

## Success Builders International (SBI) Announces **Platform: Certificate in Next Generation Telecoms** Courses for 2016

Your comprehensive platform to understanding next generation telecommunication technology

**20 days (Four x 5-day courses)**

Version 6.0

The Platform: Certificate Programme in Next Generation Telecoms has been designed to develop a vendor-independent thorough technical understanding of the broad range of technologies that have found their way into modern, next generation telecommunications Service Provider networks. The programme is the A to Z of Telecommunication technologies. It starts by providing a thorough understanding and foundation of legacy technologies and then expands this sound foundation into the technologies used to successfully converge voice, video and data services onto a single, all-IP, next generation telecommunication infrastructure. The programme starts off providing a “big picture” of how and why all the technologies are used and their role in the NGN. Once the technologies and acronyms are correctly positioned, it then drills down and provides detail of the technologies. The Platform Certificate is an intensive journey that addresses the need to develop Transmission, Telecommunication and IP skills in the Service Provider industry.

### **Platform: Certificate in Next Generation Telecoms Overview**

The Platform programme has evolved extensively over time with customised updates being made every year to optimise time and to ensure that the programme remains abreast with the technological changes and advances that have been made in the Service Provider telecommunications industry. It specifically addresses the need for industry professionals to build a strong knowledge foundation in IP-based and next generation telecommunication networks.

The programme comprises of 20 days instructor-led training which is broken down into four 5 day courses. Some of the courses include practical hands-on laboratory exercises where the learners can experientially apply what they are learning. SBI emphasises assessment during the programme. The assessment includes review exercises that form part of the learners’ after hours learning, an end of course exam, and a final exam.

The course material for Platform has all essential diagrams printed in colour which will also enhance the learner’s learning experience.

### **Who should attend the Platform Certificate programme?**

Typical delegates include technical staff, network operations personnel, network solution architects, project managers, managers who are in a technical telecoms environment, management consultants and anyone who would like to gain an in-depth knowledge of modern telecom’s transmission and IP network technologies. No previous knowledge is required although a technical background is advantageous but not essential.

### **Why should you attend this programme?**

After completing the programme you will:

- Have an end-to-end understanding of the technologies used in traditional and modern IP based NGN telecoms networks
- Understand how traditional and modern telecoms networks are architected

- Understand wireless communication including spectrum, modulation schemes, mobile technologies (GSM, EDGE, UMTS, HSPA, HSP+ and LTE), microwave systems and satellite communication technologies
- Know how the major transmission technologies work (PDH, PPP, Frame Relay, ATM, SDH next generation SDH and DWDM)
- Identify where different technologies are used in a network and the role that they play
- Have a detailed understanding of the operation of Ethernet, switching and VLAN technologies, plus be able to setup networking equipment that implements this technology
- Be in a position to use a network analyser to do detailed packet analysis
- Discuss the functionality and operation of the major protocols in the TCP/IP protocol suite
- Understand the detailed operation of the TCP and IPv4 and IPv6 protocols
- Know how IPv4 and IPv6 addresses work, including subnetting, VLSM and CIDR
- Be able to install and configure routed networks, using RIP, OSPF and BGP routing protocols
- Develop a detailed knowledge of IPv6, its functionality and transition scenarios
- Recognise the need for multicasting technologies on modern IP based networks plus the technologies that are needed to effectively implement multicast networks (IGMP, IGMP snooping, PIM etc)
- Understand QoS and CoS technologies (IntServ and DiffServ), their associated technologies (RSVP, WFQ, RED etc.) and how packet marking is used
- Develop a comprehensive understanding of MPLS and how it has become an essential tool in the Traffic Engineering on modern service provider networks.
- Learn how MPLS had been enhanced to GMPLS in order to provide end-to-end managed telecoms services over different transmission technologies including optical networks
- Identify what Metro/Carrier Ethernet is and how “Ethernet as a Service” is defined and implemented on service provider networks
- Develop a thorough understanding of modern, next generation all optical networking technologies and how they are used to build large protocol independent telecoms networks.
- Learn about DWDM, ROADMs, ASON, and OTN technologies
- Identify VoIP as a converged network application and learn about its signalling protocols (SIP and H323)

## Platform Certificate International Accreditation

Success Builders International (SBI) has international accreditation from Pearson PTY Ltd for the Platform Programme. All learners on Platform are registered by SBI with Pearson and those who successfully complete the programme and successfully meet all the SBI assessment criteria will receive an internationally recognised certificate.

