Ethernet Switch with Digital Diagnostics

EtherWAN Systems, Inc.

Agenda

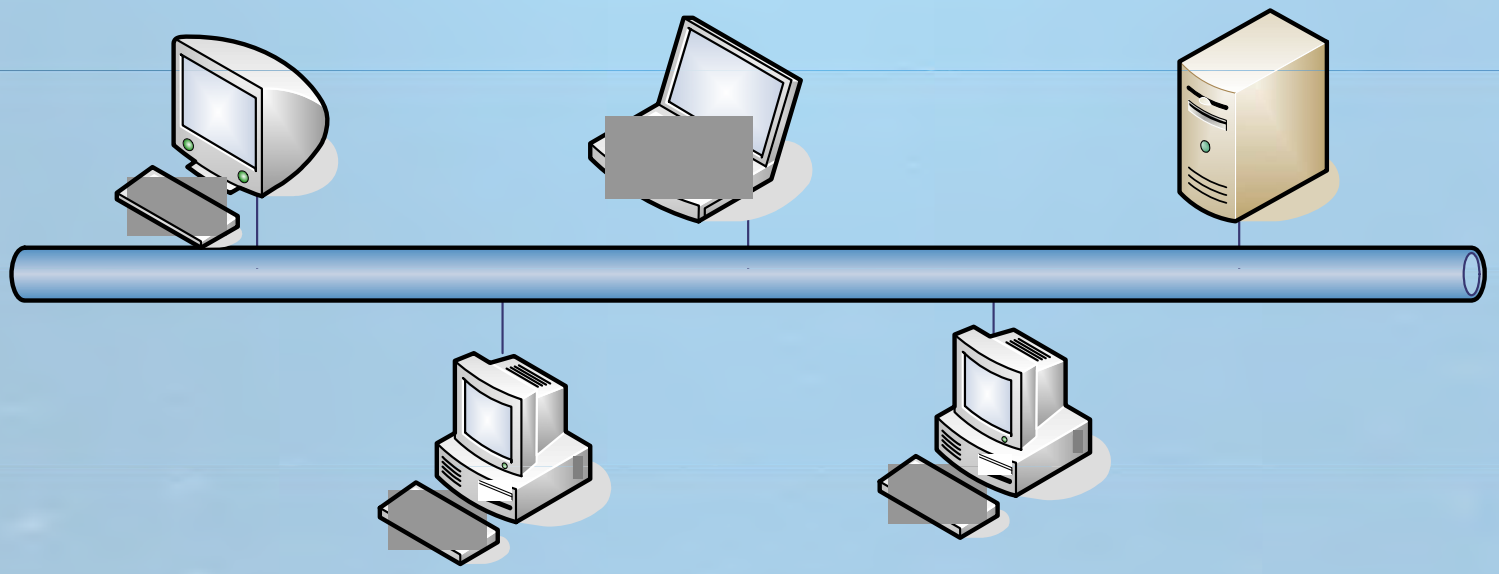
- Ethernet Overview
- Technology
  - **Protocol**
  - **Media**
  - **Addressing**
- Distributed Ethernet Network Concept
- Challenge of Distributed Networks
  - **DDM/DOM Function**
  - **Using Switch Management to measure Optical Performance**

What is Ethernet

- A communication interface specification and Protocol: IEEE 802.3 (Packet Based Communications) for computers
  - **Interface Specification:**
    - Cables, Connectors, Voltage Levels, Impedance
    - Protocol
      - A set of rules that define how two machines communicate.
      - Hardware addressing Scheme
        - » Media Access Control (MAC) Address
        - » Assigned by Manufacturer (IEEE Controlled)
- **Almost all Internet Traffic originates and ends at an Ethernet Connection (TCP/IP Protocol)**

The Original Concept

- 1973 Bob Metcalfe's Concept
- 1980 Formal Specification DEC-Intel-Xerox
- 1985 IEEE 802.3 Standard
- Single Wire Connecting All Devices in a Bus
- Listen – Talk – If Collision / Back Off – Try Again

