The specification for:

Level 3 Award for RDK-B Certified Engineers

This is version 1 of the TLM handbook for the Level 3 Award for RDK-B Certified Engineers.

Further printed copies can be obtained from Lulu.com or the pdf freely downloaded from www.tlm.org.uk.

The assessment model for the qualifications presented in this publication was designed by TLM in consultation with employers and academic institutions in order to offer the most up to date set of skills and experiences available at the time of delivery. The core units are based on RDK technologies and services, which is the most prevalent form of Broadband software solutions in use and has a recognised skills shortage. Learners study some optional units in areas of interest or ones that compliment other academic subjects they are studying. The overall assessment is based on coursework completion and an external examination.

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Contents

1. For those in a hurry!

Please read the rest of the book later as the details are important!

1.1	TLM's assessment model is common to most of its qualifications. It is based on competence-based assessment of coursework using a portfolio of evidence and supported by a free optional cloud-based evidence management system.
1.2	Learners must demonstrate competence against the assessment criteria from their day to day work and the tutor/assessor must verify that they are competent in relation to the general level descriptor using indicative assessment criteria. TLM's external moderator will check the judgements and the quality of the evidence and provide feedback. This process is not graded, the intention is that it is a flexible way of checking basic practical competence in the subject at the qualification's framework level.
Procedures	
1.3	The first thing to do is to arrange assessor training with TLM. TLM trains at least one assessor as Principal Assessor who must accept responsibility for standards within the Centre. The Principal Assessor can train and appoint assessors within the Centre as long as they are competent to take on the work and are willing to sign an agreement on the web site to uphold standards.
1.4	TLM will provide initial training in the pedagogical model and using the supporting technologies to provide the evidence needed. The purpose is to get you started and then we provide on-going support to ensure you are confident and we can work as a professional partnership. We advise new Centres to do some coursework assessment early so that they can receive feedback and quickly become confident in doing routine coursework assessment. Our aim is to make this no more onerous than normal routine assessment that anyone would do as a normal part of the teaching job. This gives more time to focus on teaching and therefore to support raising attainment.

2. Introduction

The Level 3 Award for RDK-B Certified Engineers qualification is designed for a wide range of abilities and for people who require skills and competence in the Internet of Things and broadband software functionalities. There is a wide range of units available for all skill levels and interests.

2.1 **Level 3 Award for RDK-B Certified Engineers**

The Level 3 Award is a qualification designed for people who require skills and competence in broadband software systems. The qualification consists of a mandatory unit and optional units to make up the 12 credits required:

Mandatory

Unit 1 RDK-B Software Solutions (6 credits).

Optional

Centres can choose a range of set optional units for their cohort or can work on a wider set of options so that learners can specialise in something that interests them.

There are currently 3 optional units to choose from.

3. Summary of Qualification Specification

3.1 Level 3 Award (Annexe A)

The Level 3 Award is a qualification designed for people who require a wide range of skills in IT and specifically in the design of mobile apps. The qualification consists of a mandatory unit 1 – Understanding RDK Software Solutions (6 credits). The qualification consists of 24 credits so learners can make up the credits with optional units.

Qualification Title: TLM Level 3 Award for RDK-B Certified Engineers
Qualification Number: 603/7533/4
Qualification Level: Level 3
Total Credits: 12
Guided Learning Hours: 90
Total Qualification Time: 120
Assessment Methods: Coursework, E-assessment, Portfolio of Evidence

Assessment
Learners must demonstrate competence against the assessment criteria from their day to day work and the teacher assessor must verify that they are competent in relation to the general level descriptor using indicative assessment criteria. TLM's external moderator will check the judgements and the quality of the evidence and provide feedback. This process is not graded, the intention is that it is a flexible way of checking basic practical competence in the subject at the qualification's framework level.
Mandatory Unit - Unit 1 RDK-B software solutions (6 credits)

3.5 Assessment

The internally assessed, externally moderated coursework for all qualifications is pass/fail but by submitting the evidence for external moderation, feedback can be given to the teacher on areas to improve for resubmission.

