

# **Enterprise and Solution Architecture Syllabus**

**(Covers Intermediate and Practitioner)**

**Version 3.0**

**October 2010**

## Change History

Version Number	Date	Changes Made
3.0	October 2010	Added more information to Data Classification Category. Changed the pass rate on Practitioner level from 60% (24/40) to 26/40. Changed Distinction level on Practitioner level from 80% to N/A. Changed Ally Lewington to Ally Bingham. Added Training Providers to Distribution List. Added Change Log in the main body of the syllabus. Added in trainer: classroom size.
2.0	July 2010	Added in trainer criteria for new trainers. This is not a retrospective requirement. Effective July 2010.
1.1	January 2010	Signed off and approved.

# Enterprise and Solution Architecture Syllabus

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## Background

This document is the syllabus for the ISEB Intermediate and Practitioner Certificates in Enterprise and Solution Architecture, as administered by the Information Systems Examination Board (ISEB). The syllabus in this document defines the scope of ISEB examinations in Enterprise and Solution Architecture.

It is designed to help:

- Training Providers to scope training courses that lead to the examinations.
- Examiners to scope examination questions.

## Objectives

The primary aims of the ISEB examinations and associated training are to give enterprise and solution architects a broad framework that covers the range of architecture work that precedes and steers system development, and to focus attention on areas where the architect is responsible for effective design and risk management.

A secondary aim is to provide architects with generally applicable knowledge and training. General here means independent of any specific architecture framework (Gartner, TOGAF, etc). This enables Training Providers to teach general knowledge and skills, rather than framework-specific terms, concepts, structures and processes.

Holders of the Intermediate Certificate will have demonstrated their knowledge and understanding of:

- different kinds of architecture and the roles architects play in the IT/IS industry
- the business context, and the importance of business-IT alignment
- architecture precursors: goals, directives and constraints
- architecture development process and description frameworks
- business architecture concepts and techniques
- data architecture concepts and techniques
- applications architecture concepts and techniques
- solution design to meet non-functional requirements
- infrastructure architecture as a process to support applications architecture.

Holders of the Practitioner Certificate will have demonstrated their knowledge and understanding of:

- intermediate level concepts, including architecture processes and descriptions
- shown that they can apply this knowledge to a case study that involves producing deliverables in the following areas:
- architecture precursors: goals, directives and scope
- architecture descriptions: business, data, applications and infrastructure architecture.

They will also have demonstrated their knowledge and understanding of architecture management techniques in the areas of migration planning, implementation, change management and governance.

## Reference Model

The reference model associated with the syllabus defines terms in just sufficient detail to help:

- Examiners to phrase examination questions and answers.
- Candidates to understand terms and concepts in examination questions.
- Training Providers to be consistent with the syllabus and each other.

## One syllabus covering all levels

Examination questions and associated training are based on the terms that are listed in one syllabus and defined in the companion reference model. Each term is classified as Foundation, Intermediate or Practitioner level. Each level of certification embraces the level below. So, while there is no foundation level examination, there are many foundation level concepts, and these may appear in intermediate and practitioner level examinations. It is expected that candidates will understand most if not all the foundation-level concepts before attending a training course. And that Training Providers may cover foundation-level concepts - relatively briefly.

## Training Provider Guidance

Each major subject heading in the syllabus is assigned an allocated time. The purpose of this is to give both guidance on the relative proportion of time to be allocated to each section of an accredited course and an approximate minimum time for the teaching of each section. Training Providers may spend more time than is indicated and candidates may spend more time again in reading and research.

The course may be delivered as a series of modules with gaps between them, as long as it meets all other constraints. Courses do not have to follow the same order as the syllabus.

The syllabus contains references to established standards. The use of referenced standards in the preparation of training material is mandatory. Each standard used must be the version quoted in the current version of this syllabus.

Training materials should be consistent with the terms and definitions contained in the syllabus and reference model. Training Providers may use sources that use the same terms with different meanings, but should in this case explain any terminology clashes to candidates.

Training Providers are free to decide:

- the "process" that candidates are taught at the Intermediate level and apply to the case study in the practitioner level, and
- the notations used in architecture models and descriptions.

## **On the breadth of an architect's role**

Architect roles are broad, and the enterprise or solution architect must be a generalist. No syllabus, training course or examination can be enough to make an architect. The role requires extensive experience on a variety of projects.

