

Teredo @ Microsoft

Present and Future

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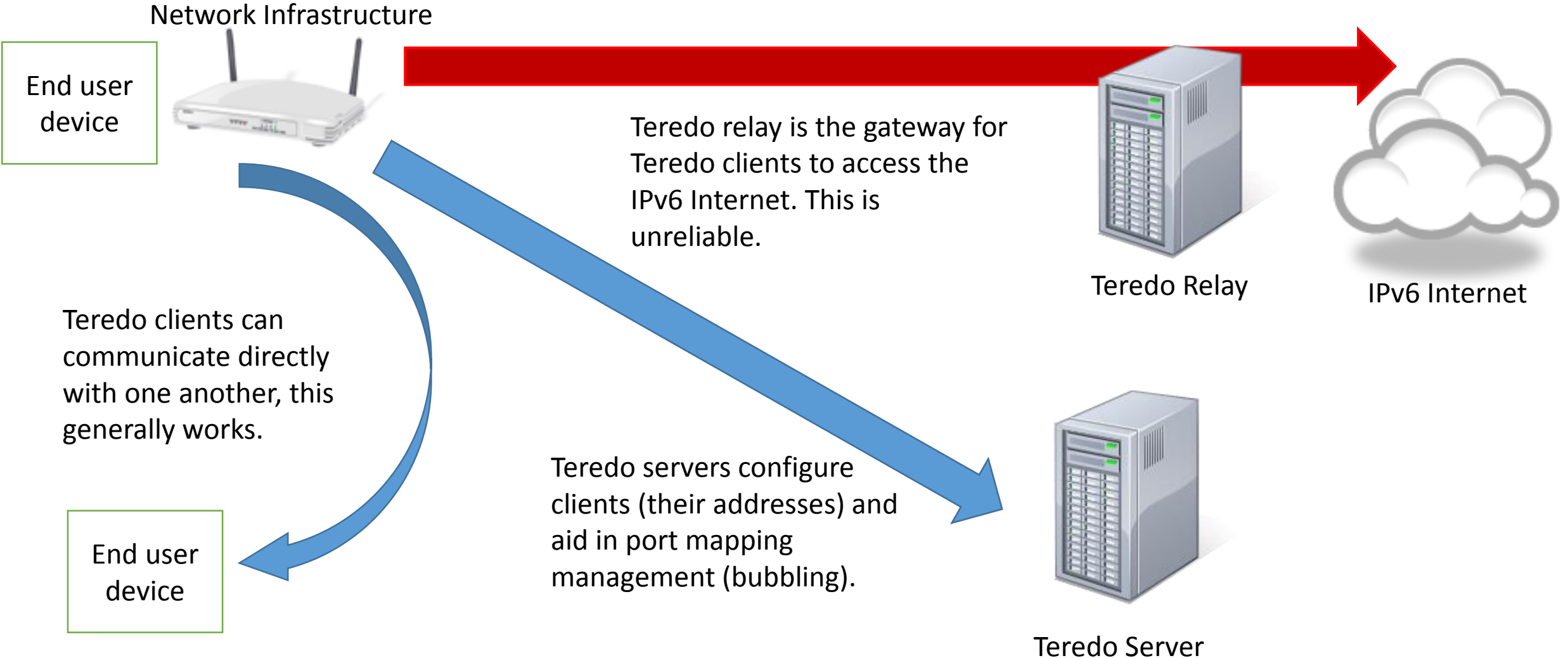
Program Manager

Networking Core – Operating System Group

Overview

- Teredo is an IPv6 transition technology that provides IPv6 addressability and connectivity for capable hosts which are on an IPv4 network but with no native connection to an IPv6 network.
 - RFC 4380, 5991, and 6081
- Microsoft has included Teredo functionality in a *default* configuration in Windows Vista, 7, and 8/8.1.
- We are simultaneously:
 - Sunsetting Teredo service for Windows Vista and Windows 7 hosts.
 - Extending Teredo support for Xbox One gaming scenarios.

