SD-WAN

Software Defined WAN

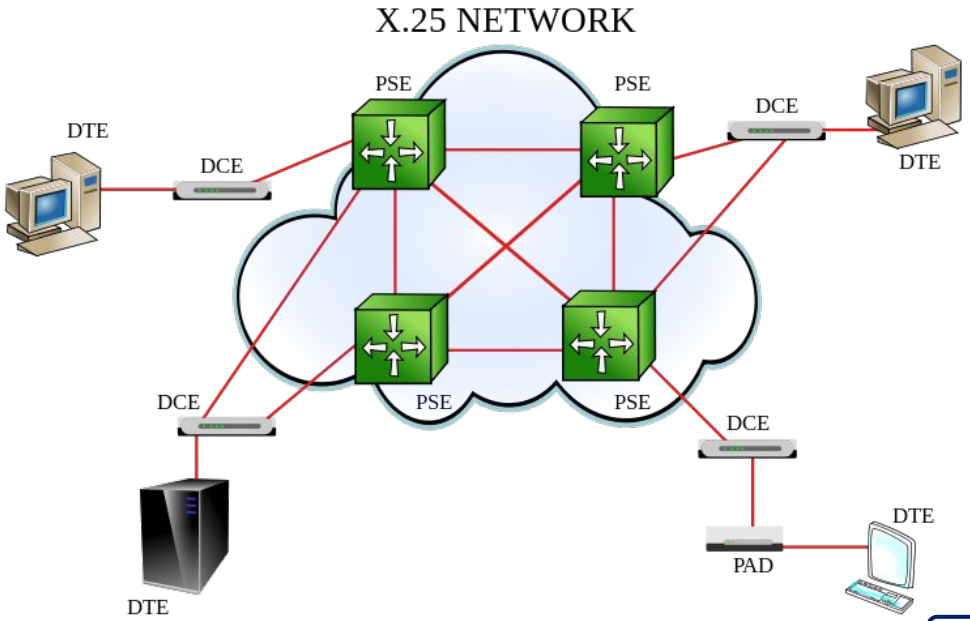
¿Por qué tan altas expectativas para Latinoamérica?

Conectividad Corporativa

Evolución Histórica

X.25

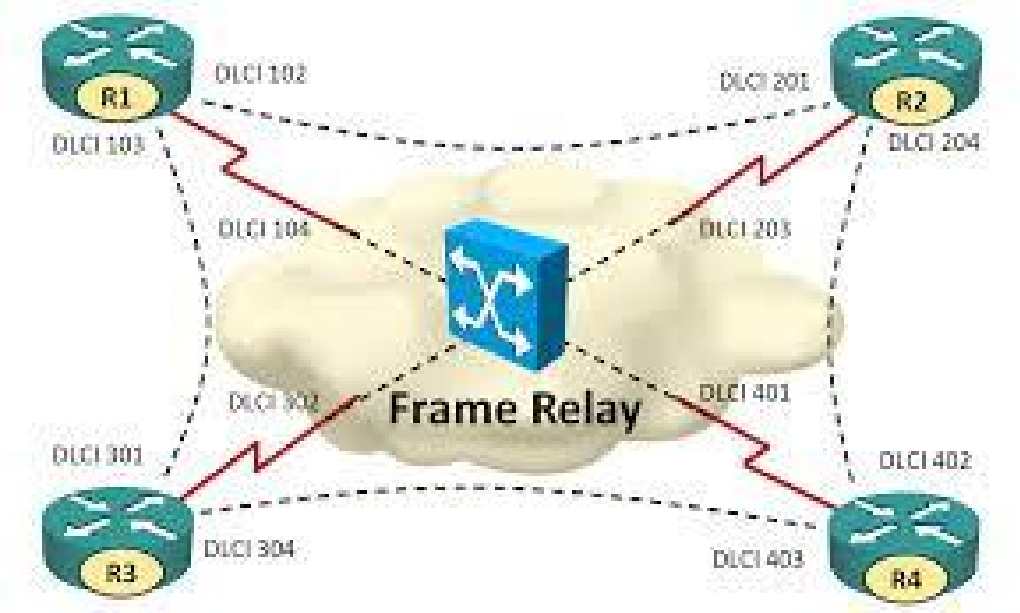
- Definida en el “Orange Book” de la CCITT, 1976
- PSE - Packet Switching Exchange
- Usa “Virtual Calls”
- X.121 - Red Global (Direccionamiento internacional)
- Muy Robusta (error detection)
- Se usó mucho en los 80s, y declinó en los 90s.



Evolución Histórica

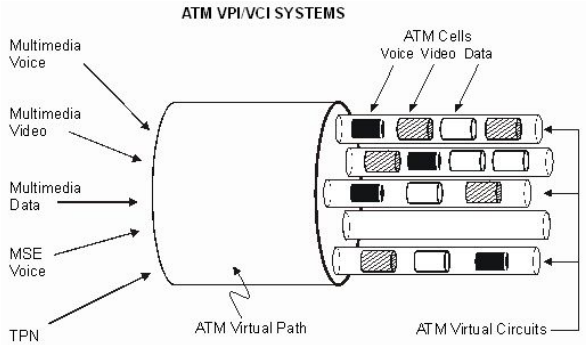
Frame Relay

- Permite Circuitos Virtuales Permanentes (PVC) o Conmutados (SVC)
- Anchos de Banda ~2Mbps (E1)
- Introduce Congestion Control
- Menos robusta (requieren enlaces error-free)
- Soportaba Voice over Frame Relay (VoFR)
- Se usó hasta fines de los 90s.

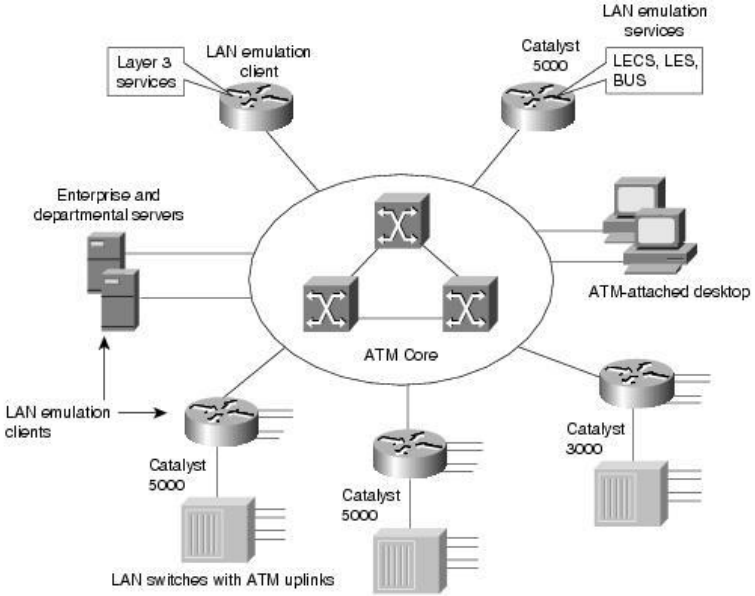


Evolución Histórica

ATM

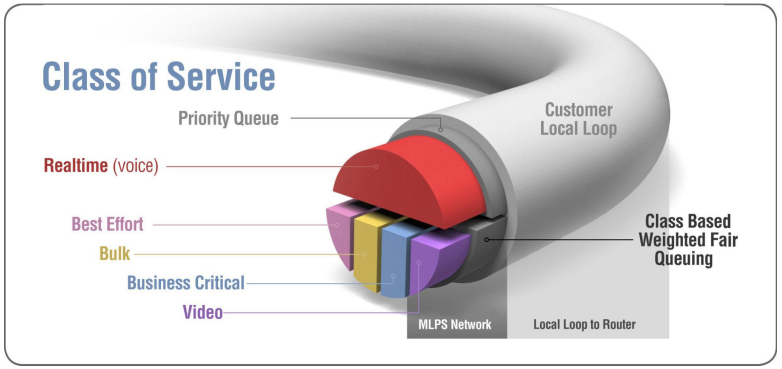


- Asynchronous Transfer Mode
- Permite Circuitos Virtuales Permanentes (PVC) o Conmutados (SVC)
- Pensada para extender LANs (**LANE** - LAN Emulation)
- Anchos de Banda ~2, 10, 100Mbps
- Soportaba Voz, Video y Datos (Multiservicio)
- Mantiene Congestion Control
- Se usó hasta inicios de los 00s

