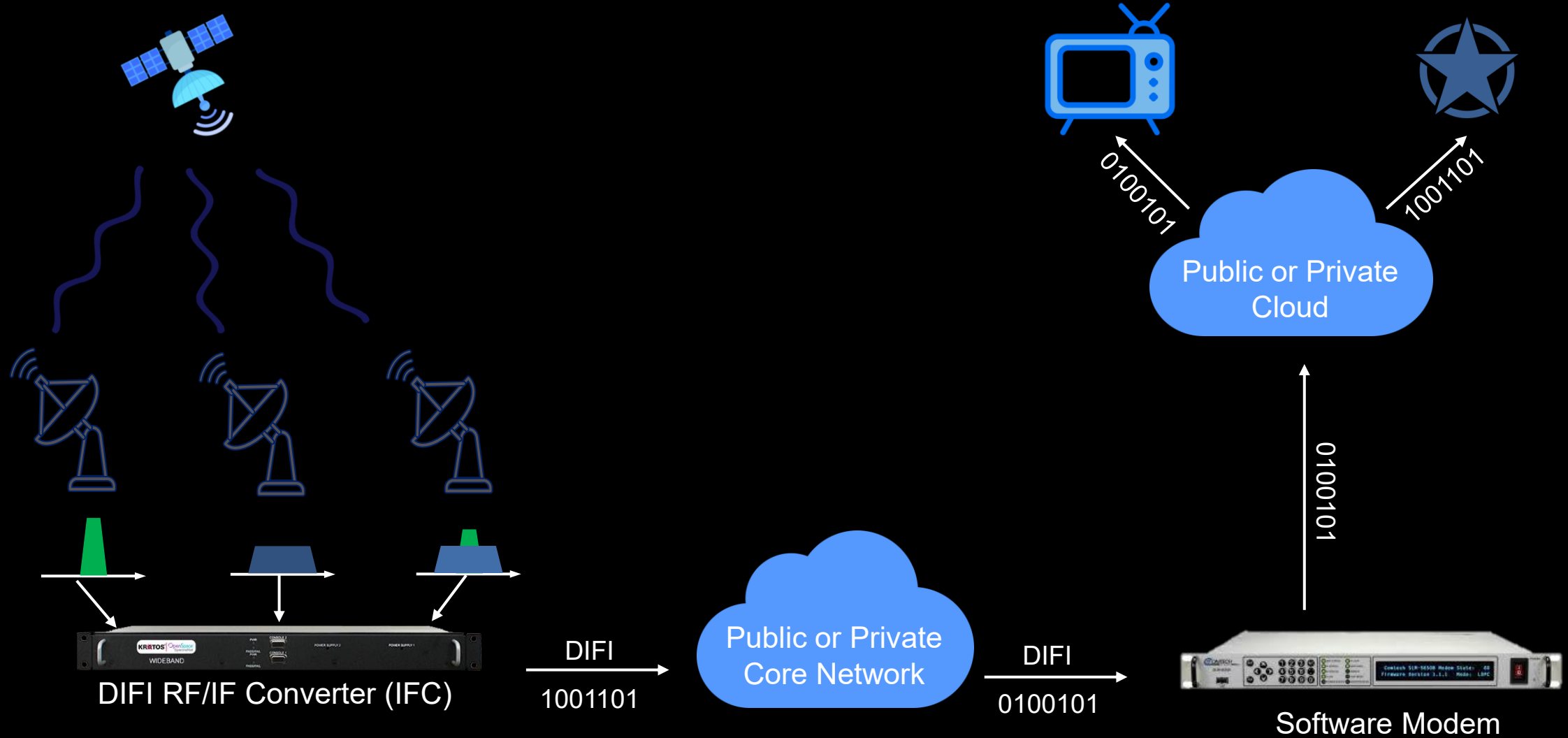


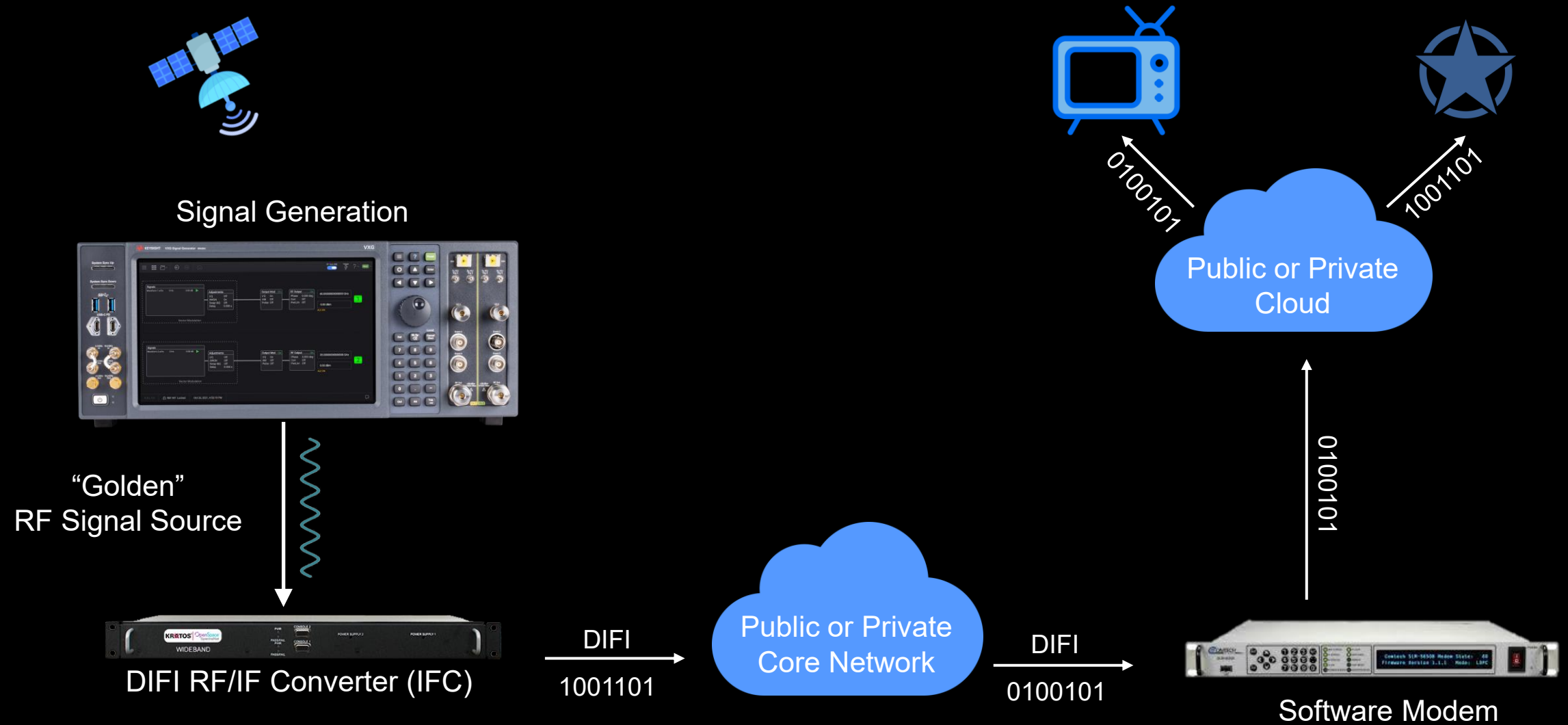
E2E L2-7 Traffic Over Channel Emulation

Scott Hill
NAS Senior Solutions Engineer
October 8th, 2026

DIFI Ecosystem



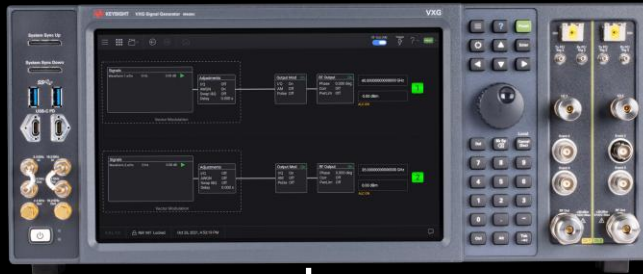
DIFI Ecosystem – Ground Station RF Emulation



