Telco Systems
A BATM Company

Metrobility R4000 Series
Coarse Wave Division Multiplexing

Flexible, scalable, managed passive optical CWDM technology

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

R4000 with "Drop and Add" OADM Module

The Metrobility® R4000 Coarse Wave Division Multiplexing (CWDM) solution from Telco Systems provides a cost-effective "no new fiber upgrade" solution for adding new services and customers to an existing fiber infrastructure.

Multiplexing and optical add/drop capabilities

Metrobility's CWDM 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 utlizing a combination of 8-channel and 4-channel multiplexers. An expansion port on the 4-channel multiplexer allows additional unique wavelengths to be combined on a single fiber pair by "chaining" multiplexers prior to the final network connection.

Optical add/drop multiplexers (OADM) provide the ability to "drop and add" or "drop and pass" one or more of the wavelengths from the fiber locally. "Drop and pass" extracts 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.

Subscriber-facing interface

The R4000 platform 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 Optical Add/Drop Multiplexer (OADM) module or 4-channel multiplexer at the subscriber site provides the "drop and pass" or "drop and add" capabilities. The R4000 connects to the subscriber's network through a complementary line card mounted in any Metrobility platform. The line card provides either a copper or fiber connection to the local switch.

Provider-facing interface

Metrobility line cards installed in a managed R5000 platform 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 platform.

Management

Each connection in the Metrobility R5000 can be managed at a central management station through the Metrobility management card and NetBeacon ESP® Element Management software.

This solution combines passive optical CWDM technology with Metrobility line cards and superior network element management through NetBeacon ESP to achieve maximum flexibility, scalability, and manageability.

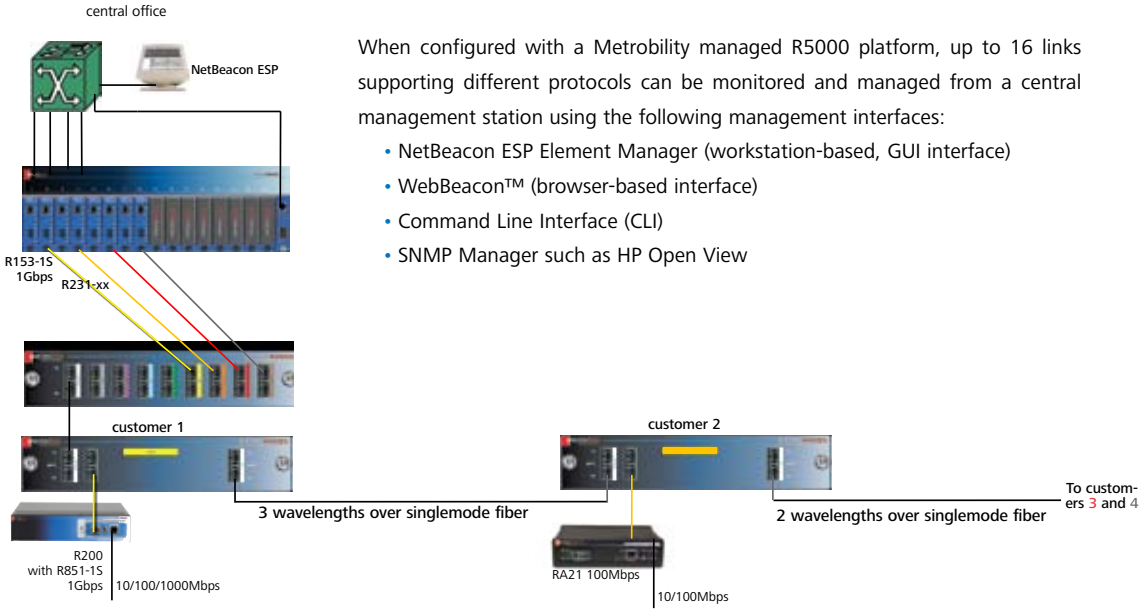
This combination creates a robust and flexible managed point-to-point or ring network solution. The Metrobility CWDM solution from Telco Systems is ideal for applications where dedicated bandwidth, enhanced diagnostics, and a secure PON connection are required on a single fiber pair.

