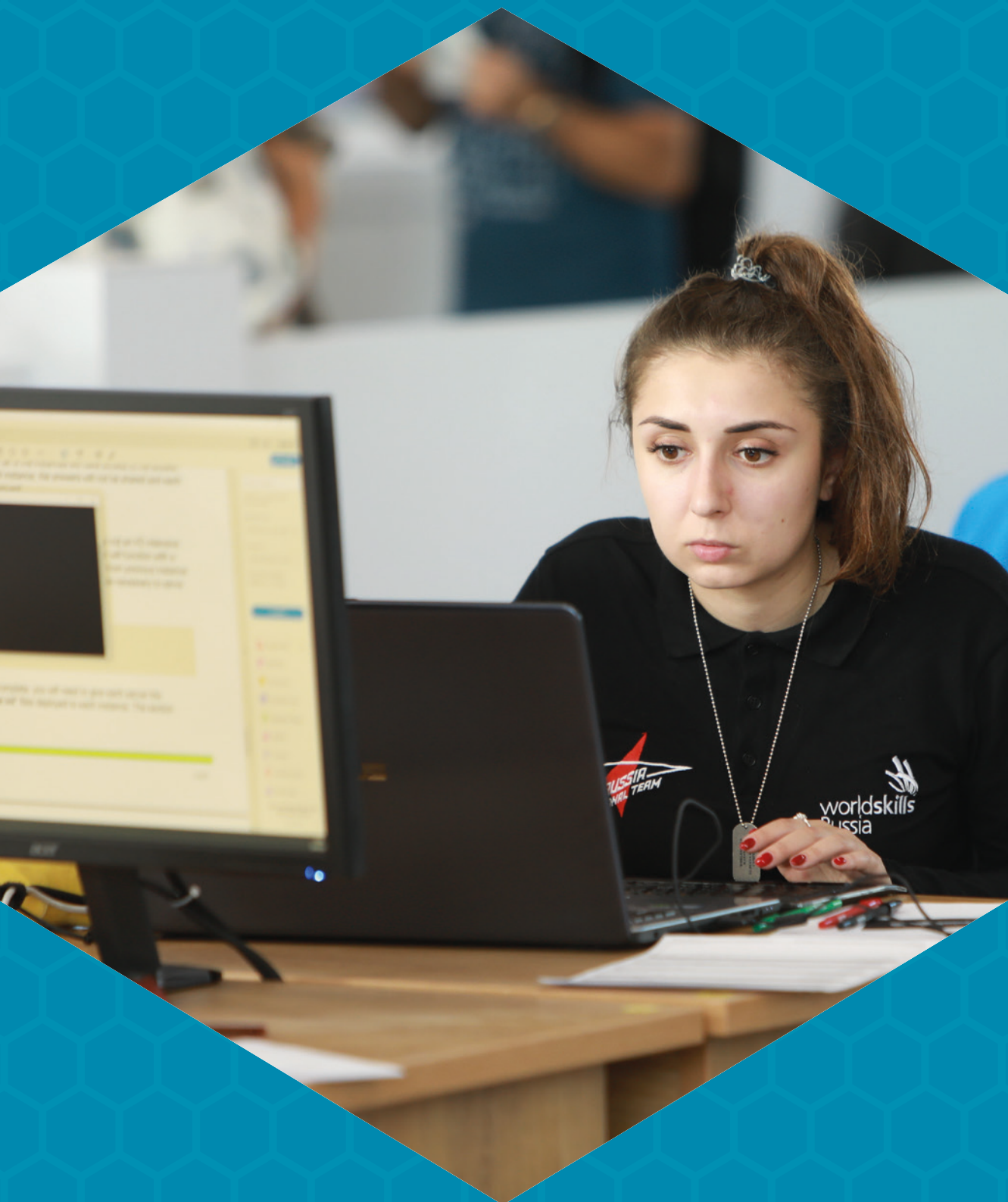


INFORMATION AND COMMUNICATION TECHNOLOGY

# Cloud Computing



## WorldSkills Occupational Standards

# WorldSkills Occupational Standards (WSOS)

## Occupation description and WSOS

### The name of the occupation is

Cloud Computing

### 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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## General notes on the WSOS

The WSOS specifies the knowledge, understanding, and specific skills that underpin international best practice in technical and vocational performance. It 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](http://www.worldskills.org/WSOS)).

The skill competition is intended to reflect international best practice as described by the WSOS, and to the extent that it is able to. 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 that are set out in the Standards Specification. 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, provided that this does not distort the weightings assigned by the Standards.

# WorldSkills Occupational Standards

Section	Relative importance (%)
<b>1 Work organization and management</b>	<b>10</b>

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
- 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.

<b>2 Communication and interpersonal skills</b>	<b>10</b>
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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.

Section	Relative importance (%)
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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.

<b>3 Problem solving, innovation, and creativity</b>	<b>20</b>
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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.

Section	Relative importance (%)
<b>4 Security</b>	<b>10</b>

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 security between cloud providers and public cloud customers.
- The importance and intent of network traffic and resource isolation.

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 security 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 security best practices while ensuring an efficient user experience.

<b>5 Reliability, scalability, and elasticity</b>	<b>20</b>
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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.

Section	Relative importance (%)
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- 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 systems.
- 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.

<b>6 Performance and optimization</b>	<b>10</b>
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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.

Section	Relative importance (%)
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>Analyse and interpret performance metrics from compute, storage, network, and application levels for use in public cloud infrastructure design objectives.</li> <li>Utilize performance tuning techniques and packages to ensure optimal resource utilization.</li> <li>Implement microservice strategies to capitalize on technology advances in areas like container development.</li> <li>Pursue the decoupling of services to allow the separation of application components to facilitate a service-oriented architecture.</li> <li>Recommend and implement database and storage solutions that best fit the needs of an application.</li> <li>Implement serverless architecture</li> </ul>	
<b>7 Operational considerations</b>	<b>10</b>
<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>The requirements of systems and applications in order to maintain functionality and availability.</li> <li>System, network, and application metrics and how they apply to infrastructure durability, availability, and performance.</li> <li>Response requirements, protocols, and procedures for various incidents including security, availability, and performance-related incidents.</li> </ul>	
<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>Implement monitoring solutions to generate alerts and automate responses to various incidents.</li> <li>Implement centralized metric collection and analysis for systems, network, and application information.</li> <li>Implement a process to continually improve architectural designs by automating infrastructure configuration updates.</li> <li>Continuously monitor and review systems and applications for design improvement opportunities.</li> <li>Continuously test for failure and design for resiliency.</li> <li>Ensure cloud configurations are kept current and versioned.</li> </ul>	
<b>Total</b>	<b>100</b>



## References for industry consultation

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/](http://www.onetonline.org/))

Your WSOS 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>

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 Shanghai 2022.

Organization	Contact name
LLC SBcloud (Russia)	Andrey Belyi, Cloud Architect
VMware (Global)	Andrey Krylov, NSX Systems Engineer