



IPv6发展趋势、策略与建议

殷康

思科全球首席技术官办公室
大中华区总监

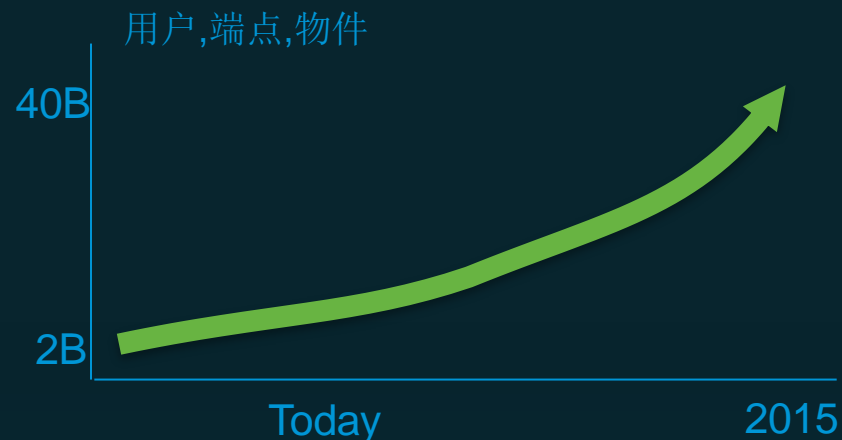
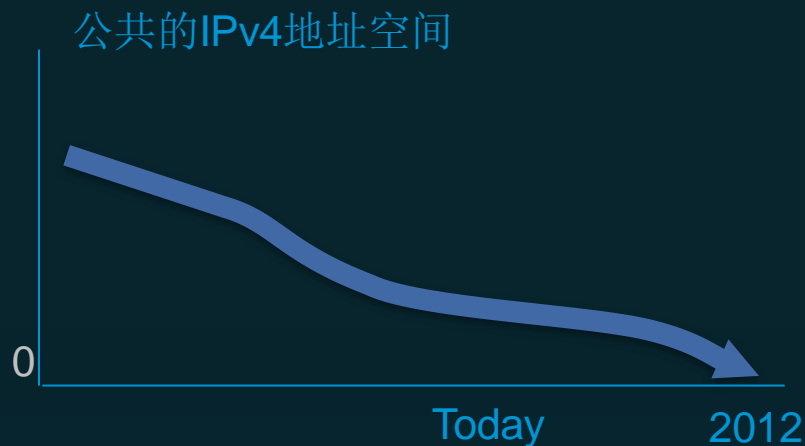
June 9, 2011

Contents

- 格局与关键 **BIG PICTURE**
- 分析与策略 **CLEAR STRATEGY**
- 建议与行动 **SIMPLE EXECUTION**

当前互联网发展最根本的挑战

The ultimate challenges



公共地址资源即将用尽！

→ 地址资源

运营商(特别是中国)将最先面临这一世界难题！

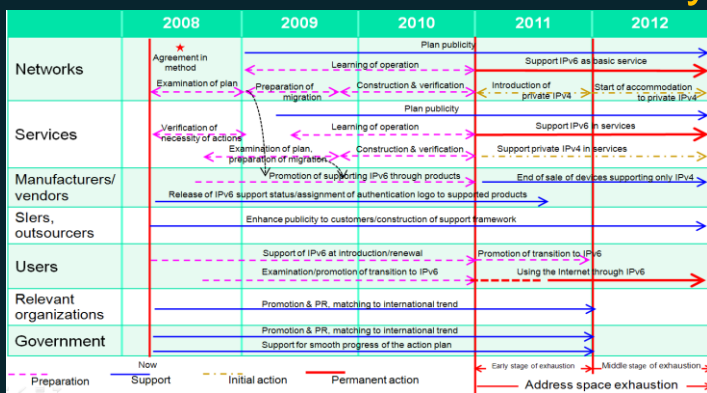
→ 业务增长

问题的提出,比较与解决思路:

同一世界, 同一互联网

典型国家IPv6发展状况及分析

Worldwide IPv6 Status & Analysis



日本

2001年3月颁布的《e-Japan重点计划》支持IPv6

在2006年“新IT改革战略”：2008年，新的设备要兼容IPv6，每个政府部门和机构要IPv6-ready.

2008年9月5日，总务省发起成立“IPv4地址用尽应对小组”

欧盟

希望通过部署IPv6，使欧盟向一些非传统优势

市场进行渗透，例如家庭网络服务，交通行业服务

(如汽车、公交、火车)，IPTV和移动电视，M2M、RFID、传感器网络应用，社会化网络应用

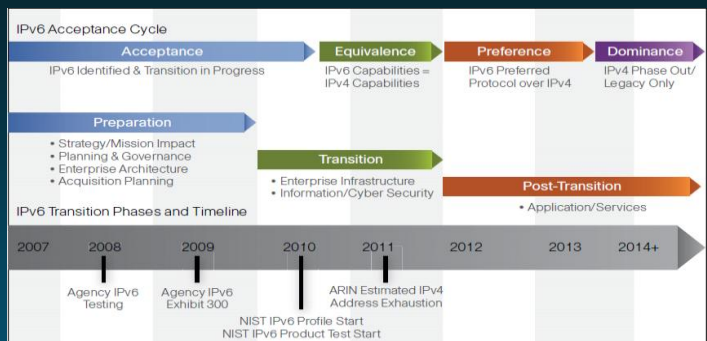
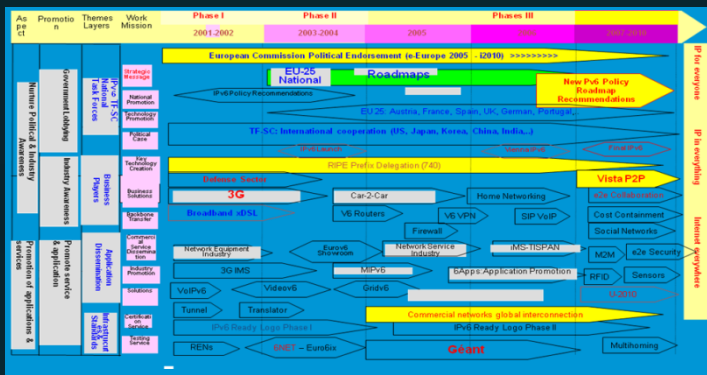
(Internet待2.0)，汽车工业，网络游戏产业。