Product Highlights

- Expansion port supports up to 16 discrete wavelengths
- Passive "Drop and Pass" or "Drop and Add" capabilities
- Managed 45Mbps - 2.7Gbps optical links
- Supports ITU G.694.2 CWDM wavelength grid with a spacing of 20nm
- Passive modules require no power
- NEBS certified

CWDM Configurations

Drop and Pass



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

- NetBeacon ESP 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

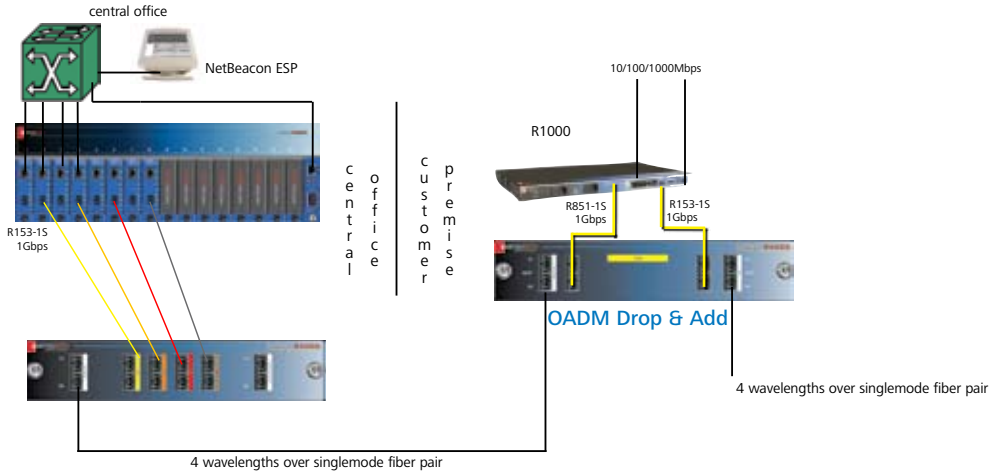
100Mbps from CO to10/100 at CP

Remote site management

- Remote loopback
- Temperature
- Voltage and Power
- RMON 1 Statistics
- Historical Database

Fixed optics

Drop and Add



Note: Equipment images not to scale.

CWDM Application

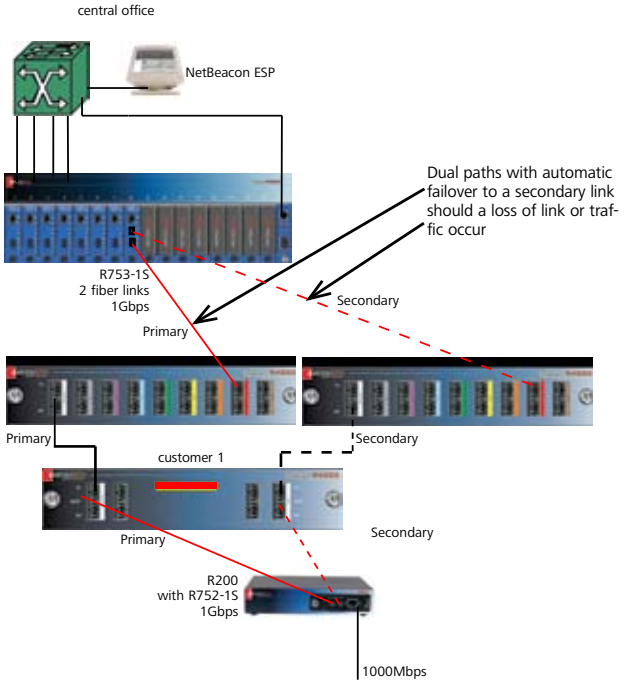
Line Protection and Restoration

Ensuring High Availability

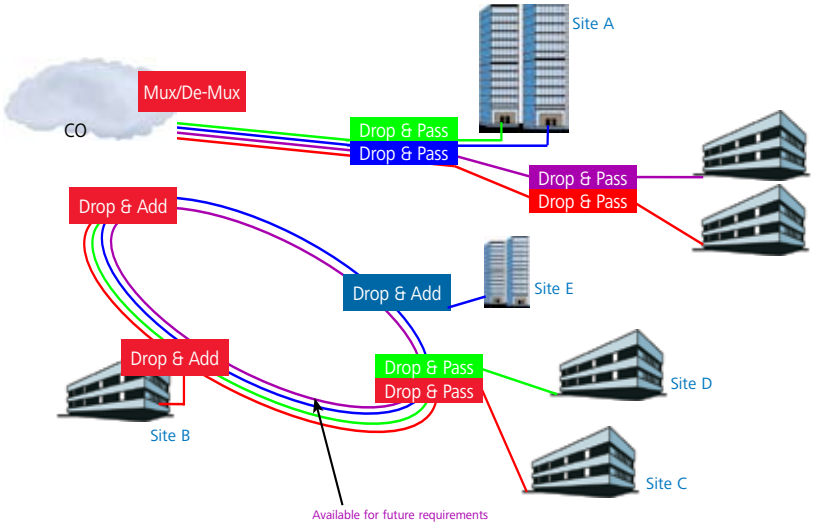
With multiple customers on a single link, the need to safeguard data becomes more critical and makes redundancy a key component of any CWDM system. In a CWDM network, this involves the use of dual links for fast failover and backup.

