CORNING

Network Monitoring - Fibre TAP Modules
It all started with………

Bend insensitive MM fibre

Less space in the DC, More organised cable management

Smaller diameter cables

Greater density

Cable with tighter bend radius

Reduced size of components
And then he asks, “Can you make me some of these……?”
Born on Oct 30th 2012…….
Virtual Instruments Certifies Corning Cable Systems Pretium EDGE Tap Module to Work with VirtualWisdom Solution

Industry-Leading Solutions Work Together to Enable End-to-End Infrastructure Performance Management

SAN JOSE, Calif., October 30, 2012 – Virtual Instruments, the leader in Infrastructure Performance Management, and Corning Cable Systems LLC, part of Corning Incorporated’s (NYSE: GLW) Telecommunications segment, today announced that Corning Cable Systems Pretium EDGE® Tap Module, a passive traffic access point that integrates seamlessly into the Pretium EDGE® structured cabling solution, is certified for interoperability with Virtual Instruments’ VirtualWisdom solution devices. Virtual Instruments validated the interoperability of the Tap Module monitor output with both the SAN Performance Probe and SAN Insight Rover to ensure transparent, error-free access to the Fiber Channel SAN traffic at line rate.

“Our customers continue to validate that comprehensive, accurate, and timely monitoring from the physical layer is the best way to optimize infrastructure performance,” said Skip Bacon, chief technology officer, Virtual Instruments. “The visibility enabled by a tap is the foundation from which customers can gain a detailed view into performance across the physical, virtual and cloud layers. It’s an honor to work with Corning to help our mutual customers streamline the deployment of taps in the physical layer infrastructure.”

“We are delighted to be working with Virtual Instruments to demonstrate the value of our passive tapping solution with their systems,” said Stuart Hoiness, senior vice president, Enterprise Networks, Corning Cable Systems. “Virtual Instruments is the undisputed Fibre Channel network performance leader, so it’s very important to us and to customers to show the compatibility of our two product sets.”

The Pretium EDGE® Tap Module combines the functionality of an interconnect, cross-connect and optical tap in one easy-to-use structured cabling module. This integrated approach simplifies the deployment of taps, allows access to the monitor ports without disruption to the live network link, and provides increased network design flexibility. As part of the Pretium EDGE® Solutions family, the Tap Module is fully compatible with other Pretium EDGE® solution components, allowing for pay-as-you-grow Tap deployment.

The monitor outputs from the Pretium EDGE® Tap Module connect directly to Virtual Instruments SAN Performance Probe to enable real-time, full line rate monitoring of the tapped links. The SAN Performance Probe examines every frame and generates hundreds of metrics each second to provide deep insight into the performance, health, and utilization of the SAN. The VirtualWisdom solution combines these metrics with those from the other VirtualWisdom Probes to provide comprehensive
Virtual Instruments Overview
January 2013
Stuart Taylor
• Proven Leader in Infrastructure Performance Management (IPM)
• Revenue growth 100% yr.
• EMC Select Partnership launched November 2012

✓ VIP Partner program on fire!
✓ Key eco-system relationships
✓ Why do so many of the worlds largest banks run VI against their environments …?

✓ Why has the worlds most innovative consumer company trusted VI…?

✓ The worlds largest commercial SAN uses VI, why…?

✓ What is it that unlocked this previously impregnable door…?
Revolutionary Evolution

1Gb Fibre Channel

2-4Gb Fibre Channel

8-16Gb Fibre Channel
Revolutionary Evolution
Virtual Instruments – Solution Portfolio

**SAN Availability Probe**

**Virtual Server Probe**

**TAP = Performance Telemetry**

**Servers $5-10M**

**Fabric $2-5M**

**Storage $15-20M**

**Applications $150-300M**
Tapping is a SAN Best Practice

Traffic Access Points (TAPs):

• Have been widely deployed in IP networks (LANs, WANs) for 20+ years

• Provide direct access to all levels of fibre traffic to derive data on SAN/storage performance, utilisation, and transmission errors

• Are used by all system and storage vendors to diagnose device-specific problems

• Enable IT personnel to:
  – *Ensure high application availability*
  – *Maximise application performance*
  – *Proactively find problems before users*
  – *Systematically align CAPEX with business requirements*