### Pearson

Pearson is a global firm which is on the cutting edge of technology and advances in education. Pearson operates internationally, awarding over 1.5 million certificates to learners around the world every year.

### Platform International Certificate

To Pearson, learning outcomes, assessments and an assessment methodology are key. All learners who pass the programme assessment will receive an internationally recognised co-branded SBI certificate from Pearson. This international certificate will provide additional value to the learners who have attended and successfully completed the Platform Certificate Programme.

## SBI Mobile Laboratory

The Platform courses are presented by knowledgeable and experienced instructors. During some of the modules, there are practical hands-on exercises that the learners need to complete. The objective of these practical exercises is to have the learners learn to apply the theoretical knowledge that they are gaining. SBI has developed a mobile laboratory which is used for this purpose. The benefit of the mobile laboratory is that learners are able to physically touch and see the equipment that they are configuring.

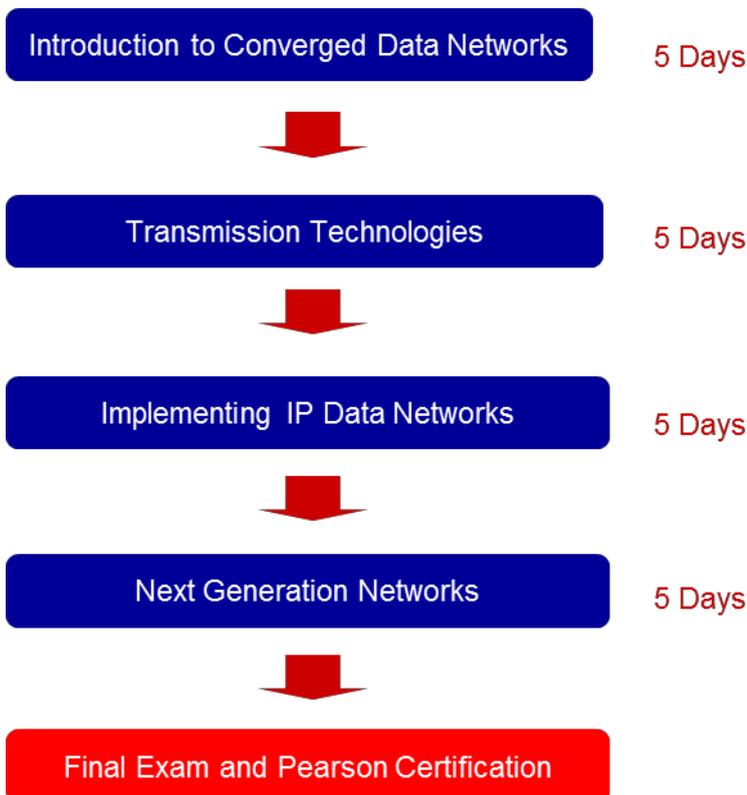
## Success Builders International

Success Builders International (SBI) is a training provider that specialises in custom developed training solutions since 1995.

### Platform: Certificate in Next Generation Telecoms course structure

Platform is a 20 day programme which comprises of four 5 day courses. Each course is carefully designed to build on the foundation developed in the previous course.

The training courses that form part of the Platform structure are:



### Programme Content

Course overviews for each of these courses are provided below.

### SBI Platform Certificate Assessment

#### Review Questions

During the programme courses there are review exercises given. These review exercises are followed by de-briefing with direct feedback to the learners by the instructor. The review exercises enable the learners to evaluate their progress with the content of the course.