Evidence must be provided against the unit assessment criteria from practical tasks related to the learners' everyday work supported by IT.

The way evidence is gathered is up to the assessor, the only requirement is that it clearly supports the judgements against the assessment criteria and the relevant learning outcomes.

If on moderation the account manager finds gaps in evidence relating to a particular candidate, they will request more evidence before approving the award or the unit certificate. Assessors must then adjust their work to ensure all their learners are providing the appropriate level and breadth of evidence.

We encourage early submission of at least some evidence so that assessors are confident from the feedback that what they are providing is sufficient. In this way we can maintain standards while supporting improved efficiency.

4. Qualification Content

Mandatory	Optional (for reference)
6 CREDITS	**18 CREDITS**
Unit 1 RDK-B Software Solutions (6 credits)	**Unit 2** Networking and Security (6 credits)
	Unit 3 Programming (6 credits)
	Unit 4 Linux Operating Systems (6 credits)

5. Transferable Skills

5.1 Key Subject Aims

The over-arching aim is to enable learners to support their learning in all subjects using Open System and industry standard IT tools that are freely and legally available from the internet. Subordinate aims include:

- Developing the skills needed for employment.
- Gaining practical experience and competence with contemporary technologies including programming where appropriate.
- Increasing the capacity to transfer knowledge and skills between contexts.
- Developing practical skills in creativity and problem solving.
- Developing an understanding of the social and commercial impact of IT.
- Developing an understanding of the legal, social, economic, ethical and environmental issues raised by IT.
- Developing safe, secure and responsible practice when using IT including reducing risk.
- Developing the skills to work collaboratively with IT.
- Developing skills in critical evaluation and feedback.

5.2 Knowledge and Understanding

The following knowledge and understanding will be required to support learning for the qualification.

- Demonstrate knowledge and understanding of audiences at which work is targeted.
- Understand the purpose in common applications and/or applications they have used.
- Demonstrate knowledge and understanding of strengths and weaknesses in the way information is presented.
- Demonstrate knowledge and understanding of intellectual property.
- Know common file types and the implications of open and proprietary standards.
- Understand information flow starting with input of information, to processing and output.
- Understand the costs associated with different applications including direct and indirect costs.
- Have the confidence to deal with the unfamiliar such as the code in a computer program and work out what to do.
- Understand the principles of ordered lists of instructions underpinning algorithms.
- Understand abstraction as picking out common features of objects in order to simplify. e.g. A common structure for a template to input information into different systems.
- Understand the benefits of target setting for IT projects.
- Know specific characteristics of software in order to make choices of tools.
- Demonstrate a practical understanding and respect for acceptable use policies.

5.3 Skills

Opportunities are provided to support the following skills, the great majority of which will be assessed directly.

- Select, use and integrate IT tools and techniques to meet needs.
- Find, select and evaluate information for its relevance, value, accuracy and plausibility.
- Manipulate and process data and other information, sequence instructions, model situations and explore ideas.
- Transfer competence in a familiar context to an unfamiliar context.
- Communicate data and information in a form fit for purpose and audience.
- Adopt safe, secure and responsible practice when using IT.
- Develop appropriate and effective IT-based solutions in a range of contexts including computer programming solutions.
- Self and peer assess to gauge the effectiveness of their own learning.
- Think creatively, logically and critically evaluate their own and others' use of digital technologies.