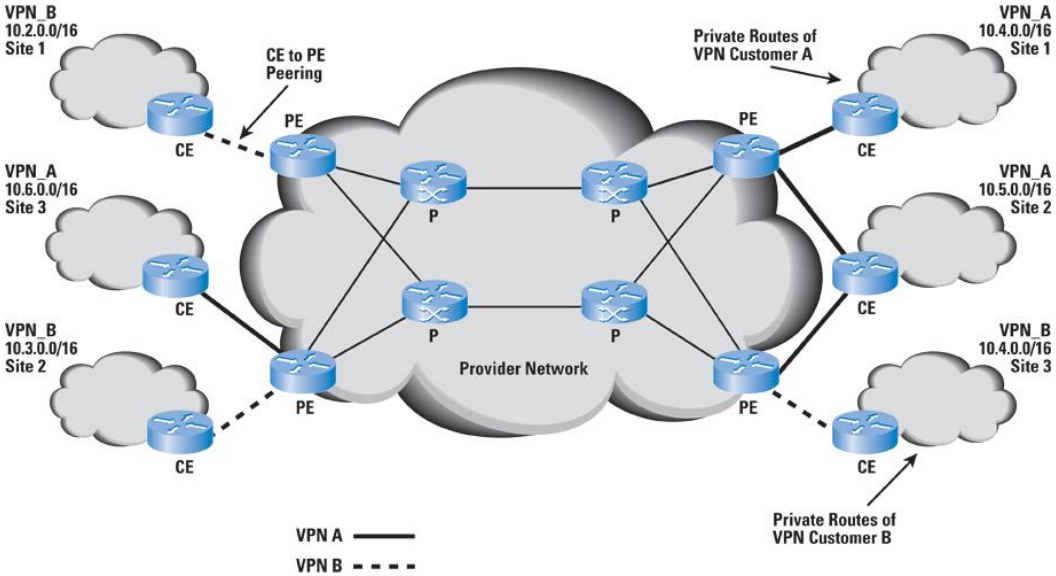


Evolución Histórica

MPLS



- Multiprotocol Label Switching
- Resuelve problemas de escalabilidad existente en redes anteriores, permitiendo enrutar de una forma más sencilla (en base a etiquetas)
- Routers se actualizaron para soportar MPLS.
- Ofrece ademas, VPN, Traffic Engineering, QoS, etc
- Es multivendor, o que trae consigo dificultades de gestión.
- MPLS es una red de configuración “Manual”, en los routers.

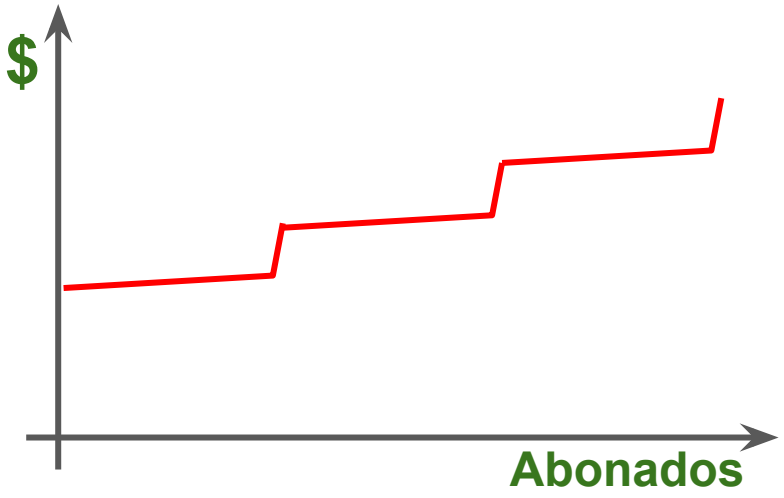


¿Que tienen en común todas estas tecnologías?

El costo y la complejidad.. están en la RED!

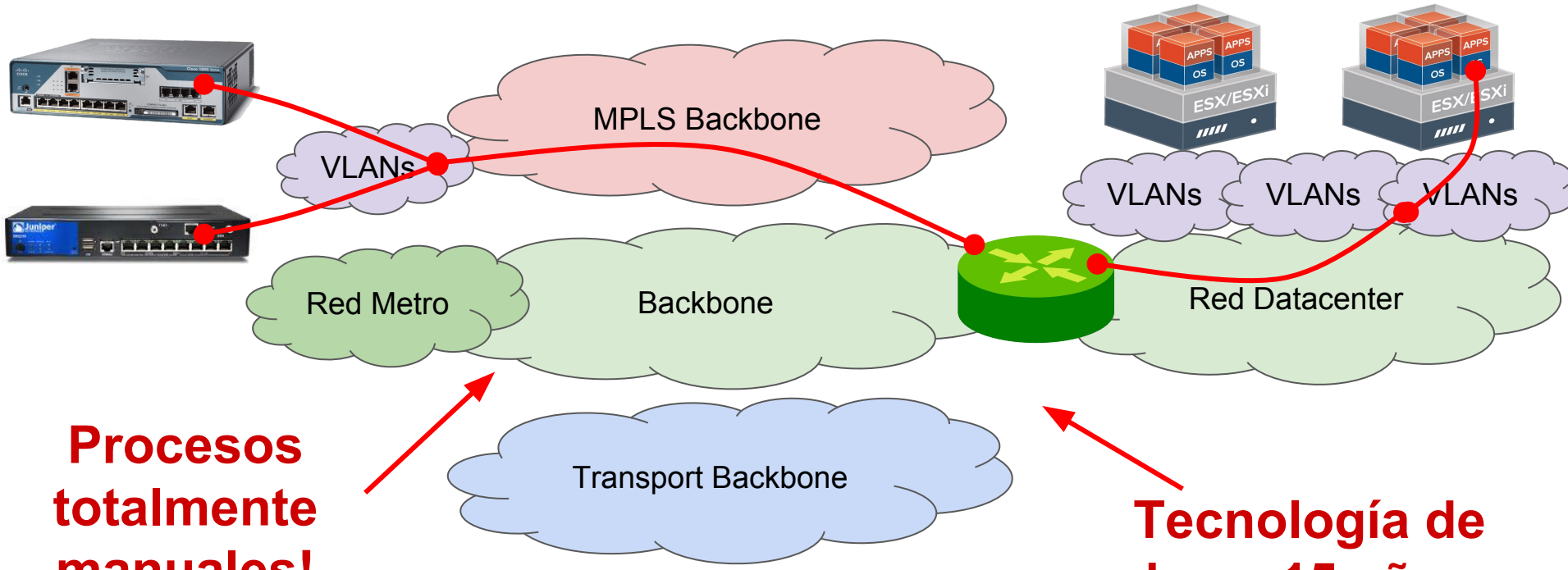
El costo y la complejidad.. están en la RED!

1. Requiere inversiones fuertes por parte del operador
   Estructura de costo poco escalable
2. Requiere importantes esfuerzos para homogeneizar la red
3. El operador queda "cautivo" a la tecnología
   (Vendor Lock-In)
4. Los ciclos de actualización son laaaaargos.
   (Todavía hay redes X.25 y F/R en operación)



¿Porque todos estos problemas?

Las Redes de las Telcos
¡SON MUY COMPLICADAS!
Y por lo tanto CARAS!



Procesos totalmente manuales!

Tecnología de hace 15 años

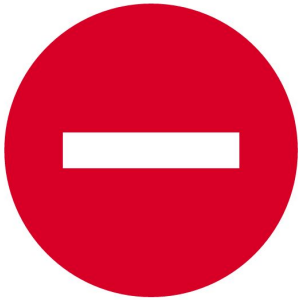
Conectividad Corporativa…
¿Como lo ve el cliente, en estos días?

Pocos proveedores de Servicio

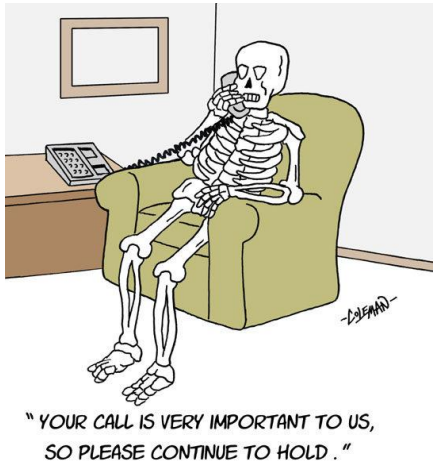
Servicio muy costoso y de plazo fijo

Brecha digital

Lento de activar



Cliente no tiene control



Altos tiempos de respuesta

¡Tenemos una Buena y una Mala noticia!

La buena:

Es un mercado gigante, y expansión!

$26.62B al 2020

Radiant Insights
Make informed business decisions

MPLS IP VPN Services Market Size Worth 26.62 Billion By 2020 : Radiant Insights,Inc

RadiantInsights.com includes new market research report on "Global MPLS IP VPN Services Market Size, Share And Trends Report Up To 2020 : Radiant Insights" to its huge collection of research reports.

December 29, 2015 01:45 ET | **Source:** Radiant Insights

San Francisco, Dec. 29, 2015 (GLOBE NEWSWIRE) -- The global **MPLS IP VPN Services Market** is expected to reach USD 26.62 billion by 2020. Despite considerably maturing over the last five years, the market is poised for high growth on account of appreciable growth potential exhibited by managed MPLS IP VPN services. Enterprises have increasingly started incorporating MPLS IP VPN services for leveraging benefits such as cost minimization and performance maximization. The market is expected to stay buoyant as a direct consequence of declining ATM/frame relay implementation.

Convergence of video, voice, and data on a single platform from different sources and the ability to provide scalable bandwidth is expected to encourage MPLS IP VPN services adoption. As MPLS supports multipoint full-mesh connectivity, organizations adopting cloud computing to address growing concerns pertaining to network security and IT costs can easily manage multiple locations in their network.

$46.26B al 2020

Grand View Research
Market Research & Consulting

Global MPLS IP VPN Services Market By Service (Layer 3) By Application (Automated Machines, Video Conferencing, Audio Conferencing) Expected To Reach USD 46.26 Billion by 2020: Grand View Research, Inc.

