D3.21 Urban platform adaptation specifications in Dresden-2nd version

WP 3, T 3.6.1, T 3.6.3

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### Technical References

<table>
<thead>
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<th>Project Acronym</th>
<th>MAtchUP</th>
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<tr>
<td>Project Title</td>
<td>MAximizing the UPscaling and replication potential of high level urban transformation strategies – MAtchUP</td>
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<th>Acronym</th>
<th>Description</th>
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<tr>
<td>API</td>
<td>Application Programming Interface</td>
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<tr>
<td>CKAN</td>
<td>Comprehensive Knowledge Archive Network</td>
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<tr>
<td>CSW</td>
<td>Catalogue Service for the Web</td>
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<tr>
<td>DCAT</td>
<td>Data Catalogue</td>
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<tr>
<td>DCAT-AP</td>
<td>Data Catalogue Application Profile for data portals in Europe</td>
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<td>DCIP</td>
<td>Data Catalogue Interoperability Protocol</td>
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<td>EIP</td>
<td>European Innovation Partnership</td>
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<td>FME</td>
<td>Feature Manipulation Engine</td>
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<td>GDPR</td>
<td>European General Data Protection Regulation</td>
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<tr>
<td>INSPIRE</td>
<td>Infrastructure for SPatial InfoRmation in Europe</td>
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<tr>
<td>IoT</td>
<td>Internet of Things</td>
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<td>ISO</td>
<td>International Organization for Standardization</td>
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<td>JSON</td>
<td>JavaScript Object Notation</td>
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<td>KPI</td>
<td>Key Performance Indicator</td>
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<td>LANs</td>
<td>Local Area Networks</td>
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<td>MQTT</td>
<td>Message Queuing Telemetry Transport</td>
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<td>NGSI</td>
<td>Next Generation Services Interface</td>
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<td>OGC</td>
<td>Open Geospatial Consortium</td>
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<td>ODP</td>
<td>Open Data Platform</td>
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<td>TLS</td>
<td>Transport Layer Security</td>
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<td>UP</td>
<td>Urban Platform</td>
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1 Abstract

This deliverable aims to report on the current state of Urban Platform concepts and developments as part of Task 3.6. This task focuses on following issues developing a number of services to improve city operation, decision-making services and citizen engagement. It describes the requirements of the Urban Platform in regard to existing and newly created use case, services and applications as well as new services in Dresden demo site. All described developments under the umbrella of the comprehensive Urban Platform approach leads to specifications. These specifications ensuring data integration and interoperability through open APIs developments are described in D3.23. The assessment and evaluation of these requirements of Dresden monitoring are outlined in Task 5.1.

Hence, the objective of D3.21 is to inform about the current state of development of the Urban Platform adaptation specifications in Dresden city. Dresden has a working Urban Platform (UP). Therefore, the task aims at adapting this platform to new MAtchUP services, improving it and adding new components based on open standards. Moreover, taking the issue of interoperability as essential requirement into account. So far, the UP is mainly used by the city council services and citizens. To improve third parties involvements first steps of basic development were achieved by deploying the Open Data Portal (described in D3.23 chapter 4.23) in the second year of MAtchUP project.

As far as the three MAtchUP lighthouse cities share common objectives, the deliverables of Valencia (D2.21), Dresden (D3.21), and Antalya (D4.21) share a common structure. Beside this, Deliverable 3.21 is the second version of D3.9 (due M12) including updates on all related issues during period M12-M24. This deliverable is due in M24 and will have its final version in M36 (D3.22).
2 Introduction

2.1 Objective

Within Dresden demo site (WP3) the aim of the implementation of the Urban Platform is developing a number of services to improve city operation, decision-making services and citizen engagement to ensure the interaction between the city of Dresden and its citizens. All these developments will follow the same principles: as much open data as possible, interoperability through open API (open Application Programming Interface) developments and assessing the evaluation process by considering the requirements of the Dresden monitoring plan outlined in Task 5.1.

This deliverable mainly addresses Subtask 3.6.1 Urban Platform adaptations and Subtask 3.6.2 New Services on top of the Urban Platform. Subtask 3.6.1 Urban Platform adaptations, is defined to the open-specifications concept, which will carry out the adaptations required for complying with the open data specifications, as well as open APIs. In this sense, open data gateways will be integrated in the Dresden Urban Platform in order to feed the urban platform with data from the multiple available resources. Subtask 3.6.2 New Services on top of the Urban Platform. Some new services will be developed on top of the Urban Platform in this subtask. This first description of the Urban Platform adaptations and new services of Dresden's platform assures open data interoperability, as well as open APIs. The document will assure that Dresden's platform will be fed with data from multiple variable resources following open data specifications.

