



# Instalación del segundo Root-Server en REACCIUN y actualización de sus políticas de enrutamiento

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**MUCHAS GRACIAS !!**



# Agenda

- Antecedentes.
- Instalación del L-ROOT en REACCIUN. Resultados.
- Optimización de esquema de enrutamiento.
- Comparación con servicio de Infraestructura Crítica.
- Conclusiones.

## Antecedentes

- A comienzos de 2012, el **CENIT propone instalación de un servidor copia del L-ROOT** en la Red Académica de Venezuela **REACCIUN**.
- En el año 2013, **CENIT inicia contactos con LACNIC e ICANN**.
- Durante 2014, **CENIT e ICANN continúan conversaciones**.
- A finales de 2014 **se formaliza acuerdo** entre Presidente del CENIT y Presidente de la Division de Dominios Globales de ICANN, a través de la firma del L-Single Hosting Agreement.
- En Febrero de 2015 **se realiza la instalación** de servidor copia del L-ROOT.
- Adicionalmente, REACCIUN aloja otros servicios de **Infraestructura Crítica: copia del F-ROOT**, NIC de Venezuela (**ccTLD .ve**).

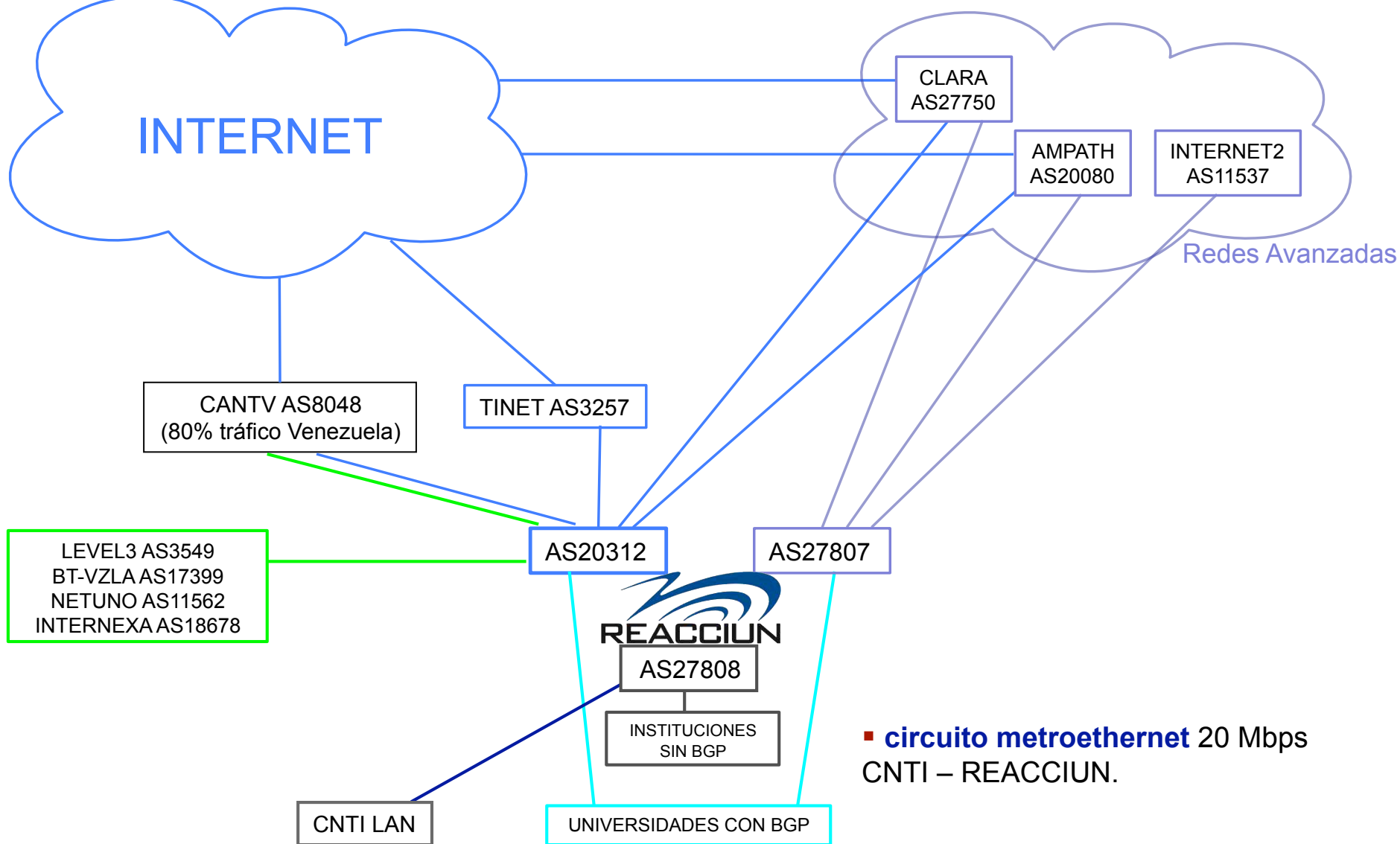
## Especificaciones de ICANN para servidor copia

Base Unit	Any model in PowerEdge Server Series: R320 , R420 , R415 , R620 or any other R series with specs below is fine
Processors	Intel Xeon, four or more cores per CPU
Memory	Minimum 16GB Memory, We suggest the host to purchase the maximum amount of memory possible.
Video Memory	Default minimum
Hard Drive	500GB minimum with Raid Mirroring ( RAID-1 ) (requires 2 identical drives)
Hard Drive Controller	RAID-1 Mirrored
Operating System	No Operating System
Network Interfaces	2 On Board GigE NIC is sufficient
Management	iDRAC7 Enterprise
CD-ROM/DVD-ROM	As desired by the host. (We will not be needing CD-Rom)
Sound Card	Default minimum
Bezel	As desired by the host.
RAID Configuration	Raid 1
Rack-Mount Feature	As desired by the host to match host's server racks.
Power Supply	Dual Redundant Power-supply.
Support	As desired by the host, However we recommend 3 years on-site at a minimum.

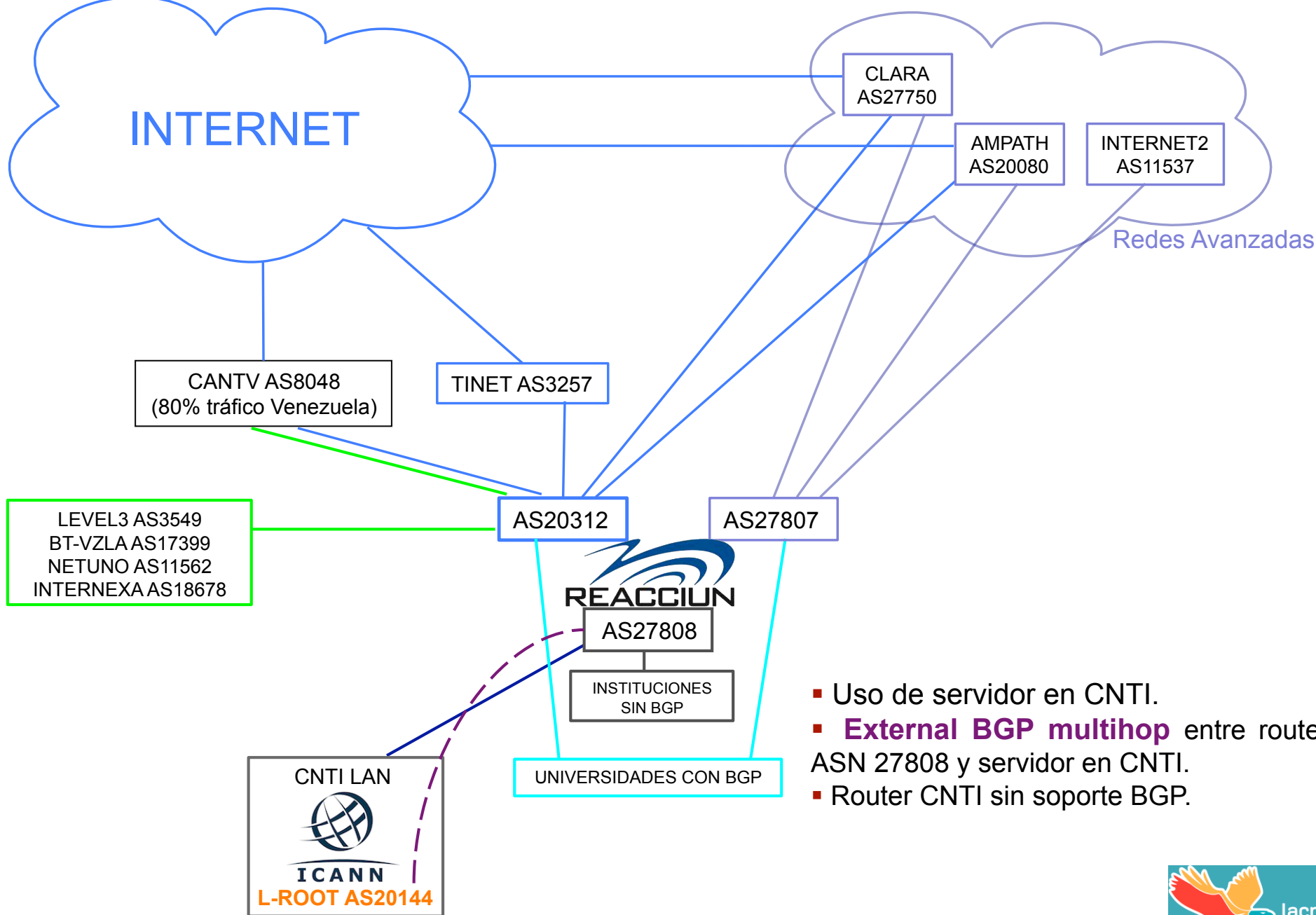
## Propuesta de REACCIUN: usar servidor de CNTI

- Dell Poweredge M600 (año 2008), blade enclosure.
- 2 Procesadores doble nucleo Intel Xeon 3.6 GHz.
- 4 GB de RAM.
- 2 Discos de 72 GB SCSI.
- 1 Controladora Raid de 256 MB de cache.
- 2 Puertos Gigabit Ethernet.
- 2 Fuentes de Poder.
- Sin puerto de administración remota ó iDRAC7 Enterprise.

