

Network Manager Deep Dive

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Powering Business Worldwide

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Network Manager Basics

NM Login and Access

- NM 9.3 or before has the following way to log in:
 - Log into Yukon and select "Network Manager" in the lower right-hand part of the page
 - This will take you to a URL similar to this: <https://10.6.0.58:8443/nmclient/>
 - You will get a login box like this:
 - Yukon and NM credential are different

[Network Manager](#) [Site Map](#) [Support](#)

Yukon®
Network Manager

Username

Password

- Shortcut to NM Client

NM Single Sign On (SSO) Access

- Yukon 9.4 or after will have Direct Access Feature:
 - Network Manager direct access feature allows users to directly access the NM dashboard page from Yukon without having to enter the NM credentials.
 - To setup this feature:
 - Login to Yukon 9.4 or above
 - Navigate to Admin > Configuration > Network Manager
 - Click "Initiate Setup" button and follow the steps
 - In Yukon 9.5+ it is required to setup
 - Note: this step is revertible in 9.4 and beyond

NM Dashboard

Gateway
 Node
 Select one

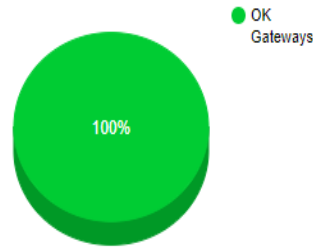
 GO

- Navigation Menu** ⏪
- Dashboard
 - Network Manager Info
 - Gateways [2]
 - Gateway Groups [0]
 - Nodes [19]
 - Node Groups [1]
 - Report Schedules [0]
 - Reports ▶

Dashboard

Data / Communications

Data Completeness: Gateways



click links below for dynamic charts

- Data
 - Gateways
- Communications
 - Gateways

Reports

< << April, 2023 >> >

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

select a date at left to view Reports below

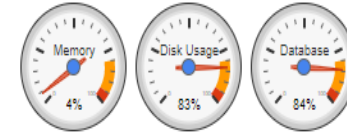
- Billing Read
- Data Completeness ▶
- Interval Data Summary
- Node Outage
- Node Status ▶
- System Health

Network Entities

- All Gateways
- All Nodes
- Gateway Groups
- Node Groups

System Info

System OK



Uptime: 4 days 18 hours 54 mins 35 secs 881 ms

[System Details](#)

Events / Alarms

NM Events

10604	9/18/2022 17:52:44	Network Manager security certificate about to ex
10603	9/18/2022 17:50:41	Network Manager security certificate about to ex
10602	9/18/2022 17:48:36	Network Manager security certificate about to ex
10601	9/18/2022 17:46:27	Network Manager security certificate about to ex
10600	9/18/2022 17:44:22	Network Manager security certificate about to ex
10599	9/18/2022 17:42:13	Network Manager security certificate about to ex
10598	9/18/2022 17:40:10	Network Manager security certificate about to ex
10597	9/18/2022 17:37:59	Network Manager security certificate about to ex
10596	9/18/2022 17:35:56	Network Manager security certificate about to ex
10595	9/18/2022 17:34:28	Network Manager security certificate about to ex
10594	9/18/2022 17:33:51	Network Manager security certificate about to ex
10593	9/18/2022 17:31:42	Network Manager security certificate about to ex
10592	9/18/2022 17:29:37	Network Manager security certificate about to ex
10591	9/18/2022 17:27:28	Network Manager security certificate about to ex

Network Manager Info

- Shows basic info on NM
- Version
- IP Address
- NM license expiration
- Number of Gateways
- Number of Nodes
- Memory usage
- Disk / Database Usage

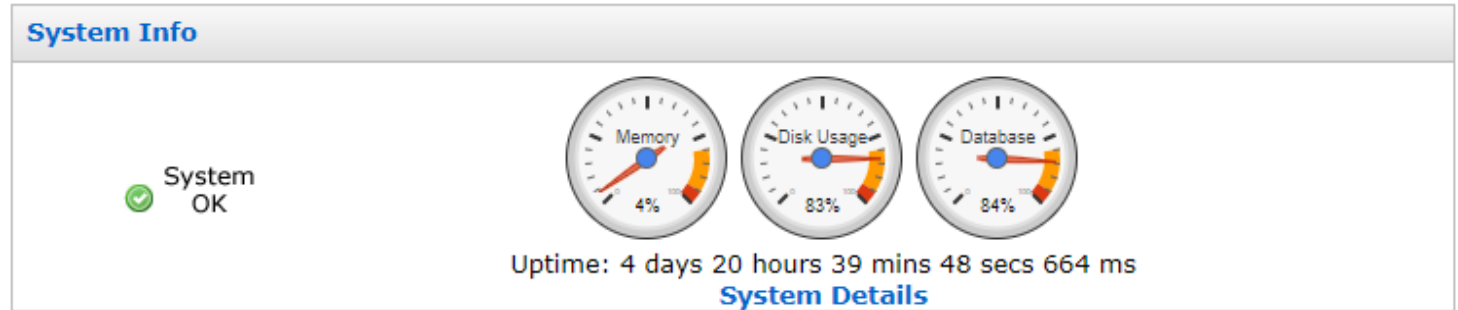
The screenshot displays the Network Manager interface. On the left is a 'Navigation Menu' with the following items: Dashboard, Network Manager Info (highlighted in yellow), Gateways [2], Gateway Groups [0], Nodes [19], Node Groups [1], Report Schedules [0], and Reports. On the right is the 'Network Manager Details' section, which includes the following information:

NETWORK MANAGER DETAILS	
Instance Name	: ekadb
Network Manager Host Name	: EASPL-TS058
Network Manager IP Address	: 10.6.0.58
Network Manager Port	: 32030
Instance Commissioned Date	: 12/2/2021 15:25:04
Instance Software Rev	: 9.1.0
Instance Database Rev	: 9.1.0
GIT Build Revision Number	: 4964-2a94b0e6d
Instance SN	: 2270000528
Network Manager License Key	: 372-948-372-628
Network Manager License Expiry Date	: 4/10/2026 09:04:32
Network Manager Product Number	: 1000227
Number of Gateways	: 2
Number of Nodes	: 19
Number of Users	: 2
Memory	: 4.58 %
Disk Usage	: 83.23 %
CPU	: Unknown
Database	: 84.33 %

Network Manager System info

- Memory
- Disk Usage
- Database

- Events/Alarms



Events / Alarms

NM Events		
11080	9/19/2022 15:46:54	Network Manager security certificate about to ex
11079	9/19/2022 15:44:51	Network Manager security certificate about to ex
11078	9/19/2022 15:42:41	Network Manager security certificate about to ex
11077	9/19/2022 15:40:37	Network Manager security certificate about to ex
11076	9/19/2022 15:38:29	Network Manager security certificate about to ex
11075	9/19/2022 15:36:25	Network Manager security certificate about to ex
11074	9/19/2022 15:34:28	Network Manager security certificate about to ex
11073	9/19/2022 15:34:23	Network Manager security certificate about to ex
11072	9/19/2022 15:32:09	Network Manager security certificate about to ex
11071	9/19/2022 15:30:07	Network Manager security certificate about to ex
11070	9/19/2022 15:27:56	Network Manager security certificate about to ex
11069	9/19/2022 15:25:53	Network Manager security certificate about to ex
11068	9/19/2022 15:23:42	Network Manager security certificate about to ex
11067	9/19/2022 15:21:39	Network Manager security certificate about to ex

Network Manager Search bar

- In the upper right-hand corner
- To find a Node, get the Node SN (Yukon Network Information)

Welcome Administrator | Log out

Gateway Node S/N

Network Information ? ^

Comm Status:	Ready
Comm Status Obtained At:	04/23/2023 00:42
Hop Count:	3
Neighbor Count:	15
Node Serial Number:	4110051853

Search for a: Gateway Node

Search by: S/N

Search Results: (1 result found)

S/N	Address	Software Version	Status	Primary Gateway	Sensor S/N
4110069866	00:14:08:0B:B0:A8	R11.3.3.S1bp	Ready	GW 2.0	4110069866

Network Manager: Gateways

- Gateway Name, S/N, IP Address, Hardware version
- Software version, Upper Stack Ver, Radio Version, Release Ver

Gateway Name	S/N	IP Address	Hardware Version	Software Version	Upper Stack Version	Radio Version	Release Version
GW 1.5	7500000049	10.106.41.107	1000750_01	R_9_3_3	R_9_3_3_0_1	R4.4.3L	9.3.3
GW 2.0	7800000375	10.106.41.106	GW2.0	R_9_3_3	R_9_3_3_0_1	R5.3.1qp	9.3.3

- Right clicking on gateway shows details>
- Communication Status>

Communications status

- Unknown Gateways
- Problem Gateways
- Warning Gateways
- OK Gateways

Connection status

- Connected
- Not Connected

Gateway Name S/N

GW 2.0

- Show Gateway Details
- Show Gateway Logs
- Show Gateway Routes
- Show Gateway Neighbors
- Show Gateway Visible Neighbors
- Delete Gateway
- Connect
- Disconnect
- Collect Gateway Data
- Set Data Collection Schedule
- Delete Data Collection Schedule
- Add to Group
- Configure Gateway

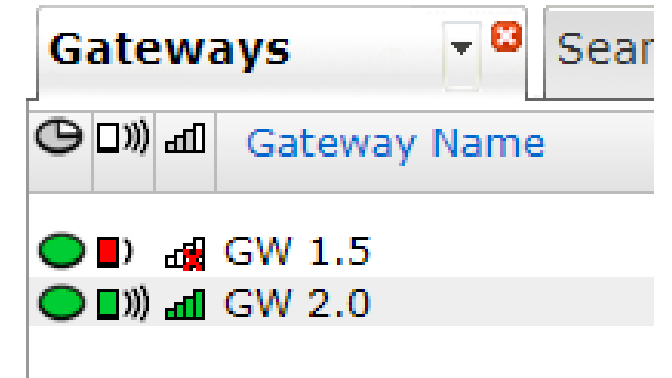
Network Manager: Gateway Version Details

Gateway Name	S/N	IP Address	Hardware Version	Software Version	Upper Stack Version	Radio Version	Release Version
GW 1.5	7500000049	10.106.41.107	1000750_01	R_9_3_3	R_9_3_3_0_1	R4.4.3L	9.3.3
GW 2.0	7800000375	10.106.41.106	GW2.0	R_9_3_3	R_9_3_3_0_1	R5.3.1qp	9.3.3

- Software Version: Version of the Gateway Application – Broadly determines what features are available
- Upper Stack Version: The RF network stack running under the GW application
- Radio Version: Firmware on the radio daughter board
- Release Version: Over-arching version of the RF firmware. Primarily indicates what RF node firmware the gateway is advertising to the RF network




Gateway Details (Continued)

- Data Completeness
 - OK – NM has collected 90% of the gateway's data
 - Warning – NM has collected at least 70% of the gateway's data
 - Problem – NM has collected less than 70% of the gateway's data
- Data completion less than 100% indicates a data gap between NM and the gateway.
- NM performs data collection hourly, if it is not 100% give it some time to catch up.



