



# Future-Proofing Network Monitoring: Vendor-Agnostic Strategies & Solutions

March 25th

1:30pm

Tech Room 209AB



## Dan Siemon

- CPO & Co-Founder @ Aterlo Networks (Preseem)
- Networking geek, product manager, start-up founder.
- Former ISP owner, network admin.



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# Why So Many Equipment Vendors?

- Different Equipment Types (Routers, APs, OLTs, ...)
- Technology Generations
- Mergers and Acquisitions
- Flexibility / Agility - Best Tool for the Job
- Negotiating Power

It's not practical to be a single vendor ISP.

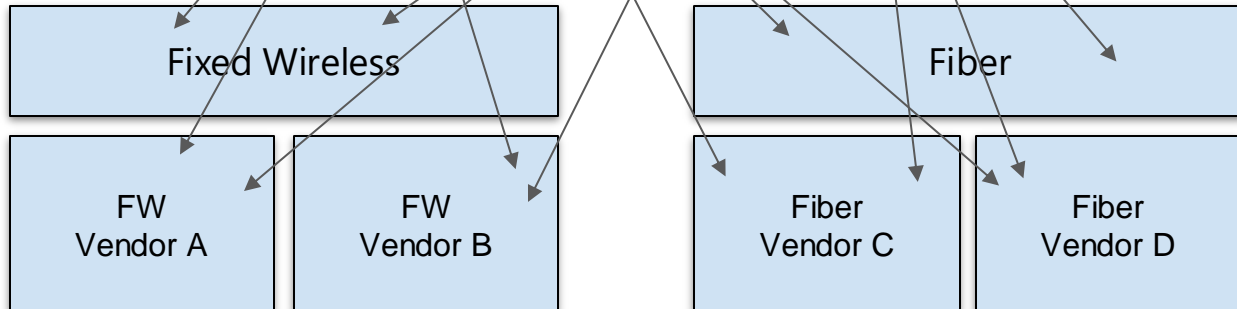
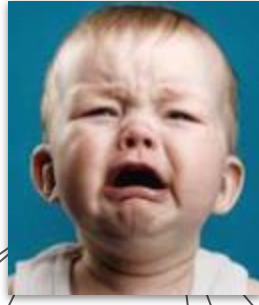
# The Dream



# So Much Pain...

Network  
Operations

Customer  
Support



- Each vendor and model has its own management platform
- Access technology specific knowledge
- Model specific knowledge
- Authentication
- Slow onboarding
- It's scary to add new vendors and models...

# Aside: The Equipment Vendors Aren't Evil (Mostly)

- Waiting for support in third-party management tools before release isn't an option
  - Delay product launch
  - Lose control
- Unique features won't exist in generic monitoring tools
- Vendors want to differentiate on being better on some dimension
- Genericizing configuration is hard



# A Strategy - What's Common?

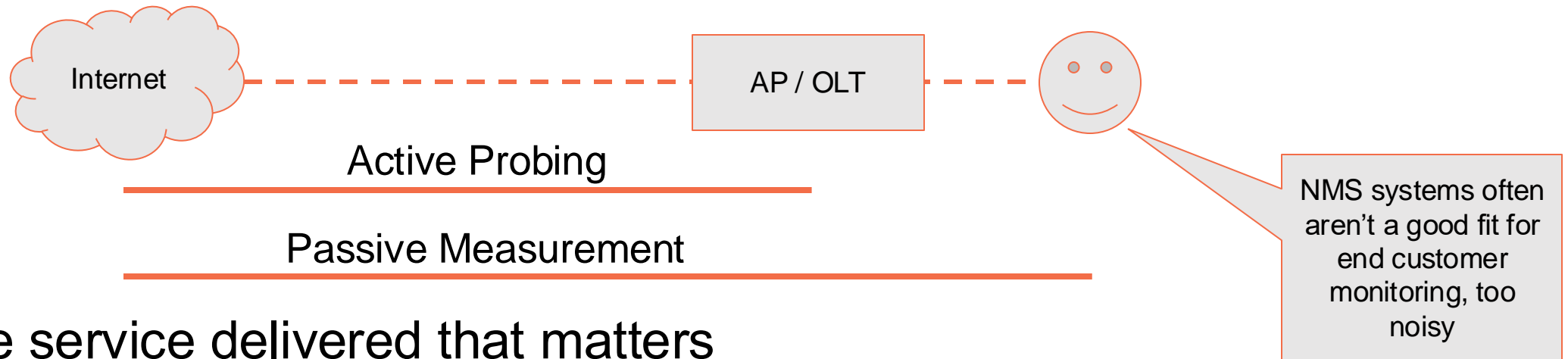
## Basic Network Connectivity

- ICMP Reachability
- ICMP Latency
- SNMP: basic history, trending and alerting on metrics
- Tie to Up/Down alerting in standard NMS