#### Online exam system

All SBI tests and exams are conducted via the SBI online exam system: <http://exam.sbi.co.za>. Learners are provided with an exam key which entitles them access to the test or exam. End of course tests have a pass mark of 75% and the final exam has a pass mark of 60%.

**SBI re-write policy**

SBI allows each learner the opportunity to re-write a test or exam if necessary. One re-write is allowed per test or exam, all further re-writes need to be motivated by the learner.

**Training Material**

Each delegate receives a training manual for each course, which includes a writing pad and pen. All essential diagrams are printed in colour in the training manuals.

SBI prides itself in developing custom training courses that provide the necessary knowledge to ensure that delegates are confident, efficient and functional in their work environment.

## Introduction to Converged Data Networks Course Overview

**(5 Days) Course 1 of Platform: Certificate in Next Generation Telecoms**

**A easy to follow introduction to next generation data networking and how data, video and voice is carried on fixed and mobile public service provider networks**

This training course is the best way to fill in the gaps and get up to speed quickly on data, mobile and wireless telecommunication technologies, IP, MPLS, the Internet, security VoIP, IPTV and VPN technologies. It has been designed to give delegates an understanding of data communication principles, practices and terminology and how they are employed within modern telecommunication service provider networks. It provides the learner with a thorough end-to-end “big-picture” of the roles that the many technologies have in service provider NGNs.

The course presents information in simple, easy to understand language that enables you to make sense of technical concepts, details and many acronyms. You will not be bombarded with over theoretical and superfluous information. The session is practical in its form and provides many useful examples. This course has been designed to give you relevant and useful information on convergence in modern NGN's. Its focus is on developing your knowledge and skills to the level where you are able to be functional in your work place.

### Course Contents

#### Communication Basics

Networking fundamentals

Introduction to wireless technology

Spectrum

Radio wave basics

Modulation techniques

Wireless multiplexing techniques

FDMA, TDMA, CDMA, OFDM

Antenna technologies

MIMO, Adaptive antennas

#### Data network fundamentals

Layers of a network

How data is carried - packets

Data networks Vs. traditional voice networks

Packet Vs. Circuit switching

What is a data network infrastructure?

LANS

Wired and wireless Ethernet

Hubs, switches

Routers

WANs

#### Access and transmission technology options

DSL / ADSL

PDH, Leased lines, E1's, nx64

Frame relay, DLCI's

SDH

DWDM

2G, 3G and 4G Mobile Technology Overview

GPRS

EDGE - Enhanced Data Rates for GSM Evolution

UMTS/Wideband CDMA (WCDMA)

HSDPA / HSUPA

HSPA+

LTE

Architectures, protocols, internetworking, quality-of-service mechanisms

WiMAX and IEEE 802.16

Frequency bands, OFDM

Capabilities, Quality of service, mobility

Microwave networks

Satellite networks

#### TCP/IP Protocol Suite

How data moves through the network

TCP/IP, TCP and IP addressing

Private Vs public addressing, NAT

#### The Internet

Introduction to the Internet

History, Architecture, ISP's

Domain name service (DNS)

### **Some typical data application protocols**

HTTP and HTML, WAP, SMTP

### **Typical servers found in the Internet environment**

Mail, Web, Proxy

## **Security**

### **Firewalls**

Perimeter security / access control, Ports

### **Data privacy / confidentiality**

Authentication, Encryption, Radius

### **IPSec**

## **MPLS**

### **Traditional routing Vs. MPLS**

Packet labeling, MPLS tunnels

### **Traffic engineering**

### **Bandwidth management**

## **QOS**

### **What is quality of service**

Latency, jitter, loss

Guarantees

Timing, round trip delays

### **Packet prioritization / marking**

## **Virtual private networks (VPNs)**

### **What is a VPN?**

### **Types of VPN tunnels**

MPLS, Frame relay, IPSec

Public Vs Private VPNs

## **Voice over IP (VoIP) and IPTV**

### **Network convergence and the future**

Packetizing voice

Typical components in a VoIP network

## **Mobile core IP network and APNs**

### **Network architecture**

### **Components of the network**

### **Operation of the GPRS IP network**

APN, address mapping, SGSN, GGSP

## **Transmission Technologies Course Overview**

**(5 Days) Course 2 of Platform: Certificate in Next Generation Telecoms**

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**Learn about the design, implementation and operation of Ethernet and its related technologies and standards, plus the role of Leased Lines, Frames Relay, ATM, SDH and DWDM technologies in building service provider transmission networks**