Teredo – Servers and Relays



Teredo – Two Sides of the Coin

The Bad

- Teredo as a technology to reach the IPv6 native Internet lacks operational reliability.
 - Geoff Huston has considerable data on this reality.
 - <http://www.potaroo.net/ispcol/2011-04/teredo.html>
 - 40%+ effective failure rate
- Should not affect users because of RFC 3484/6724.

Teredo with relays != Reliable

The Good

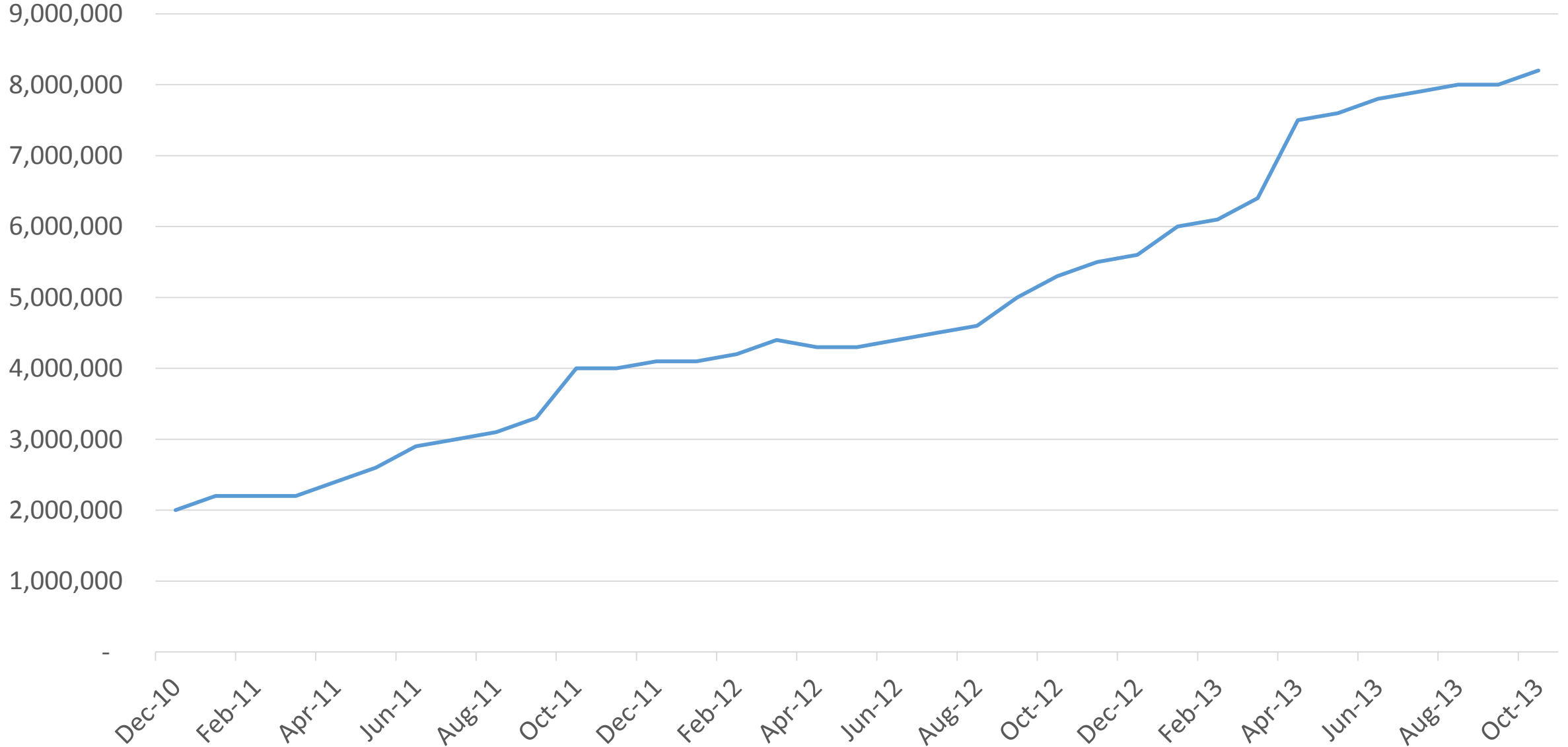
- As a technology for enabling connectivity between IPv4 peers, Teredo is pretty good.
- With basic matchmaking, able to achieve connectivity between Teredo clients about 90% of the time.
- Teredo has seen successful usage in “controlled” environments such as DirectAccess (a Microsoft remote access technology).

