WiscNet - UW System Network Update

November 2023

Brian Remer	CTO	brian.remer@wiscnet.net
Chris Wopat	Sr Network Engineer	wopat@wiscnet.net
Josh Gorton	Platform Engineer	joshg@wiscnet.net (absent)
Eric Hammons	Jr Platform Engineer	ehammons@wiscnet.net
Email Group		eng@wiscnet.net

WiscNet - ~~UW System~~ Network Update

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WiscNet - The Universities of Wisconsin Network Update

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WiscNet - The Universities of Wisconsin Network Update

November 2023

- Optical Transport
- Routing and Peering
- Server Infrastructure
- WiscNet Strategic Directions

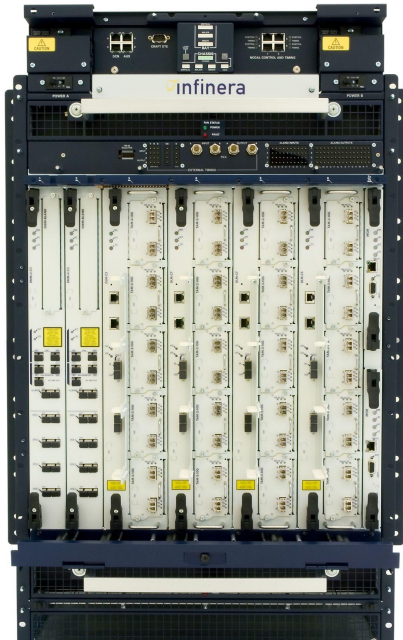# WiscNet - The Universities of Wisconsin Network Update

November 2023

- **Optical Transport**
- Routing and Peering
- Server Infrastructure
- WiscNet Strategic Directions

Optical Transport

DTN vs Groove G30

- 20 ru (1/2 rack)
- 1g / 10g only
- 200ge capacity/direction
- 2 directions per chassis

- 1 ru (1/40th of rack)
- 100g / 400g only
- 200g - 1200g capacity /direction
- 2 directions == 2 chassis
- 3 directions == 3 chassis..
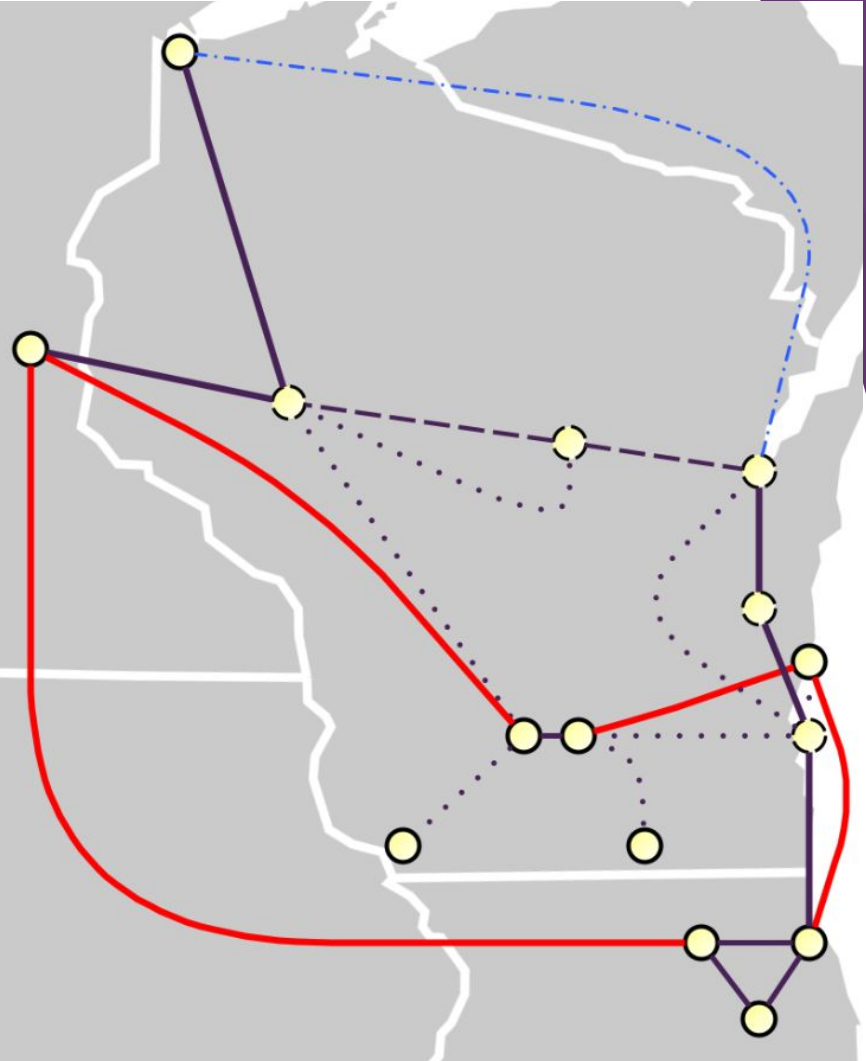
Optical Transport

Infinera Groove G30

- Modular Chassis
  - 1 rack unit "pizza boxes"
  - One per "direction" (north / south / east / west)
  - OTDR remotely
- Line system (DWDM long haul)
  - ROADM
  - Official support for foreign (non Infinera) wavelengths
  - Flex grid up to 200ghz channels
  - Express capability maintained
- Transponder (client ports)
  - 100G and 400G - (No 10G / 1G)
  - Capacity depends on modulation (distance, fiber characteristics)
  - 2x600G Line (200g to 1200g capacity each direction)

Optical Transport

Overview

BOREAS-Net
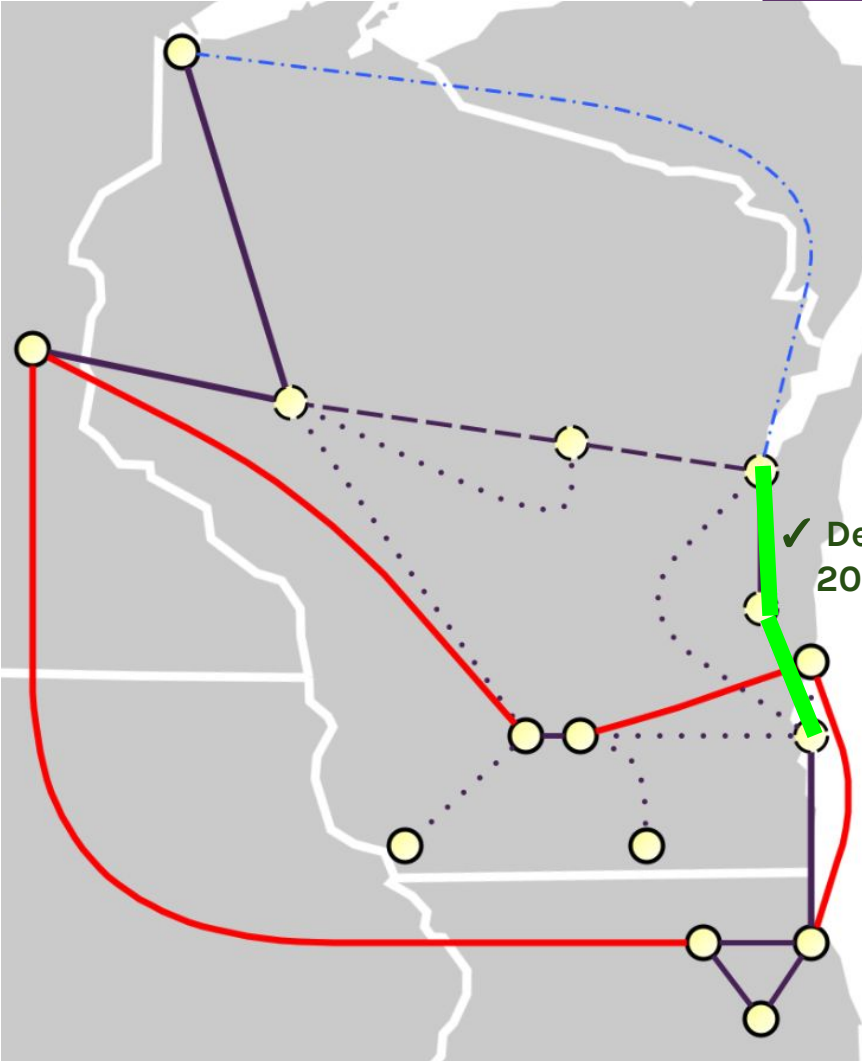WiscNet Phase 1
WiscNet Phase 2
MERIT
WiscNet Other
Complete