# Topología de REACCIUN (Enero 2015)



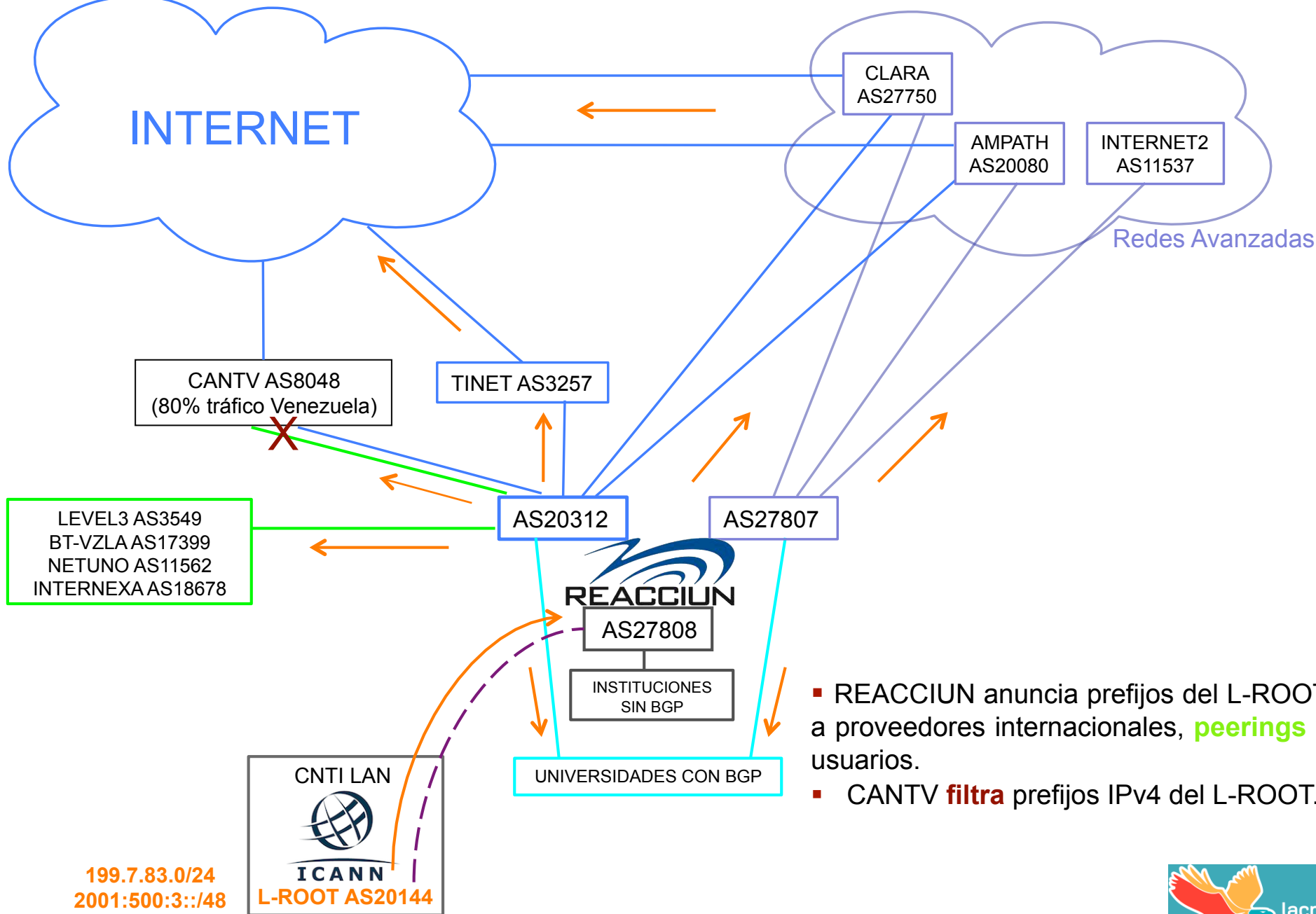
# Instalación copia L-Root (Febrero 2015)



- Uso de servidor en CNTI.
- **External BGP multihop** entre router ASN 27808 y servidor en CNTI.
- Router CNTI sin soporte BGP.



# Instalación copia L-Root (Febrero 2015)

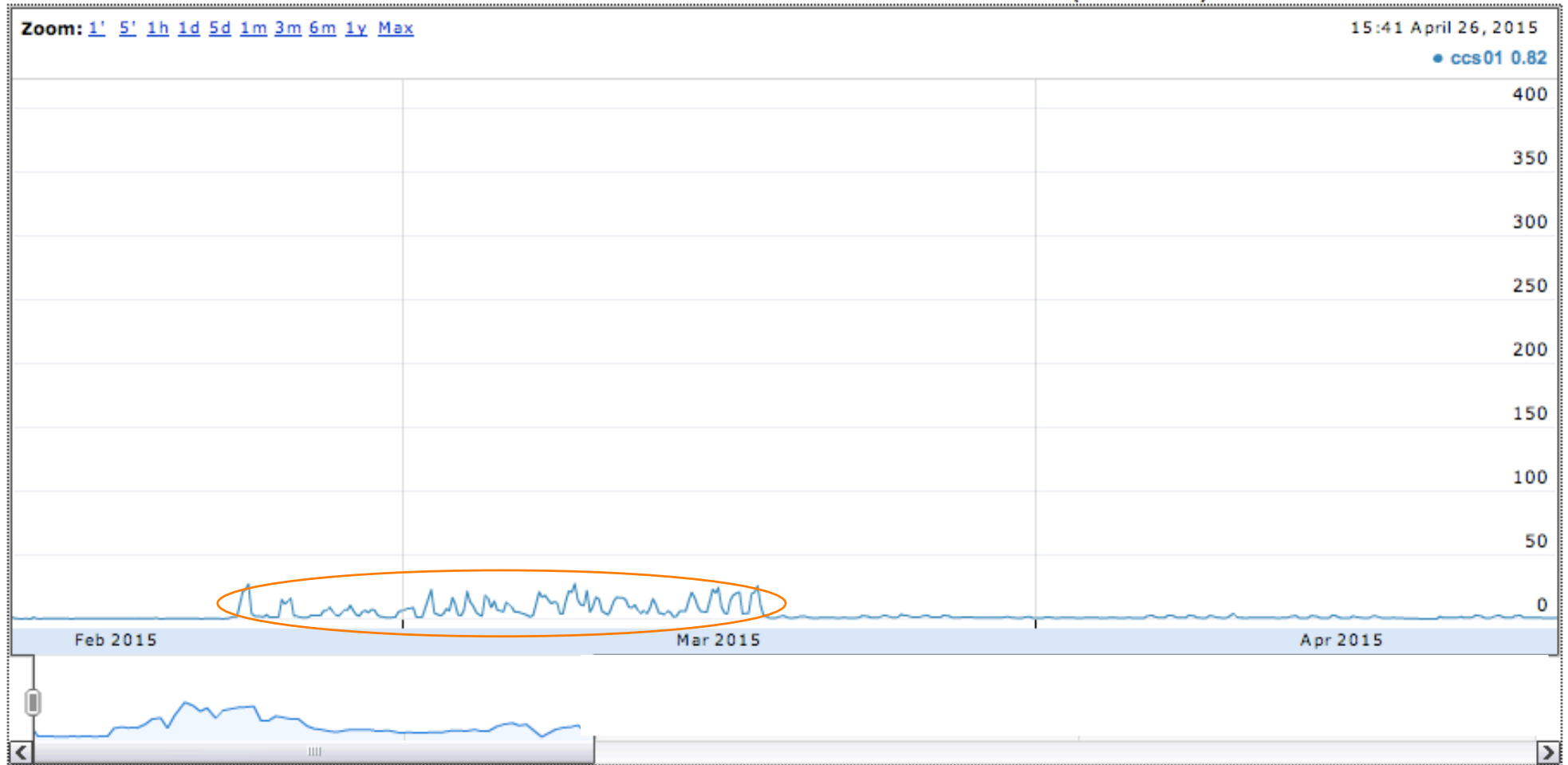


- REACCIUN anuncia prefijos del L-ROOT a proveedores internacionales, **peerings** y usuarios.
- CANTV **filtra** prefijos IPv4 del L-ROOT.

# Instalación copia L-Root (Febrero 2015)

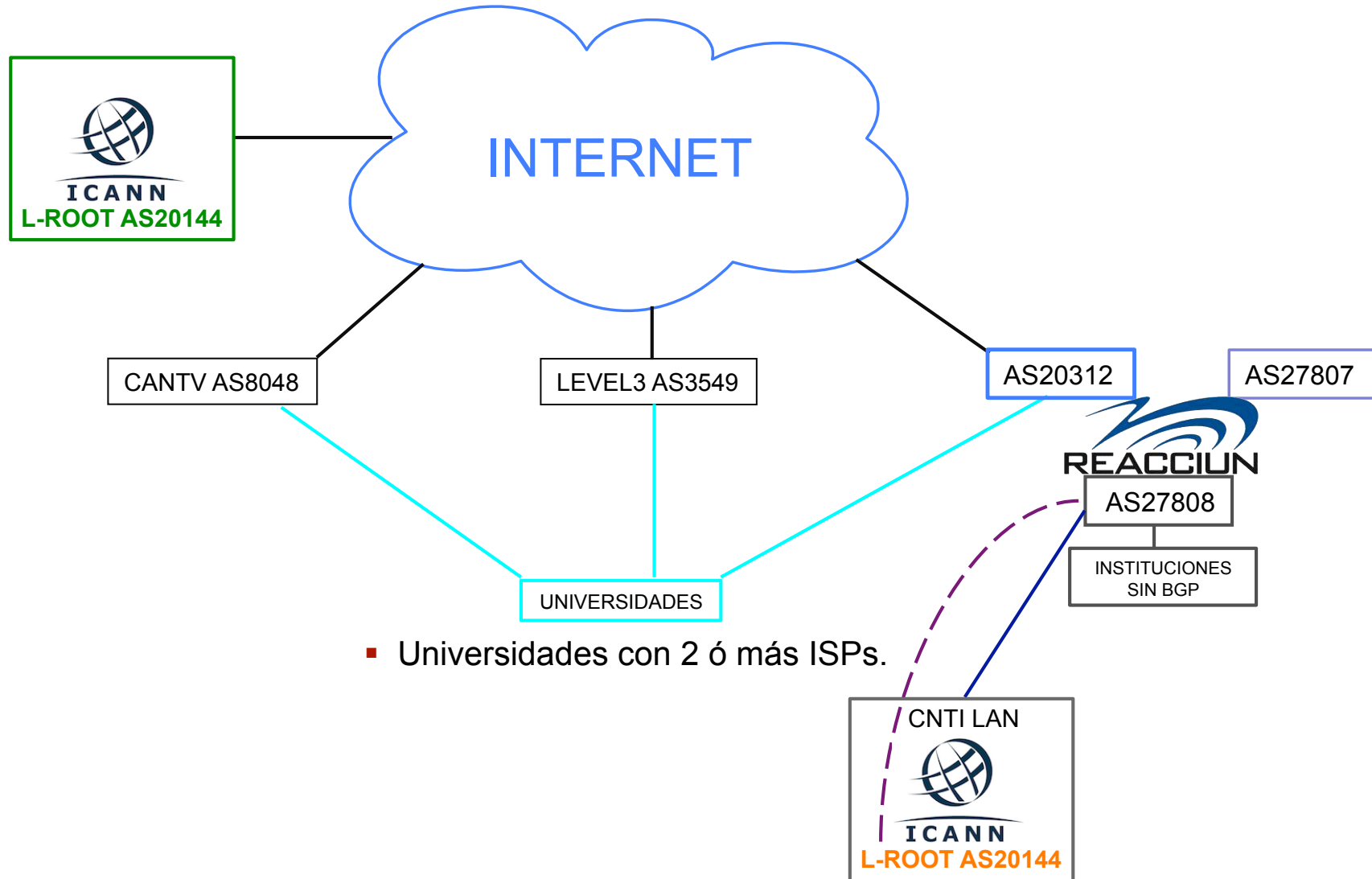
## Consultas Nodo Caracas (ccs01)

Queries by node  
from 2015-02-01 22:15 UTC to 2015-08-31 21:14 UTC (smoothed)

