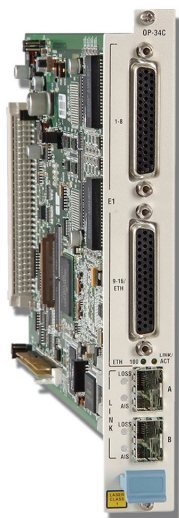# Optimux-34, Optimux-25
16-Channel E1/T1, Ethernet or Data over E3 or Fiber Multiplexers

- Up to 16 E1/T1 links and high-speed data or Ethernet traffic multiplexed into fiber opt7ic uplink
- E3 copper uplink for Optimux-34
- Single-mode, multimode, single-mode over single fiber SFP-based interfaces
- Range of up to 110 km (68 miles)
- Redundancy provided by optional second modular, hot-swappable power supply and second uplink
- Card versions for up to 12 cards in an LRS-102 rack

Multiplex any traffic over fiber

Optimux-34 and Optimux-25 provide a simple, flexible, and cost-effective solution for transporting multiple E1/T1 links, high-speed data or Ethernet over an E3 copper or fiber link to distances of up to 110 km (68 miles).

The fiber optic link is available with single-mode, multimode, and single-mode over single fiber interfaces. The Optimux-34 uplink is compliant with E3 standards and additionally features coax interfaces.

The unit provides up to 16 E1/T1 links, some of which can be replaced by high-speed data or 10/100BaseT user Ethernet traffic, selectable by the user (see *Table 1*).

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The Optimux devices are supplied with a 10/100BaseT Ethernet user port. In standalone units, this port is activated via a software key purchased from RAD.

Timing

The Optimux devices transmit each E1/T1 channel separately so that the clock of each E1/T1 channel is independent.

Link Redundancy

An optional second link provides link backup, using automatic switchover upon link failure.

Uplink Interfaces

Various interfaces (based on SFP transceivers) are available for both the active and the backup uplinks (see *Table 2* and *Ordering Options*):

- Electrical via coax (SMB) connector (Optimux-34, OP-34C only)

- 1310 nm short or long-haul laser and 1550 nm long-haul laser interfaces for extended range over single-mode fiber

- Single fiber interface using WDM technology, where the laser transmit signal is at a different wavelength from the receive signal (1310 nm and 1550 nm)

- Single fiber single wavelength interface using SC/APC connector, with a 1310 nm laser diode for single wavelength operation.

It is strongly recommended to order this device with **original** RAD SFPs **installed**. This will ensure that prior to shipping, RAD has performed comprehensive functional quality tests on the entire assembled unit, including the SFP devices. RAD cannot guarantee full compliance to product specifications for units using non-RAD SFPs.

Diagnostics

Optimux features comprehensive test and diagnostic capabilities that include local and remote loopbacks on the uplink interface and on each E1/T1 port. A local loopback is also supported on the optional V.35 user port of the standalone devices.

To ease system diagnostics, Optimux features LED status indicators and AIS alarm generation and recognition.

The standalone devices also feature dry contact closure upon link failure. An optional alarm port is available with dry relay contacts for major and minor alarms.
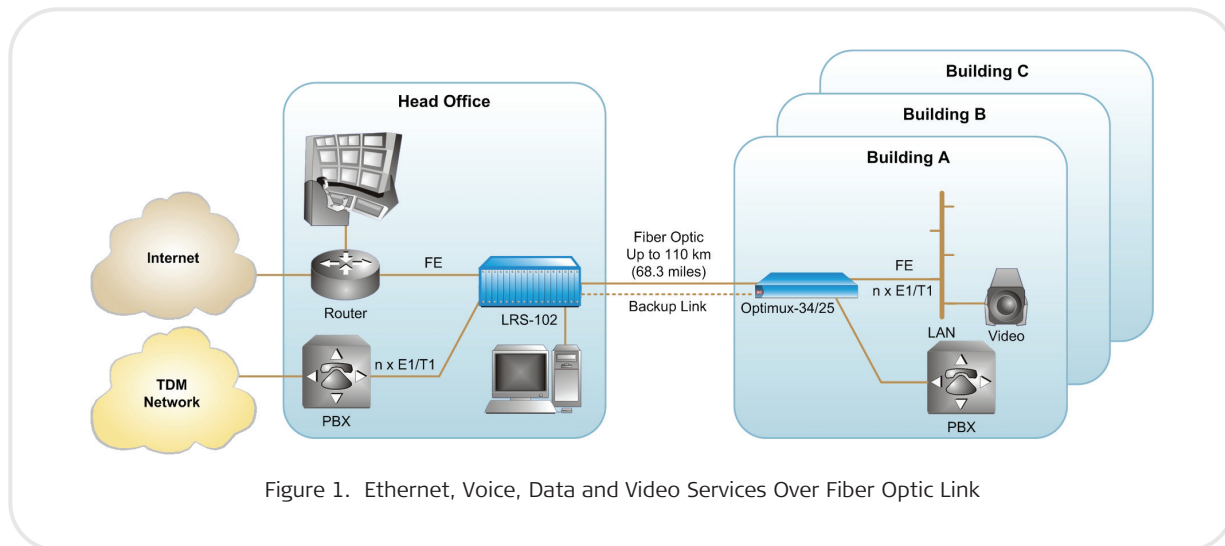

