NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

FEBRUARY 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: MOBILE APPLICATION DEVELOPMENT ENGINEER

LEVEL: NTA 8

TABLE OF CONTENT

CONTENTS

ABBREVIATIONS

AAC	Android Architecture Components
API	Application Programming Interface
CBET	Competency Based Education and Training
HTTPS	Hypertext Transfer Protocol Secure
ICB	IPMA Individual Competence Baseline
MSA	Microservices Architecture
MVC	Model-View-Controller Software Design Pattern
MVVM	Model-View-ViewModel Software Design Pattern
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OAuth	Open Authorization
ORM	Object-Relational Mapping
OS	Occupational Standards
PRINCE2	PRojects IN Controlled Environments
SOA	Service-Oriented Architecture
SDD	Software Detailed Design
TET	Technical Education and Training

TVET	Technical and Vocational Education and Training
UI	User Interface
WBS	Work Breakdown Structure

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation**.**
Performance	Indicate expected end results or outcomes in the form of evaluative

Criteria:	statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.
Standards:	A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Task Analysis:	The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical and Vocational Education and Training of Tanzania has begun the job of drafting Occupational Standards that will eventually be adopted as National Occupational Standards for TET in order to ensure that it meets the needs of the labour market and the country's economic agenda.

National Occupational Standards (NOS) are performance criteria that are matched with labour market demands. Each National Occupational Standard describes functions, performance standards, and knowledge/understanding for one important function or task. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruiting, supervision, and appraisal, as well as TET standards. They're also helpful for benchmarking and harmonizing qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current and consistent in delivery across all public and private institutions.

However, it must be noted that, Occupational Standards and Training standards/qualifications standards are different. Occupational Standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical wiring circuits, performs troubleshooting in electrical wiring, etc.) and they are usually defined by employers following procedures agreed upon by all stakeholders. Education and training standards are developed from the activities defined in occupational standards, and they include learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him or her to function at an agreed level in an occupation. Education and Training standards are used to define curricula in training institutions. It is however critical that there must be a direct link between the Occupational Standards and the training standards to respond to demands of the labour market.

In TET delivery, Tanzania adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet

the Occupational Standards. Occupational Standards are thus the starting point for developing competency-based training (CBET) programmes. TET institutions will be required to benchmark their curricula with relevant Occupational Standards.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training (TET).

The Mobile Application Development Engineer Occupation has its own set of occupational standards. The document explains how the Occupational Standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The Occupational Standards development process began with an examination of major documents that guide Tanzanian skill development. The *10-year National Skills Development Strategy (2016-2026)* was one of the documents reviewed, and it outlined six (6) economic sectors that should be prioritized when developing skills development programmes.

These sectors include: Transport and Logistics, Tourism and Hospitality, Agribusiness, Construction, Energy and ICT. NACTE labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a workshop comprised of experts and educators with substantial knowledge and experience in the occupation conducted an occupational analysis utilizing the DACUM approach to produce the occupational profile. The analysis resulted in DACUM Charts, which are attached as **Appendix 1** to this document.

The Occupational Standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the Occupational Standards. Engineers, supervisory technicians on the job, and experienced Mobile Application Development Engineers were key informants in the survey to discover occupational trends. The information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation. Multiple online surveys were completed by experts from

the labour market across the country. Apart from the survey aiding in defining the scope for the occupational analysis, they also served to engage a wide cross-section of experts in the occupation. Apart from this, the stakeholders' forum was attended by multiple participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR MOBILE APPLICATION DEVELOPMENT ENGINEERS

These standards cover a broad range of duties and tasks that can be performed by a Mobile Application Development Engineer. However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Mobile Application Development Engineer may perform tasks in a number of key areas of the Occupational Standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Mobile Application Development Engineer is responsible for designing the distributed service architecture, implementing the distributed server configuration, analyzing and solving server faults, maintaining system security, and optimizing database performance; also, the Engineer undertakes the system design task, completes the application-to-microservice development and optimization according to the microservices architecture, takes charge of comprehensive management of projects, and manages the project scope, quality and information documents in a standard and uniform way. Generally, the Mobile Application Development Engineer performs the following responsibilities:

a) Project requirement planning

b) System design

c) Mobile application development

d) Project system testing

e) Project implementation and maintenance

f) Distributed server environment maintenance and optimization

g) Software system design

h) Microservices development and optimization

i) Comprehensive project management

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA 7 and 8.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR MOBILE APPLICATION DEVELOPMENT ENGINEER - NTA 8