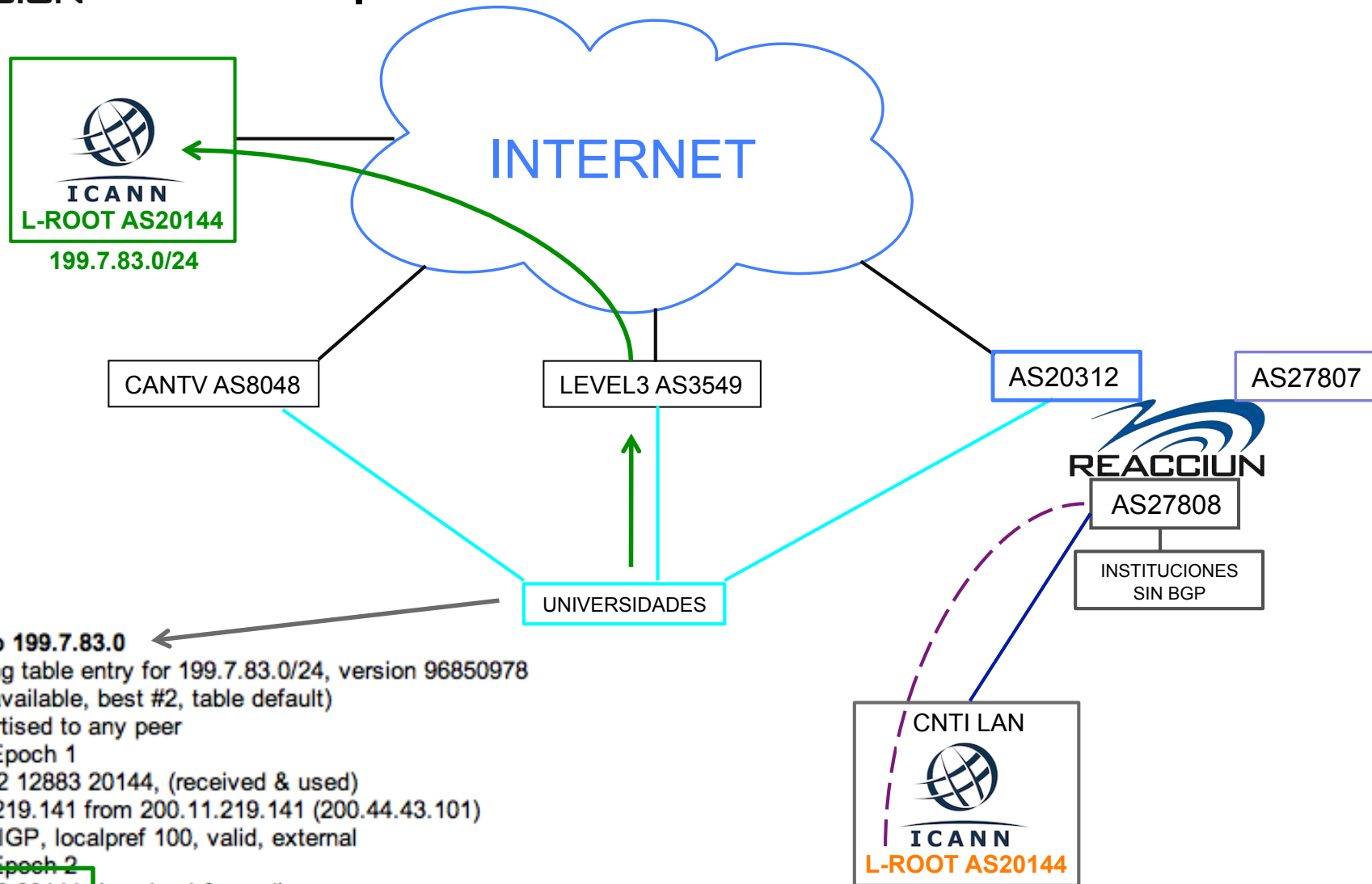


Date

## Conectividad de Universidades (Febrero 2015)



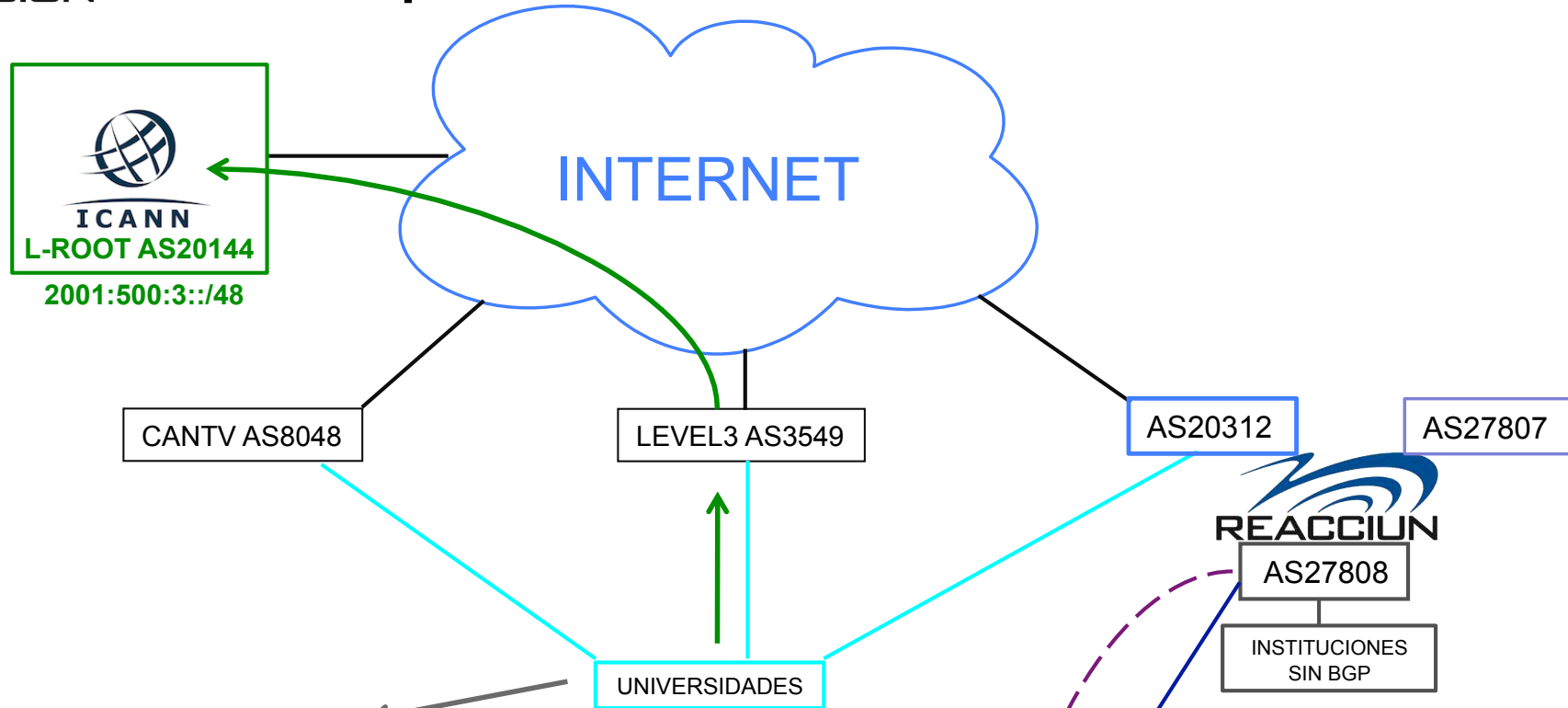
# Perspectiva IPv4 desde Universidades



```
#sh ip bgp 199.7.83.0
BGP routing table entry for 199.7.83.0/24, version 96850978
Paths: (3 available, best #2, table default)
Not advertised to any peer
Refresh Epoch 1
8048 6762 12883 20144, (received & used)
200.11.219.141 from 200.11.219.141 (200.44.43.101)
Origin IGP, localpref 100, valid, external
Refresh Epoch 2
3549 3132 20144, (received & used)
64.210.69.165 from 64.210.69.165 (67.17.82.143)
Origin IGP, metric 10639, localpref 100, valid, external, best
Community: 3549:350 3549:4950 3549:34604
Refresh Epoch 4
20312 27808 20144, (received & used)
150.185.255.41 from 150.185.255.41 (150.185.255.1)
Origin IGP, localpref 100, valid, external
```

- Preferencia sobre ruta internacional.

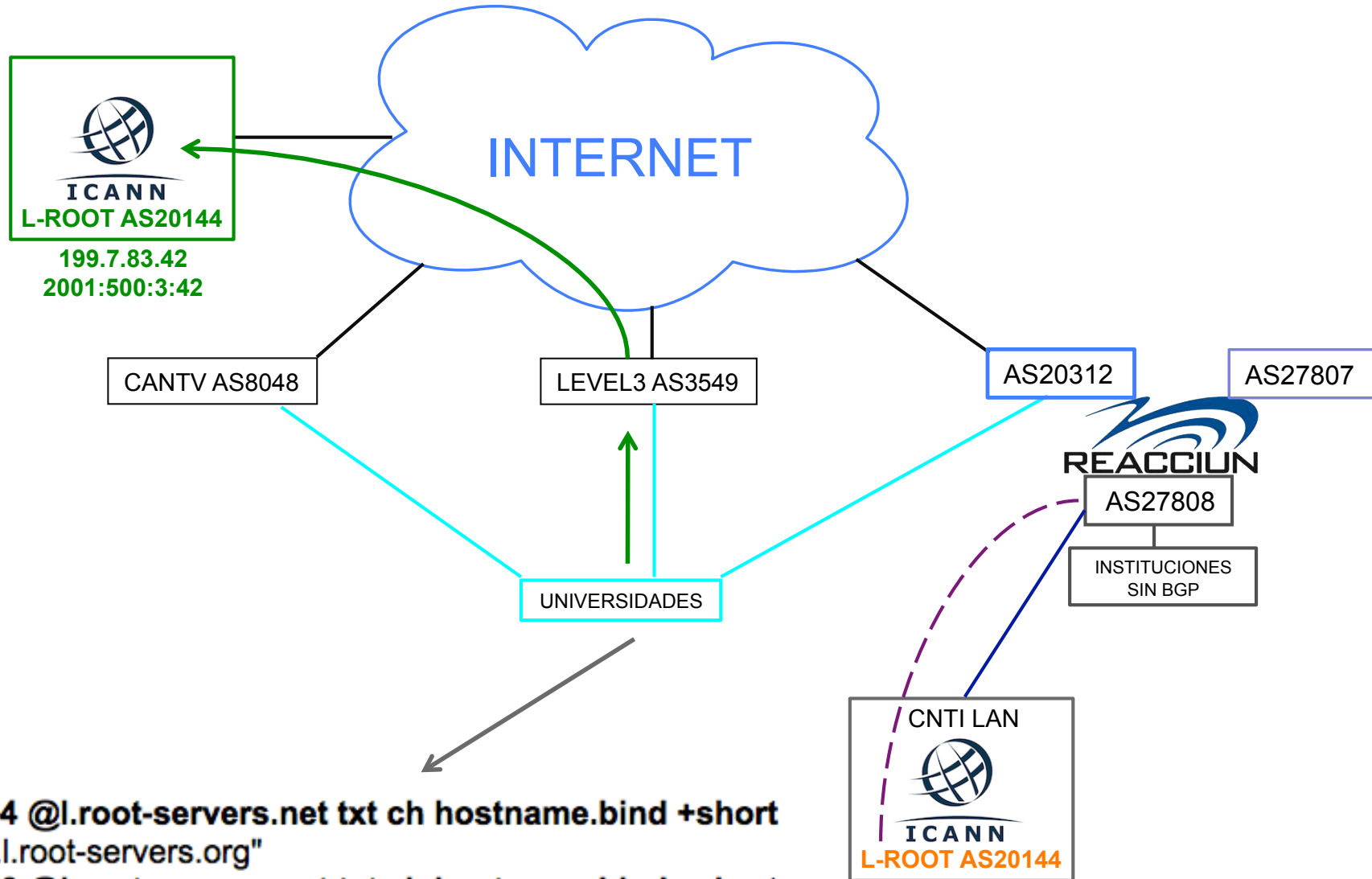
# Perspectiva IPv6 desde Universidades



```
#sh bgp ipv6 unicast 2001:500:3::/48
BGP routing table entry for 2001:500:3::/48, version 9475315
Paths: (3 available, best #3, table default)
Not advertised to any peer
Refresh Epoch 2
27807 27808 20144, (received & used)
 2800:30:FFFF:11::2 (FE80::216:9CFF:FE6E:89C0) from 2800:30:FFFF:11::2
  Origin IGP, localpref 100, valid, external
Refresh Epoch 2
20312 27808 20144, (received & used)
 2001:1338:FFFF:11::2 (FE80::214:A9FF:FED0:72C0) from 2001:1338:FFFF:11::2 (150.185.255.1)
  Origin IGP, localpref 100, valid, external
Refresh Epoch 2
3549 16735 20144, (received & used)
2001:450:2002:459::1 (FE80::223:4FF:FE0E:CA00) from 2001:450:2002:459::1 (67.17.82.143)
  Origin IGP, metric 11057, localpref 100, valid, external, best
  Community: 3549:4831 3549:34076 16735:7006
```

