project which is jointly funded by the European Commission (grant agreement n° 723076

CPaaS.io

City Platform as a Service – Integrated and Open

MiMurcia

Murcia Smart City Project

Antonio Skarmeta
Univ. Murcia/OdinS
Jose Guillen and Jose Marquez
Ayto. Murcia

MINISTERIO DE INDUSTRIA, ENERGÍA Y TURISMO
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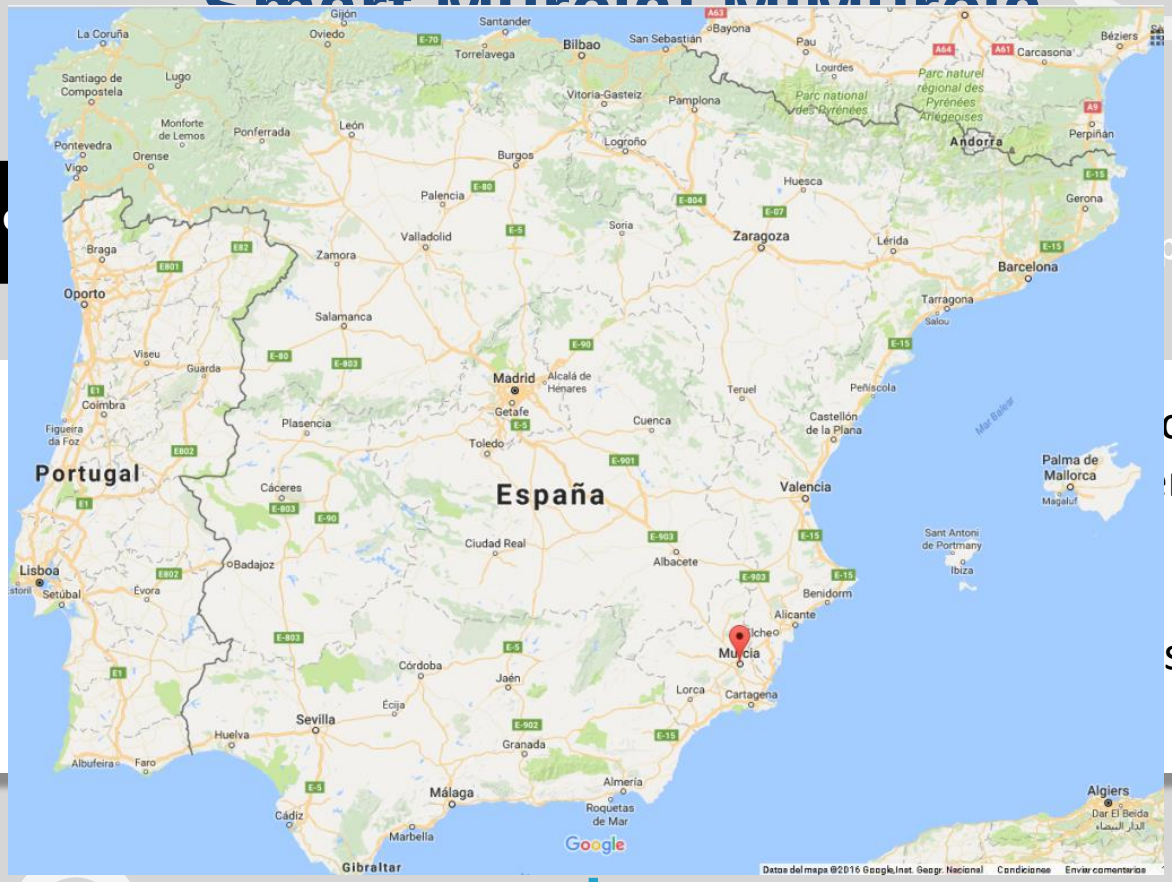
UNIÓN EUROPEA
PROYECTO COFINANCIADO POR EL FONDO EUROPEO DE DESARROLLO REGIONAL (FEDER)
Una manera de hacer Europa
Murcia

Smart Murcia: MiMurcia

7th city

Citizen participation

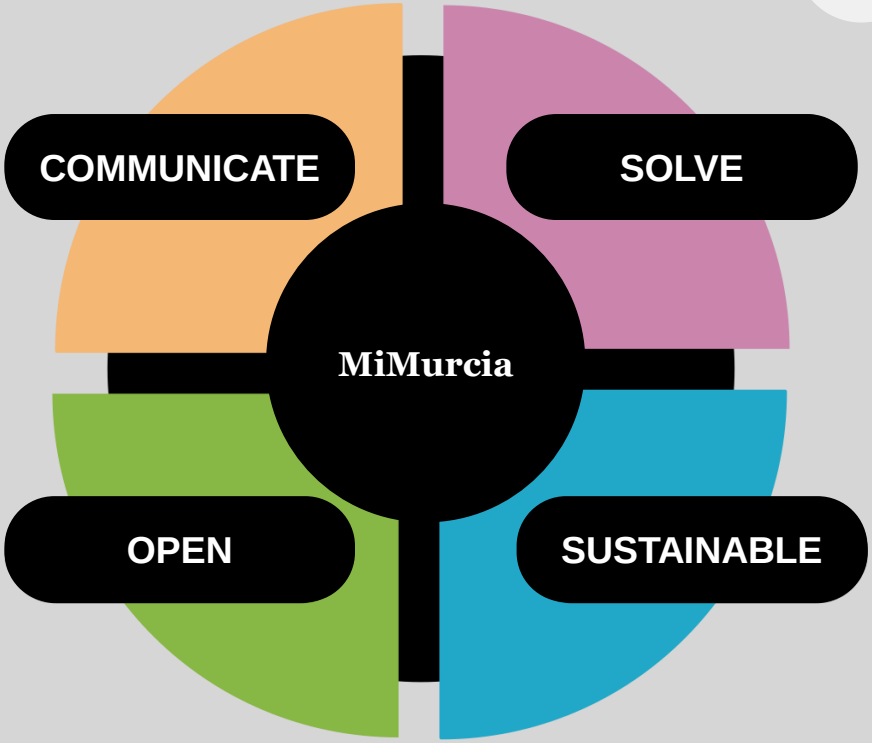


MURCIA, suitable scenario for Smart Cities

MiMurcia Vision

ONE PERSON
ONE CITY COUNCIL

- The city council in search for the citizen
- Smart city council looks for the citizen



Proposal objectives

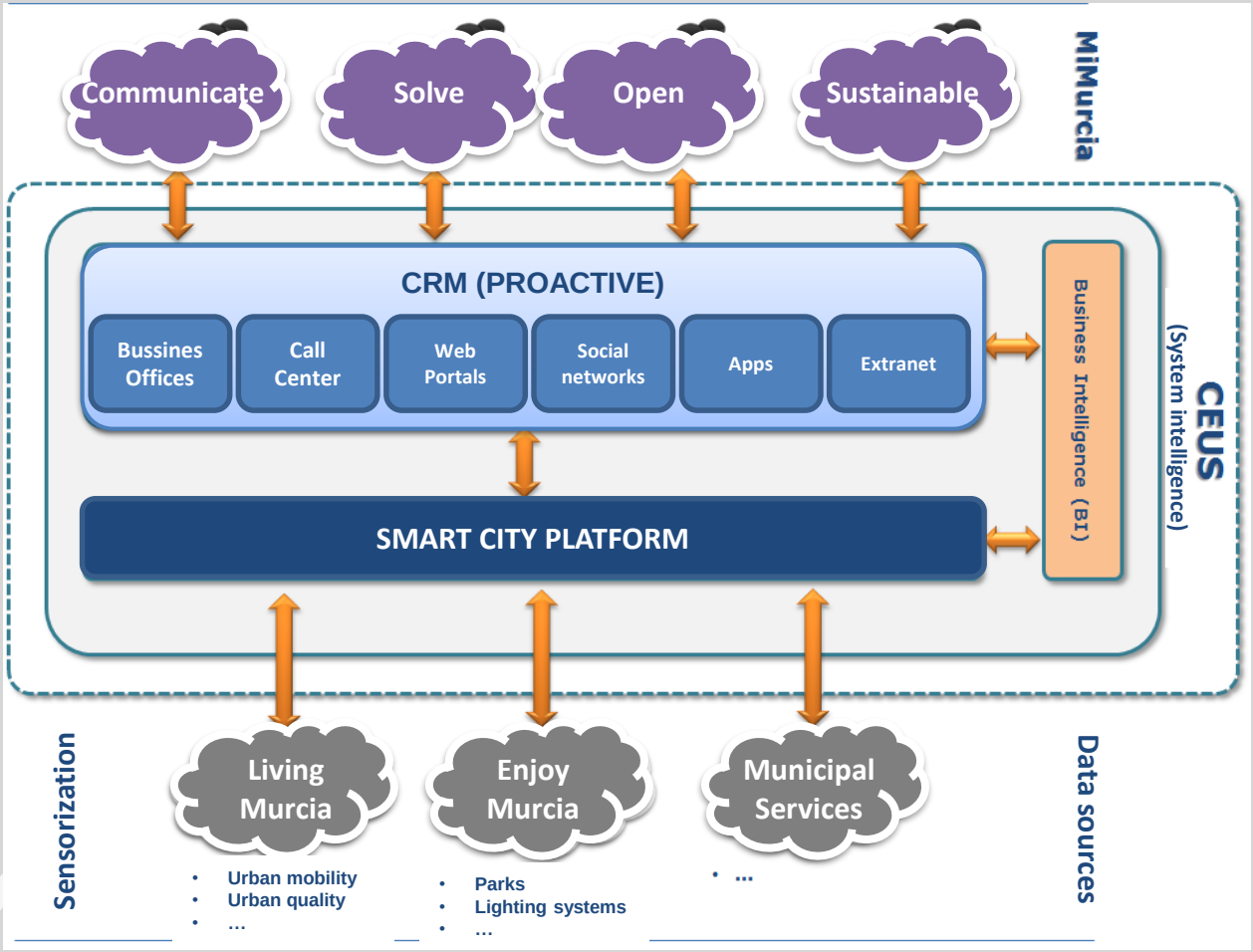
- Use of the most appropriate channel
- Information:
  - Cultural, Feasts, environmental information.
  - Customized, geo-localized, useful, required and contextualized

- Innovative paperless administration.
- Close to the citizen
- Administration modernization
- Reduce the documentation Administration 3.0

- Transparency and clarity
- Participatory democracy mechanism
- Integration into Open Data initiative
- Unified SDI-GIS
- Business attraction
- Data Marketplace and innovation support

- Smart urban mobility: State of the city, public transport ,waste collection
- Urban quality: Energy efficiency, reduction of the use of own vehicle, p&g management