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	DISTRIBUTED SERVER ENVIRONMENT MAINTENANCE AND OPTIMIZATION	**DUTY NO.**	801
TASK TITLE	DISTRIBUTED SERVER DESIGN AND CONFIGURATION	**TASK NO.**	8011
PERFORMANCE CRITERIA	The person performing this task must be able to must be able to design and configure distributed servers in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. System requirement specification instructions; 2. Computers; 3. Software development tools, such as Android Studio, VS code and Xcode; 4. Software development packages and kits.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Separate application services, data services and document services; 2. Configure application server clusters; 3. Configure load balancing scheduling servers; 4. Design database read/write splitting programs; 5. Design SOA-based vertical splitting programs; 6. Design microservices-based splitting programs.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Split a vertical application architecture; 1.2 Configure Nginx to implement load balancing; 1.3 Improve database performance. **2.0 Principles** The person performing this task must be able to explain the following principles: : 2.1 Generic system measurement standards; 2.2 Distributed architecture design principles. **3.0 Theories**

	The person performing this task must be able to explain the following: 3.1 Standards for the distributed architecture and SOA and MSA architectures; 3.2 Evolution of the distributed architecture; 3.3 Methods to create and implement distributed transactions. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Distributed servers are configured, run and maintained in accordance with technical requirements and service specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of server devices; 2. Secure operations of network devices; 3. Secure operations of server management software; 4. Definition of the scope of liability for server security.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	DISTRIBUTED SERVER ENVIRONMENT MAINTENANCE AND OPTIMIZATION	**DUTY NO.**	801
TASK TITLE	SYSTEM SECURITY MAINTENANCE AND BACKUP	**TASK NO.**	8012
PERFORMANCE CRITERIA	The person performing this task must be able to maintain and back up the server systems in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. System requirement specification instructions; 2. Computers; 3. Software development tools, such as Android Studio, VS code and Xcode; 4. Software development packages and kits.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Defend against common Web attacks; 2. Apply commonly-used security algorithms; 3. Deploy HTTPS Web server; 4. Apply heartbeat detection to handle and solve cluster server problems; 5. Analyze logs, troubleshoot servers and handle system exceptions; 6. Use various database backup tools to back up data.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Defend against and identify server attacks and faults; 1.2 Handle and detect server problems; 1.3 Back up systems. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Server security maintenance specifications; 2.2 Data backup principles. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Common Web attack means on the Internet; 3.2 Commonly-used security algorithms; 3.3 HTTPS standards; 3.4 OAuth standards; 3.5 Cluster server monitoring indicators; 3.6 Heartbeat detection mechanism; 3.7 Online log analysis methods. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills; 4.6 Data analysis skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	System maintenance and backup are executed in accordance with technical requirements and service provider's specifications to guarantee the system to operate securely and stably.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of server devices; 2. Secure operations of network devices; 3. Secure operations of server management software; 4. Definition of the scope of liability for server security.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	OCCUPATION CODE	
DUTY TITLE	DISTRIBUTED SERVER ENVIRONMENT MAINTENANCE AND OPTIMIZATION	DUTY NO.	801
TASK TITLE	DATABASE PERFORMANCE OPTIMIZATION	TASK NO.	8013
PERFORMANCE CRITERIA	The person performing this task must be able to optimize database performance in accordance with technical requirements, service specifications and industry standards.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. System requirement specification instructions; 2. Computers; 3. Software development tools, such as Android Studio, VS code and Xcode; 4. Software development packages and kits.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Use a query optimizer to evaluate database performance indicators; 2. Use explain to analyze SQL execution plans; 3. Design databases normatively and effectively; 4. Carry out the split design of databases, and avoid problems and hidden hazards; 5. Design indexes to improve single table performance; 6. Execute Select optimization; 7. Execute Join optimization; 8. Execute Insert optimization.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Evaluate database performance indicators; 1.2 Design databases normatively; 1.3 Improve database performance. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Server security maintenance specifications; 2.2 Data backup principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 MySQL InnoDB database structures;

