worldskills

Technical Description

Cloud Computing

WorldSkills International, by a resolution of the Competitions Committee and in accordance with the Constitution, the Standing Orders, and the Competition Rules, has adopted the following minimum requirements for this skill for the WorldSkills Competition.

The Technical Description consists of the following:

1 Introduction

1.1 Name and description of the skill competition

1.1.1 The name of the skill competition is

Cloud Computing

1.1.2 Description of the associated work role(s) or occupation(s)

The positions responsible for the design and implementation of information technology infrastructure in a public cloud environment can span multiple roles including, Systems Administrators/Engineers, Database Administrators, Network Administrators/Engineers, Storage Administrators/Engineers, Systems/Network/Solutions/Enterprise Architects, programmers/developers, and similar technology-driven roles which shoulder the business and functional responsibilities for architecting infrastructure design. Due to the ever-expanding features and capabilities of public cloud providers, this list of associated infrastructure specialists is also expanding.

Infrastructure Architects are responsible for the overall design and direction for system and application deployments. These architects have traditionally created designs that have spanned multiple office locations as well as corporate and collocated data centres. With the growing prevalence of public cloud deployments, they have added IaaS (Infrastructure as a Service) opportunities to their list of deployment tools. This allows these technology specialists to work towards migration solutions, offsite storage solutions, dynamic resource elasticity, and other design paradigms to create solutions that best fit the needs of each organization.

Systems Administrators/Engineers are able to utilize public cloud providers in order to automate, expand, streamline, simplify, and accelerate their deployment models. Utilizing their experience in automation, these technologists can programmatically deploy infrastructure using the command line, language-specific SDK integrations, and infrastructure templating capabilities. This group is able to manage their technology footprint through the use of managed services to offload the administration of tasks such as managing a centralized activity logging by defining permissions and recording events. The ability to define a solution and then replicate that design to multiple environments and locations can be a significant responsibility of the position along with managing the integration of cloud computing offerings into existing technology solution sets.

Database Administrators are increasingly engaging with public cloud providers as it gives them greater control over the details of their deployments. They are able to utilize resources on demand rather than waiting for resources from other departments. Additionally, they can use the advanced features of cloud providers such as managed database services for caching, relational databases, and NoSQL data solutions.

Storage Administrators gain the flexibility to scale their storage needs without concern for hardware availability or capital expense. Using multiple storage offerings from cloud vendors, storage-related technology specialists can build solutions that best fit their storage needs using the tools provided by their vendor, or solutions from the vendor’s 3rd party partners to deliver scalable, highly available primary and disaster recovery storage solutions. Implementing backups, deploying shared and clustered storage solutions, system snapshots, and data migrations are just a few examples of activities that can be automated via multiple programming languages using public cloud vendors and 3rd party partner solutions.

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1.1.3 Number of Competitors per team

Cloud Computing is a single Competitor skill competition.

1.1.4 Age limit of Competitors

The Competitors must not be older than 25 years in the year of the Competition.

1.2 The relevance and significance of this document

This document contains information about the standards required to compete in this skill competition, and the assessment principles, methods, and procedures that govern the competition.

Every Expert and Competitor must know and understand this Technical Description.

In the event of any conflict within the different languages of the Technical Descriptions, the English version takes precedence.

1.3 Associated documents

Since this Technical Description contains only skill-specific information it must be used in association with the following:

- WSI – Code of Ethics and Conduct
- WSI – Competition Rules
- WSI – WorldSkills Occupational Standards framework
- WSI – WorldSkills Assessment Strategy
- WSI online resources as indicated in this document
- WorldSkills Health, Safety, and Environment Policy and Regulations
- WorldSkills Standards and Assessment Guide (skill-specific)

2 The WorldSkills Occupational Standards (WSOS)

2.1 General notes on the WSOS

The WSOS specifies the knowledge, understanding, skills, and capabilities that underpin international best practice in technical and vocational performance. These are both specific to an occupational role and also transversal. Together they should reflect a shared global understanding of what the associated work role(s) or occupation(s) represent for industry and business (www.worldskills.org/WSOS).

The skill competition is intended to reflect international best practice as described by the WSOS, to the extent that it can. The Standard is therefore a guide to the required training and preparation for the skill competition.

In the skill competition the assessment of knowledge and understanding will take place through the assessment of performance. There will only be separate tests of knowledge and understanding where there is an overwhelming reason for these.

The Standard is divided into distinct sections with headings and reference numbers added.

Each section is assigned a percentage of the total marks to indicate its relative importance within the Standards. This is often referred to as the “weighting”. The sum of all the percentage marks is 100. The weightings determine the distribution of marks within the Marking Scheme.

Through the Test Project, the Marking Scheme will assess only those skills and capabilities that are set out in the WorldSkills Occupational Standards. They will reflect the Standards as comprehensively as possible within the constraints of the skill competition.

The Marking Scheme will follow the allocation of marks within the Standards to the extent practically possible. A variation of up to five percent is allowed, if this does not distort the weightings assigned by the Standards.