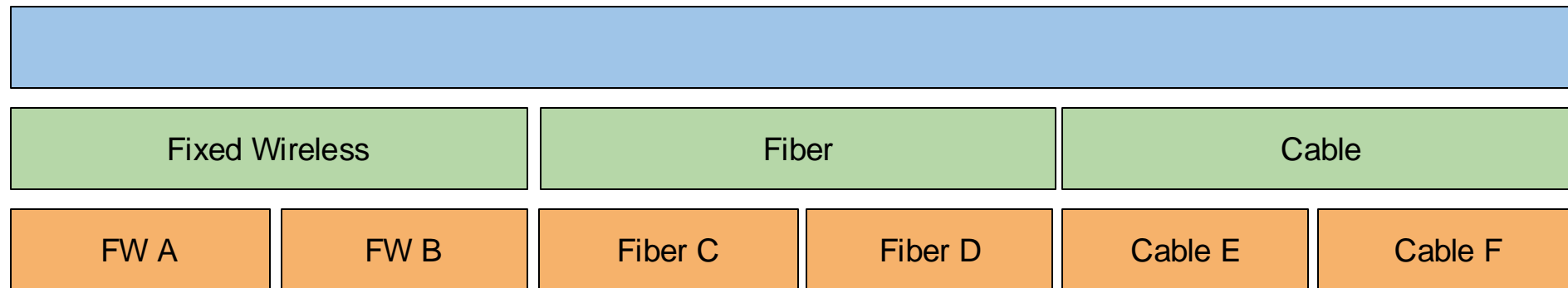
This isn't really 'network performance' though

# A Strategy - What's Common?



- It's the service delivered that matters
- Measure traffic characteristics
  - Throughput, loss, latency
  - Netflow
  - QoE
  - Combining with the network topology makes these actionable
- Provides a high level view in one place across all equipment in the path without equipment integration
  - If there are problems, dive into the individual management platforms

# A Strategy - Build a Layer On Top



- Extract common information and metrics
- Leverage data across many platforms
- Compare, benchmark, and trend
- Answer questions across the entire network

# A Strategy - Build a Layer On Top

Name	OLT	PON	Status	Manufactu...	ONT Tx Po...	ONT Rx Po...	OLT Tx Power	OLT Rx Power	Fiber Length	Connection Time	Ethernet Po...	Ethernet Po...
24@1/13/3	Osage Adtran TA5...	gpon 1/13/3	Online	Adtran	2.2 dBm	-19.8 dBm	5 dBm	-22.3 dBm	11209 m	55d 17h 38m	Up	10 Mbps
11@1/13/1	Osage Adtran TA5...	gpon 1/13/1	Online	Adtran	2.4 dBm	-21.5 dBm	4.8 dBm	-23.7 dBm	8682 m	15d 58m	Up	10 Mbps
JVidana-97798	Muleshoe OLT-01	pon4	Online	Ubiquiti	0.9 dBm	-22.9 dBm			2878 m	60d 19h 16m	Up	100 Mbps
SAscensio - 95604	Lockney OLT-01	pon6	Online	Ubiquiti	1.4 dBm	-18.1 dBm			1059 m	47d 15h 37m	Up	100 Mbps
13@1/13/1	Osage Adtran TA5...	gpon 1/13/1	Online	Adtran	2.6 dBm	-18.7 dBm	4.8 dBm	-21.7 dBm	9700 m	24d 3h 4m	Up	100 Mbps

Name	Status	Connectio...	Manufacturer	Model	Health Sc...	RF Score	Firmware
Parkdale DFS AP South	Online	10	Ubiquiti	Rocket Prism 5AC			v8.7.1
WWHwy160 330 Horn	Online	20	Ubiquiti	Rocket P...			v8.7.1
Parkdale Cambium Sect...	Online	16	Cambium	ePMAC Gen2	4.5 ↗	3.8 ↘	v8.7.1
AP-RP5AC-210-01-OWE...	Online	12	Ubiquiti	Rt5AC Gen2	4.4 ↗	5.4 ↗	v8.7.1
Mitchell Rd. South Horn	Online	10	Ubiquiti	Rc...	4.2 →	6.1 ↘	4.6.1
				5AC Gen2	5.3 ↗	5.9 →	v8.7.1
					5.9 ↗	5.5 ↘	



# A Strategy - What's Different?

## Configuration

- Each vendor has their own configuration tools
- Driving the entire network config from a third party tool is unrealistic
- Mitigate how often configuration changes are made by centralizing enforcement where possible
  - E.g. Do package and policy enforcement centrally and leave AP and OLT the same for all subscribers

# A Practical Strategy - Summary

Configuration

Simplify the config of the edge as much as possible.

Normalized Hardware  
Metrics / Analytics

Build a layer on top to expose and analyze

Measure Traffic  
(Delivered Service / QoE)

Treat traffic measurements as a universal layer

Basic Up / Down

Traditional NMS

Connectivity



## Henry Ortiz, Esq.

- Framework-based cybersecurity and risk management compliance advisor
  - NIST CSF - SCRM - Telecommunications
  - HIPPA - Healthcare
  - CMMC – Dept. of Defense Contractors
- Prior career: DBA & Status monitoring solutions for telecom
- Hands-on experience with internal and external plant devices
- [Henry.Ortiz@BorderHawk.com](mailto:Henry.Ortiz@BorderHawk.com)
- <https://www.linkedin.com/in/hjortiz/>

# Vendor-Agnostic Strategies

- Strategies:
  - Decisions you make for your company today have a direct impact on future strategic positioning
  - Role of the executive team, board of directors, owners.
  - Vendor-Agnostic Strategies
    - Risk Management
      - Supply Chain Risk Management