In this document, the terms “architect” and “architecture” apply principally to Enterprise and Solution Architects working in relation to Information Systems and Technologies. The role played by architects in these roles is broad – spanning the spectrum from business concerns to information technologies.

Note especially that while most sections of the syllabus are divided into Foundation, Intermediate or Practitioner levels, each level of certification embraces the level below. So, while there is no foundation level examination, there are many foundation level concepts, and these may appear in intermediate and practitioner level examinations. It is expected that candidates will understand most if not all the foundation-level concepts before attending a training course. And that Training Providers may cover foundation-level concepts – relatively briefly.

## **Criteria of Training Competence**

The syllabus can only be delivered to candidates by an accredited provider/trainer. Any provider/trainer must hold the following qualifications to be eligible to provide this syllabus

### **Intermediate Certificate**

Trainers must hold the Intermediate Certificate in Enterprise and Solution Architecture

### **Practitioner Certificate**

Trainers must hold the Practitioner Certificate in Enterprise and Solution Architecture

## **Bloom's Taxonomy**

Learning objectives in this syllabus are given indicators from K1-K6. These are based on Bloom's taxonomy of knowledge in the cognitive domain (ref Taxonomy of Educational Objectives, Handbook 1 – The Cognitive Domain, Bloom et al., New York 1956), and can be broadly interpreted as follows: K1 – Remembering I; K2 – Understanding; K3 – Applying; K4 – Analysing; K5 – Evaluating ; K6 – Creating. Bloom's taxonomy is explained in greater detail in Appendix A, where examples are given. All topics in this syllabus have learning objectives associated with them, each of which has an associated K level. The language used in this syllabus mirrors as closely as possible the language used in defining Bloom's taxonomy to provide candidates with consistent pointers to the expected level of knowledge and a consistent way of expressing that level in words.



## INTERMEDIATE LEVEL

Intermediate level training and examinations cover the most of the syllabus at a remembering and understanding level.

### Prerequisites

It is recommended that candidates have 3 years or more experience of IS/IT work including some contact with architects and architecture descriptions.

### Intermediate exam questions and training course timings

The Intermediate-level exam will have 40 multiple choice type questions which must be completed in 1 hour. The syllabus below includes against the headings, the number of exam questions expected, and the number of hours suitable for a training course.

A training course should contain a minimum of 18 training hours. All timings below are to the nearest half hour.

<b>Intermediate</b>				
	<b>Blooms Level</b>	<b>Number of Questions</b>	<b>Training Hours</b>	
1.	Architecture and architects	2	4	2.5
2.	Architecture precursors	2	6	3
3.	Architecture frameworks	2	5	2.5
4.	Business architecture	2	5	2.5
5.	Data architecture	2	3	1
6.	Component architecture	2	5	2
7.	Applications architecture	2	4	2
8.	Design for NFRs	2	3	1.5
9.	Infrastructure architecture	2	5	1.5
10.	Migration planning	1		0.25
11.	Architecture management	1		0.25
<b>Totals</b>		<b>40</b>		

### Mapping the Intermediate level to Bloom's taxonomy

The relevant levels in Bloom's taxonomy are Level 1 - Remembering and 2 Understanding. An Intermediate Enterprise or Solution Architect should be at Bloom Level 2 for all Sections 1 to 9. This means they remember and understand all the terms defined in the syllabus at Foundation and Intermediate Levels.

An Intermediate training course should lightly introduce the topics in sections 10 and 11, but no exam questions will be set.

## PRACTITIONER LEVEL

Practitioner level training and examinations elaborates on the more practical parts of the syllabus, and focuses on the practical application of the knowledge to a case study.

### Prerequisites

It is recommended that candidates have 6 years or more experience of IS/IT work, including some architecture definition. Must have attended the Intermediate level course, or else have a TOGAF certificate and have studied the ISEB Intermediate level syllabus before attending.

### Practitioner exam questions and training course timings

The Practitioner-level exam will have 40 multiple choice type questions which must be completed in questions in 1 hour, based on application of the syllabus and acquired knowledge to a case study.

Practitioner level training must remind people of Intermediate-level knowledge and exemplify best practice (up to 50%) and lead the candidates through a practical case study (at least 50%).

The table below includes the number of exam questions expected, and the number of hours suitable for a training course.

A training course should contain at least 18 training hours. All timings below are to the nearest half hour.