The global MPLS IP VPN services market is expected to reach USD 26.62 billion by 2020, according to a new study by Grand View Research, Inc. Despite considerably maturing over the last five years, the market is poised for high growth on account of appreciable growth potential exhibited by managed MPLS IP VPN services. Enterprises have increasingly started incorporating MPLS IP VPN services for leveraging benefits such as cost minimization and performance maximization. The market is expected to stay buoyant as a direct consequence of declining ATM/frame relay implementation.

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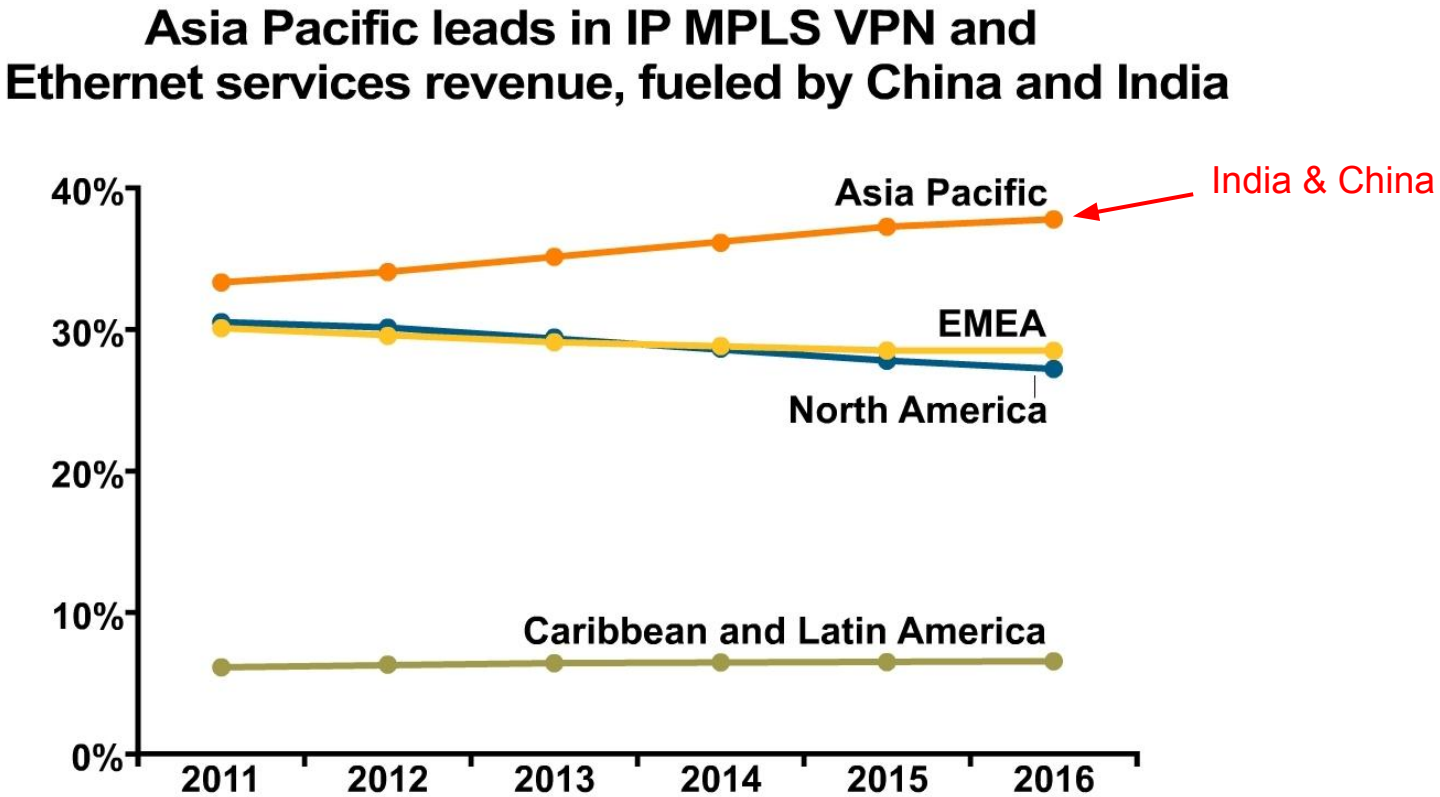
Stringent regulations pertaining to the use of VPN for personal applications, especially in the Middle East countries and China are expected to pose a challenge to the MPLS IP VPN services market growth over the forecast period.

View summary of this report @ http://www.grandviewresearch.com/industry-analysis/multi-protocol-labelled-switching-internet-protocol-virtual-private-network-market

La mala:

¡América Latina se quedó atrás!



© Infonetics Research, *Ethernet and IP MPLS VPN Services Annual Market Size and Forecasts*, June 2012

¡Esto limita las posibilidades de llevar aplicaciones corporativas al Cloud!

SD-WAN

Aplicar

SDN

Software Defined Networks

Redes Programáticas

- Separa Plano Control & Datos
- Plano de Control: con API
- Plano de Datos: Commodity!

Redes Servicios Privados

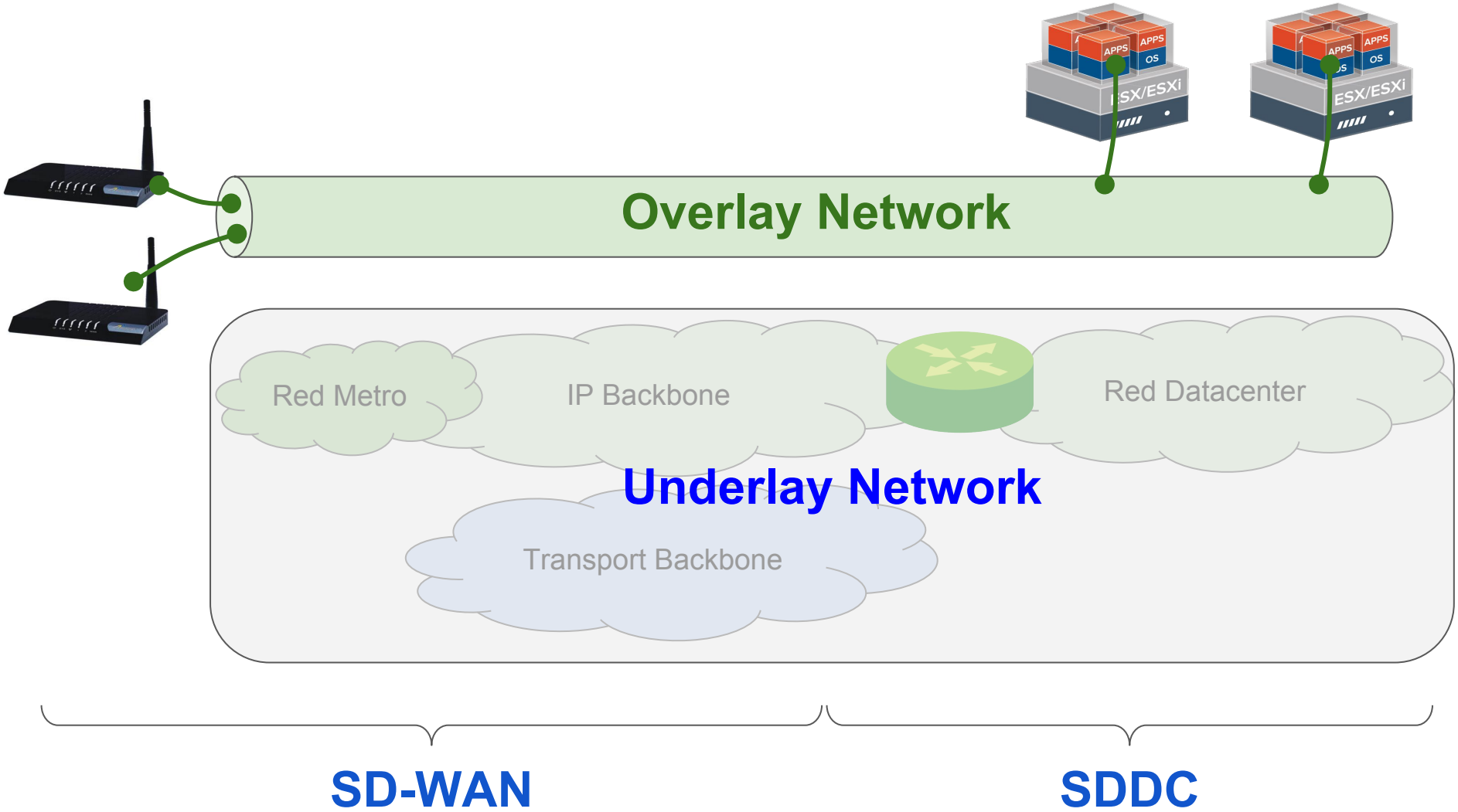
- OTT - Over-the-Top
- Redundante
- Menor Costo