2.2 WorldSkills Occupational Standards

Section		Relative importance (%)
1	**Work organization and management**	**10**
	The individual needs to know and understand: • The relationships between different technologies and areas of expertise used in a public cloud deployment • Interoperability requirements for each aspect of a systems deployment within public cloud providers • The requirements of each group of stakeholders in the design of an IT solution using public cloud services • Methods of Integrating an organization’s best practices and public cloud offerings to create application-specific deployments • Methods of evaluating, comparing, and contrasting the wide range of possible solutions for each IT implementation	

Section		Relative importance (%)
	• Methods of determining which solution is optimal for each organization taking into account internal best practices, business requirements, existing infrastructure, and resource expertise	
	The individual shall be able to: • Identify common deployment models with public cloud providers and how those models can apply to organization-specific requirements • Identify opportunities and create migrations plans to phase-in public cloud deployments and reduce risks • Create highly available, scalable, and secure IT architectural designs specific to each application, taking into account compute, storage, networking, database management, and deployment requirements • Take advantage of public cloud provider solutions to reduce operational burden associated with service deployments	
2	**Communication and interpersonal skills**	**10**
	The individual needs to know and understand: • How to communicate across organizational teams to identify infrastructure requirements and architectural opportunities • How to engage with business units to identify best practices for deployment and create a migration path to the public cloud • Methods and techniques for working with business stakeholders in meeting organizational and compliance related goals • The bases for creating department and team-specific infrastructure designs that take advantage of public cloud capabilities and value-add services	
	The individual shall be able to: • Discover and document key requirements and how they relate to public cloud offerings • Discover and document technology-specific opportunities to leverage public cloud offerings • Translate business goals and objectives into briefs, designs, and plans, and present such documents to stakeholders and management teams • Clearly map departmental and technology-specific requirements and goals to public cloud solutions • Using project-specific migration plans, facilitate the implementation of an organizational transition to public cloud resources	
3	**Problem solving, innovation, and creativity**	**15**

Section		Relative importance (%)
	The individual needs to know and understand: • The role and importance of each layer of infrastructure design including compute, storage, networking, database, caching, and application • Various technology solutions to meet business objectives (e.g. different relational database solutions as well the use of NoSQL technologies for transactional data workloads) • Various storage capabilities including block level replication, network block device sharing, shared/clustered file systems, object storage, and storage caching solutions • Various network architectures to facilitate communication with existing/legacy applications and environments • Automation methodologies and opportunities commonly used throughout the technical community • Serverless, API, stacks	
	The individual shall be able to: • Evaluate, select, and implement foundational cloud computing services such as compute, network, and storage • Evaluate, select, and implement advanced cloud computing services such as managed data services, caching services, and automated scaling and availability features • Evaluate, select, and implement various network-related technologies to infrastructure design such as network communication protocols, sub netting, NAT, DNS, VPN, broadcast networking, and dynamic routing protocols • Automate infrastructure creation and modification through the use of scripting or programming, and the use of infrastructure templates	
4	**Cybersecurity**	**20**
	The individual needs to know and understand: • Best practices for securing systems and networks using authorizations, authentications, and accounting • Best practices for developing secure deployment and the ongoing monitoring of traffic and assets • Best practices for deploying, monitoring, and maintaining secure infrastructure • Best practices for the creation and deployment of secure application designs for public cloud infrastructure • The demarcation of responsibility for cybersecurity between cloud providers and public cloud customers • The importance and intent of network traffic and resource isolation	

Section		Relative importance (%)
	The individual shall be able to: • Design and implement authentication processes at departmental and organizational level, controlling access to public cloud administrative capabilities and system access • Develop policies and procedures for systems and application access to public cloud interfaces and services • Implement policies and procedures for auditing of public cloud activities and access • Create internal prescriptive guidance and requirements for procedures necessary to create, update, remove and access public cloud infrastructure and resources • Implement service and technology specific cybersecurity controls on resources running within a public cloud environment as well as utilization of services provided by an IaaS vendor • Engage with business, development, and leadership staff to identify, recommend, and implement cybersecurity best practices while ensuring an efficient user experience	
5	**Reliability, scalability, and elasticity**	**15**
	The individual needs to know and understand: • How business requirements translate to operational objectives in relation to resource constraints addressed by the use of public cloud features and services • The principles and architectures for different availability/deployment models such as disaster recovery, high availability, blue-green deployments, global load balancing, and pilot light deployments • Application and service-specific availability requirements and nuances as they relate to systems and application availability • Network data flow and the corresponding relationship to systems availability • Organizational and departmental business and technology goals related to system survivability and data durability in the event of different failure scenarios • How application, system, and network metrics can be used to define the implementation of available, scalable, and elastic architectures • Different applications, systems, and protocol nuances and requirements necessary to automate the scaling, durability, and availability of infrastructure	
	The individual shall be able to: • Record, analyse, and interpret application, system, and network data to facilitate the recommendation of an appropriate architecture that sufficiently utilizes scalability and elasticity to meet the variable demands of internal and external users and system	

