D5.5: Implementation of INCIT-EV ICT platform

Date of document – 12/2021 (M24)

D5.5:

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Technical References

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[1] PU = Public

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Document history

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V	Date	Beneficiary partner(s)
1.1	29/11/2021	ATOS – Toc draft, EVBOX Contribution and Ready for review
1.2	14/12/2021	ATOS - Consolidated version
1.3	21/12/2021	CIRCE - Final Quality Review

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0 EXECUTIVE SUMMARY

This document is the DEM deliverable "D5.5 – Implementation of INCIT-EV ICT platform" of the H2020 project INCIT-EV (project reference: 875683). This demonstrator deliverable provides the implementation details of the first version of the INCIT-EV ICT platform. The second and final version of this deliverable will be on December 31, 2022.

This Deliverable demonstrates the first version of the INCIT-EV platform which objective is to provide the information and communication technology environment for including the developments that will be part of the ecosystem of the project. These developments will support the use cases and boost the interoperability by defining a common information model (CIM), open application interfaces and suitable human machine interfaces.

The summary of this report is the following:

1. Introduction
2. INCIT-EV Platform Architecture
   2.1. Use case and adaptors mapping: This section describes the different adaptors by Use Case
   2.2. Source code of the release: This section describes the management of the source code and shows examples of the source code.
   2.3. Installation Guide
   2.4. Requirements Addressed: This section describes the requirements covered by this version.

The delivery of this deliverable is done in accordance with the description in the Grant Agreement Annex 1 Part A with no time deviation and no content deviation from the original planning.

0.1 Acronym table

Table 1: Acronym table

Acronym	Definition
FTP	File Transfer Protocol
REST	Representational state transfer
API	Application Programming Interface
CIM	Common Information Model
DevOps	Development and Operations
CI/CD	Continuous Integration / Continuous Deployment

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1 INTRODUCTION

This document is the first version of the implementation of the INCIT-EV Architecture which is specified in the following Architecture reports:

- D5.1: INCIT-EV ICT Reference architecture
- D5.8: First Update of INCIT-EV ICT Reference architecture

This version of the implementation includes the following main components:

- Kubernetes configuration core with the following components:
  - Traefik[1] to facilitate the publication of services and service discovery.
  - Keycloak[2] to manage the authentication of applications and services with technologies like Single Sign On, Open ID Connect, OAuth 2.0…
- Specific adaptors:
  - Generic REST Interface for UC2, UC3, UC4, UC6 and UC7
  - FTP Adaptor for UC1
  - Web socket adaptor for UC5

[1] https://doc.traefik.io/traefik/

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

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2 INCIT-EV PLATFORM ARCHITECTURE

The implementation of the architecture of this deliverable has been addressed throughout the different Use Cases analysing the connectivity requirements and the data sets that can provide to the INCIT-EV platform.

The design of the are architecture has been provided in the deliverables D5.2 and D5.8.

2.1 Use case and adaptors mapping

Throughout different recurring meeting in WP5, the following developments are being specified in accordance with the following table:

Developments	UC1A	UC1B	UC1C	UC2	UC3	UC4	UC5	UC6	UC7
INGESTION Adaptor Smart Charging	ATOS/FTP Server GFX/FTP Client		ATOS/ FTP Server GFX/FTP Client						
INGESTION Adaptor Bidirectional		ATOS/ FTP Server GFX/FTP Client				ATOS/REST Server LINKS/Client			
INGESTION Adaptor API Dynamic Wireless Charging				CIRCE/REST Client	ATOS/REST Server CIRCE/REST Client				ATOS/REST Server CIRCE/REST Client
INGESTION Adaptor API Super Fast Charging						ATOS/REST Server LINKS/REST Client	ATOS/Web socket Server? EVBox/Web socket Client?		
INGESTION Adaptor API V2V Charging								ATOS/REST Server CIRCE REST Client	

Figure 1: Use case and adaptors mapping

The following figure shows the adaptors in the INCIT-EV architecture:

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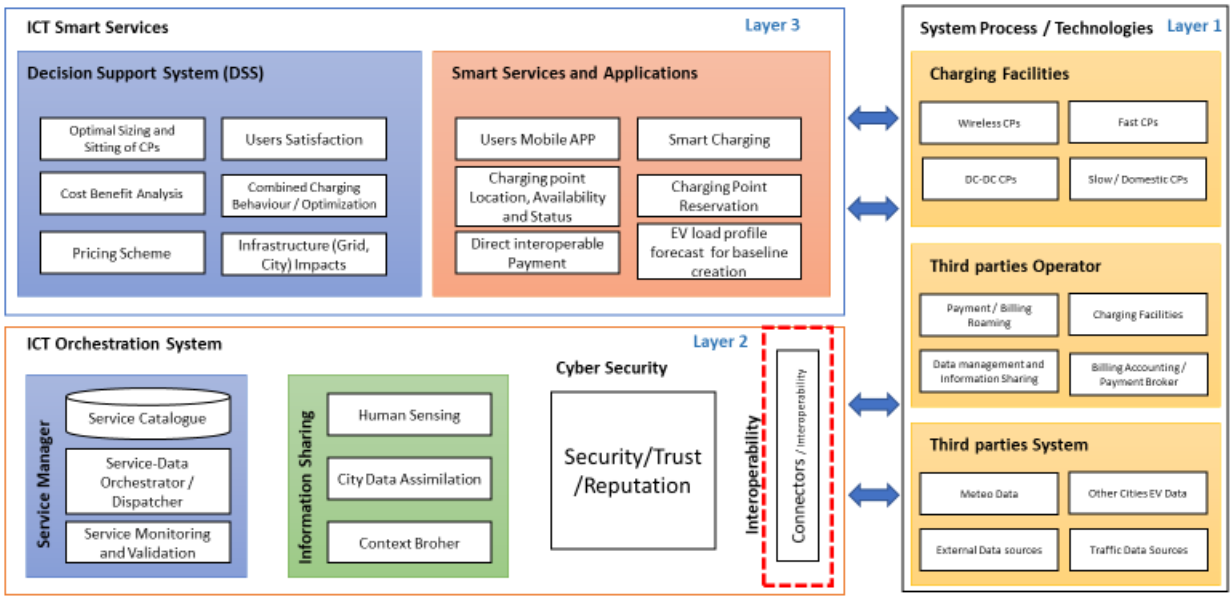

Figure 2: Adaptors in the INCITE-EV architecture

2.1.1 UC5 Adaptor

The solution addressed in UC5 is different from FTP Adaptor and REST API adaptor, therefore the proposal is described in this section:

Different from the FTP and REST API Services is the proposal in UC5 via WebSocket[3].

2.1.1.1 Static & Dynamic info

Proposal of static & dynamic data from EVBOX charging stations to send to ATOS IT via WebSocket

[3] https://en.wikipedia.org/wiki/WebSocket

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	Data	Units	Data format	Saving step	Saving frequency	Upload frequency
	Static & Dynamic Info					
Product config.	Model	N/A	Alphanum	N/A	Once	Once
	Connectors types (+ Position TBC)	N/A	Alphanum	N/A	Once	Once
	Power output configuration	kW	digital (1 kW step)	N/A	Once	Once & for each modification on product
	Optional features	N/A	Alphanum	N/A	Once	Once & for each modification on product
	Customer	N/A	Alphanum	N/A	Once	Once
	SW version (per board)	N/A	v.X.X.X	N/A	@ commissioning + for each update	@ commissioning + for each update
	Station ID	N/A	Alphanum	N/A	Once	Once
	EVSE Ids	N/A	Alphanum	N/A	Once	Once
	Connector Ids	N/A	Alphanum	N/A	Once	Once
Backend info	Backend provider	N/A	Alphanum	N/A	Once & for each modification on product	Once & for each modification on product
	URL OCPP	N/A	Alphanum	Each time backend is changed	Each time backend is changed	Each time backend is changed
	Cellular Infos - operator	N/A	Alphanum	N/A	Once	Once
	Cellular Infos - SIM ICCID	N/A	Alphanum	N/A	Once	Once
	Production date	N/A	dd/mm/yy	N/A	Once	Once
	Commissioning date	N/A	dd/mm/yy	N/A	Once	Once
	Intervention date (last HW intervention date)	N/A	dd/mm/yy	for each intervention	Once & for each intervention (via WebConfig)	Once & for each intervention (history)

