

XLX Multi-protocol System

An implementation of a remote AMBE server

Background, Challenges & Purpose

Background

Why XLX?

- Hotspots are growing like mushrooms; almost anyone with a digital HT has some form of HotSpot
- PC access using a ThumbDV devices is available for DMR, D-Star, and YSF
- Digital Mode protocols are not natively interoperable
- XLX provides a Cross-Mode solution for DMR, D-Star, and YSF
- XLX access is “built into” the HotSpot for each Mode
- XLX uses hardware (AMBE Encoder/Decoder) for D-Star
- XLX uses software for DMR & YSF

Challenges

Why do I choose these things?

- AMBE decoder for D-Star requires HARDWARE
 - Hardware limits Datacenter hosted XLX Server capabilities
 - YSF & DMR will work (software)
 - D-Star requires Hardware device
 - AMBE **SERVER** requires Hardware for the OS and the ThumbDVs
 - AMBE **SERVICE** requires network connectivity to the XLX Server
- Network @ Home
 - Port Forwarding can (and does!) work - until your IP address changes!
 - ISP's are not fond of residential "service" hosting

Purpose

Why spend blood & treasure? It's a fun hobby!

- Enjoyment of learning; I've always wanted to build a multi-protocol system
- Promotion of our hobby, education, and community support
- Creation of Virginia focused **Cross-Mode** Reflector "Modules"
- Available to anyone in Virginia/DMV who'd like to chat with their digital "neighbor"
- A way to bring a true "Digital" collaborative "Net" experience regardless of preferred digital Mode
- This project was a side project - I was initially trying to develop a WireGuard VPN solution for D-Star gateways with limited/expensive internet access; helping reduce Internet costs for trustees/clubs - yep, I figured that out... But back to this...