Architecture



Smart City Platform

- Integration and interoperability layer
- Analysis and storage layer
- Advanced services layer
- Balanced scorecard
- Access identification and authorization layer
- Configuration, management and monitoring layer
- Data publishing layer (OpenData)

Data sources

- **Regulated Parking Service and private car parks**
- **Mix-modal public transport and the use of bicycle**
  - Citizen Card
- **Traffic management**
- **Lighting system**
- **Watering systems for parks and gardens**
- **Noisy zones detection**
- **Waste collection**
- **Incidences of citizens**
- **Commerce promoting in the centre of the city (iBeacons)**

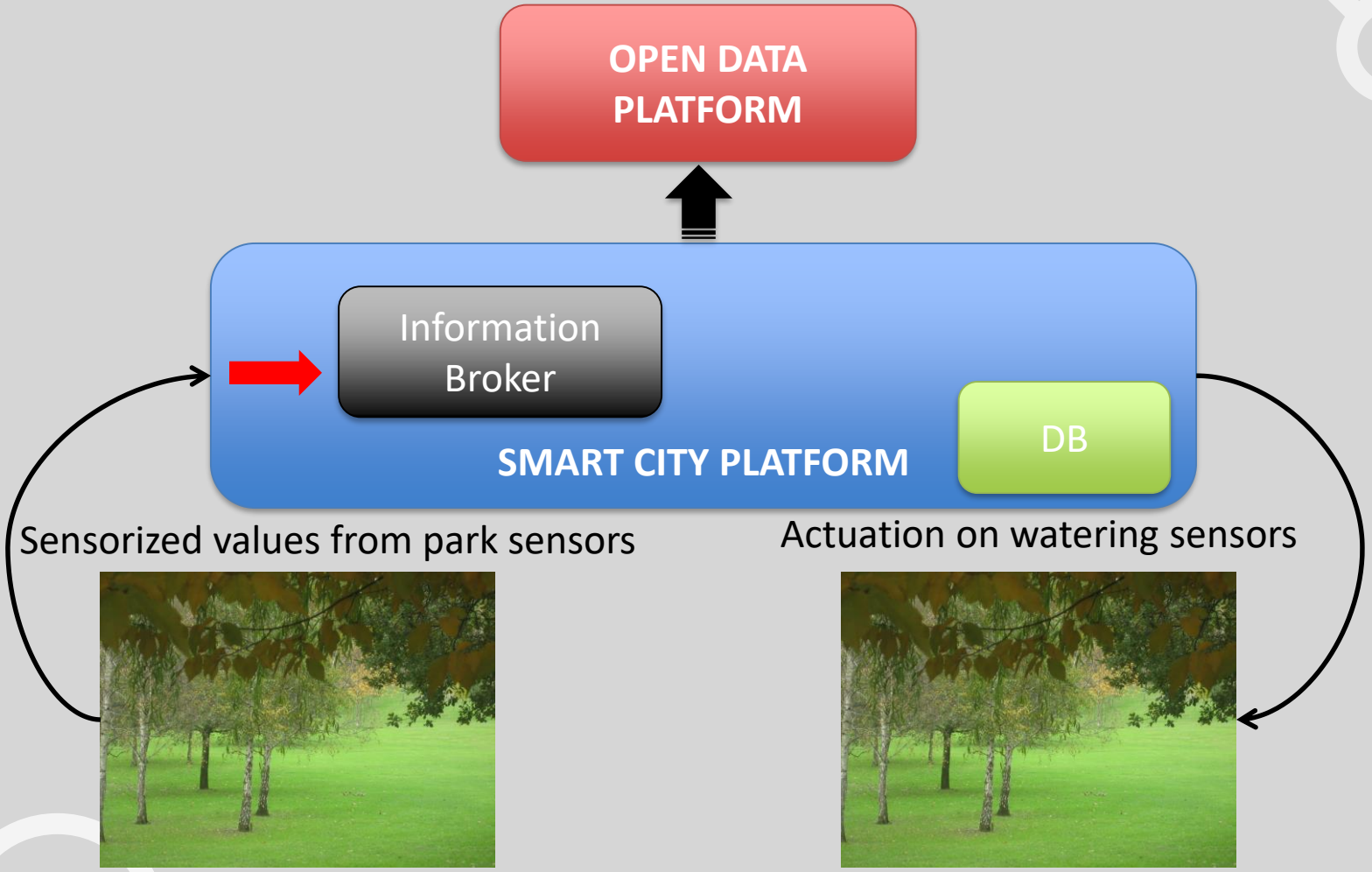
Main Objective

- Integrate data from sensors, open data sources and internal database by means of common data model (NSGI)
- Provide facilities for orchestrating new services based on connecting different municipality areas of information
- Create new channels of communication with citizens based on social networks contextualized information
- Increase the efficiency of services and reaction time based on the real time information of the city

Interoperability

- **Create end-point for integration existing vertical**
- **Identify communication options to give better coverage**
- **Define mechanism for supporting data exchange**
- **Municipality agreement for requesting any further tender involving ICT components to be compatible with the Smart City platform and provide NGSI interfaces for interoperability:**
  - New tenders on traffic management, public parking, garden and parks maintenance
-

