

Training Courses

Performance and Capacity Management



Performance & Capacity Training

"In an industrial society, the strategic resource is capital. In the new information society, that key resource has shifted to information, knowledge, creativity. And there is only one place where the corporation can mine this valuable new resource - in its employees. That means a whole new emphasis on human resources."

John Naisbitt and Patricia Aburdene,
Re-inventing the Corporation, 1985.

"There is ample evidence that [...] economic performance will increasingly depend on quality, service, constant innovation/improvement and enhanced flexibility/responsiveness. Committed, flexible, multi-skilled, constantly retrained people, joined together in self managing teams, are the only possible implementers of this strategy."

Tom Peters,
Thriving on Chaos: Handbook for a Management Revolution, 1987.

Training Benefits

Capacitas offers a comprehensive suite of training courses to meet all of your needs.

The key benefits of each area of training are listed below:

Training:

- Training courses written and presented by capacity planners for capacity planners
- Vendor independent courses
- Courses can be tailored to suit a particular client's environment or processes
- Courses may be presented on the customer's site for added flexibility
- Modular course structure so the user can select courses appropriate to his or her needs
- Courses are based on real life experiences of Capacitas consultants, which take the form of numerous case studies within each course

Accreditation:

- Enables team leads to facilitate the career development of team members
- Allows capacity and performance management specialists to gain recognised qualifications
- Provides employers with an additional means to gauge job candidates

Mentoring:

- An onsite service, minimising the amount of time to be away from the office
- Provides the opportunity to train employees whilst solving real-world problems
- Ideal for junior members of staff who require rapid 'on the job' development

Please contact training@capacitas.co.uk if you would like to discuss your training requirements in more detail.

Please access our website for recent course additions or changes

Why choose Capacitas®

"The course is conducted at a pace that should suit most requirements, with a well-balanced mixture of lectures, worked examples and case studies. The course material is both relevant and well structured enabling casework to be re-visited and understood once back in the workplace. Capacitas do not shy away from covering those subjects which can typically be difficult to explain or create examples for, such as traffic routing, link failure analysis, statistical filtering methods and much more. The lecturers share their wealth of experience with the delegates in a friendly and positive way encouraging learning and promoting thought along the way. T-Mobile UK will benefit from this training both in the retrospective application of lessons learned and the opportunities to improve planning for the deployment of IP based services."

Graeme Chalklin, Manager, Capacity Management and Engineering Planning, T-Mobile UK

"The CAPACITAS tutorials are absolutely the BEST study materials for Capacity Planning. They somehow manage to condense key concepts into a few pages of excellently written material that is easy to understand. The mix of tutorials and examples are in my opinion the best way to learn any subject. I have recommended CAPACITAS to many friends and to my employer. Keep up the good work!"

Hassan Bayouni, Capacity Planner, Europe, Level 3 Communications Inc.

"The course was presented in a fresh, easy to understand manner. Capacitas brought together a number of examples from the real world to allow the students to more easily understand the network planning application / technique that was being explained. No section under or over ran and Q&A was interspersed with the main presentation facilitating full understanding during the chapter being covered. A very well run training course, both in presentation and time management. I foresee that Capacitas will be used again in the near future, by ntl, to provide outsourced training for both advertised and bespoke courses."

Charles Watson, Senior Equipment Engineer, ntl:business

"I found the course to be excellent - it covered virtually all aspects of capacity planning, providing for a better understanding of existing capacity planning techniques we use and highlighted opportunities to use different techniques to enhance our planning process. The presentation was engaging and each topic was dealt with in the appropriate depth with plenty of opportunity to discuss real examples and develop particular topics of interest. I'd have no problem recommending this course to anybody working in capacity management."

Richard Arrowsmith, Interconnect Manager, Opal Telecom Ltd.

Course Tutors:

Dr. Manzoor Mohammed

Manzoor Mohammed has worked in the telecommunications industry for over 9 years. He has extensive experience of capacity management methodologies and development of decision support software for voice and data networks. Manzoor worked as a Senior Network Analyst at Level 3 Communications where he identified the requirement for a single software tool to plan all the network technologies. He provided technical leadership for the team responsible for designing and developing this tool. Prior to Level 3 Manzoor he worked as a Performance Engineer at BT Research Laboratories, Martlesham.

Danny Quilton

Danny Quilton is a capacity planning and performance specialist, with over 7 years experience working in blue chip companies. As lead IP Network Analyst at Level 3 Communications he was responsible for producing decision support tools for a global, multi technology network. He has extensive experience in building and maintaining large network performance information systems. Prior to that, he worked for National Westminster Bank where he worked in a customer facing, consultative role. There he implemented network reporting systems in order to provide decision support to senior management.

Andy Bolton

Andy has 17 years experience in the IT and Telecommunications industries and previously worked at Level 3 Communications, where he led the Long-Range Planning function for Europe. He was responsible for setting budgets and controlling expenditure, whilst ensuring the European region met all customer capacity requirements. Prior to that Andy worked at National Westminster Bank and was responsible for Capacity Planning for the Retail Banking Services division, also providing additional planning expertise to the Corporate Banking Services division. In both these roles he built and managed successful Capacity Planning functions with broad ranges of responsibilities across the entire product development cycle. This included defining process and systems to deliver best-in-class capacity planning, as recognised by Gartner Group at Natwest and Adventis at Level 3 Communications.

Training Strategy

Course Options

Capacitas offers a unique suite of capacity and performance management training services, unrivalled in the training market. Capacitas' training suite is based on its founders' real-life experiences solving capacity and performance problems. Training services fall into the following categories:

- Standard training courses
- Capacitas accreditation. Accreditation is built around the standard course suite and is attained through examination
- Customised training courses. These are structured around standard courses tailored to a particular client's requirements
- Mentoring services

Course Location

Course location is subject to demand, but will normally fall into one of the following categories:

- Capacitas' dedicated training centre in Farringdon, London
- UK based hotel / conferencing centre
- At a customer's site

Course Accommodation

Capacitas can arrange accommodation with course booking or provide a list of hotels close to our training facilities. In addition, courses are offered outside the UK, subject to demand.

Course Structure

Capacitas recognises that there are common capacity & performance management methodologies across multiple technology domains. For this reason, Capacity Planning: Tools and Methods is a core module of the training course suite. There are a number of other course modules that deal with planning methodologies specific to a technology domain, e.g.:

- Capacity Planning TCP/IP Networks
- Capacity Planning Voice Networks
- Capacity Planning SDH Networks
- Capacity Planning Metro Networks
- Capacity Planning & Performance Tuning of Solaris/Linux
- Capacity Planning Windows 2000/2003
- Capacity Planning VPN Networks

Further to this, Capacitas recognise that capacity planning is essentially a business process. The following modules focus on business and process issues:

- Using Capacity Planning to Competitive Advantage
- Capacity Planning & Management Processes

Finally, the following courses address issues specific to application planning:

- Application Performance Assurance through Volume & Performance Testing
- Developing Applications for Performance
- Capacity Planning & Performance Management of Web Based Applications

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Certification

Capacitas Accreditation Programme

The Capacitas Accreditation Programme is a unique offering that enables ICT capacity and performance management professionals to gain recognised qualification. The programme is based around Capacitas' leading suite of training courses with accompanying examinations. Examinations are sat at the Capacitas Training Centre in Farringdon, London and are multiple choice based. There are a number of paths to accreditation, which are described below.