Optical Transport

Progress

———	BOREAS-Net
———	WiscNet Phase 1
− − −	WiscNet Phase 2
− · −	MERIT
· · · ·	WiscNet Other
———	Complete

Dec 2022   Green Bay - Milwaukee

✓ Dec 2022

Optical Transport

Progress

———	BOREAS-Net
———	WiscNet Phase 1
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– · –	MERIT
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———	Complete

Dec 2022   Green Bay - Milwaukee
Jan 2023   Milwaukee - Madison
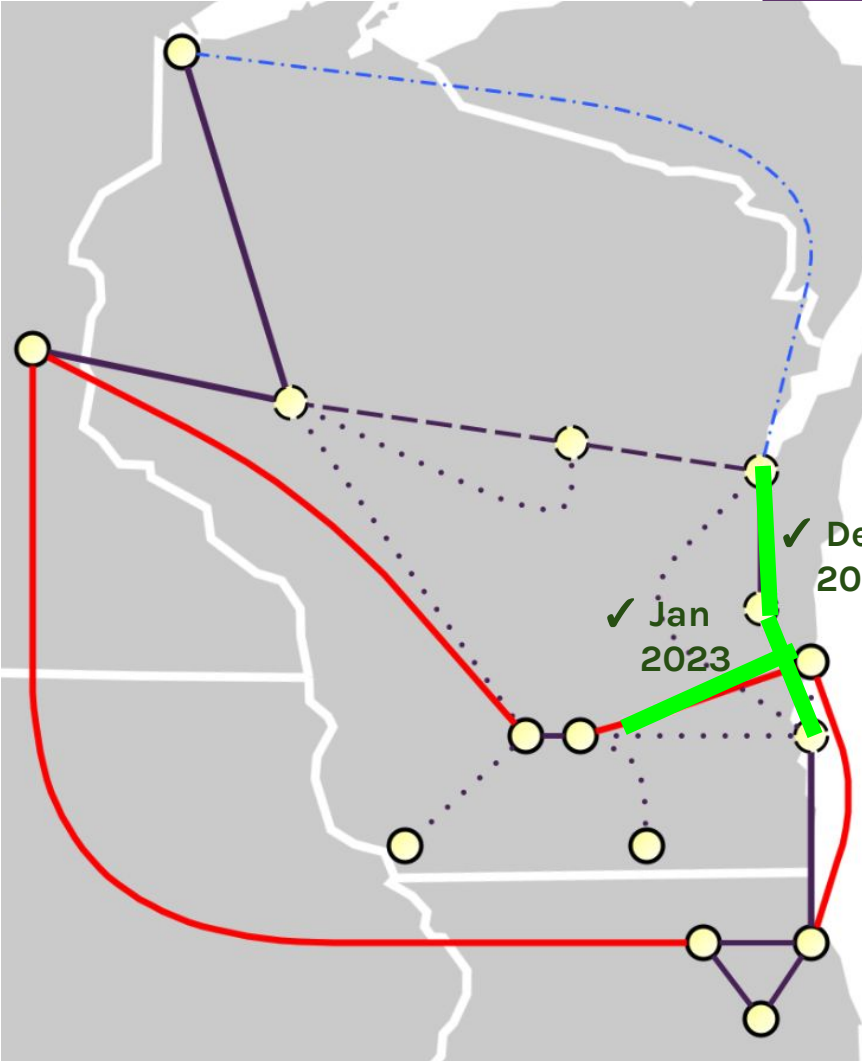
✓ Dec 2022

✓ Jan 2023

Optical Transport

Progress

- ——— BOREAS-Net
- ——— WiscNet Phase 1
- — — WiscNet Phase 2
- — · — MERIT
- ······· WiscNet Other
- ——— Complete

Dec 2022	Green Bay - Milwaukee
Jan 2023	Milwaukee - Madison
Apr 2023	Superior - Eau Claire

Optical Transport

Progress

——	BOREAS-Net
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Dec 2022	Green Bay - Milwaukee
Jan 2023	Milwaukee - Madison
Apr 2023	Superior - Eau Claire
May 2023	Madison - Minneapolis
May 2023	Chicago Metro (3 sites)
Jun 2023	Madison Metro (2 sites)

✓ Apr 2023

✓ Dec 2022

✓ May 2023

✓ Jan 2023

✓ Jun 2023

✓ May 2023

Optical Transport

Progress

—— (red)	BOREAS-Net
—— (purple)	WiscNet Phase 1
– – – (purple dashed)	WiscNet Phase 2
– · – (blue)	MERIT
· · · · (purple dotted)	WiscNet Other
—— (green)	Complete

