Cisco optical solution overview and update

Jaromír Pilař
Consulting System Engineer, CCIE #2910
Cisco footprint in optical networking

- Market entrance in 1999 through Pirelli, Cerent and Monterey acquisition
- Cisco continues in investment into advanced optical technology
  - CoreOptics acquisition to obtain coherent optical technology (CP-QPSK) and MLSE
  - Massive investment Cisco ONS 15454 MSTP future functionality including 100 Gbps technology and beyond
- Flexible, zero-touch optical networking
  - Market leader in two degree and multi degree ROADM technology and packet optical transport
  - Support for omni-directional and colorless ROADM available
  - Automated optical control plane in the roadmap
- Tight integration with core routing, Metro Ethernet and TDM technology
  - IPoDWDM technology for close integration of core routing with Cisco ONS 15454 MSTP or 3rd party optical transport system
  - Xponder technology for Metro Ethernet integration
  - MSPP on the Blade for integrated TDM solution
- High quality planning and management tool
  - Comprehensive design and validation tool available to customers (Cisco Transport Planner)
  - Enhanced craft terminal for initial setup and deployment (Cisco Transport Controller)
  - Advanced management suite (Cisco Transport Manager)
Cisco ONS 15454 MSTP

Platform introduction and overview
Cisco ONS 15454 MSTP
Fully reconfigurable, intelligent DWDM platform

• Carrier Class DWDM Transport
  • Combines TDM, Ethernet, SAN and video services (fully integrated with Cisco ONS 15454 MSPP)
  • Originally introduced in 2003 as advanced metropolitan DWDM platform (broad services range, 800 km reach)
  • Through several releases evolves into platform covering all requirements for enterprise BC/DR solutions, metropolitan DWDM networks and LH applications (2300 km in release 9.2)

• Flexible optical networking platform
  • Cost effective Reconfigurable Optical Add/Drop Multiplexers (ROADM) with support for optical mesh
  • Full band Tunable 10G Lasers, modular client interfaces
  • Tight integration with IP core routers (IPoDWDM strategy)

• Future proof extensible platform
  • Up to 112 wavelengths available for the platform today
  • Support for 40 Gbps transport, 100 Gbps demonstrated in public
  • Further developed to extend the reach and functionality
  • High level of investment protection
Cisco ONS 15454 MSTP
Examples of installations in Central and Eastern Europe

- Hansapank Estonia
- KPSI – Regional Government Poland
- Hungarian PTT National backbone
- Czech Republic (NREN)
- Sloane Park Czech Republic
- Elekto Maribor Slovenia
- Slovanet Slovakia
- Energotel Slovakia
- OSE (Greek Railways) National Backbone
- UMC – Mobile SP National Backbone
- UComLine – Ukrainian Challenger National Backbone
- KievStar – Mobile SP National Backbone
- Datacom – Ukrainian Challenger National Backbone
- UkrTelecom – Ukrainian PTT National Backbone
- ComBridge – Romania
- Bulgarian Telecom (BTC) National Backbone
- 6Tm
Cisco ONS 15454 MSTP

System performance, topologies and supported interfaces
Cisco ONS 15454 MSTP Chassis (ETSI) - M12

- BITS IN/OUT
- Serial/Modem
- Alarm Inputs/Outputs
- LAN
- Power A
- Power B
- 100MB User Channel RJ-45
- LAN
- Optional Alarm Interface Card
- Shelf Processor A
- Shelf Processor B
- OSCM or XC
- OSCM or XC
- TXP/MXP/XP, EDFA, RAMAN, ROADM, OADM, OSC-CSM
- FMEC slots

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New smaller chassis - M6 and M2

New MSTP Chassis - R9.2

- MSTP Line card Backward Compatibility (SM-ROADM, OTU2-XP, 10G DME, Ethernet-XP, etc...)
- Improved Cooling
- Integrated OSC
- Integrated Multi-Shelf Management
- Integrated Database Back-Up
- Both ANSI & ETSI compliant
- Both AC & DC Power Options
- >50% Footprint Reduction

6 Slot ONS 15454 MSTP

2 Slot ONS 15454 MSTP
Cisco ONS 15454 MSTP release 9.2: 
Network Topologies (examples w/o RAMAN)

- Ring
- Single span point to point
- Multi span point to point (bus)
- Optical mesh - manually patched (OIC) or using WXC (OXC)
Cisco ONS 15454 MSTP - native client support
Wide range of telco and enterprise client interfaces

