Mapping Address + Port

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Dual Stack Lite (DS-Lite)
Mapping Address + Port (MAP)
Lightweight 4 over 6*

*draft-cui-softwire-b4-translated-ds-lite-08
Imagine the Internet ... without any IP address aggregation.
DS-Lite/LW46 – No IP Aggregation

1 000 000s of Subscribers

10 000s Host routes

100s “Interior” prefixes

“10s exterior prefixes”

1 000 000s of DS-Lite or LW46 Tunnel endpoints
MAP Exploits IPv6 Aggregation

1,000,000s of Subscribers

10,000s Hostroutes

100s Interior prefixes

10s Exterior prefixes

10s of MAP Rules and no CGN
MAP 3-Step Tutorial

① IPv6 to IPv4+Port Mapping

② Stateless Border Relay

③ Packet Flow and Forwarding
IPv6 → IPv4 + Port Mapping

IPv6 Delegated Prefix (e.g., /X)

Mapping Domain Prefix

Size = X bits (provisioned)

IPv6 Prefix

01010101 111000

Subnet-ID

“EA Bits”

Interface ID

IPv4 Prefix

130.67.1 /Z

IPv4 Suffix

01010101

IPv4 Address

Z bits (provisioned)

32 – Z = b

IPv4 Address

+ 01010101

IPv4 Suffix

Port Set ID

+ 01010101

IPv4 Suffix

Port
IPv6 → IPv4 + Port Mapping

IPv6 Delegated Prefix (e.g., /56)

Size = 42 bits (provisioned)
Size = 56-42 = 14

01010101 111000

IPv4 Address Prefix

IPv4 Prefix

IPv4 Address

IPv4 Subnet-ID

IPv4 Port Set ID

For this Example…

2^6 = 64 port sets per IPv4 Address

Ports 0-1023 skipped, each CPE gets
2^{16}/2^6 - 2^4 = 1008 ports

One IPv4 /24 serves
2^{6+8} ≈ 16,384 (vs. ≈256) subscribers
MAP Simulation Tool (beta)

Rule 0

IPv6: 2001:db8:9500:0 /40
IPv4: Port 198.51.100.0 /24

256 IPv4 addresses, 65536 users, 240 ports each (1:256)

In order to help us understand how this tool is being used and to improve it in the future, it will periodically save anonymous usage information for analysis. This does NOT include your IP address or any other information not needed by the tool itself. If you wish, you may override this by unchecking the box below.

Data collection is currently on.

MAP Simulation tool created by Arthur Lacoste of Cisco Systems based on this IETF draft.
A quick video tutorial for this tool is available on youtube.
Please send comments, bug reports, and other feedback to: map46-tool-feedback[at]external.cisco.com

Last updated: 6/19/2012
MAP Calculator
Cisco IPv6 Project

Description
MAP Calculator is a tool designed to help you deal with MAP (Mapping Address and Port), IETF's last IPv4 - IPv6 stateless tunneling solution. The spec for MAP is being edited by the Softwire Working Group and is available here: http://datatracker.ietf.org/doc/draft-ietf-softw-re-map/

MAP Calculator features:
- Immediately understand how IPv6 and IPv4+Port are mapped thanks to an intuitive graphical representation
- Get a feeling of the trade-offs through a clear display of core information (addresses used, customers impacted, service levels)

Visit Developer's Website  Email Developer

App Screenshots

User Reviews
No fans or critics yet. Be the first!

Average rating: 5.0

5 star 2
4 star 0
3 star 0
2 star 0
1 star 0
Cisco MAP Calculator
By Cisco
Open iTunes to buy and download apps.

Description
MAP Calculator allows you to quickly visualize different layouts of the address space partitioning for the MAP port mapping algorithm

Cisco MAP Calculator Support

Screenshots

Customer Reviews
haji ★★★★★
by Haji Danger
good work
Stateless Border Relays

- Handle traffic to/from a given MAP domain
- Reachable via anycast, “built-in” load-balancing
- Each MAP rule is similar to a single LW46 entry, but MAP rules allow for aggregation
- Processed inline with normal IP traffic (at least on Cisco’s ASR9K)
- Scales according to traffic and number of rules only, not number of users or number of users per rule
IPv4 + IPv6

IPv4 + IPv6

IPv4 + IPv6

IPv4 follows IPv6 routing within a domain (traffic destined to another subscriber does not traverse the BR)

- All other traffic sent via anycast to any MAP BR

- Forwarding is handled either by double translation (MAP-T) or encapsulation (MAP-E)
Forwarding (Encapsulation, MAP-E)

- Private IPv4
- NAPT 44 (w/ALGs)
- MAP IPv4 Address and Port to IPv6
- Encap in IPv6
- IPv4 Internet
- Forward IPv4
- Check Mapping
- Decap IPv6
Forwarding (Translation, MAP-T)

- Private IPv4
- NAPT 44 (w/ALGs)
- MAP IPv4 Address and Port to IPv6
- Replace IPv4 Header with IPv6 Header
- IPv4 Internet
- Forward IPv4
- Recreate IPv4 Header
- Decap IPv6
Encapsulation or Translation – Boils down to 20 bytes
Prior to the last IETF, the softwires WG was wedged with entrenched parties on all sides of MAP-T/E vs 4rd-U debate.

Encapsulation:
- Well-understood, simple, transparent, same as stateful dual-stack lite

Translation:
- Native IPv6 ACLs and DPI functionality not masked by IPv4 header. NAT64 code reuse. Feels like “Real IPv6.”

4rd-U: Somewhere between T and E

Arguments gravitate towards speculation about what future IPv6 deployments will require and what feature availability will be.
Evolution of MAP in the IETF

- NAT-PT
- NAT64
- NAT464
- XLAT464
- IVI
- divI
- divI-pd
- MAP-T
- MAP-E
- MAP-DHCP
- MAP-DEPLOYMENT
- 4rd
- 4rd-(H,U)
- SAM
- A+P
- RFC1933
- RFC3056
- RFC5969
- 6to4
- 6over4
- Teredo
- ISATAP
- BGP tunnels
- Softwire mesh
- 6PE
- 6VPE
- Configured tunnels
- Tunnel brokers
“MAP” or “MAP-T and MAP-E”? 
Standardizing MAP

- MAP-E will be published as a Standards Track RFC
- MAP-T and 4rd will likely be published as Experimental or Informational (TBD)
- There have been various interop tests from multiple vendors**

**Cisco has ASR1K, ASR9K, and Linksys MAP demonstration code available for you to see, and will begin shipping by the end of this year**
In Sum:

- You must have deployed IPv6 to use any of this
- MAP has very attractive scaling properties vs. DS-Lite or LW46
- The IETF has converged on a single Standards Track solution (MAP-E), commercial products are arriving now