Dec 2022   Green Bay - Milwaukee
Jan 2023   Milwaukee - Madison
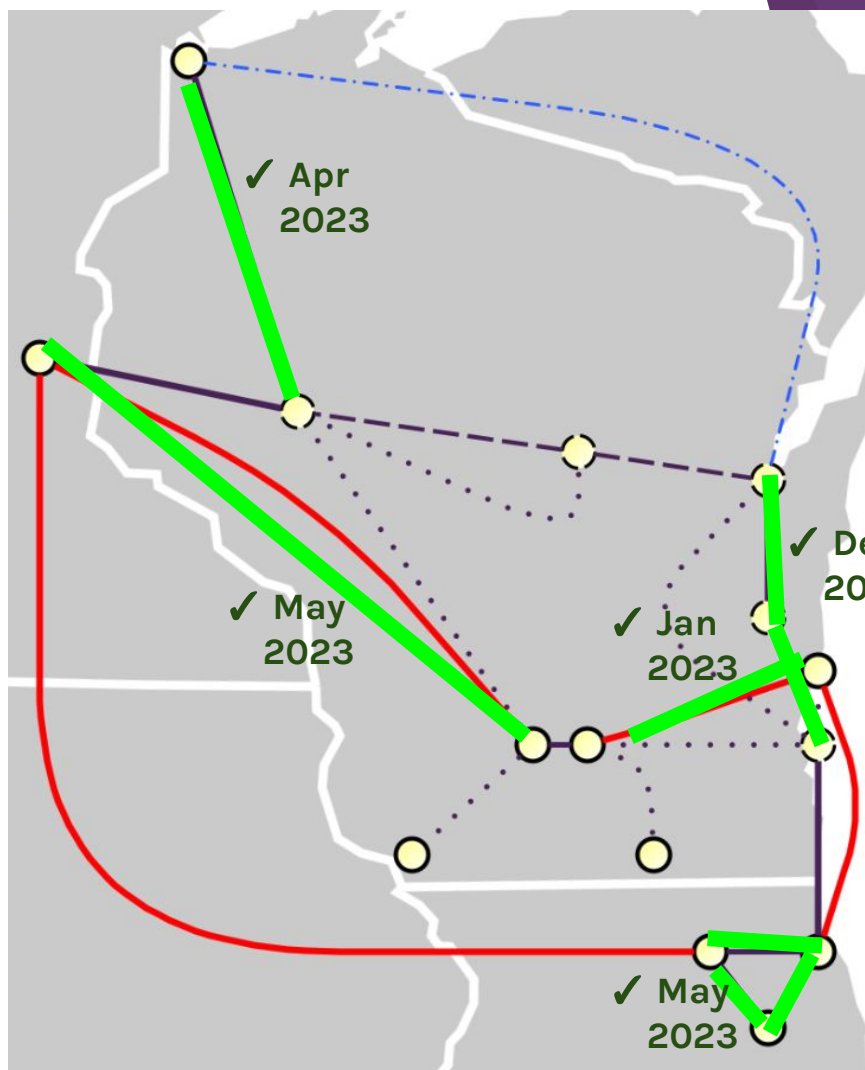Apr 2023   Superior - Eau Claire
May 2023   Madison - Minneapolis
May 2023   Chicago Metro (3 sites)
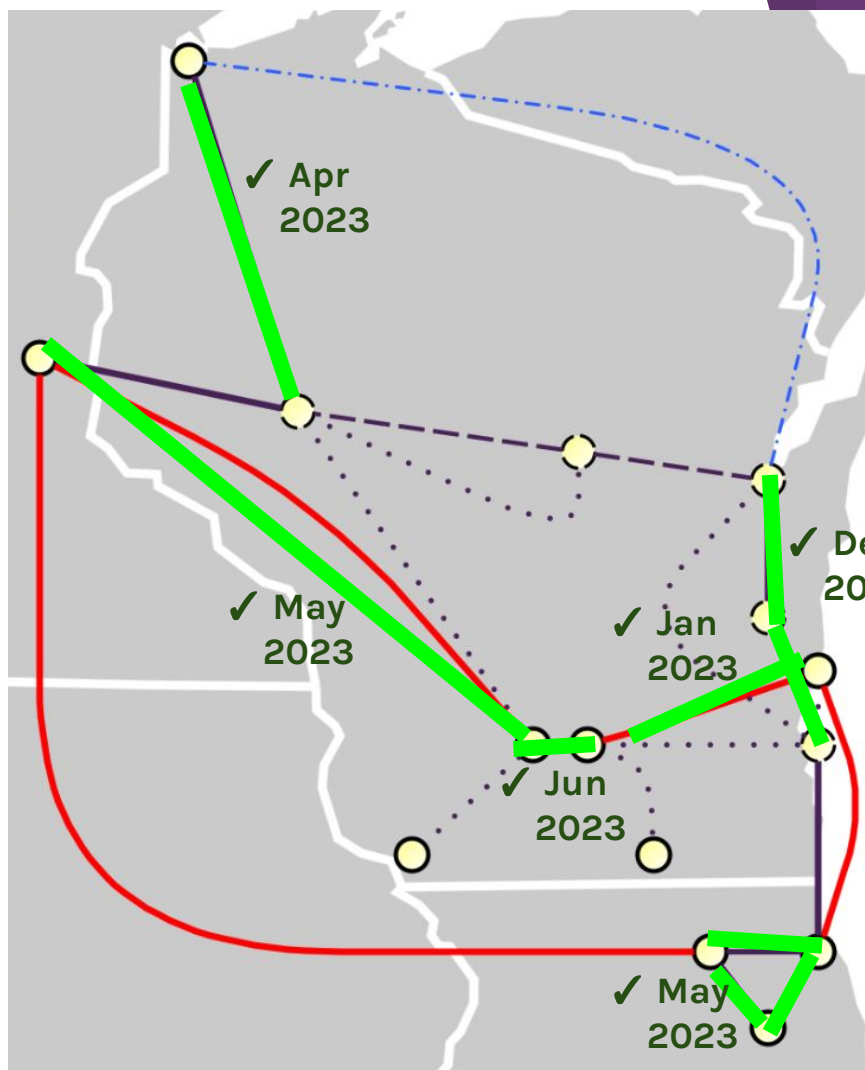Jun 2023   Madison Metro (2 sites)
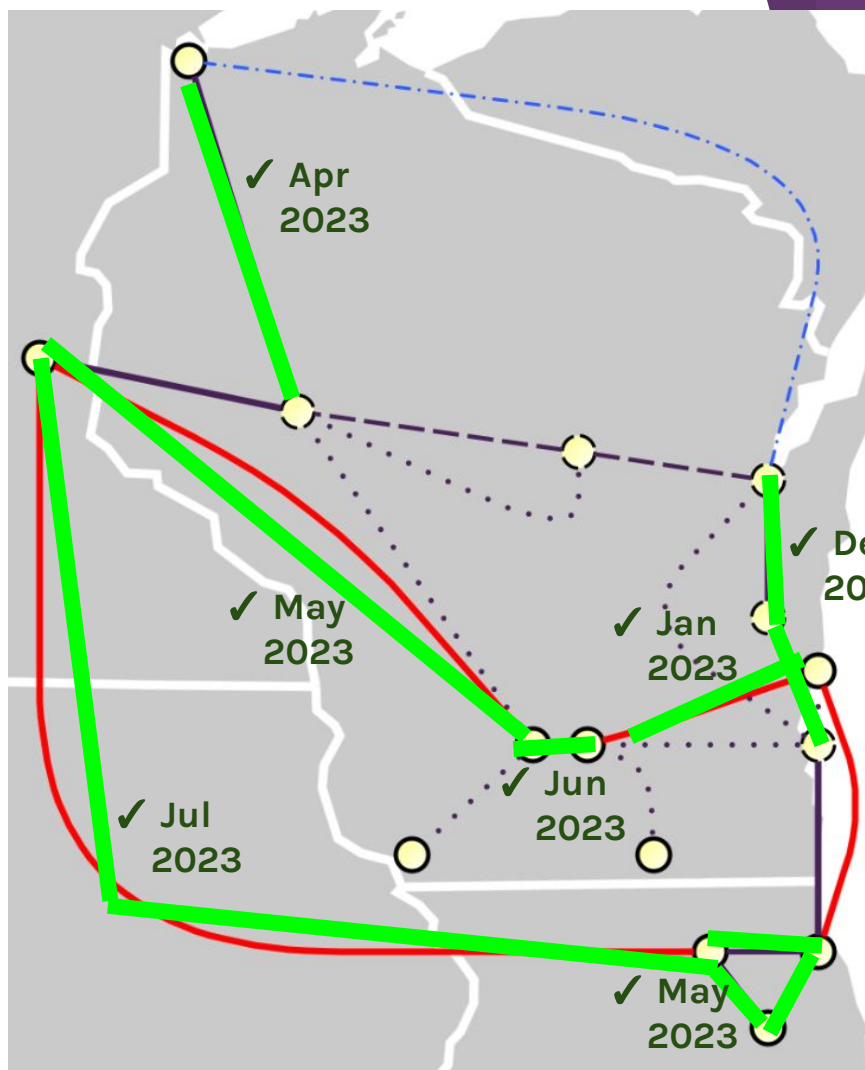Jul 2023   Chicago - Minneapolis
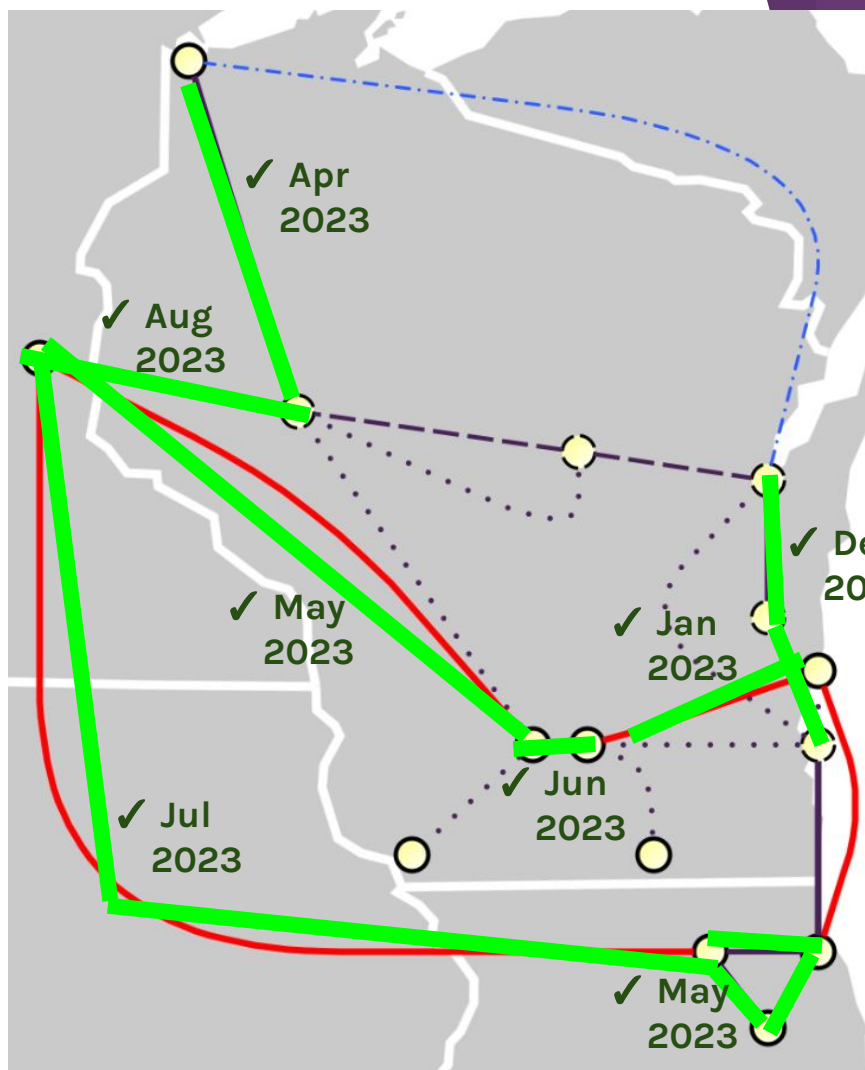
✓ Apr 2023

