SONET SDH & DWDM CONSULTING WORKSHOP

DURATION: 5 days (approx- 25 hours)

SUNDAY TO THURSDAY June 22 to 26 - 2014

DUBAI – UAE
Program Overview:
This course provides an overview of the SONET/SDH and DWDM network architecture, networking elements and components, and technologies, required to build evolving transport networks. The participants will gain understanding of architecture, services and applications commonly used in SONET/SDH and DWDM networks.

Target Audience:
This course is designed to provide a general overview for strategic or technical managers, professionals, software engineers, system engineers, network professionals, marketing and sales professional, IT professionals, and others who plan on using, evaluating, designing or working with SONET/SDH, D/WDM and optical networks.

Prerequisites: No prerequisites.

Objectives:
Upon completion of this course, the attendees will be able to:
• Understand SONET/SDH Technology, Transmission Hierarchy, Architectures & Services, SONET/SDH Network Elements
• Understand Digital Signal Synchronization
• Develop SONET/SDH network architecture and configuration using Terminal Multiplex, Regenerator, Add/Drop Multiplexer (ADMs), Digital Cross-Connects and Digital Loop Carrier.
• Understand the basics of DWDM
• Explain basic DWDM Network Designs and Engineering, Utilize different parameters in DWDM networks and optical systems
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<td>• Pre Evaluation Test:</td>
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<td>Session 1 (From 9 to 11:30):</td>
<td>• SONET Technology and Terminology:</td>
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<td>o SONET digital hierarchy</td>
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<td>o Line Overhead (LOH)</td>
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<td>o Path Overhead (POH)</td>
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<td>o Floating payload: SONET pointers</td>
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<td>o Synchronization and accommodating jitter</td>
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<td>• Virtual Tributaries (Containers):</td>
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<td>o VT groups</td>
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<td>o Virtual tributaries pointers</td>
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<td>o SONET VT multiframe</td>
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<td>o SONET mapping of asynchronous DS-1, byte-synchronous DS-1, asynchronous DS-3, and asynchronous DS-4</td>
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<td>• STS-N Frame Format:</td>
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<td>o Concatenated STS-Nc frame format</td>
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### Day 2: Monday:

#### Session 1 (From 9 to 11:30):

- **SDH versus SONET:**
  - SONET vs SDH frame structure
  - STM-1 frame
  - Overhead bytes and their function
  - SDH layers
  - Mapping in SDH: C4 mapping and C-3 mapping examples
  - Hierarchical multiplexing structure

- **SONET/SDH Networking:**
  - Network survivability architectures
  - Protection topologies: Linear
  - Protection topologies: Ring
  - Protection topologies: Mesh
  - Topologies: Rings, # fibers, directionality
  - SONET: Automatic Protection Switching (APS)
  - SONET linear APS
  - Add-Drop Multiplexing (ADM)
  - Digital Cross-Connects (DCC)

#### (From 11:30 to 12:00):

- Coffee Break

#### Session 2 (From 12:00 to 14:30):

- **Current Architectures: Ring Protection:**
  - Unidirectional Path Switched Ring (UPSR)
  - Bidirectional Line Switched Ring (BLSR/2)
  - Bi-directional Line Switched Ring (BLSR/4)
  - Mesh restoration versus ring/linear protection

- **IP over SONET:**
  - IP+SONET vs. IP+ATM+SONET
  - IP over Optical Networks (IPO)
  - Packets over SONET (POS)
  - Point-to-Point Protocol (PPP) - RFC1661

- **SONET/SDH Limitations:**
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| Day_3: Tuesday: | • **Next Generation SONET/SDH:**  
  o Virtual Concatenation: VCAT  
  o SONET channelization and concatenation  
  o Virtual concatenation group  
  o Link Capacity Adjustment Scheme: LCAS  
  o LCAS architecture  
  • **Generic Framing Procedure (GFP):**  
  o GFP client signal adaptation  
  o GFP frame format  
  o adding GFP on SONET  
  o Ethernet over SONET  
  o virtual concatenation for Ethernet  
| (From 11:30 to 12:00): | Coffee Break |
| Day_4: Wednesday: | • **Optical Transport Network:**  
  o OTN hierarchical overview  
  o Basic transport structure of an OTN  
  o OTN transmitter and receiver  
  o OTN layer structure  
  o OTN interface classes  
  o OTN hierarchical overview  
  • **Next Generation Network (NGN):**  
  o Merging the voice and data worlds  
  o Vision of ITU-T NGN  
  o Structure of ITU NGN Focus Group (FGNGN)  
| Session 1 (From 9 to 11:30): | • **Wave Propagation through Fibers: Linear Regime:**  
  o Types of fiber  
  o Attenuation and dispersion  
  • **More on Wave Propagation through Fibers: Non-Linear Regimes:**  
  o Chromatic dispersion  
  o Polarization mode dispersion  
  o Pulse dispersion  
  o Effective length/area  
  o Brillouin/Raman scattering  
  o Four-wave mixing  
  o Self-/Cross-Phase Modulation (SPM/XPM)  
| (From 11:30 to 12:00): | Coffee Break |
Session 2 (From 12:00 to 14:30):