- **BENEFIT**: High flexibility in system deployment, most of applications covered
- **BENEFIT**: Broad range of potential service offerings
- **BENEFIT**: 40Gbps support allows for further bandwidth scaling

### TDM
- STM-1
- STM-4
- STM-16
- STM-64
- STM-256
- OTU-2
- OTU-2e
- OTU-3
- E1
- E3

### Data
- E
- FE
- GE
- 10 GE LAN PHY
- 10 GE WAN PHY
- 40 GE

### Storage
- 1G FC/FICON
- 2G FC/FICON
- 4G FC/FICON
- 8G FC/FICON
- 10G FC/FICON
- ESCON
- ISC 1
- ISC 3
- Sysplex CLO
- Sysplex ETR
- STP
- 5G Infiniband

### Video
- DV-6000
- HDTV
- SDI
- D1 video
- DVB ASI

### 2R
- Any rate from 100 Mbps to 2.5 Gbps
WDM system anatomy – transponder based system

GE

ATM

ESCON/FC

'Grey' MM/SM 850/1310/1550 nm

ITU-T Grid for CWDM or DWDM

OEO = transponder

Optically Amplified Wavelengths

Optical Amplifier

WDM Mux (Filter)

OEO

Wavelength Multiplexed Signals

Primary functions:
- wavelength conversion
- G.709 encapsulation
- FEC/EFEC
- protocol monitoring
- service demarcation point
- OFC
Cisco ONS 15454 MSTP
2.5Gbps Service Cards

- Simple planning, sparing, and ordering with multi-rate, multiprotocol and pluggable optics
- Optical, G.709 and payload monitoring
- FEC support at 2.5Gbps transponder
- G.709 support, trunk lasers 400GHz tunable in 100GHz grid
- Client 1+1, Y-cable and splitter protection
Cisco ONS 15454 MSTP
10Gbps Service Cards

- All 10G applications covered by 1 transponder,
- Aggregation cards reduce the cost of service delivery
- Full C-band or L-band tunability - 80 channels @ 50GHz spacing
- FEC and EFEC support (G.975, G.975.1), G.709 support
- Optical, G.709 and payload monitoring, Client 1+1, Y-cable protection and 'splitter' (XP)
- MLSE support for PMD challenged fiber
Pluggable client interfaces

*Integrating flexible core with cost effective edge*

<table>
<thead>
<tr>
<th>Type/category</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey optics 850 nm SFP</td>
<td>1000BaseSX, MMF FC clients</td>
</tr>
<tr>
<td>Grey optics 1310 nm SFP</td>
<td>1000BaseLX, SDH SR/IR clients, FC SMF clients</td>
</tr>
<tr>
<td>Grey optics 1550 nm SFP</td>
<td>1000BaseZX, SDH LR clients</td>
</tr>
<tr>
<td>Grey optics 850 nm XFP</td>
<td>10GE, 10G FC</td>
</tr>
<tr>
<td>Grey optics 1310 nm XFP</td>
<td>10GBaseLR, 10G FC, STM-64</td>
</tr>
<tr>
<td>Grey optics 1550 nm XFP</td>
<td>10GBaseER/EW, STM-64 LR</td>
</tr>
<tr>
<td>CWDM client optics</td>
<td>GE, 1/2G FC, STM-16</td>
</tr>
<tr>
<td>DWDM client optics</td>
<td>GE, 1/2G FC, STM-16, 10GE, 10G FC, STM-64, OTU-2</td>
</tr>
<tr>
<td>Electrical client SFP</td>
<td>10/100/1000BaseT for GE Xponder</td>
</tr>
</tbody>
</table>

- **BENEFIT:** Lower opex through common sparing with other Cisco products
- **BENEFIT:** Per port reach and rate selection
- **BENEFIT:** Tight integration of CWDM and DWDM from network perimeter
- **BENEFIT:** High transponder reusability for different services

40Gbps transport
What is the market demand?

Compatibility with existing 10G systems.

New modulation formats are needed!

