THE NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

OCCUPATIONAL STANDARDS

OCCUPATION: MOBILE APPLICATION DEVELOPMENT ENGINEER

LEVEL: NTA LEVEL 8

FEBRUARY 2024

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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 Criteria:	Indicate expected end results or outcomes in the form of evaluative 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, with a high level of human development. 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 (NACTVET) has begun the job of drafting Occupational Standards (OS) that will eventually be adopted as National Occupational Standards (NOS) for use in the delivery of TET that meets the needs of the labour market and the country's economic agenda.

Occupational Standards (OS) are performance criteria that are matched with labour market demands. Each of them describes the functions, performance standards, and understanding or knowledge underpinning a given occupation. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruitment, supervision, and appraisal, as well as TET Standards. They are also helpful for benchmarking and harmonizing job 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 application across all public and private institutions.

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

For the purpose of TET delivery, Tanzania has 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. Therefore, it is quite pertinent for TET institutions to use the relevant occupational standards as a benchmark for formulating their curricula. 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.

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 process of developing these Occupational Standards involved both local and international expertise. The process began with an examination of major documents that guide Tanzanian skills development including the *10-year National Skills Development Strategy (2016-2026).* NACTVET 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 team of experts in consultation with practitioners developed draft occupational standards. The draft document was used to develop an occupational profile for each occupation (DACUM Chart), which is attached as an **Appendix** to every Occupational Standard.

The occupational standards were validated during the stakeholders' forum held on 22nd and 23rd February 2024 at Morogoro. The information from the stakeholders' forum provides insight from the workplace, professional bodies, regulatory bodies and sector ministries regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation.

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, analysing 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 LEVEL 8

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MAINTAIN AND OPTIMISE DISTRIBUTED SERVER ENVIRONMENT	**DUTY NO.**	801
TASK TITLE	DESIGN AND CONFIGURE DISTRIBUTED SERVER	**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; 5. Safety gear.		

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	**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;

servers; 4. Design database read/write splitting programs; 5. Design SOA-based vertical splitting programs; 6. Design microservices-based splitting programs; 7. Observe health, occupational and environmental safety rules and regulations.	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	MAINTAIN AND OPTIMISE DISTRIBUTED SERVER ENVIRONMENT	**DUTY NO.**	801
TASK TITLE	MAINTAIN AND BACK UP SYSTEM SECURITY	**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; 5. Safety gear.		

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	**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;

solve cluster server problems; 5. Analyse logs, troubleshoot servers and handle system exceptions; 6. Use various database backup tools to back up data; 7. Observe health, occupational and environmental safety rules and regulations.	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	MAINTAIN AND OPTIMISE DISTRIBUTED SERVER ENVIRONMENT	DUTY NO.	801
TASK TITLE	OPTIMISE DATABASE PERFORMANCE	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; 5. Safety gear.		

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 analyse SQL execution plans; 3. Design databases normatively and effectively; 4. Carry out the split design of databases, and avoid problems and hidden	**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

hazards; 5. Design indexes to improve single table performance; 6. Execute Select optimization; 7. Execute Join optimization; 8. Execute Insert optimization; 9. Observe health, occupational and environmental safety rules and regulations.	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	DESIGN SOFTWARE SYSTEM	**DUTY NO.**	802
TASK TITLE	MANAGE PROJECT LIFECYCLE	**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; 5. Safety gear.		

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; 5. Observe health, occupational and	**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:

environmental safety rules and regulations.	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.

<table>
<tr><td>OCCUPATION</td><td>MOBILE APPLICATION DEVELOPMENT ENGINEER</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>DESIGN SOFTWARE SYSTEM</td><td>DUTY NO.</td><td>802</td></tr>
<tr><td>TASK TITLE</td><td>DESIGN PATTERN APPLICATION</td><td>TASK NO.</td><td>8022</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to use design patterns to implement coding through engineering approaches.</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;
5. Safety gear.</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. Use creational design patterns to create objects;
2. Use structural patterns to process the combinations of classes or objects;
3. Use behavioural patterns to describe how classes and objects interact;
4. Use behavioural patterns to describe how classes and objects assign responsibilities;</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 design patterns to implement coding through engineering approaches.

