Bridging the security, privacy, and data protection gap for smaller enterprises in Europe

D2.2 - The SENTINEL privacy & data protection suite for SMEs/MEs: Full-featured version

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Abbreviations

Abbreviation	Explanation
2FA	Two Factor Authentication
AI	Artificial Intelligence
API	Application Programming Interface
AuthN	Authentication
AuthZ	Authorization
CAPEC	Common Attack Pattern Enumeration and Classification
CPE	Common Platform Enumeration
CR	Common Repository
CSA	Compliance Self-Assessment
CSRA	Cybersecurity Risk Assessment
CVE	Common Vulnerabilities and Exposures
CVSS	Common Vulnerability Scoring System
CWE	Common Weakness Enumeration
DMZ	Demilitarized Zone
DPMAN	Data Protection Management
DoA	Description of Action
FFV	Full-Featured Version
GDPR	General Data Protection Regulation
IDaaS	Identity as a Service
IdMS	Identity Management System
IdP	Identity Provider
IoT	Internet of Things
MVP	Minimum Viable Product
NIST	National Institute of Standards and Technology
NVD	National Vulnerability Database
OTM	Organizational and Technical Measures
PA	Processing Activity
RBAC	Role Based Access Control
RDBMS	Relational Database Management System
RE	Recommendation Engine
PDLM	Personal Data Lifecycle Management
SCAP	Security Content Automation Protocol
SecDLC	Security Development Lifecycle
SME/ME	Small Medium Enterprise/Micro Enterprise
SSO	Single Sign On
UI/UX	User Interface / User Experience

Executive Summary

This deliverable accompanies the full feature version for the SENTINEL privacy and personal data protection technologies. It is developed within the scope of *‘WP2 – The SENTINEL privacy and personal data protection technologies’*, under Grant Agreement No. 101021659. The work presented in this document is mainly based on deliverables *‘D1.1 – The SENTINEL baseline’,* the *‘D1.2 – The SENTINEL technical architecture’* and builds upon the ‘*D2.1 - The SENTINEL privacy & data protection suite for SMEs/MEs: MVP*’, which presents the work done relevant to the MVP demonstrator.

As WP2 covers a wide range of data protection aspects technologies, this deliverable presents the work done in each of the Tasks that comprise this work package, relevant to the full feature version of the SENTINEL platform. These Tasks include a) the privacy and data protection compliance framework, b) the integrated *Identity Management System (IdMS)* (T2.2), c) contributed cybersecurity components (T2.3), and d) continuous management and integration of open-source technology offerings and solutions (T2.4).

Specifically, the document presents the current implementation status of the modules, tools and services, including the GDPR *Compliance Self-Assessment (CSA)* tool, the SENTINEL IdMS, the MITIGATE core plugin that performs cybersecurity risk assessment on the infrastructure of an SME/ME, a significantly updated set of selected open-source components that help the SME/ME to properly address the SENTINEL recommendations, and a big list of training material that can also help the representatives of an SME/ME to better understand, design and implement security and privacy controls within the organization.

The presentation for each of the above services, tools and modules contains a brief description of their purpose, role, and technical details regarding implementation, deployment, and testing. Their integration and function within the context of the defined SENTINEL use cases is further presented in deliverable *‘D5.5 – The SENTINEL integrated solution – interim version’*.

1 Introduction

1.1 Purpose of the document

1.1.1 Scope

The purpose of this deliverable is to accompany the delivered, functional version of SENTINEL's set of privacy and personal data protection technologies, by providing a description of the relevant services, tools, and modules for the SENTINEL's full-featured version. This deliverable builds upon the SENTINEL MVP version [1], which was an early release that served as a proof-of-concept for the project's main objectives, offering a functional demonstration that was minimum but complete, in terms of end-to-end integration and delivery of value to the end-user.

The SENTINEL full featured version implements and delivers a mature version of the SENTINEL platform and services, offering:

- a complete functional demonstration
- a mature and stable version of all internal architectural SENTINEL modules and components
- end-to-end integration with all internal SENTINEL plugins

This deliverable reports on the following:

- The data protection and privacy compliance framework as part of the SENTINEL data protection and cybersecurity components, focusing on the proper implementation and integration of the GDPR CSA module
- The IdMS, which offers end-users GDPR-compliant data portability and a human-centric data processing model, enabling SME/ME customers easy and instant access to SENTINEL services
- The integrated contributed cybersecurity components, which feed the SENTINEL intelligent digital core, delivering a holistic set of services to SMEs and MEs through the SENTINEL platform
- The opensource technology offering of the project, consisting of an envisioned curated collection of self-serving, state-of-the-art security and privacy enhancing modules

For each of the above, this document provides an updated overview, description of purpose and role within the context of the SENTINEL full feature version, as well as technical details that are useful for the reader to understand the responsibilities, inner workings and offered services of each of the above modules. Moreover, for each one of them it highlights the main updates in relation with the MVP version.

1.1.2 Contribution to WP2 and project objectives

As mentioned previously, this deliverable builds upon the SENTINEL MVP [1], addressing four of the five Tasks defined in the *Description of Action (DoA)* that correspond to this work packages objectives, which have as follows:

Objective 1. *SENTINEL's unified privacy and personal data protection compliance self-assessment framework for GDPR compliance*

The full-feature version of the SENTINEL platform delivers an updated version of the GDPR CSA, which is a module that performs an analysis of *Processing Activities (PAs)* to determine whether personal data are handled in accordance with data protection requirements. GDPR CSA provides SMEs with:

a) GDPR Compliance Level of PAs they are responsible for, and PAs they carry out on behalf of another company, and
b) a list of recommendations to improve PA's GDPR Compliance Level.

Objective 2. *SENTINEL's integrated Identity Management System (IdMS), based on the decentralized MyData model for human-centric personal data management*[1] *for SMEs/MEs, enabling a unified European Personal Data Space*

The full version of the centralized identity management system with *Single Sign-On (SSO)* capabilities for SENTINEL end-users is delivered, implementing personal data portability and transparent vendor switching.

Objective 3. *A curated collection of self-serving, state-of-the-art security- and privacy-enhancing modules, both open-source and contributed by consortium partners, which will be selected to meet individual specific needs of participants*

This objective is addressed in two ways in the context of the MVP. In Section 4, MITIGATE is presented as the main SENTINEL cybersecurity component, used by SMEs/MEs through:

- The creation (and update) process of the organization cyber-assets
- The simulation environment, which allows the building of scenarios for identifying and analyzing the evolving threat landscape of one or more preferred cyber-assets.
- The performance of cybersecurity risk assessments

In Section 5, an updated list of open-source data privacy and protection cybersecurity components is presented.

1.1.3 Relation to other WPs and deliverables

This deliverable is tightly coupled with and builds upon D2.1 "The SENTINEL privacy & data protection suite for SMEs/MEs: MVP" which introduced an early release that served as a proof-of-concept for the project's main objectives, offering a functional demonstration that was minimum but complete, in terms of end-to-end integration and delivery of value to the end-user.

Both deliverables (D2.1 and this deliverable) consider the work performed at *'WP5 - SENTINEL continuous integration and system validation'* and more specifically task *'T5.2 – Continuous integration towards the realisation of a complete system'.* Within the activities of that task, all results described in the current document have been integrated in an allocated infrastructure and operate in the context of predefined use cases to deliver the desired services to the end-user. The integration activities, interaction with other SENTINEL contexts and modules, along with the end-user benefits are detailed in the deliverable *'D5.5 – The SENTINEL integrated solution – interim version'*.

[1] https://mydata.org/wp-content/uploads/2020/08/mydata-white-paper-english-2020.pdf

Obviously, the output and results of all WP2 tasks, in which this deliverable reports, are very well related with the work performed in other technical work packages, such as:

- '*WP3 -The SENTINEL digital Core'*, the GDPR CSA provides the assessment as input to the Core context's *Recommendation Engine (RE)* for the generation of policy drafts. Additionally, the metadata and description of the cybersecurity offerings and open-source solutions are stored in the *Common Repository (CR)*.
- *'WP4 – The SENTINEL services'*, the CyberRange offering developed within the context of task *'T4.1: The SENTINEL Observatory'* is integrated with the SENTINEL IdMS for authentication and authorization purposes. There is also a relationship between the GDPR CSA plugin and task *'T4.2: Data protection Impact assessment and assurance'* where similar assessment tools are grouped to make their assessments available as services to the rest of the SENTINEL framework.

Finally, this deliverable will serve as a basis for the upcoming deliverable *'D2.3 - The SENTINEL privacy & data protection suite for SMEs/MEs: Final product'* (due M30).

1.2 Structure of the document

The structure of this document has as follows:

- Section 2 presents the full-feature version of the GDPR CSA module that performs an analysis of PAs to determine whether personal data are handled in accordance with data protection requirements.
- Section 3 presents the full feature version of the SENTINEL IdMS, which provides authentication, authorization, and Single Sign-On services to SENTINEL end-users.
- Section 3.1 presents the main SENTINEL cybersecurity component, and how this is incorporated in SENTINEL environment.
- Section 5 lists selected open-source plugins that contribute to the protection of an SME/ME's infrastructure, delivered in this full-featured version of SENTINEL.
- Section 6 draws conclusions and summarizes future steps.

1.3 Intended readership

As in the case of the first deliverable, also this one is a public document that accompanies the public demonstrator for the SENTINEL full feature release. The content found in this document aims to help all stakeholders and potential users of the framework understand the purpose, role and technical details of the services and modules that are grouped under the concepts of privacy and personal data protection.

1.4 Updates since D2.1

The MVP version of the SENTINEL platform implemented and offered indicative features and services while the full-feature version releases a mature prototype of the platform, providing results for all WP2 related tasks. Specifically:

The full feature version of the SENTINEL platform develops an end-to-end digitalised and user friendly GDPR and data protection compliance framework for self-assessment based on the established process assessment principles defined in ISO/IEC 33001, which is the main output of Task 2.1. The MVP version allowed only to determine the compliance level of PA description, while the current version significantly extends its functionalities by:

i. Determining GDPR level of SME
ii. Identifying and collecting required information
iii. Establishing recommendations to improve GDPR compliance level
iv. Delivering GDPR CSA results

In the context of the MVP and for the SENTINEL IdMS a study of the MyData model conducted in order to understand in depth the relevant concepts and design the sought solution. Then, a minimum implementation of authentication and *Single Sign-on (SSO)* features was delivered, based on the open-source solution Keycloak[2]. The full feature version however significantly updates the features of services of the MVP version, implementing and providing a mature version of the SENTINEL IdMS and applying its services to the personal data of the actual end-users for the pilot SMEs/MEs. This version is fully compliant with the MyData model enabling easy integrations with existing SME/ME solutions, secure storage, and communication, enforcing at the same time data privacy regulations.

Concerning Task 2.3, which is related to the proper integration, configuration and deployment of the necessary MITIGATE cybersecurity modules, the MVP version offered only the SENTINEL Simulation Environment. This module implemented the proper user interface, where the SME/ME representative was capable of setting experiments on specific cyber-assets and automatically identify possible attack scenarios.

The full feature version significantly updates the MITIGATE adapter and the integration with the MITIGATE platform, implementing the following functionalities and services:

- Create (and update) process of a SENTINEL cyber-asset (Section 4.2.1)
- Performance of cybersecurity risk assessments (CSRA) for a selected PA (Section 4.2.3).

In relation with Task 2.4, which builds upon Task 2.3 and offers the list of opensource technology solutions and tools, during this reporting period, the consortium adapted the methodology of SecDLC phases to have a better mapping of the offered capabilities to the end-user needs. Specifically, the tools' list was significantly expanded, including 54 tools, covering all SecDLC phases and the OTMs that are considered by SENTINEL. Additionally, the corresponding training material list now contains 117 materials (from 6 materials in the MVP version). Both lists are processed by the *Recommendation Engine (RE)*, which makes suggestions to the user based on the OTM mapping.

[2] https://www.keycloak.org/

2 The Privacy and Data Protection Compliance Framework

2.1 GDPR Compliance Self-Assessment (GDPR CSA)

Complying with GDPR implies for SMEs handling personal data to "implement appropriate technical and organisational measures to ensure and to be able to demonstrate that processing is performed in accordance with[3]" GDPR requirements. These OTMs aim at meeting data protection principles[4]. In addition to these measures related to the handling personal data, companies must also implement appropriate data protection policies[5]. Data protection policies refer to "planning process that, if fulfilled, should be congruent with the regulatory objective[6]". Practically speaking it implies that any system handling personal data must be continuously managed, which requires appropriate governance and management process.

Privacy evaluation consists in examining both:

a) the extent to which organisational and technical measures are appropriates and effectives, and
b) the extent to which data protection policies allow to maintain data protection performance of the system over time.

Complying with GDPR supposes for SMEs to demonstrate that OTMs implemented to meet data protection requirements are appropriate and effective. It is then a twofold challenge for SMEs:

1) Identify data protection requirements, and
2) Determine OTMs to meet them.

Evaluate compliance with GDPR consists in verifying whether OTMs are implemented, appropriate, and effective. GDPR CSA has been developed to allow SMEs to perform such verification. Based on ISO/IEC 330xx processes assessment method, GDPR CSA uses a process assessment model that organises data protection requirement into six data protection process: *Record, Personal Data Lifecycle Management (PDLM)*, Rights, Consent, *Data Protection Management (DPMAN)*, and Breach. These processes allow to structure the collection of information related to OTMs implemented. Assessment of their appropriateness and effectiveness depends on the PA's privacy risk level.

GDPR CSA allows companies to:

- Demonstrate their accountability by providing to data protection authorities the list of technical and organisational measures putted in place to preserve privacy.
- Monitor compliance with GDPR from compliance assessment results (i.e., compliance level).

In order to take better account of limited resources SMEs can allocated to data protection, GDPR CSA has been designed to adapt time spending to feed the module according to the risk level of

[3] GDPR, Art. 24, Paragraph 1
[4] GDPR, Art. 5, Paragraph 2
[5] GDPR, Art. 24, Paragraph 2
[6] Decker, Christopher "Goals-Based and Rules-Based Approaches to Regulation" SSRN scholarly Paper, ID 3717739, Social Science Research Network, 1 May 2018, p.18.

PA: the more risky PA is, the more data protection processes must be assessed. GDPR CSA's assessment scope is illustrated in figure below.

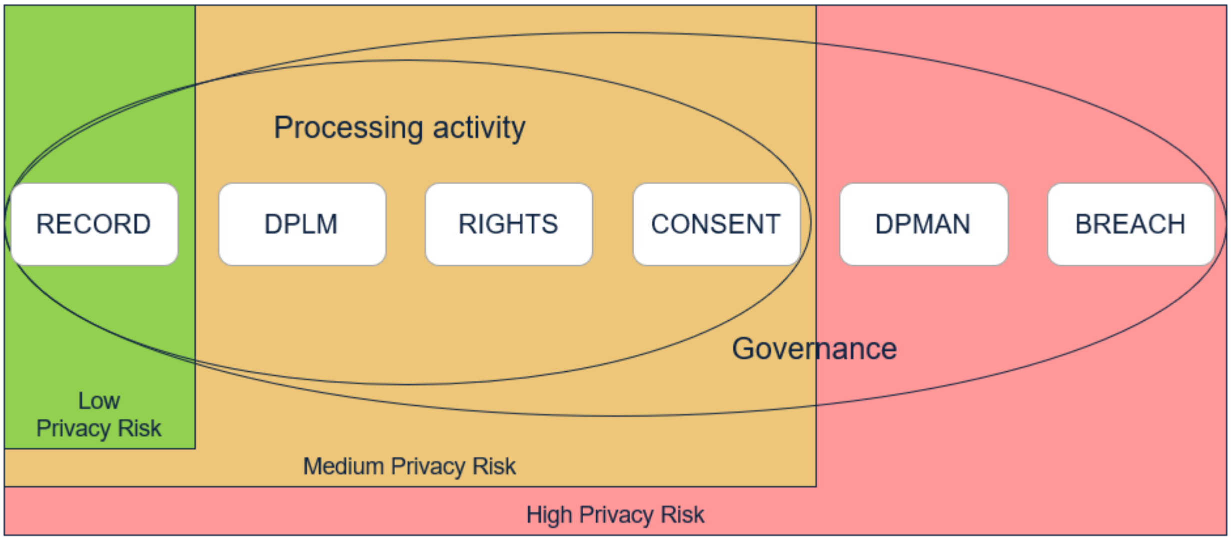


Figure 1. Assessment scope according Privacy Risk level

2.2 GDPR CSA Full-Featured Version functionalities

As described in D2.1, initial version of GDPR CSA (i.e., MVP version) allowed to determine Compliance Level of PA description (i.e., RECORD). GDPR CSA full-featured version extends module functionalities by implementing the five remaining GDPR processes.

Table 1. Evolution of GDPR CSA between MVP and FFV

	MVP	FFV
0. **Launch GDPR CSA** User can launch compliance assessment of either one specific PA or all PAs recorded in PAs Database.	✓	✓
1. **Collect automatically data related to Processing activities (PAs database) and SME (SME Profile)** Data stored in both PAs database and SME Profile are automatically transmitted to GDRP CSA.	✓	✓
2. **Determine GDPR Compliance Level of PA(s)** GDPR CSA automatically performs GDPR compliance assessment of requirements related to PA (i.e. Record, PDLM, RIGHTS, and CONSENT if lawful basis of PA is Consent).	Record	✓
3. **Determine GDPR Compliance Level of SME** GDRP CSA also automatically performs GDPR compliance assessment of organisational capabilities that are required to ensure compliance with GDPR over time (DPMAN, BREACH).	✗	✓

4. **Identify and collect missing required information** GDPR CSA identifies what required information to perform GDPR compliance assessment are missing, and it sends question(s) to user to collect them.	✗	✓
5. **Establish recommendations to improve GDPR compliance level** Based on GDPR compliance assessment results, GDPR CSA establish recommendations to improve GDPR compliance level.	Record	✓
6. **Deliver GDPR CSA results** GDPR CSA delivers GDPR compliance assessment results and recommendations to the user.	Record	✓

The GDPR CSA Full-Featured version now covers all remaining data protection capabilities.

2.3 Technical specifications

2.3.1 Data Consumed

The module will rely on two main data sources:

1. The organisational data (from the SME profile database),
2. The processing activities' data (from the PAs database).

The module will only need the organisations' ID from the shared data and will call the corresponding APIs to retrieve organisational data and processing activities data and to ask questions to the user.

2.3.2 Data generated

Assessment is performed according to the ISO/IEC 33000 Family Standard on process assessment. Then, GDPR processes are scored to determine their capability level and compare it to expected target level. However, a simpler version of the scoring is also given to ease the understanding for users that are not familiar with process assessment approach (i.e. GDPR Compliance Level). Then, for each PA, GDPR Compliance Level is provided for GDPR processes that are relevant regarding privacy risk level of PA. Such compliance level is expressed according quantitative, qualitative, and colour scale as summarized in table 2.

Table 2. GDPR CSA Compliance Level

Quantitative scale	0	1	2	3	4
Qualitative scale	Not compliant	Partially compliant	Largely compliant	Compliant	N/A
Colour scale	Red	Orange	Yellow	Green	Grey

2.3.3 Integration Overview

The connection between SENTINEL's platform and GDPR CSA module is ensured via an application programming interface (API). Instead of just deploying the code, the GDPR CSA module environment is deployed as well. A docker image is then used to create, run, and deploy the application in the container.

As illustrated in Figure 2, Docker image contains application code ("assessment rules"), libraries and dependencies ("GDPR self-assessment"), and instructions related to data preparation (“JSON processing”). Assessment rules is split into two different sub-components (“ropa assessment” and “question-based assessment”) allowing to distinguish treatment based on, respectively, PAs database and data collected via questionnaire engine.

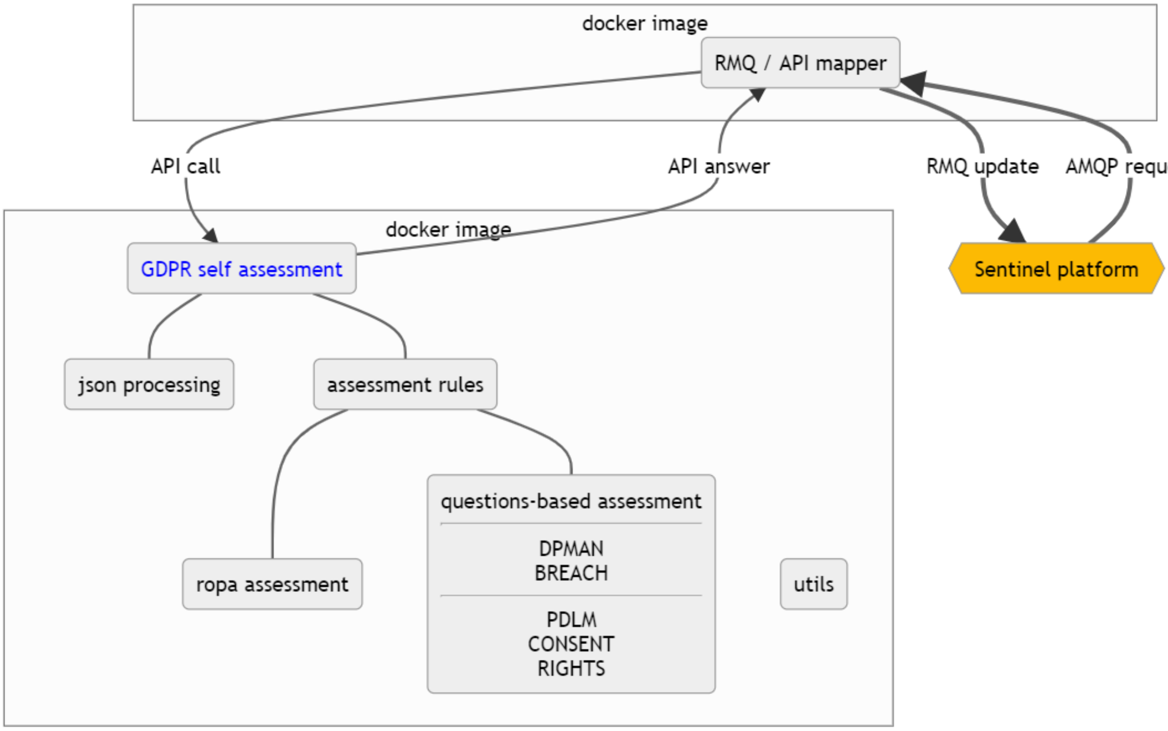


Figure 2. GDPR CSA Full Feature Version Docker Image

3 The Integrated Identity Management System

3.1 Overview

The SENTINEL IdMS delivers a solution that enables:

a) Creation of centralized, trusted digital identities for individuals,
b) Relating these identities with specific roles and access rights,
c) Use of those identities with the aforementioned accesses to securely leverage user data both from the user perspective, and the SMEs that need to act in a regulations' compliant manner.

This solution is based on six main pillars, related to the robust management of EU-wide user access, secure and GDPR-compliant data management that is easily available for third party SMEs:

1. Central, EU-wide, self-service identity management,
2. Credentials and access tokens management that allow *Authentication (AuthN)* of the above identities,
3. *Role Based Access Control (RBAC)*,
4. Federation with 3rd party applications, based on protocols that allow scalable expansion based on the needs of SMEs/MEs wanting to leverage SENTINEL IdMS,
5. My Data, data management scheme for secure, GDPR compliant storage and access of user data,
6. Governance

In order to elaborate on the delivered IdMS solution within the scope of SENTINEL, the five pillars are detailed and demonstrated in the following sections as follows:

- Section 3.2 details the high-level architecture of the solution under development. Core functionalities are also described here.
- Section 3.3 describes the implementation of central identity management offer as a service.
- Section 3.4 describes the process of applying RBAC throughout the solution, My Data access and all third-party applications' requests.
- Section 3.5 defines the integration with all third-party application providers, typically offered by SMEs/MEs, and the way it is achieved in a seamless manner, based on protocols.
- Section 3.6 describes the secure and trustworthy process of accessing, storing and editing data that related to the user.
- Section 3.7, the final section, refers to the governance of this solution, that will include observability, end to end solution monitoring and low-level auditing process definition.

3.2 SENTINEL IdMS architecture

Main drivers that led the efforts of designing and implementing the SENTINEL IdMS were the openness of the solution, based on market-standard open-source technologies and leveraging protocols and integration patterns that will make the solution easy to use as a service. Moreover, the architecture targets an open business environment, with central control but decentralized application of entitlements and data access.

The following figure depicts an in-depth view of the solution, in terms of functional areas / blocks, placed within an aligned system diagram.