✓ Dec 2022

✓ May 2023

✓ Jan 2023

✓ Jun 2023

✓ Jul 2023

✓ May 2023

Optical Transport

Progress

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Optical Transport

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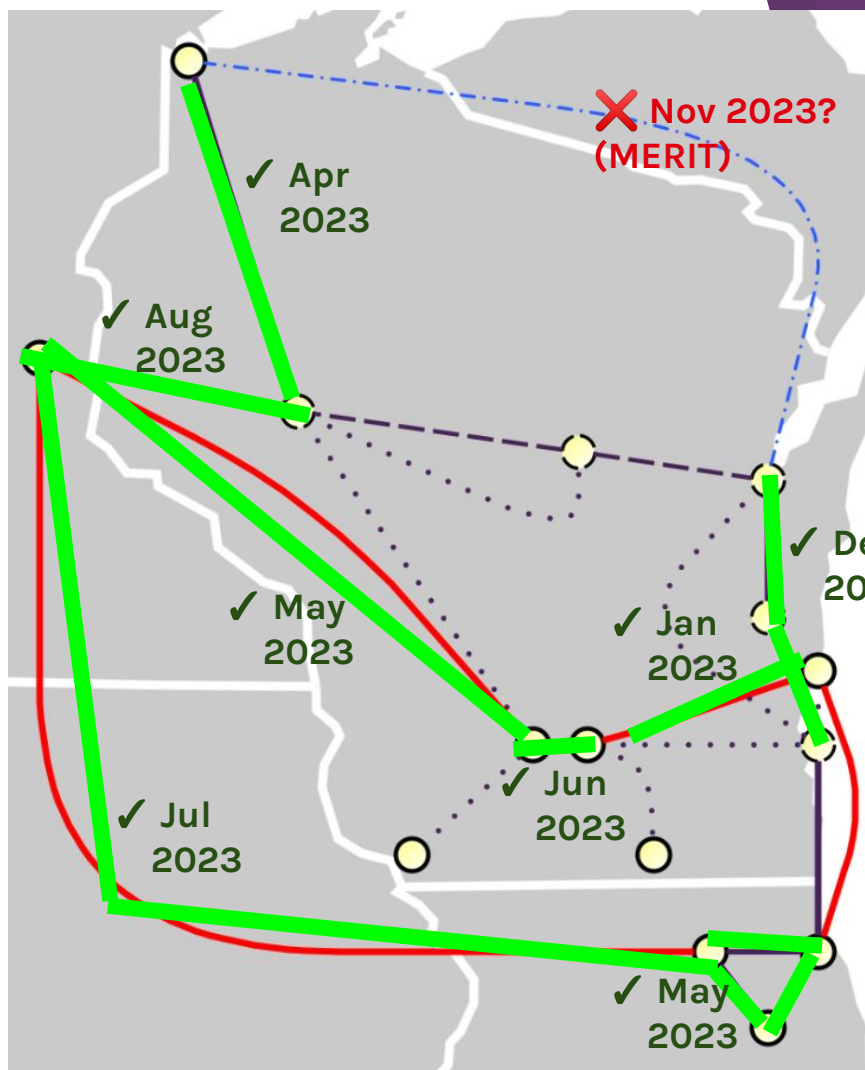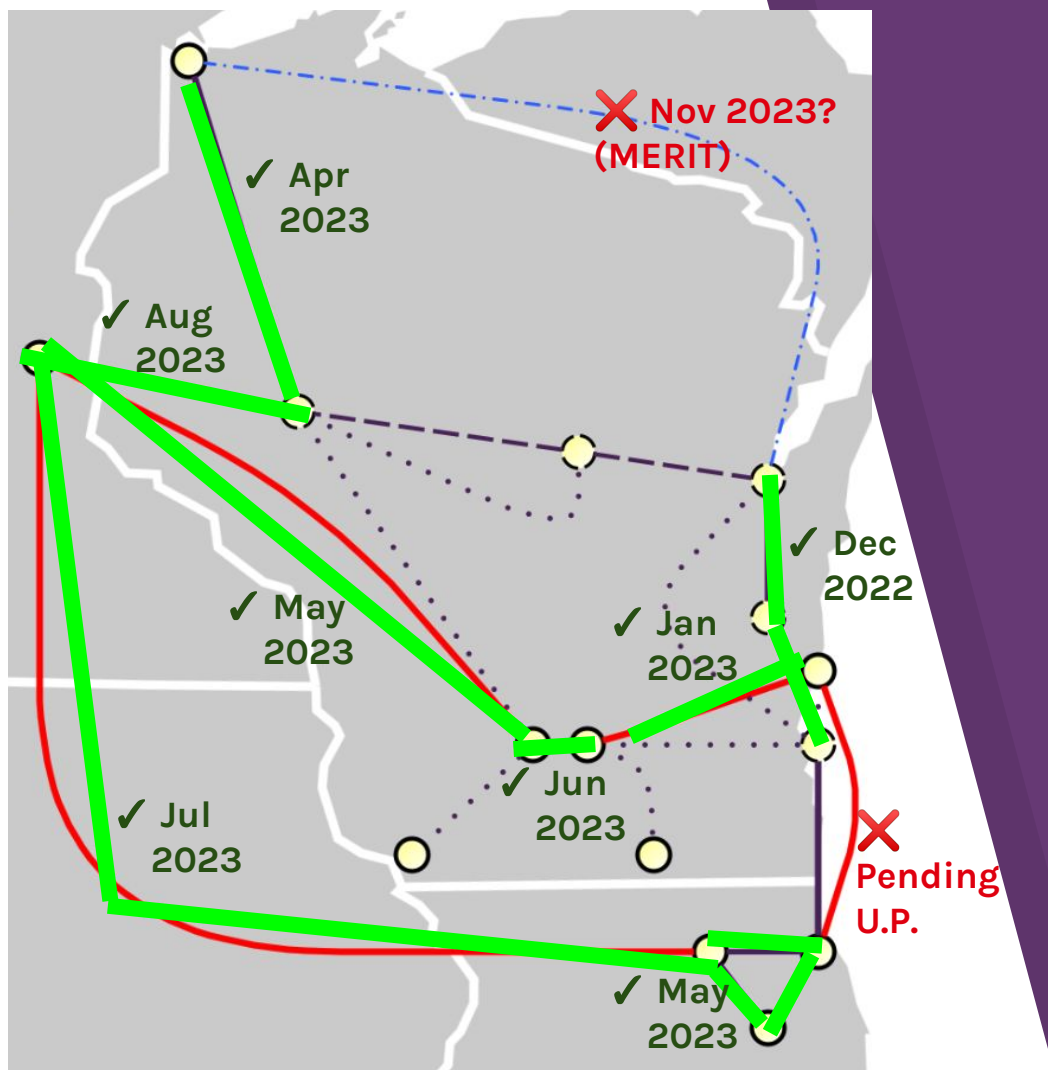|	
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Nov 2023	U.P. Path