Legend

Data Completeness status

-  Problem Gateways
-  Warning Gateways
-  OK Gateways

Gateway Details

- Software/Firmware Ver
- IP Address



- Gateway Node Summary
 - Total Nodes
 - Total Ready Nodes
 - 5000 node cap

INFO

Name : GW 2.0
Gateway Type : Energy Management
Maximum No. of Nodes :
User Access ID :
Administrator Access ID : admin
Product Number : 2.0
Serial Number : 7800000375
Hardware Version : GW2.0
Software Version : R_9_3_3
Upper Stack Version : R_9_3_3_0_1
Radio Version : R5.3.1qp
Release Version : 9.3.3
Version Conflicts : None
Application Mode : Normal Mode
Groups :
Route Color : 21
GW IPv6 Prefix :

COMMUNICATIONS

Connection Type : TCP/IP
IP Addresses : 10.106.41.106 Port: 32030 EkaNet (TCP + SSL)

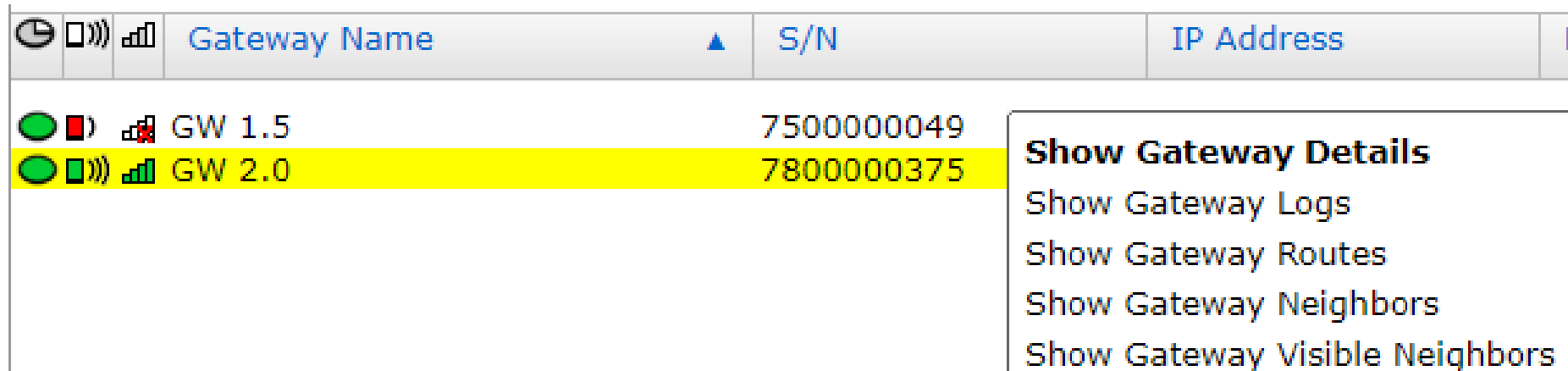
Connection Status :  (Connected)
Communication Status :  Last connected at: 4/19/2023 00:01:14
Radios : EkaNet 915 MHz MAC Address: 00:14:08:0B:0B:54 [12/2/2021 15:43:14]
Radio Stack Revision : V_13_49

GATEWAY NODE SUMMARY

Row	Data Type	Value
1	Total Nodes	26
2	Total Ready Nodes	15
3	Total Not Ready Nodes	11
4	Total Nodes With SN	18
5	Total Nodes With Info	20
6	Total Nodes Without Info	6

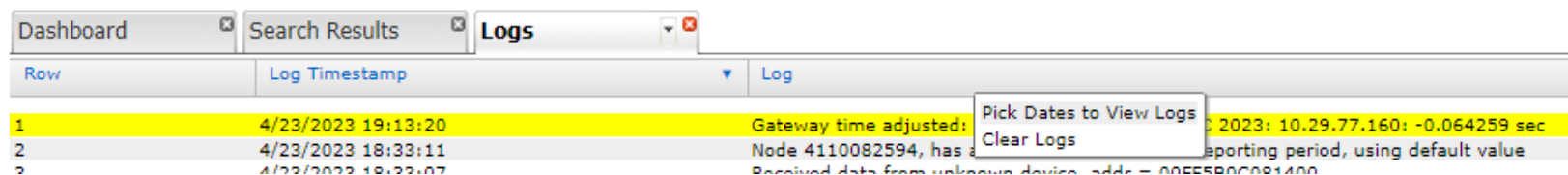
Gateway Logs: Introduction

- Accessing Log – Right click on gateway and select "Show Gateway Logs"



Gateway Name	S/N	IP Address
GW 1.5	7500000049	
GW 2.0	7800000375	

- To select a date range for logs, right click on a line and select "Pick Dates to View Logs" and select the From and To values



Row	Log Timestamp	Log
1	4/23/2023 19:13:20	Gateway time adjusted: 2023: 10.29.77.160: -0.064259 sec
2	4/23/2023 18:33:11	Node 4110082594, has reporting period, using default value
3	4/23/2023 18:33:07	Received data from unknown device, addr = 00EE5B0C091400

Gateway Logs: Examples

- Time syncs should happen every 6 hours. The gateway needs to have accurate time and gets its time from an NTP server that was setup at commissioning of the gateway

GW 2.0

1	4/23/2023 17:28:36	Gateway time adjusted: Sun Apr 23 21:46:33 UTC 2023: 10.6.0.58: 0.696754 sec
2	4/23/2023 11:28:39	Gateway time adjusted: Sun Apr 23 15:46:33 UTC 2023: 10.6.0.58: 0.622725 sec
3	4/23/2023 05:28:41	Gateway time adjusted: Sun Apr 23 09:46:33 UTC 2023: 10.6.0.58: 0.374933 sec
4	4/22/2023 23:28:23	Gateway time adjusted: Sun Apr 23 03:46:33 UTC 2023: 10.6.0.58: 0.857865 sec

- Missing or invalid reporting: GW is creating or recreating a node and is assuming the reporting period is 24 hours until it learns the true period from node itself. Not significant and for the most part can be ignored.

08726604

1	4/23/2023 19:13:20	Gateway time adjusted: Mon Apr 24 00:04:03 UTC 2023: 10.29.77.160: -0.064259 sec
2	4/23/2023 18:33:11	Node 4110082594, has a missing or invalid data reporting period, using default value
3	4/23/2023 18:33:07	Received data from unknown device, addr = 00FF5B0C081400

Gateway Logs: Other examples

- Gateway routes log: used as a routing table for the gateway

Row	Data Timestamp	Dest. Address	Next Hop Address	Hop Count	Cost	Flags
1162	4/23/2023 16:26:59	00:14:08:0C:5E:F9	00:14:08:0B:6D:C1	3	3	PR
1163	4/23/2023 16:26:59	00:14:08:0C:5E:12	00:14:08:0B:6D:C1	2	2	PR
1164	4/23/2023 16:26:59	00:14:08:0B:F5:E0	00:14:08:0B:6D:C1	2	2	PR
1165	4/23/2023 16:26:59	00:14:08:07:EB:17	00:14:08:0B:6D:C1	2	2	PR
1166	4/23/2023 16:26:59	00:14:08:0C:62:69	00:14:08:0B:6D:C1	2	2	PR

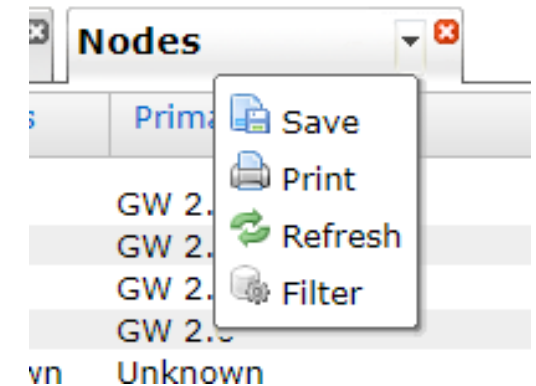
- Gateway Neighbors: used for calculation for routing algorithm

Row	Data Timestamp	Neighbor Address	Link Cost	ETX Band	Current Rate	Current Power	Samples	Flags
08726604								
1	4/23/2023 16:16:58	00:14:08:10:AE:05	1.9	2	1/2x	1 Watt	546	PR
2	4/23/2023 16:16:58	00:14:08:0B:D9:47	1.1	1	1/2x	1 Watt	509	F
3	4/23/2023 16:16:58	00:14:08:14:72:F7	1.0	1	1/2x	250 mWatt	152	PR

Network Manager: Nodes

S/N	Address	Software Version	Status	Primary Gateway	Sensor S/N	
4110069866	00:14:08:0B:B0:A8	R11.3.3.S1bp	Ready	GW 2.0	4110069866	✓ S/N
4110085277	00:14:08:0C:6D:14	R11.3.3.S1bp	Ready	GW 2.0	56741583	✓ Address
4110085279	00:14:08:0C:6D:16	R11.3.3.S1bp	Ready	GW 2.0	39631956	Hardware Version
4110085281	00:14:08:0C:6D:18	R11.3.3.S1bp	Ready	GW 2.0	56741577	✓ Software Version
4200069082	00:14:08:0A:7D:41	R8.0.2L	Unknown	Unknown	136254801	✓ Status
4210157976	00:14:08:0B:5D:AB	R9.1.0.S1Kp	Not Ready	GW 2.0	310830887	✓ Primary Gateway
4210157995	00:14:08:0B:5D:BE	R11.3.3.S1Kp	Ready	GW 2.0	310830888	✓ Sensor S/N
4210158014	00:14:08:0B:5D:D1	R9.0.0Kp	Not Ready	GW 2.0	310830889	Sensor Manufacturer
4310002352	00:14:08:0B:37:E6	R5.3.2.S1cp	Ready	GW 2.0	316528796	Sensor Model
4310002358	00:14:08:0B:37:EC	R5.3.2.S1cp	Ready	GW 2.0	316528797	Names
4310002364	00:14:08:0B:37:F2	R5.3.2.S1cp	Ready	GW 2.0	316528798	Groups
4500000330	00:14:08:08:1D:E2	Q4.1.0.4.S1dp	Not Ready	GW 2.0	4500000330	Node Type
4510145436	00:14:08:0B:AF:0E	R11.3.2.S1Qp	Ready	GW 2.0	720013596	MAC Address
4510145478	00:14:08:0B:AF:38	R11.3.2.S1Qp	Ready	GW 2.0	710002106	
4510145482	00:14:08:0B:AF:3C	R11.3.2.S1Qp	Ready	GW 2.0	720013595	
4510145485	00:14:08:0B:AF:40	R11.3.2.S1Qp	Ready	GW 2.0	710002105	

- Nodes can be ordered by category
- May take a while to load if there are 1000's
- Add/remove categories on the right
- Export option available on each tab -->



Node Logs:

- Node Columns: S/N, address, software version, status, primary Gateway Sensor S/N

