

# Applications Service & Data delivery IoT Services Enablement Advanced Web-based UI

*Jorge Fernández*

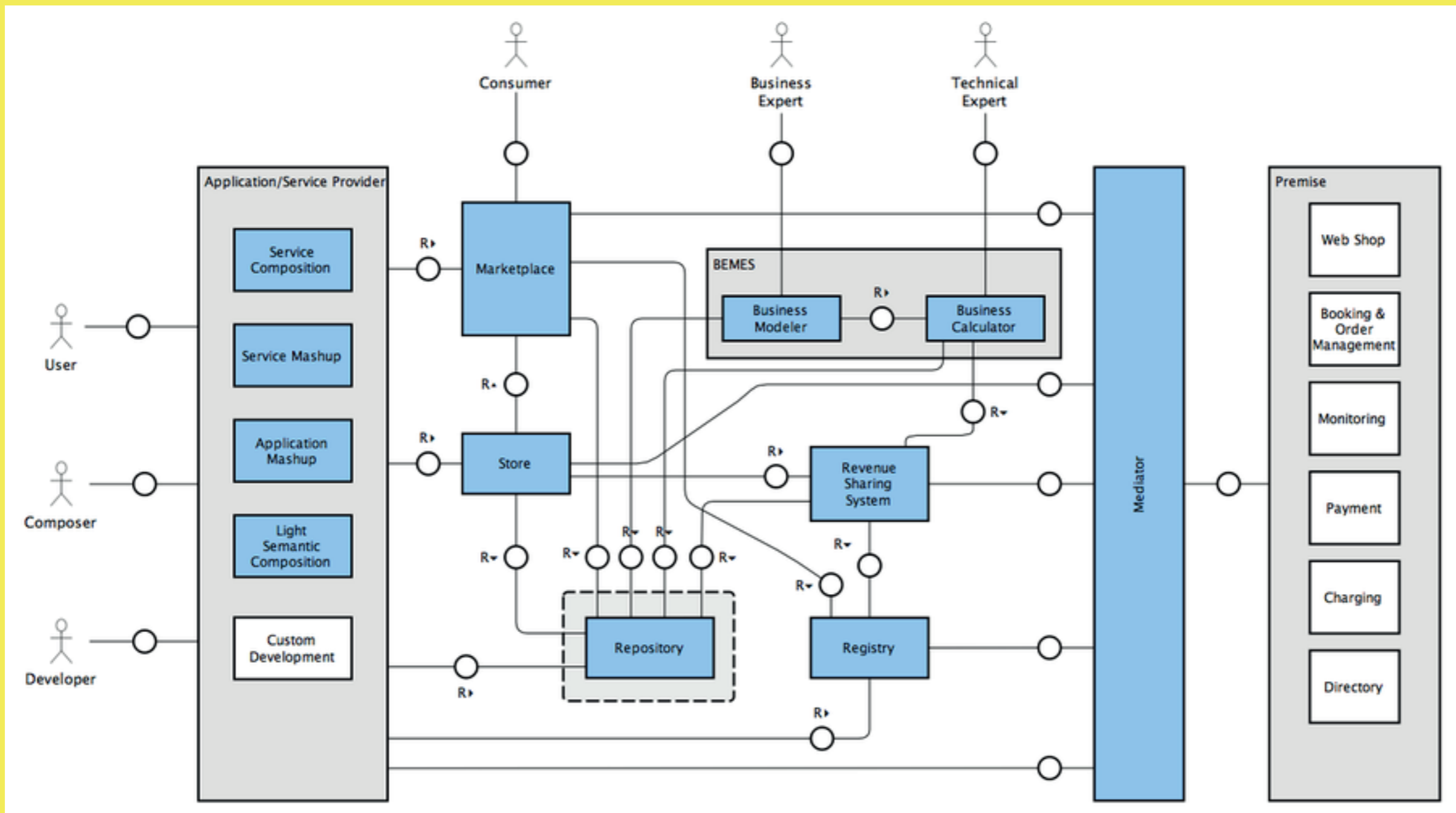


# Applications Service & Data delivery

The Generic Enablers of the Applications/Services Ecosystem and Delivery Framework together build an ecosystem of applications and services that is sustainable and fosters innovation as well as cross-fertilization.

In particular the Apps Generic Enablers supports managing services in a business framework across the whole service lifecycle from creation and composition of services to monetization and revenue sharing.