美国

2010年，IPv6处于“开始被接受”的阶段

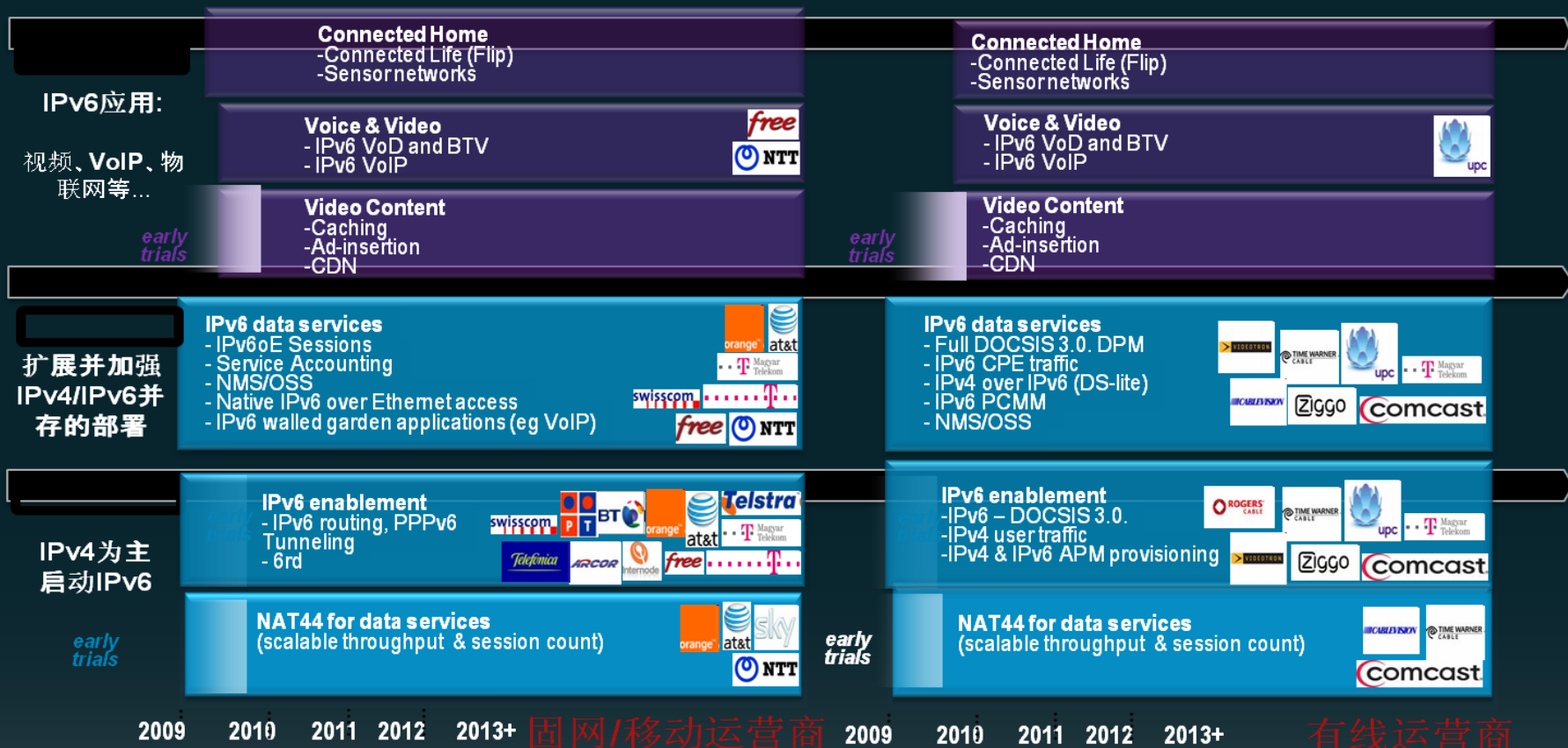
2010年到2012年，网络过渡阶段，v4和v6都处于平等地位

2012年之后作为后过渡阶段，优选IPv6



全球范围内运营商IPv6实践

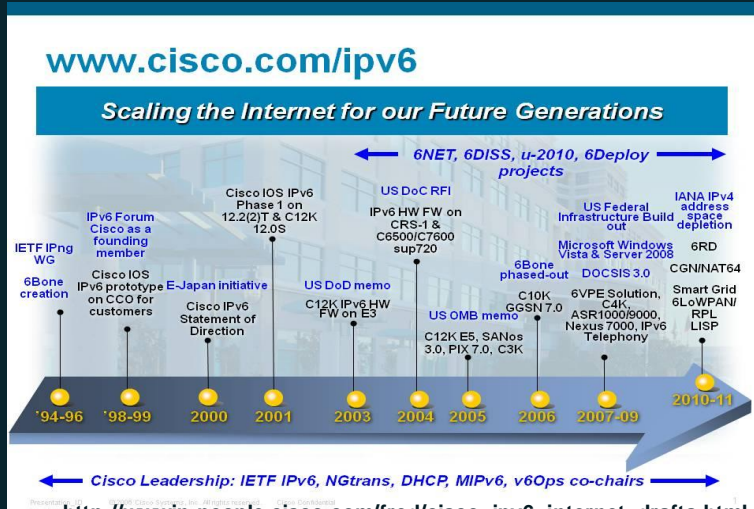
Worldwide SP IPv6 practices



内容提供商

思科的责任和贡献: 领导和推动IPv6过渡

长期推动和全面支持



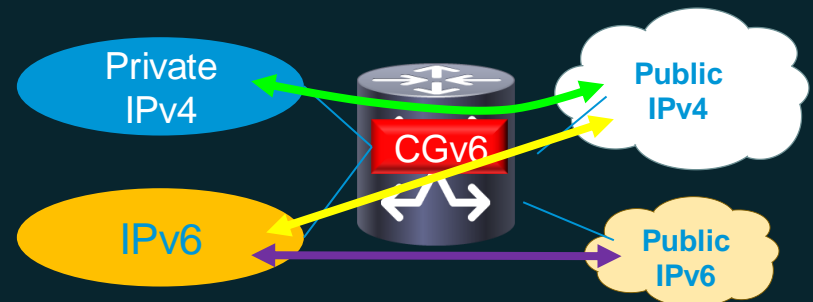
业界独特和领先的运营级技术



不断创新与合作

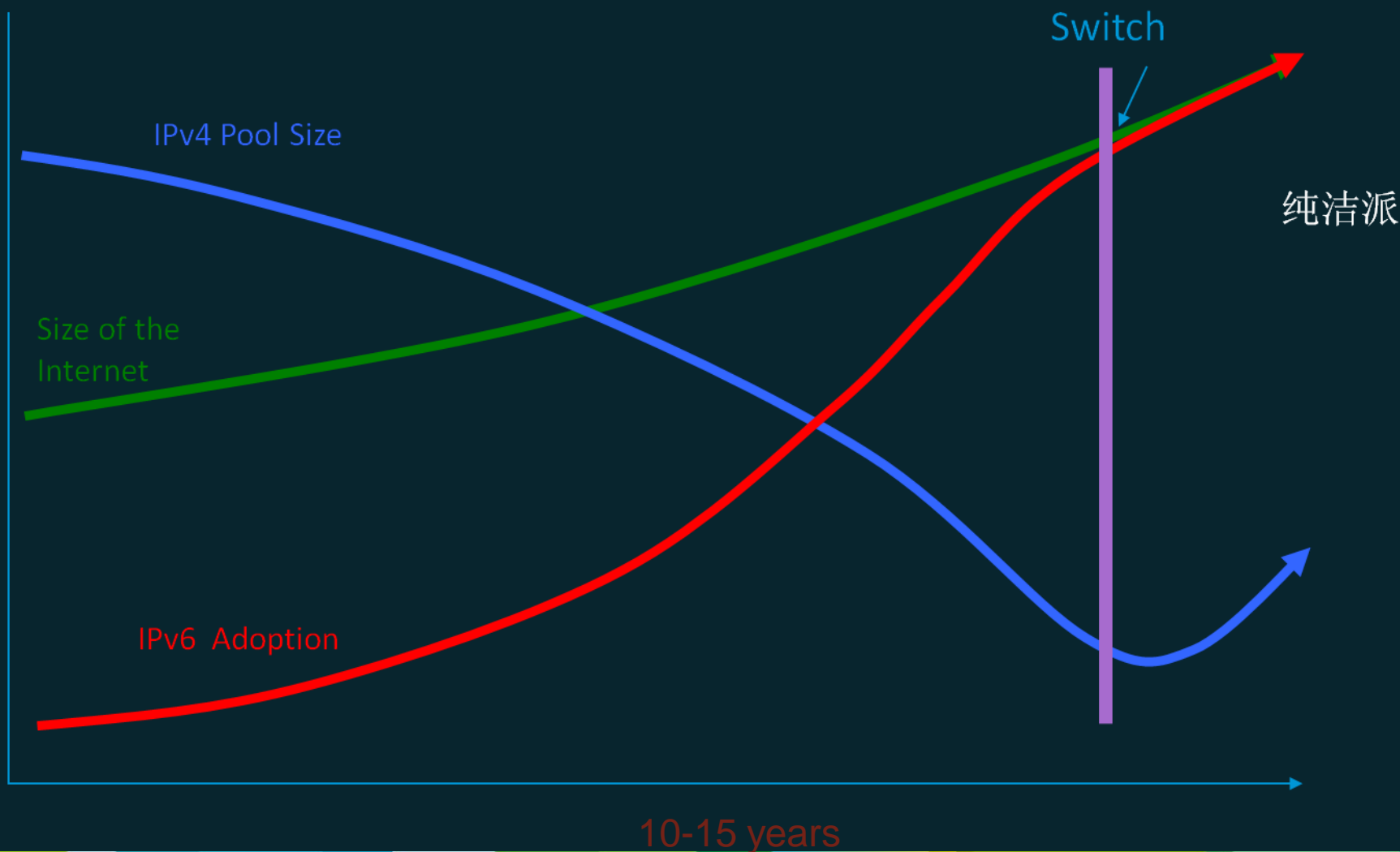
- IETF BEHAVE standards
- 6rd Standardization and Deployment
- BGP IPv6 Core Edge PIC; IPv6FRR
- IPv6 Ext Header Hardware Accelerator
- LISP

最广泛的部署和运营规模的实施



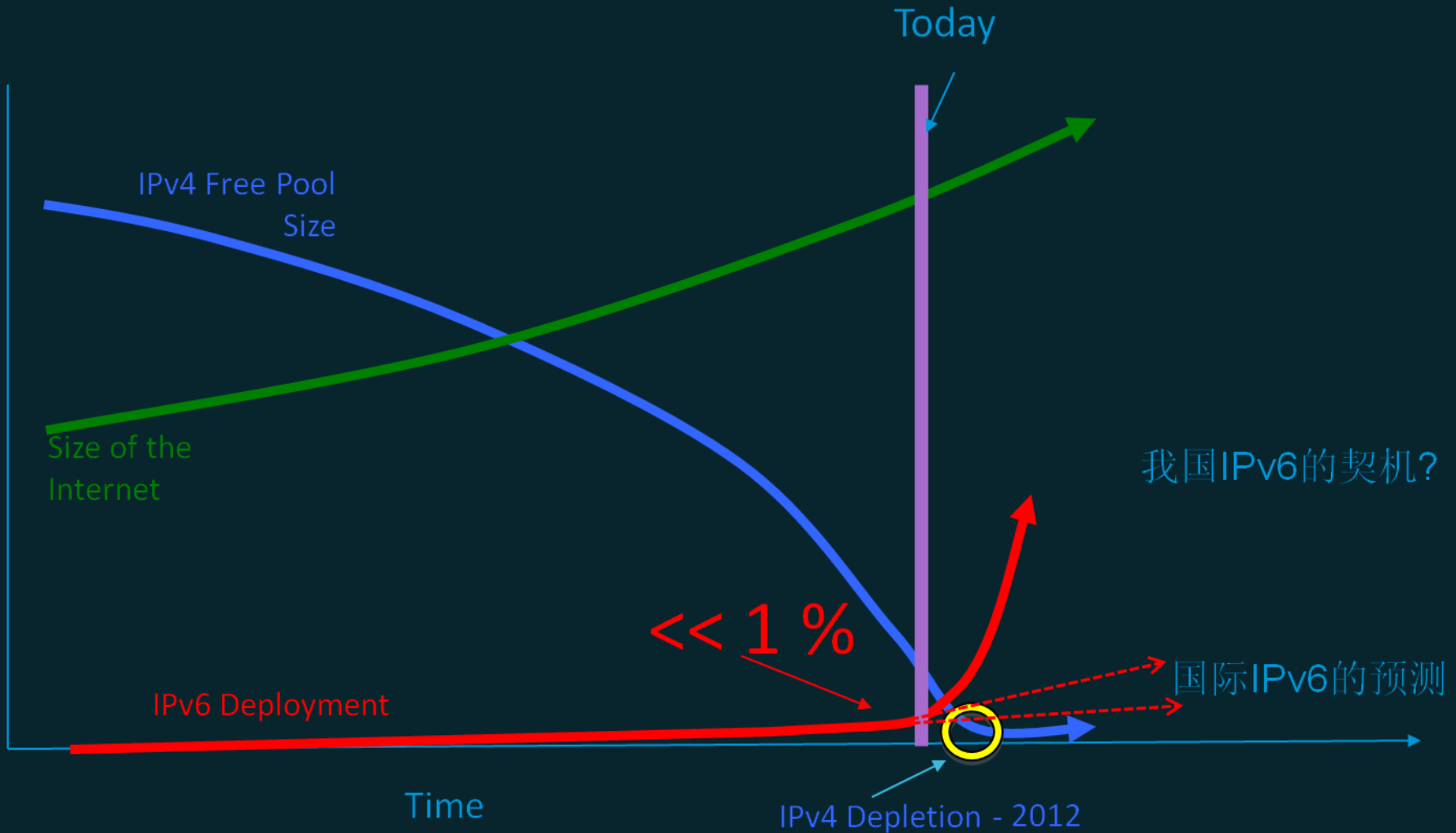
典型的理想技术方案...

同一世界, 同一互联网



当前状况分析及判断

- 未来1-3年是关键



过渡将充满机会和挑战

Need Market Great Leader to Leads the Way

The journey to IPv6 – has met many obstacles



技术兼容

No Backward
Compatibility



投资巨大

Huge Investment
For E2E Solution



任务重时间紧

Not Enough Time
for Big Migration



业务平滑过渡

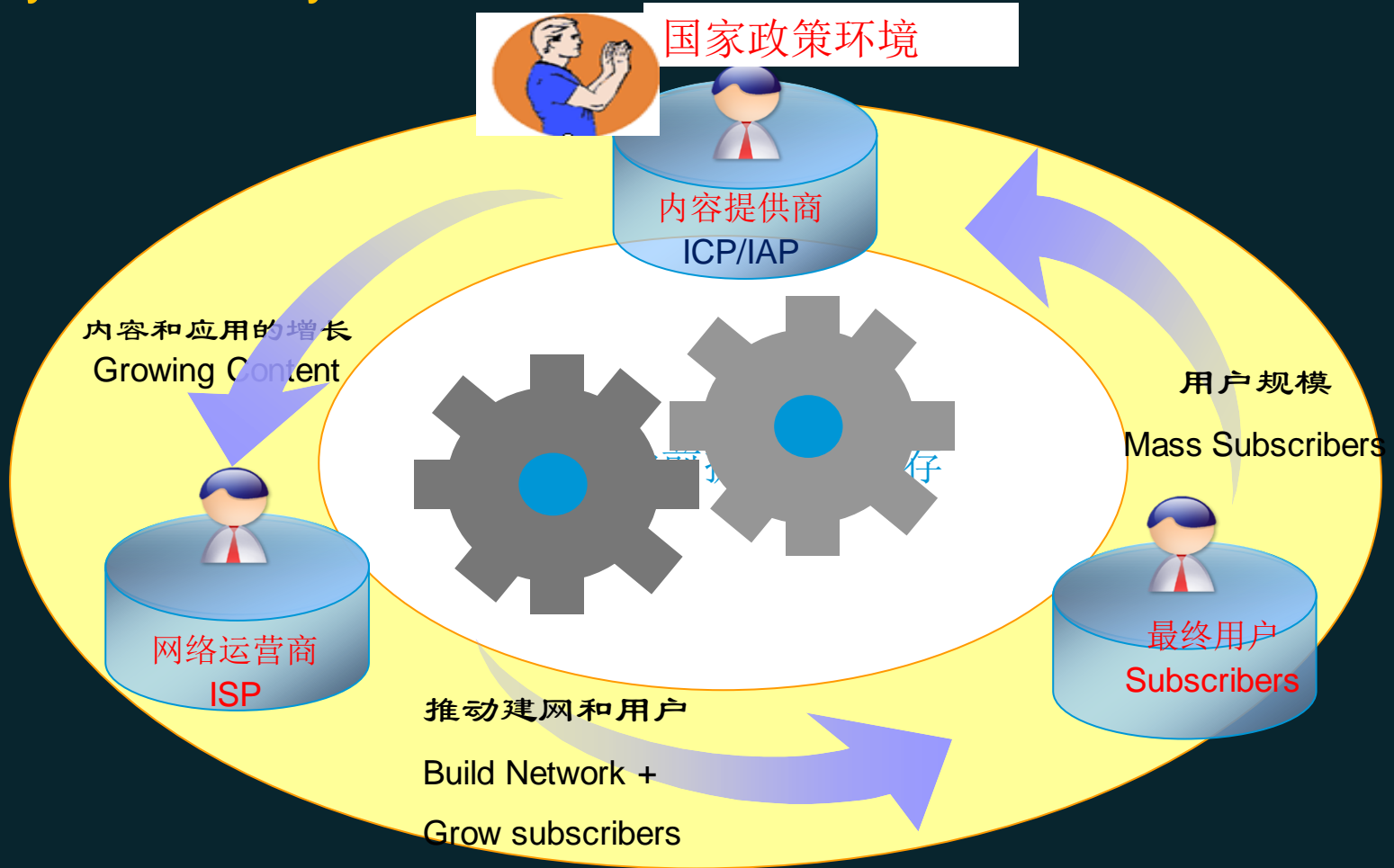
Incompatible
Devices

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产业链的分析: 如何破解将扭力变合力

Eco-System Analysis



用户, 内容, 网络发展, 相互依赖, 地址用尽影响不同时, 容易相互等待, 形成扭力怪圈
扭力都变合力, 将呐喊化为行动, 各个环节都动一步, 正确的一步, 而不需要革命性变化.