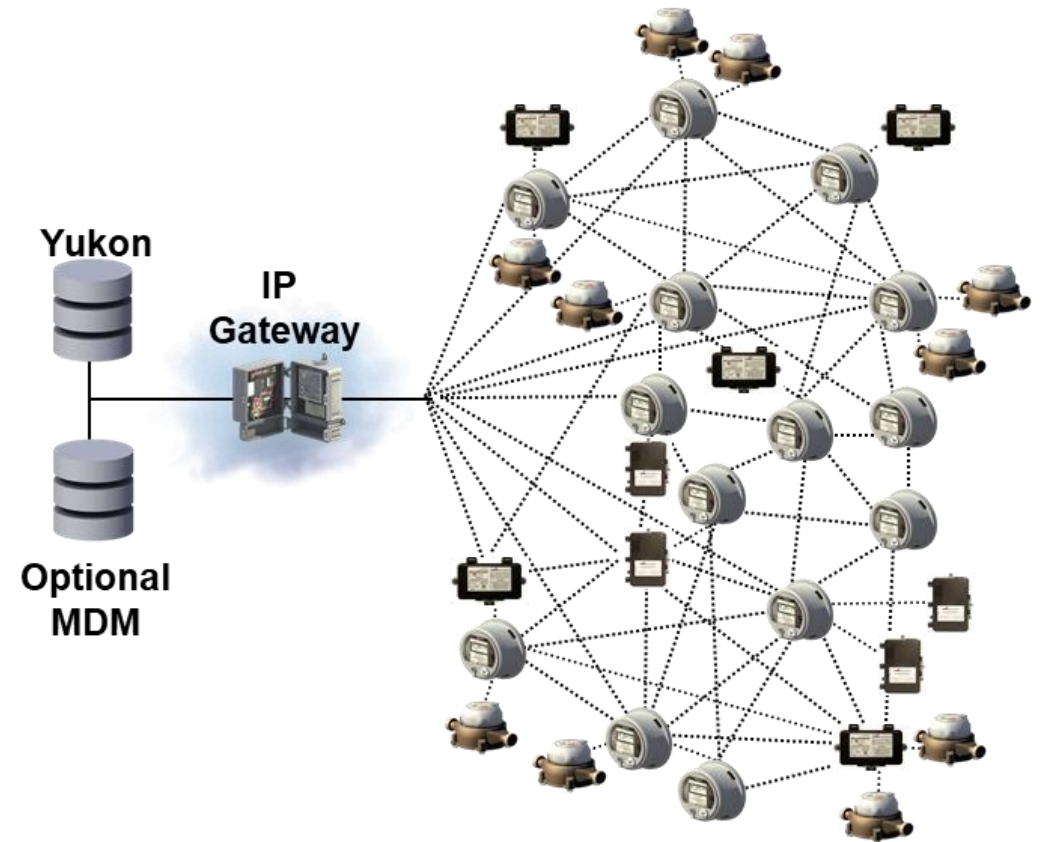
S/N	Address	Software Version	Status	Primary Gateway	Sensor S/N
4110069866	00:14:08:0B:B0:A8	R11.3.3.S1bp	Ready	GW 2.0	4110069866
4110085277	00:14:08:0C:6D:14	R11.3.3.S1bp	Ready	GW 2.0	56741583
4110085279	00:14:08:0C:6D:16	R11.3.3.S1bp	Ready	GW 2.0	39631956
4110085281	00:14:08:0C:6D:18	R11.3.3.S1bp	Ready	GW 2.0	56741577

- Primary Gateway: Gateway that the node has chosen to report its data to
 - For determining the Primary Gateway, NM takes into consideration the node's routing data, communication status, and accessibility of the gateway
- Questions?

Network Manager's Role in AMI System

Path of data: from meter to Yukon

- The Path of data is as follows:
 - Meter(s) – Could be several meters
 - Gateway
 - Network Manager
 - Yukon
- The Mesh firmware determines path for meters



Role of Network Manager

- Collect Data
 - Network Manager will collect data from the meters and other devices and store in its own DB
 - NM parses data from RF network devices into a format that Yukon can understand
- Yukon and Network manager usually reside on the same server but can be separate as well



Role of Network Manager (continued)

- Reduce duplicate data collection between gateways and nodes
 - Multiple gateways may be able to see the same node
 - Each gateway will want to gap-fill data from that node
 - Because NM has a broader view of the RF network, NM can see when this is happening and coordinate, so that only one gateway is gap-filling data from that node

Role of Network Manager (continued)





- Determine which gateway to use to reach a node
 - Multiple gateways may be able to see the same node.
 - NM looks at routing data and node communication status data from each gateway to determine which gateway is the best gateway to use in order to send a message to the node. This is referred to in Yukon as it's "Reverse Lookup".

Relationship between Yukon and NM

- Yukon interfaces with the network through Network Manager
 - The communication path between Yukon and NM may be the issue if you are seeing every meter fail an on demand read, etc.
 - Sometimes the NM service may need to be restarted or a Yukon service restarted
- NM decides the "Reverse Lookup" gateway for a node.
- NM controls the flow / throttling of the data to the nodes and gateways

Network Manager and Gateway Connectivity

- Gateway connectivity status can be found in Yukon by going to **Assets** then **Gateways** on the Yukon toolbar

Gateway Information						
Name ^	Serial Number	IP Address	Firmware Version	Last Communication	Data Collection	
 GW 1.5	7500000049	10.106.41.107	9.3.3	Failed	 100%	
 GW 2.0	7800000375	10.106.41.106	9.3.3	Successful	 100%	

- How is the connection status determined by Yukon/NM?
 - NM established a secure TLS connection over TCP with the gateway.
 - NM logs into the gateway
 - If the login is successful, NM reports to Yukon that the connection to that gateway is “Connected”, if not a “Failed” status will be sent

Node Detail Page

Node Details

INFO

Node Serial Number : 4210
Node Type : Electric node
Sensor Info : 3211 (ITRN , C2SX-SD) [3/22/2023 10:50:48]
Product Number : RFN420CL
Hardware Version : RFN420CL
Software Version : R11.3.4.S1Kp
Node Names :
Groups :
Commissioned ? : Yes
Commissioned Time :
In Network ? : Yes
In Network Time : 11/1/2019 17:12:53
Latitude : 41.586149
Longitude : -84.595198
GPS Source : RF Node

NODE VERSIONS

Backup Eka Software Version : R10.2.1.S1Kp

COMMUNICATIONS

Node Address : 00:14:08:
Primary Gateway : Gateway
Communication Status : Ready
Communication Status obtained at : 4/13/2023 18:17:52
Number of Hops to Gateway : 1
Current Number of Neighbors : 19
Current Primary Neighbor : 00:14:08:
Link Cost to Primary Neighbor : 1.0 (ETX band: 1)
Current Link Rate to Primary Neighbor : 2x
Current Link Power to Primary Neighbor : 0.5 Watt
Current Neighbor Data Timestamp : 4/13/2023 17:51:07
Number of Associations : 1

Menu Options

Refresh Node Details

Show Node Logs
Show Node Routes
Show Node Neighbors
Show Node Visible Neighbors
Show Node Data Points
Show Node Status Points
Show Node Events
Show Node Alarms
Set Channel Configuration
Get Channel Configuration
Get Current Meter Reading
Get Node Information
Get Communication Status
Add to Group
Generate Report

Show Node.. Logs, Routes, Neighbors, etc.

- What are these?
 - Logged data pertaining to RF node's interactions and radio communication (RFN Meter, RFN Relay, etc.)
- When to review?
 - Deeper dive if warranted after utilizing Yukon resources, mapping features
- Why use?
 - **Comprehensive review** of a node's connectivity behavior from multiple angles
 - **Identify patterns** from behavior over time

Node Logs

- **About Node Logs**
 - Each RF Gateway logs certain interactions with subscribed RF Nodes
 - When user accesses Node Logs, Network Manager filters RF Gateways for applicable logs over specified time period
 - If multiple Gateways log interaction with an RF node, Node Logs will include the logs from each
- **Why Review?**
 - Helps build understanding of node circumstances

Node Logs – Normal Output

Row	Log Timestamp	Log	Log Level	Gateway Name
4210460469				
1	4/14/2023 15:47:30	Updated formatID 1281 index for node 4210460469: StartSeq 8734, EndSeq 8744	Information Log	VCGW228
2	4/14/2023 15:47:30	Received formatID 1281 report from node 4210460469: StartSeq 8734, EndSeq 8744	Information Log	VCGW228
3	4/14/2023 10:25:44	Received routing table from 4210460469	Information Log	VCGW228
4	4/14/2023 10:25:43	Requested routing table for 4210460469	Information Log	VCGW228
5	4/14/2023 10:09:44	Received visibility table from 4210460469	Information Log	VCGW228
6	4/14/2023 10:09:44	Received neighbor table from 4210460469	Information Log	VCGW228
7	4/14/2023 10:09:43	Requested visibility table for 4210460469	Information Log	VCGW228
8	4/14/2023 10:09:43	Requested neighbor table for 4210460469	Information Log	VCGW228
9	4/13/2023 23:50:42	Received routing table from 4210460469	Information Log	GW218
10	4/13/2023 23:50:41	Requested routing table for 4210460469	Information Log	GW218

Node Logs - Sign of Distress

3/22/2023 22:34:23	Node lost: NodeID = 4210000055, NodeAddr = 00FF5253081400	Information Log	GW221
3/21/2023 03:20:12	Node 4210000055 not routable	Information Log	GW221
3/21/2023 02:34:37	Requested visibility table for 4210000055	Information Log	GW221
3/21/2023 02:34:37	Requested neighbor table for 4210000055	Information Log	GW221
3/21/2023 01:34:36	Requested visibility table for 4210000055	Information Log	GW221
3/21/2023 01:34:36	Requested neighbor table for 4210000055	Information Log	GW221
3/21/2023 01:22:36	Requesting all new data from node 4210000055	Information Log	GW221
3/21/2023 01:22:36	Requesting sensor data gaps from node 4210000055	Information Log	GW221
3/21/2023 00:34:36	Requested visibility table for 4210000055	Information Log	GW221
3/21/2023 00:34:36	Requested neighbor table for 4210000055	Information Log	GW221
3/20/2023 23:34:35	Requested visibility table for 4210000055	Information Log	GW221
3/20/2023 23:34:35	Requested neighbor table for 4210000055	Information Log	GW221
3/20/2023 22:34:35	Requested visibility table for 4210000055	Information Log	GW221
3/20/2023 22:34:35	Requested neighbor table for 4210000055	Information Log	GW221
3/20/2023 21:34:34	Requested visibility table for 4210000055	Information Log	GW221
3/20/2023 21:34:34	Requested neighbor table for 4210000055	Information Log	GW221
3/20/2023 20:34:34	Requested visibility table for 4210000055	Information Log	GW221
3/20/2023 20:34:34	Requested neighbor table for 4210000055	Information Log	GW221
3/20/2023 19:34:32	Requested visibility table for 4210000055	Information Log	GW221
3/20/2023 19:34:32	Requested neighbor table for 4210000055	Information Log	GW221
3/20/2023 18:34:32	Requested visibility table for 4210000055	Information Log	GW221
3/20/2023 18:34:32	Requested neighbor table for 4210000055	Information Log	GW221
3/20/2023 17:34:30	Requested visibility table for 4210000055	Information Log	GW221
3/20/2023 17:34:30	Requested neighbor table for 4210000055	Information Log	GW221
3/20/2023 17:22:39	Updated formatID 1281 index for node 4210000055: StartSeq 18736, EndSeq 18741	Information Log	GW221
3/20/2023 17:22:39	Received formatID 1281 report from node 4210000055: StartSeq 18736, EndSeq 18741	Information Log	GW221
3/20/2023 17:22:31	Requesting all new data from node 4210000055	Information Log	GW221
3/20/2023 17:22:31	Requesting sensor data gaps from node 4210000055	Information Log	GW221

