Lumentis
Mentis System

Testing Template:

This document will be used to describe, from a technical perspective, the elements that were included as part of the IBM TotalStorage Proven testing. It is intended to give an overall picture of the technical elements of the configuration, with a brief description of the results of the testing including any specific highlights of the interoperability results.

High-level architecture/description, include a list of products that meet the compatibility requirements ("Approved Product(s)") as well as a list of the IBM storage products with which the Approved Products meet the compatibility requirements ("Qualified IBM Storage Products"):

Product Description

The Mentis platform is an optical transport solution covering transparent transport of any service from 100Mb/s to 10Gb/s for metro, regional and medium haul applications. The unique characteristics support any network applications and topologies (i.e. ptp, bus, ring, mesh) within this environment, e.g.
- Mobile transmission networks
- City carriers networks
- High-end enterprise networks
- Storage networks
- Medium haul networks

The cornerstone in the Lumentis solution is a system architecture that includes CWDM-, DWDM- and SDH/SONET transmission solutions within the same system. Both amplified fiber-pair as well as un-amplified single-fiber configurations are supported providing a unique flexibility in networking and ability to mix CWDM and DWDM connections on the same fiber and where the plug-in units share the same card cage.

"All in one" system
This technology-mix gives powerful advantages for any operator within the competitive metro/regional environment.

Within a Mentis network solution you can carry SDH/SONET, IP, SAN, Video services etc. where each connection can be optimized from cost and functionality perspective without having the limitations that are imposed by a stand-alone SDH/SONET, DWDM or CWDM system.

The Lumentis solution combines the advantages of all three technologies into one product. We combine the capacity and scalability capabilities only found in DWDM systems, with the low equipment costs of CWDM systems and the cost-efficient handling of SDH/SONET rates in ADM networks. And all is managed by the same node or network management system.

The Mentis portfolio contains transparent, multi-protocol Transponders as well as dedicated Transponders for SDH/SONET, GbE, 10GbE, 1G Fiberchannel, 2G Fiberchannel, FICON, ESCON where electrical multiplexing (e.g. GFP-multiplexing) enables multiple traffic channels to be carried per wavelength channel. Protection can be applied on a per wavelength basis with full equipment redundancy, or on an aggregated fiber level. The SAN Transponders are available in both CWDM and DWDM variants where the latter support distances up to 120km without optical amplifiers and up to 250km with amplified configurations.

The equipment practice is based on a modular and scalable platform where a generic backplane enables singular or multiple network elements of any type to be configured within the same chassis. Three different sizes of chassis are provided that can house any of the available plug-in unit types. In all this provides an optical networking solution that can be tailored to address any initial and future needs with lowest initial cost (CAPEX) and due to its simplicity and modularity provide a low OPEX compared to traditional solutions.

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Test cases

ESCON and 2 Gb/s FC traffic was tested using synchronic PPRC with two Mentis systems between two ESSs.

1 Gb/s FC traffic was tested by using two 2 Gb/s FC interfaces that were connected from the ESS to an IBM 2109 F16 to the Mentis system. A traffic path was then created across the Mentis network to allow the Fibre Channel interfaces to be presented to 5 FC adapters 1 Gb of IBM xSeries 360 servers.

Test scenarios:

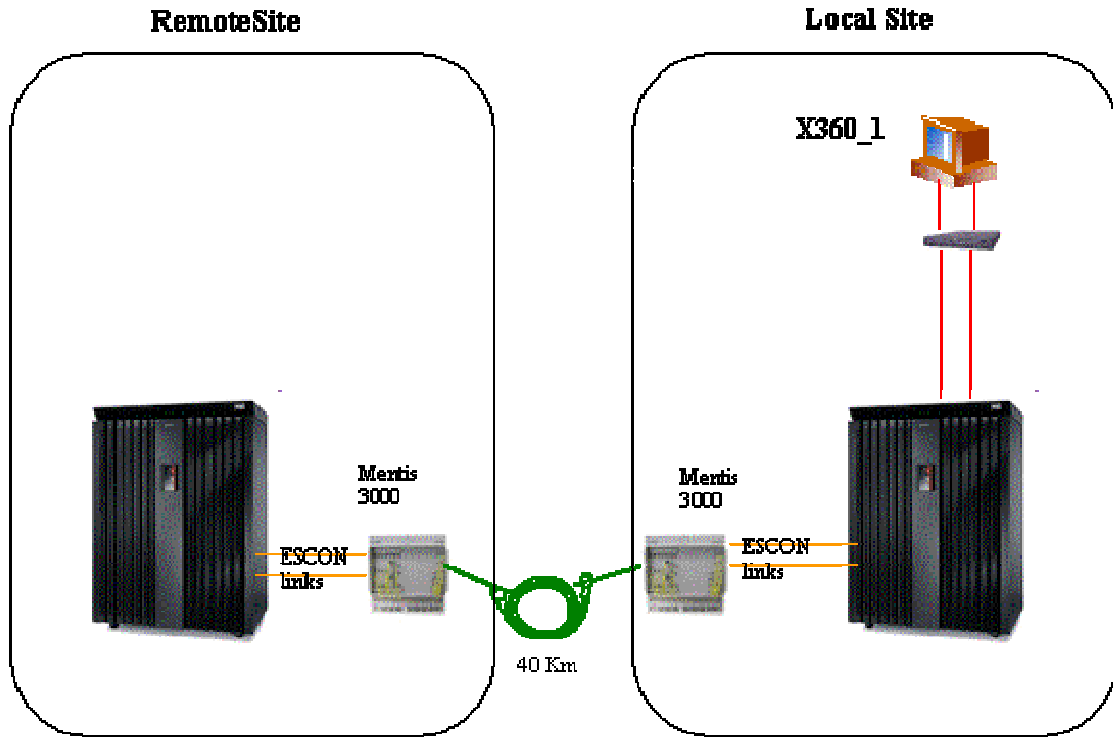## PPRC ESCON environment

Scenario 1:

The Lumentis systems are used to extend the distance between the ESSs Model 800 over 40 km using ESCON Synchronic PPRC bidirectional. Two ESCON links for each direction (bidirectional). The Lumentis equipment is fully transparent for the ESSs.
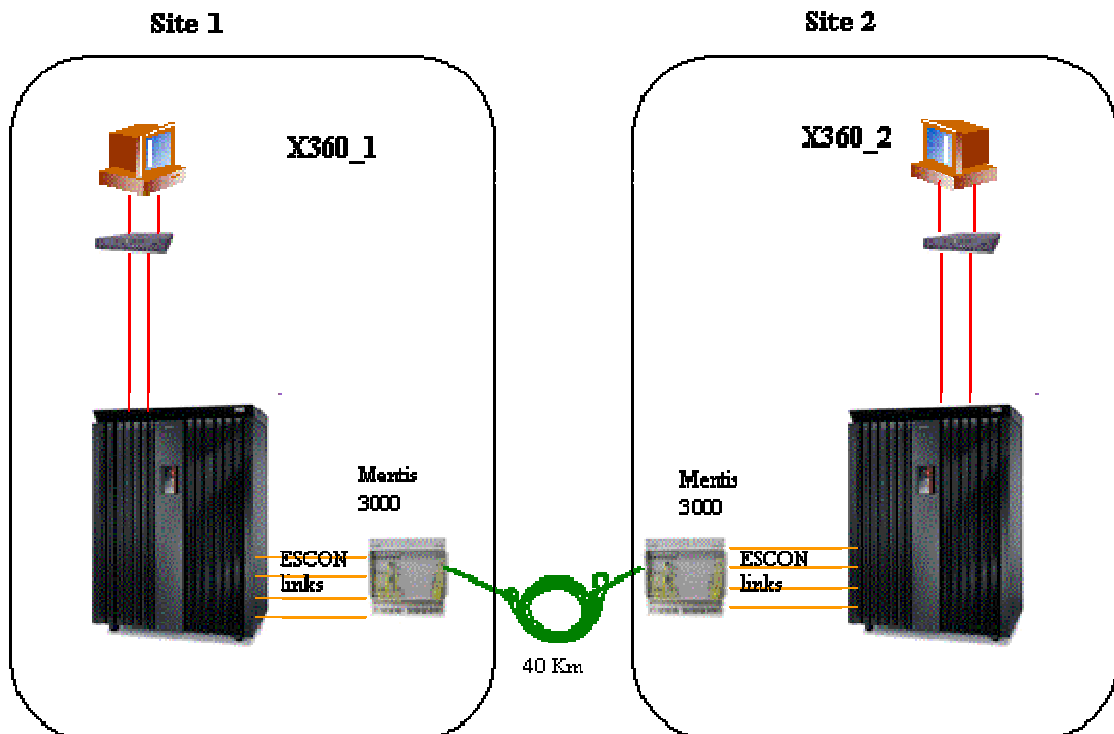
Scenario 2:

The Lumentis system are used to extend the distance between the ESSs Model 800 over 40 km using ESCON Synchronic PPRC unidirectional. Two ESCON links from site Local to site Remote (unidirectional).
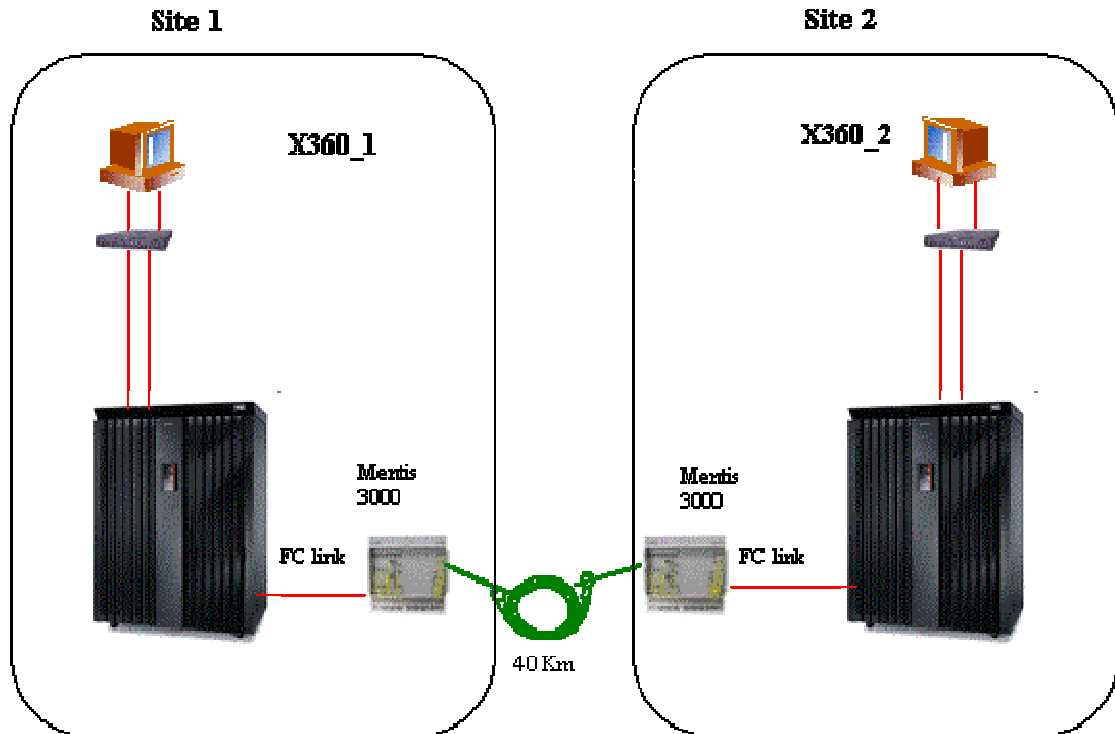
PPRC 2 Gb FC environment

Scenario 3:

The Lumentis system is used to extend the distance between the ESSs Model 800 over 40 km using FC Synchronic PPRC bidirectional. One FC link 2 Gb for bidirectional PPRC traffic. **Note!** The Mentis system supports distances up to 120 km in un-amplified 2 Gb FC configurations but due to lack of fibre was only 40 km tested on this occasion.

