Setting Up, Understanding and Troubleshooting of Industrial Ethernet and Automation Networks

INTRODUCTION:

We have taken all the latest techniques and know-how relating to industrial data communications systems and distilled them into this two day hard-hitting workshop so you can update yourself in this fast-moving and powerful area. This workshop will also update you with the latest information on industrial Ethernet, industrial automation networks, industrial network security and OPC.

OVERVIEW OF THE WORKSHOP:

Ethernet is fast becoming the obvious choice for automation networks worldwide. It is a rugged, versatile technology, equally at home in a chemical plant, on an ocean-going vessel and in the cockpit of a fighter aircraft. While the packet structure of Ethernet has not changed since its inception, technologies such as fast and gigabit Ethernet, industrial Ethernet, VLANs, redundant rings and real-time (deterministic) Ethernet for motor control applications have increased the complexity and choices available in planning and designing these systems. As Ethernet has become more complex, a number of misconceptions have arisen as to how Ethernet functions and how the system should be optimally configured. This workshop addresses these issues in a clear and practical manner.

Ethernet can be easily augmented with wireless technologies, and the workshop takes a brief look at the current and emerging industrial wireless technologies such as IEEE802.11, wireless mesh and wireless sensor networks; how they function, and where they fit into the overall picture.

Ethernet is almost synonymous with the TCP/IP protocol suite. Because of its rugged design and the fact that it is Internet-compatible, all major automation system vendors are adopting TCP/IP (and, of course, Ethernet). This complex topic will be covered in an easily-understandable and coherent manner.

OPC has made vast inroads into the process automation arena and has been adopted by every single SCADA system vendor. We will look at current standards, in particular the DA standard, and also at new developments such as the 'Unified Architecture'. We will also highlight some tricky implementation issues and ways to avoid the pitfalls.

With regard to the automation arena there is a strong move to wireless and Ethernet/TCP/IP. We will look at the offerings of the HART communication foundation, the open DeviceNet Vendor Association, The PROFIBUS/PROFINET user organisations and the fieldbus foundation, as well as the latest Ethernet fieldbuses such as EtherCAT, EPL and SercosIII, to get an overall idea of the current trends. In particular we will focus on the real-time issue, a prerequisite for motor control applications. Real-time Ethernet can now operate at sub-millisecond access times and less than one microsecond jitter. We will look at the various offerings by the abovementioned vendors and the two basic methods through which this incredible performance is being achieved.

Finally we will look at every system manager's nightmare, security, and will suggest some simple common-sense and internationally-accepted measures to keep the hackers at bay.

WHAT YOU WILL GAIN:

- A practical toolkit of know-how on latest data communications technologies
- How to grasp the latest updates to OPC
- How to understand the operation of industrial wireless systems
- Practical experience in troubleshooting cable and wireless systems
- Design tips and tricks for your own operational industrial data communications systems
- How to integrate the different industrial communications protocols and standards
- How to skill yourself up as the local guru in industrial data communications

TIMING:

Course timing is generally 8.00am registration and 8.30am start with 12.30 lunch and 5.00pm finish. There are also morning and afternoon breaks. These can be varied for on-site presentations.

WHO SHOULD ATTEND?

Anyone who wants to get the latest up to date practical information on industrial data communications systems and challenges ranging from fieldbus and Ethernet systems to OPC and security, including:

- Consulting engineers
- Control engineers and technicians
- Design engineers
- Designers
- Electrical engineers
- Electronic technicians
- Instrumentation engineers and technicians
- Network maintenance staff
- Network planners
- Plant managers
- Process control engineers
- Test engineers
- Systems engineers
- System integrators

COMPANION COURSES:

Other IDC workshops which that enhance the knowledge gained from this workshop include:

- Best Practice in Industrial Data Communications
- Practical Data Communications and Networking for Engineers and Technicians
- Practical Troubleshooting and Problem Solving of Ethernet Networks
- Practical Fieldbus, DeviceNet and Ethernet for Industry
- Practical Fibre Optics for Engineers and Technicians
- Practical Troubleshooting, Design and Selection of Fibre Optic Systems
- Practical Industrial Ethernet and TCP/IP Networks
- Practical Routers and Switches for Engineers and Technicians
- Practical TCP/IP and Ethernet Networking for Industry
- Practical Fundamentals of Telecommunications and Wireless Communications
- Practical TCP/IP: Troubleshooting and Problem Solving for Industry
- Practical Fundamentals Of Voice Over IP (VO/IP)
- Practical Wireless Networking for Engineers and Technicians

Technology Training that Works

IDC TECHNOLOGIES ACCREDITATION STATUS:

It is very important to us, at IDC Technologies, to ensure that our clients can confidently attend our workshops and courses, knowing that the professional development they are receiving is of a creditable standard and will provide them with personal measurable, productivity gains and the opportunity for career advancements.

IDC has received recognition, endorsement and/or accreditation (varies by course and location) from authorising bodies based around the world. These organisations include:

- ☑ The Engineering Institute of Technology (EIT) is a sister company of IDC. EIT provides Professional Certificates of Competency and endorsed engineering Advanced Diplomas, designed for students working in industry who need a practical, relevant education that is delivered efficiently.

- ☑ Institute of Measurement and Control (IMC) in the United Kingdom is Britain's foremost professional body for the Automation Industry. IDC Technologies is a recognized Companion Company of the IMC.

- ☑ The Institution of Professional Engineers New Zealand (IPENZ) is the professional body which represents professional engineers from all disciplines in New Zealand. IPENZ members can self assess for CPD points associated with IDC Technologies' public workshops.

- ☑ IDC Technologies is registered with Pembangunan Sumber Manusia Berhad (PSMB) (Human Resources Development Fund in Malaysia) in Category A.

- ☑ The South African Institution of Mechanical Engineers (SAIMechE) covers all fields of application including automobile, energy generation, process engineering, heavy manufacture, design, management, research, mining and education.

- ☑ IDC Technologies is a Participating Partner with the Engineering Institute of Canada (EIC) and IDC programs and courses can be utilised by members to register for Continuing Education Units (CEUs). EIC's Continuing Education Program is supported by The Canadian Council of Professional Engineers, The Association of Consulting Engineers of Canada, and The Canadian Academy for Engineering. EIC is a member of the International Association for Continuing Education and Training, with headquarters in Washington, DC.

In order to receive the necessary endorsements IDC Technologies has been through formal and often exacting application processes with success as outlined above.

We have presented training courses to over 200,000 engineers and technicians over the past 16 years and our aim of maintaining the highest of standards has endured. We have rigorously designed procedures to achieve this end; from the conception of the topics through to the training of the instructors, prior to the workshops' delivery.

Technology Training that Works

IDC TECHNOLOGIES CLIENT LIST:

IDC Technologies training workshops have been supported by, and invited to present on-site to a substantial number of major corporations, Government Departments and other organisations around the World, some examples are:

ABB – Global	Kelogg Brown Root – UK & USA
Anglo – South Africa & Australia	Kuwait Petroleum
ArcelorMittal - Global	LaFarge - Africa
Astra Zeneca – UK & Australia	Mars – USA
Atomic Energy Commission – Canada	Met-Mex Penoles - Mexico
Australian Navy & Air Force	Michelin - USA
BAE – UK & Australia	Modec - Africa
BHP Billiton – Global	NASA – USA
Boeing – USA	Norske Skog – New Zealand & Canada
Bombardier - Canada & South Africa	Petro Canada
BP - Global	Petronas – Myanmar
British Nuclear Fuels – UK	PetroSA – South Africa
Caltex - Global	Pfizer – Ireland & Australia
Canadian Forces Bases – Canada	Pratt & Whitney - USA
Chevron – Global	PSN - Global
ConacoPhillips - USA	Qatar Gas
DeBeers – South Africa & Ireland	Qatar Petroleum
Dept of Energy – USA	Reyrolle – Pacific
Dept. of Defence – USA	Rio Tinto – Global
Downer EDI – Australia	Rolls Royce – UK
EDF - UK	SAB – South Africa
Elf Exploration – UK	Saudi Electricity – Saudi Arabia
Emerson – Australia	Schlumberger – Europe
ESB - Ireland	Schneider – Australia
Eskom - Africa	Shell – Global
ExxonMobil - Global	Siemens – Global
Eurotunnel – UK & France	South African Breweries
Fonterra – New Zealand	Syncrude – Canada
GE Oil & Gas - UK	Tati – India & South Africa
General Motors – Global	Thales – Australia & South Africa
GSK - Global	Toshiba - Australia
Halliburton – UK	Total Oil - Global
Hatch – Australia, Asia	Toyota – UK & USA
Honeywell – Global	UKAEA – UK
Invensys - Australia	Unilever – UK & South Africa
Irish Navy	United Nations - Iraq
ITER – Europe	Xstrata - Global
Joy Mining – South Africa & Australia	Yokogawa – Australia and Asia