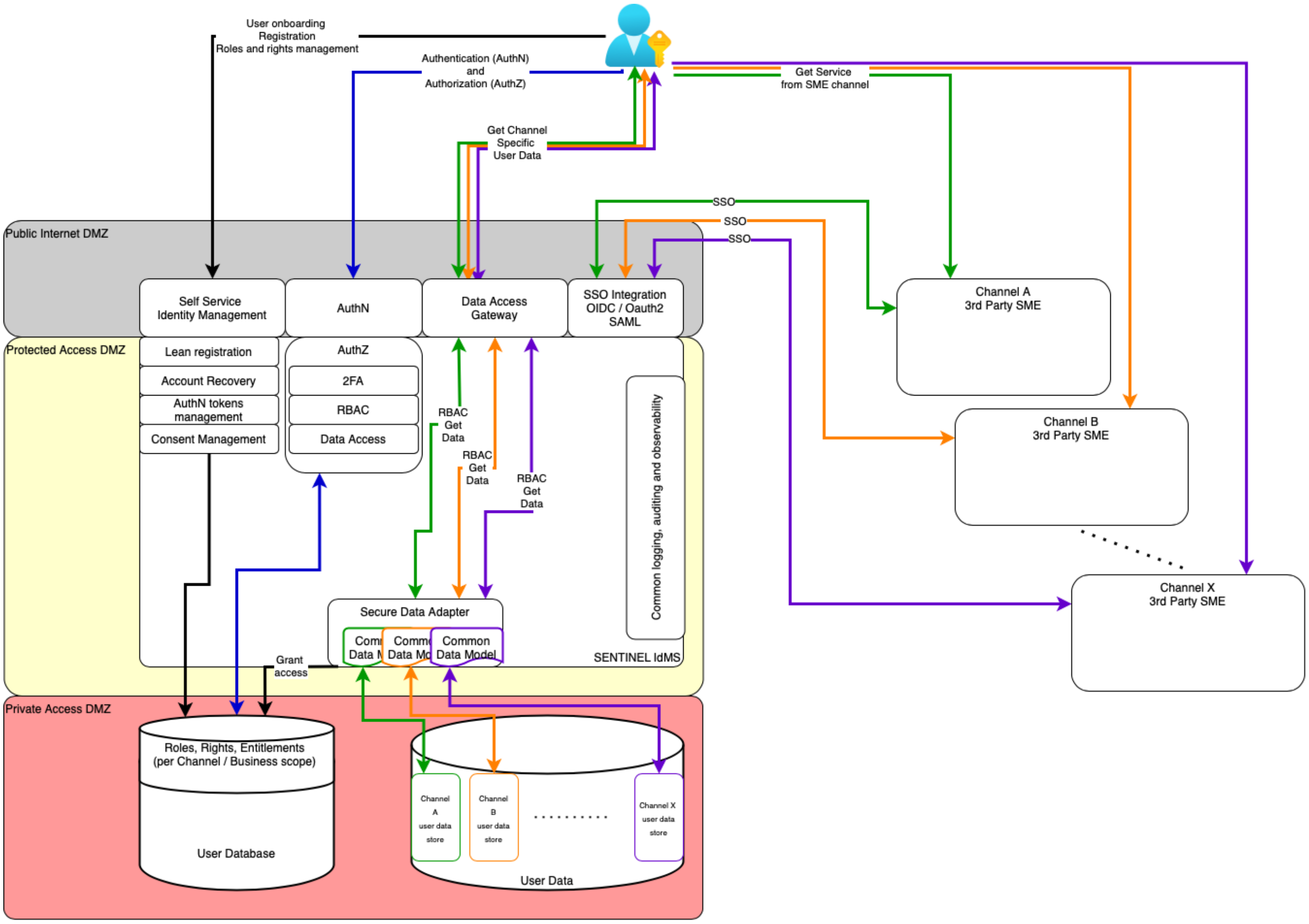


Figure 3. IdMS system diagram

More specifically the application is split in 3 network layers. The public internet accessible layer, where modules for self-service identity and credentials management, authentication, data access and SSO are exposed. The protected access *demilitarized zone (DMZ)*, where all the functional elements are deployed, accessible only through the public internet modules / gateways. The *Identity Provider (IdP)* with its sub-modules is deployed in the protected access DMZ, along with the Secure Data Adapter and the Observability module. Finally, the private access DMZ, where the data is stored. The data stored in this layer include the user identities, the user roles, rights and entitlements, along with a separate repository for the user related data held, segregated per requestor application but following a common data model.

A short description, along with a demonstration wherever applicable, is provided per module below.

3.2.1 Self-Service Identity Management

Description

Self-Service Identity Management is delivered as a service via SENTINEL IdMS as a Service and delivers processes to collect, verify, and manage attributes and entitlements that are necessary for the creation and maintenance of digital identities for all users accessing third party applications EU-wide. This includes functionalities and flows like user registration, account recovery, profile management, credentials management, and consent management.

Submodules

- Lean registration
- Account recovery
- Profile management
- Credentials and tokens management
- Consent management

3.2.2 Authentication

Description

This module is providing all basic authentication (are you who you say you are?) and authorization (are you entitled to access what you request?) capabilities. This entails functional areas like use of credentials, conditionally requesting another authentication factor (two factor authentication – 2FA), roles, access control based on roles as well as access to data through a secure and privacy aware mechanism.

Submodules

- Authorization (AuthZ) module
- Second factor authentication (2FA)
- Role based access control (RBAC)
- Data access delegator

3.2.3 Data Access Gateway

Description

This gateway allows with the use of specific tokens, valid only while the user is logged in and active on any of the third-party apps, to access specific data, on a need-to-know basis, and only related to the user within the context of each connected application.

Submodules

- Secure Data Adapter
- Common Data Model
- Data Segregation Module

3.2.4 Single Sign On (SSO) integration module

Description

This module and the respective sub-modules ensure the smooth operation of as many third-party applications as needed, on an EU-wide market, in order to allow the user to effortlessly navigate cross-apps and access the data the user is entitled to access, in a secure, privacy-aware manner. The *Single Sign On (SSO)* - login once, access any app from the SENTINEL eco-system - is based on market standard protocols, namely Open ID Connect 2.0, OAuth 2.0 and SAML. Each protocol comes with the related API that enables further integration capabilities, should the applications have more advanced requirements.

Submodules

- SSO OIDC Module
- SSO OAuth 2.0 Module
- SSO SAML 2.0 Module
- API Integration Module

3.3 Central Identity Management

The following list of use cases depicts the features offered by the central identity management authority within the SENTINEL *Identity as a Service (IDaaS)*.

3.3.1 Use cases

The following use-cases are supported concerning the identity management:

- Creation of an identity comprised of attributes that is linked to a person.
- Use and maintain the attributes in order to keep the relation between digital and physical identities.
- Maintain latest valid attributes in all digital identities, in a single storage, over its lifecycle.
- Update digital identity accounts, access rights and entitlements.
- Deactivate or remove identity records for GDPR compliance.
- Collect the necessary credentials and tokens from all persons creating a new digital identity.
- Assign one or more sets of credentials to a person via its related digital identity.
- Update credentials throughout its lifecycle.
- Revoke a credential from a person or deactivate an authenticator when needed.

3.3.2 Sample demo functionalities / screens

The following figures provide same indicative sample screens of the functionalities implemented concerning authentication processes, forgot password, credentials management.

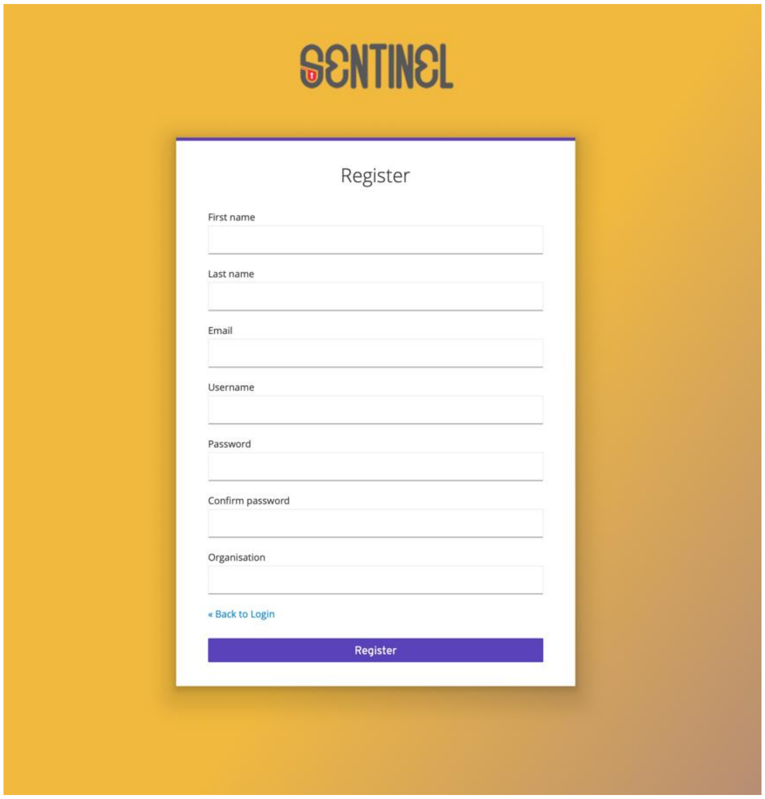
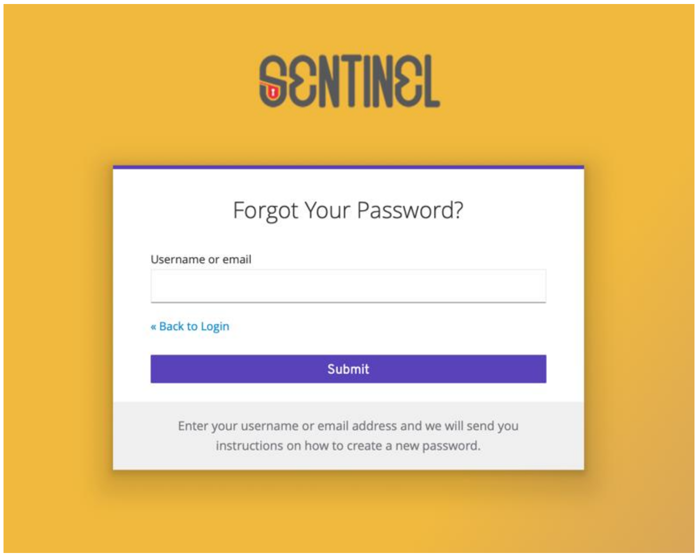


Figure 4. EU-wide, common user registration



Enter your username or email address and we will send you instructions on how to create a new password.

Figure 5. User account recovery

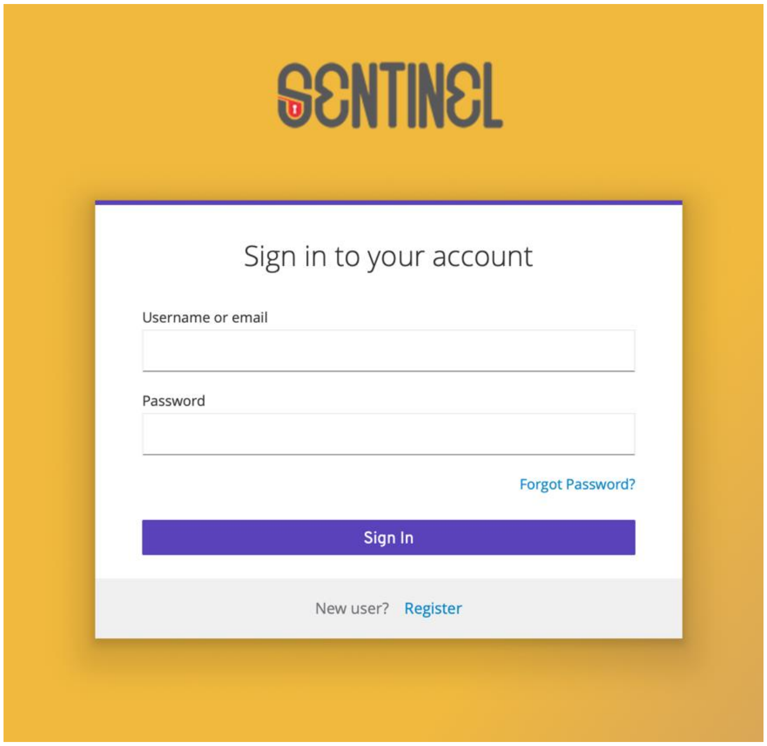


Figure 6. End user authentication

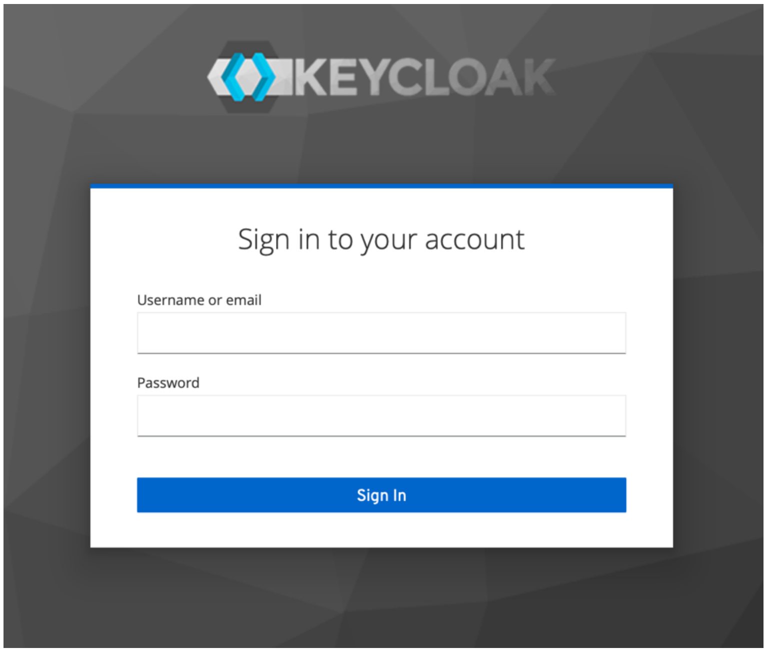
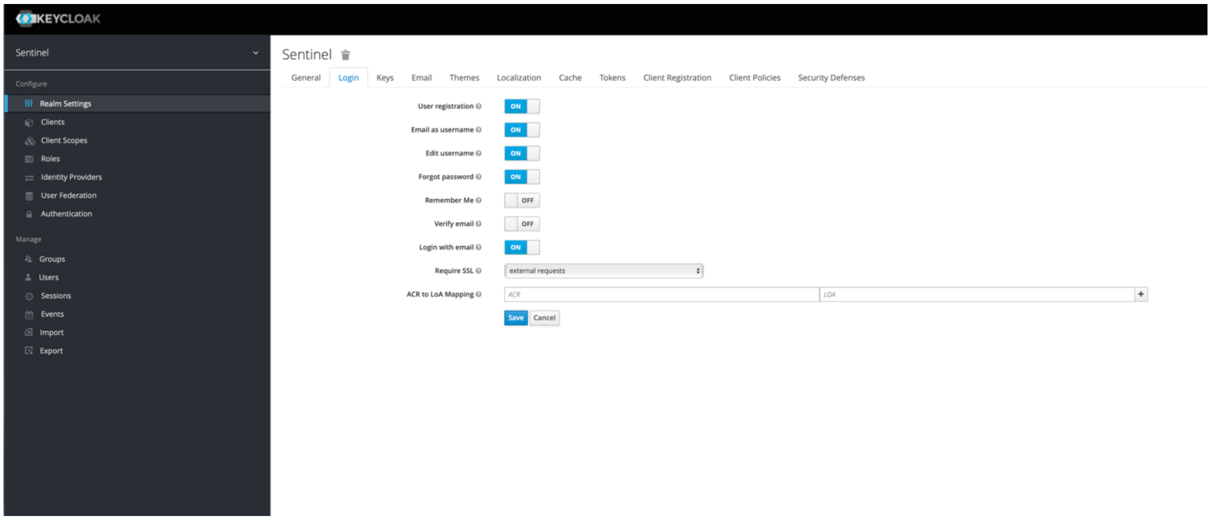
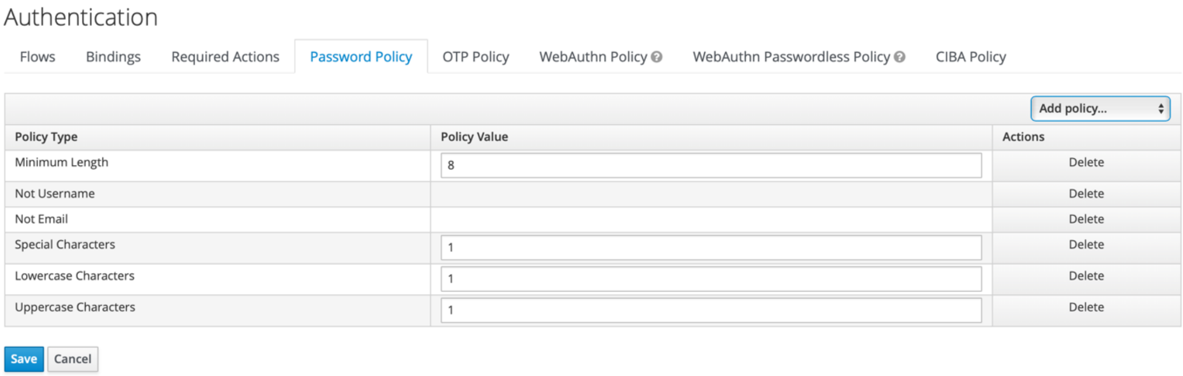


Figure 7. Admin user authentication



User registration: ON
Email as username: ON
Edit username: ON
Forgot password: ON
Remember Me: OFF
Verify email: OFF
Login with email: ON
Require SSL: external requests
ACR to LoA Mapping: ACR | LOA

Figure 8. SENTINEL authentication realm basic features



Policy Type	Policy Value	Actions
Minimum Length	8	Delete
Not Username		Delete
Not Email		Delete
Special Characters	1	Delete
Lowercase Characters	1	Delete
Uppercase Characters	1	Delete

Figure 9. Credentials management: SENTINEL password policy

3.4 Access management

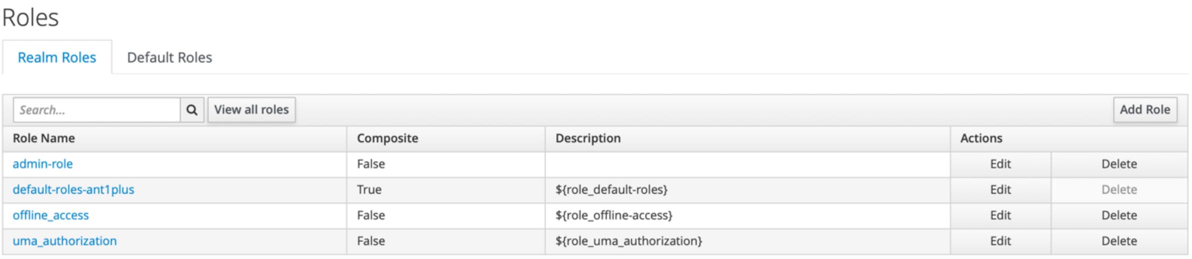
3.4.1 Use cases

The following use-cases are supported in relation with the SENTINEL access management:

- Create and maintain the access rules that define access to protected resources and/or applications.
- Grant or deny access requests to protected resources based on roles and access rules, identity attributes, and related entitlements.
- Limit access to accounts that have elevated access permissions (e.g., administrator accounts, super users, or infrastructure admins).
- Make evident the applied roles and access rights by clearly communicating the established authorities (end user, channel administrator, auditor, etc.), policies in place, standards, and other principles.
- Request and acquire identity or other attributes between different systems as needed to allow access elevation decisions and interoperability.

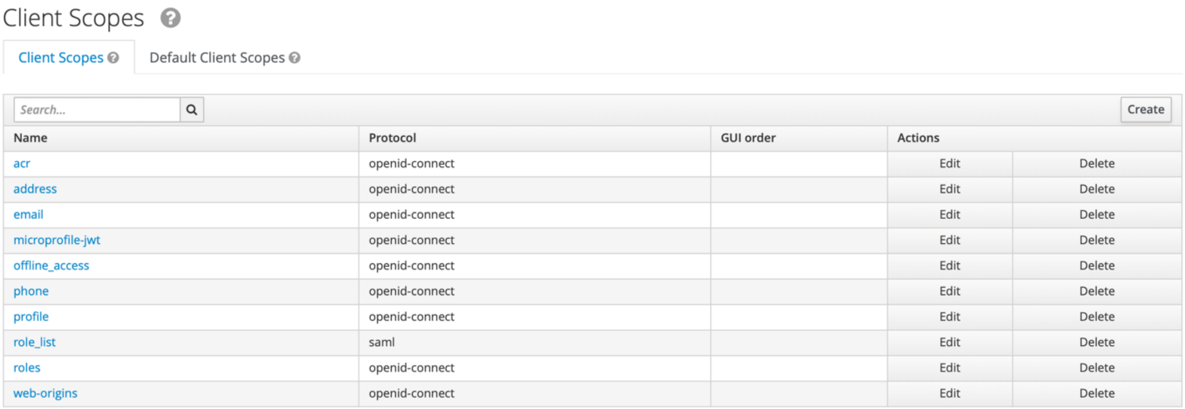
3.4.2 Sample demo functionalities / screens

The following figures depict some indicative keycloak screens concerning access control configuration and management features.



Role Name	Composite	Description	Actions	
admin-role	False		Edit	Delete
default-roles-ant1plus	True	${role_default-roles}	Edit	Delete
offline_access	False	${role_offline-access}	Edit	Delete
uma_authorization	False	${role_uma_authorization}	Edit	Delete

Figure 10. Sample of initial roles defined within SENTINEL IdaaS



Name	Protocol	GUI order	Actions	
acr	openid-connect		Edit	Delete
address	openid-connect		Edit	Delete
email	openid-connect		Edit	Delete
microprofile-jwt	openid-connect		Edit	Delete
offline_access	openid-connect		Edit	Delete
phone	openid-connect		Edit	Delete
profile	openid-connect		Edit	Delete
role_list	saml		Edit	Delete
roles	openid-connect		Edit	Delete
web-origins	openid-connect		Edit	Delete

Figure 11. AuthN / AuthZ client scopes and related to the users' attributes

3.5 SSO and 3rd party applications integration

Several logins and SSO clients can be configured, either one per 3rd party application, for high-criticality and/or large volume applications, or one per applications' segment. This allows for uniform integration of most technology platforms, as the SSO protocols used are state of the art, as well as well-adopted market standards.

3.5.1 Use cases

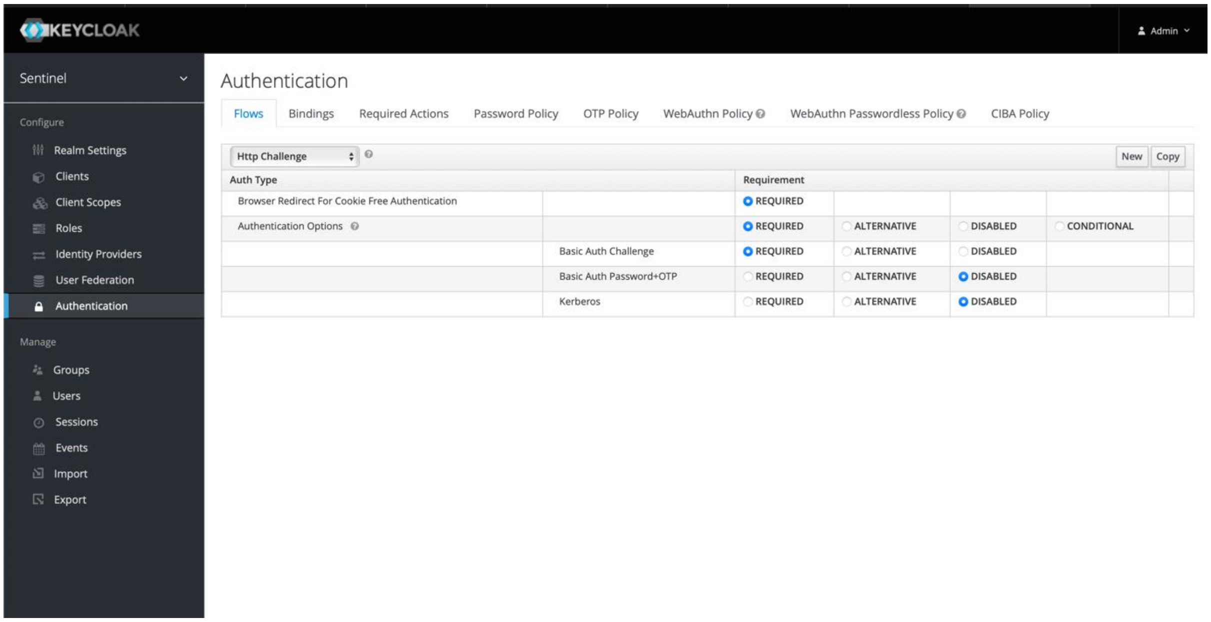
The following use-cases are supported for SSO with 3rdparty applications:

- Develop linked between authorities, policies, standards, principles, and least third-party channels / applications.
- Allow authentication events to be accessible in various formats, such as an assertion, containing all the necessary attributes to grant access to a resource.

- Provide the means to enable exchange of identity or other user-related attributes between different applications that will allow secure, centralized access decisions and interoperability between any third-party application.