Capacity and Performance Management: Business Planning Accreditation:

Requires the following courses and associated exams:

- Using Capacity Planning to Competitive Advantage
- Capacity Management Processes

Capacity and Performance Management Technical Accreditations:

Capacity and Performance Management of IP Networks Accreditation

Requires the following courses and associated exams:

- Capacity Planning: Tools and Methods
- Capacity Planning TCP/IP Networks
- Capacity Planning VPN Networks

Capacity and Performance Management of SDH Networks Accreditation

Requires the following courses and associated exams:

- Capacity Planning: Tools and Methods
- Capacity Planning SDH Networks
- Capacity Planning Metro Networks

Capacity and Performance Management of Voice Networks Accreditation

Requires the following courses and associated exams:

- Capacity Planning: Tools and Methods
- Capacity Planning SDH Networks - or - Capacity Planning TCP/IP Networks
- Capacity Planning Voice Networks

Systems Capacity and Performance Management Accreditation

Requires the following courses and associated exams:

- Capacity Planning: Tools and Methods
- Capacity Planning & Performance Tuning of Solaris/Linux
- Capacity Planning Windows 2000/2003

Systems Performance Accreditation

Requires 2 of the following courses and associated exams:

- Application Performance Assurance through Volume & Performance Testing
- Developing Applications for Performance
- Capacity Planning & Performance Management of Web Based Applications

Capacity and Performance Management: Sterling Accreditation:

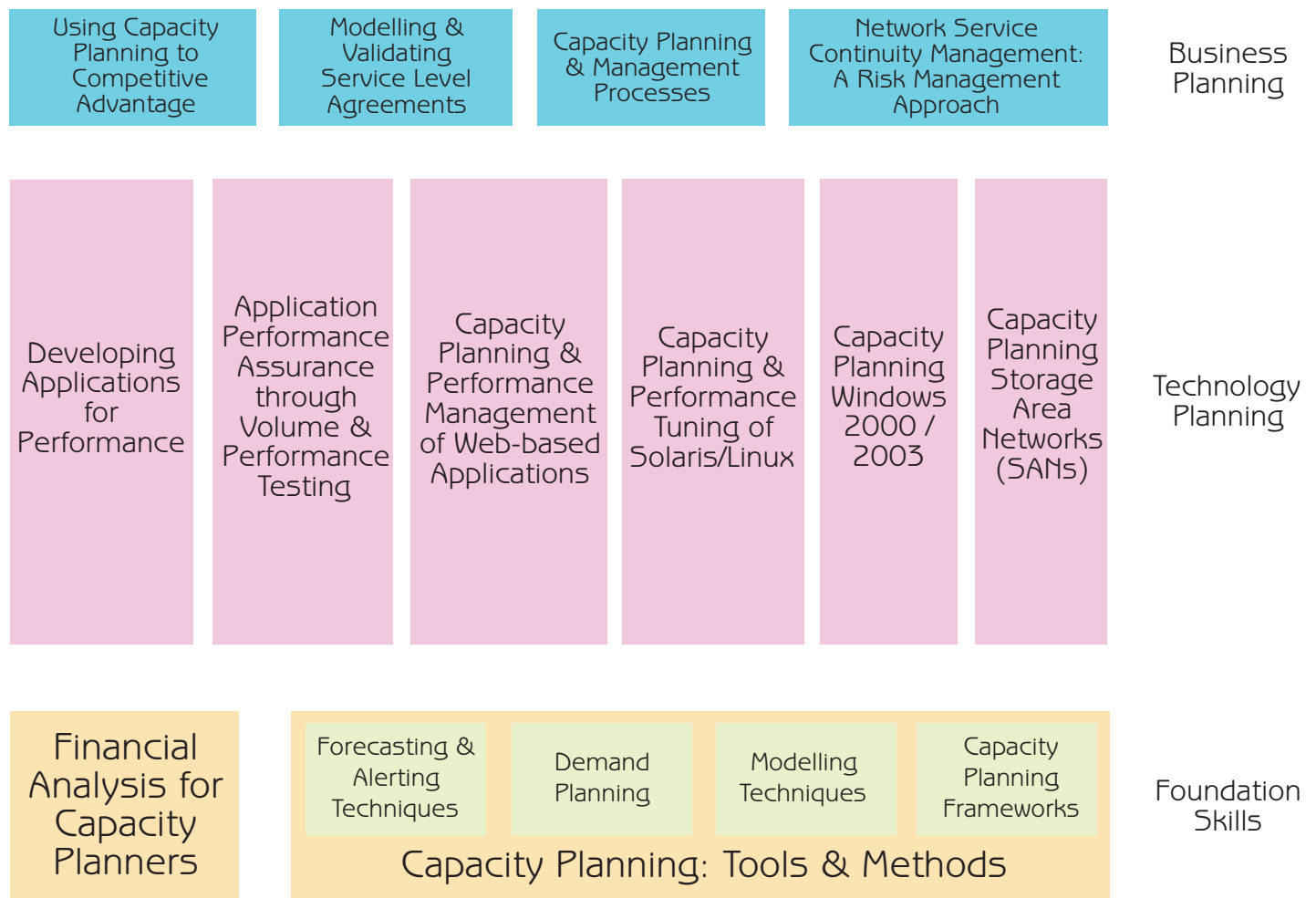
Sterling accreditation is achieved once business planning accreditation and 2 technical accreditations have been attained

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Information Systems Courses

Information Systems - Performance, Capacity & Cost

As business relies ever-increasingly on Information Systems, the need to ensure service performance meets or exceeds the customer expectation is paramount. Too many enterprises simply throw extra systems capacity at the problem, which is an expensive solution and often does not help.



By adopting a systematic approach to the problem, performance targets can be achieved at minimal cost. Capacitas' Information Systems courses are focussed on helping our customers achieve the required capacity planning and technological skills. Each *Technology Planning* platform course develops the knowledge required to plan a particular platform, building on the capacity and performance skills gained in the *Foundation Skills Capacity Planning: Tools and Methods* course. Capacity or Performance Analysts who deal with the business aspects of information systems also have several courses to assist their particular focus at the *Business Planning* level.