Figure 1. Ethernet, Voice, Data and Video Services Over Fiber Optic Link

STANDALONE DEVICES

The standalone devices can be supplied with one V.35 (2 MB/sec) channel that replaces channel 16 by user activation.

Management
Management and diagnostics can be performed via:

- ASCII terminal
- Telnet
- RAD's Web-based management application
- RADview, RAD's SNMP-based management application.

Physical
Optimux-25 is a compact, 1U-high unit. Optimux-34 is available in two versions:

- 1U-high unit with balanced E1 interface, RJ-45 connectors
- 2U-high unit with unbalanced E1 interface, BNC or IEC-169/13 connectors.

The units can be mounted in a 19-inch rack.

Power
The standalone power supply is a wide-range AC/DC power supply that can be connected to either an AC power source (100 to 240 VAC), or a DC power source (–48 VDC).

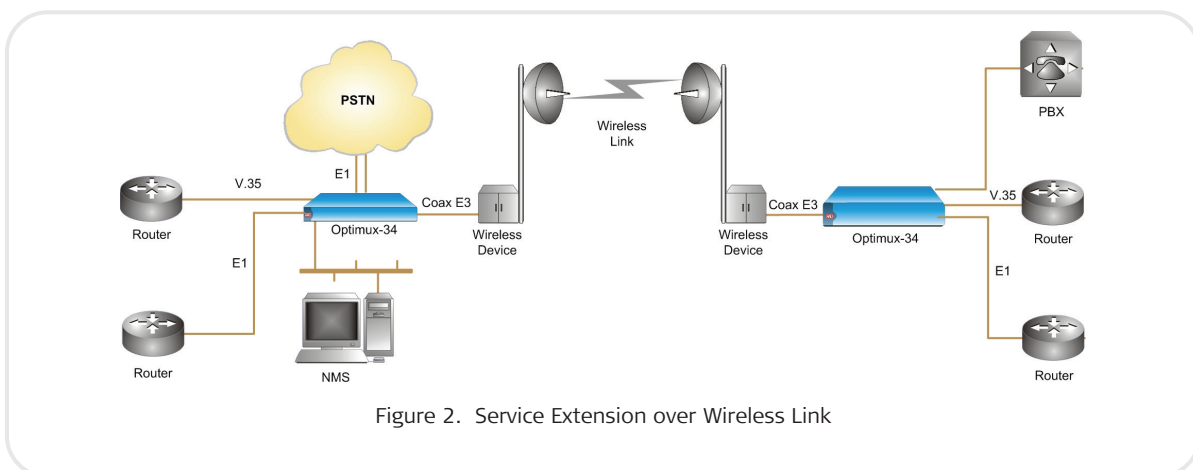An optional second power supply provides power redundancy.

Figure 2. Service Extension over Wireless Link

CARD MODULES

The OP-34C and OP-25C multiplexers are cards designed for operation in the LRS-102 chassis. The LRS-102 chassis can contain up to 12 cards (192 links). An Optimux link provides a simple and low-cost solution for connectivity over distances of up to 110 km (68 miles).

Link Interfaces

Pluggable SFP units provide the link interfaces. A wide variety of optical/electrical interfaces are available for ordering as single or dual modules (see *Table 2* and *Ordering Options*).

It is strongly recommended to order this device with **original** RAD SFPs **installed**. This will ensure that prior to shipping, RAD has performed comprehensive functional quality tests on the entire assembled unit, including the SFP devices. RAD cannot guarantee full compliance to product specifications for units using non-RAD SFPs.