# Network Monitoring

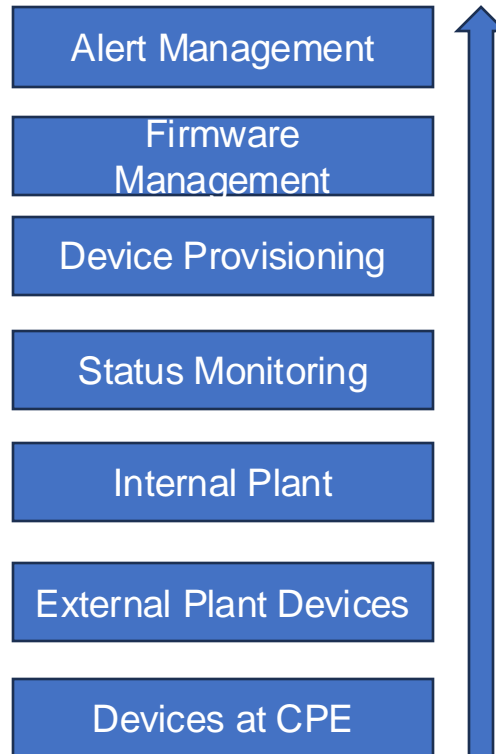
- 25 years ago: No standard protocols
  - Great for vendors
  - Sell solutions that included hardware & software
  - Barrier of entry for competitors
  - Appeal for buyers: Network Monitoring - No other options
- Nowadays: Still vendors with proprietary solutions?
  - Why? Appeal?
    - Extended functionalities or out of the box integrations (billing, accounting, dispatch, marketing, user portals, cybersecurity, etc.. )
- Strategies:
  - Long term risk vs short-term convenience

# Vendor Agnostic Strategies

- Supply chain risk management
  - How: identify, assess, and mitigate risks within the supply chain to ensure business continuity.
    - IT / OT
    - Other business units
      - MSP/MSSP
      - Data center
  - Someone else's critical vendor in the supply chain
    - Telecom: The critical sector industry that other critical sectors depend on
      - Law enforcement
      - Transportation
      - Healthcare
- Goal: minimizing disruptions from factors like supplier failures, geopolitical issues, and cybersecurity threats

# Device Monitoring Supply Chain Risk Management

Identify, Assess, and Mitigate Risks within the supply chain



- Identify: Critical vendors/brands/devices 80/20 rule
- Assess Vulnerabilities: (Supply chain disruptions)
  - o Manufacturing locations (import/export, sanctions, geopolitical)
  - o Financial stability
  - o Cyber (especially if cloud based)
  - o Data privacy (liability)
- Risks
  - o Threats: Telecom & bad actors
- Prioritize
  - o Likelihood & impact

# Supply Chain Risk Management "SCRM"

- Risk management plans
  - Cyber
  - Supply Chain
- FCC Security Council (Created this month - March 2025)
  - **Thursday March 27th Room 203 / 830 am**
    - Important FCC And Other Federal Agency Cybersecurity Proceedings
      - Louis Peraertz, Esq. WISPA
      - Jeff Carlisle, Esq. Lerman Senter PLLC
      - Henry Ortiz, Esq. BorderHawk
      - Anand Chari Kognitive Networks Inc.

# Inventive Wireless of Nebraska LLC (Vistabeam)



## Andrew (Drew) Wicker

- Partner & COO @ Vistabeam
- Former owner of LaCreek Tower Service and AW Consulting, Inc.
- Former Tower Technician
- 17 years industry veteran



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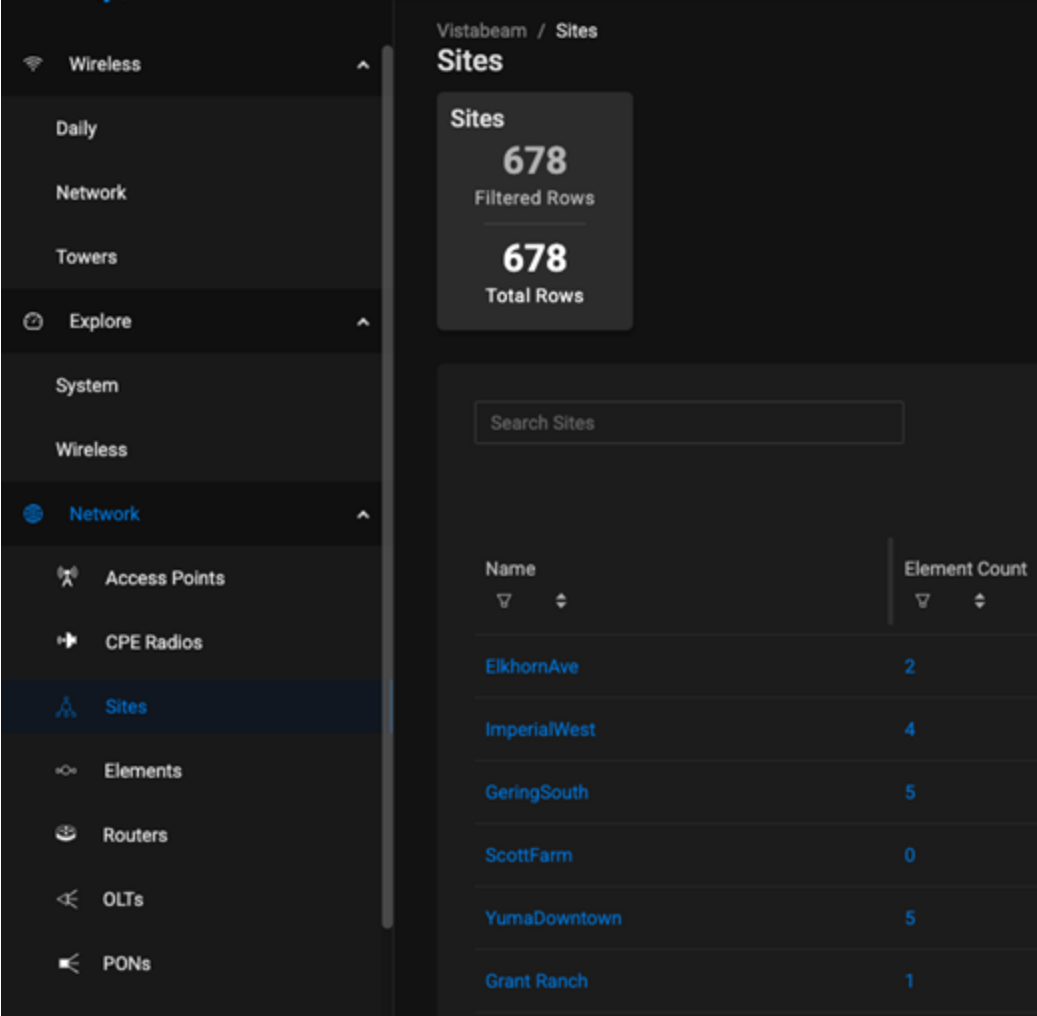
# We use vendor agnostic solutions

