Encapsulation versus Translation

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Stateless architecture:

Purpose of this discussion:

Goal:

Understand the pros and cons of double translation and encapsulation.

Either make a choice or be able to explain why both are needed.

Think about:

Do we need two solutions?

Document organization and work

Parallel or serial?

One base document with one mechanism? Separate port mapping?

Documents:

Specifications:

http://tools.ietf.org/html/draft-xli-behave-divi-03

http://tools.ietf.org/html/draft-xli-behave-divi-pd-00

http://tools.ietf.org/html/draft-murakami-softwire-4rd-00

http://tools.ietf.org/html/draft-murakami-softwire-4v6-translation-00

Analysis:

http://tools.ietf.org/html/draft-dec-stateless-4v6-03

http://tools.ietf.org/html/draft-ietf-softwire-stateless-4v6-motivation-00

A+P issues:

http://tools.ietf.org/html/rfc6269

Encapsulation vs double Translation

To translate or not to translate that is the question.

To tunnel or not to tunnel that is the question.

翻譯或翻譯這是個問題。

隧道或隧道的問題是不的。

Translation or translation of this is a problem.

Tunnel or tunnel is not the problem.

Source: Google Translate

Solutions Requirements

Requirement	E	T
Minimizes impact on OSS and logging systems	✓	✓
No per-subscriber configuration on active data plane network elements	✓	✓
Scales in terms of IP forwarding capacity, rather than amount of dynamic state, or new session creation rate	✓	✓
Support a single architecture that allows 1:1 or N:1 (port range) NAT44 usage without additional extensions	✓	✓
Preserves current engineering practices (e.g., anycast-based load-balancing)	✓	✓
Relies on IPv6 and supports transition to an IPv6-only network	✓	✓
Supports asymmetric routing to/from the IPv4 Internet	✓	✓
Maximizes the ease of deployment and redundancy of nodes	✓	✓
Readily supports a multi vendor environment (including redundancy)	✓	✓
Allows direct user-user traffic flows (i.e., allows for no-tromboning)	✓	✓
Retains today's user experience (NAT on CPE) and supports today's operational model	✓	✓
Does not require deployment of dynamic signaling protocols to the end-user CPE beyond those already used	✓	✓
Minimizes required non-regression testing effort	✓	✓
Does not require organizational changes	✓	✓
Clear separation between the service and the network layer	✓	✓

Encapsulation versus Translation

	Encapsulate	**Translate**
Base technology	Port restricted NAPT44 + IPv4 in IPv6 mapped encap/decap	Port restricted NAPT44 + Port aware Stateless NAT64
Location of NAPT44 function	CPE	CPE
IPv6 addressing constraints	Yes (IPv4 + port in embedded IPv6 address).	Yes (IPv4 + port in embedded IPv6 address)
IPv4 addressing constraints	Sharing fixed per IPv4 subnet/domain	Sharing fixed per IPv4 subnet/domain
Stateless Domain identified by	IPv6 Prefix, IPv4 subnet	IPv6 Prefix, IPv4 subnet
IPv4 + TCP/UDP port mapping into IPv6 header	Yes	Yes
ICMPv4 identifier NAT/Markup needed	Yes	Yes
Supports IPv4 host – IPv4 communication	Yes	Yes

Encapsulation versus Translation -summary

	Encapsulate	Translate
IPv4 checksum update required	Yes - with ICMPv4 support	Yes
		Yes (as per NAT64)
Passes IPv4 Options	Yes	No
Supports IPv6 host – IPv4 communication	Requires NAT64 and DNS64	Requires DNS64 (re-uses NAT64)
Allows IPv4 host – IPv6 server (SP domain/outside)	No	Yes (Native to IVI addressed server/using DNS46)
		Minimum overhead of 20 bytes. Additional overhead in case of ALGs
	Done on encapsulation endpoints or on tunnel aware data plane	
		Encoded in IPv6 fragment header

Encapsulation versus Translation

Stateless architecture

Observations:

Mapping of Address and Port (MAP) function
    Given a flexible enough mapping; all mechanisms can be represented.
    Stateless 4over6, 4rd, 6rd, 6to4, Automatic IPv4, 6over4, ISATAP, SA46-AS,
    Teredo, divi, divi-pd

Provisioning
    Provisioning of translation or encapsulation is basically the same

Hub and spoke can be achieved in a mesh solution
    By "just" routing or provisioning with "default route" mapping rule only

With a standard track documents for:
    MAP algorithm (forwarding and provisioning modes)

    DHCPv6 option

Doesn't the translation and encapsulation solution come out of the wash?