Crosswalk between ESCO and ECSF

EXECUTIVE SUMMARY

The ESCO classification and the ECSF framework both aim to analyse the labour market in terms of job roles and required skills, albeit with different scopes. ESCO classifies the entire EU market across various sectors, while ECSF focuses specifically on the cybersecurity sector

During the update for ESCO v1.2, ENISA collaborated effectively with the ESCO team by improving the cybersecurity occupations and related skills.

The ESCO v1.2 has five occupations exactly matched with 5 ECSF cybersecurity role profiles, and 7 ECSF profiles are associated with multiple ESCO occupations based on tasks, skills, and scope with different relationship levels.

This crosswalk between ECSF and ESCO taxonomies enhances their overall effectiveness, usability, and application for stakeholders by ensuring that cybersecurity roles and skills are accurately represented and aligned across both frameworks.

1. INTRODUCTION

THE ESCO CLASSIFICATION

ESCO is the multilingual classification of European Skills, Competences and Occupations. The ESCO classification works as a dictionary, identifying and categorising skills, competences, qualifications and professional occupations relevant to the EU labour market, education and training. Currently, ESCO provides descriptions of 3,039 occupations and 13,939 skills, translated into 28 languages. The aim of ESCO is to support job mobility across Europe and therefore achieve a more integrated and effective labour market, by offering a common language on occupations and skills that can be used by different stakeholders on employment and education and training topics.

THE EUROPEAN CYBERSECURITY SKILLS FRAMEWORK (ECSF)

The European Cybersecurity Skills Framework (ECSF), released by ENISA, is a practical tool to support the identification and articulation of tasks, competences, skills and knowledge associated with the roles of cybersecurity professionals. The ECSF summarises the cybersecurity-related roles into 12 job profiles, providing a common understanding of the main cybersecurity job profiles, competencies, skills and knowledge across the EU.

ECSF AND ESCO RELATIONSHIP

The **ESCO classification and the ECSF framework share common goals**, that of **analysing the labour market in terms of professional roles and skills required**, though working under different scopes. While the **ESCO classification tries to classify the whole EU labour market** and its various sectors, the **ECSF focuses on the cybersecurity sector** providing a specific analysis of its needs in job profiles. Consequently, linking the two initiatives through a mapping could further enhance them, increase their usability and area of application.

An **initial mapping between ESCO occupations and ECSF role profiles conducted for the first release of the ECSF, in 2022**. During that mapping, which was included in the ECSF user manual, it was identified that some **ESCO cybersecurity-related occupations needed to be updated to provide a more accurate description** and a refined mapping with the associated cybersecurity-related skills and competences.

IMPROVEMENTS IN ESCO V1.2

During the update phase of ESCO towards the release of the new v1.2, **ENISA collaborated with the ESCO team** and, **using the ECSF**, **introduced several changes to the ESCO** classification to better reflect the occupations and the skills needed in the field of cybersecurity. The collaboration resulted in the following changes to the ESCO:

- 3 cybersecurity-related occupations were reformulated, namely the "director of compliance and information security", the "cybersecurity risk manager" and the "cyber incident responder"
- 5 new cybersecurity-related skills were added
- 46 alternative labels were added in various cybersecurity-related occupations
- 6 cybersecurity-related occupations had skill set improvements
- 8 cybersecurity-related skills were reformulated in terms of PTs and descriptions
- 34 alternative labels were added in various cybersecurity-related skills

2. MAPPING OF THE ESCO AND ECSF ROLES

2.1 IDENTIFIED RELATIONSHIP TYPES

The conducted analysis of the ECSF role profiles and the ESCO occupations highlighted 4 possible relationship types that can be used to link the 12 ECSF role profiles with various ESCO profiles that share similar skills, knowledge, tasks, or competences.