Management

Setup, control, and diagnostics are performed by the LRS-102 management rack (see *LRS-102 Data Sheet*).

Physical

Each card fits in a single slot of the LRS-102 chassis.

Note: For OP-34C/OP-25C cards operating in the Megaplex-4100 enclosure, refer to a separate OP-34C/OP-25C data sheet included into the Megaplex-4100 folder.

Power

The power for cards is provided by the LRS-102 power supply.

Table 1. Bandwidth Available for Ethernet Traffic

Model	Maximum Number of Active Ports	Bandwidth Available for Ethernet Traffic
Optimux-34, OP-34C	16 E1	No bandwidth available
	12 E1	8 Mbps
	8 E1	16 Mbps
	4 E1	24 Mbps
	No port	32 Mbps
Optimux-25, OP-25C	16 T1	No bandwidth available
	12 T1	6 Mbps
	8 T1	12 Mbps
	4 T1	18 Mbps
	No port	25 Mbps

Specifications

E1/T1 INTERFACE

Number of Channels
16

Data Rate
E1: 2048 kbps
T1: 1544 kbps

Impedance
120Ω, E1 balanced
100Ω, T1 balanced
75Ω, E1 unbalanced

Connectors
Optimux-34
E1 Balanced: RJ-45
E1 Unbalanced: BNC or IEC-169/13 (in 2U
    unit)

Note: For balanced and unbalanced channels in the
same unit, order a 1U-high unit and one
CBL-RJ45/BNC/E1/X adaptor cable for each pair of
BNC connectors.

Optimux-25
T1 Balanced: RJ-45
OP-34C, OP-25C
Two DB-44 connectors on the front
module panel convertible to 16 balanced
interfaces via adaptor cables. With
OP-34C, unbalanced interfaces are also
available (see *Ordering*)

LINK INTERFACES
(MAIN AND BACKUP)

Data Rate
Optimux-34, OP-34C: E3 (34.368 Mbps)
Optimux-25, OP-25C: RAD proprietary
(25.910 Mbps)

Interface Options
See *Table 2*

Connectors
SFP interfaces with LC connectors or
SC/APC for single wavelength single fiber

Standards
OP-34: ITU G.703, G.742, G.751, G.823,
G.955, IEEE 802.3

OP-25: ITU G.703, G.824, G.955, IEEE
802.3

HIGH-SPEED INTERFACE (STANDALONE
ONLY)

Type
V.35

Connector
DB-25 (ISO-2110 or Telebras pinout)

ETHERNET INTERFACES

Type
10/100BaseT

Connectors
Standalone: RJ-45
Card: lower DB-44 connector, via adaptor
cables

CONTROL PORT (STANDALONE UNITS
ONLY)

Type
RS-232 DCE asynchronous

Data Rate
9.6, 19.2, 38.4, 57.6, 115.2 kbps

Connector
9-pin D-type female

ALARM PORT (STANDALONE UNITS
ONLY)

Type
Dry relay contacts for major and minor
alarms

Connector
9-pin D-type female

STANDALONE INDICATORS

Power
OFF – Not powered
ON (green) – Normal operation
ON (red) – Power malfunction

System
TST (yellow) – Self-test or loop
FLT (red) – System fault

Table 2. Link Interface Options

Module Name	Transmitter Type and Wavelength	Connector Type	Fiber Type	Typical Output Power	Receiver Sensitivity	Typical Range	
(Ordering Option)	[nm]			[dBm]	[dBm]	[km]	[miles]
SFP-12 (Optimux-34, OP-34C only)	–	SMB	Coax cable	–	–	(Per ITU-T G.703 standard)	
SFP-1	LED, 1310	LC	62.5/125 Multimode	-18	-31	6.5	4.0
SFP-2	Laser, 1310	LC	9/125 Single mode	-12	-31	38	23.6
SFP-3	Long haul laser, 1310	LC	9/125 Single mode	-2	-34	70	43.4
SFP-4	Long haul laser, 1550	LC	9/125 Single mode	-2	-34	110	68.3
SFP-10a	Laser WDM, Transmit: 1310, Receive: 1550	LC	9/125 Single mode (single fiber)	-12	-30	40	24.8
SFP-10b	Laser WDM, Transmit: 1550, Receive: 1310	LC	9/125 Single mode (single fiber)	-12	-30	40	24.8

Note: Typical ranges are calculated according to attenuation of 0.4 dB/km for 1310 nm, 0.25 dB/km for 1550 nm for single mode fiber.

