

Ethernet over CWDM

Managed Coarse Wave Division Multiplexing

- Supports up to 16 discrete wavelengths
- "Drop and Pass" or "Drop and Add" capabilities
- Managed Gig-E and 100Mbps optical links



R4000 with 8-Channel Multiplexer Module and 4-Channel Multiplexer Module with Expansion Port



R4000 with Drop and Add OADM Module

Metrobility's Ethernet over Coarse Wave Division Multiplexing (EoCWDM) solution combines passive optical CWDM technology with Radiance Access Line Cards and Gigabit Ethernet line cards and superior network element management through NetBeacon® Element Manager to achieve maximum flexibility, scalability, and manageability. This combination creates a robust and flexible *managed* point-to-point or ring network solution. Metrobility's CWDM solution is ideal for applications where dedicated bandwidth, enhanced diagnostics, and a secure PON connection are required on a single fiber pair.

The CWDM network provides a cost-effective "no new fiber upgrade" solution for adding a new Ethernet service backhaul for the new broadband services.

Multiplexing and optical add/drop capabilities

Metrobility's **EoCWDM solutions** allow users to increase the capacity of existing fiber by utilizing widely spaced, separate wavelengths - between 1350nm and 1610nm - within the same fiber pair. These CWDM solutions can support up to 16 different channels, each carrying either 100Mbps or 1Gbps of bandwidth, and is accomplished through the expansion port on the 4-channel multiplexer. The expansion port allows additional unique wavelengths to be combined on a single fiber pair by 'chaining' multiplexers prior to the final network connection.

'Drop & Add' and 'Drop & Pass' modules provide the ability to terminate ("Drop") one or more of the wavelengths from the fiber locally and allows the other wavelengths to continue ("Pass") to other nodes. Similarly, the "Drop and Add" ability allows a wavelength to be added ("Add") from a local fiber interface and allows the other wavelengths to continue ("Pass") to other nodes.

Provider-facing interface

Metrobility **line cards** installed in a managed Metrobility R5000 chassis which support the ITU CWDM wavelength grid provides the interface to the service provider's switch. Each line card connects to a **multiplexer module** in the **R4000 chassis**. Each connection in the R5000 can be managed at a central management station through Metrobility's management card and NetBeacon Element Management software.

Subscriber-facing interface

The **R4000** chassis can support up to two (2) **multiplexer modules**. Each module provides either four (4) or eight (8) discrete wavelengths for subscriber connections. These wavelengths are combined, or multiplexed, onto a single fiber pair to the external network. Multiple modules may be linked through the expansion port to increase wavelength capacity to a total of 16 on a single fiber pair.

Subscriber site

An **R4000** with an **OADM module** or **4-channel multiplexer** at the subscriber site provides the "drop and pass" or "drop and add" capabilities. "Drop and pass" extracts (de-multiplexes) the assigned wavelengths and relays the remaining channels to the next destination creating a point-to-point optical link from the subscriber site to the central locations. "Drop and Add" inserts a wavelength onto the link to create a point-to-point link from one site to another.

The R4000 connects to the subscriber's network through a complementary line card mounted in any Radiance chassis. The line card provides either a copper or fiber connection to local switch.

The Metrobility® Difference

Management capabilities when configured with a managed R5000:

IEEE 802.3ah feature-ready (Access Line Card and Optical Network Units)

Advanced diagnostics:

- Optical Power Measurement
- Remote Loopback
- Quality of Line
- Quality of Equipment
- Link Loss Return
- Link Loss Carry Forward
- Far End Fault

Central Office Options

- Gigabit Ethernet
- 100Mbps
- 2-U, 17-slot chassis
- AC or DC power

Customer Premise Options

- Gigabit Ethernet
- 100Mbps Ethernet
- 10/100Mbps Ethernet
- 1-U, 2-slot chassis
- Standalone units