• Unlock the unrivaled power of VirtualWisdom through integrated SAN Performance Probes and Protocol Analysers
TAP Technology

- A TAP uses fibre optic splitters to create a mirror copy of the signal from both channels of a duplex link
  - TAPs are passive and transparent to the live data path
  - The signal copy is out-of-band and transmit-only – upstream operations cannot impact the live link

Typical TAP Deployment

On Storage Link

Core Switch

Traffic Access Point

Monitoring and diagnostic devices

Storage Array

Fibre optic splitter 1 per channel

In from TX

Out to RX

TX

RX

RX

TX
TAPs are fundamental to monitoring

• TAPs provide complete, real time, transparent access
  – Access to all protocol layers in all traffic
    • Every bit and byte of traffic; FC0 through FC4 layers of Fibre Channel
  – Completely lossless at full line rate
  – Real time, no latency on either live link or TAP output
  – Work on all Fibre Channel links, irrespective of device type or vendor
  – Always-on, passive and transparent in operation

• Far superior to Switch Port Analyser (SPAN) or mirror ports, which…
  – Only access upper level protocol layers (FC3-4), no error traffic
  – Work only with switch ports, only from some vendors
  – Must change live switch configuration to enable
  – Arbitrarily drop frame data when port and/or switch capacity limits are reached
  – Introduce small, but significant latency on TAP output that makes correlation impossible
TAP Patch System

- Incorporate TAPs into patch panels via Patch-TAP Cassettes
  - Also have ‘passthrough’ configurations for Tapping into patch links
  - Designed for Virtual Instruments and other 3rd party shelves
    - Configurations for many cable combinations

- Works with all single- and multi-mode fibre optic signals up to 20 Gbps

- Streamlines widespread TAP deployment
  - Replacing patch-only panels most streamlined option
    - Integrate TAPs into existing layer in cable plant
    - Provides greatest fibre density, least rackspace impact
    - Obviates additional cable hop in data path

- Can also retrofit into existing patch link

LC connector

MTP connector
Fibre Channel Taps

- Virtual Instruments is the only player on the Fibre Channel side
- 12 ports per 1U for all LC based tap
Ethernet Taps

- Major TAP vendors on the Ethernet side are Gigamon, Net Optics and Network Critical (nTAP); make passive and active gear

Gigamon G-TAP Solution is 16 tap ports per 1U (1/2U panels with 2 tap ports per module, each 1/U panel supports 4 modules)

Blackbox solution is 3 tap ports per 1U (3 modules in a panel)

nTap solution is 9 tap ports per 1U (3 modules in a panel)

NetOptics G-TAP is 8 tap ports per 1U (8 modules in a panel)
Corning Fibre Channel and Ethernet Tap’s

- 72 Ports per 1U
- 288 Ports per 4U
Tap Module

• Red adapter indicates TAP port
# Configuration B.1 – Integrated MTP/MTP/LC

<table>
<thead>
<tr>
<th>Tap Ratio</th>
<th>Application</th>
<th>Protocol</th>
<th>Data Rate</th>
<th>Traffic Type</th>
<th>Fibre Type</th>
<th>Max Channel Link Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>70/30</td>
<td>Switch to Storage</td>
<td>Fibre Channel</td>
<td>8G</td>
<td>Live</td>
<td>OM4/OM3</td>
<td>135/105 m</td>
</tr>
<tr>
<td>50/50</td>
<td>Switch-Switch Switch-Server</td>
<td>Ethernet</td>
<td>10GbE</td>
<td>Live</td>
<td>OM4/OM3</td>
<td>400/275 m</td>
</tr>
<tr>
<td>50/50</td>
<td>Switch-Switch Switch-Server</td>
<td>Ethernet</td>
<td>10GbE</td>
<td>Tap</td>
<td>OM4/OM3</td>
<td>390/265 m</td>
</tr>
</tbody>
</table>

*Note: TAP port module harness is limited to 5m for 8G Fibre Channel*
## Configuration B.2 – Integrated MTP/MTP/LC