		<b>Practitioner</b>		
		Blooms Level	Number of Questions	Training Hours
1.	Architecture and architects			0.5
2.	Architecture precursors	3	5	2.5
3.	Architecture frameworks	2	1	2
4.	Business architecture	3	5	2
5.	Data architecture	3	4	2
6.	Component architecture	3	3	1
7.	Applications architecture	3	6	2
8.	Design for NFRs	3	6	1
9.	Infrastructure architecture	3	4	2
10.	Migration planning	3	2	1
11.	Architecture management	3	4	2
<b>Totals</b>			<b>40</b>	

### Mapping the Practitioner level to Bloom's taxonomy

The relevant levels in Bloom's taxonomy are Level 1 – Remembering; Level 2 Understanding and Level 3 Applying. A Practitioner Enterprise or Solution Architect should be at Bloom Level 2 for all sections of the syllabus.

This means they remember and understand all the terms defined in the syllabus, at all levels. In addition:

- **3 ARCHITECTURE PRECURSORS:** The Practitioner should be able to define SMART goals and business cases, and identify risks relating to non-functional requirements.
- **4 ARCHITECTURE FRAMEWORKS:** The Practitioner should be aware of alternative frameworks and comprehend one framework in more depth.
- **5 BUSINESS ARCHITECTURE:** The Practitioner should be able to describe business architecture building blocks, models and views.
- **6 DATA ARCHITECTURE:** The Practitioner should be able to describe data architecture building blocks, models and views.
- **7 APPLICATIONS ARCHITECTURE:** The Practitioner should be able to describe an applications architecture.
- **8 SOLUTION DESIGN FOR NFRS:** The Practitioner should be able to design or redesign a solution to meet non-functional requirements.
- **9 INFRASTRUCTURE ARCHITECTURE:** The Practitioner should be able to outline an infrastructure in sufficient detail for technical/infrastructure architects to complete.
- **10 MIGRATION PLANNING:** The Practitioner should be able to plan an architecture migration, alongside managers using standard management planning processes.
- **11 ARCHITECTURE MANAGEMENT:** The Practitioner should be able to govern the implementation of an architecture.

## ARCHITECTURE AND ARCHITECTS

Recognise the work and roles involved in describing the architecture (the high-level design) of business systems and the information systems that support them. (Not, in this context, work and roles related to buildings).

### Foundation Learning Objectives

Recognise the ways base terms like architecture, system, structure, behaviour, interface, service and function are used in the ISEB reference model (and so, examination question wording).

### Intermediate Learning Objectives

#### Architecture granularity

Distinguish the following three levels of granularity in architecture definition: Enterprise, Solution(s) and Software.

#### Architecture domains

Recognise the need for separation of concerns. Recognise that architecture descriptions are sliced into high-level views to address the separate concerns of different stakeholders. Distinguish the following four broad perspectives: Business, Information/Data, Applications and Technology/Infrastructure.

#### Hierarchical or layered architecture

Recognise division into layers as a fundamental and widely-used technique of architecture and design. Recognise how the architecture domains (above) may be regarded as layers.

#### Architect roles, goals and skills

List a variety of architect roles. Distinguish the goals of enterprise architects and solution architects. List some knowledge and skills required for those roles.

### Practitioner Learning Objectives

Discuss the practical use of the concepts above and apply them a case study. Draw analogies between human activity systems and software systems. Recognise the limits to these analogies.

## **ARCHITECTURE PRECURSORS**

Recognise the various inputs, statements of requirements and constraints that guide an architect as to the nature and shape of solutions to be built. Recognise the information that may be needed in a statement of architecture work.

### **Foundation Learning Objectives**

#### **Stakeholders**

Identify stakeholders and their concerns. Apply stakeholder management techniques.

#### **Elaboration of inputs to become deliverables**

Recognise that architecture involves hierarchical decomposition inputs into outputs, so the outputs at one level are inputs to the level below.

### **Intermediate Learning Objectives**

#### **Drivers, aims and directives**

Distinguish drivers, aims and directives. Recognise the hierarchical decomposition of both aims and directives. Define SMART aims.

#### **Solution descriptions and plans**

Distinguish business from IT. Recognise the hierarchical decomposition of solutions and the plans to deliver them.

#### **Standards**

Identify several standard bodies. Recognise the need for the enterprise to have a Standards Information Base, and to define the standards profile of solution components.