The 4 types of relationships identified are:

- The ESCO occupation **is an exact match with** the ECSF role profile – Indicates a direct, one-to-one match between an ESCO occupation and an ECSF role profile. The description, tasks, skills, knowledge, and competencies outlined in both frameworks are almost identical, providing a unified definition of the cybersecurity role.
- The ESCO occupation **shares tasks with** the ECSF role profile – Highlights overlapping areas of skills, knowledge, and tasks between an ESCO occupation and an ECSF role profile without a direct hierarchical inclusion. Both profiles share certain tasks and competencies, indicating areas of similarity and common ground between the two classifications.
- The ESCO occupation **is more specific than** the ECSF role profile – Showcase that the ECSO occupation might encompass a narrower set of skills, knowledge, and/or tasks with respect to the ESCF role profiles. This means that while the ESCO occupation is part of the ECSF role profile, the latter includes additional items not covered by the ESCO occupation alone.
- The ESCO occupation **is broader than** the ECSF role profile – The ESCO occupation covers a broader scope, covering a wider range of skills, knowledge, and/or tasks, possibly including the ECSF role profile.
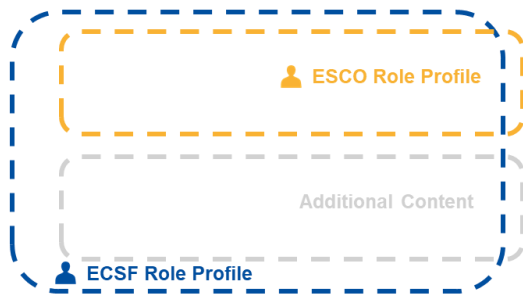
Thus, the ECSF role profile is most probably fully contained within the broader scope of the ESCO occupation.

The ESCO occupation is an exact match with the ECSF role profile
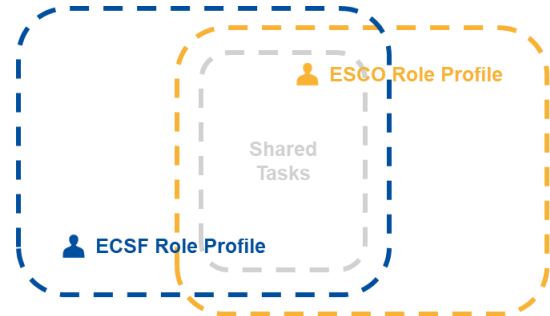
The ESCO occupation shares tasks with the ECSF role profile

The ESCO occupation is more specific than ECSF role profile

The ESCO occupation is broader than the ECSF role profile

2.2 MAPPING OF ESCO AND ECSF ROLES

In this section the results of the mapping are presented in detail, linking the 12 ECSF role profiles with the appropriate ESCO occupations using the relationships presented in the previous section.

For each of the job profiles, the outcome of the analysis and integration of the mapping in ESCO v1.2 is also presented.

Profile 1: Chief Information Security Officer

The ESCO occupation of "Chief ICT Security Officer" matches the ECSF role of "**Chief Information Security Officer (CISO)**" sharing the same scope.

The Chief Information Security Officer (CISO) ECSF role profile **is an exact match with** the Chief ICT Security Officer ESCO occupation

Outcome in ESCO v1.2: 6 cybersecurity-related alternative labels were added to the existing ESCO occupation "**Chief ICT Security Officer**". These include "*information security officer*", "*ISO*", "*IT security officer*" and "*ICT security officer*".

Profile 2: Cyber Incident Responder

As the name suggests, the ESCO occupation of "Cyber Incident Responder" is an exact match for the ECSF role of "**Cyber Incident Responder**" describing the same role.


The Cyber Incident Responder ECSF role profile **is an exact match with** the Cyber Incident Responder ESCO occupation

Outcome in ESCO v1.2: 9 cybersecurity-related alternative labels were added to the existing ESCO occupation "**Cyber Incident Responder**". These include "*cyber incident handler "*, "*SOC analyst*" and "*incident response engineer*".

Profile 3: Cyber Legal, Policy & Compliance Officer

The ESCO occupation of "Director of Compliance and Information Security" is more specific than the ECSF role of "**Cyber Legal, Policy & Compliance Officer.**