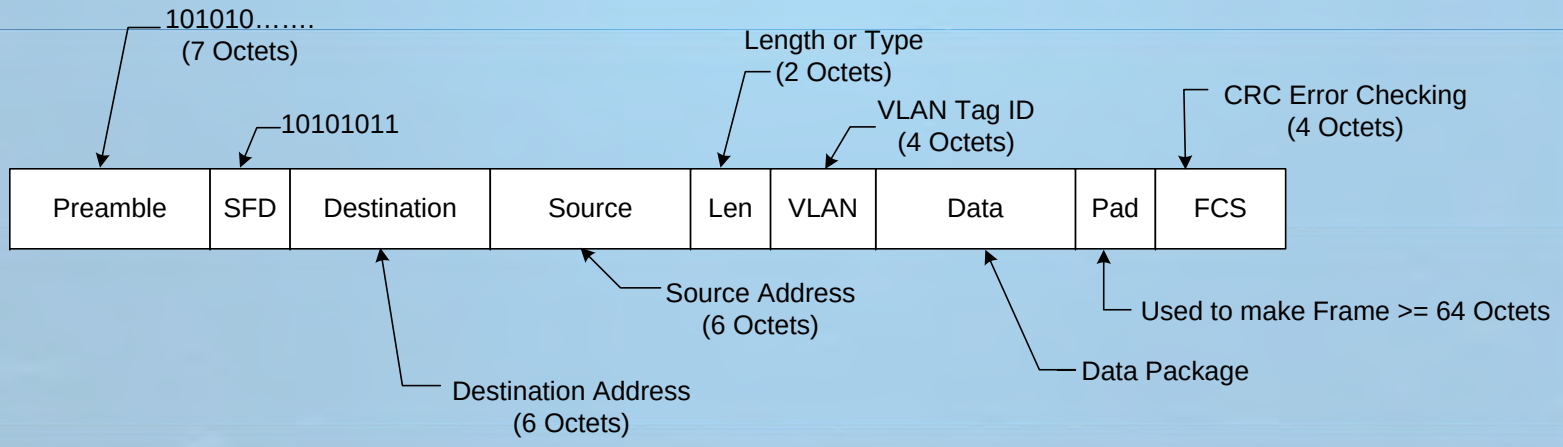


Media for Ethernet Networks

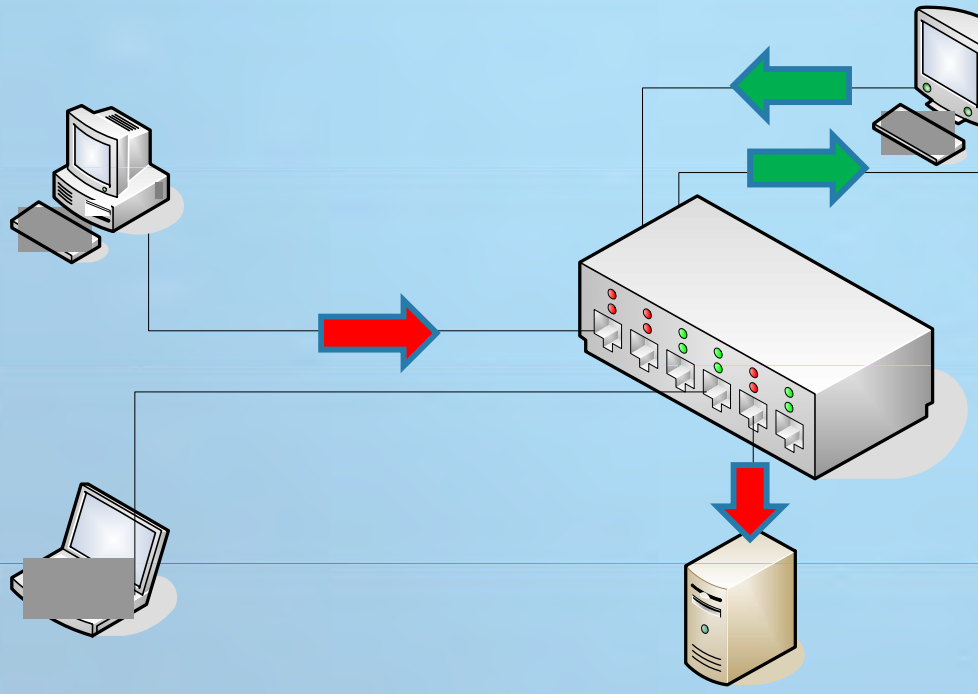
- Category 5, 5e & 6 Unshielded Twisted Pair
- Category 7 Shielded Twisted Pair
  - **100 m**
- Fiber Optics:
  - **Multi-mode**
    - Connectors – SC, ST, LC, MTRJ, VF45
    - 2km 100 Mbps
    - 220 m to 1100 m Gigabit
  - **Single Mode**
    - Connectors – SC, ST, LC, FC
    - > 100 km 100 mbps or Gigabit
- Wireless