The objective of this deliverable is to report on the characteristics that the Urban Platform of Dresden is going to adapt in line with open data strategies, open APIs, and data integration requirements. In the context of MAtechUP, the requirements of the urban platform must be specified, considering the Dresden demo site actions, interventions and the overall objectives of the project. These have to be carried out within the main issues of MAtechUP: Mobility, Energy, and ICT, but concerning the Non-Technical Actions facing economic and social aspects as well. Reference architectures for urban platforms as well as related European urban projects were taken into account.
2.2 Contribution of partners

The following Table 1 depicts the main contributions from participant partners in the development of this deliverable.

<table>
<thead>
<tr>
<th>Participant short name</th>
<th>Contributions</th>
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<tbody>
<tr>
<td>TUD</td>
<td>Content</td>
</tr>
<tr>
<td>DRE</td>
<td>Content and additional information</td>
</tr>
<tr>
<td>EASD / DWG / FhG</td>
<td>Comments on related issues</td>
</tr>
</tbody>
</table>

Table 1. Contribution of partners
3 Requirements of the Urban Platform

The requirements and specifications of an urban platform stand at the core of understanding and start of development of a smart city platform. This chapter describes more detailed the urban platforms that are developed by each of the cities in the project. Firstly, the needed specifications of an urban platform are depicted. Secondly, conceptual and technical architecture are described, and thirdly other European projects related to the development of urban platforms are named.

3.1 Specifications of the Urban Platform

All City Urban Platforms are having similar specifications due to the fact that they share common features and elements as needs, demands, citizens, services, or IoT devices. Moreover, main components are comparable too and have common specifications. On the other hand, each city is very specific, and individual specifications due to its contexts as technological, legal, social and economic constraints differ. For example, a city can decide whether information on waste management is collected in real-time, in which case the way to collect and process the information would be different technologically speaking. In D3.21 the focus lies on existing systems (as DUVA or KOMMIS_DD) and further on applications. However, in general, the following main specification for integration and interoperability are explained in D3.23. So far, the following common specifications belong to all three Urban Platforms:

- **Big Data** refers to the distributed storage of a huge amount of data that can be accessed in a reliable way, but also it is related to functions and processes to analyse pieces of data as quick as possible, obtaining analytics, statistics or indicators.
- **Context Broker** enables publication of context information by entities, referred as context producers, so that published context information becomes available to other entities, referred as context consumers or sinks, which are interested in processing the published context information.
- **Dashboards** are the easiest way of representing all the data stored and processed in the urban platform. Using panels and graphs, city administrators or citizens can keep up with anything that the city is monitoring. The use of maps is another way of showing georeferenced information, enhancing the comprehension of data.
- **IoT Devices** involve all sensors and devices that collect information from the city or the environment and are able to send that measurements to the urban platform.
- **Open (DATA) Portal** involves the publication of those data that can be considered of public interest, improving government transparency and making datasets available for citizens, entrepreneurs or third parties that can take advantage of these functions to improve the social and business network.
- **Security** is an important piece of any urban platform, which may require mechanisms of authentication to ensure the correct operation of the platform.
3.2 City Urban Platform

In this section, each city urban platform is described. As far as this deliverable is about urban platform adaptation and specifications of Dresden, Dresden UP is explained in detail. For the other lighthouse cities within MAtehUP, the reference Deliverable to D3.21 is named.

3.2.1 Valencia Urban Platform

The Valencia Urban platform is described in deliverable D2.21.

3.2.2 City Urban Platform - Dresden

3.2.2.1 Reference architecture

There are several well-known reference architectures for Urban Platforms such as the Reference Architecture Model "Open Urban Platform" (OUP) DIN SPEC 91357 [1] as well as architectures, which are part of existing frameworks like EIP (European Innovation Partnership) [2], ITU-T (International Telecommunication Union) [3] and ESPRESSO [4]. Beside the different surface forms and descriptions, all the reference architectures have a lot in common and follow the same ideas. The most important insights of these works are the following:

✔ Sensing devices need to be deployed throughout the city in order to monitor multiple parameters.
✔ Data acquisition and information gathering should rely on open and standard protocols.
✔ Interoperability aspects with the objective of providing open APIs, open Data and open SDKs need to be considered.
✔ Data storage, implementation of analytics and data management should also be import modules within the Urban Platform.
✔ Calculation of indicators gives support to decision-making tools for the city stakeholders and are important to present useful information.