Figure 3: Static & Dynamic Info

2.1.1.2 Real Time data

Proposal of real time data from EVBOX charging stations to send to ATOS IT via WebSocket

	Data	Units	Data format	Saving step	Saving frequency	Upload frequency
	Real-Time data					
	Current UNIX time	hh:mm:ss	digital (1 sec. step)			
At Plug Level	Active energy consumption (stand by mode & operation mode)	kWh	digital (0.01 kWh step)	Stand by : 10 min (TBC) OR variable step Operation mode : 10 sec.	Every hour	Once a day
	Total energy provided	MWh	digital (1 Wh step)	Once per session	After each session	Once a day
	Total energy per cable (left)	MWh	digital (1 Wh step)	Once per session	After each session	Once a day
	Total energy per cable (right)	MWh	digital (1 Wh step)	Once per session	After each session	Once a day
Charging session data	Time since last session	hh:mm:ss	digital (1 sec.step)	N/A	@ each session start	@ each session start
	Power output (active power)	kW	digital (1 kW step)	10 sec.	Every hour	Once a day
	Energy delivered	kWh	digital (0.01 kWh step)	10 sec.	Every hour	Once a day
	Session duration	hh:mm: ss	digital hh:mm:ss	10 sec.	Every hour	Once a day
	Total nb of sessions	nb	digital	@ each end of session	After each session (increment throughout the day)	Once a day
	Nb failed session	nb	digital	@ each session failed	After each session (increment throughout the day)	Once a day
	DC Voltage	VDC	digital (0.1 V step)	10 sec.	After each session	Once a day
	DC Current	ADC	digital (0.1 A)	10 sec.	After each session	Once a day
	SOC EV battery	%	digital (1% step)	10 sec.	After each session	Once a day
Te	Ambiant (internal)	°C	digital (0.1°C step)	10 sec.	Every 10 min.	Once a day
	Average power delivered	kW	digital (1 kW step)	10 sec.	Update after each session	Once a day
	Average energy provided	kWh	digital (0.01 kWh step)	10 sec.	Update after each session	Once a day
	Errors & Warnings	nb	incremenal counting	For each triggered error/warning	For each triggered error/warning	Once a day

Figure 4: Real Time data

2.1.1.3 Format Data in WebSocket

The specification of data format is currently written to be proposed to ATOS IT because need to be synchronized between EVBOX and ATOS IT.

2.2 Source code of the release

The source code is stored in internal Gitlab[4] which is the software configuration management tool used in ATOS for this project.

[4] https://about.gitlab.com/

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The development technologies adopted are detailed in the Deliverable D5.2 (INCIT-EV ICT Reference architecture) and D5.8.(First Update of INCIT- EV ICT Reference architecture). These technologies are mainly based on a microservices approach and are the following:

- DevOps (Development and Operation) practices with Agile methodologies to facilitate delivering in an iterative process.
- Continuous Integration & Continuous Deployment (CI/CD) techniques to automate development and delivery.

The source code has been tagged with ARCHITECTURE_1ST_VERSION_M24 tag.