内容和应用是向IPv6规模迁移的关键

Content & Application to IPv6 is key

内容/应用是产业链的关键环节，是最迫切需要解决的问题！

我国此领域的认识和行动明显落后！不尽快解决会直接影响运营商的行动

用户, 内容, 网络谁先行?
如何破解, 思科有绝计!

内容和应用支持IPv6技术并向IPv6过渡并不十分困难，采取新事新办，事半功倍!

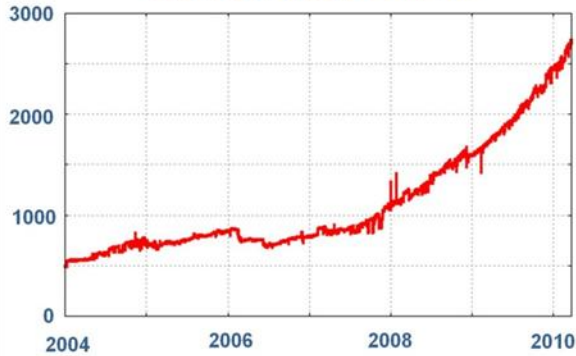
IPv6的推广不仅需要在新兴产业的应用和业务中推广和普及，更有赖于现有的内容和应用向IPv6过渡和迁移。



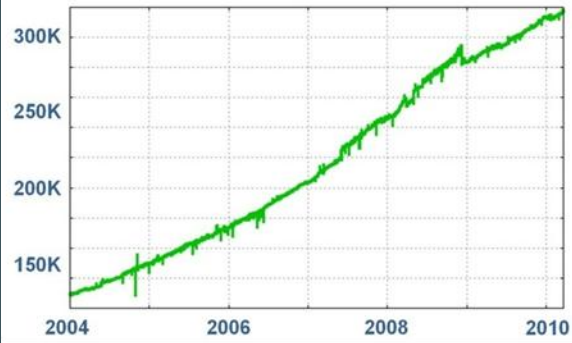
我国最有影响的前100家 (TOP100) 网站要尽早全面支持IPv6，政府机关的公共服务内容和应用网站要尽早支持IPv6。

全球IPv6成长动力

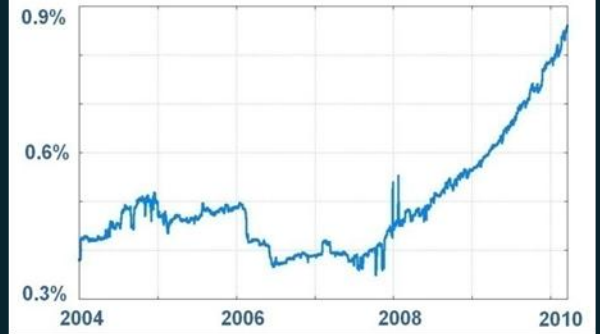
The BGP view of IPv6



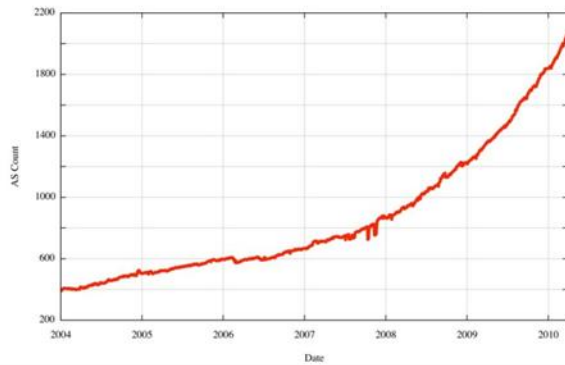
The BGP view of IPv4



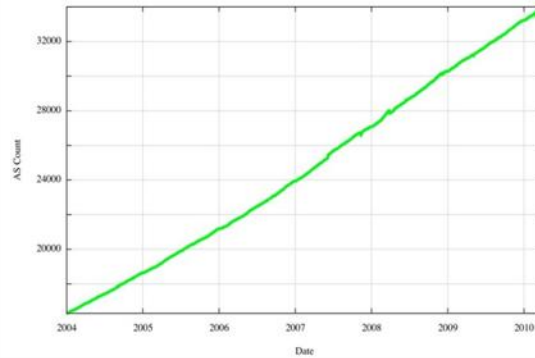
Ratio of IPv6 to IPv4



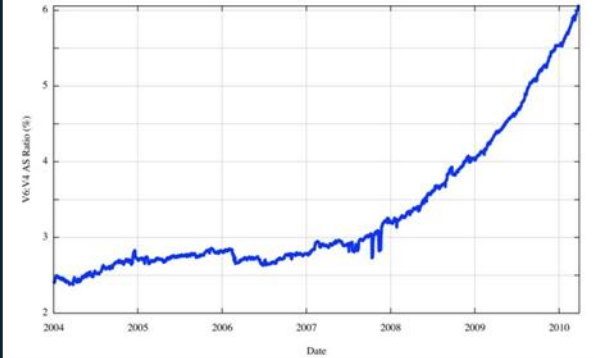
IPv6 AS count



IPv4 AS count

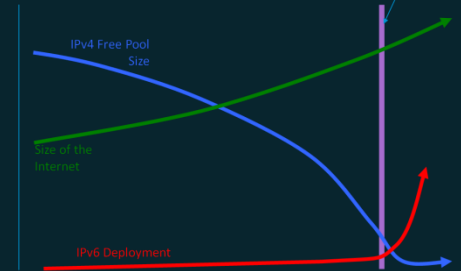


Ratio of IPv6 to IPv4 ASes



IPv6流量与国际领先ICP的行动密切相关

国外内容提供商近1-2年,开始启动支持IPv6



思科网站已支持IPv6

currently www.ipv6.cisco.com

File Edit View History Bookmarks Tools Help

<http://www.ipv6.cisco.com/>

Most Visited IEP Projects - CEC - Ci... Task Tracking Tool Networking (NW) - CE... EDCS - IT:Infrastruct... Quicken® Software: ... NDCS Architecture - N...

Cisco System... Architecture Proces... My View - Cisco Quad My View - Cisco Quad My View - Cisco Quad My View - Cisco Quad My View - Cisco Quad

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Done 2001:420:80:1::5

世界IPv6日

思科率先倡导和组织

每环节一小步，业界一大步！

The screenshot shows the IPv6 Day website interface. At the top, it says "IPv6日" and "www.ipv6day.cn". Below the navigation bar, there is a banner for "IPv4 → IPv6". The main content area is titled "参与IPv6日的网站名单" (List of websites participating in IPv6 Day) with a date of "2011-3-22 17:07:12". The text states: "全球IPv6日/世界IPv6日活动面向全球的公司、研究机构、和IPv6产业相关者，目前主要是以美国欧洲的业者参与为主，以互联网/网站企业和运营商/ISP参与为主。此次支持IPv6日的网站名单如下：" (The global IPv6 Day/World IPv6 Day activity is open to companies, research institutions, and IPv6 industry-related parties worldwide. Currently, participation is mainly from the US and Europe. It is primarily driven by internet/web companies and operators/ISPs. The list of websites supporting IPv6 Day is as follows:)

Cisco (www.cisco.com)	Meebo (www.meebo.com)	Genius (www.genius.com)
W3C (www.w3.org)	Universidad Nacional Autonoma de Mexico (www.unam.mx)	Rensselaer Polytechnic Institute (www.rpi.edu)
NYI NET (www.nyi.net)	Host Europe (www.hosteurope.de)	Xiphastec (www.xiphastec.com)
Tom's Hardware (www.tomshardware.com)	NUST School of Electrical Engineering and Computer Science (seecs.nust.edu.pk)	Twenga (www.twenga.com)
		Jolokia Networks

PARTICIPATING WEBSITES

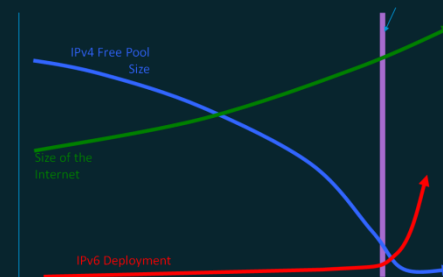
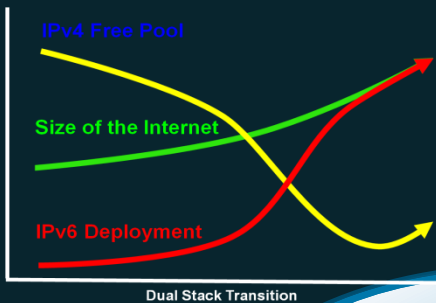
See below for other participating organisations

Show entries Search:

Join Order	Participants	IPv6 Page	Participating Websites
1	Google		www.google.com www.youtube.com
1	Facebook		www.facebook.com
1	Yahoo!		www.yahoo.com
1	Akamai		www.akamai.com
1	Limelight Networks		www.limelightnetworks.com
1	Youtube		www.youtube.com
1	cisco.com		www.cisco.com
8	meebo.com		www.meebo.com
9	genius.com		www.genius.com
10	W3C		www.w3.org
11	Universidad Nacional Autonoma de Mexico		www.unam.mx
12	Rensselaer Polytechnic Institute		www.rpi.edu
13	NYI NET		www.nyi.net
14	Host Europe		www.hosteurope.de
15	Xiphastec		www.xiphastec.com
16	Tom's Hardware		www.tomshardware.com
17	NUST School of Electrical Engineering and Computer Science		www.seecs.edu.pk
18	Twenga		www.twenga.com
19	Plurk		www.plurk.com
20	Terra (Brazil)		www.terra.com.br

IPv6部署的基本路线

同一世界, 同一互联网



基本战略

纯洁派

现实派

并存路经

(两代网并存工作)

互通路经

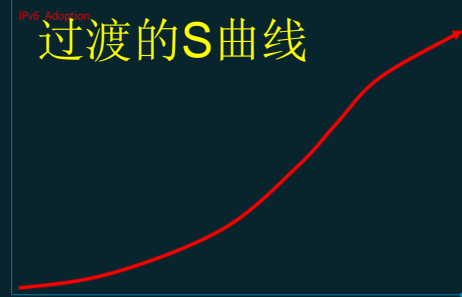
(两代网融合一体)