The ESCO occupations of "Data Protection Officer" is a close match with the ECSF role of "**Cyber Legal, Policy & Compliance Officer**", who manages compliance with cybersecurity-related standards, legal and regulatory frameworks based on the organisation's strategy and legal requirements.
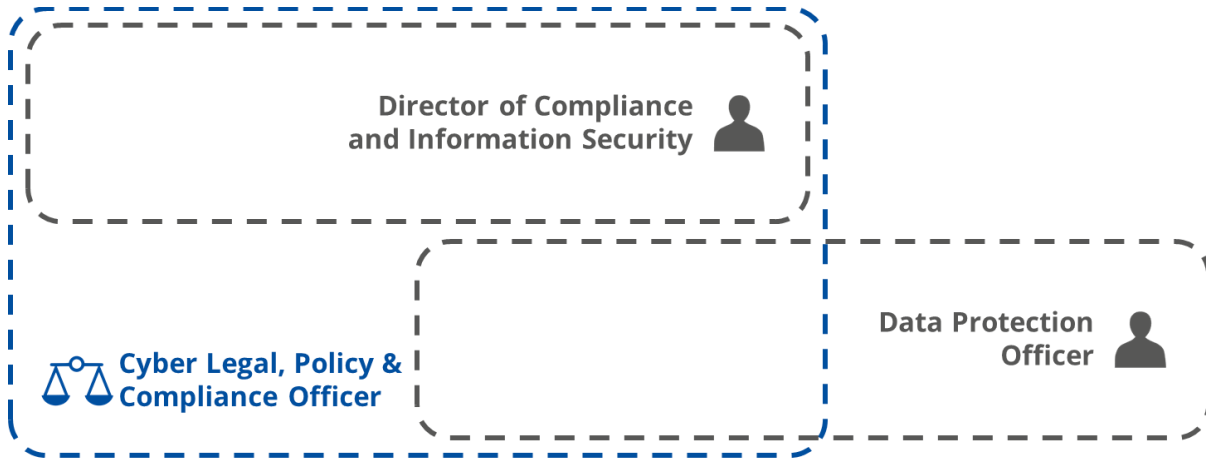
The Director of Compliance and Information Security ESCO occupation **is more specific than** the Cyber Legal, Policy & Compliance Officer ECSF role profile, while the Data Protection Officer ESCO occupation **shares tasks with** the latter

Outcome in ESCO v1.2: 3 cybersecurity-related alternative labels were added to the existing ESCO occupation "**Data Protection Officer**", including "data compliance officer," which highlights the compliance aspect.

Additionality 8 cybersecurity-related alternative labels were added to the existing ESCO occupation "**Director of Compliance and Information Security**". These include "*compliance and information security manager*", "*ICT compliance manager*", "*cyber legal advisor*" and "*cybersecurity legal officer*".

Profile 4: Cyber Threat Intelligence Specialists

The ESCO occupation of "Intelligence Officer" defines a broader scope enclosing the ECSF role of "**Cyber Threat Intelligence Specialists**", who focuses on the cybersecurity aspect of the intelligence.


The Intelligence Officer ESCO occupation **is more specific than** the
Cyber Threat Intelligence Specialist ECSF role profile

Outcome in ESCO v1.2: the cybersecurity-related alternative label *cyber threat intelligence specialist* was added as a narrower synonym to the existing ESCO occupation "**Intelligence Officer**" to cover the ECSF role "**Threat Intelligence Specialist**".

Profile 5: Cybersecurity Architect

The ESCO occupations of "ICT System Architect", "Software Architect", "Cloud Architect", and "ICT Network Architect" share tasks with the ECSF role of "**Cybersecurity Architect**", who has the

responsibility to plan and design security-by-design solutions and cybersecurity controls in any domain (ICT, software, cloud, network).
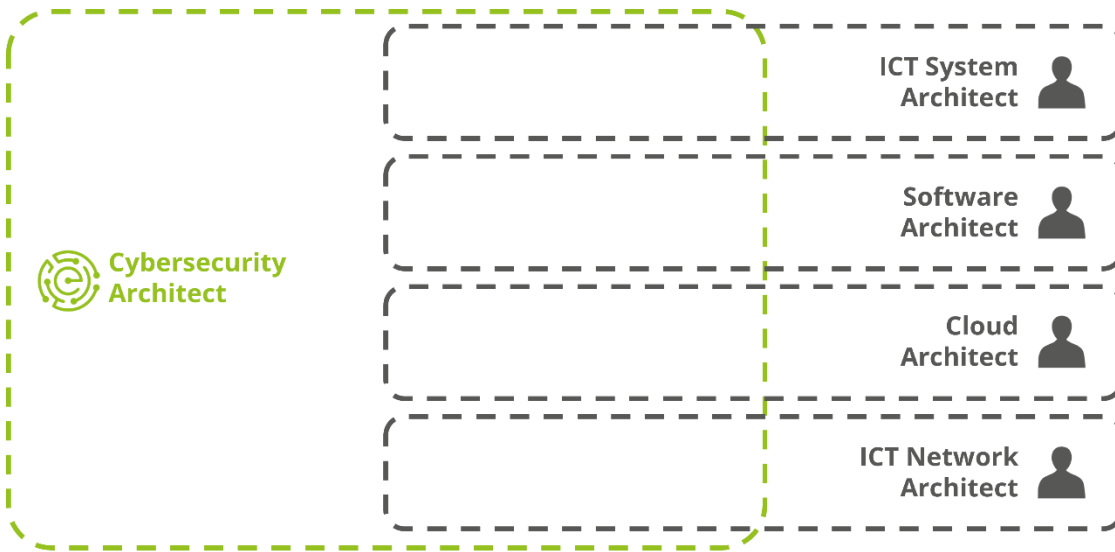
The ICT System Architect, the Software Architect, the Cloud Architect, and the ICT Network Architect ESCO occupations all **share tasks with** the Cybersecurity Architect ECSF role profile