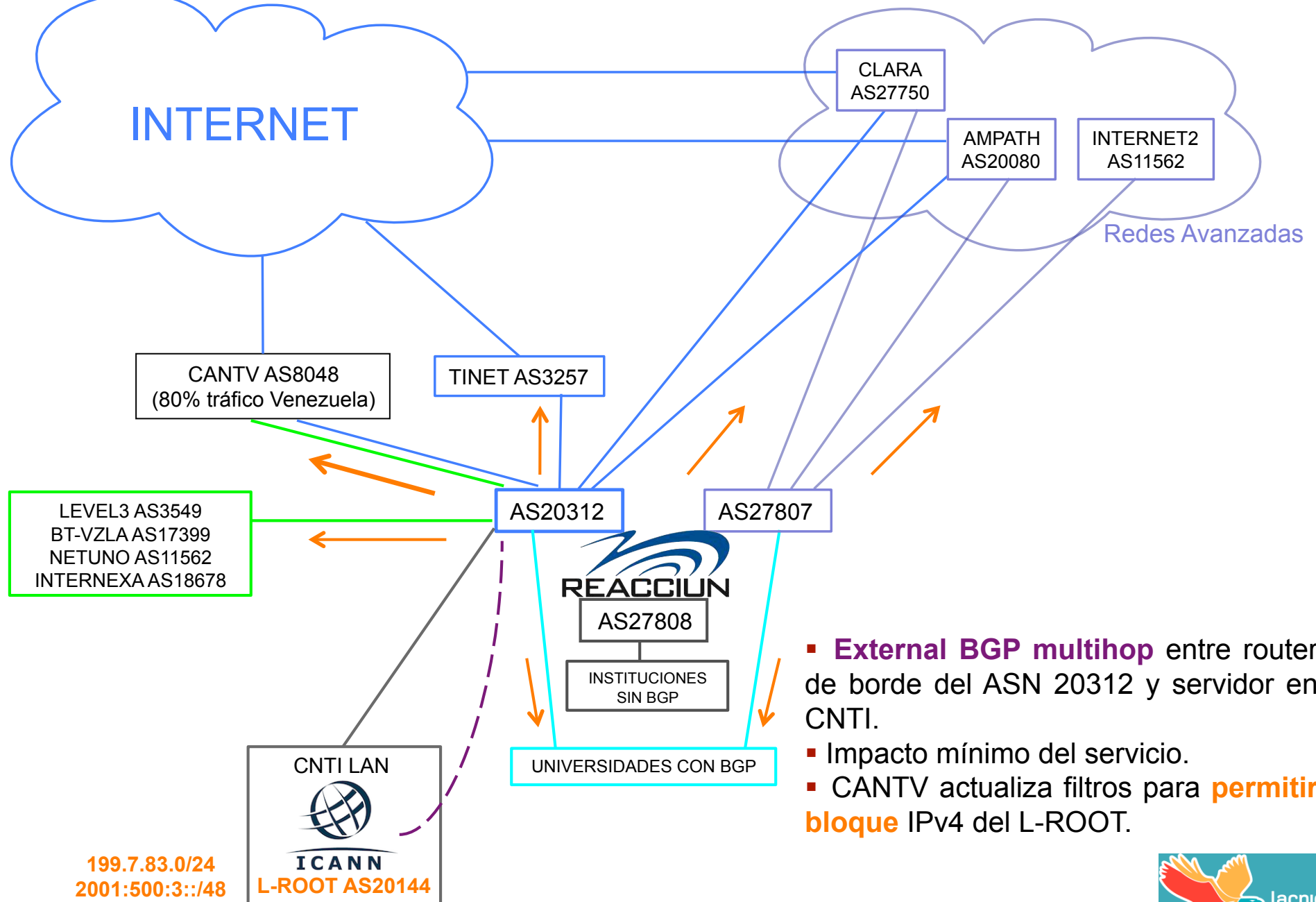
■ Preferencia sobre ruta internacional.

# Perspectivas IPv4 e IPv6 desde Universidades



```
# dig -4 @l.root-servers.net txt ch hostname.bind +short
"lim02.l.root-servers.org"
# dig -6 @l.root-servers.net txt ch hostname.bind +short
"udi01.l.root-servers.org"
```

# Optimización enrutamiento copia L-Root (Abril 2015)

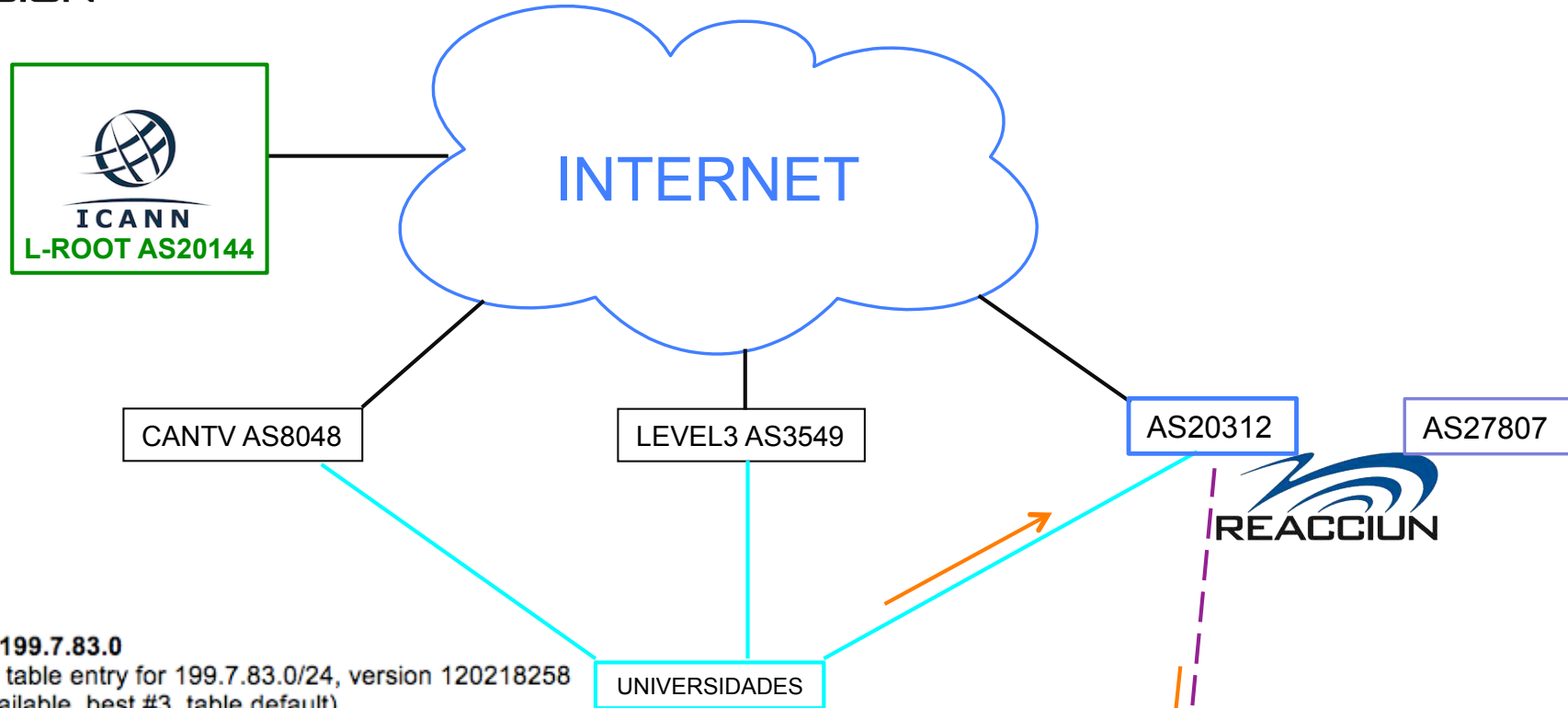


- **External BGP multihop** entre router de borde del ASN 20312 y servidor en CNTI.
- Impacto mínimo del servicio.
- CANTV actualiza filtros para **permitir bloque** IPv4 del L-ROOT.