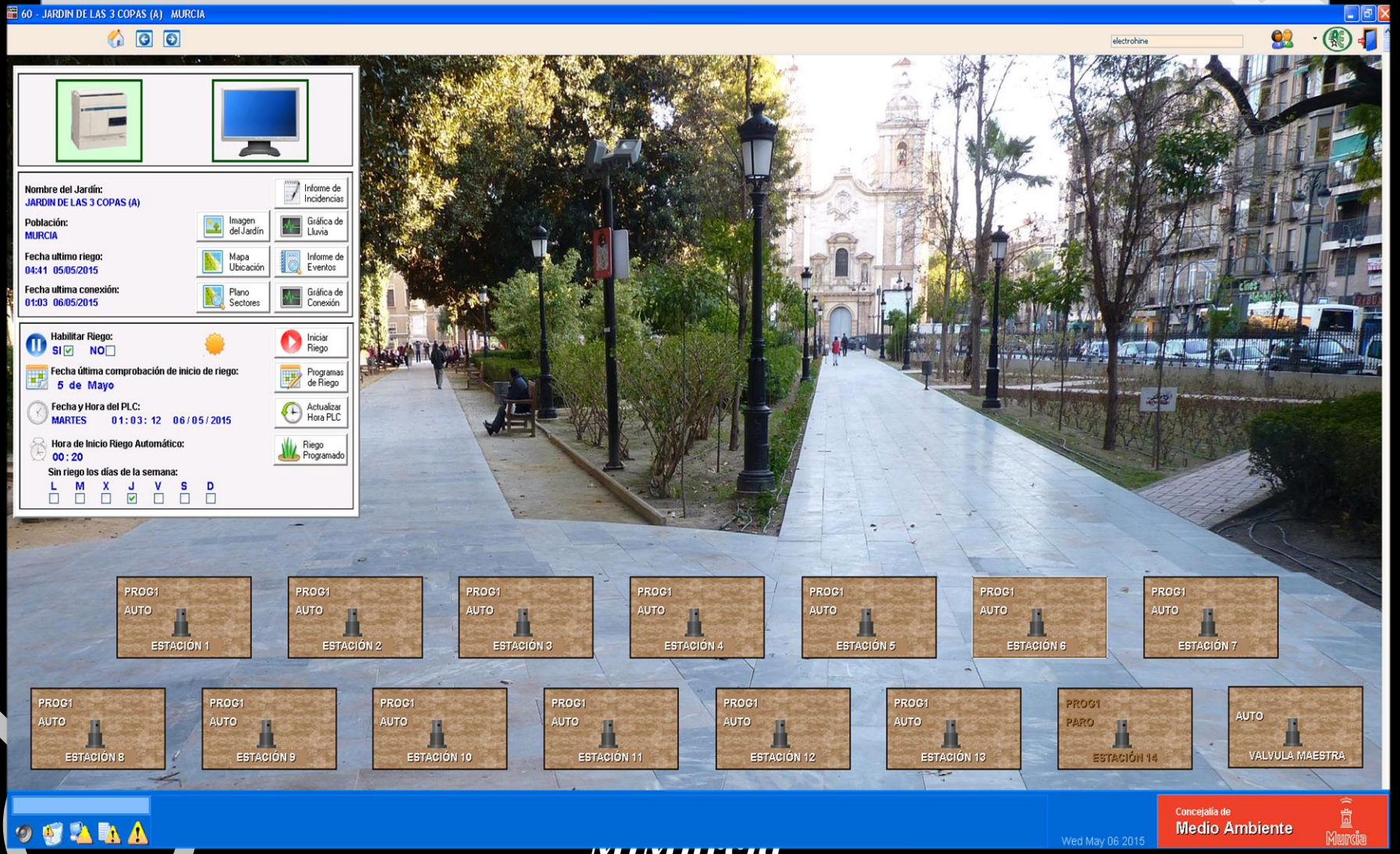
Integration of existing vertical



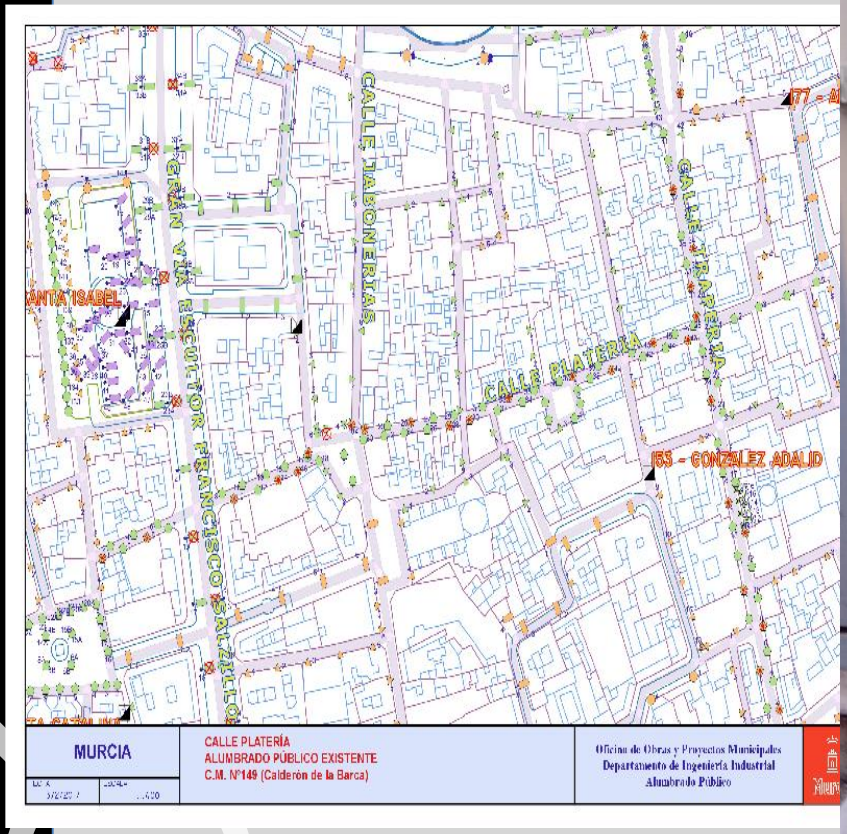
Smart Irrigation of Garden and Parks

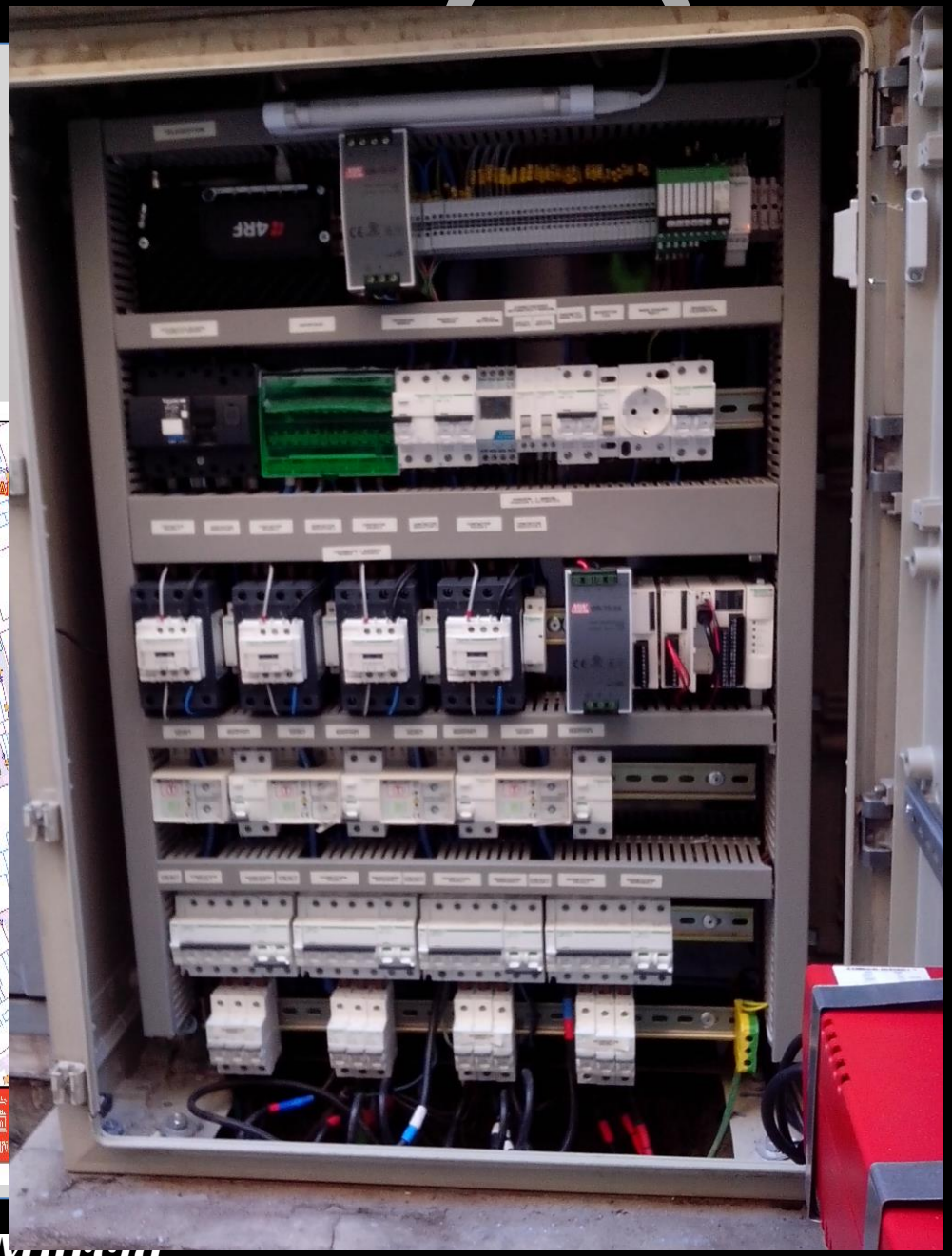
MiMurcia

SCADA Integration

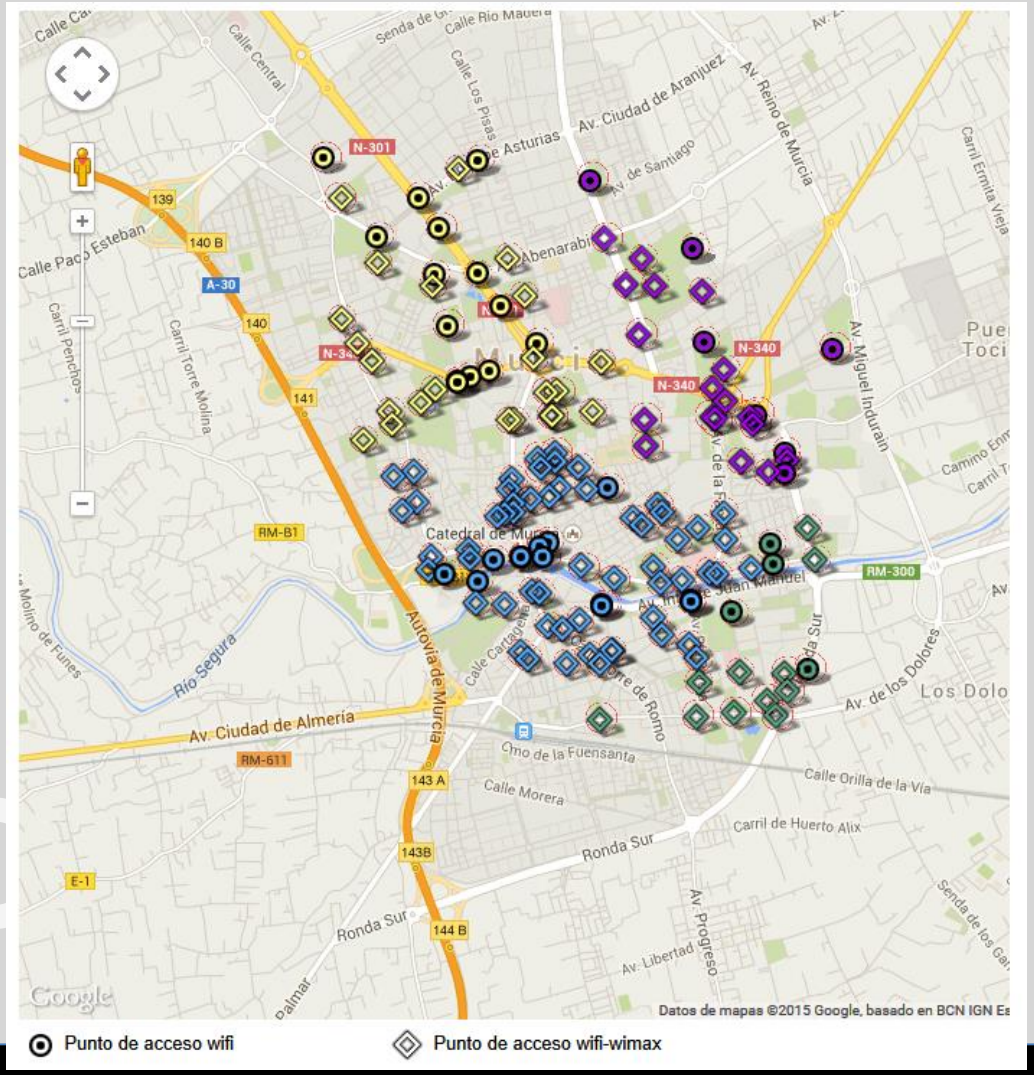


Street Lighting





WIFI coverage



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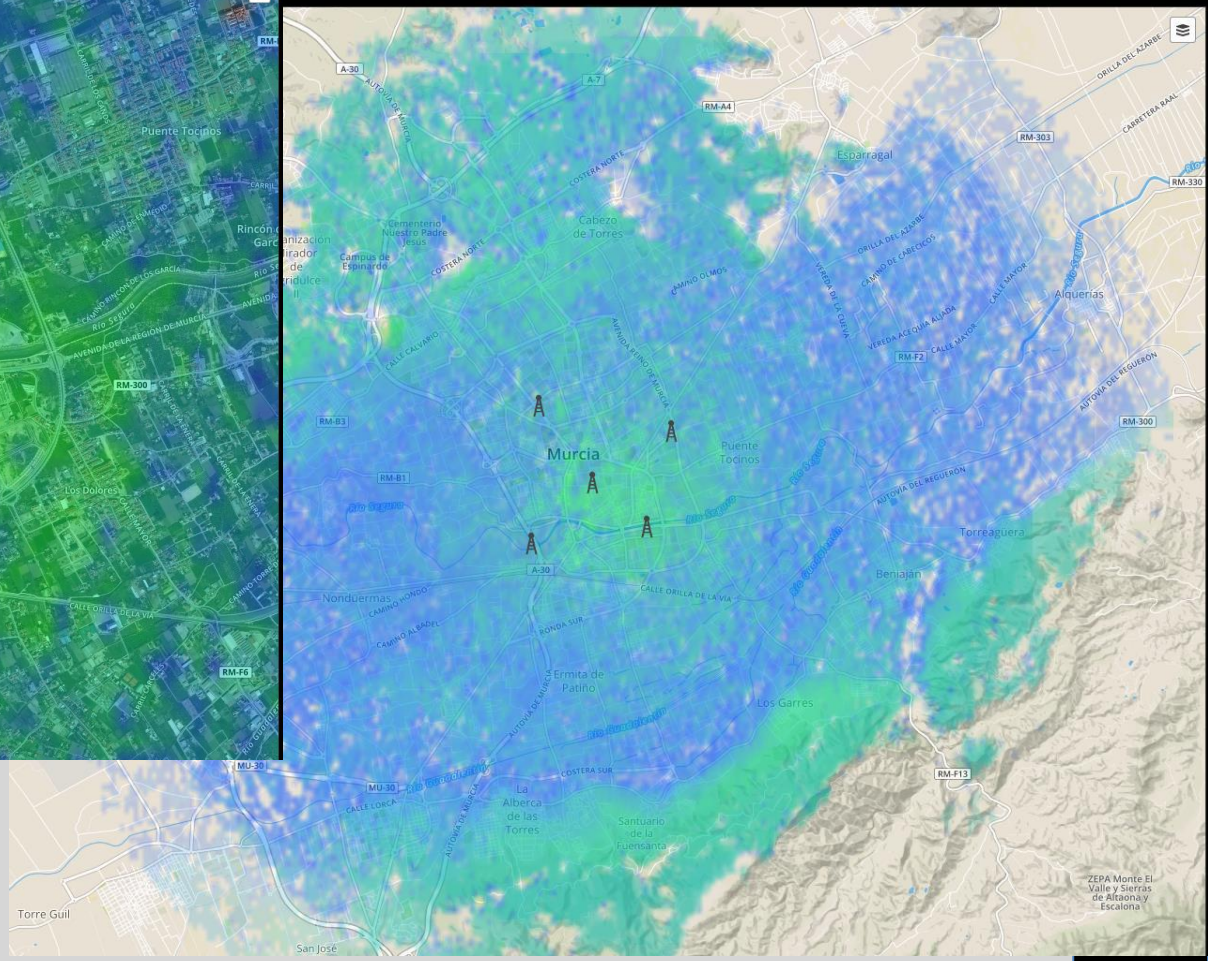
LoRA Connectivity