Section		Relative importance (%)
	• Implement different availability, scalability, and durability models in accordance with application and system design requirements • Design availability models that meet the business requirements of an organization, taking into account allowed recovery time and allowable service interruption parameters • Utilize public cloud services and features to aid the design and deployment of availability, durability, and scalability requirements	
6	**Performance and optimization**	**10**
	The individual needs to know and understand: • Different infrastructure performance opportunities available through solutions such as caching, resource right-sizing, and vendor-provided services • Performance requirements and possible bottlenecks with infrastructure design • Vendor-specific pricing opportunities as they relate to different public cloud offerings for optimizing costs • Opportunities available during the creation of new applications or redesign of existing applications to take advantage of public cloud offerings such as server-less computing and microservice orchestration	
	The individual shall be able to: • Analyse and interpret performance metrics from compute, storage, network, and application levels for use in public cloud infrastructure design objectives • Utilize performance tuning techniques and packages to ensure optimal resource utilization • Implement microservice strategies to capitalize on technology advances in areas like container development • Pursue the decoupling of services to allow the separation of application components to facilitate a service-oriented architecture • Recommend and implement database and storage solutions that best fit the needs of an application • Implement serverless architecture	

Section		Relative importance (%)
7	**Operational considerations**	**10**
	The individual needs to know and understand: • The requirements of systems and applications in order to maintain functionality and availability • System, network, and application metrics and how they apply to infrastructure durability, availability, and performance • Response requirements, protocols, and procedures for various incidents including cybersecurity, availability, and performance-related incidents	
	The individual shall be able to: • Maintain functionality and availability within the requirements of a given system • Maintain functionality and availability within the requirements of a given system's applications • Use the metrics of a given system, network, and applications to assess the durability, availability, and performance of the infrastructure • Respond to cybersecurity, availability, and performance-related incidents by applying given requirements, protocols, and procedures	
8	**Sustainability**	**10**
	The individual needs to know and understand: • The purpose and nature of sustainability goals for cloud computing; e.g., reducing the resources required for each operational and architectural transaction • Design principles for architecting cloud workloads to maximise sustainability and minimize environmental impact • Methods for estimating future impacts of workloads • The sources of impacts: including customer use, eventual decommissioning, and retirement • Methodologies for comparing productive output with the impacts (resources and emissions) per unit of work • The purpose, value, and uses of Key Performance Indicators (KPIs) in relation to sustainability. • Rationales and methods for maximizing utilization • Innovation and trends in software and architectures to support sustainability • The implications for cloud workload design of rapid innovation in hardware and software • The implications for sustainability of shared managed services across a broad customer base • The business case for offering sustainable solutions to customers	

Section		Relative importance (%)
	The individual shall be able to: • Architect cloud workloads to maximize sustainability and minimize environmental impact • Measure the impact of given cloud workloads and model the future impact of workloads • Identify and estimate the sources of impacts across the lifetime of given products • Compare productive output of given products with their impacts, per work unit • Create KPIs for given products' improved productivity, evaluate the options for meeting the KPIs, including their cost implications, and estimate their relative impact over time • Research new and alternative hardware and software to support energy efficiency, and identify their implications for design • Review the implications for sustainability of using managed services across a wide customer base • Explain and illustrate to customers their options for sustainable solutions, their relative cost benefit and wider implications	
	Total	**100**

3 The Assessment Strategy and Specification

3.1 General guidance

Assessment is governed by the WorldSkills Assessment Strategy. The Strategy establishes the principles and techniques to which WorldSkills assessment and marking must conform.

Expert assessment practice lies at the heart of the WorldSkills Competition. For this reason, it is the subject of continuing professional development and scrutiny. The growth of expertise in assessment will inform the future use and direction of the main assessment instruments used by the WorldSkills Competition: the Marking Scheme, Test Project, and Competition Information System (CIS).

Assessment at the WorldSkills Competition falls into two broad types: Measurement and Judgement. For both types of assessment, the use of explicit benchmarks against which to assess each Aspect is essential to guarantee quality.

The Marking Scheme must follow the weightings within the Standards. The Test Project is the assessment vehicle for the skill competition, and therefore also follows the Standards. The CIS enables the timely and accurate recording of marks; its capacity for scrutiny, support, and feedback is continuously expanding.

The Marking Scheme, in outline, will lead the process of Test Project design. After this, the Marking Scheme and Test Project will be designed, developed, and verified through an iterative process, to ensure that both together optimize their relationship with the Standards and the Assessment Strategy. They will be agreed by the Experts and submitted to WSI for approval together, to demonstrate their quality and conformity with the Standards.

Prior to submission for approval to WSI, the Marking Scheme and Test Project will liaise with the WSI Skill Advisors for quality assurance and to benefit from the capabilities of the CIS.

4 The Marking Scheme

4.1 General guidance

This section describes the role and place of the Marking Scheme, how the Experts will assess Competitors' work as demonstrated through the Test Project, and the procedures and requirements for marking.

The Marking Scheme is the pivotal instrument of the WorldSkills Competition, in that it ties assessment to the standard that represents each skill competition, which itself represents a global occupation. It is designed to allocate marks for each assessed aspect of performance in accordance with the weightings in the Standards.

By reflecting the weightings in the Standards, the Marking Scheme establishes the parameters for the design of the Test Project. Depending on the nature of the skill competition and its assessment needs, it may initially be appropriate to develop the Marking Scheme in more detail as a guide for Test Project design. Alternatively, initial Test Project design can be based on the outline Marking Scheme. From this point onwards the Marking Scheme and Test Project should be developed together.