Teredo without relays = Usable

The Teredo Service

- We don't have very specific telemetry on Teredo usage (privacy is important).
- We do know that Teredo server load had a dramatic increase - correlated to a popular BitTorrent client activating Teredo/IPv6 support.

Worldwide Teredo Server Traffic (Monthly Average - UDP Datagrams/Second)



The Overall Value of Teredo

- Teredo's value is best realized when coupled with supporting infrastructure for peer discovery, selection, and security.
 - As in, the infrastructure and API support we have for Xbox One.
- Having a tunneled IPv6 address, by itself, provides little value and causes pain for developers and end-users (because of random bad app behavior).

Proposed Sunset Plan

- We plan to deactivate our Teredo servers for Windows clients in the first half of 2014 (exact date TBD).
- Aligned to that, we encourage the deactivation of publically operated Teredo relays.
- We will maintain separate Teredo services for special-purpose scenarios that do not require public Teredo relays – like Xbox One.
- We deactivated the Teredo service earlier this year for a test. (see IETF 87 presentation)
 - Folks in the technical community seemed quite happy.
 - There were some app compat issues that we are following-up on.

Xbox One and Teredo (and IPv6)

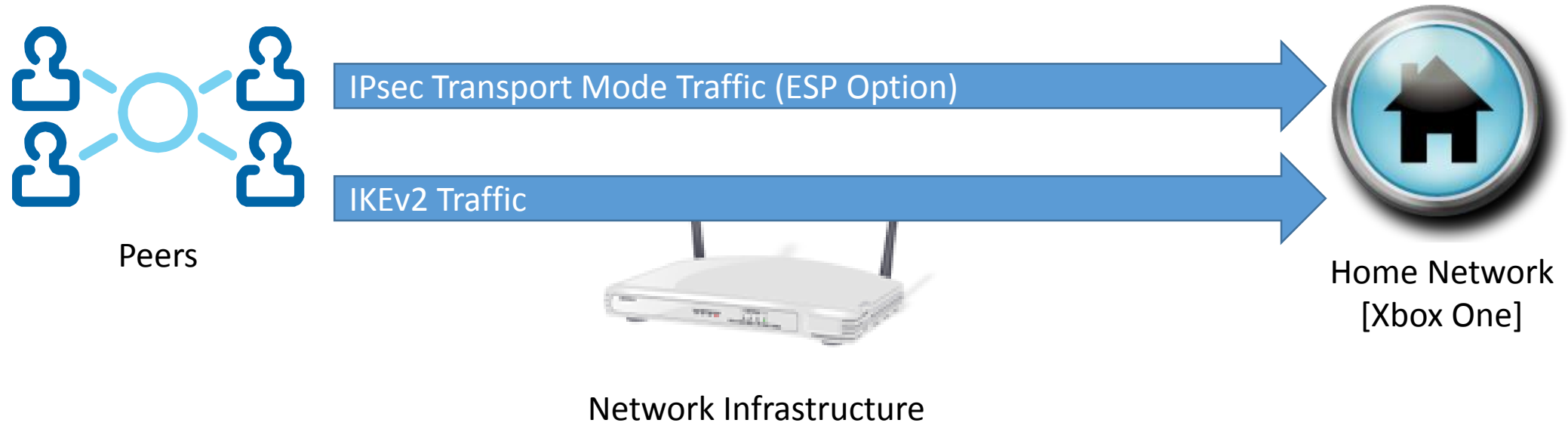
Xbox One and Teredo

- Teredo provides an IPv6 abstraction for peers.
- Combined with IPsec, this can provide straightforward, application-transparent, secure P2P connectivity.
- Xbox One uses Teredo for this purpose.