Ethernet Addressing Scheme

- MAC address (Media Access Control)
  - **48 bits (6 Bytes)**
  - **Hardware Address Assigned during manufacturing**
  - **Unique for each Ethernet Device**
  - **Assigned by IEEE Organization**



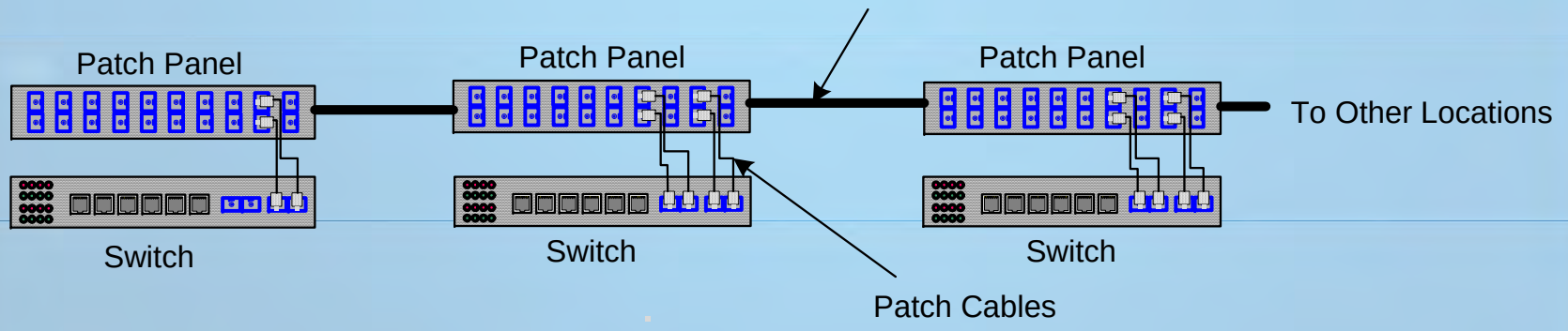