Section 2.1 above indicates the extent to which the Marking Scheme and Test Project may diverge from the weightings given in the Standards, if there is no practicable alternative.

For integrity and fairness, the Marking Scheme and Test Project are increasingly designed and developed by one or more Independent Test Project Designer(s) with relevant expertise. In these instances, the Marking Scheme and Test Project are unseen by Experts until immediately before the start of the skill competition, or competition module. Where the detailed and final Marking Scheme and Test Project are designed by Experts, they must be approved by the whole Expert group prior to submission for independent validation and quality assurance. Please see the Competition Rules for further details.

Experts and Independent Test Project Designers are required to submit their Marking Schemes and Test Projects for review, verification, and validation well in advance of completion. They are also expected to work with their Skill Advisor, reviewers, and verifiers, throughout the design and development process, for quality assurance and in order to take full advantage of the CIS's features.

In all cases a draft Marking Scheme must be entered into the CIS at least eight weeks prior to the Competition. Skill Advisors actively facilitate this process.

4.2 Assessment Criteria

The main headings of the Marking Scheme are the Assessment Criteria. These headings are derived before, or in conjunction with, the Test Project. In some skill competitions the Assessment Criteria may be similar to the section headings in the Standards; in others they may be different. There will normally be between five and nine Assessment Criteria. Whether or not the headings match, the Marking Scheme as a whole must reflect the weightings in the Standards.

Assessment Criteria are created by the person or people developing the Marking Scheme, who are free to define the Criteria that they consider most suited to the assessment and marking of the Test Project. Each Assessment Criterion is defined by a letter (A-I). **The Assessment Criteria, the allocation of marks, and the assessment methods, should not be set out within this Technical Description. This is because the Criteria, allocation of marks, and assessment**

methods all depend on the nature of the Marking Scheme and Test Project, which is decided after this Technical Description is published.

The Mark Summary Form generated by the CIS will comprise a list of the Assessment Criteria and Sub Criteria.

The marks allocated to each Criterion will be calculated by the CIS. These will be the cumulative sum of marks given to each Aspect within that Assessment Criterion.

4.3 Sub Criteria

Each Assessment Criterion is divided into one or more Sub Criteria. Each Sub Criterion becomes the heading for a WorldSkills marking form. Each marking form (Sub Criterion) contains Aspects to be assessed and marked by Measurement or Judgement, or both Measurement and Judgement.

Each marking form (Sub Criterion) specifies both the day on which it will be marked, and the identity of the marking team.

4.4 Aspects

Each Aspect defines, in detail, a single item to be assessed and marked, together with the marks, and detailed descriptors or instructions as a guide to marking. Each Aspect is assessed either by Measurement or by Judgement.

The marking form lists, in detail, every Aspect to be marked together with the mark allocated to it. The sum of the marks allocated to each Aspect must fall within the range of marks specified for that section of the Standards. This will be displayed in the Mark Allocation Table of the CIS, in the following format, when the Marking Scheme is reviewed from C-8 weeks. (Section 4.1 refers.)

		CRITERIA								TOTAL MARKS PER SECTION	WSSS MARKS PER SECTION	VARIANCE
		A	B	C	D	E	F	G	H			
STANDARDS SPECIFICATION SECTION	1	5.00								5.00	5.00	0.00
	2		2.00					7.50		9.50	10.00	0.50
	3								11.00	11.00	10.00	1.00
	4			5.00						5.00	5.00	0.00
	5				10.00	10.00	10.00			30.00	30.00	0.00
	6		8.00	5.00				2.50	9.00	24.50	25.00	0.50
	7			10.00				5.00		15.00	15.00	0.00
TOTAL MARKS		5.00	10.00	20.00	10.00	10.00	10.00	15.00	20.00	100.00	100.00	2.00

4.5 Assessment and marking

There is to be one marking team for each Sub Criterion, whether it is assessed and marked by Judgement, Measurement, or both. The same marking team must assess and mark all Competitors. Where this is impracticable (for example where an action must be done by every Competitor simultaneously, and must be observed doing so), a second tier of assessment and marking will be put in place, with the approval of the Competitions Committee Management Team. The marking teams must be organized to ensure that there is no compatriot marking in any circumstances. (Section 4.6 refers.)

4.6 Assessment and marking using Judgement

Judgement uses a scale of 0-3. To apply the scale with rigour and consistency, Judgement must be conducted using:

- benchmarks (criteria) for detailed guidance for each Aspect (in words, images, artefacts, or separate guidance notes). This is documented in the Standards and Assessment Guide.
- the 0-3 scale to indicate:
  - 0: performance below industry standard
  - 1: performance meets industry standard
  - 2: performance meets and, in specific respects, exceeds industry standard
  - 3: performance wholly exceeds industry standard and is judged as excellent

Three Experts will judge each Aspect, normally simultaneously, and record their scores. A fourth Expert coordinates and supervises the scoring, and checks their validity. They also act as a judge when required to prevent compatriot marking.

4.7 Assessment and marking using Measurement

Normally three Experts will be used to assess each Aspect, with a fourth Expert supervising. In some circumstances the team may organize itself as two pairs, for dual marking. Unless otherwise stated, only the maximum mark or zero will be awarded. Where they are used, the benchmarks for awarding partial marks will be clearly defined within the Aspect. To avoid errors in calculation or transmission, the CIS provides a large number of automated calculation options, the use of which is mandated.

