HI REPLY ▶ SIMPLY CONNECTED

HI REPLY IS AN INNOVATIVE PLATFORM CREATED BY REPLY, WHICH INCORPORATES SERVICES, DEVICES AND MIDDLEWARE FOR THE INTERNET OF THINGS. HI REPLY CREATES AN ECOSYSTEM OF PEOPLE, OBJECTS AND SERVICES THAT COMMUNICATE VIA THE NETWORK. HI REPLY USES SECTIONAL, CONFIGURABLE MODULES TO PROVIDE ALL THE ELEMENTS NECESSARY FOR THE CREATION OF VERTICAL SOLUTIONS THAT ARE SECURE, SCALABLE AND FLEXIBLE, AND BASED ON THE INTERACTION AND COOPERATION OF CONNECTED OBJECTS.

The convergence between Telco, Media and Consumer Electronics leads ever more to the need to interpret as "network devices" items very different in themselves and detached from any form of connectivity. The Internet of Things is destined to become a fundamental sector for the distribution of new technologies, both within companies and in daily life.

The aim of the Internet of Things is the development of the current Internet network communication paradigm, which remains dominated by the exchange of information using instruments that are all very similar (PCs, Tablets, Smartphones).

This exchange almost always views the human user as the intended recipient or source of such information. In the new paradigm, objects acquire the capability to interact with one another, even without human intervention. They must therefore present a high level of auto-configuration and auto-regulation, based on information drawn automatically from the operating context (Context Awareness).

A layer of interconnecting objects and services, that help cities to be transformed into intelligent ecosystems is currently being created alongside the more classic urban infrastructures (transport, street-lighting, sourcing and distribution of energy, cabled telephone lines, etc.).