- Preseem
- Vetro FiberMaps
- Nagios
- LibreNMS
- Cambium QOE / Bequant
- Netbox
- gaiia



Lots of sites to manage

logging into many different vender specific dashboards would not be efficient



The screenshot shows a network management interface with a sidebar on the left and a main content area on the right. The sidebar includes navigation options: Wireless, Daily, Network, Towers, Explore, System, and another Wireless section. Under the second Wireless section, there is a 'Network' section with sub-items: Access Points, CPE Radios, Sites (highlighted), Elements, Routers, OLTs, and PONs. The main content area is titled 'Vistabeam / Sites' and 'Sites'. It displays a summary card with '678 Filtered Rows' and '678 Total Rows'. Below this is a search bar labeled 'Search Sites'. A table lists sites with their names and element counts:

Name	Element Count
ElkhornAve	2
ImperialWest	4
GeringSouth	5
ScottFarm	0
YumaDowntown	5
Grant Ranch	1

# Many tools in the toolbox for different jobs

- Adtran & Cambium OLTs for Fiber to the X
- Tarana for distance and nonLOS
- Tachyon 60 GHz mmWave w/ fiber like speeds & latency
- ePMP4000 / LTU for low density & low cost applications
- Siklu for 10 Gbps full duplex backhaul



# Mergers and Acquisitions

We have inherited and deployed almost every brand of tech

- Mikrotik
- UBNT
- Mimosa
- Cambium
- Baicells
- Tachyon
- Dragonwave
- Trango
- Exalt
- SAF
- Ceregon
- Aviat
- Juniper
- Siklu
- Adtran
- FiberStore.com
- Brocade



# Multiple brands & models

Wave60 AP	
Model	Count
Wave AP Micro	1
Wave60 AP	9

Cambium 1000/2000 AP	
Model	Count
ePMP1000	40
ePMP2000	88

Tarana AP	
Model	Count
TaranaBN	41
Unknown	13

Cambium 450 3GHz AP	
Model	Count
PMP 450	2
PMP 450i	90
PMP 450m	93

Mimosa AP	
Model	Count
A5-14	5
A5c	12
A5c-2	1

Tachyon AP	
Model	Count
TNA-301	5
TNA-303X	58
Unknown	4

Cambium 450 5GHz AP	
Model	Count
Offline / Error	6
PMP 450i	10
PMP 450m	16

Cambium 3000 AP	
Model	Count
ePMP3000	298
ePMP3000L	47
Unknown	1

Ubiquiti AP	
Model	Count
LiteAP GPS	1
LTU-Rocket	10
NanoStation M2	2
Rocket 5AC Prism	1
Rocket 5AC PTMP	5
Rocket M2	1
Rocket M5	16

# Using “best of breed” to build core

A10 for cgNAT

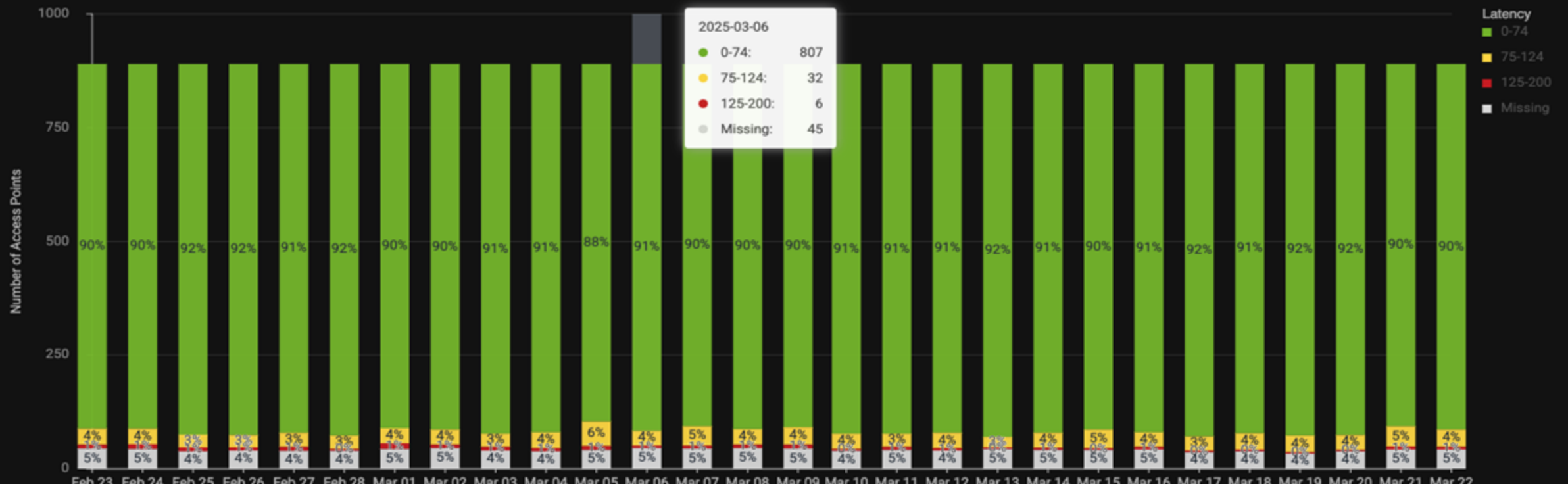
Juniper for BGP at the border and VPLS route reflector

