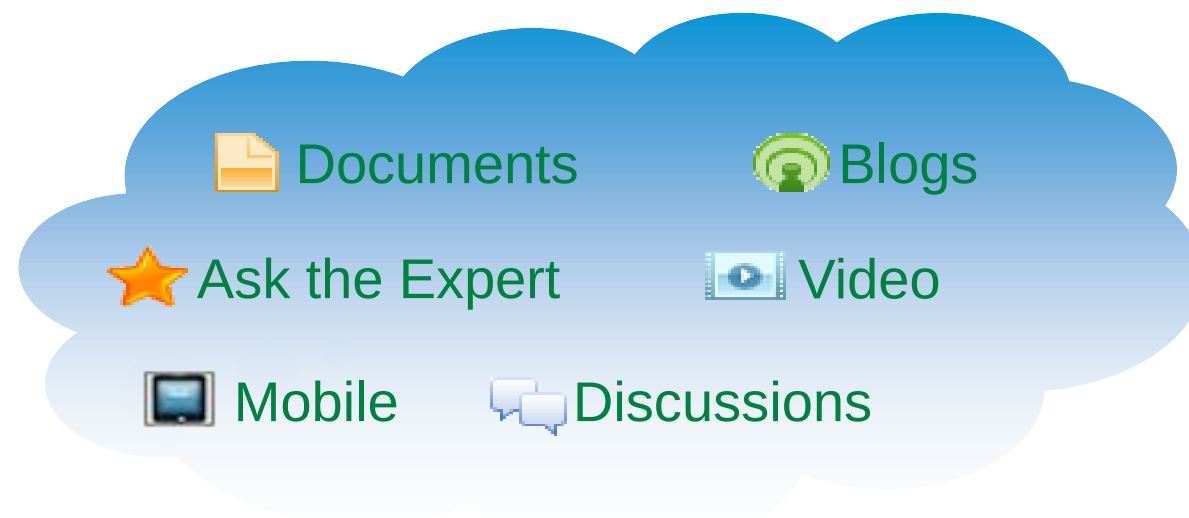


下一步

Join Cisco IPv6 Support Communities!

- **Free** for anyone with Cisco.com registration
- Get **timely** answers to your technical questions
- Find **relevant** technical documentation
- Engage with over 200,000 **top technical experts**
- **Seamless** transition from discussion to TAC Service Request (*Cisco customers and partners only*)
- Visit the Cisco Support Community booth in the World of Solutions for more information

supportforums.cisco.com
supportforums.cisco.mobi



The Cisco Support Community is your one-stop community destination from Cisco for sharing current, real-world technical support knowledge with peers and experts.

Link with your Life Cycle Management

IPv6 Ready Certifications

Cisco first to receive IPv6 Education/Training certification from the IPv6 Forum



Three Cisco training courses received IPv6 Forum certification

- CCNA, CCNP and CCIE
- Cisco Certified Engineers may use the Certified Engineer logo



USGv6 and IPv6-ready logo certifications

Customer Notification September 24, 2010

Cisco Achieves Certifications
Under the New United States
Government Mandate for IPv6

<http://blogs.cisco.com/government/ten-cisco-products-achieve-ipv6-certifications/>