Link SFP (per port)

SYNC LOSS (red) – Signal loss or frame loss detected on uplink

AIS (yellow) – AIS detected on uplink

User Ethernet Port

LINK/ACT (lights yellow) – LAN up status

LINK/ACT (flashes yellow) – LAN traffic transfer

100 (green) – On: 100 Mbps operation

100 (green) – Off: 10 Mbps operation

E1/T1 Interfaces (per port)

SYNC LOSS (red) – Signal loss detected on E1/T1 link

AIS (yellow) – AIS detected on E1/T1 link

Management Port

LINK/ACT (lights yellow) – LAN up status

LINK/ACT (flashes yellow) – LAN traffic transfer

100 (green) – On: 100 Mbps operation

100 (green) – Off: 10 Mbps operation

CARD INDICATORS

Ethernet Port

LINK/ACT

    On (yellow): link is up

    Off: link is down

    Flashes: frames are transmitted

100

    On (green): 100 Mbps mode

    Off: 10 Mbps mode

Link SFP (per port)

SYNC LOSS (red) – Signal loss or frame loss detected on uplink

AIS (yellow) – AIS detected on uplink

GENERAL

Diagnostics

Local and remote loopbacks on uplink and on each E1/T1 port

Local loopback on optional V.35 user port ((Optimux-34 only)

Timing

Uplink: internal, loopback

E1/T1 port: transferred transparently, independent for each channel

V.35: internal, external, loopback

Power

Standalone: wide range power supply

    AC: 100 to 240 VAC

    DC: –48 VDC (–40 to –72 VDC)

Card: supplied by LRS-102

Power Consumption

Standalone:

    AC: 32 VA max

    DC: 13W max

Card: 10.4W max

Physical

1U-high

    Height: 4.4 cm (1.8 in)

    Width: 44.0 cm (17.0 in)

    Depth: 24.0 cm (9.0 in)

    Weight: 3.5 kg (8.0 lb)

2U-high (Optimux-34 only)

    Height: 8.8 cm (3.5 in)

    Width: 44.0 cm (17.0 in)

    Depth: 24.0 cm (9.0 in)

    Weight: 4.0 kg (9.0 lb)

Card: fits into the LRS-102 rack

Environment

Temperature: 0°–50°C (32°–122°F)

Humidity: Up to 90%, non-condensing

Table 3. Optimux Comparison Chart

Feature	Optimux-108	Optimux-106	Optimux-34	Optimux-25	Optimux-45/45L	Optimux-1551	Optimux-1553
Uplink	Fiber Optic	Fiber Optic	E3, Fiber Optic	Fiber Optic	T3, Fiber Optic	Copper, STM-1/OC-3	Copper, STM-1/OC-3
Bandwidth (Mbps)	108	81	34	25	45	155	155
Number of trunks	4 E1	4 T1	16 E1	16 T1	21 E1 28 T1	21/42/63 E1 28/56/84 T1	3 E3 3 T3
Ethernet support	✓	✓	✓	✓	–	–	–
Card version for LRS-102	✓	✓	✓	✓			
Special features	Redundant, hot-swappable uplinks	Redundant, hot-swappable uplinks	SFP-based uplinks	SFP-based uplinks	Ring support (Optimux-45)	Full redundancy	Full redundancy

Ordering

STANDALONE UNITS

OP-34/?/+/*/%/$/#/&
16-Channel E1, Ethernet or Data over E3 or Fiber Multiplexer

OP-25/+/*/%/$/#/&
16-Channel T1, Ethernet or Data over Fiber Multiplexer

Legend

?　E1 connector for Optimux-34:
- **B**　Balanced (RJ-45, 1U-high unit)
- **U**　Unbalanced (BNC, 2U-high unit)
- **UBR**　Unbalanced (IEC-169/13, 2U-high unit)

+　Alarm port (Default=no alarm port):
- **A**　Alarm port

*　Power supply:
Note: Optimux-34/25 is supplied with one OP-34/25-PS wide range power supply.
- **R**　Dual power supply (110-240 AC, -48 VDC)
- **DC**　Single +24/-48 VDC
- **DCR**　Dual +24/-48 VDC

%　V.35 user port (Default=no V.35 user port):
- **V35**　DB-25 connector with ISO-2110 pinout
- **V35T**　DB-25 connector with Telebras pinout