Server to Mentis 1 Gb FC environment
Scenario 4:

The Lumentis system is used to extend the distance between the Servers and ESSs Model 800 over 40 km using FC 1Gb. **Note!** The Mentis system supports distances up to 120 km in un-amplified 1 Gb FC configurations but due to lack of fibre was only 40 km tested on this occasion.
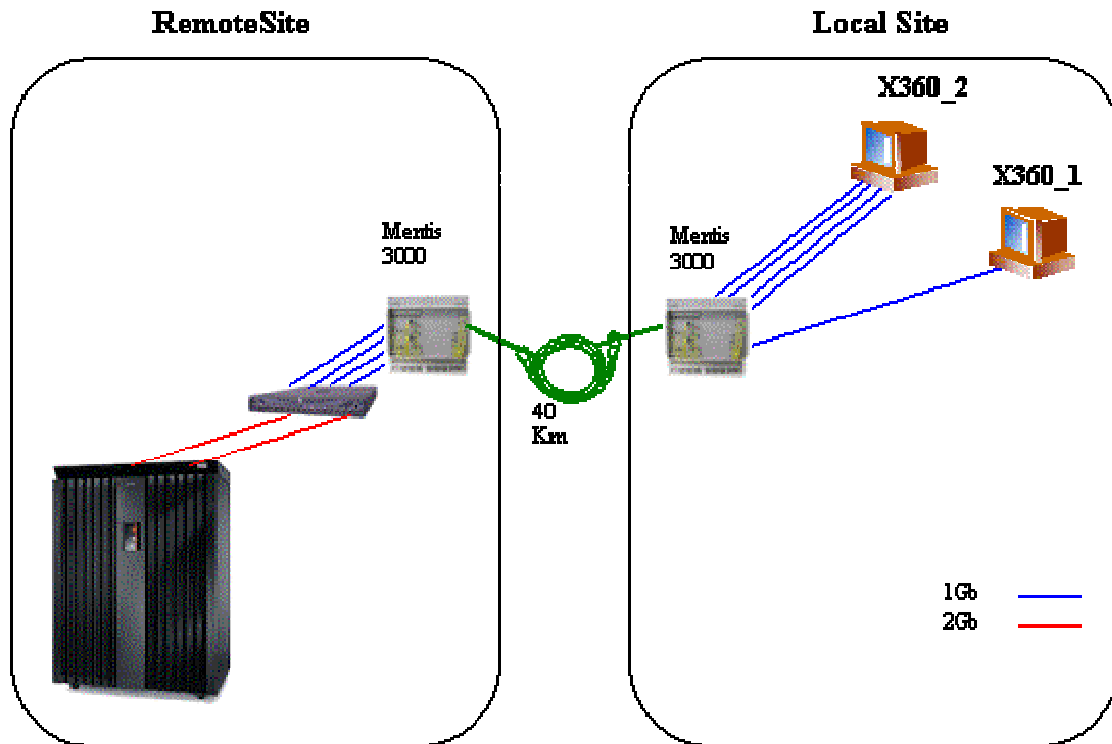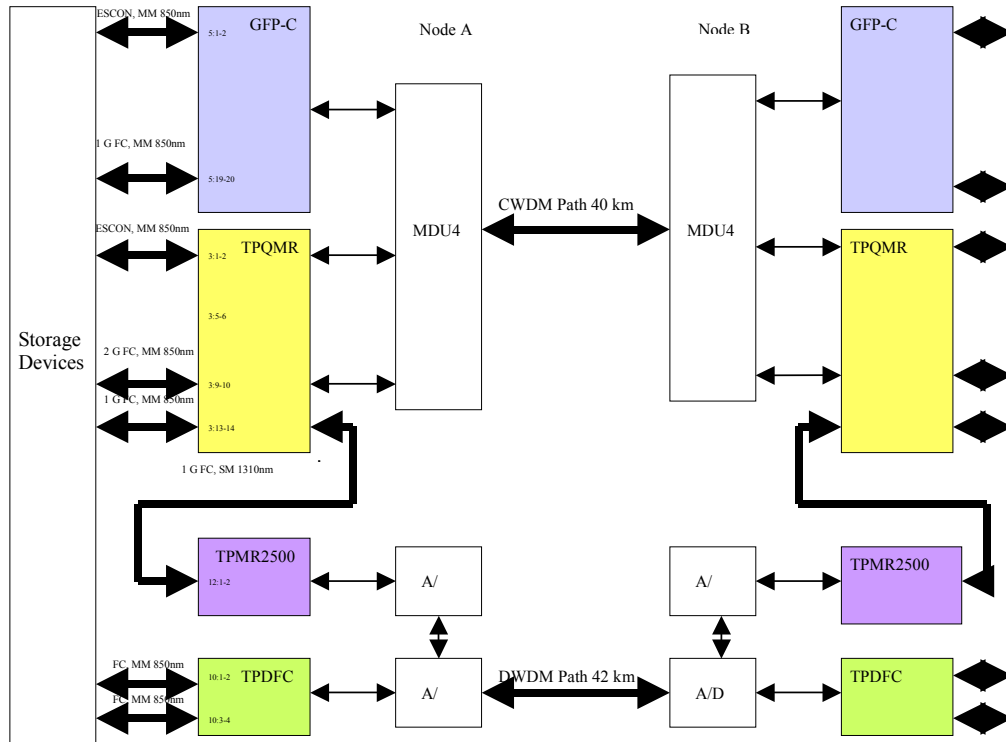
In all four of the scenarios the Mentis systems was equipped with the following:

Testing level achieved: Comprehensive

IBM TotalStorage Proven™ program

Testing level achieved: **Comprehensive**

Testing was performed with 1 Gb FC, 2 Gb FC and ESCON.

A brief description of the test environment
- PPRC over CWDM 2 Gb FC and ESCON.
- Server scenario over CWDM/DWDM 1 Gb FC.

Highlight specific storage features and/or product/solution benefits used in the scenario.

The Mentis solutions provide a number of benefits:
- Cost-cutting on SAN transport networks
- High fiber utilization and flexibility via unique system architecture using only a single-fiber within a fiber-pair
- Supports native SAN formats (ESCON, 1G Fiberchannel, 2G Fiberchannel) as well as new emerging GbE and 10GbE based solutions
- Highest availability via amplifier-less networks and protection configurations
- Secure connections via unique multiplexing technique

Many SAN networks are utilizing one fiber connection per SAN channel. As the capacity needs increase, the number of fibers becomes high and the consequent cost for leasing fiber can be a considerable part of the operational costs.

Also, the need for secure connections, redundant paths and extreme availability requirements has an impact on equipment cost and complexity as well as cost of the fiber infrastructure.

Considerable cost savings can be achieved by introducing the Mentis transport solution where multiple SAN channels can be carried on either DWDM and/or CWDM wavelength channels. The more established ESCON and Fiberchannel signal formats can be mixed with e.g. the emerging alternative format GbE having full quality monitoring end-to-end through the network.

CWDM alternative:
Distances up to ~80km and 80 SAN channels

SAN networks are mostly point-to-point links within metropolitan or regional areas. The distance between the sites can thus be relatively short (up to 10-60km) or quite long (up to 100-120km). It is important to be able to select the most cost-effective technology for each case. The shorter distances are best bridged using the simpler CWDM optics. The Mentis solution requires only one fiber within a fiber-pair to establish a CWDM-link with up to 4 wavelength channels. Each wavelength can be configured to carry ten ESCON, two Fiberchannel/GbE or a single SAN channel.

