

IPv6

127.0.0.1



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Agenda

- 1** Colt Introduction
- 2** IPv6 overview
- 3** Colt Architecture and Migration Plan
- 4** What is going to happen with...?
- 5** Where to start with...?
- 6** Datacenter visit

Colt Introduction

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Acerca de Colt

Alcance

- Excepcional red Europea propia/operada y 19 data centres
- Incomparable cobertura en 100 ciudades de Europa
- Infraestructura extensiva e integrada

Capacidad

- Servicios gestionados de TI, servicios de datos y voz
- Trabajando con los proveedores de tecnología de punta y 600 partners de canal
- 5,000 empleados en 15 países

Credibilidad

- Mas de 35,000 organizaciones confían en nosotros
- Proveyendo servicios de misión crítica en los principales sectores del mercados
- Gestionamos miles de sistemas IT para nuestros clientes
- Contamos con la confianza de otros carriers

Resultados

- Facturación de €1,583m en 2010
 - 2010 EBITDA de €330m con beneficio 80 m€.
- Estabilidad Financiera



Modelo de Negocio

La Information delivery platform para negocios Europeos

- Un potente recurso que permite a nuestros clientes compartir, procesar y almacenar la información vital para sus negocios

Colt esta potenciado por tres elementos críticos:

- Redes
- Infraestructuras de TI & Servicios
- Experiencia

Nuestras propuestas de negocio están basadas en la movilización de recursos excepcionales:

- Red
- Data centres
- Services Centres altamente eficientes (India, Barcelona y Londres)

Nuestro modelo de negocio esta construido sobre la IDP y recursos excepcionales

- Un modelo go-to-market alineado con nuestros grupos de clientes
- Enfoque exclusivo en las necesidades de negocio Europeas
- 5000 personas a través de 15 países gestionando las necesidades del cliente
- Una fuerte tradición de liderazgo de mercado en nuestros servicios al cliente
- Enfoque clave en el desarrollo de conocimientos y propuestas al mercado
- GNS orientadas a aplicaciones a través de nuestra red e infraestructura de TI
- Modelo de service delivery basado en ITIL
- Relaciones con socios lideres en tecnología tales como VMWare, Ipanema, Unisys y Avaya.



Colt Fibre Network

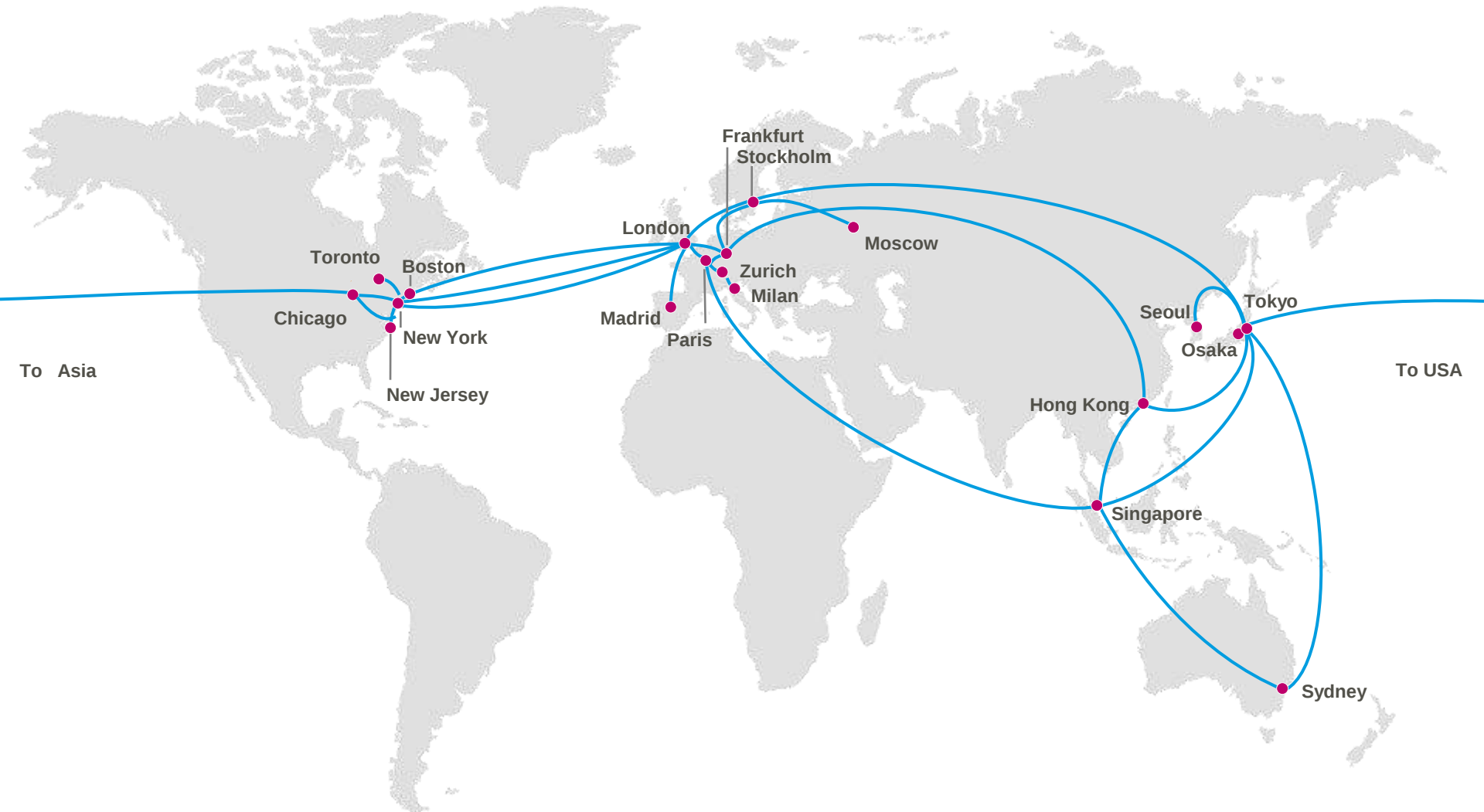
Long Distance Network, City Networks and Data Centres