#### **Scope of architecture work**

Recognise ways to define the scope of architecture work, and the scope of an enterprise or system. Draw a context diagram showing interfaces to external systems). Distinguish the concepts of external entity, actor, role.

#### **Requirements**

Recognise the difference between functional and non-functional requirements. List ten kinds of non-functional requirement. Distinguish requirements, Service Level Agreements and Service Level Requirements.

## **Regulatory requirements**

Recognise several kinds of regulatory requirement relevant to architecture definition.

## **Business case**

Recognise the contents of a business case; notably RoI, cost-benefit analysis, solution options and risk analysis. Recognise in this connection the nature and purposes of gap analysis (between options), trade-off analysis, and business scenarios.

## **Practitioner Learning Objectives**

Discuss the practical use of the concepts above and apply them a case study.

## **ARCHITECTURE FRAMEWORKS**

Recognise methodologies designed to help people create architecture descriptions and use them to good effect. Distinguish a development process (a process framework) from a classification of architecture descriptions (a description framework).

### **Foundation Learning Objectives**

None.

### **Intermediate Learning Objectives**

#### **Architecture process frameworks**

Recognise the phases of an architecture process framework that helps architects to describe a baseline architecture, a target architecture and the transformation between them.

Recognise the ten phases of the method for enterprise architecture development (ADM) in the Open Group Architecture Framework (TOGAF) Recognise that a process for solution architecture involves similar activities but with different goals and a different level of detail.

#### **Architecture descriptions**

Distinguish the key concepts of architecture description (system, view, view point, concern, and stakeholder) and the relationships between them, as described in the standard popularly known as ANSI 1471. Identify building blocks used in architecture descriptions.

#### **Architecture models**

Recognise that models are abstractions composed of instances of artefact types and mappings between them.

Distinguish three kinds of abstraction: by composition, generalisation and idealisation.

Distinguish three levels in an idealisation hierarchy: conceptual, logical and physical. Recognise the possible transformations involved in Model-Driven Architecture (MDA).

Recognise the relationship (line) symbols shared by the Unified Modelling Language (UML) and ArchiMate.

#### **Architecture description frameworks**

Identify the rows and columns of the architecture description framework known as the Zachman framework. Recognise the meta model of an architecture repository. Recognise the two dimensions of the Enterprise Continuum in TOGAF.

### **Practitioner Learning Objectives**

Discuss the practical use of the concepts above and apply them a case study.

## **BUSINESS ARCHITECTURE**

Recognise ways to describe the structure and behaviour of a business system (not necessarily related to computers), covering business functions or capabilities, business processes and the roles of the actors involved.

Recognise how to map business functions and business processes to each other, to the business goals and business services they support, and to the applications and data they need.

### **Foundation Learning Objectives**

Distinguish the physical and logical structures of a business (organisation units and business functions or capabilities). Recognise several synonyms in this area.

Distinguish business services and business processes. Recognise synonyms in this area, and the use of the terms value stream and value chain.

Recognise mappings of the above to place and time.

### **Intermediate Learning Objectives**

#### **Business architecture structure and behaviour**

Recognise ways to model a business system, including business process structures, business function (or capability) structures, business data models and business rules.

#### **Business process decomposition and automation**

Recognise three levels of business process granularity: workflow, use case and automated service.

Recognise the benefits of implementing a process as an ACID transaction and the need for compensating transactions where this is not possible.

Distinguish business services from data services.

#### **Design for business security**

Identify several features in design for human and organisational security.

### **Practitioner Learning Objectives**

Discuss the practical use of the concepts above and apply them a case study.



## **DATA ARCHITECTURE**

Recognise ways to describe the data structures used by a business and/or its applications, including meta data: that is, descriptions of data in storage, data in motion, data structures and data items. Recognise mappings of data objects to data qualities, applications, technologies etc.

Recognise information architecture can embrace not only data architecture but also knowledge/content management.

### **Foundation Learning Objectives**

Recognises how the data stored in and transmitted between information systems is a model of entities and events in the external environment, or real world.

Recognise how data is described using meta data, data structures, data types and data dictionaries.

### **Intermediate Learning Objectives**

#### **Knowledge and/or content management**

Distinguish knowledge and/or content management from data management.