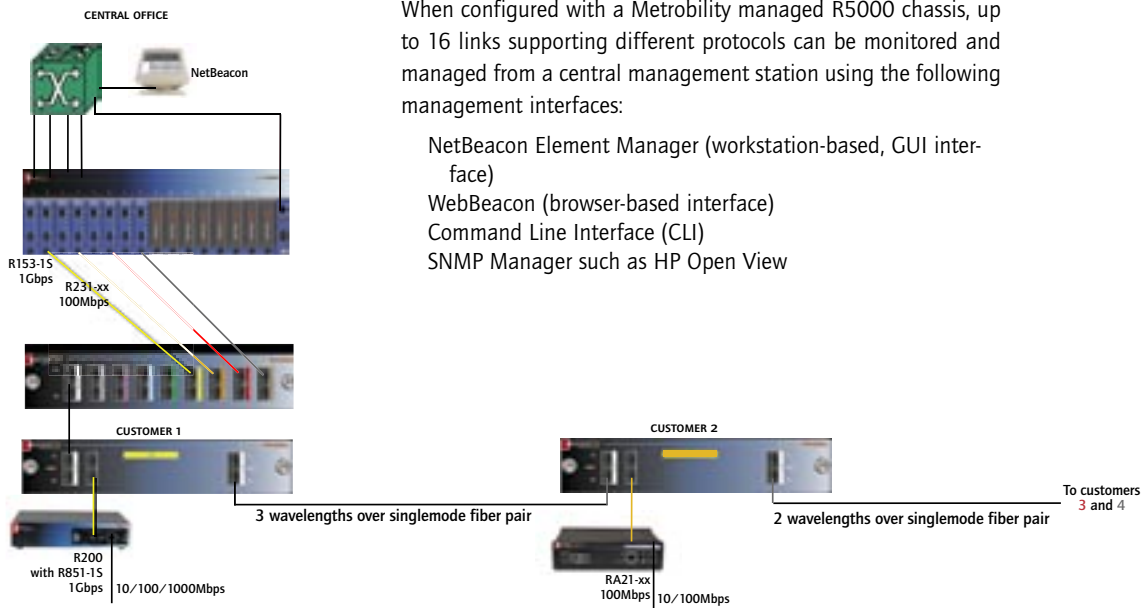
Product Highlights

ITU G.694.2 CWDM wavelength grid with a spacing of 20nm:

1310nm	1470nm
1330nm	1490nm
1350nm	1510nm
1370nm	1530nm
1390nm	1550nm
1410nm	1570nm
1430nm	1590nm
1450nm	1610nm

CWDM Configurations

Drop and Pass



When configured with a Metrobility managed R5000 chassis, up to 16 links supporting different protocols can be monitored and managed from a central management station using the following management interfaces:

- NetBeacon Element Manager (workstation-based, GUI interface)
- WebBeacon (browser-based interface)
- Command Line Interface (CLI)
- SNMP Manager such as HP Open View

Customer 1

Gig-E from CO to 10/100/1000Mbps at CP

- 802.3ah Compliant
- Field upgradable
- Remote site management:
 - Remote loopback
 - RMON statistics
 - Voltage and temperature
 - Optical power
- SFP pluggable optic for flexible inventory options

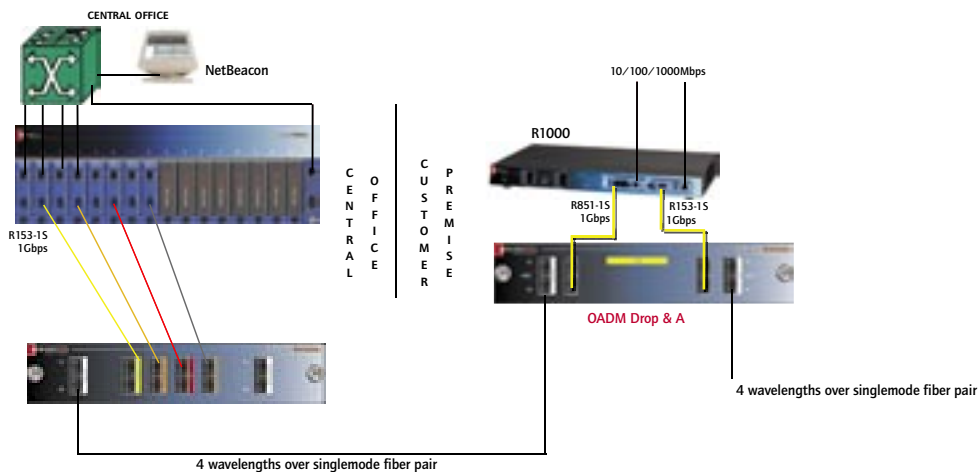
Management capabilities are dependent on individual line card features

Customer 2

100Mbps from CO to 10/100 at CP

- Remote site management
- Remote loopback
- Temperature
- Voltage and Power
- RMON 1 Statistics
- Historical Database
- Fixed optics