过渡技术

(双栈、隧道, 单栈, 翻译)

过渡的基本方针:积极,简化,逐步而有序

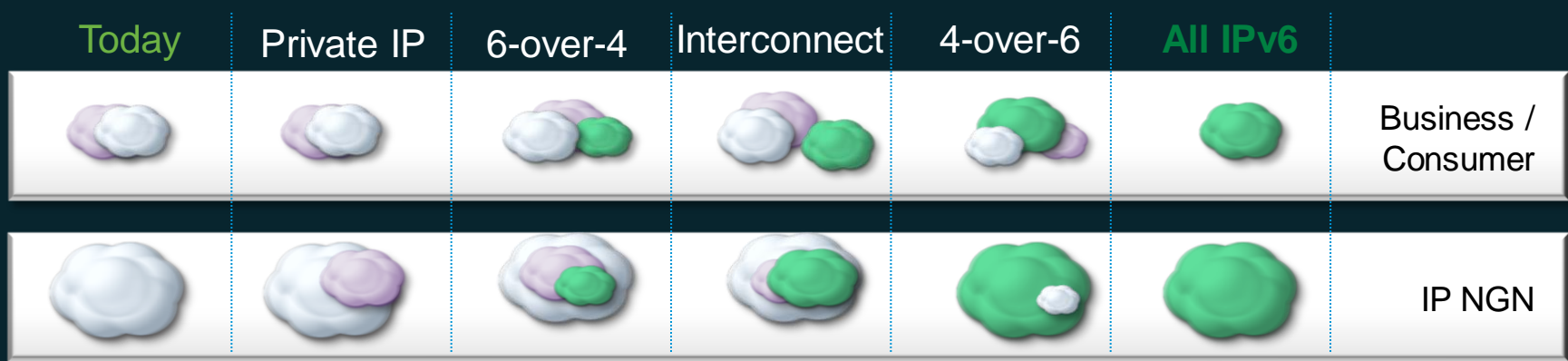
Advocate, Simplify, Orderly, Incremental Transition,



新应用,新业务,新用户率先, 抢占先机与优势,促进技术全面迁移

逐步引入新技术, 业务和市场共存共融

延续已有技术架构, 确保业务和商务平稳成长



简化策略原则

Simplicity & Place In Network (PIN)

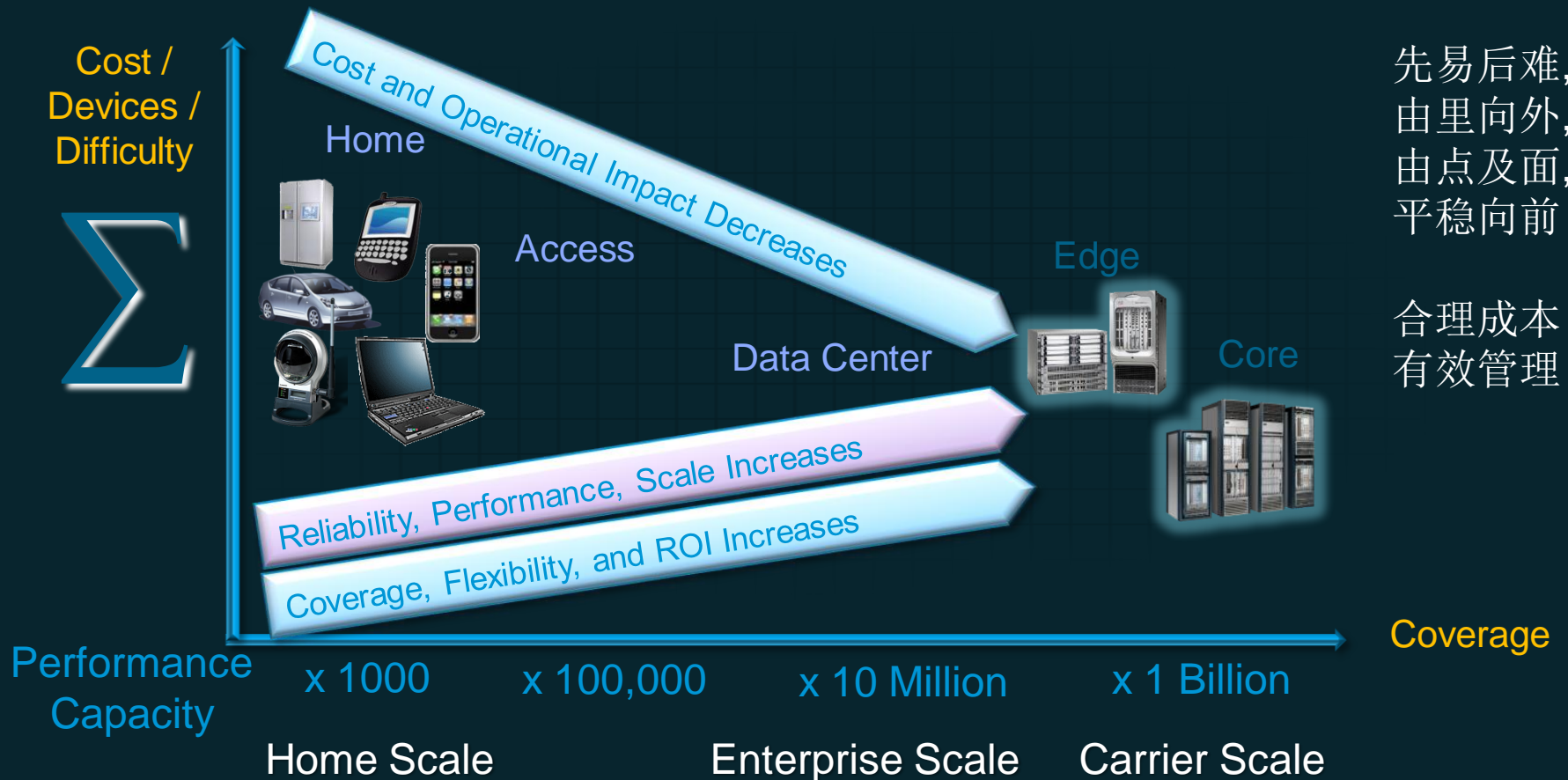
	部署的范围和难度 Scope & Ease of Deployment	特征 Characteristics
No PIN	Continuous Deployment (Simple)	Have enough IPv4 & want to wait & see, "Head in Sand"
1 PIN	Single Box Deployment (Medium)	Translation: Address Family Translators (AFT) will typically be housed in one place in the network.
2 PINs	Coordinated Deployment (Hard)	Tunnels: Overlay networks are a classic way to get an early technology deployment. Still, there is a need for coordination between tunnel endpoints in different administrative domains.
Peering PINs	Coordinated Deployment (Harder)	Trading: Control Plane credentials (usually encrypted) need to be passed between federated entities to validate that a requested transaction is to be trusted
All PINs	Ubiquitous Deployment (Hardest)	IPv6 Native / Dual-stack: Support for Native IPv6 on all devices within a domain

运营商IPv6发展的架构策略:逐步,有序

Technology Architecture Strategy

为何要由里往外 Why Begin at Core / Edge?

scale, performance and impact are maximized in the core and edge



先易后难,
由里向外,
由点及面,
平稳向前

合理成本
有效管理

思科运营商IPv6的策略与部署

Cisco SP IPv6 Deployment Strategy

Preserve
确保平稳



- Carrier-Scale Address Translator
- Private IP Subscriber Addressing

Protect the existing IPv4 Investment for large scale deployment,
Preserve the service & business continuity or buy time for planning IPv6 deployment

Prepare
逐步引入



- Dual-Stack Core Infrastructures
- Address Translators
- Encapsulation and Tunneling

Introduce IPv6 support & deployment gradually
To deliver IPv6 service alongside IPv4

Prosper
内容驱动



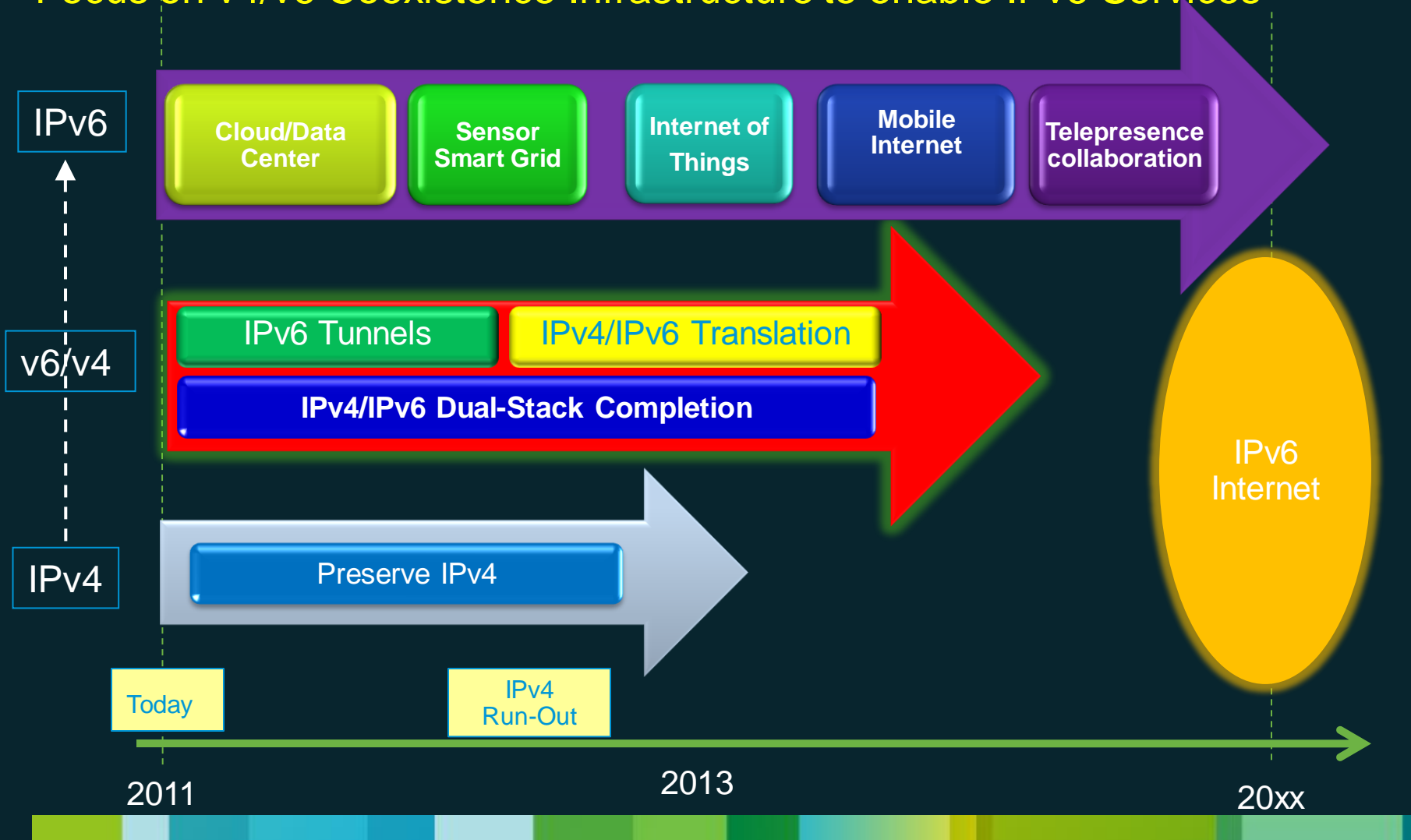
- Ubiquitous IPv6 Services
- IPv6 Mobility / Global Accessibility
- Wireless Sensor Network