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Global low latency footprint



Soluciones de Negocio



IPv6 overview

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Quick History of the Internet Protocol

- Internet Protocol version 4 (IPv4, or just “IP”)
 - First developed for the original Internet (ARPANET) in spring 1978
 - Deployed globally with growth of the Internet
 - Total of 4 billion IP addresses available
 - Well entrenched and used by every ISP and hosting company to connect customers to the Internet
 - Allocated based on documented need
- Internet Protocol version 6 (IPv6)
 - Design started in 1993 when IETF forecasts showed IPv4 depletion between 2010 and 2017
 - Completed, tested, and available for production since 1999
 - Total of 340,282,366,920,938,463,463,374,607,431,768,211,456 IP addresses available
 - Used and managed similar to IPv4

About IPv4 and IPv6

IP version	IPv4	IPv6
Deployed	1981	1999
Address Size	32-bit number	128-bit number
Address Format	Dotted Decimal Notation: 192.0.2.76	Hexadecimal Notation: 2001:0DB8:0234:AB00: 0123:4567:8901:ABCD
Number of Addresses	$2^{32} = 4,294,967,296$	$2^{128} = 340,282,366,920,938,463,463,374,607,431,768,211,456$
Examples of Prefix Notation	192.0.2.0/24 10/8 (a “/8” block = $1/256^{\text{th}}$ of total IPv4 address space = $2^{24} = 16,777,216$ addresses)	2001:0DB8:0234::/48 2600:0000::/12

New features in IPv6

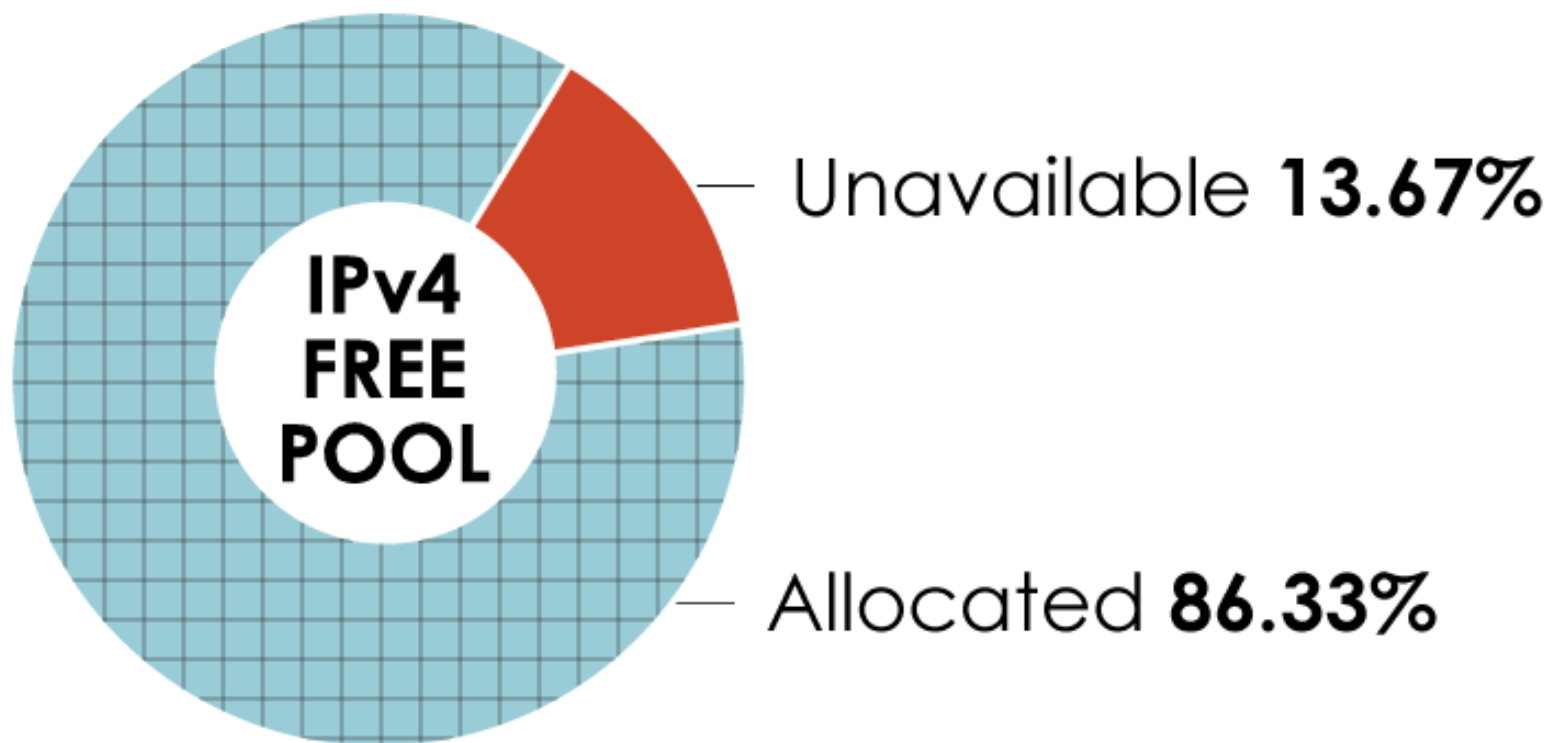
- Bigger address space
- Autoconfiguration
- Simpler with fixed header length
- Security & Mobility
- Enhanced Multicast (no more broadcast)



