

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE

Madrid Trial

Madrid, 10th March, 2014



David Conde
david.conde.baena@acciona.com

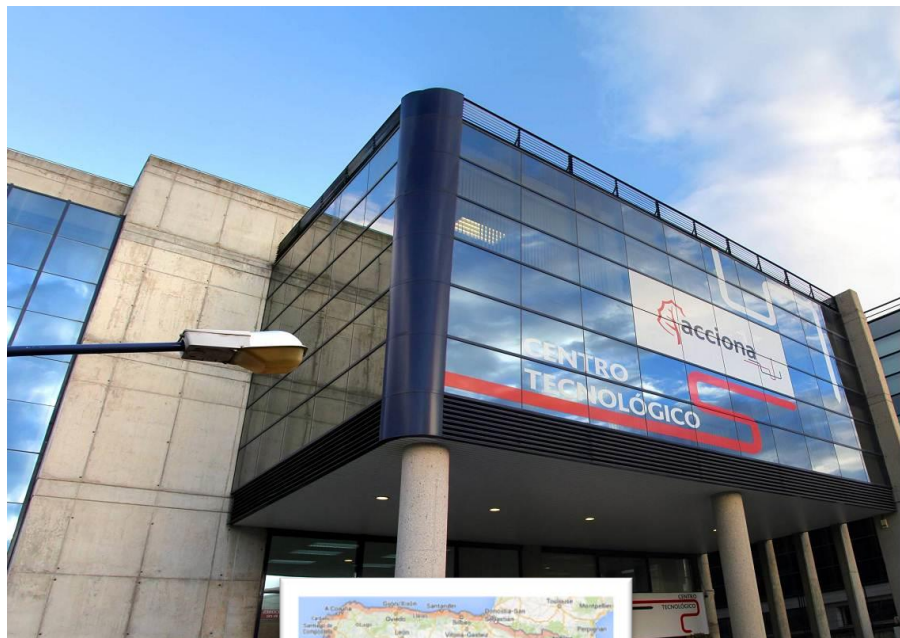


FUTURE
INTERNET
PPP

WP2 trial sites: FI for end users of energy ecosystems

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE



Objectives

Development of an open IT-infrastructure to be used to develop and offer new Future Internet app-based solutions in the smart energy buildings domain.

Validation of FI Generic Enablers in the Smart Building domain

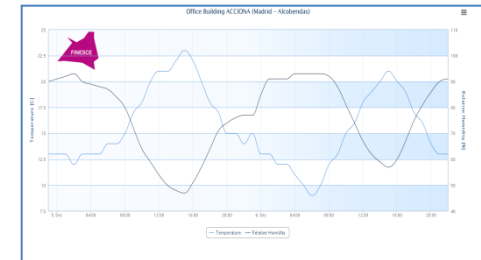
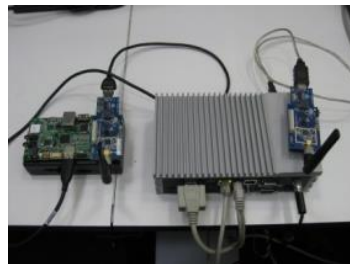
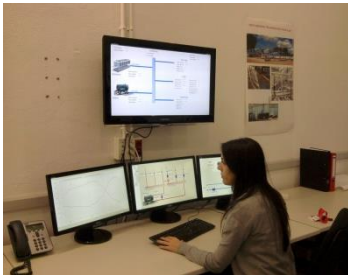
Enable value added services through an open FI based platform with FINESCE APIs offering rich data on energy needs and consumption patterns.