DIFI Ecosystem – Ground Station RF Emulation



Signal Generation



“Golden”
RF Signal Source



DIFI RF/IF Converter (IFC)

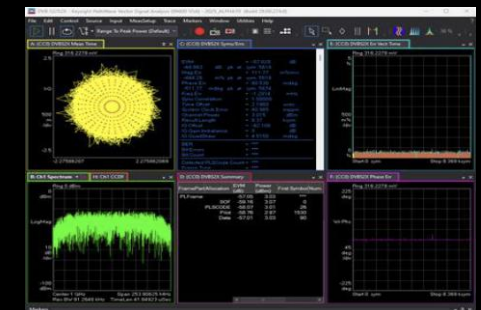
DIFI
1001101



Public or Private
Core Network

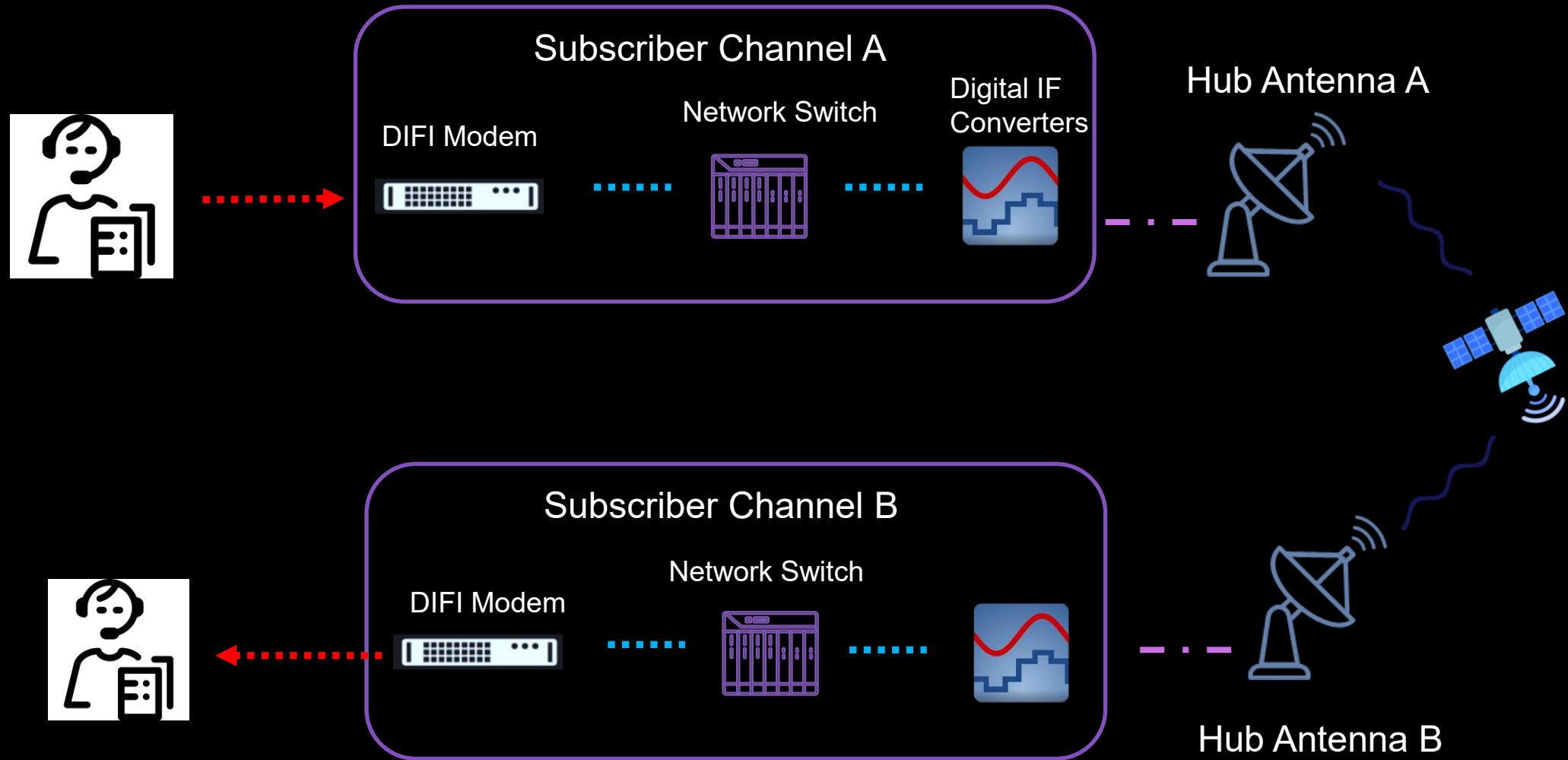
DIFI
0100101

Vector Signal Analysis Software
Running on PC Workstation, ESXi
VM WARE Instance, DIFI / VITA 49
Spectrum Analyzer



VSA RF Receiver

DIFI Real World Traffic Scenario: Subscriber Network Traffic



--- Coax (RF) IP subscriber traffic Ethernet DIFI traffic Ethernet

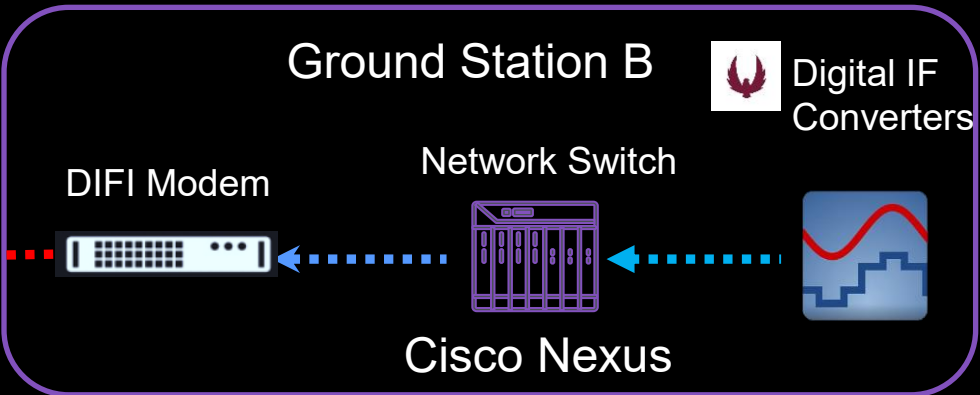
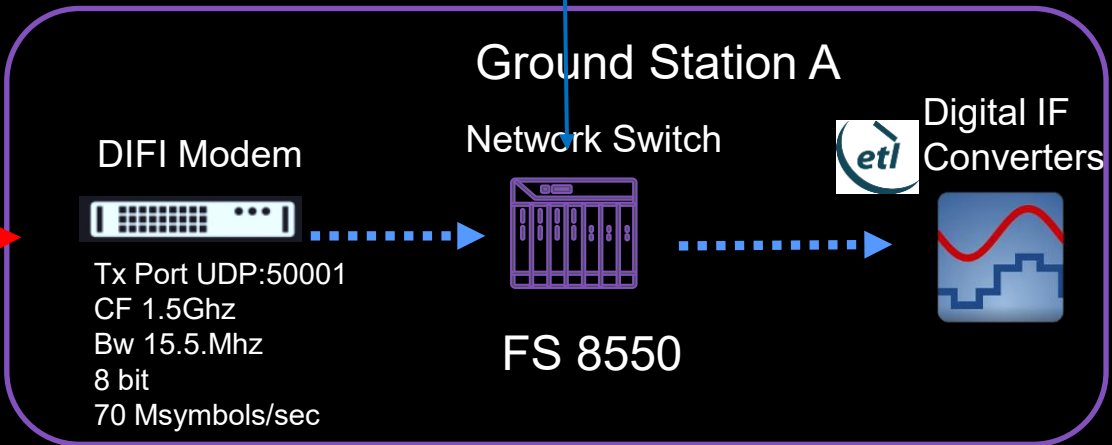
DIFI Plugfest 2026 – System 2