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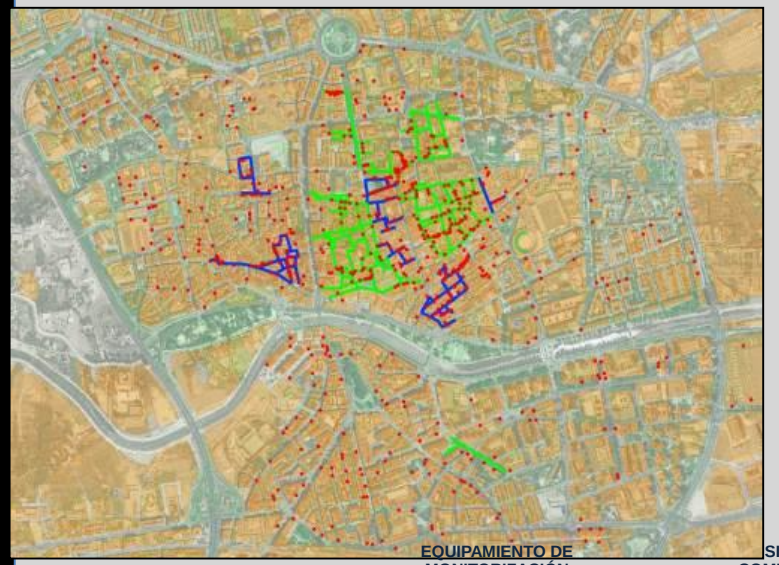
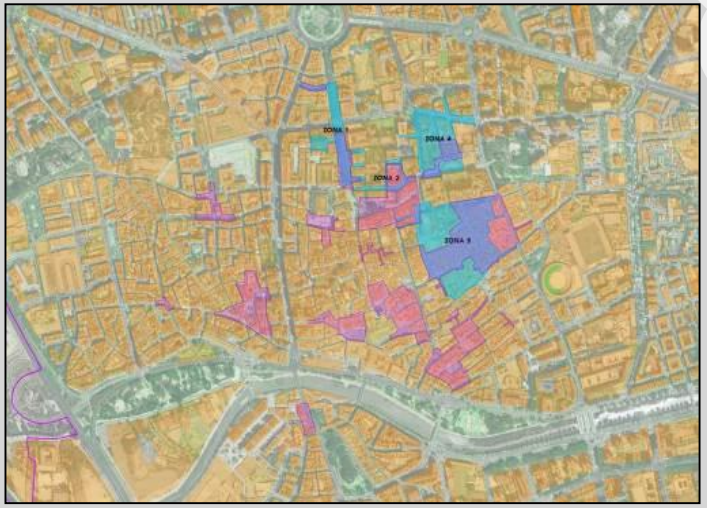
Sonometers for Noisy Area



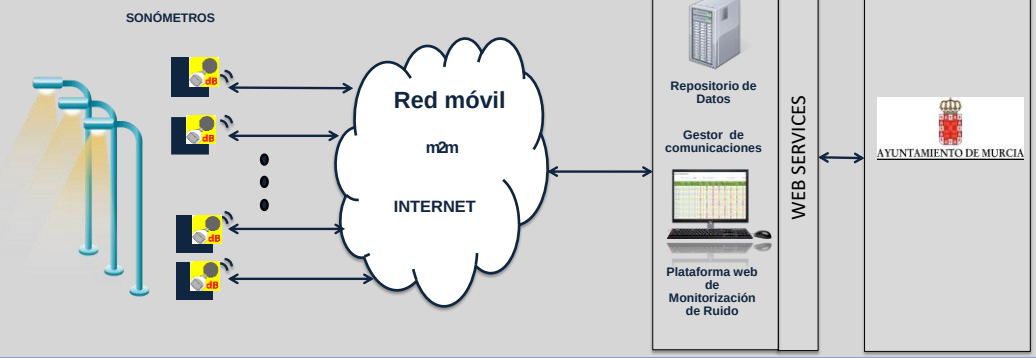


EQUIPAMIENTO DE MONITORIZACIÓN

SISTEMA DE COMUNICACIONES

SISTEMA DE MONITORIZACIÓN DE RUIDO

PLATAFORMA SMART CITY DE MURCIA



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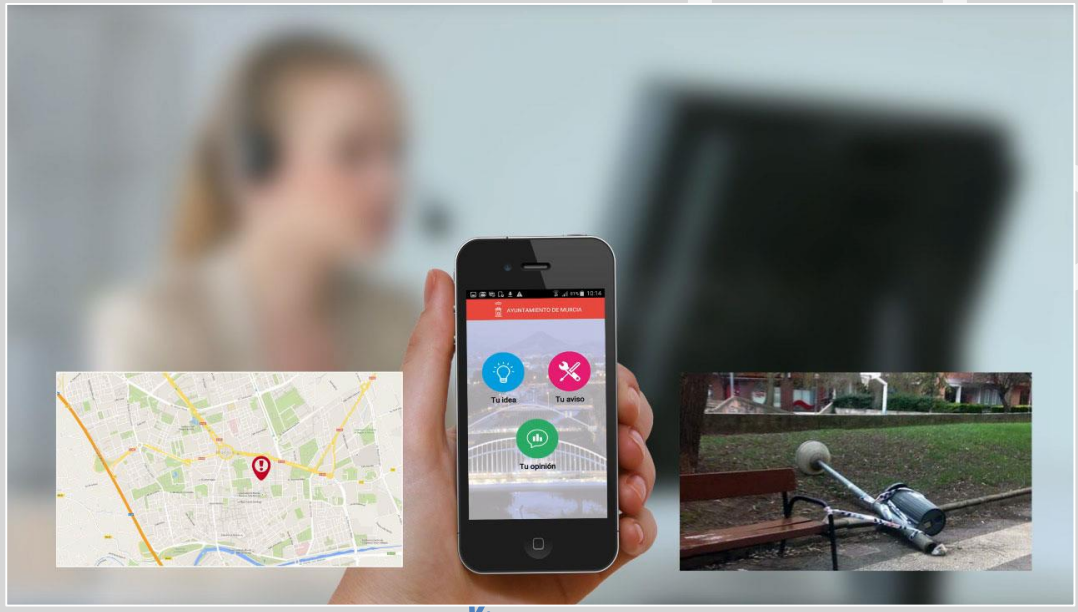
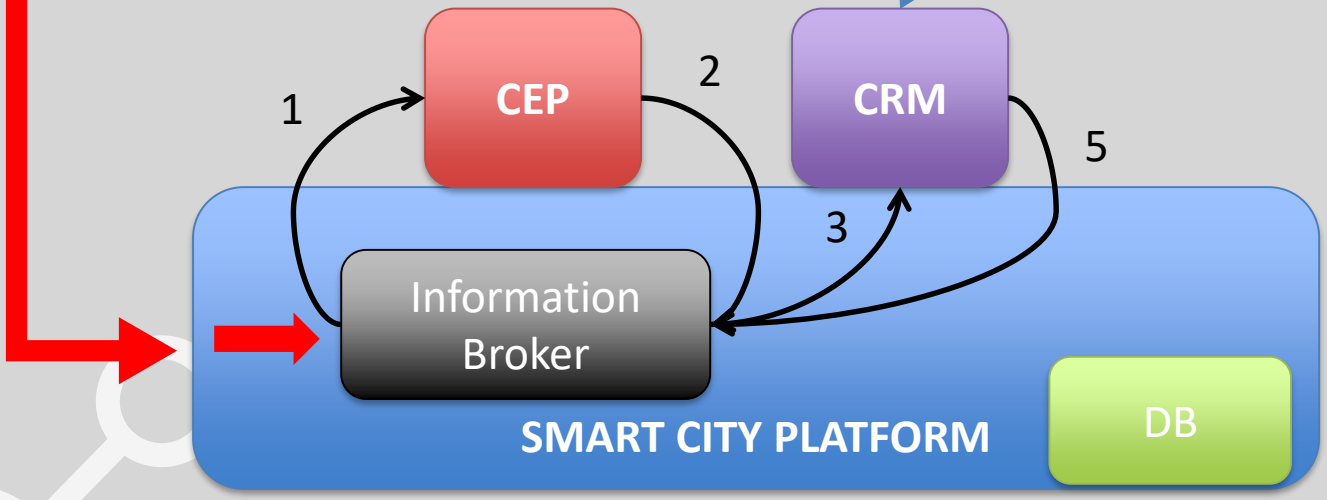
Informative Panels


Formulario de aportación
Añade una imagen o ubicación
Introduce el título
Título
Selecciona la categoría
Categoría
Escribe tu mensaje
Contenido del mensaje...
Reportar incidencia