Derived objectives:

1. Provide access to the trial site data in a FI platform
2. Provide access to the FINESCE API for new applications development
3. Enable efficient energy consumption via FI technologies

Trial site Madrid

- ACCIONA's office building serves as test bed of innovative services based on FI platform
- This trial integrates energy generation and storage assets, as well as a building management system with remote real time monitoring
- This infrastructure is being complemented with the necessary ICT equipment for enabling the provision of new FI services



Trial site Madrid

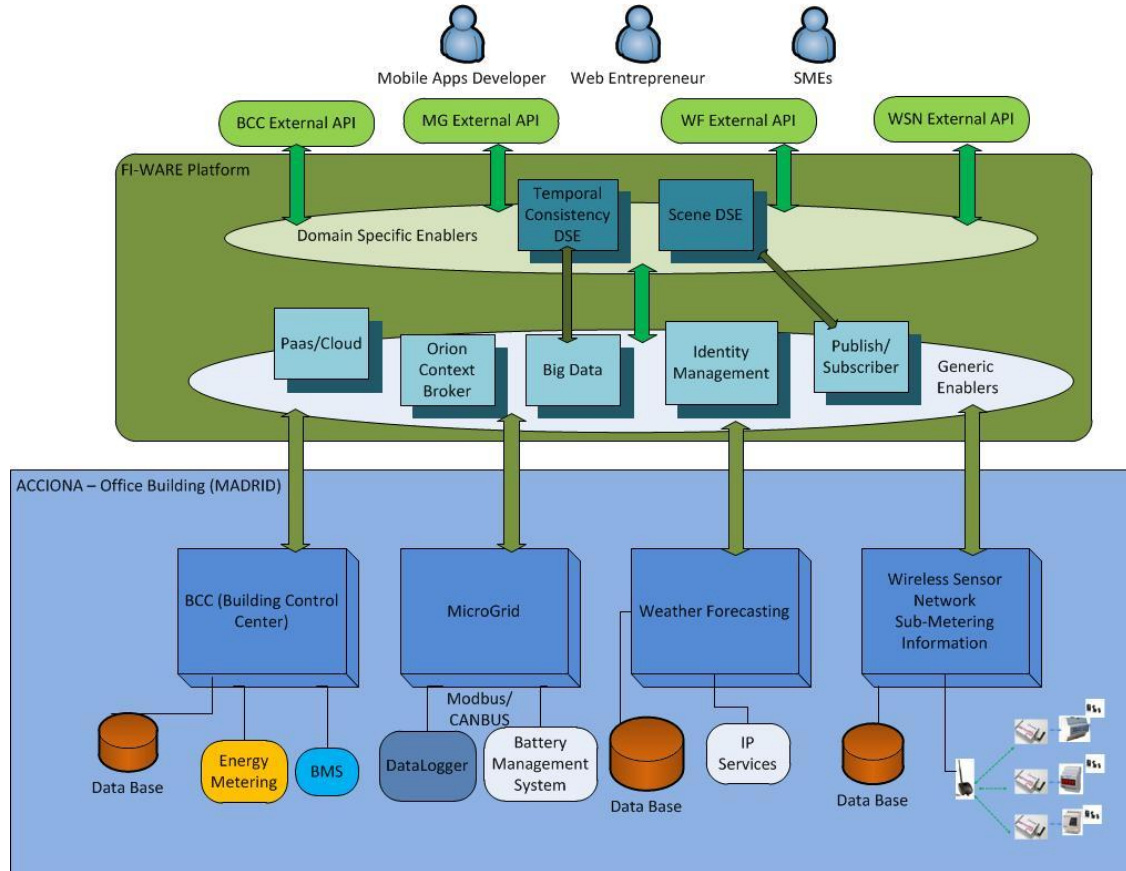
The building is equipped with the next elements which could interact with external FI services:

- **Building Control Service:** This system gather information from different subsystems inside the building such as energy meters, air conditioning systems, comfort measurement devices, etc.
- **Micro-Grid:** This system is comprise by different elements such as PV panels, battery storage system, and
- **Sub-Metering infrastructure:** This system aims to provide granular energy metering inside the building to have more detailed information about the power consumption in different areas at building level.
- **Weather Forecasting module:** This service provides weather forecasting information from different Internet services.