What is Ethernet



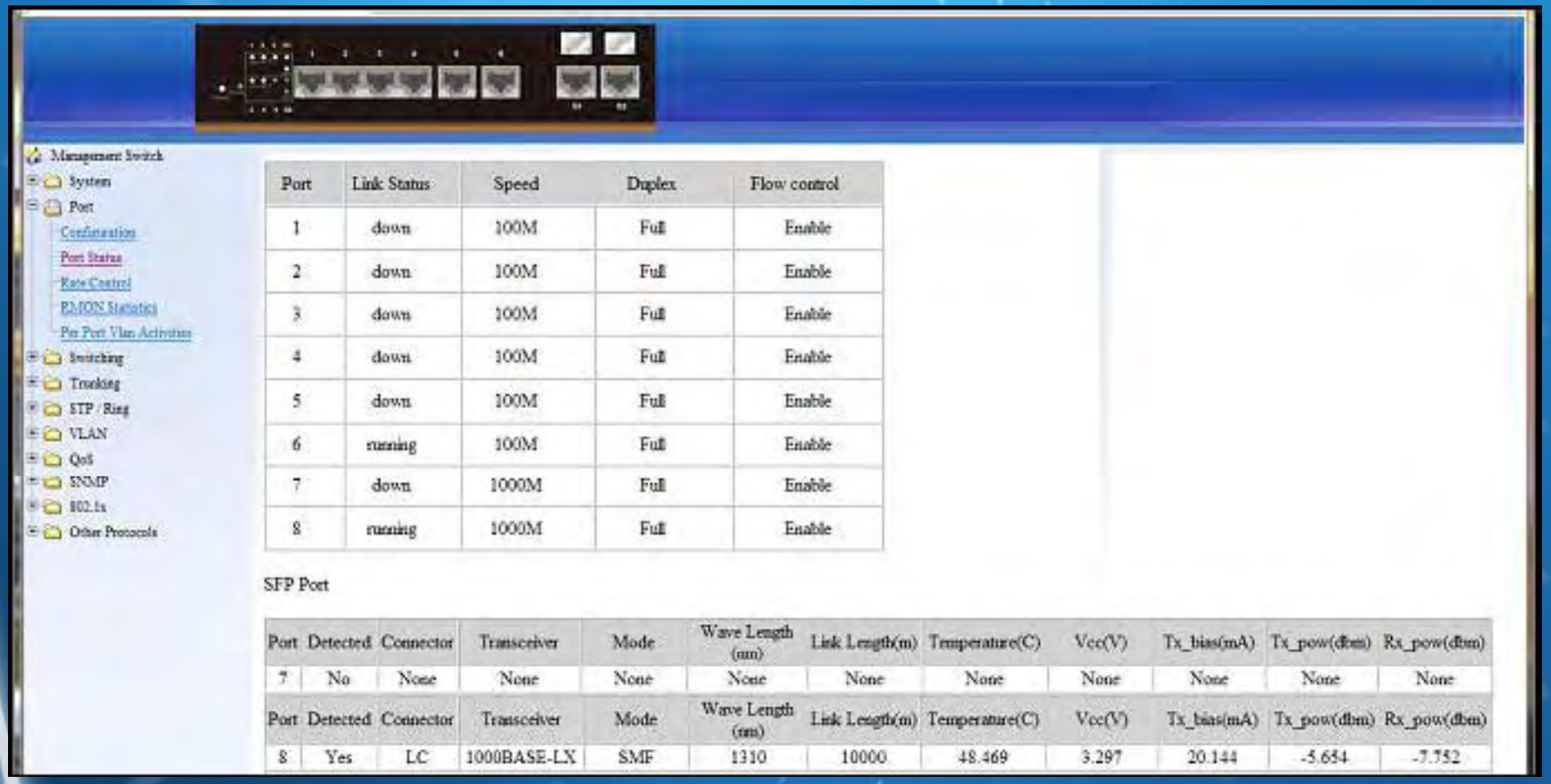
- Star Topology
- Twisted Pair
- Operates on MAC
- Full Duplex
- No Collisions
- Full Speed

Distributed Network Challenge

- Fiber Optic Cable Plant
  - **Patch Cables**
  - **Patch Panel**
  - **Splices**