	3.2 B+ Tree and index design methods; 3.3 SQL general optimization strategies. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills; 4.6 Data analysis skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Database performance optimization is executed in accordance with technical requirements and service provider's specifications to improve database performance.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of server devices; 2. Secure operations of network devices; 3. Secure operations of server management software; 4. Definition of the scope of liability for server security.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SOFTWARE SYSTEM DESIGN	**DUTY NO.**	802
TASK TITLE	PROJECT LIFECYCLE MANAGEMENT	**TASK NO.**	8021
PERFORMANCE CRITERIA	The person performing this task must be able to use software development tools to complete the whole process of software development guided by software development methods.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. System requirement specification instructions; 2. Computers; 3. Software development tools, such as Android Studio, VS code and Xcode; 4. Software development packages and kits.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Apply basic principles of software engineering to achieve software management through engineering approaches; 2. Complete software definition; 3. Complete software development; 4. Complete software operation and maintenance.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Perform project lifecycle management. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Software development lifecycle management principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Software development methods; 3.2 System analysis methods; 3.3 System design methods; 3.4 System testing methods; 3.5 System operation and maintenance methods.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills; 4.6 Data analysis skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The whole process of software development is completed using software development tools in accordance with technical requirements and specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of server devices; 2. Secure operations of network devices; 3. Secure operations of server management software; 4. Definition of the scope of liability for server security.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SOFTWARE SYSTEM DESIGN	**DUTY NO.**	802
TASK TITLE	DESIGN PATTERN APPLICATION	**TASK NO.**	8022
PERFORMANCE CRITERIA	The person performing this task must be able to use design patterns to implement coding through engineering approaches.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. System requirement specification instructions; 2. Computers; 3. Software development tools, such as Android Studio, VS code and Xcode; 4. Software development packages and kits.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Use creational design patterns to create objects; 2. Use structural patterns to process the combinations of classes or objects; 3. Use behavioral patterns to describe how classes and objects interact; 4. Use behavioral patterns to describe how classes and objects assign responsibilities; 5. Use design patterns to develop reusable codes; 6. Carry out specific application of design patterns.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use design patterns to implement coding through engineering approaches. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Object-oriented design principles; 2.2 Design pattern principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Composition of creational design patterns; 3.2 Composition of structural patterns; 3.3 Composition of behavioral patterns. **4.0 Essential Skills**

	4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills; 4.6 Data analysis skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Coding is carried out through engineering approaches in accordance with technical requirements and specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of server devices; 2. Secure operations of network devices; 3. Secure operations of server management software; 4. Definition of the scope of liability for server security.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SOFTWARE SYSTEM DESIGN	**DUTY NO.**	802
TASK TITLE	SOFTWARE COMPONENT NORMALIZATION AND INTERACTION	**TASK NO.**	8023
PERFORMANCE CRITERIA	The person performing this task must be able to carry out component-oriented software design.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. System requirement specification instructions; 2. Computers; 3. Software development tools, such as Android Studio, VS code and Xcode; 4. Software development packages and kits.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select components; 2. Analyze cabling standards of components; 3. Establish component architecture; 4. Combine components; 5. Develop components; 6. Implement component composition.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Obtain reusable components; 1.2 Carry out component cabling; 1.3 Establish component architecture to develop components. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Component normalization and standardization principles; 2.2 Component connection rules; 2.3 Basic software design decision-making methods and principles. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Component normalization and standardization standards; 3.2 Component cabling standards. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills; 4.6 Data analysis skills; 4.7 Strategic planning skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Component software design is carried out in accordance with technical requirements and specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Intellectual property laws; 2. Codes of network behaviors; 3. Confidentiality principles of trade secrets.

<table>
<tr><td>OCCUPATION</td><td>MOBILE APPLICATION DEVELOPMENT ENGINEER</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>SOFTWARE SYSTEM DESIGN</td><td>DUTY NO.</td><td>802</td></tr>
<tr><td>TASK TITLE</td><td>SYSTEM ARCHITECTURE DESIGN</td><td>TASK NO.</td><td>8024</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to carry out mobile software architecture design.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers.
The tools and equipment to be used include:
1. System requirement specification instructions;
2. Computers;
3. Software development tools, such as Android Studio, VS code and Xcode;
4. Software development packages and kits.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Apply mainstream architectural patterns to develop codes;
2. Use MVC style to do coding;
3. Use MVP style to do coding;
4. Use MVVM style to do coding.</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Select an architectural style to design architecture.