System overview - Madrid

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE



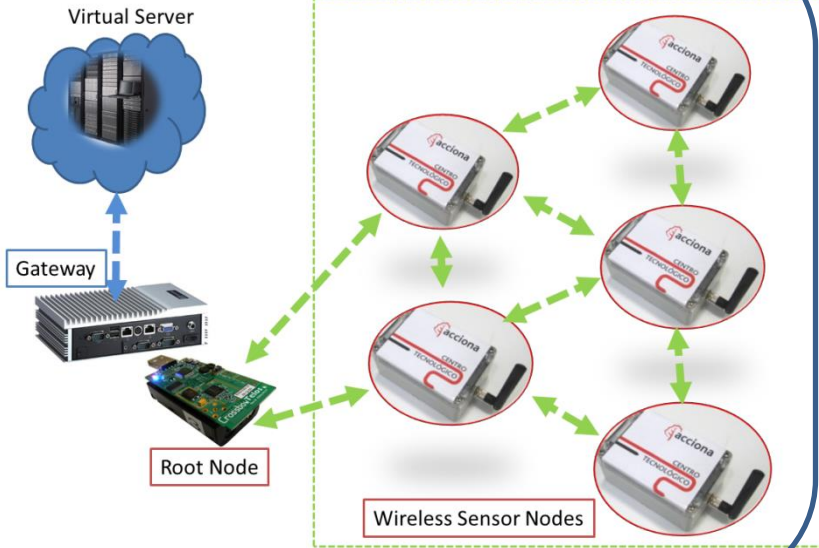
API content (Madrid trial)

| Service | Description |
|---------------------------|--|
| getPowerConsumption | Provides buildings' energy consumption information |
| getBuildingData | Provides different information about building conditions (temperature, humidity, HVAC) |
| getWeatherForecastingData | Provides weather forecast for the specific location |
| getMicroGridConditions | Provides information about the MicroGrid status |