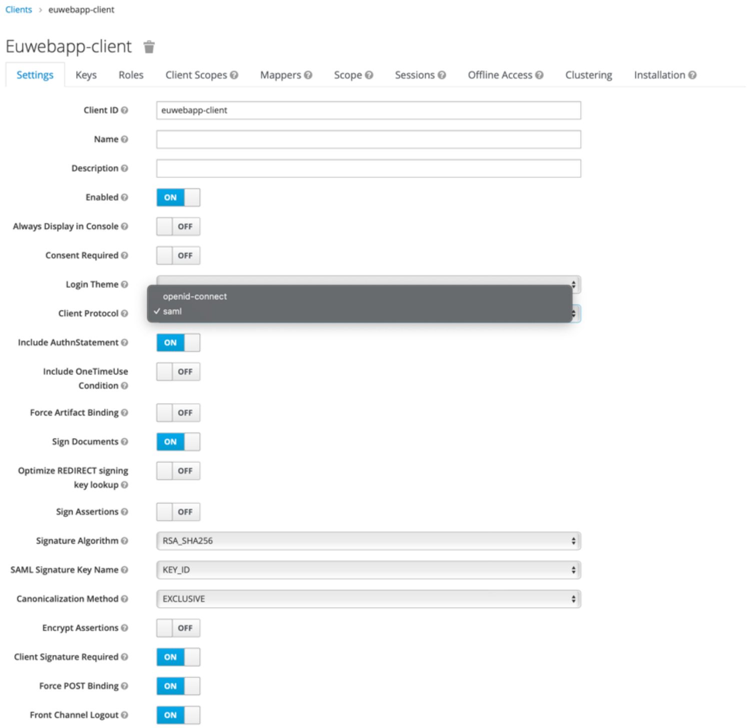
3.5.2 Sample demo functionalities / screens

The following figures provide some indicative keycloak screens concerning SSO and integration features with 3rd party systems.



Auth Type		Requirement			
Browser Redirect For Cookie Free Authentication		● REQUIRED			
Authentication Options		● REQUIRED	○ ALTERNATIVE	○ DISABLED	○ CONDITIONAL
	Basic Auth Challenge	● REQUIRED	○ ALTERNATIVE	○ DISABLED	
	Basic Auth Password+OTP	○ REQUIRED	○ ALTERNATIVE	● DISABLED	
	Kerberos	○ REQUIRED	○ ALTERNATIVE	● DISABLED	

Figure 12. Cross-app authentication configuration



Client ID	euwebapp-client
Name	
Description	
Enabled	ON
Always Display in Console	OFF
Consent Required	OFF
Login Theme	
Client Protocol	saml
Include AuthnStatement	ON
Include OneTimeUse Condition	OFF
Force Artifact Binding	OFF
Sign Documents	ON
Optimize REDIRECT signing key lookup	OFF
Sign Assertions	OFF
Signature Algorithm	RSA_SHA256
SAML Signature Key Name	KEY_ID
Canonicalization Method	EXCLUSIVE
Encrypt Assertions	OFF
Client Signature Required	ON
Force POST Binding	ON
Front Channel Logout	ON

Figure 13. Sample client for a generic 3rd party web application

3.6 MyData and data management scheme

The main vision related to the data management that drove the development efforts of SENTINEL IdaaS was “store and control centrally, own and use distributed”. This resulted in the following design decisions and related functionality:

I. The users and roles are centrally stored, validated, maintained within the persistence layer of SENTINEL IdaaS. Self-service user onboarding, account recovery, credentials and account management accommodates this need making the user onboarding experi-ence GDPR compliant once, applied for all integrated applications.

II. User related data (My Data) are again centrally stored, but initiated by the third party applications utilizing both the SSO capabilities (per user) and anonymization-enabled data storage (only user id is stored along with the channel data). Again, the user data storage is maintained and controlled centrally, but owned and used in a distributed (per application) manner.

III. All flows for inserting, updating and reading data are performed through a security layer that applies control based on the user’s roles and entitlements. This is achieved via the Data Access Gateway acting as a single-entry point for data management in SENTINEL IdaaS, as well as the Secure Data Adapter that ensures application of roles and rights are applied before the data requesting channel receives data that are related to the logged in user and for the specific channel only.

IV. For data anonymization and accessing the data in a uniform approach, table X shows a sample data entry, for user with id "`6de1f7b4-fa57-4bd7-87c4-23cf4b8cfc86`" accessing the site/app/channel with id "eu4good-web-app" and the site requests for data chunk with id "9402098f-16c4-4cdf-8dd6-a37688acff47".

Sample user data for this has as follows:

```
{
    "user_id": "6de1f7b4-fa57-4bd7-87c4-23cf4b8cfc86",
    "channel_id": "eu4good-web-app",
    "data_entry_id": "9402098f-16c4-4cdf-8dd6-a37688acff47",
    "timestamp": "2022-04-23T18:25:43.511Z",
    "category": "inner_entitlements",
    "channel_data":
                    [
                           { "id": "5001", "type": "None" },
                           { "id": "5002", "type": "Premium Subscription" },
                           { "id": "5005", "type": "Cart" },
                           { "id": "5007", "type": "Reporting" },
                           { "id": "5006", "type": "Administer" },
                           { "id": "5003", "type": "Article" },
                           { "id": "5004", "type": "Homepage" }
                    ]
}
```

3.7 Governance

The following is an indicative, non-exhaustive, list of use cases that depicts the governance actions and principles.

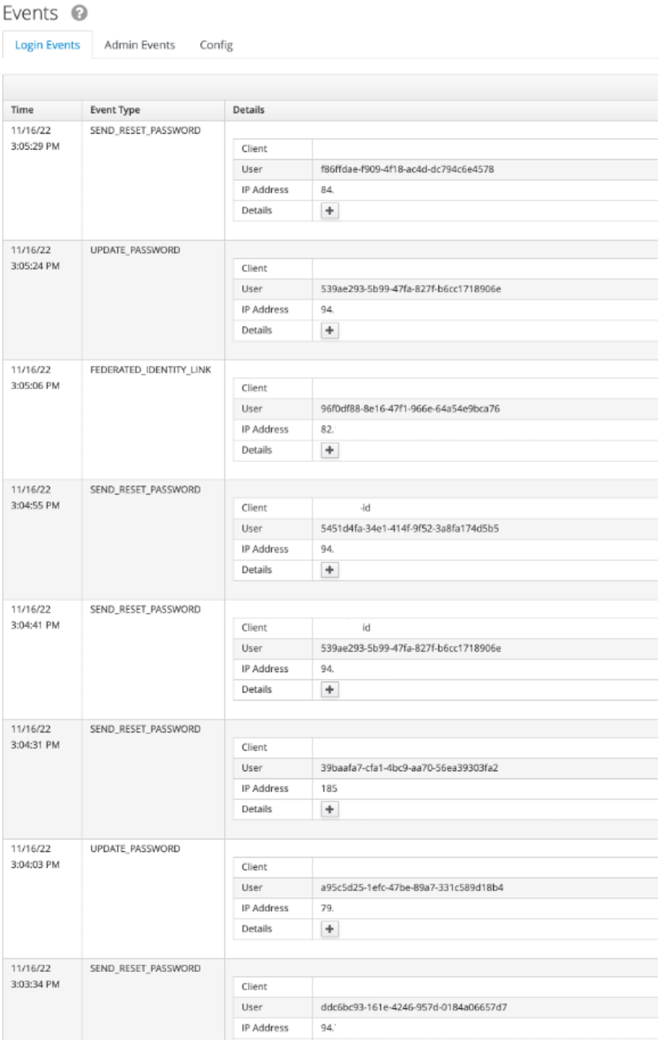
3.7.1 Use cases

The following use-cases are supported in relation to data management governance:

- The systems, solutions, and rules that link enterprise personnel, applications, and data to help agencies manage access and risk.
- Leverage continuous monitoring data to identify abnormalities that suggest unauthorized access, malicious behavior or any other situation that imposes risk to the SENTINEL IdaaS operation.
- Take action to amend situations that entail risks, as suggested by the monitoring process analysis, as part of standard operations.

3.7.2 Sample demo functionalities / screens

The following figures provide some indicative keycloak screens concerning data management and governance features.



Events

Login Events | Admin Events | Config

Time	Event Type	Details
11/16/22 3:05:29 PM	SEND_RESET_PASSWORD	Client User f86ffdae-f909-4f18-ac4d-dc794c6e4578 IP Address 84. Details +
11/16/22 3:05:24 PM	UPDATE_PASSWORD	Client User 539ae293-5b99-47fa-827f-b6cc1718906e IP Address 94. Details +
11/16/22 3:05:06 PM	FEDERATED_IDENTITY_LINK	Client User 96f0df88-8e16-47f1-966e-64a54e9bca76 IP Address 82. Details +
11/16/22 3:04:55 PM	SEND_RESET_PASSWORD	Client -id User 5451d4fa-34e1-414f-9f52-3a8fa174d5b5 IP Address 94. Details +
11/16/22 3:04:41 PM	SEND_RESET_PASSWORD	Client id User 539ae293-5b99-47fa-827f-b6cc1718906e IP Address 94. Details +
11/16/22 3:04:31 PM	SEND_RESET_PASSWORD	Client User 39baafa7-cfa1-4bc9-aa70-56ea39303fa2 IP Address 185 Details +
11/16/22 3:04:03 PM	UPDATE_PASSWORD	Client User a95c5d25-1efc-47be-89a7-331c589d18b4 IP Address 79. Details +
11/16/22 3:03:34 PM	SEND_RESET_PASSWORD	Client User ddc6bc93-161e-4246-957d-0184a06657d7 IP Address 94.

Figure 14. Low level auditing of user-related events

4 Contributed Cybersecurity Components

4.1 Overview

MITIGATE [1][3] is a standards-based risk management tool providing a collaborative, evidence-driven risk assessment approach, which delves into the technical specificities and security particularities of an organisation's infrastructure, analyses assets' interdependencies, detects all cyber threats and assets' vulnerabilities and calculates all cyber risks related to the underlined infrastructure, including potential cascading effects. It promotes collaboration among business entities in assessing and exploring their risks allowing them to manage their cybersecurity in a holistic and cost-effective manner.

The full featured version of SENTINEL properly integrates with MITIGATE, building the following functionalities / components:

- The SENTINEL simulation environment, which enables SME/ME representatives to identify the cybersecurity level of specific cyber-assets
- The SENTINEL *Cybersecurity Risk Assessment (CSRA)*, which allows SME/ME representatives to perform risk assessments on a list of PA's cyber-assets
- The SENTINEL asset inventory, in which it participates on the creation process of a SENTINEL asset

All functionalities could be utilized by SMEs/MEs as a cybersecurity guide to automatically alleviate existing cyber threats and reach the right decisions for enhancing organizational level of security, ensuring among other data protection.

4.2 Functionalities

In this section, the functionalities of the SENTINEL cybersecurity component are introduced and presented.

4.2.1 Vendor and product management

Cyber assets which are utilised in daily operations to support the organisation's services engage vendor and product characteristics. In MITIGATE, assets vendor and product details are synchronised with the asset's *Common Platform Enumeration (CPE)*[7] catalogue of *National Institute of Standards and Technology (NIST)*. The catalogue is parsed for the embedded vendor names and products along with their CPE identifier, name, version, and edition, which are then extracted and assigned with a unique id. These details are synchronized automatically, get inserted and enumerated.

In this second implementation period from the release of the MVP version, the project designed and implemented the SENTINEL asset model, allowing the SME/ME to build its own asset inventory. This SENTINEL asset model, among others, allows the detailed specification of the vendor, the product, and the exact version of the cyber-asset. To succeed on this, MITIGATE provides a list of worldwide known vendors in which the user can easily find the preferred one. Upon selecting the preferred vendor MITIGATE filters and provides the list of different products

[7] https://nvd.nist.gov/products/cpe

for this vendor. As a third step, the end user can select the preferred detailed version of the last selected product. All these are realized transparently for the SENTINEL user, through the MITIGATE adapter which resides on the SENTINEL platform and allows the secure integration with the actual MITIGATE tool.

4.2.2 Threat intelligence

MITIGATE threat intelligence provides all security-related information concerning threats and vulnerabilities of vendors' products. This information stems from vulnerability and threat open repositories, utilizing open intelligence and big-data analytics to provide near real-time notifications on such security details. Thereby, vulnerabilities and threats are mapped with specific products of the previously described list of vendors' products. Specifically, threat intelligence encompasses the following processes:

- Vulnerability management
- Common weaknesses management
- Threat management

The following paragraphs analyze in detail the above-mentioned processes.

4.2.2.1 Vulnerability management

MITIGATE implements specific components which are used for the identification of all known vulnerabilities identified on the selected cyber-assets (cf. Section 4.2.1) of the organisation's IT infrastructure using the open online repository *Common Vulnerabilities and Exposures (CVE)* of MITRE[8]. This is realized corelating the CPE (see Section 4.2.1) and CVE connection already catalogued in the *National Vulnerability Database (NVD)* of NIST[9].

The NVD maintained by the NIST is one of the largest publicly available security-related databases. Developed before 2005, NVD is a product of the NIST Computer Security Division and sponsored by the National Cyber Security Division of the Department of Homeland Security. Since 2005, it is freely available to the public, i.e., it is possible to download the complete database from the NIST website. Its purpose is described by NIST as a repository of vulnerability-related data, including several other databases (e.g., on security checklists, security-related software flaws misconfigurations, etc.). This data can be accessed automatically using the *Security Content Automation Protocol (SCAP)* [10] and thus enables the automation of vulnerability and security management.

The proper integration of SENTINEL with MITIGATE through the MITIGATE adapter allows the exact vulnerabilities related to the declared SENTINEL cyber-asset to be automatically inherited, based on the selected product version and the vulnerability records, that are replicated in the persistency engine from the NVD open source. Afterwards, a vulnerability analysis is provided following the *Common Vulnerability Scoring System (CVSS)* vector, upon which the vulnerability attributes are determined along with the CVSS severity score illustrated per product vulnerability.

[8] https://www.cve.org/
[9] https://nvd.nist.gov/
[10] https://csrc.nist.gov/projects/security-content-automation-protocol

4.2.2.2 Common weaknesses management

MITIGATE also implements various components which are used for the identification of all known common weaknesses related with vulnerabilities. This is realized through the utilization of the *Common Weakness Enumeration (CWE)* [11] specification, which provides a common language of discourse for discussing, finding, and dealing with the causes of software security vulnerabilities as they are found in code, design, or system architecture. Each individual CWE represents a single vulnerability type, while all individual CWEs are held within a hierarchical structure that allows for multiple levels of abstraction. CWEs located at higher levels of the structure (i.e. Configuration) provide a broad overview of a vulnerability type and can have many children CWEs associated with them. CWEs at deeper levels in the structure (i.e. Cross Site Scripting) provide a finer granularity and usually have fewer or no children CWEs.

CWE is currently maintained by the MITRE Corporation; NVD integrates CWE into the scoring of CVE vulnerabilities by providing a cross section of the overall CWE structure. NVD analysts score CVEs using CWEs from different levels of the hierarchical structure. This cross section of CWEs allows analysts to score CVEs at both a fine and coarse granularity, which is necessary due to the varying levels of specificity possessed by different CVEs.

All these allows MITIGATE to automatically relate specific vulnerabilities, identified on the selected cyber-assets (cf. Section 4.2.1), with one or more types of weaknesses, and eventually identify specific threats (as introduced in the following paragraph) building the threat profile of the SENTINEL cyber-asset.

4.2.2.3 Threat management

Threat management, also implemented in MITIGATE, allows the identification of the threat landscape the underlined organisation's IT infrastructure may be exposed to. In this vein, MITIGATE provides to SENTINEL an up-to-date catalogue of known threats, which raises the security awareness of the organisation. The current functionality utilizes a combination of the NIST NVD, the CWE and the *Common Attack Pattern Enumeration and Classification (CAPEC*) of MITRE[12].

Specifically, for each vulnerability entry a related CWE id is enumerated through NVD, whereas in CWE for each entry the related CAPEC ids are enumerated. According to these relationships threats are automatically extracted in the context of either CWE or CAPEC entries. A local instance of all three databases is created at MITIGATE and threats are synchronised with the corresponding vulnerabilities identified on the selected vendors' products.

The proper integration of SENTINEL with MITIGATE through the MITIGATE adapter allows the identification of specific threats for each declared SENTINEL cyber-asset. Therefore, upon creating a new SENTINEL cyber-asset the organization gets automatically aware of the following:

- Existing vulnerabilities
- Related types of weaknesses
- Specific threats

[11] https://cwe.mitre.org/
[12] https://capec.mitre.org/

4.2.3 Cybersecurity risk assessment

Cybersecurity risk management plays a critical role in managing the threats, aiming to overall system's resilience. It enables the identification of critical assets, vulnerabilities, and threats and the determination of suitable proactive control measures to tackle the related risks. Towards this, cybersecurity risk assessment has been identified as an essential tool [6] for any organization, involving some of the best preventive activities to protect systems and their cyber-components. The periodic execution of risk assessments can unveil potential risks to the system, determining the suitable controls to mitigate the risks. Risk assessment needs to be performed proactively, so that organizations can implement suitable controls before a risk is materialized*.* Hence, risk assessment provides the overall consideration of interrelating assets, threats, exposures, and countermeasures to ascertain the current risk level.

Based on ISO 31000 [4], risk management is a set of coordinated activities to direct and control an organization regarding a risk. The risk management process involves the systematic application of policies, procedures, and practices to the activities of communicating and consulting, establishing the context and assessing, treating, monitoring, reviewing, recording, and reporting risk. The risk management process is thus defined by the correlation and interaction of all its components:

- scope,
- context and criteria,
- risk assessment,
- risk treatment,
- risk reporting and recording,
- risk monitoring and review,
- risk communication and consultation

Risk assessment is the overall process of risk identification, analysis, and evaluation.

- The purpose of *risk identification* is to find, recognize, and describe risks that might help or prevent an organization achieving its objectives. Relevant, appropriate, and up-to-date information is important in identifying risks [4].
- The purpose of *risk analysis* is to comprehend the nature of risk and its characteristics, including, where appropriate, the level of risk. Risk analysis involves a detailed consideration of uncertainties, risk sources, consequences, likelihood, events, scenarios, controls, and their effectiveness [4].
- The purpose of *risk evaluation* is to support decisions. Risk evaluation involves comparing the results of the risk analysis with the established risk criteria to determine where additional action is required [4].

Risk on MITIGATE reflects three basic concepts:

- event
- likelihood*,* and
- severity

A *risk event* can be certain or uncertain and can be influenced by a single occurrence or a series of occurrences. *Likelihood* indicates the frequency of an event and how probable it is to occur. *Severity* is the expected result of an event (degree of injury, property damage or other mission impairing factors). An event is modelled via likelihood of uncertainty by several mathematical theories, such as probability theory [5], expected utility theory [6], Dempster-Shaffer theory of evidence [7], and fuzzy set [8]. These theories are all implemented for different purposes and refer to different classes of uncertainties.

The cybersecurity risk assessment initiation process is available at the *Processing Activity (PA)* level when at least one SENTINEL cyber-asset assigned has a proper CPE identifier. The SME/ME representative that gains access to the SENTINEL dashboard may request a cybersecurity risk assessment. Then the following events are realized:

1. Risk assessment procedure is initiated;
2. SENTINEL core provides to MITIGATE adapter the risk level of the selected PA, along with the list of CPE identifiers for the assigned to the PA cyber-assets;
3. Based on the list of CPEs the MITIGATE identifies the list of vulnerabilities for each one of them
4. For each identified vulnerability, types of weaknesses are identified
5. Based on the list of weaknesses CAPEC MITRE threats are also identified
6. Considering the list of vulnerabilities, weaknesses, and threats, MITIGATE builds automatically all attack scenarios (risks) for each one of the cyber-assets of the PA
7. Likelihood of occurrence for threats is revealed from MITRE registry
8. Once all the steps are completed the cybersecurity risk assessment is executed
9. Upon successful completion of the risk assessment process, MITIGATE returns the results to the MITIGATE adapter
10. MITIGATE adapter stores the results to the SENTINEL Profiling component
11. A detailed summary of the calculated risk for each cyber-asset is created

4.2.4 Simulation environment

The SENTINEL simulation environment offers the user interface, where the end user of the SENTINEL platform may set experiments on specific cyber-assets and automatically identify possible attack scenarios. An attack scenario is considered a relation (triplet) of a vendor’s product, vulnerability, and threat. The current functionality initiates an evaluation process that builds a hybrid model of the information catalogued through the previous processes, which delivers the attack scenarios.

The SENTINEL user may develop and explore different possible attack scenarios upon selecting various vendors’ products from the respective lists delivered from the previously described “Vendor and product management” paragraph (Section 4.2.1) that rely on the organisation’s assets. The selected vendors’ products are automatically linked to available vulnerabilities and threats that are relevant, which are derived from the respective vulnerabilities list and threat catalogue of the open sources, described in “Threat intelligence” (Section 4.2.2). The vendors’ products along with the linked information (i.e., vulnerabilities, threats/attack types) are intuitively visualised using a graph visualization modality. The specific component offers this visualization functionality, where graphical analytics facilitates the SENTINEL end user to better comprehend the generated results and alleviate some of the analysis burden from the assessor’s point of view.

To this aim, the user may review information concerning:

- the affected vendor’s product

- the corresponding identified vulnerability
- the threat that can impact the respective vulnerability

Reports containing lists of products associated with the corresponding vulnerabilities and threats are generated.

4.3 Technical specifications

The cybersecurity component of SENTINEL is an intelligent mechanism of an optimized solution, which communicates with the SENTINEL digital core through an adapter. It is built on the Java Spring Framework, an open source, enterprise-level framework for creating standalone, production-grade applications. It offers dependency injection features providing a list of objects defining their own dependencies, which the Spring container later injects into them. This process enables the creation of modular applications consisting of loosely coupled components that are ideal for microservices and distributed network applications as in the SENTINEL case. The PostgreSQL is used for the data store of vendors, products, threat, and vulnerabilities catalogues, which is a free and open-source *Relational Database Management System (RDBMS)* emphasizing extensibility and SQL compliance.

In addition, the MITIGATE cybersecurity component provides near real-time notifications of security related information (vulnerabilities, common weaknesses, and threats) on products extracted from open online repositories (CPE of NIST; CWE of MITRE, CVE of MITRE; CAPEC of MITRE) through text processing, utilising open intelligence techniques and big data analytics. Such Mining techniques are extremely computationally intensive; thus, the component relies on Apache SPARK big-data framework[13] to achieve linear scalability. Server push notifications are provided to the end-user, concerning any type of messages that are published in the pub/sub queue to ingest and distribute the relevant data. The consistency of the various ‘enumerations’ concerning vendor/products, threats and vulnerabilities is managed through semi-automated updates from the open sources. The graph visualiser is responsible to render all types of the supported graphs in the simulation environment.

The MITIGATE adapter is also built on the Java Spring Framework and implements all the integration and harmonization services required for SENTINEL to be able to use and built upon the MITIGATE services.

4.4 Updates since D2.1

The MVP version of the SENTINEL platform only implemented the Simulation environment, which offered the proper user interface, where the SME/ME representative was capable of setting experiments on specific cyber-assets and automatically identify possible attack scenarios.

The full feature version significantly updates the MITIGATE adapter and the integration with MITIGATE implementing the following functionalities:

- Participate on the creation (and update) process of a SENTINEL cyber-asset (Section 4.2.1)

[13] http://spark.apache.org/

- Perform cybersecurity risk assessments for a selected PA in which at least one assigned cyber-asset has a proper CPE identifier, as thoroughly explained in Section 4.2.3.

Based on this new functionality MITIGATE also becomes an available assessment tool in the SENTINEL platform, while it can be also recommended from the SENTINEL policies as an available SENTINEL plugin for a list of OTMs. With these new features, estimation on threat / vulnerability / risk levels is successfully provided by initiating a risk assessment process, which allows the SME/ME to conduct and review the recorded results and further expand the cybersecurity awareness. Specifically, the latter significantly guides and helps decision makers within the enterprise to undertake optimal mitigation strategies and thus maintain organisation’s security and data protection.

4.5 Future Steps

As a future step we may consider to further enhance the integration with MITIGATE and provide to SENTINEL platform a more advanced simulation environment which will allow the SME/ME to build cyber-attack scenarios and investigate the probability of occurrence based on evidences. This will be realized through the MITIGATE Attack Simulation environment, which concentrates on the modeling of cyber-attacks / threats paths and patterns. Specifically, it undertakes the responsibility to reconstruct reliable and valid chains of evidence associated with known vulnerabilities one real cyber-assets. This could be furthered expanded considering real incidents taken from the SENTINEL observatory. Its main goal will be to create valid chains of evidence that represent a cyber-attack.

The MITIGATE Attack Simulation environment has a multidisciplinary role. Initially, it is used for the creation of the asset interdependencies model. This model is a comprehensive graph representation of the system, containing all the necessary information for the discovery and identification of the chain of sequential vulnerabilities on different assets that arise from consequential multi-steps attacks initiated from the Entry Points to exploit the vulnerabilities of the Target Points.

The second main functionality has to do with the actual discovery and identification of the so-called vulnerability chains or paths. The path discovery process assumes that no security controls are in place and can be used for comparative analysis to evaluate the effectiveness and hence cost effectiveness of existing security controls. It should be noted that this component creates the graphs in a way that the visualization component can render them.

In order for this environment to be also provided in SENTINEL, the following enhancements are required:

- Further expand the SENTINEL asset modelling, also including the interrelation of cyber-assets within the enterprise
- Update the MITIGATE adapter to properly utilize the MITIGATE Attack Simulation environment

5 Continuous Management and Integration of Opensource Technology Offerings and Solutions

5.1 Overview

This section details the list of the **external tools** and **training material** that will be managed by the SENTINEL platform. Each of these elements is mapped to the related *Organisational & Technical Measures (OTMs)* by ENISA [9][10], and then, the *SENTINEL's Recommendation Engine* can make appropriate suggestions to the user based on this information. These include:

i. the use or integration of opensource tools, or
ii. the participation in free training.

The overall solution will complete an SME's security and privacy capabilities. The following subsections detail the selected tools (Section 5.2) and training elements (Section 5.3), respectively.