Optical Transport

Progress

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Jul 2023   Chicago - Minneapolis
Aug 2023   Minneapolis - Eau Claire
Nov 2023   U.P. Path
EOY 2023   Milwaukee - Chicago
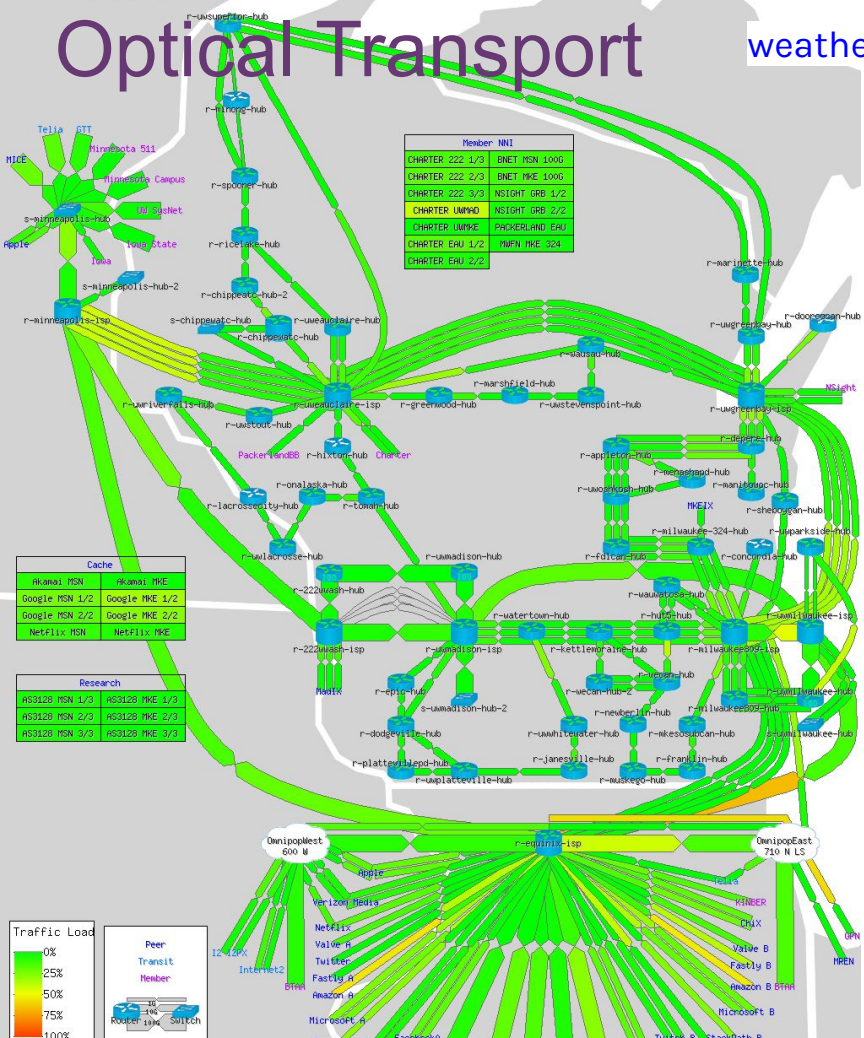
Optical Transport

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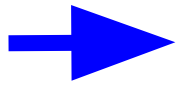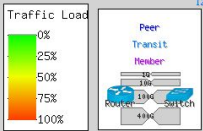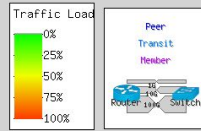EOY 2023   Milwaukee - Chicago
2024/25?   Phase 2
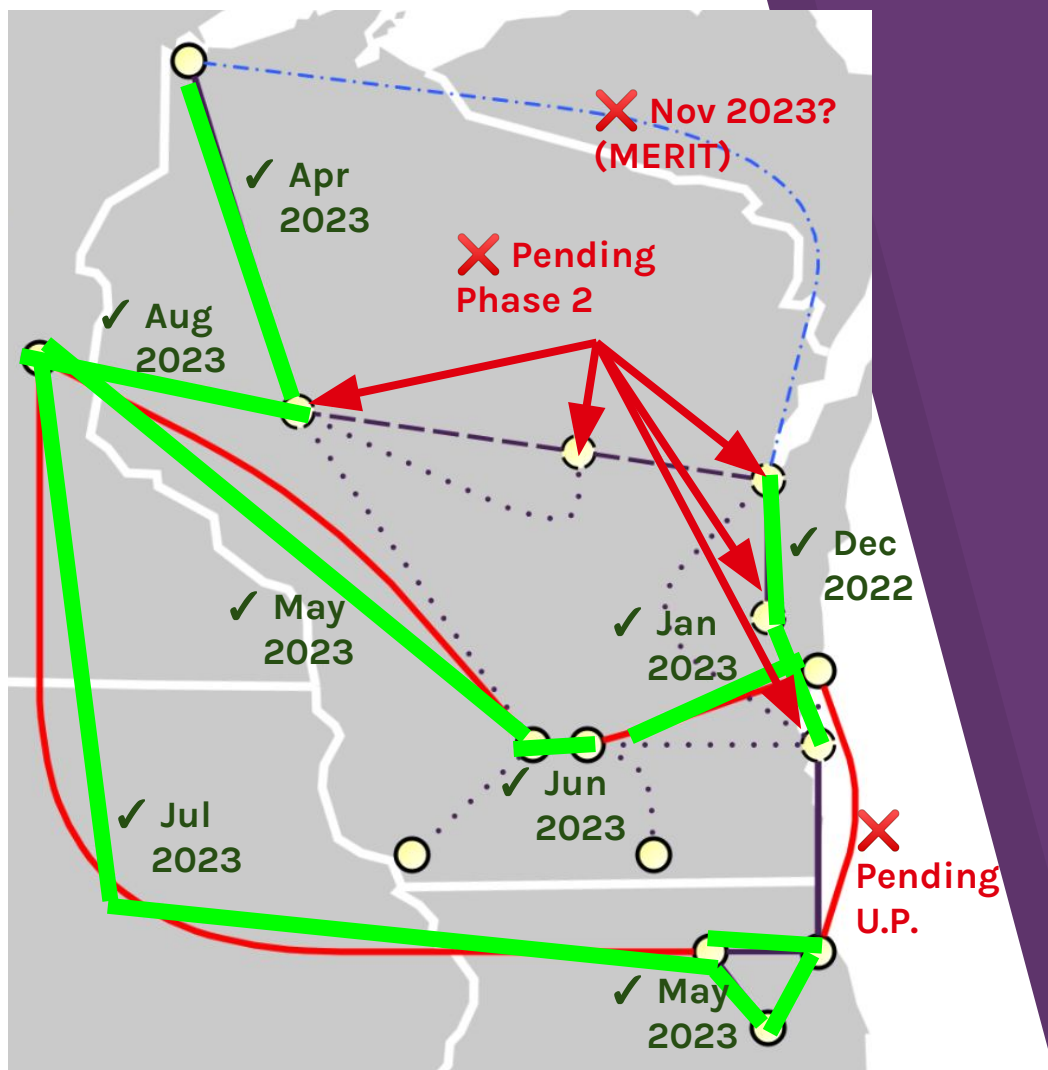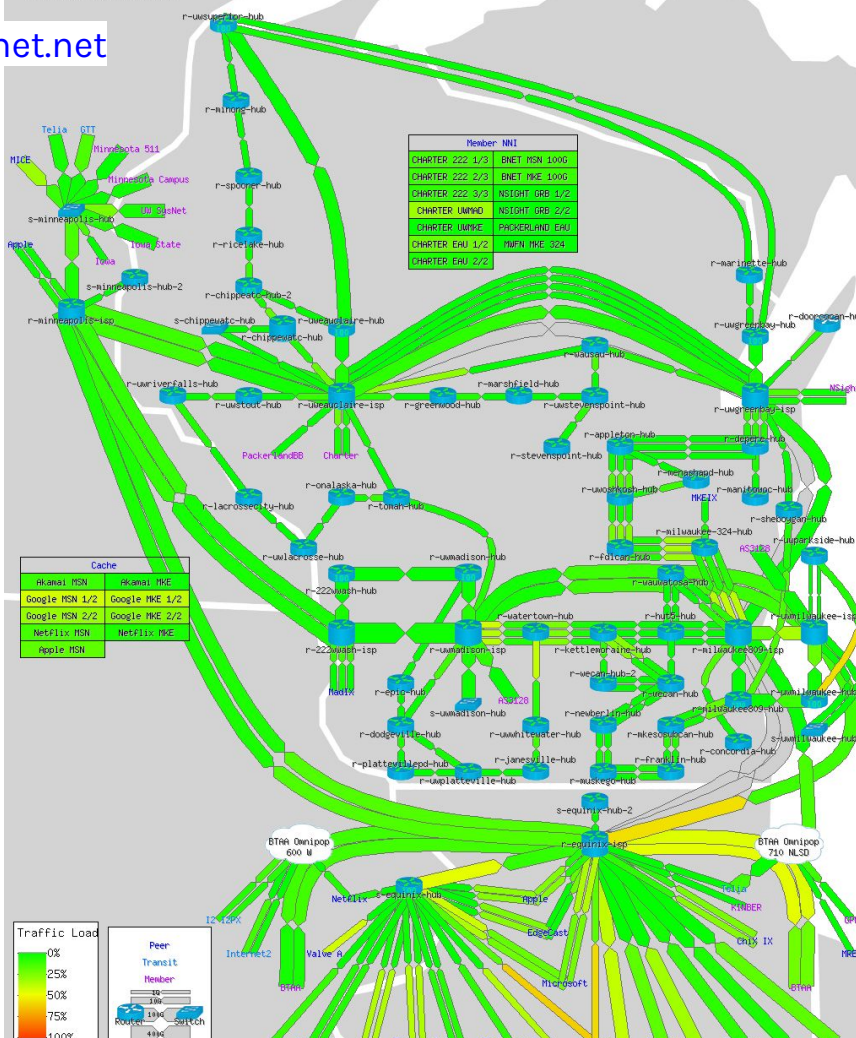
Optical Transport