Why

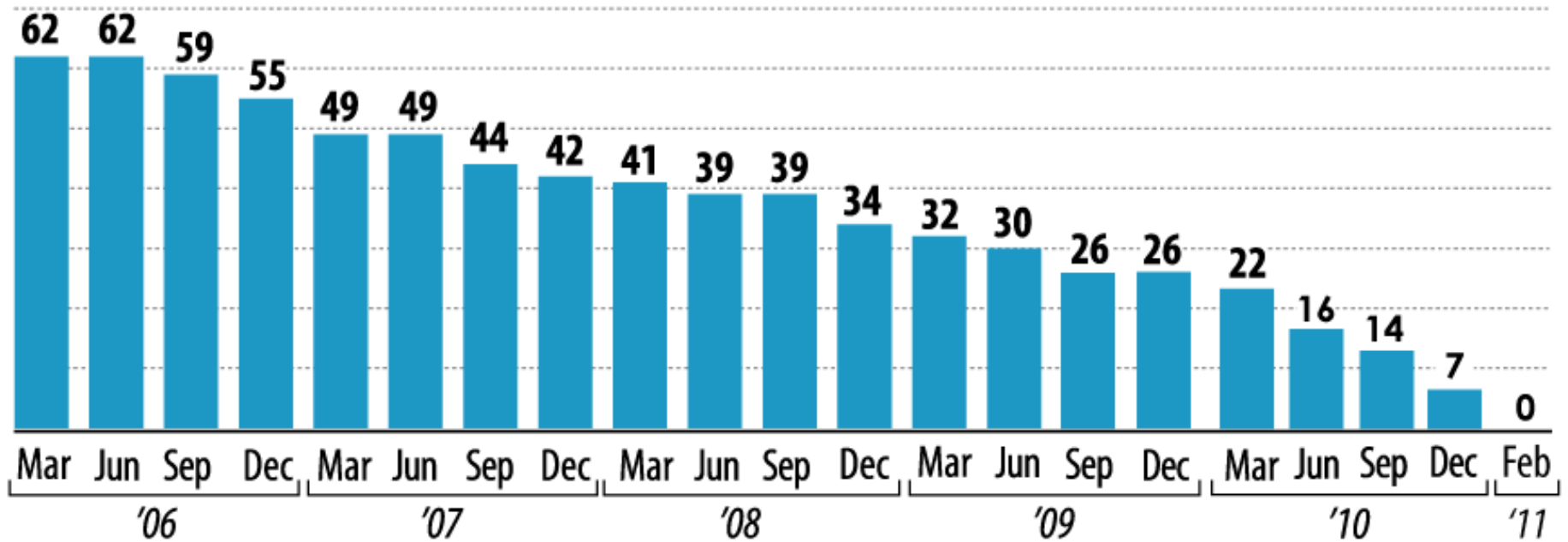
Why now?

IPv4 Address Space Utilization



* as of 3 February 2011

Available IPv4 Space in /8s



IPv4 Depletion*

IANA Unallocated Address Pool Exhaustion: 03-Feb-2011

Projected RIR Address Pool Exhaustion Dates:

- APNIC: 19-Apr-2011
- RIPENCC: 13-Jul-2012
- ARIN: 20-Jun-2013
- LACNIC: 30-Jan-2014
- AFRINIC: 03-Sep-2014



*estimates only from <http://www.potaroo.net/tools/ipv4/index.html> as of 28/11/11