End-users access the functionalities of the urban platform Services by means of services and apps

3.2.2.2 Urban Platform Objectives & Comprehensive Approach

The Urban Platform is an intellectual and logical approach to connect existing and future IT systems of the state capital Dresden as well as data gained by the local MAtehUP project partners. The systems involved not only are aware of each other, and exchange data, moreover they use their logical and analytical abilities in interactive processes to prepare decision-making and atomize processes. The prerequisites for the implementation of this logical approach are the use of state-of-the-art technologies and infrastructures, standards and services (technical services) as well as data and applications (apps). The aim is to improve the available infrastructure data in Dresden, to develop new applications on this basis and to give third parties the opportunity to
create new business models on the basis of data in the city. The cross-office use of data is also improved.

To this end, MAtechUP will implement a targeted selection of practical applications for the Urban Platform and establish standards for the future. With regard to these standards, there is not only a need from a technical point of view, but increasingly also for conceptual standards. An urban platform is not only about the technical networking of the systems, but primarily about content and knowledge-based networking on a technical level. But building up knowledge requires the passing on of information, which in turn requires a technically understandable exchange of data. To make this data interchangeable, analysable and interpretable, conceptual standard must be created as a prerequisite for constantly increasing data collection. The quality and quantity of services available within the Urban Platform have a decisive influence on the digital intelligence quotient of a Smart City. According to the European definition, the urban platform should:

- Cater for interoperability between urban infrastructures
- Enable replicability of the solutions/platforms city to city
- Scale without technical constraints and excessive cost increase
- Provide open APIs
- Enable Real Time capabilities
- Support implementation of functional and technical capabilities

The Municipality of Dresden, in line with its Digital Agenda, has developed a comprehensive ICT-Infrastructure in which many vertical services of the city are integrated by now. This Urban Platform of Dresden is in charge of gathering information from several municipal services in order to provide information for decision-making within the city of Dresden. Furthermore, the existing set of key indicators to support this decision processes needs to be elaborated. Another objective of the platform is to offer data to the citizens and municipal managers to support all the necessary information to ease their daily life.

The following vertical services are to be integrated and managed through this platform:

- Water: data gathered and local water managed services deployed
- Traffic: maps and status integrated (e.g. parking space, online ticket purchasing and construction sites)
- City dashboard
- Charging infrastructure information
- Mobility app for public transport
- BikeNow app
- Open Data Platform
- eGovernment
- Energy Management in Municipal buildings
- Citizens’ portal

The Smart City strategy of Dresden found its place in the guiding strategic planning documents approved by the city council and discussed with citizens in the course of the planning process. According to the IDC Smart City [5], it encompasses processes that are based on the involvement of information and communication technologies and
further technologies to support urban organisation and development. The networked and intelligent infrastructure serves to improve competitiveness of the local economy, resource efficiency, strengthens the participation of citizens and helps to integrate social aspects. This allows citizens being part of a wider network and allows for social integration, enables participation in the knowledge society and fosters thus a higher quality of urban life. The competences within the city in the fields of building, mobility, energy and government as well as security need to be enhanced.

The local Urban Platform is further developed and more services will be derived from the needs of different stakeholders as for instance municipality, citizens, or companies. By now, several applications exist and are processed by the Urban Platform, but the UP lacked an overall concept on how to combine data collection and making the most use out of the data so far. Within MAatchUP we further develop the existing platform systems towards a central data hub used for social, administrative, and as well for commercial purposes. As a first step an overall picture was depicted in order to derive a comprehensive logic for the further technical development, the professional and conceptual perspective was aggregated in Figure 3.1.

![Figure 3.1: Dresden Urban Platform – content view](image)

The overall "Big picture" shown in Figure 3.1 illustrates the underlying concept on how the integration of different data sources – processed by the Dresden Urban Platform – leads to several new services, here called Urban Business Models. So far, the adaptations are clustered in the following three categories:
1.) Application with a city council focus,
2.) Application for Citizens and for the city itself, and
3.) Application for existing and newly created businesses and economy of Dresden.