WAN

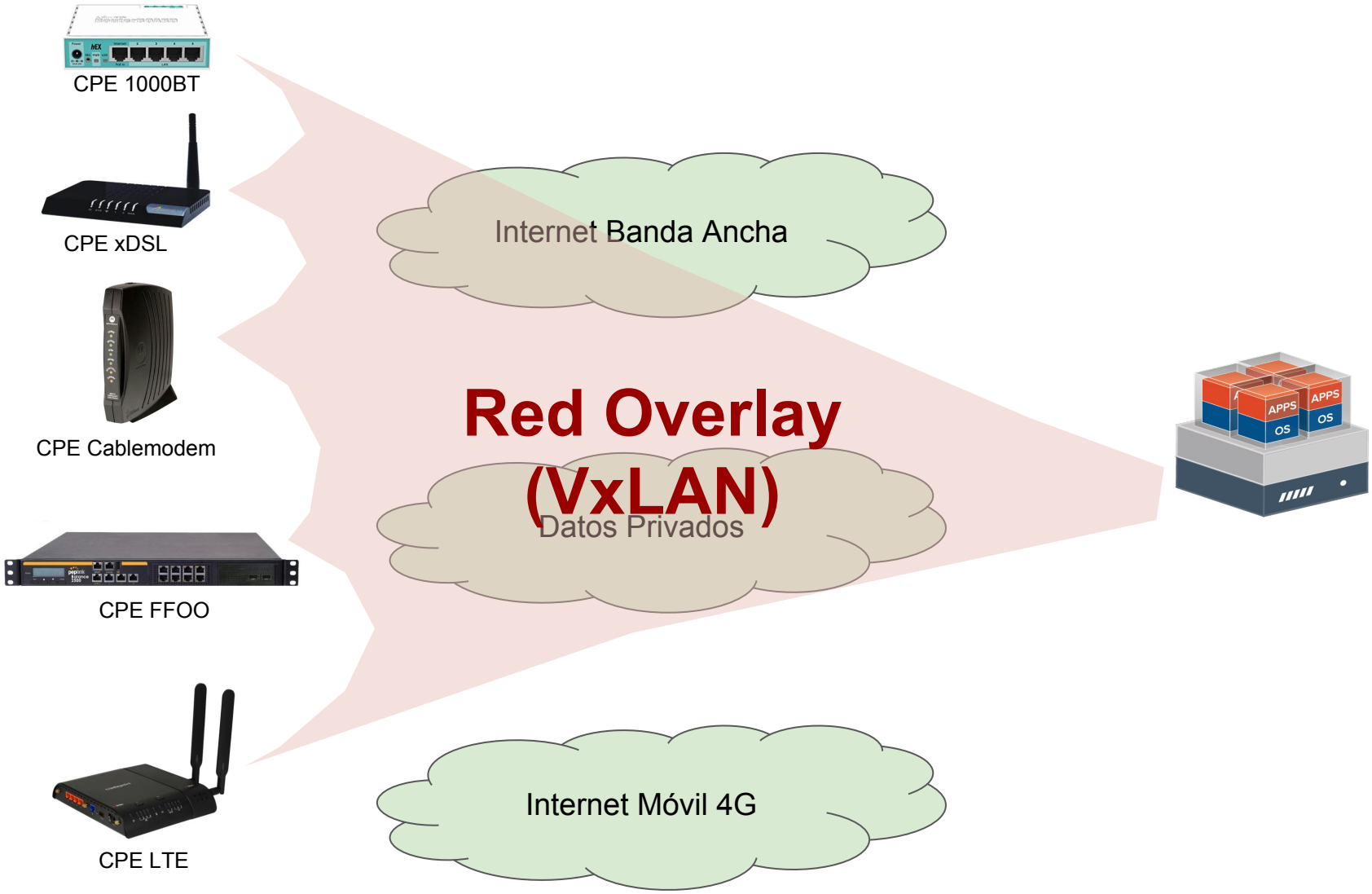
Wide Area Networks

Conectividad Corporativa...

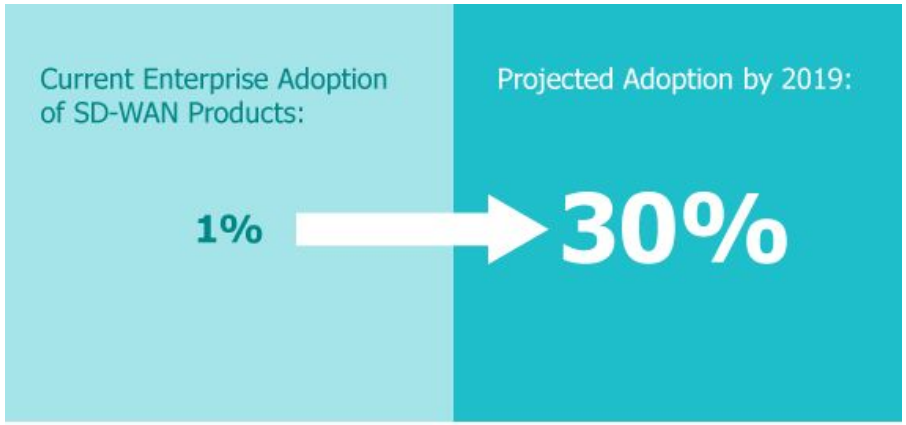
Modelo overlay



Un nuevo concepto
Cloud VPN (Over-the-Top)



Mercado Software Defined WAN, Pequeño aún, ¡Pero será Gigante!



Source: Gartner, 2015

$6B al 2020

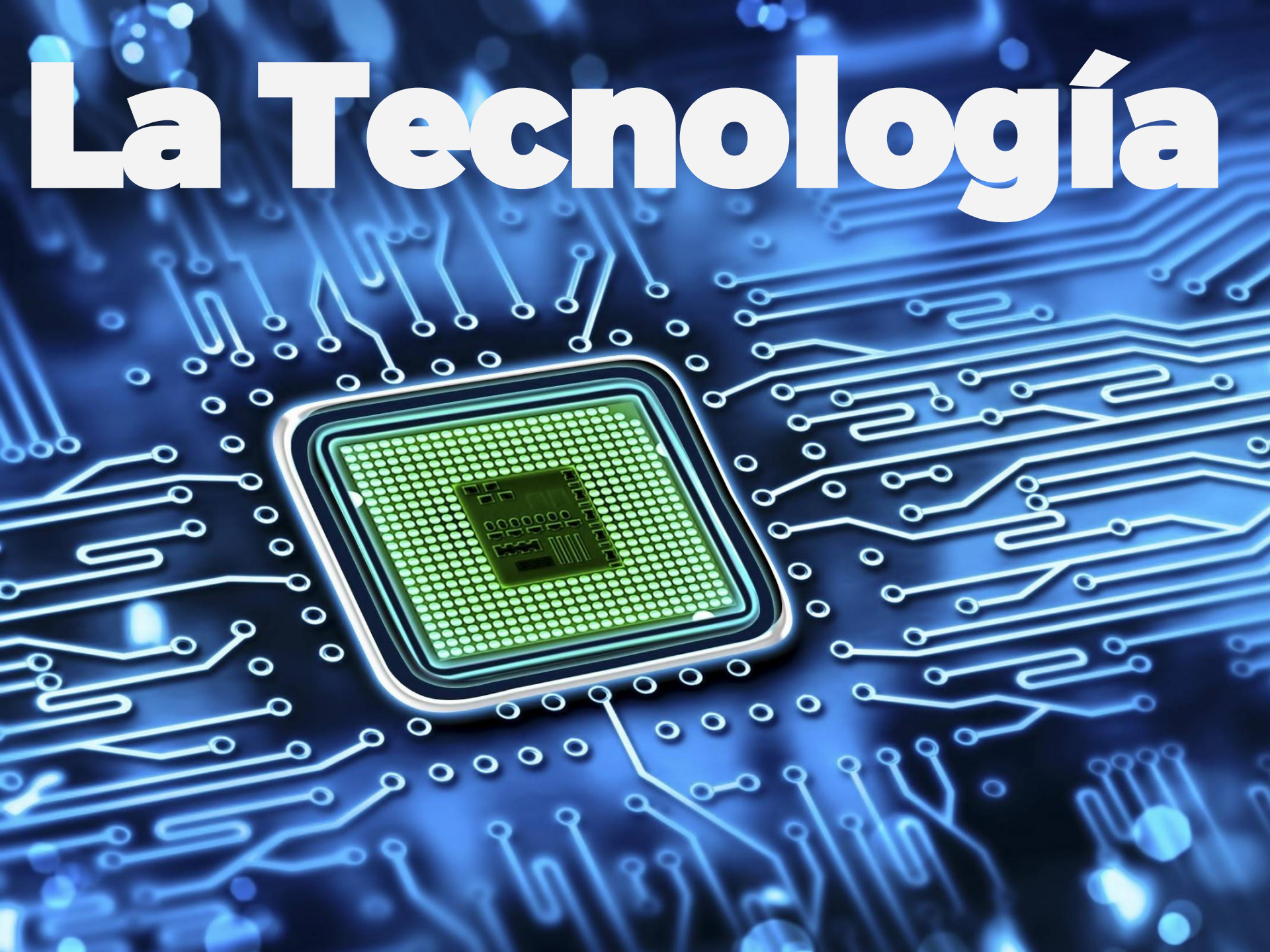
Source: IDC Corp

Una tremenda oportunidad para Latam

The report also covers the total SD-WAN market by geography. North America is expected to have the largest market share; however, Latin America will grow with the highest CAGR from 2015 to 2020. On-going demand for the increasing bandwidth and increasing dependency in high performance networks are the reason for growth of SD WAN in North America.