Colt architecture and transition plans

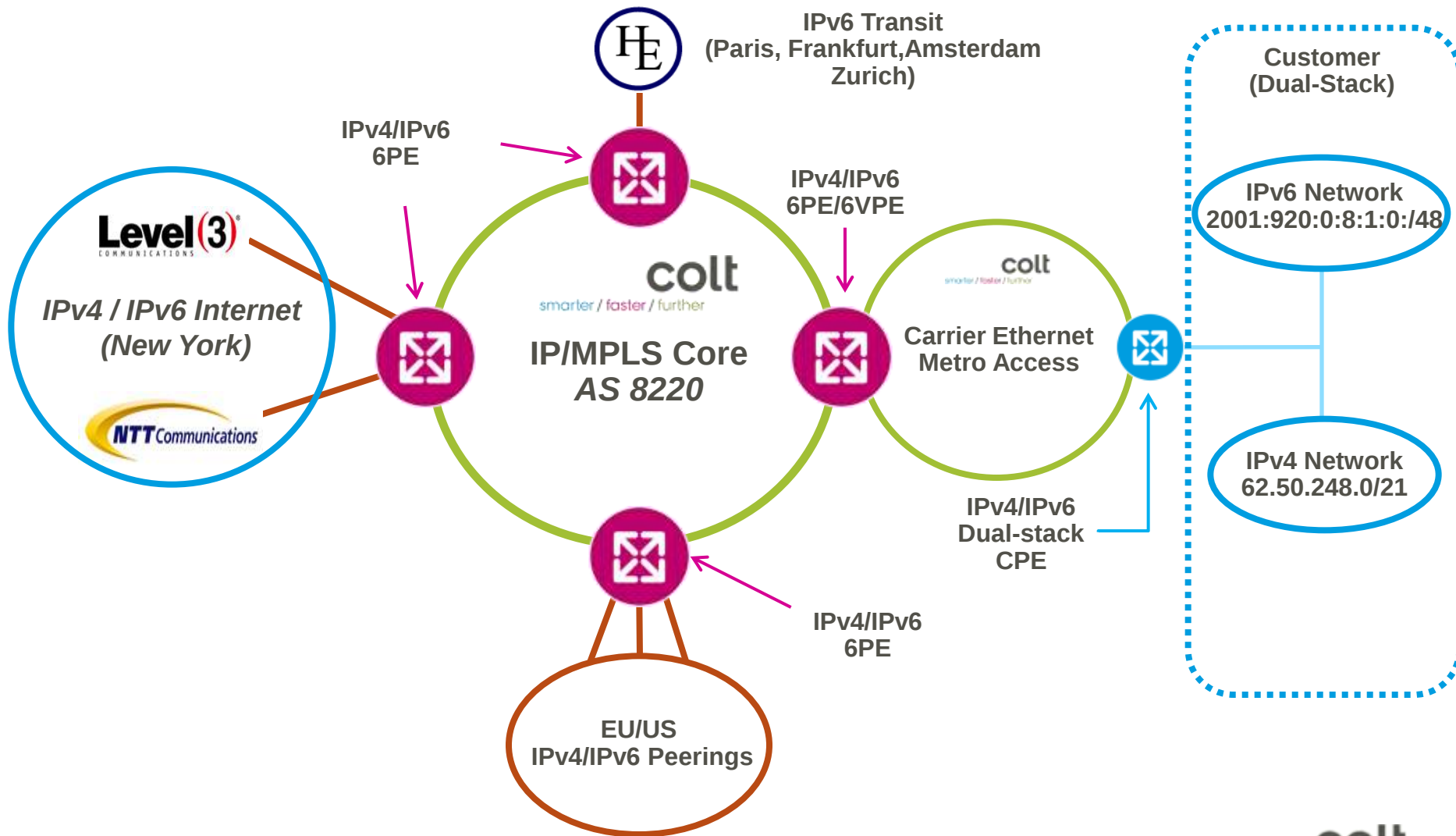
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Colt's IPv6 Network Architecture

- Colt's IP Network delivers IPv4 based services for Internet Access, L3 VPN and Multicast VPN (draft-Rosen).
- MPLS switching was enabled in 2003 and is used for Internet Access and L3 VPN traffic (Multicast transport is native IPv4 – GRE)
- IPv4-IPv6 dual-stack strategy: MPLS transport for both IPv4 and IPv6 by deploying 6PE & 6VPE features
 - **6PE (RFC 4798)**: global IPv6 connectivity over and MPLS core. PEs are updated to support dual stack/6PE. Control plane (IPv6 reachability) via MBGP and data plane using MPLS.
 - **6VPE (RFC 4659)**: just an extension of IPv4 MPLS VPN for IPv6, based on exactly the same BGP-MPLS architecture. Control plane (VPNv6 reachability) via MBGP and data plane using MPLS.
- The core remains MPLS (IS-IS / LDP); same LSPs for IPv4 and IPv6 traffic

Colt's IPv6 Architecture – IPv4/IPv6 Dual Stack



Colt's IPv6 Transition & Coexistence Plans

- Dual-Stack is Colt's IPv6 short and mid term strategy as the only one serving business customers' needs. This architecture provides native, end-to-end IPv4 and IPv6 services, in parallel, over the same infrastructure
- Beyond dual-stack, Colt will introduce the required transition functionality distributed across PE devices. The main components are:
 - **IPv4 address preservation:** the objective is to reach higher efficiency in terms of customer's IPv4 assignment. One way to accomplish this is by being able to fully disaggregate the customer IPv4 address space and be able to assign customers only the exact number of IPv4 addresses needed.
 - **IPv4-IPv6 translation:** different NAT techniques are being standardised by IETF to provide translation between IPv4 and IPv6; however, they will only be practical to solve specific problems. One potential application is to bring content quickly in IPv6 by providing NAT64 translation "in the cloud"
 - **IPv4-IPv6 tunnelling:** also, a wide range of tunnelling techniques are being developed by IETF. The likelihood of Colt using any tunnelling technique is low because as long the customer is capable of running dual-stack end systems, then Colt will be able to provide native dual-stack service without any need for tunnelling
 - **CGN (NAT444):** Colt has no plans to implement CGN in the sense of NAT444 and port sharing among customers. We don't see this appropriate for business customers

IPv6 Product Strategy

- No commercial distinction between v4/v6 traffic (one rate for all traffic)
- Enable all existing IP products and features for IPv6
- Deliver the required flexibility to support customer's own transition plans
- Eventual (long-term) withdrawal of all products and features not compatible with IPv6