This work is mainly conducted under the task *"T2.4: Continuous management and integration of opensource technology offerings and solutions"*. The last subsection (Section 5.4) presents the updates from the first iteration that was documented under the deliverable *"D2.1: The SENTINEL privacy & data protection suite for SMEs/MEs: MVP"*, due in M12.

5.2 External opensource tools

One of the main recommendation features of SENTINEL is to propose to the user/SME a list of tools that can be used in the monitored system and can enhance the overall security and privacy features. A wide list of free and opensource solutions have been gathered so far, covering all phases of the *Security Development Lifecycle (SecDLC)* [11]. The four SecDLC phases are:

- *Assessment:* evaluation of the underlying system concerning known vulnerabilities, the status of security and privacy controls, compliance level, and risk management.
- *Detection:* usage of monitoring tools to identify wily actions.
- *Protection:* application of defence controls and mechanisms for incident handling.
- *Response:* response to incidents in tandem with protection, collect feedback, and perform post-incident actions.

The following figure illustrates these four phases and their main security/privacy elements.

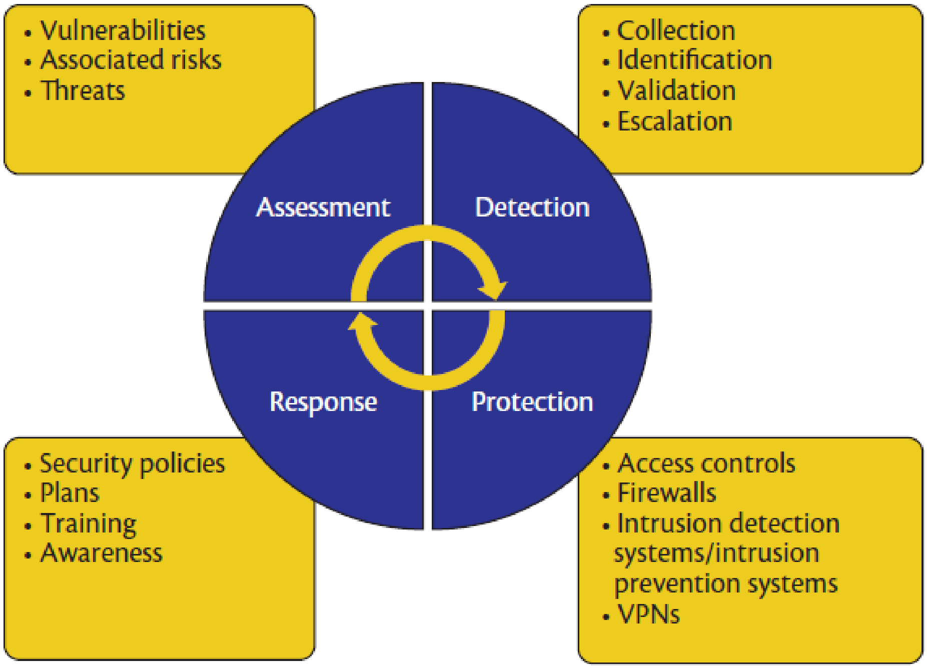


Figure 15. Security Development Lifecycle (SecDLC)

In total, *54 tools* are chosen based on the community support and maturity. These solutions cover all OTMs that are considered by the SENTINEL methodology (10 operational and 10 technical capabilities), enhance the long-term maintainability, and are ease to integrate or applied in the SMEs' information systems.

The next table summarizes the number of tools per SecDLC phase, the expertise level that is required in order to apply or use them, and the main functionality that is offered.

Table 3. External tools

SecDLC Phase	**Number of tools**	**Tools per expertise level (Beginner, Intermediate, Expert)**	**Provided functionality**
Assessment	22	*B:* 8, *I:* 7, *E:* 7	• Crete privacy policies, compliant with GDPR or other frameworks outside Europe (CCPA, CalOPPA, PIPEDA, UK GDPR, and Australia's Privacy Act) • Data Protection Impact Assessment (DPIA) • Self-assessment for GDPR compliance • Data anonymization (several models are supported, like k-Anonymity, l-diversity, Differential privacy, membership/attribute/identity disclosure, etc. • Fair and transparent use of personal data

			• Assessment of data protection mechanisms • Analytics • Web server and application analysis • Vulnerability scanning • Malware scanning • Network mapping • Code review in terms of quality and security
Detection	8	*B:* 0, *I:* 2, *E:* 6	• Network monitoring and Threat hunting • Intrusion Detection System (IDS) • Intrusion Prevention System (IPS) • Security information and event management (SIEM) • Penetration testing and Digital Forensics
Protection	18	*B:* 12, *I:* 5, *E:* 1	• Firewall • Antivirus • Disk and data encryption • Secure deletion of files • Backup • Digital certifications, Pretty Good Privacy (PGP), email security • Secure remote access • Virtual Private Network (VPN) • Identity and Access Management
Response	6	*B:* 0, *I:* 1, *E:* 5	• Data recovery • Forensics and Incident response • Cyber Threat Intelligence (CTI) and Information sharing

Appendices provides the whole list of external tools, along with a short description, the covered OTMs, the supported Operating Systems, and their license. A model has been established that defines each tool’s details, including information such as:

- Tool name
- Short description
- SecDLC phase
- Expertise level (i.e., Beginner, Intermediate, and Expert)
- Operational capabilities (OTMs)
- Technical capabilities (OTMs)
- Operating systems
- Link
- Installation guide link

- Tutorial link

5.3 External Training

The second recommendation feature of SENTINEL is to suggest a list of training materials that can enhance the awareness, knowledge, and skills of the end-user and/or the SME employees regarding security and privacy concepts. Therefore, a wide list of *117 training elements* has been determined so far, covering all OTMs that are subject of the SENTINEL methodology. These include courses, webinars, articles, and other online reading material for various levels of expertise (ranging from beginners to experts).

Also, a wide range of topics is considered like security, privacy, combination of security and privacy, as well as ethics, safety, and the implications from emerging technologies of *Artificial Intelligence (AI)*, Big Data, the *Internet of Things (IoT)*, surveillance systems, and several others. The SENTINEL user can learn from fundamental concepts of security and privacy to very technical and research issues. Thus, training for all security and privacy principles (e.g., confidentiality, integrity, availability, authentication, authorization, anonymity, pseudo-anonymity, etc.) is provided, as well as practical and technology-oriented aspects (e.g., penetration testing, digital forensics, ethical hacking, network monitoring, system administration, personal cybersecurity, etc.).

Moreover, several different sources are consumed. The user can receive recommendations with some very useful papers, articles, and reports from ENISA, the European Data Protection Board (EDPB), and other organizations. Also, many courses are included from popular Massive Open Online Courses (MOOCs) platforms, like Coursera, Udemy, and edX, which may also offer the opportunity to receive a certificate or a diploma. Moreover, there are trainings that can prepare experts to assert professional certification for the examinations of CompTIA, ISC^2 SSCP, ISACA CISA.

Appendix – II: External training materials provides the whole list of external training materials, along with a short description, the covered OTMs, and the topics that they cover. Thereupon, a model has been established that defines each material's details, including information such as:

- Material name
- Short description
- Keywords
- Difficulty level (i.e., Beginner, Intermediate, and Advance)
- Type (e.g., course, webinar, article, report, blog entry, etc.)
- Property (i.e., security, privacy, security & privacy, safety, ethics, AI, Big Data, IoT, or other)
- Operational capabilities (OTMs)
- Technical capabilities (OTMs)
- Link

5.4 Updates since D2.1

This subsection highlights the updates of T2.4 and the continuous management and integration of opensource technologies from M18 and D2.1 up to M18 and the current D2.2.

Concerning ***tools***, we adapted the methodology of SecDLC phases in order to have a better mapping of the offered capabilities to the end-user needs. The tools' list was expanded including 54 tools (from 5 tools in D2.1) and covering all SecDLC phases and the OTMs that are considered by SENTINEL. A model defining each tool entry was also established.

Regarding ***training***, the current list contains 117 materials (from 6 materials in D2.1). All SENTINEL OTMs that are considered by the project are covered. Furthermore, a model defining each training material entry was also established.

The two models are processed by the *Recommendation Engine*, which makes suggestions to the user based on the OTM mapping. This effort is also devoted under the integration work package *"WP5: SENTINEL continuous integration and system validation"*.

All these activities for the management of external elements will be continued up to M30 and the end of T2.4, covering further SENTINEL requirements and the security/privacy needs of the collaborating SMEs. The final status will be documented in the upcoming *"D2.3: The SENTINEL privacy & data protection suite for SMEs/MEs: Final product"*, due at M30.

6 Conclusion and Future Steps

The full feature version of the SENTINEL platform significantly updates what was introduced at the MVP version, introducing many new features, and presenting the results of the work performed at all technical tasks of WP2. Specifically, the document presents the current implementation status of the following modules, tools and services:

a) the GDPR CSA tool, which allows companies to demonstrate their accountability by providing to data protection authorities the list of technical and organisational measures putted in place to preserve privacy and monitor compliance with GDPR from compliance assessment results (i.e., compliance level).
b) the SENTINEL IdMS, which applies identity management services to the personal data of the actual end-users for the pilot SMEs/MEs. The full feature version of the SENTINEL IdMS is fully compliant with the MyData model enabling easy integrations with existing SME/ME solutions, secure storage, and communication, enforcing at the same time data privacy regulations.
c) the MITIGATE core plugin, which is a standards-based risk management tool providing a collaborative, evidence-driven risk MITIGATE adapter allows SENTINEL platform to offer (i) the SENTINEL simulation environment, which enables SME/ME representatives to identify the cybersecurity level of specific cyber-assets, (ii) the SENTINEL CSRA, which allows SME/ME representatives to perform cybersecurity risk assessments on a list of PA's cyber-assets, and (iii) the SENTINEL asset inventory, in which it participates on the creation process of a SENTINEL asset.
d) the list of selected open-source components that help the SME/ME to properly address the SENTINEL recommendations. Specifically, 54 tools are chosen based on the community support and maturity. These solutions cover all SENTINEL OTMs grouped in 10 operational and 10 technical capabilities, enhancing the long-term maintainability, and easily applied in the SMEs' information systems.
e) the list of training material that can also help the representatives of an SME/ME to better understand, design and implement security and privacy controls within the organization. A wide range of topics is considered like security, privacy, combination of security and privacy, as well as ethics, safety, and the implications from emerging technologies of AI, Big Data, the IoT, surveillance systems, and several others. The current list contains 117 materials, covering all SENTINEL OTMs.

This document also embarked from the previous work on requirements, framework architecture, and the MVP version of the platform, properly updating the specifications of the scope, role and technologies for each of the aforementioned modules, tools and services for data protection. Especially for the final SENTINEL product (M30), this document constitutes a natural continuation of the integration efforts that have started at the first project period and the release of the MVP, currently realized at this full feature version, and will be finalized in the upcoming 12-month period.

Within the next period SENTINEL will mainly focus on the platform services' and user interface / user experience (UI/UX) improvements, which will be a continuous process where the consortium will move around a specific improvement cycle. Within this cycle, improvements will be accomplished in a series of steps and/or specific actions, such as introducing new or changed practices and requirements into platform's services and processes. After carefully assessing and gathering feedback from pilots, all involved project teams will be required to get aligned on objectives and prioritization factors, moving forward to specific implementations in the upcoming period.

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Appendices

Appendix - I: External tools

This appendix details the list of the external tools.

#1 – Privacy Policy Generator			
Create privacy policies for websites, apps, and Facebook pages/apps (Support of GDPR, CCPA, CalOPPA, PIPEDA, and Australia's Privacy Act).			
SecDLC phase	Assessment	Expertise	Beginner
License	Free for use	Operating systems	Web interface
Operational capabilities (OTMs)	O1: Defining and enforcing a policy		
Technical capabilities (OTMs)	T8: Application lifecycle security		
Link	https://www.privacypolicygenerator.info/		
Installation guide	-		
Tutorial	-		

#2 – ARX Data Anonymization Tool			
Data anonymization for several Privacy Models (i.e., membership disclosure, attribute disclosure, and identity disclosure). Support several anonymization techniques, like k-Anonymity, k-Map, Average risk, population uniqueness, sample uniqueness, l-diversity, t-closeness, δ-Disclosure privacy, β-Likeness, δ-Presence, Profitability, and Differential privacy. Also, compatible with SQL databases, Excel, and CSV files).			
SecDLC phase	Assessment	Expertise	Intermediate
License	Apache License v2	Operating systems	Windows, MacOS, Linux
Operational capabilities (OTMs)	O6: Managing data processors for the GDPR		
Technical capabilities (OTMs)	T8: Application lifecycle security, T1: Authentication and Access control		
Link	https://arx.deidentifier.org/		
Installation guide	https://arx.deidentifier.org/downloads/		
Tutorial	https://arx.deidentifier.org/publications/		

#3 – CNIL's Privacy Impact Assessment tool
Performs Data Protection Impact Assessment (DPIA).

SecDLC phase	Assessment	Expertise	Beginner
License	GPL-3.0 license	Operating systems	Windows, MacOS, Linux, Web interface
Operational capabilities (OTMs)	O1: Defining and enforcing a policy, O2: Assigning roles and responsibilities, O3: Enforcing an access control policy, O4: Securely managing assets, O5: Managing change, O6: Managing data processors for the GDPR		
Technical capabilities (OTMs)	T8: Application lifecycle security		
Link	https://www.cnil.fr/en/privacy-impact-assessment-pia		
Installation guide	https://www.cnil.fr/en/open-source-pia-software-helps-carry-out-data-protection-impact-assessment		
Tutorial	https://www.cnil.fr/en/privacy-impact-assessment-pia https://www.youtube.com/watch?v=-SdA9L4j0a8		

#4 – BayLDA			
GDPR maturity level self-assessment.			
SecDLC phase	Assessment	Expertise	Beginner
License	Free for use	Operating systems	Web interface
Operational capabilities (OTMs)	O1: Defining and enforcing a policy		
Technical capabilities (OTMs)	T8: Application lifecycle security		
Link	https://www.lda.bayern.de/tool/start.html#		
Installation guide	-		
Tutorial	https://www.cnil.fr/en/privacy-impact-assessment-pia https://www.youtube.com/watch?v=-SdA9L4j0a8		

#5 – Webskoll			
Assessment of data-protecting measures for websites.			
SecDLC phase	Assessment	Expertise	Intermediate
License	Free for use	Operating systems	Web interface

Operational capabilities (OTMs)	O4 org_asset_management, O5: org_change_management
Technical capabilities (OTMs)	T8: Application lifecycle security
Link	https://webbkoll.dataskydd.net/en
Installation guide	-
Tutorial	-

#6 – OpenDSR framework			
Cooperate around the fair and transparent use of consumer data. Build interoperable systems for tracking and fulfilling Data Subject requests. Supports both GDPR and CCPA.			
SecDLC phase	Assessment	Expertise	Intermediate
License	Apache License v2	Operating systems	Web interface
Operational capabilities (OTMs)	O4 org_asset_management		
Technical capabilities (OTMs)	T8: Application lifecycle security		
Link	https://opendsr.org/		
Installation guide	https://github.com/opengdpr/OpenDSR		
Tutorial	-		

#7 – GDPR check list			
GDPR Compliance Checklist - Self-Assessment.			
SecDLC phase	Assessment	Expertise	Beginner
License	Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Public License ("Public License")	Operating systems	Web interface
Operational capabilities (OTMs)	O1: Defining and enforcing a policy		
Technical capabilities (OTMs)	T8: Application lifecycle security		
Link	https://gdprchecklist.io/		

Installation guide	https://github.com/privacyradius/gdpr-checklist
Tutorial	-

#8 – ICO Data protection self-assessment			
UK GDPR Data protection self-assessment.			
SecDLC phase	Assessment	Expertise	Intermediate
License	Free for use	Operating systems	Web interface
Operational capabilities (OTMs)	O4 org_asset_management, O5: org_change_management		
Technical capabilities (OTMs)	T8: Application lifecycle security		
Link	https://ico.org.uk/for-organisations/sme-web-hub/checklists/data-protection-self-assessment/		
Installation guide	-		
Tutorial	-		

#9 – PostHog			
Analytics Platform.			
SecDLC phase	Assessment	Expertise	Expert
License	MIT License	Operating systems	Linux
Operational capabilities (OTMs)	O6: org_gdpr_management		
Technical capabilities (OTMs)	T2: tec_logging_monitoring		
Link	https://posthog.com/		
Installation guide	https://github.com/PostHog/posthog		
Tutorial	https://posthog.com/blog/best-gdpr-compliant-analytics-tools		

#10 – GoAccess			
Web log analyzer and viewer.			
SecDLC phase	Assessment	Expertise	Beginner

License	MIT License	Operating systems	Linux, Windows (via Cygwin)
Operational capabilities (OTMs)	O6: org_gdpr_management		
Technical capabilities (OTMs)	T2: tec_logging_monitoring		
Link	https://goaccess.io/		
Installation guide	https://goaccess.io/get-started		
Tutorial	https://posthog.com/blog/best-gdpr-compliant-analytics-tools		

#11 – Nikto			
Web server scanner.			
SecDLC phase	Assessment	Expertise	Expert
License	GNU GPL v2	Operating systems	Unix-like
Operational capabilities (OTMs)	O4 org_asset_management, O5: org_change_management		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://sectools.org/tool/nikto/		
Installation guide	-		
Tutorial	-		

#12 – w3af			
Web application scanner.			
SecDLC phase	Assessment	Expertise	Expert
License	GNU GPL v2	Operating systems	Windows, OS X, Linux, FreeBSD, OpenBSD
Operational capabilities (OTMs)	O4 org_asset_management, O5: org_change_management		
Technical capabilities (OTMs)	T8: tec_app		
Link	http://w3af.org/		
Installation guide	-		

Tutorial	-

#13 – OWASP Zap			
Web application scanner.			
SecDLC phase	Assessment	Expertise	Expert
License	Apache License	Operating systems	Windows, MacOS, Linux
Operational capabilities (OTMs)	O4 org_asset_management, O5: org_change_management		
Technical capabilities (OTMs)	T8: tec_app, T3:tec_server_database		
Link	https://www.zaproxy.org/		
Installation guide	https://github.com/zaproxy/zaproxy		
Tutorial	https://www.zaproxy.org/zap-deep-dive/ https://www.zaproxy.org/docs/		

#14 – OpenVAS			
Vulnerability scanner.			
SecDLC phase	Assessment	Expertise	Expert
License	GPL	Operating systems	Windows, MacOS, Linux
Operational capabilities (OTMs)	O4 org_asset_management, O5: org_change_management		
Technical capabilities (OTMs)	T6: tec_network		
Link	https://www.openvas.org/		
Installation guide	-		
Tutorial	-		

#15 – Nmap			
Network Mapper.			
SecDLC phase	Assessment	Expertise	Intermediate
License	NPSL or modified GPLv2 or proprietary	Operating systems	Windows, MacOS, Linux

Operational capabilities (OTMs)	O4 org_asset_management, O5: org_change_management
Technical capabilities (OTMs)	T6: tec_network
Link	https://nmap.org/
Installation guide	-
Tutorial	-

#16 – inSSIDer			
Network scanner.			
SecDLC phase	Assessment	Expertise	Expert
License	4.x: Shareware; 3.x: Proprietary; 2.x: Apache License	Operating systems	Windows
Operational capabilities (OTMs)	O4 org_asset_management, O5: org_change_management		
Technical capabilities (OTMs)	T6: tec_network		
Link	https://www.metageek.com/inssider/		
Installation guide	-		
Tutorial	-		

#17 – Aircrack-Ng			
Wireless network cracker.			
SecDLC phase	Assessment	Expertise	Expert
License	GPL v2, BSD 3 Clause, OpenSSL	Operating systems	Windows, Linux
Operational capabilities (OTMs)	O4 org_asset_management, O5: org_change_management		
Technical capabilities (OTMs)	T6: tec_network		
Link	https://www.aircrack-ng.org/		
Installation guide	-		
Tutorial	-		

#18 – SonarQube			
Code review (quality and security) for several programming languages (i.e., Java, JS, TS, Kotlin, C/C#/C++, VB, PHP, Terraform, Cloudformation, GO, HTML, SQL, Ruby, XML, etc.).			
SecDLC phase	Assessment	Expertise	Intermediate
License	GNU Lesser GPL v3.0	Operating systems	Windows, MacOS, Linux
Operational capabilities (OTMs)	O4 org_asset_management, O5: org_change_management		
Technical capabilities (OTMs)	T8:tec_app, T3:tec_server_database		
Link	https://www.sonarqube.org/		
Installation guide	https://github.com/SonarSource		
Tutorial	https://docs.sonarqube.org/latest/		

#19 – BloodHound			
Attack graphs for Active Directory.			
SecDLC phase	Assessment	Expertise	Intermediate
License	GNU GPL v3	Operating systems	Web interface
Operational capabilities (OTMs)	O4 org_asset_management, O5: org_change_management		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://github.com/BloodHoundAD/BloodHound		
Installation guide	-		
Tutorial	-		

#20 – CVE Search			
Vulnerabilities search engine.			
SecDLC phase	Assessment	Expertise	Beginner
License	Free for use	Operating systems	Web interface
Operational capabilities (OTMs)	O10: Cybersecurity awareness, education and training, O7: org_incident_handling		
Technical capabilities (OTMs)	T8: tec_app		

Link	https://www.cve-search.org/
Installation guide	-
Tutorial	-

#21 – VirusTotal			
Malware scanner.			
SecDLC phase	Assessment	Expertise	Beginner
License	Free for use	Operating systems	Web interface
Operational capabilities (OTMs)	O7: org_incident_handling, O10: Cybersecurity awarenes		
Technical capabilities (OTMs)	T4: tec_endpoint_workstations, T3:tec_server_database		
Link	https://www.virustotal.com/gui/home/upload		
Installation guide	-		
Tutorial	-		

#22 – VirusTotal Mobile			
Malware scanner.			
SecDLC phase	Assessment	Expertise	Beginner
License	Free for use	Operating systems	Android
Operational capabilities (OTMs)	O7: org_incident_handling, O10: Cybersecurity awarenes		
Technical capabilities (OTMs)	T4: tec_endpoint_workstations, T3:tec_server_database		
Link	https://support.virustotal.com/hc/en-us/articles/115002146549-Mobile-Apps		
Installation guide	-		
Tutorial	-		

#23 – Wireshark			
Network traffic monitoring.			
SecDLC phase	Detection	Expertise	Intermediate

License	GPL-2.0-or-later	Operating systems	Windows, Linux, MacOS
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T6: tec_network		
Link	https://www.wireshark.org/		
Installation guide	https://www.wireshark.org/docs/wsug_html/#ChapterBuildInstall		
Tutorial	-		

#24 – BackTrack			
Linux distribution for Digital Forensics and Penetration testing.			
SecDLC phase	Detection	Expertise	Expert
License	GNU General Public License (GPL)	Operating systems	Linux
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T2: tec_logging_monitoring		
Link	https://www.backtrack-linux.org/		
Installation guide	-		
Tutorial	-		

#25 – Security Onion Solutions			
IDS, threat hunting, network security monitoring.			
SecDLC phase	Detection	Expertise	Expert
License	Elastic License	Operating systems	Linux
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T6: tec_network		
Link	https://securityonionsolutions.com/		
Installation guide	-		
Tutorial	https://securityonionsolutions.com/training/		

#26 – Elastic SIEM			
Security Information and Event Management (SIEM).			
SecDLC phase	Detection	Expertise	Expert
License	Elastic License 2.0 (ELv2)	Operating systems	Windows, Linux, MacOS
Operational capabilities (OTMs)	O7: org_incident_handling, O4: org_asset_management		
Technical capabilities (OTMs)	T2: tec_logging_monitoring		
Link	https://www.elastic.co/security/siem		
Installation guide	-		
Tutorial	https://securityonionsolutions.com/training/		

#27 – Suricata			
Intrusion Detection System (IDS) / Intrusion Prevention System (IPS).			
SecDLC phase	Detection	Expertise	Expert
License	GNU GPL v2	Operating systems	Windows, Linux, MacOS
Operational capabilities (OTMs)	O7: org_incident_handling, O4: org_asset_management		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T4: tec_endpoint_workstations		
Link	https://suricata.io/		
Installation guide	-		
Tutorial	https://securityonionsolutions.com/training/		

#28 – Snort			
Intrusion Detection System (IDS).			
SecDLC phase	Detection	Expertise	Intermediate
License	GPLv2+	Operating systems	Windows, Linux
Operational capabilities (OTMs)	O7: org_incident_handling		

Technical capabilities (OTMs)	T6: tec_network, T3: tec_server_database
Link	https://www.snort.org/
Installation guide	-
Tutorial	-

#29 – OSSEC			
Intrusion Detection System (IDS) / Intrusion Prevention System (IPS) (Host-based IDS, log analysis, integrity checking, Windows registry monitoring, rootkit detection, alerting, and active response).			
SecDLC phase	Detection	Expertise	Expert
License	GNU GPL v2	Operating systems	Windows, Linux
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T4: tec_endpoint_workstations, T3: tec_server_database		
Link	https://www.ossec.net/		
Installation guide	https://www.ossec.net/docs/docs/manual/installation/index.html		
Tutorial	https://www.ossec.net/docs/docs/manual/index.html		

#30 – Wazuh			
Security Information and Event Management (SIEM), Security Analytics, Intrusion Detection, Log Data Analysis, File Integrity Monitoring. Vulnerability Detection, Incident Response, Regulatory Compliance, Cloud Security.			
SecDLC phase	Detection	Expertise	Expert
License	GNU GPL v2	Operating systems	Windows, Linux, MacOS
Operational capabilities (OTMs)	O7: org_incident_handling, O4: org_asset_management		
Technical capabilities (OTMs)	T4: tec_endpoint_workstations, T3: tec_server_database, T2: Logging - monitoring and alerting		
Link	https://wazuh.com/		
Installation guide	https://wazuh.com/install/		
Tutorial	-		

#31 – OpenSSH			
Secure shell – Remote access.			
SecDLC phase	Protection	Expertise	Beginner
License	BSD, ISC, Public domain	Operating systems	Linux
Operational capabilities (OTMs)	O3: org_access_policy, O9: org_hr		
Technical capabilities (OTMs)	T6: tec_network, T1:tec_auth_acl		
Link	http://www.openssh.com/		
Installation guide	-		
Tutorial	-		

#32 – Putty			
Secure shell – Remote access.			
SecDLC phase	Protection	Expertise	Beginner
License	MIT Licence	Operating systems	Windows and mobile
Operational capabilities (OTMs)	O3: org_access_policy, O9: org_hr		
Technical capabilities (OTMs)	T6: tec_network, T1:tec_auth_acl		
Link	https://www.putty.org/		
Installation guide	-		
Tutorial	-		

#33 – WinSCP			
Secure shell – Remote access.			
SecDLC phase	Protection	Expertise	Beginner
License	GPL-3.0-only	Operating systems	Windows
Operational capabilities (OTMs)	O3: org_access_policy, O9: org_hr		
Technical capabilities (OTMs)	T6: tec_network, T1:tec_auth_acl		

Link	https://winscp.net/eng/download.php
Installation guide	-
Tutorial	-

#34 – Kleopatra			
Open PGP, Digital certificates, Email security.			
SecDLC phase	Protection	Expertise	Beginner
License	GNU GPL	Operating systems	Windows, Linux, MacOS, Android, Web interface, Browser pluggins
Operational capabilities (OTMs)	O3: org_access_policy, O9: org_hr		
Technical capabilities (OTMs)	T1:tec_auth_acl, T8: tec_app		
Link	https://www.openpgp.org/software/kleopatra/		
Installation guide	-		
Tutorial	-		

#35 – VeraCrypt			
Disk and data Encryption.			
SecDLC phase	Protection	Expertise	Beginner
License	Apache License 2.0 and TrueCrypt License 3.0	Operating systems	Windows, MacOS, Linux, Raspberry Pi
Operational capabilities (OTMs)	O3: org_access_policy		
Technical capabilities (OTMs)	T8: tec_app, T10: tec_physical		
Link	https://www.veracrypt.fr/code/VeraCrypt/		
Installation guide	https://www.veracrypt.fr/en/Documentation.html#hide1		
Tutorial	-		

#36 – PASSWORDSAFE
Password management.