Platform	Operating System	Up/Down Time
TH3350	A10 Networks 5.2.1-P9(build: 72)	9mos 1w 5d
Juniper JNP204 [MX204] Edge Router	Juniper JunOS 23.1R1.8	1yr 7mos 3w
Juniper JNP204 [MX204] Edge Router	Juniper JunOS 23.1R1.8	1yr 6mos 1w
CCR2116-12G-4S+	Mikrotik RouterOS 7.16 (Level 6)	3mos 3h 16m
CCR2116-12G-4S+	Mikrotik RouterOS 7.16 (Level 6)	2mos 3w 8h
CCR2216-1G-12XS-2XQ	Mikrotik RouterOS 7.16.1 (Level 6)	2mos 1d 9h

# Monitoring spread across many vender specific applications often gets ignored

## Access Point Latency Over Time

The Latency metric is designed to help you understand and compare the latency experienced by subscribers on each of your access points (APs) during the times of the day with the highest demand [1].



# Quickly confirm what is working well

Wireless				Metrics									
Tower	Sector	📶 Latency (ms)	🕒 Busy Hours	📶 Oversubscription Ratio	📶 Downstream (mbps)	📶 Upstream (mbps)	📶 Active Subscribers	📶 Connected Stations	📶 TCP Retransmit %	📶 Subscriber Downstream	📶 Subscriber Upstream	📶 Vendor	📶 Model
Tram	TRM16	26	1.05	65.25	309.7	24.19	40	119	0%	3.98	0.19	Tarana	30-0141-001
TorringtonCenter	TC5	36	0.05	42.42	242.15	30.34	27	55	1%	6.66	0.23	Tarana	30-0134-001
SchnorrFarms	SCH10	36	0	34.23	218.44	13.81	12	26	1%	3.64	0.15	Tarana	30-0141-001
TorringtonCenter	TC7	39	0	40.24	201.75	19.01	20	42	0%	5.27	0.22	Tarana	30-0134-001
KeyBank	KBK3	35	0	24.65	198.24	29.83	12	22	0%	6.36	0.47	Tarana	30-0134-001
TorringtonCenter	TC6	29	0	21.69	191.3	16.96	18	35	0%	6.74	0.46	Tarana	30-0134-001
GreenMountain	GM8	33	0.02	79.63	183.66	25.85	35	65	1%	4.38	0.28	Tarana	30-0141-001
WaldenWater	WW9	45	0.02	17.86	175.91	13.89	32	65	0%	6.68	0.23	Cambium	PMP 450m
AkronGrain	AK19	32	0	20.5	171.96	10.93	12	24	0%	5.9	0.28	Tarana	30-0134-001
AkronGrain	AK15	30	0	66.88	165.53	26.1	37	76	0%	4.53	0.2	Tarana	30-0141-001
LaramieNorth	NL2	34	0	11.8	141.3	17.02	19	36	0%	6.12	0.27	Cambium	PMP 450m
BudweiserEventCenter	BEC7	29	0	3.04	135.19	4.85	2	3	0%	88.47	4.38	Tarana	30-0134-001
BudweiserEventCenter	BEC9	34	0	14.96	133.06	23.84	10	15	0%	6.56	0.49	Tarana	30-0134-001
BayardSugar	BA14	40	0.42	16.86	131.86	12.15	20	37	1%	7.63	0.2	Cambium	PMP 450m
WaldenWater	WW8	47	0	14.94	126.07	16.81	24	51	0%	4.6	0.19	Cambium	PMP 450m
TorringtonCenter	TC4	33	0	35.26	123.66	16.25	25	46	1%	6.04	0.28	Tarana	30-0134-001
TieSiding	TS5	51	0.88	9.19	121.2	7.15	8	16	0%	5.71	0.41	Cambium	ePMP 3000
LingleNorth	LIN6	55	0.05	12.92	114.13	13.26	21	40	1%	5.33	0.16	Cambium	PMP 450m
BayardSugar	BA15	55	0	18.36	113.76	15.63	27	40	1%	4.92	0.22	Cambium	PMP 450m