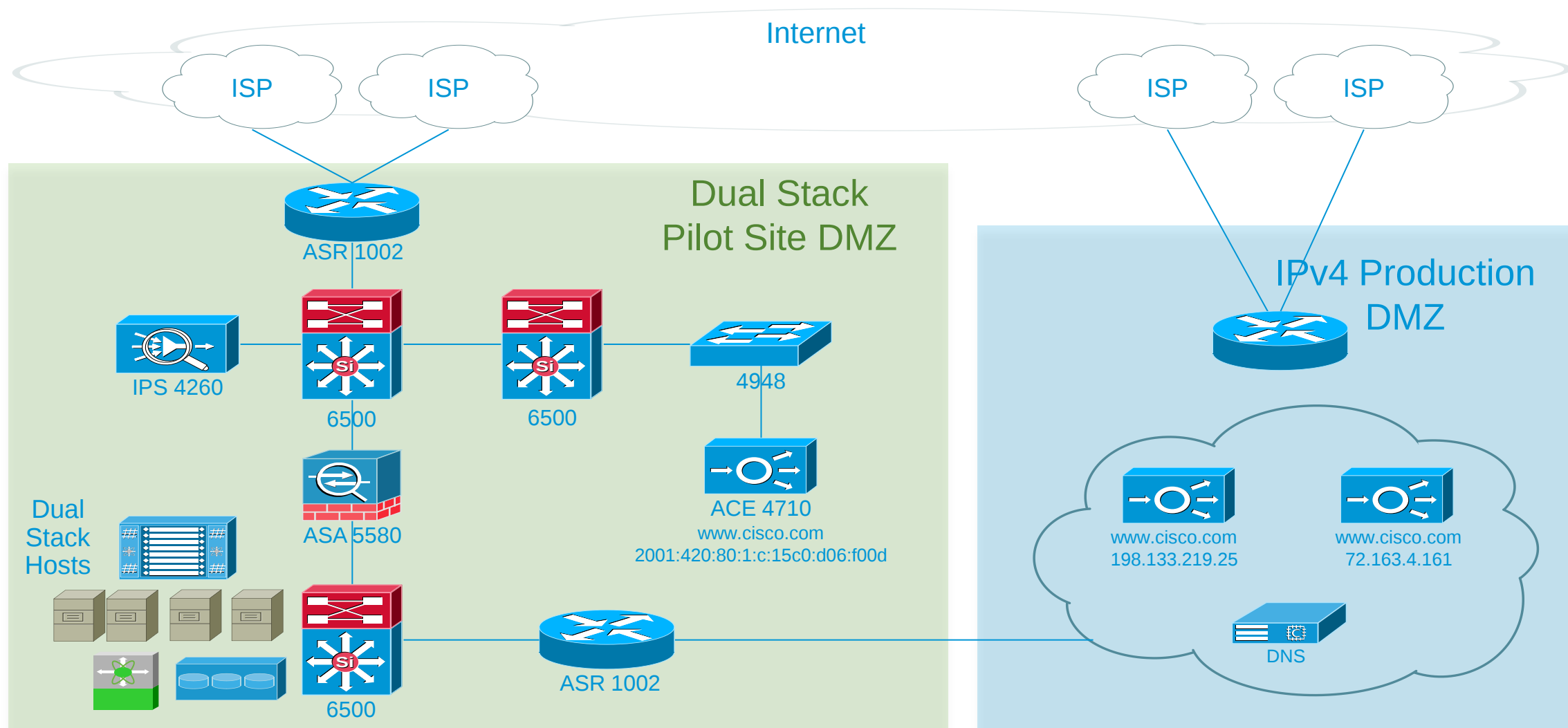
IPv6 Ready Internet Edge Project

How do we proceed?

Business Case Identified / Justified

- 1 – Evaluate Business Model Impact
- 2 – Establish Project Management Team
- 3 - Decide on IPv6 Architecture Strategy
- 4 - Develop Exception Strategy
- 5 - Assessment – Network, Systems, Apps
- 6 – Develop Adoption Timelines, Cost, Procurement
- 7- Obtain Address, Develop Address and Security Plan
- 8 – Detailed Design – Phase 1
- 9 – Test Solution with Apps/ NW Mgmt
- 10- Train Engineering, Operations, Tech