SecDLC phase	Protection	Expertise	Beginner
License	Artistic-2.0	Operating systems	Windows, Android, Linux (beta)
Operational capabilities (OTMs)	O3: org_access_policy		
Technical capabilities (OTMs)	T1:tec_auth_acl, T3: tec_server_database		
Link	https://pwsafe.org/		
Installation guide	-		
Tutorial	-		

#37 – KeePass			
Password management.			
SecDLC phase	Protection	Expertise	Beginner
License	GPL-2.0-or-later	Operating systems	Windows, Linux, MacOS, Android
Operational capabilities (OTMs)	O3: org_access_policy		
Technical capabilities (OTMs)	T1:tec_auth_acl, T3: tec_server_database		
Link	https://keepass.info/		
Installation guide	-		
Tutorial	-		

#38 – Bitwarden			
Password management.			
SecDLC phase	Protection	Expertise	Beginner
License	Server: AGPL-3.0-only Clients: GPL-3.0-only	Operating systems	Windows, Linux, MacOS, IOS, Android, Web browsers
Operational capabilities (OTMs)	O3: org_access_policy		
Technical capabilities (OTMs)	T1:tec_auth_acl, T3: tec_server_database		
Link	https://bitwarden.com/		

Installation guide	https://bitwarden.com/help/create-bitwarden-account/
Tutorial	-

#39 – OpenVPN			
Virtual Private Network (VPN).			
SecDLC phase	Protection	Expertise	Intermediate
License	GNU GPLv2	Operating systems	Windows, MacOS, Linux, Android, IOS
Operational capabilities (OTMs)	O3: org_access_policy, O9: org_hr		
Technical capabilities (OTMs)	T1:tec_auth_acl, T6: tec_network		
Link	https://openvpn.net/		
Installation guide	-		
Tutorial	-		

#40 – Let’s Encrypt			
Digital certificates.			
SecDLC phase	Protection	Expertise	Intermediate
License	Free for use	Operating systems	Linux
Operational capabilities (OTMs)	O3: org_access_policy		
Technical capabilities (OTMs)	T1:tec_auth_acl		
Link	https://letsencrypt.org/		
Installation guide	-		
Tutorial	-		

#41 – Keycloak			
Single sign-on with Identity and Access Management.			
SecDLC phase	Protection	Expertise	Expert
License	Apache License 2.0	Operating systems	Linux

Operational capabilities (OTMs)	O3: org_access_policy; O2: org_assigning_roles
Technical capabilities (OTMs)	T1:tec_auth_acl, T3: tec_server_database
Link	https://www.keycloak.org/downloads
Installation guide	https://www.keycloak.org/guides
Tutorial	-

#42 – pfSense			
Firewall.			
SecDLC phase	Protection	Expertise	Intermediate
License	Apache License 2.0 applies to pfSense CE	Operating systems	Windows, Linux, MacOS
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T6: tec_network, T3: tec_server_database, T4: tec_endpoint_workstations		
Link	https://www.pfsense.org/download/		
Installation guide	https://docs.netgate.com/pfsense/en/latest/install/download-installer-image.html		
Tutorial	-		

#43 – ClamAV			
Antivirus.			
SecDLC phase	Protection	Expertise	Beginner
License	GPLv2	Operating systems	Windows, Linux, MacOS
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T6: tec_network, T3: tec_server_database, T4: tec_endpoint_workstations. T5: tec_endpoint_mobile		
Link	https://www.clamav.net/		
Installation guide	-		
Tutorial	-		

#44 – Areca Backup			
Backup.			
SecDLC phase	Protection	Expertise	Intermediate
License	GPLv2	Operating systems	Windows, Linux
Operational capabilities (OTMs)	O8: org_business_continuity		
Technical capabilities (OTMs)	T7:tec_backup, T3:tec_server_database		
Link	http://www.areca-backup.org/		
Installation guide	-		
Tutorial	-		

#45 – Clonezilla			
Backup and Clone hard drive.			
SecDLC phase	Protection	Expertise	Intermediate
License	GPL	Operating systems	Linux
Operational capabilities (OTMs)	O8: org_business_continuity		
Technical capabilities (OTMs)	T7:tec_backup, T3:tec_server_database		
Link	https://clonezilla.org/		
Installation guide	-		
Tutorial	-		

#46 – Eraser			
Secure delete of files.			
SecDLC phase	Protection	Expertise	Beginner
License	GNU GPL	Operating systems	Windows
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T9: tec_disposal		

Link	https://eraser.heidi.ie/
Installation guide	-
Tutorial	-

#47 – sDelete			
Secure delete of files.			
SecDLC phase	Protection	Expertise	Beginner
License	Sysinternals Software License	Operating systems	Windows
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T9: tec_disposal		
Link	https://learn.microsoft.com/el-gr/sysinternals/downloads/sdelete		
Installation guide	-		
Tutorial	-		

#48 – Nwipe			
Secure delete of files.			
SecDLC phase	Protection	Expertise	Beginner
License	GPLv2	Operating systems	Linux
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T9: tec_disposal		
Link	https://github.com/martijnvanbrummelen/nwipe/		
Installation guide	https://github.com/martijnvanbrummelen/nwipe/		
Tutorial	-		

#49 – TestDisk			
Data recovery.			
SecDLC phase	Response	Expertise	Intermediate

License	GPL v2+, Freeware	Operating systems	Windows, Linux, MacOS
Operational capabilities (OTMs)	O8: org_business_continuity, O7: org_incident_handling		
Technical capabilities (OTMs)	T10: tec_physical, T9: tec_disposal		
Link	https://www.cgsecurity.org/wiki/TestDisk		
Installation guide	(No installation needed)		
Tutorial	-		

#50 – Velociraptor			
Forensics and Incident response.			
SecDLC phase	Response	Expertise	Expert
License	AGPLv3	Operating systems	Windows, Linux, MacOS
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T2: tec_logging_monitoring		
Link	https://docs.velociraptor.app/		
Installation guide	-		
Tutorial	-		

#51 – MISP			
Cyber Threat Intelligence (CTI).			
SecDLC phase	Response	Expertise	Expert
License	AGPL	Operating systems	Linux
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T8: tec_app, T2: tec_logging_monitoring		
Link	https://www.misp-project.org/		
Installation guide	https://misp.github.io/MISP/INSTALL.ubuntu1804/		
Tutorial	-		

#52 – SpiderFoot			
Cyber Threat Intelligence (CTI).			
SecDLC phase	Response	Expertise	Expert
License	MIT-licensed	Operating systems	Linux
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T8: tec_app, T2: tec_logging_monitoring		
Link	https://github.com/smicallef/spiderfoot		
Installation guide	-		
Tutorial	-		

#53 – OpenCTI Platform			
Cyber Threat Intelligence (CTI).			
SecDLC phase	Response	Expertise	Expert
License	Apache License 2.0	Operating systems	Linux
Operational capabilities (OTMs)	O7: org_incident_handling		
Technical capabilities (OTMs)	T8: tec_app, T2: tec_logging_monitoring		
Link	https://www.filigran.io/en/products/opencti/		
Installation guide	https://filigran.notion.site/Installation-and-upgrade-f0f3308ed5c94ecba341d714a4d4dc3b		
Tutorial	-		

#54 – TheHive			
Incident response.			
SecDLC phase	Response	Expertise	Expert
License	AGPL	Operating systems	Linux
Operational capabilities (OTMs)	O7: org_incident_handling		

Technical capabilities (OTMs)	T2: tec_logging_monitoring
Link	https://thehive-project.org/
Installation guide	https://github.com/TheHive-Project/TheHive
Tutorial	-

Appendix – II: External training materials

This appendix details the list of the external training materials.

#1 – Guidelines 07/2020 on the concepts of controller and processor in the GDPR			
Guidelines from the European Data Protection Board (EDPB) regarding the GDPR aspects for controllers and processors.			
Type	Document	Difficulty level	Beginner
Property	Privacy		
Operational capabilities (OTMs)	O6: org_gdpr_management, O10: Cybersecurity awareness, education and training		
Technical capabilities (OTMs)	T1: Authentication and Access control		
Link	https://edpb.europa.eu/system/files/2021-07/eppb_guidelines_202007_controllerprocessor_final_en.pdf		
Keywords	GDPR, Data processing, Data protection, Legal compliance		

#2 – GDPR data controllers and data processors			
Article from the European Data Protection Board (EDPB) regarding the GDPR aspects for controllers and processors.			
Type	Web article / Blog entry	Difficulty level	Beginner
Property	Privacy		
Operational capabilities (OTMs)	O6: org_gdpr_management, O10: Cybersecurity awareness, education and training		
Technical capabilities (OTMs)	T1: Authentication and Access control		
Link	https://www.gdpreu.org/the-regulation/key-concepts/data-controllers-and-processors/		
Keywords	GDPR, Data processing, Data protection, Legal compliance		

#3 – GDPR Compliance: “Explain Like I’m Five” with Data Privacy Expert			
Jodi Daniels, data privacy expert and former SVP of Enterprise Privacy Compliance at Bank of America, explains the fundamentals of GDPR and what IT must do to comply. Jodi is also the founder of Red Clover Advisors, a data privacy consultancy that assists companies with GDPR compliance, operationalizing privacy, digital governance, and online data strategy.			
Type	Video / Talk	Difficulty level	Beginner
Property	Privacy		

Operational capabilities (OTMs)	O6: org_gdpr_management, O10: Cybersecurity awareness, education and training
Technical capabilities (OTMs)	T1: Authentication and Access control, T8: Application lifecycle security
Link	https://www.youtube.com/watch?v=nG9RJLhDTXc
Keywords	GDPR, Data processing, Data protection, Legal compliance, Operational privacy, Digital governance

#4 – An introduction to GDPR			
Online course by the platform Virtual College. The Essentials of Data Protection (GDPR) training is ideal for anyone who handles personal information in their job. During this data protection training course, you will learn what the different types of data are and about the six principles, how to handle sensitive data, the rights of data subjects, and key responsibilities of the information commissioner.			
Type	Online Course	Difficulty level	Beginner
Property	Privacy		
Operational capabilities (OTMs)	O10: Cybersecurity awareness, education and training		
Technical capabilities (OTMs)	T1: Authentication and Access control, T7: Backup policy, T8: Application lifecycle security, T9: Data disposal		
Link	https://www.virtual-college.co.uk/courses/compliance/introduction-to-gdpr		
Keywords	GDPR, Data processing, Data protection, Legal compliance, Handling sensitive data		

#5 – Regulatory Spotlight: GDPR and Incident Response (Incident Response Forum Europe 2020)			
Talk by the experts (Rohan Massey, Partner, Ropes & Gray, John O'Dwyer (Deputy Commissioner, Data Protection Commission Ireland), Sandra Skehan (Assistant Commissioner, Data Protection Commission Ireland), concerning GDPR and incident response. The talk was given in 2020 under the Incident Response Forum Europe.			
Type	Video / Talk	Difficulty level	Beginner
Property	Privacy, Security		
Operational capabilities (OTMs)	O7:org_incident_handling, O10: Cybersecurity awareness, education and training		
Technical capabilities (OTMs)	T2: Logging, monitoring and alerting		
Link	https://www.youtube.com/watch?v=wY7mL_QMPok		

Keywords	GDPR, Data processing, Data protection, Incident response, Cyber Threat Intelligence (CTI)

#6 – Webinar: Responding to a Data Breach | What you should know!			
Led by Alan Calder (IT Governance Ltd), this webinar provides insight into preparing for and responding effectively to a data breach, helping you limit your liability and ensure optimal compliance with the GDPR.			
Type	Webinar	Difficulty level	Beginner
Property	Privacy, Security		
Operational capabilities (OTMs)	O7:org_incident_handling, O10: Cybersecurity awareness, education and training		
Technical capabilities (OTMs)	T2: Logging, monitoring and alerting, T8: Application lifecycle security		
Link	https://www.youtube.com/watch?v=iryvaQicnKU		
Keywords	GDPR, Data processing, Data protection, Data breach, Incident response		

#7 – Handbook on Security of Personal Data Processing			
The overall scope of the report is to provide practical demonstrations and interpretation of the methodological steps of the ENISA's 2016 guidelines for SMEs on the security of personal data processing. This is performed through specific use cases and pragmatic processing operations that are common for all SMEs.			
Type	Report	Difficulty level	Beginner
Property	Security, Privacy		
Operational capabilities (OTMs)	O3: org_access_policy, O10: Cybersecurity awareness, education and training		
Technical capabilities (OTMs)	T2: Logging, monitoring and alerting, T8: Application lifecycle security		
Link	https://www.enisa.europa.eu/publications/handbook-on-security-of-personal-data-processing		
Keywords	GDPR, Security for SMEs, Personal data processing		

#8 – Data Protection Engineering
Data Protection Engineering can be perceived as part of data protection by Design and by Default. It aims to support the selection, deployment and configuration of appropriate technical and organizational measures in order to satisfy specific data protection principles. The current report took a broader look into data protection engineering with a view to support

practitioners and organizations with practical implementation of technical aspects of data protection by design and by default. Towards this direction this report presents existing (security) technologies and techniques and discusses possible strengths and applicability in relation to meeting data protection principles as set out in Article 5 GDPR. Based on this analysis, the report provides conclusions and recommendations for relevant stakeholders.			
Type	Report	Difficulty level	Beginner
Property	Security, Privacy		
Operational capabilities (OTMs)	O4: org_asset_management, O10: Cybersecurity awareness, education and training		
Technical capabilities (OTMs)	T1: Authentication and Access control, T2: Logging, monitoring and alerting, T3: Server and database security, T8: Application lifecycle security		
Link	https://www.enisa.europa.eu/publications/data-protection-engineering		
Keywords	Privacy by Default, Privacy by Design, Security by Default, Security by Design, Data protection, GDPR, Legal compliance		

#9 – ENISA: SecureSME			
Online sources by ENISA for the implementation and maintenance of security for SMEs.			
Type	Web sources	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O10: Cybersecurity awareness, education and training		
Technical capabilities (OTMs)	T1: Authentication and Access control, T2: Logging, monitoring and alerting, T3: Server and database security, T7: Backup policy, T8: Application lifecycle security		
Link	https://www.enisa.europa.eu/securesme/#/cyber-tips#		
Keywords	Security for SMEs, Awareness		

#10 – Incident Response Under GDPR: What to Do Before, During and After a Data Breach			
Online article in SecurityIntelligence by Gant Redmon, regarding the preparation of incident response procedures in the GDPR era.			
Type	Web article / Blog entry	Difficulty level	Beginner
Property	Security, Privacy		
Operational capabilities (OTMs)	O7:org_incident_handling, O10: Cybersecurity awareness, education and training		

Technical capabilities (OTMs)	T1: Authentication and Access control, T2: Logging, monitoring and alerting, T3: Server and database security, T7: Backup policy, T8: Application lifecycle security
Link	https://securityintelligence.com/incident-response-under-gdpr-what-to-do-before-during-and-after-a-data-breach/
Keywords	Incident response, GDPR, Information sharing, Data breach

#11 – How to build an incident response program: GDPR guidelines			
Online article in Malwarebytes Labs by Paul Kincaid for the development of incident response programs, taking into consideration the GDPR aspects.			
Type	Web article / Blog entry	Difficulty level	Beginner
Property	Security, Privacy		
Operational capabilities (OTMs)	O7:org_incident_handling, O10: Cybersecurity awareness, education and training		
Technical capabilities (OTMs)	T1: Authentication and Access control, T2: Logging, monitoring and alerting, T3: Server and database security, T7: Backup policy, T8: Application lifecycle security		
Link	https://blog.malwarebytes.com/101/2018/02/how-to-build-an-incident-response-program-gdpr-guidelines/		
Keywords	Incident response, GDPR, Information sharing, Data breach		

#12 – Wireshark for Basic Network Security Analysis			
In this 1-hour 30-minutes long project-based course, you will learn how to use Wireshark to capture the Network Traffic you need and analyze it securely. You will have a better understanding of encrypted and unencrypted traffic and how to differentiate between them. You will dig deeply into unencrypted protocols such as RADIUS, HTTP, DNS, and Telnet by generating the Traffic of each of them and capturing it yourself. Also, you will generate, capture, and look into secure and encrypted protocols such as HTTPS and SSH. Additionally, you will learn how to capture HTTPS Traffic and decrypt them by using a pre-master secret key.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T6: tec_network		
Link	https://www.coursera.org/projects/wireshark-for-network-security		
Keywords	Wireshark, Network Monitoring, Traffic analysis		

#13 – Managing Policies and Security with Istio			
This is a self-paced lab that takes place in the Google Cloud console. In this lab you will learn about service mesh authentication, and authorization using Istio, and enable service-to-service authentication using the Hipster Shop microservices application.			
Type	Online Course	Difficulty level	Intermediate
Property	Security, Privacy		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy		
Technical capabilities (OTMs)	T1: Authentication and Access control		
Link	https://www.coursera.org/projects/googlecloud-managing-policies-and-security-with-istio-j9wpn		
Keywords	Google Cloud, Istio, Authentication, Authorization, Security policies		

#14 – Web Application Security Testing with OWASP ZAP			
By the end of this project, you will learn the fundamentals of how to use OWASP Zed Attack Proxy (ZAP). This tool greatly aids security professionals and penetration testers to discover vulnerabilities within web applications. You will learn how to perform a basic web app vulnerability scan, analyze the results, and generate a report of those results. This course includes steps on how to configure the browser proxy to passively scan web requests and responses by simply exploring websites. This course will also include how to use dictionary lists to find files and folders on a web server, and how to spider crawl websites to find all the links and URLs. Finally, the end of the course gives a brief overview of how to intercept, view, modify, and forward web requests that occur between the browser and web application.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O5: org_change_management		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations		
Link	https://www.coursera.org/projects/web-application-security-testing-with-owsap-zap		
Keywords	OWASP Zed Attack Proxy (ZAP), Pentesting, Vulnerabilities scanning, Web application security, Web application analysis, Digital forensics, Incident reporting		

#15 – International Security Management

In this MOOC you will learn about the colorful and diverse international security landscape, and gain insights into challenging topics including Open Source Intelligence, serious organized crime and illicit trade. You will also meet stakeholders from different sectors and backgrounds. We recorded our videos at different locations in Europe to also give you an insight into the original environment of our contributing experts. You will realize that the style and focus of the various presentations will differ from one week to the other. We feel that this is a big asset! And yes, we also have men in suits and uniforms.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring		
Link	https://www.coursera.org/learn/international-security-management		
Keywords	Security management, Cyber Threat Inteligence, CTI, Cyber crime		

#16 – Security & Safety Challenges in a Globalized World			
The course will introduce you to the broad theme of security and safety in an increasingly complex world. Together we will search for answers to important questions: what is security and safety? How can we understand complex modern-day security and safety challenges? And how do we deal with such challenges? This course combines scholarly inquiry from multiple disciplines (ranging from terrorism studies to crisis management, to medical science) with real-life cases to explore and understand complex modern-day safety and security challenges.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T2: tec_logging_monitoring		
Link	https://www.coursera.org/learn/security-safety-globalized-world		
Keywords	Safety, Crisis management		

#17 – Security Awareness Training
This course is a complete foundational security awareness training program that covers a wide array of topics for nearly every type of end-user and learner level. The content is designed to allow organizations to be able to provide a comprehensive training program to help them protect their information assets against threats. Topics included in this course are as follows:

Importance of Security, Data and Account Security, Passwords, Networking and Mobile Security, Malware, and Social Engineering.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app, T10: tec_physical		
Link	https://www.coursera.org/learn/security-awareness-training		
Keywords	Data security, Password management, Network security, Mobile security, Malware, Social engineering		

#18 – Data Privacy Fundamentals			
This course is designed to introduce data privacy to a wide audience and help each participant see how data privacy has evolved as a compelling concern to public and private organizations as well as individuals. In this course, you will hear from legal and technical experts and practitioners who encounter data privacy issues daily. This course will review theories of data privacy as well as data privacy in the context of social media and artificial intelligence. It will also explore data privacy issues in journalism, surveillance, new technologies like facial recognition and biometrics.			
Type	Online Course	Difficulty level	Beginner
Property	Privacy		
Operational capabilities (OTMs)	O6: org_gdpr_management, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.coursera.org/learn/northeastern-data-privacy		
Keywords	Data privacy, Social media, Artificial Intelligence (AI), surveillance, face recognition, biometrics, journalism		

#19 – Cyber Security Fundamentals			
This course is intended to provide a general introduction to key concepts in cyber security. It is aimed at anyone with a good general knowledge of information and communications technology. The nature, scope and importance of cyber security are explained, and key concepts are justified and explored. This includes examining the types of threat that cyber security must address, as well as the range of mechanisms, both technological and procedural, that can be deployed.			
Type	Online Course	Difficulty level	Beginner

Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O7: org_incident_handling, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T4: tec_endpoint_workstations		
Link	https://www.coursera.org/learn/cyber-security-fundamentals		
Keywords	Security principles, Threats, Defences		

#20 – Cybersecurity and Its Ten Domains			
This course is designed to introduce students, working professionals and the community to the exciting field of cybersecurity. Throughout the MOOC, participants will engage in community discourse and online interaction. Participants will gain knowledge and understanding of cybersecurity and its domains. They will engage with expertly produced videos, gain insight from industry experts, participate in knowledge assessments, practice assessing their environmental awareness, and gain access to materials that address governance and risk management, compliance, business continuity and disaster recovery, cryptography, software development security, access control, network security, security architecture, security operations, and physical and environmental security. Learning will be assessed using strategies aligned to knowledge and understanding.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O5: org_change_management, O7: org_incident_handling, O8: org_business_continuity, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T6: tec_network, T7: tec_backup, T8: tec_app, T10: tec_physical		
Link	https://www.coursera.org/learn/cyber-security-domain		
Keywords	Risk management, Cryptography, Software development, Network security, Access control, Physicla security, Awareness, Compliance, Business continuity, Recovery		

#21 – Terrorism and Counterterrorism: Comparing Theory and Practice
On this six-week course from Leiden University, you'll explore the essence of terrorism and discover why it is so difficult to define. Unpacking its history and the theory of the waves of terrorism, you'll analyse both the theoretical approaches and practical applications of terrorism and counterterrorism in the real world.