# Architecture overview



# Applications & Services



A Store, which enables selling services for consumers as well as developers of future Internet applications, and is responsible for managing offerings and sales.

A Marketplace, which allows consumers to find and compare service offerings published on different stores and provides further functionality to foster the market for future internet applications and services in a specific domain.

A Revenue Sharing System (RSS Engine), which allows the calculation and distribution of revenues according to the agreed business models.

A set of Service Composition enablers, which enable the composition of existing services into value added composite services, which can be monetized in the Business Framework.

Two BEMES (Business Elements Model Editor and Simulator) GEs used to create and simulate business models for value-added composite services and applications, where many other providers are involved. The BEMES component is an integration of both a Business Elements Model Editor GE and a Business Elements Model.

A set of Mediator enablers, which can be used to achieve interoperability between future internet services and also to allow interfacing to existing enterprise systems.

# Applications Service & Data delivery GEs I

## Repository

The Repository provides a consistent uniform API to access USDL service descriptions and associated media files for applications of the business framework.

A service provider can use the Repository to publish the description of various aspects of the service according to a unified description language.

## Marketplace

The core functionality of the Marketplace is to provide a uniform service interface to discover and match application and service offerings from providers and sources (e.g. published by different stores) with demand of consumers.

## Registry

Registry Enabler is used to store information on service instances necessary for run-time execution.

The registry serves as a kind of directory and for example can store detailed settings for concrete infrastructure components as well as information about human or computing agents.

## RSS

The RSS GE is in charge of distributing the revenues originated by the usage of a given service among the involved stakeholders.

In particular, it focuses on distributing part of the revenue generated by a service between the Marketplace Provider and the Service Provider(s) responsible for the service.

# Applications Service & Data delivery GEs II

## Store

The Store GE is mainly responsible for managing offerings and sales: it supports the publication of new offerings, manages offering payment, provides access to all purchased services and provides software downloads if the offering is part of a downloadable service (e.g. applications, widgets, etc.)

## Business Calculator

The business calculator is the component which will be closely interacting with the Business modeler in order to add the simulation capabilities.

## Business Modeller

The Business Modeler GE provides a graphical tool to business experts for creating and evaluating high-level business models.

It allows them to get an estimation of the profitability of a certain model and define value and money streams quickly and transparently.

## Service composition

The Service Composition allows users to create, manage and execute composed services.

It consists of two main parts, the editor and the execution environment.

The core functionality of each of these plugins is to provide the user with a means to estimate the evolution of costs in one consisting element of the business model according to a structured calculation model.

# Applications Service & Data delivery GEs III

## Service Mashup

The Service Mashup GE is implemented as a tool called Mashup Factory.

Mashup Factory allows end users without programming know-how to compose their own services for their immediate needs in communication, organization and information.

## Application Mashup

Application Mashup GE describes a Web platform that helps users to easily and visually create and run their own Web application mashups.

Its functionality can be divided into a client-side part running on the user web browser and a server-side part running on a web server.

## Light-weighted Semantic-enabled Composition

Light-weighted Semantic-enabled Composition is a tool suite that aims at simplifying the development of domain-specific business process, such as service compositions, by exploiting the full potential of semantic technologies.

## Mediator

The Mediator is basically a middleware application responsible for providing interoperability among different communication protocols and among different data models.