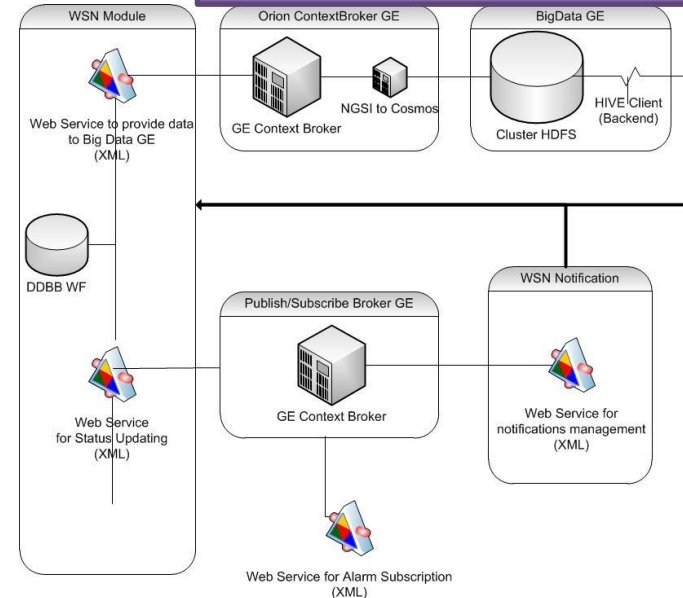
Trial Architecture diagrams - Madrid

Wireless Sensor Network Architecture

Previous



FI GEs Integration



Trial Architecture diagrams - Madrid

Wireless Sensor Network Architecture

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE



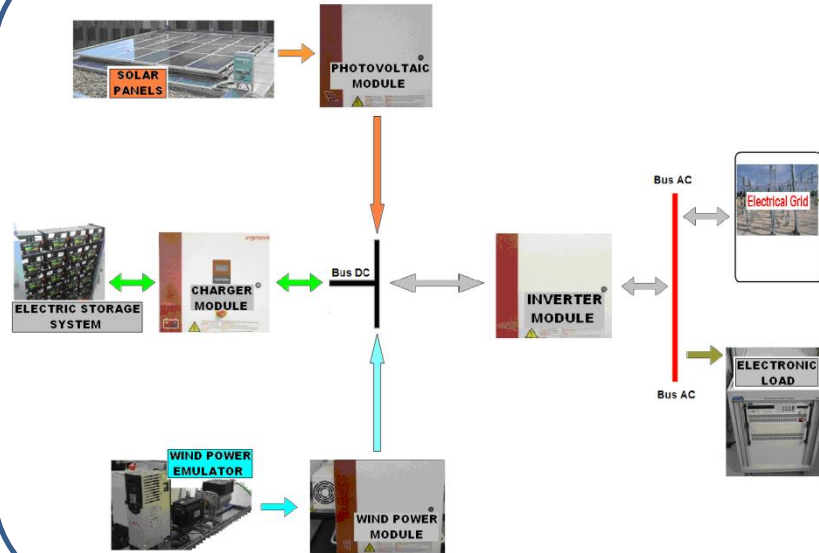
Trial Architecture diagrams - Madrid