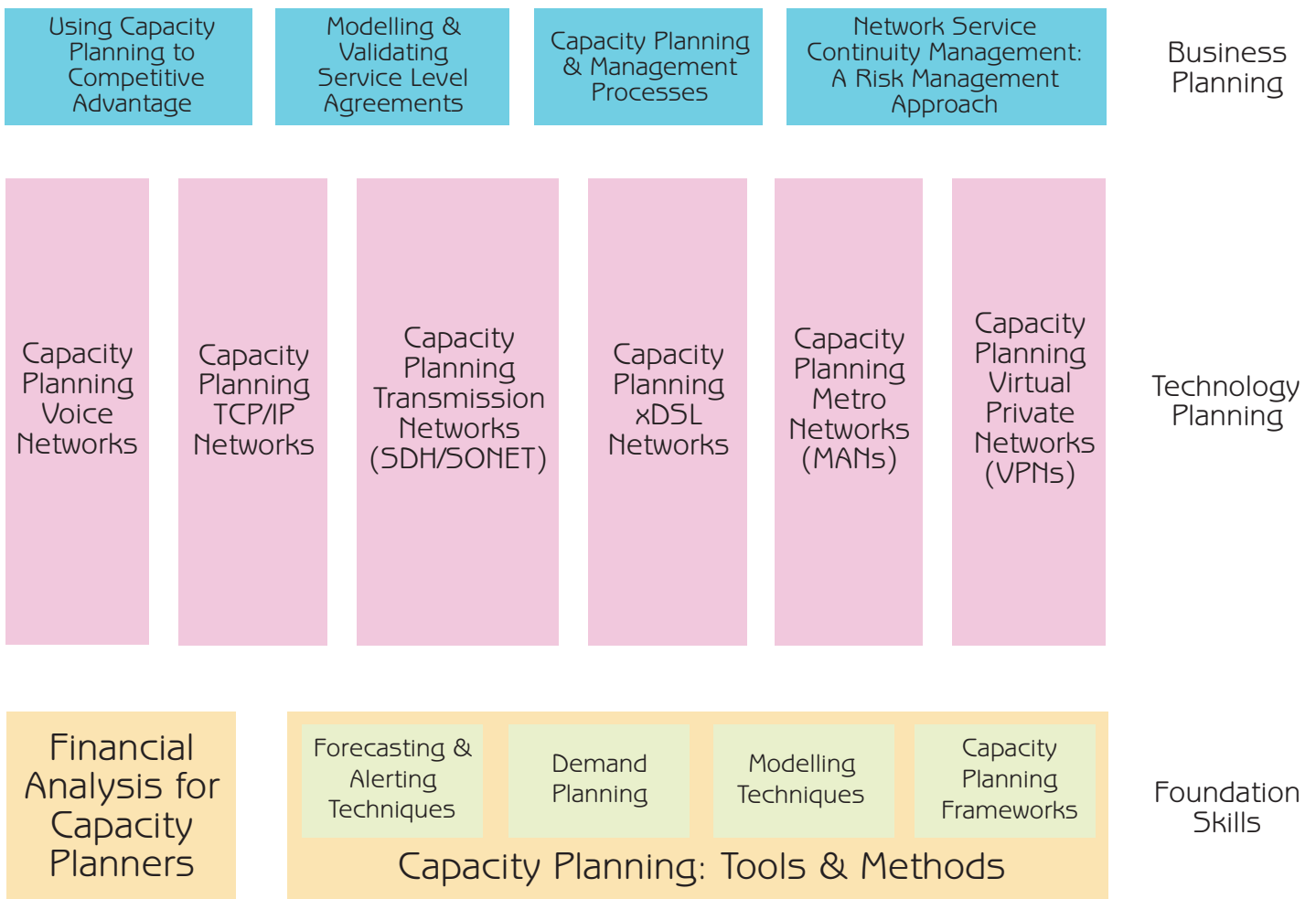
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Communication Systems Courses

Communication Systems - Performance, Capacity & Cost

The explosive growth of telecommunications voice and data services has produced a plethora of network providers with many service offerings. These companies need to ensure service performance meets or exceeds their customers' requirements, or they often incur significant service penalties. Many network service providers over-provision capacity to ensure their SLA targets can be achieved.



By adopting a systematic approach to the problem, performance targets can be achieved at minimal cost. Capacitas' Communication Systems courses are focussed on helping our customers achieve the required capacity planning and technological skills. Each *Technology Planning* platform course develops the knowledge required to plan a particular platform, building on the capacity and performance skills gained in the *Foundation Skills Capacity Planning: Tools and Methods* course. Capacity or Performance Analysts who deal with the business aspects of communication systems also have several courses to assist their particular focus at the *Business Planning* level.

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Capacity Planning: Tools & Methods

4 Days
£1,995

Capacity Planning is a specialist discipline that is integral to any organisation that owns or manages an Information and Communication Technology (ICT) infrastructure. This course introduces the tools and methods that are the foundation to good Capacity Planning practice across all technologies. The application of these methods is demonstrated with real life case studies.

Learn How To:

- Employ forecasting techniques to solve common capacity planning problems
- Use regression models to establish relationship between business drivers and network demand
- Design a threshold alerting scheme to capacity manage a large number of network/server elements
- Implement effective demand planning and traffic forecasting
- Identify the demand drivers of your enterprise applications
- Recognise the different network routing implementations and their impact on planning
- Use mathematical modelling to solve capacity planning problems
- Apply the techniques learnt to real life problems across applications, servers and networks
- Define a capacity and performance monitoring strategy for your servers and network
- Produce an effective capacity plan

Topics

Forecasting & Alerting Techniques

- Baselining Techniques
- Regression Techniques
- Other Forecasting Techniques
- Threshold Alerting

Demand Planning

- Introduction to Demand Planning
- Workload Profiling
- Application Demand Planning
- Network Demand Planning
- Traffic Generation

Modelling Techniques

- Applying Demand Forecasts
- Mathematical Modelling
- Simulation Modelling

Capacity Planning Frameworks

- A Performance & Capacity Monitoring Framework
- Case Study: Capacity & Performance
- Monitoring in the Enterprise
- Putting it all together: The Capacity Plan

Please note that the **Capacity Planning: Tools & Methods** course is a pre-requisite for all the technology layer courses marked with the dagger symbol (†). Tools & Methods contains the common techniques required for capacity planning on all technology platforms, so rather than duplicate these principles in all the technology courses we have created a foundation course that should be attended first.

Financial Analysis for Capacity Planners

2 Days
£1,195

A core skill for all capacity planners is to be able to demonstrate the financial costs and benefits for any proposed change. To do this the capacity planner must be able to speak the language of their most important customer - the Chief Financial Officer (CFO) - as they sign off all major expenditure. This course gives an overview of the typical financial ratios and metrics required by the CFO.