Drop and Add



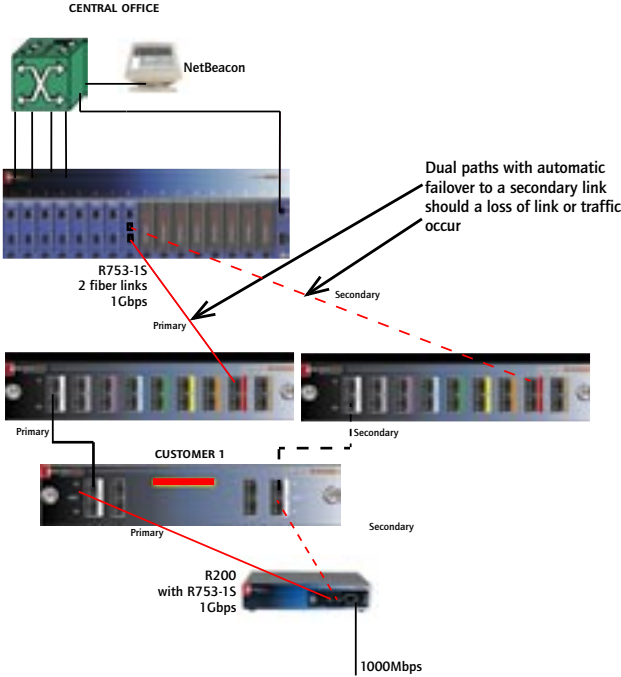
Line Protection and Restoration

Ensuring High Availability

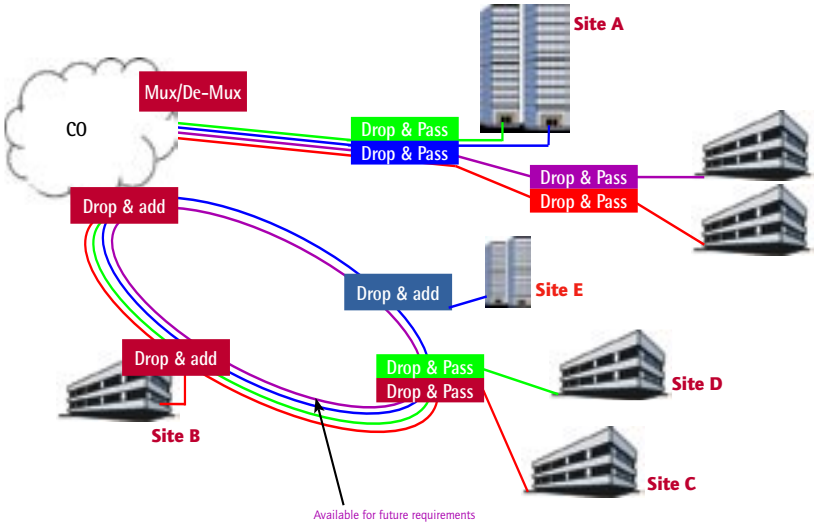
With multiple customers on a single link, the need to safeguard data becomes more critical and makes redundancy a key component of any CWDM system. In a CWDM network, this involves the use of dual links for fast failover and backup.

Metrobility's patented line protection and restoration (LPR) interface line cards offer redundant data paths to prevent data loss due to cable failure, port failure, or catastrophic switch failures.

This physical layer solution is able to isolate failures with a faster recovery time and is simpler to implement when compared to using Spanning Tree protocols.



Remote Terminals



- **Site A** has 4 point to point connections from the Central Office to a high rise office building. In this case two wavelengths are dropped at the office building and the remaining two continue to two other locations.
- **Site B** is on a fiber ring with the red wavelengths that connects to the Central Office and a second red wavelength creating a point to point connection between Site B and Site C.
- **Site D** is connected to the Central Office on the green wavelength.
- **Site E** is connected to the Central Office on both the East and West side of the ring on the blue wavelength.
- In the ring configuration, the **violet** wavelength is not used. If a new point to point or ring application is being added in the local area, new local equipment is installed and an available CWDM wavelength, in this case violet, is then used to provide the service.