The Transmission Technologies course addresses the various Layer 1 and Layer 2 technologies that are used in today's telecommunication networks.

It is estimated that more than 98% of all data transmissions start and end on an Ethernet connection. This course provides a basic introduction to Ethernet, its protocol and related IEEE 802.3x standards. At appropriate stages in the course, practical laboratory exercises are also given so that learners are exposed to the physical implementation and configuration of these technologies.

Long distance transmission technologies have evolved and changed over time. This course discusses the major transmission technologies: Leased Lines, Frame Relay, ATM and SDH, plus the underlying physical layer technologies such as fibre optic and DWDM that are used as the underlying infrastructures by these technologies. In the course SDH is expanded upon as a major technology that is used in the telecommunication network.

SDH historically has been the fundamental technology for optical transport systems in telecommunication service providers' networks. This course provides an understanding of the key objectives of SDH. It explains the SDH hierarchy and related terminology. The shapes, sizes, and formats of the SDH STM-N frames are explained. The course also covers the features and benefits of SDH ring topologies such as the automatic protection switching features of SDH. The various types of SDH network equipment is also covered. While the emphasis is on SDH, several key aspects of fibre optics and DWDM are discussed to give a complete picture.

### **Course Contents**

#### **Ethernet**

#### **Structured Cabling and Transmission Media**

##### **Wiring standards and specifications**

##### **UTP**

Categories and specifications

##### **Introduction to fibre optic technology**

##### **Single mode and multimode fibre types**

##### **LEDs and lasers**

#### **Hardware components**

##### **Hubs / Repeaters**

##### **Bridges / Switches**

Collision domains

#### **Ethernet protocol**

##### **Media Access Control**

CSMA/CD

##### **Frame structure**

Encapsulation variants

#### **Power over Ethernet**

##### **PoE Delivery options**

##### **PoE Power Classes**

#### **Wireless LANs / IEEE 802.11**

##### **Standards and Protocols**

##### **Channelization and capacity comparison**

802.11a, b, g and n

Security: 802.11i (WEP, WPA, WPA2)

##### **Architectures**

Implementing and Configuring Wireless LANs

## Leased Line Technologies

Point to Point services  
Time Division Multiplexing  
The basics of E1  
Higher hierarchies of E1  
Diginet services

## The PPP Protocol

PPP in the OSI Model  
Where to use PPP  
PPP components  
PPP Link Operation  
PPP Authentication  
Frame format  
Multi-Link PPP

## Frame Relay

How Frame Relay operates  
Comparison to other technologies  
Frame format  
Virtual Circuits  
Addressing (DLCI)  
Dealing with Congestion  
Link Management (LMI)

## ATM

Cell Vs. packet switching  
  
ATM architecture  
ATM interfaces: the UNI and NNI  
ATM cell structure  
Virtual paths and virtual channels  
Virtual circuit connections  
  
ATM Adaptation Layers

## SDH

### Introduction

Synchronisation and clocking  
Plesiochronous digital hierarchy (PDH)  
Synchronous digital hierarchy (SDH)