Learn How To:

- Undertake and demonstrate the value of a cost/benefit analysis
- Represent changes to capacity requirements in a business format
- Write a convincing business case for change
- Understand and use financial measures where appropriate
- Use financial analysis to assist with quantifiable decision making

Topics

Introduction to Financial Analysis

Why is Financial Analysis Needed?
Capital Expenditure (CAPEX)
Operating Expenditure (OPEX)

Financial Analytical Measures

Return-on-Investment
Internal Rate of Return
Discounted Cash Flow
Net Present Value
Lifetime Cost/Total Cost of Ownership

Cashflow Profiles

Expenditure Profile of a Purchase
Equipment Depreciation

Other Costs for Capacity Planners

Order Cancellations
Hidden Costs
Quantifying the Unquantifiable

Financial Decisions

Buying vs. Leasing Capacity: an Analysis
Selling vs. Leasing Capacity: an Analysis

Undertaking the Analysis

Finding the Data to Analyse
Using Excel for Financial Analysis
Presenting the Answers
The use of Graphs

Business Cases

What the Customer Wants to See
Key Requirements of a Business Case
Business Case Structure
Underlying Analysis & Conclusions

Budgets

Why Budgets are Needed
The Budget Process
The CAPEX Budget
The OPEX Budget
The Strengths/Weaknesses of Budgets

Application Development

Developing Applications for Performance[†] 2 Days £1,195

Application performance is a common reason for software projects to fail, usually due to poor attention to performance early in the development cycle. Problems with performance cannot easily be fixed in the testing phase, as development is already ramping down at this point. Performance should be the design goal, not an afterthought to be iteratively fixed in testing. This course provides the skills and processes needed to implement performance engineering.

Learn How To:

- Reduce development, testing and rollout costs of a software project
- Evaluate software architecture for performance characteristics
- Identify critical use-cases within a software project
- Understand where performance data can be found
- Predict application performance and scalability
- Model an application with appropriate modelling technologies
- Recognise poor performance designs by using anti-patterns

Topics

A Risk Management Approach

Software Development Processes
The Costs of Software Development
Performance Engineering (PE)

Performance Engineering Frameworks

Capability Maturity Model
Performance Engineering Maturity Model
Software Performance Engineering

Software Requirements Analysis

Non-Functional Requirements
Identifying the Critical Use Cases

Modelling an Application

Why Modelling is Mandatory
Response, Throughput, Scalability
Analytical Modelling & Queuing
Simulation Modelling & Contention

Software Patterns

An Introduction to Patterns
Performance Patterns
Performance Anti-Patterns

Performance, Capacity & Cost

The Relationships
Capacity Planning & PE
The False Economy of Oversizing

Validating Performance Models

Collecting Performance Data
Application Profiling & Bottlenecks
Using Benchmark Data
The Software Testing Process

Implementing Performance Engineering

The Cost/Benefit Analysis of PE
Selling the Need for PE
Quantifying Hidden Costs of Failure

Application Performance Assurance through Volume & Performance Testing[†]

4 Days
£2,495

Increasingly complex client/server environments, with demand for stringent service level agreements, has increased the need for Volume & Performance Testing (VPT). This course describes the principles and methodologies required to define a VPT approach. This course is ideal for any professional who wants to enhance or implement a performance testing function within their organisation.

Learn How To:

- How to apply best practice VPT processes
- Avoid costly post implementation hardware upgrades or service level penalties by correctly performing VPT
- Reduce development and deployment times through performance assurance
- Reduce system operational costs by deploying performant applications
- Predict system capacity before performance issues arise in the production environment
- Ensure accurate and meaningful service level agreements through VPT

Topics

Overviews

Volume/Performance Testing Overview

VPT Strategies

Client/Server Overview including:

- Java
- .NET
- TCP/IP

Understanding Performance Issues

Client/Server Performance

The Workload Characterisation Model

Obtaining Workload Data

Identifying Business Drivers

Profiling the Workload

The Volume/Performance Test Process

Building a VPT Plan

Entry and Exit Criteria

Test Pass Strategies

Choosing Test Scenarios

Building a VPT Environment

Building a Representative Environment

The need for Configuration Management

Implementing VPT

VPT Execution, Results and Analysis

Common Pitfalls in Testing

Volume/Performance Testing Tools

- Monitoring Tools
- Load Generation Tools

The Capacity and Sizing Model

The Benefits of a Capacity Model

Quantifying Model Accuracy

Additional Course Presenter

Phil Riley has over 15 years experience in capacity and performance management of large-scale client/server mainframe applications across a diverse range of industries. Over the past 3 years he has been responsible for defining the VPT process in one of Europe's largest re-platforming programmes. Among the companies Phil has worked for are Bank of New Zealand, M&G, Cable and Wireless, Sainsbury's and Accenture.

Platform Capacity Planning

Capacity Planning & Performance Management of Web-based Applications[†] 4 Days £1,995

The growth of the internet, and the ease of deployment and maintenance are key reasons why web based applications are increasingly being introduced by ASPs and enterprises. The capacity planning analyst faces the challenge of having to plan the end-to-end system rather than individual platforms in isolation. This course allows the analyst to plan and performance model a system comprising of web servers, database servers, LANs and WANs.

Learn:

- How to perform end-to-end capacity planning of a client-server system
- The performance characteristics of a web based application
- How web and database servers impact performance
- How LAN and WANs impact application performance
- To use a capacity planning methodology for web based applications
- To characterise the system workload
- To build performance models to proactively capacity plan a web based application and forecast future workload
- To undertake performance vs. cost analyses
- Use benchmarks to aid the capacity planning process

Topics

Performance Overviews

Intranet Performance
Internet/Extranet Performance

Client/Server Overviews

Server Types
LAN/WAN Technologies
TCP/IP Overview

End-to-End Performance of Web Apps

Service Times of Routers & Servers
The Network as a Shared Resource
Applying Queuing Techniques
End-to-End Performance Modelling

Performance Analysis

Business/Technical Transaction Mapping
Network Bandwidth & Latency Analysis
Performance Constraints of ISPs

Capacity Planning Methodology

Understanding the Components
Workload Characterisation
Workload Forecasting

Workload Characterisation

Workload Characterisation Approaches
The Workload Model

End-to-End Performance Modelling

System & Component Level Models
Queuing Models
Analysing Burstiness of Demand

Capacity Sizing

Sizing a New Application: A Case Study

Using Benchmarks for Capacity Sizing

Common Industry Standard Benchmarks
When and How to use Benchmarks

Capacity Planning & Performance Tuning of Solaris/Linux†

4 Days
£1,995

Sun Solaris based applications are widely deployed in today's ICT environments, often supporting mission critical business processes, and Linux based systems are increasingly being deployed as a cost effective alternative to common operating systems. This course explores the capacity planning and performance tuning techniques specific to Linux and Solaris systems. It provides the insight required to ensure your applications meet required levels of service whilst minimising cost.