199.7.83.0/24  
2001:500:3::/48

ICANN  
L-ROOT AS20144

# Perspectiva IPv4 desde Universidades



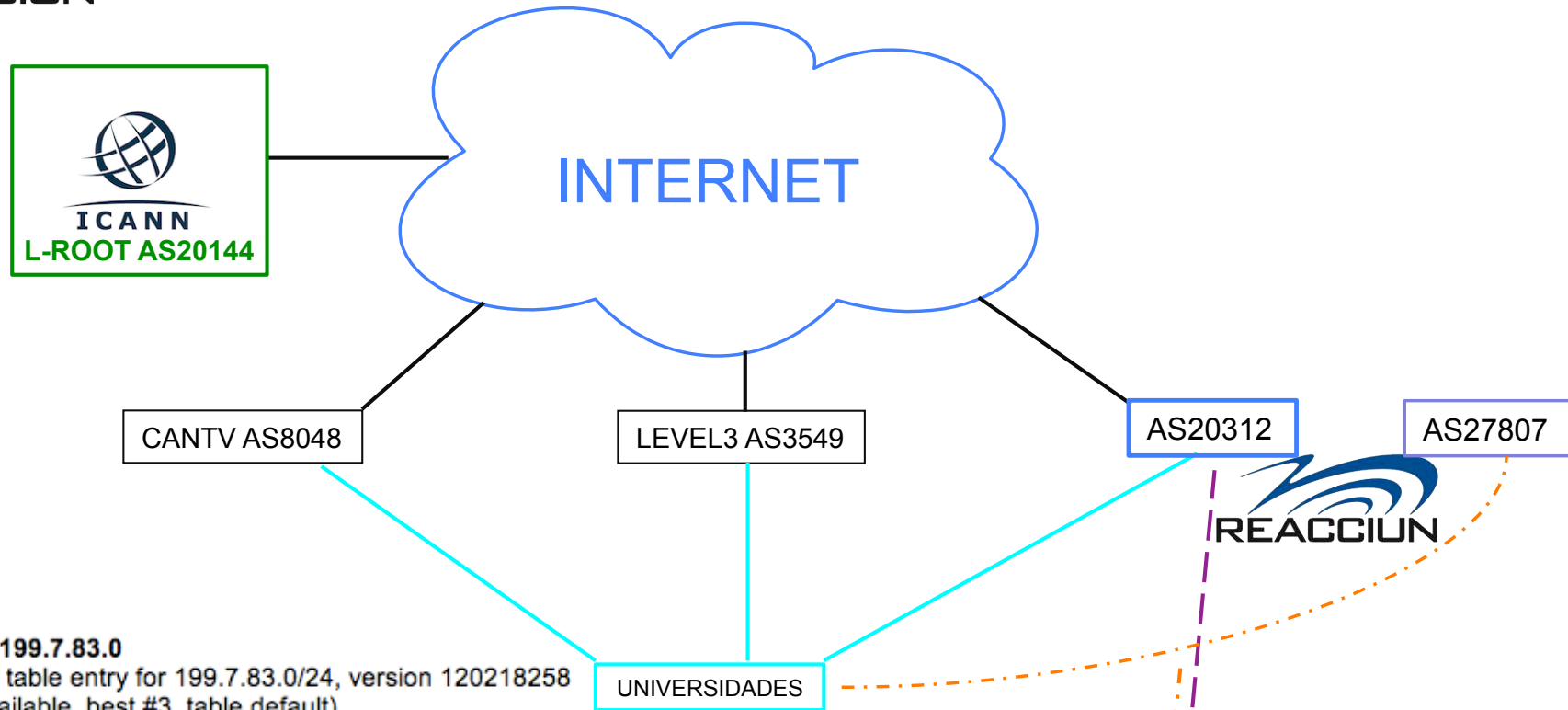
```
#sh ip bgp 199.7.83.0
BGP routing table entry for 199.7.83.0/24, version 120218258
Paths: (4 available, best #3, table default)
Not advertised to any peer
Refresh Epoch 1
8048 6762 12883 20144, (received & used)
 200.11.219.141 from 200.11.219.141 (200.44.43.101)
  Origin IGP, localpref 100, valid, external
Refresh Epoch 2
3549 3132 20144, (received & used)
 64.210.69.165 from 64.210.69.165 (67.17.82.143)
  Origin IGP, metric 10736, localpref 100, valid, external
  Community: 3549:350 3549:4950 3549:34604
Refresh Epoch 8
20312 20144, (received & used)
 150.185.255.41 from 150.185.255.41 (150.185.255.1)
  Origin IGP, localpref 100, valid, external, best
Refresh Epoch 7
27807 20312 20144, (received & used)
 150.189.255.42 from 150.189.255.42 (150.189.255.1)
  Origin IGP, localpref 100, valid, external
```




CNTI LAN  
ICANN  
L-ROOT AS20144  
199.7.83.0/24



# Perspectiva IPv4 desde Universidades

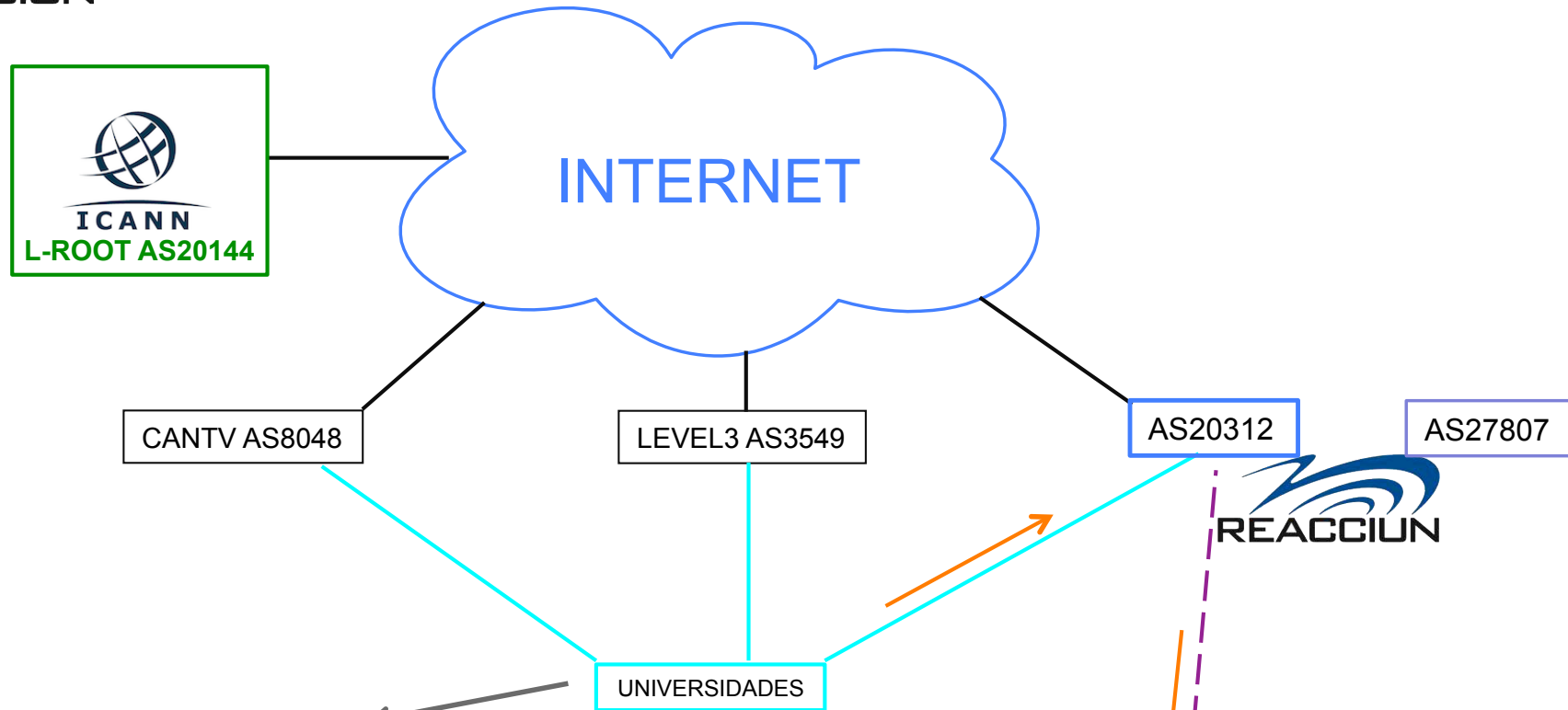


```
#sh ip bgp 199.7.83.0
BGP routing table entry for 199.7.83.0/24, version 120218258
Paths: (4 available, best #3, table default)
Not advertised to any peer
Refresh Epoch 1
8048 6762 12883 20144, (received & used)
  200.11.219.141 from 200.11.219.141 (200.44.43.101)
  Origin IGP, localpref 100, valid, external
Refresh Epoch 2
3549 3132 20144, (received & used)
  64.210.69.165 from 64.210.69.165 (67.17.82.143)
  Origin IGP, metric 10736, localpref 100, valid, external
  Community: 3549:350 3549:4950 3549:34604
Refresh Epoch 8
20312 20144, (received & used)
  150.185.255.41 from 150.185.255.41 (150.185.255.1)
  Origin IGP, localpref 100, valid, external, best
Refresh Epoch 7
27807 20312 20144, (received & used)
  150.189.255.42 from 150.189.255.42 (150.189.255.1)
  Origin IGP, localpref 100, valid, external
```




CNTI LAN  
ICANN  
L-ROOT AS20144  
199.7.83.0/24

# Perspectiva IPv6 desde Universidades

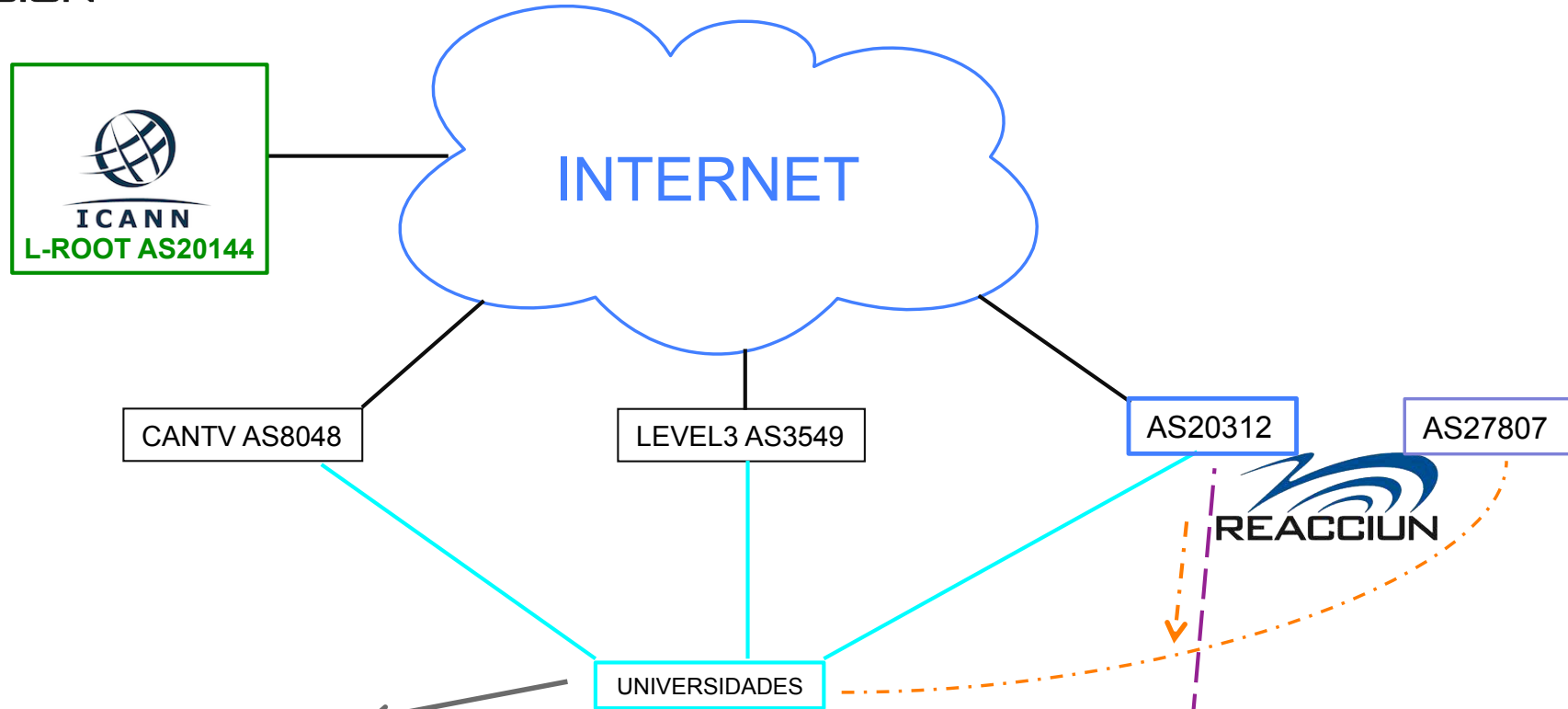


```
#sh bgp ipv6 unicast 2001:500:3::/48
BGP routing table entry for 2001:500:3::/48, version 12379657
Paths: (3 available, best #1, table default)
  Not advertised to any peer
  Refresh Epoch 2
  20312 20144, (received & used)
    2001:1338:FFFF:11::2 (FE80::214:A9FF:FED0:72C0) from 2001:1338:FFFF:11::2
      Origin IGP, localpref 100, valid, external, best
  Refresh Epoch 2
  27807 20312 20144, (received & used)
    2800:30:FFFF:11::2 (FE80::216:9CFF:FE6E:89C0) from 2800:30:FFFF:11::2 (150.189.255.1)
      Origin IGP, localpref 100, valid, external
  Refresh Epoch 2
  3549 16735 20144, (received & used)
    2001:450:2002:459::1 (FE80::223:4FF:FE0E:CA00) from 2001:450:2002:459::1 (67.17.82.143)
      Origin IGP, metric 11057, localpref 100, valid, external
      Community: 3549:4831 3549:34076 16735:7006
```



