QUALIFICATION FILE

Application Documentation: Version 1 /01 September, 2016

CONTACT DETAILS OF SUBMITTING BODY

Name and address of submitting body:

C-DAC,ACTS

ACTS, Innovation Park, S. No. 34/B/1,

Panchvati, Pashan, Pune 411 008

Name and contact details of individual dealing with the submission

Name: Shri. Aditya Kumar Sinha

Position in the organisation: Joint Director

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List of documents submitted in support of the Qualifications File

1. Qualification File
2. Course Content

QUALIFICATION FILE

SUMMARY

Qualification Title and Code:	Certificate Course in Linux System Administration
Body/bodies which will award the qualification:	Centre for Development of Advanced Computing (C-DAC) organization of the Ministry of Electronics and Information Technology (MeitY), Ministry of Communications & Information Technology
Body which will accredit providers to offer the qualification:	C-DAC
Body/bodies which will be responsible for assessment:	C-DAC
Occupation(s) to which the qualification gives access:	Certificate Course in Linux System Administration aims to groom the students to enable them to work on current technology scenarios as well as prepare them to keep pace with the changing face of technology and the requirements of the growing IT industry. After the completion of the course, students can work as Linux Administrator/Operations Engineer/Site Reliability Engineer/Devops Engineer.
Proposed level of the qualification in the NSQF:	Level 7
Anticipated volume of training/learning required to complete the qualification:	320 hrs of classroom/lab learning
Entry requirements / recommendations:	Any Engineering /Science graduate with mathematics up to 10+2 level.
Progression from the qualification:	The course aims to groom the students to enable them to work on current technology scenarios as well as prepare them to keep pace with the changing face of technology and the requirements of the growing IT industry. The course curriculum has been designed keeping in view the emerging trends in advanced computing as well as contemporary and futuristic human resource requirements of the ICT industry. These candidates will be trained in networking, System

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<table>
<tr>
<td colspan="4">Administration and Linux Administration skills.
Linux System administrators can work in a variety of industries, ranging from telecommunications to security exchanges. The need a bachelor's degree in a relevant field, and professional certification may help with career advancement. Jobs for Linux System administrators are expected to increase at an average rate over the next several years.

Candidate can start from level 7 and lead to further levels.</td>
</tr>
<tr>
<td colspan="4">Planned arrangements for RPL: NA</td>
</tr>
<tr>
<td colspan="4">International comparability where known: There are many courses available on Linux System administration but CDAC providing knowledge of networking, System Administration, Linux Administration and management development program in one course also implementation of learning can be evaluated under project.</td>
</tr>
</table>

Formal structure of the qualification:

Title of NOS/unit or other component (include any identification code used)	Mandatory/ Optional Enter M or O for each unit/ component	Estimated size (learning hours) The total should be the same as the entry under "anticipated volume" above	Level In the NSQF, individual units or components of qualifications can have outcomes which put them at levels which are higher or lower than the whole qualification.
Basic of Linux Administration	M	50	7
Fundamentals of Networking	M	40	7
System Administration	M	130	7
Management Development Program	M	60	7
Project	M	40	7

Please attach any document giving further detail about the structure of the qualification – eg a Curriculum or Qualification Pack.
Give details of the document here:

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SECTION 1

ASSESSMENT

Body/Bodies which will carry out assessment:
C-DAC's Exam, Evaluation and Certification department will carry out assessment as per evaluation guideline finalized by Academic Council/ Academic Management Committee.

Will the assessment body be responsible for RPL assessment?

- Same will be finalised when the national RPL Policy will be finalised.
- Assessment is online through our e-Pariksha system or manually, depending on the strength of students.
- Issuance of qualification is centralized through C-DAC.

Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, consistent and fair and show that these are in line with the requirements of the NSQF:

Assessment is a necessary and essential part of conducting the Certificate Course in Linux System Administration, as it provides important feedback and inputs to both the institute as well as the student. The institute gets an idea about the relative performance of each student, which also serves as feedback about the design and conduct of the course. The student gets a clear picture of his academic standing, individually and in comparison to his fellow students.

- A separate evaluation process is to be conducted for every module of the course.
- The evaluation for each module must be completed as per guidelines given below. The mid-module /surprise test evaluation is mandatory and can be taken after discussion with the concerned faculty.
- Students are evaluated on a continuous and throughout the duration of the course to make a fair assessment of the skills acquired by them. To have a very uniform and fair assessment. The evaluation process is divided into two parts:
  - Continuous Assessment - CA (150 marks)
  - Course End Examination - CCE (150 marks)

Continuous Assessment :This is being done primarily by the respective faculty in the form of Lab tests, assignments, quizzes, submission of term reports, presentations etc. conducted (with the help of respective course co-coordinators) at regular intervals and as and when the portions of the subjects are completed. These are basically internal exams and local to the centre. This process is further categorized into two parts.