For emerging & accelerating service such as mobile Internet, IoT, smart grid & S+CC, leverage IPv6 innovation at most first, and transit all service later

运营商IPv6的迁移步骤-内容驱动

SP IPv6 Transition

Focus on v4/v6 Coexistence Infrastructure to enable IPv6 Services

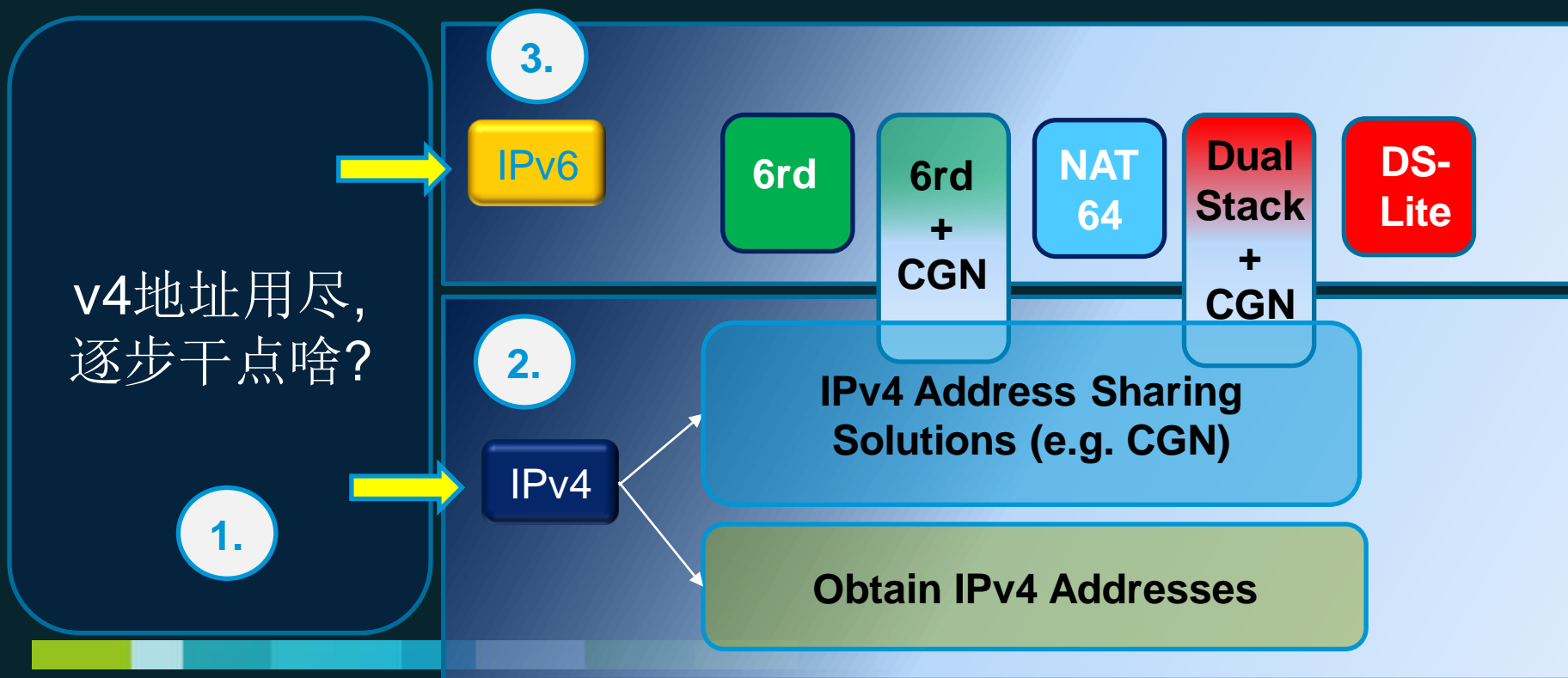
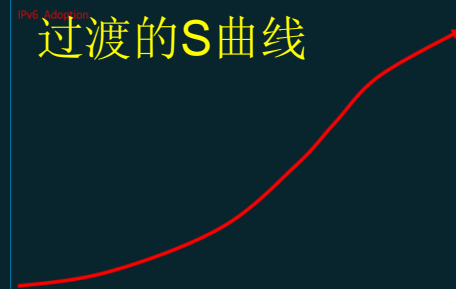


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- 建议与行动 **SIMPLE EXECUTION**

着眼全局,简化迁移策略

1. 尽快对网络进行评估,审计和规划
2. 制订和实施近期和长期应对策略和方案
3. 逐步确定何时,何处,如何引入v6



思科全面的IPv6业务



IPv6 Discovery Service

Guidance in the early stages of considering a transition to IPv6



IPv6 Assessment Service

Determine how your network needs to change to support your IPv6 strategy



IPv6 Planning and Design Service

Designs, transition strategy, and support to enable a smooth migration



IPv6 Implementation Service

Validation testing and implementation consulting services

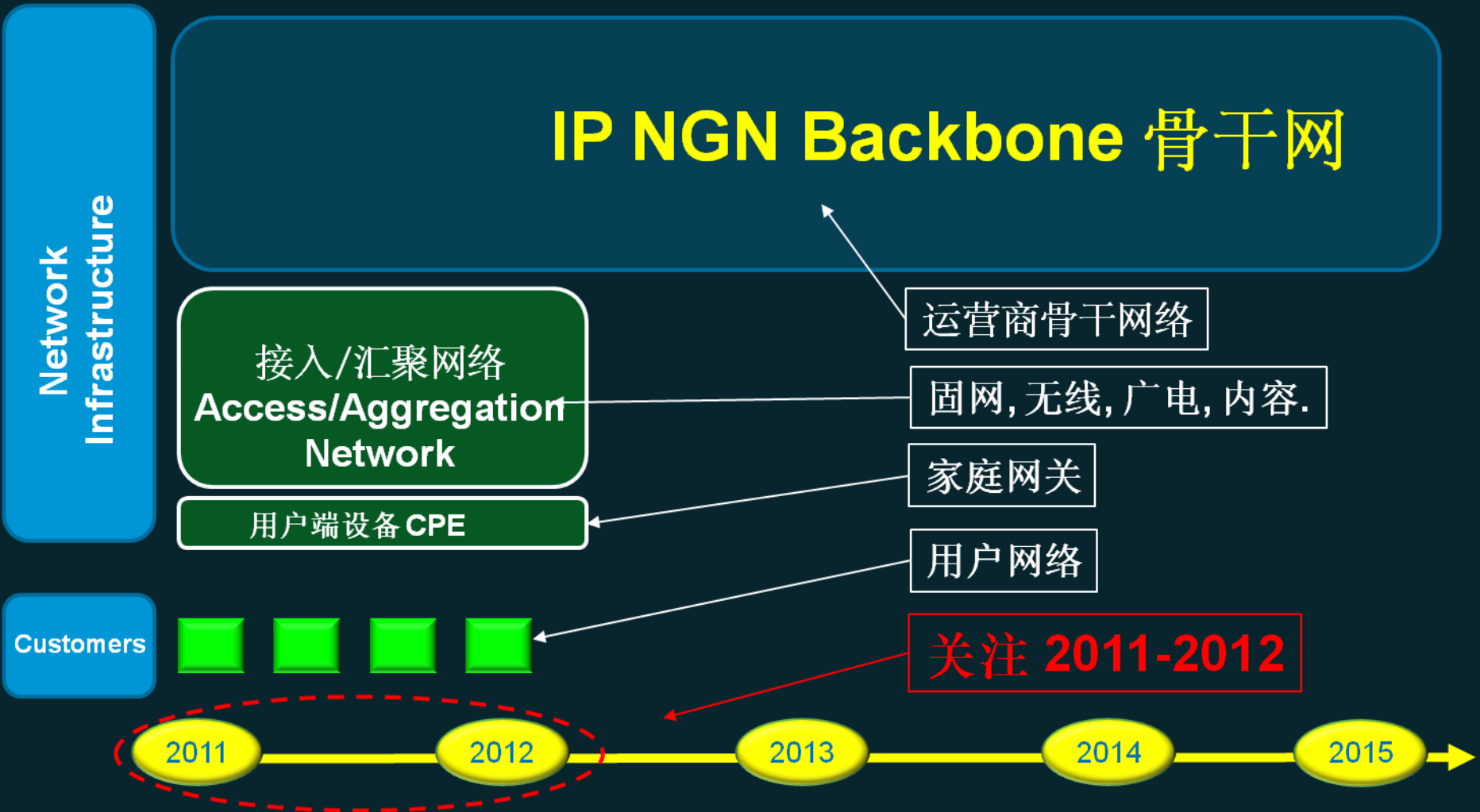


Network Optimization Service

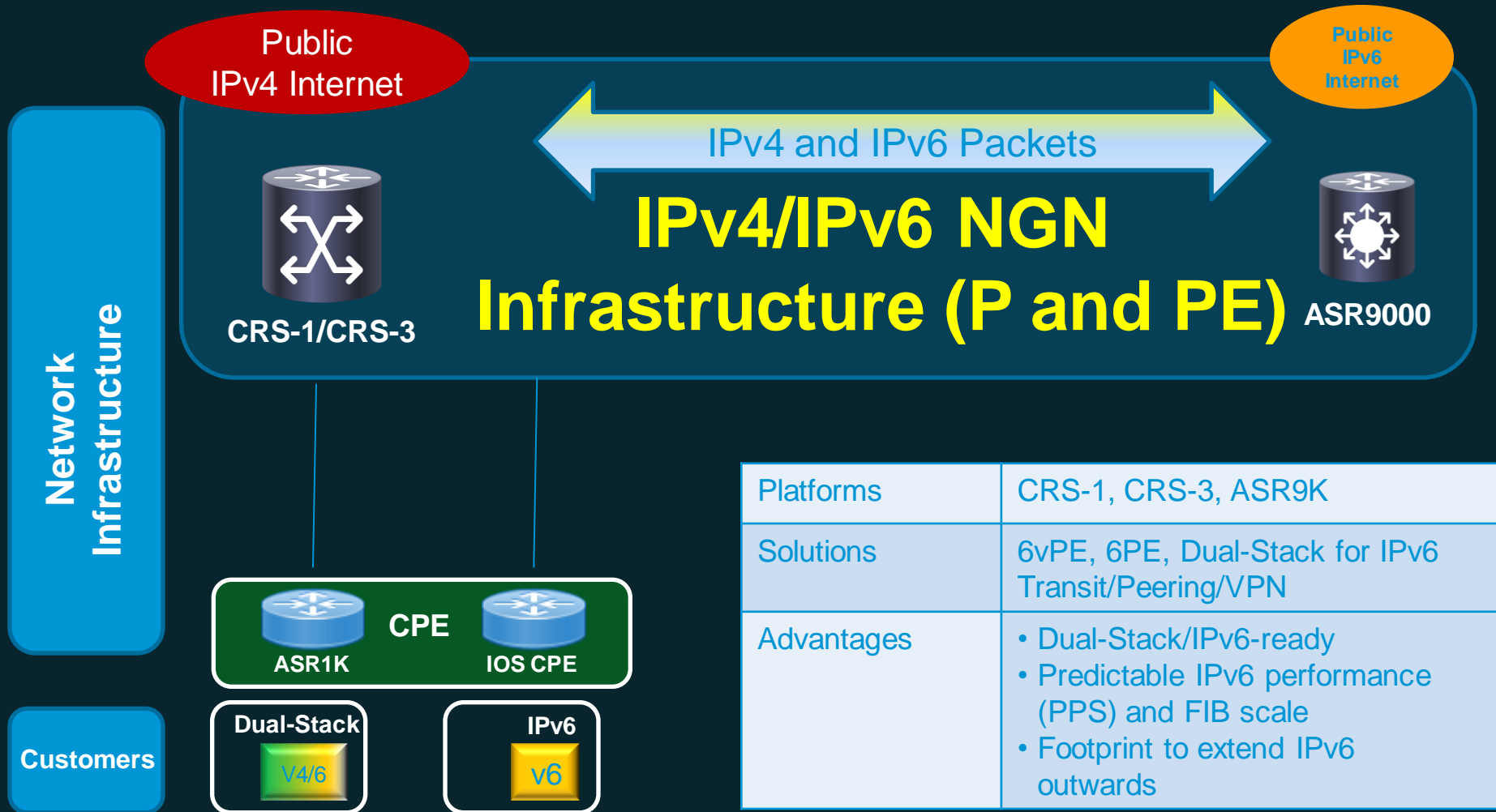
Absorb, manage, and scale IPv6 in your environment