DDM/DOM Output Screen

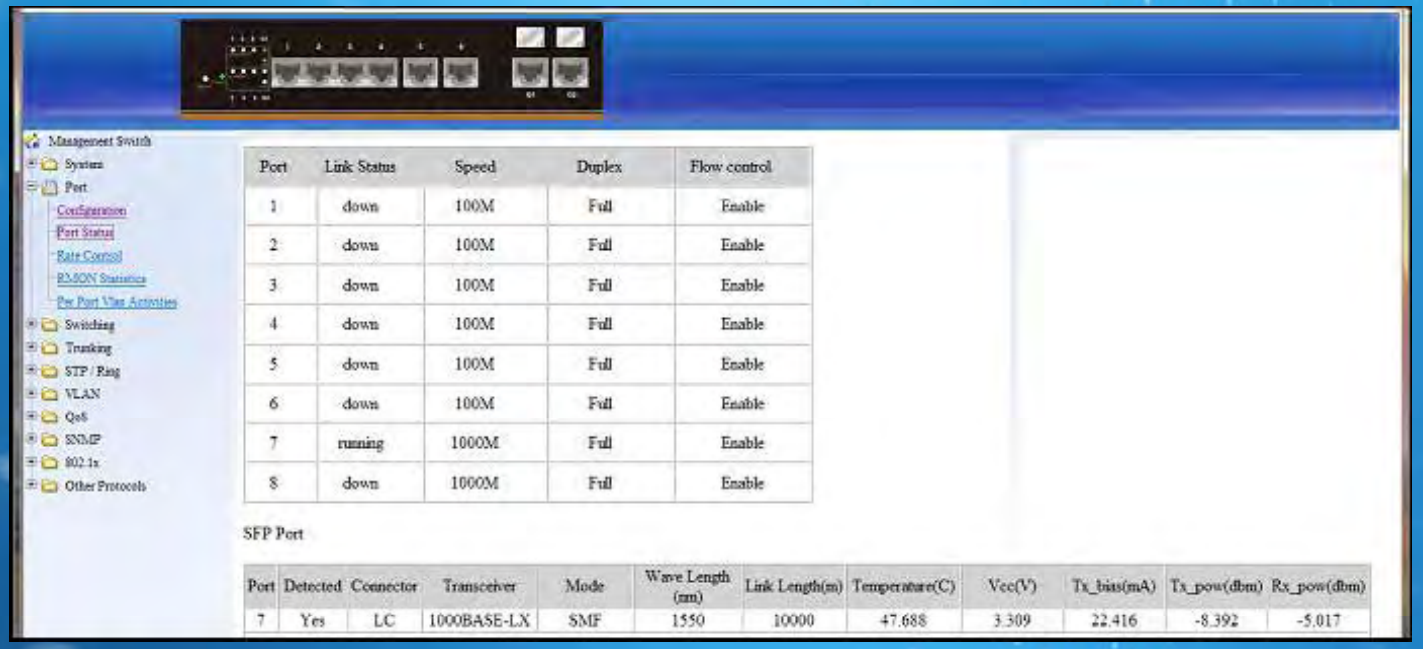


Port	Link Status	Speed	Duplex	Flow control
1	down	100M	Full	Enable
2	down	100M	Full	Enable
3	down	100M	Full	Enable
4	down	100M	Full	Enable
5	down	100M	Full	Enable
6	running	100M	Full	Enable
7	down	1000M	Full	Enable
8	running	1000M	Full	Enable

SFP Port

Port	Detected	Connector	Transceiver	Mode	Wave Length (nm)	Link Length(m)	Temperature(C)	Vcc(V)	Tx_bias(mA)	Tx_pow(dbm)	Rx_pow(dbm)
7	No	None	None	None	None	None	None	None	None	None	None
Port	Detected	Connector	Transceiver	Mode	Wave Length (nm)	Link Length(m)	Temperature(C)	Vcc(V)	Tx_bias(mA)	Tx_pow(dbm)	Rx_pow(dbm)
8	Yes	LC	1000BASE-LX	SMF	1310	10000	48.469	3.297	20.144	-5.654	-7.752

Comparison SW1 to SW2



Management Switch
- System
- Port
  - Configuration
  - Port Status
  - Rate Control
  - RMON Statistics
  - Per Port Vlan Activities
- Switching
- Trunking
- STP / Ring
- VLAN
- QoS
- SNMP
- 802.1x
- Other Protocols

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7	running	1000M	Full	Enable
8	down	1000M	Full	Enable