- Lab test

- Internal test : Assignment/Case Studies /quiz and other valuation methods like case study, viva, group discussion depending on the subject and the faculty

It is recommended to conduct Management Development Program and Organisational Behaviour sessions and also conduct surprise test for the development of soft skills, logical, analytical capabilities and managerial skills for the benefit of the students and also give assignments and conduct some surprise test related to Management Development Program and Organisational Behaviour.

The figures shown below indicate the weightage of each module in the final performance statement. The examination(s) for each module must be conducted for at least that number of marks. However, the centre may conduct evaluation for a higher number of marks, in which case the marks will be

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scaled down. For example, if the examination for the Operating Systems Concepts module is conducted for 100 marks, the marks earned by the student will be scaled down to out of 40.

A student must score a minimum of 40 percent marks in each component of the evaluation, and also in the aggregate score, in order to successfully clear the module. If a student scores more than 40% on aggregate but has scored less than 40% in one component of the evaluation, he will not be declared as passed.

The weight age for each component will normally be:

Theory examination – (CCEE)   150 marks

Laboratory examination, Internal marks   150 marks

(Internal marks: Lab Assignment Evaluation, Surprise Tests, attendance, Viva, Seminars)

The question papers for the theory as well as the laboratory examinations at all the centres will be set by C-DAC, ACTS, Pune. The centres according to guidelines provided by, ACTS, Pune, will conduct the evaluation of the laboratory and assignments locally.

Minimum Pass marks:

The minimum marks to be obtained for declaring a student pass in any module is as follows:

For 40 mark QP   :   16 marks

For 20 mark QP   :   8 marks

For 60 mark QP   :   24 marks

Assessment is through e-Pariksha system.

About e-Priksha System:
ePariksha is a web based application for the automation of the examination process. The system provides a great control on exams from preparing question paper to scheduling exam and from monitoring exam to generate results.

ePariksha has a strong administration which provides complete system status in one glance.

It's Results & Reports generations functionality provides system details in all standard and required formats.

An image based, LAN based, secure, fault tolerant and scalable system through which examinations can be delivered "on demand" basis in selected examination centres spread across the country.

System Support:

- Decentralized mode of operation(LAN based)
- Question Paper approach
- Multi lingual and multi subject support
- Browser based

Components of the e-Parikhsa System Includes:

- **Administration Module**- To design course structure, Manage users, view results.
- **ePariksha System** –Assessment of students through online system.
- **Examiner Module** -To manage the examination related activity and conduct- i.e Registration data and question paper uploading, conduct of examination, response generation

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- **Student Login** –Allows students to login and attempt exams.
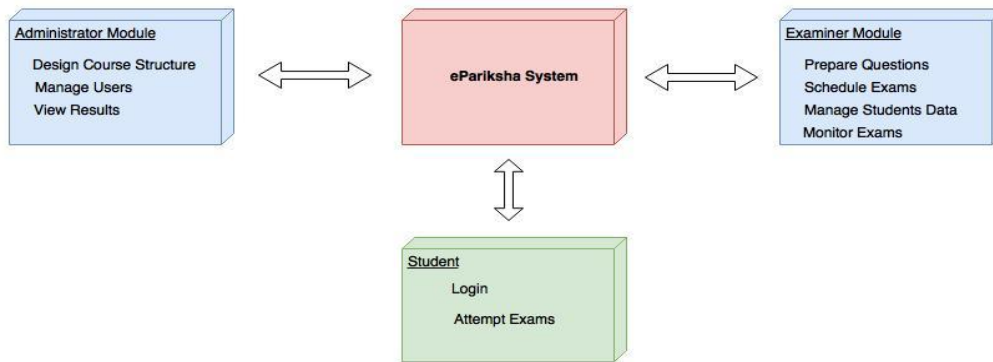
Salient Features:

- Exam Resume - Power Failure Handling
- Random Question Paper
- User friendly Interface
- Question Bank
- Instant Result
- Live Monitoring of Exams & Assignment
- Time bound exams
- Multilingual support
- Handheld devices Support
- Responsive Design

Feedback System: C-DAC**'s** Advanced Computing Training School (ACTS) offers various courses and training programs through its own training centres and its network of Affiliated Training Centres (ATC) spread across the country. Each year, thousands of students and professionals are trained at these centres.

