

Unit 10: An Introduction to Telephony Systems

Unit code: D/600/4036
QCF Level 2: BTEC Specialist
Credit value: 9
Guided learning hours: 60

Aim and purpose

This unit introduces the public switched telephone network (PSTN) starting with a brief history of telecommunications from the analogue exchange system with its linked numbering schemes, through to common processor controlled digital exchanges, now referred to as the legacy network. This is followed by a study of packet switched networks and examines VoIP technologies and systems.

Unit introduction

Telecommunications have developed rapidly from a simple circuit switched network into the current 21st century broadband network capable of carrying a wide range of multimedia applications.

This unit introduces learners to some of the basic concepts, terminology and methodologies of telecommunications systems and telecommunications networks.

Learning outcomes and assessment criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Know the basic principles of speech encoding and compression	1.1 state the advantages and disadvantages of analogue and digital signals 1.2 describe one speech encoding and one speech compression technique
2 Know the capabilities and topology of the public switched telephony network	2.1 illustrate, at block level, an overview of the operation of the PSTN

Unit content

1 Know the basic principles of speech encoding and compression

Applications: mobile telephony, 2G, 3G, history and future development; Voice over IP (VoIP), history and future development; analogue and digital signals, uses and advantages / disadvantages of each

Techniques: signal processing, analogue to digital, digital to analogue, audio compression / decompression, codecs; data compression, lossy and lossless; A-law algorithm, μ -law algorithm, code-excited linear prediction (CELP)

2 Know the capabilities and topology of the public switched telephony network

History and development: direct connection, local exchanges, trunks, pulse dialing, automatic exchanges, packet switched networks; current technology and future developments; International Telecommunication Union (ITU), recommendations and standards co-ordination

PSTN structure: topology, switch hierarchy, foreign exchange, international exchange, trunks, local loops

Essential guidance for tutors

Delivery

Although rapid technological changes are occurring in the systems that provide telephony services, many countries still rely on the use of conventional circuit-switched systems. Tutors should ensure that learners appreciate this, while at the same time, assisting them in gaining an insight into how telephony systems may evolve.

The Internet can be used to give learners access to company specific and other websites that give explanations of technical and service aspects of telephony systems. Many company sites provide technical 'white papers' that can develop learners' understanding of the technologies used in telephony systems and an appreciation of their capabilities. Descriptions of the types of technology used by a service provider may also be found, ensuring learners are exposed to current practices.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass criteria in the outcomes and assessment grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Topic and suggested assignments/activities and/assessment
<p>Introduction to the unit</p> <p>Know the basic principles of speech encoding and compression:</p> <ul style="list-style-type: none"> • whole-class exercise – tutor presentation on the history and development of mobile communications, followed by directed research • whole-class exercise – tutor presentation on the history and development of VoIP communications, followed by directed research • whole-class exercise – tutor presentation on analogue and digital signals, followed by directed research / practical exercise • whole-class exercise – tutor presentation on encoding and compression, followed by directed research / practical exercise
<p>Assignment 1 - Which one to use</p> <p>Assignment 2 - Digitising speech</p>
<p>Know the capabilities and topology of the public switched telephony network:</p> <ul style="list-style-type: none"> • whole-class exercise – tutor presentation on the history and development of the public switched telephony network, followed by directed research • whole-class exercise – tutor presentation on the structure of the public switched telephony network, followed by directed research
<p>Assignment 3 - How it works</p>

Assessment

It is suggested that this unit is assessed using three assignments as summarised in the *Programme of suggested assignments* table.

Finding a scenario which covers all aspects of all criteria is preferable.

Some of the evidence required to complete the assignments could be naturally occurring within learners' work for other units within the qualification, or for other courses they are undertaking, and tutors are encouraged to use such evidence.

For 1.1 and 1.2 learners should produce material for technical audiences specified either by learners or the tutor. The material could be presented in a number of different formats and learners should be encouraged to use more than one.

2.1 is probably best assessed in a similar manner to the learning outcome 1 criteria. Learners should be encouraged to try to use a different method to demonstrate their knowledge of the material to those used for learning outcome 1. These could be selected by learners or the tutor.

Some parts of the criteria could be assessed by learners being observed when undertaking practical tasks. In which case, tutors must keep comprehensive documentation to support the assessment process.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass criteria in the outcomes and assessment grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment methods
1.1	Which one to use	<p>A company asks you to provide training material that describes analogue and digital signals.</p> <p>The material should be suitable for someone who is new to the industry and should describe:</p> <ul style="list-style-type: none"> • some uses of analogue and digital signals • the advantages and disadvantages of each 	<p>Web pages.</p> <p>Presentation.</p> <p>Posters.</p>
1.2	Digitising speech	<p>Your training material is well received and the company now asks you to provide material that describes speech encoding and compression.</p> <ul style="list-style-type: none"> • The material must explain: • what speech encoding is • what speech compression is <p>how encoding and compression are achieved</p>	<p>Web pages.</p> <p>Presentation.</p> <p>Posters.</p>

Criteria covered	Assignment title	Scenario	Assessment methods
2.1	How it works	The company now asks you to provide an illustration showing how the public switched telephone network operates. The illustration will form part of a training package. It must be annotated, easy for a new employee to understand, and must fit on a single page.	Web page. Poster.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC in IT sector suite. This unit has particular links with:

Level 1	Level 2	Level 3
	Telecommunications Technology	Telecommunications Principles
	Mobile Communication Technologies	Communication Technologies

This unit maps to some of the underpinning knowledge from the following areas of competence in the Level 2 National Occupational Standards for IT (ProCom):

- 4.7 Systems Design
- 5.1 Systems Development
- 5.3 IT/Technology Solution Testing.

Essential resources

There are no essential resources for this unit, although the opportunity to visit businesses that run different telephony systems would be desirable.

Employer engagement and vocational contexts

There is a range of organisations that may be able help centres to engage and involve local employers in the delivery of this unit, for example:

- Learning and Skills Network – www.vocationallearning.org.uk
- Local, regional business links – www.businesslink.gov.uk
- National Education and Business Partnership Network – www.nebpn.org
- Network for Science, Technology, Engineering and Maths Network Ambassadors Scheme – www.stemnet.org.uk
- Work-based learning guidance – www.aimhighersw.ac.uk/wbl.htm
- Work experience/workplace learning frameworks – Centre for Education and Industry (CEI University of Warwick) – www.warwick.ac.uk/wie/cei

Indicative reading for learners

Textbooks

Dodd A — *The Essential Guide to Telecommunications –4th edition* (Prentice Hall, 2005)
ISBN-10: 0131487256 ISBN-13: 978-0131487253

Goleniewski L — *Telecommunications Essentials – 2nd edition* (Addison Wesley, 2006)
ISBN-10: 0321427610 ISBN-13: 978-0321427618

Websites

www.inetdaemon.com/tutorials/telecom/pstn

www.its.bldrdoc.gov/fs-1037

www.privateline.com/index.html

Functional Skills – Level 2

Skill	When learners are ...
ICT - Finding and selecting information	
Use appropriate search techniques to locate and select relevant information	developing training material on speech encoding and compression
Select information from a variety of sources to meet requirements of a complex task	developing training material on speech encoding and compression
ICT - Developing, presenting and communicating information	
Combine and present information in ways that are fit for purpose and audience	developing training material on speech encoding and compression.