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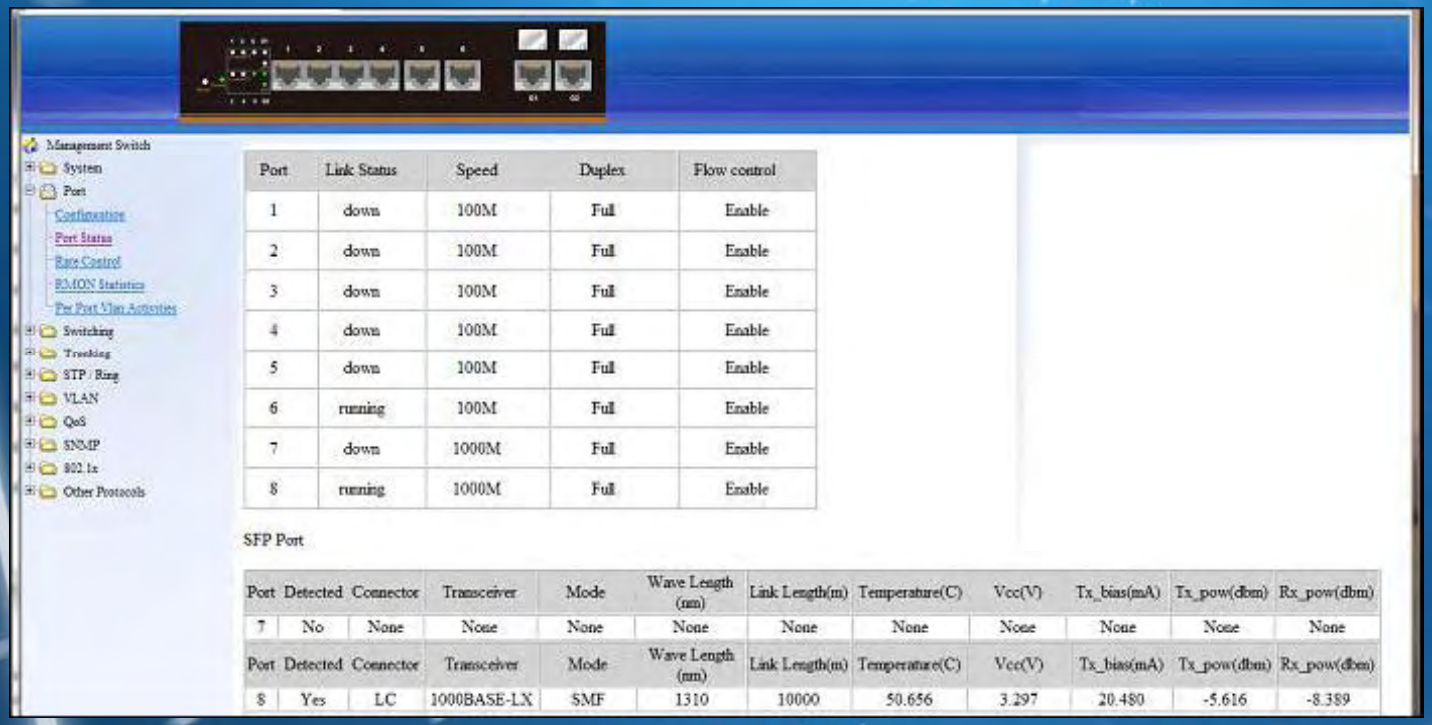
7	Yes	LC	1000BASE-LX	SMF	1550	10000	47.688	3.309	22.416	-8.392	-5.017



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8	Yes	LC	1000BASE-LX	SMF	1310	10000	50.656	3.297	20.480	-5.616	-8.389

Loose Fiber Optic Connector

Switch 2 Screen with Loose Connector

SFP Port

Port	Detected	Connector	Transceiver	Mode	Wave Length (nm)	Link Length(m)	Temperature(C)	Vcc(V)	Tx_bias(mA)	Tx_pow(dbm)	Rx_pow(dbm)
7	No	None	None	None	None	None	None	None	None	None	None
Port	Detected	Connector	Transceiver	Mode	Wave Length (nm)	Link Length(m)	Temperature(C)	Vcc(V)	Tx_bias(mA)	Tx_pow(dbm)	Rx_pow(dbm)
8	Yes	LC	1000BASE-LX	SMF	1310	10000	50.906	3.295	20.416	-5.654	-22.366

Switch 1 Screen with Loose Connector on Switch 2

SFP Port

Port	Detected	Connector	Transceiver	Mode	Wave Length (nm)	Link Length(m)	Temperature(C)	Vcc(V)	Tx_bias(mA)	Tx_pow(dbm)	Rx_pow(dbm)
7	Yes	LC	1000BASE-LX	SMF	1550	10000	47.688	3.309	22.416	-8.392	-5.017

DDM/DOM Benefits

- Track Optical Interface Performance
  - **Perform Preventative Maintenance**
    - Less down time
- Trouble Shoot Fiber Cable Plant Anomalies on a Live Network
  - **Centralized trouble shooting from Management System**
    - Fewer Truck Rolls
    - Less Expensive
    - Safety
  - **Less Intrusive Troubleshooting**

EtherWAN

THANK YOU

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