This new "Digital Layer" will enable communication over the network between items hitherto isolated, and integration with the other layers of infrastructure, thereby creating opportunities for the realisation of the Smart City concept talked about for some time. This will bring about substantial improvements to quality of life, especially in urban areas (e.g. systems supporting and optimising traffic management, energy saving, remote assistance for hospital patients, ways to make people and places safer, automation of services for the city and tourism, etc.).
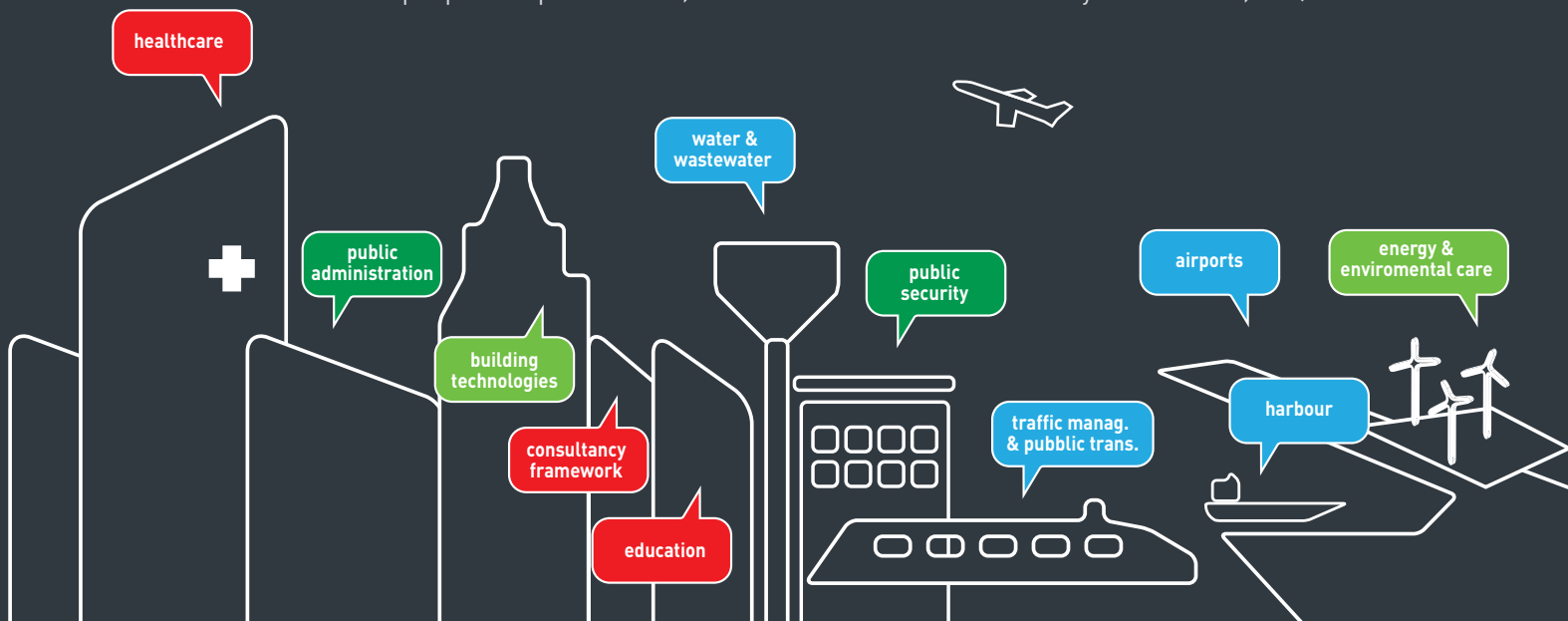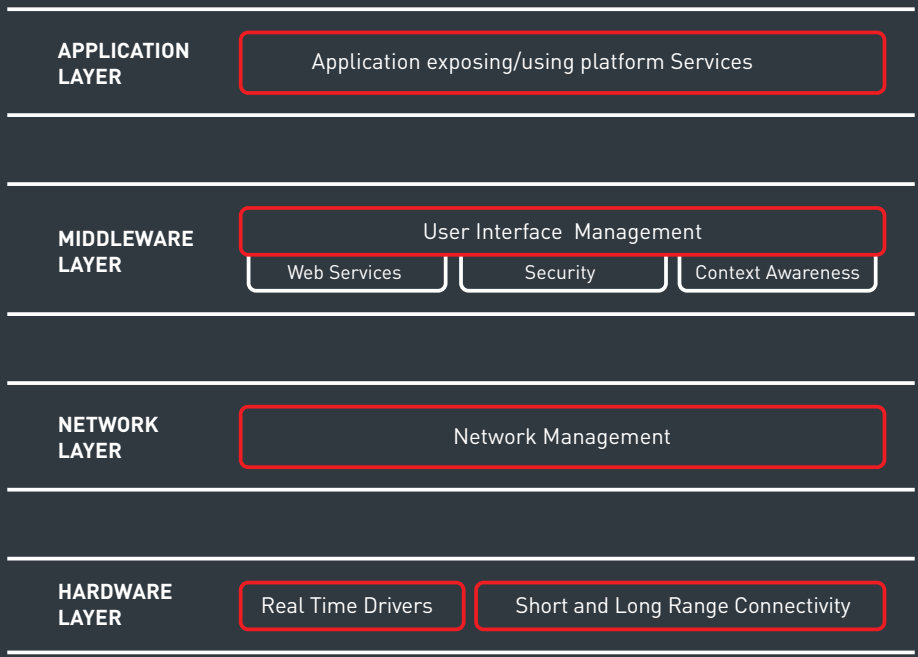
In response to these new requirements, Reply has developed **HI Reply**, an innovative platform capable of bypassing the limits set by the current solutions. The main features of **HI Reply** are pervasiveness, transparency, portability, flexibility, context sensitivity and a capacity to self-adapt and self-configure.

HI Reply creates an ecosystem of people, objects and services, linked by a network and supported by technology conceived to meet the following requirements:

▶ ENSURING a high level of **interoperability** between nodes, whether on the electrical or communication protocol level, via the exchange of data using the shared standard Web Services.

▶ FACILITATING new nodes, with a reduced level of interaction and configuration, to be introduced to the network, setting up new services by providing means by which the nodes may **self-configure**.

▶ REACTING quickly to critical or unexpected **events** by distributing intelligence to the sensors, activator nodes and context processing.

▶ MONITORING the chemical and physical characteristics of elements for specific applications (for example biomedical, environmental parameters, and parameters for equipment operation, etc.).

▶ ACTIVATING controls to deal with events or control actions (for example domotics, industrial systems, etc.).

APPLICATION LAYER	Application exposing/using platform Services

MIDDLEWARE LAYER	User Interface Management
	Web Services / Security / Context Awareness

NETWORK LAYER	Network Management

HARDWARE LAYER	Real Time Drivers / Short and Long Range Connectivity

MAIN MODULES

HI Reply, through the use of **configurable modules** supplies all the elements necessary for the creation of **secure, scalable and flexible** vertical solutions based on the interaction and cooperation of objects connected by the network.