# Check for down devices at a glance

## Nagios Monitoring System

Status file last updated at 2025-03-23 10:40:14

Sunday 10:40:56

### Hosts Status

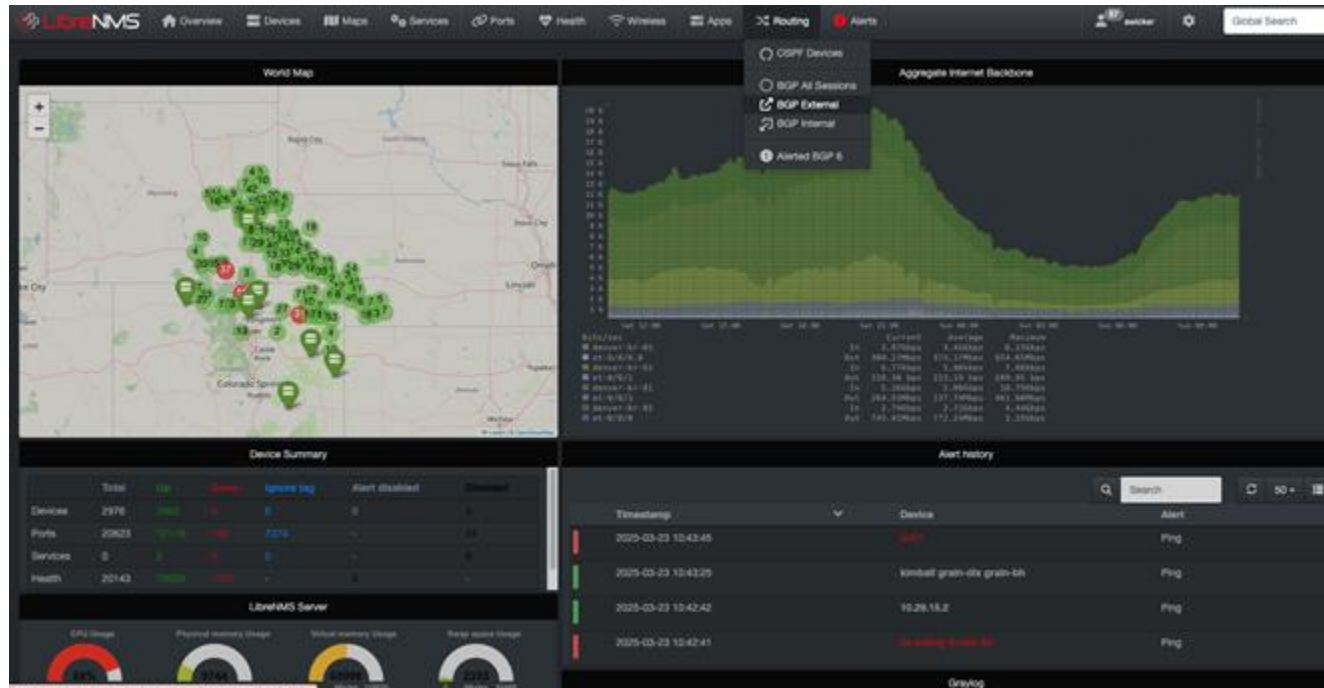
3237 Ok 2 Down

Host	Address	Status	Duration	Plugin Output
FallRiverResort-R4-Router	10.255.254.200	down	3d, 18h:30m:19s	CRITICAL - Plugin timed out
ScottsbluffMain-UPS	10.2.0.4	down	3d, 17h:44m:35s	CRITICAL - Plugin timed out

Acknowledged: 2pifi-4958, HartvilleWest-Casa-BH-MGMT, Yoder-YO7-AP, YumaChurchofChrist-4765

### Services Status

4845 Ok 6 Critical 6 Warning 2 Notification



# Spot oversubscription problems

Search Access Points

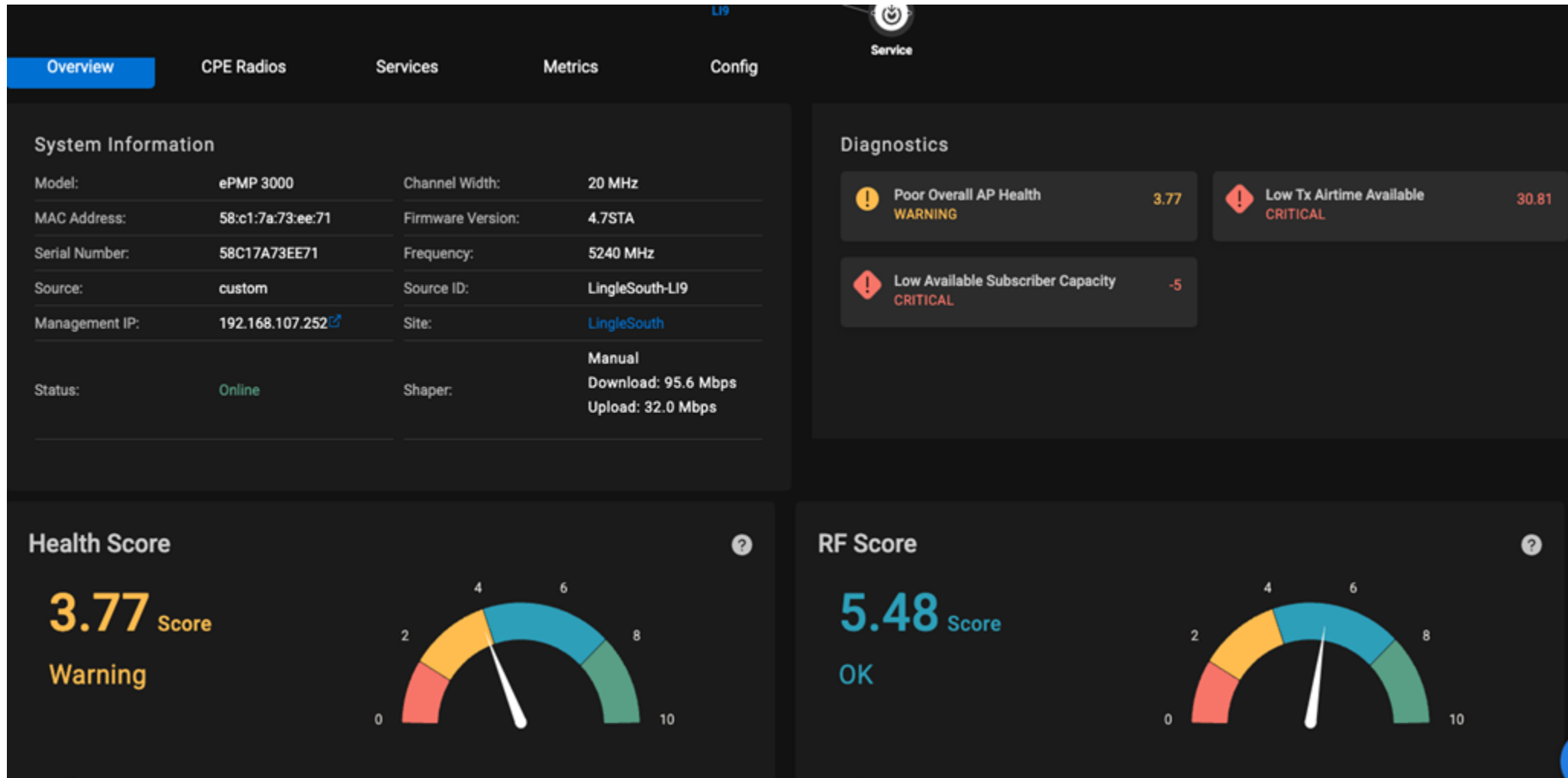
Summary Health Hardware All Columns Custom