6. Support

	Guidance and Assistance
6.1	There is further guidance for coursework assessment on the TLM web site. All centres have an assigned Account Manager who will be pleased to help at any time. Our aim is to give professional assessors, most of whom are qualified teachers, the confidence to make judgements with a minimum of bureaucracy so that they can focus their time on maintaining their professional knowledge, skills and supporting learning through effective teaching rather than “chasing paper”. There is often a confusion between bureaucracy and rigour, since unnecessarily complex bureaucracy can actually detract from rigour by obscuring the importance of the outcomes.
6.2	**Web sites** - TLM provides support through cloud-based systems. Providing assessment grades and the management of certification through the Markbook Site is mandatory and all assessors are provided with training in its use. It is simply a matter of recording learner competence against the unit criteria as the evidence is collected and claiming a certificate on behalf of the learner when a unit has been fully assessed.
6.3	The **community learning site** provides free optional facilities for learners to submit their evidence on-line, linking it to the assessment criteria across single or multiple units. The assessor can accept or reject this evidence and comment on it providing a full audit trail for evidence. Moderator/verifiers can get immediate access to this evidence and so it is potentially a lot more efficient than alternative methods. No paper, no e-mails with file attachments necessary. There are facilities for progress tracking that can be based on criteria and/or units. The system can be linked as an extension to any standards compliant VLE/e-portfolio system for centres that are already committed to a specific VLE product. Training can be provided, and free support is available from your Account Manager. The aim is to eliminate all paper-based bureaucracy, all screen-shots and referencing that draws time away from teaching.
6.4	**Telephone** and e-mail support are available to all Centres. There is a general convention of firstname.secondname@tlm.org.uk for e-mail addresses. It is usually best to e-mail your account manager in the first instance. Google hangouts can be arranged for video conferencing support.

7. Registration & Procedures

	Registration
7.1	TLM publishes all of its fees on its main website There are no fees for replacement certificates or verification of certificates because all certificates can be directly authenticated against TLM's secure database. For details of current subscription costs please contact us or refer to the web site
	Internal standardisation
7.2	The Principal Assessor has the ultimate responsibility for consistency in assessment standards within a centre. All assessors have signed a contract agreeing to uphold standards and should therefore co-operate with the Principal Assessor and Account Manager at TLM to ensure that standards across the centre are consistent. It is advisable to send work samples to TLM early to check that evidence is at the right standard so that there is time to make any adjustments necessary to the course and learner expectations. TLM will generally check a higher quantity of work from new assessors and feedback to ensure that they are confident to make appropriate judgements over time. This reduces risk and improves efficiency in the longer term.
	Authentication
7.3	All assessors must take reasonable steps to ensure that any coursework evidence submitted by candidates is a true reflection of the candidates' competence. This is in keeping with the assessor undertaking to uphold and maintain standards in the contract with TLM.
7.4	Certificates can be authenticated directly on-line using the certificate number or by scanning the QR code on the certificate. There is no charge and it makes it more likely that certificates will be checked and that in turn improves security. Certificate forgeries are a significant problem when authentication is not simple and straightforward because convincing forgeries are easy to achieve with recent technologies and will get easier as time goes on.

8. Other Considerations

	Access arrangements and special requirements
8.1	All TLM's qualifications are intended to be accessible, as widely as possible. There is an extensive policy documented on the web site at https://tlm.org.uk/policy-download-centre/ Centres should contact TLM if they have any questions related to accessibility issues.
	Language
8.2	The language for provision of this qualification is English only. This will only change if we have a significant demand in another language that is sufficient to cover the additional costs involved.
	Malpractice
8.3	TLM has comprehensive policies and procedures for dealing with malpractice. These are documented with links on the web site at https://tlm.org.uk/policy-download-centre/ Assessors should be familiar with these policies and make them clear to candidates. Assessors should inform their account manager if they suspect any instance of malpractice that could have a material effect on the outcome of any assessments, either for themselves or colleagues. This is part of the upholding of standards that is part of the contract with TLM.
	Equality of opportunity
8.4	TLM promotes equality of opportunity through policies and procedures. These are again documented in detail on the web site at https://tlm.org.uk/policy-download-centre/
	Resources, Support and Training
8.5	A clear goal is to enable learners to support all their IT user needs using resources freely and legally available from the internet. This is related directly to national policies for inclusion and equality of opportunity. The reality is that there is so much user dependence on proprietary applications that we can only support the transition to free and open resources through education and common sense.
8.6	TLM does not require centres to use Free and Open Source applications but it certainly encourages them to do so. Most of the key software applications needed to support any of the assessed units are available freely from the web including office suites, graphics and sound editing. As a nation we could save hundreds of millions if not billions of pounds in software licensing fees by providing users with the skills, knowledge and confidence to migrate to free and open source applications. You Tube, OpenClipart.org, Wikipedia and many other sites provide free content that supports learning and the number and range of such sites is increasing.

