

Communication Network for Nagothane Pipelines



Team - Pipeline Integrity
COE

Communication network for Nagothane Pipelines

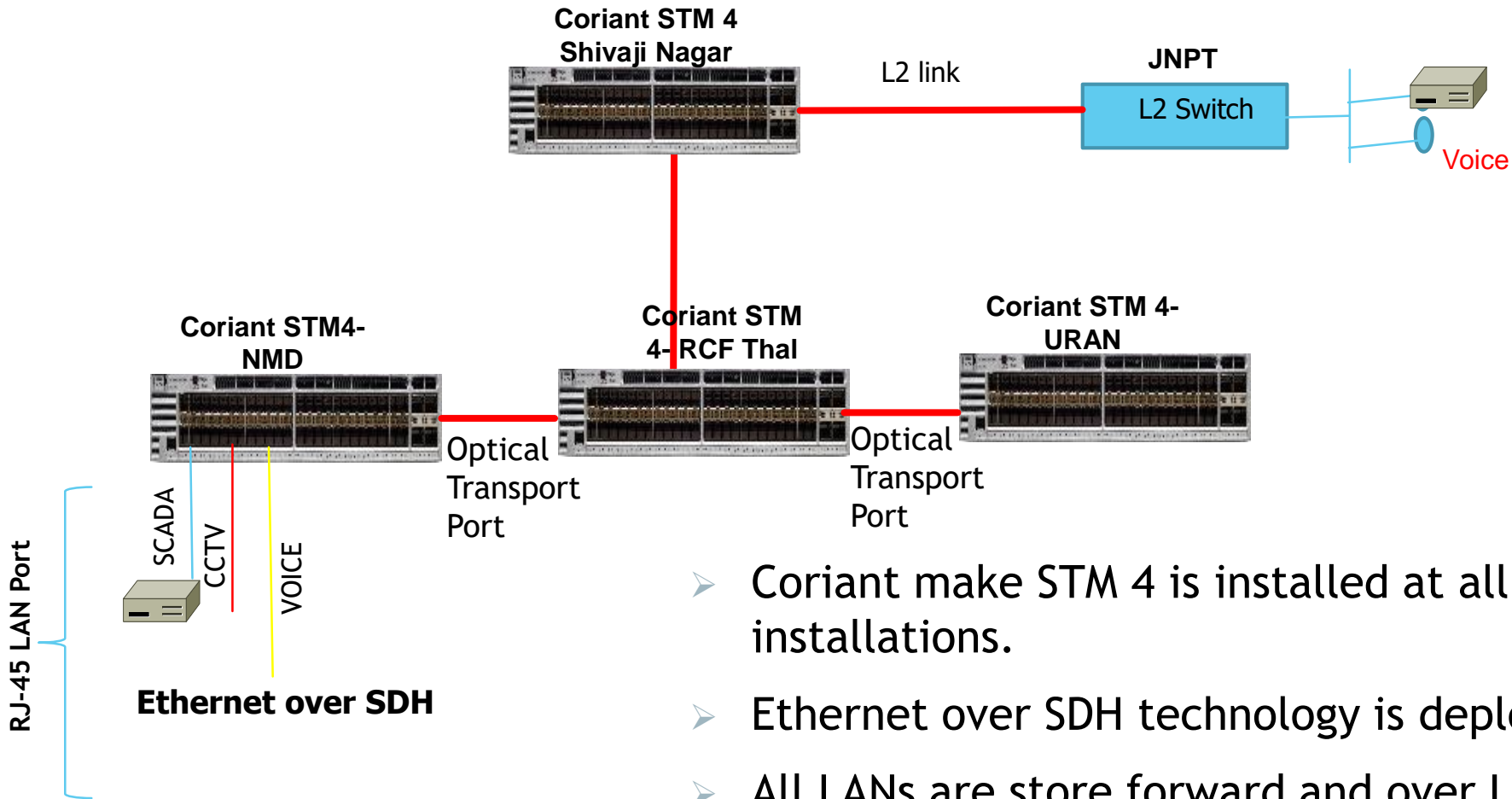
- Nagothane is operating three pipelines for daily operations.
- All Pipelines are in operational since 1991.
- Optical fiber cable laid along the pipeline during construction is also operational since then.
- Communication backbone had been commissioned over PDH link & upgraded in the year 2013.
- Communication for pipeline SCADA and Voice etc. had been active through upgraded SDH system (STM 4) since 2013.
- Existing communication backbone experienced frequent outages due to fault in OFC.
- SCADA system also becomes non-operational due to unavailability of reliable back up communication links.