Quickly...

Going to review Xbox One behavior

IPv6 Networks: IPsec and Transparent Operation



Allow users to disable firewall capabilities (transparent operation)

Allow **unsolicited inbound** IPsec and IKE

Sometimes Teredo is more reliable for P2P than native IPv6

Xbox will consider the following peer pairs:

Teredo Client -> Teredo Client

IPv6 -> IPv6

IPv4-> IPv4

NO Teredo Client -> Native

IPv4 Networks: Allow Teredo

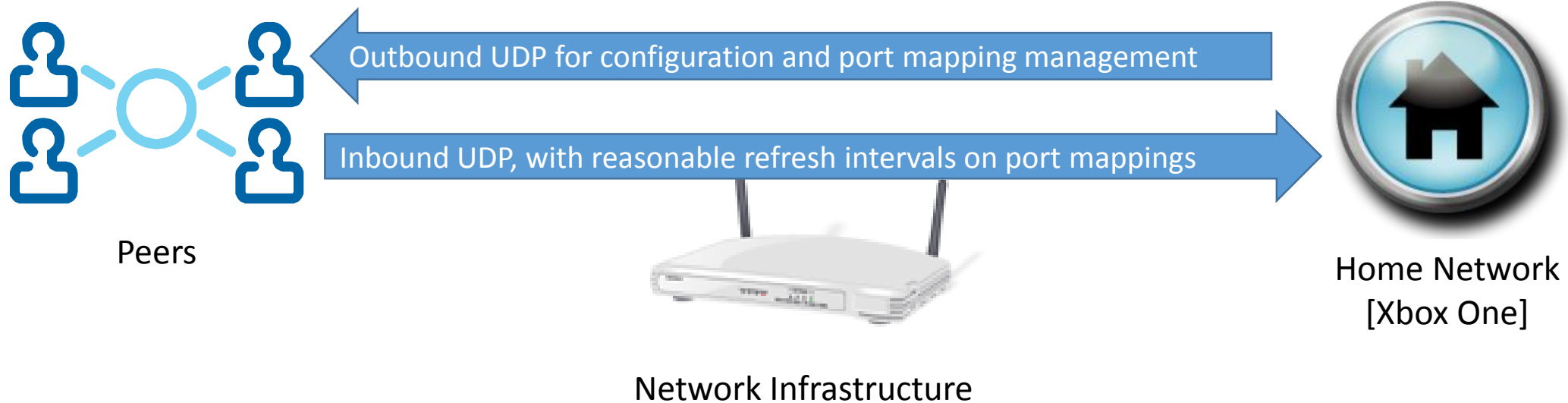
Support outbound UDP with long port mapping refresh intervals (60 seconds +)

Teredo traffic will **prefer** port 3074 for peer traffic. Port forwarding for 3074 is helpful but not necessary (usually).

The more “open” the NAT behavior, the better.

Address-Independent > Address-Dependent > Address-and-Port Dependent > UDP Blocked
with older nomenclature