CNTI LAN  
ICANN  
L-ROOT AS20144  
2001:500:3::/48

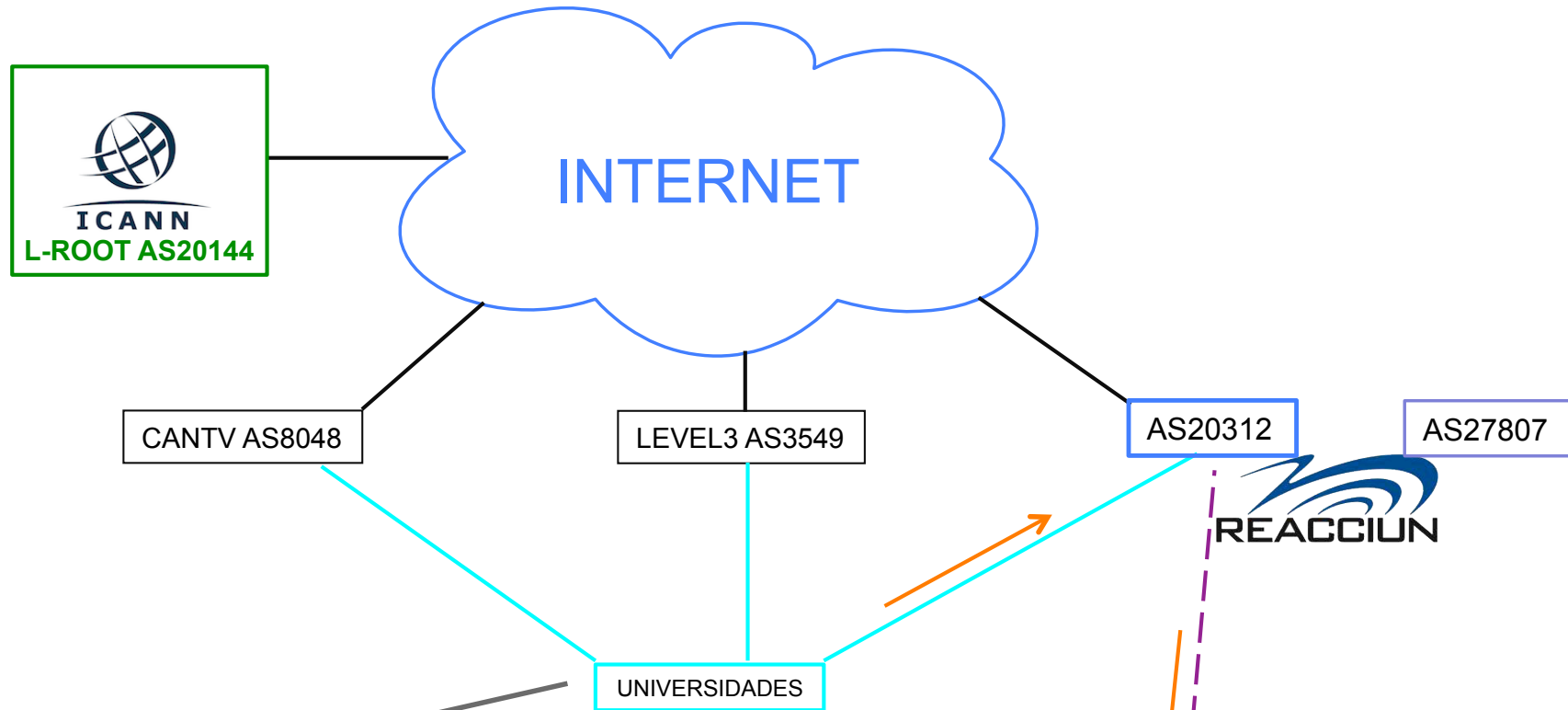
# Perspectiva IPv6 desde Universidades




```
#sh bgp ipv6 unicast 2001:500:3::/48
BGP routing table entry for 2001:500:3::/48, version 12379657
Paths: (3 available, best #1, table default)
  Not advertised to any peer
  Refresh Epoch 2
  20312 20144, (received & used)
    2001:1338:FFFF:11::2 (FE80::214:A9FF:FED0:72C0) from 2001:1338:FFFF:11::2
      Origin IGP, localpref 100, valid, external, best
  Refresh Epoch 2
  27807 20312 20144, (received & used)
  - 2800:30:FFFF:11::2 (FE80::216:9CFF:FE6E:89C0) from 2800:30:FFFF:11::2 (150.189.255.1)
    Origin IGP, localpref 100, valid, external
  Refresh Epoch 2
  3549 16735 20144, (received & used)
    2001:450:2002:459::1 (FE80::223:4FF:FE0E:CA00) from 2001:450:2002:459::1 (67.17.82.143)
      Origin IGP, metric 11057, localpref 100, valid, external
      Community: 3549:4831 3549:34076 16735:7006
```



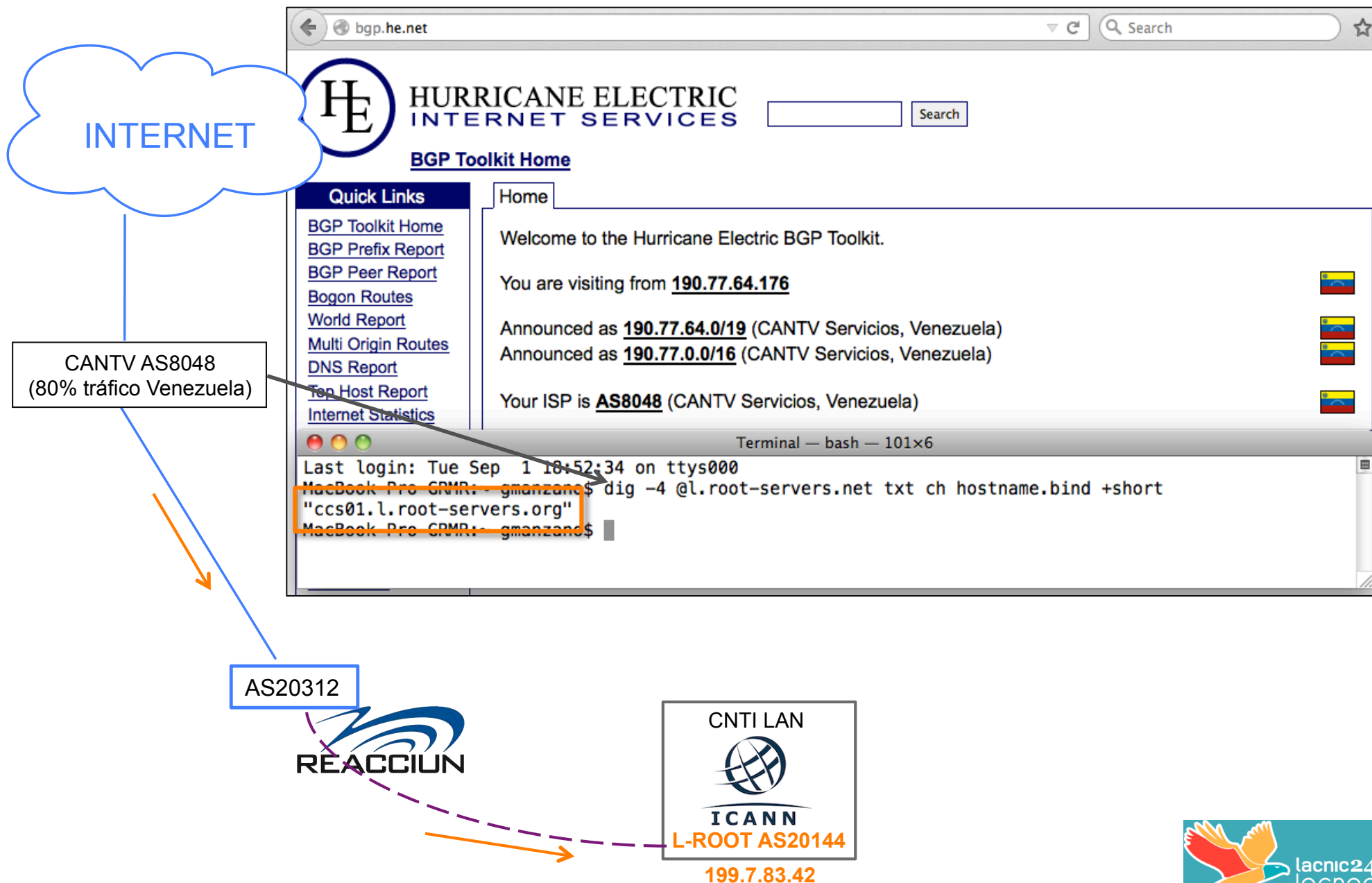
# Perspectivas IPv4 e IPv6 desde Universidades



```
# dig -4 @l.root-servers.net txt ch hostname.bind +short
"ccs01.l.root-servers.org" ✓
# dig -6 @l.root-servers.net txt ch hostname.bind +short
"ccs01.l.root-servers.org" ✓
```