The purpose of the system i.e. Online Feedback System (OFS) is to develop a web application for getting the online faculty feedback by the students studying at centres and also at the various Authorized Training Centres (ATC) affiliated to for different training programs offered by C-DAC ACTS.

This system is for conducting "The Student Survey" for quality assurance of education. Students, Faculties and administrators can all benefit from survey. This is helpful in the continual improvements in teaching programs, processes as well as infrastructure and thereby enhancing the students' learning experience at C-DAC ACTS.

The Online Feedback System make the student feedback procedure centralized for all C-DAC centres as well as various Authorized Training Centres (ATCs) located across the country through which headquarter manager can manage student feedback of faculties as well as infrastructure studying at different training centres with different reports for feedback analysis.

Please attach any documents giving further information about assessment and/or RPL.
Give details of the document(s) here:

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ASSESSMENT EVIDENCE

There will be 150 questions to answer in 3 hours duration in Course End Exam as per the following distribution mentioned below.

Sr. No.	Module	Learning Outcome	Theory	Lab & IA	Total Marks
1.	**Basic of Linux Administration**	• Make appropriate decisions during the configuration process to create a properly functioning Linux environment. • Use programs and utilities to administer a Linux machine. • Explain how a Linux server can be integrated within a multi-platform environment. • Analyze the need for security measures for a Linux environment. • Identify the different uses and advantages of Linux in a business environment in order to participate in discussions regarding network servers and services.	30	50	80
2.	**Fundamentals of Networking**	• Describe the protocols and services provided by the application, transport, network, data link and	30	40	70

		physical layers in the OSI and TCP/IP models and describe how these layers operates in various networks. • Explain the importance of communications and data networks in supporting business communications and everyday activities. Connecting and configuring computers, switches, and routers into an Ethernet LAN. • Explain the role of and use of network protocols models to explain the layers of communications in networks. • Identify various network media needed to make successful LAN and WAN connections and their distinct roles. Design, calculate, and apply subnet masks and addresses to full fill given requirements. • Explain the fundamental concepts of routing			
3.	**System**	• The aim of this is to teach the principles,	60	60	120

	Administration	theory and practice of system management, including operating system, network and system design, analysis, efficiency and security. • Demonstrate essential IT support skills including installing, configuring, securing and troubleshooting operating systems and hardware. • Demonstrate essential systems administration skills related to server operating systems, system and network service administration, and directory services administration.			
4.	**Management Development Program**	Students can demonstrate: • Good conversation skills • Writing effective emails /business letters • Acquire good communication skills/Interview skills /Mock Interview	30	-	30
5.	**Project**	• Students will apply knowledge gained during term I for project work.	**Grade**		

		• Design, implement and evaluate computer technologies, systems, processes, components and/or programs appropriate to a defined task, while analyzing the impact on existing systems and potential future applications. • Think critically, relatively and analytically in technological solutions to simple and complex problems. • Apply formal frameworks, methods and management systems to the organization, storage and retrieval of data in ways that demonstrate an understanding of both the business enterprise and the relevant technology. • Implement effective business solutions across an organization that demonstrates appropriate consideration of alternative computer technologies, including networks, servers, programming languages and database systems. • Plan, analyze, design and construct information systems to identified specifications, using clear and efficient code in the relevant	

		programming language(s). • Work effectively in a team to analyze the requirements of a complex software system, and solve problems by creating appropriate designs that satisfies these requirements Communicate to others the progress of the system development and the content of the design by means of reports and presentations.			
Total			**150**	**150**	**300**

Complete a grid for each grouping of NOS, assessment unit or other component as listed in the entry on the structure of the qualification on page 1.