#### **Data architecture structure**

Understand how to describe data in storage using data models. Recognise the issues in storing state outside of a database in a cache. Recognise the functions of database management system and concept of a federated transaction across a distributed database.

Understand how to describe data in motion, data flow definitions, regular expression, message formats and canonical data models.

#### **Data qualities and integration**

Recognise how the three primary data qualities (CIA) may be measured at three or more levels.

Distinguish data store integrity from data flow (or message) integrity.

Recognise the dimensions of a data dissemination view.

Recognise the way denormalisation is used to optimise output from a data warehouse,

Recognise the concept of master data management, and ways to implement it.

## **Design for data security**

Recognise key concepts in data security: security protection, security feature, security policy, information domain, identity, encryption, checksum and digital signature.

## **Practitioner Learning Objectives**

Discuss the practical use of the concepts above and apply them a case study.

## **SOFTWARE ARCHITECTURE**

Recognise ways to modularise the internal structure of an application, and ways to connect components, ranging from tightly coupled to loosely-coupled.

### **Foundation Learning Objectives**

Recognise system modeling techniques including at least context diagrams, data flow diagrams, use case diagrams, process flow charts (activity diagrams), interaction diagrams (sequence diagrams) and state charts.

Recognise the core concepts of modular design including: encapsulation, façade, aggregation by cluster or affinity analysis, stateful and stateless components.

Recognise the core elements of a service contract and principles of service-oriented design.

Recognise the concepts of transactional processing.

Recognise the concept of delegation from clients to servers. Distinguish cyclic dependency from hierarchical (non-cyclic) dependency. Recognise several service qualities and service-oriented design challenges.

### **Intermediate Learning Objectives**

#### **Component structures and patterns**

Recognise the essential ideas in component structures and patterns: client versus server, loosely-coupled versus tightly-coupled.

Recognise basic design patterns: hierarchical and peer-to-peer structures, fork and chain structures. model-view controller (MVC).

Recognise a few common OO design patterns.

#### **Component interfaces**

Recognise the concepts of an Application Programming Interface (API) and Interface Description Language (IDL). Recognise how an interface is realised by a component.

Distinguish asynchronous from synchronous communication, from both client and server perspectives.

#### **Component interoperation styles**

Recognise how the following component interoperation styles are successively more loosely-coupled: Distributed Objects style (DO): Service-Oriented Architecture style (SOA): Representational State Transfer style (REST): Event-Driven Architecture style (EDA).

## **Component communication styles**

Recognise how the following component communication styles increasingly decouple client/sender from server/receiver: point-to-point communication, introduction agent (direct broker) and mediator (indirect broker). Recognise at least one middleware technology used for each style.

## **Publish and subscribe distribution**

Distinguish different kinds of publish and subscribe distribution.

## **APPLICATIONS ARCHITECTURE**

Recognise ways to describe the structure and behaviour of applications used in a business, with a focus on how they interact with each other and with business users or actors. Recognise the need for enterprise and solution architects to focus on data consumed and produced by applications rather than their internal structure. Recognise mappings of applications to business functions they support and to application platform technologies they need.

### **Foundation Learning Objectives**

Distinguish three kinds of application: user application, infrastructure application, platform application.

Recognise the main purposes of Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) systems.

### **Intermediate Learning Objectives**

#### **Applications architecture structure and behaviour**

Recognise the goals and concepts of application portfolio management.

Distinguish structural and behavioural models of applications architecture.

Recognise a variety of approaches to application integration: screen scrapers, ETL, application consolidation. Distinguish point-to-point from hub and spoke application integration. Recognise the TOGAF concepts of Boundaryless Information Flow and Integrated Information Infrastructure Reference Model (III-RM).

#### **Design for applications security**

Distinguish the steps in applications security: identification, authentication, authorisation and access. Recognise the concept of three-factor authentication. Recognise different security controls needed in different layers of an enterprise application.

#### **Application platform**

Recognise the purposes of application platform technologies: notably component distribution middleware, database and transaction middleware (remote database access, transaction processing and distributed transaction manager).

### **Practitioner Learning Objectives**

Discuss the practical use of the concepts above and apply them a case study.

## **DESIGN for NFRS**

Recognise a selection of common techniques used in design for NFRs.

### **Foundation Learning Objectives**

None.

### **Intermediate Learning Objectives**

Recognise four design for performance techniques: Database optimization (normalisation, denormalisation, index, access path analysis), cache, scale up, scale out (aka clustering).