### SDH frame structure

The basic SDH frame structure

### Basic Rates

STM-1, STM-4, STM-16 and STM-64

## SDH multiplexing

Containers and Virtual containers

Higher rate SDH

## SDH layered architecture and overhead

Section overhead

Path overhead

## SDH Vs. SONET

Similarities, Differences, Interoperability

## SDH pointers

Pointers and frequency / phase alignment

## SDH network elements

Regenerator

Terminal multiplexer

Add/drop multiplexers - ADM

Digital Cross-Connects - DCS

Grooming

## SDH network topologies

Hub

Mesh

Ring

## Automatic protection switching

Automatic Protection Switching

1+1 Protection

1:N Protection

## Synchronization and timing

Stratum clocks

Primary reference clock

## Next generation SDH

Generic framing procedure (GFP)

Virtual concatenation (VCAT)

Link capacity adjustment scheme (LCAS)

## DWDM Fundamentals

Frequency vs. wavelength

WDM and DWDM Overview

Evolving DWDM

DWDM Applications and Deployment

## DWDM Architecture and Products

DWDM and SDH

DWDM and ATM

DWDM and IP

## Implementing IP Data Networks Course Overview

(5 Days) Course 3 of Platform: Certificate in Next Generation Telecoms

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**Learn the fundamentals of building an All-IP next generation network.**

This course addresses the basic building blocks and technology that are needed to understand how an IP data network works. The course is not overly theoretical, but will rather focus on teaching the course delegates the practical implementation issues, technology and configuration information that is needed to build IP data networks. The objectives of the course are thus to expose the delegates to the basics of IP networking.

The course discusses TCP/IP and IP routing. The Implementing IP Data Networks course is a combination of lecture based training and practical exercises that provide the course attendees with the opportunity to apply the concepts that they are learning.

### Course Contents

#### Introduction to TCP/IP

Protocols and the OSI model

Layer 2 Vs layer 3 addressing

TCP/IP protocol layers

Encapsulation

#### Introduction to IP Classful IP Addressing

Two-Tier address structure

Dotted decimal notation

Primary address classes

Class A, B and C networks

Other classes

Limitations of classful addressing

Practical exercises in Classful addressing

#### Subnetting

Why subnetting

Subnet address hierarchy

The Subnet mask

Extended-network-prefix length

Subnetting and routing

Designing subnets

Important planning considerations

Subnet implementation examples

Defining the subnet mask

Defining subnet numbers

The all 0's and 1's subnets

Defining host addresses per subnet

Practical exercises on subnetting

Configuring IP hosts

#### Layer 4 protocols (TCP and UDP)

Connection-less Vs connection oriented protocols

Comparison

TCP

Making IP reliable

Functionality

Setting up a connection

UDP

Best-effort IP service

Functionality

Typical applications

TCP and UDP Ports and sockets

#### Troubleshooting TCP/IP

What to look for in troublesome IP networks

Troubleshooting tools

Troubleshooting guidelines

## Some basic IP troubleshooting tools :

- Ping
- Traceroute
- Ipconfig
- arp

## Routing

### Basic routing concepts

#### What is a router?

- How do routers work?
- Why are they important in a network?

### Introduction to routing protocols

#### Interior gateway protocols (IGPs)

- RIP, OSPF

### IP Address allocation in routed networks

## Routing Information Protocol (RIP)

### Operation

### Advantages and disadvantages

### Versions of RIP

## Open Shortest Path First (OSPF)

### Operation

### Areas

### Advantages and disadvantages

## Border Gateway Protocol (BGP)

### Why EGPs

### Features

### Operation and functionality

## Classless Inter-Domain Routing (CIDR)

### Benefits of CIDR

### CIDR Allocation of address space

### Host implications for CIDR deployment

### CIDR vs VLSMs

## Layer 3 & 4 Switching

### Defined

### Operation

## IPv6

### IPv4 limitations

### IPv6 Protocol Basics

### Headers

#### IPv6 addressing

- Unicast addresses
  - Global unicast
  - Unique local unicast
  - Link local unicast
- Special addresses
- Anycast addresses
- Multicast addresses

#### Introduction to:

- IPv6 Address configuration options
- IPv6 Mobility
- IPv6 Security
- IPv6 QoS

#### Migrating to IPv6

- Dual stacks
- 6to4 & 6over4
- ISATAP, Teredo
- IPv6 Tunnel brokers
- Protocol Translators

#### Routing protocols for IPv6

- RIPv6
- OSPFv6
- BGP+

## Next Generation Networks Course Overview

**(5 Days) Course 4 of Platform: Certificate in Next Generation Telecoms**

Learn about the technologies and converged services used by large optical, next generation, multi service telecommunication networks.

