# Unit 21: Virtualisation

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

## Unit in brief

Learners study how and why virtualisation can be used by individuals and organisations, and set up virtualised solutions to meet identified needs.

## Unit introduction

The use of virtualisation gives individuals and organisations a flexible approach to how computer infrastructure is used. From individual developers to large multinational organisations, virtualisation offers IT professionals the scope to use resources in new, efficient and creative ways. As a future IT professional, it is essential that you are able to assess the needs of users and organisations, as well as analyse the extent to which IT systems and computing solutions fulfil these needs.

In this unit, you will explore the scope of virtualised solutions, how different types of virtualisation can be used to meet user/business needs and the impact that implementing virtualised solutions has on individuals and organisations. You will analyse the computing needs of organisations and how virtualisation can help an organisation meet its aims. Finally, you will design and create virtualised solutions to meet a range of identified requirements.

This unit will provide you with the analytical skills and knowledge base that you will need to enter an IT apprenticeship as a network support engineer, or for progression to a degree course with the goal of becoming a systems analyst or programmer/developer.

## Learning aims

In this unit you will:

**A** Examine the concepts, uses and implications of virtualisation

**B** Implement a virtualised solution to meet identified requirements

**C** Demonstrate appropriate testing and maintenance procedures.

## Summary of unit

| Learning aim | Key content areas | Recommended assessment approach |
|---|---|---|
| **A** Examine the concepts, uses and implications of virtualisation | **A1** Types of virtualisation<br>**A2** Computing requirements of an organisation<br>**A3** Impact of virtualisation | A report detailing an investigation carried out on how virtualised solutions could be implemented within an identified organisation in order to fulfil the organisation's business and computing requirements. |
| **B** Implement a virtualised solution to meet identified requirements | **B1** Planning virtualised solutions<br>**B2** Reviewing and refining plans<br>**B3** Developing virtualised solutions | A project brief detailing client requirements, design specifications for the proposed solution, development and testing logs, meeting notes and a report that evaluates the effectiveness and appropriateness of the implemented solution. |
| **C** Demonstrate appropriate testing and maintenance procedures | **C1** Testing and maintaining virtualised solutions<br>**C2** Reviewing and refining virtualised solutions<br>**C3** Lessons learned from developing virtualised solutions<br>**C4** Presentation skills<br>**C5** Reviewing own skills, knowledge and behaviours | |

 

# Content

## Learning aim A: Examine the concepts, uses and implications of virtualisation

### A1 Types of virtualisation

The characteristics, application requirements and implications of different types of virtualisation.

- Hardware virtualisation:
  - 'full virtualisation', 'partial virtualisation' and 'paravirtualisation'
  - emulation
  - hardware-assisted virtualisation
  - snapshots and teleportation.
- Local desktop virtualisation (using a client-based virtualisation application).
- Remote desktop virtualisation, e.g. 'fat', 'thin' and 'zero' client, use of remote desktop services, application of a virtual desktop infrastructure (VDI).
- Memory virtualisation.

### A2 Computing requirements of an organisation

The aims and requirements of businesses and organisations, and how IT is used to support these.

- The services an organisation provides and how they may be virtualised.
- Aims and goals of organisations in the context of virtualisation and how these may be met.
- Customers – needs, expectations, how product/service is delivered.
- Staff – needs, working styles and patterns.
- Location – staff, customers, business premises, market/service delivery point.
- Legal and ethical considerations, e.g. licensing, data security, privacy.
- Requirements that cannot be met using virtualisation.

### A3 Impact of virtualisation

- The implications of virtualised computing solutions for individual users:
  - uses and applications of virtualisation
  - flexibility
  - cost
  - efficiency
  - challenges, e.g. technical support staff skills, staff training, implementation procedures.
- The implications of virtualised computing solutions for organisations:
  - user experience, e.g. ease of use, performance, availability, accessibility
  - staffing issues, e.g. skills, training, individual needs, working patterns
  - cost, e.g. virtualisation resources, infrastructure staffing, training
  - implementation, e.g. choosing a solution(s), timescales, testing, migration to new system
  - legal and ethical considerations under current or equivalent legislation in England, Wales and Northern Ireland, e.g. licensing, data security, privacy.

## Learning aim B: Implement a virtualised solution to meet identified requirements

### B1 Planning virtualised solutions

Planning documentation for virtualised solutions, to include:

- purpose
- client requirements
- user needs
- technical requirements
- hardware, software and other resources required.

### B2 Reviewing and refining plans

Working with clients and others to improve the quality, effectiveness and appropriateness of plans, including:

- gathering feedback from client(s) and potential users
- communicating with clients, e.g. email, verbal communication
- scheduling and documenting meetings
- agreeing and adjusting timescales
- refining ideas and solutions
- updating design specification documentation.