A Phased-Plan Approach for Successful IPv6 Adoption

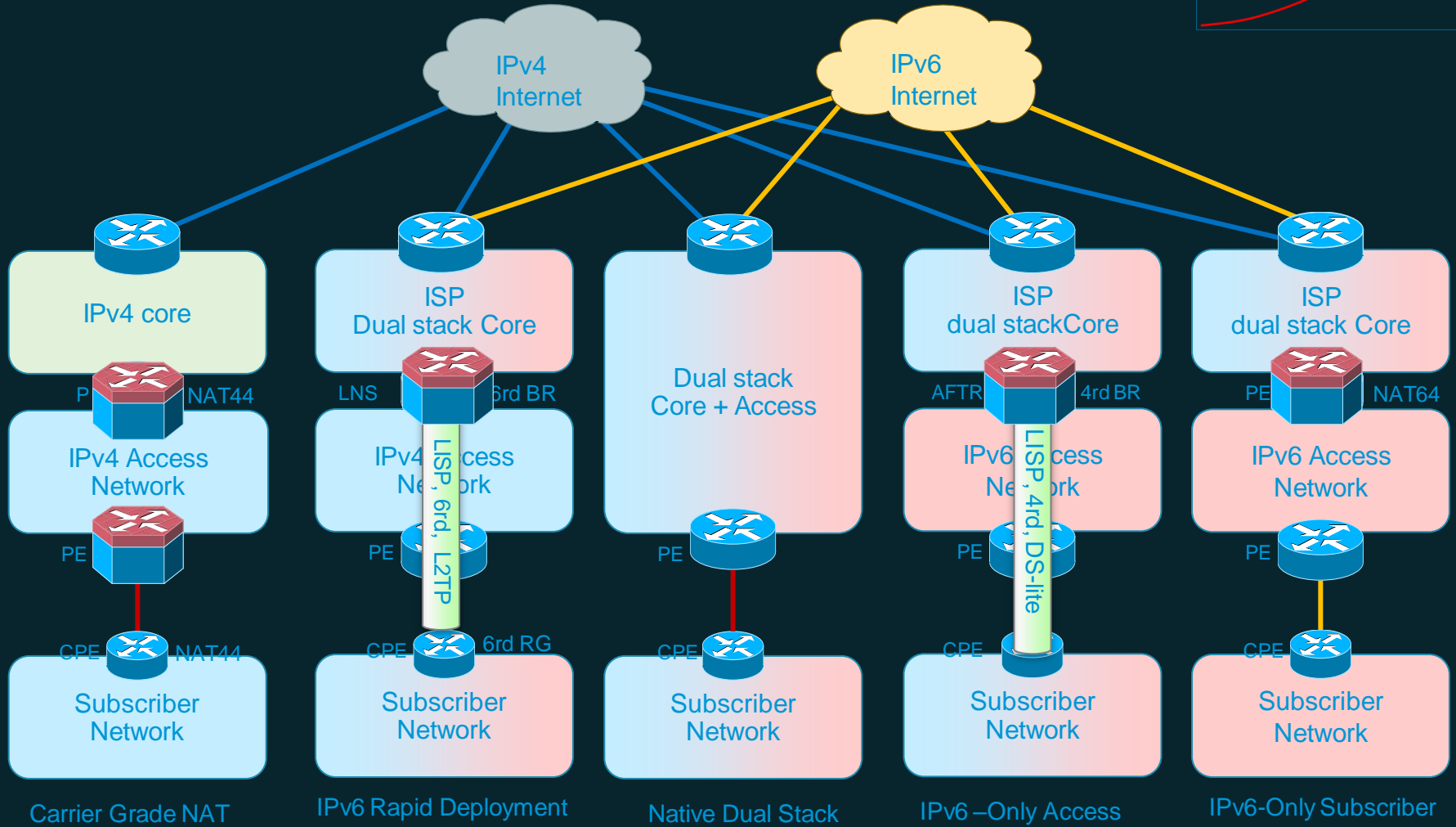
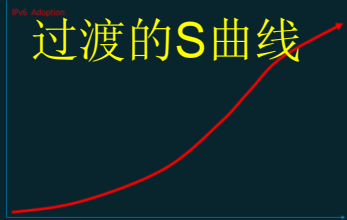
2011-2012 迁移策略



骨干网IPv6策略



接入IPv6策略 Broadband Access



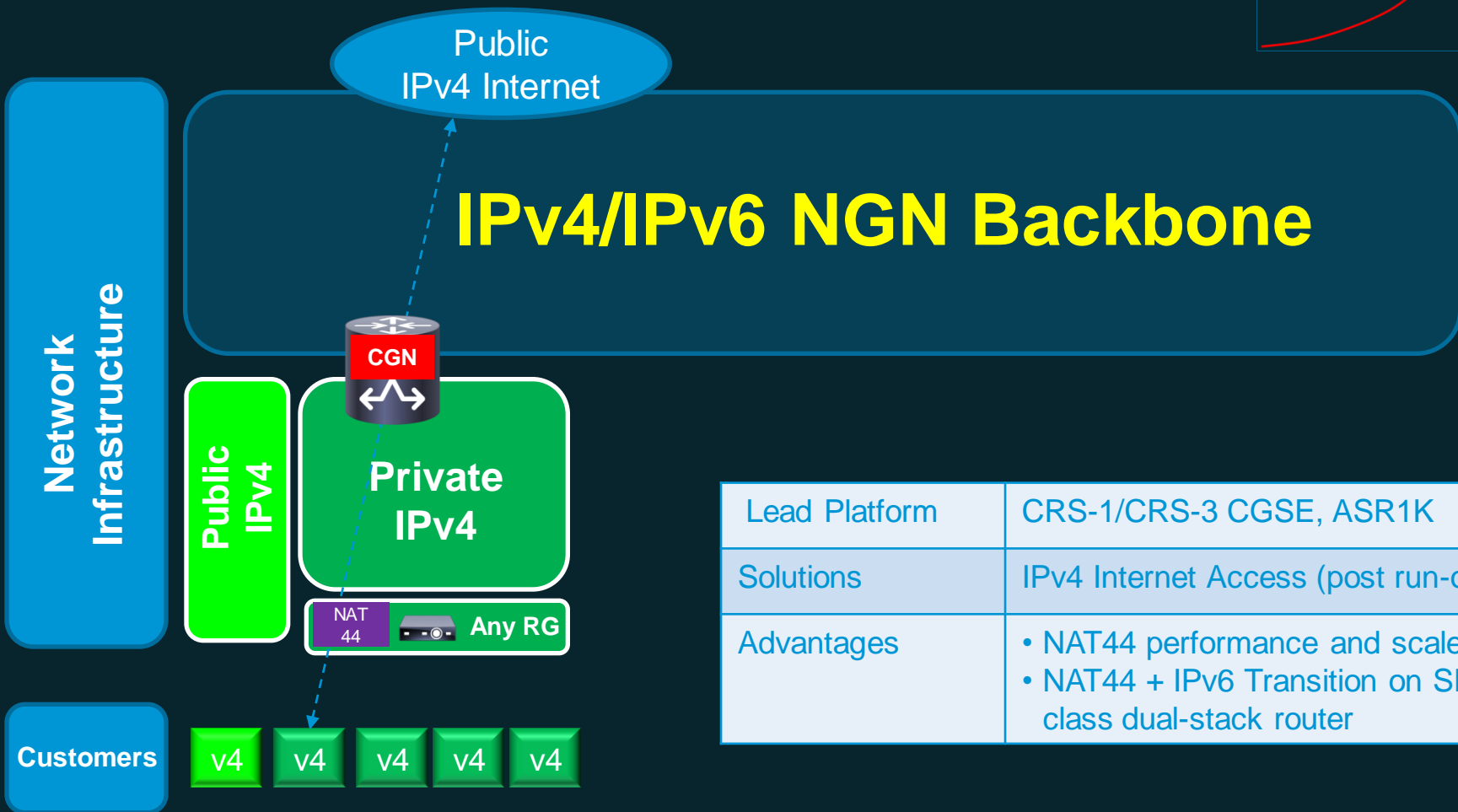
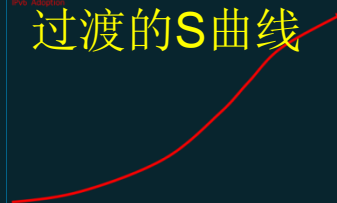
Preserve 确保平稳

Prepare 逐步引入

Prosper 内容驱动

确保业务平稳 Preserve

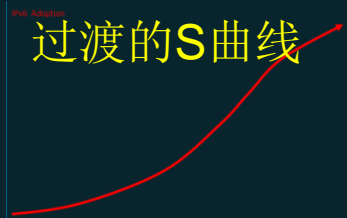
CGN NAT44



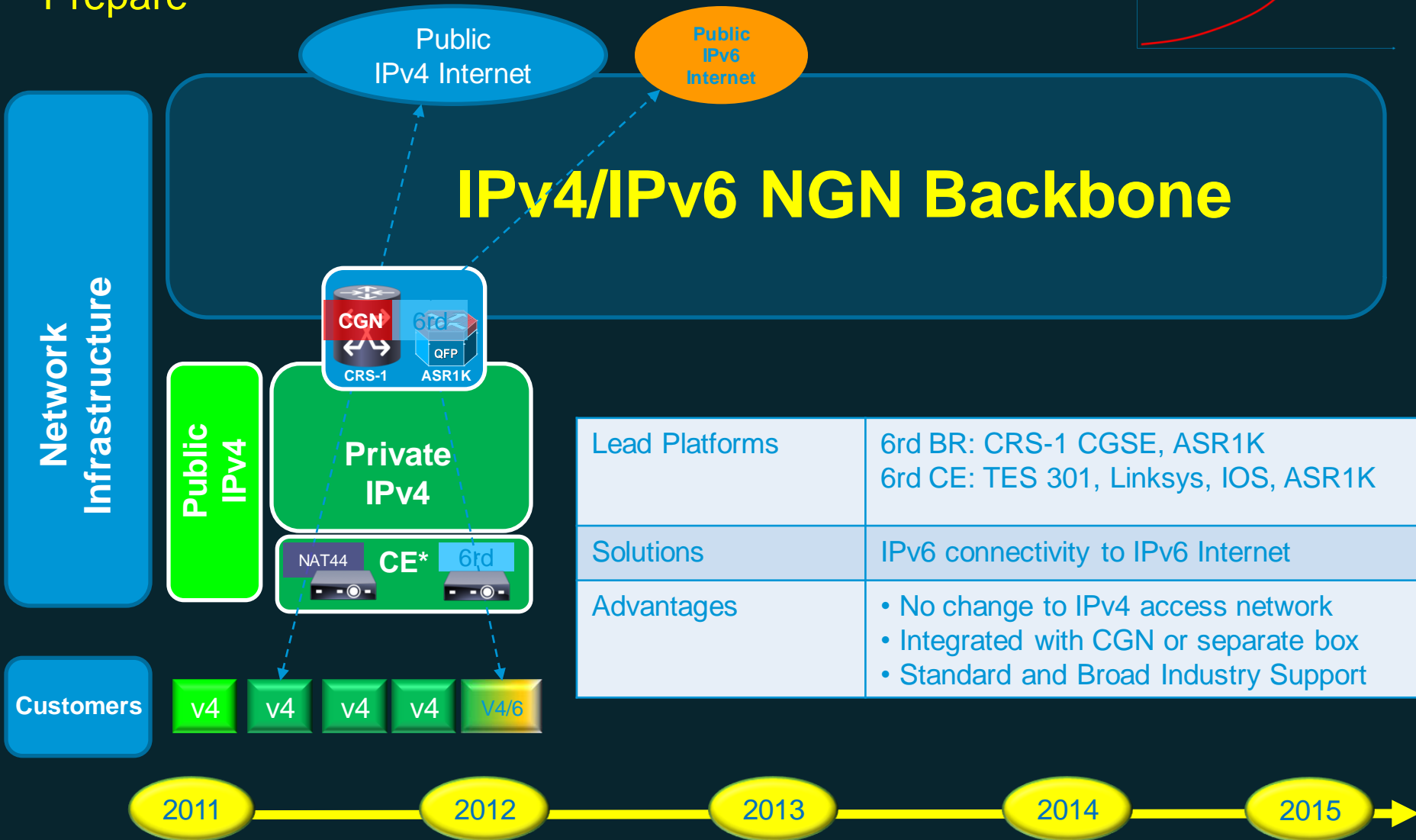
Lead Platform	CRS-1/CRS-3 CGSE, ASR1K
Solutions	IPv4 Internet Access (post run-out)
Advantages	<ul style="list-style-type: none"> NAT44 performance and scale NAT44 + IPv6 Transition on SP-class dual-stack router