Learn How To:

- Avoid costly hardware upgrades through effective capacity planning and performance tuning
- Reduce operational costs through performance management
- Ensure service level compliance through capacity and performance monitoring
- Identify business drivers of common applications
- Use the techniques to convert business forecasts into server workloads

Topics

Architecture Overview

Processor Architectures
Memory Management
Multiprocessing Architectures

Performance & Capacity Monitoring

The Three Metric Types:

- Throughput
- Response
- Utilisation

Performance Monitoring Tools

Memory Capacity & Performance

Real vs. Virtual Memory
Memory Sizing Tools

Processor Capacity & Performance

Analysing/Interpreting Performance Data
Understanding Threading Models
Symmetrical Multiprocessing Systems

I/O Capacity & Performance

Understanding Disk Workload & Delay

Cache Performance

Monitoring Cache Performance

Network Capacity & Performance

Using NFS
Using SAMBA

Capacity Planning/Performance Tuning of Database Servers

Database Server Workloads
Database Tuning

Capacity Planning & Performance Tuning of Application Servers

Workloads: Batches, Interfaces & Online

Capacity Planning & Performance Tuning of Web Servers

Understanding/Analysing Web Server
Workloads

Platform Capacity Planning

Capacity Planning Windows 2000/2003[†]

3 Days
£1,595

Windows 2000/2003 based applications are widely deployed in today's ICT environments. This course explores the capacity planning and performance tuning techniques specific to Windows 2000/2003 systems. It provides the insight required to ensure your applications meet required levels of service whilst minimising cost. The information in this course is also applicable to Windows NT.

Learn:

- The benefits of capacity planning Windows 2000/2003 systems
- How to avoid costly hardware upgrades through effective capacity planning and performance tuning
- How to reduce operational costs through performance management
- To ensure service level compliance through capacity and performance monitoring
- How to identify business drivers of common applications
- The techniques to convert business forecasts into server workloads

Topics

Performance and Capacity Monitoring

Windows Performance Objects
Counter Types and Sampling
Key Metrics for Monitoring

Processor Capacity Management

The Windows 200x Scheduler
Processor Monitoring & Sizing
Application and Kernel Thread Mapping

Memory Capacity Management

Memory Architectures
Windows 200x Memory Management
Memory Monitoring & Sizing

Disk Capacity Management

Windows 200x I/O Subsystem
Disk Performance Monitoring
Understanding the File System Cache
Bottlenecks: Memory or I/O?

Network Capacity Management

Windows 200x Network Monitoring
Analysing Network Performance Data

Capacity Planning Internet Information Server (IIS)

IIS Overview
Identifying Key Drivers of IIS Workload
Analysing Web Log Data

Capacity Planning Exchange Server

Microsoft Exchange Server Overview
Identifying Key Drivers Exchange Workload & Analysing Throughput

Capacity Planning File & Print Services

Capacity/Performance Monitoring of FPS

Capacity Planning SQL Server

SQL Server Memory Management
Analysing SQL Server logs
Case Study: Capacity Baselining SQL Server

Capacity & Performance Management of Storage Area Networks (SANs)[†]

3 Days
£1,595

Most modern enterprises are migrating to Storage Area Networks (SANs) for a variety of reasons, including cost, security and business continuity. However the migration to SANs is not an easy path. SANs bring a wealth of performance and capacity implications, depending on the architecture and technology chosen. This course is designed to give the Storage Capacity Analyst an understanding of how to cope with the issues surrounding SANs.

Learn How To:

- Identify performance issues and improve the performance of your storage mechanisms
- Identify the business need for a Storage Area Network
- Write a compelling business justification for a SAN
- Capacity plan your SAN to ensure growth is met
- Understand the performance implications of moving to SAN technologies
- Optimise your SAN performance to reflect your actual workload, not a fictitious sample workload
- Develop a data management strategy to accurately reflect your business growth and data constraints

Topics

Introduction to SANs

The Value of Data
History of Disk Architectures
Modern Data Storage Requirements
The Advantages of SANs
A Data Management Strategy
SAN Capital Cost Trends

Data Storage Options

Direct Attached Storage
Network Attached Storage
Storage Area Networks
Redundant Array of Inexpensive Disks

SAN Technologies & Architectures

SAN Interfaces, Interconnects & Fabrics
Fibre Channel vs. iSCSI
Data Sharing
Mirroring
SAN Performance Monitoring Tools

SAN Performance Management

Disk Performance Characteristics
Network Performance Characteristics
Filesystem Performance
Write vs. Read Performance
I/O Filesize Impact
Case Study: UFS Performance
Volume Management
Database Performance Management
Backup & Batch Windows
Queuing Theory & SANs
Workload Characterisation & Forecasting
SAN Performance Modelling
Cryptography Issues

SAN Capacity Management

Mirroring/RAID Technology
Backups & Disaster Recovery
Planning for Growth

Implementing a SAN

Business Justification for a SAN
Migration Planning for a SAN

Platform Capacity Planning

Capacity Planning Voice Networks[†]

4 Days
£1,995

Fixed-line voice revenues still account for over £2Bn per quarter in the UK alone, with mobile revenues even larger than this. To make the most of this revenue voice providers must ensure their network costs are controlled to maximise profits. Effective Capacity Planning is key to this process. This course addresses the traditional techniques for sizing voice networks and the challenges in sizing for new technologies such as Voice over IP.

Learn:

- Generation of traffic data when no or little data is available
- Sizing voice links to minimise network expenses without significantly impacting revenue
- Traffic demand generation techniques
- Traffic Forecasting Techniques
- The appropriate capacity planning techniques for your company
- How to reduce operational costs by accurate capacity planning

Topics

Fixed Voice Network

Voice Network Architecture
Signalling System 7 (SS7)
The IN Platform

Call Set-up Process

Impact of Capacity Bottlenecks on:

- Call Set-ups
- Revenue and Customer Service

Least Cost Routing (LCR)

Building a Least Cost Routing Tool
QoS Considerations

Demand Planning for Voice Circuits

Customer Numbers & Profiles
Busy Hour Traffic Profiling
Gravity Models/Communities of Interest
Statistical Nature of Voice Arrivals
Poisson Distribution
Erlang's Blocking formula and SLAs

Demand Planning for Signalling Traffic

Why Predict Signalling Traffic?
Relating Voice Traffic to Signalling Traffic
Performance Impact of Signalling Traffic

Monitoring Network Capacity

Analysing Call Records
Find Bottlenecks with Call Records

Simulation Modelling a Voice Network

Introduction to Simulation Modelling

Call Gapping & Impact on Throughput

What is Call Gapping & Why Use It?
Deriving Parameter Values for Gapping

Voice over IP (VoIP)

Introduction to Voice Over IP
Protocols (H.323, SIP)
Capacity Planning Challenges of VoIP

Please access our website for recent course additions or changes

Capacity Planning TCP/IP Networks[†]

4 Days
£1,995

Most modern organisations utilise TCP/IP networks for data communications, whether just for email and web access, more complex client/server applications, or for converged applications involving telephony and multimedia. IP Network Capacity Planning is a specialist discipline that is integral to ensuring performance service levels are achieved and costs minimised. This course provides best IP network capacity planning practice and is applicable to enterprise and commercial Networks.