4.8 The use of Measurement and Judgement

Decisions regarding the choice of criteria and assessment methods will be made during the design of the competition through the Marking Scheme and Test Project.

4.9 Skill assessment strategy and procedures

WorldSkills is committed to continuous improvement including reviewing past limitations and building on good practice. The following skill assessment strategy and procedures for this skill competition take this into account and explain how the marking process will be managed.

Marking Teams are formed in accordance with the Competition Rules.

The Marking Scheme developed by the Independent Test Project Designer will comprise Aspects with clear calculations and/or added detail.

There may be up to five (5) different types of measurement in the Marking Scheme. The table below explains these. Judgement marking is used to assess qualitative aspects.

Type	Example	Maximum marks	Correct	Not correct
Full marks or zero marks	Deployment of MySQL compatible service (i.e. a required service).	1	1	0

Type	Example	Maximum marks	Correct	Not correct
Deduct from full marks	Failure to design for high availability	1.0	1.0	0 – 0.9
Add to zero marks	Deployment of suggested but not required service or feature (e.g. CDN, database or HTTP cache)	1.0		
Processed messages	Calculated based upon rate and number of completed processed messages.			
Operational efficiency	Calculated based upon the ability to scale up and down infrastructure (instances) to ensure limited wasted resources.			

A team of Experts will

- Review each Competitor's infrastructure data, and
- Orchestrate infrastructure processing and failure requests.

This team will have access to a dashboard with command and control capabilities along with a status display of each Competitor's progress.

At the start of the competition, a designated Expert will explain the purpose of an application design and goals for a deployment. Competitors are expected to utilize a broad range of technologies and solutions in order to meet the demands of the application requests.

Since the application limitations are not based upon the vertical scalability of resources, each Competitor shall be limited in implementation to cost-effective infrastructure resources.

Each Competitor may use any means of infrastructure design, implementation, and deployment with the exception of de-compilation or modification of the supplied application.

Competition will be considered "fault finding" for two days, and two days of "fault finding" in the afternoon only.

5 The Test Project

5.1 General notes

Sections 3 and 4 govern the development of the Test Project. These notes are supplementary.

Whether it is a single entity, or a series of stand-alone or connected modules, the Test Project will enable the assessment of the applied knowledge, skills, and behaviours set out in each section of the WSOS.

The purpose of the Test Project is to provide full, balanced, and authentic opportunities for assessment and marking across the Standards, in conjunction with the Marking Scheme. The relationship between the Test Project, Marking Scheme, and Standards will be a key indicator of quality, as will be its relationship with actual work performance.

The Test Project will not cover areas outside the Standards or affect the balance of marks within the Standards other than in the circumstances indicated by Section 2. This Technical Description will note any issues that affect the Test Project's capacity to support the full range of assessment relative to the Standards. Section 2.1 refers.

The Test Project will enable knowledge and understanding to be assessed solely through their applications within practical work. The Test Project will not assess knowledge of WorldSkills rules and regulations.

Most Test Projects and Marking Schemes are now designed and developed independently of the Experts. They are designed and developed either by the Skill Competition Manager, or an Independent Test Project Designer, normally from C-12 months. They are subject to independent review, verification, and validation. (Section 4.1 refers.)

The information provided below will be subject to what is known at the time of completing this Technical Description, and the requirement for confidentiality.

Please refer to the current version of the Competition Rules for further details.

5.2 Format/structure of the Test Project

The Test Project is a series of standalone modules.

5.3 Test Project design requirements

Test Projects should reflect the purposes, structures, processes, and outcomes of the occupational role they are based on. They should aim to be a small-scale version of that role. Before focusing on practicalities, SMTs should show how the Test Project design will provide full, balanced, and authentic opportunities for assessment and marking across the Standards, as set out in Section 5.1.

To be determined in accordance with the WorldSkills Occupational Standards by the Skill Competition Manager and the Independent Test Project Designer.

5.4 Test Project coordination and development

The Test Project MUST be submitted using the templates provided by WorldSkills International (www.worldskills.org/expertcentre). Use the Word template for text documents and DWG template for drawings.

5.4.1 Test Project coordination (preparation for Competition)

Coordination of the Test Project/modules will be undertaken by the Skill Competition Manager.

5.4.2 Who develops the Test Project/modules

The Test Project/modules are developed by an Independent Test Project Designer (ITPD) in collaboration with the Skill Competition Manager.

5.4.3 When is the Test Project developed

The Test Project/modules are developed according to the following timeline:

Time	Action
Ten (10) months prior to the Competition	The ITPD is identified and a Confidentiality Agreement between WSI and the ITPD is organized.
Three (3) months prior to the Competition	The Test Project documents are sent to the WorldSkills International Skills Competitions Administration Manager.
At the Competition on C1	The Test Project/modules are presented to Experts and Competitors.

5.5 Test Project initial review and verification

The purpose of a Test Project is to create a challenge for Competitors which authentically represents working life for an outstanding practitioner in an identified occupation. By doing this, the Test Project will apply the Marking Scheme and fully represent the WSOS. In this way it is unique in its context, purpose, activities, and expectations.