FUTURE
INTERNET
SMART
UTILITY
SERVICES

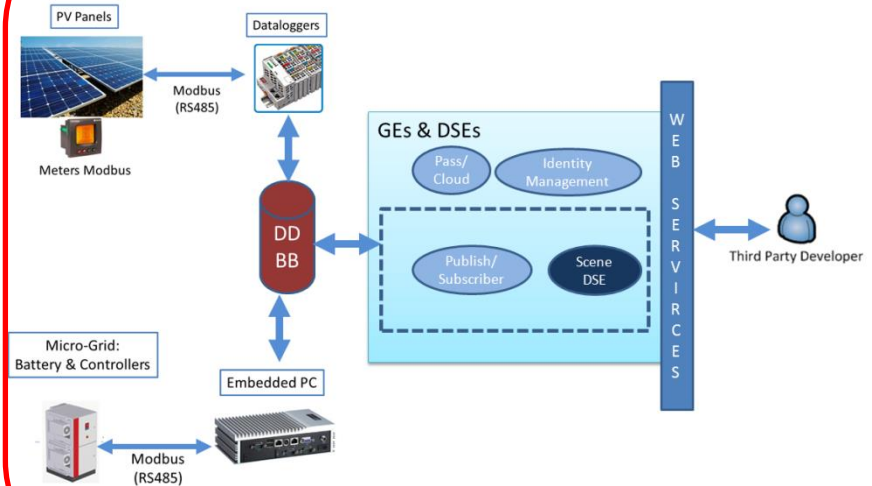
FINESCE

MicroGrid - Architecture

Previous



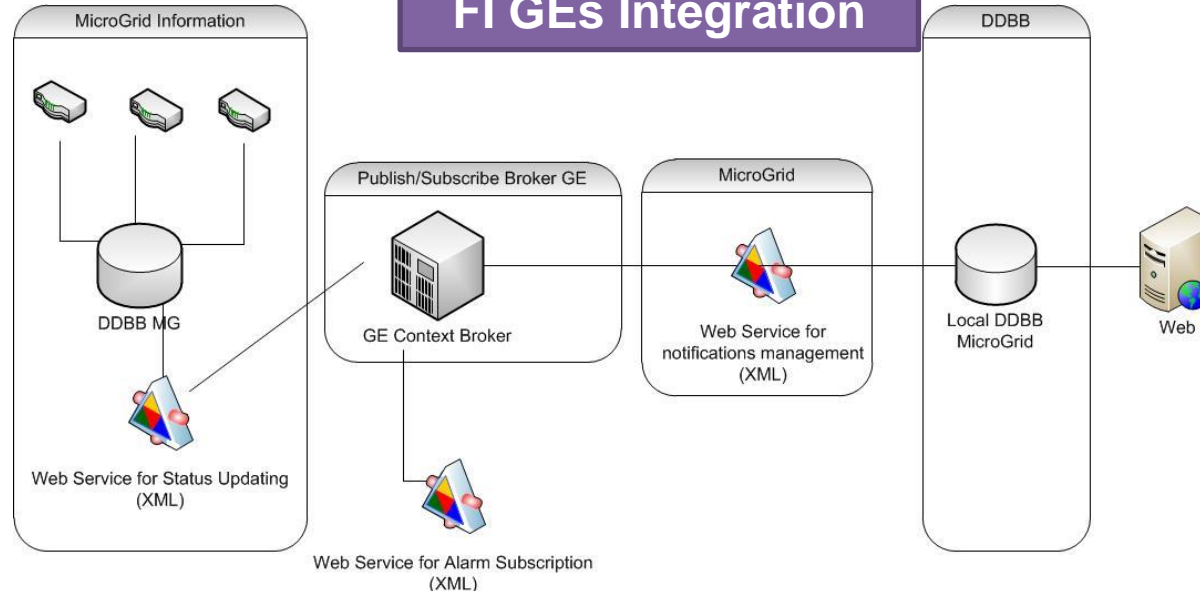
FI GEs Integration



Trial Architecture diagrams - Madrid

MicroGrid - Architecture

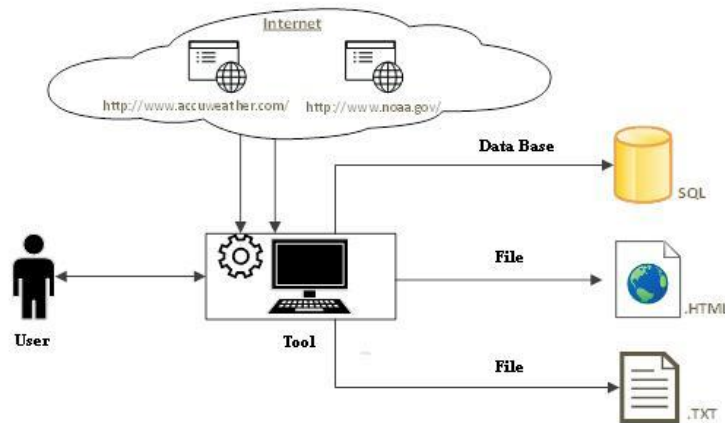
FI GEs Integration



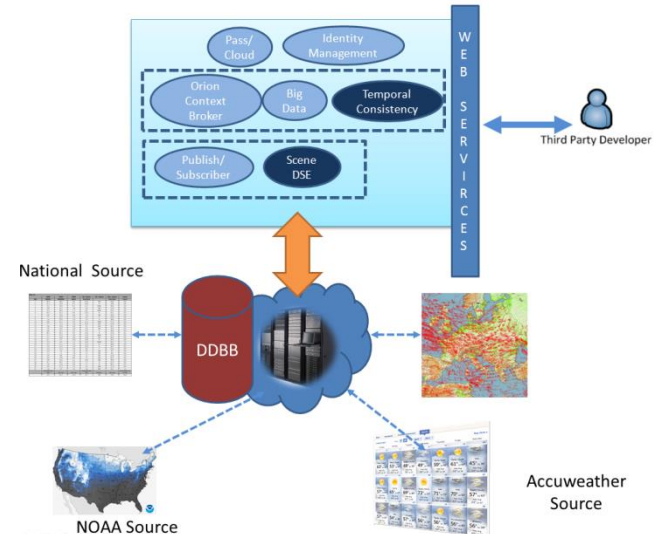