$　Activation key (Default=no activation key):
- **PACK1**　Software key for activating the 10/100BaseT Ethernet port

*Note: It is strongly recommended to order this device with **original** RAD SFPs **installed**. This will ensure that prior to shipping, RAD has performed comprehensive functional quality tests on the entire assembled unit, including the SFP devices. RAD cannot guarantee full compliance to product specifications for units using non-RAD SFPs.*

#　Uplink interface:
- **SFP-12**　Electrical coax, SMB (Optimux-34 only)
- **SFP-1**　1310 nm, multimode, LED, LC connector
- **SFP-2**　1310 nm, single mode, laser diode, LC connector
- **SFP-3**　1310nm, single mode, long-haul laser diode, LC connector
- **SFP-4**　1550 nm, single mode, long-haul laser diode, LC connector
- **SFP-10a**　Transmit 1310 nm, receive 1550 nm (WDM), LC connector
- **SFP-10b**　Transmit 1550 nm, receive 1310 nm (WDM), LC connector

&　Redundant Main Link
- **D**　Redundant Main Link

Note: For single-fiber applications, a device with the SFP-10a interface should always be used opposite a device with the SFP-10b interface, and vice versa.

OP-34-PACK1
OP-25-PACK1
Software keys for activating the 10/100BaseT Ethernet port

OP-34-PACK1-DEMO
OP-25-PACK1-DEMO
Evaluation software keys for activating the 10/100BaseT Ethernet port (expires after 30 days)

OP-34-PS
OP-25-PS
Wide range 100–240 VAC/–48 VDC power supply modules for adding a redundant power supply to an existing unit or replacing the original power supply module

SUPPLIED STANDALONE ACCESSORIES
AC/DC power cord

OPTIONAL STANDALONE ACCESSORIES

OP-34-PS-BP
OP-25-PS-BP
Blank panels for power supply modules

CBL-RJ45/BNC/E1/X
RJ-45 to BNC adapter cross-cable (for use with 1U Optimux-34 chassis)

CBL-8H/M/1METER
V.35, DB-25 to M-34 cable for Optimux-34

CBL-DB9F-DB9M-STR
Control port cable

CBL-SMB-BNC/M
SMB to BNC adapter cable for Optimux-34 (supplied with SFP-12)

RM-34
Kit for mounting one 1U-high unit in a 19-inch rack (supplied with balanced unit only)

RM-36
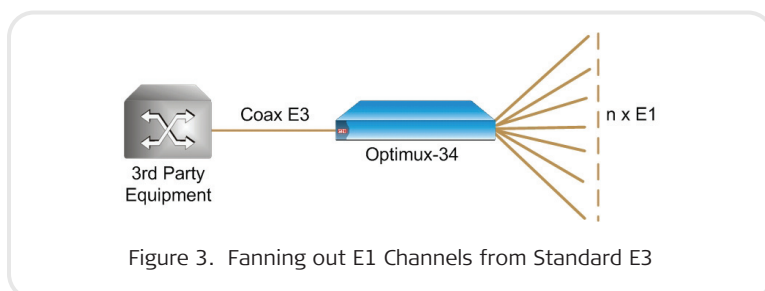Kit for mounting one 2U-high Optimux-34 unit in a 19-inch rack (supplied with unbalanced unit only)

Figure 3.　Fanning out E1 Channels from Standard E3

Optimux-34, Optimux-25

16-Channel E1/T1, Ethernet or Data over E3 or Fiber Multiplexers

CARD MODULES FOR LRS-102

Note: For OP-34C/OP-25C cards operating in the Megaplex-4100 enclosure, refer to a separate OP-34C/OP-25C data sheet included into the Megaplex-4100 folder.