Node Logs - Sign of Distress

1/25/2023 07:17:57	Node lost: NodeID = 42108 , NodeAddr = 00EB4C
1/22/2023 17:19:38	Node 42108 not routable
1/22/2023 15:24:14	Updated formatID 1281 index for node 42108 : StartSeq
1/22/2023 15:24:14	Received formatID 1281 report from node 42108 : StartS
1/22/2023 15:19:11	Requesting all new data from node 42108
1/22/2023 15:19:11	Requesting sensor data gaps from node 42108
1/22/2023 12:05:12	Received routing table from 42108
1/22/2023 12:04:39	Requested routing table for 42108
1/22/2023 07:17:56	Updated formatID 1281 index for node 42108 : StartSeq
1/22/2023 07:17:56	Received formatID 1281 report from node 42108 : StartS
1/22/2023 07:17:38	Requesting all new data from node 42108
1/22/2023 07:17:38	Requesting sensor data gaps from node 42108
1/21/2023 23:16:46	Updated formatID 1281 index for node 42108 : StartSeq
1/21/2023 23:16:46	Received formatID 1281 report from node 42108 : StartS
1/21/2023 23:16:33	Requesting all new data from node 4210863157
1/21/2023 23:16:33	Requesting sensor data gaps from node 42108
1/21/2023 15:15:37	Updated formatID 1281 index for node 42108 : StartSeq
1/21/2023 15:15:37	Received formatID 1281 report from node 42108 : StartS
1/21/2023 15:10:28	Requesting all new data from node 42108
1/21/2023 15:10:28	Requesting sensor data gaps from node 42108
1/21/2023 12:04:09	Received visibility table from 42108
1/21/2023 12:04:09	Received routing table from 42108
1/21/2023 12:04:07	Info received for node 42108
1/21/2023 12:03:42	Requested visibility table for 42108
1/21/2023 12:03:42	Requested routing table for 42108
1/21/2023 01:24:49	Info received for node 42108
1/21/2023 01:24:47	Node discovered: NodeID = , NodeAddr = 00EB4C
1/20/2023 13:00:46	Node routable
12/14/2022 23:53:17	Node 42108 routable
12/13/2022 18:59:38	Node 42108 not routable
12/11/2022 19:56:27	Node 42108 routable
12/5/2022 10:46:50	Node 42108 not routable
12/3/2022 04:29:20	Node 42108 routable
11/29/2022 05:16:50	Node 42108 not routable
11/26/2022 21:12:36	Node 42108 routable

Node Logs - Sign of Distress - GW Requesting same Sequences Repeatedly

Row	Log Timestamp	Log	Log Level	Gateway Name
5010000074				
1	4/21/2023 16:54:25	Received visibility table from 5010000074	Information Log	GW221
2	4/21/2023 16:54:24	Received neighbor table from 5010000074	Information Log	GW221
3	4/21/2023 16:54:14	Requested visibility table for 5010000074	Information Log	GW221
4	4/21/2023 16:54:14	Requested neighbor table for 5010000074	Information Log	GW221
105	4/21/2023 09:58:06	Requesting 41006 to 41009 from node 5010000074	Verbose Log	GW221
106	4/21/2023 09:58:06	Requesting 40958 to 40960 from node 5010000074	Verbose Log	GW221
107	4/21/2023 09:58:06	Requesting 36673 to 40955 from node 5010000074	Verbose Log	GW221
108	4/21/2023 09:54:20	Received visibility table from 5010000074	Information Log	GW221
109	4/21/2023 09:54:19	Received neighbor table from 5010000074	Information Log	GW221
325	4/20/2023 17:57:56	Requesting 41006 to 41009 from node 5010000074	Verbose Log	GW221
326	4/20/2023 17:57:56	Requesting 40958 to 40960 from node 5010000074	Verbose Log	GW221
327	4/20/2023 17:57:56	Requesting 36673 to 40955 from node 5010000074	Verbose Log	GW221
328	4/20/2023 17:54:12	Received visibility table from 5010000074	Information Log	GW221
329	4/20/2023 17:54:11	Received neighbor table from 5010000074	Information Log	GW221
655	4/19/2023 17:56:42	Requesting 41006 to 41009 from node 5010000074	Verbose Log	GW221
656	4/19/2023 17:56:42	Requesting 40958 to 40960 from node 5010000074	Verbose Log	GW221
657	4/19/2023 17:56:42	Requesting 36673 to 40955 from node 5010000074	Verbose Log	GW221
658	4/19/2023 17:54:10	Received visibility table from 5010000074	Information Log	GW221
659	4/19/2023 17:54:08	Received neighbor table from 5010000074	Information Log	GW221
985	4/18/2023 17:56:27	Requesting 41006 to 41009 from node 5010000074	Verbose Log	GW221
986	4/18/2023 17:56:27	Requesting 40958 to 40960 from node 5010000074	Verbose Log	GW221
987	4/18/2023 17:56:27	Requesting 36673 to 40955 from node 5010000074	Verbose Log	GW221
988	4/18/2023 17:53:45	Received visibility table from 5010000074	Information Log	GW221
989	4/18/2023 17:53:45	Received neighbor table from 5010000074	Information Log	GW221

Node Route Table

- **About Node Route Table**
 - Nodes typically report route data to RF Gateway **daily**
 - One row per day
 - Illustrates connection quality of node's reliant route for reaching RF Gateway
- **Why Review?**
 - Helps build understanding of node route connections, over time
- **What to look for**
 - Hop count, route cost and **'Count to Cost' ratio**
 - 1:1 is GOOD,
 - 1:2 can be problematic
 - Gaps in data entry

Node Routes – Reliable Routes

Row	Data Timestamp	Dest. Address	Next Hop Address	Hop Count	Cost
4110032890					
1	4/21/2023 03:39:14	00:14:08:03:E2:AB	00:14:08:03:E2:AB	1	0
2	4/20/2023 03:38:48	00:14:08:03:E2:AB	00:14:08:03:E2:AB	1	0
3	4/19/2023 03:52:00	00:14:08:03:E2:AB	00:14:08:03:E2:AB	1	0
4	4/18/2023 03:37:58	00:14:08:03:E2:AB	00:14:08:03:E2:AB	1	0
5	4/17/2023 03:37:33	00:14:08:03:E2:AB	00:14:08:03:E2:AB	1	0
6	4/16/2023 03:37:11	00:14:08:03:E2:AB	00:14:08:03:E2:AB	1	0
7	4/15/2023 03:36:46	00:14:08:03:E2:AB	00:14:08:03:E2:AB	1	0
8	4/14/2023 03:36:22	00:14:08:03:E2:AB	00:14:08:03:E2:AB	1	0
9	4/13/2023 03:35:55	00:14:08:03:E2:AB	00:14:08:03:E2:AB	1	0
10	4/12/2023 03:35:30	00:14:08:03:E2:AB	00:14:08:03:E2:AB	1	0

Row	Data Timestamp	Dest. Address	Next Hop Address	Hop Count	Cost
4110173772					
1	4/21/2023 05:14:12	00:14:08:04:B5:4B	00:14:08:04:B5:4B	1	1
2	4/20/2023 05:13:57	00:14:08:04:B5:4B	00:14:08:04:B5:4B	1	1
3	4/19/2023 05:13:42	00:14:08:04:B5:4B	00:14:08:04:B5:4B	1	1
4	4/18/2023 05:13:22	00:14:08:04:B5:4B	00:14:08:04:B5:4B	1	1
5	4/17/2023 05:13:11	00:14:08:04:B5:4B	00:14:08:04:B5:4B	1	1
6	4/16/2023 05:12:56	00:14:08:04:B5:4B	00:14:08:04:B5:4B	1	1
7	4/15/2023 05:12:42	00:14:08:04:B5:4B	00:14:08:04:B5:4B	1	1

Node Routes – Reliable Route

Row	Data Timestamp	Dest. Address	Next Hop Address	Hop Count	Cost
4210301228					
1	4/21/2023 03:12:18	00:14:08:00:00:01	00:14:08:16:F9:97	3	2
2	4/20/2023 03:12:01	00:14:08:00:00:01	00:14:08:16:F9:97	3	2
3	4/19/2023 03:11:51	00:14:08:00:00:01	00:14:08:16:F9:97	3	2
4	4/18/2023 03:12:09	00:14:08:00:00:01	00:14:08:16:F9:97	3	2
5	4/17/2023 03:10:49	00:14:08:00:00:01	00:14:08:16:F9:97	3	2
6	4/16/2023 03:10:27	00:14:08:00:00:01	00:14:08:16:F9:97	3	2
7	4/15/2023 03:10:07	00:14:08:00:00:01	00:14:08:16:F9:97	3	2

Low Hop Count *may* overcome ratio

Row	Data Timestamp	Dest. Address	Next Hop Address	Hop Count	Cost
MAC001408000025					
1	4/21/2023 04:51:19	00:14:08:03:44:62	00:14:08:03:E2:97	2	5
2	4/20/2023 04:50:24	00:14:08:03:44:62	00:14:08:01:D8:7E	2	5
3	4/19/2023 04:49:25	00:14:08:03:44:62	00:14:08:01:D8:7E	2	5
4	4/18/2023 04:48:28	00:14:08:03:44:62	00:14:08:01:D8:7E	2	5
5	4/17/2023 04:47:38	00:14:08:03:44:62	00:14:08:01:D8:7E	2	5
6	4/16/2023 04:46:45	00:14:08:03:44:62	00:14:08:01:D8:7E	2	5
7	4/15/2023 04:45:50	00:14:08:03:44:62	00:14:08:03:E2:97	2	5
8	4/14/2023 04:44:54	00:14:08:03:44:62	00:14:08:03:E2:97	2	3
9	4/13/2023 04:44:03	00:14:08:03:44:62	00:14:08:0A:72:50	2	5
10	4/12/2023 04:32:00	00:14:08:03:44:62	00:14:08:01:D8:7E	2	5
11	4/11/2023 04:32:16	00:14:08:03:44:62	00:14:08:01:D8:7E	2	5

Node Routes - Sign of Distress

Data Timestamp	▼	Dest. Address	Next Hop Address	Hop Count	Cost
3/1/2023 05:45:34		00:14:08	00:14:08	5	10
2/28/2023 05:45:15		00:14:08	00:14:08	5	10
2/28/2023 02:40:04		00:14:08	00:14:08	5	10
2/27/2023 22:43:47		00:14:08	00:14:08	4	9
2/27/2023 13:00:10		00:14:08	00:14:08	5	10
2/27/2023 11:26:22		00:14:08	00:14:08	4	7
2/27/2023 05:45:14		00:14:08	00:14:08	5	10
2/27/2023 04:57:15		00:14:08	00:14:08	5	10
2/26/2023 05:44:25		00:14:08	00:14:08	4	8
2/25/2023 05:57:41		00:14:08	00:14:08	6	10
2/24/2023 05:44:00		00:14:08	00:14:08	4	9
2/23/2023 11:52:25		00:14:08	00:14:08	9	10
2/23/2023 11:29:28		00:14:08	00:14:08	5	11
2/23/2023 05:43:55		00:14:08	00:14:08	4	10
2/22/2023 05:45:36		00:14:08	00:14:08	4	9
2/21/2023 05:49:19		00:14:08	00:14:08	4	9

Node Routes - Sign of Distress

Data Timestamp	▼	Dest. Address	Next Hop Address	Hop Count	Cost
4/14/2023 12:12:53		00:14:08	00:14:08	1	1
4/13/2023 12:15:09		00:14:08	00:14:08	1	1
4/12/2023 12:15:19		00:14:08	00:14:08	1	8
4/12/2023 11:04:39		00:14:08	00:14:08	5	23
4/3/2023 12:52:13		00:14:08	00:14:08	1	1
4/2/2023 12:50:47		00:14:08	00:14:08	1	1
4/1/2023 12:50:53		00:14:08	00:14:08	1	1
3/31/2023 12:51:40		00:14:08	00:14:08	1	1
3/30/2023 12:49:14		00:14:08	00:14:08	1	1
3/29/2023 12:48:44		00:14:08	00:14:08	2	4
3/29/2023 11:32:48		00:14:08	00:14:08	3	10
3/29/2023 11:32:04		00:14:08	00:14:08	4	11
3/8/2023 04:57:02		00:14:08	00:14:08	1	1
3/7/2023 04:57:07		00:14:08	00:14:08	1	1

Node Neighbor Table

- **About Node Neighbor Table**
 - Nodes typically report neighbor data to RF Gateway **every 3 days**
 - 0-to-many rows per day -> however many neighbors are present!
 - Illustrates connection quality of RF mesh resources which are accessible to node in question
- **Why Review?**
 - Helps build understanding of node's accessible RF neighbor resources, over time
- **What to look for**
 - Link Cost, ETX Band, and 'PF' Flag
 - PF = Primary Forward; reliable connection to PF is impactful
 - Gaps in data entry