Annexe A

Level 3 Award - Unit assessment - coursework guidance

The **Level 3 learner** has knowledge and understanding of facts, procedures and ideas in an area of study or field of work to complete well-defined tasks and address straightforward problems. Holder can interpret relevant information and ideas. Holder is aware of a range of information that is relevant to the area of study or work. AND/OR Holder can select and use relevant cognitive and practical skills to complete well-defined, generally routine tasks and address straightforward problems. Holder can identify how effective actions have been. Holder can identify, gather and use relevant information to inform actions.	**Moderation/verification:** The assessor should keep a record of assessment judgements made for each candidate and make notes of any significant issues for any candidate. They must be prepared to enter into dialogue with their Account Manager and provide their assessment records to the Account Manager through the on-line mark book. They should be prepared to provide evidence as a basis for their judgements should it be required by the Principal Assessor or their Account Manager/external moderator. Before authorising certification, the Account Manager must be satisfied that the assessor's judgements are sound.

General Information

The Level 3 qualification has the following characteristics for learners:

- Achievement at RQF level 3 (EQF Level 4) reflects the ability to select and use relevant knowledge, ideas, skills and procedures to complete well-defined tasks and address straightforward problems. It includes taking responsibility for completing tasks and procedures and exercising autonomy and judgement subject to overall direction or guidance.
- Use understanding of facts, procedures and ideas to complete well-defined tasks and address straightforward problems. Interpret relevant information and ideas. Be aware of the types of information that are relevant to the area of study or work.
- Complete well-defined, generally routine tasks and address straightforward problems. Select and use relevant skills and procedures. Identify, gather and use relevant information to inform actions. Identify how effective actions have been.
- Take responsibility for completing tasks and procedures subject to direction or guidance as needed.

- The specification for the Level 3 award provides an outcome framework for assessment and is not intended to dictate any particular context for learning and so can be used with adults and be applied to a wide range of existing courses.

Requirements

- Standards must be confirmed by a trained Level 3 Assessor
- Assessors must as a minimum record assessment judgement as entries in the on-line mark book on the TLM certification site.
- It is expected that there will be routine evidence of work used for judging assessment outcomes in the candidates' records of their day-to-day work. Samples, including related plans and schemes of work should be available at the annual visit and/or by video conference.
- Different approaches to learning will be required in order to match differing needs, for example, the needs of children will be different from the needs of adults with learning disabilities.
- When the candidate demonstrates secure capability against each of the criteria in the unit, they are entitled to a certificate for passing the unit and the overall award.
- We expect at least 170 hours of guided study to be under-taken for the certificate for complete beginners generally new to formal education, but discretion can be used to take account of prior learning where this is sensible in individual cases. In terms of making the certificate, what matters is outcomes. Can the candidate securely meet the criteria?

The Mandatory Unit - Level 3, Unit 1 – RDK-B Software Solutions (6 credits)

1. Understanding the mechanics of RDK-B	2. Working within the RDK-B framework	3. Developing projects for RDK-B
1.1 I can understand the role of the RDK platform	**2.1** I can identify the management protocols available in RDK-B	**3.1** I can work with build tools to create embedded systems
1.2 I can explain the role of RDK-B	**2.2** I can understand the role of Xconf in RDK-B	**3.2** I can understand how to implement build tool SDKs into the RDK-B development workflow
1.3 I can highlight the data model used by RDK-B	**2.3** I can highlight common features that are unavailable in RDK-B	**3.3** I can work with key components of the RDK-B framework
1.4 I can understand the management protocols available in RDK-B	**2.4** I can explain the RDK-B layers	**3.4** I can highlight the features of key technologies like rbus brings to RDK-B
1.5 I can explain how networking is implemented in RDK-B.	**2.5** I can understand the RDK-B WiFi stack	**3.5** I can identify the appropriate technologies for managing databases in RDK-B

Assessment Method

Assessors can score each of the criteria L, S or H. N indicates no evidence and is the default starting point. L indicates some capability, but some help still required. S indicates that the candidate can match the criterion to its required specification. H indicates performance that goes beyond the expected in at least some aspects. Candidates are required to achieve at least S on all the criteria to achieve the full award.