### B3 Developing virtualised solutions

Implement virtualised solutions to meet identified requirements.

- Preparing the host computer, e.g. virtualisation software installation, upgrading of components.
- Preparing a virtualised solution, e.g. guest operating system image, allocation of host computer resources.
- Adding, removing and updating software on the virtualised solution.
- Detailed documentation of the development process.

## Learning aim C: Demonstrate appropriate testing and maintenance procedures

### C1 Testing and maintaining virtualised solutions

- Selecting and using a range of appropriate testing methodologies to ensure virtualised solutions meet identified requirements:
  - different types of testing, e.g. system testing, user testing
  - selecting suitable test users
  - gathering feedback from users
  - producing appropriate test documentation
  - making use of testing outcomes.
- Ongoing maintenance activities:
  - software updates
  - security updates, virus scanning
  - user management
  - performance monitoring and configuration adjustments.

### C2 Reviewing and refining virtualised solutions

Monitoring ongoing performance of virtualised solutions, making updates and changes as required.

- Security issues and updates.
- Software updates.
- Compatibility issues.
- Changing user requirements.
- Hardware developments.

### C3 Lessons learned from developing virtualised solutions

Evaluating the effectiveness of the solutions that have been developed with reference to:

- how far the solution met the identified requirements
- efficiency of the solution
- ease of use
- issues arising during testing and maintenance
- stability
- the potential update schedule
- how the implemented solution could be improved to better meet the needs of the user and fulfil the identified needs
- alternative solutions that could be implemented if the task were to be repeated.

### C4 Presentation skills

Communication requirements:

- media conventions and requirements to convey intended meaning, e.g. written communication requirements (email, design documentation, recording documentation, reports, visual aids for presentation use, etc.), verbal communication requirements (one-to-one and group, formal and informal situations)
- use of tone and language for verbal and written communications to convey intended meaning and make a positive and constructive impact on audience, e.g. positive and engaging tone, technical/vocational language suitable for intended audience, avoidance of jargon
- responding constructively to the contributions of others, e.g. being supportive, managing contributions so that all have the opportunity to contribute, responding to objections, managing expectations, resolving conflict.

### C5 Reviewing own skills, knowledge and behaviours

- Planning and recording opportunities for development of skills, knowledge and behaviours, including the setting of relevant targets with timescales, and how and when feedback from others will be gathered.
- Reviewing and responding to the outcomes of own skills, knowledge and behaviours development, including the use of feedback from others.
- Own behaviours, and their impact on outcomes, including professionalism, etiquette, being supportive of others, timely and appropriate leadership, accountability and individual responsibility.
- Evaluating targets set for development of skills, knowledge and behaviour to obtain insights into own performance.

## Assessment criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">Learning aim A: Examine the concepts, uses and implications of virtualisation</td><td rowspan="2">A.D1 Evaluate the impact that the implementation of virtualised solutions can have on an organisation.</td></tr>
<tr><td>A.P1 Explain the characteristics of different types of virtualisation.<br>A.P2 Explain how virtualised solutions can be used to meet the computing requirements of an organisation and their potential impact.</td><td>A.M1 Analyse the impact that the implementation of virtualised solutions can have on an organisation.</td></tr>
<tr><td colspan="2">Learning aim B: Implement a virtualised solution to meet identified requirements</td><td rowspan="3">BC.D2 Evaluate the plan and optimised virtualised solution against client requirements.<br>BC.D3 Demonstrate individual responsibility, creativity, and effective self-management in the design, development and review of virtualised solutions.</td></tr>
<tr><td>B.P3 Produce plans for a virtualised solution to meet client requirements.<br>B.P4 Develop a virtualised solution to meet client requirements.</td><td>B.M2 Justify planning and implementation decisions, showing how they will provide an effective solution that meets client requirements.</td></tr>
<tr><td colspan="2">Learning aim C: Demonstrate appropriate testing and maintenance procedures</td></tr>
<tr><td>C.P5 Test a virtualised solution, confirming that it meets client requirements.<br>C.P6 Review the extent to which a virtualised solution meets client requirements.</td><td>C.M3 Optimise a virtualised solution to meet client requirements.</td><td></td></tr>
</table>

## Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M2, C.M3, BC.D2, BC.D3)

# Further information for teachers and assessors

## Resource requirements

For this unit, learners must have access to:

- hardware and software resources that will allow them to use the tools and techniques (given in the unit content) to design and develop virtualised solutions
- a range of commercial cost-based and free virtualisation resources.

This unit does not require any particular technology. Centres will be able to effectively deliver this entire unit using free-licensed operating systems and virtualisation, or they can opt for paid-for solutions.