Learn How:

- To implement an effective threshold alerting system for a large network
- Routing optimisation can reduce costs and increase network utilisation
- To convert business forecasts into IP traffic matrices
- Capacity planning data can be used to create effective reports for senior management
- To implement an effective threshold alerting system for a large network
- To identify appropriate mathematical models to analyse IP traffic throughput and response

Topics

Understanding IP Network Technologies

Layer 3 and Layer 2 Topologies
IP/ATM & IP/MPLS Overview

Routing Protocols

OSPF(-TE), BGP, MPLS, RSVP, LDP, PNNI

IP Resilience

Protection Mechanisms in IP Networks
IP Restoration & MPLS Fast Reroute
Protection at the Transport Layer

Understanding Dijkstra's Algorithm

Routing Protocols that use Dijkstra
Dijkstra's Algorithm using VBA for Excel

Collecting IP Network Planning Data

Extracting Routing Metrics from Devices
SNMP Overview & MIB Object Types
Capacity/Performance of IP Links/Nodes

Storing & Reporting IP Planning Data

Storage Requirements
Storing Summary Data
Examples of Effective Reporting

Demand Planning & Traffic Generation

Identifying Business Drivers
Business Forecasting
Conversion of Business Drivers to Traffic
Understanding Application Data Flow
Traffic Distribution & Traffic Matrices
Community of Interests
Gravity Modelling

Mathematical & Simulation Modelling

Throughput and Response Analysis
An Introduction to Queuing Theory
Sizing Buffers with Mixed Loss Priorities
Modelling Network Firewall Devices
Empirical Approaches
Self-Similar IP Traffic
Accelerated Simulation

Platform Capacity Planning

Capacity Planning Transmission Networks (SDH/SONET)[†] 3 Days £1,595

Transmission network technology is used for all major backbones and many local circuits in voice and data communications. The planning of transmission networks is both mathematically and technically challenging, due to the number of competing technologies and protection mechanisms. The course gives an overview of the challenges and solutions for the steps in this process.

Learn How To:

- Recognise the importance of architecture, topology and protection systems in capacity & costs
- Use routing algorithms to optimise networks
- Use grooming/routing/ring optimisation to reduce costs and increase network utilisation
- Generate capacity build plans
- Use IT solutions to support the network planning process and speed up the network planning process
- Collect appropriate data from the network

Topics

An Overview of Transmission Systems

The SDH Standard

Ring Networks

Mesh Networks

Physical and Logical Networks

Protection (SNCP, MS-SPRing, Mesh)

DWDM Systems

Grooming Transmission Networks

Traffic Demand Planning

The Gravity Model

Demand Planning Channelised Networks

Generating Traffic Forecasts

The N² Problem

Traffic Routing

Routing Algorithms (OSPF)

Manual Routing

Network Optimisation

Routing Optimisation

Grooming Optimisation

Ring Optimisation

Ring Placement (Express/Local Rings)

Failure Analysis

Data Collection

Measuring the Physical/Logical Network

Finding Accurate Data

Automated Provisioning Systems (APS)

Demand Planning for APS

Probabilistic Demand Planning

The Dangers of Over Sizing a Network

Capacity Build Plans

Automating the Build Plan Process

Capacity Planning Digital Subscriber Line (xDSL) Networks[†] 2 Days £1,195

Digital Subscriber Line (xDSL) services have outstripped demand and generated a major industry of small to medium Internet Service Providers, who offer public broadband services. These providers all face specific capacity and performance management issues with xDSL, whether they provide Local Loop Unbundled (LLU) services or re-sell commercial wholesale products. This course assists the xDSL Capacity Planner to effectively manage their broadband network.

Learn How To:

- Understand the xDSL technology options and impacts
- Understand the constraints of re-selling wholesale xDSL services
- Size ATM PVCs according to performance service levels and cost constraints
- Ensure your network meets all customer demand for services
- Prioritise multiple network traffic types and size PVCs accordingly
- Determine the cost effectiveness of using a wholesale product against Local Loop Unbundling

Topics

Introduction to xDSL Technologies

The Business Need for Broadband
 Fundamentals of xDSL
 The Local-Loop & Unbundling
 Asynchronous Digital Subscriber Line
 Synchronous Digital Subscriber Line
 Standards & Data Transmission Speeds
 Evaluate xDSL Technology Options

xDSL Architecture

Customer Premises Equipment
 The Metallic Path Characteristics
 The DSL Access Multiplexer (DSLAM)
 The ATM/IP Network

Wholesale Commercial xDSL Services

The BT IPStream/DataStream Services
 The EasyNet LLU Service
 Constraints of Using Wholesale Products
 Assess Wholesale Provider Performance

Local-Loop Unbundled (LLU) xDSL

Issues Surrounding LLU
 Capacity & Performance Planning LLU

Data Collection

Where & How to Collect Planning Data
 Using Customer Data to Map Traffic
 Forecasting xDSL Customer Take-Up
 Workload Characterisation of Traffic

Data Analysis

What is the Objective of Analysis?
 Using Scripting Tools to Analyse Data

Capacity Sizing

Sizing the ATM Circuits
 Empirical Sizing
 Modelling to Determine PVC Size
 Using xDSL to Carry Voice over IP (VoIP)

Case Study:

Sizing PVC for Multiple Services/Priorities

Platform Capacity Planning

Capacity Planning Metro Networks (MANs)[†]

2 Days
£1,195

All telecommunication networks require some form of local access technology. This is usually provided in the form of a metropolitan area network (known as a Metro or MAN). The placement of these networks is a difficult problem for telecommunications providers, as dedicated facilities are costly to build. For corporate enterprises the only choice is to lease capacity, which many telecom carriers also have to do. This course is designed to ensure that these networks are cost-efficient.

Learn How To:

- Understand the capacity and cost issues associated with MANs
- Understand the technologies available and their limitations
- Choose an appropriate MAN technology platform for your company
- Minimise costs of a MAN whilst ensuring SLA performance targets are met
- Plan and route demand to best optimise the MAN

Topics

Introduction to Metropolitan Networks

The Business Imperative for MANs
Issues with Building & Owning MANs
Issues with Leasing MAN capacity

Metro Network Technology

Synchronous Digital Hierarchy (SDH)
Fibre-based Systems
Ethernet - the Challenger to SDH
xDSL and other Broadband Systems
Virtual Private Networks
Wireless Systems

Demand Planning for MANs

Demand Planning using Gravity Models
Identifying Communities of Interest

Metro Network Design

Topology & Architecture
Technology Issues Affecting Capacity

Traffic Provisioning on a MAN

SDH Provisioning
The Ring Loading Problem
Ethernet Capacity Limitations

Sizing Metro Networks

Using Demand Forecasts
Probabilistic Forecasting of Demand
Cost Forecasting of Metro Networks
The Buy vs. Lease Decision
Service Level Agreements

Supply Chain Management

Using SCM to Reduce Turn-Up Leadtime

Optimising Metro Networks

SDH Ring Optimisation
SDH Mesh Optimisation
Ethernet Optimisation

Future Directions

The Changes to the MAN Marketplace

Capacity Planning Virtual Private Networks (VPNs)[†]

2 Days
£1,195

Virtual Private Networks (VPNs) have become more commonplace in recent years due primarily to the cost savings that can be achieved over a traditional leased-line network. However, using a VPN does still require accurate capacity planning to ensure that performance service levels are achieved. This course covers the key areas to ensure a cost-effective VPN that meets the performance SLA.