逐步引入, v6接入业务 6rd

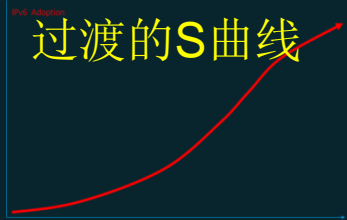


Prepare

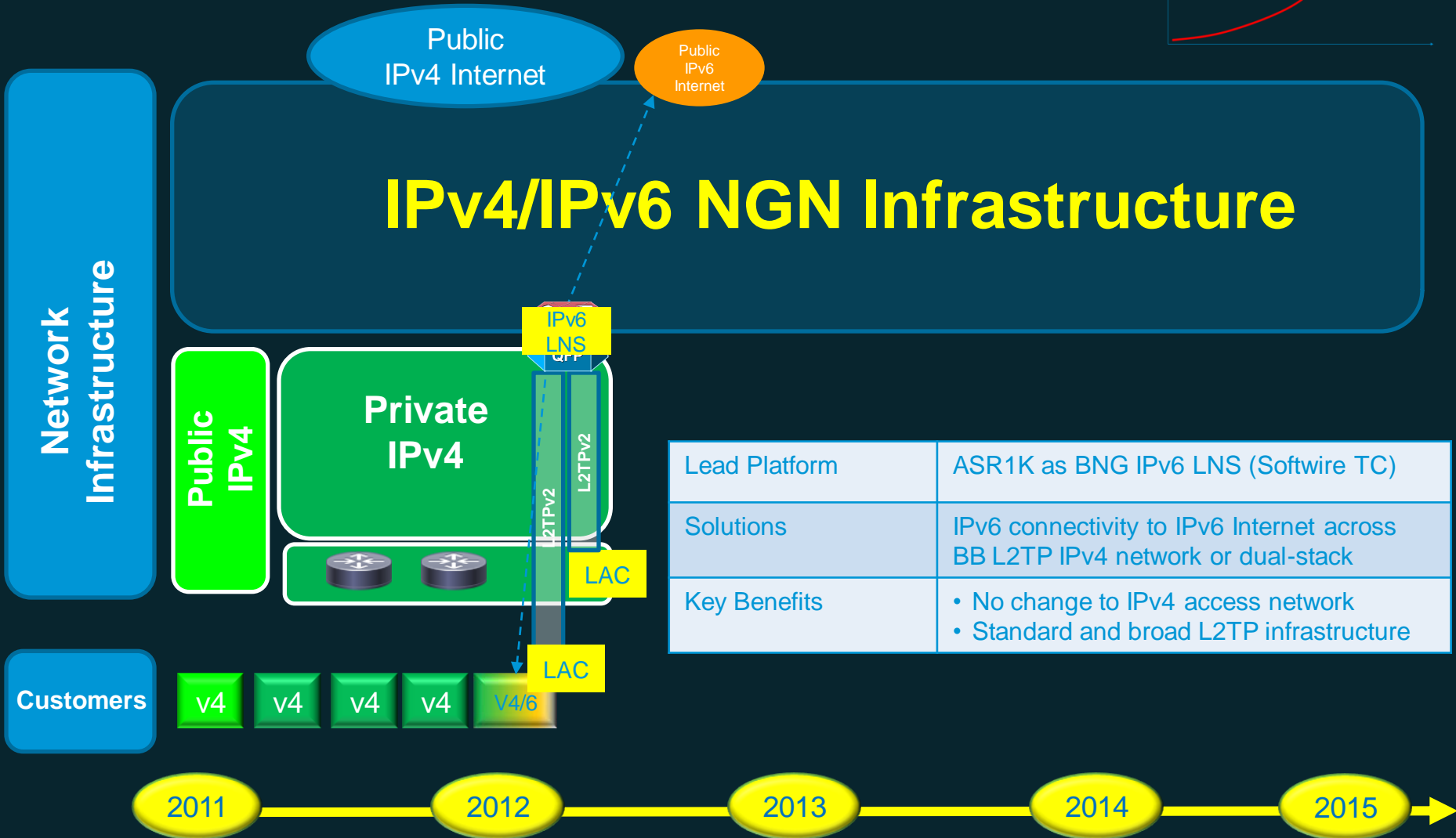


Lead Platforms	6rd BR: CRS-1 CGSE, ASR1K 6rd CE: TES 301, Linksys, IOS, ASR1K
Solutions	IPv6 connectivity to IPv6 Internet
Advantages	<ul style="list-style-type: none"> • No change to IPv4 access network • Integrated with CGN or separate box • Standard and Broad Industry Support

逐步引入, v6接入业务 – SW

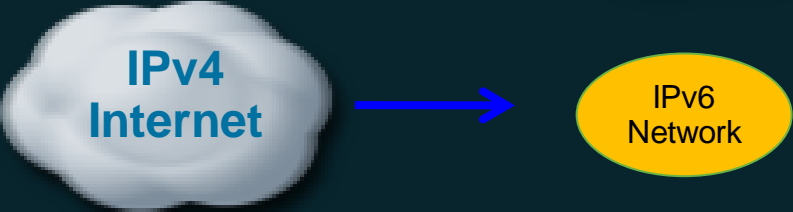

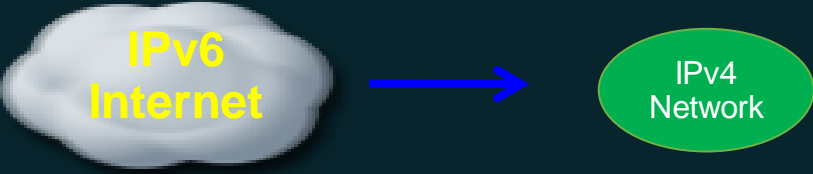
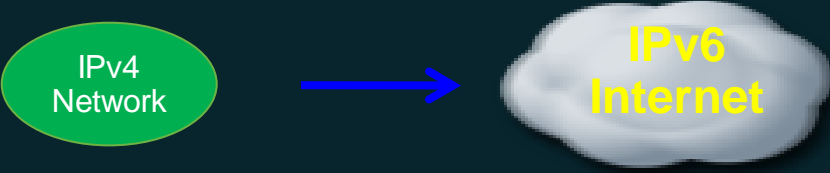



Prepare

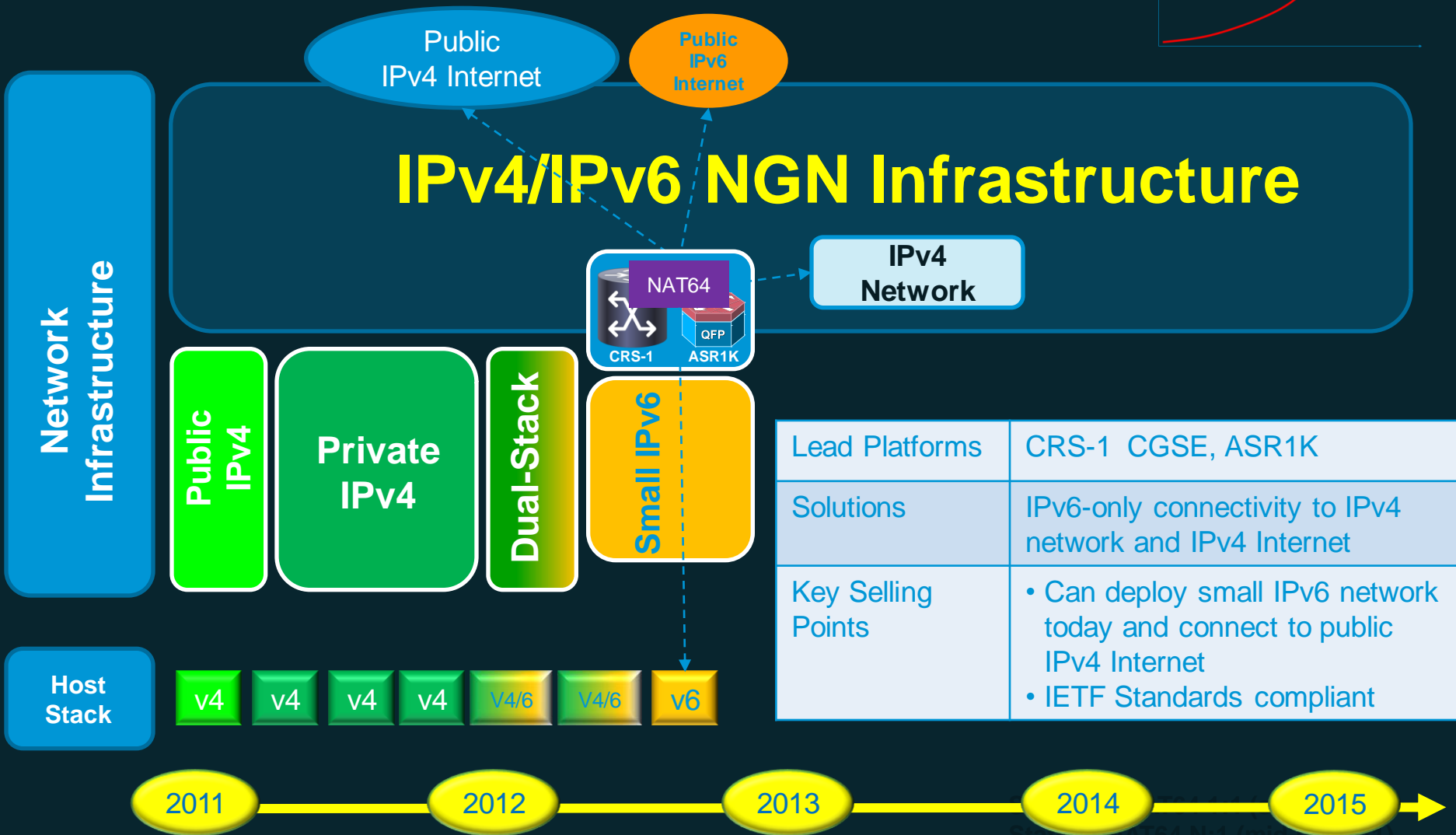
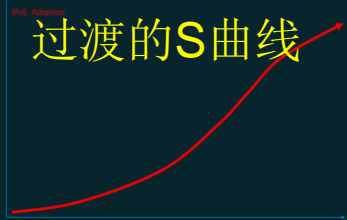


Lead Platform	ASR1K as BNG IPv6 LNS (Softwire TC)
Solutions	IPv6 connectivity to IPv6 Internet across BB L2TP IPv4 network or dual-stack
Key Benefits	<ul style="list-style-type: none"> • No change to IPv4 access network • Standard and broad L2TP infrastructure

IPv4/IPv6 Translation Scenarios

		<u>stateful</u>	<u>stateless</u>
1.			
2.			
3.			
4.			
5.			
6.			