IPv6 Product Schedule

- Development Projects started early 2010
- Alpha trial in Feb 2011
- Beta trial started Jun 2011
- Launch standard “Wires-Only” IP Access service with limited feature-set: Early 2012
- V6-enablement of remaining product set: Late 2012/early 2013



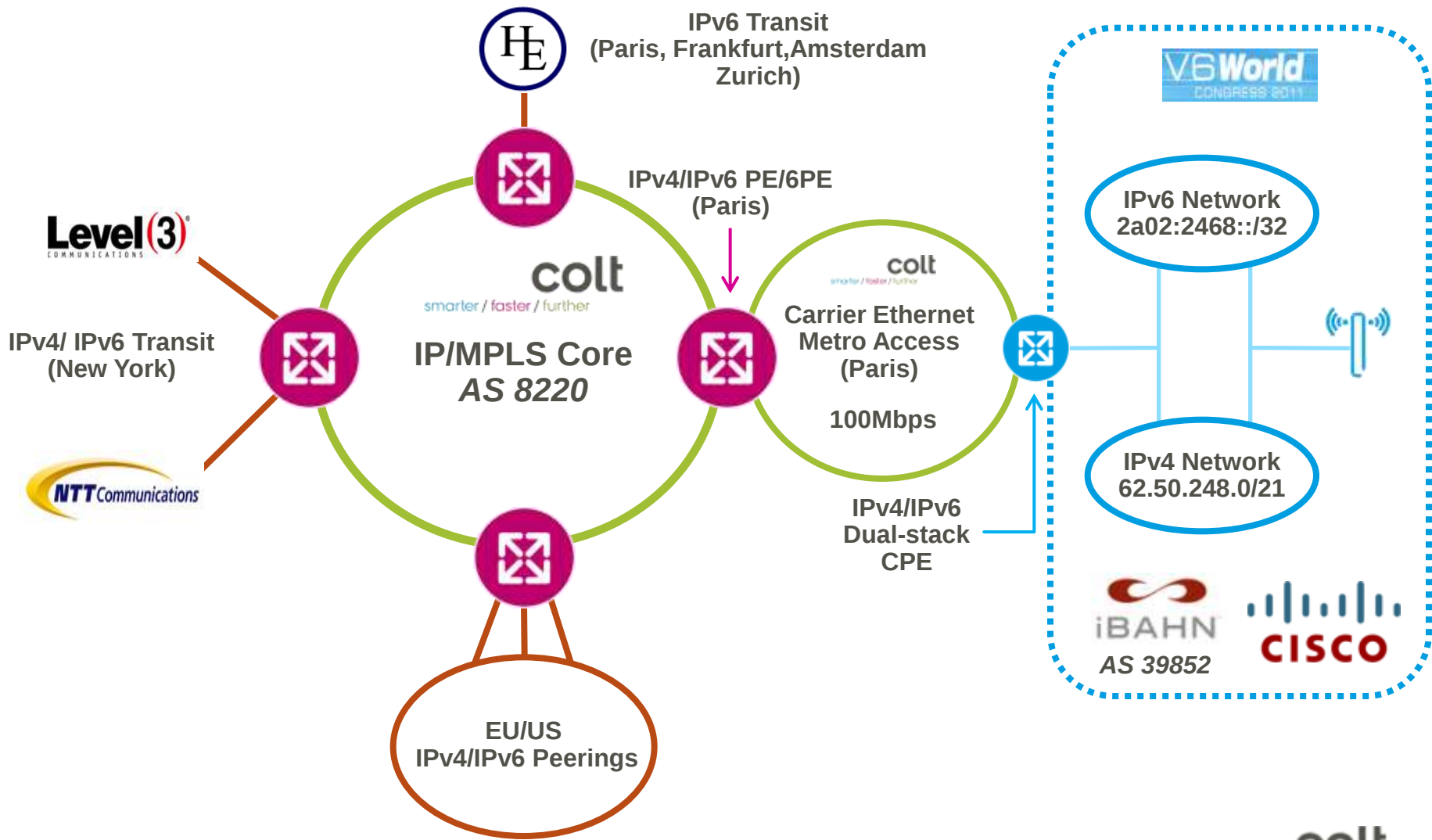
V6 World Congress – Paris Feb 2011

IPv4/IPv6 Internet Access Powered by Colt