Trial Architecture diagrams - Madrid

Weather Forecasting Module Architecture

Previous



FI GEs Integration

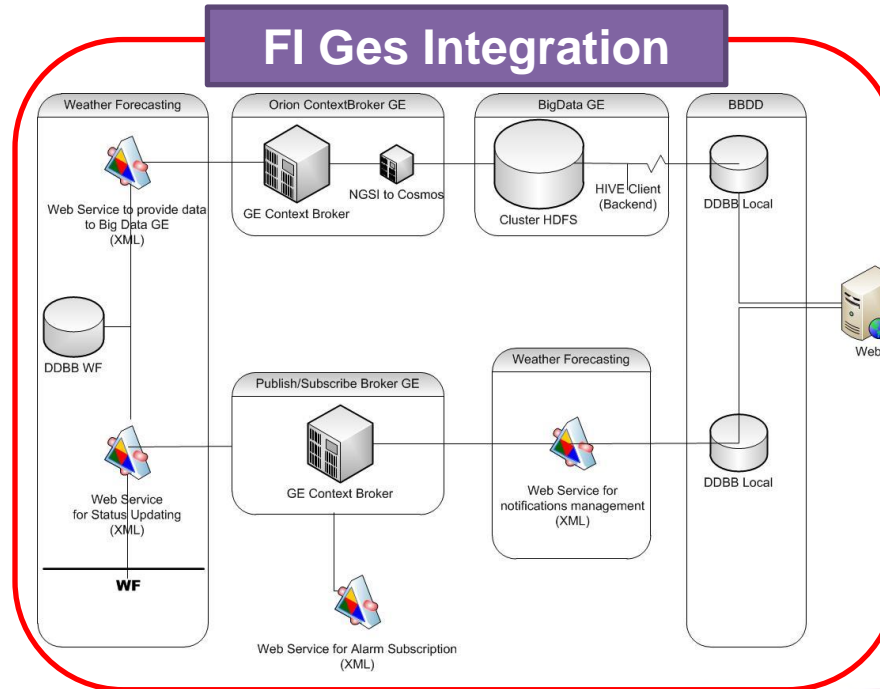


Trial Architecture diagrams - Madrid

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE

Weather Forecasting Module Architecture

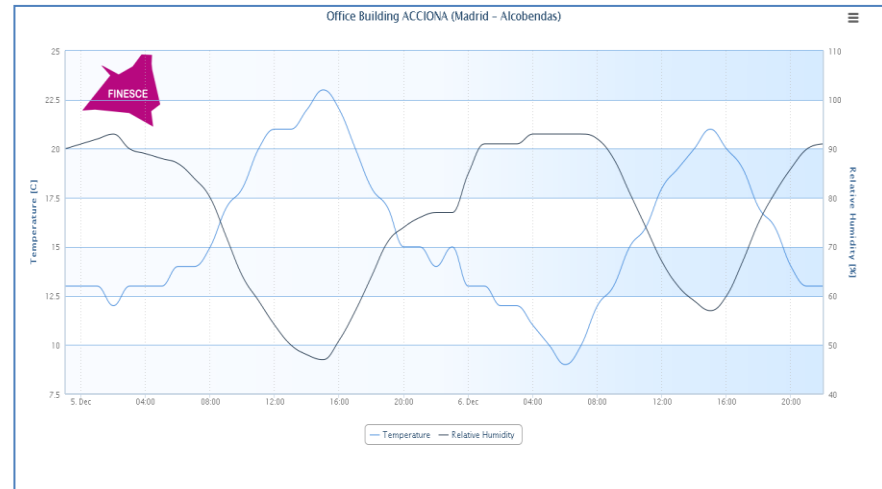
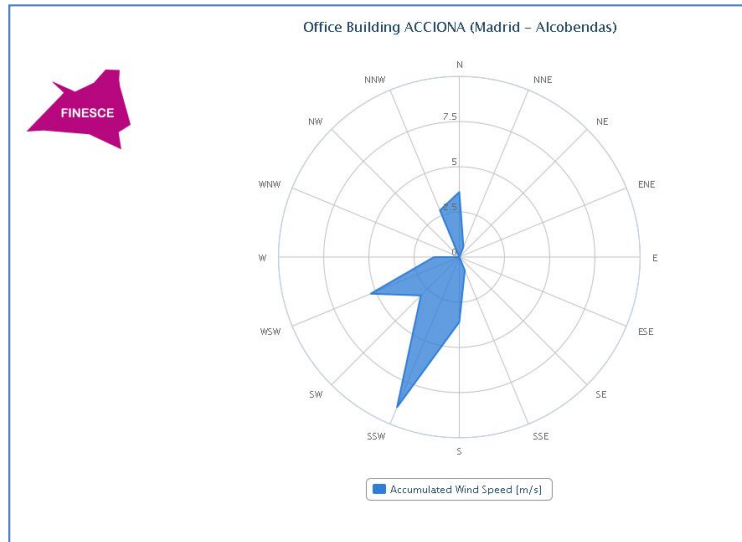