Learn How To:

- Demonstrate cost justification of migrating to a VPN
- Size network links and tunnels appropriately, reducing costs where possible
- Identify appropriate VPN service providers to meet your requirements
- Improve application performance across your network
- Understand the impact of different VPN protocols on performance and capacity
- Prioritise multiple services across the VPN according to their performance requirements
- Identify architecture capacity & performance issues

Topics

Introduction to Virtual Private Networks

Tunnels - the Virtual Network
Security - the Private Network

Reasons for Using a VPN

Cost Analysis of VPN vs. Leased Lines
Scalability Issues & Advantages of VPNs
Flexibility of VPNs
Technical Support Issues

VPN Technologies

Hardware VPNs
Capacity Planning VPN Hardware
Software VPNs
Managing Performance of VPN Software

VPN Solutions

Site to Site Networks
Intranets
Secure Remote Access

VPN Tunnels

Protocols (inc PPTP, L2F, L2TP, IPSec)
Sizing of VPN Tunnels

VPN Authentication Mechanisms

An Encryption Primer
Public-Key Infrastructure
The Various Protocols Available
Performance Issues: DES & Triple-DES

VPN Architectures

Impact on Capacity/Performance

Service Level Management

Importance of SLAs with VPNs
VPN Service Providers
Monitoring VPN Performance
Service Classification
Quality-of-Service in a Graded Network

Capacity Planning Multiple Services

Using Queuing Analysis to Size Tunnels

Strategic Planning

Using Capacity Planning to Competitive Advantage (Strategic Capacity Planning)

2 Days
£1,195

Capacity Planning (CP) is the key function within any organisation that determines the company profits. Capacity Planning is central to profit optimisation as it determines whether customer demand can be met and controls the cost of supplying service to the customer. This value chain optimisation enables a company to gain competitive advantage, as demonstrated by Dell, Tesco and Toyota in their respective industries. ICT Capacity Planning should adopt the same principles.

Learn How To:

- Optimise your company's profits by balancing supply and demand of ICT services
- Prevent stranded capital where possible by operating a lean supply chain
- Gain competitive advantage in the marketplace by turning up new services faster while enjoying a lower cost base
- Widen your tool-set for capacity planning by using industry-wide techniques

Topics

Introduction to Strategic Capacity Planning

Analysing Companies Outside of ICT
Finding Good CP Techniques

Objective: Optimise Capacity & Profit

The Value Chain

Analyse your Book-to-Bank Process
Identify Areas Where CP Can Help

The Supply Chain

Supply Chain Management Techniques
Demand Amplification

Supply Chain Integration

Just-in-Time & Lean Techniques

What is Too Little/ Too Much Capacity?

The Demand Chain

Techniques to Control Demand
The Dangers of Demand Forecasting
Forecasting Errors & Their Impact

The Value Chain (II)

Optimise the Value Chain

Yield/Revenue Management

Capacity Planning Cost/Benefit Analysis

Capacity Planning Processes

Material Requirements Planning

Reflecting the Changes in Production

Pressures on Capacity Planning:

- Product Customisation - Build to Order (BTO)
- Faster Time-to-Market
- Aggressive Service Level Agreements
- Cost Management

Planning Input Data Requirements

Utilisation, Inventory, Demand, Designs
Costs, Lead-Times, Vendor Confidence

Tools for Strategic Capacity Planning

Business Process Management Tools
Effective Systems Integration
Capacity-on-Demand

Modelling & Validating Service Level Agreements (SLAs)

4 Days
£1,995

Most contemporary SLAs have financial penalties for non-compliance, so meeting the customer's performance criteria is essential for revenue assurance. Key areas that need to be covered within any SLA are transaction response times, quality-of-Service guarantees, systems throughput and scalability and system availability. This course teaches how to model and validate these key performance metrics at an early stage in the development cycle to ensure the requirements can be met.

Learn How To:

- Use SLAs to optimise profits
- Minimise SLA breaches where possible at minimum cost
- Prevent SLA failures from causing reputational impact to your business
- Ensure service level compliance by accurate and effective monitoring
- Predict application response times before a line of code has been written
- Validate whether an SLA is achievable using industry best practices

Topics

Introduction to SLAs

Financial Penalties within SLAs
SLAs & Software Development Process

SLA Performance Categories

Transaction Throughput and Scalability
Service and System Availability

Modelling & Validating Response Times

Strategy for Modelling Response Times
Deconstructing End-to-End Transactions

Modelling Quality-of-Service (QoS)

Traffic Engineering in Networks
Workload Management in IT Systems

Validating Quality-of-Service (QoS)

How to Measure QoS
Complexity of Measuring Mixed Services
Sensitivity Analysis for Better Accuracy

Modelling System Throughput/Scalability

Contention within Information Systems
An Overview of Utilisation Trending
Performance Modelling of Systems

Validating System Throughput/Scalability

Volume Load Testing Overview

Modelling & Validating System Availability

System Availability: an Overview
Modelling Mean Time Between Failures
System Recovery Times
Benchmarking of Systems Availability
High Availability Systems

Modelling & Validating Service Continuity

Resilience and Contingency Defined
Realistic and Achievable Measures

Financial Penalties & Profit Optimisation

Are Service Remedies Cost Effective?
Profit Optimisation Formulae

Strategic Planning

Capacity Planning & Management Processes

2 Days
£1,195

Capacity Management of Information and Communication Technology (ICT) is a key process within any organisation. All modern organisations rely on ICT to service customer demand in some way, and for some, such as ISPs and Telcos, the selling of ICT capacity is their business. Effective Capacity Management is not easy to achieve due to other demands on Capacity Analysts time. This course provides a framework for building an integrated, effective and efficient process.