Tu idea
Tu aviso
Tu opinión

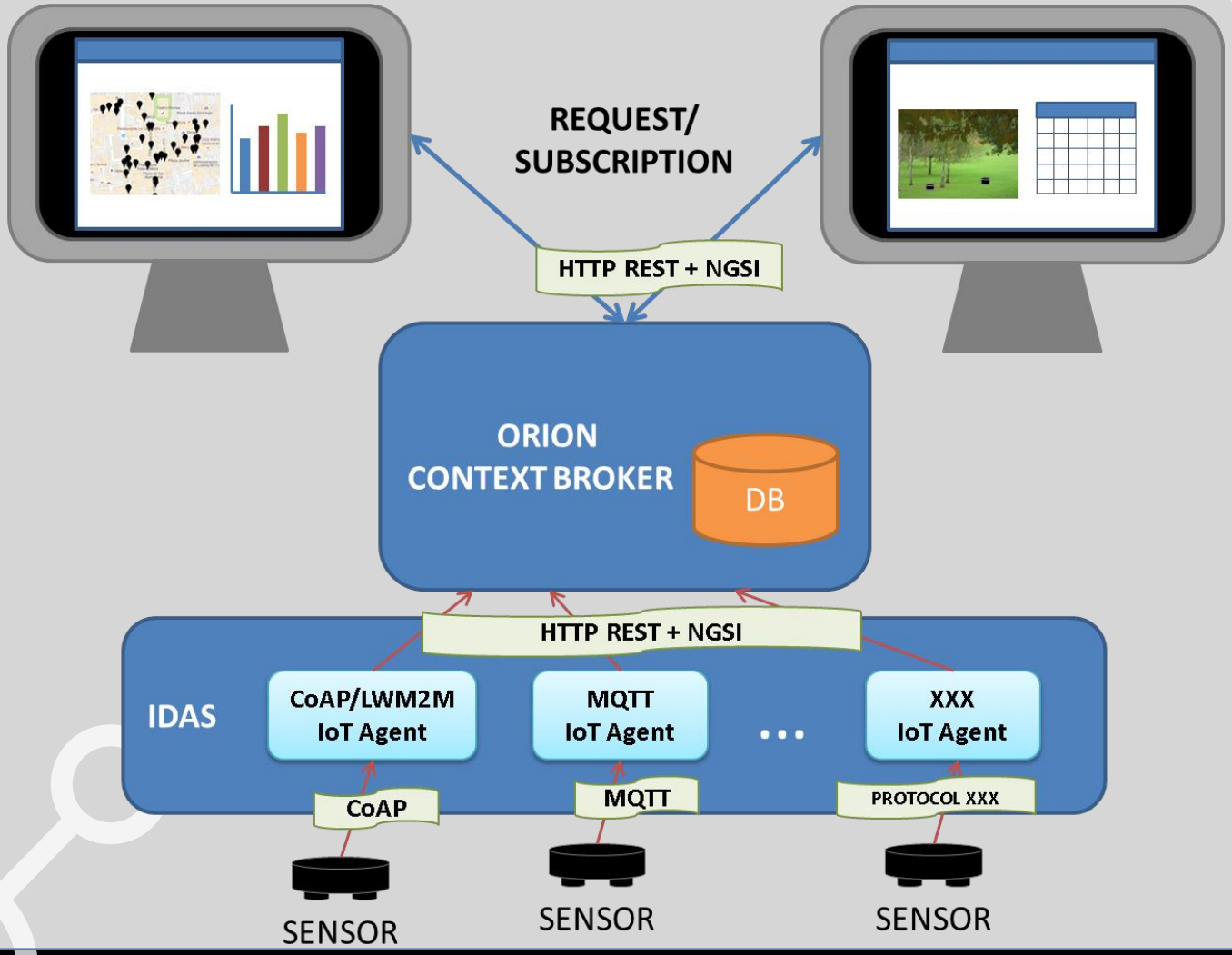

1
CEP
2
CRM
5
3
Information Broker
SMART CITY PLATFORM
DB

MiMurcia

Citizen profiling

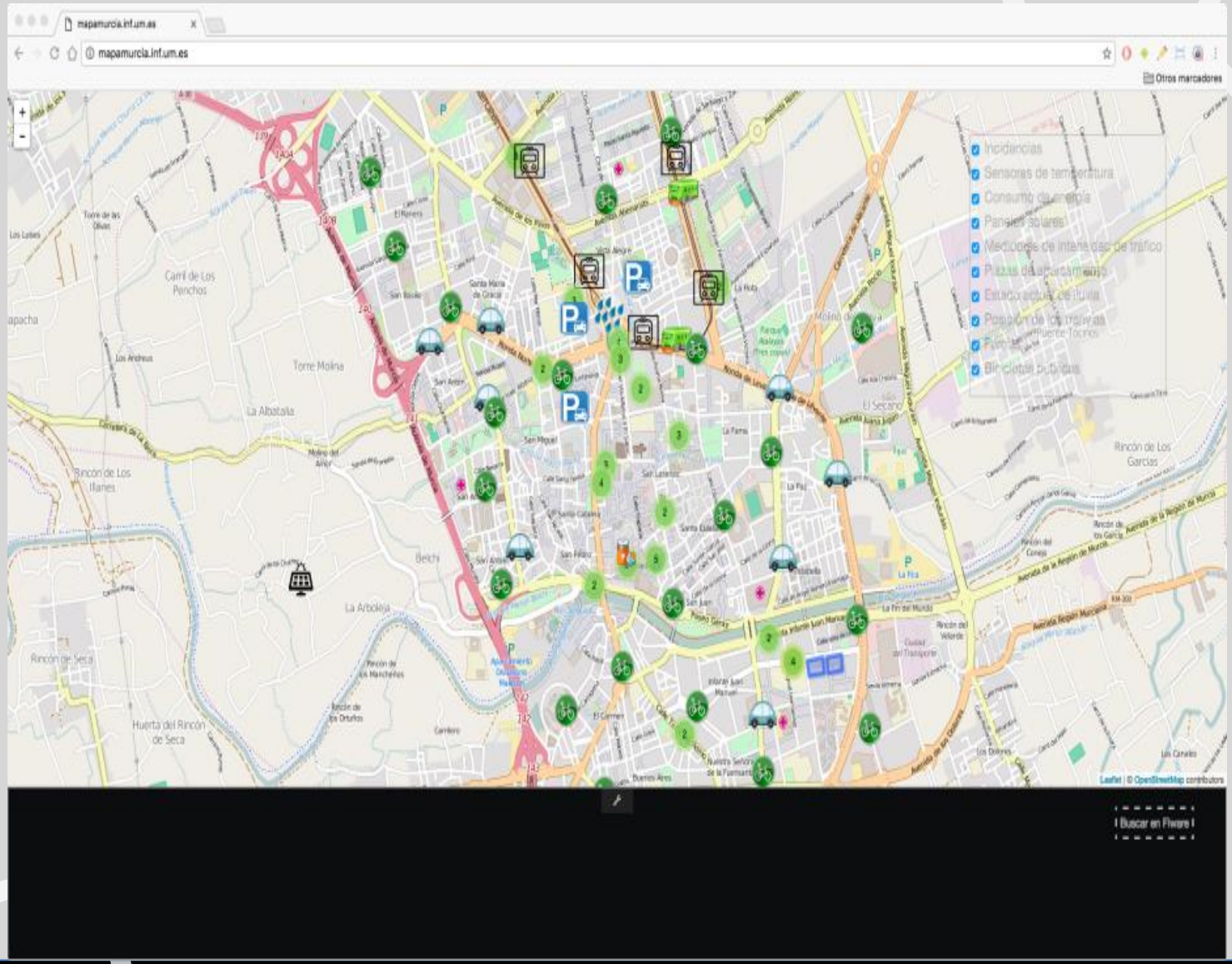
- **Using location based information (cellular or beacons, etc).**
  - ¬ Schedule and orchestrate a strategy for:
    - Derivate traffic improving quality of living
    - Incentivate and promote public transport
    - Balance the city council resources to assure security, confortability, and a great variety of services to tourist
    - Avoid overcrowding and provide mechanisms to handle it.
  - ¬ Identify tourist flows
  - ¬ Special dates movements and how affect city
    - Christmas
    - Summer holidays
    - Easter, …

PoC Platform Architecture



FIWARE platform deployment for Smart City

- **Heterogeneus information**
- **Different nature of sources of information**
- **Set up and develop different ways for integration**
  - ¬ Using enablers such as COMET and CYGNUS
  - ¬ Developing new conectors to integrate the information

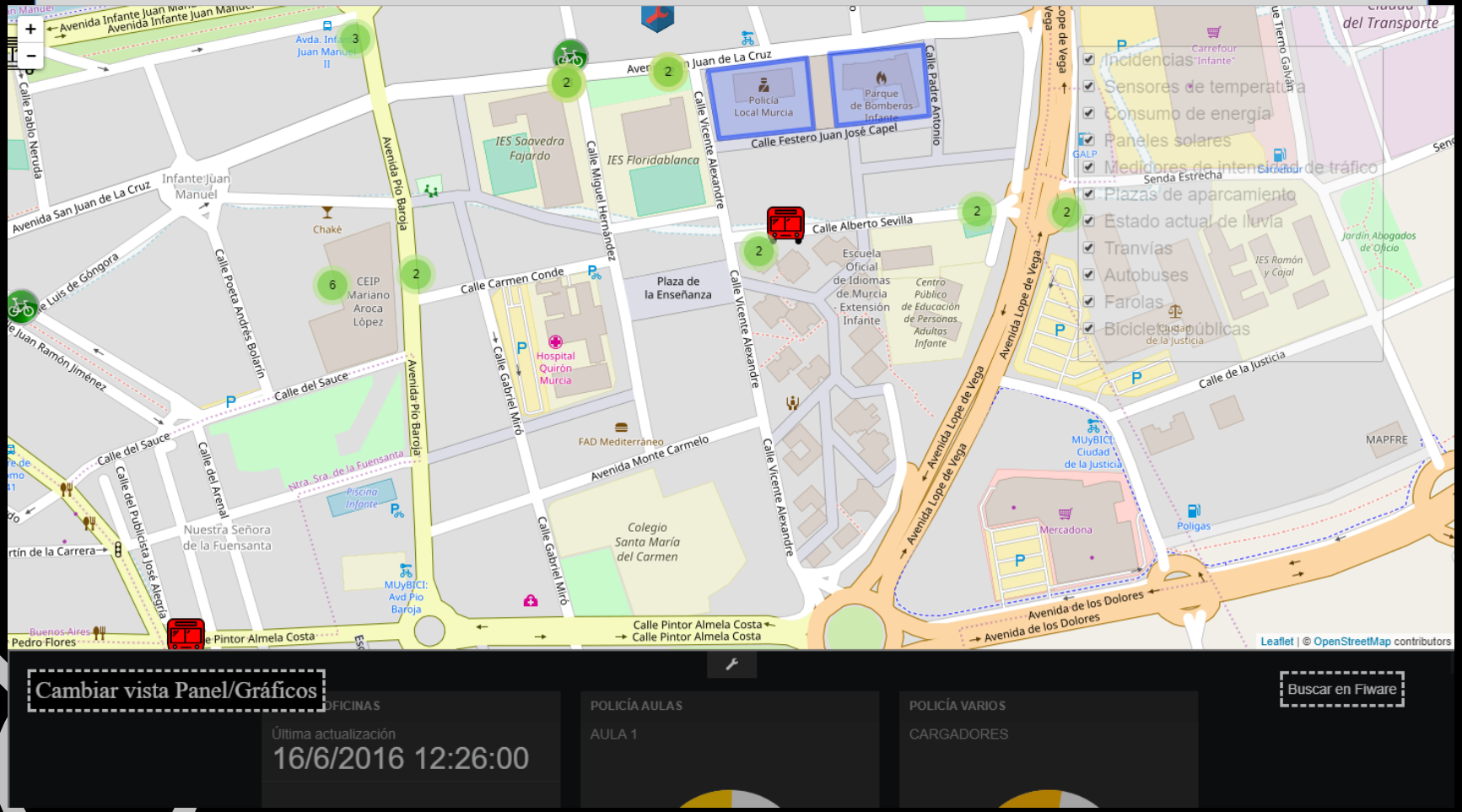

mapamurcia.inf.um.es
Otros marcadores
Incidencias
Sensores de temperatura
Consumo de energía
Paneles solares
Mediciones de intensidad de tráfico
Plazas de aparcamiento
Estado actual de lluvia
Bicicletas públicas
Buscar en Fiware