Therefore all the Dresden Actions (see D3.14) is going to feed data into the Urban Platform in either one-to-one or in an aggregated manner. Data provided by MAthUP Actions, which depict on the right side of Figure 3.1, termed MAthUP Data and mainly focused in D3.21 and D3.23. Moreover, data of the city council itself may be considered to be processed by the Urban Platform later on as well as citizens data and data collection through citizens will be assessed in future applications of the Urban Platform. Therefore, investigations in useful data and application scenarios will be pursued. By now, the MAthUP actions play a double role: they contribute with data to the platform and make most use of this.

![Use Case visual graphs](image1.png)

**Figure 3.2:** Use Case visual graphs

To better describe and create new Use Case, several Use Case workshops with different stakeholder perspectives were carried out during the last 24 month. Within these, one aim was to depict the content view of the Use Cases in visual graphs (see Figure 3.2). Moreover, a Data Collection of current and future Use Cases of the UP was started in an excel database (see Figure 3.3).

![Dresden Urban Platform Interventions and Adaptation](image2.png)

**Figure 3.3:** Dresden Urban Platform Interventions and Adaptation (parts of the Excel Table)
3.2.2.3 Urban Platform Description (technical view)

The Urban Platform, as the main tool for the implementing the Smart City strategy of the city of Dresden, is further developed based on the architecture shown in Figure 3.4. Here the technical view shows what service, application and core features are to operate in several back-end databases. In order to specify the Urban Platform regarding the requirements of current and future adaptations the needed Data Input formats, Output formats, core components and additional features are described in D3.23 more detailed.

**Figure 3.4:** Technical view of Dresden Urban Platform

The city of Dresden already has an existing Urban Platform deployed and running. The interconnection and additional future development planning visualized in Figure above. It depicts the running systems explained in D3.23 (See Chapter 3, 3.1-3.4).

In its current deployed version, the Dresden UP already hosts most of the basic parts and components of the envisioned Urban Platform. For instance a structured storage of municipal data, with partial access to this city data – as Open Data in a machine-readable format via open APIs is in use. Several services built on top of these data stores, such as the Themenstadtplan [6] (city theme map), the Dresden Bürger App (Citizen Service App Services) or the Dresden App. The existing components and services will be described in the following paragraphs.
3.2.2.3.1 System: DUVA

This system manages statistical information and can provide information through an interface in CKAN metadata format. Based on this interface data can be automatically extracted and made available in other Open Data portals. As of August 2019 DUVA hosts about 300 topics from the Urban Platform description of various administrative areas, which from an open data point of view, these are open data records. For each of the topics, there are also special interactive visualizations that can be addressed via a unique identifier. In terms of content, the visualization of the data set is treated as a separate representation and thus as a linked resource.

3.2.2.3.2 System: KOMMIS_DD

The state capital of Dresden uses following software components to implement the uniform geo data infrastructure:

- ✔ the municipal meta information system (KOMMIS_DD) which is in operation since July 2008
- ✔ the central geodata database (OracleSDE)
- ✔ the unified geographic information system ArcGIS
- ✔ the geodata portals Cardo and Themenstadtplan

All datasets, which are part of the geodata portal CARDO, are centrally registered and described in KOMMIS_DD. KOMMIS_DD is based on a dynamic data model. Besides descriptive data, it contains also technical metadata and lookup lists. KOMMIS_DD fulfills the following functions:

- ✔ Controlling the visualization of geodata in the geodata portals (permissions, availability, etc.)
- ✔ Central overview and documentation of data sources content and their applications
- ✔ Provision of metadata services in the form of OGC-compliant Catalogue Service for the Web (CSW), documents for external portals, e.g. in the environmental data catalogue or GeoMIS Saxony

The data stored in KOMMIS_DD is made available to the general public as a map centric end user web portal called Themenstadtplan [6].