Profile 6: Cybersecurity auditor

The ESCO occupations of "IT Auditor" and "ICT Auditor Manager" combined cover the scope of the ECSF role of "**Cybersecurity Auditor**", who has a special focus on the cybersecurity aspect.
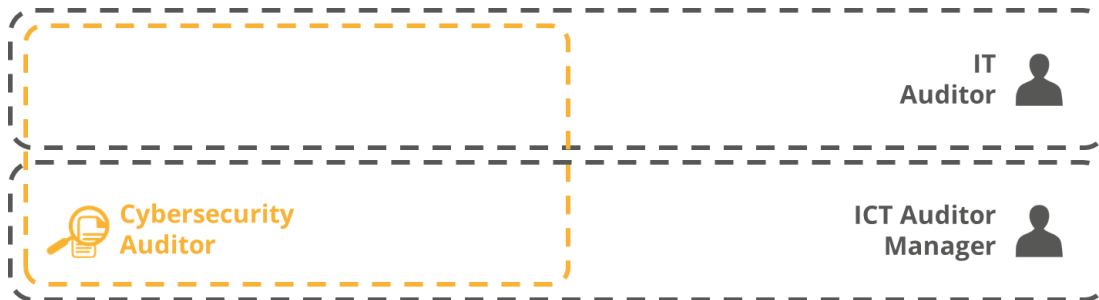
Both the IT Auditor and the ICT Auditor Manager ESCO occupations
are broader than the Cybersecurity Auditor ECSF role profile

Profile 7: Cybersecurity educator

The ESCO occupations of "Higher Education Lecturer" and "Information Technology Trainer" are broader than the ECSF role of "**Cybersecurity Educator**", as depending on their expertise they might be able to teach cybersecurity-related topics.
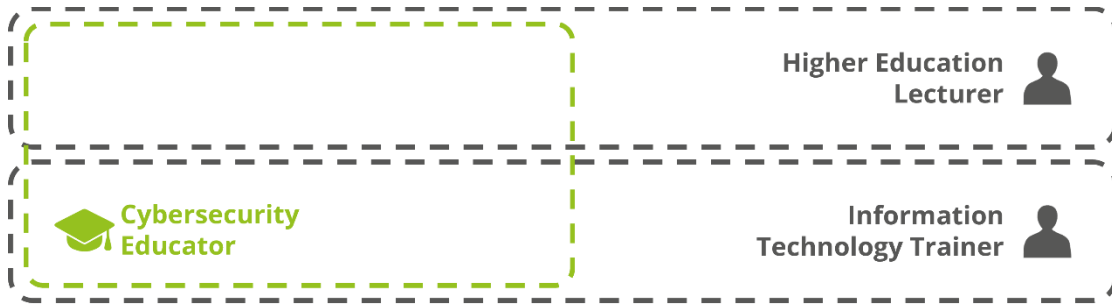
Both the Higher Education Lecturer and the Information Technology Trainer ESCO occupations **are broader than** the Cybersecurity Educator ECSF role profile

Outcome in ESCO v1.2: the ECSF job role "**Cybersecurity Educator**" was not included in ESCO because it was deemed as too granular for the classification based on the internal validation guidelines.