Subscriber Capacity: **Critical** X

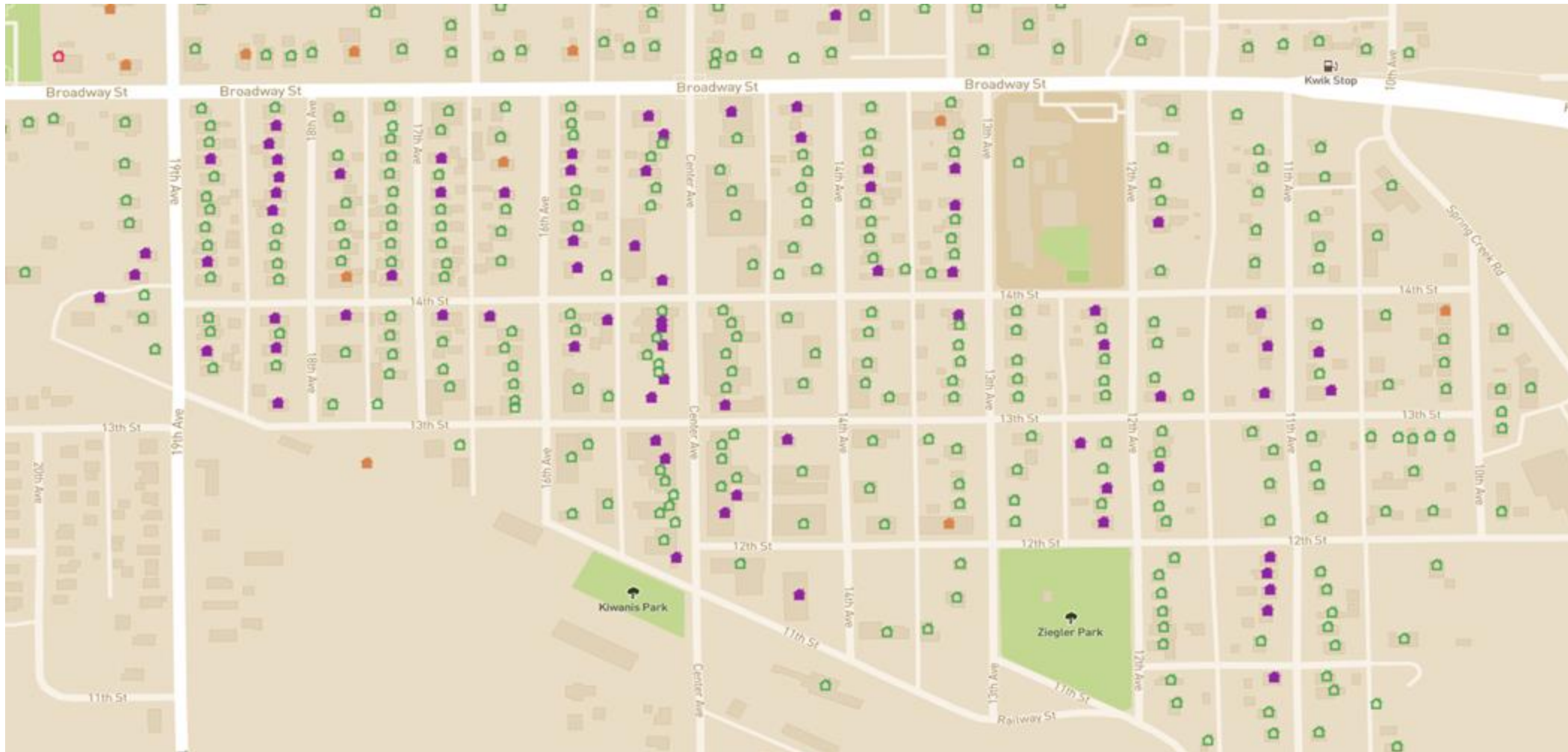
Sorted by: Subscriber Capacity

Name	Source	Status	Connectio...	Manufacturer	Site	Model	Health Score	Subscriber Capacity	RF Score	Tx Airtime Remaining	Latency
GB2	custom	Online	13	Cambium	Gibbons	ePMP 3000L	3.1 →	-6 →	5.1 →	26 %	84 ms
WR18	custom	Online	14	Cambium	WraySouth	ePMP 3000	3.8 ↓	-5 ↗	5.4 ↗	36 %	64 ms
LI9	custom	Online	17	Cambium	LingleSouth	ePMP 3000	3.8 ↗	-5 →	5.5 ↘	28 %	84 ms
HN5	custom	Online	16	Cambium	Henry	ePMP 3000	4.8 ↑	-3 →	6.4 →	48 %	49 ms