Need an explanation of XLX,
WireGuard and AMBE

Might be good to describe
the digital modes: D/D/Y

Product Descriptions

XLX

AMBE

WireGuard

Digital Mode Comparison

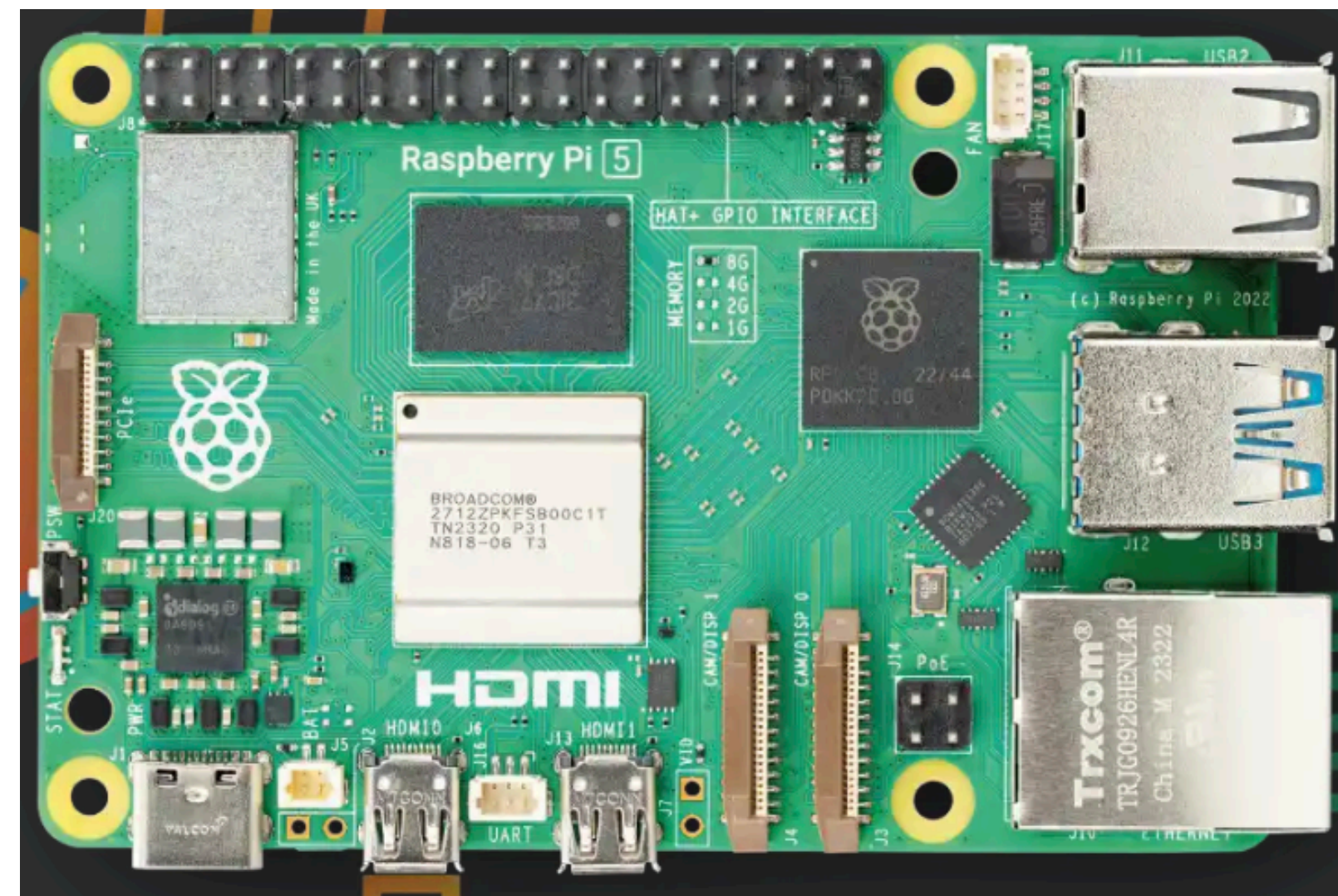
The Journey

Pieces & Parts

Stuff I had, stuff I bought, stuff I rent



**Northwest Digital
ThumbDV**



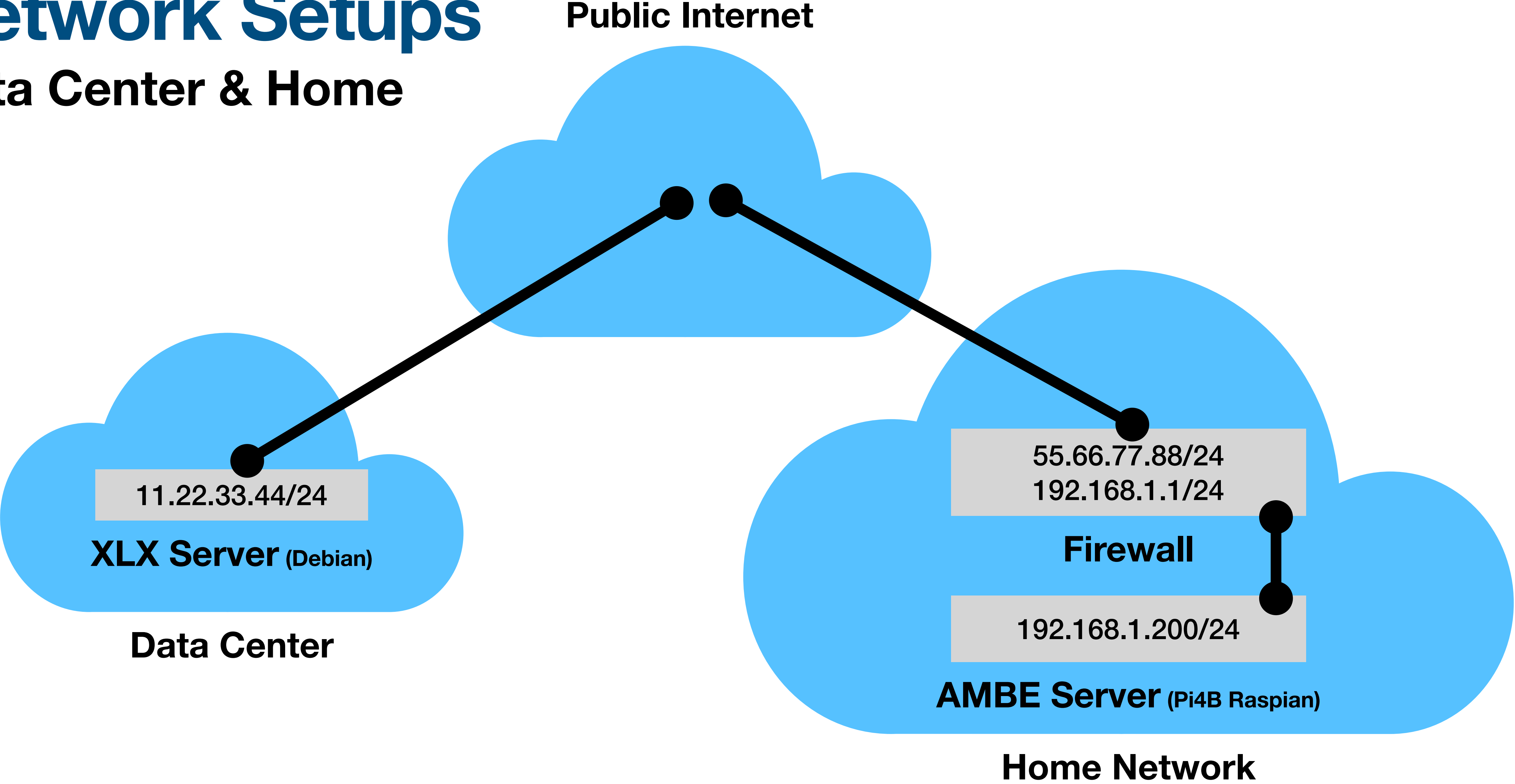
Raspberry Pi-4B



Cloud Hosted Server

Network Setups

Data Center & Home



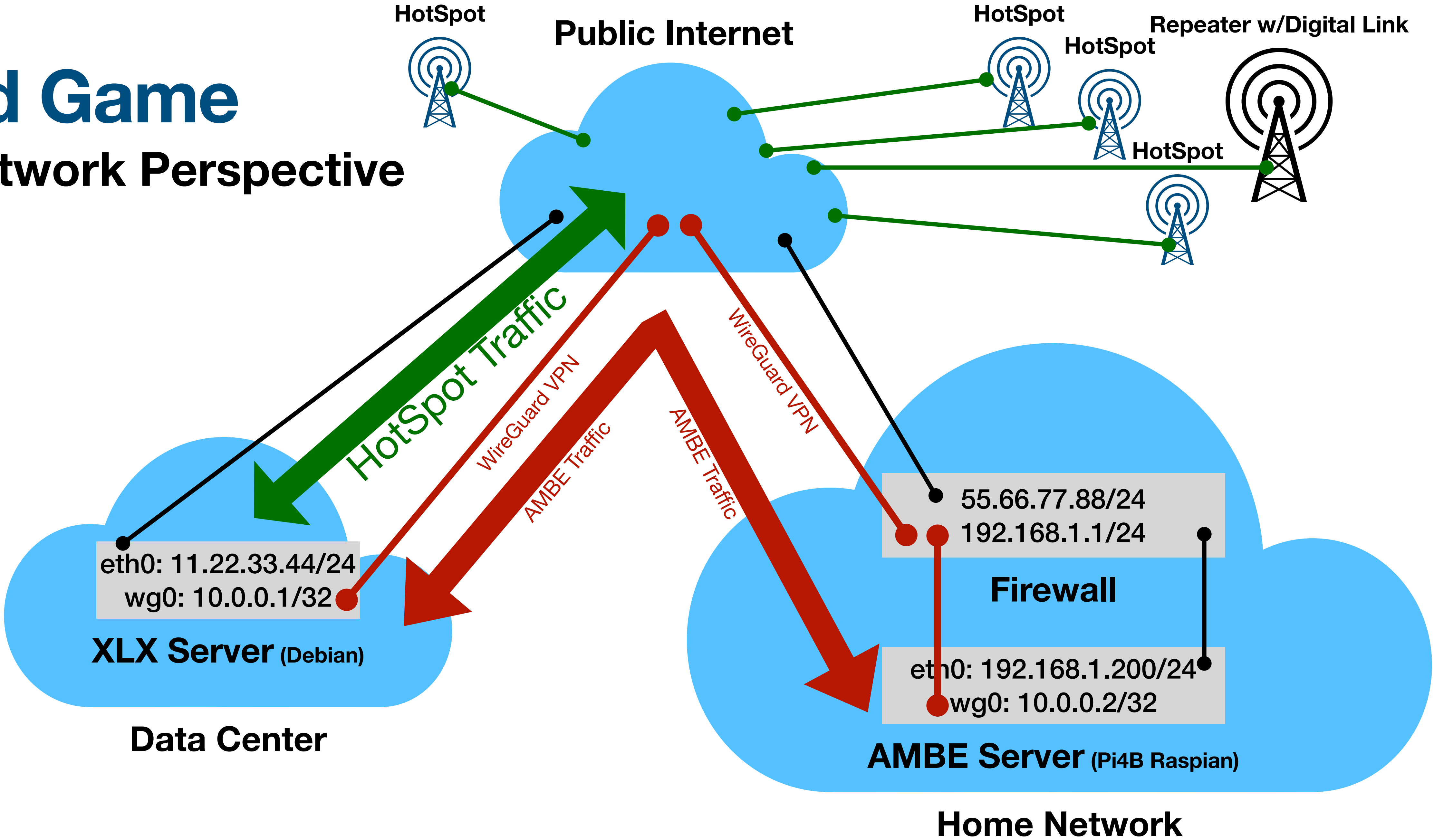
Stuff Notes

- XLX Server
 - Fixed, public facing IP address
 - Debian OS
 - Installed XLX Server & WireGuard
- ABME Server
 - DHCP private address behind router
 - Raspain 64bit OS
 - Installed AMBE Server & WireGuard
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The Destination

End Game

A Network Perspective



References

URL References

- **K8OI GitHub Repo:** <https://github.com/k8oi/xlx-wg-ambe-vpn>
- **Northwest Digital ThumbDV:** <https://nwdigitalradio.com/products/thumbdv™>
- **XLX Installation:** <https://n5amd.com/digital-radio-how-tos/create-xlx-xrf-d-star-reflector>
- **WireGuard Configuration:** <https://miguelmota.com/blog/getting-started-with-wireguard>
- **AMBE Configuration:** <https://github.com/n5amd/ambed-debian-installer/>