Type	Online Course	Difficulty level	Beginner
Property	General, Safety, Security		
Operational capabilities (OTMs)	O10: org_awareness		
Technical capabilities (OTMs)	T10: tec_physical		
Link	https://www.coursera.org/learn/terrorism		
Keywords	Safety, Terrorism		

#22 – Cybersecurity for Everyone			
Cybersecurity for Everyone lays the groundwork to understand and explore the key issues facing policy makers attempting to manage the problem of cybersecurity, from its technical foundations to the domestic and international policy considerations surrounding governance, privacy, and risk management, to applications for achieving the goals of an enterprise, an institution, or a nation. This course is designed for students with some or no background in information technology, whether a novice or active in the cybersecurity field (engineers and computer scientists will learn the broader context and business aspects of cybersecurity) and will provide the principles to understand the current debates shaping a rapidly evolving security landscape.			
Type	Online Course	Difficulty level	Beginner
Property	Security, Privacy		
Operational capabilities (OTMs)	O4: org_asset_management, O5: org_change_management, O6: org_gdpr_management, O8: org_business_continuity, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T8: tec_app		
Link	https://www.coursera.org/learn/cybersecurity-for-everyone		
Keywords	Risk management, Privacy management		

#23 – Security Operations and Administration
The Security operations and Administration course addresses basic security concepts and the application of those concepts in the day to day operation and administration of enterprise computer systems and the information that they host. Ethical considerations in general, and the (ISC)2 Code of Ethics in particular, provide the backdrop for any discussion of information security and SSCP candidates will be tested on both. Information security professionals often find themselves in positions of trust and must be beyond reproach in every way. Several core principles of information security stand above all others and this domain covers these principles in some depth. It can be said that the CIA triad of confidentiality, integrity and availability forms the basis for almost everything that we do in information security and the SSCP

candidate must not only fully understand these principles but be able to apply them in all situations. additional security concepts covered in this domain include privacy, least privilege, non-repudiation and the separation of duties. Course Objectives: 1. Define Code of Ethics, 2. Describe the security concepts, 3. Document and operate security controls, 4. Describe the asset management process, 5. Implement compliance controls, 6. Assess compliance controls, 7. Describe the change management process, 8. Contribute to the security awareness training program, and 9. Contribute to physical security operations.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O5: org_change_management, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app, T10: tec_physical		
Link	https://www.coursera.org/learn/security-operations-administration-sscp		
Keywords	SSCP certification, Security controls, Ethics, Compliance controls, Change management, Awareness, Physical security		

#24 – In the Trenches: Security Operations Center			
This course is designed to be a primer for anyone planning on taking the EC-Council CSA course. We will discuss the structure, organization, and general daily activities of SOC analysts. We will also look at several defensive tools including SEIMs, IDS, and IPS. We will talk about event monitoring and vulnerability management. Finally, we will talk about what to expect when an incident happens.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O5: org_change_management, O7: org_incident_handling, O8: org_business_continuity, O10: org_awareness		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app, T10: tec_physical		
Link	https://www.coursera.org/learn/in-the-trenches-security-operations-center		
Keywords	EC-Council CSA, SOC, SIEM, IDS, IPS, Device security, Cloud security, Malware, Big Data, VMs		

#25 – Systems and Application Security			
In the Systems and Application Security Course, you will gain an understanding of computer code that can be described as harmful or malicious. Both technical and non-technical attacks will be discussed. You will learn how an organization can protect itself from these attacks. You will learn concepts in endpoint device security, cloud infrastructure security, securing big data systems, and securing virtual environments. Objectives: 1. Identify malicious code activity, 2. Describe malicious code and the various countermeasures, 3. Describe the processes for operating endpoint device security, 4. Define mobile device management processes, 5. Describe the process for configuring cloud security, 6. Explain the process for securing big data systems, and 7. Summarize the process for securing virtual environments.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app, T10: tec_physical		
Link	https://www.coursera.org/learn/systems-application-security-sscp		
Keywords	Malware, Device security, Cloud security, Big Data, VMs		

#26 – Internet History, Technology, and Security			
After this course you will not take the Internet and Web for granted. You will be better informed about important technological issues currently facing society. You will realize that the Internet and Web are spaces for innovation and you will get a better understanding of how you might fit into that innovation. If you get excited about the material in this course, it is a great lead-in to taking a course in Web design, Web development, programming, or even network administration. At a minimum, you will be a much wiser network citizen.			
Type	Online Course	Difficulty level	Beginner
Property	General, Security		
Operational capabilities (OTMs)	O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.coursera.org/learn/internet-history		
Keywords	History		

#27 – Security and Privacy for Big Data - Part 1

This course sensitizes security in Big Data environments. You will discover cryptographic principles, mechanisms to manage access controls in your Big Data system. By the end of the course, you will be ready to plan your next Big Data project successfully, ensuring that all security-related issues are under control. You will look at decent-sized big data projects with security-skilled eyes, being able to recognize dangers. This will allow you to improve your systems to a grown and sustainable level.			
Type	Online Course	Difficulty level	Intermediate
Property	Security, Privacy		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O6: org_gdpr_management, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T8: tec_app		
Link	https://www.coursera.org/learn/security-privacy-big-data		
Keywords	Big Data, Cryptography, Access control, Security management, Privacy management		

#28 – Security and Privacy for Big Data - Part 2			
This course sensitizes regarding privacy and data protection in Big Data environments. You will discover privacy preserving methodologies, as well as data protection regulations and concepts in your Big Data system. By the end of the course, you will be ready to plan your next Big Data project successfully, ensuring that all privacy and data protection related issues are under control. You will look at decent-sized big data projects with privacy-skilled eyes, being able to recognize dangers. This will allow you to improve your systems to a grown and sustainable level. If you are an ICT professional or someone who designs and manages systems in big data environments, this course is for you! Knowledge about Big Data and IT is advantageous, but if you are e.g., a product manager just touching the surface of Big Data and privacy, this course will suit you as well.			
Type	Online Course	Difficulty level	Advance
Property	Security, Privacy		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O6: org_gdpr_management, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T7: tec_backup, T8: tec_app, T9: tec_disposal, T10: tec_physical		
Link	https://www.coursera.org/learn/security-privacy-big-data-protection		

Keywords	Big Data, Cryptography, Access control, Security management, Privacy management

#29 – Information Systems Auditing, Controls and Assurance			
The course is awarded The Best Free Online Courses of All Time, and Best Online Courses of the Year (2021 Edition) by Class Central (http://www.classcentral.com). This course is suitable for students and graduates from Information Systems, Information Technology and Computer Science, and IT practitioners who are interested to get into the IS auditing field. It is also a good starting point for learners who would like to pursue further studies for IS audit certifications – such as Certified Information Systems Auditor (CISA).			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O5: org_change_management, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T8: tec_app		
Link	https://www.coursera.org/learn/information-systems-audit		
Keywords	CISA certification, Audit		

#30 – Cybersecurity in Healthcare (Hospitals & Care Centres)			
The Cybersecurity in Healthcare MOOC was developed as part the SecureHospitals.eu project. This project has received funding from the European Union's Horizon 2020 Coordination Research and Innovation Action under Grant Agreement No. 826497. The course "Cybersecurity in Healthcare" has been developed to raise awareness and understanding the role of cybersecurity in healthcare (e.g., hospitals, care centres, clinics, other medical or social care institutions and service organisations) and the challenges that surround it. In this course, we will cover both theoretical and practical aspects of cybersecurity. We look at both social aspects as technical aspects that come into play. Furthermore, we offer helpful resources that cover different aspects of cybersecurity. Even if you are not active in the healthcare domain, you will find helpful tips and insights to deal with cybersecurity challenges within any other organisation or in personal contexts as well.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app, T10: tec_physical		

Link	https://www.coursera.org/learn/cybersecurity-in-healthcare
Keywords	Healthcare, Security management

#31 – Cybersecurity Awareness and Innovation			
This course empowers students, professionals and the wider community to deal with cybersecurity attacks and risks focused on identity management and it is an introduction to the upcoming full course focused on cybersecurity awareness. It provides a practical overview of challenging issues like identity credentials management and security, e-mail threats and web impersonation, or web hacking. In addition to this, you will have a practical appreciation of innovation applied to these concepts through an interview with a renowned expert in fraud and cybercrime. The teaching staff consists of Iván Pau, UPM researcher and expert in usable security, and Román Ramírez, hacker and cybersecurity expert. Learning will be carried out by introducing use cases related to cybersecurity incidents, in a way that ensures participants to get really involved in the course. You will easily acquire practical skills and be ready to face real threats in a digital world.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T8: tec_app		
Link	https://www.coursera.org/learn/cybersecurity		
Keywords	Security, Awareness, Attacks, Threats, Risks, Identity management, e-mail security, Web impersonation, Web hacking, Fraud, Cyber-crime		

#32 – AI, Business & the Future of Work			
This course from Lunds university will help you understand and use AI so that you can transform your organisation to be more efficient, more sustainable and thus innovative. The lives of people all over the world are increasingly enhanced and shaped by artificial intelligence. To organisations there are tremendous opportunities, but also risks, so where do you start to plan for AI, business and the future of work?			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		

Link	https://www.coursera.org/learn/ai-business-future-of-work
Keywords	AI insights, AI applications

#33 – Risk in Modern Society			
The course Risk in Modern Society sheds light on the broad concept of risk. In five distinctive weeks, this course closely examines various types of safety and security risks, and how these are perceived and dealt with in a wide array of professional and academic fields, ranging from criminology, counter-terrorism and cyber security, to philosophy, safety and medical science. Developed in collaboration with scholars from three universities (Leiden, Delft and Erasmus), this course will search for answers to questions such as: “what is risk?”, “how do we study and deal with risk?”, “does ‘perceived risk’ correspond to 'real' risk?”, and “how should we deal with societal perceptions of risk, safety and security?			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.coursera.org/learn/risk-in-modern-society		
Keywords	General risk, Cyber risk, Safety, Security, Criminology, Counter-terrorism		

#34 – International Cyber Conflicts			
The course is designed to reach an international audience and will encourage discussion on relevant current events among participants to enrich the experience with various personal and cultural perspectives on cutting-edge issues. In addition, assignments and other assessments will supplement video lectures and selected readings to ensure application of the material. After taking this course you will be able to: 1. Identify different types of actors involved in cyber threats (individuals, organizations & nation-states), 2. Distinguish between different types of threats and issues in cyber security including, data theft, political espionage, critical infrastructure protection, and propaganda, 3. Detail the basic characteristics of the Internet infrastructure and international efforts to address Internet governance, 4. List several international efforts to address cyber crime and espionage. 5. Evaluate how principals that govern international conflicts might be applied in context of cyber security, 6. Apply different psychological theories of human motivation and cooperation and communication and political theories in analysis of different international issues related to cyber security including censorship, media operations and role of social technologies.			
Type	Online Course	Difficulty level	Beginner
Property	Security		

Operational capabilities (OTMs)	O7: org_incident_handling, O9: org_hr, O10: org_awareness
Technical capabilities (OTMs)	T8: tec_app
Link	https://www.coursera.org/learn/cyber-conflicts
Keywords	Cyber conflicts, Threat actors, Threats, Data theft, Political espionage, Propaganda, Critical infrastructure protection, Internet, International Internet governance, Cyber-crime, Psychological aspects of cyber-security, Political theories, Censorship, Media operation, Social technologies

#35 – Data Science Ethics			
What are the ethical considerations regarding the privacy and control of consumer information and big data, especially in the aftermath of recent large-scale data breaches? This course provides a framework to analyze these concerns as you examine the ethical and privacy implications of collecting and managing big data. Explore the broader impact of the data science field on modern society and the principles of fairness, accountability and transparency as you gain a deeper understanding of the importance of a shared set of ethical values. You will examine the need for voluntary disclosure when leveraging metadata to inform basic algorithms and/or complex artificial intelligence systems while also learning best practices for responsible data management, understanding the significance of the Fair Information Practices Principles Act and the laws concerning the "right to be forgotten.".			
Type	Online Course	Difficulty level	Beginner
Property	Privacy		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O4: org_asset_management, O5: org_change_management, O6: org_gdpr_management, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T8: tec_app		
Link	https://www.coursera.org/learn/data-science-ethics		
Keywords	Ethics, Privacy, Data protection, Data breach, Large-scale data breach, Big Data, Faireness, Accountability, Transparency, Voluntary disclosure on metadata, Artificial Intelligence (AI), Fair Information Practices Principles Act, Right to be forgotten, Data disposal		

#36 – Malware Analysis and Introduction to Assembly Language
In this course, through video demonstrations, hands-on reverse engineering, and capture-the-flag type activities, you will be introduced to the processes and methods for conducting malware analysis of different file types. You will analyze native executable files, and analyze popular files like PowerShell, JavaScripts, and Microsoft Office documents.

Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O7: org_incident_handling, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.coursera.org/learn/malware-analysis-and-assembly		
Keywords	Malware analysis, Reverse engineer, Capture-The-Flag (CTF), Assembly language, PowerShell, JavaScript		

#37 – Reputation Crisis? Facebook meets Cambridge Analytica			
In this course, you will take a deep dive into reputation management by tackling a case study on the crisis, the effects of which are still unravelling for Facebook, the tech industry, and society at large. You will explore the concept of corporate reputation, and touch upon topics such as data privacy implications for the big tech or the importance of leadership and culture, and how Mark Zuckerberg's leadership might have affected Facebook in particular. In the final project, you will be asked to link theory and practice to provide an analysis of events and make recommendations for Facebook, going forward.			
Type	Online Course	Difficulty level	Beginner
Property	Privacy		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O5: org_change_management, O8: org_business_continuity, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.coursera.org/learn/reputation-management-facebook-cambridge-analytica		
Keywords	Reputation management, Facebook, Cambridge analytica, Ethics, Data privacy implications, Leadership, Business culture, Counter-institutional mechanisms, Whistleblowing, Social consequences, Politics		

#38 – eHealth: More than just an electronic record			
The MOOC, "eHealth: More than just an electronic record!", is multidisciplinary in nature, and aims to equip the global audience of health clinicians, students, managers, administrators, and researchers to reflect on the overall impact of eHealth on the integration of care. It explores the breadth of technology application, current and emerging trends, and showcases both local and international eHealth practice and research.			
Type	Online Course	Difficulty level	Beginner

Property	Security, Privacy		
Operational capabilities (OTMs)	O5: org_change_management, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.coursera.org/learn/ehealth		
Keywords	e-Health, Modern healthcare applications, Emerging trends in e-Health		

#39 – Copyright for Multimedia			
Copyright questions about different formats (data, images, music and video) can be especially difficult. Sometimes the law specifically distinguishes between these different formats, and in most cases, there are media-specific considerations that impact a copyright analysis. In this course we will look at four different media, paying special attention to the unique issues for each one and the kinds of information that is important when making copyright decisions for each type of material. We will work through fair use issues for each multimedia format, look at format-specific exceptions in the law, and consider unique issues for seeking permission for film, music, images, and data. At the end of this course, participants will have a deeper understanding of how to apply our framework for making copyright decisions and will be more comfortable with assessing multi-media issues. They will have gained more and more diverse experience for considering fair use.			
Type	Online Course	Difficulty level	Beginner
Property	General		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O4: org_asset_management, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.coursera.org/learn/copyright-for-multimedia		
Keywords	Copyright, Copyright analysis, Copyright decision-making, Multimedia		

#40 – Mind of the Universe - Genetic Privacy: should we be concerned?
Should all our genetic information be made public in order to eradicate genetic diseases from this world? Who owns your genetic data once it becomes publicly accessible? What is your responsibility to family members when you know more about genetic diseases than they do? Who decides what kind of genetic information is relevant to a person? And what does genetic privacy mean to you?

In this challenge with Robert Zwijnenberg (Professor in Art and Science Interactions) you will critically reflect upon the issue of genetic privacy. You will dive into the ethical questions that come up with the disclosure of genetic data in biobanks and through genetic tests. This course encourages you to think about the cultural, philosophical, and political tensions present in the debate around genetic privacy. You are invited to identify and listen to the viewpoints and values provided by the different stakeholders that shape this debate: corporations, researchers, consumers, and patients. Furthermore, you will go off the beaten track by exploring the issue from the unique perspective of art and culture. After a lot of thinking, supplementing, deleting, and adjusting, you will be asked to share a recommendation on how to regulate practices of disclosing genetic information, while taking into consideration the concept of genetic privacy. Your advice could serve as an eye-opener for policy makers!			
Type	Online Course	Difficulty level	Beginner
Property	Privacy		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O6: org_gdpr_management, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T8: tec_app		
Link	https://www.coursera.org/learn/mind-of-the-universe-genetic-privacy		
Keywords	Privacy, Genetic information, Genetic privacy, Ethics, e-Health		

#41 – Internet Giants: The Law and Economics of Media Platforms			
This seven-week course will explore the relationship between law and technology with a strong focus on the law of the United States with some comparisons to laws around the world, especially in Europe. Tech progress is an important source of economic growth and raises broader questions about the human condition, including how culture evolves and who controls that evolution. Technology also matters in countless other ways as it often establishes the framework in which governments interact with their citizens, both in allowing speech and blocking it and in establishing exactly what the boundaries are between private life and the government. And technology itself is powerfully shaped by the laws that apply in areas as diverse as copyright, antitrust, patents, privacy, speech law and the regulation of networks.			
Type	Online Course	Difficulty level	Beginner
Property	Ethics		
Operational capabilities (OTMs)	O5: org_change_management, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.coursera.org/learn/internetgiants		
Keywords	Law & Technology in USA, Law & Technology in EU, Law & Technology in several regions around the world, Law & Technology,		

	Media platforms, Copyright, Antitrust, Patents, Privacy, Speech law, Regulation of networks

#42 – Artificial Intelligence: Ethics & Societal Challenges			
Artificial Intelligence: Ethics & Societal Challenges is a four-week course that explores ethical and societal aspects of the increasing use of artificial intelligent technologies (AI). The aim of the course is to raise awareness of ethical and societal aspects of AI and to stimulate reflection and discussion upon implications of the use of AI in society.			
Type	Online Course	Difficulty level	Beginner
Property	Ethics		
Operational capabilities (OTMs)	O5: org_change_management, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T8: tec_app		
Link	https://www.coursera.org/learn/ai-ethics		
Keywords	Artificial Intelligence (AI), Ethics, Social challenges, Awareness, AI implications		

#43 – Securing Applications on Kubernetes Engine - Three Examples			
This is a self-paced lab that takes place in the Google Cloud console. In this lab, you will learn how Kubernetes Engine security features can be used to grant varying levels of privilege to applications based on their particular requirements.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T7: tec_backup, T8: tec_app		
Link	https://www.coursera.org/projects/googlecloud-securing-applications-on-kubernetes-engine-three-examples-1rm0s		
Keywords	Kubernetes, Google Cloud, Security, Application privileges		

#44 – Introduction to Architecting Smart IoT Devices
Embedded Systems are so ubiquitous that some of us take them for granted: we find them in smartphones, GPS systems, airplanes, and so on. But have you ever wondered how these devices actually work? If so, you're in the right place!

In this course, you'll learn about the characteristics of embedded systems: the possibilities, dangers, complications, and recipes for success. We'll discuss all of this in the framework of a flourishing embedded systems field: the Internet of Things, where billions of intercommunicating devices could enable unprecedented, innovative products and services. If you'd like to learn how to create similarly innovative products, then this is the course for you!			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app, T10: tec_physical		
Link	https://www.coursera.org/learn/iot-devices		
Keywords	Embedded systems, Smartphones, Intenet of Things (IoT), IoT architecture		

#45 – Global Systemic Risk			
The course will be of interest to those studying global affairs, system dynamics, and world governance. It offers a set of heuristics that students can use to analyze contemporary global challenges. Linking the recording of Abbey Road to the COVID-19 pandemic provides new insights into the apparently chaotic world around us.			
Type	Online Course	Difficulty level	Beginner
Property	General		
Operational capabilities (OTMs)	O5: org_change_management, O8: org_business_continuity, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.coursera.org/learn/global-systemic-risk		
Keywords	Global affairs, Global Systemics Risk, World Governance, Global challenges		

#46 – Data Literacy – What is it and why does it matter?
You might already know that data is not neutral. Our values and assumptions are influenced by the data surrounding us - the data we create, the data we collect, and the data we share with each other. Economic needs, social structures, or algorithmic biases can have profound consequences for the way we collect and use data. Most often, the result is an increase of inequity in the world. Data also changes the way we interact. It shapes our thoughts, our feelings, our preferences and actions. It determines what we have access to, and what not. It enables global dissemination of best practices and life improving technologies, as well as the spread of mistrust and radicalization. This is why data literacy matters.

A key principle of data literacy is to have a heightened awareness of the risks and opportunities of data-driven technologies and to stay up-to-date with their consequences. In this course, we view data literacy from three perspectives: Data in personal life, data in society, and data in knowledge production. The aim is threefold: 1. To expand your skills and abilities to identify, understand, and interpret the many roles of digital technologies in daily life. 2. To enable you to discern when data-driven technologies add value to people's lives, and when they exploit human vulnerabilities or deplete the commons. 3. To cultivate a deeper understanding of how data-driven technologies are shaping knowledge production and how they may be realigned with real human needs and values.			
Type	Online Course	Difficulty level	Beginner
Property	General		
Operational capabilities (OTMs)	O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.coursera.org/learn/data-literacy-what-is-it-and-why-does-it-matter		
Keywords	Data Literacy, Data-driven technologies, Human vulnerabilities, Social engineering, Awareness, Risks		

#47 – Access Controls			
The Access Controls Course provides information pertaining to specify what users are permitted to do, the resources they are allowed to access, and what operations they are able to perform on a system. Access Controls help managers limit and monitor systems use at a user level or group membership. You will understand the different access control systems and how they should be implemented to protect the system and data using the different levels of confidentiality, integrity, and availability.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O2: org_assigning_roles, O3: org_access_policy		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring		
Link	https://www.coursera.org/learn/access-control-sscp		
Keywords	Access control, Authentication, Authorization, Confidentiality, Integrity, Availability, Security principles		

#48 – Identifying, Monitoring, and Analyzing Risk and Incident Response and Recovery

Risk Identification, Monitoring, and Analysis: In the Risk Identification, Monitoring, and Analysis session, you will learn how to identify, measure, and control losses associated with adverse events. You will review, analyze, select, and evaluate safeguards for mitigating risk.You will learn processes for collecting information, providing methods of identifying security events, assigning priority levels, taking the appropriate actions, and reporting the findings to the correct individuals. After collection of the details from monitoring, we can analyze to determine if the system is being operated in accordance with accepted industry practices, and in compliance with organization policies and procedures.

Incident Response and Recovery: In the Incident Response and Recovery Session, you will gain an understanding of how to handle incidents using consistent, applied approaches in order to resolve. Once an incident is identified, action will be necessary in order to resolve. We will examine processes such as damage recovery, data integrity and preservation, and the collection, handling, reporting, and prevention. You will be introduced to the Business Continuity Plan (BCP) and Disaster Recovery Plan (DRP) concepts and how they can be utilized in order to mitigate damages, recover business operations, and avoid critical business interruption. Through the use of the DRP, you will understand the procedures for emergency response and post-disaster recovery.

Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O3: org_access_policy, O4: org_asset_management, O7: org_incident_handling, O8: org_business_continuity		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T7: tec_backup, T8: tec_app		
Link	https://www.coursera.org/learn/incident-response-recovery-risks-sscp		
Keywords	Risk management, System monitoring, Event analysis, Prioritize controls, Incident response, Recovery, Business Continuity Plan (BCP), Disaster Recovery Plan (DRP), Post-incident response		

#49 – Dark Web Foundation: A Guide to the Deep/Dark Web 2019

Ever heard of the Deep Web? The Dark Web? If you have then this course is for you!

Throughout this course we will dive into the concepts behind the Deep Web and teach you how to navigate and use it. First you will learn about the tools used to access the Deep Web and then we will dive right in to get hand on with the topics we discuss. We will cover things like: Tor, Bitcoin, PGP, Tails, Tor Networks, Deep Web Markets, and Bitcoin Wallets.