2.0 Principles
The person performing this task must be able to explain the following principles:
2.1 Interface programming principles;
2.2 High cohesion and low coupling programming principles;
2.3 Code maintainability principles.

3.0 Theories
The person performing this task must be able to explain the following:
3.1 Selection of technical routes for various system architecture styles;
3.2 Architecture design methods.</td></tr>
</table>

	4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills; 4.6 Data analysis skills; 4.7 Strategic planning skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	With an architectural style selected, the software architecture is designed in accordance with technical requirements and specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Intellectual property laws; 2. Codes of network behaviors; 3. Confidentiality principles of trade secrets.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MICROSERVICES DEVELOPMENT AND OPTIMIZATION	**DUTY NO.**	803
TASK TITLE	MICROSERVICE APPLICATION DEVELOPMENT	**TASK NO.**	8031
PERFORMANCE CRITERIA	The person performing this task must be able to develop microservice applications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. System requirement specification instructions; 2. Computers; 3. Software development tools, such as Android Studio, VS code and Xcode; 4. Software development packages and kits.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select microservices architectures; 2. Use microservices to develop applications.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use microservers to develop applications. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Single responsibility principle; 2.2 Common closure principle; 2.3 High cohesion and low coupling principles; 2.4 One-way dependence principle. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Technical routes of microservices architectures;

	3.2 Use of microservers to develop applications. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.6 Management skills; 4.7 Data analysis skills; 4.8 Strategic planning skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	With component frameworks established, software codes are developed in accordance with technical requirements and specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Intellectual property laws; 2. Codes of network behaviors; 3. Confidentiality principles of trade secrets.

<table>
<tr><td>OCCUPATION</td><td>MOBILE APPLICATION DEVELOPMENT ENGINEER</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>MICROSERVICES DEVELOPMENT AND OPTIMIZATION</td><td>DUTY NO.</td><td>803</td></tr>
<tr><td>TASK TITLE</td><td>MICROSERVICE APPLICATION DEPLOYMENT AND MAINTENANCE</td><td>TASK NO.</td><td>8032</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to deploy and maintain microservice applications.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers.
The tools and equipment to be used include:
1. System requirement specification instructions;
2. Computers;
3. Software development tools, such as Android Studio, VS code and Xcode;
4. Software development packages and kits.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Select microservices architectures;
2. Use microservices to deploy applications;
3. Use microservers to maintain applications.</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Use microservers to deploy and maintain applications.

2.0 Principles
The person performing this task must be able to explain the following principles:
2.1 Single responsibility principle;
2.2 Common closure principle;
2.3 High cohesion and low coupling principles;
2.4 One-way dependence principle.

3.0 Theories
The person performing this task must be able to explain the following:</td></tr>
</table>

	3.1 Technical routes of microservices architectures; 3.2 Use of microservers to deploy and maintain applications. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills; 4.6 Data analysis skills; 4.7 Strategic planning skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Applications deployed using microservices are maintained in accordance with technical requirements and specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Intellectual property laws; 2. Codes of network behaviors; 3. Confidentiality principles of trade secrets.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MICROSERVICES DEVELOPMENT AND OPTIMIZATION	**DUTY NO.**	803
TASK TITLE	MOBILE APPLICATION DEBUGGING AND OPTIMIZATION	**TASK NO.**	8033
PERFORMANCE CRITERIA	The person performing this task must be able to debug and optimize mobile applications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. System requirement specification instructions; 2. Computers; 3. Software development tools, such as Android Studio, VS code and Xcode; 4. Software development packages and kits.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Optimize App starting speed; 2. Optimize App memory speed; 3. Optimize App layout rendering; 4. Optimize the phenomenon of App being stuck; 5. Optimize App thread usage; 6. Optimize App network access speed; 7. Optimize App power consumption; 8. Optimize App compression volume; 9. Optimize App stability; 10. Debug Apps.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Optimize mobile applications. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 App performance optimization principles; 2.2 App functional optimization principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Mobile application debugging methods; 3.2 Mobile application optimization methods. **4.0 Essential Skills**