Recognise two design for resilience techniques: Fail over, Defensive design.

Recognise two design for recoverability techniques: Back up, Backup site.

Recognise two design for integrity techniques.

Recognise two design for serviceability techniques.

Recognise design for security techniques mentioned in other sections of the syllabus and identify relevant standards (ISO/IEC 27001, ISO/IEC 17799).

### **Practitioner Learning Objectives**

Discuss the practical use of the concepts above and refer to them during a case study.

## **INFRASTRUCTURE ARCHITECTURE**

Recognise ways to describe the structure and behaviour of the technology platform that underpins user applications: covering the client and server nodes of the hardware configuration, the platform applications that run on them, the platform services they offer to applications, and the protocols and networks that connect applications and nodes.

### **Foundation Learning Objectives**

#### **Computers**

Recognise the basic units of computer network: computer, processor, operating system, peripheral, router, bridge.

#### **Connecting computers to networks**

Distinguish physical and logical network addresses: MAC address, IP address.

Recognise the use by a process of a socket of a port to send and receive data of a service type.

#### **Topologies**

Distinguish four topology shapes: hub and spoke, point to point, bus and ring. Recognise these terms have different meanings in different areas of computing.

Recognise different shapes may apply at different topology levels.

#### **Networks and protocols**

Distinguish four levels of network geography: PAN, LAN, MAN, and WAN.

Recognise the convergence of telecommunications media, and Voice Over IP.

Distinguish the seven layers of the OSI model of communication protocols. Distinguish the TCP/IP 5 layer stack from the OSI 7 layer model. Recognise the protocols used in the web services stack.

Recognise the division of an IP address by a network administrator to identify a subnet.

## **Intermediate Learning Objectives**

### **Infrastructure architecture structure and behaviour**

Recognise why TOGAF recommends listing platform services under a logical hierarchical structure, known as a Technical Reference Model.

Recognise the building blocks commonly shown in a hardware configuration diagram, and the process of infrastructure architecture design.

Recognise the concepts of virtualisation and server consolidation.

### **Design for infrastructure security**

Recognise techniques for infrastructure security used to protect client devices, web sites and services, including https, firewalls and a De-Militarised Zone (DMZ).

## **Practitioner Learning Objectives**

Discuss the practical use of the concepts above and apply them a case study.



## **MIGRATION PLANNING**

Recognise the process of turning baseline and target architecture descriptions into a plan for a programme or project, and the contributions made by architects to programme/project planning.

Recognise the need to integrate architectural planning activities with programme/project management offices approaches such as MSP, PRINCE2 and PMI).

### **Foundation and Intermediate Learning Objectives**

None. Though Training Providers should introduce the concepts below lightly in an intermediate level course.

### **Practitioner Learning Objectives**

Recognise the use of analysis techniques such as gap analysis, and critical path analysis in defining a migration path.

Recognise the formation of a roadmap with time, costs and resources, from a migration path.

Recognise the need to maintain a RAID catalogue and work alongside managers using methods for programme and project management.

## **ARCHITECTURE MANAGEMENT**

Recognise the organisations and processes needed to govern and implement an architecture description, both in development and in operation, including the management of changes.

### **Foundation and Intermediate Learning Objectives**

None. Though Training Providers should introduce the concepts below lightly in an intermediate level course.

### **Practitioner Learning Objectives**

#### **Architecture implementation**

Distinguish three varieties of Software Development Life Cycle (SDLC): Waterfall, Iterative Development and Agile Development.

#### **Architecture change management**

Recognise the need for and concepts used in architecture change management: baseline configuration, configuration item, change management, change control, request for change (rfc), impact analysis, configuration management.

#### **Architecture governance**

Recognise the need for and concepts used in architecture governance: architecture board, architecture contract, governing architect, architecture compliance review, architecture review checklist, architecture conformance level, architecture compliance level, dispensation, capability maturity model.

#### **Architecture in operations**

Recognise approaches used to manage the architecture in operations: COBIT, IT services management (ITSM), Information technology Infrastructure Library (ITIL), IT Configuration Management Database (CMDB), Common Information Model (CIM), Problem and help-desk management. Systems management.