逐步引入, v6接入业务 NAT64



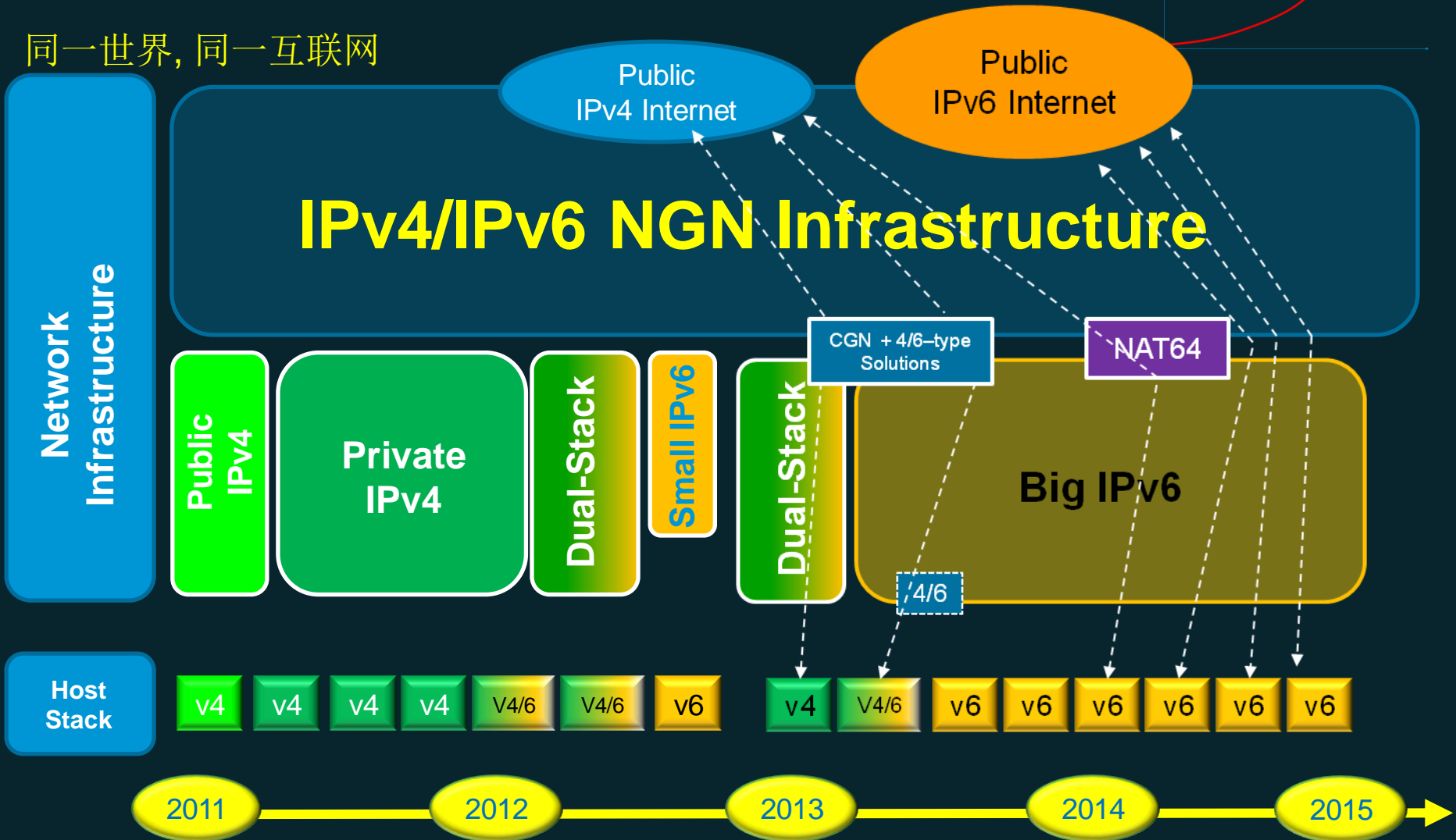
Lead Platforms	CRS-1 CGSE, ASR1K
Solutions	IPv6-only connectivity to IPv4 network and IPv4 Internet
Key Selling Points	<ul style="list-style-type: none"> • Can deploy small IPv6 network today and connect to public IPv4 Internet • IETF Standards compliant

展望未来, 业务驱动迁移

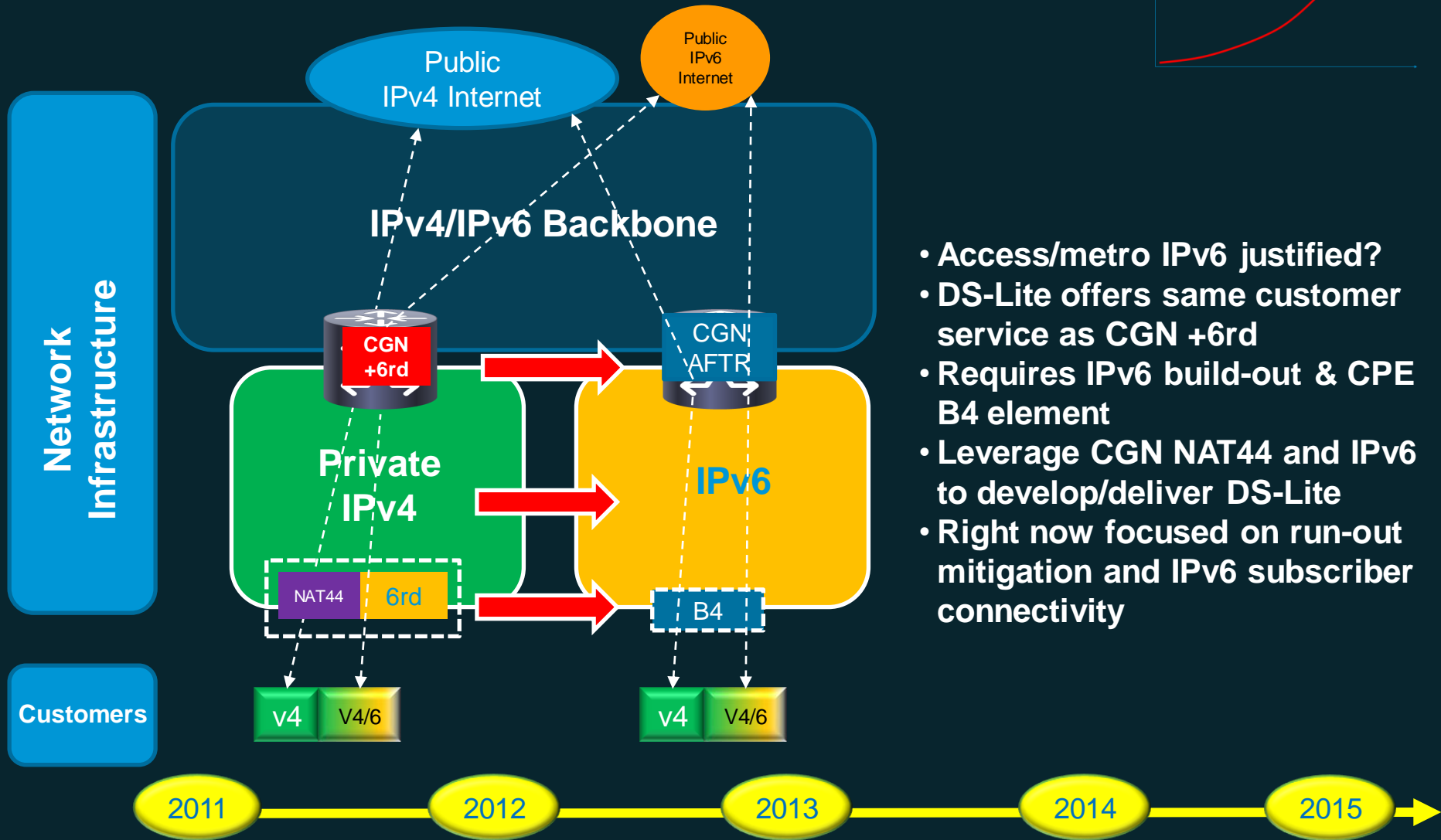
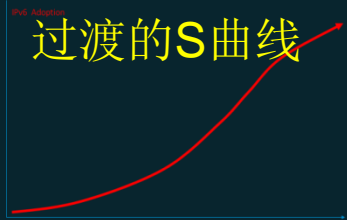
Looking Ahead-IPv6 Adoption and Growth

过渡的S曲线

同一世界, 同一互联网



IPv6大势已成: DS-Lite ?

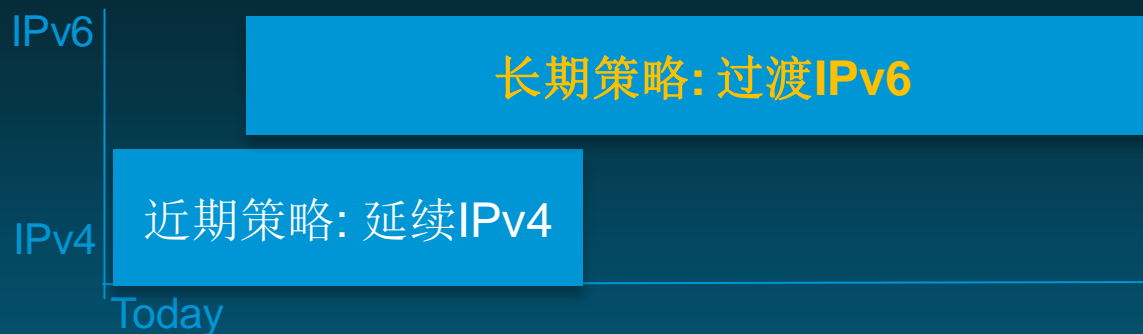


- Access/metro IPv6 justified?
- DS-Lite offers same customer service as CGN +6rd
- Requires IPv6 build-out & CPE B4 element
- Leverage CGN NAT44 and IPv6 to develop/deliver DS-Lite
- Right now focused on run-out mitigation and IPv6 subscriber connectivity

核心观点概述

Executive Summary

- IPv6发展, 全球共识, 但规模部署的任务仍然十分艰巨。
- 我国压力尤为严峻, 难度大且具有风险, 市场机制和国际合作是根本保证。
- IPv6产业链和市场机制的关键在于是内容和应用
- IPv6过渡的基本方针是积极, 简化, 逐步, 有序进行.
- 运营商IPv6的基本策略: 确保平稳, 逐步引入(先易后难, 由里向外, 由点及面), 内容驱动, 促进技术全面迁移
- 运营商优先推动在移动互联网、下一代互联网、物联网、无线传感器网络和其它新兴产业领域大力发展IPv6技术。



Thank you.