2.0 Principles
The person performing this task must be able to explain the following principles:</td></tr>
</table>

5. Use design patterns to develop reusable codes; 6. Carry out specific application of design patterns; 7. Observe health, occupational and environmental safety rules and regulations.	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 behavioural 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 by using design patterns 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	DESIGN SOFTWARE SYSTEM	**DUTY NO.**	802
TASK TITLE	DESIGN SOFTWARE COMPONENT NORMALISATION 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; 5. Safety gear.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select components; 2. Analyse cabling standards of components; 3. Establish component architecture; 4. Combine components; 5. Develop components; 6. Implement component composition; 7. Observe health, occupational and	**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

environmental safety rules and regulations.	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	Software component composition is carried out in accordance with technical requirements and specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Intellectual property laws; 2. Codes of network behaviours; 3. Confidentiality principles of trade secrets.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	DESIGN SOFTWARE SYSTEM	**DUTY NO.**	802
TASK TITLE	DESIGN SYSTEM ARCHITECTURE	**TASK NO.**	8024
PERFORMANCE CRITERIA	The person performing this task must be able to carry out mobile software architecture 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; 5. Safety gear.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
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; 5. Observe health, occupational and environmental safety rules and regulations.	**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. **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 behaviours; 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>DEVELOP AND OPTIMISE MICROSERVICES</td><td>DUTY NO.</td><td>803</td></tr>
<tr><td>TASK TITLE</td><td>DEVELOP MICROSERVICE APPLICATION</td><td>TASK NO.</td><td>8031</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to develop 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;
5. Safety gear.</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 develop applications;
3. Observe health, occupational and environmental safety rules and regulations.</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 micro servers to develop applications.

2.0 Principles
The person performing this task must be able to explain the following principles:</td></tr>
</table>

	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 micro servers 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, microservice applications are developed in accordance with technical requirements and specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Intellectual property laws; 2. Codes of network behaviours; 3. Confidentiality principles of trade secrets.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	DEVELOP AND OPTIMISE MICROSERVICES	**DUTY NO.**	803
TASK TITLE	DEPLOY AND MAINTAIN MICROSERVICE APPLICATION	**TASK NO.**	8032
PERFORMANCE CRITERIA	The person performing this task must be able to deploy and maintain 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; 5. Safety gear.		

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 deploy applications; 3. Use micro servers to maintain applications; 4. Observe health, occupational and environmental safety rules and	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use micro servers to deploy and maintain applications. **2.0 Principles** The person performing this task must be able to

regulations.	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 micro servers 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 behaviours; 3. Confidentiality principles of trade secrets.

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<tr><td>DUTY TITLE</td><td>DEVELOP AND OPTIMISE MICROSERVICES</td><td>DUTY NO.</td><td>803</td></tr>
<tr><td>TASK TITLE</td><td>DEBUG AND OPTIMISE MOBILE APPLICATION</td><td>TASK NO.</td><td>8033</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to debug and optimise mobile 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;
5. Safety gear.</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. 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</td><td colspan="2">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</td></tr>
</table>

speed; 7. Optimize App power consumption; 8. Optimize App compression volume; 9. Optimize App stability; 10. Debug Apps; 11. Observe health, occupational and environmental safety rules and regulations.	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 debugged and optimised in accordance with technical requirements and specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Intellectual property laws; 2. Codes of network behaviours; 3. Confidentiality principles of trade secrets.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	IMPLEMENT COMPREHENSIVE PROJECT MANAGEMENT	**DUTY NO.**	804
TASK TITLE	DETERMINE PROJECT SCOPE OF WORKS	**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; 5. Safety gear.		

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;	**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.

4. Break down the project deliverables and project achievements, and create WBS structured view; 5. Manage project requirement changes through the project scope control; 6. Observe health, occupational and environmental safety rules and regulations.	**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	IMPLEMENT COMPREHENSIVE PROJECT MANAGEMENT	**DUTY NO.**	804
TASK TITLE	IMPLEMENT 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; 5. Safety gear.		

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	**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**

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; 5. Observe health, occupational and environmental safety rules and regulations.	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	IMPLEMENT COMPREHENSIVE PROJECT MANAGEMENT	**DUTY NO.**	804
TASK TITLE	MANAGE AND CONFIGURE PROJECT INFORMATION DOCUMENT	**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; 5. Safety gear.		

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;	**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.

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; 6. Observe health, occupational and environmental safety rules and regulations.	**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 project documents related to information system 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.

APPENDIX: DACUM CHARTS FOR MOBILE APPLICATION DEVELOPMENT ENGINEER - NTA LEVEL 8

DUTIES	TASKS	ENABLERS
1.0 Maintain and optimise distributed server environment	1.1 Design and configure distributed server 1.2 Maintain and back-up system security. 1.3 Optimise database performance.	**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 · Android Studio, 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 Design software system	2.1 Manage project lifecycle. 2.2 Design pattern application. 2.3 Design software component normalisation and interaction. 2.4 Design system architecture.	**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 Develop and optimise microservices	3.1 Develop microservice application. 3.2 Deploy and maintain microservice application. 3.3 Debug and optimise mobile Application	**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 Implement comprehensive project management	4.1 Determine project scope of works.	**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
	4.2 Implement project quality control.	
	4.3 Manage and configure project information document	

		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