	4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills; 4.6 Data analysis skills; 4.7 Strategic planning skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Applications are optimized in accordance with technical requirements and specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Intellectual property laws; 2. Codes of network behaviors; 3. Confidentiality principles of trade secrets.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	COMPREHENSIVE PROJECT MANAGEMENT	**DUTY NO.**	804
TASK TITLE	PROJECT SCOPE MANAGEMENT	**TASK NO.**	8041
PERFORMANCE CRITERIA	The person performing this task must be able to determine the works to be done in the specified project scope in accordance with service requirements and project objectives.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. System requirement specification instructions; 2. Computers; 3. Software development tools, such as Android Studio, VS code and Xcode; 4. Software development packages and kits.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Develop the scope management plan, and plan the project scope management process; 2. Collect project requirements based on project objectives; 3. Prepare the project scope statement; 4. Break down the project deliverables and project achievements, and create WBS structured view; 5. Manage project requirement changes through the project scope control.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Develop the project scope management plan; 1.2 Define the project scope; 1.3 Create WBS. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 IPMA Individual Competence Baseline (ICB); 2.2 PRINCE2 principle. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Project scope management process and planning; 3.2 Project objectives and requirements confirmation standards; 3.3 Definition of the project scope boundary; 3.4 Work breakdown structure (WBS); 3.5 Project scope control requirements. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills; 4.6 Data analysis skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The project scope is executed and confirmed in accordance with service requirements and project objectives, so that the scope is concrete, hierarchical and structured to reach the objectives of being manageable, controllable and implementable.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of server devices; 2. Secure operations of network devices; 3. Secure operations of server management software; 4. Definition of the scope of liability for comprehensive project management.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	COMPREHENSIVE PROJECT MANAGEMENT	**DUTY NO.**	804
TASK TITLE	PROJECT QUALITY CONTROL	**TASK NO.**	8042
PERFORMANCE CRITERIA	The person performing this task must be able to determine the project quality policies, objectives and responsibilities in accordance with service requirements and project objectives.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. System requirement specification instructions; 2. Computers; 3. Software development tools, such as Android Studio, VS code and Xcode; 4. Software development packages and kits.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Provide project management and quality guidelines and directions, and formulate quality control plans, process improvement plans, quality measurement indicators and quality checklists; 2. Adopt reasonable quality standards to prevent and check project defects; 3. Supervise and record the implementation results of quality activities, and evaluate the performance; 4. Apply targeted quality control techniques.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Plan the quality control; 1.2 Implement the quality assurance; 1.3 Implement the quality control. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 IPMA Individual Competence Baseline (ICB); 2.2 PRINCE2 principle. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Quality control standard systems; 3.2 Engineering standards of project quality control;

	3.3 Technical requirements of project quality control. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills; 4.6 Data analysis skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Project quality policies, objectives and responsibilities are executed and determined in accordance with service requirements and project objectives, with quality objectives achieved.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of server devices; 2. Secure operations of network devices; 3. Secure operations of server management software; 4. Definition of the scope of liability for comprehensive project management.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	COMPREHENSIVE PROJECT MANAGEMENT	**DUTY NO.**	804
TASK TITLE	PROJECT INFORMATION DOCUMENT MANAGEMENT AND CONFIGURATION MANAGEMENT	**TASK NO.**	8043
PERFORMANCE CRITERIA	The person performing this task must be able to, in accordance with service requirements and project objectives, complete the writing and management of documents related to information system projects and the configuration management of each software product lifecycle.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. System requirement specification instructions; 2. Computers; 3. Software development tools, such as Android Studio, VS code and Xcode; 4. Software development packages and kits.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Write documents of information system projects, including development and product documents; 2. Record and manage the project documents; 3. Set the configuration management objectives and policies; 4. Execute the change control of configuration items and baselines; 5. Apply software configuration management tools normatively.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Manage information system project documents; 1.2 Maintain the integrity of system configuration. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 IPMA Individual Competence Baseline (ICB); 2.2 PRINCE2 principle; 2.3 Information system project document writing norms. **3.0 Theories** The person performing this task must be able to

	explain the following: 3.1 Classification methods of information system project documents; 3.2 Document management systems; 3.3 Task requirements of project configuration management; 3.4 Project version management. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills; 4.6 Data analysis skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The writing and management of documents related to information system projects and the configuration management are executed in accordance with service requirements and project objectives, with the integrity and traceability of system configuration maintained in the entire lifecycle.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of server devices; 2. Secure operations of network devices; 3. Secure operations of server management software; 4. Definition of the scope of liability for comprehensive project management.

