Xbox One: P2P
IPv6, Teredo, and IPsec

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Overview

One benefit of IPv6 with IPsec is the promise of simple peer to peer (P2P) connectivity between end-user devices on the Internet.

Xbox One is an attempt to realize that promise, with our P2P stack leveraging Internet standards.

Network operators that want to provide the best possible user experience for Xbox One users:

- Provide IPv6 Connectivity
- Allow transition technologies such as Teredo to function
- Allow for IPsec transport mode to function

P2P – What are we talking about?

P2P is a key part of many common gaming experiences, one console communicating with another across different networks.

Xbox 360 used a custom STUN and security implementation.

An increasing desire for standardization and increasing availability of IPv6 made IPv6+IPsec attractive for Xbox One.
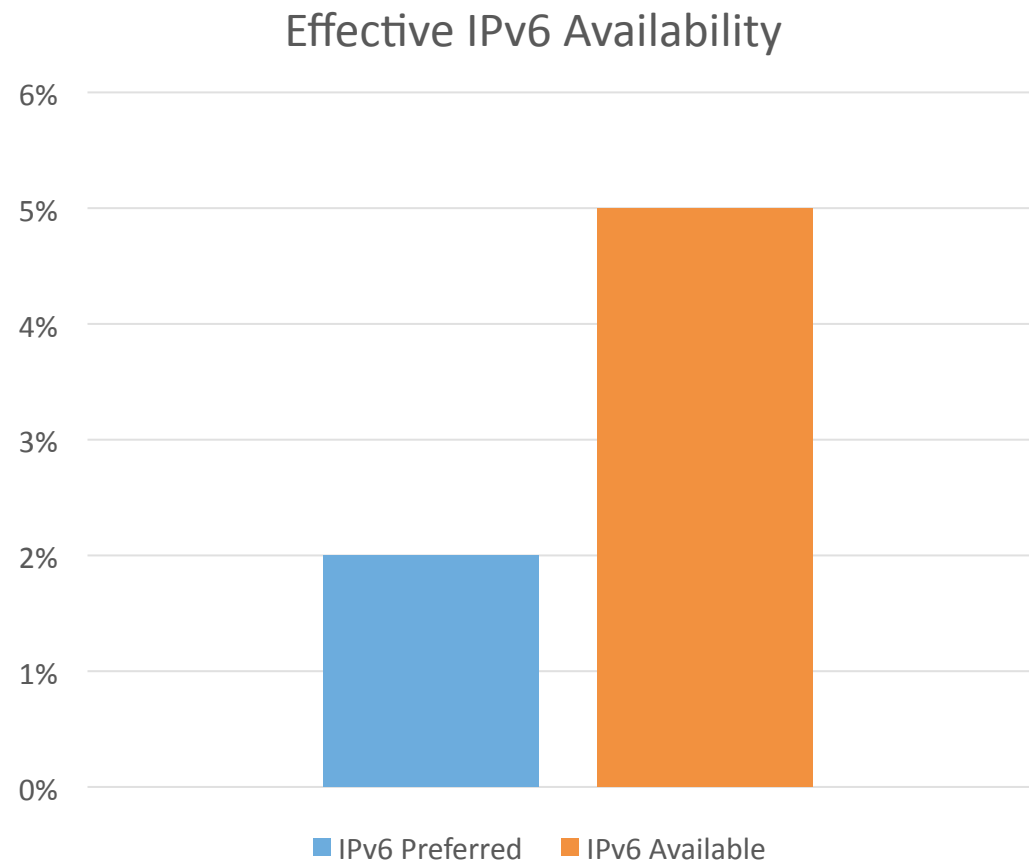
The Current Reality of IPv6 Adoption

Using IPv6 directly makes P2P pretty easy.