Modulation Attributes

Amplitude
- NRZ
  - CS/RZ
  - PSBT

Phase
- DPSK
- DQPSK
- QPSK

Polarization
- PM-2X^a

^a Where 'X' can be DPSK, DQPSK, QPSK, etc.
# 40Gbps transport

## Technology options

<table>
<thead>
<tr>
<th>Parameter</th>
<th>10G NRZ</th>
<th>ODB</th>
<th>DPSK</th>
<th>DQPSK</th>
<th>CP-DQPSK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required OSNR B2B (dB)</td>
<td>5</td>
<td>13</td>
<td>8.5</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Reach (km)</td>
<td>&gt;2000</td>
<td>&gt;500</td>
<td>&gt;1000</td>
<td>&gt;1000</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>50 GHz Compatible</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Chromatic Dispersion Robustness with 1 / 2 dB of OSNR margin (±ps/nm)</td>
<td>500/800</td>
<td>250</td>
<td>650</td>
<td>750</td>
<td>20,000</td>
</tr>
<tr>
<td>PMD Robustness with 1 / 2 dB of OSNR margin (ps)</td>
<td>10 / 14</td>
<td>2.5</td>
<td>2.5 / 3.5</td>
<td>5 / 8</td>
<td>&gt; 25</td>
</tr>
<tr>
<td>Complexity</td>
<td>LOW</td>
<td>LOW</td>
<td>LOW</td>
<td>MEDIUM</td>
<td>HIGH</td>
</tr>
</tbody>
</table>
DQPSK – 4-Level Phase Modulation

- Four “signal points” are used
- This way, each “phase”, or “signal point”, carries two bits
CP-DQPSK Solution

Dual Polarization DQPSK with Coherent Detection

**Transmitter:** Two QPSK signals are muxed in polarization

![Diagram showing CP-DQPSK solution](image)

- **Laser**
  - 10Gb/s input to QPSK1 Modulator
  - 10Gb/s input to QPSK2 Modulator

- **QPSK1 Modulator**
  - 10Gb/s output

- **QPSK2 Modulator**
  - 10Gb/s output

- **10Gb/s = 10Gbaud**

- **40Gb/s**

- **Same Optical Bandwidth as a 10G NRZ!!**

- **20Gb/s**

- **10' 00' 11' 01'**

- **40Gb/s = 10Gbaud**

- **10Gbaud signal propagate into the fiber as a 10Gb/s signal**
Coherent Detection and Post Processing

- RX Laser serves as Local Oscillator to provide a polarization and phase
- 90° Hybrid converts phase modulation in amplitude modulation
- Coherent receiver with Digital Signal Processing (DSP):
  - Synchronizes to carrier frequency and phase electronically
  - Recovers Polarization electronically
  - Compensates CD and PMD electronically

Key Benefits:
- ~3dB better noise tolerance vs. conventional (~2x distance)
- Can compensate huge amounts of dispersion (>200x more than conventional)
- Usable for 40Gbps and 100Gbps, can scale to higher speeds
Cisco ONS 15454 MSTP
40 Gbps Service Cards

OTN

SONET/SDH

Ethernet

SAN

OTU-3

STM-256/OC-768

40 GE CBR

4x10Gb OTU-2
4x10Gb OTU-2e

40Gb Transponder CP-DQPSK

4x STM-256/OC-768

4x10GE

40Gb Muxponder RZ-DQPSK/CP-DQPSK

4x STM-256/OC-768

4x10G FC
4x8G FC
Journey towards 100Gbps

- 100GE commercial availability expected ~ 2010
- 100G DWDM interface expected within following 12 months
- Initial deployment will be limited to Core IP backbone network
- Customer can anticipate the deployment for other applications only if pricing will provide better trade off respect 40G
- Same requirements for interoperability with existing systems built for 10G transmission
- Standardization effort in IEEE and ITU-T
Cisco ONS 15454 - 100Gbps program

- CP-DQPSK Modulation, 50,000ps/nm CD robustness, 30ps PMD robustness
- 100Gbps transmission will leverage on 3 cards that can be differently combined:
  - 100GE/OTU-4 Full C band tunable Line Card
  - 10x10G Client Line Card
  - Mixed 40G/10G Client Line Card
- Common development between DWDM Optical team (ONS), ASR and CRS
- The 3 units can be placed in M2 or M6 and chassis
WDM system anatomy – colored client signals