Trial Architecture diagrams - Madrid

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE

Weather Forecasting Module Architecture

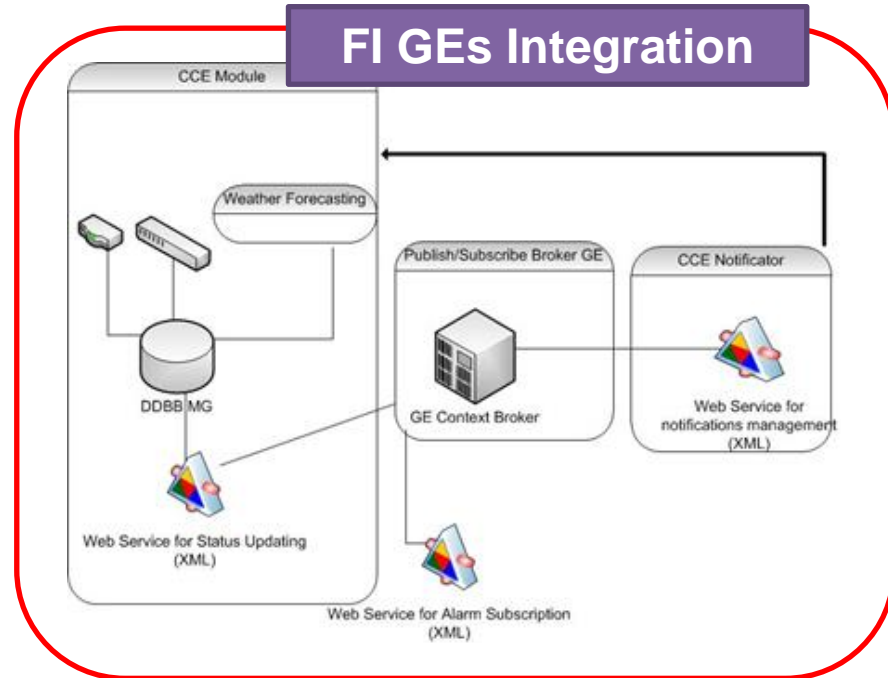


Trial Architecture diagrams - Madrid

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE

Building Control Center Architecture

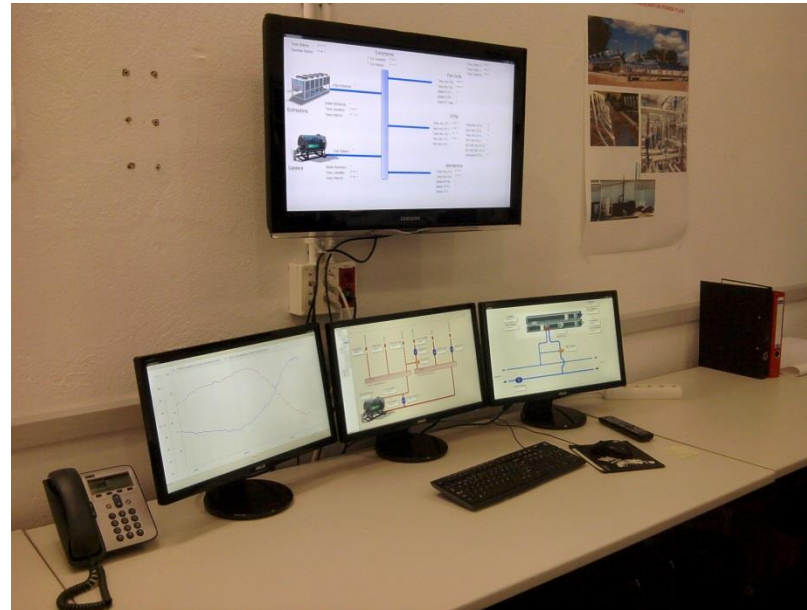


Trial Architecture diagrams - Madrid

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE

Building Control Center Architecture



GES Integration – Madrid Trial (Big Data)

