

Building-to-Building Voice and Data Connectivity

Overview

Business today migrate their networks from dial-up and low bandwidth connectivity to high bandwidth multi-service networking infrastructure. They need data (Ethernet) and Voice (T1/E1) connectivity in order to provide mission critical broadband networks that swiftly adapt to changes and empower the delivery of future application throughout the enterprise. Today, businesses use data and voice connectivity between their buildings and pay a monthly fee to the local transport provider. With the migration from low bandwidth to broadband voice and data connectivity, they must add new technologies to their existing infrastructure to include data and PBX connectivity.

Typical business buildings application today, is lease data and voice lines to connect between buildings and to provide the required services from one building to another. Each month, the business owner pays the local provider a fee for about 5-6 Mbps of capacity (3 T1/E1). On the other hand the demands for more bandwidth increase and the building owners, though understanding the needs, cannot justify the increased monthly cost for additional data and voice lines.

How do we reduce cost while increasing bandwidth?

The MRV Solutions

MRV offers 3 solutions for building-to-building connectivity:

- Voice solution
- Data solution
- Integrated voice/data solution.

Solution 1: Voice Solution - Multiple T1/E1 connectivity

Business deploys T1/E1 all-optics wireless connections to connect their voice PBXs or other T1/E1 (i.e. data) connectivity. The solution includes up to 4 T1/E1 connections, i.e. connectivity can be upgraded with additional T1/E1 voice/data traffic at no additional cost.

Solution building blocks:

The solution is built using the TereScope 1 Photonic Air Link (PAL) systems, directly connected via optical fibers to an MM04 T1/E1 multiplexer that functions as the TereScope 1 network interface unit (NIU). Offering up to 4 T1/E1 connections, at distances of up to 380 m, these systems avoid the need for costly and time-consuming fiber runs. Easy to install and align, these systems can be deployed almost instantly to expand an existing network.



- TereScope1 - all-optics wireless links

The TereScope 1 (TS1) is an innovative modular solution for wireless

optical communications without electronics. The TS1 is an optical transceiver, which sits on rooftops, or behind widows and provides fiber-like connection speeds without electronics or electricity power. TereScope 1 responds to today's and tomorrow's user services demands, while providing higher potential capacity, license free and protocol independent (Ethernet/IP, TDM, SONET, ATM and Cellular) transmission, at lower costs, over the air.

For more info: http://www.mrv.com/products/FSO/ts_1.php

- T1/E1 to fiber multiplexer

The MM04 product is a 4 ports E1 or T1 multiplexer/demultiplexer that transmits over a fiber optic link. The products are standalone (1U), 19" rack mountable (half size devices). The chassis is available with universal AC power supply (100-240v) or DC power supply (36-60v) and with an optional redundant power supply.

MM04 devices support four (4) link interfaces and are available for E1 or T1 configurations with connections for RJ-48 (E1/T1 balanced).

Each E1/T1 port is designed to meet regulatory compliant solutions such as for circuit protection against surges and AC lightning, which is essential for long haul E1/T1 lines. A robust frame acquisition and frame holding algorithm minimizes frame slippage and resynchronization.

For more info: <http://www.mrv.com/products/>

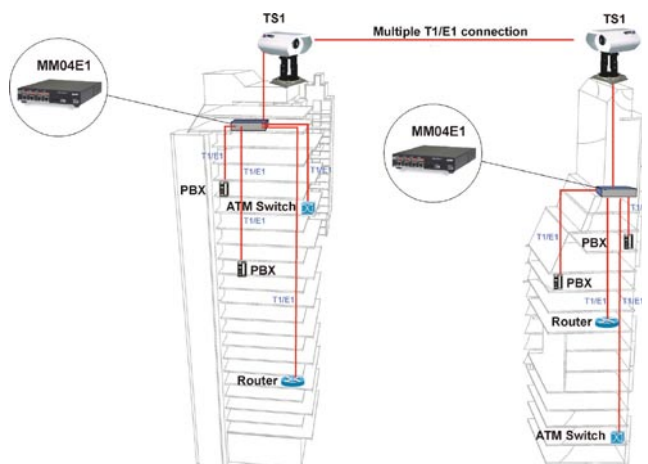


Figure1: Building to Building: Multiple T1/E1 connectivity using the MM04 (T1/E1 multiplexer) and the TereScope-1 all optics wireless link.