To support Test Project design and development, a rigorous quality assurance and design process is in place (Competition Rules sections 10.6-10.7 refer.) Once approved by WorldSkills, the Independent Test Project Designer (ITPD) is expected to identify one or more independent expert(s), and trusted individuals initially to review the Independent Test Project Designer's ideas and plans, and subsequently to verify the Test Project, prior to validation.

A Skill Advisor will ensure and coordinate this arrangement, to guarantee the timeliness and thoroughness of both initial review, and verification, based on the risk analysis that underpins Section 10.7 of the Competition Rules.

5.6 Test Project validation

The Skill Competition Manager coordinates the validation of the Test Project/modules and will ensure that it can be completed within the material, equipment, knowledge, and time constraints of Competitors.

5.7 Test Project circulation

The Test Project/modules are not circulated prior to the Competition. The Test Project/modules are presented to Experts and Competitors on C1.

5.8 Test Project change

Due to the Test Project being developed by an Independent Test Project Designer (ITPD), there is no change required to be made to the Test Project/modules at the Competition. Exceptions are amendments to technical errors in the Test Project documents and according to infrastructure limitations.

5.9 Material or manufacturer specifications

Specific material and/or manufacturer specifications required to allow the Competitor to complete the Test Project will be supplied by the Competition Organizer and are available from www.worldskills.org/infrastructure located in the Expert Centre. However, note that in some cases details of specific materials and/or manufacturer specifications may remain secret and will not be released prior to the Competition. These items may include those for fault finding modules or modules not circulated.

6 Skill management and communication

6.1 Discussion Forum

Prior to the Competition, all discussion, communication, collaboration, and decision making regarding the skill competition must take place on the WorldSkills skill-specific Discussion Forum. (http://forums.worldskills.org). Skill related decisions and communication are only valid if they take place on the WorldSkills Discussion Forum. The Chief Expert (or an Expert Lead appointed by the Skill Management Team) will be the moderator for this Discussion Forum. Refer to the Competition Rules for the timeline of communication and competition development requirements.

6.2 Competitor information

All information for registered Competitors is available from the Competitor Centre (www.worldskills.org/competitorcentre).

This information includes:

- Competition Rules
- Technical Descriptions
- Mark Summary Form (where applicable)
- Test Projects (where applicable)
- Infrastructure List
- WorldSkills Health, Safety, and Environment Policy and Regulations
- Other Competition-related information

6.3 Test Projects and Marking Schemes

Circulated Test Projects will be available from www.worldskills.org/testprojects and the Competitor Centre (www.worldskills.org/competitorcentre).

6.4 Day-to-day management

The day-to-day management of the skill competition during the Competition is defined in the Skill Management Plan that is created by the Skill Management Team. The Skill Management Team comprises the Skill Competition Manager, Chief Expert, and the Expert Leads. The Skill Management Plan is progressively developed in the six (6) months prior to the Competition and finalized at the Competition. The Skill Management Plan can be viewed in the Expert Centre (www.worldskills.org/expertcentre).

6.5 General best practice procedures

General best practice procedures clearly delineate the difference between what is a best practice procedure and skill-specific rules (section 9). General best practice procedures are those where Experts and Competitors CANNOT be held accountable as a breach to the Competition Rules or skill-specific rules which would have a penalty applied as part of the Issue and Dispute Resolution procedure including the Code of Ethics and Conduct Penalty System. In some cases, general best practice procedures for Competitors may be reflected in the Marking Scheme.

Topic/task	Best practice procedure
Equipment failure	• Competitors – In the occurrence of equipment failure Competitors must notify Experts immediately by raising their hand. Experts will take note of the time that the Competitor is not able to make use of their equipment. Any time lost due to equipment failure is provided to the Competitor at the end of the standard module time. • No additional time is granted for work not saved prior to the equipment failure.
Final Test Projects	• Competitors - Final Test Projects for all Competitor are backed up and made available to all Competitors at the conclusion of the competition on C4 where possible.
Familiarization Day	• Competitors - During Familiarization Day Competitors cannot use the available time to work on or solve any tasks related to the Competition. Prior to completing familiarization all Competitors need to clean their respective computers removing all the files created/used to test the software. This includes the removal of all databases which have been created.
Breaks	• Competitors - No extra time is given to Competitors who stop work during competition time to go to the bathroom or for those who break for a food and/or drink. When time is completed all Competitors must stop all work on their computer immediately. • When breaks start, all Competitors must stop all work on their computer immediately
Announcements	• Every announcement must be accompanied by a web-based document that is available to all Competitors during competition.
Music	• Competitors are allowed to using headphones with the approval of either the Chief Expert or Deputy Chief Expert. The headphones are kept at the Competitor's workstation or lockers until the completion of competition on C4. • Music streaming from an outside source such as Apple Music or Spotify is allowed only after the approval of either the Chief Expert or Deputy Chief Expert.
Assessment	• Marking is based on metrics measured by automatic tools.

7 Skill-specific safety requirements

7.1 Personal Protective Equipment

Refer to WorldSkills Health, Safety, and Environment Policy and Regulations for Host country or region regulations.