Title of NOS/Unit/Component:

Assessable outcomes	Assessment criteria for the outcome
Enter the learning outcomes /elements of competence which will be assessed.	List all the criteria applying to this element/outcome.
Certificate Course in Linux System Administration	**A+ >= 85%,** **A >= 70% to < 85%** **B >= 60% to < 70 %** **C >= 50% to < 60%** **D >= 40% to < 50%** **F < 40%**
Means of assessment 1 Theory portion Assessment will be done through LAN based online system. Paper will be Objective question based. Lab evaluation will be done under project evaluation.	
Means of assessment 2 **Re-examinations:**	

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The following conditions will be applicable for the course end re-exam:

- Students who do not appear for an exam on the scheduled date will not have an automatic right to re-examination. Only those students who, in the opinion of the centre/course coordinator have a genuine reason for being absent may be allowed to appear for a re-exam.
- Students who have failed an exam may be allowed to appear for a re-exam.
- The re-exam should be conducted following the same process as the regular examination.
- Students, who failed/remained absent in the Course End Examination conducted by , shall be allowed to appear in the re-examination only once.
- Students who remain absent or fail in the re-examination will not get any further chance for appearing for the re-examination. In such case the candidate can receive the Performance Statement and the certificate of participation without any grade.
- On evaluation of their answer sheets 20% of the marks obtained by the students will be deducted (towards de-rating for re-examination) for arriving at the final score, i.e. in order to clear the module test the student has to score a minimum of 48% marks instead of 40%.
- There will be no re-exam for the re-exam

Pass/Fail:

If Candidate scored below 40% in any of the component like Theory, lab or Internal will be consider as FAIL.

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SECTION 2

SUMMARY EVIDENCE OF LEVEL

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
7	Requires a command of wide-ranging specialised theoretical and practical skills, involving variable routine and non-routine contexts.	Wide-ranging factual and theoretical knowledge in broad contexts within a field of work or study.	Wide range of cognitive and practical skills required to generate solutions to specific problems in a field of work of study.	Good logical and mathematical skill understanding of social political and natural environment and organising information, communication and presentation skill.	Full responsibility for output of group and development

Assessed outcome	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
1. Basic of Linux Administration 2. Fundamentals of Networking 3. System Administration 4. Management Development Program 5. Project	Person may carry out a job as Linux System Administrator. This job demands a command of wide-ranging specialised theoretical and practical skills, involving variable routine and non-routine contexts.	Learning Networking concepts, System Administration and Linux Administration concepts will help to learner to get employment as Linux System Administrator, System Administrator.	Candidate can setup /Trouble shoot Linux Operating System based on practical knowledge.	Candidate will be learning effective communications. Language to communicate written and oral. Aptitude, basic understanding of social political and natural environment.	Candidate can perform well and responsible for output of group and development

SECTION 3

EVIDENCE OF NEED

> **What evidence is there that the qualification is needed?**
>
> Set up the Advanced Computing Training School (ACTS) in 1993 to meet the ever-increasing skilled manpower requirements of the Information Communication Technologies (ICT) industry as well as

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supplement its intellectual resource base for cutting-edge research and development. Over the years has designed and delivered various postgraduate and undergraduate degree and diploma programmes. In addition, imparts ICT training to state and national governments and agencies, strategic sectors, corporate and industries, foreign countries and international students, based on specific requirements.

What is the estimated uptake of this qualification and what is the basis of this estimate?

https://www.quora.com/What-is-the-job-life-and-salary-of-a-new-Linux-Administrator-in-India

What steps were taken to ensure that the qualification(s) does/do not duplicate already existing or planned qualifications in the NSQF?

NA

What arrangements are in place to monitor and review the qualification(s)? What data will be used and at what point will the qualification(s) be revised or updated?

Effective course design begins with understanding who your students are, deciding what you want them to learn; determining how you will measure student learning; and planning activities, assignments and materials that support student learning.
Our courses are specialized and market driven.
There is a dedicated team in CDAC to design and develop courses. There is a set process of reviewing and updating the by taking feedback from industry and domain experts .We are in touch with more than 500 companies and we design and updated courses with their interventions as per market demand.

SECTION 4

EVIDENCE OF RECOGNITION AND PROGRESSION

What steps have been taken in the design of this or other qualifications to ensure that there is a clear path to other qualifications in this sector?

-    This qualification has been designed in consultation with industry and domain expert keeping in mind today's need. Evaluation criteria have been added to ensure progression to related path ways identified as per career path.