The solution's technology includes

- All-optics wireless communication:
 - No need to run power to the roof
 - No need for grounding or lightning protection
 - Complies with: E1/T1 - G.703/G.704
 - Completely transparent transmission and reception
- Distances up to 380 m (to reach longer distances, use other TereScope series)
- License free technology
- Rapid deployment time
- Secure transmission
- Major cost and time saving

Economics and Costs levels:

The following chart compares the Return On Investment (ROI) period of T1/E1 network connectivity based on MRV's TereScope 1 – all-optics wireless solution, in two cases: (case 1) leasing of two T1/E1 connectivity or (case 2) leasing of four T1/E1 connections for building-to-building connectivity.

Investment	Capital Investment	1 Month	2 Month	3 Month	4 Month	ROI Period
TS1- All Optics System + Two MM04 (includes 50 m cables)	\$6,735					
Infrastructure Installation	\$750					
Additional Equipment	\$700					
Total Investment	\$8,185					
Current Payment:						
Case 1: Two T1/E1 voice (pay per month)		\$2,100	\$2,100	\$2,100	\$2,100	
Case 2: Four T1/E1 (pay per month)		\$3,000	\$3,000	\$3,000		
Total Cost saving:						
ROI case 1		\$6,085	\$3985	\$1885	\$0	4 months
ROI case 2		\$5,185	\$5,185	\$5,185		3 months

Solution 2: Data Solution - Building-to-Building (Ethernet) Solution

Connecting the networks of multiple buildings or campuses is never a simple task. As a building owner, your customers demand more and more bandwidth. Using this solution you can save the cost and the time involved in the implementation of data networks bandwidth demands.

Rather than waiting for a communications provider to run fiber to buildings, the TereScope systems, integrated with OptiSwitch™ service aware systems, allow you to expand your network by yourself, according to the evolution of your needs. Furthermore, if you already have fiber run between your buildings, TereScope links can be used as backup systems to further solidify and secure your network.

This solution is based on the TereScope 1 systems being directly connected via optical fibers to the OptiSwitch™ module that functions as the TereScope 1 network interface unit (NIU) or to the Media Converter MC102/P, offering data rates of 1-100 Mbps, at distances of up to 380 m. Designed for short distance connectivity, and offered at low cost, TereScope 1 is an ideal and highly reliable solution for dense urban areas and for Ethernet traffic based networks. This solution is fully managed by MegaVision Web™, MRV's SNMP and Web network management software.

Solution building blocks:

The solution is built using the TereScope 1 Photonic Air Link (PAL) systems, directly connected via optical fibers to an MM04 T1/E1 multiplexer that functions as the TereScope 1 network interface unit (NIU). Offering up to 4 T1/E1 connections, at distances of up to 380 m, these systems avoid the need for costly and time-consuming fiber runs. Easy to install and align, these systems can be deployed almost instantly to expand you're an already existing network.



- **TereScope 1 – all-optics-wireless links**
- **OptiSwitch – Application aware switch**

The OptiSwitch™ (OS) product line presents a unique integration of Ethernet multi-layer systems, QoS and carrier circuit switches, with its choice of five chassis (hosting from 1 to 24 expansion slots or ports) and over 80 different module types. It is an exclusive combination of hardware features with Ethernet pricing and simplicity of operation.

The OS is designed to provide fiber optic based solutions and support applications such as Carrier-to-Carrier, ISP connectivity, Fiber-to-the-x coupled with Voice, Video and Data solutions.

OS enables the provision of legacy telephony services together with advanced IP communication on a single optical access infrastructure as well as complete enterprise service enabling solutions to support different office and business networking and services requirements.