XGS2 Chassis + Novus

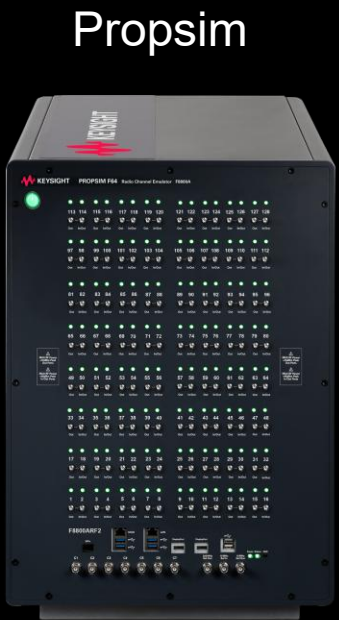


- PPPoE Subscribers
- Video and Voice
- Real World Application traffic
- Routing Protocols



Hub Antenna A
CF 1.5Ghz

CF 1.5Ghz
Hub Antenna B

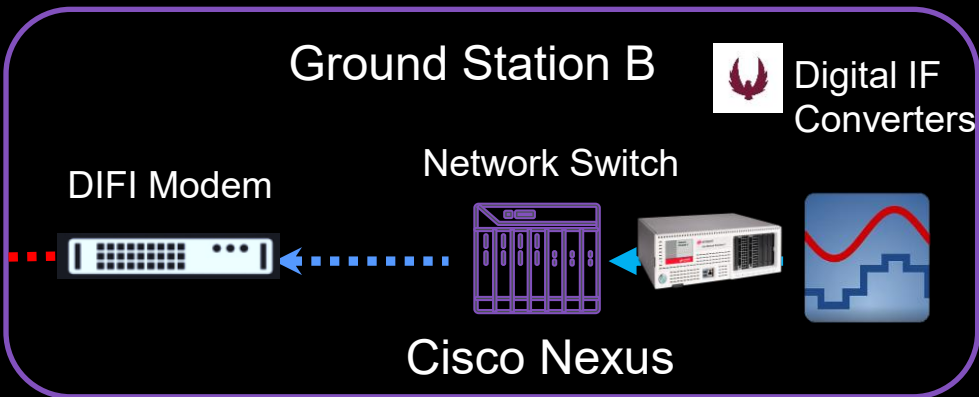
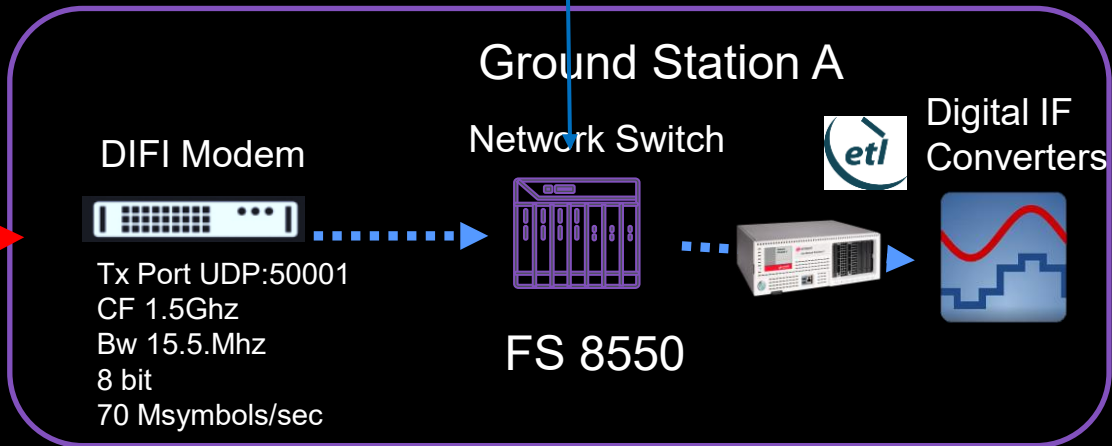


- - - - Coax (RF)
 - - - - IP subscriber traffic Ethernet
 - - - - DIFI traffic Ethernet

DIFI Plugfest 2026 – System 2

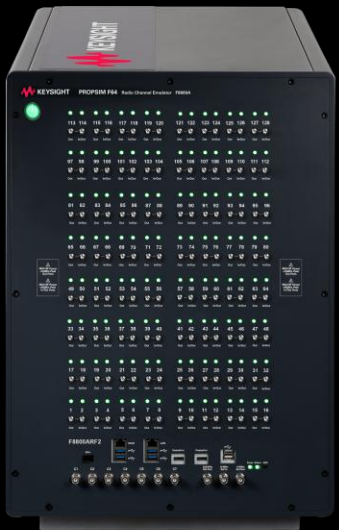


- PPPoE Subscribers
- Video and Voice
- Real World Application traffic
- Routing Protocols