OP-34C/!/+
16-Channel E1, Ethernet or Data over E3 or Fiber Multiplexer Module

OP-25C/!/+
16-Channel T1, Ethernet or Data over Fiber Multiplexer Module

Legend

! Ethernet port (Default=no Ethernet):
  ETH 10/100BaseT Ethernet port
+ SFP link interface:
  SFP-12 Electrical coax, SMB (OP-34C only)
  SFP1 LED, 1310 nm, multimode, LC
  SFP2 Laser, 1310 nm, single mode, LC

SFP3 Long-haul laser, 1310 nm, single mode, LC

SFP4 Long-haul laser, 1550 nm, single mode, LC

SFP10a Laser WDM, Tx –1550 nm, Rx –1310 nm, single mode, single fiber, LC (SF1)

SFP10b Laser WDM, Tx –1310 nm, Rx –1550 nm, single mode, single fiber, LC (SF2)

2XSFP12 Dual SFP-12 modules
2XSFP1 Dual SFP-1 modules
2XSFP2 Dual SFP-2 modules
2XSFP3 Dual SFP-3 modules
2XSFP4 Dual SFP-4 modules
2XSFP10a Dual SFP-10a modules
2XSFP10b Dual SFP-10b modules

Note: For single fiber applications, a device with SFP-10a interface is always used opposite a device with SFP-10b interface, and vice versa.

SUPPLIED CARD ACCESSORIES

CBL-SMB-BNC/M
SMB to BNC adapter ~~cable~~ for OP-34C (supplied with SFP-12)

OPTIONAL CARD ACCESSORIES

CBL-G703-8/RJ45/ETH
Splitter cable for splitting each 44-pin card connector to 8 E1 or 8 T1 balanced RJ-45 connectors and one Ethernet RJ-45 connector

CBL-G703-8/COAX/ETH

Splitter cable for splitting each 44-pin OP-34C card connector to 8 pairs of unbalanced BNC connectors and one Ethernet RJ-45 connector
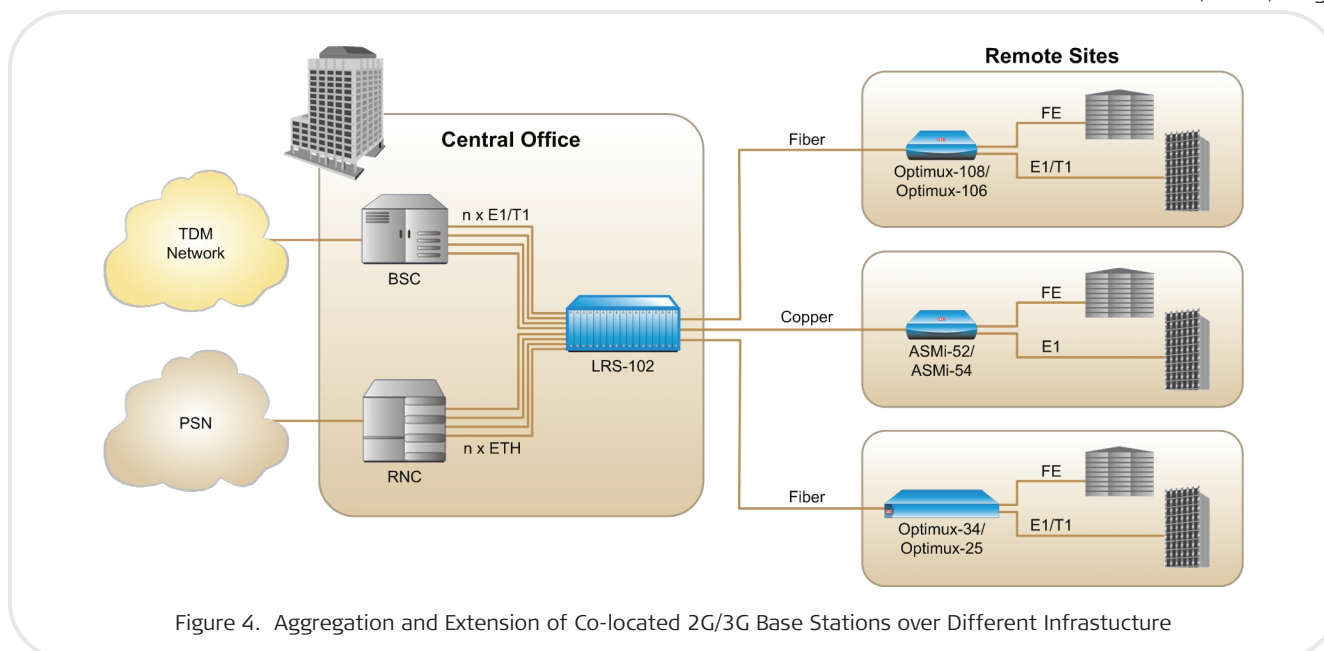
All cables are 2m (6.6 ft) long.

Figure 4. Aggregation and Extension of Co-located 2G/3G Base Stations over Different Infrastucture

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