Profile 8: Cybersecurity implementer

The ESCO occupations of "Embedded System Security Engineer", "ICT Security Administrator" and "ICT Security Technician" share tasks with the ECSF role of "**Cybersecurity Implementer**", who is in charge of developing, deploying, and operating cybersecurity solutions (systems, assets, software, controls, and services) on infrastructures and products.
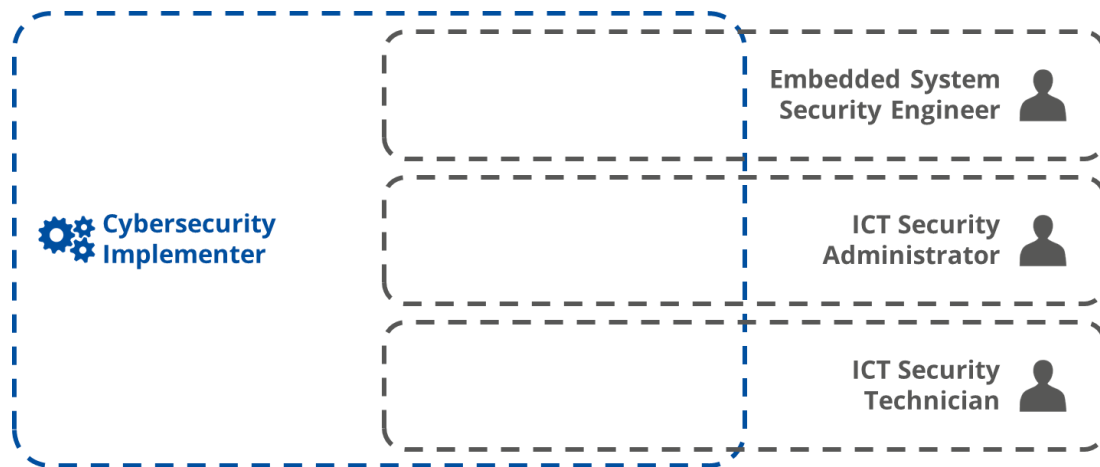
The Embedded System Security Engineer, the ICT Security Administrator, and the ICT Security Technician ESCO occupations **share tasks with** the Cybersecurity Implementer ECSF role profile

Outcome in ESCO v1.2: 6 cybersecurity-related alternative labels were added to the existing ESCO occupation "**ICT security technician**". Among those, we can find *cybersecurity implementer* and "*information security implementer"* which are synonyms of the ECSF role "**Cybersecurity Implementer**".

Profile 9: Cybersecurity researcher

The ESCO occupation of "Research Engineer" defines a broader scope than the ECSF role of "**Cybersecurity Researcher**", with the latter focusing on the cybersecurity sector.

The Research Engineer ESCO occupation **is broader than** the
Cybersecurity Researcher ECSF role profile

Outcome in ESCO v1.2: the ECSF job role "**Cybersecurity Researcher**" was not included in ESCO because it was deemed too granular for the classification based on the internal validation guidelines.

Profile 10: Cybersecurity risk manager

The ESCO occupation of "Cyber Risk Manager" matches the ECSF role of "**Cybersecurity Risk Manager**" describing the same role.

The Cybersecurity Risk Manager ECSF role profile **is an exact
match with** the Cybersecurity Risk Manager ESCO occupation

Outcome in ESCO v1.2: the ECSF job role "**Cybersecurity Risk Manager**" was added as a new occupation in ESCO during the last major revision.

Profile 11: Digital Forensics Investigator

the ESCO occupation of "**Digital Forensics Expert**" matches the ECSF role of "**Digital Forensics Investigator**" sharing the same scope.

The Digital Forensics Investigator ECSF role profile **is an exact
match with** the Digital Forensic Expert ESCO occupation

Outcome in ESCO v1.2: 2 cybersecurity-related alternative labels were added to the ESCO occupation "**Digital Forensics Expert**".

Profile 12: Penetration Tester

Lastly, the ESCO occupation of "**Ethical Hacker**" is an exact match with the ECSF role of "**Penetration Tester**" with the latter also featuring an alternative name with the same title.