建立先期實驗區



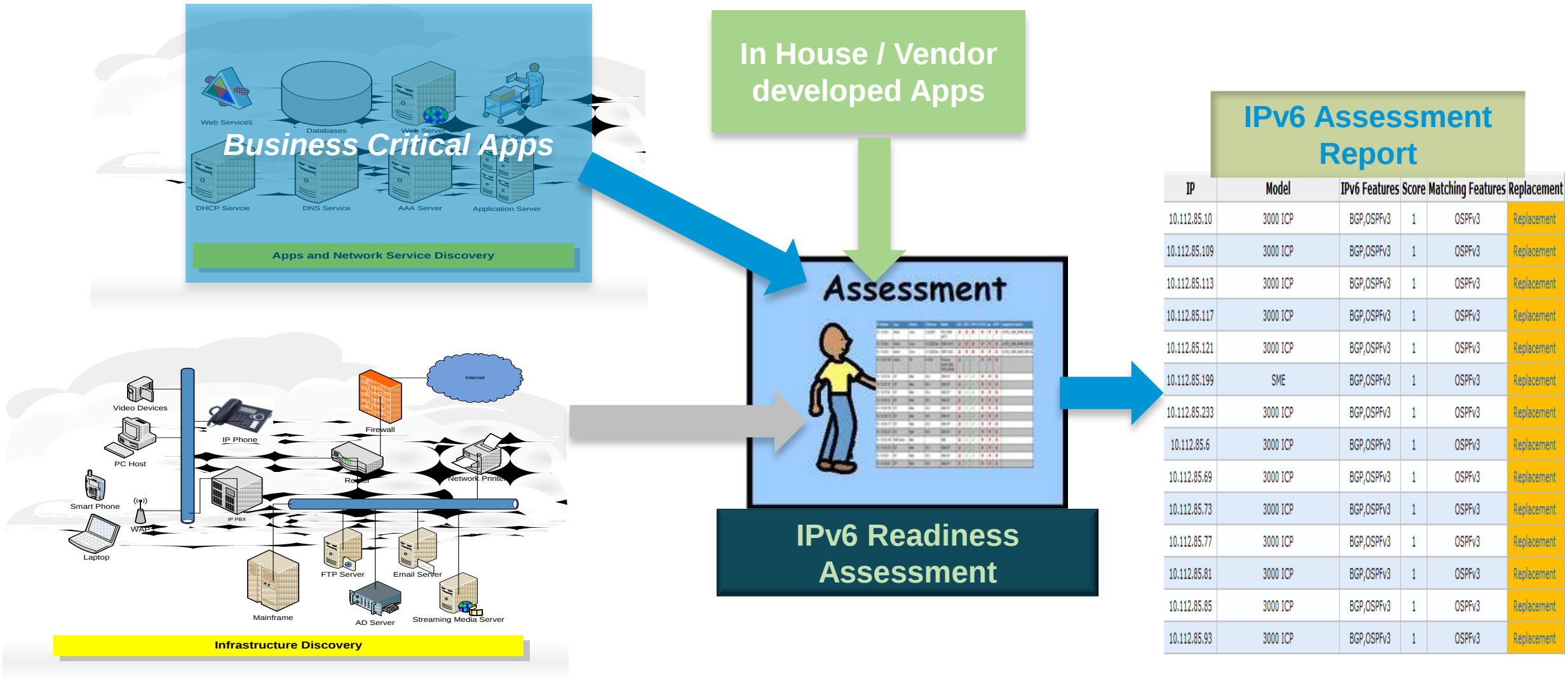
IPv6 Ready Internet Edge Assessment Services

Key Service Features



Service	Included	Requires Additional Service Scoping
Internet Edge / DMZ Assessment	Internet edge / DMZ components: Cisco devices (< 500) non-Cisco devices, servers and applications (< 200) Security design assessment	Assessments for the entire network
Design	Design package with best practice and testing recommendations	Test plan and execution; custom designs have to be scoped separately
Training	One, remote 'knowledge transfer' session	Overall end-to-end network infrastructure migration service related training