Hub Antenna A

Propsim



CF 1.5Ghz

CF 1.5Ghz

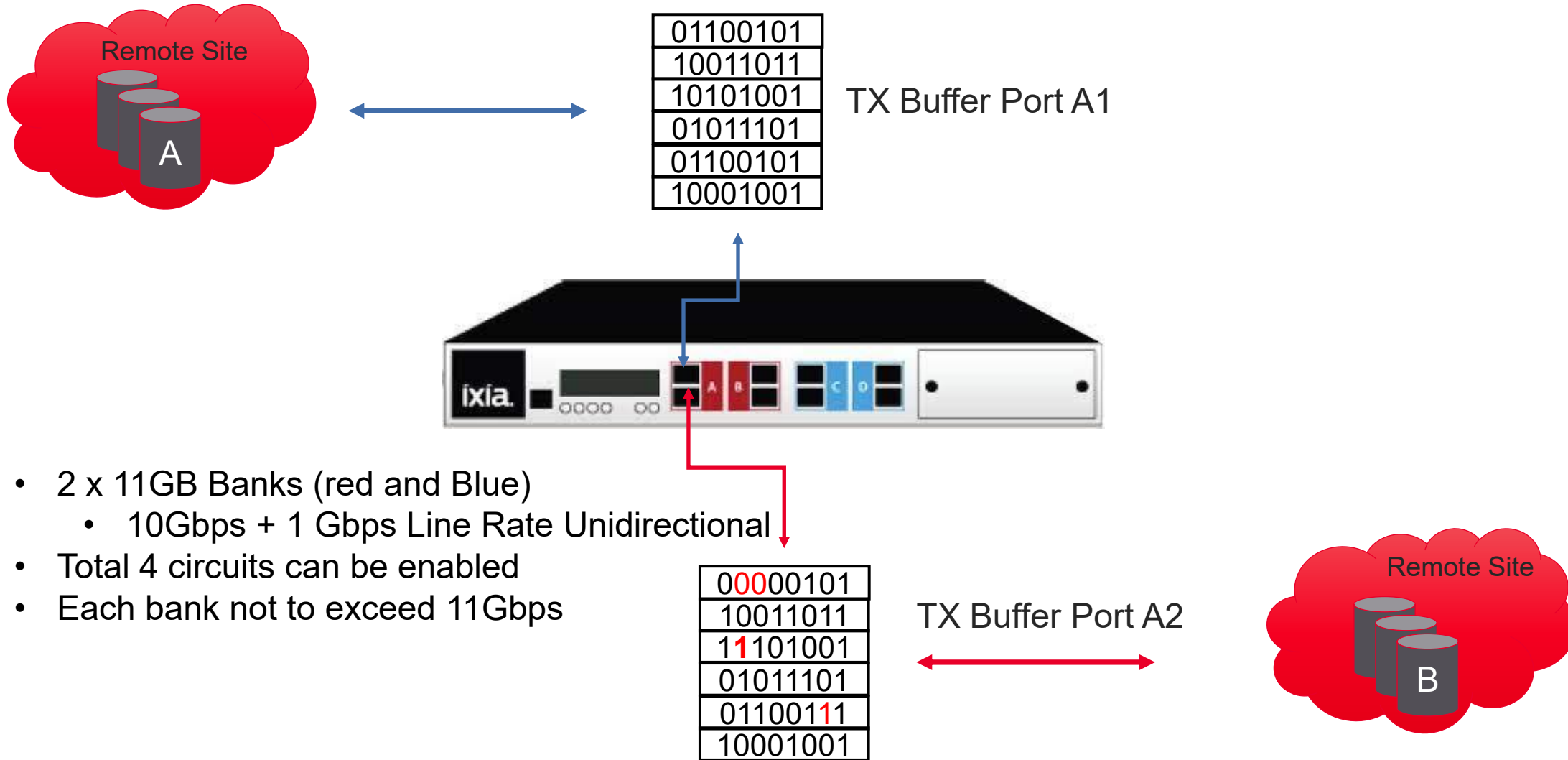
Hub Antenna B

- - - - Coax (RF)

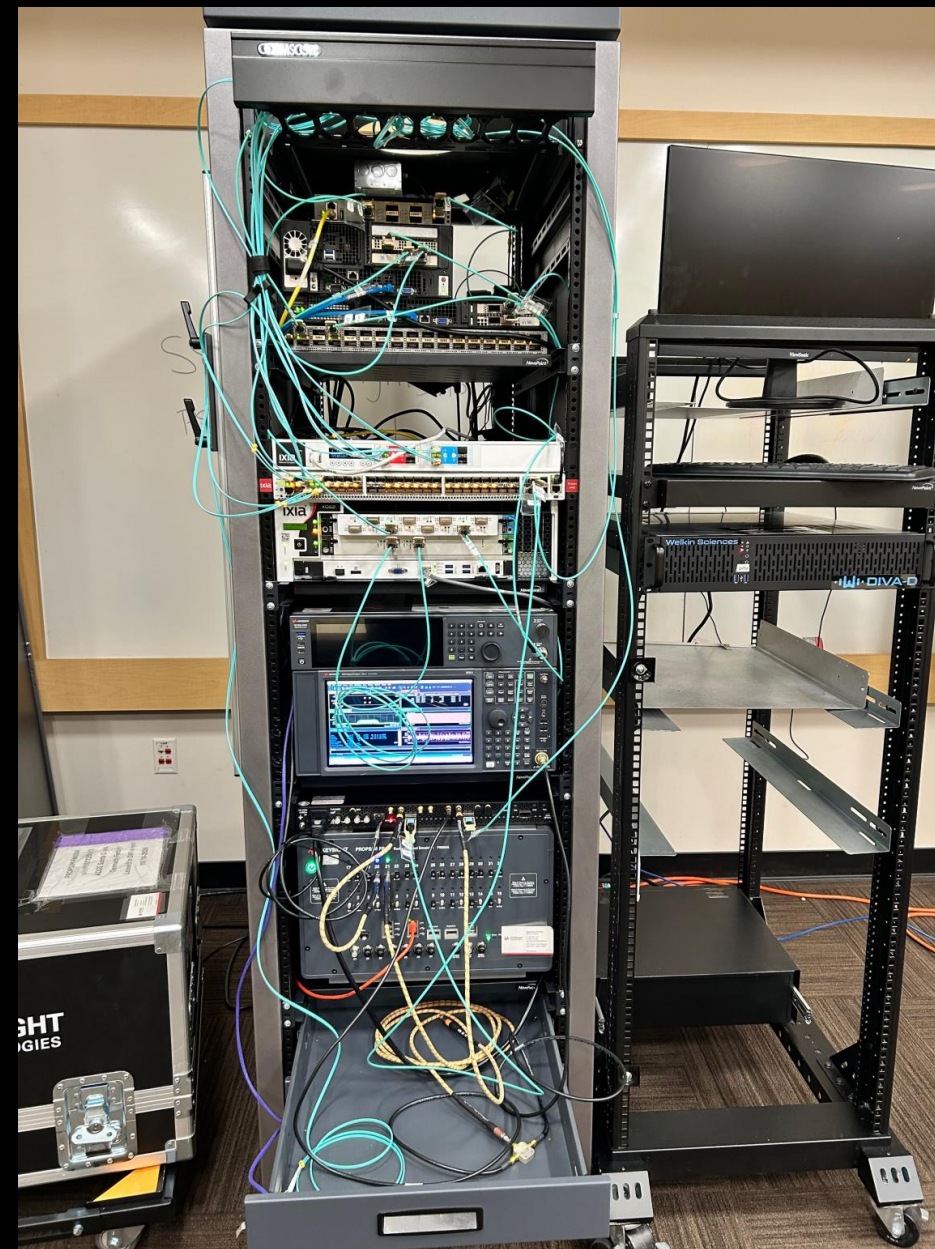
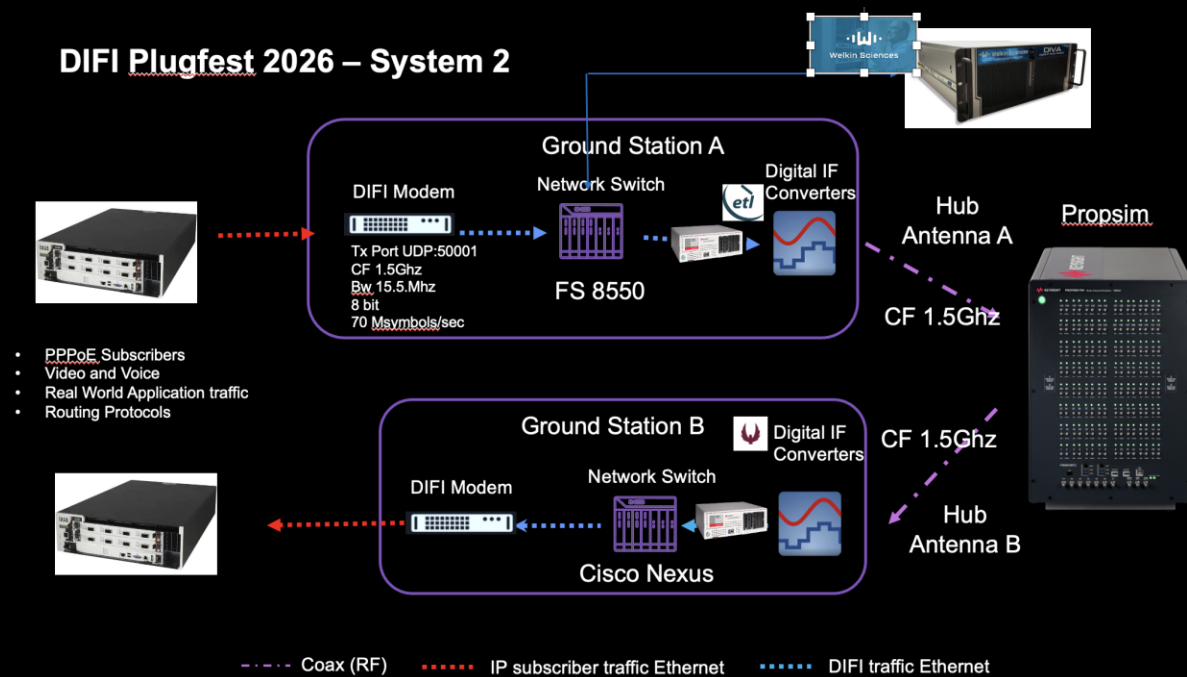
..... IP subscriber traffic Ethernet