Source: Markets & Markets

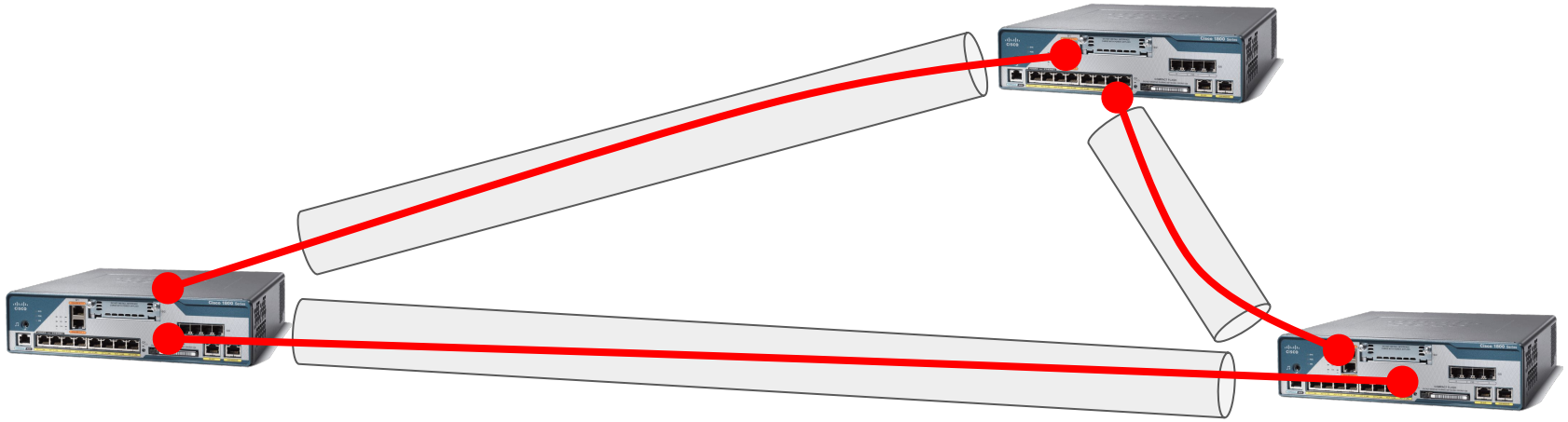
La Tecnología



Tecnología Overlay

Basicamente, consiste en

1. Establecer Túneles (entre CPEs) [Plano de Control]
2. Encaminar el tráfico por los túneles [Plano de Datos]



Existe un protocolo (olvidado) que resuelve un problema similar

LISP - The Locator/ID Separation Protocol (LISP)

The Locator/ID Separation Protocol (LISP)

RFC6830, RFC6833, ...

- Protocolo definido por Cisco,
- Propuesto en 2009
- Aprobado en 2013
- Escasamente implementado

Internet Engineering Task Force (IETF)
Request for Comments: 6830
Category: Experimental
ISSN: 2070-1721

D. Farinacci
Cisco Systems
V. Fuller

D. Meyer
D. Lewis
Cisco Systems
January 2013

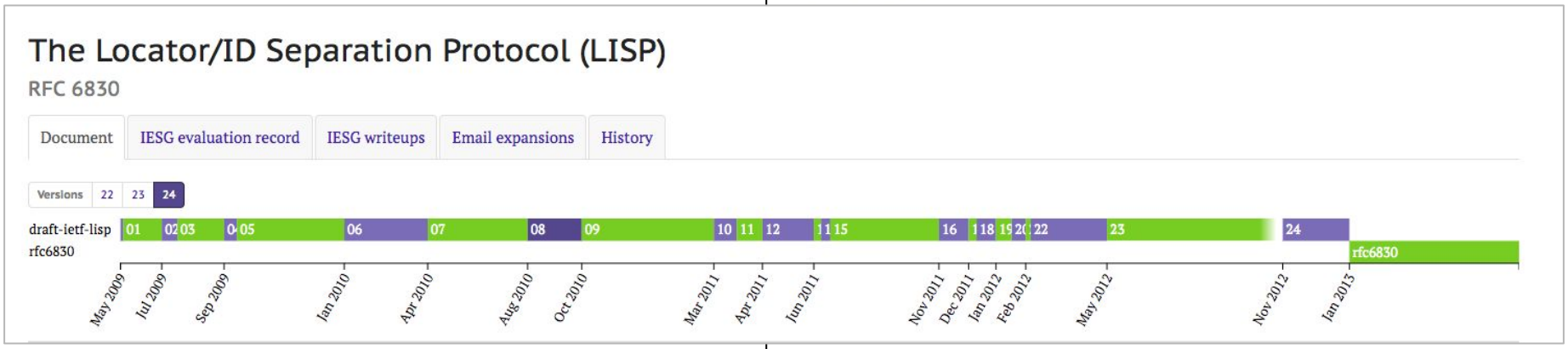
The Locator/ID Separation Protocol (LISP)

Abstract

This document describes a network-layer-based protocol that enables separation of IP addresses into two new numbering spaces: Endpoint Identifiers (EIDs) and Routing Locators (RLOCs). No changes are required to either host protocol stacks or to the "core" of the Internet infrastructure. The Locator/ID Separation Protocol (LISP) can be incrementally deployed, without a "flag day", and offers Traffic Engineering, multihoming, and mobility benefits to early adopters, even when there are relatively few LISP-capable sites.

Design and development of LISP was largely motivated by the problem statement produced by the October 2006 IAB Routing and Addressing Workshop.

Status of This Memo



The Locator/ID Separation Protocol (LISP)

RFC6830, RFC6833, ...

Protocolo de “Mapeo y Encapsulamiento”, que busca separar

- **EID (Endpoint ID)**: Quien el Usuario es?
- **RLOC (Routing Locator)**: Donde el Usuario está?

Busca resolver el problema

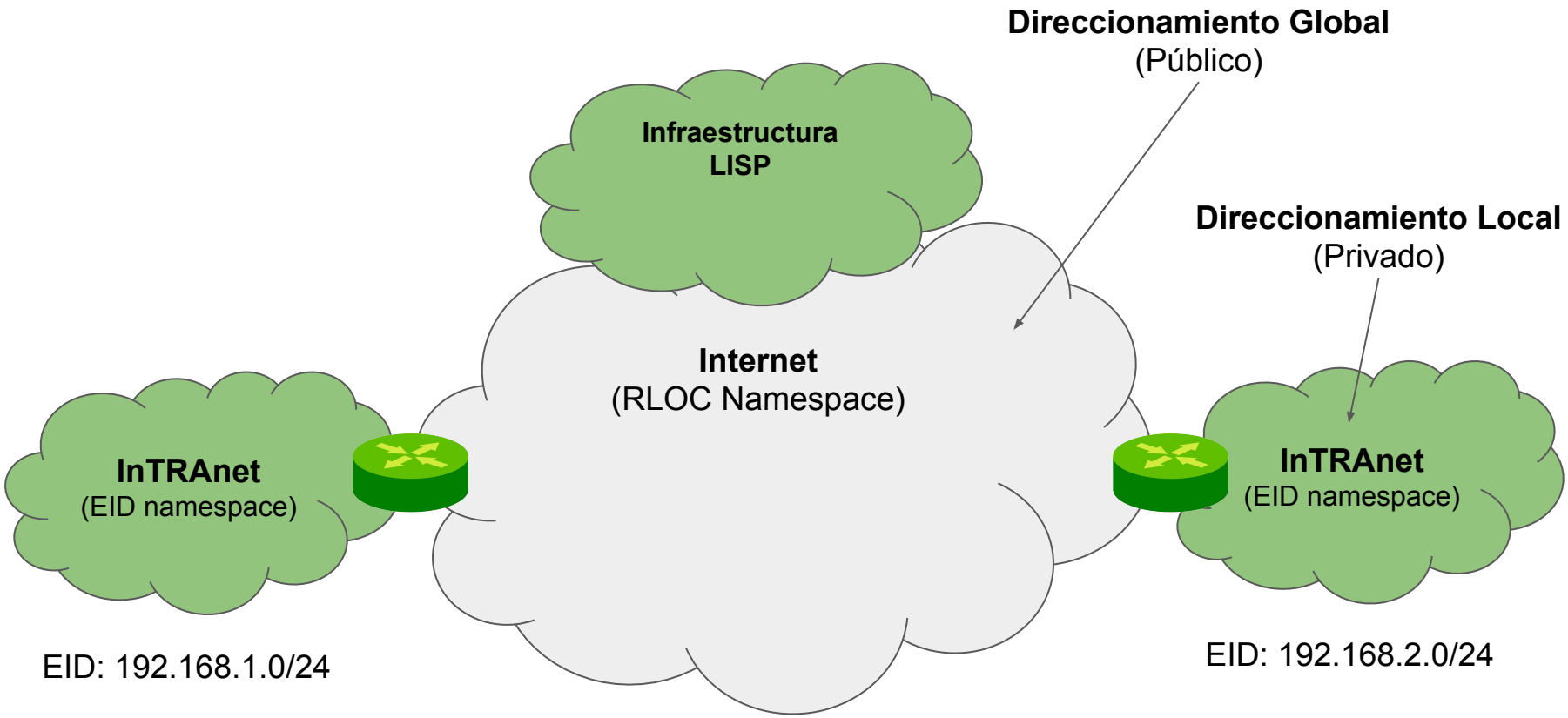
- Dirección IP está asociada a ubicación, la debo cambiar si me muevo.
- Dirección IP está asociada a mi, no se podrá enrutar si me muevo.