For more info: http://www.mrv.com/products/switches_routers/os.php

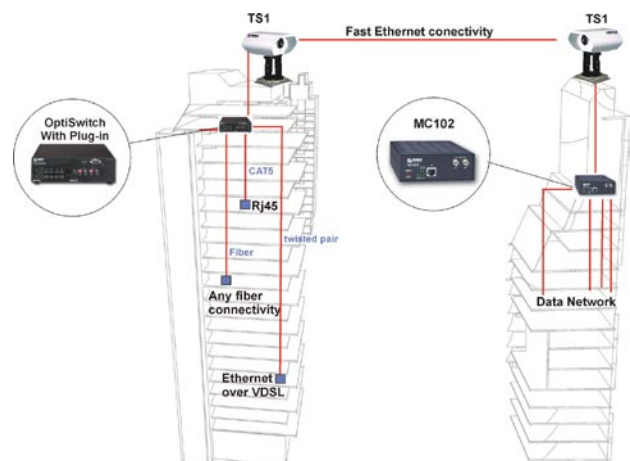


Figure 2: Building to Building: Data connectivity using the Media-Converter, Modular OptiSwitch™ and the TereScope-1 all optics wireless link.

This solution's technology includes:

- All-optics wireless communication:
 - No need to run power to the roof
 - No need for grounding or lighting protection
- Distances up to 380 m (to reach higher distances, use other TereScope series)
- License Free Technology
- Rapid deployment time and Secure transmission
- The integration with the OptiSwitch™ modular chassis enables connection to any fiber, CAT5 and twisted pair (using Ethernet over VDSL).
- Non-blocking, wire-speed policy based QoS and traffic engineering providing Kilobit granularity of rate limitation
- Modular - "grow along" solution – starting from 4TP and up to 192 fiber ports.

Economics and Costs levels:

The following chart compares the Return On Investment (ROI) period of fast Ethernet connectivity for data based on MRV's OptiSwitch and TereScope 1 integrated solution.

Option 1: TereScope 1 + OptiSwitch™

Investment	Capital Investment	1 Month	2 Month	3 Month	4 Month	5 Month	ROI Period
TS1- All Optics System and two OS200 + Em2003 TS1 module + Em2003 4TP modules (including 25 m fibers)	\$8,335						
Infrastructure Installation	\$750						
Additional Equipment	\$700						
Total Investment	\$9,785						
Current Payment:							
Case 1: Two T1/E1 voice (pay per month)		\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	
Case 2: Four T1/E1 (pay per month)		\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	
OptiSwitch Solutions - Total Cost saving:							
ROI case 1		\$2,100	\$4,200	\$6,300	\$8,400	\$0	5 months
ROI case 2		\$3,000	\$6,000	\$9,000	\$0		4 months

* Due to short period of time we didn't include the interest.

Option 2: TereScope 1 + Media Converter



Investment	Capital Investment	1 Month	2 Month	3 Month	4 Month	ROI Period
TS1- All Optics System and two OS200 + 2 x Media Converters (MC102/p) (including 25 m fibers)	\$4,335					
Infrastructure Installation	\$750					
Additional Equipment	\$700					
Total Investment	\$5,785					
Current Payment:						
Case 1: Two T1/E1 for data (pay per month)		\$2,100	\$2,100	\$2,100	\$2,100	
Case 2: Four T1/E1 data (pay per month)		\$3,000	\$3,000	\$3,000	\$3,000	
Media Converters solution - Total Cost saving:						
ROI case 1		\$3,685	1585	-515		5 months
ROI case 2		\$2,785	-215			4 months

* Due to short period of time we didn't include the interest.

Solution 3: Converged Data (Ethernet) & Voice (T1/E1) Solution

MRV offers an integrated voice/video/data solution for providing building-to-building connectivity in enterprise environments. The solution is based on the deployment of MRV's TereScope 1 all-optics wireless connection, integrated with an OptiSwitch™ populated with Data (fiber, copper or twisted pair ports) and E1/T1 voice modules. Through this connection, the office now has access to multiple 100 Mbps of bandwidth for data and access to an additional T1/E1 connection for voice traffic if needed.