When utilizing both fibers within the fiber-pair, up to 80 ESCON channels can be transported.

DWDM alternative:
Distances up to ~120km w/o amplifiers and 400 SAN channels

For higher capacity requirements or when the distance is beyond CWDM optics, the DWDM alternative is the natural choice.

Again, only one fiber within a fiber-pair is required to establish a DWDM-link with up to 20 wavelength channels. Each wavelength can be configured to carry 10 ESCON, two Fiberchannel/GbE or a single SAN channel.

When utilizing both fibers within the fiber-pair, up to 400 ESCON channels can be transported.

The Mentis DWDM-network can be configured to the exact capacity need by using the 1ch, 2ch or 4ch optical Add/drop filters in any combination.
The unique system architecture of the Mentis solution removes the need for costly optical amplifiers, which has a tremendous impact on both equipment and operational costs and also improves the network availability.

Mixed DWDM & CWDM

It is possible to mix CWDM- and DWDM- solutions on the same fiber by using one of the single-fibers for CWDM and the other for DWDM. A small network can thus be cost-optimized using CWDM connections and still be able to introduce a 10GbE connection on the same fiber.

Protected configurations

The highest availability will be achieved having two fully redundant paths in separate ducts as well as having the equipment for each paths separated. It is possible to select the most appropriate technology for each path, i.e. either CWDM or DWDM to provide the most cost-effective solution. Redundant power and fan units also enable single-chassis setups where both DWDM and CWDM units can share the same card cage with sufficient availability figures. It is possible to place the protection mechanisms within the SAN or Mentis layer on a per wavelength basis or on an aggregated fiber-level.

Secure configurations

The unique combination of electrical multiplexing, wavelength multiplexing and single-fiber architecture provides in itself a high level of security and makes eavesdropping extremely difficult.

Products included in the testing

Solution name: Mentis system with SAN-units
Hardware: CWDM/DWDM
Details:

Server

	xSeries 360	xSeries 360
Operating system	Windows 2000 adv. Server SP4	Windows 2003 adv. Server SP1
FC Adapter card Qlogic	4* QLA 2340L	4* QLA 2340L
Bios version	1.43	1.43
Driver level	9.0.1.10	9.0.1.10
SDD Version	1.5.1.3	1.5.1.3

Storage Product(s)

Vendor	IBM
Model Name and Number	ESS 2105
Version	Model 800
Serial Number	25688, 24997, 29144, 29458
Microcode Level	2.4.1.62 and 2.4.1.54

Storage area network equipment

Switch #	
Vendor	IBM (Brocade)
Model Name	IBM 2109 F16
Microcode Level	V3.1.1b

Lumentis equipment
Two Mentis 3000 equipped with the following boards/settings:

Item	HW	SW	Traffic type
M3000/DAC/19	R1A	-	-
CU	R2B	cuappl01a-r3b-041112_10	-
TPQMR	R1B	tuappl01a-r3b-041111_5	2 Gb/s FC
			1 Gb/s FC
			ESCON
GXP2500SFP	R1A	tuappl01a-r3b-041111_5	1 Gb/s FC
			ESCON
TPDFC	R1A	tuappl01a-r3b-041111_5	2x 1 Gb/s FC
TPMR2500	R1D	tuappl01a-r3b-041111_5	1 Gb/s FC
MDU4TermAB	R1A	-	-
AD1A/B	R1B	-	-
AD1A/B	R1B	-	-

The Mentis 3000 chassis and Control Unit (CU) are not traffic affecting and other types of chassis, e.g. M301 and M101 can be used also.

IBM TotalStorage Proven™ program

Description of the testing results obtained:

The tests were performed in November 2004.

The Mentis system passed all of the performed tests including:

- long-term testing
- restart tests
- stress-tests
- interoperability-tests
- performance tests
- documentation
- reliability/availability/serviceability

A detailed test log for the performed tests are included in the report "TS Proven, Lumentis, Mentis System, PPRC and Server Environment over distance" released by IBM TotalStorage Interoperability Center Mainz, Germany.

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