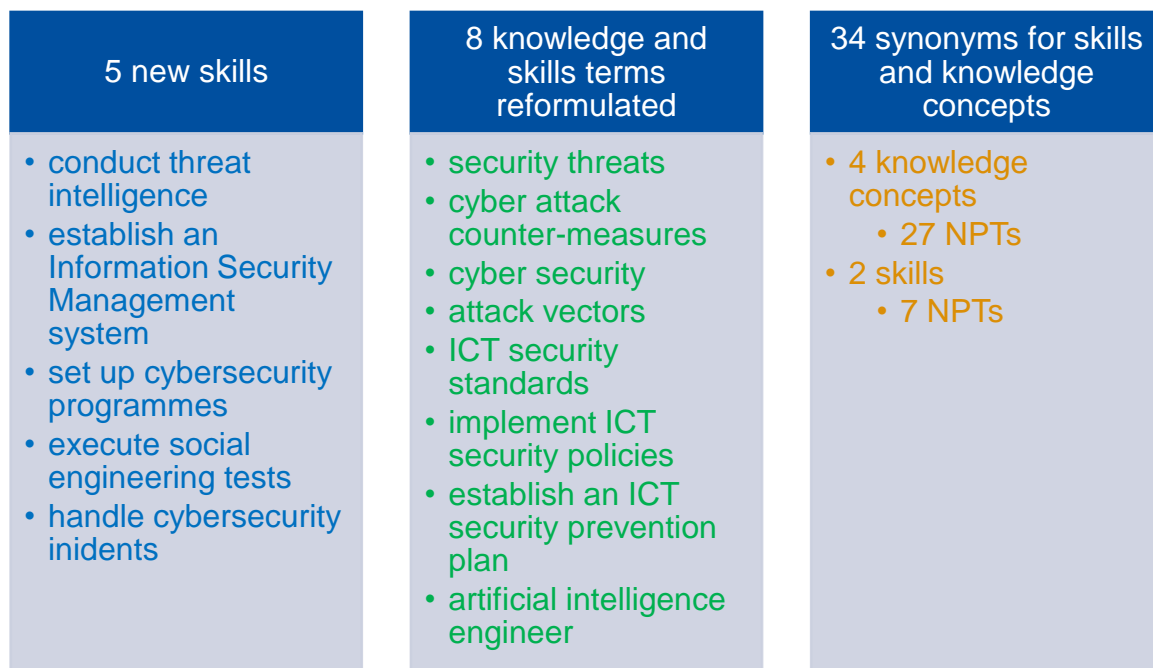The Penetration Tester ECSF role profile **is an exact match with** the Ethical Hacker ESCO occupation

Outcome in ESCO v1.2: 4 cybersecurity-related alternative labels were added to the ESCO occupation "Ethical Hacker". These include the "pentester" and the "cybersecurity tester".

ESCF FEEDBACK ON ESCO SKILLS

The feedback provided by ESCF on ESCO skills was processed in the following way in the major ESCO version v1.2:

- 5 new skills were added to the ESCO
- 8 ESCO knowledge, skills and competences (KSCs) were changed in their Preferred Terms (PT) and/or descriptions
- 6 ESCO knowledge, skills and competences were enriched with 34 new Non-Preferred Terms (NPTs)

Details on the concepts and numbers of related labels are presented in the graph below

5 new skills	8 knowledge and skills terms reformulated	34 synonyms for skills and knowledge concepts

• conduct threat intelligence
• establish an Information Security Management system
• set up cybersecurity programmes
• execute social engineering tests
• handle cybersecurity inidents
	• security threats
	• cyber attack counter-measures
	• cyber security
	• attack vectors
	• ICT security standards
	• implement ICT security policies
	• establish an ICT security prevention plan
	• artificial intelligence engineer
		• 4 knowledge concepts
		   • 27 NPTs
		• 2 skills
		   • 7 NPTs

ANNEX

This annex presents a summary table outlining the relationship between ESCO occupations (including their respective ESCO codes) and ESCF role profiles. Each row in the table provides the ESCO code, ESCO occupation, the description of the ESCO occupation, the type of relationship between the ESCO occupation and the ESCF role profile, the corresponding ESCF role profile, and the ESCF summary statement.