MiMurcia

Integrated services

- Incidences
- Temperature of town hall buildings
- Energy consumption of buildings
- Traffic measurements
- Parking slots of parking sites
- Free parking slots of public rental bike service
- Tramp
- Bus stops and vehicle locations
- Rainfall
- Solar panels

Service Map


Incidencias
Sensores de temperatura
Consumo de energía
Paneles solares
Medidores de intensidad de tráfico
Plazas de aparcamiento
Estado actual de lluvia
Tranvías
Autobuses
Farolas
Bicicletas públicas
Avenida Infante Juan Manuel
Avenida San Juan de La Cruz
Calle Festero Juan José Capel
Calle Alberto Sevilla
Calle Carmen Conde
Calle del Sauce
Avenida Monte Carmelo
Calle de la Justicia
Avenida Lope de Vega
Avenida de los Dolores
Calle Pintor Almela Costa
Avenida Pío Baroja
Calle Vicente Alexandre
Calle Miguel Hernández
Calle Gabriel Miró
Calle Poeta Andrés Bolarín
Calle Padre Antonio
Calle Pablo Neruda
Senda Estrecha
Policía Local Murcia
Parque de Bomberos Infante
IES Saavedra Fajardo
IES Floridablanca
Chaké
CEIP Mariano Aroca López
Plaza de la Enseñanza
Escuela Oficial de Idiomas de Murcia - Extensión Infante
Centro Público de Educación de Personas Adultas Infante
Hospital Quirón Murcia
FAD Mediterráneo
Colegio Santa María del Carmen
Nuestra Señora de la Fuensanta
Piscina Infante
Mercadona
Poligas
MAPFRE
Jardín Abogados de Oficio
IES Ramón y Cajal
Ciudad de la Justicia
MUyBICI: Ciudad de la Justicia
MUyBICI: Avd. Pío Baroja
Leaflet | © OpenStreetMap contributors
Cambiar vista Panel/Gráficos
Buscar en Fiware
OFICINAS
Última actualización
16/6/2016 12:26:00
POLICÍA AULAS
AULA 1
POLICÍA VARIOS
CARGADORES

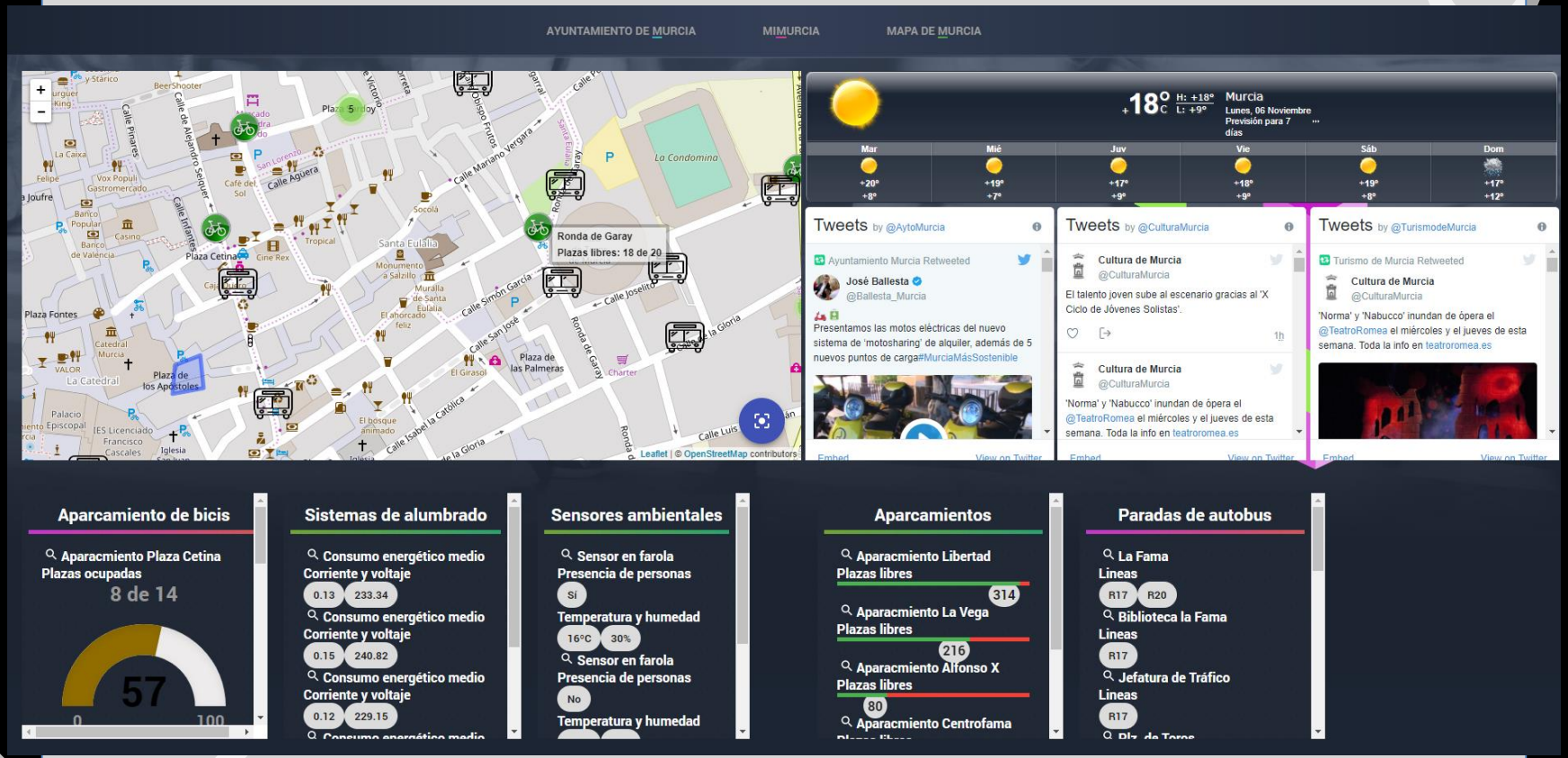
Service Map

Cambiar vista Panel/Gráficos

Buscar en Fiware

	FASE1	FASE2	FASE3
Última Actualización	20/7/2016 13:26:00		
Energía Activa	6.6 kWh	F1 Energía Activa 1.7 kWh	F2 Energía Activa 3.1 kWh	F3 Energía Activa 1.8 kWh
Energía Reactiva	6.4 kWh	Energía Reactiva 1.5 kWh	Energía Reactiva 2.9 kWh	Energía Reactiva 2.0 kWh
Factor de Potencia	0.7	Factor de Potencia 0.7	Factor de Potencia 0.7	Factor de Potencia 0.7
Potencia Activa Instantánea	15.3 kW	Potencia Activa Instantánea 4.0 kW	Potencia Activa Instantánea 7.2 kW	Potencia Activa Instantánea 4.1 kW
Potencia Reactiva Instantánea	15.6 kW	Potencia Reactiva Instantánea 3.8 kW	Potencia Reactiva Instantánea 7.1 kW	Potencia Reactiva Instantánea 4.7 kW

Quater View



MiMurcia

Platform deployment

- **Enablers:**
  - ORION Context Broker
  - COMET Short Therm Historic
  - CKAN Open Data
  - CYGNUS

Integration examples – Urban bus

- **They provide an API using SOAP**
  - We have to develop a **Python-based conector** to extract the information and integrate it into our platform
  - Using **suds** – **Lighweight SOAP client**
- **Organization of the information**
  - fiware-service: autobuses
  - fiware-servicepath: /murcia

Integration examples – Urban bus

```
22          dictparada['type'] = 'Punto'
23          dictparada['isPattern'] = 'false'
24          dictparada['id'] = 'ParadaAutobus:' + str(parada.StopPointRef)
25          dictparada['attributes'] = [
26              {
27                "name": "nombre",
28                "type": "string",
29                "value": urllib.quote(parada.StopName[0].encode('utf-8')),
30                "metadatas": [{
31                  "name": "encoded",
32                  "type": "encoding",
33                  "value": "url, utf-8"
34                }]
35              },
36              {
37                "name": "geoposicion",
38                "type": "coords",
39                "value": str(parada.Location.Latitude) + ', ' + str(parada.Location.Longitude),
40                "metadatas": [{
41                  "name": "location",
42                  "type": "string",
43                  "value": "WGS84"
44                }]
45              },
46              {
47                "name": "lineas",
48                "type": "linea[]",
49                "value": map(lambda x: {
50                  "id": x.LineRef,
51                  "direction": x.DirectionRef
52                }, parada.Lines.LineDirection if isinstance(parada.Lines.LineDirection, list) else [parada.Lines.LineDirection])
53              }
54          ]
```

Bus-stops are represented as points.