Task	Earplugs
General PPE for safe areas	Optional

8 Materials and equipment

8.1 Infrastructure List

The Infrastructure List details all equipment, materials, and facilities provided by the Competition Organizer.

The Infrastructure List is available at www.worldskills.org/infrastructure.

The Infrastructure List specifies the items and quantities requested by the Skill Management Team for the next Competition. The Competition Organizer will progressively update the Infrastructure List specifying the actual quantity, type, brand, and model of the items. Note that in some cases details of specific materials and/or manufacturer specifications may remain secret and will not be released prior to the Competition. These items may include those for fault finding modules or modules not circulated.

At each Competition, the Skill Management Team must review and update the Infrastructure List in preparation for the next Competition. The Skill Competition Manager must advise the Director of Skills Competitions of any increases in space and/or equipment.

At each Competition, the Technical Observer must audit the Infrastructure List that was used at that Competition for the upcoming WorldSkills Competition.

The Infrastructure List does not include items that Competitors and/or Experts are required to bring and items that Competitors are not allowed to bring – they are specified below.

8.2 Competitors toolbox

Competitors are not allowed to send a toolbox to the Competition. All tools are provided by the Competition Organizer.

8.3 Materials, equipment, and tools supplied by Competitors

It is not applicable for Competitors to bring materials, equipment, and tools to the Competition.

8.4 Materials, equipment, and tools supplied by Experts

Experts are required to supply their own Personal Protective Equipment as specified in section 7 skill-specific safety requirements.

Experts are responsible that Interpreters bring their PPE.

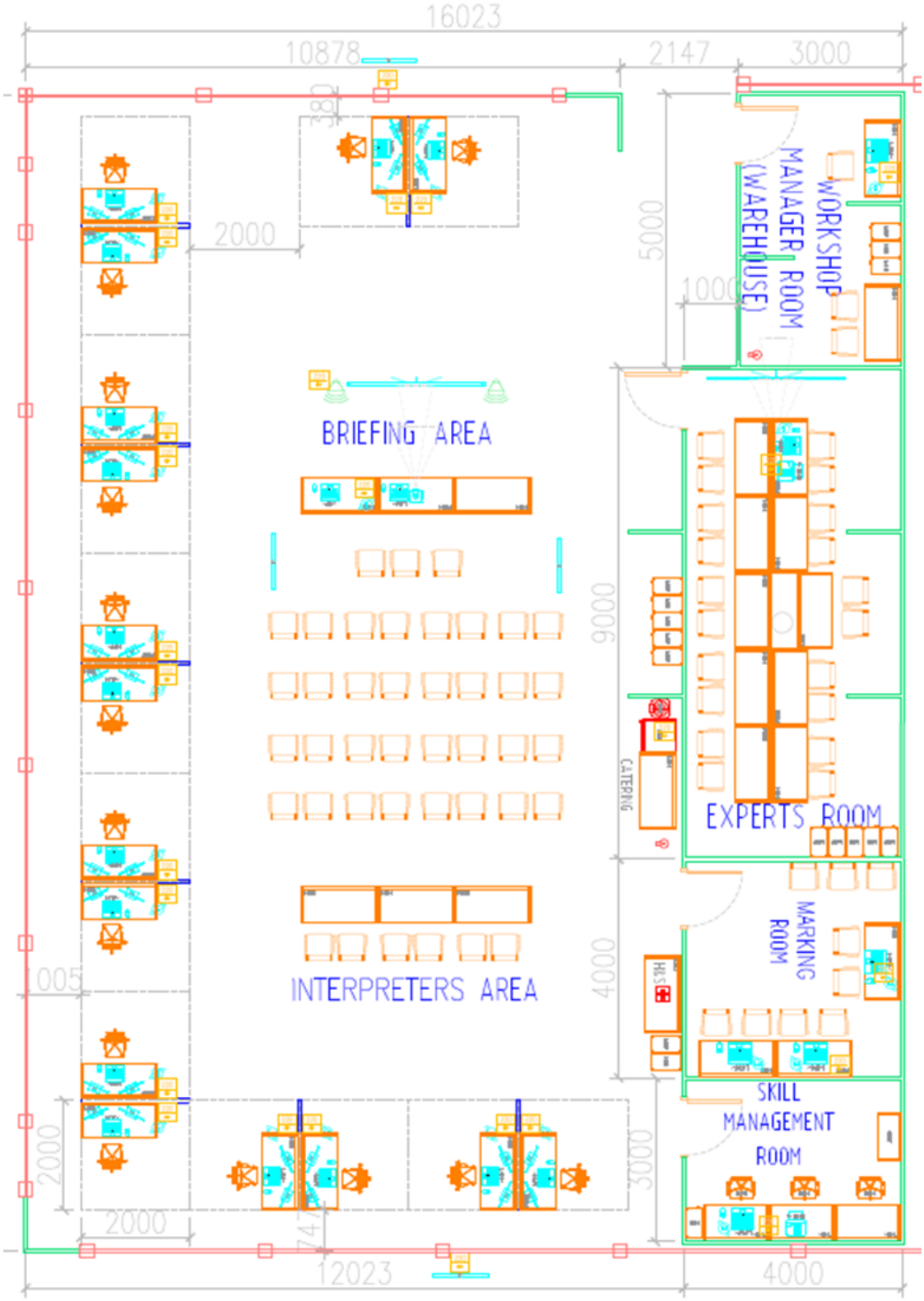
8.5 Materials and equipment prohibited in the skill area

Competitors and Experts are prohibited to bring any materials or equipment not listed in section 8.3 and section 8.4.