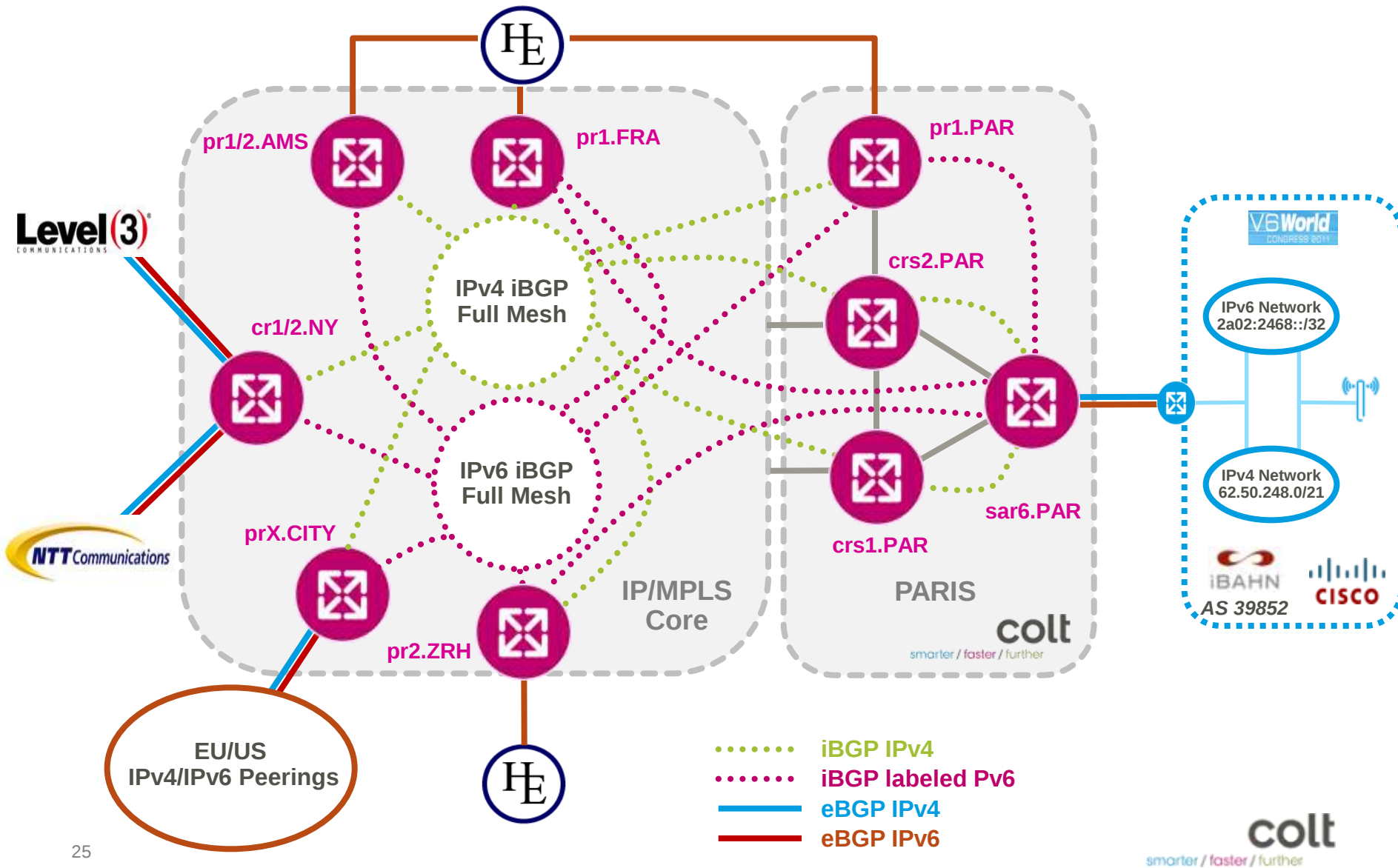
Javier Benitez
Network Strategy & Architecture



V6 World Congress – IPv4/IPv6 Dual Stack



V6 World Congress – IPv4/IPv6 Dual Stack



World IPv6 Day (June 8th, 2011) Colt Setup

Javier Benitez
Network Strategy & Architecture

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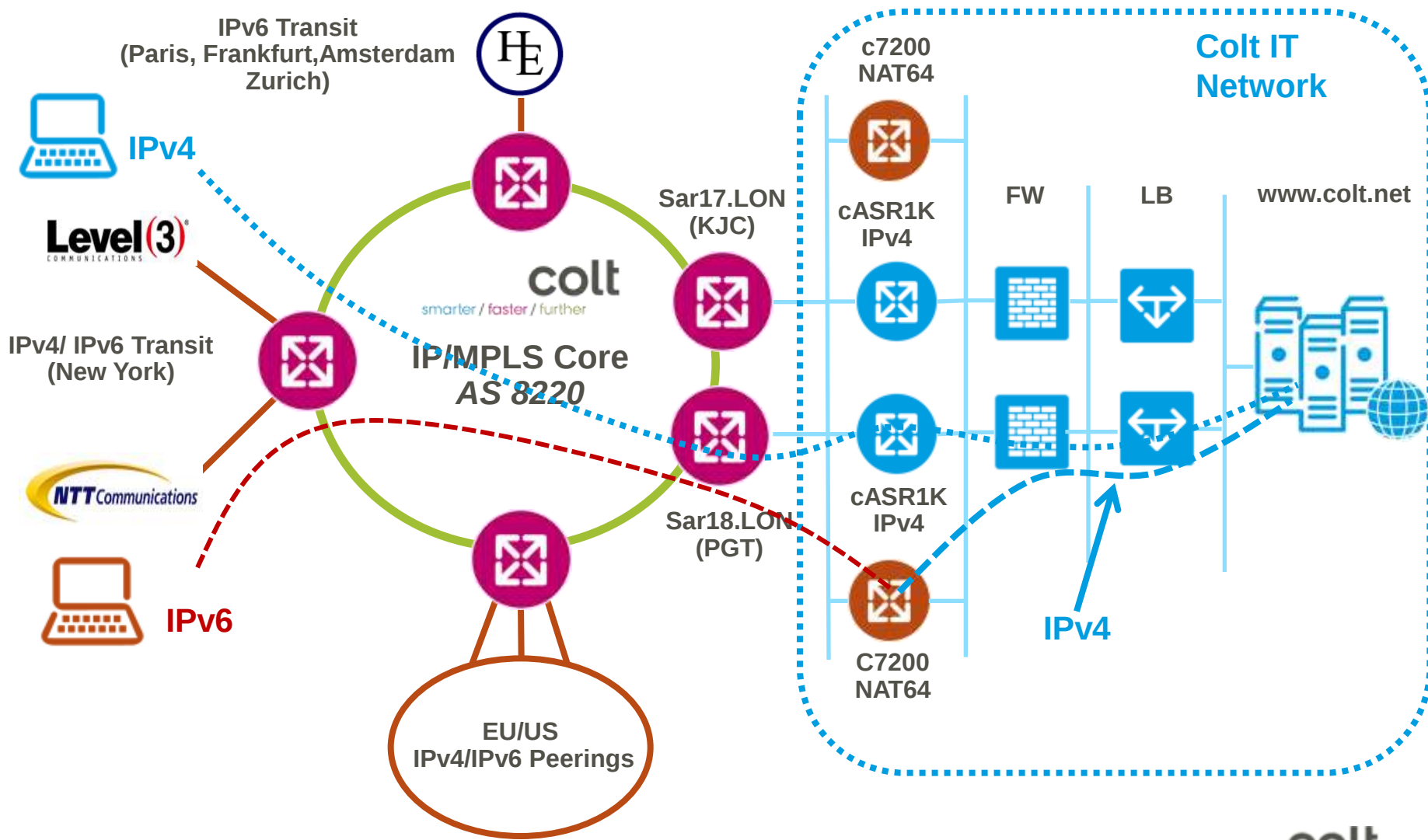
World IPv6 Day – June 8th, 2011