They contain:

- Location
- Bus lines in each stops
  - Id
  - direction

Integration examples – Bike rental service

- **They provide a REST API**
  - We developed nodejs conector to extract the information and integrate it into our platform
- **Organization of the information**
  - fiware-service: bicis
  - fiware-servicepath: /murcia

Integration examples – Bike rental

```
17          type: "Sensor",
18          isPattern: "false",
19          id: "AparcamientoBicis:" + obj[i].id_aparcamiento,
20          attributes: [{
21            name: "libres",
22            type: "number",
23            value: obj[i].libres+""
24          }, {
25            name: "ocupados",
26            type: "number",
27            value: obj[i].ocupados
28          }, {
29            name: "habilitado",
30            type: "number",
31            value: obj[i].eshabilitada
32          }, {
33            name: "descripcion",
34            type: "string",
35            value: encodeURIComponent(obj[i].descripcion.trim())
36          }, {
37            "name": "geoposicion",
38            "type": "coords",
39            "value": obj[i].latitude+","+obj[i].longitude,
40            "metadatas": [{
41              "name": "location",
42              "type": "string",
43              "value": "WGS84"
44            }]
```

Representation of bike parking slots:

- **Id: BikeParkingSite:***
- **Free slots**
- **Occupied slots**
- **Enabled**
- **Description**
- **Location**

Integration examples – Tramp service

- **Two different services:**
  - Information in tramp stops
  - Information and location of tramp vehicles
  - We developed a nodejs conector
- **Organization of the information**
  - fiware-service: tranvia
  - fiware-servicepath: /murcia

Integration examples – Tramp service

```
// Mandar las paradas de los tranvias:
var context = [];
for (var k in paradas) {
  context.push({
    type: "Punto",
    isPattern: "false",
    id: "ParadaTranvia:" + encodeURI(k),
    attributes: [{
      "name": "estado",
      "type": "string",
      "value": encodeURI(estadoParadas[k] || " ").replace("'", "min"),
    }, {
      "name": "geoposicion",
      "type": "coords",
      "value": paradas[k],
      "metadatas": [{
        "name": "location",
        "type": "string",
        "value": "WGS84"
      }]
    }]
  });
}
```

Tramp stops:

- **Id TrampStop.**
- **Location**
  - **State: info of both directions**

```
context.push({
  type: "Vehiculo",
  isPattern: "false",
  id: "Tranvia:" + match[1],
  attributes: [{
    "name": "geoposicion",
    "type": "coords",
    "value": match[3] + "," + match[2],
    "metadatas": [{
      "name": "location",
      "type": "string",
      "value": "WGS84"
    }]
  }]
});
```

Tramp vehicle:

- **Id Tramp.**
- **Location**

Integration examples – Tramp service

Updating context to our FIWARE platform

```
var strjson = JSON.stringify({
  contextElements: context,
  updateAction: "UPDATE"
});

var req = http.request({
  method: "post",
  path: "/v1/updateContext",
  host: hostAddr,
  port: 1026,
  headers: {
    "Content-Type": "application/json",
    "Content-Length": strjson.length,
    "Accept": "application/json",
    "fiware-service": service,
    "fiware-servicepath": servicePath
  }
}, function(res) {
```

Comet/Cygnus Integration - Subscription

```
curl localhost:1026/v1/subscribeContext -s -S --header 'Content-Type: application/json' \ --header
'fiware-service: tranvia' -header 'fiware-servicepath: /murcia' --header 'Accept: application/json' -d @-
 python -mjson.tool) <<EOF

    "entities": [
          {
                "type": "Vehiculo",
                "isPattern": "true",
                "id": "Tranvia:*"
          }
    ],
    "attributes": [
          "geoposicion"
    ],
    "reference": "http://sth-host:port/notify",
    "duration": "P1M",
    "notifyConditions": [
          {
                "type": "ONCHANGE",
                "condValues": [
                      "geoposicion"
                ]
          }
    ],
    "throttling": "PT5S"
}
EOF
```

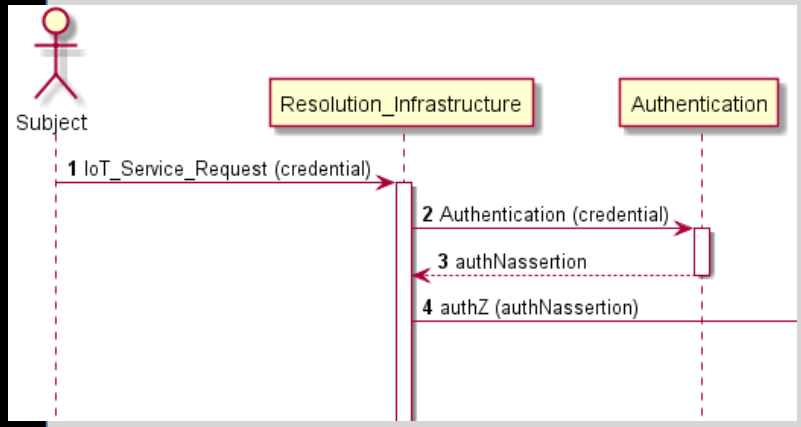
Details about subscription

End point of subscriber

Security components

- **Enablers**
  - KeyRock: Id Management
- **New components**
  - Capability Manager: Authorization
  - PEP_Proxy: Authorization enforcement and data encryption using CP-ABE

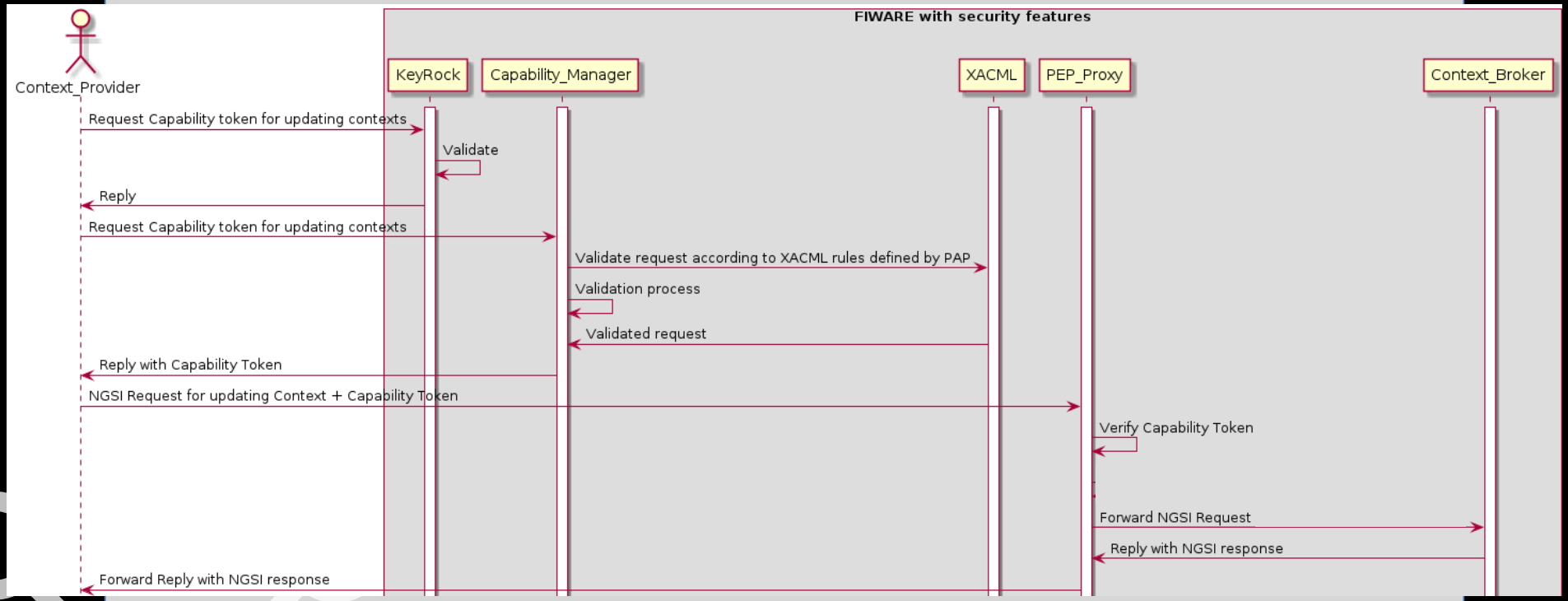
Authentication



KeyRock is the component responsable for verifying user credentials providing authentication verdict

Authorization

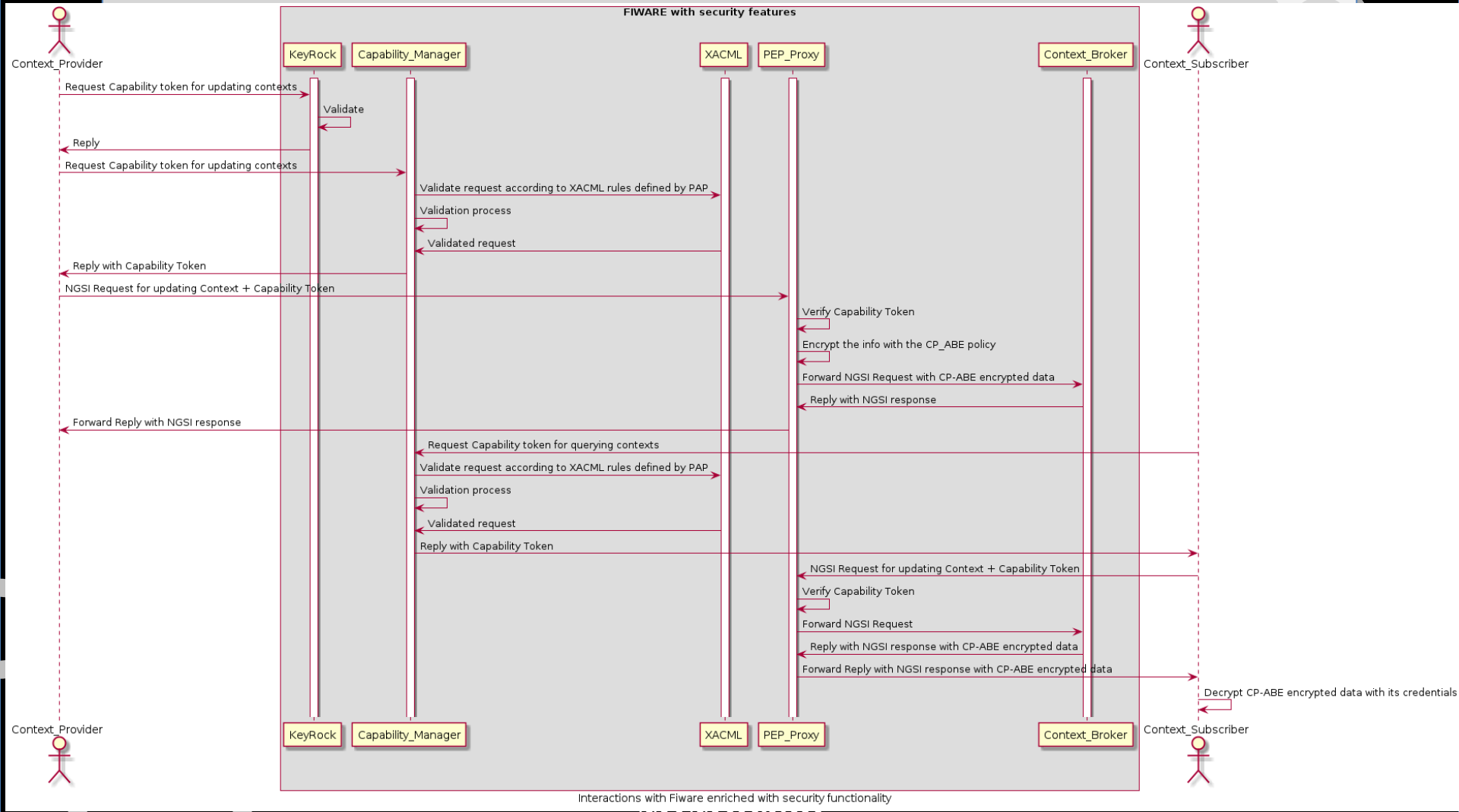
Capability Manager is accesed via POST API REST