Open > Address Restricted > Port Restricted > Symmetric > UDP Blocked



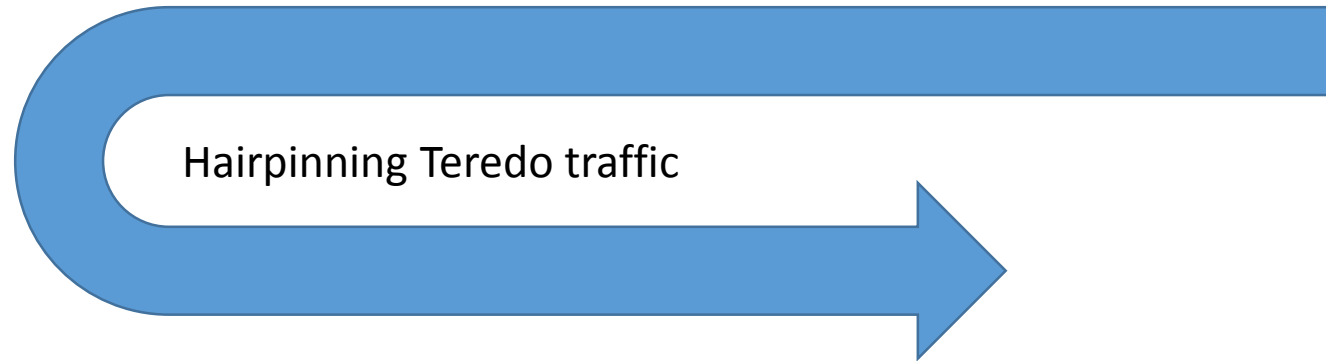
IPv4 Networks: Be Mindful of Hairpinning

With CGN, multiple peers may be behind the same NAT device

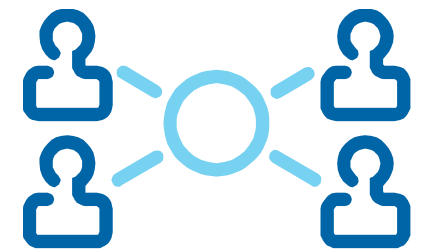
Hairpinning allows those peers to communicate



Network Infrastructure



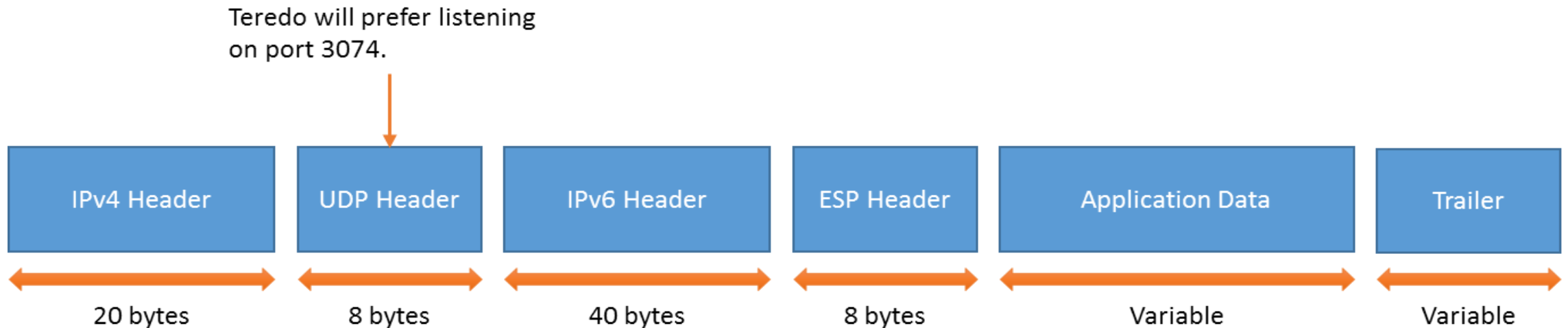
Home Network
[Xbox One]



Peers

Packet Format and Native IPv4

- P2P traffic will use the ESP option for IPsec
- Native IPv4 will be used if available, generally for link-local peers.



Questions?

We will send v6ops/NANOG notice about exact Teredo service dates.

- More detailed documentation aligned to this presentation is available at www.microsoft.com/IPv6.
- Relevant RFC's
 - RFC 6092 for IPv6 security recommendations
 - RFC 4380, 5991, and 6081 for more information on Teredo
 - RFC 4787 and 6888 have recommendations for NAT behavior