SAT-IoT: An Architectural Model for a High-Performance Fog/Edge/Cloud IoT Platform

Miguel Angel López Peña
Innovation and Development Department
Sistemas Avanzados de Tecnología, S.A. (SATEC)
Madrid, Spain
miguelel.lopez@satec.es

Isabel Muñoz Fernández
Departamento de Sistemas Informáticos E.T.S.I.S.I.
Technical University of Madrid
Madrid, Spain
isabel.munoz@upm.es

Problem
Some features in IoT standards are not detailed enough
- Fog/Edge/Cloud Computing
- Visualization

ISO/IEC 30141 Standard (IoT RA)
IoT Architecture = Entities + Functionality

Goals
I. New Key Concept Definitions for IoT
II. Integration of concepts in a new architectural model (SAT-IoT)
III. Design and implementation of an IoT Platform (SAT-IoT)
IV. Compliance with ISO/IEC 30141

I. NEW KEY CONCEPTS

Edge/Cloud Computing Location Transparency
Dynamic change of computation node when processing needs data from different zones
Why? For optimization: response latency, bandwidth consumption, storage, ...
When? Changes of system conditions: shared data, application requests, data volume, ...
Where? In edge, mid, or cloud nodes
How? Using an optimization algorithm from RECAP project

IoT Computing Topology Management
Services to manage IoT hybrid topologies
- Definition, configuration, deployment and tests
- Global view of HW, SW and network in a IoT system

Integrated IoT Visualization System
Visualization of the status of the whole IoT system
- Automatic generation of a system dashboard showing the IoT topology graph and data flow paths
- Configurable data dashboard generation showing a selection of data received from devices

IoT Audit System
Lightweight, scalable, and distributed security and privacy safeguard services
- Supported by Blockchain or distributed Ledgers

From Concepts to Entities
1. Data flow Dynamic Routing Entity
2. IoT Topology Management
3. IoT Visualization Entity
4. IoT Regulations & Audit System

II. SAT-IoT Architectural Model

PLATFORM ACCESS ENTITY

Network

IoT Cloud Entity (Platform Applications and Services)
Operation and Management System
Application Services System
IoT Resources and Interchange System
IoT Orchestration Management System

IoT Visualization Entity
IoT Topology Visualization System
IoT Apps, Dashboard Generation System

IoT Topology Management Entity
Smart Device Entity (Gateways, Sensors & Actuators)

IoT Data Flow Collector Entity

Visualization System

III. SAT-IoT Implementation

CONCLUSIONS
- New concepts for IoT architectures and the SAT-IoT reference model have been defined.
- The “Edge-Cloud Computing Location transparency” lets dynamic computation in a IoT hybrid topology.
- The "IoT Computing Topology Management" provides the definition and monitoring of the IoT system in a global way.
- The “Embedded IoT Visualization System” concept shows graphical status information of IoT systems, reducing the time to make decisions.
- SAT-IoT architectural model provides feasible solutions for complex IoT systems.
- The implementation of The SAT-IoT platform under this architectural model is in progress.