Node Neighbors – Reliable Connection

Row	Data Timestamp	Neighbor Address	Link Cost	ETX Band	Current Rate	Current Power	Samples	Flags
1	4/23/2023 04:46:07	00:14:08:03:E2:A	5.0	2	1x	1 Watt	0	S1
2	4/23/2023 04:46:07	00:14:08:03:E2:A	5.0	2	1x	1 Watt	0	S1
3	4/23/2023 04:46:07	00:14:08:00:00:2	5.0	2	1x	1 Watt	0	S1
4	4/23/2023 04:46:07	00:14:08:03:73:0	2.7	2	1x	1 Watt	8	S1
5	4/23/2023 04:46:07	00:14:08:03:E2:9	5.0	2	1x	1 Watt	0	PF
6	4/23/2023 04:46:07	FF:FF:FF:FF:FF:AC	5.0	2	1x	1 Watt	0	
7	4/23/2023 04:46:07	00:14:08:0A:72:5	5.0	2	1x	1 Watt	0	S1
8	4/20/2023 04:45:20	00:14:08:03:E2:A	5.0	2	1x	1 Watt	0	S1
9	4/20/2023 04:45:20	00:14:08:01:D8:7	1.0	2	1x	1 Watt	6	PF
10	4/20/2023 04:45:20	00:14:08:00:00:2	5.0	2	1x	1 Watt	0	S1
11	4/20/2023 04:45:20	00:14:08:03:73:0	2.7	2	1x	1 Watt	8	S1
12	4/20/2023 04:45:20	00:14:08:03:E2:9	5.0	2	1x	1 Watt	0	S1
13	4/20/2023 04:45:20	FF:FF:FF:FF:FF:AC	5.0	2	1x	1 Watt	0	
14	4/20/2023 04:45:20	00:14:08:0A:72:5	5.0	2	1x	1 Watt	0	S1
15	4/17/2023 04:44:38	00:14:08:03:E2:A	5.0	2	1x	1 Watt	0	S1
16	4/17/2023 04:44:38	00:14:08:01:D8:7	1.0	2	1x	1 Watt	6	PF
17	4/17/2023 04:44:38	00:14:08:00:00:2	5.0	2	1x	1 Watt	0	S1
18	4/17/2023 04:44:38	00:14:08:03:73:0	2.7	2	1x	1 Watt	8	S1
19	4/17/2023 04:44:38	00:14:08:03:E2:9	5.0	2	1x	1 Watt	0	S1
20	4/17/2023 04:44:38	FF:FF:FF:FF:FF:AC	5.0	2	1x	1 Watt	0	
21	4/17/2023 04:44:38	00:14:08:0A:72:5	5.0	2	1x	1 Watt	0	S1
22	4/14/2023 04:43:59	00:14:08:03:E2:A	5.0	2	1x	1 Watt	0	S1
23	4/14/2023 04:43:59	00:14:08:01:D8:7	5.0	2	1x	1 Watt	0	S1
24	4/14/2023 04:43:59	00:14:08:03:5F:1	5.0	2	1x	1 Watt	0	F
25	4/14/2023 04:43:59	00:14:08:00:00:2	5.0	2	1x	1 Watt	0	S1
26	4/14/2023 04:43:59	00:14:08:03:73:0	5.0	2	1x	1 Watt	0	S1
27	4/14/2023 04:43:59	00:14:08:03:E2:9	1.6	1	1x	1 Watt	26	PF
28	4/14/2023 04:43:59	FF:FF:FF:FF:FF:AC	5.0	2	1x	1 Watt	0	

Node Neighbors - Sign of Distress

Data Timestamp	Neighbor Address	Link Cost	ETX Band	Current Rate	Current Power	Samples	Flags
3/31/2023 05:40:49	FF:FF:FF:FF:FF:AC	5.0	2	1/2x	1 Watt	0	
3/31/2023 05:40:49	00:14:08:0A:72:45	11.0	5	1/2x	1 Watt	121	PF
3/27/2023 12:23:17	00:14:08:0A:72:48	6.8	5	1/2x	1 Watt	69	F
3/27/2023 12:23:17	FF:FF:FF:FF:FF:AC	5.0	2	1/2x	1 Watt	0	
3/27/2023 12:23:17	00:14:08:0E:D7:16	10.9	5	1/2x	1 Watt	65	PF
3/16/2023 04:45:46	00:14:08:03:CB:03	5.0	2	1/2x	1 Watt	0	S1
3/16/2023 04:45:46	00:14:08:0A:BF:54	25.5	6	1/2x	1 Watt	2	F
3/16/2023 04:45:46	FF:FF:FF:FF:FF:AC	5.0	2	1/2x	1 Watt	0	
3/16/2023 04:45:46	00:14:08:0E:D7:16	18.0	6	1/2x	1 Watt	67	PF
2/20/2023 13:22:33	00:14:08:0A:72:51	25.5	6	1/2x	1 Watt	8	F
2/20/2023 13:22:33	FF:FF:FF:FF:FF:AC	5.0	2	1/2x	1 Watt	0	
2/20/2023 13:22:33	00:14:08:09:9B:B6	2.3	2	1/2x	1 Watt	2	PF
2/20/2023 13:18:12	00:14:08:0A:72:51	7.3	5	1/2x	1 Watt	531	
2/20/2023 13:18:12	00:14:08:04:35:B9	5.0	2	1/2x	1 Watt	0	S1
2/20/2023 13:18:12	00:14:08:03:E2:A0	5.0	2	1/2x	1 Watt	0	S1
2/20/2023 13:18:12	00:14:08:09:9B:B6	19.7	6	1/2x	1 Watt	19	F
2/20/2023 13:18:12	00:14:08:03:E2:BA	5.0	2	1/2x	1 Watt	0	S1
2/20/2023 13:18:12	00:14:08:0A:72:4B	5.0	2	1/2x	1 Watt	0	S1
2/20/2023 13:18:12	00:14:08:0E:D7:16	5.0	2	1/2x	1 Watt	0	S1
2/20/2023 13:18:12	FF:FF:FF:FF:FF:AC	5.0	2	1/2x	1 Watt	0	
2/20/2023 13:18:12	00:14:08:07:9E:B7	4.0	3	1/2x	1 Watt	30	PF
2/19/2023 09:31:39	00:14:08:0A:72:51	9.0	5	1/2x	1 Watt	6	F
2/19/2023 09:31:39	FF:FF:FF:FF:FF:AC	5.0	2	1/2x	1 Watt	0	
2/19/2023 09:31:39	00:14:08:04:66:59	5.9	4	1/2x	1 Watt	49	PF

Get Current Meter Reading

- **About 'Get Current Read'**
 - Read RF Meter from the direct-to-field interface, eliminating Yukon from variables list
- **When to use?**
 - Yukon On Demand reads not functioning as expected
 - Read unsuccessful but Comm Status = 'Ready'
 - Troubleshoot when individual points don't update when meter read
 - Meter Readings Widget shows "Successful Read" but reading didn't update
- **What to look for**
 - Was read successful from Network Manager (but not Yukon)?
 - Can you identify the metric returned from meter which matches expected the Yukon attribute (or not)?
 - Peak Demand, kVAr, KVA, Received kWh, etc.

FIELD

SERVER



Read Meter, Yukon



Get Current Meter Read,
Network Manager

Interpreting an NM Meter Reading

Data Timestamp	Channel	Value	Units
Monday, 24 April 2023 10:26:51	1	15850278	Wh Quadrant 1, Quadrant 4
Monday, 24 April 2023 10:26:51	2	2655294	Varh Quadrant 1, Quadrant 2
Monday, 24 April 2023 10:26:51	3	653	W Quadrant 1, Quadrant 4, Max
Monday, 24 April 2023 10:26:51	4	1681623000	s Coincident Value 1
Monday, 24 April 2023 10:26:51	5	29096	W Quadrant 1, Quadrant 4, Max, Coincident Value 2, Cumulative
Monday, 24 April 2023 10:26:51	6	29750	W Quadrant 1, Quadrant 4, Max, Coincident Value 3, Continuous Cumulative
Monday, 24 April 2023 10:26:51	7	963	PF Coincident Value 4
Monday, 24 April 2023 10:26:51	8	183	Var Quadrant 1, Quadrant 2, Max
Monday, 24 April 2023 10:26:51	9	1681652700	s Coincident Value 1
Monday, 24 April 2023 10:26:51	10	9413	Var Quadrant 1, Quadrant 2, Max, Coincident Value 2, Cumulative
Monday, 24 April 2023 10:26:51	11	9596	Var Quadrant 1, Quadrant 2, Max, Coincident Value 3, Continuous Cumulative
Monday, 24 April 2023 10:26:51	12	958	PF Min
Monday, 24 April 2023 10:26:51	13	1682036100	s Coincident Value 1
Monday, 24 April 2023 10:26:51	14	0	PF Min, Coincident Value 2, Cumulative
Monday, 24 April 2023 10:26:51	15	0	PF Min, Coincident Value 3, Continuous Cumulative
Monday, 24 April 2023 10:26:51	16	822	W Quadrant 1, Quadrant 4, Max, Previous
Monday, 24 April 2023 10:26:51	17	1681502400	s Coincident Value 1, Previous
Monday, 24 April 2023 10:26:51	18	316	Var Quadrant 1, Quadrant 2, Max, Previous
Monday, 24 April 2023 10:26:51	19	1681420500	s Coincident Value 1, Previous
Monday, 24 April 2023 10:26:51	20	930	PF Min, Previous
Monday, 24 April 2023 10:26:51	21	1681416900	s Coincident Value 1, Previous
Monday, 24 April 2023 10:26:51	22	435	W Quadrant 1, Quadrant 4
Monday, 24 April 2023 10:26:51	23	67	Var Quadrant 1, Quadrant 2
Monday, 24 April 2023 10:26:51	24	988	PF
Monday, 24 April 2023 10:26:51	25	383327	W milli
Monday, 24 April 2023 10:26:51	26	48968	Var milli
Monday, 24 April 2023 10:26:51	27	386448	VA milli
Monday, 24 April 2023 10:26:51	28	121350	V Phase A, milli
Monday, 24 April 2023 10:26:51	29	121725	V Phase B, milli
Monday, 24 April 2023 10:26:51	30	122125	V Phase C, milli
Monday, 24 April 2023 10:26:51	31	1340	A Phase A, milli
Monday, 24 April 2023 10:26:51	32	1066	A Phase B, milli
Monday, 24 April 2023 10:26:51	33	846	A Phase C, milli
Monday, 24 April 2023 10:26:51	34	650	A Phase Neutral->Ground, milli
Monday, 24 April 2023 10:26:51	35	119.0	V degree Phase B
Monday, 24 April 2023 10:26:51	36	239.4	V degree Phase C