- 24-hour “test flight” for organisations to bring content on IPv6
 - <http://isoc.org/wp/worldipv6day/>
- Supported by key players in the industry: Google, Facebook, Yahoo, Akamai, Limelight Network, Comcast, etc.
- Main objectives:
 - Raise awareness about IPv4 address depletion
 - Motivate all players in the industry to take the required actions to support transition to IPv6
- Colt participate by enabling IPv6 access for www.colt.net
 - www.colt.net dual-stack enabled, being accessible both via IPv4 & IPv6
 - The dual-stack setup was left in production after the World IPv6 day

World IPv6 Day – IT Colt Setup

- www.colt.net was assigned two IP addresses in the DNS
 - IPv4 address (A record): **213.86.182.108**
 - IPv6 address (AAAA record): **2001:920:1:2:213:86:182:108**
- Separate IT Internet access routers for IPv4 and IPv6 (**No impact to IPv4 traffic!**)
 - Existing Cisco ASR1K used for IPv4 Internet access
 - “old” Cisco 7200 dedicated for IPv6 Internet access
- IPv6 traffic translated to IPv4 and vice versa by the Cisco 7200 routers Internet facing routers
- IT FW, IT load balancers & the actual www.colt.net server remain on IPv4
- This is a tactical implementation. Target design will be based on translation implemented at load balancers
- Only http traffic on the local www.colt.net servers impacted

World IPv6 Day – Colt Setup Topology



What is going to happen with...?

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DHCP replaced by SLAAC?

- SLAAC (Stateless Automatic Address Configuration) allows IPv6 hosts to autoconfigure when connected to an IPv6 routed network (via ICMPv6):
 - Can autogenerate IPv6 address using network prefix received from any router (RS / RA)
 - A host can autogenerate IPv6 host prefix using its own MAC address or a random number
- Alternatively, there is DHCPv6. DHCPv6 is the Dynamic Host Configuration Protocol for IPv6.
 - Although IPv6's stateless address auto-configuration removes the primary motivation for DHCP in IPv4, DHCPv6 can still be used to statefully assign addresses if the network administrator desires more control over addressing.
 - It can also be used to distribute information which is not otherwise discoverable; the most important case of this is the DNS server.
- Colt's recommendation is to keep using DHCP in a business environment

NAT

- NAT was introduced in IPv4 to help with IPv4 address exhaustion
- The price to pay was breaking the end-to-end IP architecture causing technical issues with many applications and protocols:
 - **Multimedia applications** like videoconference applications, telephony through Internet or video on demand
 - **Kerberos authentication**
 - **IPSec**
 - **Multicast**
- IPv6 solves the IP address exhaustion problem; no need for NAT anymore
 - No IETF standard for NAT66. However, still some valid uses of NAT being explored by IETF (topology hiding, avoid renumbering, etc)
 - Security concerns need to be properly addressed using Firewalls

RFC 1918 vs ULA

- Private address space in IPv4 is defined in RFC1918 and are the well known ranges
 - 10.0.0.0/8 172.16.0.0/12 192.168.0.0/16
- Similar private ranges in IPv6 are defined they originate from the block fc00::/7 and are defined in RFC 4193 (ULA: Unique Local Address).
 - There are ways to guarantee ULA uniqueness
- ULA address just like RFC1918 addresses are NOT routable on the public internet.
- In IPv4 RFC1918 addresses are often (mostly) used in combination with NAT - NAT is not defined in IPv6 this means that host that require access to the public internet are better off with plain public addresses.
- Colt will support both IPv6 ULA as well as IPv6 global for IPVPN customers