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- Failure of OFC is frequent due to aging, cable sheath damage coupled with degradation of fiber health.
- System uptime gets affected due to high MTTR as caused due to hindrances by the landowners in accessing of ROU.
- To enhance reliability in pipeline remote operation and increase safety, integrity, alternate communication links had been proposed.
- L3 VPN has been suggested for deployment at all locations and work as main backbone.
- Additionally, LTE SIM card has been integrated for providing smooth back up link.
- Existing OFC link shall be adding as a 2nd back up link.

Existing Network



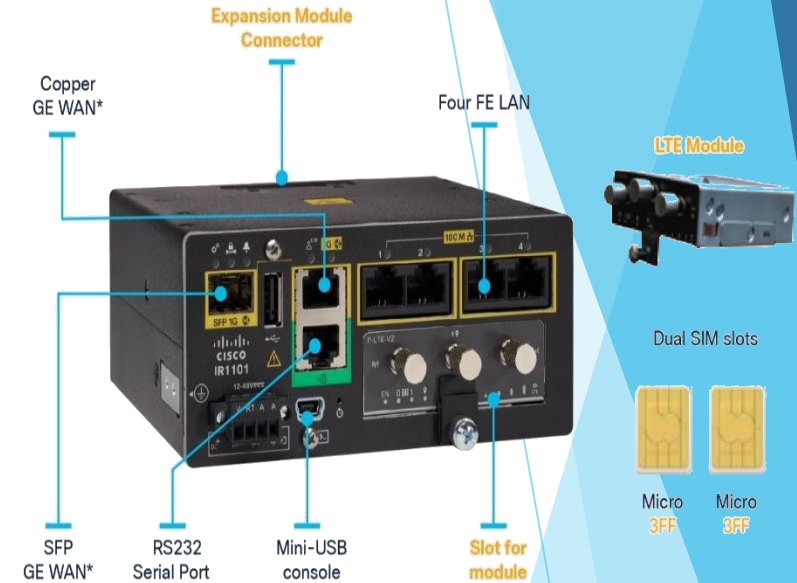
- Coriant make STM 4 is installed at all above ground installations.
- Ethernet over SDH technology is deployed for services.
- All LANs are store forward and over Layer 2.
- All LANs have logical separation and does not talk with others