However, IPv6 is not commonly available to end-users, especially in the terrestrial market.
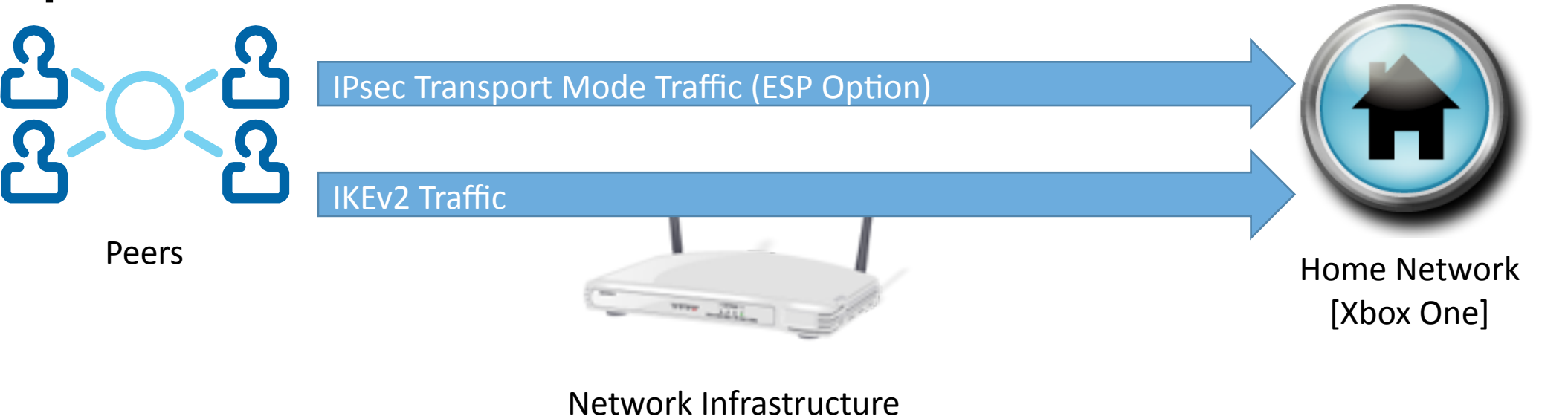
Network operators are making considerable progress (<1% a year ago, to more than 1.5% now).

Teredo fills the gap and will be used most of the time.

Effective IPv6 Availability

- IPv6 Preferred
- IPv6 Available

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IPv6 Networks: IPsec and Transparent Operation

IPsec Transport Mode Traffic (ESP Option)

IKEv2 Traffic

Peers

Network Infrastructure

Home Network
[Xbox One]

Allow users to disable firewall capabilities (transparent operation).

Allow unsolicited inbound IPsec and IKEv
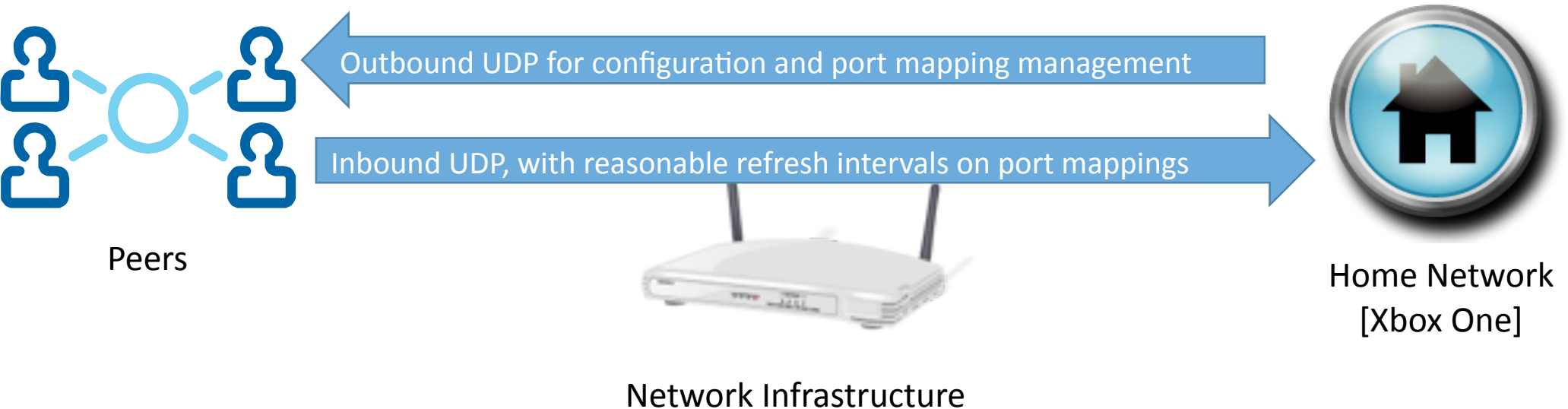
IPv4 Networks: Allow Teredo

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

The more "open" the NAT behavior, the better. Open > Address Restricted > Port Restricted > Symmetric > UDP Blocked

Teredo traffic will *prefer* port 3074 for peer traffic. Port forwarding for 3074 is helpful but generally unnecessary.