ESCO code	ESCO Occupation v 1.2	ESCO Occupation Description	Relationship	ECSF role profile	ECSF summary statement
2529.1	Chief ICT security officer	Chief ICT security officers protect company and employee information against unauthorized access. They also define the Information System security policy, manage security deployment across all Information Systems and ensure the provision of information availability.	The ESCO occupation **is an exact match with** the ECSF role profile	Chief Information Security Officer (CISO)	Manages an organisation's cybersecurity strategy and its implementation to ensure that digital systems, services and assets are adequately secure and protected.
2529.7	Cyber incident responder	Cyber incident responders monitor and assess cybersecurity state systems, analysing, evaluating, and mitigating the impact of cybersecurity incidents. Moreover, they identify malicious actors and cyber incident root causes. According to the organisation's Incident Response Plan, they restore systems and process functionalities to an operational state, collecting evidence and documenting actions taken.	The ESCO occupation **is an exact match with** the ECSF role profile	Cyber incident responder	Monitor the organisation's cybersecurity state, handle incidents during cyber-attacks and assure the continued operations of ICT systems.
1213.9	Director of compliance and information security	Directors of compliance and information security follow the regulatory compliance and oversee information security to ensure the security of all	The ESCO occupation **is more specific than** the ECSF role profile	Cyber Legal, Policy & Compliance Officer	Manages compliance with cybersecurity-related standards, legal and regulatory frameworks based on the organisation's

		information technology associated.			strategy and legal requirements.
2619.4	Data protection officer	Data protection officers ensure that the processing of personal data in an organisation is compliant with data protection standards and with the obligations set out in the applicable legislation such as GDPR. They elaborate and implement the organisation policy related to data protection, are responsible for data protection impact assessments and handle complaints and requests from third parties and regulatory agencies.	The ESCO occupation **shares tasks with** the ECSF role profile	Cyber Legal, Policy & Compliance Officer	Manages compliance with cybersecurity-related standards, legal and regulatory frameworks based on the organisation's strategy and legal requirements.
2422.8	Intelligence officer	Intelligence officers develop and execute plans to gather information and intelligence.	The ESCO occupation **is broader than** the ECSF role profile	Cyber Threat Intelligence Specialist	Collect, process, analyse data and information to produce actionable intelligence reports and disseminate them to target stakeholders.
2511.14	ICT system architect	ICT system architects design architecture, components, modules, interfaces, and data for a multi-component system to meet specified requirements.	The ESCO occupation **shares tasks with** the ECSF role profile	Cybersecurity Architect	Plans and designs security-by-design solutions (infrastructures, systems, assets, software, hardware and services) and cybersecurity controls.
2512.3	software architect	Software architects create the technical design and the functional model of a software system, based on functional specifications.	The ESCO occupation **shares tasks with** the ECSF role profile	Cybersecurity Architect	Plans and designs security-by-design solutions (infrastructures, systems, assets, software, hardware and services) and cybersecurity controls.
2512.6	cloud architect	Cloud architects are responsible for converting the technical features of a project into the architecture to lead to the final product.	The ESCO occupation **shares tasks with** the ECSF role profile	Cybersecurity Architect	Plans and designs security-by-design solutions (infrastructures, systems, assets, software, hardware and services) and cybersecurity controls.

2523.2	ICT network architect	ICT network architects design the topology and connectivity of ICT networks such as hardware, infrastructure, communication and hardware components.	The ESCO occupation **shares tasks with** the ECSF role profile	Cybersecurity Architect	Plans and designs security-by-design solutions (infrastructures, systems, assets, software, hardware and services) and cybersecurity controls.
2511.18	IT auditor	IT auditors perform audits of information systems, platforms, and operating procedures in accordance with established corporate standards for efficiency, accuracy and security. They evaluate ICT infrastructure in terms of risk to the organisation and establish controls to mitigate loss. They determine and recommend improvements in the current risk management controls and in the implementation of system changes or upgrades.	The ESCO occupation **is broader than** the ECSF role profile	Cybersecurity Auditor	Perform cybersecurity audits on the organisation's ecosystem. Ensuring compliance with statutory, regulatory, policy information, security requirements, industry standards and best practices.
2519.2	ICT auditor manager	ICT auditor managers monitor ICT auditors responsible for auditing information systems, platforms, and operating procedures in accordance with established corporate standards for efficiency, accuracy and security. They evaluate ICT infrastructure in terms of risk to the organisation and establish controls to mitigate loss. They determine and recommend improvements in the current risk management controls and in the implementation of system changes or upgrades	The ESCO occupation **is broader than** the ECSF role profile	Cybersecurity Auditor	Perform cybersecurity audits on the organisation's ecosystem. Ensuring compliance with statutory, regulatory, policy information, security requirements, industry standards and best practices.
2310.1	Higher education lecturer	Higher education lecturers instruct students who have obtained an upper secondary education diploma in their own specialised field of study, which is predominantly academic in nature.	The ESCO occupation **is broader than** the ECSF role profile	Cybersecurity Educator	Improves cybersecurity knowledge, skills and competencies of humans.