NM Read

Value	Units
15850278	Wh Quadrant 1, Quadrant 4
2655294	Varh Quadrant 1, Quadrant 2
653	W Quadrant 1, Quadrant 4, Max
1681623000	s Coincident Value 1
29096	W Quadrant 1, Quadrant 4, Max, Coincident Value 2, Cumulative
29750	W Quadrant 1, Quadrant 4, Max, Coincident Value 3, Continuous Cumulative
963	PF Coincident Value 4
183	Var Quadrant 1, Quadrant 2, Max
1681652700	s Coincident Value 1
9413	Var Quadrant 1, Quadrant 2, Max, Coincident Value 2, Cumulative
9596	Var Quadrant 1, Quadrant 2, Max, Coincident Value 3, Continuous Cumulative
958	PF Min
1682036100	s Coincident Value 1
0	PF Min, Coincident Value 2, Cumulative
0	PF Min, Coincident Value 3, Continuous Cumulative
822	W Quadrant 1, Quadrant 4, Max, Previous
1681502400	s Coincident Value 1, Previous
316	Var Quadrant 1, Quadrant 2, Max, Previous
1681420500	s Coincident Value 1, Previous
930	PF Min, Previous
1681416900	s Coincident Value 1, Previous
435	W Quadrant 1, Quadrant 4
67	Var Quadrant 1, Quadrant 2
988	PF
383327	W milli
48968	Var milli
386448	VA milli
121350	V Phase A, milli
121725	V Phase B, milli
122125	V Phase C, milli
1340	A Phase A, milli
1066	A Phase B, milli
846	A Phase C, milli
650	A Phase Neutral->Ground, milli
119.0	V degree Phase B
239.4	V degree Phase C

Yukon PT List, After Read

Point Name	Attribute	Value/State	Date/Time
Alternate Mode Entry	Alternate Mode Entry	<input checked="" type="checkbox"/> Cleared	08/14/2020 10:00:02
Amps Phase A	Current (Phase A)	1.340 Amps	04/24/2023 10:26:51
Amps Phase B	Current (Phase B)	1.066 Amps	04/24/2023 10:26:51
Amps Phase C	Current (Phase C)	0.846 Amps	04/24/2023 10:26:51
Coincident Cumulative Peak kVAr	N/A	9.413 kVAr	04/16/2023 09:45:00
Coincident Power Factor	Power Factor Coincidental	0.963 PF	04/16/2023 01:30:00
Configuration Error	Configuration Error	<input checked="" type="checkbox"/> Cleared	08/14/2020 10:00:02
Current Waveform Distortion	Current Waveform Distortion	<input checked="" type="checkbox"/> Cleared	08/14/2020 10:00:02
Delivered kVAr Load Profile	Delivered kVAr Load Profile	0.000 kVAr !	01/01/2010 12:00:00
Delivered kVArh	kVArh	2,655.294 kVArh	04/24/2023 10:26:51
Delivered kVArh (Rate A kVArh)	kVArh Rate A	0.000 kVArh !	01/01/2010 12:00:00
Delivered kW Load Profile	Load Profile (+1 more)	0.396 kW	04/24/2023 10:00:00
Delivered kWh	Usage Reading (+1 more)	15,850.278 kWh	04/24/2023 10:26:51
Delivered kWh per Interval	Delivered kWh per Interval	0.099 kWh	04/24/2023 10:00:00
Demand Overload	Demand Overload	<input checked="" type="checkbox"/> Cleared	08/14/2020 10:00:02
Demand Reads And Reset	Demand Reads And Reset	<input checked="" type="checkbox"/> Active	08/16/2020 00:15:02
Device Temperature	Temperature of Device	63 Temp-F	04/24/2023 10:26:51
Inactive Phase Current Diagnostic Error	Inactive Phase Current Diagnostic Error	<input checked="" type="checkbox"/> Cleared	08/14/2020 10:00:02
kVA	kVA	0.386 kVA	04/24/2023 10:26:51
kVAr	kVAr	0.049 kVAr	04/24/2023 10:26:51

NM Read

Yukon PT List, After Read

Value	Units
15850278	Wh Quadrant 1, Quadrant 4
2655294	Varh Quadrant 1, Quadrant 2
653	W Quadrant 1, Quadrant 4, Max
1681623000	s Coincident Value 1
29096	W Quadrant 1, Quadrant 4, Max, Coincident Value 2, Cumulative
29750	W Quadrant 1, Quadrant 4, Max, Coincident Value 3, Continuous Cumulative
963	PF Coincident Value 4
183	Var Quadrant 1, Quadrant 2, Max
1681652700	s Coincident Value 1
9413	Var Quadrant 1, Quadrant 2, Max, Coincident Value 2, Cumulative
9596	Var Quadrant 1, Quadrant 2, Max, Coincident Value 3, Continuous Cumulative
958	PF Min
1682036100	s Coincident Value 1
0	PF Min, Coincident Value 2, Cumulative
0	PF Min, Coincident Value 3, Continuous Cumulative
822	W Quadrant 1, Quadrant 4, Max, Previous
1681502400	s Coincident Value 1, Previous
316	Var Quadrant 1, Quadrant 2, Max, Previous
1681420500	s Coincident Value 1, Previous
930	PF Min, Previous
1681416900	s Coincident Value 1, Previous
435	W Quadrant 1, Quadrant 4
67	Var Quadrant 1, Quadrant 2
988	PF
383327	W milli
48968	Var milli
386448	VA milli
121350	V Phase A, milli
121725	V Phase B, milli
122125	V Phase C, milli
185609	Wh Quadrant 1, Quadrant 2, Quadrant 3, Quadrant 4

kW	Demand (+1 more)	0.383 kW
Low Battery Warning	Low Battery Warning	<input checked="" type="checkbox"/> Cleared
Low Loss Potential	Low Loss Potential	<input checked="" type="checkbox"/> Cleared
Mass Memory Error	Mass Memory Error	<input checked="" type="checkbox"/> Cleared
Meter Reconfigure	Meter Reconfigure	<input checked="" type="checkbox"/> Cleared
Metrology Communication Failure	Metrology Communication Failure	<input checked="" type="checkbox"/> Cleared
Net kWh	Net kWh	0.000 kWh !
Non Volatile Mem Failure	Non Volatile Mem Failure	<input checked="" type="checkbox"/> Cleared
Outage Count	RFN Outage Count	9 Counts
Outage Restore Count	RFN Outage Restore Count	9 Counts
Outage Status	Outage Status	<input checked="" type="checkbox"/> Good
Outages	Outage Log	44.000 Seconds
Peak kVAR	Peak kVAR	0.183 kVAR
Peak kW	Peak Demand	0.653 kW
Peak kW (Rate A kW)	Peak Demand Rate A	0.000 kW !
Power Factor	Power Factor	0.988 PF
Sum kW Load Profile	Sum kW Load Profile	0.000 kW
Sum kWh	Usage Reading (+1 more)	185.609 kWh
Sum kWh per Interval	Sum kWh per Interval	0.000 kWh

NM Read

Yukon PT List, After Read

3706152	Wh Quadrant 1, Quadrant 4
4904020	Wh Quadrant 2, Quadrant 3
-1197868	Wh Quadrant 1, Quadrant 2, Quadrant 3, Quadrant 4, Net Flow
800	W Quadrant 1, Quadrant 4
4104	W Quadrant 1, Quadrant 4, Max
1682356500	s Coincident Value 1
2400	W Quadrant 1, Quadrant 4, Max, Previous
1681587900	s Coincident Value 1, Previous
1832	W Quadrant 1, Quadrant 4, Daily Max
1682432999	s Coincident Value 1
247250	V milli
251250	V Daily Max, milli
1682402340	s Coincident Value 1
244375	V Daily Min, milli
1682437320	s Coincident Value 1
247500	V Primary, milli
0	V Secondary, milli

Received kWh	Received kWh	4,904.020 kWh	04/25/2023 20:41:19
Received kWh per Interval	Received kWh per Interval	0.000 kWh	04/25/2023 20:00:00
RF Demand Reset Status	RF Demand Reset Status	<input checked="" type="checkbox"/> Success	04/20/2023 00:00:20
Sum kWh	Sum kWh	46.792 kWh	09/24/2021 00:00:00

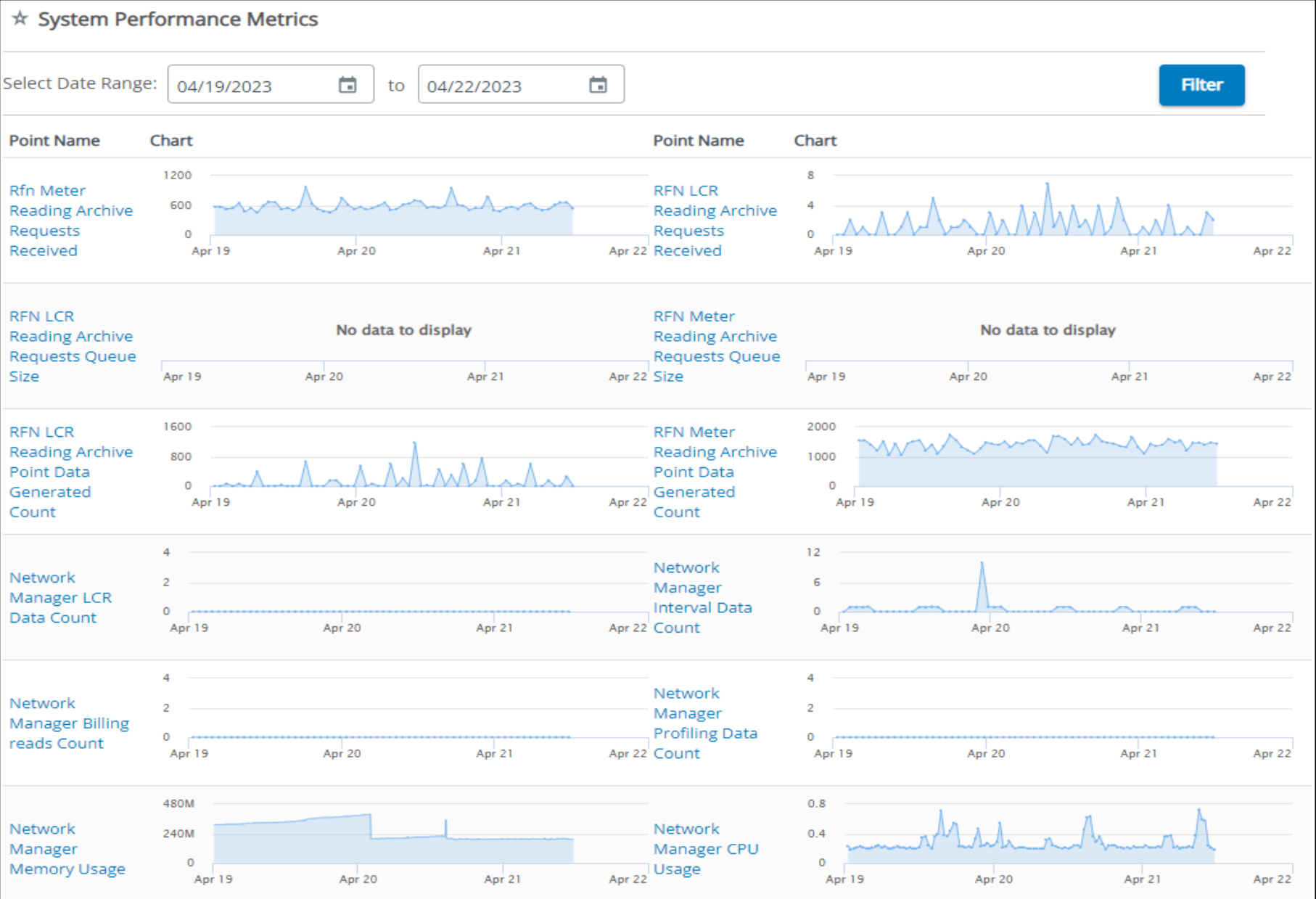
Get Current Meter Reading – Follow Up

- **Observation: expected metric doesn't update any points in Yukon but confirmed in NM read**
 - Confirm that the correct corresponding point is enabled in Yukon
 - Restart Yukon services
 - Contact Support
- **Observation: expected metric is NOT found in NM read**
 - Review Yukon Device Configuration associated with meter
 - Polyphase meters: Review third party software meter config (1132, MeterCat)
 - Power Cycle/reset meter