Client equipment

ITU-T Grid for CWDM or DWDM

Wavelength Multiplexed Signals

Optically Amplified Wavelengths

Optical Amplifier

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Cisco ONS 15454MSTP multivendor interoperability
Alien wavelength support

Available options:

• Colored pluggables:
  • DWDM XENPAK, X2, XFP
  • DWDM GBIC, SFP
• DWDM line cards (e.g. from MSPP)
• IPoverDWDM interfaces
• Generic signal (e.g. from 3rd party)

1. Technology:
   • Transmitter characteristics:
     • Modulation format: NRZ / ODB
     • Transmitter type: MZ / DML / EML
   • Receiver characteristics:
     • Receiver Threshold: Opt / Avg
     • no-FEC / FEC / E-FEC
     • 2R / 3R

2. Bit Rate
4. TX Optical Output Power Range: $P_{\text{min}} \div P_{\text{max}}$ [dBm]
5. TX Wavelength Stability: $[\pm \text{pm}]$
6. Chromatic Dispersion Robustness
7. Scale Factors: F-PPL, F-POL, F-OSNRPL, F-OSNROL
8. Gaussian X-Talk-penalties

- BENEFIT: High degree of interoperability with 3rd party equipment
- BENEFIT: Lower cost per channel where transponder is not needed
Cisco ONS 15454 MSTP - support for both options
Advanced monitoring functionalities
*Monitoring of multiple levels of communication*

- Optical parameters
  - signal levels
  - laser bias

- OTN
  - G.709
  - FEC/EFEC statistics

- Payload specific
  - RMON like information for ethernet
  - 8B/10B, running disparity for FC
  - SDH specific
  - others (ESCON, ...)
Automatic Power Control

*The tool for keeping the network operational and stable*

- Keep either power or gain constant on each amplifier
- Avoid BER or non linear effect
- APC automatically starts when network detects needs for a gain correction
- No human intervention required
- Correct amplifier power/gain
  - whenever the # of channels changes
  - to compensate ageing effects
  - To compensate changing in operating conditions (e.g. temperature increase)

**BENEFIT: Automatic reaction of network to fast and slow changes in the network**
Cisco ONS 15454 MSTP

Muxponding, crossponding and MSPP integration
Flexible muxponding
Effective use of bandwidth by Cisco ONS 15454 MSTP

<table>
<thead>
<tr>
<th>2.5G DM</th>
<th>10G DME(X)</th>
<th>40G MXP</th>
<th>4xSTM-16 -&gt; OTU2 Muxponder</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 8 ports</td>
<td>• 8 ports</td>
<td>• 4 ports</td>
<td>• 4 ports</td>
</tr>
<tr>
<td>• GE</td>
<td>• GE</td>
<td>• 10GE</td>
<td>• STM-16 clients</td>
</tr>
<tr>
<td>• 1/2G FC</td>
<td>• 1/2/4G FC</td>
<td>• 8/10G FC</td>
<td>• ODU1 into OTU2</td>
</tr>
<tr>
<td>• 1/2G FICON</td>
<td>• 1/2/4G FICON</td>
<td>• 8/10G FICON</td>
<td></td>
</tr>
<tr>
<td>• ESCON</td>
<td>• ISC-1, ISC-3</td>
<td>• STM-64</td>
<td></td>
</tr>
<tr>
<td>• signal mix supported</td>
<td>• signal mix supported</td>
<td>• OTU-2, OTU-2e</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• signal mix supported</td>
<td></td>
</tr>
</tbody>
</table>

- **BENEFIT:** Better lambda capacity utilization
- **BENEFIT:** Higher service density and flexibility

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### Ethernet enabled DWDM

**Solution components - GE/10GE XP/XPE**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
</table>
| **GE crossponder** | • 20x GE ports (UNI)  
• 2x 10GE ports (NNI) |
| **10GE crossponder** | • 2x 10GE ports (UNI)  
• 2x 10GE ports (NNI) |

**Features**

- Smart optical ring protection based on G.709 overhead (sub 50 ms)
- Configurable as muxponder, transponder, 10GE regenerator and in L2 switch mode
- SFP for GE ports
- XFP for 10GE ports (DWDM or 'grey')
- Can interoperate with IPoDWDM card in routers
- Enhanced version available in release 9
Cisco ONS 15454 MSTP flexible optical networking