..... DIFI traffic Ethernet

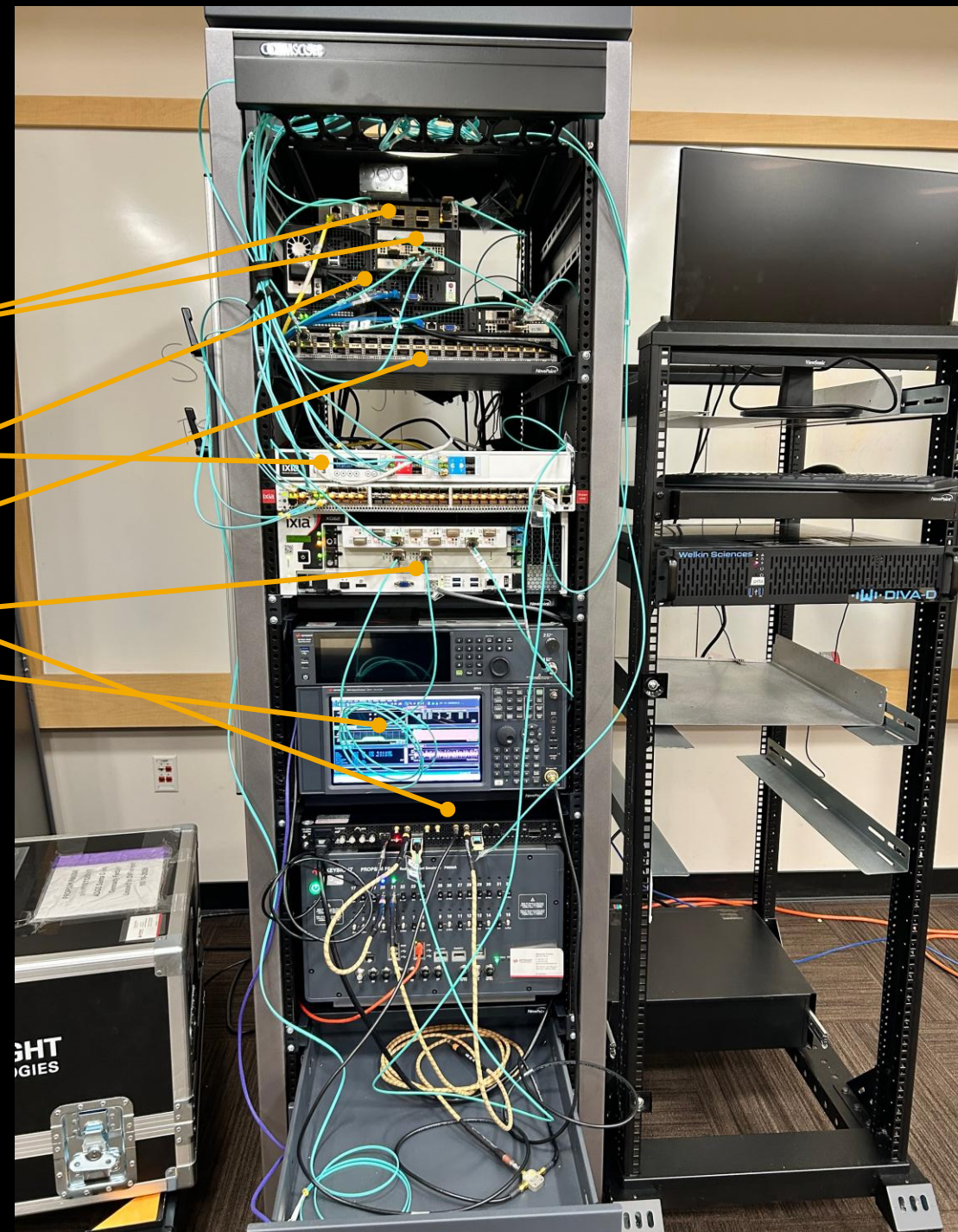
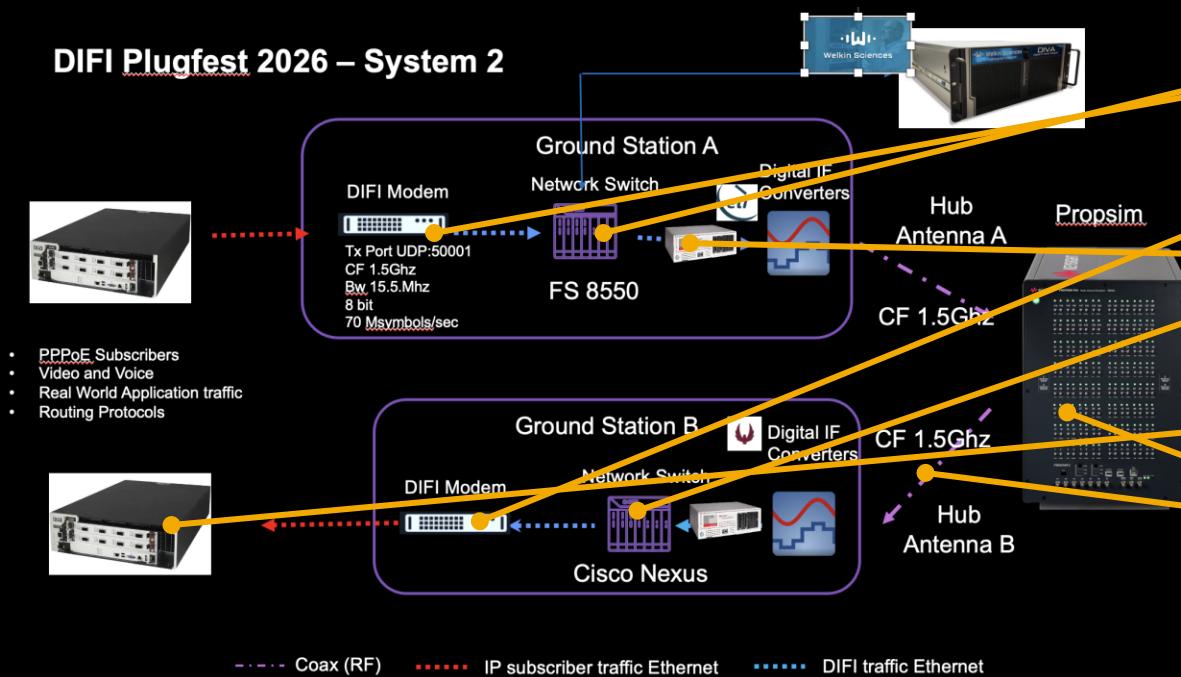
NE2 Banks & Buffers