TABLE 1: DACUM CHARTS FOR MOBILE APPLICATION DEVELOPMENT ENGINEER - NTA 8

DUTIES	TASKS	ENABLERS
1.0 Distributed server environment maintenance and optimization	1.1 Distributed server design and configuration. 1.2 System security maintenance and backup. 1.3 Database performance optimization.	**General skills and knowledge** · Skills and knowledge of distributed server system environment configuration, parameter settings and optimization · Skills and knowledge of network database problem handling and performance optimization · Skills and knowledge of various database performance operations design and writing · Methods to set and write stored procedures, triggers, indexes and user permissions · Skills and knowledge of program data backup **Tools and equipment** · Development devices · Computers **Materials** · Commonly-used operating systems such as Windows, Mac and Linux · Various virtual machine environments · AndroidStudio, XCode and other development tools and related framework dependence **Requirements for employees** · Teamwork spirit

		· Integrity · Time management · Intensive study and emphasis on commitment
2.0 Software system design	2.1 Project lifecycle management. 2.2 Design pattern application. 2.3 Software component normalization and interaction. 2.4 System architecture design.	**General skills and knowledge** · Skills and knowledge of project lifecycle management · Knowledge of determining the requirements of software systems at different levels, such as functional and performance requirements · Skills to respond to and handle requirement changes · Knowledge of three forms of design patterns · Skills and knowledge of principles and application of basic design patterns · Structures, attributes and interactions of software components · Skills and knowledge of ADL use for describing software system structures · Skills and knowledge of system structure styles and system architecture styles · Technical requirements of components **Tools and equipment** · Development devices · Computers **Materials** · Commonly-used operating systems such as Windows, Mac and Linux

		· Various virtual machine environments · Office document processing software · IntelliJ IDEA and other development tools and related framework dependence **Requirements for employees** · Teamwork spirit · Integrity · Time management · Intensive study and emphasis on commitment
3.0 Microservices development and optimization	3.1 Microservice application development. 3.2 Microservice application deployment and maintenance. 3.3 Application debugging and optimization.	**General skills and knowledge** · Skills of calling multimedia and internationalized APIs · Skills and knowledge of microservice-based application development and debugging · Skills and knowledge of microservices deployment · Remote debugging environment settings and application **Tools and equipment** · Development devices · Computers with Intel I5 or higher-level processors, 8GB or more RAM, and 500GB or more hard disk memory · Devices for test running (optional) · Mobile devices running Android OS (mobile phones and tablets)

		· Mobile devices running iOS or iPadOS (iPhone and iPad) **Materials** · Commonly-used operating systems such as Windows, Mac and Linux · Various virtual machine environments · IntelliJ IDEA and other development tools and related framework dependence **Requirements for employees** · Teamwork spirit · Integrity · Time management · Intensive study and emphasis on commitment
4.0 Comprehensive project management	4.1 Project scope management. 4.2 Project quality control. 4.3 Project information document management and configuration management.	**General skills and knowledge** · Underpinning knowledge of information system project management · Knowledge of project scope management · Skills and knowledge of WBS creation · Skills and knowledge of version control and related tool use · Skills and knowledge of code quality review · Skills and knowledge of information system project documentation and management · Skills and knowledge of team management software use

		Tools and equipment · Operation platforms for management tools · Computers with Intel I5 or higher-level processors, 8GB or more RAM, and 500GB or more hard disk memory **Materials** · Commonly-used operating systems such as Windows, Mac and Linux · Version management software (SVN and GIT) · Office document processing software · Team management software **Requirements for employees** · Teamwork spirit · Integrity · Time management · Intensive study and emphasis on commitment