Get Current Meter Reading – Follow Up

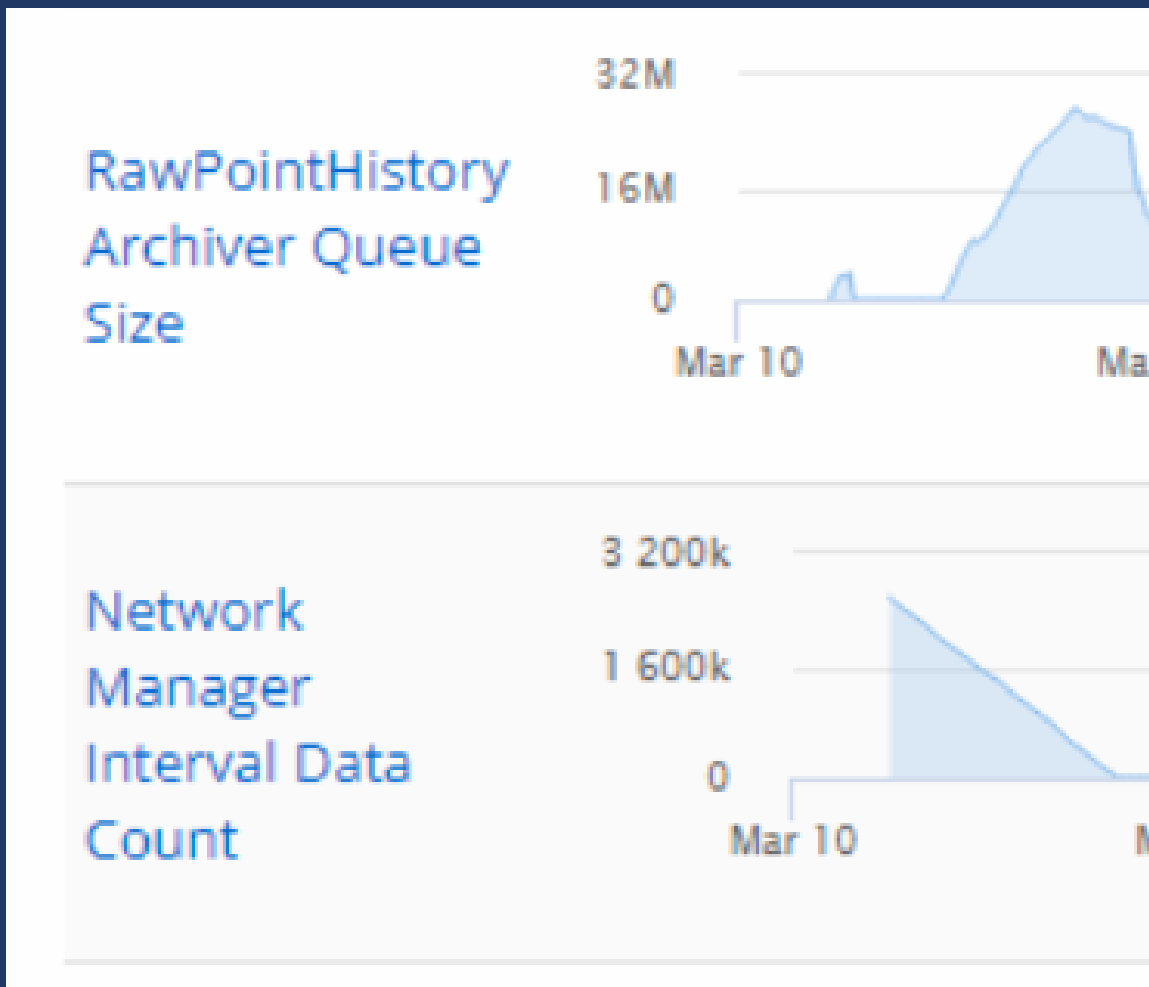
- Observation: Successfully read meter through Network Manager (but unsuccessful from Yukon)
 - You know Meter's path through gateway, to Network Manager, is good
 - Issue lies with...
 - Data transfer, between Network Manager and Yukon
 - Review Performance Metrics (Next Slide)
 - Internal function of Network Manager or Yukon
 - Restart Yukon, NM services (is it 1 meter or a group of meters?)
 - Contact Support

System Performance Metrics (Yukon->Support)

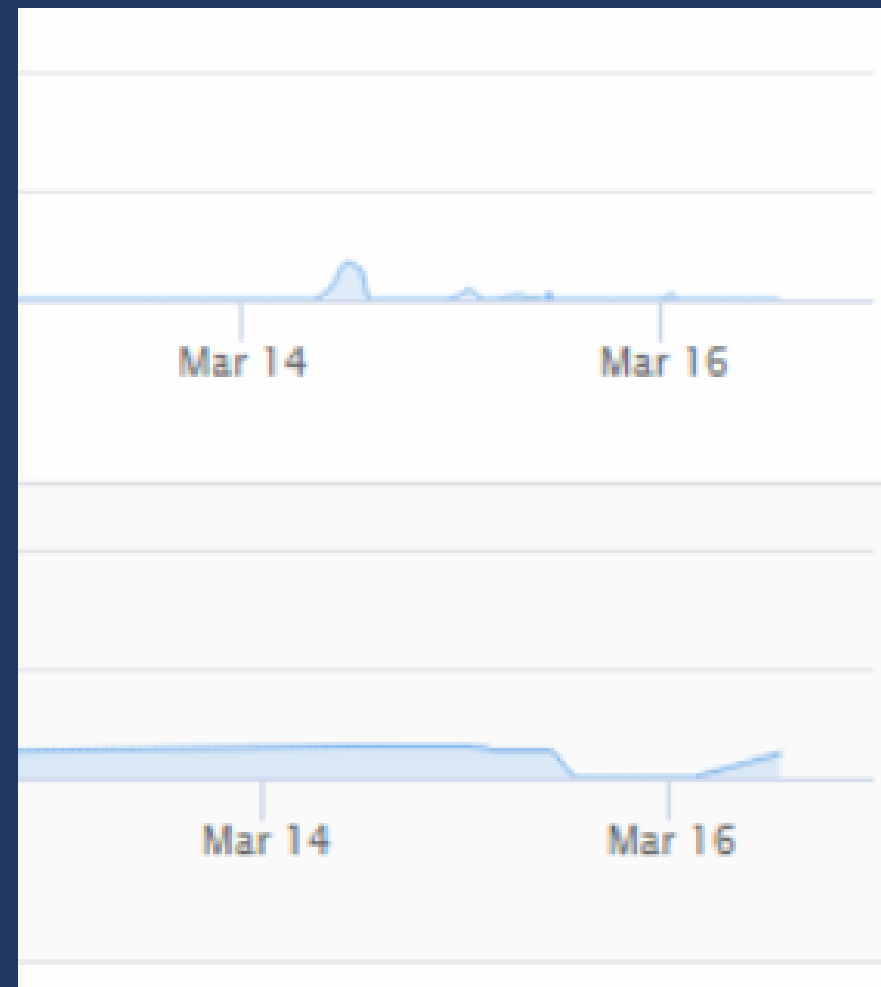


System Performance Metrics (Yukon->Support)

Loaded



Not Loaded





Questions and Comments



Intermission

Gateway Troubleshooting

Nathan Brown, Mark Harkins

5/9/2023

What is within our control to fix and when do we open a Support Ticket?



*What logging
would point me to
troubleshoot the
backhaul?*

Network Manager GW Logs - What to Look For

- Lack of logging

- Missed 6 hour time adjustments

- Connection Errors

- Connection Timeout
- Connection Aborted
- Connection Forcibly Closed

- “Gateway time adjusted”

8/14/2022 22:14:43	Gateway time adjusted: Mon Aug 15 02:05:33 UTC 2022:	: -1.354047 sec
8/14/2022 16:14:46	Gateway time adjusted: Sun Aug 14 20:05:03 UTC 2022:	: -0.490073 sec
8/14/2022 10:14:48	Gateway time adjusted: Sun Aug 14 14:05:03 UTC 2022:	: 0.799218 sec
8/14/2022 04:14:52	Gateway time adjusted: Sun Aug 14 08:04:33 UTC 2022:	: 0.396522 sec

- “Error connecting to /<IP_Addr>:32030: Connection timed out: connect ”
- 2022-06-28 00:45:37,255
WARN [GatewayComm] Error while reading data from Gateway(742) java.io.IOException : An existing connection was forcibly closed by the remote host

Backhaul Troubleshooting



Backhaul Troubleshooting Tips & Tricks

- What's Implicated?
 - Core Networks / Edge Networks
 - Firewalls
 - VLAN's
 - VPN's
 - Cellular APN's
 - Public
 - Private
- What to do?
 - Confirm Cables and physical connectivity
 - Can I ping the Gateway (not the modem/backhaul)?
 - Confirm MTU
 - Fragmentation Required
 - Round Trip Times
 - Media Converter in between?
 - What is in Firewall Logging?
 - Have we looked at Antivirus / Security?
 - Exclusions for Yukon Server & GW Traffic
 - Endpoint Detection & Remediation Solutions (EDR/EDX)