Solution building blocks:

The solution is built using the TereScope 1 Photonic Air Link (PAL) systems, directly connected via optical fibers to an MM04 T1/E1 multiplexer that functions as the TereScope 1 network interface unit (NIU). Offering up to 4 T1/E1 connections, at distances of up to 380 m, these systems avoid the need for costly and time-consuming fiber runs. Easy to install and align, these systems can be deployed almost instantly to expand your already existing network.

- TereScope1 – all-optics-wireless links
- Modular OptiSwitch™ platform – Service Aware Switch with Fiber, CAT5, VDSL data connectivity and
- OptiSwitch T1/E1 modules

The OptiSwitch E1/T1 TDM gateway module transports trunk voice traffic over an Ethernet and IP transport medium. Each E1 Interface accepts PCM voice on one side performs the signal processing, packetization, encapsulates the signaling and control functions. The E1 module combines a unique hardware and software architecture, which enables it to provide a high density of up to 240 low bit rate voice/fax channels per module. The E1 module can be installed with any one of the EM2004 QoS series for the OptiSwitch™ family and be fitted into any OptiSwitch™ chassis. Once the TDM traffic is encapsulated into the IP frames, the traffic can go out through any one of the interfaces installed in the OptiSwitch, such as a 10/100Base-Tx, 100Base-Fx or Gigabit Ethernet.

For more info: http://www.mrv.com/products/switches_routers/os.php

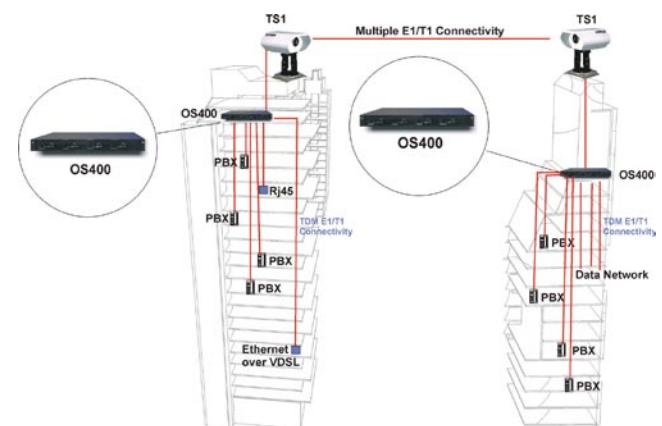


Figure 3: Converged Data & Voice (TDM) connectivity using the TereScope 1 all optics wireless link and one of the modular OptiSwitch™ chassis with T1/E1 TDM module and Ethernet module.

This solution's technology includes:

- Saving roof top space by providing data & voice convergence solution.
- Non-blocking, wire-speed policy based QoS and traffic engineering providing Kilobit granularity of rate limitation
- Modular - "grow along" solution – starting from 4TP and up to 192 fiber ports.
- All-optics wireless communication:
- No need to run power to the roof
- No need for grounding or lightning protection
- License free technology
- Rapid deployment time and secure transmission
- The integration with the OptiSwitch™ modular chassis enables connection to any fiber, CAT5 and twisted pair (using Ethernet over VDSL).

Investment	Capital Investment	1 Month	2 Month	3 Month	4 Month	ROI Period
TS1- All Optics System and two OS200 + 2 x Media Converters (MC102/p) (including 25 m fibers)	\$4,335					
Infrastructure Installation	\$750					
Additional Equipment	\$700					
Total Investment	\$5,785					
Current Payment:						
Case 1: Two T1/E1 for data (pay per month)		\$2,100	\$2,100	\$2,100	\$2,100	
Case 2: Four T1/E1 data (pay per month)		\$3,000	\$3,000	\$3,000	\$3,000	
Media Converters solution - Total Cost saving:						
ROI case 1		\$3,685	1585	-515		5 months
ROI case 2		\$2,785	-215			4 months

Economics and Costs levels:

The following chart compares the Return On Investment (ROI) period of data & voice network connectivity based on MRV's TereScope 1 – all-optics wireless solution, compare to leasing of eight T1/E1 voice connection and data connections for building-to-building connectivity.

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