CNTI LAN  
  
 ICANN  
 L-ROOT AS20144  
 199.7.83.42  
 2001:500:3::42

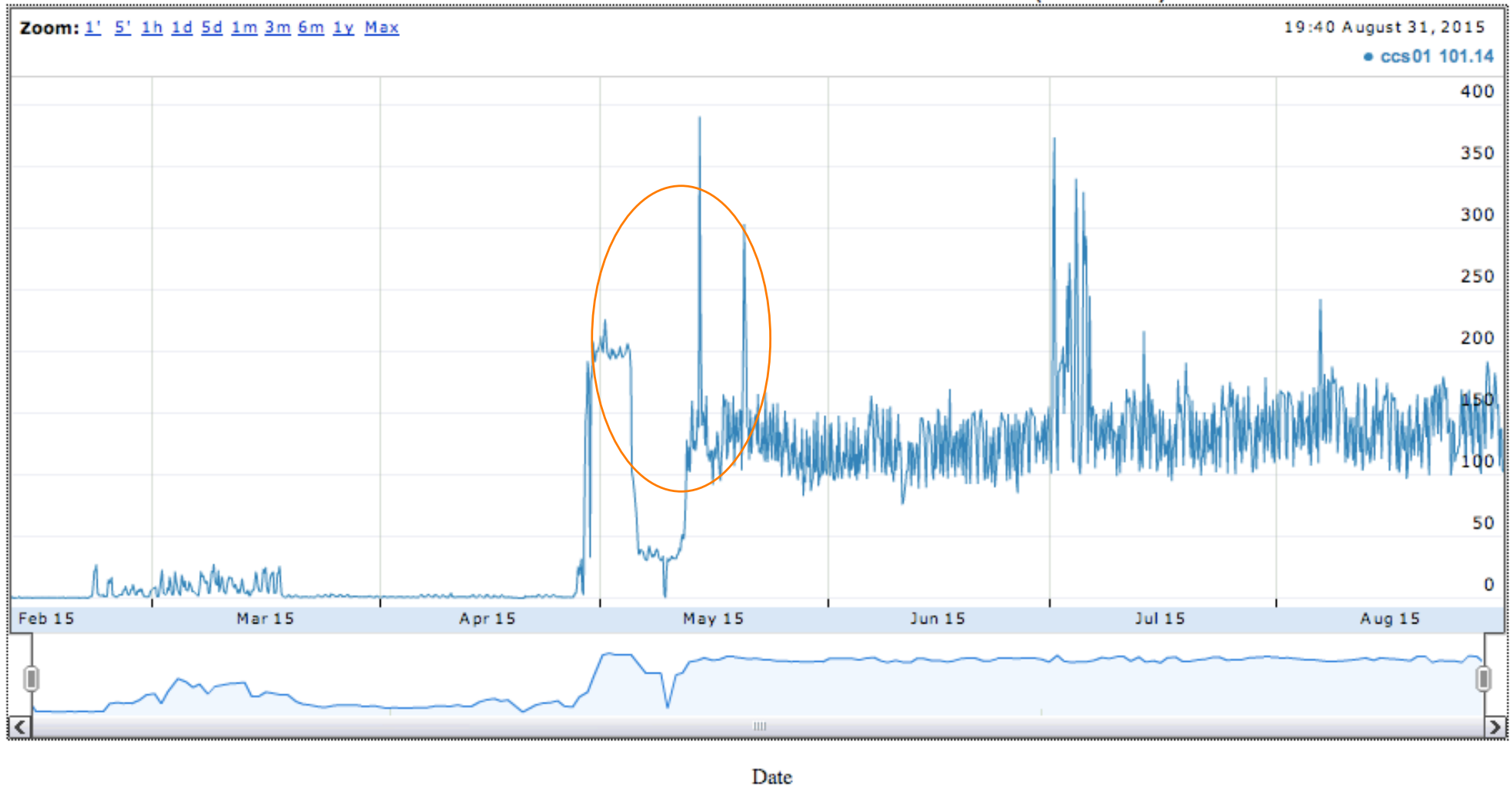
# Perspectiva IPv4 desde CANTV



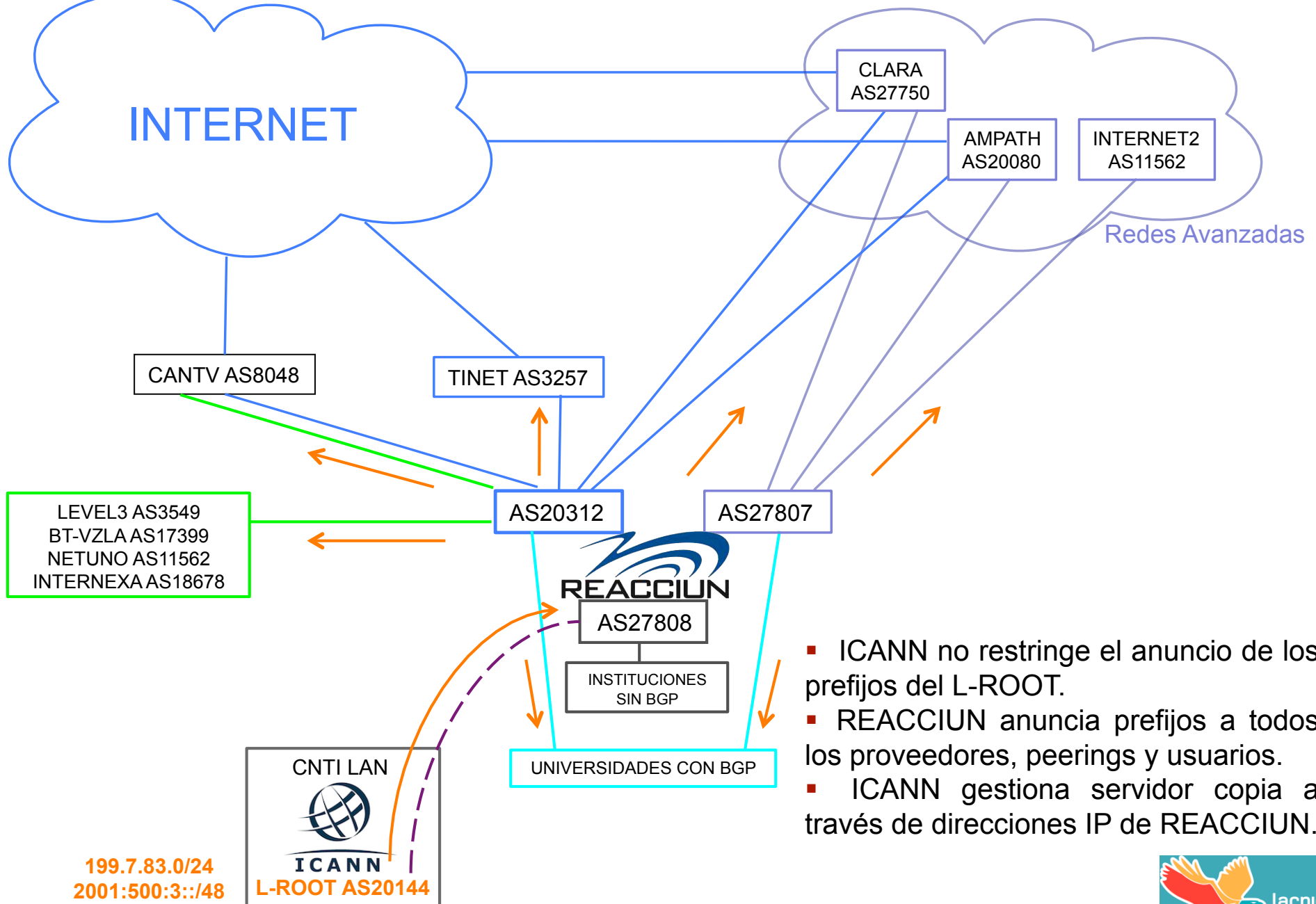
# Optimización copia L-Root (Abril 2015)

## Consultas Nodo Caracas (ccs01)

Queries by node  
from 2015-02-01 22:15 UTC to 2015-08-31 21:14 UTC (smoothed)



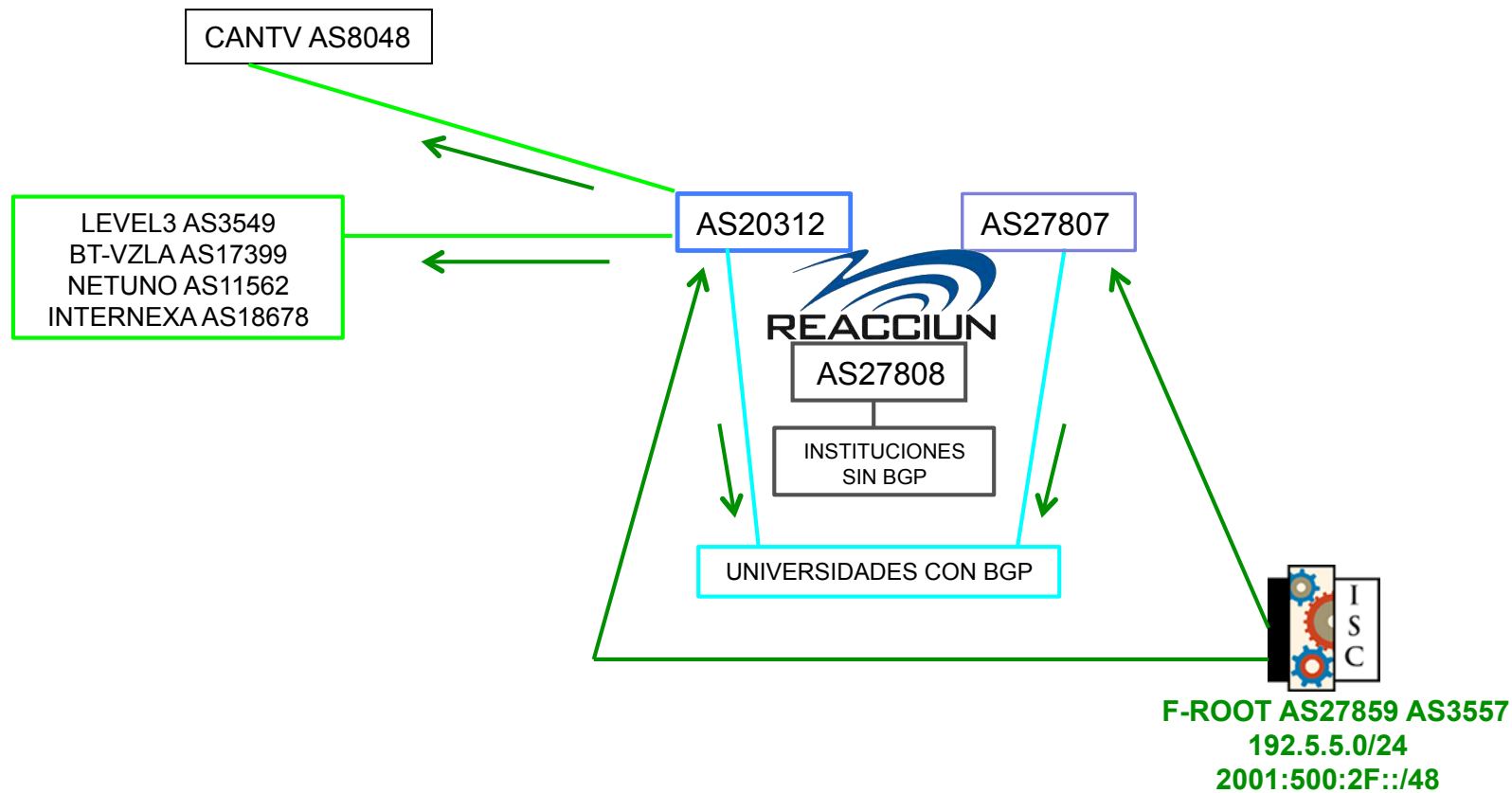
# Comparación enrutamiento L-Root – F-Root



- ICANN no restringe el anuncio de los prefijos del L-ROOT.
- REACCIUN anuncia prefijos a todos los proveedores, peerings y usuarios.
- ICANN gestiona servidor copia a través de direcciones IP de REACCIUN.