<table>
<thead>
<tr>
<th>Tap Ratio</th>
<th>Application</th>
<th>Protocol</th>
<th>Data Rate</th>
<th>Traffic Type</th>
<th>Fibre Type</th>
<th>Max Channel Link Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>70/30</td>
<td>Switch to Storage</td>
<td>Fibre Channel</td>
<td>8G</td>
<td>Live</td>
<td>OM4/OM3</td>
<td>100/80 m</td>
</tr>
<tr>
<td>50/50</td>
<td>Switch-Switch Switch-Server</td>
<td>Ethernet</td>
<td>10GbE</td>
<td>Live</td>
<td>OM4/OM3</td>
<td>390/265 m</td>
</tr>
<tr>
<td>50/50</td>
<td>Switch-Switch Switch-Server</td>
<td>Ethernet</td>
<td>10GbE</td>
<td>Tap</td>
<td>OM4/OM3</td>
<td>390/265 m</td>
</tr>
</tbody>
</table>

*Note: TAP port module harness is limited to 5m for 8G Fibre Channel*
## Configuration B.3 – Integrated MTP/MTP/LC

<table>
<thead>
<tr>
<th>Tap Ratio</th>
<th>Application</th>
<th>Protocol</th>
<th>Data Rate</th>
<th>Traffic Type</th>
<th>Fibre Type</th>
<th>Max Channel Link Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/50</td>
<td>Switch-Switch Switch-Server</td>
<td>Ethernet</td>
<td>10GbE</td>
<td>Live (A)</td>
<td>OM4/OM3</td>
<td>400/275 m</td>
</tr>
<tr>
<td>50/50</td>
<td>Switch-Switch Switch-Server</td>
<td>Ethernet</td>
<td>10GbE</td>
<td>Tap (A+B)</td>
<td>OM4/OM3</td>
<td>380/260 m</td>
</tr>
</tbody>
</table>

*Note: This design not applicable to Fibre Channel due to 5 meter limit*
<table>
<thead>
<tr>
<th>Architecture</th>
<th>Notes</th>
<th>When to Deploy</th>
</tr>
</thead>
</table>
| Configuration B1 | • Simplest architecture to deploy  
• Monitor + MDA in the same area | • When you need to tap selected ports in a network                          |
| Configuration B2 | • Cross-connect architecture  
• MDA switch is port replicated | • When you need to tap every port  
• When you want to tap ports without disrupting the existing infrastructure |
| Configuration B3 | • Consolidation of monitoring equipment into a single controlled area | • When you desires to have all the monitoring in a single area for easy access to data |
Product Requirements

Specifications

<table>
<thead>
<tr>
<th>Fibre Type</th>
<th>Split Ratio Live/Tap</th>
<th>Part Number</th>
<th>Module Port Density</th>
<th>Attenuation Live/Tap MM-850 nm SM-1310 nm</th>
<th>MTP® Connector Insertion Loss</th>
<th>LC Insertion Loss</th>
<th>Polarity</th>
</tr>
</thead>
<tbody>
<tr>
<td>OM4</td>
<td>50/50</td>
<td>ETM-5B-Q</td>
<td>6</td>
<td>3.8/3.8</td>
<td>0.35 dB</td>
<td>0.15 dB</td>
<td>Universal</td>
</tr>
<tr>
<td>OM4</td>
<td>70/30</td>
<td>ETM-7B-Q</td>
<td>6</td>
<td>1.8/6.6</td>
<td>0.35 dB</td>
<td>0.15 dB</td>
<td>Universal</td>
</tr>
<tr>
<td>OS2</td>
<td>50/50</td>
<td>ETM-5B-G</td>
<td>6</td>
<td>3.6/3.6</td>
<td>0.75 dB</td>
<td>0.5 dB</td>
<td>Universal</td>
</tr>
<tr>
<td>OS2</td>
<td>70/30</td>
<td>ETM-7B-G</td>
<td>6</td>
<td>2.0/6.0</td>
<td>0.75 dB</td>
<td>0.5 dB</td>
<td>Universal</td>
</tr>
</tbody>
</table>