Assessment Capabilities –Details





附件

Reference Materials

- Deploying IPv6 in the Internet Edge:
http://www.cisco.com/en/US/docs/solutions/Enterprise/Borderless_Networks/Internet_Edge/InternetEdgeIPv6.html
- Deploying IPv6 in Campus Networks:
<http://www.cisco.com/en/US/docs/solutions/Enterprise/Campus/CampIPv6.html>
- Deploying IPv6 in Branch Networks:
http://www.cisco.com/en/US/solutions/ns340/ns414/ns742/ns816/landing_br_ipv6.html
- New/Updated IPv6 Cisco Sites:
<http://www.cisco.com/go/ipv6> <http://www.cisco.com/go/entipv6>
- Smart Business Architecture – IPv6Guides:
http://www.cisco.com/en/US/netsol/ns982/networking_solutions_program_home.html
- Cisco Network Designs:
<http://www.cisco.com/go/designzone>
- IPv6 Knowledge Base Portal:
<http://www.cisco.com/web/solutions/netsys/ipv6/knowledgebase/index.html>

Reference Materials

- Cisco Advanced

http://www.cisco.com/en/US/services/ps6887/ps10716/docs/IPv6_Service_Overview.pdf

- Cisco IPv6 Address Resources :

http://www.cisco.com/web/strategy/docs/gov/IPv6_WP.pdf

http://www.cisco.com/en/US/docs/solutions/Enterprise/Borderless_Networks/Smart_Business_Architecture/August2011/SBA_Ent_BN_IPv6AddressingGuide-August2011.pdf

- IPv6 Reachability :

http://docwiki.cisco.com/wiki/What_To_Ask_From_Your_Service_Provider_About_IPv6

<http://www.bgp4.as/looking-glasses>

- Ciso Press :

<http://www.ciscopress.com/bookstore/product.asp?isbn=1587142279>

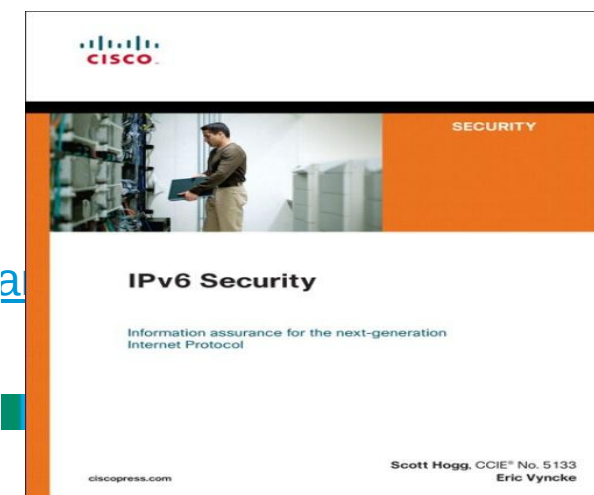
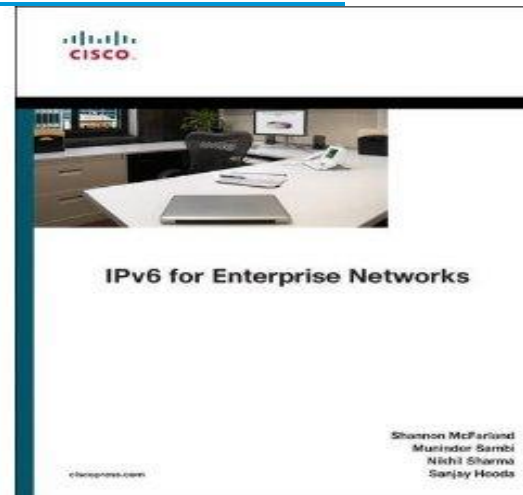
<http://www.ciscopress.com/bookstore/product.asp?isbn=1587052105&rl=1>

<http://www.ciscopress.com/bookstore/product.asp?isbn>

- LISP : <http://lisp.cisco.com/>

- IPv6 Hot Topics (IETF Draft, RFCs, White Paper, CVD

- [\\hkg-filer03a\users-h\hchien\published\NGN_Seminar\](#)



Thank you.