New Architecture L3VPN along with LTE SIM as back up Deployed

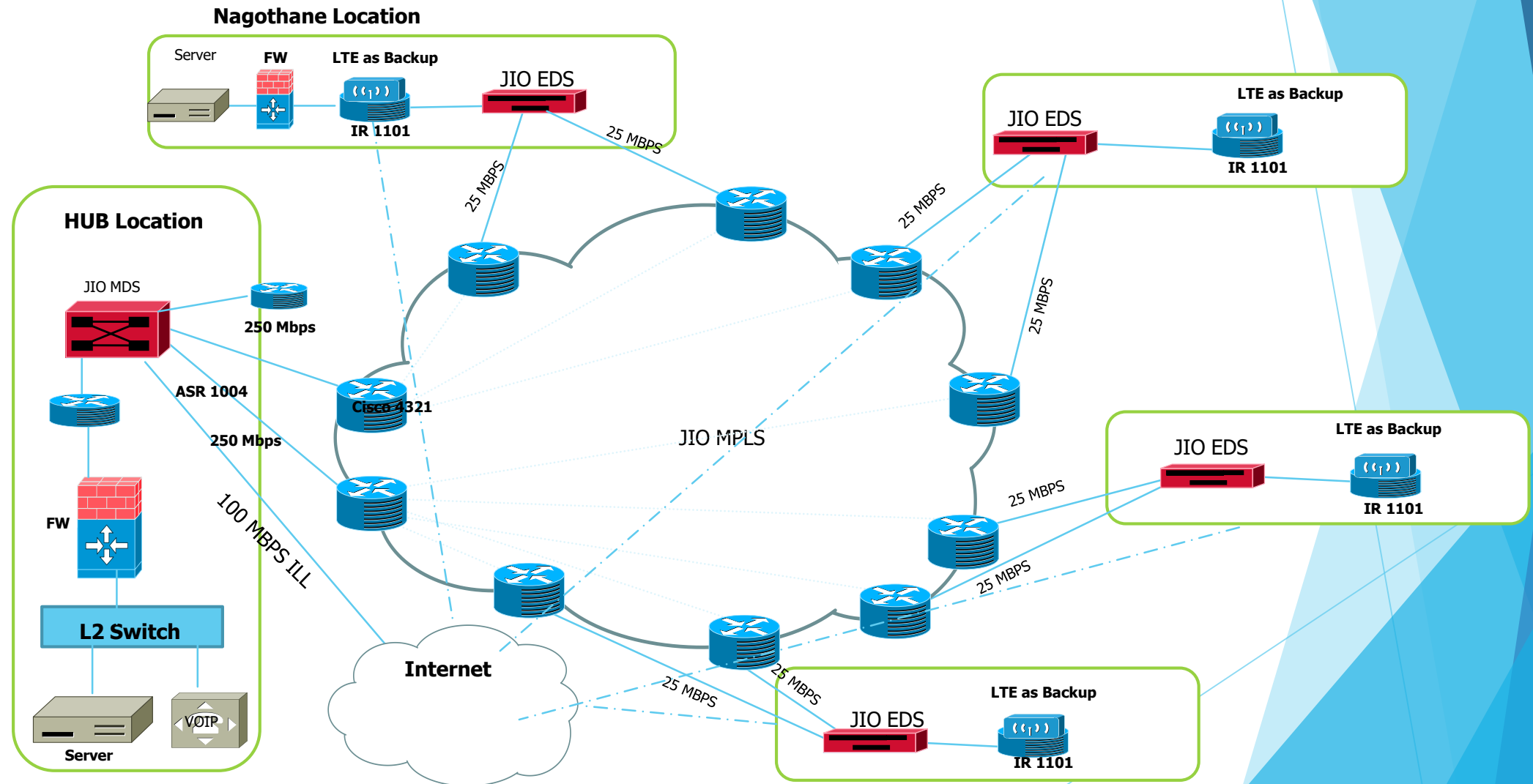
- All nodes shall be provided with Cisco IR 1101 LTE SIM capable industrial routers.
- Traffic will be running on the JIO L3VPN which has the capacity of 25Mbps.
- JNPT will be the HUB location which will have the total bandwidth of 250 Mbps.
- JNPT will also have a 100 MBPS ILL link, which will be used for LTE SIM link as failover.
- VPN will be configured from remote location to the HUB in case of JIO link failure.
- Primary Jio Leased line connectivity is catered for -SCADA, Voice, CCTV.
- Jio SIM Backup Connectivity for SCADA and Voice.
- Optical fiber link is considered as 2nd back up link.