- **Passive Transmission Devices:**
  - Couplers
  - Splitters
  - Isolators
  - Circulators
  - Gratings
- **More on Passive Transmission Devices:**
  - Fabry-Perot filter (FSR, Finesse)
  - Mach-Zehnder interferometers
  - Arrayed Waveguide Gratings (AWGs)
  - Multiplexer architecture
- **Active Transmission Devices:**
  - Erbium-doped and Raman fiber amplifiers
  - Semiconductor Optical Amplifiers (SOAs).
  - Transmitters: Lasers, distributed-feedback lasers, mode-locked lasers
  - LEDs
- **More on Active Transmission Devices:**
  - Direct and external modulation
  - Detectors: Photodetectors and photodiodes
  - Optical switches
  - Wavelength converters
| Session 1 (From 9 to 11:30) | Modulation:  
• Signal formats  
• Subcarrier modulation  
• Optical channel capacity  
• Demodulation: Shot/thermal noise; ideal signal detection  
• Optical signal-to-noise, bit error rate  
• Intersymbol Interference (ISI)  
• Coherent detection  
| Point-to-Point Links:  
• Optical link budgets, margin  
• Power penalties, maximum transmit power  
• Dispersion compensation  
• Amplifier cascades  
| Client Layers:  
• SONET/SDH  
• ATM  
• IP  
| DWDM Network Architecture:  
• Optical Add-Drop Multiplexers (OADMs)  
• Optical Cross-Connects (OXC)s  
• Lightpath Topology Design (LTD)  
• Routing & Wavelength Assignment (RWA), Graph coloring  
<p>| (From 11:30 to 12:00) | Coffee Break |</p>
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<th>Session 2 (From 12:00 to 14:30):</th>
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<td><strong>More on DWDM Network Architecture:</strong></td>
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<tr>
<td>o Network survivability</td>
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<td>o SONET rings</td>
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<td>o Optical protection, reliability (MTBF, MTTR).</td>
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<td>o Optical control and management</td>
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<td>o Performance management, optical overhead.</td>
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<td>o Optical Transport Network (OTN)</td>
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<td><strong>Access Networks:</strong></td>
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<td><strong>Deployment Considerations:</strong></td>
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<td>o Undersea cable</td>
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<td><strong>Emerging and Future DWDM Systems:</strong></td>
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<td>o Photonic packet switching</td>
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<td><strong>Wrap-up: Course Recap, Q/A, and Evaluations:</strong></td>
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<td><strong>Post Evaluation Test:</strong></td>
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**OPEN QUESTION ANSWERS & PROGRAM CLOSURE**

**SCHEDULE: Each day**

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<td>Day 4</td>
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<td>Day 5</td>
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<td>Session 2 (From 12:00 to 14:30 )</td>
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Course Material

All participants will be provided course material designed by the trainer comprising power-point slides used for presentation, case studies, Industry examples and other training material used for the program.

Certificate of Participation

The program will consist of a pre-training test and a post-training test based on which All participants will receive a certificate of participation which will be endorsed by the trainer and the organizers.

TRAINERS PROFILE

ONE OF THE FOLLOWING TRAININERS WILL BE MADE AVAILABLE BASED ON DATES OF THE TRAINING AGREED.

Mr. Ahmed  (Language proficiency: English – Arabic)

14+ years of Experience in telecommunication field in ME region, I have high skills and knowledge in Telecommunications field especially Telecom Transmission techniques, IP domains, Wireless and Mobile technologies, as GSM, CDMA, UMTS, LTE, WIMAX and TETRA. He also have broad experience in projects and manage projects in telecom industry including Telecom products delivery and migration, Telecom services delivery including optimization, Audit and benchmarking, several Telecom installation and integration projects.