2356	Information technology trainer	Information technology trainers develop, schedule and conduct training programmes and courses for computer and other information technology users outside the mainstream primary, secondary and higher education systems	The ESCO occupation **is broader than** the ECSF role profile	Cybersecurity Educator	Improves cybersecurity knowledge, skills and competencies of humans.
2529.3	Embedded system security engineer	Embedded systems security engineers advise and implement solutions to control access to data and programs in embedded and connected systems. They help ensuring the safe operation of products with embedded systems and connected devices by being responsible for the protection and security of the related systems and design, plan and execute security measures accordingly. Embedded systems security engineers help to keep attackers at bay by implementing safeguards that prevent intrusions and breaches.	The ESCO occupation **shares tasks with** the ECSF role profile	Cybersecurity Implementer	Develop, deploy and operate cybersecurity solutions (systems, assets, software, controls and services) on infrastructures and products.
2529.6	ICT security administrator	ICT security administrators plan and carry out security measures to protect information and data from unauthorised access, deliberate attack, theft and corruption.	The ESCO occupation **shares tasks with** the ECSF role profile	Cybersecurity Implementer	Develop, deploy and operate cybersecurity solutions (systems, assets, software, controls and services) on infrastructures and products.
3512.3	ICT security technician	ICT security technicians propose and implement necessary security updates and measures whenever is required.	The ESCO occupation **shares tasks with** the ECSF role profile	Cybersecurity Implementer	Develop, deploy and operate cybersecurity solutions (systems, assets, software, controls and services) on infrastructures and products.

2149.2.8	Research engineer	Research engineers combine research skills and knowledge of engineering principles to assist in the development or design of new products and technology. They also improve existing technical processes, machines and systems and create new, innovative technologies. The duties of research engineers depend on the branch of engineering and the industry in which they work. Research engineers generally work in an office or laboratory, analysing processes and conducting experiments.	The ESCO occupation **is broader than** the ECSF role profile	Cybersecurity Researcher	Research the cybersecurity domain and incorporate results in cybersecurity solutions.
2529.8	cybersecurity risk manager	Cybersecurity risk managers identify, analyse, assess, estimate and mitigate cybersecurity-related risks of ICT infrastructures such as systems or services. They manage these aspects by planning risk analysis, applying, reporting, assessing, communicating, and treating them. They establish a risk management strategy for the organisation and ensure that risks remain at an acceptable level for the organisation by selecting mitigation actions and controls.	The ESCO occupation is **an exact match with** the ECSF role profile	Cybersecurity Risk Manager	Manage the organisation's cybersecurity-related risks aligned to the organisation's strategy. Develop, maintain and communicate the risk management processes and reports.
2529.2	Digital forensic expert	Digital forensics experts retrieve and analyse information from computers and other types of data storage devices. They examine digital media that may have been hidden, encrypted or damaged, in a forensic manner with the aim to identify, preserve, recover, analyse and present facts and opinions about the digital information.	The ESCO occupation **is an exact match with** the ECSF role profile	Digital Forensics Investigator	Ensure the cybercriminal investigation reveals all digital evidence to prove the malicious activity.

| 2529.4 | Ethical hacker | Ethical hackers perform security vulnerability assessments and penetration tests in accordance with industry-accepted methods and protocols. They analyse systems for potential vulnerabilities that may result from improper system configuration, hardware or software flaws, or operational weaknesses. | The ESCO occupation **is an exact match with** the ECSF role profile | Penetration Tester | Assess the effectiveness of security controls, reveal and utilise cybersecurity vulnerabilities, assessing their criticality if exploited by threat actors. |