Expansion of the assessment criteria

Criteria	Additional Information and Guidance
1.1 I can understand the role of the RDK platform **Evidence:** will be provided directly from the presentation of work in web pages that has clear purpose and describes the purpose of the work.	Learners will be able to demonstrate their knowledge of the Reference Design Kit for Broadband that is an open-source initiative standardising software functionalities for broadband devices enabling MSOs to efficiently deploy services to a large customer base. The primary purpose of RDK-B is to create a standardised software stack for various OEM's providing them with specific features to manage complex broadband functions such as Wide Area Networking (WAN), Local Area Networking (LAN), data reporting and management, home-networking technologies such as Wi-Fi and Multimedia over Coax Alliance (MoCA) and Internet of Things (IoT) controllers such as ZigBee, Bluetooth LE, and AllJoyn/OIC.
1.2 I can explain the role of RDK-B **Evidence**: will be provided directly from the presentation of work in web pages that has clear purpose and describes the methods skills and resources relevant to successful completion.	Learners can explain how the Reference Design Kit for Broadband software solution is utilised by industry to support the needs for a fully modular and customisable software solution
1.3 : I can highlight the data model used by RDK-B **Evidence:** A documented plan that supports a project presented in a digital format e.g. a web page, document file or IT planning software.	Learners will be able to explain the data model used by the Reference Design Kit for Broadband
1.4 : I can understand the management protocols available in RDK-B **Evidence**: Evidence from content of their web pages describing these factors and considerations in their planning	Learner will be able to demonstrate they understand the management protocols that are available for the Reference Design Kit for Broadband
1.5 : I can explain how networking is implemented in RDK-B **Evidence**: Evidence from content of their web pages and day to day working files indicating effective results and appropriately selected supporting resources.	Learners will be able to demonstrate their knowledge of the Reference Design Kit for Broadband functionalities and its primary purpose of RDK-B to create a standardised software stack including: • Wide Area Networking (WAN), • Local Area Networking (LAN), • data reporting and management, • home-networking technologies such as Wi-Fi and Multimedia over Coax Alliance • (MoCA) and Internet of Things (IoT) controllers such as ZigBee, Bluetooth LE, and AllJoyn/OIC.
2.1 : I can identify the management protocols available in RDK-B	Learners will be able to identify the protocols available for the Reference Design Kit for Broadband

Evidence: Written recorded evidence in web pages or day to day document files describing their work	
2.2 : I can understand the role of Xconf in RDK-B. **Evidence**: Evidence from documented description conforming to the criterion and guidance	Learners will be able to explain Xconf and its role within the Reference Design Kit for Broadband
2.3 : I can highlight common features that are unavailable in RDK-B **Evidence**: Evidence from documented descriptions conforming to the criterion and guidance	Learners will be able to demonstrate a knowledge of the most common features of the Reference Design Kit for Broadband
2.4 I can explain the RDK-B layers **Evidence**: Evidence from documented descriptions conforming to the criterion and guidance	Learners will be able to explain the Reference Design Kit for Broadband layers and how layering is the organization of programming into separate functional components that interact in some sequential and hierarchical way, with each layer usually having an interface only to the layer above it and the layer below it.
2.5 I can understand the RDK-B WiFi stack **Evidence**: Evidence from third party feedback, analysis of strengths and weaknesses and any other relevant documented descriptions conforming to the criterion and guidance	Learners will be able to explain the Reference Design Kit for Broadband WiFi stack and how layering is the organization of programming into separate functional components that interact in some sequential and hierarchical way, with each layer usually having an interface only to the layer above it and the layer below it.
3.1 : I can work with build tools to create embedded systems **Evidence**: Evidence of review through documentation of evaluation in web pages and/or day to day files.	Learners will be able to use the build tools for the Reference Design Kit for Broadband to create embedded systems
3.2 : I can understand how to implement build tool SDKs into the RDK-B development workflow **Evidence**: Evidence of descriptions through documentation in web pages and/or day to day files.	Learners will be able to demonstrate a knowledge of how to use and implement the build tools of into the Reference Design Kit for Broadband development workflow

Annexe B

Optional Units

The TLM Level 3 Award has a requirement of 12 overall credits to pass. Unit 1 is a mandatory unit, but the following are a small sample of possible optional units to complete.