3.2.2.3.3 Application: dresden.de

With the Internet portal dresden.de all public information of the state capital from different offices as well as municipal institutions from culture, sports etc. are made available for the inhabitants. The Themenstadtplan (city theme map) (see D3.23 section 4.2.4) is a map-centric web application that allows visualization of data with geo references in a user-friendly manner. There is a very comprehensive list of several hundred topics available. This web portal is equipped with an API, which can be used for example with the CKAN GeoMISHarvester. Furthermore, links to the MapControl can be integrated into the corresponding CKAN data record.
The data is stored centrally in a database (Oracle) with separation by individual clients depending on the application case. It is possible to connect further data sources to the system at any time. A universal import interface is currently under development through Feature Manipulation Engine (FME). The entire layout of the website was completely revised in 2015 and is directly managed by DRE (previously external service). The individual applications are captured in apps depending on these specifics. The development of the front-end is done using Java Wicket. Open interfaces for the transfer of data to internal and external systems are under development. Regarding the actual data basis, the corresponding authorization concept must still be agreed with the technical office in charge.

3.2.2.3.4 Urban Platform - Future Plans

For the near future, we envision the Dresden Urban Platform to be a system of systems architecture that connects heterogeneous data stores by developing a harvesting and ingest layer that is able to cope with different data models and data formats. This layer should be able to quickly transform the acquired dataset into the target data formats as needed by the different city data systems. Furthermore, the harvesting and ingest layer has to be highly scalable to be able to scale based on varying load conditions especially for sensor data streams. Currently, the city of Dresden is using FME (described in D3.23, see Chapter 3.2), a data integration platform for building scalable integration architecture, to cope with these types of requirements. Within the MAtechUP project investigations whether FME can be used to integrate the various data sources of the Dresden Urban Platform are carried out.

On top of the different repositories such as DUVA, KOMMIS_DD and dresden.de we aim to build a data access layer dedicated to the connectivity and openness aspects. This layer takes as input the information coming from the repositories and results of analytics in order to make it open for the end-users through portals and APIs. The transparency portal takes up the role of making municipal data more transparent, more visible, and easy to find and make useable.

3.2.3 Antalya Urban Platform

The Antalya Urban platform is described in deliverable D4.21 in Section 3.

3.3 Related European Urban Platforms

In this section, we briefly describe other European projects whose purpose is or has been to define or propose a smart city platform or architecture.

mySMARTLife -
ID: 731297 Start date: 2016-12-01, End date: 2021-11-30
mySMARTLife project aims at the development of an Urban Transformation Strategy to support cities in the definition of transition models, as a suitable path to reach a high level of excellence in its development process, addressing the main city challenges and progress.
UNALAB -
ID: 730052 Start date: 2017-06-01, End date: 2022-05-31
UNaLab will develop, via co-creation with stakeholders and implementation of ‘living lab’ demonstration areas, a robust evidence base and European framework of innovative, replicable, and locally-attuned nature-based solutions to enhance the climate and water resilience.

Programme: H2020-EU.3.3.1. Record Number: 206242 Last updated on: 2017-07-12

Programme: H2020-EU.3.5.2.1. Record Number: 210510 Last updated on: 2017-07-12
4 Integration strategies

The Integration strategies of Dresden Urban Platform according to the actions and interventions carried out are in preparation right now. A local ICT-Group with responsible participants of each partner action is set up and plans the strategies on data, data collection and data processing through the Urban Platform from the ICT perspective for the future integration of the several Dresden MAtechUP Actions.

As setting up the different actions was aimed first (see deliverable D3.23), describing data integration from the actions to be deployed in the city interventions is still an ongoing process. In Dresden we follow a more holistic view on the several actions and do think that adaptation and integration at the interfaces of the topic Mobility, Energy, and ICT are the most promising ones. The general description of the Integration strategies on Data collection, Data procession, and Data exchange is described within D3.23 chapter 2 and chapter 3.

In order to carry out the MAtechUP project successfully, it is necessary to plan integration strategies of the current actions proposed, and describe this more detailed in the follow ups of this deliverable on how data will be gathered, transmitted and stored. Hence, this section will be updated about describing data integration from the actions to be deployed in the Dresden city interventions. There are some social and non-technical actions aiming to foster citizen participation and engagement. The results from these actions regarding citizen involvement will be integrated in the urban platform, using the generated KPIs of these interventions.