Type	Online Course	Difficulty level	Beginner
Property	Security, General		
Operational capabilities (OTMs)	O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T6: tec_network, T8: tec_app		

Link	https://www.udemy.com/course/deep-web/
Keywords	Dark Web, Deep Web, Tor, Bitcoin, PGP, Tails, Deep Web markets

<table>
<tr><th colspan="4">#50 – Kali Linux 101</th></tr>
<tr><td colspan="4">Kali is a penetration testing Linux distribution created by the Offensive Security. It holds a repository of multiple tools for security related engineers including hacking wireless networks, web applications, databases, Reverse engineering, password crackers, and much more! So, as you can see, Kali is a versatile and powerful tool for anyone looking to do any cyber security related work.
As indicated by the ‘101’ in the course title, this course is a beginner’s guide to getting started in Kali…to get your feet wet. The course is broken down into 3 sections; Getting started, Basic Configuration, and Tools overview. We first give you an overview of Kali and its use cases then offer a step-by-step walkthrough of installing Kali using VMware. Next, we teach you some important configuration setting in the distribution including configuring your network and managing services in Kali. Knowing these procedures will help you setup the proper environments when using Kali and its tools. Finally, we go over the top available in Kali and describe their top features and best use cases.</td></tr>
<tr><td>Type</td><td>Online Course</td><td rowspan="2">Difficulty level</td><td rowspan="2">Intermediate</td></tr>
<tr><td>Property</td><td>Security</td></tr>
<tr><td>Operational capabilities (OTMs)</td><td colspan="3">O3: org_access_policy, O7: org_incident_handling</td></tr>
<tr><td>Technical capabilities (OTMs)</td><td colspan="3">T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app</td></tr>
<tr><td>Link</td><td colspan="3">https://www.udemy.com/course/kali-linux-101/</td></tr>
<tr><td>Keywords</td><td colspan="3">Kali Linux, VMware, Pentest, Reverse engineer, Password cracking</td></tr>
</table>

<table>
<tr><th colspan="4">#51 – Start Ethical Hacking with Parrot Security OS (Alt. to Kali)</th></tr>
<tr><td colspan="4">This is a crash course to give you a firm understanding of the whole Ethical Hacking world, what technics and tools are used, and what kind of work awaits you if you shift your career to the cybersecurity field.
This is an abstract of our +40 hours masterclass called "Applied Ethical Hacking and Rules of Engagement".
You can do the whole tutorial using another flavor of Linux, preferably a security-enhanced Linux such as Kali Linux or BlackArch.</td></tr>
<tr><td>Type</td><td>Online Course</td><td rowspan="2">Difficulty level</td><td rowspan="2">Advance</td></tr>
<tr><td>Property</td><td>Security</td></tr>
<tr><td>Operational capabilities (OTMs)</td><td colspan="3">O3: org_access_policy, O7: org_incident_handling</td></tr>
</table>

Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app
Link	https://www.udemy.com/course/ethical-hacking-with-parrot-security-os/
Keywords	Parrot Security OS, Pentest, Ethical hacking, Nmap, Rapid7 Nexpose, Nessus, OpenVAS, Metasploit, Searchsploit, GitHub, Empire3, Cobalt Strike,

#52 – The Practical Guide to Mac Security			
The Practical Guide to Mac Security is a complete course with 24 lessons that will enable the typical home and office Mac user to secure their Mac from dangers like malware, online account break-ins, data loss, and online scams.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O3: org_access_policy, O4: org_asset_management		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T7: tec_backup, T8: tec_app, T9: tec_disposal, T10: tec_physical		
Link	https://www.udemy.com/course/mac-security/		
Keywords	Mac, Password management, 2-factor authentication, Backup, Scam, Anti-virus		

#53 – Web Application Hacking /Penetration Testing & Bug Bounty			
Gain the ability to do Bug hunting and Web penetration testing by taking this course! Get answers from an experienced IT expert to every single question you have related to the learning you do in this course. This course provides a 100% hands-on approach to learning to be a web security expert. All of the vulnerabilities covered here are very common in bug bounty programs, and most of them are part of the OWASP top 10. This course is beginner-friendly After this course you will be able to hunt on live websites and earn a bounty.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O7: org_incident_handling		

Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T8: tec_app
Link	https://www.udemy.com/course/web-application-hacking-penetration-testing-bug-bounty/
Keywords	Web security, Pentest, XSS, CSRF, Filters, Bug hunting, OWASP

#54 – Cybersecurity 101: Adopting A Security Mindset			
Enter Cybersecurity 101: Adopting A Security Mindset. Led by AI & Cybersecurity expert Jordan Sauchuk, this course is designed to get you up to speed with core and foundational cybersecurity material. It's intended to help get you started thinking with a security mindset and to keep cybersecurity principles in mind, no matter the domain that you work in. You will also be able to obtain hands experience setting up, deploying, and finding a vulnerability in a Capture The Flag exercise or CTF.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O3: org_access_policy, O4: org_asset_management, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T6: tec_network, T7: tec_backup, T8: tec_app		
Link	https://www.udemy.com/course/cybersecurity101/		
Keywords	Security, Vulnerabilies identification, Capture-The-Flag (CTF), Artificial Intelligence (AI)		

#55 – Cyber Security Awareness (Lite)			
Cyber Security awareness has become critical today to preserve your privacy and security online as well as become an employee that is security aware and is able to protect the organisation to which they belong.			
Type	Online Course	Difficulty level	Beginner
Property	Security, Privacy		
Operational capabilities (OTMs)	O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T8: tec_app		
Link	https://www.udemy.com/course/cyber-security-awareness-lite/		
Keywords	Security, Privacy, Social Engineering, Awareness		

#56 – Cloud Security Architecture - An introduction			
This course gives an introduction to security architecture for the cloud. You as a cloud consumer must be able to document, create and govern your security architecture. The purpose of security architecture work is to protect your data and services in the cloud from potential misuse from hackers and other unauthorized individuals. You have to know what the cloud service provider will do to protect you and what you have to take responsibility for yourself.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T7: tec_backup, T8: tec_app		
Link	https://www.udemy.com/course/cloud-security-architecture-an-introduction/		
Keywords	Cloud, User management, Cloud service security, Cloud security architecture		

#57 – Cyber Security Course for Beginners - Level 01			
Cyber Security is one in every of cutting-edge most up to date profession fields. This course will provide a wide overview of Cyber Security concepts and practices. Beginning with underlying fundamentals of cyber security, additional lessons discover centre technologies along with encryption, sandboxing, and antiviruses. Securing your Wordpress website and your online identity is likewise featured, as are secure online transactions, email security, and how to conduct cyber activities.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T8: tec_app		
Link	https://www.udemy.com/course/certified-secure-netizen/		
Keywords	Security, Cryptography, Sandboxing, Anti-viruses, Wordpress security, Online identity, Online transactions, e-mail security		

#58 – Cybersecurity Prep Course for Absolute Beginners
This course is designed to first answer the question: "is cybersecurity right for me?" without any cost. Second, this course will give you enough foundational knowledge so that you can go off into the ether and start learning courses without having to go through introductory lectures or materials. Why pay for non-cyber content when you are wanting to learn cyber? When you join

the course you will be provided with a link to join my discord server as well as zoom links for FREE weekly masterclasses and Q&A sessions.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.udemy.com/course/cybersecurity-prep-course-for-absolute-beginners/		
Keywords	Security, Awareness		

#59 – Nmap Crash Course for Ethical Hackers			
Nmap is a free and open-source network scanner created by Gordon Lyon. Nmap is used to discover hosts and services on a computer network by sending packets and analyzing the responses. Nmap provides a number of features for probing computer networks, including host discovery and service and operating system detection. Some of this tool's best features are that it's open-source, free, multi-platform and receives constant updates each year. It also has a big plus: it's one of the most complete host and network and port scanners available. It includes a large set of options to enhance your scanning and mapping tasks, and brings with it an incredible community and comprehensive documentation to help you understand this tool from the very start.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T6: tec_network		
Link	https://www.udemy.com/course/nmap-crash-course-for-ethical-hackers/		
Keywords	Nmap, Network mapping, Network scanning, Enumeration of services/assets		

#60 – Wireshark Crash Course for Ethical Hackers
Wireshark is a free and open-source packet analyzer. It is used for network troubleshooting, analysis, software and communications protocol development, and education. Originally named Ethereal, the project was renamed Wireshark in May 2006 due to trademark issues.

Wireshark is cross-platform, using the Qt widget toolkit in current releases to implement its user interface, and using pcap to capture packets; it runs on Linux, macOS, BSD, Solaris, some other Unix-like operating systems, and Microsoft Windows. There is also a terminal-based (non-GUI) version called TShark. Wireshark, and the other programs distributed with it such as TShark, are free software, released under the terms of the GNU General Public License version 2 or any later version.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T6: tec_network		
Link	https://www.udemy.com/course/wireshark-crash-course-for-ethical-hackers/		
Keywords	Wireshark, Packet analyzer, Network monitoring, Traffic analysis, Communication protocol development		

#61 – Personal Technical Security: How to keep yourself safe			
This course will discuss both physical and digital security. We'll look at how to secure your computer, phone, router, and other devices. We'll also explore how to keep digital life safe with password managers, backups, encrypted DNS, multifactor authentication, and how to configure your browser to stay safe. We'll also look at today's communication with email, instant messaging, chatting, video, and social media. What can you do to make sure you're safe and secure? This course starts with the basics and gives recommendations on what you can do to stay safe.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O3: org_access_policy, O4: org_asset_management, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T7: tec_backup, T8: tec_app, T9: tec_disposal, T10: tec_physical		
Link	https://www.udemy.com/course/personal-technical-security/		
Keywords	Security, Personal security, Physical security, Home security, Password managers, Backups, DNS, Multi-factor authentication, Browser security, Socail-media		

#62 – Network Security with Hands on LABs

Network security consists of the policies, processes, and practices adopted to prevent, detect and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources. Network Security protects your network and data from breaches, intrusions and other threats. This is a vast and overarching term that describes hardware and software solutions as well as processes or rules and configurations relating to network use, accessibility, and overall threat protection. Network Security involves access control, virus and antivirus software, application security, network analytics, types of network-related security (endpoint, web, wireless), firewalls, VPN encryption and more.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T1: tec_auth_acl, T3: tec_server_database, T4: tec_endpoint_workstations, T6: tec_network		
Link	https://www.udemy.com/course/network-security-with-hands-on-labs/		
Keywords	Network security, Network policies, Access control, Firewalls, VPN, Wireless security, Endpoint security		

#63 – Introduction to Cyber Security			
Ethical hacking involves an authorized attempt to gain unauthorized access to a computer system, application, or data. Carrying out an ethical hack involves duplicating strategies and actions of malicious attackers. This practice helps to identify security vulnerabilities which can then be resolved before a malicious attacker has the opportunity to exploit them. Who this course is for: Cyber Security, Ethical Hackers, DevSecOps Engineers, and Penteration testers.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O7: org_incident_handling, O10: org_awareness		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T6: tec_network, T8: tec_app		
Link	https://www.udemy.com/course/introduction-to-cyber-security-new/		
Keywords	Security, Ethical hacking, Pentest, DevSecOps		

#64 – Fundamentals of Cyber Security

In this course we will start with the basics and key Terms. Then we will learn about malwares and various types of malwares. Then we will learn what social engineering attacks are and different types of social engineering attacks carried out by bad actors. Once we're done with that, then we will learn about the security policies and procedures and organization should follow.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.udemy.com/course/fundamentals-of-cyber-security-x/		
Keywords	Beginners, Security, Social engineering, Malwares, Defences, Cryptography		

#65 – Security Awareness Campaigns (Lite)			
Security Awareness Campaigns is about the components and reality of what makes awareness campaigns successful and which components are needed in it. This course will cover the basics of a security awareness campaign that is aimed at increasing security levels by addressing social engineering attacks and communicating the basics of awareness and threats companies face today.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O5: org_change_management, O7: org_incident_handling, O8: org_business_continuity, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app		
Link	https://www.udemy.com/course/security-awareness-campaigns/		
Keywords	Security Awareness Campaigns, Security Policy. Change management, Incident response, Endpoint security		

#66 – Introduction to network and network security
This course will cover the most basic concepts of network and network security. It includes OSI layer model, TCP/IP layer model their protocols. comparison between OSI and TCP/IP model. and some vulnerabilities, threat and Attacks basic definitions. It also include some basic concept of DDOS attack technique. Further It is the the pre-req of network security. It makes your concepts clear about OSI reference model and TCP model. discussion of types of threats.

Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T1: tec_auth_acl, T6: tec_network		
Link	https://www.udemy.com/course/introduction-to-network-and-network-security/		
Keywords	Network security, OSI model, TCP/IP, Dos, DDoS		

#67 – Hacking Academy: How to Monitor & Intercept Transmitted Data			
We are introducing one of the most interesting modules from our Hacking in Practice: Certified Ethical Hacking MEGA Course available on Udemy. During 1.5 hours of training you will learn how to intercept data in your network. You'll get to know one of the most powerful and versatile ethical hacking tools - Wireshark. You'll be shocked how much there is to read and monitor...			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T6: tec_network		
Link	https://www.udemy.com/course/hacking-academy-monitoring-transmitted-data/		
Keywords	Wireshark, Network security, Ethical hacking		

#68 – Introduction to Information Security			
Information Security is not only about securing information from unauthorized access. Information Security is basically the practice of preventing unauthorized access, use, disclosure, disruption, modification, inspection, recording or destruction of information. Information can be physical or electronic one. Information can be anything like Your details or we can say your profile on social media, your data in mobile phone, your bio-metrics etc. Thus Information Security spans so many research areas like Cryptography, Mobile Computing, Cyber Forensics, Online Social Media etc. Information Security programs are built around 3 objectives, commonly known as CIA – Confidentiality, Integrity, Availability.			
Type	Online Course	Difficulty level	Beginner

Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.udemy.com/course/introduction-to-information-security-s/		
Keywords	Beginners, Security Principles (CIA), Cryptography, social media, Digital Forensics, Security Analysts		

#69 – Basic security measures for working on the Internet			
"Security is the prevention of evil." Plato, verse 415. The course provides an overview of online threats and how to prevent them. There's no much security! From philosophical to practical level of understanding of this issue. In this course you learn about: Threat classification and reasons. Rump's Paradox and history... Computer virus classification. 4) How does the virus work? Anti-virus program classification. Hackers and Anti-hacker programs. Rating of anti-virus programs. Rating of anti-hacker programs. Protection against spam. Examples of practical protection against intruders on the Internet. Welcome!			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.udemy.com/course/basic-security-measures-for-working-on-the-internet/		
Keywords	Online security, Anti-virus, Spam, Threat classification		

#70 – Free CCNA Security 210-260 Course: All About VPNs			
Don't know what AH and ESP are? No problem! Join up right now and you will -- and you'll be notified of every new video I post to this course until its completion in about 10 days.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management		
Technical capabilities (OTMs)	T1: tec_auth_acl, T6: tec_network		

Link	https://www.udemy.com/course/ccnasecuritypreview/
Keywords	VPN

#71 – Bitcoin Self-Custody & Security			
This class is designed as a beginner's guide to Bitcoin & Crypto Self-Custody & Security. The number one threat we all have when buying and storing crypto is ourselves, -not just hacking or third-party exchange breaches. There is no gold standard of crypto security that applies to everyone, so remember to stay within your own range of security comfort, and hopefully, this lesson will have moved the needle a little bit further for you in understanding the importance of self-custody and personal crypto security.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.udemy.com/course/bitcoin-crypto-self-custody/		
Keywords	Bitcoin, Crypto-currency, Cryptography		

#72 – Information Systems Security Professional (CISSP)			
This course contains all of the information that you'll need to pass the SSCP exam Earning your SSCP credential is a professional journey. It won't happen overnight, but it also doesn't need to take years of arduous planning and preparation. In this course, I'll explain how you can plan your time wisely and work your way toward passing the SSCP exam. Employers and IT professionals around the world recognize the SSCP as a strong certification program that allows candidates to demonstrate a breadth of knowledge across seven domains of information security. Earning the SSCP requires a combination of passing a rigorously administered exam and demonstrating one year of work experience in information security. Most people attempting the SSCP exam have some experience working in the security field, but you don't need to have the experience in hand before you take the exam.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O7: org_incident_handling, O8: org_business_continuity, O9: org_hr, O10: org_awareness		

Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T7: tec_backup, T8: tec_app, T9: tec_disposal, T10: tec_physical
Link	https://www.udemy.com/course/information-systems-security-professional-cissp/
Keywords	CISSP certification, Incident handling, Recovery, Asset management, Policy drafting, Risk management, Incident analysis, Security principles (Confidentiality, Integrity, Availability)

#73 – Computer and Internet Security: E-mail & Passwords			
This course is a quick and informative introduction to the basics of computer and information security that will help you make you online life and communication much more secure. I will show you how simple it is to make up your own strong, hacker-proof passwords and how to memorize them forever. You will learn about password managers, alternative authentication techniques, and email encryption. You can’t underestimate the value of having such skills in today's world of total Internet surveillance. We will also have an overview of the best secure email providers to help you choose one for your business or personal email communication.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O3: org_access_policy, O4: org_asset_management, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T8: tec_app		
Link	https://www.udemy.com/course/computer-and-internet-security/		
Keywords	Internet security, email security, password management, 2-factor authentication		

#74 – Introduction to Application Security (AppSec)			
Welcome to this Introduction to Application Security! Whether you are looking to lay down a solid foundation for a successful career in AppSec, or whether you're simply wanting to learn how to apply security best practices to your applications, this course is for you. By learning how to navigate practical resources and frameworks, and by learning how to apply them to real-world applications, you will be well on your way to building more secure software. This course introduces concepts for web, mobile, and cloud apps so that you can gain exposure to all three and identify the specialty that you are most interested in. In addition, we discuss top risks to defend against, including hands-on demonstrations of how attacks could be carried out against vulnerable applications.			
Type	Online Course	Difficulty level	Intermediate

Property	Security		
Operational capabilities (OTMs)	O3: org_access_policy, O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T1: tec_auth_acl, T8: tec_app		
Link	https://www.udemy.com/course/introduction-to-application-security-appsec/		
Keywords	Application security, Pentest, Cloud security, OWASP, NICE Framework, Threat modelling, Access control		

#75 – IT Security for Project Managers			
No matter if you are a manager in a small company or even on your own or if you are part of a large enterprise with information security management in place. This pragmatic guide helps you to understand information security on a high level and how to integrate security in your project or product. What needs to be done for long-term success and why? The author, Computer Scientist Frank Hissen, explains it in a few practical steps from over 15 years of experience as IT security consultant			
Type	Online Course	Difficulty level	Beginner
Property	Security, Privacy		
Operational capabilities (OTMs)	O4: org_asset_management, O5: org_change_management, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T8: tec_app		
Link	https://www.udemy.com/course/it-security-for-project-managers/		
Keywords	IT security, Information security management, Security management, Data Privacy		

#76 – Cyber Security Training Course			
In this course you will learn about Firewalls, Data Encryption, Two Factor Verification, Algebraic Passwords and Disabling Old Internet Devices. The purpose is to help users learn how to increase their security by changing their device and browser security settings.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O3: org_access_policy, O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T8: tec_app		

Link	https://www.udemy.com/course/cyber-security-training-course/
Keywords	Firewalls, Cryptography, 2-factor authentication, Password management

#77 – Unconventional IT & Network Security - Innovative Approaches			
Welcome to the Unconventional IT Security Approach Course, this course is based on our real-life production security issues we faced as part of building and running a commercial cloud Platform. Conventional means of security simply do not cut it in this every changing threat landscape, these tutorials will help you in being as secure as you can be.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T6: tec_network, T8: tec_app		
Link	https://www.udemy.com/course/unconventional-it-network-security-innovative-approaches/		
Keywords	IT security, Cloud security, Network security		

#78 – Building Docker & Kubernetes Network & Security Lab for Free			
This course is designed to assist you build your own Docker and Kubernetes Network & Security home lab. You will be guided to complete easy steps like downloading and installing necessary Software such as Arista vEOS, Cisco Nexus 900v, F5 BIG-IP Virtual Edition, Ubuntu and Kali Linux images.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.udemy.com/course/build-dk8s/		
Keywords	Docker, Kubernetes, CISCO Nexus, KalixLinux, System Administration		

#79 – Ethical Hacking from Scratch - The Complete Course

Ethical hacking involves an authorized attempt to gain unauthorized access to a computer system, application, or data. Carrying out an ethical hack involves duplicating strategies and actions of malicious attackers. This practice helps to identify security vulnerabilities which can then be resolved before a malicious attacker has the opportunity to exploit them. Also known as "white hats," ethical hackers are security experts that perform these assessments. The proactive work they do helps to improve an organization's security posture. With prior approval from the organization or owner of the IT asset, the mission of ethical hacking is opposite from malicious hacking.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app		
Link	https://www.udemy.com/course/ethical-hacking-by-digiflax/		
Keywords	Ethical hacking, DoS, DDoS, SQL injection, DNS hacking, Attacks, Defences		

#80 – The Essential Guide to Online Privacy & Security in 2022			
In a world with increasing tracking and surveillance, online freedom and privacy might seem out of reach. But, going online doesn't have to mean being exposed. Protect Yourself Online and Make Smarter Decisions About the Personal Data You Share -Encrypt data in motion; stay safe on public and home Wi-Fi -Secure your online accounts with strong passwords -Store, share, and delete your files securely and privately -Protect your smartphone from malware and threats -Hide your personal and browsing data from snoops and third parties -Discover best practices for safe social media use.			
Type	Online Course	Difficulty level	Intermediate
Property	Security, Privacy		
Operational capabilities (OTMs)	O3: org_access_policy, O4: org_asset_management, O6: org_gdpr_management, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app		

Link	https://www.udemy.com/course/the-essential-guide-to-online-privacy-security-in-2022/
Keywords	Anonymity, WiFi, VPN, Mobile devices, Data security, Social-media, Malware, Fake apps, Spam, Online security, Password management, 2-factor authentication, Online banking

#81 – The Internet Security Guide			
This course is my contribution as a Cyber Security professional to enhance the online experience of people by making it more secure. The Internet security guide is a series of online cyber security videos that severs as a security awareness tool on the Internet. The Internet security guide will help anyone that uses the internet to protect and better secure his online experience by following clear and detailed step by step online security measures.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile		
Link	https://www.udemy.com/course/internet-security-guide/		
Keywords	Internet security, Phishing, Social engineering, Ransomware, Social media, Online banking, email security		

#82 – Cyber Security Training for Maritime Employees			
Given the high frequency and impact of attacks, organizations spend millions on the prevention and mitigation of cyberattacks. Many of these attacks stem from phishing and social engineering techniques so it is crucial that all employees within an organization are aware of these attacks and know how to help prevent them. This course aims to: - Highlight the basics and importance of cybersecurity in Maritime; - Help employees to spot common attacks such as phishing emails; - Provide techniques on how to use technology securely.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		

Link	https://www.udemy.com/course/cyber-security-training-for-maritime-employees/
Keywords	Maritime security, Social engineering, Phishing attacks

#83 – Learn Wordpress Website Security			
This specific training course was designed to help you understand how to secure and protect your valuable WordPress site. In a recent study done by Sucuri, around 90% of all the hacked content management systems that they investigated and helped fix in 2018 were WordPress sites. If you rely on your website for your business - whether that means for marketing purposes, business operations, or anything important - protecting your asset is crucial. It's essential to be proactive.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O3: org_access_policy, O4: org_asset_management		
Technical capabilities (OTMs)	T1: tec_auth_acl, T3: tec_server_database, T8: tec_app		
Link	https://www.udemy.com/course/wordpress-website-security-hack/		
Keywords	Wordpress, Security Plugins, 2-factor authentication, Password management, Backdoors		

#84 – Cyber Security Fundamentals			
Fundamentally, cyber security is the body of technology, process, and practice, designed to protect systems, networks, programs, and data from cyber risks like cyber attacks, damage, or unauthorized access. It is also referred to as information technology security. With cyber attacks evolving today as a danger to organizations, employees and customers, cyber security plays a very crucial role in prevention against such security threats.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O3: org_access_policy, O4: org_asset_management, O10: org_awareness		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T3: tec_server_database, T6: tec_network		
Link	https://www.udemy.com/course/cyber-security-fundamentals/		
Keywords	Information security, Digital signatures, Cryptography, Data security, IDS, Firewalls		

#85 – Web Security & Bug Bounty Basics			
With the rise of information and immersive applications, developers have created a global network that society relies upon. With this comes a responsibility to ensure that the Web is an open and inclusive space for all. So, it’s important to shape the experiences of users’ online lives by making a secure world for everyone. That’s what we’ll touch on, and try to learn throughout the web security course.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T3: tec_server_database, T8: tec_app		
Link	https://www.udemy.com/course/web-security-bug-bounty-basics/		
Keywords	Web security, Ethical hacking, Pentest, Application security, QA, HackerOne, OWASP		

#86 – Anti-Hacker Security | Step By Step Guide			
Anti-Hacker Security | Step By Step Guide is a course that everyone can benefit from. This course will discuss security and privacy in regards to our personal devices, the passwords we use, phishing attacks and suspicious URLs, social engineering, data leakage, and some general tips for staying safe online. This course is offered at a basic level and it is not a technical course. Anyone who wants more information on security and privacy will benefit from taking this course.			
Type	Online Course	Difficulty level	Beginner
Property	Security, Privacy		
Operational capabilities (OTMs)	O7: org_incident_handling, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile		
Link	https://www.udemy.com/course/anti-hacker-security-step-by-step-guide-wallo/		
Keywords	Internet security, Social engineering, Phishing attacks, Password managent, Personal devices		

#87 – (Security Operation Centre) SOC Essentials by SOC Experts

"I want to start a cybersecurity career, but I am not from IT background or studied computer science"

"I want to start cybersecurity career, but I am afraid it is too technical."

If you have ever got these thoughts, then you are in the right place to get the perfect answer. The answer to the question you always wondered? "Can I get a Cybersecurity Job?". Spoiler alert, the answer is Yes. SOC Experts works with the motto - Cybersecurity Careers for Everyone. But I know this is not enough to convince you. So I have made this course keeping aspirants like you in mind (a person who is ready to put-in all the effort, but not confident if you can). Entire course is explained in simple terms and with easy-to-understand examples. By the time you complete this course you will be pretty confident about pursing a career in cybersecurity.

If not anything, this course will help you in deciding if Cybersecurity Career is right for you or not.

Note - This is purely non-technical course, designed to help you get 360 degree view of People, Processes and Technologies used in Security Operations Center.

Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O7: org_incident_handling, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T7: tec_backup, T8: tec_app, T9: tec_disposal, T10: tec_physical		
Link	https://www.udemy.com/course/soc-essentials/		
Keywords	SOC, Security analyst		

#88 – Cybersecurity Awareness Training

Learn Best Practices for Stopping Data Breaches, Fraud and Identity Theft.

Even the best cybersecurity software can’t stop you from choosing a weak password, clicking a bad link or installing a social networking app that snoops into your address book, calendar or geodata.

And that’s not all. With cybercrime and corporate espionage on the rise, we’ve entered the age where even private digital correspondence should be created to withstand public scrutiny. This course teaches you how.

The risks are everywhere. 11.5 million people are victims of identity fraud each year and that number is rising. And it takes 330 hours, on average, to repair the damage.

Protect yourself, your family and your work. Get this introductory course right now and learn how to safeguard your data and reputation.