For Our IT Folks

- Ping with MTU of 1472 and requesting fragmentation
 - Image (1) we see that the interface on the far end has the Don't Fragment bit set
 - Image (2) we have a successful ping with Maximum Transmission Unit and Fragmentation

```
C:\Users\[redacted]>ping 10.0.0.1 -l 1500 -f

Pinging 10.0.0.1 with 1500 bytes of data:
Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.
Packet needs to be fragmented but DF set.

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

*What logging
would point me to a
reboot of a
Gateway?*

Network Manager Logs - What to Look For

- Application Deaths
 - Gateway Storage Full
 - Unable to power the board
- Radio Issues
 - Possible Power Issue
- Truck roll !

- “Application Started”

8/13/2022 09:13:29 Application started. Version R_9_5_0

- “Radio stack reset”

2/3/2023 15:20:14 Radio stack reset

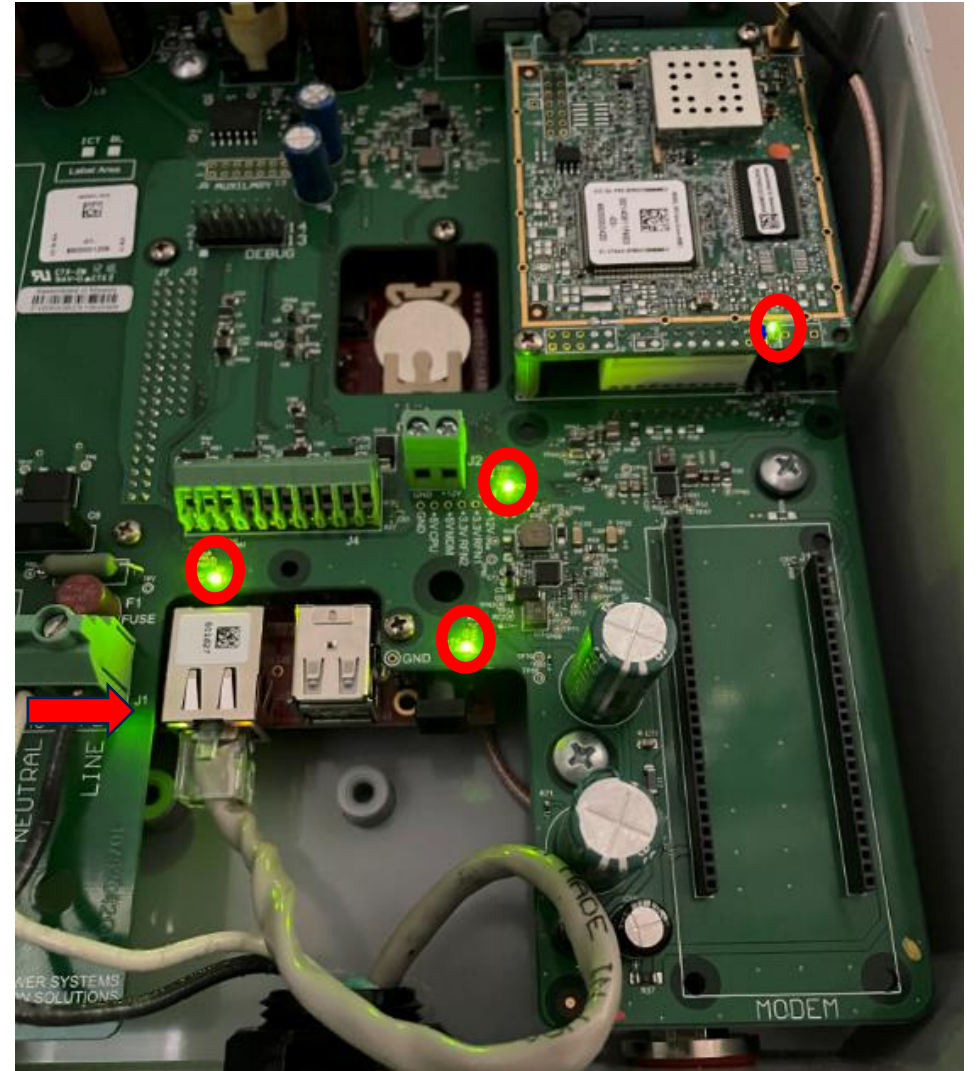
*What should I do
when I reboot a
Gateway?*

When Rebooting a Gateway

Confirm Lights on Radio Board

1. Flashing Red Light (Bad)
2. Flashing/Solid Green (Good)
3. Flashing Blue Light (Good)

- Radio LED
- 12 V Carrier Board LED
- 5 V CPU & Modem LED
- Processor Board LED
- Ethernet Port



When Rebooting a Gateway

If any of these LEDs is off, there is a problem with the power or carrier board and it will probably not work.

Radio Board LEDs:

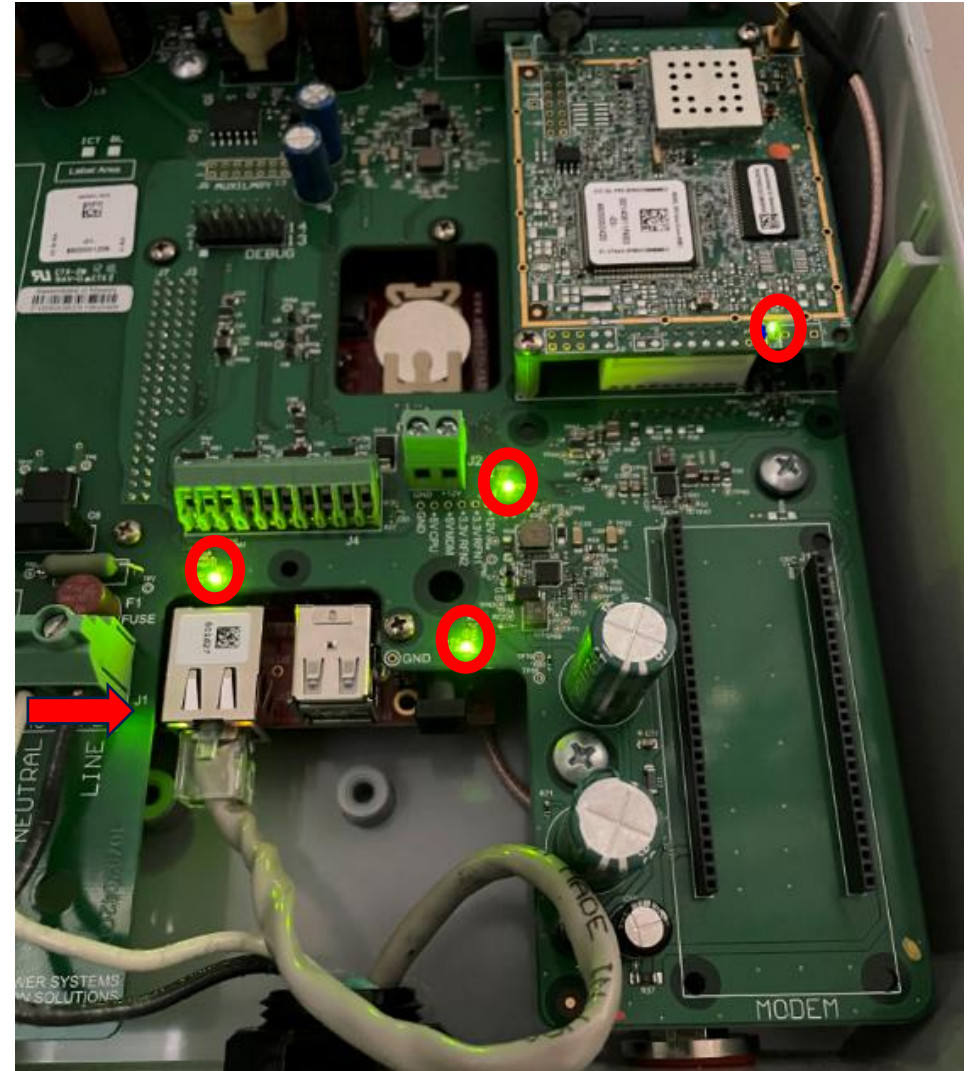
- On bottom right of the radio board. Blinking once per second green.
- The blue LED will turn on when the board is processing; typically during a connection with a node in the RF network. It should not stay on.

If the green LED is not blinking, or the blue LED is on continuously, the RF module is probably not working or able to communicate with the gateway on the processor board.

CPU Board LEDs:

- There is a component with a red and green LED under the edge of the carrier board left of the Ethernet port. The green LED should be solid. The red LED should be OFF.

If the green LED is blinking and the red LED is on, it means that the capacitor is still charging. This normally takes about 5 minutes. During this time, the gateway is not running. As a result, you will not be able to communicate with it. If both LEDs are off, on, or the red LED only is on, the processor board is not working correctly or is not powered.

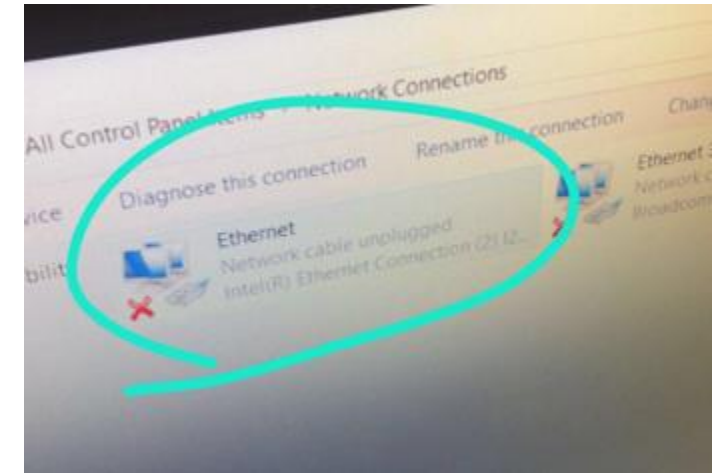


When Rebooting a Gateway

1. Disconnect Batteries
2. Remove Power
3. Allow for 20 minutes to let Super Capacitor bleed out
4. Apply Power (wait 15 mins)
5. Connect Field Tool
6. Confirm RSSI
7. Confirm Network Neighbors
8. Confirm Network Data
9. Confirm Connectivity to Yukon

After We've Rolled a Truck..

- Back at the office
- Again- confirm Ethernet port
 - Connect Ethernet cable directly to Gateway from another computer (should show indication of no connection prior to connecting cable)




*What logging
would point me to
open a Support
Ticket?*

Yukon Infrastructure Warnings

Door Open	Tessco cabinet has always included a cabinet door open sensor and wiring for the GWY-800 to use <u>Not Operation Inhibiting</u>
UPS Battery Low Voltage	Tessco cabinet has always included wiring directly from the UPS for the GWY-800 to use. Status output will turn on when battery drops below 11 VDC. <i>WHE REQUIREMENT</i> <u>Not Operation Inhibiting</u>
Full Power Fail	AC and DC power are both lost, to the extent that the gateway shuts down, received from HCM. <u>Critical. Contact Eaton support.</u>
Security Alert	SSH service enabled <u>Not Operation Inhibiting. Contact Eaton support.</u>
Radio Failure	Gateway loses the radio interface. <u>Not Operation Inhibiting</u> UNLESS repeating with high density, and does not come accompanied with a CLEAR at some point
Time Synchronization Error	Gateway has gone 24 hours without successful NTP sync. <u>Critical. Contact Eaton support.</u>
Max Node Count	Node count reaches the configured maximum, no other devices can connect. <u>Critical. Contact Eaton support.</u>
Security Certificate Expiring	Triggered 60 days before the gateway certificate actually expires <u>Not Operation Inhibiting UNTIL certificate expires. Contact Eaton support.</u>

Yukon Infrastructure Warnings (Cont'd)

AC Power Fail	Tessco's UPS provides AC OK output that can be used. This is wired directly from the UPS for the GWY-800 to use. <u>Not Operation Inhibiting</u>
RTC Battery Low	<p>For Gateway's coin cell CPU battery. <u>Critical</u>; William: the RTC battery is the button battery on the single board computer, like the one on a desktop motherboard, it keeps the clock alive across power losses, it shouldn't be related to the capacitors on the carrier board. It's just a CR2032 button battery. I assume there's a procedure to replace it since there's a cutout in the carrier board explicitly so it can be accessed. FROM RFNFIVE-933:</p> <p>The coin cell battery used in Gateway CPU board has an expected life of 10 years, but it may fail prematurely. When it failed, when there gateway reboot and NTP time is not available, a bad time might be spread to nodes. CPU has a command that can check if battery voltage is critical. This should be used to generate an alarm to Yukon for customer to replace the coin cell battery. Some other logic in software should also be implemented to detect if it gets a bad time as the RTC's default time will be much earlier than the firmware release time.</p> 

Yukon Infrastructure Warnings (Cont'd)

Low Remaining Disk Space	90% full Critical. Contact Eaton support. This alarm likely will NOT clear itself. The GW will typically NOT reach the disk usage threshold in normal use. If it does, contact Eaton support
Gateway Communications Interrupted since X date/time	-The alarm triggers off of a configurable setting in the Dashboard Configuration Yukon page, default is 60 minutes -As with any 'disconnect' status observed in Yukon, first response is to attempt a manual connect. If the connect is successful then the alarm can be treated as minor. If the attempt fails, further investigation is required to diagnose the situation. -By default, NM connects to the gateway hourly for data collection.
Gateway Node Count Exceeded	-This alarm indicates that the Gateway has reached capacity in the amount of nodes that it is able to communicate to. No additional nodes can be added- and this can lead to communication issues with other nodes connected to this Gateway. -This could be some indication that another Gateway is having connectivity/communication issues

Network Manager Logs - What to Look For

- When all else fails...
 - *“We’ve tried everything”*
- Gateway in Failsafe Mode
- Security Certificate Expiration Warnings



- Reach out for support!

Let's Talk About Inventory.....

- My Gateway has been sitting on the shelf since....
- Firmware matters / Certificates matter



Dead/Removed Gateways in Yukon & Network Manager

- Remove ALL Gateways from Yukon and Network Manager

- Why?
 - Gateways will have to maintain routing tables and attempt to communicate with/to those dead endpoints

Questions and Comments

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