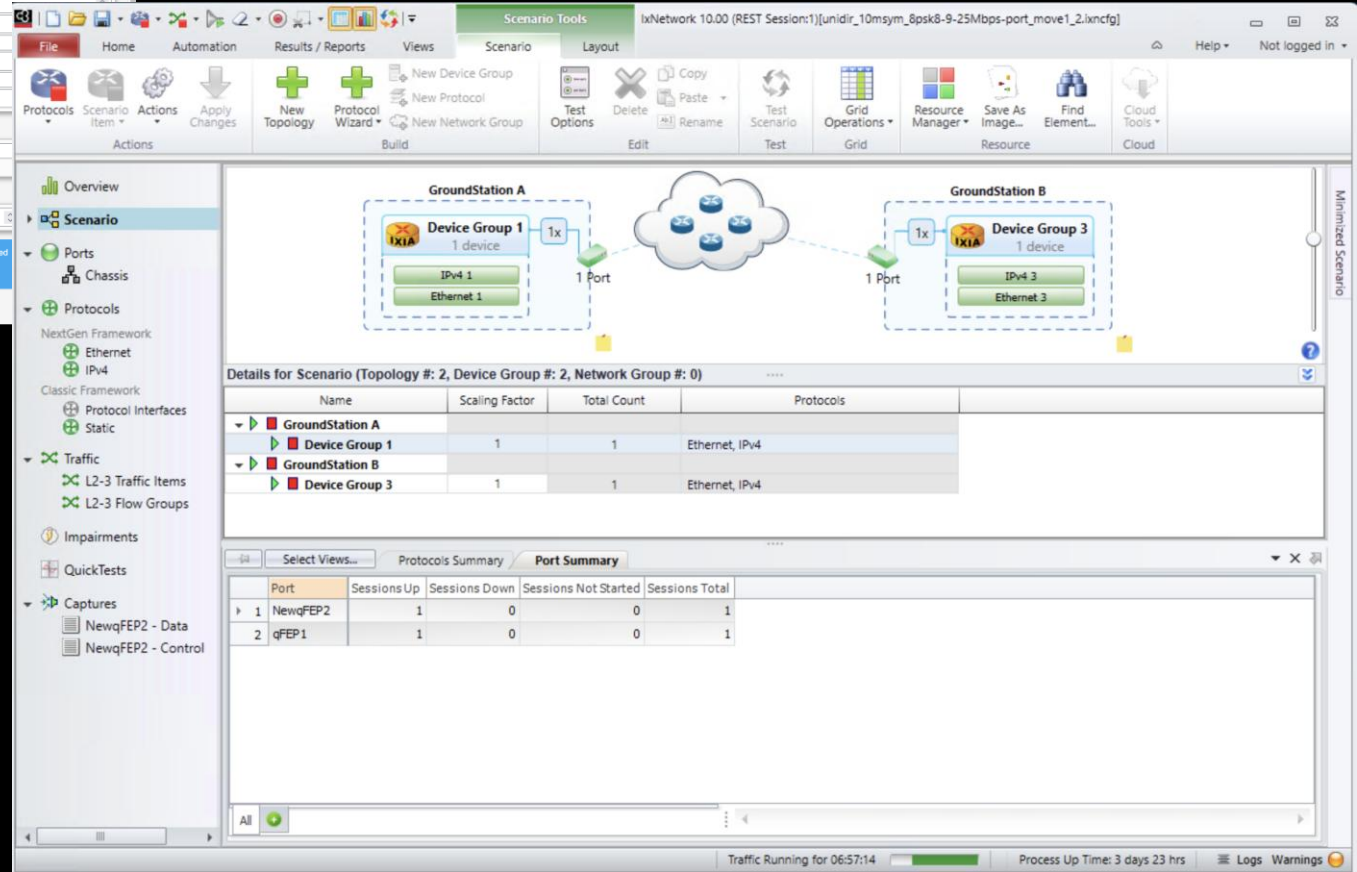
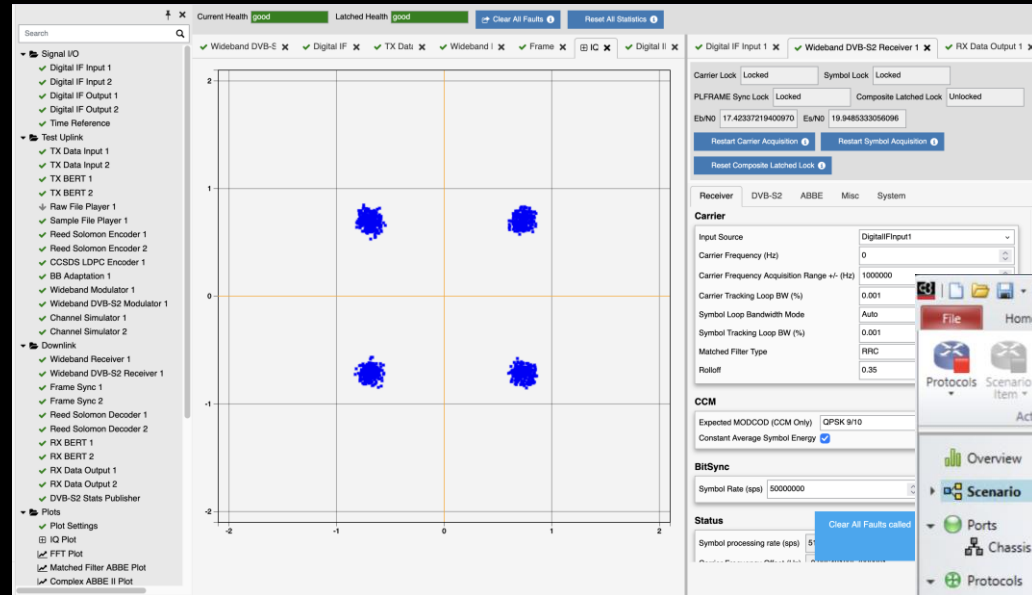