There are many others not on the above list, it is provided only as a guide to the stature with which IDC Technologies Training is held and the global nature of our business.

Please e-mail to training@idc-online.com and see why these, and many other organisations, choose IDC Technologies for their Engineering and Technical Training needs.

CONTENT SUMMARY

REGISTRATION

INTRODUCTION
- The OSI model and client/server paradigm
- The overall picture: where all these technologies fit in
- Current trends

INDUSTRIAL ETHERNET
- Background: IEEE 802.3 CSMA/CD
- Fast, gigabit and ten gigabit Ethernet
- Switched Ethernet networks, redundant rings and VLANs
- Industrial Ethernet components
- Real-time (deterministic) Ethernet and IEEE1588
- Implementation and troubleshooting

INDUSTRIAL WIRELESS
- Wi-Fi (IEEE802.11a/b/g/n)
- Wireless mesh networks (IEEE 802.15.4)
- Wireless sensor networks (IEEE 1451)

TCP/IP
- The TCP/IP protocol suite
- Network layer protocols (IPv4, ICMP, ARP)
- Host-to-host layer protocols (TCP, UDP)
- Application layer protocols (FTP, HTTP, Telnet etc)
- Configuration and troubleshooting

OPC
- The OPC concept
- OPC specifications and unified architecture
- DCOM and registry issues
- OPD DA (Data Access)
- Redundancy, tunnelling and bridging
- Implementation and troubleshooting issues (especially Windows XP SP2)

AUTOMATION NETWORK DEVELOPMENTS
- Fieldbus definition and standards
- HART communication foundation: HART and WirelessHART
- ODVA: DeviceNet, Ethernet/IP and CIPSync
- PNO: PROFIBUS DP/PA, PROFINET v1, v2 (SRT), v3 (IRT)
- Fieldbus foundation: FOUNDATION fieldbus H1 and HSE
- Real-time Ethernet fieldbuses:
    - EtherCAT
    - Ethernet PowerLink (EPL)
    - Sercos III

SECURITY FOR INDUSTRIAL NETWORKS
- Authentication
- Encryption
- Firewalls
- Wireless LAN issues
- Practical steps to safeguard your automation network

SUMMARY & OPEN FORUM

COMPLETE FEEDBACK SHEETS

CLOSING

14 PRACTICAL SESSSIONS DURING THE WORKSHOP:
- Install and configure an industrial wireless access point as part of Ethernet network
- Interconnect industrial wireless and Ethernet networks
- Control access with MAC address filtering
- Perform path loss calculations on radio link
- Use protocol analyser to solve Ethernet problems
- Connect up simple analog and digital I/O system to network
- Troubleshoot a HART instrument
- Analyse protocols for ProfiNet and Ethernet/IP
- Configure IP addresses and subnet masks
- Analyse ARP/ICMP/IP/UDP/TCP using protocol analyser
- Connect up different packages using OPC
- Troubleshoot a simple OPC problem
- Set up a simple firewall
- Demonstrate network security using encryption and authentication