LISP lo resuelve, usando

- Plano de direccionamiento Global para los **RLOC**, y que cambia según me muevo
- Plano de direccionamiento Local para los **EID**, que no cambia si me muevo.

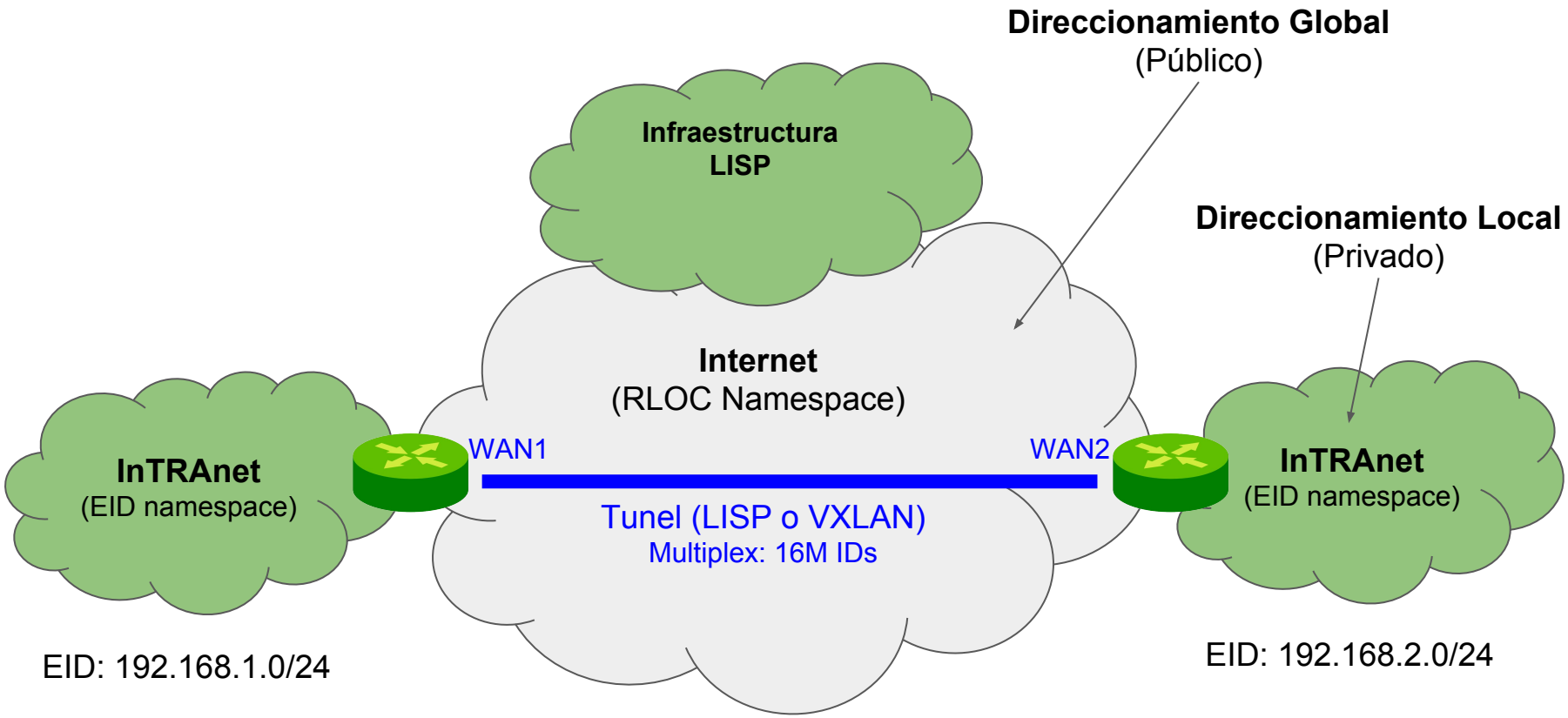
The Locator/ID Separation Protocol (LISP)

RFC6830, RFC6833, ...



Más Información: https://datatracker.ietf.org/wg/lisp/documents/

The Locator/ID Separation Protocol (LISP)
Dataplane



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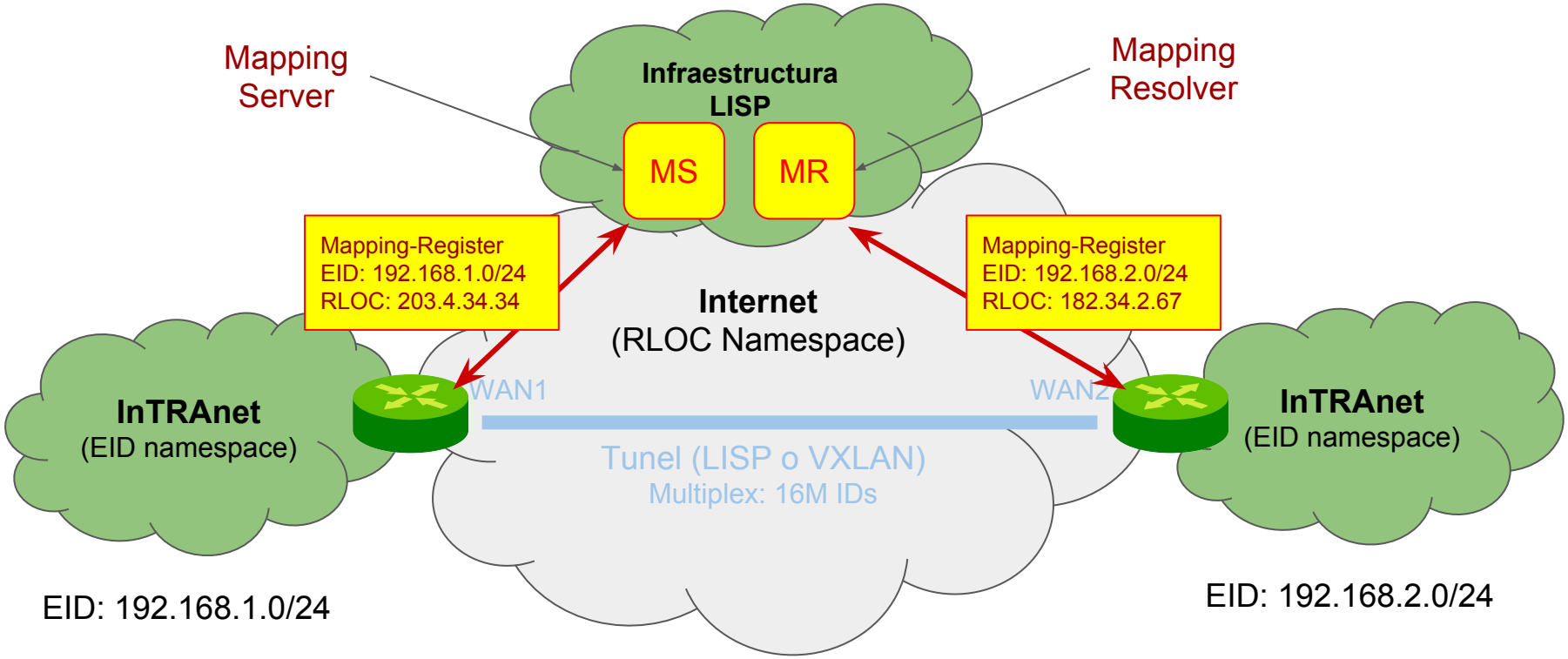
The Locator/ID Separation Protocol (LISP)