8.6 Proposed workshop and workstation layouts

Workshop layouts from previous competitions are available at www.worldskills.org/sitelayout.

Example workshop layout



9 Skill-specific rules

9.1 General notes

Skill-specific rules cannot contradict or take priority over the Competition Rules. They do provide specific details and clarity in areas that may vary from skill competition to skill competition. This includes but is not limited to personal IT equipment, data storage devices, Internet access, procedures and workflow, and documentation management and distribution. Breaches of these rules will be solved according to the Issue and Dispute Resolution procedure including the Code of Ethics and Conduct Penalty System.

9.2 Skill-specific rules

Topic/task	Skill-specific rule
Use of technology – USB, memory sticks	• The Chief Expert, Experts, and Interpreters are allowed to bring USB/ memory sticks into the Expert Meeting room only, they are not allowed in the general workshop area. If these items are brought into the workshop they must be locked in the personal locker when not in use in the meeting room, they can be taken out at the end of each day.
Use of technology – personal laptops	• The Chief Expert and Experts are allowed to bring laptops into the Expert Meeting room. When not in use they should be locked in the personal lockers and are allowed to be taken outside of the meeting room at the end of each day. • Competitors and Interpreters – No laptops are allowed in the workshop. If these items are brought into the workshop they must be locked in the personal locker, they can be taken out at the end of each day.
Use of technology – personal cameras	• The Chief Expert, Experts, and Interpreters are allowed to bring cameras into the Expert Meeting room. When not in use they should be locked in the personal lockers and are allowed to be taken outside of the meeting room at the end of each day. • Competitors – No cameras are allowed in the workshop until the completion of competition on C4. If these items are brought into the workshop they must be locked in the personal locker, they can be taken out at the end of each day.

Topic/task	Skill-specific rule
Use of technology – mobile devices	• The Chief Expert, Experts, and Interpreters – No electronic devices are to be brought to any Competitor workstation under any circumstances unless with approval of the Chief Expert. • Competitors – Electronic devices (Including mobile phones) must stay in Competitor bags (switched off or on silent) within the lockers provided. No electronic devices are to be brought to Competitors workstations under any circumstances unless with the approval of the Chief Expert. Electronic devices are allowed to be taken outside at the end of each day. • Interpreters are allowed to use electronic translators with the approval of the Chief Expert.
Source file/ notes	• Competitors – No notes may be brought into the workshop under any circumstances. All notes made at the Competitor workstation must remain on the Competitors desk at all times. No notes may be taken outside of the workshop by any mean.
Competition Files	• To foster growth of the skill, if applicable, all materials given to all WSI members (Source files, binaries, requests) through WorldSkills website.
Uniqueness of Challenges	• Any “AWS JAM” challenges must be new, non-public challenges previously unreleased to the marketplace.

10 Visitor and media engagement

10.1 Engagement methods

Following is a list of possible ways to maximize visitor and media engagement:

- Display screens Competitors virtual rating (not marks);
- Display screens showing a presentation on what competitors are currently working on;
- Enhanced understanding of Competitor activity;
- Career opportunities.

11 Sustainability

11.1 Sustainable practices

This skill competition will focus on the sustainable practices below:

- Recycling;
- No printing facilities at each Competitor workstations;
- No printing of Test Projects. Test Projects are provided within media files;
- Limit the amount of software to be installed on Competitor workstations;
- Open source software;
- Single-use plastic should be avoided where possible (e.g. provide re-useable water bottles).

12 References for industry consultation

12.1 General notes

WorldSkills is committed to ensuring that the WorldSkills Occupational Standards fully reflect the dynamism of internationally recognized best practice in industry and business. To do this WorldSkills approaches a number of organizations across the world that can offer feedback on the draft Description of the Associated Role and WorldSkills Occupational Standards on a two-yearly cycle.

In parallel to this, WSI consults three international occupational classifications and databases:

- ISCO-08: (http://www.ilo.org/public/english/bureau/stat/isco/isco08/)
- ESCO: (https://ec.europa.eu/esco/portal/home)
- O*NET OnLine (www.onetonline.org/)

12.2 References

Your WSOS (Section 2) appears most closely to relate to a junior version of IT System Architect:
http://data.europa.eu/esco/occupation/e1c72b5f-4c5c-487c-a6df-e84b64a51dae

or a junior version of Computer Network Architects:
https://www.onetonline.org/link/summary/15-1143.00

Junior version ILO 2511.

The following table indicates which organizations were approached and provided valuable feedback for the Description of the Associated Role and WorldSkills Occupational Standards in place for WorldSkills Lyon 2024.

Organization	Contact name
Amazon Web Services	Ronan Guilfoyle, Head of Commercial Solutions Architecture, Ireland
Shanghai iddeal information industry CO., LTD	Yuqing Xu, BU Manager

13 Appendix

13.1 Appendix information

Not applicable.