Learn How To:

- Measure the effectiveness & efficiency of a capacity management function
- Understand the need for a proactive capacity management function and the benefits that it brings
- Identify staff skills shortages
- Build a well-defined CM process, seamlessly integrated into all the business and technical functions
- Reduce capacity-driven service problems quickly
- Measure and control performance of vendors
- Justify capacity upgrades quickly and professionally

Topics

Capacity Management (CM) Introduction

Business-Driven Capacity Management
CM as a Risk Management Discipline
Reactive vs. Proactive CM & Planning
Capacity Management Interfaces
Common CM Process Issues

Measuring CM Effectiveness

Service Achievement Models
Measurement Points
Key Performance Indicators (KPIs)
The Problem with Measurement
Measuring %Reactive vs. %Proactive
Measuring the Effectiveness of Staff

ITIL Overview

ITIL Service Delivery Framework & CM
Strengths & Weaknesses of ITIL
Comparison to Capacitas Framework
Terminology Differences

Capacitas CM Competency Framework

The 9 Core Functions within CM
The 6 Process Triggers within CM
Roles & Responsibilities

Key Areas of Capacity Management

Interfacing with the Business Functions
Typical Organisational Structures
Value & Limitations of Trending
Performance Management & CM
Augment/Inventory Tracking
Vendor Performance Measurement
Justifying Capacity Upgrades
Integrating with Budgeting Processes

Implementing a CM Process

Breaking the Firefighting Vicious Circle
Process Measurement Points & KPIs
Cost/Benefit Analysis of a CM Function
Justifying the Need for Change
The use of Contract Capacity Analysts
A Change Management Process

Please access our website for recent course additions or changes

Network Service Continuity Management: 3 Days A Risk Management Approach £1,595

Telecommunication networks and services are integral to modern business and the economies they support. Like all technologies they are susceptible to failure, whether through fatigue, external hazards, human error or deliberate attack. Network outages have a catastrophic effect on the network users, with the possibility of some customers losing their entire business. To prevent serious consequences appropriate Network Risk Management techniques are needed.

Learn How To:

- Identify, categorise and manage risks to telecommunication networks and their customers
- Ensure service levels for availability and recovery are met
- Plan networks to be resilient
- Define, test and maintain a Disaster Recovery Plan
- Define appropriate counter-measures and strategies for risks
- Guarantee a reputation for high-availability service
- Ensure business and service continuity and reduce insurance costs

Topics

Risk Management Primer

The Risk Management Process
Planning a Risk Management Strategy
The Analysis & Prioritisation of Risks
Defining and Costing Counter-Measures

Service Continuity Management

Defining Service Continuity Management
Proactive Versus Reactive Approaches
Defining Resilience & Contingency

Service Level Management (SLM)

Defining Service Level Management
Reliability, Availability & Serviceability
Calculating Failure Probabilities

Disaster Recovery Planning Process

Risk Identification & Categorisation
Risk Analysis & Prioritisation
Complexity: Enemy of Risk Management

Disaster Recovery Scope

Defining the Scope of the DR Plan
Network Technologies
Building Usage and Recovery Options

The Disaster Recovery Plan

Development, Testing & Maintenance

Case Study & Horror Stories

Environment: Power, HVAC etc.
Site: Fire, Explosion, Flood etc.
Criminal: Viruses, Worms, Theft etc.
Systematic: Hardware/Software Failure

Service Level Agreements

Availability Management: ITIL Approach
Measuring Resilience: the Mythical 5x9s

Defining & Designing Resilience

Enterprise Resilience Requirements
Client/Server architectures & Resilience
Carrier Grade Resilience Requirements

How to book courses

REGISTRATION FORM - Please photocopy, complete and post/fax

Please reserve me a place on the following course(s) as indicated below. My details are as listed below. I do/do not require accommodation at an additional £ 100 + VAT (£ 117.50) for each night.

<input type="checkbox"/>	Capacity Planning: Tools & Methods	4 days	£1,995
<input type="checkbox"/>	Financial Analysis for Capacity Planners	2 days	£1,195
<input type="checkbox"/>	Developing Applications for Performance	2 days	£1,195
<input type="checkbox"/>	Performance Assurance Through Volume & Performance Testing	4 days	£2,495
<input type="checkbox"/>	Capacity/Performance Management of Web-Based Applications	4 days	£1,995
<input type="checkbox"/>	Capacity/Performance Tuning of Solaris/Linux	4 days	£1,995
<input type="checkbox"/>	Capacity Planning Windows 2000/2003	3 days	£1,595
<input type="checkbox"/>	Capacity Planning Storage Area Networks	3 days	£1,595
<input type="checkbox"/>	Capacity Planning Voice Networks	4 days	£1,995
<input type="checkbox"/>	Capacity Planning TCP/IP Networks	4 days	£1,995
<input type="checkbox"/>	Capacity Planning Transmission Networks	3 days	£1,595
<input type="checkbox"/>	Capacity Planning xDSL Networks	2 days	£1,195
<input type="checkbox"/>	Capacity Planning Metro Networks	2 days	£1,195
<input type="checkbox"/>	Capacity Planning Virtual Private Networks	2 days	£1,195
<input type="checkbox"/>	Using Capacity Planning to Strategic Advantage	2 days	£1,195
<input type="checkbox"/>	Modelling & Validating Service Level Agreements	4 days	£1,995
<input type="checkbox"/>	Capacity Planning & Management Processes	2 days	£1,195
<input type="checkbox"/>	Network Service Continuity: A Risk Management Approach	3 days	£1,595

Mr/Mrs/Miss/Ms/Dr/Other

First Name _____

Last Name _____

Job Title _____

Company _____

Address _____

Postcode/Zipcode _____

Country _____

Telephone _____

Email Address _____

Payment

Cheque number enclosed: _____

invoice my company at this address:

Await purchase order before invoicing

Purchase Order Number: _____

Direct payment to following bank account:

City of London Office,
National Westminster Bank,
PO Box 12258,
1, Princes Street,
London. EC2R 8PA

A/C No. 83640746

Sort Code: 60-00-01

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Terms & Conditions

PRICING - All pricing is exclusive of Value Added Tax (VAT), which will be added at the appropriate rate at the time of booking.

COURSE AVAILABILITY - All courses are offered subject to availability. Changes to the course date, location or content will be informed no less than 10 working days prior to course date and the attendee will be given the opportunity to cancel or change to an alternative start date or course. Course fees can be refunded in these circumstances, although CAPACITAS accepts no further liability.

REGISTRATION FEES - Invoices will be issued upon receiving registration details, which must be paid in full prior to attending the course. Course fees include lunch, refreshments (tea, coffee, juices, fruit) and all course materials. Course fees are quoted excluding VAT, which will be included on the invoice. Money Orders, Drafts and Cheques should be made payable to "CAPACITAS LIMITED". Please note that we reserve the right to refuse course admission if full payment is not forthcoming prior to the course start.

ACCOMMODATION - Accommodation is not included in the course cost, although this can be arranged through Capacitas at an additional cost of £100 + VAT per night. Accommodation fees are not subject to any discounts at any time. For attendees wishing to book accommodation please contact us directly.

EARLY BOOKING DISCOUNT - Course booked and paid for 30 working days prior to the course start date are entitled to a 5% discount on the standard fee. Taking advantage of this offer does not prevent use of any other promotional discounts that may apply at the time of booking.

GROUP DISCOUNT - Bookings of multiple attendees from any one person or company will be subject to a sliding scale of discount of 5% per additional course booked, up to a maximum of 6 attendees (maximum 25% discount). This discount is only applicable if all courses are booked together and are taken within 12 calendar months of the first course booked. Any courses taken outside of the group discount 12 month window will be subject to full charge.

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Please note that these terms and conditions are accurate at time of printing but can be changed by Capacitas without notice. Any changes to the standard terms & conditions will be published on our website.

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