Control Plane



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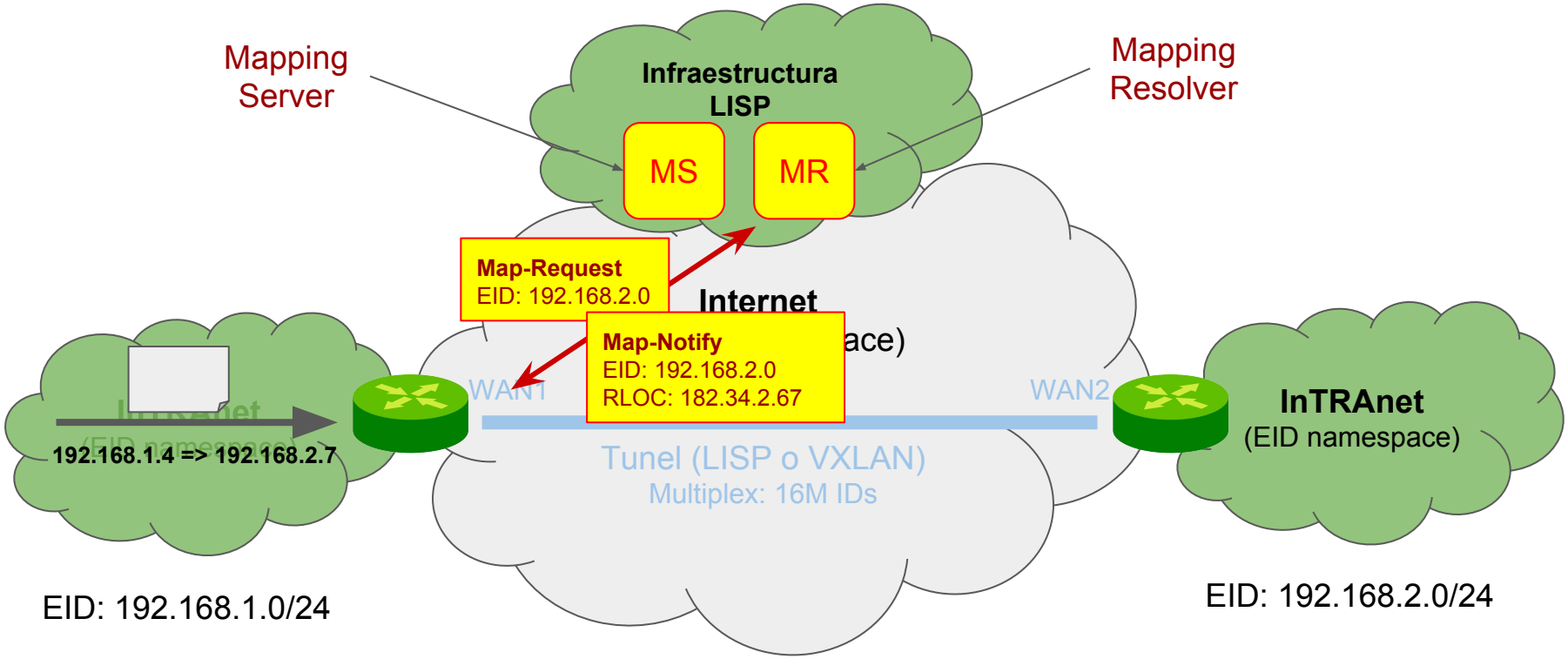
The Locator/ID Separation Protocol (LISP)

Control Plane



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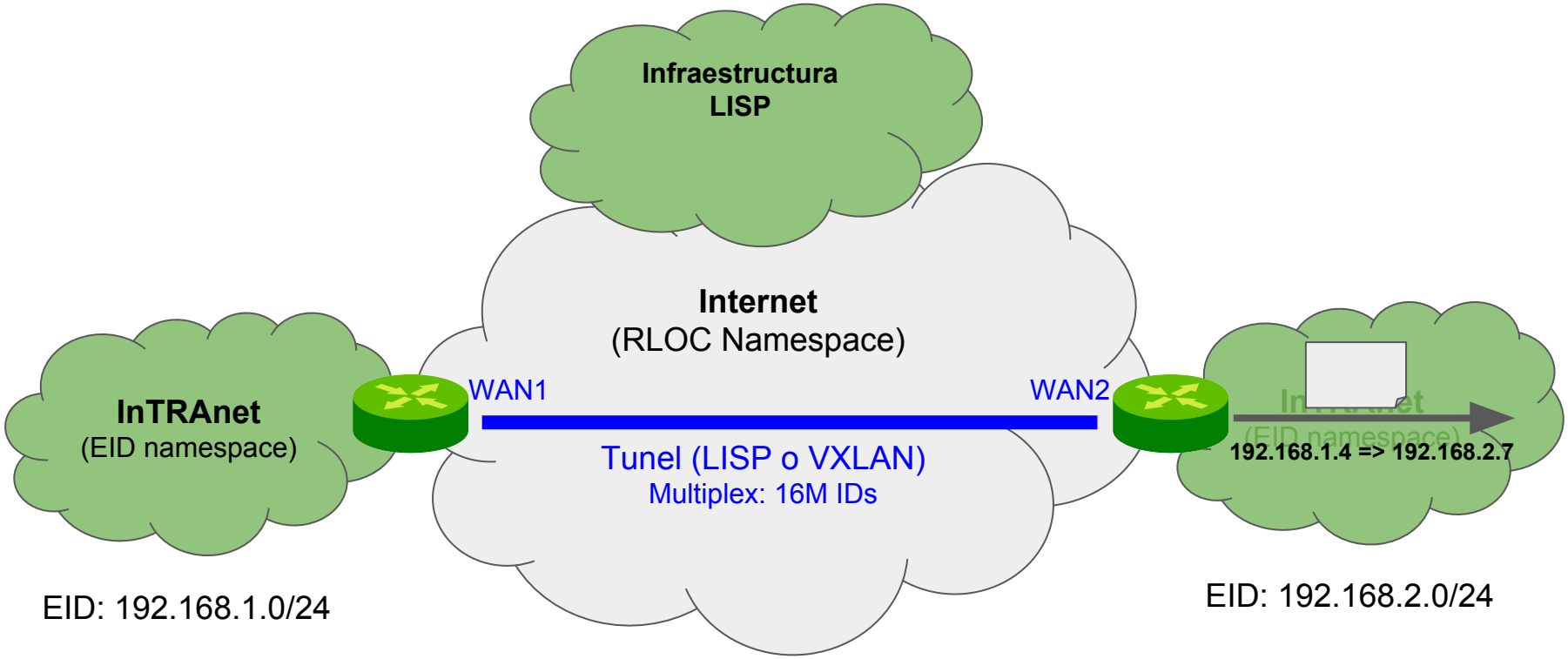
The Locator/ID Separation Protocol (LISP)
Dataplane



Más Información: https://datatracker.ietf.org/wg/lisp/documents/

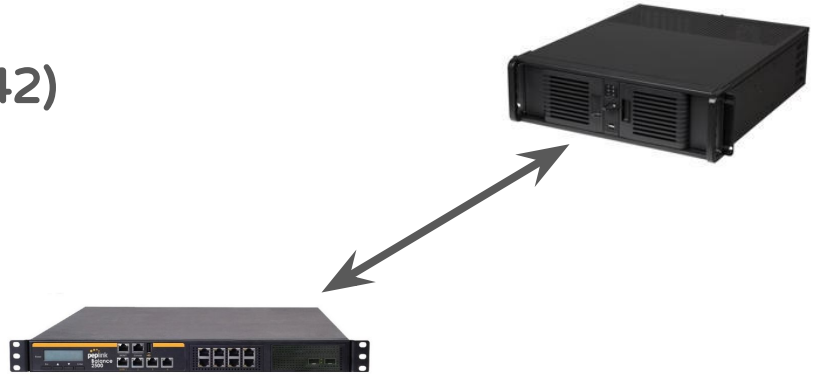
The Locator/ID Separation Protocol (LISP)

RFC6830, RFC6833, ...

Protocolo de Plano de Control

LISP Control-Plane Protocol (UDP/4342)

- LISP Map-Request
- LISP Map-Reply
- LISP Map-Register
- LISP Map-Notify
- LISP Encapsulated Control Message



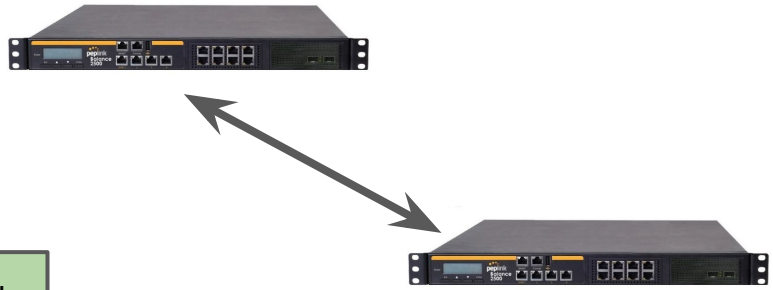
Plano de Datos

LISP Encapsulation Protocol (UDP/4341)