## Appendix A: Levels of Knowledge

The following levels of knowledge are defined as applying to this syllabus. Each topic in the syllabus will be examined according to the learning objectives defined elaborated in the section devoted to that topic. Each learning objective has a level of knowledge (K level) associated with it and this K level defines the nature of any examination questions related to that topic.

Note that each K level subsumes lower levels. For example, a K4 level topic is one for which a candidate must be able to analyse a situation and extract relevant information. A question on a K4 topic could be at any level up to and including K4. As an example, a scenario requiring a candidate to analyse a scenario and select the best risk identification method would be at K4, but questions could also be asked about this topic at K3 and a question at K3 for this topic might require a candidate to apply one of the risk identification methods to a situation.

### Level 1: Remembering (K1)

The candidate will recognise, remember and recall a term or concept. All topics in this syllabus require K1 level of understanding.

#### Example

Can recognise the definition of “failure” as:

- “non-delivery of service to an end user or any other stakeholder” or
- “actual deviation of the component or system from its expected delivery, service or result”.

### Level 2: Understanding (K2)

The candidate can select the reasons or explanations for statements related to the topic, and can summarise, compare, classify and give examples for the testing concept. All topics in this syllabus require K2 level of understanding.

#### Examples

Can explain the reason why tests should be designed as early as possible:

- To find defects when they are cheaper to remove.
- To find the most important defects first.

Can explain the similarities and differences between equivalence partitioning (EP) and classification tree method (CTM):

- Similarities: both partition inputs to reduce the required number of test cases to achieve good coverage.
- Differences: EP partitions both input and output while CTM partition only inputs.

### **Level 3: Applying (K3)**

The candidate can select the correct application of a concept or technique and apply it to a given context. No topics in this syllabus are at the K3 level but those at K4 level and above include a K3 level of understanding.

#### Examples

- Can identify boundary values for valid and invalid partitions.
- Can select test cases from a given state transition diagram in order to cover all transitions.

### **Level 4: Analysing (K4)**

The candidate can separate information related to a concept or technique into its constituent parts for better understanding, and can distinguish between facts and inferences. Some topics in this syllabus require a K4 level of understanding.

#### Examples

- Can identify inconsistencies in a test basis.
- Can select test design techniques for a given context.

### **Level 5: Evaluating (K5)**

The candidate can identify and build patterns in facts and information related to a concept or technique, and can create new meaning or structure from parts of a concept. Some topics in this syllabus require a K5 level of understanding.

#### Examples

- Can analyse test results and identify further tests to be applied.
- Can identify potential problems from system documentation.

### **Level 6: Creating (K6)**

The candidate can judge the value of information and decide on its applicability in a given situation. Some topics in this syllabus require a K6 level of understanding.

#### Examples

- Can determine the relative effectiveness and efficiency of different testing techniques.
- Can determine the type of information that should be gathered for an incident report.

## References

(For the cognitive levels of learning objectives)

**Title** Taxonomy of Educational Objectives, Handbook 1  
**Author** Benjamin S Bloom  
**Publisher** Longman Higher Education  
**Publication Date** October 1965  
**ISBN** 978-0582323865

**Title** A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives  
**Author** Lorin W. Anderson and David R. Krathwohl  
**Publisher** Allyn & Bacon; 1 edition  
**Publication Date** December 2000  
**ISBN** 978-0801319037

## Standards and Syllabuses

- ISO/IEC DIS 25961 Recommended Practice for Architectural Description of Software-Intensive Systems.
- IEEE 1471: another, popularly used, identity of the above.
- ANSI 1471: another, popularly used, identity of the above.
- ISO/IEC 17799 Information technology: Code of practice for information security management.
- ISO/IEC 24762:2008 Information technology — Security techniques — Guidelines for information.
- ISO/IEC 27001 Information technology — Security techniques — Information security management systems — Requirements.
- ISO/IEC 20000:2005 IT Service Management System (based on BS15000).
- ISO 9000: Quality management system in production environments.

## Books and Web Sites

None of the books listed below is required reading, but an architect is expected to have a breadth of knowledge, which reading some of these documents will help to provide.