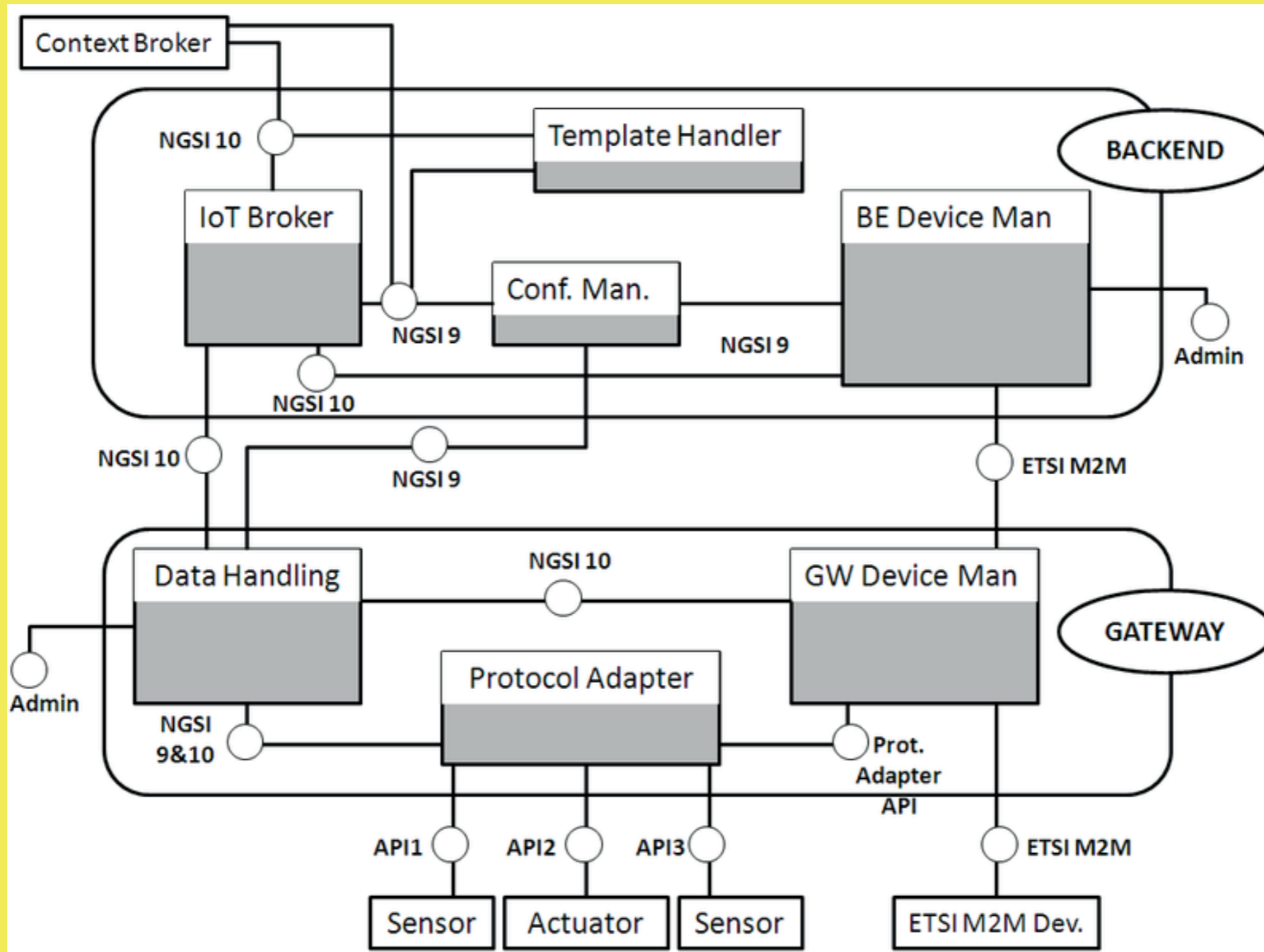
The main capabilities of the mediator are protocol and data transformations.

# **Internet of Things (IoT) Services Enablement**

FI-WARE will build the relevant Generic Enablers for Internet of Things Service Enablement, in order for things to become citizens of the Internet -available, searchable, accessible, and usable - and for FI services to create value from real-world interaction enabled by the ubiquity of heterogeneous and resource-constrained devices.



# Architecture overview



# Internet of Things (IoT)

From a physical architecture standpoint, IoT GEs have been spread in two different domains:

**IOT Gateway**

**IOT Backend**

FI-WARE IoT Gateway. A hardware device that hosts a number of features of one or several Gateway Generic Enablers of the IoT Service Enablement. It is usually located at proximity of the devices (sensors/actuators) to be connected. In the FI-WARE IoT model, the IoT Gateway is an optional element aiming to optimize the network traffic sent to the Backend and IoT services and reach higher efficiency and reliability. Zero, one or more IoT Gateways can be part of a FI-WARE IoT setting. Several m2m technologies introduce specific gateway devices too, where it is not feasible to install FI-WARE gateway features. Those gateways are considered plain devices grouping other devices and not FI-WARE IoT Gateways.

FI-WARE IoT Backend. A setting in the cloud that hosts a number of features of one or several Generic Enablers of the IoT Service Enablement. It is typically part of a FI-WARE platform instance in a Datacenter. In the FI-WARE IoT model, at least one IoT Backend is mandatory, which will be connected to all IoT end devices either via IoT Gateway(s) and/or straight interfaces.