Please attach any documents giving further information about any of the topics above.
Give details of the document(s) here:

1. **Course Content**

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Linux System Administration

Sl. No.	Modules	Hours
1	Basic of Linux Administration	50
2	Fundamentals of Networking	40
3	System Administration	130
4	Management Development Program	60
5	Project	40
	Total	**320**

Detailed Syllabus

Basic of Linux Administration   (50 Hours)
- Introducing Linux
- Installing Linux
- History
- Distributions
- Devices and Drives in Linux
- File system Hierarchy
- Components: Kernel, Distribution, XFree86, Sawfish, Gnome.
- GNOME Basics. Changing the desktop background, adding menu items, plugins.
- Changing the screen resolution
- Evolution - the default e-mail client in Fedora.
- Mozilla - Web browser
- OpenOffice - Productivity tools. Word processor, spreadsheet, presentation software.
- gaim - Chat application
- XScreensaver
- How user preferences are stored in your home directory
- Updating your system with up2date / yum.
- How to restart X11: Ctrl-Alt-Backspace
- The command-line (shells, tab completion, cd, ls)
- file management: cd, df, find, locate
- nano, the text editor that replaces pico.
- man pages - the help system
- ssh - secure text-based connectivity to other machines. Demonstrate X-Forwarding.
- Handling compressed archives with zip and tar.
- GNU screen - The ability to resume command-line sessions from anywhere.
- Adding users, groups
- su - the obsoleted way to become the root user.
- sudo - the modern way to run processes as another user.
- Changing users' passwords with the passwd command.
- Printing with CUPS.
- Installing new software with yum (if Fedora) or YaST (if SUSE)
- Installing new software with rpm
- Installing webmin for easy web based systems administration

Fundamentals of Networking   (40 Hours)
- Introduction to computer Networking
- Categories of Networking according to size (LAN,WAN,DAN,MAN)
- Types of connections
- Network classifications (Wired, Wireless)

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- Network Hardware Devices (Hub, Switch, Modem, Router, Bridge, firewall etc)
- TCP/IP overview
- IP addressing, IPv6, Sub-netting, super-netting
- Planning and Implementing
- Architecture of Internet and intranet
- Port Security
- Spanning tree Protocol
- Troubleshooting

System Administration   (130 Hours)
- logfiles. Using tail -f to watch /var/log/messages
- Configuring Kerberos authentication
- Explaining file permissions, including setuid.
- How to enable and disable services
- ntp - Setting up time synchronization
- Setting DNS settings by editing /etc/resolv.conf
- Changing XFree86 settings in /etc/XFree86/XFree86.conf

- **Apache and MySQL administration**
  - About the Apache webserver.
  - About the MySQL database engine.
  - About the PHP scripting language.
  - Enabling the Apache with PHP and MySQL services
  - Using MySQL Administrator
  - PHPMyAdmin - web based administration and query console for MySQL.
  - Adding a MySQL user in phpmyadmin
  - Installing WordPress - a popular blogging software that uses MySQL.
  - Installing Coppermine - a popular photo gallery software that uses MySQL.

- **Windows Integration**
  - Connecting to your Linux machine from Windows using PuTTY and WinSCP.
  - WINE - free Windows API compatibility layer, for running Windows applications in Linux. We will use mIRC as a sample application.
  - Samba basics.
  - Configuring Samba to authenticate using ADS
  - rdesktop - Windows Terminal Server Client.
  - smbclient - an FTP-like client for SMB shares
  - smbmount - Mounting samba shares to a local directory (explain mount)
  - smb4k

- **Automation**
  - cut - cutting out the good parts of your input
  - sort - sorting files
  - uniq - finding the unique lines in a set of input
  - sed - searching and replacing
  - tail, head
  - find -exec - running a command on a large set of files
  - Writing a shell script
  - Scheduling tasks with cron.

- **System Administration**
  - Mounting disks
  - Killing processes with kill
  - Fetching files with wget

- o Compiling software: configure, make, make install, fstab
- o Reviewing find and du for finding out where your disk space went to.
- o Single user mode
- o X: Networking Tools
- o ping - check if a host is online
- o traceroute - see your hops between hosts
- o telnet - diagnostics
- o nmap - seeing what ports are open on a host
- o xinetd - the "internet super server". TCP/IP service manager.
- o lsof - list open ports and files
- o ethereal - Packet Sniffer Extraordinaire.

- **Customizing your user environment**
  - o symbolic links
  - o The Z Shell
  - o aliases, including -s types in zsh.
  - o variables
  - o PATH
  - o prompts
  - o Terminal transparency
  - o adding things to your X startup

Management Development Program

Introduction to communication, Barriers to communication, Kind of communication, Confidence building Non-verbal Communication, Fluency and vocabulary, Synonyms, Antonyms, Grammar, Noun Pronoun, Verb, Adjective, Preposition, Conjunction, Words of Idioms & phrases, Sentence Construction, Fill up the blanks, Pronunciation, Conversation practice, Polite Conversation, Greeting, Logical reasoning, General Aptitude, Writing: Covering letter, Resume, Email, Presentation Skill, group discussion, Interview skills, Mock interview

Project