weathermap.wiscnet.net

SysNet mtg '22

SysNet mtg '23

Optical Transport

weathermap.wiscnet.net
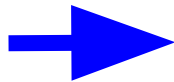
SysNet mtg '22

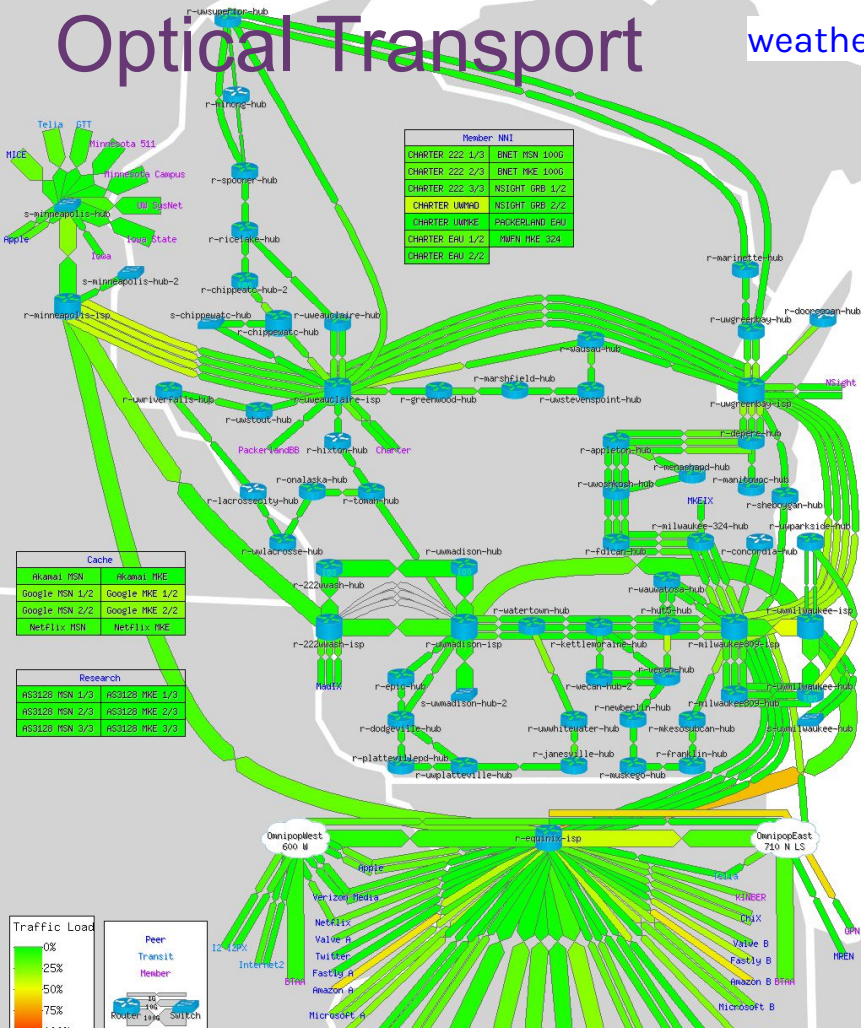SysNet mtg '23

WiscNet - The Universities of Wisconsin Network Update

November 2023

- Optical Transport
- **Routing and Peering**
- Server Infrastructure
- WiscNet Strategic Directions

Routing and Peering

New Hardware / Evaluation Hardware

- Arista 7020SR-32C2
  - BCM Jericho Qumran
  - 32x10g SFP+
  - 2x10g QSFP28
  - Layer2 only - to start
  - Chicago 10g peering

- Juniper PTX10001-36MR
  - Eval soon
  - Juniper Express 4 BT
  - 12 x 100g QSFP28
  - 24 x 400g QSFP56-DD
  - Layer2 agg - Minneapolis

Routing and Peering

Juniper MX304

- Tech
  - Modular / Compact - 2RU
  - Redundant Routing Engines
  - 100ge / 400ge client support
  - 3.2Tbps per chassis
    - 8x400g
    - 32x100g
    - or some combination
    - 10g / 1g with adapters / breakouts

- Cost
  - In Chicago, ~55% reduction in 5 year TCO over MX960
  - Should last 7+ years without any hardware upgrades

Routing and Peering

Juniper MX304

PO 1) Qty 3 in 2022
- Jun 2022 (FY 22/23)
- Lab, Chicago, Minneapolis
- Arrived June 2023 (year + a few days)
- Placed In production June (MSP), Jul (CHI)

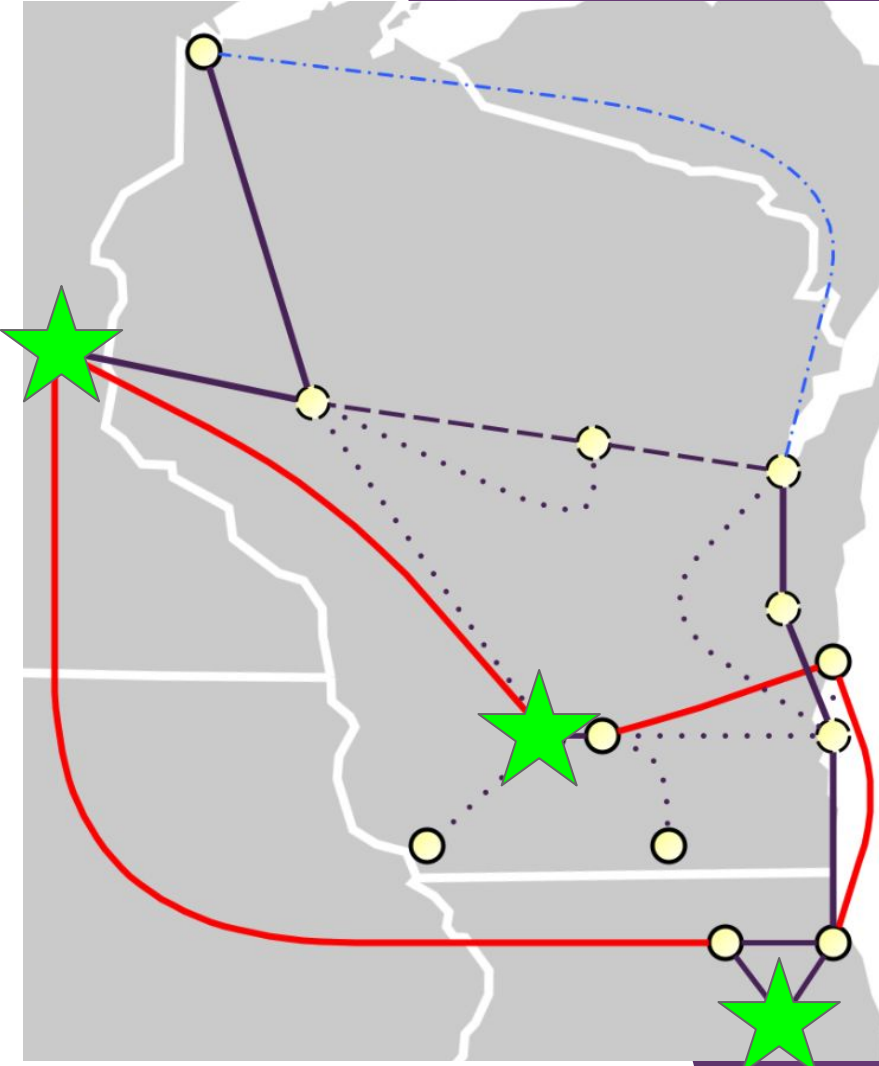# Routing and Peering

Juniper MX304

PO 1) Qty 3 in 2022
  - Jun 2022 (FY 22/23)
  - Lab, Chicago, Minneapolis
  - Arrived June 2023 (year + a few days)
  - Placed In production June (MSP), Jul (CHI)