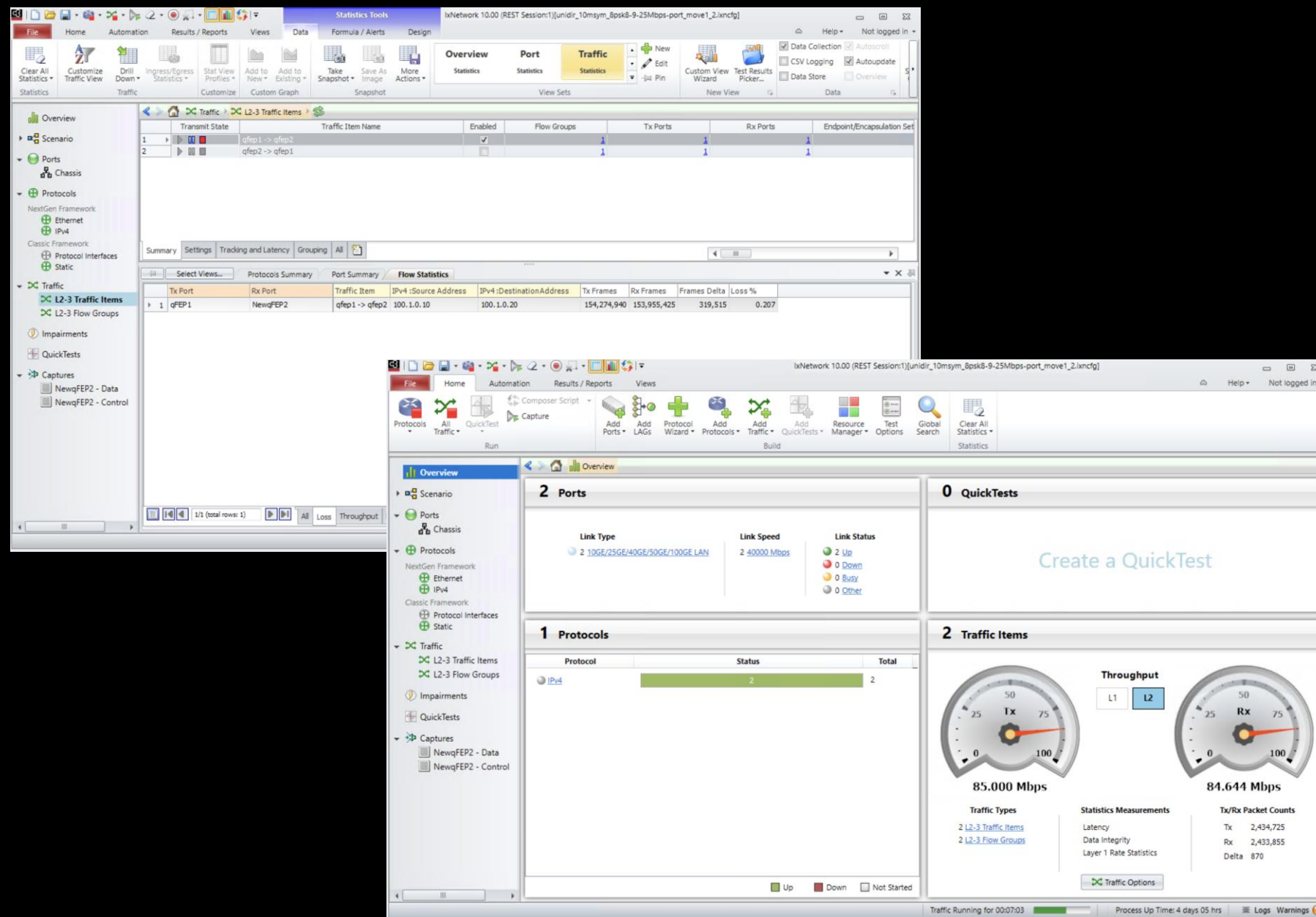
DIFI Plugfest 2026 – System 2

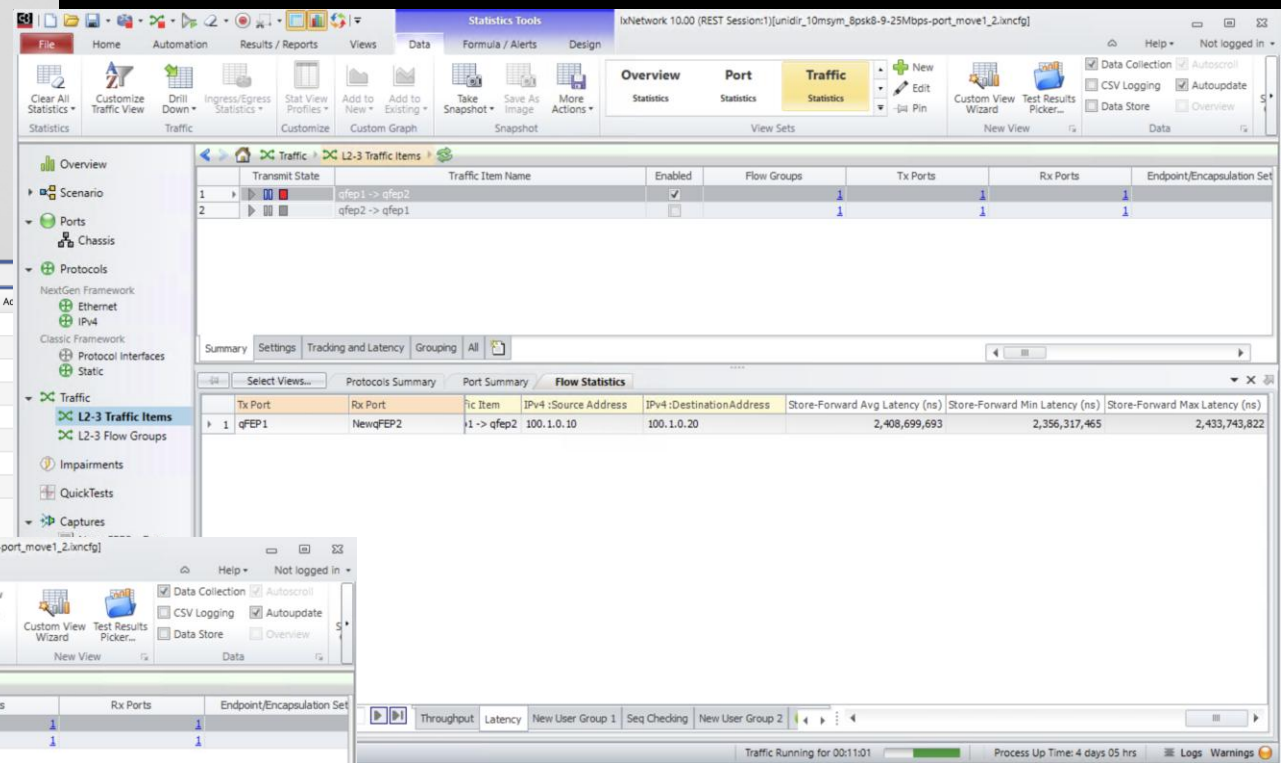
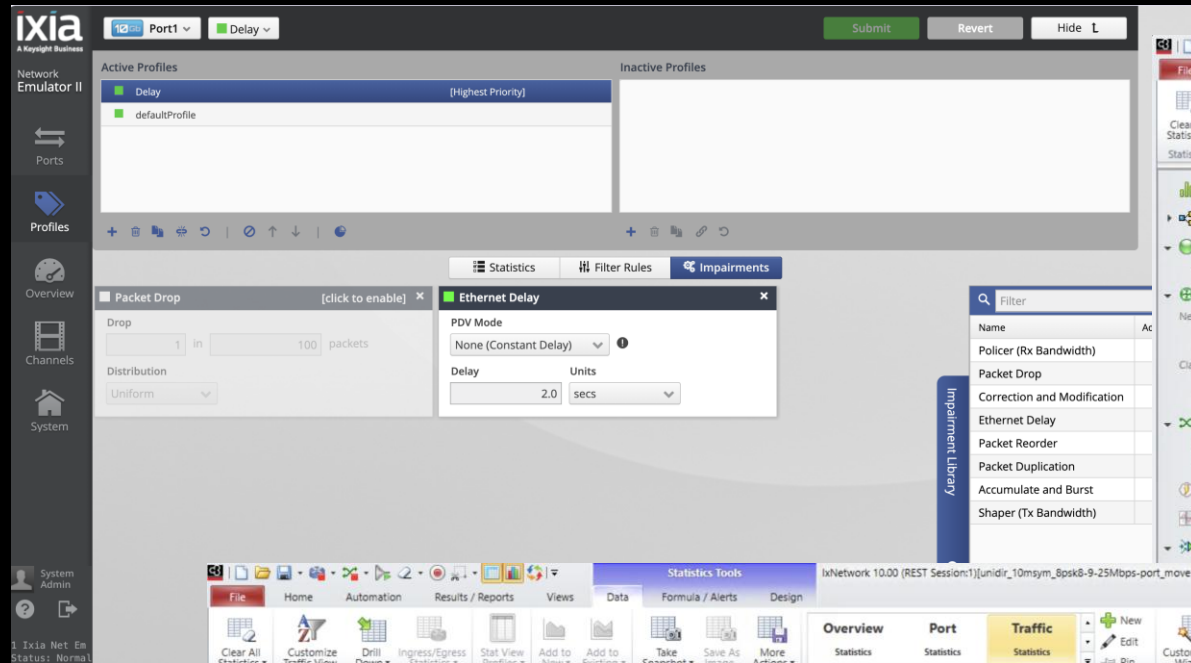


DIFI Plugfest 2026 – System 2









2 Seconds Delay

ixia
A Keysight Business

Network Emulator II

Port1 Delay

Statistics Filter Rules Impairments

Packet Drop

Drop: 1 in 100 packets

Distribution: Uniform

Ethernet Delay [click to enable]

PDV Mode: None (Constant Delay)

Delay: 5.0 Units: secs

Submit Revert Manage... 1

ixNetwork 10.00 (REST Session:1)[unidir_10msym_8psk8-9-25Mbps-port_move1_2.knctg]

Overview Port Traffic

Statistics Statistics Statistics

View Sets

Custom View Wizard Test Results Picker... Data Store Overview

File Home Automation Results / Reports Views Data Formula / Alerts Design

Clear All Statistics Customize Traffic View Drill Down Ingress/Egress Statistics Stat View Profiles Add to New Add to Existing Take Snapshot Save As Image More Actions