Enterprise and Solution Architecture:

**Title** Enterprise Architecture as Strategy: Creating a Foundation for Business Execution  
**Author** Jeanne Ross, Peter Weill, & David C. Robertson  
**Publisher** Harvard Business School Press  
**Publication Date** August 2006  
**ISBN** 978 15913 98394

- Federal Enterprise Architecture Framework (FEAF), Version 1.1, US Federal Chief Information Officer (CIO) Council, September 1999; refer to [www.cio.gov/documents/fedarch1.pdf](http://www.cio.gov/documents/fedarch1.pdf).
- Practical Guide to Federal Enterprise Architecture, Version 1.0, US Federal Chief Information Officer (CIO) Council, February 2001; a cooperative venture with the General Accounting Office (GAO) and the Office of Management and Budget (OMB).
- The Open Group Architecture Framework (TOGAF). <http://www.opengroup.org>
- The Zachman Institute for Framework Advancement (ZIFA) <http://www.zifa.com/>
- The Avancier Method (AM). <http://avancier.co.uk>
- Governance and principles:
- OECD Principles of Corporate Governance, Organization for Economic Co-operation and Development, December 2001; refer to [www.oecd.org](http://www.oecd.org).
- Control Objectives for Information and related Technology (COBIT), Version 4.0, IT Governance Institute, 2005.
- The Information Technology Governance Institute: [www.itgi.org](http://www.itgi.org)
- Headquarters Air Force Principles for Information Management, US Air Force, June 29, 1998.

Architectural styles and patterns:

**Title** SOA In Practice  
**Author** Nicolai M. Josuttis  
**Publisher** O'Reilly Media  
**Publication Date** August 2007  
**ISBN** 978 059 6529550

**Title** Patterns for e-business  
**Author** Jonathan Adams  
**Publisher** IBM Press  
**Publication Date** October 2001  
**ISBN** 978 19311 82027

**Title** Design Patterns: Elements of Reusable Object-Oriented Software  
**Author** Erich Gamma, Richard Helm, Ralph Johnson, & John Vlissides  
**Publisher** Addison Wesley  
**Publication Date** October 1994  
**ISBN** 978-0201633610

**Title** Patterns of Enterprise Application Architecture  
**Author** Martin Fowler  
**Publisher** Addison Wesley  
**Publication Date** October 1994  
**ISBN** 978-0321127426

- Architectural Styles and the Design of Network-based Software Architectures, Roy Thomas Fielding <http://www.ics.uci.edu/~fielding/pubs/dissertation/top.htm>
- IBM Patterns for e-business Resources (also known as the “Red Books”): [www.ibm.com/developerworks/patterns/library](http://www.ibm.com/developerworks/patterns/library)
- Object Management Group (OMG) specifications and standards:
- Business Motivation Model
  
- Business Process Modeling Notation (BPMN) Specification, [www.bpmn.org](http://www.bpmn.org).
- Unified Modeling Language (UML) Specification, [www.uml.org](http://www.uml.org).
- Model Driven Architecture (MDA) Specification, [www.omg.org/mda](http://www.omg.org/mda).
- Common Object Request Broker Architecture (CORBA), to [www.corba.org](http://www.corba.org).
- IT Portfolio Management Facility (ITPMF) Specification.

## Format of the Intermediate Examination

This syllabus has an accompanying examination at which the candidate must achieve a pass score to gain the ISEB Intermediate Certificate in Enterprise and Solution Architecture.

Type	40 Question Multiple Choice
Duration	1 Hour
Pre-requisites	Recommended 3 years experience of IS/IT work including some contacts with architects and architecture descriptions
Supervised/Invigilated	Yes
Open Book	No
Pass Mark	26/40
Distinction Mark	N/A
Delivery	Paper based examination only via an ISEB Approved Provider

## Format of the Practitioner Examination

This syllabus has an accompanying examination at which the candidate must achieve a pass score to gain the ISEB Practitioner Certificate in Enterprise and Solution Architecture.

Type	40 Question Multiple Choice based on a Case Study (Available up to two weeks prior to the examination date)
Duration	1 Hour
Pre-requisites	Recommended 6 years experience of IS/IT work including some architecture definition and one of the following alternative qualifications Either the ISEB Intermediate Certificate in Enterprise and Solution Architecture <b>OR</b> Studied the ISEB Enterprise and Solution Architecture Syllabus and reference model, and have either the TOGAAF 8 or TOGAF 9 level 2 Certificate.
Supervised/Invigilated	Yes
Open Book	No
Pass Mark	26/40
Distinction Mark	N/A
Delivery	Paper based examination only via an ISEB Approved Provider

## Class Room Size

Trainer to candidate ratio:	1:16
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