Centres can pick units themselves as long as they make a minimum of 12 credits overall.

The units can be chosen to have an overall focus, for example units that are about office productivity or more creative design, or they can be something to match local industry needs, for example focussing on managing data such as spreadsheets and databases.

3 Optional Units are included below as reference to centres in relation to how much evidence is required from learners.

Level 3 Unit 2: Networking and Security (6 credits)

1. Understand, demonstrate and explain how networks function	**2. Design and implement computer networks**	**3. Understand the concepts and technologies that allow network scaling**	**4. Understanding network security issues and technologies**
1.1 I can understand common networking technologies	**2.1** I can design and build a local area network infrastructure to meet a commercial requirement	**3.1** I can understand and implement common dynamic routing technologies and concepts	**4.1** I can work with Linux tools to create a secure networked environment
1.2 I can configure a range of different systems used within a network infrastructure	**2.2** I can design and build a wide area network infrastructure to meet a commercial requirement	**3.2** I can explain the benefits of network redundancy and resilience	**4.2** I can explain the functional operation of different security features in Linux
1.3 I can explain common protocols, their purpose and how to use them in RDK	**2.3** I can configure and build and justify a secure network infrastructure design	**3.3** : I can effectively troubleshoot connectivity issues between networks	**4.3** I can describe cryptographic techniques and where they are applied
1.4 I can design and build a networked solution to meet a commercial requirement		**3.4** I can describe the benefits and demands of scalable networked systems	**4.4** I can describe, manage and implement secure systems
1.5 I can evaluate the potential performance effectiveness of an implemented solution			**4.5** I can configure and build secure network infrastructure

Level 3 Unit 3: Programming (6 credits)

1. Understanding the C programming language and the bash scripting language	**2. Creating applications with C**	**3. Understanding how C and RDK-B work together with supporting technologies**
1.1 I can understand the key features of the C programming language	**2.1** I can highlight the tools and technologies needed to create RDK-B applications with C	**3.1** I can highlight the need for build tools when working with RDK-B
1.2 I can highlight the purpose of the Bash scripting language	**2.2** I can create applications using the C programming language	**3.2** I can highlight how RDK-B applications utilise the C programming language for embedded systems development
1.3 I can understand how Bash works with Linux	**2.3** I can create RDK-B applications using the C programming language	**3.3** I can use build tools with RDK-B
1.4 I can explain how RDK-B works with C	**2.4** I understand how to deploy C powered RDK-B applications	**3.4** I can build applications using the RDK-B development workflow

Level 2 Unit 4: The Linux Operating System (6 credits)

1. **Understand the mechanics and ecosystem of Linux**	**2. Navigating the Linux operating system**	**3. Working with and configuring Linux for enterprise and development use**	**4. Setting up networking on Linux**
1.1 I can understand the concept of different Linux distributions	**2.1** I can Installing Linux in a virtualised environment	**3.1** I can work with wildcards and advanced file management	**4.1** I can configure Linux to operate on a computer network
1.2 I can explain the role that Linux plays in both traditional systems and embedded devices	**2.2** I can Understand the Linux directory system and structure	**3.2** I can configure environment variables	**4.2** I can explain how containers work
1.3 I can highlight the range of implementations that Linux is available in	**2.3** I can use the Linux command line to navigate around the system and searching for files	**3.3** : I can understand Linux processes	**4.3** I can configure DNS and hostnames
1.4 I can explain the role open-source systems	**2.4** I can understand and work with the Linux permissions structure on files and folders	**3.4** I can perform user management and maintenance on Linux	
1.5 I can explain the relationships between commercial and volunteer interests in a software development community	**2.5** I can use Vi to edit files	**3.5** I can demonstrate advanced OS management skills	