Type	Online Course	Difficulty level	Beginner
Property	Security		

Operational capabilities (OTMs)	O3: org_access_policy, O4: org_asset_management, O10: org_awareness
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T7: tec_backup, T8: tec_app
Link	https://www.udemy.com/course/security-awareness/
Keywords	Security Awareness, Password management, Third-party apps, Social-media, Mobile devices, 2-factor authentication, Malware, Spyware, Ransomware, Virus, Social engineering, Phishing attacks, Scams, Cyber crime

#89 – [NEW] Cyber Security 2020

This course is a comprehensive overview of web security. The goal is to build an understanding of the most common web attacks and their countermeasures. Given the pervasive insecurity of the modern web landscape, there is a pressing need for programmers and system designers improve their understanding of web security issues.

We'll be covering the fundamentals as well as the state-of-the-art in web security.

Topics include: Principles of web security, attacks and countermeasures, the browser security model, web app vulnerabilities, injection, denial-of-service, TLS attacks, privacy, fingerprinting, same-origin policy, cross site scripting, authentication, JavaScript security, emerging threats, defense-in-depth, and techniques for writing secure code. Course projects include writing security exploits, defending insecure web apps, and implementing emerging web standards.

Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O7: org_incident_handling, O10: org_awareness		
Technical capabilities (OTMs)	T3: tec_server_database, T6: tec_network, T8: tec_app		
Link	https://www.udemy.com/course/new-web-security-2020/		
Keywords	Web security, DoS, DDoS, TLS attacks, Fingerprinting, XSS, Defence-in-depth, Secure code		

#90 – Nmap For Ethical Hackers

In this Course we will learn:

1. You will become an expert in using Nmap for ethical hacking, system administration and network security

2. Learn how to successfully discover active and vulnerable hosts on a network

3. Discover the secrets of ethical hacking and network discovery, using Nmap

4. You will understand how Nmap is used in combination with criminal hacking infrastructures (command and control) servers.

5. You will master Service detection, Version detection, Operating system detection, and performance.

6. Scan to determine firewall rules while avoiding intrusion detection systems (IDS).

7. You will explore the Nmap Scripting Engine (NSE) used for more advanced discovery and hacking.

Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T6: tec_network		
Link	https://www.udemy.com/course/nmap-for-ethical-hackers-n/		
Keywords	Nmap, Ethical hacking, IDS		

#91 – Cyber Security Stories: Because of You!

I've upgraded my hacking gear!

Have you updated your security?

Together, we learn only 1 thing at a time.

Episode 1: Awareness.

Episode 2: Bitcoin

Episode 3: Noob Guide (Progressing...)

Episode 4: Future of Work (Soon)

Episode 5: Crypto Manifesto (Soon)

Episode 6: Future of Internet Finance (Soon)

Episode 7: Cookies (Soon)

Episode 8: Data is the New Oil

Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.udemy.com/course/cyber-security-stories/		

Keywords	Security awareness, Bitcoin, Social engineering, Phishing, Online security

#92 – Certified Security Analyst Training Preview			
This course is designed for anyone who wants an understanding of information security analysis. More than ever, information security analysts are needed to rescue business when they have been breached as well as put in the controls and countermeasures to prevent cyber-attacks.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O4: org_asset_management, O7: org_incident_handling, O8: org_business_continuity		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T7: tec_backup, T8: tec_app, T9: tec_disposal, T10: tec_physical		
Link	https://www.udemy.com/course/certified-security-analyst-training-preview/		
Keywords	Security analyst, Security principles (CIA, Authentication, Authorization, Non-repudiation)		

#93 – SSH Basics for Cloud Security			
This course will explain why SSH is important, why it is used and how to implement it on MacOS, Linux and Windows environments. You will learn the benefits of using SSH as compared to passwords. You will see how SSH functions and looks at the structure of SSH keys. Finally, you'll get hands on experience generating and using a SSH key pair on the platform of your choice.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O3: org_access_policy		
Technical capabilities (OTMs)	T1: tec_auth_acl, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network		
Link	https://www.udemy.com/course/ssh-basics-for-cloud-security/		
Keywords	SSH, User authentication		

#94 – Learn Ethical Hacking From Scratch

Welcome to this Ethical Hacking course from scratch! To start this course there is no specific prerequisite, something like that you have strong knowledge about ethical hacking before that. We are going to start from scratch. And by the end of it you'll be able to hack systems like white-hat hackers and secure them like security experts!			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O7: org_incident_handling, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T7: tec_backup, T8: tec_app, T9: tec_disposal, T10: tec_physical		
Link	https://www.udemy.com/course/learn-ethical-haacking-from-scratch/		
Keywords	Security analyst, Ethical hacking, Footprinting, Network scanning, Enumeration, DoS, DDoS, SQL injection, XSS, Malware analysis, Vulnerability analysis		

#95 – Cyber Security: The Ultimate Beginner's Handbook			
I assume you are a beginner. I am very much confident that you will be loaded with enough information about cyber security while working on computer or any devices connected with Internet. You may also start your career in cyber security as a beginner after completing this.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O3: org_access_policy, O4: org_asset_management, O7: org_incident_handling, O8: org_business_continuity, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T6: tec_network, T8: tec_app		
Link	https://www.udemy.com/course/cyber-security-the-ultimate-beginners-handbook/		
Keywords	Security principles, Threats, email security, Online banking, Social-media, Games, Digital wallets, E-commerce, Cyber bullying, Cyber harassment, Business continuity, Disaster recovery, Backup, DDoS, Keyloggers, Trojan Horse, Bot, Botnets, Spam, Phishing attacks, Eavedropping, 2-factor authentication		

#96 – Staying Safe Online: Cyber Security Best Practices for Kids

It's not personal, kid. Hundreds of millions of people lose their personal information to hacks, but by following good cybersecurity practices, you can stay safe. It's essential for any kids going online to understand the cybersecurity attacks that happen everyday. This hour-long course is perfect for kids as they start using YouTube, social media, playing video games, and more.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O3: org_access_policy, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T8: tec_app		
Link	https://www.udemy.com/course/cybersecurity-for-kids/		
Keywords	Kids, Parents, Online security, Password management, Social-media, Scams		

#97 – Current Threat And Vulnerabilities - Know Yourself Part 1			
Have you ever wondered exactly how hackers 'hack'? Do words like firewalls, encryption, biometrics and malware sound confusing to you? Have you been looking for a course that teaches you all the basics of both information and cyber security in a fun relaxed manner? If so, then you are going to find this course absolutely perfect for you. This is a course that is perfect as an introductory one for individuals and students who are interested in becoming cyber security or information security professionals. It is also ideal for students who just want to have a well-rounded knowledge about the basic concepts used in the world of information security.			
Type	Online Course	Difficulty level	Beginner
Property	Security, Privacy		
Operational capabilities (OTMs)	O7: org_incident_handling, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T6: tec_network, T8: tec_app		
Link	https://www.udemy.com/course/current-threat-and-vulnerabilities-know-yourself-part-1/		
Keywords	Threat Modelling, Zero-trust model, Privacy, Anonymity, Pseudonomity, Firewalls, Cryptography, Biometrics, Malware		

#98 – Ransomware from A to Z

In Ransomware course, I have cleared all question related to RANSOMWARE! By end of this course, you will totally learn about "Ransomware", how to protect and your recover data from infected computer! You do not have to pay millions of dollars for someone to protect and recover your data, what you need to do? You Just need to enroll in this course and, it's time to protect your company, community or family digital devices from the most known malicious attack (RANSOMWARE !!).			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O7: org_incident_handling, O10: org_awareness		
Technical capabilities (OTMs)	T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T7: tec_backup, T8: tec_app		
Link	https://www.udemy.com/course/the-complete-guidance-of-ransomware/		
Keywords	Ransomware, Hacker tactics, Attack strategies		

#99 – Discover Web Application Security Issues using Burp Proxy			
This course will teach you how to set up Burp Proxy, which is a tool used to find security issues outlined in the OWASP Top 10 (See below for details). This course will also show you to set up my proprietary distribution (WAED) which is loaded with vulnerable web applications. This distribution has around 18 vulnerable applications, and you'll have ample opportunity to learn how to identify web application security issues. This course will get you set up, and my next course will go into details of Web Application pentesting principles. This course should take less than an hour to complete, and once you complete you should already see the power of using these tools whether you're a developer, pentester or a QA analyst.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management		
Technical capabilities (OTMs)	T3: tec_server_database, T8: tec_app		
Link	https://www.udemy.com/course/web-application-hacking-burp-proxy-part-1/		
Keywords	Burp proxy, Web application security, QA, OWASP		

#100 – Ethical Hacking Kali Linux Command Line (CLI) Hands-On
In this Course we will Learn all the below in one course only: -Environment Variables

-Bash History Command -Piping and Redirection -Text Searching and Manipulation -Editing Files -Comparing Files -Managing Processes -File and Command Monitoring -Downloading Files -Customizing the Bash Environment.			
Type	Online Course	Difficulty level	Advance
Property	Security		
Operational capabilities (OTMs)	O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T7: tec_backup, T8: tec_app, T9: tec_disposal, T10: tec_physical		
Link	https://www.udemy.com/course/kali-linux-command-line-cli-hands-on/		
Keywords	Kali Linux, Ethical hacking, DevSecOps, Pentest, System administration		

#101 – Fundamentals of Internet Security | Secure Your Environment			
Creating an Online Business requires a lot of planning and dedicated resources. Without securing it, all of your investment and time can go in vain or wasted in simple word. Let's understand, what it takes to secure a working environment which will protect your websites and support you in the time, when you really need one. In this course we will cover, the Fundamentals of Security, Know your online adversaries, Hacker's intentions, how they exploit someone's Business to gain money and how we can stop them and create a ring fence. When 10's of Thousands of websites are at risk every single day and getting blacklisted, it is important to understand how you can avoid being on that list by following some simple rules that i have defined in this course. Let's start this course now and secure your environment.			
Type	Online Course	Difficulty level	Beginner
Property	Security		

Operational capabilities (OTMs)	O4: org_asset_management, O10: org_awareness
Technical capabilities (OTMs)	T1: tec_auth_acl, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile
Link	https://www.udemy.com/course/fundamental-of-wordpress-security-secure-your-environment/
Keywords	Internet security

#102 – AppSec Incident Response Course			
Each day of this course will feature a video from our Application Security Foundations Level 3 course. You can either watch the video on our academy or read the text where we’ll recap everything. Afterwards, we’ll test your understanding through a quick two-question quiz. The topics that will be covered are: -What is Incident Response? -Create an incident response process -Inventory -Backups and Rollbacks -During the Incident (The Process) -Post-Mortem -Wrap-up.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O7: org_incident_handling, O8: org_business_continuity		
Technical capabilities (OTMs)	T7: tec_backup, T8: tec_app, T9: tec_disposal		
Link	https://www.udemy.com/course/wehackpurple-incident-response/		
Keywords	Application security, Incident response, Backup, Rollback		

#103 – Introduction to Dark Web, Anonymity and Cryptocurrency
In this course, you'll learn to get started with Dark Web, Tor Browser and Cryptocurrency. -Section 1. Introduction to DarkWeb: In this, you'll learn about Onion network and dark web in detail. -Section 2. Tor Browser: In this section, you'll learn to install Tor Browser and proxy-chains in multiple platforms such as Windows, Mac OS and Kali Linux.

-Section 3. Accessing Dark Web: In this section, we'll learn to access Dark Web search engine, markets, and Bitcoin Cryptocurrency.			
Type	Online Course	Difficulty level	Beginner
Property	Security, Privacy		
Operational capabilities (OTMs)	O3: org_access_policy, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T6: tec_network, T8: tec_app		
Link	https://www.udemy.com/course/introduction-to-dark-web-anonymity-and-cryptocurrency/		
Keywords	Dark Web, Bitcoin, Cryptocurrency, Anonimity, TOR, Proxychain		

#104 – An Introduction to OWASP Top 10 Vulnerabilities			
The purpose of this course is to provide students with a fundamental understanding of computer security, through the study of the top 10 most common security vulnerabilities, as provided by OWASP. By the end of this course, students will have enough of an understanding to make design choices that preserve the security of the applications they own. This course can also serve as a way to gain foundations required to proceed to more advanced security topics. You will Learn: -Injection Vulnerabilities -Broken Authentication -Sensitive Data Exposure -XML External Entities -Broken Access Control -Security Misconfiguration -Cross-Site Scripting (XSS) -Insecure Deserialization -Using Components with Known Vulnerabilities -Insufficient Logging and Monitoring.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O7: org_incident_handling		
Technical capabilities (OTMs)	T1: tec_auth_acl, T6: tec_network, T8: tec_app		

Link	https://www.udemy.com/course/an-introduction-to-owasp-top-10-vulnerabilities/
Keywords	Vulnerabilities, XSS, Code injection, Logging, Monitoring, Authentication

#105 – Social Media Security 101 - Stop The Hackers!			
We will be going over a lot of different settings within each Social Media Platform. I will show you how to enable MultiFactor Authentication as well as making sure all the appropriate settings are checked to inform and protect you and your information. Protect Your Facebook, Instagram, LinkedIn, and Twitter Accounts and Stop The Hackers by enabling the built in Security! Nobody wants to be that person who says "My Account Got Hacked, Ignore All Messages From Me!".			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O3: org_access_policy, O7: org_incident_handling, O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T8: tec_app, T10: tec_physical		
Link	https://www.udemy.com/course/social-media-security-101-stop-the-hackers/		
Keywords	Social media, Third party apps, Phishing attacks, Social engineering, Fake accounts, Password management, 2-factor authentication, Location tracking		

#106 – Ethical Hacking for beginners: Beginner to Advance			
For those who have had no prior training or understanding in hacking or cybersecurity, this hands-on, practical course was designed just for them, with a focus on practical skills and hands-on experience. In this course, you will learn not only what black-hat hatters do and how they do it, but you will also learn how to hack systems like a pro and win the cat and mouse game by protecting systems like a professional security expert, which is the ultimate goal. Using a combination of hands-on experience and excellent theoretical instruction, we teach you from the fundamentals of ethical hacking all the way up to mastery, providing you with the skills you need not just to hack, but also to protect yourself from being hacked.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O7: org_incident_handling, O8: org_business_continuity, O9: org_hr, O10: org_awareness		

Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T3: tec_server_database, T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T7: tec_backup, T8: tec_app, T9: tec_disposal, T10: tec_physical
Link	https://www.udemy.com/course/ethical-hacking-for-beginners-beginner-to-advance/
Keywords	CompTIA certification, Ethical hacking, Pentest, Security configuration, Attacks

#107 – Acronis #CyberFit Tech Associate Protect			
The newly updated Acronis #CyberFit Tech trainings consists of four separate courses that you and your team can take either live, on-demand, or a combination of the two. Additionally, all Acronis #CyberFit Academy courses will be free this quarter for all existing Acronis partners. These technical training courses are designed to provide IT professionals with broad knowledge and background information about the usage of Acronis Cyber Cloud and Cyber Protect Cloud software solutions. These hands-on training courses allow participants to learn and test all product functionality both on premises and in the cloud. Tech Associate Protect course consists of 6 sections: 1. Planning for Cyber Protection - this section covers Security and Management Features, CyberFit Score, and Voice Control. 2. Cyber Protection for Backup & Recovery - this section covers Continuous Data Protection Backup, Forensic Backup, and Safe Recovery. 3. Cyber Security - this section covers Antivirus and Antimalware Protection, Windows Defender and Microsoft Security Essentials, URL Filtering, Patch Management, and Data Protection Map. 4. Other Operations - this section covers Backup Scanning, Whitelist, Quarantine, and Remote Wipe. 5. Remote Desktop - this section covers HTML5 Client, Remote Desktop Client, and Sharing Remote Connection. 6. Monitoring & Reporting - this section covers Dashboard and Reports, Monitoring Disk Health, and Threat Feed Overview.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O8: org_business_continuity		
Technical capabilities (OTMs)	T2: tec_logging_monitoring, T3: tec_server_database, T7: tec_backup, T8: tec_app, T9: tec_disposal		
Link	https://www.udemy.com/course/acronis-cyberfit-tech-associate-protect/		

Keywords	Acronis, Cloud security, Backup, Monitoring, Reporting, Recovery, Remote desktop

<table>
<tr><th colspan="4">#108 – Basic tips to Secure Your IT Corporate Network</th></tr>
<tr><td colspan="4">In this video series you will learn some basic recommendations that you can put in place to strengthen your IT Security and Network.
We'll give you the top tips that you should be putting in place to help mitigate the risks of cybersecurity treats, hackers and malware. We'll also give you an overview of some of the techniques used by pentesters (ethical hackers).
The topics that we will cover in this series includes:
- Server Security Hardening including Active Directory
- Storage Security Hardening for SAN and NAS
- Network and Firewall Security Hardening
- Email Security
- Hardware Security
- What does a Penetration Tester (Pentester) do?
- Important IT Policies and Documents you need to have.</td></tr>
<tr><td>Type</td><td>Online Course</td><td rowspan="2">Difficulty level</td><td rowspan="2">Intermediate</td></tr>
<tr><td>Property</td><td>Security</td></tr>
<tr><td>Operational capabilities (OTMs)</td><td colspan="3">O4: org_asset_management, O7: org_incident_handling</td></tr>
<tr><td>Technical capabilities (OTMs)</td><td colspan="3">T3: tec_server_database, T6: tec_network, T7: tec_backup, T9: tec_disposal, T10: tec_physical</td></tr>
<tr><td>Link</td><td colspan="3">https://www.udemy.com/course/how-to-secure-your-it-corporate-network-cybersecurity/</td></tr>
<tr><td>Keywords</td><td colspan="3">Network security, Server hardening, Firewalls, Pentest, Email security, Hardware security, Storage security</td></tr>
</table>

#109 – Cybersecurity for Businesses - The Fundamental Edition
Are you a small business owner that is worried about being hacked? Are you confused on where to start and how to begin? Have you been looking for a course that teaches you the information/cybersecurity basics to best protect your business in a fun relaxed manner? If so, you are going to find that this course is absolutely perfect for you! This course is designed to give you the tools you need to begin with the task of protecting your business or company. This course can also be used as an introductory path for employees/individuals of company's who want to start gaining knowledge toward a career in cybersecurity

or information security. Understanding these key concepts is the foundation for protecting businesses of all shapes and sizes.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O4: org_asset_management, O5: org_change_management, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.udemy.com/course/cybersecurity-for-businesses-the-fundamental-edition/		
Keywords	SMEs, Cyber risk management, Ransomware		

#110 – Cyber Security Threat Intelligence Researcher Preview			
The Cyber Security Threat Intelligence Researcher Certification will help you acquire the skills needed to find out who is behind an attack, what the specific threat group is, the nation from which the attack is being launched, as well as techniques being used to launch this attack. You will know how to take a small piece of malware, find out who is responsible for launching it, the threat actor location, and also, how to take down that threat actor, with the support of your local law enforcement. In this course, we'll introduce you to the 8 phases of threat intelligence: -Hunting - The goal of hunting is to establish techniques to collect samples from different sources that help to start profiling malicious threat actors. -Features Extraction - The goal of Features Extraction is to identify unique Static features in the binaries that help to classify them into a specific malicious group. -Behavior Extraction - The goal of Behavior Extraction is to identify unique Dynamic features in the binaries that help to classify them into a specific malicious group. -Clustering and Correlation - The goal of Clustering and Correlation is to classify malware based on Features and Behavior extracted and correlate the information to understand the attack flow. -Threat Actor Attribution - The goal of Threat Actors is to locate the threat actors behind the malicious clusters identified. -Tracking - The goal of tracking is to anticipate new attacks and identify new variants proactively. -Taking Down - The goal of Taking down is to Dismantled Organized Crime Operations.			
Type	Online Course	Difficulty level	Intermediate
Property	Security		
Operational capabilities (OTMs)	O4: org_asset_management, O7: org_incident_handling, O8: org_business_continuity		

Technical capabilities (OTMs)	T2: tec_logging_monitoring, T6: tec_network, T8: tec_app
Link	https://www.udemy.com/course/cyber-security-threat-intelligence-researcher-preview/
Keywords	Cyber Threat Inteligence, CTI, Threat actors, Tracking, Mitigation

#111 – The Art of Hacking Humans: Intro to Social Engineering			
This course seeks to give a basic overview of social engineering to the beginner. It introduces the concept of social engineering and some common social engineering techniques, and how these techniques can be used to manipulate victims resulting in compromise.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O9: org_hr, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T8: tec_app		
Link	https://www.udemy.com/course/the-art-of-hacking-humans-intro-to-social-engineering/		
Keywords	Social engineering, Phishing attacks		

#112 – Wiretaps to Big Data: Privacy and Surveillance in the Age of Interconnection			
How does cellular technology enable massive surveillance? Do users have rights against surveillance? How does surveillance affect how we use cellular and other technologies? How does it affect our democratic institutions? Do you know that the metadata collected by a cellular network speaks volumes about its users? In this course you will explore all of these questions while investigating related issues in WiFi and Internet surveillance. The issues explored in this course are at the intersection of networking technology, law, and sociology and will appeal to anyone interested in the technical, political, and moral questions inherent in the use of information networks. The course will include broad overviews for the novice, while pointing to the detailed resources needed for those engaged in the development of corporate or governmental policies.			
Type	Online Course	Difficulty level	Beginner
Property	Privacy		
Operational capabilities (OTMs)	O6: org_gdpr_management, O10: org_awareness		
Technical	T8: tec_app		

capabilities (OTMs)	
Link	https://www.edx.org/course/wiretaps-to-big-data-privacy-and-surveillance-in-t?index=product_value_experiment_a&queryID=eeb145a89428054b89bdcadc3db8ce5e&position=4
Keywords	Big Data, Surveillance

#113 – Data Privacy Awareness			
This course provides an understanding of data privacy compliance in Rolls-Royce: what data privacy means; why handling personal data correctly and in accordance with legislation is so important.			
Type	Online Course	Difficulty level	Beginner
Property	Privacy		
Operational capabilities (OTMs)	O6: org_gdpr_management, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.edx.org/course/data-privacy-awareness?index=product_value_experiment_a&queryID=eeb145a89428054b89bdcadc3db8ce5e&position=3		
Keywords	Data privacy, Data protection, GDPR, Awareness		

#114 – Cybersecurity and Privacy in the IoT			
In this course, you will learn about security and privacy issues in IoT environments. We'll explore the organizational risks posed by IoT networks, and the principles of IoT device vulnerabilities. We'll also look at software and hardware IoT Applications for industry.			
Type	Online Course	Difficulty level	Beginner
Property	Security, Privacy		
Operational	O4: org_asset_management, O6: org_gdpr_management, O10: org_awareness		

capabilities (OTMs)	
Technical capabilities (OTMs)	T4: tec_endpoint_workstations, T5: tec_endpoint_mobile, T6: tec_network, T8: tec_app, T10: tec_physical
Link	https://www.edx.org/course/cybersecurity-and-privacy-in-the-iot?index=product_value_experiment_a&queryID=eeb145a89428054b89bdcadc3db8ce5e&position=2
Keywords	IoT, IoT security, IoT privacy, Hardware security

#115 – Learn the basics of cyber vulnerabilities, exploits & defenses			
What you will learn: -The main concepts and technologies in the field of Information Security -A vast array of design, implementation and operational vulnerabilities -The principles of secure computer systems -Ways to take part in the design and implementation of secure computer systems -How to identify situations that should involve information security considerations and make informed decisions about them			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O4: org_asset_management, O10: org_awareness		
Technical capabilities (OTMs)	T8: tec_app		
Link	https://www.edx.org/professional-certificate/israelx-unlocking-information-security?index=product_value_experiment_a&queryID=a170b78b98dcf212f6dce4ea8efb2782&position=2		
Keywords	Security principles, Vulnerabilites, Secure design		

#116 – Learn and practice the side channel mindset			
What you will learn: -Ability to spot side channels. -Ability to utilize side channels to leak information. -Understand how side channels can be mitigated. -High-level overview of side channel attacks in the real world and in computers.			
Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O7: org_incident_handling, O10: org_awareness		
Technical capabilities (OTMs)	T6: tec_network, T8: tec_app		
Link	https://www.edx.org/professional-certificate/tugrazx-side-channel-security-basics?index=product_value_experiment_a&queryID=a170b78b98dcf212f6dce4ea8efb2782&position=4		
Keywords	Side-channel attacks, Attack identification, Attack mitigation		

#117 – Information Security - Introduction to Information Security
This is the 1st course in the intermediate, undergraduate-level offering that makes up the larger Cybersecurity Fundamentals MicroBachelors Program. We recommend taking them in order, unless you have a background in these areas already and feel comfortable skipping ahead. You will learn: 1. Information Security – Introduction to Information Security 2. Information Security – Authentication and Access Control 3. Information Security – Advanced Topics 4. Network Security – Introduction to Network Security 5. Network Security – Protocols 6. Network Security – Advanced Topics 7. Penetration Testing – Discovering Vulnerabilities 8. Penetration Testing – Exploitation 9. Penetration Testing – Post Exploitation

Type	Online Course	Difficulty level	Beginner
Property	Security		
Operational capabilities (OTMs)	O1: org_policy_drafting_enforcing, O2: org_assigning_roles, O3: org_access_policy, O4: org_asset_management, O7: org_incident_handling, O8: org_business_continuity, O10: org_awareness		
Technical capabilities (OTMs)	T1: tec_auth_acl, T2: tec_logging_monitoring, T6: tec_network, T8: tec_app		
Link	https://www.edx.org/course/information-security-introduction-to-information-security?index=product_value_experiment_a&queryID=1720e8febcada9192726cb327409d2d1&position=3		
Keywords	Information security, Network security, Pentest, Access control, Authentication, Post incident response		