Technological developments in telecommunications networks are allowing operators to build cost-effective multi- service networks and offer converged services to their customers.

This training course will provide you with an understanding of the key technologies and services used in next generation, converged, optical, multi services networks.

The Next Generation Networks course discusses the following technologies. Multicast routing, Quality of Service (QoS), Multiprotocol Label Switching (MPLS), Generalised MPLS (GMPLS), Metro/Carrier Ethernet, DWDM and its network components and topologies and the G.709 Optical Transport Network (OTN) specification.

### Course Contents

#### Multi Services Networking

Defining Convergence and Converged Services

Characteristics of Convergent Networks

#### Multicast Routing (MC)

IGMP

Multicast Addressing

Multicast in Switches

Routing Protocols

Distribution Trees

#### Quality of Service (QoS)

QoS Service Models & Mechanisms

Integrated Services / Resource Reservation Protocol (RSVP) model  
RSVP-TE

Differentiated Services (DS) model

Per-hop behaviours

Traffic classes

Queuing techniques

Traffic shaping and Admission control

QoS Parameters

#### Multi Protocol Label Switching

What is MLPS?

MPLS operation

MPLS labels

Label distribution protocols

MPLS-TE

#### Generalized MPLS

Separation of Control & Data

Switching Domains

Generalized Labels

GMPLS LSP's

GMPLS protocols

GMPLS operation

## Metro Ethernet

Services and Attributes

Bandwidth Profiles

Network Architectures

Ethernet transport technologies

## Ethernet over SDH

EOS Node Functionality

EOS Protocols – PPP, X.86, GFP

EOS Features

## Ethernet over WDM

Elements of WDM systems

CWDM, DWDM

Ethernet over WDM applications

## Ethernet over MPLS

Virtual Private Wire Service (VPWS)

Virtual Private LAN Service (VPLS)

IP only LAN Service (IPLS)

## Ethernet over RPR

Understanding of RPR and its features

Transport Options, Frame Structure

Traffic Handling and Protection

RPR applications

## Ethernet over Fibre

Understanding of Provider Bridging (Q-in-Q)

Understanding of Provider Backbone Bridging (MAC-in-MAC)

## Ethernet in the First Mile

Understanding Ethernet in the first Mile (EFM)

Key EFM features

Physical interface details

## EtherSAM Service Testing

## Optical transmission technologies

### Introduction to WDM Technologies

Evolution of DWDM

Overview and comparison of DWDM and CWDM

Channel spacing

Wavelengths

## WDM Equipment Components

Equipment components and building blocks

Optical transmitters

Optical receivers

Optical Terminal Multiplexers (OTM)

Optical Multiplexers (OADM)

Optical Amplifiers, Optical line amplifier (OLA)

Erbium Doped Fibre Amplifiers (EDFA)

Transponders

Tuneable transponders

Optical and Electrical Cross Connects (OXC)

## Reconfigurable add/drop multiplexer (ROADM)

Wavelength selectable switch (WSS) based ROADM

Multi-degree ROADM

NG ROADMs, colourless, directionless, contentionless, Gridless ROADMs

## Optical control plane

Data, management and control

Multilayer control plane

ASTN/ASON, GMPLS, OIF interfacing protocols

## Optical transport network (OTN)

G709, digital wrapper, OTU-1,2,3,4

OTN frame structure

OTU mapping

## Packet optical transport platforms Optical Protection and Restoration

## MultiServices Networking

Session establishment

H.323, SIP

SDP

Real-Time Transport Protocols

RTP, RTCP, RTSP

Media Gateway Control

MGCP

Megaco / H.248

IP Multimedia Subsystem - IMS