# IOT Gateway GEs

The main role of the Gateway is to work as a bridge with devices based on different technologies. The second main role is deployment of optimized smart services as closely as possible to the Things to enable smart applications development.

## Device management

The Gateway Device Management GE is contains much of the "core" gateway functionality. It is responsible for the communication with the Backend and IoT and non-IoT devices.

## Data handling

The Data Handling GE addresses the need of filtering, aggregating and merging real-time data from different sources.

## Protocol adapter

The Protocol Adapter GE deals with the incoming and outgoing traffic and messages between the IoT Gateway and registered devices, to be served by either the Gateway Device Management GE or the Data Handling GE.

# IOT Backend GEs

The IoT Backend provides management functionalities for the devices and IoT domain-specific support for the applications. It supports access at both IoT resource and virtual thing-level.

## IOT Broker

The IoT Broker GE is a component for retrieving and aggregating information from the Internet of Things

## Configuration manager

The Configuration Manager GE is the part of the IoT Backend which is responsible for context availability registration. The underlying data model of this GE is based on the OMA NGSI9 Context Management Information Model.

## Device management

This is the central component for the IoT backend. It provides the resource-level management of remote assets (devices with sensors and/or actuators) as well as core communication capabilities such as basic IP connectivity and management of disconnected devices.

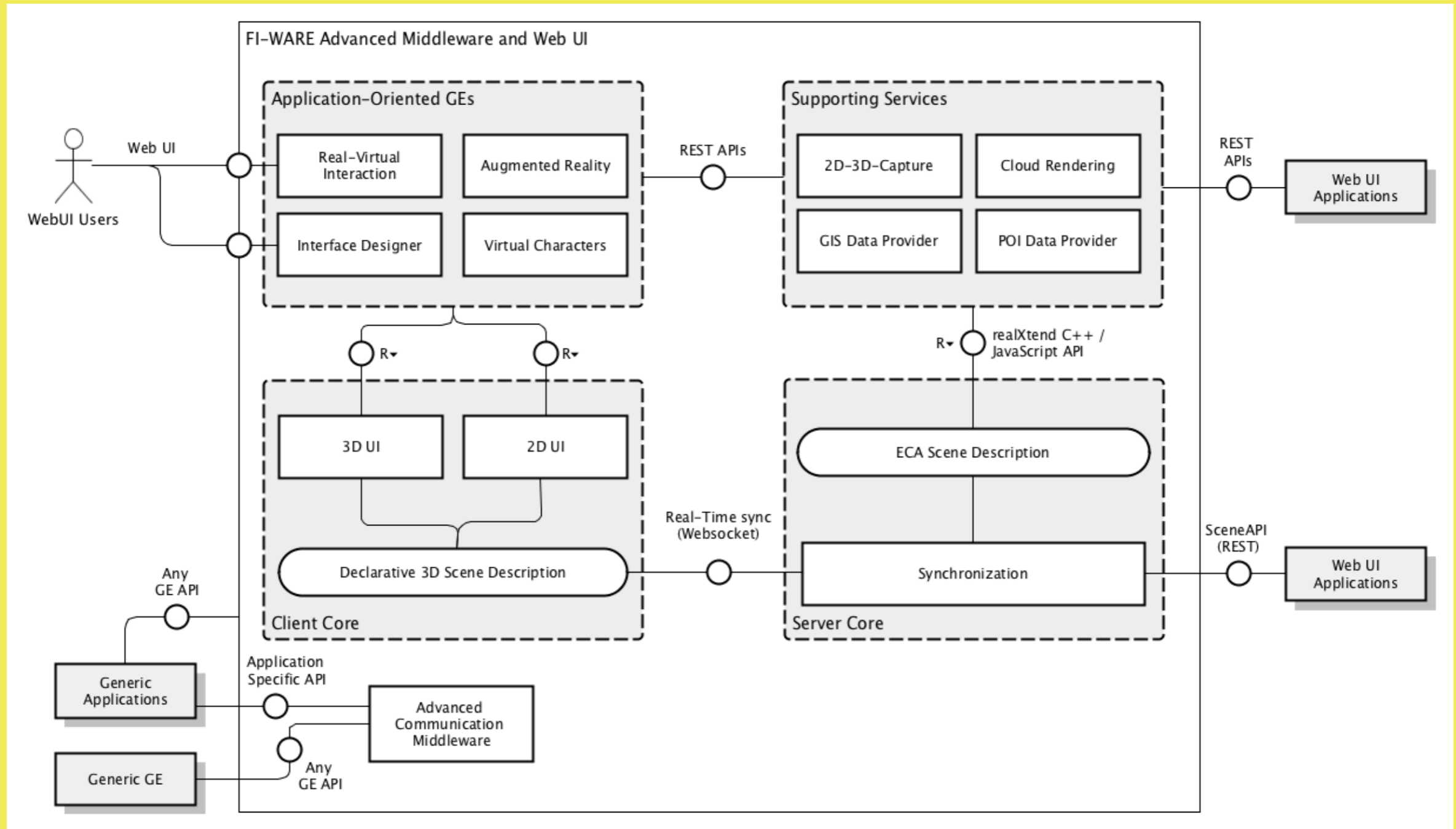
## Template handler

The NGSI Backend Template Handler allows modeling and executing BPMN business processes.

# **Advanced Web-based User Interface**

The Advanced web-based User Interface chapter brings components that will provide a simple, uniform way to create rich networked 2D and 3D applications that run in a browser.

# Architecture overview



# Advanced Web UI Modules

**Client Core**

**Server Core**

**Supporting  
Services**

**Application-oriented  
Services**

# Client Core GEs

The Client Core module provides the core functionality for creating HTML based user interfaces. These GEs run within the Web browser.

## 2D-UI

The 2D-UI GE enhances HTML with some additional functionality that improves the development of advanced user interfaces. It makes use of WebComponents and ShadowDOM technology to encapsulate functionality and provide user interface elements in an object-oriented form. In addition it will provide ways to handle a larger variety of input devices as necessary for 3D functionality

## 3D-UI

The 3D-UI GE adds new HTML elements (using a polyfill implementation) for describing 3D scenes, including geometry, material, textures, lights, and cameras. A new functional dataflow mechanism is used to enable interactive animations, image processing, augmented reality, and other dynamic elements to a scene.