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE



FINESCE Demo I+D+i















BigData GE Demo

Public Subscribe Broker GE

BigData GE

BigData GE Alt

Logout

| Meter | Value | Date | Aprox | Ok |
|---|-------|---------------------|-------|---|
|  | 15.23 | 2014-03-09 12:52:25 | -- |  |
|  | 13.74 | 2014-03-09 11:52:20 | -- |  |
|  | 9.29 | 2014-03-09 11:42:21 | -- |  |
|  | 9.29 | 2014-03-09 10:42:30 | -- |  |
|  | 6.59 | 2014-03-09 09:42:22 | -- |  |
|  | 4.28 | 2014-03-09 08:42:21 | -- |  |
|  | 2.81 | 2014-03-09 07:42:22 | -- |  |

GEs Integration – Madrid Trial (Big Data)

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE

FINESCE

FINESCE Demo I+D+i





















BigData GE Demo

Public Subscribe Broker GE

BigData GE

BigData GE Alt


Logout

| Meter | Value | Date | Aprox | Ok |
|---|-------|---------------------|-------|---|
|  | 15.23 | 2014-03-09 12:52:25 | -- |  |
|  | 13.74 | 2014-03-09 11:52:20 | 11.81 |  |
|  | 9.29 | 2014-03-09 11:42:21 | 6.86 |  |
|  | 9.29 | 2014-03-09 10:42:30 | 6.86 |  |
|  | 6.59 | 2014-03-09 09:42:22 | 4.51 |  |
|  | 4.28 | 2014-03-09 08:42:21 | 2.96 |  |
|  | 2.81 | 2014-03-09 07:42:22 | -- |  |
|  | 2.4 | 2014-03-09 06:42:22 | -- |  |
|  | 2.84 | 2014-03-09 05:42:21 | -- |  |
|  | 3.53 | 2014-03-09 04:42:22 | -- |  |

GEs Integration – (Publish/Subscriber)

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE







FINESCE

FINESCE Demo I+D+i

Public Subscribe GE Demo

[Public Subscribe Broker GE](#) [BigData GE](#) [BigData GE Alt](#) [Logout](#)

| Scene | Param | Conditions | Module | Date |
|----------------------|---------|---------------|---------------------|------------|
| Low battery level | battery | < 20% | Microgrid | 2014-03-01 |
| Medium battery level | battery | > 50% & < 70% | Microgrid | 2014-03-01 |
| Chance of rain | precip | > 0.2 | Weather Forecasting | 2014-03-01 |
| Low temperatures | temp | < 0 | Weather Forecasting | 2014-03-01 |

| Meter | Value | Time | Module |
|---|-------|---------------------|--------|
|  | 60 | 2014-03-07 19:42:08 | MG |
|  | 9 | 2014-03-07 10:23:13 | MG |
|  | 9 | 2014-03-07 10:23:13 | MG |
|  | 9 | 2014-03-07 10:23:13 | MG |

Use cases, GEs and APIs for Madrid

FUTURE
INTERNET
SMART
UTILITY
SERVICES

FINESCE

Use cases

- Weather forecasting information as BMS input
- Energy sub metering in big buildings
- Multi-building energy management
- Micro-Grid data analysis

GE validated

- Big Data Analysis
- Data Handling – PPL
- Publish/Subscribe
- Orion Context Broker
- PAAS/Cloud

APIs

- **getPowerConsumption:** Provides buildings' energy consumption information
- **getBuildingData:** Provides different information about building conditions (temperature, humidity, HVAC status....)
- **getWeatherForecastingData:** Provides weather forecast for the building specific location
- **getMicroGridConditions:** Provides information about the MicroGrid status

**THANK YOU
FOR YOUR ATTENTION**