**MSPP on the blade**

### HW features
- 16 SFP Based Client (Grey and CWDM optics available)
- Support of OC-3/OC-12/OC-48 and GE client signals
- 1 Trunks XFP Based supporting E-FEC/FEC and G.709
- 2 SR XFP supporting redundancy connection with protection board and Pass-through Traffic
- GFP-F Mapping

### SW features
- OTN PM on Trunk
- A to Z Circuit provisioning (STS layer)
- SONET PM (B1, B2 on Trunk and aggregate) and Alarm Management (Line, Section and Path)
- Ethernet RMON statistics
- UPSR Protection on Trunk
- 1+1 APS on Client

- **BENEFIT:** Better lambda capacity utilization
- **BENEFIT:** Higher service density and flexibility
- **BENEFIT:** Compact MSPP integration
Cisco ONS 15454 MSTP

Reconfigurable OADM
Reconfigurable optical add/drop multiplexers

Evolution steps

- Basic implementation
  - 2° ROADM
  - Multidegree ROADM (optical mesh)

- Enhanced functionality
  - Omnidirectional
  - Colourless
  - DWDM aware control plane

- Integration and space/power efficiency
  - Single module ROADM
Increasing flexibility of optical networks

What is a ROADM?

- ROADM (Reconfigurable Optical Add & Drop Multiplexer) is an optical Network Element able to Add/Drop or Pass through any wavelength composing the DWDM spectrum
  - A ROADM is typically composed by 2 line interfaces and 2 Add/Drop interfaces

- Typical ROADM implementations have Add/Drop interfaces dedicated to a direction
  - As a side-effect, if it is required to reconfigure the connection to drop the channel from a different side the new channel is sent to a different physical port: this would require to manually change the cabling of any connected client equipment
What is an Omnidirectional ROADM?

Omnidirectional ROADM functionalities can, again, be understood comparing it with a Directional ROADM.

- A Directional ROADM always add/drop a given wavelength from/to a given Line Side: channel #1 is always dropped from West Side.
- If it is required to reconfigure the connection to drop the channel from a different side the new channel is sent to a different physical port: this would require to manually change the cabling of any connected client equipment.

A Omnidirectional ROADM, on the contrary, can be reconfigured to drop ANY wavelength from ANY Line Side:

- For instance we can start dropping the red wavelength from the West Side.
- and reconfigure the ROADM to drop the red wavelength from the East Side on the same port.
- No re-cabling is required.

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What is a Colourless ROADM?

Colourless ROADM functionalities can be understood comparing it with a Coloured ROADM:

- A *Coloured* ROADM always add/drop a given wavelength from/to a given port: channel #1 is always dropped on port #1.

- If it is required to reconfigure the connection to drop a different wavelength (i.e. channel) the new channel is sent to a different physical port: this would require to manually change the cabling of any connected client equipment.

A colourless ROADM, on the contrary, can be reconfigured to drop ANY wavelength on ANY port:

- For instance we can start dropping the green wavelength.
- and reconfigure the ROADM to drop the red one on the same port.
- No re-cabling is required.
Single Module ROADM (SMR)

- **Next Generation ROADM Technology**
  - Hyper Integration:
    - Booster
    - Preamplifier
    - Wavelength crossconnect
    - OSC add/drop
    - Integrated Optical Channel Monitoring
  - Consumes ~40% less Power
  - Address terminal, 2\(^0\), 3\(^0\) and 4\(^0\) ROADM applications
  - 15454-40-SMR1-C=
    - 40chs Degree-2 ROADM with integrated Pre-Amplifier.
  - 15454-40-SMR2-C=
    - 40chs Degree-4 ROADM with integrated Booster & Pre Amplifier

- **Attractive pricing with PAYG bundles**
Cisco ONS 15454 MSTP: Comprehensive design tool - Cisco Transport Planner

- GUI-based Network Design Entry
- Traffic requirements:
  - Any-to-Any Demand provided by ROADM
  - Point-to-point demands
- Comprehensive Analysis checks for:
  - wavelength routing and selection
  - optical budget and OSNR
  - CD, PMD, amplifier tilt etc.
- Smooth Transition from Design to Implementation
  - Bill of Materials
  - Rack Diagrams
  - Step-by-Step Interconnect

BENEFIT: Fast and comprehensive network design
Cisco ONS 15454 MSTP flexible optical networking