Layer 3

ETH	IP	UDP	LISP	IP	Payload
18B	20B	8B	8B	20B	

36 Bytes overhead

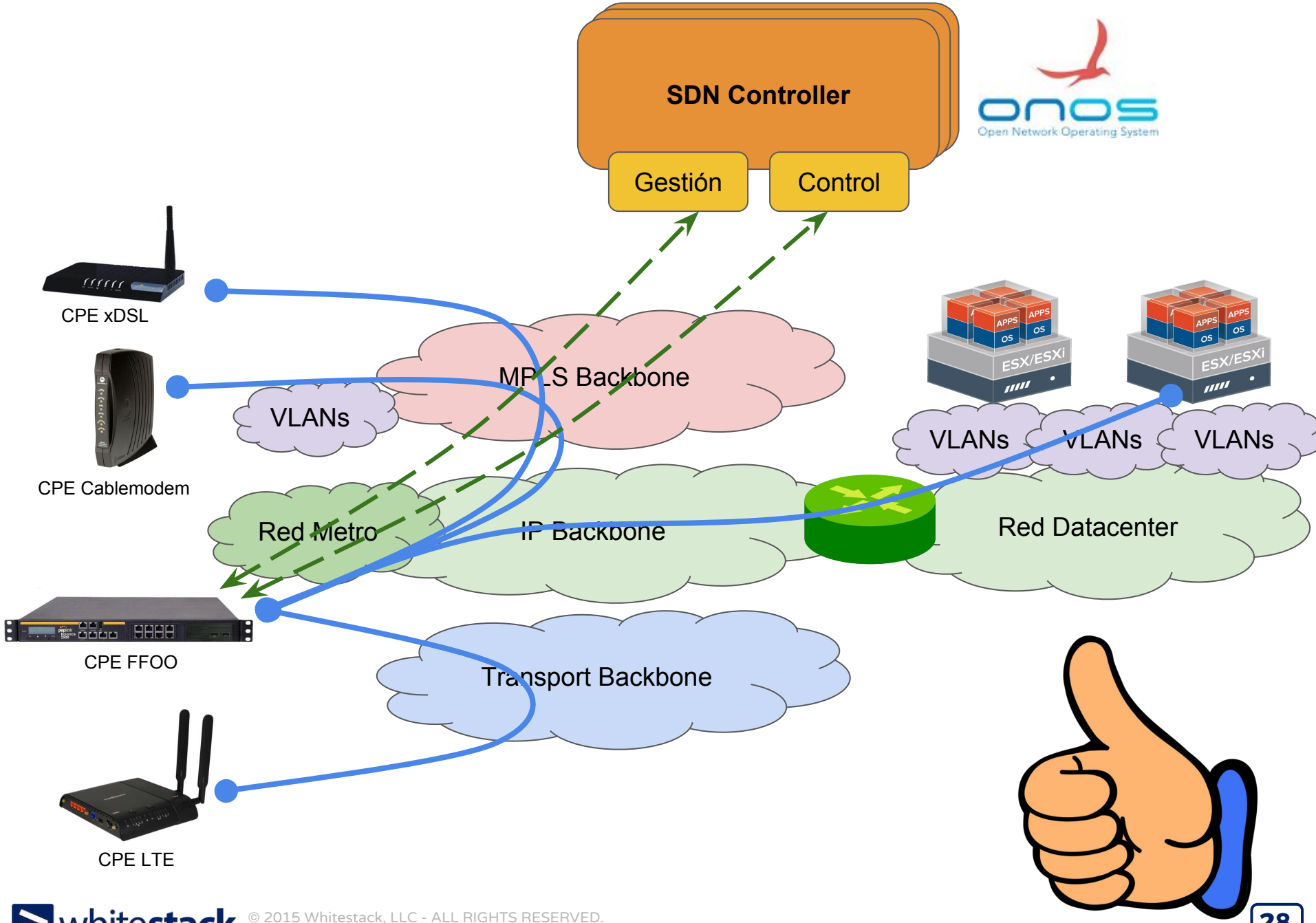


VXLAN Encapsulation Protocol (UDP/4789)

Layer 2

ETH	IP	UDP	VXLAN	ETH	IP	Payload
18B	20B	8B	8B	18B	20B	

54 Bytes overhead



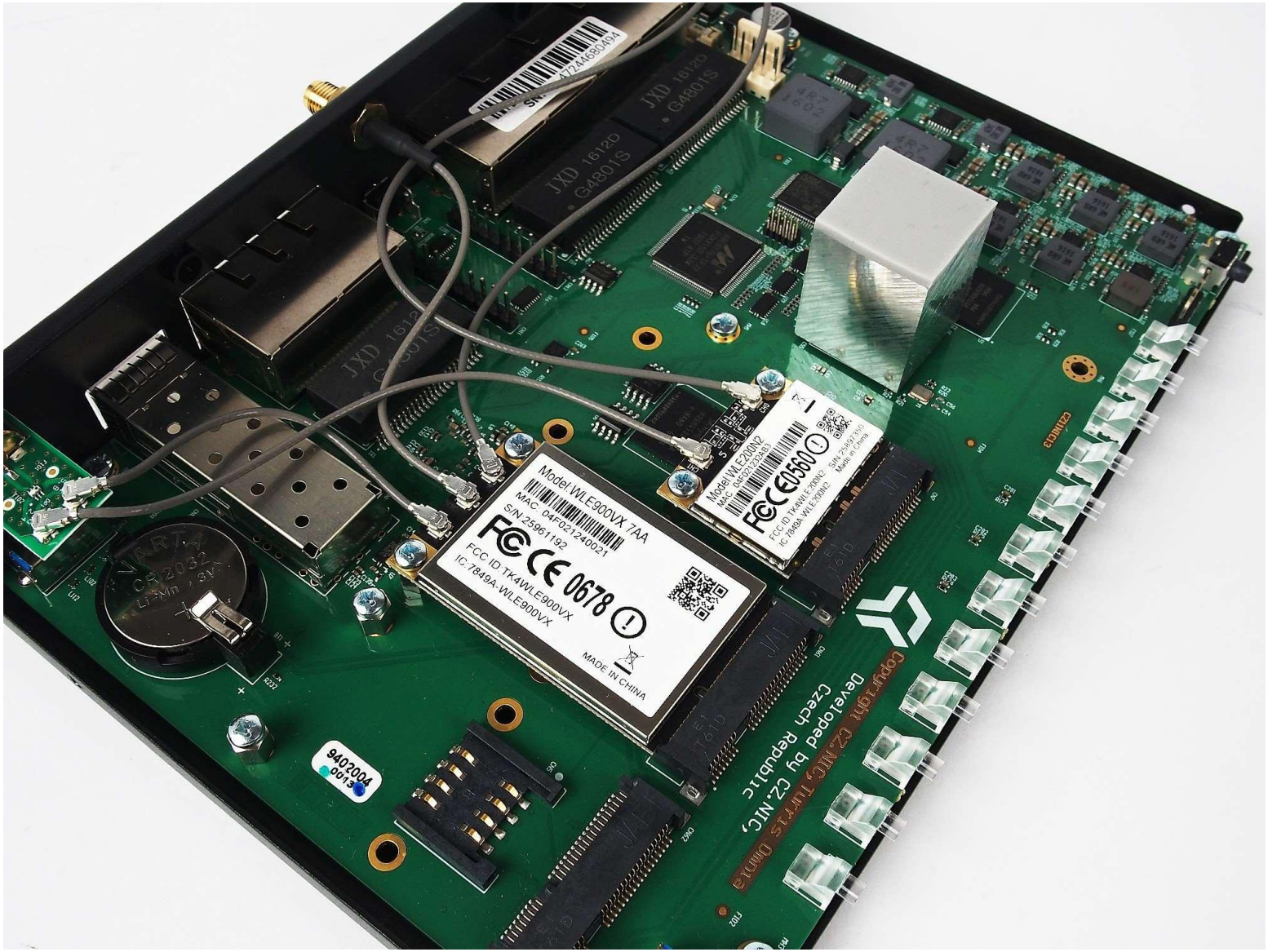
Implementación

Existe un mercado de dispositivos de hardware “baremetal”, que no tienen Sistema Operativo, bajo distintas arquitecturas

- Intel x86 (Celeron / Core)
- Mediatek (MIPS)
- Armada (ARM)
- Atheros (MIPS)
- Freescale (PPC)

Linux (embedded) compilado para la arquitectura y chipset

Implementación



En producción

Algunos elementos a considerar

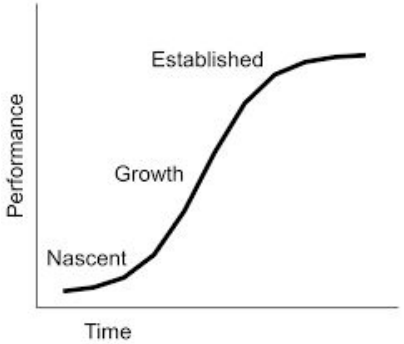
1. **Seguridad**
   a. Protocolo de plano de control, IPSEC (AH+ESP)
   b. Protocolo de plano de datos, IPSEC (AH+ESP)
   c. Se puede usar infraestructura PKI, o similar, para intercambio de llaves
   d. Existen dispositivos con chips de encriptación por hardware
2. **Calidad de Servicio (QoS)**
   a. Clasificación de tráfico (Layer2, 3, 4 o 7)
   b. Traffic Shapping en la salida
   c. Traffic Policing en la entrada
   d. Marcado (DiffServ o TOS) de acuerdo a reglas.
3. **Monitoreo de Calidad de Experiencia** (QoE)
   a. Monitoreo Activo (pruebas sintéticas, activas, hacia los extremos)
   b. Monitoreo Pasivo (monitoreo de métricas del tráfico)

Resumen

- **Servicios Privados "Tradicionales" en LATAM**
  - Tecnología muy costosa (MPLS)
  - Alto precio con respecto a servicio Internet
  - Tasas de penetración muy bajas (precio, servicio, calidad)

- **SD-WAN cambia el paradigma**
  - Nueva estructura de costos más liviana
  - Solución "Over-The-Top", no requiere inversiones en red
  - CPE basados en equipos "Baremetal" + Linux
  - LATAM promete las más altas tasas de adopción

- **Estado del Arte**
  - CPEs: Hardware Maduro
  - Software: Linux Maduro
  - Protocolos: LISP, VXLAN Maduros



whitestack

Gracias!

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