Overview

Scenario

Ports

Chassis

Protocols

NextGen Framework

Ethernet

IPv4

Classic Framework

Protocol Interfaces

Static

Traffic

L2-3 Traffic Items

L2-3 Flow Groups

Impairments

QuickTests

Captures

NewqFEP2 - Data

NewqFEP2 - Control

Transmit State	Traffic Item Name	Enabled	Flow Groups	Tx Ports	Rx Ports	Endpoint/Encapsulation Set
1	qfep1 -> qfep2	☒	1	1	1	1
2	qfep2 -> qfep1	☐	1	1	1	1

Summary Settings Tracking and Latency Grouping All

Select Views... Protocols Summary Port Summary Flow Statistics

Tx Port	Rx Port	Traffic Item	IPv4 :Source Address	IPv4 :Destination Address	Tx Frames	Rx Frames	Frames Delta	Loss %
1	NewqFEP2	qfep1 -> qfep2	100.1.0.10	100.1.0.20	112,374	176	112,198	99.843

1/1 (total rows: 1)

Loss Throughput Latency New User Group Seq Checking New User Group

Traffic Running for 00:22:31 Process Up Time: 4 days 05 hrs Logs Warnings



Packet Drop

Packet Drop



DIFI Testing from a Network Perspective

RF Robustness vs Network Robustness

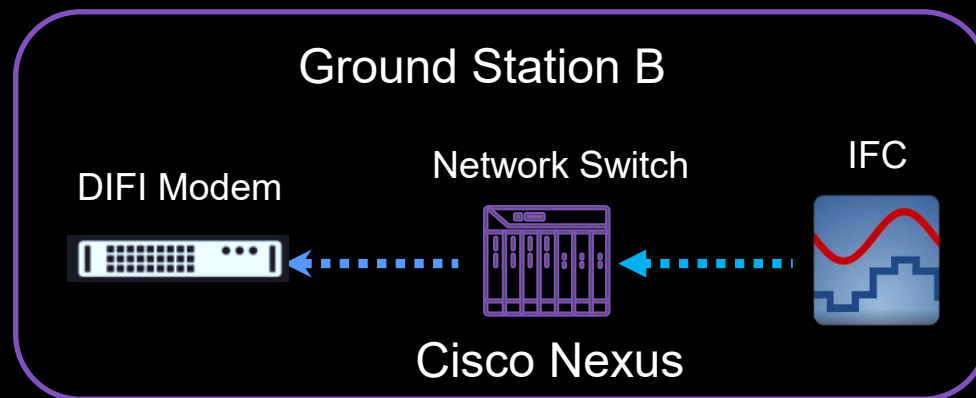
- Devices need to fully support L2/L3 protocol headers in your device, ethernet , IPv4, and IPv6.
- Does your modem or terminal have forwarding or NAT'ing capability?
- You will be unplugged!
 - Accidental disconnects (pulled cables or failed transceivers) happen quite commonly in a datacenter or NOC. Can your device recover?
- Latency is tolerated while packet loss and packet reordering is fatal. Should that be the case?
- 5 seconds of delay caused the lock to drop every 32 seconds but recovered in seconds.

Future Versions of System 2

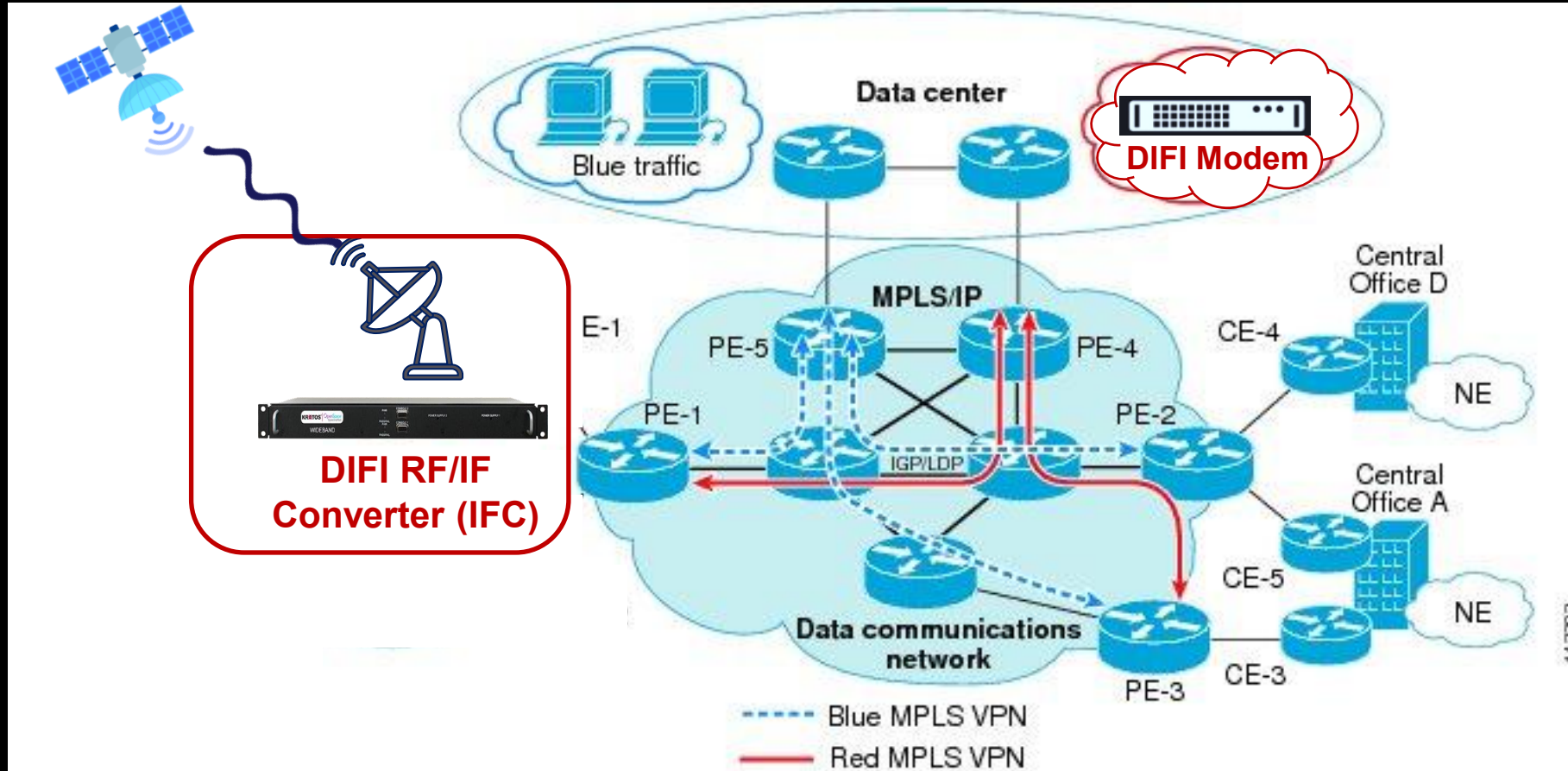
Considerations for the next iteration

- Timing and sync
 - Without a clock modems and IFCs will drift out of sync. This leads to buffers filling up over time and increased latency
- Signal interference using a generator
- DIFI Protocol fuzzing
- Forwarding capability – what speeds should expect from a SW modem in the future?
- Increased participation
 - We had 3 vendors this year Kratos, Welkins, and ETL.
 - Low participation was partly due operator bandwidth and focus e.g. – me.
- More sophisticated Network infrastructure
 - Insert a VPN between the modem and IFC.
 - What are the implications of a secure circuit augmenting the header on frames that are already close the limit of mtu size?

System2 - L2 Switching Fabric



Metro Ethernet POP Routing & Switching Fabric





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