Automatic Node Setup

**BENEFIT:** Fast network deployment and setup
Cisco ONS 15454 MSTP: Management Applications Options

- **Cisco Transport Controller (CTC)**
  - Installation and setup
  - Full node/ring management capability

- **Cisco Transport Manager (CTM)**
  - EMS/NMS layer applications for advanced optical management
  - CORBA/TL1 and SNMP NBI available for OOS integration

- **Cisco Transport Planner**
  - Network design
  - Network modelling
  - Computer-aided installation: from network design straight to installation

- **OSMINE completed**
  - TIRKS, NMA and TEMS
Cisco Transport Controller
Views & Navigation

Multi-Shelf or Node/NE View
Shelf View*
Network View
Card View

* If the top-level node view is a single shelf (not multi-shelf) this is referred to as Node/NE View
Cisco Transport Controller
Alarms Pane

The image displays the Alarms Pane of the Cisco Transport Controller software. The pane shows a network topology with various network elements such as ncp53, ncp51, and ncps22, connected by lines indicating network paths. The alarms are listed in a table format, showing details such as the date, time, node, alarm type, and description. The alarms include issues like Lack of Connection between Node and LCT, Loss of Signal, and Protection Unit Not Available.
WDM Span Check (Non-Raman link)
1. From Network, NE, Shelf, or Card view > Circuits tab click the Create button to bring up the Circuit Types window… Select a circuit type and click Next to bring up the Circuit Attributes window…

2. OCHCC example… from Circuit Attributes user can choose protocol type, data rate, wavelength, protection option, and the final service state of the circuit and interface ports… then Click Next…
3. Choose Source and Destination: The circuit attributes chosen previously act as a filter... only nodes with cards having the selected attributes will be available as sources and destinations. If there is more than one card in the node with the selected attributes they will all be available as choices...

4. Choose trunk attributes (if different from current). These changes cannot be made on the interface if the trunk port is in IS state...

Indicates the entry/exit points of the circuit to/from the node, based on interface slot/port chosen.

enable/set revert time for protection
5. The Circuit Routing Preferences screen evaluates the default route (blue arrows) through the network based on the chosen source and destination and allows the user to choose an alternate route (mesh only) by including or excluding nodes. Once nodes are chosen the changes must be applied (Apply) and CTC will attempt to evaluate a new route…

6. Once the desired route is chosen just click Finish and the circuit is activated and shows in CTC Circuit list…
**DWDM Functional View**

- Available since 8.5
- Displays logical port connections between Amp, Filter, and OSC units for all available optical sides, based on internal connections list
- Useful for understanding optical signal flow
- Show TX/RX power on a connection
- Rearrange card and link objects
ROADM Power Monitoring

- Available since release 4.7. Accessed in NE View > Maintenance > DWDM > ROADM Power Monitoring
- In ROADM and Mesh nodes using 32/40-WSS or 40-WXC it provides capability to monitor the DWDM signal presence and equalization for each optical side separately
- Also available for TERM sites (later releases) and Dynamic Gain Equalization sites
- Color-coded to identify signal origin / optical side
- Color key for **multi-degree** indicates the cross-connected optical side…

Place cursor over colored area on bar to retrieve wavelength and associated signal power

A signal shown on optical side A graph which is cross-connected from side B would show a bar with top part in blue as shown (multi-degree only)
For DWDM filters, amplifiers, and OSC units an 8-hour (15 min intervals) / 2-day (1 day intervals) optical power history showing min/max/average power (dBm) for the period is available for each port on the card. This is available in Card View > Performance. All PM history can be exported in excel or html format.

Select a port to monitor on the card, then Refresh

For DWDM filters, amplifiers, and OSC units real-time power values are available in Card View > Provisioning.

Real-time dBm values
Performance Monitoring (PM) / Interfaces (TXP, MXP, etc)

Real-time values for each port can be viewed from **Current Values** tab.

15 min period
Database Backup and Restore

Use the database backup utility to back up all provisioning on the node...

Use the database restore utility to restore shelf, card, port, and circuit provisioning. The “Complete Database” option restores settings such as node name and IP settings, otherwise these are not restored...

The database can be also be restored to default using a special re-initialization utility on the Cisco ONS 15454 System Software CD. This will undo all provisioning and cross-connects on the node.
Q & A