## Essential information for assessment decisions

### Learning aim A

Learners will provide evidence that demonstrates an understanding of virtualisation through analysis of an organisation's computing requirements.

**For distinction standard,** learners will produce a clear and balanced evaluation, supported by fluent and accurate technical language, of how the virtualised solutions will impact on the case study organisation. Learners will provide an accurate and robust analysis of how different virtualised solutions would impact on all areas of the business and its stakeholders, providing reasoned and balanced justification as to why one suggested solution may be preferable to another and/or where tasks may be better suited to non-virtualised solutions. The report will demonstrate high-quality written/oral communication through the use of accurate and fluent technical vocabulary to support a well-structured and considered response that clearly connects chains of reasoning.

**For merit standard,** learners will show a clear understanding of how the characteristics of a variety of types of virtualisation can impact on the organisation. Learners will also provide a clear, accurate and robust analysis of the issues. The report will be technically accurate and demonstrate the use of good-quality communication.

**For pass standard,** learners will provide explanations of the characteristics of hardware virtualisation, local desktop virtualisation and remote desktop virtualisation. The explanations will be supported by examples of how these systems can be implemented to replace and/or support current systems. Learners will demonstrate an understanding of the resource requirements of the identified uses and how these might impact – both positively and negatively – on the requirements of the organisation and its stakeholders. The report may have some inaccuracies and the review of the impact may be unbalanced.

### Learning aims B and C

Learners will provide evidence that identifies and develops virtualised solutions to meet stated client requirements.

Centres will ensure that the client requirements are sufficiently detailed and complex to allow learners to demonstrate the required skills. For example, the scenario might require the development of a virtualised desktop that provides a range of end user facilities (such as applications, shared resources).

**For distinction standard,** learners will draw on, and show synthesis of, knowledge across the learning aims to evaluate how the decisions and methodologies applied throughout the designing, development, optimisation, testing and maintenance of the implemented virtualised solution impacted on their effectiveness. Learners will make suitable and reasoned justification of decisions made in comparison to alternative solutions.

Learners will provide a thorough evaluation of the effectiveness of the implemented solution (including comparison to alternative solutions), which will be supported by evidence from all stages of the development in order to reach valid conclusions and suggest future actions and

 

improvements. The evaluation will contain a systematic and accurate review of their skills and performance, and the impact that this had on the effectiveness of the solutions. Evaluation of behaviours will consider learners' use of 'soft skills' in relation to the vocational context of the project, such as managing and liaising with other members of the team or clients, and in time management.

Learners will evaluate their own behaviours throughout the project and the impact these had on the outcomes. Learners will take individual responsibility for their own work, e.g. identifying potential issues and resolving these, reviewing their work and making improvements, keeping their work safe and secure and demonstrating responsible use of quoted materials. Creativity will be demonstrated, for example, through taking innovative approaches to problem-solving and through the originality of their solution. Where possible, learners will refer to tangible evidence to support their evaluation, such as meeting notes, correspondence and time plans.

**For merit standard,** learners will apply their knowledge through the selection and application of appropriate methodologies to design, develop, maintain and test an effective, optimised virtualised solution to meet client needs.

Learners will consider how decisions they made during the planning and implementation of the project affected the outcomes and justify why these decisions were made. Using the results of testing and review completed at pass level, learners will optimise the virtualised solution they have created so that it better meets the client requirements. The optimisation could include adjustment of the security or performance of the system, changes to improve the user interface or other aspects of the system.

**For pass standard,** learners will apply their understanding through the planning and development of virtualised solutions to meet client requirements. Plans will include an explanation of the requirements of the solution and technical specifications for the suggested solutions. Learners will provide evidence that different types of testing have been carried out and that problems and errors identified have been responded to. Learners should also perform ongoing maintenance to the solution, applying changes and updates as required. The implemented solution must work but there may be some performance issues and/or the implemented solution may not be as efficient or effective as it could be.

Learners will review how the decisions they made during planning and development affected the implemented solution, explaining to what extent they met the initial project briefs. They will consider both positive and negative aspects of the solution, although their review may be unbalanced and/or superficial.

## Links to other units

This unit links to:

- Unit 19: Computer Networking
- Unit 20: Managing and Supporting Systems
- Unit 29: Network Operating Systems
- Unit 30: Communication Technologies.

## Employer involvement

This unit would benefit from employer involvement in the form of:

- guest speakers
- technical workshops involving staff from local organisations/businesses
- contribution of design/ideas to unit assignment/scenario/case study/project materials, including own organisation/business materials as exemplars where appropriate
- feedback from staff from local organisations/businesses on plans/designs/items developed
- opportunities for observation of organisational/business application during work experience
- support from local organisation/business staff as mentors.