The Metrobility 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.

Metrobility R4000 Series

Ordering Information

R4000 CWDM Options

Part Number	Description
R4000-02*	19", 1U Rack Mount Platform for CWDM multiplexer and OADM modules
RM-1000	Extension for 23" rack
4000-CA	Fiber Cable kit - (4) SM LC to SC (1m)
Multipler Modules (SC connectors)	
R416-B4*	8-Channel CWDM mux/de-mux module
Multipler Modules (SC connectors with expansion port)	
R416-A4-A*	4-Channel CWDM mux/de-mux module
R416-A4-B*	4-Channel CWDM mux/de-mux module
R416-A4-C*	4-Channel CWDM mux/de-mux module
R416-A4-D*	4-Channel CWDM mux/de-mux module
Multipler Modules (SC connectors with expansion port and extended temperature range)	
R416-A4-AE*	4-Channel CWDM mux/de-mux module
R416-A4-BE*	4-Channel CWDM mux/de-mux module
Single Channel OADM Modules	
R426-D4-xx*	1310nm to 1610nm drop and pass modules
R436-J4-xx*	1310nm to 1610nm drop and add modules
Single Channel OADM Modules (SC connectors with extended temperature range)	
R426-D4-xxE*	1470nm to 1610nm drop and pass modules
R426-J4-xxE*	1470nm to 1610nm drop and add modules

Metrobility Active Electrical-to-Optical Options

R5000 Managed Platform	
R5000-17HS*	17-slot platform with two bays for optional AC/DC power supplies
CWDM Managed Line Card Options	
R821-1S	10/100BASE-T RJ-45 to 100BASE-X LC SFP (requires 1 pluggable optic**)
R821-11	10/100BASE-T RJ-45 to 10/100BASE-T RJ-45
R851-1S	10/100/1000TX to 10/100BASE-X LC SFP (requires 1 pluggable optic**)
R851-SS	1000BASE-X LC SFP to 1000BASE-X LC SFP (requires 2 pluggable optics**)
R231-47 to -61*** RA21-47 to -61	100M TX RJ-45 to 100M FX CWDM wavelength-specific fixed optics (1470nm to 1610nm)
R153-1S	1000BASE-T RJ-45 to 1000BASE-X LC SFP (requires 1 pluggable optic**)
R153-SS	1000BASE-X LC SFP to 1000BASE-X LC SFP (requires 2 pluggable optics**)
R752-11	1000Base-T to Dual 1000BASE-T (requires 1 pluggable optic**)
R752-1S	1000Base-T to Dual 1000BASE-X (requires 2 pluggable optics**)
R752-SS	1000Base-X to Dual 1000BASE-X (requires 3 pluggable optics**)
NetBeacon ESP Element Management System	
NBESP-99 NBESP-249 NBESP-UNLIMITED	Management Software for Windows XP Professional and NetBeacon ESP software license for 99, 249 or Unlimited network elements
R502-M*	Management Card - requires one slot in platform (One DB-15 and two RJ-45 connectors)

*NEBS certified

**see R4000 user manual for list of recommended CWDM pluggable optics

***U.S. Patent No. 6,741,566 B1

R4000 Specifications

SPECIFICATIONS

Environmental

Operating Temperature	0°C to 50°C
Operating Humidity	5% - 95%
Storage Temperature	-30°C to 70°C

Environmental (Extended Temperature)

Operating Temperature	-40°C to 80°C

Regulatory

Compliance	ITU G.694.2; NEBS
Safety and EMC	FCC, UL, CE, C-UL

Physical Specification

Dimensions	1.7"H x 17.0"W x 10.0"L 4.4cmH x 43.2cmW x 25.4cmL
Weight	2.85lb / 1.29kg

A6285 ISO 9001

Metrobility Optical Systems,Inc.

R4000 platform and all modules are NEBS certified

Features and Benefits

- Management capabilities when configured with a managed R5000 platform
- Advanced diagnostics:
  - Optical Power Measurement
  - Remote Loopback
  - Quality of Line
  - Quality of Equipment
  - Link Loss Return
  - Link Loss Carry Forward
  - Far End Fault
- Extended temperature modules for outdoor installations

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