The specific needs of the Mobility, Energy and ICT Actions as well as the needs of the Non-Technical-Actions are described in the Use Case Excel-data collection shown in Figure 3.3. During the last period, main functions of the UP to serve these Data input and service processing integrated in the UP and deployed by using the existing systems as described in section 3. So far this development is only used and based on single Actions being processed. Future work need to be done for a better interlinked and integrated data analytics for a more massively used data approach need to be developed, and specified according to their data acquisition and data processing requirements. Considering the social and non-technical Actions and Interventions, no data acquisition or processing was required so far. This may change during the next period.

As further planned steps the APIs among several partners components and application in use (see Figure 4.1) need to be specified in order to gain technical easy data exchange and on the other hand derive more benefits with an integrated approach also for non-technical benefits.
5 Open Data Adaptation

The commitment to open data for the city of Dresden was manifested on 3 September 2015, where the City Council commissioned the Lord Mayor with resolution A0076 / 15 to present an open data concept with the aim of making available open data from official procedures and data files of the city administration of Dresden online for free use. The concept was developed and decided on by the city council on 22nd May 2018 (on the decision see figure 5.1).

In order to promote administrative transparency and economy, datasets are being made available online ranging from education, culture, urban development and planning, environment to traffic and many more. Geo-data are provided in a reusable, vendor-independent format, which is suitable for automated processing. However, datasets are protected if they interfere with other laws or interests, e.g. privacy law. This means all data that are not protected as described before, will be accessible as open data. The further development of the Dresden Urban Platform will follow these guidelines for the future integration of the several Dresden MAtechUP Actions.

1. The state capital Dresden (LHD) introduces an Open Data portal. The data will be in a machine-readable, open and standardized format integrated in www.dresden.de made available.

2. The Open Data Portal starts with the datasets listed in Appendix 3 to the template and will be further developed with the involvement of external stakeholders.

3. The revenue loss expected from free provision of open data is suitably compensated.

Figure 5.1: City Council Decision on Open Data Concept

5.1 Open Data Specifications

Data generated within MAtechUP Actions will be integrated into the urban platform, and partially published on the transparency portal. Most probably data will be accessed via CKAN (Comprehensive Knowledge Archive Network). In addition, a specific open data catalogue will be compiled with those datasets generated during the project life time using the different data collection systems as sources. In order to ensure the interoperability of the implemented Open Data Portal with other existing Open Data catalogues and portals, we will also include the necessary standard mechanisms (DCAT-AP) to enable the harvesting of datasets from external Open Data catalogues, as well as exporting Open Data sets to other external catalogues.
5.1.1 Open Data Sources

The decision about which data is going to be published is still not taken. Open data sources will be reported later in the next deliverables, because the city council is studying which open data should be published.

5.1.1 Open Data Privacy and Security

According to the tasks of the MAtechUP, it must be ensured that the data can be queried and explored in a uniform and interoperable way, which will be able to be replicated by other cities. The aim is to only publish non-sensible/no-private and anonymized data, taking into account privacy and security aspects and legal regulations (see also chapter 6 in D3.23).

5.1.2 Open Data Operability

The data catalogue of MAtechUP project data with specifications, similar among all cities, will serve as the basis for the creation of a new catalogue of project data. For this, a template has been created jointly to define and fill in this catalogue. This is developed and applied for general data in Dresden and therefore encompasses not only open data. Currently, the template looks like this:

<table>
<thead>
<tr>
<th>field</th>
<th>Description / Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the dataset</td>
<td>Concise name of the dataset (short but informative)</td>
</tr>
<tr>
<td>ID</td>
<td>Dataset identifier</td>
</tr>
<tr>
<td>Node Type</td>
<td></td>
</tr>
<tr>
<td>Contact</td>
<td>Contact information for questions/remarks.</td>
</tr>
<tr>
<td>Description</td>
<td>Short description of scope/contents of the dataset. Also remarks (e.g. restrictions, data gaps).</td>
</tr>
<tr>
<td>Category</td>
<td>Category from ISO19115 standard</td>
</tr>
<tr>
<td></td>
<td>GEMET Key Words</td>
</tr>
<tr>
<td>Data source</td>
<td>Used sources to prepare/provide the dataset.</td>
</tr>
<tr>
<td>Date</td>
<td>Date of up-/download (e.g. 03/2019)</td>
</tr>
<tr>
<td>Date of last modification</td>
<td></td>
</tr>
</tbody>
</table>
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under Grant Agreement N°774477
6 Open API Adaptation

Considering the aim of “openness”, the current Urban Platform will need to be adapted and extended to provide open APIs for providing the capability of collecting, aggregating and analysing data, following the open data approaches. Hence, new Open APIs adapted to the city will be created and will also be offered to citizens.