Authorization – Capability Token

```
{
    “id”: “eg3fq:fb5r23tra3”,
    “ii”: 1485172121,
    “is”: “issuer@odins.es”,
    “su”: “zNwS5FetB4rwzSKsWwSBAxm5wDa=JgLjHU8zSnmeSFQgSG9HhdsJrE8=”,
    “de”: “coap://sensortemp.floor1.computersciencefaculty.um.es”,
    “si”: “SbUudG4zuXswFBxDeHB87N6t9hR=PBQqCN3gpu7nSkuPzDk7kaR3dq1=”,
    “ar”: [
        {
            “ac”: “queryContext”,
            “re”: “temperature”
        }
    ],
    “nb”: 1485172121,
    “na”: 1485174121
}
```

Authentication and authorization

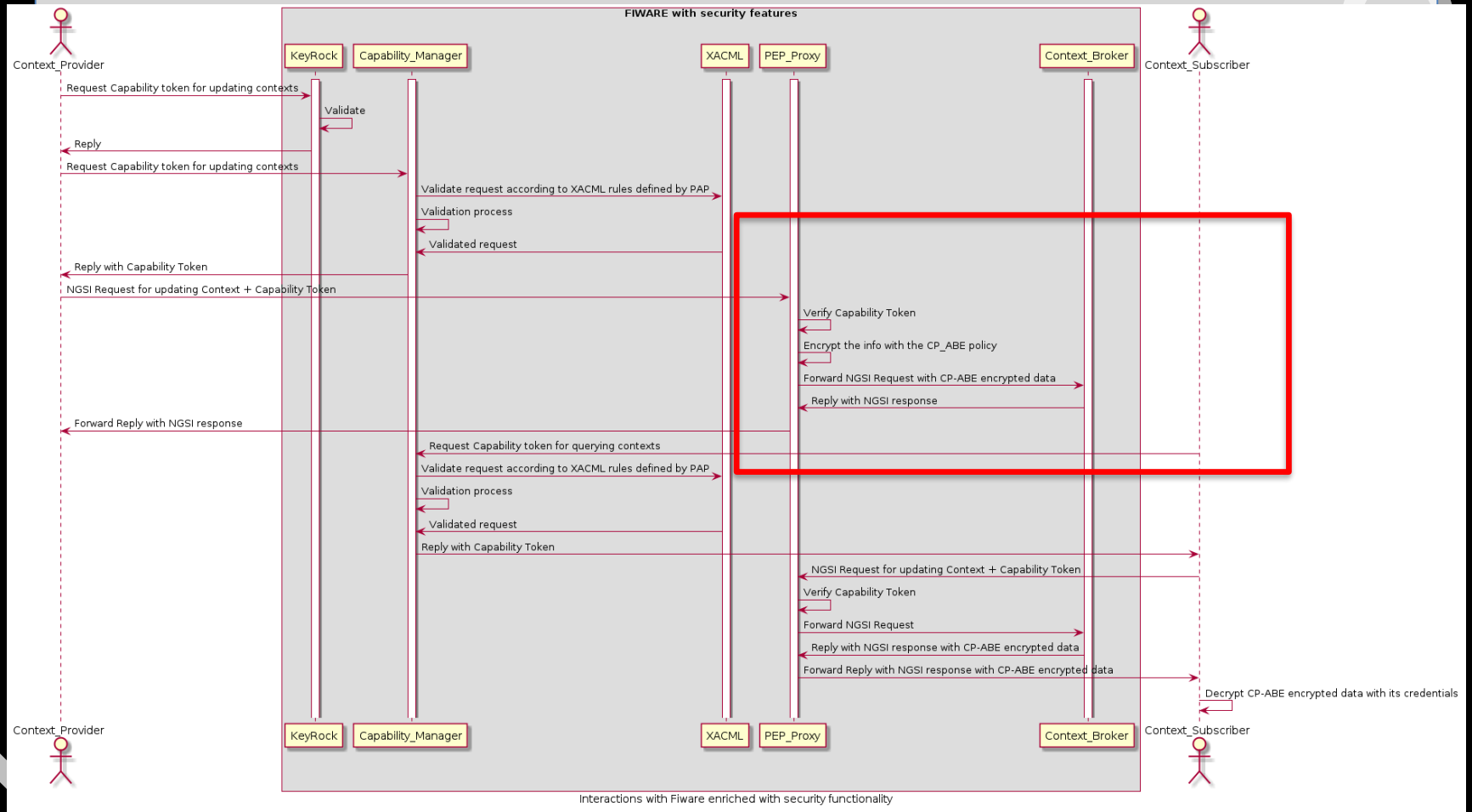


CP-ABE Encryption integration

```
"contextElements": [
        {
"type": "Test",
"isPattern": "false",
"id": "Test:1",
"attributes": [
    {
        "name": "cipheredAttribute",
        "type": "cyphertext",
        "value": "hello",
        "metadatas": [{
          "name": "cpabe-policy",
          "type": "string",
          "value": "floor1 and admin"
        }]
    }
]
        }
    ]
```

PEP_Proxy will use the highlited information and encrypt the **cipheredAttribute** with the corresponding CP-ABE policy **floor1 and admin**

CP-ABE Encryption performance

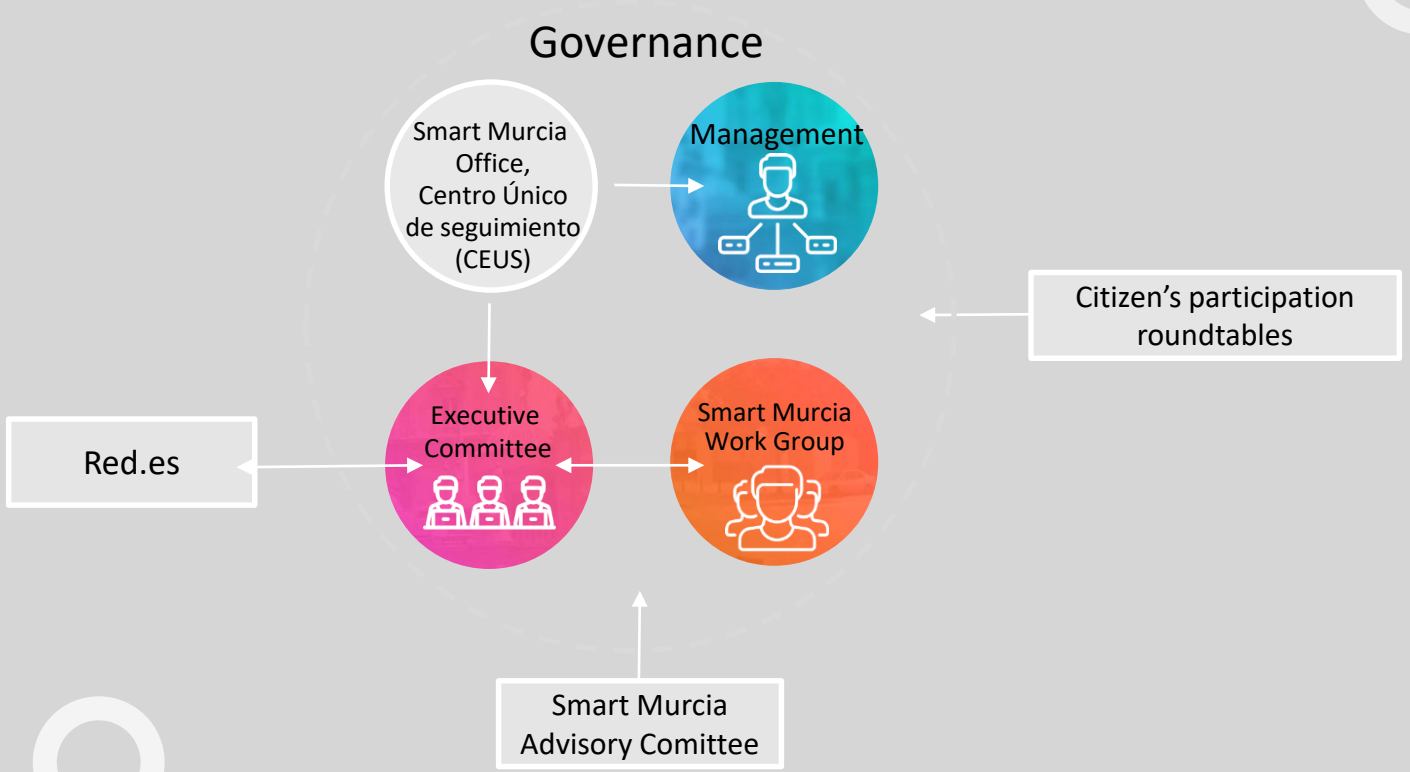


MiMurcia

Innovation Ecosystem

- **MiMurcia Open Innovation Smart City Lab (MiOS):**
  - IoT-based living lab provided by MiOS with several sensors deployed over the city
  - Promote and improve the business innovation using data provided by the smart city platform
  - Offer possibility to define new services/apps based on the data available of the city behaviour
  - Create open APIs and foster meetup and co-creation workshops

How we achieve it



CEUS: The intelligence of the project

- **There is a huge amount of information provided by different devices and sensors along the city**
- **An smart brain is needed to process this information**
  - Analysis of the whole information
  - Decision making
  - Action plans elaboration

- **CEUS**
  - The intelligence of the city, coordinating actuations and areas of the city council
  - Training, information and interaction point with the citizen
  - A demonstration and support place for the citizen

Conclusions

- Great complexity in City with new and legacy solutions
- We have integrated heterogeneous information into our FIWARE PoC platform.
- Important to provided security and privacy
- Most important –> create a team