PO 2) Qty 2
  - Jun 2023 (FY 23/24)
  - UW Eau Claire, UW Green Bay
  - Replaced BCCB funded Juniper MX480
        Circa 2013
  - Should arrive Winter 2023/2024
  - Possibly install over Winter Break
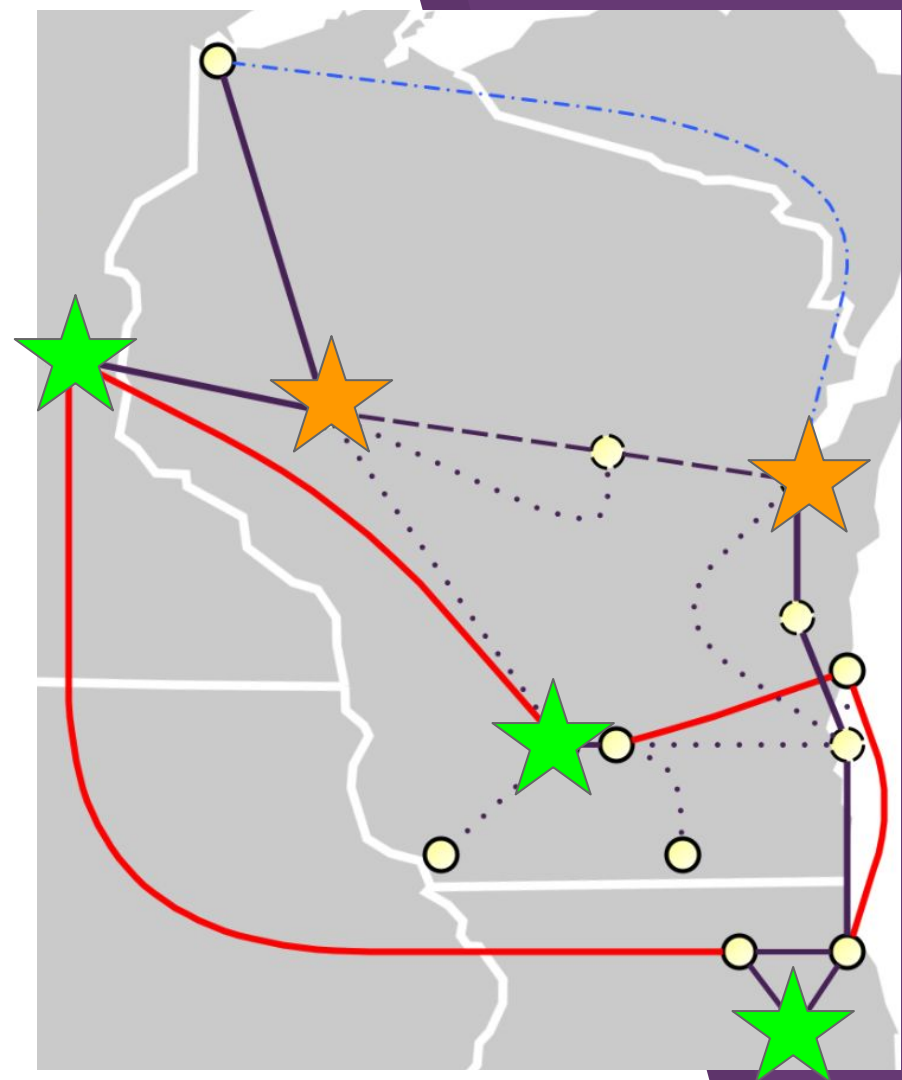
Routing and Peering

WRIPS peering service

- Removals
    - Twitter - CDN now - Pre-Musk

- Peer Upgrades
    - Microsoft 2x100g - Pending Microsoft
    - Google 2nd 100g - Recently completed
    - Amazon 2x100g - In Progress, not very responsive
    - Chix IX 1x100g - In Progress

- BTAA Upgrades
    - BTAA 2x100g to WN - Complete

- Diversity
    - Anything 2x 100g will land
      On WN router and BTAA router via
      Logical System
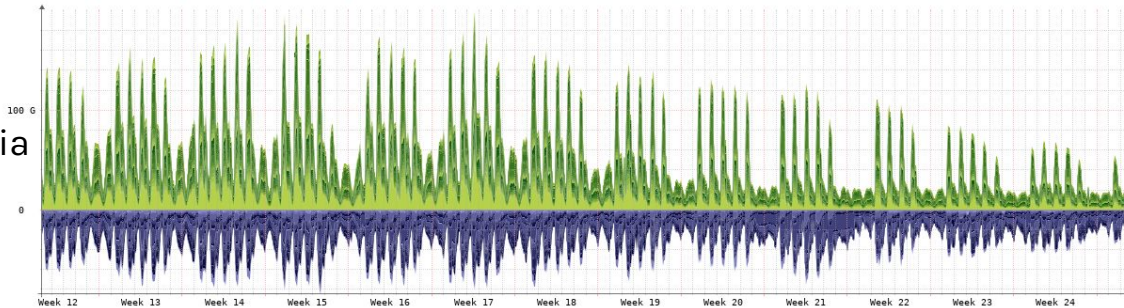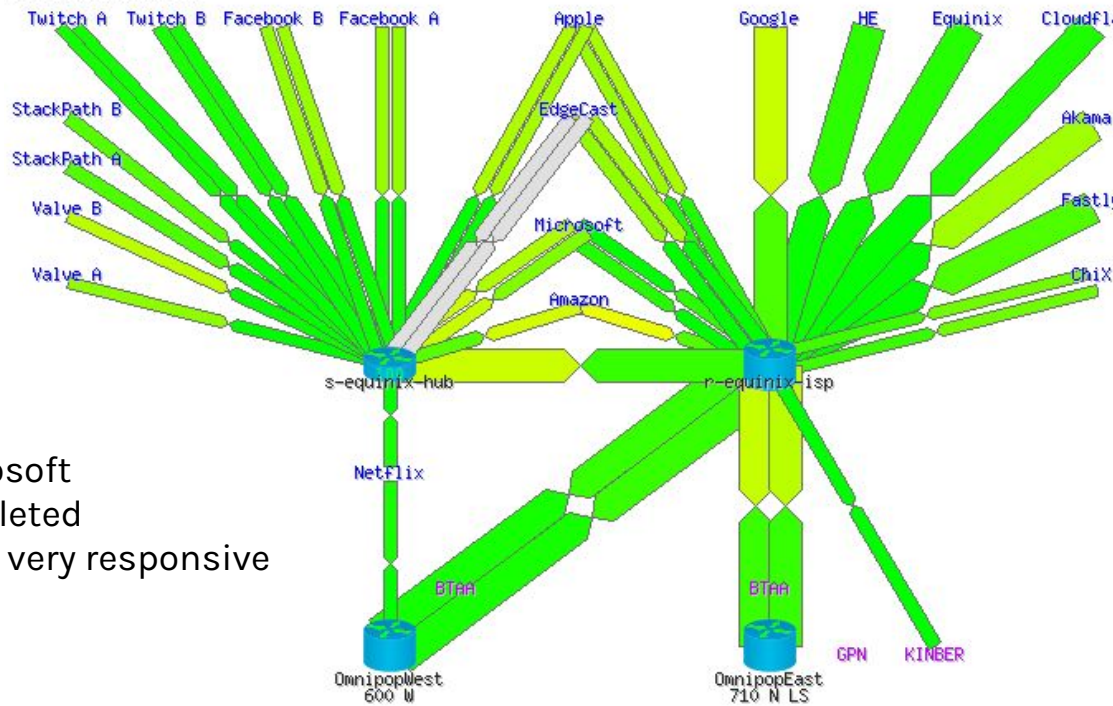
Routing and Peering