6.1 Open APIs context

An open API is a piece of software that allows the owner of a network-accessible service to give universal access to consumers of that service, such as developers. An API is a software intermediary that makes it possible for application programs to interact with each other and share data. Through the consistent use of open interfaces, the exchange of information and results of different actions and among different partners involved, is possible in an easy and useful manner, e.g. an application built on top of Dresden’s Urban Platform should work also – at technical level – with Valencia’s or Antalya’s Urban Platform.

Of course, it needs to be taken into consideration that the service is developed with certain requirements of data availability and, if they are not complied, the application will not work properly, but at least it will be deployable. Additionally, this interoperability at API level provides the opportunity to 3rd parties to develop on high-level services that should work on multiple platforms. In this way, 3rd parties can easily adapt their software assets to new platforms and gain a larger visibility.

Furthermore, the APIs exposed to Data Publishers to provide data and to the Data Consumers to query and retrieve data (API-Level Interoperability) should be fully documented and the documentation should be freely accessible as opposed to a proprietary API where the access to which is bound to commercial and non-disclosure agreements.

6.2 New City APIs

Use cases, which involve time series data such as e-mobility charging station or the electricity consumption of public buildings, will rely on the SensorThings API specification that provides a generic model applicable to any type of measurement or observation. The SensorThings API offers a JSON-based data model on either REST/HTTP or MQTT transport protocol. The sensors used in the project, e.g. for monitoring the parking spaces at the charging stations of the e-cars, only report changes (publish and subscribe via middleware). This capability already comes with the SensorThings AP. All other interfaces should follow this functionality.

This will help in maintaining as few standards as possible and simplify the integration with the Urban Platform.
6.3 Benefits of Open API

We benefit in several ways from Open APIs. An Open API is a useful tool for the developers community – it eases the co-creation of new services and functionalities of the developers among each other. Moreover, an Open API helps both new developers to base on already existing codes to create more powerful applications. An Open API can improve existing services with less effort and time. Furthermore, most of the Open APIs are very well documented, with tutorials and examples of code of using the API, such as the Open APIs.

By Smart Cities strategy Dresden will make more data available to citizens and third parties. As an easy access to public services and data of the city by means of Open APIs assure the benefit to various stakeholders, and a sustainable use and re-use of data. Hence, here tools to implement applications are identified but not broadly used among the several MAtchUP Actions. By using standardized and open API approaches, Smart cities Dresden offers opportunities to entrepreneurs for developing new businesses or services that improve the citizen life, governmental support and decision-making processes. Moreover, open APIs allows an automatically exchange of data and aggregated data between main pillars Energy and Mobility. So the benefits of each (individual) data set may be enhanced by its usage of different MAtchUP Partners during the project lifetime but later also by new parties to gain their own benefits or finding answers to their needs by using already monitored and captured data sets being made available via the Urban Platforms.
7 Big Data Functionalities and Adaptation

Big Data defined as very large sets of data that are produced by people using the internet, and that can only be stored, understood, and used with the help of special tools and methods. This section describes the Big Data Functionalities and Adaptation approaches to be carried out in Dresden. Hence, here mainly Action 62 is being involved.

The functionalities aims to cover the data analysis activities for the calculation of new insights associated to the planned interventions in Dresden. The exploitation of available historic and real time data, will create new insights on the energy optimization, sustainable mobility, high performance buildings and environment. A set of common data analytic functionalities prepared for reuse will be created to enable the design of more complex big data analysis required.

Within Action 62, a big data cluster gathers all raw continuous data coming from vehicles via on-board-units. The data is stored and provided to certain analytics modules, executed in the big data cluster, in order to calculate specific KPI (such as the load predictor algorithm). The calculated data is provided to further use by other actions. For Instance: the load prediction model from A23 is going to be implemented as big data module, refinement of big data analytics user interface (see Figure 7.1) or the evaluated performance of charging load (reference to A23) as a prediction module for being used in Big data analytics and adaptations. This is still an ongoing operation and needs also further developments. E.g regarding the integration of further vehicle data (Action 19) into this analytics

Moreover, Dresden will develop an open data gateway, mobility services including balance the grid load with storage and charging stations and decision making systems based on big data together with citizens’ engagement services in the urban platform.