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETM-5B-Q</td>
<td>Pretium EDGE® Tap Module, OM4 50 micron multimode fibre, 50/50 split ratio</td>
</tr>
<tr>
<td></td>
<td>(live/tap), 12 fibre LC duplex ports, one pinned MTP® adapter labelled LIVE,</td>
</tr>
<tr>
<td></td>
<td>one pinned red MTP adapter labelled TAP</td>
</tr>
<tr>
<td>ETM-7B-Q</td>
<td>Pretium EDGE Tap Module, OM4 50 micron multimode fibre, 70/30 split ratio</td>
</tr>
<tr>
<td></td>
<td>(live/tap), 12 fibre LC duplex ports, one pinned MTP adapter labelled LIVE,</td>
</tr>
<tr>
<td></td>
<td>one pinned red MTP adapter labelled TAP</td>
</tr>
<tr>
<td>ETM-5B-G</td>
<td>Pretium EDGE Tap Module, OS2 single-mode fibre, 50/50 split ratio (live/tap)</td>
</tr>
<tr>
<td></td>
<td>, 12 fibre LC duplex ports, one pinned MTP adapter labelled LIVE, one pinned</td>
</tr>
<tr>
<td></td>
<td>red MTP adapter labelled TAP</td>
</tr>
<tr>
<td>ETM-7B-G</td>
<td>Pretium EDGE Tap Module, OS2 single-fibre, 70/30 split ratio (live/tap), 12</td>
</tr>
<tr>
<td></td>
<td>fibre LC duplex ports, one pinned MTP adapter labelled LIVE, one pinned red</td>
</tr>
<tr>
<td></td>
<td>MTP adapter labelled TAP</td>
</tr>
</tbody>
</table>
Products

• MTP connections into LIVE ports of TAP module:
  – Module Harness (formally known as direct-connect harness), Hybrid trunk, Univ Trunk + Univ Module (all will work)
• LC connections into LIVE ports of TAP module:
  – Can be Uniboot LCs or Duplex LCs
• MTP connections into TAP ports of TAP module:
  – Limited to 5m for 8G Fibre Channel
  – PnP Module Harness (formally known as direct-connect harness), Univ Trunk + Univ Module
• LC connections into TAP port of Devices:
  – Simplex LC or Duplex LC (aka, non-uniboot)
### Value

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear exiting TAP ports</td>
<td>Does not require additional rack space like current solutions</td>
<td>Better utilisation of rack space results in higher revenue generation per RU</td>
</tr>
</tbody>
</table>

- 1U for every 8-16 ports to tap (based on vendor)
- Corning EDGE Tap requires no additional rack space
<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration of TAPs in structured cabling component (module)</td>
<td>Allows “built-in” ability to add and remove ports which are monitored with no disruption in LIVE network traffic</td>
<td>Reduces risk by eliminating downtime associated with temporally breaking a link in order to “install” a TAP</td>
</tr>
<tr>
<td></td>
<td>Removes two LC connections (one jumper) from the LIVE network link</td>
<td>Removes the additional LC jumper (cost savings) and reduces attenuation of links (results in extended distances)</td>
</tr>
</tbody>
</table>
## Value

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High performance Multi-mode Splitters</td>
<td>Reduced insertion loss of splitter allows for extended reach</td>
<td>Reduced risk of working outside standard guidance of Fibre Channel and Ethernet</td>
</tr>
</tbody>
</table>

### Data Rate

<table>
<thead>
<tr>
<th>Data Rate</th>
<th>Link</th>
<th>Insertion Loss (coupler)</th>
<th>Fibre Type</th>
<th>Link Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>8G Fibre Channel</td>
<td>70% LIVE</td>
<td>2.2 dB (std)</td>
<td>OM4/OM3</td>
<td>5/-m</td>
</tr>
<tr>
<td>8G Fibre Channel</td>
<td>70% LIVE</td>
<td>1.8 dB (Corning)</td>
<td>OM4/OM3</td>
<td>85/75 m</td>
</tr>
</tbody>
</table>

Cabinet/Pod A

Cabinet/Pod B
<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTP Based TAP port</td>
<td>Allows separation of LIVE and TAP ports into different cabinet locations via a Tap harness or trunk &amp; module</td>
<td>Cost savings from consolidation of active monitoring gear (utilisation); reduce risk of patching errors</td>
</tr>
</tbody>
</table>
Follow up webinar – more in depth

- Thursday 7th February
- 14:00 CET/13:00 GMT
Thank You for your attention!

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