Outbound UDP for configuration and port mapping management

Inbound UDP, with reasonable refresh intervals on port mappings

Peers

Network Infrastructure

Home Network
[Xbox One]

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IPv4 Networks: Be Mindful of Hairpinning

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

Hairpinning allows those peers to communicate.

Hairpinning Teredo traffic

x Infrastructure
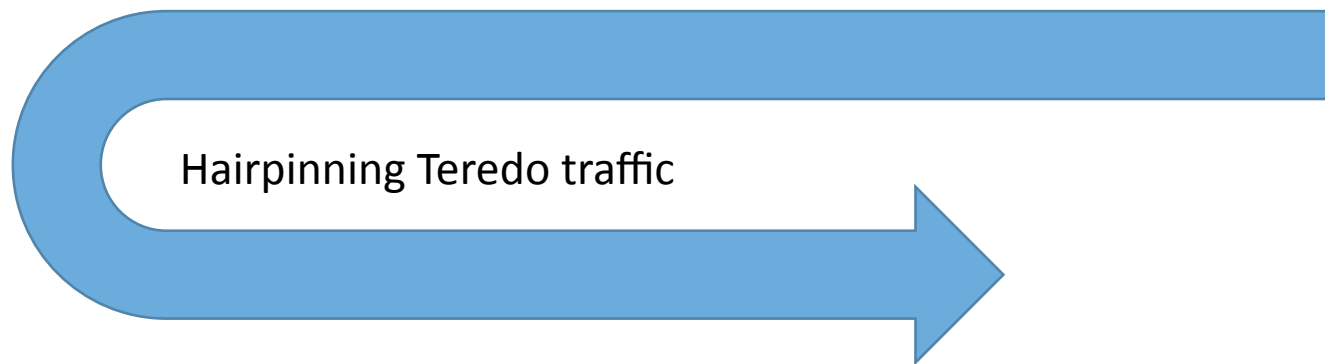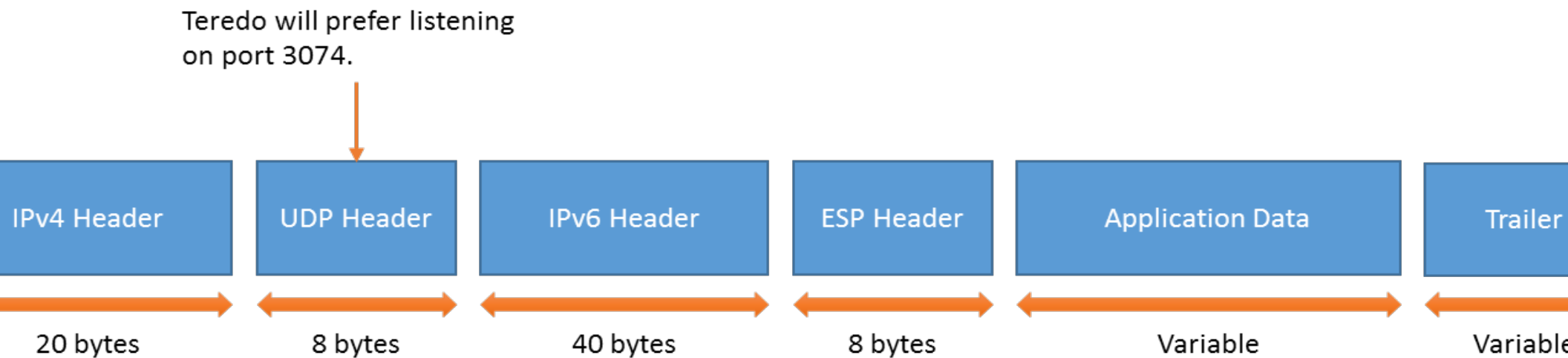
Home Network
[Xbox One]
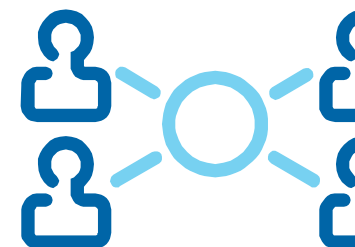
Peers

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.

Teredo will prefer listening
on port 3074.

IPv4 Header	UDP Header	IPv6 Header	ESP Header	Application Data	Trailer
20 bytes	8 bytes	40 bytes	8 bytes	Variable	Variable

More Information

More detailed documentation aligned to this presentation is available at www.microsoft.com/IPv6.
- Xbox One – Technical information on P2P Networking Behavior

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

Xbox One includes a troubleshooter for end-users, that informs them of their effective NAT type.

Performance issues are monitored and we will follow-up if we see patterns.

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