Cisco IR 1101 5G ready Router deployed at Remote locations

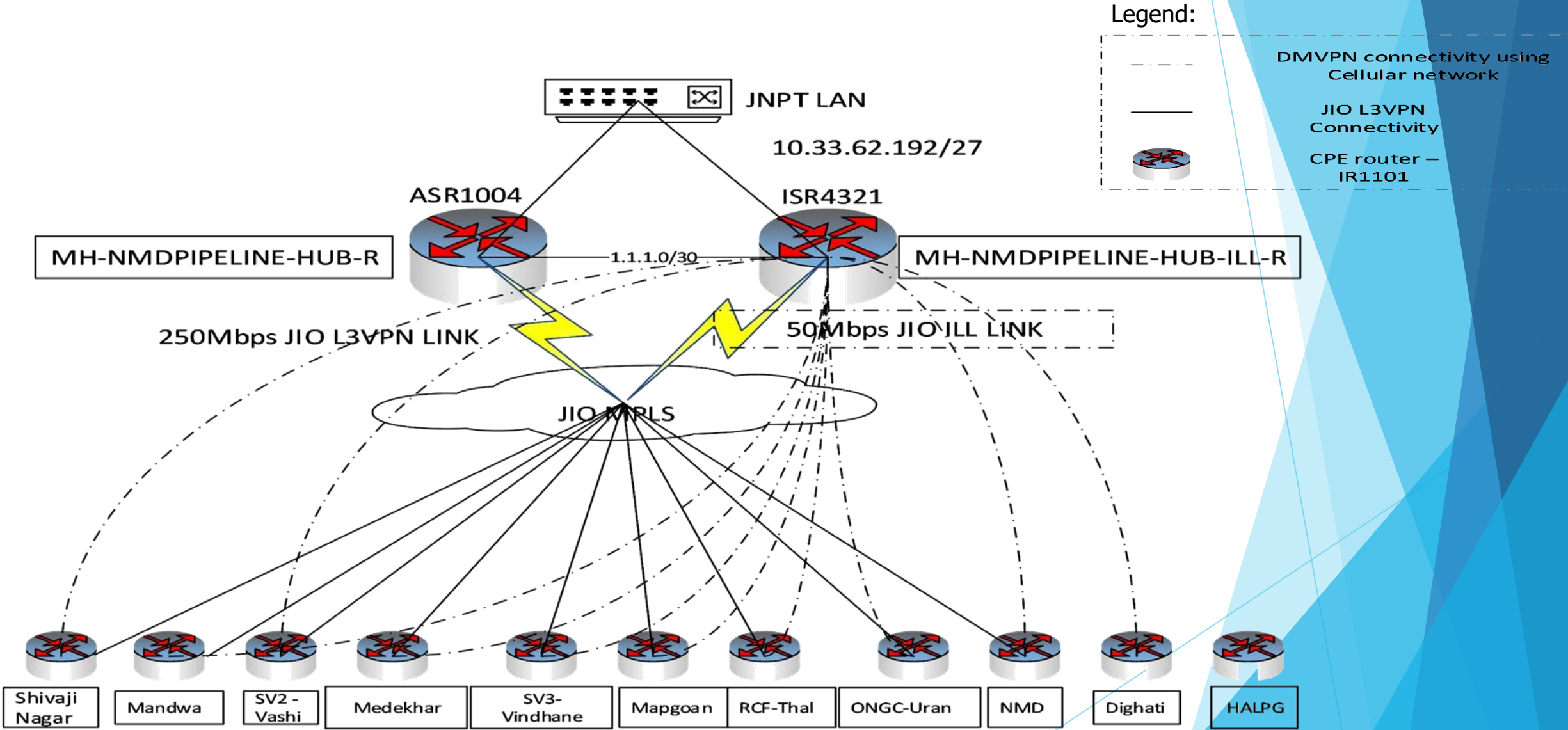
- Ruggedized, compact with low power consumption.
- This device is 5G-ready, dual WAN gigabit router.
- Software-defined WAN Cisco SD-WAN architecture delivers unified management for distributed IoT deployment.
- Open extensible platform with IOS-XE at the edge. Cisco IOS XE is highly programmable with multilayer security built in.
- Scale with choice of management.
- Scale and simplify operations. Equip communication and operations teams with powerful management tools such as IoT Operations Dashboard, Field Network Director.



Deployed L3VPN NMD Pipeline Network



Connectivity Diagram



L3 MPLS network deployed

- An MPLS cloud created by the service provider Reliance Jio for communication backbone.
- Every individual site is linked with 25MBPS MPLS link for WAN connectivity.
- Hub location is provided with larger bandwidth of 250MBPS.
- SCADA servers are placed at JNPT Hub and NMD are networked with Jio MPLS as well LTE SIM.
- There are two firewalls provided one at JNPT and another at NMD for inspection of traffic, intrusion detection and prevention.
- MPLS network is seamlessly connecting remote node with hub locations placed with SCADA servers.
- In a case any one link goes down, LTE SIM card tunnel is activated to make the connectivity with a stipulated time.
- The network is also deployed with an NMS to manage the fault and expansion whenever required.

Performance of the deployed network

- The network is deployed for a while now and all remote sites are connected to SCADA server.
- Data connectivity is not being missed even if communication link is switched over to LTE SIM channel.
- Because of superior capability of LTE SIM over 2G/3G network, the connectivity is seamless.
- Sectionalizing Valve operation, start/stop of pumps are possible with LTE SIM link.
- Hub end is provided with 100MBPS ILL to have improved connectivity and functioning very well.
- Since, leased lines from service providers are very reliable SCADA system are always operation.
- As OFC rectifications get delayed in pipeline due to ROU hindrances and opposition by landowners at numerous occasions, new system is providing more reliability in SCADA links.

Thank
You