WEB SERVICES (WS)

▶ WS development on Microsoft platform

▶ Breakdown of Physical Models into basic Logical Models

▶ Exchange of data using Single or Dual Binding

NETWORK MANAGEMENT

▶ Network Management Console

▶ Network Management of sub-networks involving Basic Nodes

▶ Monitoring & Diagnostic, Configuration and Performance Management

▶ Solution using distributed Web Services

SECURITY

▶ Confidentiality, Integrity and Authentication of Web Services by way of WS-Security

▶ Infrastructure for Identity and Access Management of Intelligent Nodes

▶ Cryptographic communication between nodes using TLS (Transport Layer Security)

CONNECTIVITY

▶ Development of a universal protocol for the transportation of data over a serial interface

▶ Development of SW Layer for the adaptation of low power radio systems (Zigbee and ZigBee PRO)

▶ Connectivity for RFID devices

▶ GSM/GPRS/UMTS Connectivity

▶ WiFi Connectivity

▶ Integration of GPS receiver

SENSOR MANAGEMENT

▶ Off-the-shelf hardware based on ARM families

▶ Biological and environmental parametrical sensors

▶ Electromechanical activators

▶ Autonomous self-powered sensors that detect environmental and biological parameters (Energy Harvesting Sensors)

CONTEXT AWARENESS (CA)

▶ Flexibility of the CA framework through the combination of different approaches (Semantic, probabilistic/ Statistical, Complex Events)

▶ Integration of the system's own semantic engine with the Microsoft platform

▶ Presentation of reasoning frameworks such as WS

▶ Characterisation of a hierarchical Ontological Model

USER INTERFACE

▶ HI Reply Control Panel based on Microsoft Silverlight

▶ Graphic interface with icons

▶ Access to data via User Profiles

▶ Easy customisation

▶ Minimisation of data flow to the network

▲ | **Web Service Layer**
- Public unifield interface
- Single/Dual binding support

W3C

▲ | **Logical Device Layer**
- Translation of device specific data into common logical structure

```
<service>
<temperature>20</temperature>
</service>
```

▲ | **Physical Device Layer**
- Legacy network adaptation
- Device message parsing & formatting

```
.....
-> 00F1BAC00237F
<- = C498FF05
.....
```

SMART OBJECTS AND ORCHESTRATION

The foundation of **Hi Reply** is the so-called **"Smart Objects"**, through which both large physical control and command signals are transmitted over the network, by way of standards.

THE SMART OBJECTS OF THE PLATFORM MAKE IT POSSIBLE TO:

▶ DEFINE THE LEVEL OF PHYSICAL ABSTRACTION IN DEVICES, using models capable of offering a high level of object classification and therefore creating a kind of common universal language.

▶ EXPOSE THE FUNCTIONS OF THE DEVICES AS WEB SERVICES, in order to access services by standard means and also by way of different communication mechanisms depending on the specific requirements (REST, HTTP single binding, HTTP dual binding).

▶ INTERACT AUTONOMOUSLY WITH OTHER DEVICES, using the standard DPWS protocol (Device Profile for Web Services) that allows devices with low computing power to communicate via Web Services and activate mechanisms of self-discovery.

Through the distribution of intelligence to the various nodes and the **Context Awareness (CA)** framework of **HI Reply**, it is possible to rapidly create even complex applications based on contextual data: Smart Objects adapt to the environment where they are operating.

APPLICATIONS THUS CREATED ARE CAPABLE OF:

▶ Recognizing context, establishing it on data originating from heterogeneous sources.

▶ Adapting their actions to the context that has been recognized (for example by generating suitable commands for activating nodes or recommendations for the rest of the system).

The CA module combines several techniques, from semantic reasoning to specific or optimized processing, and aims to meet the most diverse requirements of adaptive reasoning. In particular, the framework includes:

▶ Semantic Methods (used for complex logic and/ or logic that need to be revised frequently).

▶ Complex event processing (used in cases where large quantities of data have to be managed, such as for example in smart-grid systems).

▶ Statistic methods (used in cases where data sets are incomplete or partially inconsistent).

Using the **HI Reply** CA Module, developers can concentrate on the application logic without concerning themselves with details relative to aspects such as communication, security, etc. managed by the other modules of the **HI Reply** platform.

events → Recognize Contex → reasoning → Decode Actions → actions