Member Connections

~**645** network access uplinks (aka /30 p2p circuits)

	2022	**2023**	**Change**
100G:	0	0	0
10G:	135	175	+40
1G:	420	385	-35
100M - 500M:	?	4	?
30M:	1	0	-1

Routing and Peering

ARIN LRSA v12.0 signed Aug 2022

Addendum to Registration Services Agreement

This is an addendum to the American Registry for Internet Numbers, Ltd.("ARIN") Registration Services Agreement, dated Aug 30, 2022 between ARIN and WiscNet, with Org-ID WISC (identified as "Holder"), (the "RSA"). The Parties agree that effective as of the later date executed below, the following Internet Number Resources (identified as "Legacy Number Resources" in the RSA) currently registered to Holder shall be as follows:

1) Holder specifically identifies the following Legacy Number Resources as subject to the RSA;
2) The Legacy Number Resources will be registered to the Org-ID WISC-Z which identifies that these Legacy Number Resources maintain their legacy status;
3) Upon full execution of this Addendum, the "Services" will be available for the Legacy Number Resources; and
4) All other terms of the RSA shall remain in full force and effect.

Holder identifies the following Legacy Number Resources as subject to the RSA as stated above:

IP or ASN	Reg. Date mm-dd-yyyy	IP or ASN	Reg. Date mm-dd-yyyy
AS2381	02-03-1993		
AS2382	02-03-1993		
140.189.0.0/16	05-23-1990		
198.150.0.0/16	04-29-1993		
205.213.0.0/16	04-25-1995		

Routing and Peering

Misc

- Edge ACL on peering and transit
    - Protect network infrastructure (cpe, backbone)
    - Permit Management, ICMP
    - deny rest ssh, http, other internet static
    - Add police UDP fragments at 100m per m7h yesterday?

- RPKI ROA
    - 140.189.0.0/16 - infrastructure - done Oct 2022
    - 2001:4e0::/32 - all ipv6 - done Jan 2023
    - 198.150.0.0/16 - members - soon
    - 205.213.0.0/16 - members - soon
    - 216.56.0.0/16 - members - soon

WiscNet - The Universities of Wisconsin Network Update

November 2023

- Optical Transport
- Routing and Peering
- **Server Infrastructure**
- WiscNet Strategic Directions

Server Infrastructure

Why

- Member Facing
  - Member graphs - https://graphs.wiscnet.net/
  - DNS Admin - https://dnsportal.wiscnet.net/
  - GNU Mailman - Mailing Lists https://lists.wiscnet.net/
  - SMTP / Email Relay
  - No "member services" such as web hosting or member's VMs

- Infrastructure
  - DNS - Authoritative (Primary)
  - DNS - Recursive (Lookup) - Anycast
  - Network Monitoring / Management / logging / graphing / alerting
  - Active Directory (WiscNet Staff)
  - NTP - Time Synchronization
  - RADIUS - Router authentication

- Automation
  - IPAM - Netbox
  - Config Pushing / syncing go devices (Python)

Server Infrastructure

What

- **Dell / Nimble / VMWare**
- 10 years old (2013/2014)
- 9RU cluster

- **Nutanix / Nutanix / Nutanix**
- 5 year support/licensing
- 3RU cluster

Server Infrastructure

How

Nutanix NX-1175S-G8

- **Nutanix**
- Servers / Virtualization / Storage all same vendor - "Hyperconverged"
- 5 year support/licensing up front
- Clusters at 2 diverse sites
- Spoke with many WiscNet members that seem happy
- Lower burden on operators - WiscNet does not have dedicated Sysadmins
- Live migrate VM's for maintenance of host or cluster

Server Infrastructure

Where

- Primary
  - Chippewa Valley Technical College

- Secondary
  - Madison

- Failover
  - Some VM's primary at one site, secondary at others
  - Migrate VM or entire cluster
  - May be manual intervention (intentionally)
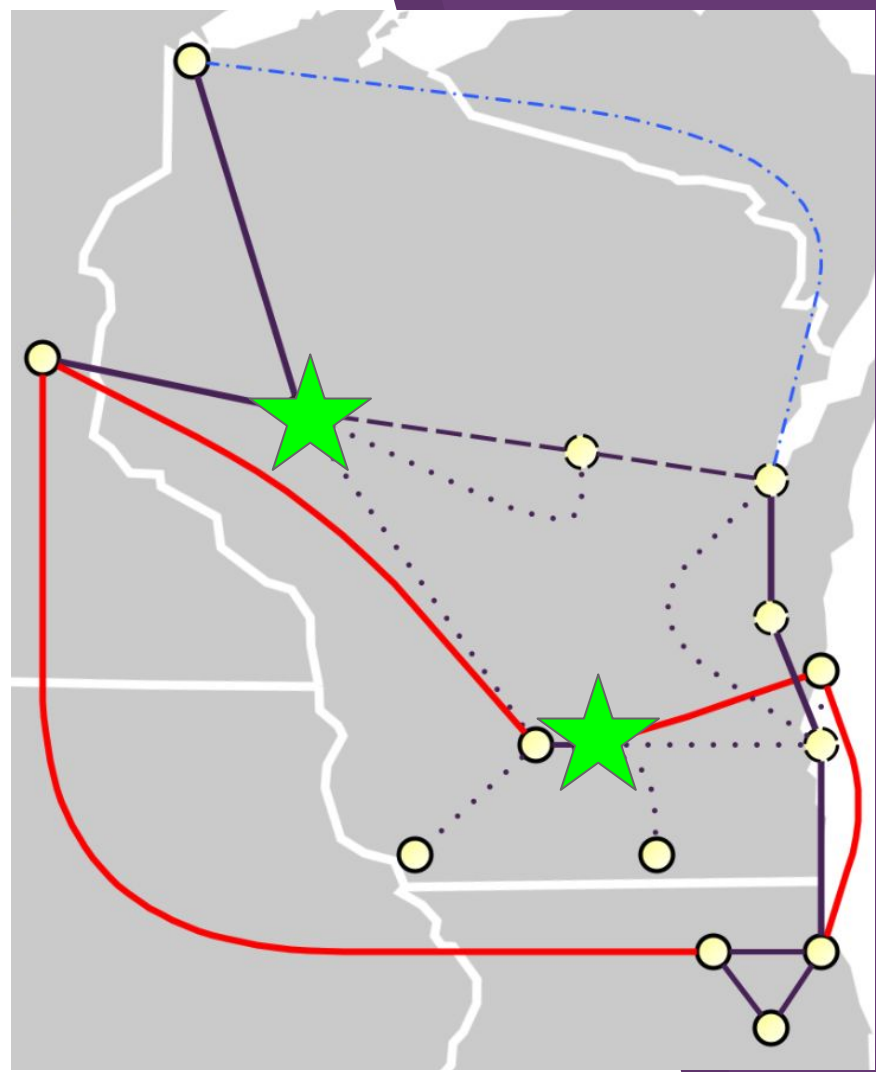
WiscNet - The Universities of Wisconsin Network Update

November 2023

- Optical Transport
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- Server Infrastructure
- **WiscNet Strategic Directions**

WiscNet Strategic Directions

- Keep doing what we do - Cooperative networking will be at our core forever
- Adding security to the mix, branded the *"Secure Platform"*
- Trying to figure out what that means now…
- Will most likely involve additional analysis of traffic carried over the network looking for security anomalies
  - Kentik?
  - LogicMonitor?
  - Splunk?
- Looking to collaborate with UW and others in these areas

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November 2023

- **Questions?**

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