Technical Skills:

- Various Telecom Transmission Technologies
- Optical Networks
- TDM and IP based Networks
- Microwave Networks
- WDM and OTN Technology
- SDH Technology
- Project Delivery
- Performance KPIs Benchmarking and Optimization
- Network Capacity Audit and Optimization
- Various technologies capacity forecasting and Control

Huawei, Damamax, Motorola
Education - Jami‘at Mu‘tah

Sr. Telecom Transmission Consultant - October 2011 – Present (2 years 6 months)|ME
Transmission Audit and Optimization for Transmission networks, including gathering data, create database for links and unify other related data, Benchmarking Network KPIs with ITU Standards, E2E Capacity, Frequency, performance analysis and optimization.

Projects:
- Zain SA Audit - Nov 2012
- Sudatel Tx optimization Dec 2011 - May 2012
- Zain KW Audit May 2012 - present

Senior Network Engineer - Huawei March 2010 – June 2011 (1 year 4 months)|UAE
- Plan and integrate Huawei optical products including microwave (RTN 600, RTN 900), SDH (OSN 3500, OSN 7500), and NG-WDM (OSN 6800, OSN 8800)
- Plan network capacity and network topology according to customer demands

Projects: UAE DU OTN Project- May 2010- May 2011

Telecom Transmission Consultant - Damamax - January 2009 – March 2010 (1 year 3 months)|Khartoum - Sudan
- Lead the transmission department to improve network KPIs and achieve flawless transmission network with the highest possible availability.

Projects: DamaMax Khartoum Transmission Netowrk: Jan 2009-Jan 2010

Senior Transmission Engineer - Motorola - March 2008 – January 2009 (11 months)
- Define network topologies and major nodes, estimate network size and capability using PL 4.0
- Follow up subcontractors for microwave line of sight and installation,


Transmission Planning Engineer - Umniah - February 2007 – March 2008 (1 year 2 months)
Full end to end telecom transmission network design and optimization including issuing detailed network descriptions (as diagrams and schematics) showing the proposed Core and Access network, including configuration, capacity and functionality of each network element in the network.
- Full network capacity planning and optimization including analysing inter-node connections and the capacity requirements between all nodes
- Issuing microwave frequency plans optimized for best performance and capacity
- Perform all required changes to the existing microwave equipment and parameters to increase the total network availability and minimize the interference (e.g. TX Power, Dish Sizes, Antenna heights etc...).
- Provide all redundancy plans and detail how resilience will be built into the network so that the failure on any network element or links will not seriously affect the network.
- Provide and analyse internationally acceptable KPI indicators and corresponding target values for the hall network.

Provide all required recommendations on processes and procedures related to running, operating and maintaining the transmission network

Analysis of capacity plans & utilization for GSM, 3G, CDMA and LTE as well as microwave link budget and network plans using PATHLOSS 4.0, PATHLOSS 5.0 and Ellipse - Mentum
- Ensure the alignment of existing frequency plans with corresponding ITU recommendations and ensuring the accuracy of budget calculations.
- Enhance network performance by minimizing and eliminating network interference and extra power.
- Optimization of transmission, data analysis, creation of proper links database.
Projects handled:

JEPCO transmission network optimization - January 2005  
ASIACELL transmission network design - January 2005  
Xpress transmission network design - January 2004  
UMNIAH phase 3,4 & WIMAX planning and roll out - Jordan  
Implementation of 2G, 3G network in TABOUK region  
Implementation of 2G, 3G network in Medina region  
E2E Planning and Implementation of DAMAMAX Transmission network  
DU OTN backbone Project  
Transmission network Audit and Optimization for ETISALAT – UAE  
Transmission network Audit for ZAIN – Kuwait  
Optimization for SUDATEL Telecom Network  
Transmission network Audit for ZAIN – Saudi Arabia  
ZAIN Saudi - Network Planning Tools Delivery  
ZAIN Iraq Netowrk Planning Tools Delivery  
Nedjma Algeria I-View Dimension Delivery

It will be our pleasure to submit any further information you may require in this regard. Any customizations you may require in this program should also be addressed minimum 20 days in advance

We look forward to hear from you

Thanks and Regards

PROGRAM COORDINATOR

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