OS1	custom	Online	10	Cambium	OtisSouth	ePMP 3000	4.6 ↓	-3 ↘	6.3 ↓	49 %	49 ms
SA1	custom	Online	15	Cambium	ScottsbluffWaterAir...	ePMP 3000	4.0 ↗	-3 →	5.1 ↗	44 %	85 ms
MW2	custom	Offline	16	Cambium	MinatareWater	PMP 450i	3.5 ●	-3 ●	6.0 ●	45 %	49 ms
LY3	custom	Online	12	Cambium	Lyman	ePMP 3000	4.1 →	-2 ↘	5.0 ↓	51 %	60 ms

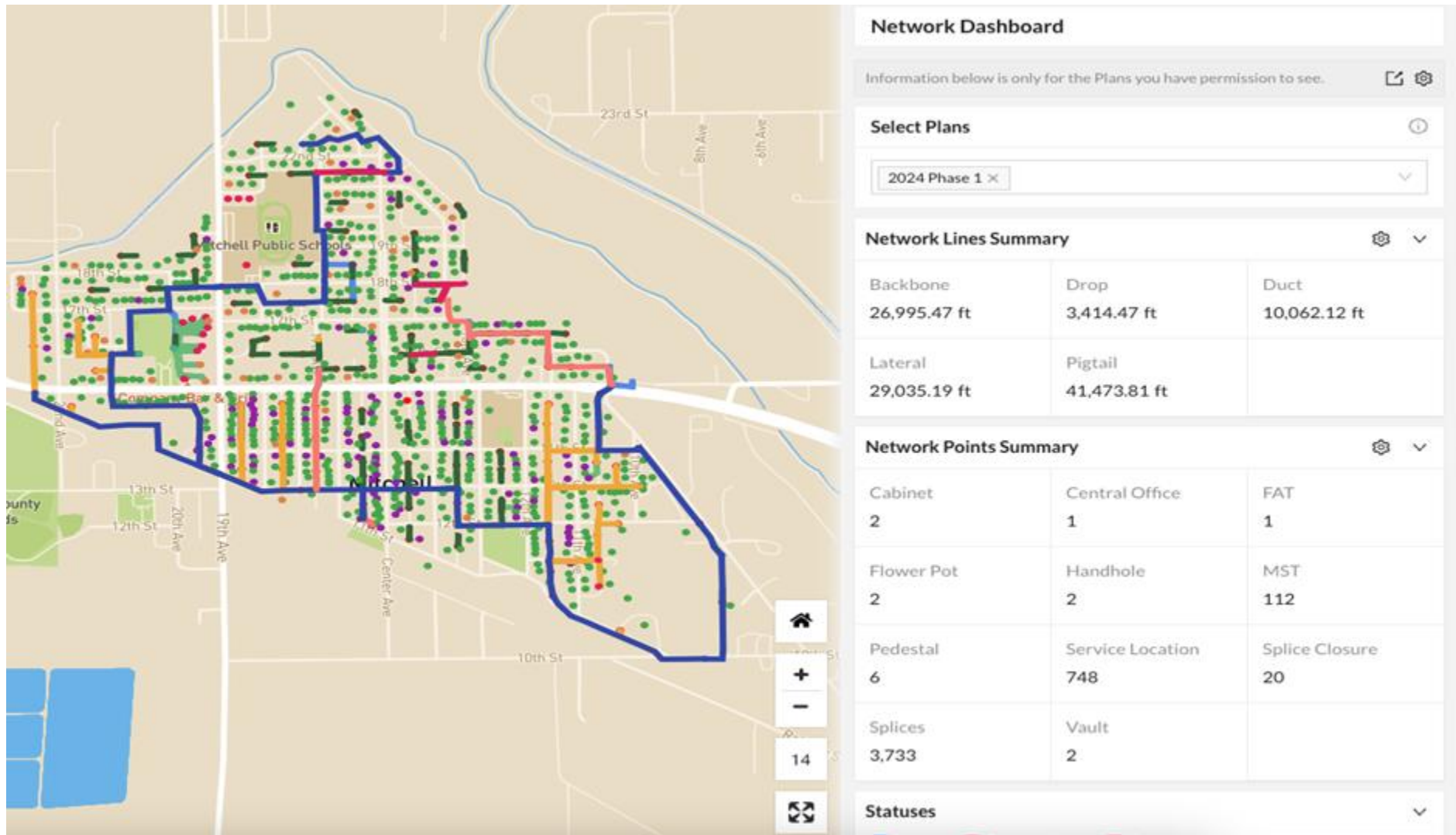
# Fix problems and increase capacity



# Clearly communicate customers that can get fiber to sales and ops teams



# Summary of network components





**THANK YOU**