2.2.1 Examples of Kubernetes files

The following example is referred to the deployment of Keycloak in the platform:

```
apiVersion: v1
kind: Namespace
metadata:
  name: keycloak
  labels:
    field.cattle.io/projectId: p-pw4lj
  annotations:
    field.cattle.io/projectId: c-2jn8b:p-pw4lj
---
apiVersion: v1
kind: Service
metadata:
    name: keycloak
    namespace: keycloak
    labels:
        app: keycloak
spec:
    type: ClusterIP
    selector:
        app: keycloak
    ports:
      - name: keycloak-port
        port: 8080
        protocol: TCP
        targetPort: 8080
---
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: keycloak
  namespace: keycloak
spec:
  tls:
  - hosts:
    - keycloak.incitev.fuse.ovh
  rules:
```

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```
  - host: keycloak.incitev.fuse.ovh
    http:
      paths:
      - backend:
          serviceName: keycloak
          servicePort: 8080
---
apiVersion: v1
kind: ConfigMap
metadata:
  name: keycloak-config
  namespace: keycloak
  labels:
    app: keycloak
data:
  PROXY_ADDRESS_FORWARDING: "true"  # VERY IMPORTANT SINCE WE'RE USING A REVERSE PROXY
  DB_VENDOR: "postgres"
  DB_ADDR: "keycloak-postgres.keycloak.svc.cluster.local"
  DB_PORT: "5432"
  DB_DATABASE: "keycloakdb"
---
apiVersion: v1
kind: Secret
metadata:
  name: keycloak-secret
  namespace: keycloak
  labels:
    app: dashboard
type: Opaque
#data:
stringData:
  DB_USER: keycloakdb
  DB_PASSWORD: keycloakdb
  KEYCLOAK_USER: XXXX
  KEYCLOAK_PASSWORD: XXXX
---
apiVersion: apps/v1
kind: Deployment
metadata:
    name: keycloak
    namespace: keycloak
    labels:
        app: keycloak
spec:
    replicas: 1
    selector:
        matchLabels:
            app: keycloak
    template:
        metadata:
            labels:
                app: keycloak
```

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```
    spec:
        hostname: keycloak
        containers:
            - name: keycloak
              image: quay.io/keycloak/keycloak:11.0.2
              imagePullPolicy: Always
              #image: jboss/keycloak:6.0.1
              envFrom:
                - configMapRef:
                    name: keycloak-config
                - secretRef:
                    name: keycloak-secret
              ports:
                - containerPort: 8080
                  protocol: TCP
                - containerPort: 8443
                  protocol: TCP
              stdin: true
              tty: true
        restartPolicy: Always
```

The following file is referred to the deployment of the FTP server:

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: sftp
  namespace: sftp

spec:
  selector:
    matchLabels:
      app: sftp
  replicas: 1 # tells deployment to run 1 pods matching the template
  template:
    metadata:
      labels:
        app: sftp
    spec:
      containers:
      - name: sftp
        image: emberstack/sftp:latest
        imagePullPolicy: Always
        ports:
           - containerPort: 22

             protocol: TCP
```

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2.3 Installation Guide

The installation guide will be specified in the next version but, at this stage, it can be said that will be based on Kubernetes [5]tool for managing the containerized workloads and services.

2.4 Requirements Addressed

The following table describes status of the requirements of this version. These requirements are partially achieved due to these are not totally defined but it is convenient to enumerate the requirements addressed in the release.

Table 2: Requirements Addressed

Req. ID	Description
ARCH-1	Kubernetes Cluster Deployment
ARCH-2	Traefik deployment
ARCH-3	Keycloak Deployment
ARCH-4	FTP Adaptor Deployment
ARCH-5	REST Generic Adaptor Deployment

[5] https://kubernetes.io/docs/concepts/overview/what-is-kubernetes/

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3 CONCLUSIONS

The approach of this Deliverable throughout the Use Cases discloses that different technologies and types of information must be harmonized in the INCIT-EV platform. Recurring meetings have been held to carry out this first version of the deliverable but for sure, more requirements will be discovered for the next version. To facilitate the adaptation of the developments to new requirements during the project, the iterative process of the development relies in the approach based on microservices architecture to achieve a modular development. Also, DevOps and CI/CD facilitate the iterative development of the platform and necessary developments to satisfy and support the requirements of the Use Cases.

Therefore, at this stage of the project, it can be observed that the approach of the architecture, the process of acquisition of requirements and the development and operational techniques are appropriate to support the current level of uncertainty.

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