Figure 7.1: Big Data User Interface (by FhG)
7.1 Big Data Analysis Platforms

In order to prepare, develop and implement the necessary big data IT infrastructure the following items need to be considered: allocated large amounts of redundant disk space in data centres, virtual machines, server-side processes and databased to receive data, specified data schemes and database setups, specified long term data storage and short-term storage of aggregated and pre-processed.

Taking into account stakeholder workshops, user needs, scenarios, use cases and requirements, the following big data processes should be identified and specified:

- ✔ data acquisition processes
- ✔ data integration
- ✔ data analysis
- ✔ data provision
- ✔ information visualization
- ✔ information exploring

All the user interface application is currently under development.

7.2 Big Data Collection and Analysis

The next steps are planned. So far, first investigations and a brief comparison on exciting and to be developed software components were carried out. Further development on Big Data Collection and Analyses is needed in order to do a software implementation of the following big data processes into the server-side components:

- ✔ data integration
- ✔ data analysis
- ✔ data provision

7.3 Big Data Visualization

The next steps are planned. So far, first investigations and a brief comparison on exciting and to be developed software components were carried out. Software implementation of the following processes into the user application:

- ✔ information visualization
- ✔ information exploring

Mainly within the development of the Open Data Portal Big data visualization is already established and being used. To transfer the existing Knowledge to other Actions and application the next period is going to be used.
7.4 Application of Machine Learning Methods to Big Data

In Dresden case, we still need to figure out on existing (scientific and technological) approaches on how information may be better explored by use of machine learning approaches and if this can be implemented to the Urban Platform. The evaluation process (ROC curves, etc.) of the machine learning may be resulting as an interoperability assurance among different MAtchUP data sources.

7.5 Benefits of Big Data Analysis

The estimated benefits of Big Data analysis need still to be adapted to Dresden context. But generally speaking the main benefit is given by the use big data analytics for exploring and exploiting various data collected from different sources, containing various types and data format, mixing structured, semi-structured and unstructured data in a large scale in order to assist and support decision-making processes.

Advanced analysis may include predictive models and pattern analysis, to obtain an aggregated worth over data. Hence, the speed of carrying out the analysis is another benefit regarding a short term, quickly performance in order to have results immediately available.
8 Action Plan

The actions of Dresden Demo site are described in their detailed status in D3.14. Each Dresden Action describes there how the plans for the several interactions looks like for the up-coming period and the next version of the deliverables.

In regard to the new services and adaptation, the further development of the Dresden Urban Platform needs to be interlinked not only within an intellectual concept, moreover, the technical developments are to ensure the data exchange and Open API concept described within this deliverable. Therefore, also the interdependencies of the Dresden interventions need to be further investigated and developed towards new services and applications. Currently, all existing use case and potential newly created cases are collected in an excel database mainly describing concept, content, in- and out-going data as well as different benefits and stakeholder groups. In parallel to the technical further development, this Use Cases are to be described and evaluated in line with the List of Indicators developed in WP1 and WP5.

The Urban Platform will offer various data from MAtchUP actions outcomes to the citizens and municipal managers to support all the necessary information to ease their daily life.

The content of the Open API and IoT adapter can be found in the Actions Cards:

- Action 61: New open API developments
- Action 63: IoT adaptors
9 Conclusion

In D3.21, we reflect on the current state of work, approach and development of the Urban Platform adaptation specifications in the city of Dresden. We briefly described main objectives and outcomes regarding the City Urban Platform of Dresden mainly by explaining the systems and applications in use so far. The requirements and specifications of the urban platform were described, identifying the existing and needed components for enhancing the city services according to the MAtchUP interventions.

Moreover, the overall concept as well as the Urban Platform IT architecture of Dresden UP has been detailed, linked to some reference architectures for urban platforms and related European urban projects. Additionally, the ongoing integration strategies have been outlined as well as the mobility, energy and ICT actions together with the non-technical interventions. The current state of work according to Open Data and open API Adaptations were briefly summarized.

For the upcoming period the further development and improvements on Big Data functionalities, analytics and adaptation requires special focus. All exciting work carried out within the order MAtchUP Actions and their data and results are to be integrated in this further approaches in order to derive a more comprehensive and comparable final version of this deliverable in M36 (D3.22).
10 References


