IoT Architecture Patterns: A Generalized Approach for IoT Systems

oneM2M presentation to the Industrial Internet Consortium

Ken Figueredo, 16 June 2021
oneM2M is the global community that develops standards for end-to-end IoT systems

More than 250 member organizations in oneM2M

Join forces
=> reduce fragmentation
=> Reuse e.g.

Founded July, 24th 2012, Technical Plenary#1: Sep 24th-29th 2012
All documents and specifications are publicly accessible at www.oneM2M.org

INTERNATIONAL STANDARDIZATION STATUS
Release 2 transposition as ITU-T SG20 Y.4500.x

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Objective: help developers to build repeatable and scalable IoT systems using a common ‘toolkit’

**Traditional Market Structure**

- Application
- Application Enablement Platform
- Connected Devices Platform
  - Communications Network #A
    - Device(s)
    - Sensor(s)

**oneM2M’s Standards-based Structure**

- Application
- Common Services Layer
  - Communications Network #A
  - Device(s)
  - Sensor(s)
  - AE

Legend:

- AE: oneM2M Application Entity

Many hundreds of proprietary, IoT platforms vs. Extensible ‘toolkit’ of standardized common services.
A standardized framework to add new tools or ‘Common Service Functions’ over time

Common Services Layer

- Device Management
- Registration
- Communication Management
- Data Management & Repository
- Security
- Discovery
- Subscription & Notification
- Group Management
- Application & Service Management
- Network Service Exposure
- Location
- Service Charging & Accounting
- Semantics
- Transaction Management
- Time Management

New addition in oneM2M Release 4

IoT Application Layer

Common Services (middleware)

IoT Devices and Connectivity Layer
Pattern: A Simple IoT system

- Application #1
- IoT Platform (AEP/CDP)
- Communications Network #A
- Local Network
- Gateway or Edge-processing node
  - G
- Device, sensor, control input device etc.
  - D
- Application that consumes and processes IoT data
  - Application #n
Pattern: Single Purpose Application

Common Services Layer

Application #1

Communications Network #A

Local Network

Things

Representation of ‘Things’ (including semantics)

LEGEND

G: Gateway or Edge-processing node
D: Device, sensor, control input device etc.
Application #n: Application that consumes and processes IoT data
AE: oneM2M Application Entity

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Pattern: Edge and Edge/Fog Processing
Pattern: Multi-user, Shared Platform

Common Services Layer

Application #1
Application #2

Communications Network #A
Communications Network #B

Things
Local Network

LEGEND

G
Gateway or Edge-processing node

D
Device, sensor, control input device etc.

AE
Application that consumes and processes IoT data

AE
oneM2M Application Entity
Pattern: Brownfield + Greenfield

Common Services Layer

Application #2

Communications Network #A

Communications Network #B

Inter-Working Proxy Entity (IPE)

Local Network

Representation of ‘Things’ (including semantics)

LEGEND

G: Gateway or Edge-processing node
D: Device, sensor, control input device etc.
Application #n: Application that consumes and processes IoT data
AE: oneM2M Application Entity

Brownfield or Proprietary-technology Domain
Pattern: Brownfield + Greenfield (example)
Pattern: Federation Across Platforms and/or Between Organizations

Application #1

Common Services Layer (User A)

Communications Network #A

Local Network

Application #2

Common Services Layer (User B)

Communications Network #B
General-purpose framework for IoT systems

Application #1
Application #2
Application #3

Common Services Layer

Communications Network #A
Communications Network #B

Local Network

Things

Common Services Layer (User B)

LEGEND

G
Gateway or Edge-processing node

D
Device, sensor, control input device etc.

Application #n
Application that consumes and processes IoT data

AE
oneM2M Application Entity

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For more information

- About oneM2M – www.oneM2M.org

- Joint IIC/oneM2M White Paper comparing architecture approaches (2019)

- Roland Hechwartner (Deutsche Telekom) – oneM2M’s growing role as a universal hub for standards-based IoT

- IIC Journal of Innovation - Data marketplace for intelligent transport and smart regions using oneM2M

- oneM2M deployment examples

ken.figuere@interdigital.com
https://www.linkedin.com/in/kenfigueredo/