R4000 Options

4 channel multiplexer (A) 1550nm, 1570nm, 1590nm, 1610nm 1 Expansion port (SC)	4 channel multiplexer (C) 1390nm, 1410nm, 1430nm, 1450nm 1 Expansion port (SC)
4 channel multiplexer (B) 1470nm, 1490nm, 1510nm 1530nm 1 Expansion port (SC)	4 channel multiplexer (D) 1310nm, 1330nm, 1350nm, 1370nm 1 Expansion port (SC)

Model Description

R4000-02	19", 1U Rack Mount Chassis for CWDM multiplexer and OADM modules
RM-1000	Extension for 23" Rack

Multiplexer Modules (SC connectors)

R416-A4-A	4-Channel CWDM mux/de-mux module (1550, 1570, 1590, 1610 nm)
R416-A4-B	4-Channel CWDM mux/de-mux module (1470, 1490, 1510, 1530 nm)
R416-A4-C	4-Channel CWDM mux/de-mux module (1390, 1410, 1430, 1450 nm)
R416-A4-D	4-Channel CWDM mux/de-mux module (1310, 1330, 1350, 1370 nm)
R416-B4	8-Channel CWDM mux/de-mux module (1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610 nm)

Single Channel OADM Modules

R426-D4-31	1310nm drop & pass module	R436-J4-31	1310nm drop & add module
R426-D4-33	1330nm drop & pass module	R436-J4-33	1330nm drop & add module
R426-D4-35	1350nm drop & pass module	R436-J4-35	1350nm drop & add module
R426-D4-37	1370nm drop & pass module	R436-J4-37	1370nm drop & add module
R426-D4-39	1390nm drop & pass module	R436-J4-39	1390nm drop & add module
R426-D4-41	1410nm drop & pass module	R436-J4-41	1410nm drop & add module
R426-D4-43	1430nm drop & pass module	R436-J4-43	1430nm drop & add module
R426-D4-45	1450nm drop & pass module	R436-J4-45	1450nm drop & add module
R426-D4-47	1470nm drop & pass module	R436-J4-47	1470nm drop & add module
R426-D4-49	1490nm drop & pass module	R436-J4-49	1490nm drop & add module
R426-D4-51	1510nm drop & pass module	R436-J4-51	1510nm drop & add module
R426-D4-53	1530nm drop & pass module	R436-J4-53	1530nm drop & add module
R426-D4-55	1550nm drop & pass module	R436-J4-55	1550nm drop & add module
R426-D4-57	1570nm drop & pass module	R436-J4-57	1570nm drop & add module
R426-D4-59	1590nm drop & pass module	R436-J4-59	1590nm drop & add module
R426-D4-61	1610nm drop & pass module	R436-J4-61	1610nm drop & add module

Interface Options*

Model Description

Access Line Cards (100Mbps Fixed Optics)

R231 Copper to Fiber, 1470nm - 1610nm

Access Optical Network Unit (10/100Mbps Fixed Optics)

RA21 Copper to Fiber, 1470nm - 1610nm

Ethernet Services Line Cards (1 Gig SFP Optics)

R851-IS Copper to SFP Fiber
R851-SS SFP Fiber to SFP Fiber

Interface Line Cards (1 Gig SFP Optics)

R153-IS Copper to SFP Fiber
R153-SS SFP Fiber to SFP Fiber

LPR Interface Line Cards (1 Gig SFP Optics)

R752-IS Copper to Dual SFP Fiber LPR
R752-SS SFP Fiber to Dual SFP Fiber LPR

SFP Pluggable Optics (80km extension)

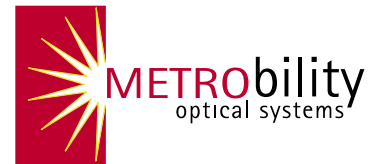
O411-80-xx SM/LC

xx = wavelength as follows:

-31	1310nm	-47	1470nm
-33	1330nm	-49	1490nm
-35	1350nm	-51	1510nm
-37	1370nm	-53	1530nm
-39	1390nm	-55	1550nm
-41	1410nm	-57	1570nm
-43	1430nm	-59	1590nm
-45	1450nm	-61	1610nm

* All line cards are supported in the following Metrobility chassis:

R5000	17-slot, 2U rack-mount, AC or DC power
R1000	2-slot, 1U rack-mount, AC or DC power
R400	2-slot, standalone
R200	1-slot, standalone



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Metrobility Optical Systems is an innovative next generation optical networking company whose focus is on delivering optical access platforms and to harness the power of Ethernet and fiber optics to deliver superior network edge access, connectivity and wavelength multiplexing solutions.

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