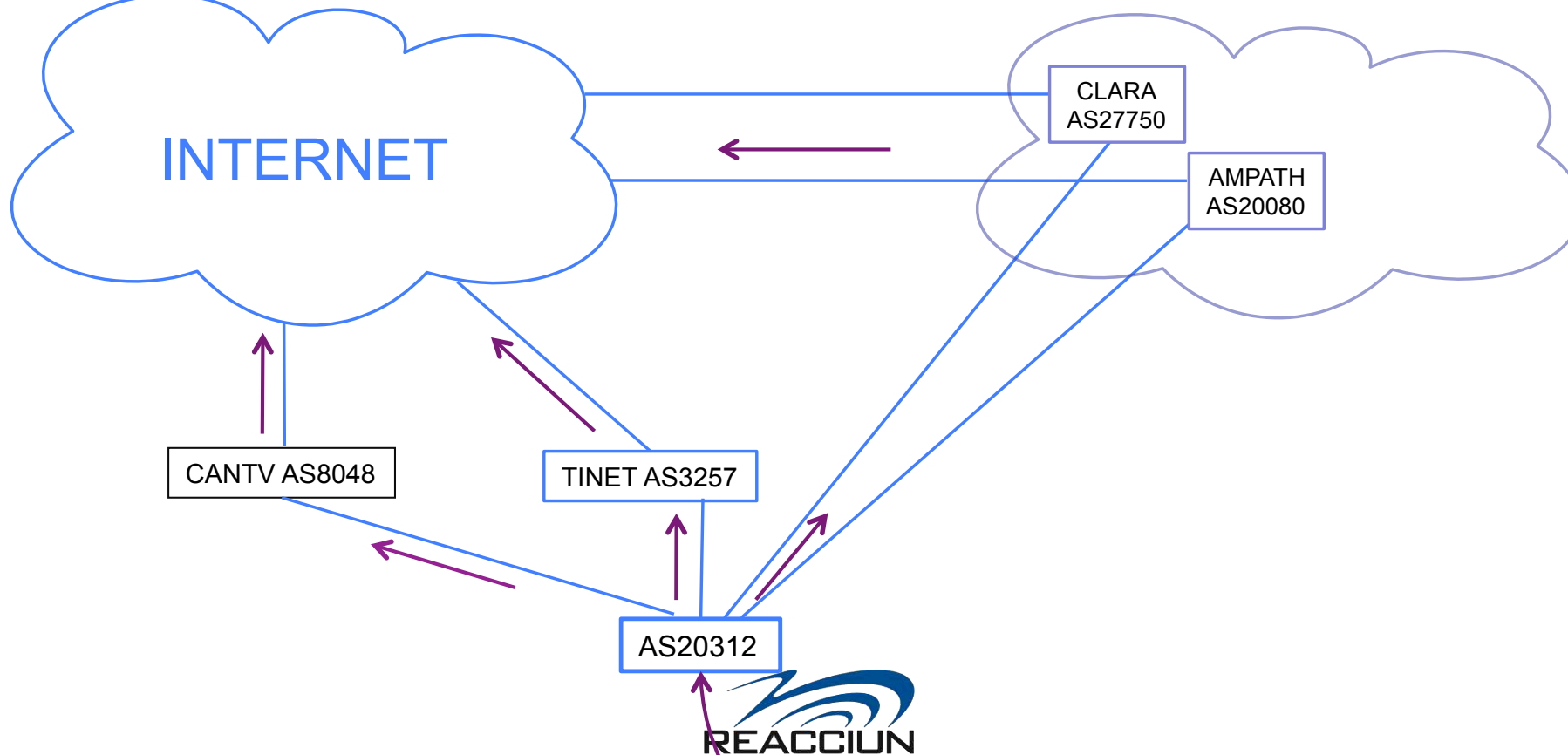
## Comparación enrutamiento L-Root – F-Root

- REACCIUN anuncia **prefijos de servicio** del F-ROOT sólo a peerings y usuarios, con **community no-export**.





# Comparación enrutamiento L-Root – F-Root

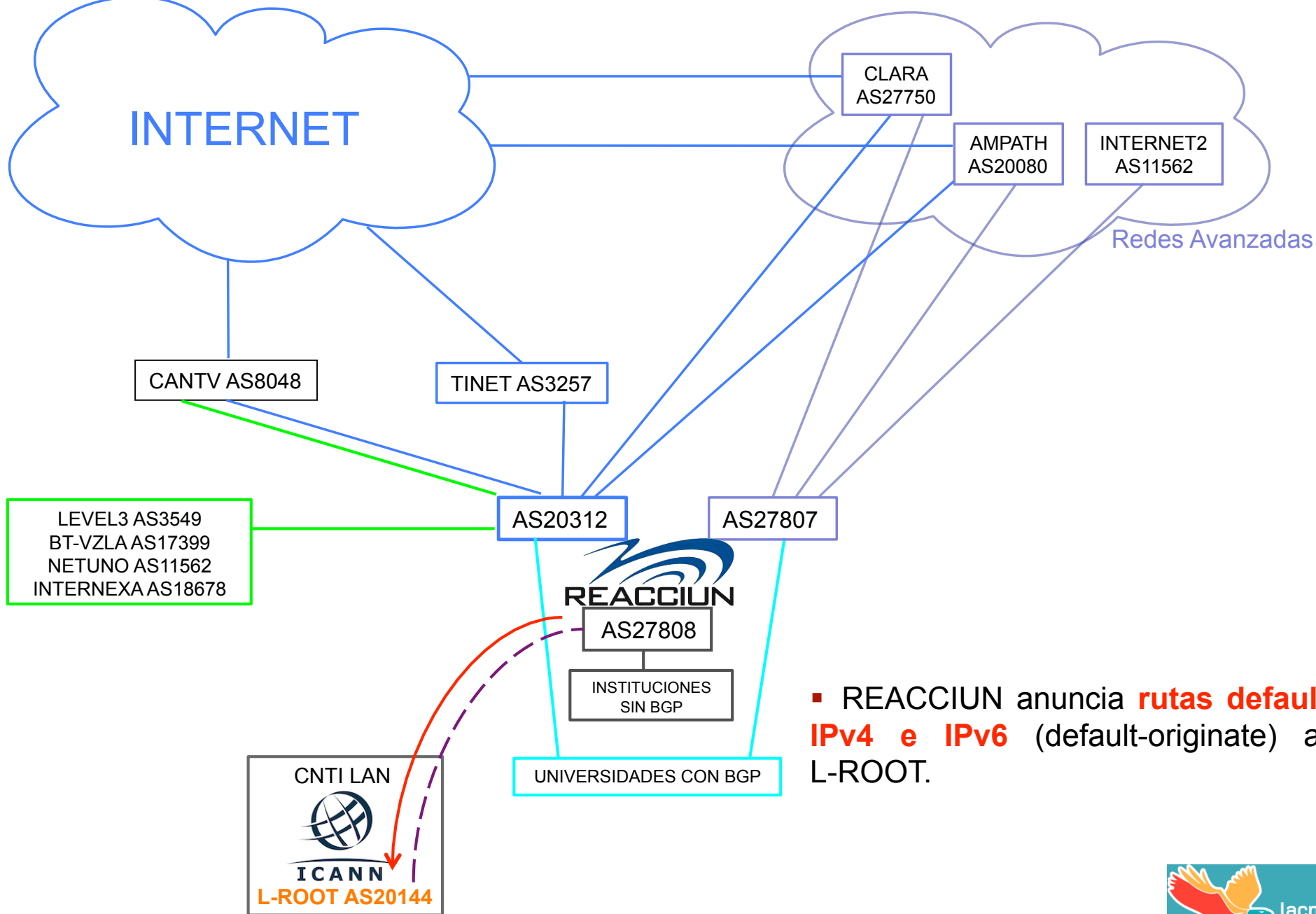


- REACCIUN anuncia **prefijos de gestión** del F-ROOT a Internet, para acceso de ISC.



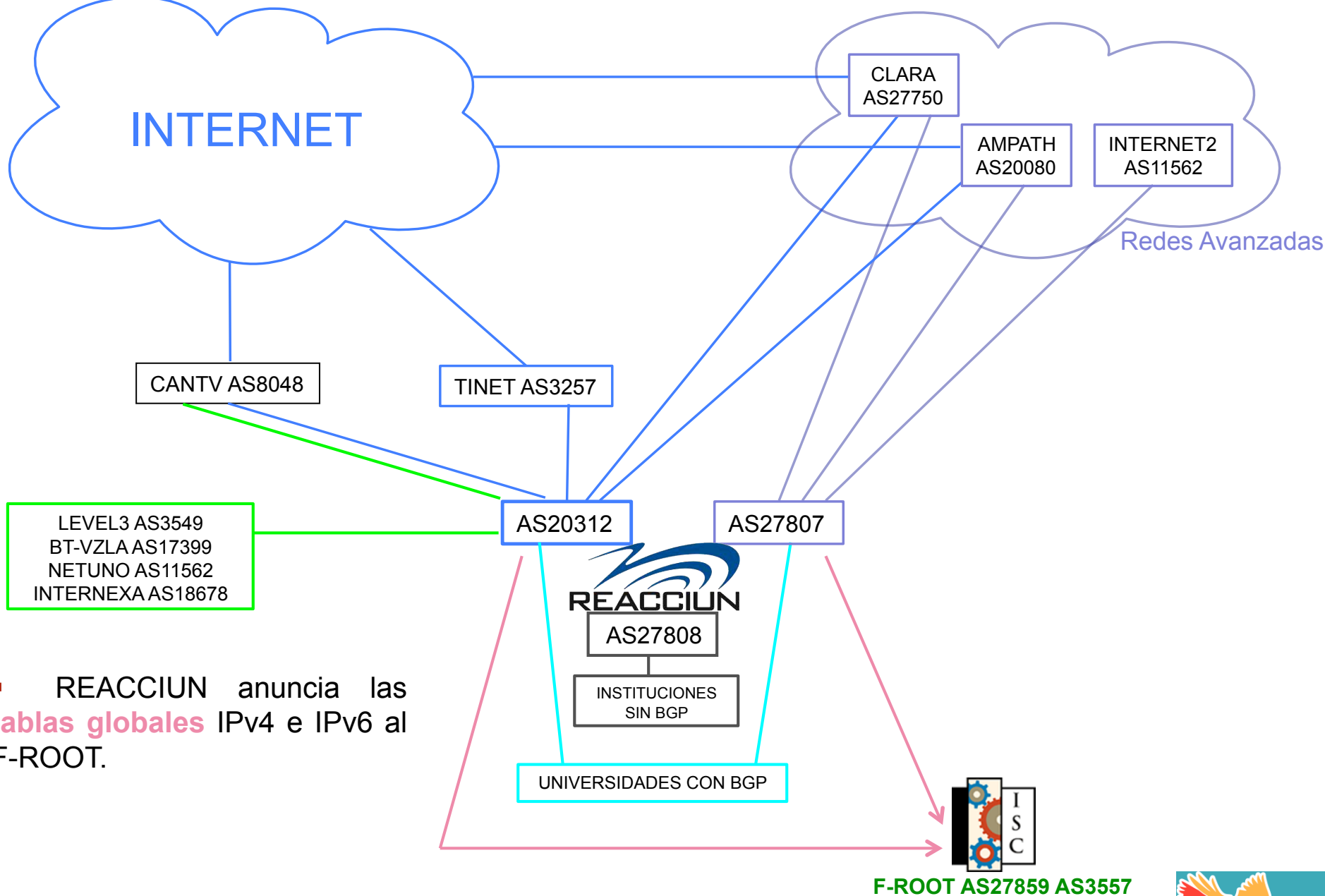
F-ROOT AS27859  
200.93.241.0/24  
2001:13C7:7007::/48

# Comparación enrutamiento L-Root – F-Root



- REACCIUN anuncia  **rutas default IPv4 e IPv6**  (default-originate) al L-ROOT.

# Comparación enrutamiento L-Root – F-Root



- REACCIUN anuncia las **tablas globales** IPv4 e IPv6 al F-ROOT.

## Conclusiones

- La instalación del servidor **implicó modificaciones menores** en los archivos de configuración.
- Fue posible el uso de un blade con software del L-ROOT, pero con **instalación manual**. El actual servidor **requiere de soporte local** para algunos cambios solicitados por ICANN.
- **REACCIUN debe adquirir el appliance adecuado** con software preinstalado, y con puerto iDRAC7 para gestión remota de ICANN.
- Implementación con **Costo Cero**. Instalación de hardware más simple.
- Configuración y gestión BGP más sencilla y eficiente.
- Optimización de enrutamiento influye favorablemente en selección de la ruta nacional hacia servidor copia del L-ROOT.

**Preguntas? Comentarios?  
Muchas gracias por su atención ;-)**

**Gregorio Manzano R.  
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Red Académica de Venezuela REACCIUN  
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**LACNIC 24 – LACNOG 2015. Bogotá, 02 de Octubre de 2015**