# Server Core GEs

The Server Core module mainly provides a scalable synchronization server.

## Synchronization

The Synchronization GE allows multiple Advanced Web-UI instances running on different clients to synchronize in real-time. While this is mandatory for providing shared 3D environments (e.g. for games) it can also be applied for 2D functionality. A key element will be the use of a highly flexible and highly scalable design of the synchronization server architecture that will enable the dynamic repartitioning of the 3D environment for different server functionality like scripting, physics, and others. The AMi middleware will be used to provide optimal network performance for such demanding applications. A SceneAPI is used to offer remote services to connect to a 3D environment and modify it in real-time.

# Supporting services GEs

This module provides services that are commonly being used when creating Web-based user interfaces.

## Cloud Rendering

The Cloud Rendering GE is a service that connects to a synchronization server renders the scene based on a chosen camera view and streams the results using common video streaming functionality (e.g. in FI-WARE).

## GIS data provider

The GIS Data Provider GE offers access to 3D GIS data via geo-location queries which can be used by any application to render content in a virtual real world scenario.

## POI data provider

The POI Data Provider GE provides access to advanced Point of Interest data that can be used to position 2D and 3D content in the context of a 3D scene.

## 2D/3D Capture

The 2D-3DCapture GE allows for capturing data from the real world in the form of images, augmenting them with additional data, and providing the results to other services including those that create 3D structures from these images.

# Application-oriented Services GEs

This module provides high-level GEs that operate more on the application level in the form of tools.

## Augmented Reality

This provides AR functionality that can be used by applications and other services. This includes the registration and tracking with various forms of markers or features, the setup of such tracking based on data from various sources and in various formats, and finally the setup of the rendering of such tracked features.

## Real-Virtual Interaction

The Real-Virtual Interaction GE combines AR with the Internet of Things (IoT) in order to monitor the state of sensors and other information sources from the real world, visualizes this state in a 3D world, allows user to interact with these visual elements, and then uses services to act on the real world.

## Virtual Characters

The Virtual Characters GE allows application to add and control animated virtual characters in 3D scenes.

## Interface designer

The Interface Designer GE is an interactive, web-based composition and editing tools that allows users to interactively edit 3D world in the same browser environment that is also used to run an application. It is not a fully 3D content creation tools but depends on pre-existing content that can be added to a scene.

**Thank you for your attention**

*Jorge Fernández*

 **BOTCAR**