BGP

- BGP remains the same in IPv6 world
 - Bogons
 - Max prefixes
 - Default/Partial/All
- Smallest allowable network
 - Outside Colt /48
 - Inside Colt /64 or smaller?
- IPv6 internet will take time to mature

DNS

- No Major changes to DNS (architectural different from IP)
- Three specific changes for DNS in IPv6:
 - **New AAAA (“Quad A”) resource record** format for IPv6 addresses
 - **New Reverse Resolution Hierarchy:** A new hierarchical structure similar to *IN-ADDR.ARPA* is defined for IPv6 reverse lookups, but the IETF put it in a different top-level domain. The new domain is *IP6.INT*
 - **Changes To Query Types And Resolution Procedure:** All query types that work with A records must be changed to also handle AAAA records.
- Most DNS resolvers already giving both A and AAAA records where they have them
- Customers will have to look closely at host behaviour – preference between A and AAAA records may vary with OS type and version (happy-eyeballs)

Summary

- Colt aims to deliver dual-stack services to help customers with their own transition to IPv6
- The transition to IPv6 will take many years
- Don't panic, but do start your own project now (if you haven't already)
- Colt is fully engaged with IPv6 – we're ready



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DataCenter Visit

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CPD's COLT España



CPD Madrid

- > Superficie Total: 7.394 m2
- > Redundancia n+1
- > Seguridad y Monitorización 24x7
- > Proyectos de Recuperación ante Desastres

CPD Barcelona

- > Superficie Total: 10.000 m2
- > Redundancia n+1
- > Seguridad y Monitorización 24x7
- > Proyectos de Recuperación ante desastres



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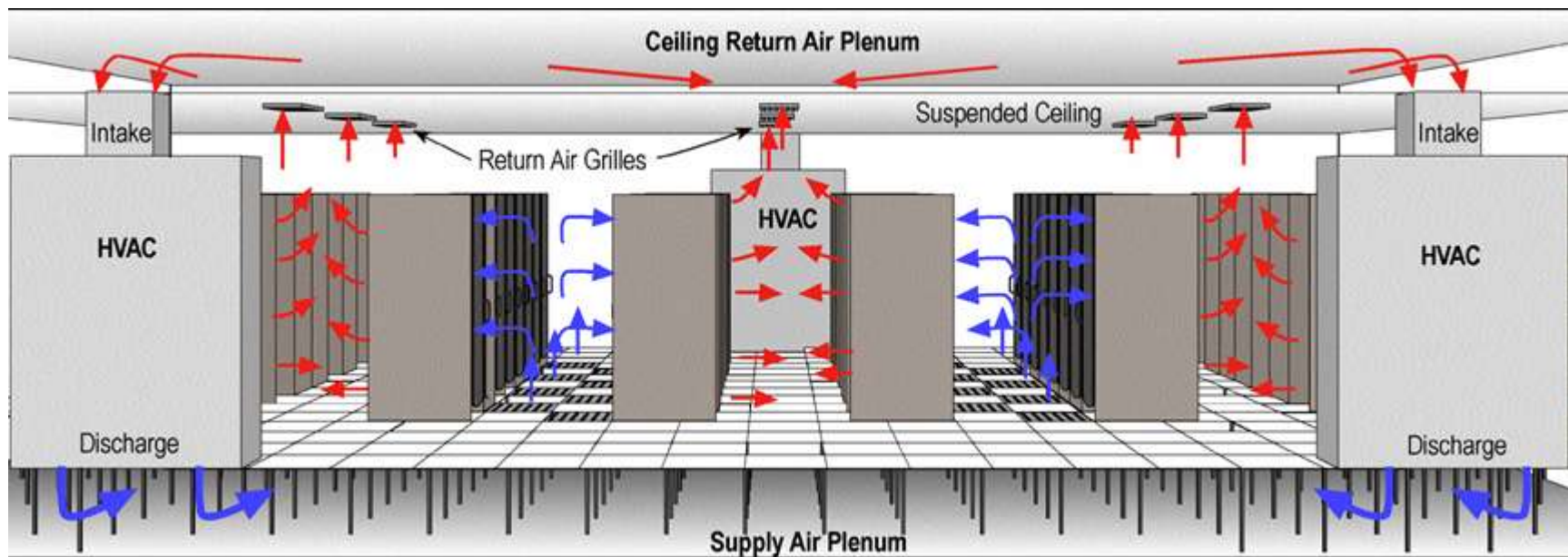
Características de los DataCentre de COLT

CPDs más eficientes

- Menor consumo para refrigeración
- Menor consumo de luz

Refrigeración mediante inyección de aire forzado a temperatura controlada.

Creación de zonas calientes y frías para una mayor fuerza de convección



No todos los DataCenters son iguales...

Performance standards by Tier level

Tier Requirement	Tier I	Tier II	Tier III	Tier IV
Source	System	System	System	System+System
System Component Redundancy	N	N+1	N+1	Minimum of N+1
Distribution Paths	1	1	1 normal & 1 alternate	2 simultaneously active
Compartmentalisation	No	No	No	Yes
Concurrently Maintainable	No	No	Yes	Yes
Fault Tolerance (Single event)	No	No	No	Yes
Uptimes (Availability)	99.67%	99.75%	99.98%	99.99%

Source: The Uptime Institute

Colt Data Centres $\geq$ Tier III