

# Introduction to IPSO Smart Objects

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# Problems to solve in IoT

## › Interoperability

- Software's interaction with physical resources.
- Device independence from software management and vendors.
- Discovery, Management, Reporting, Security, Authorization.

## › Scalability

- Billions of devices, users, connections...
- Billions of interactions.

## › Reusability and modularity

- Software, networks, protocols, data models.
- In a vertical segment, across vendors.
- Across diverse vertical segments.

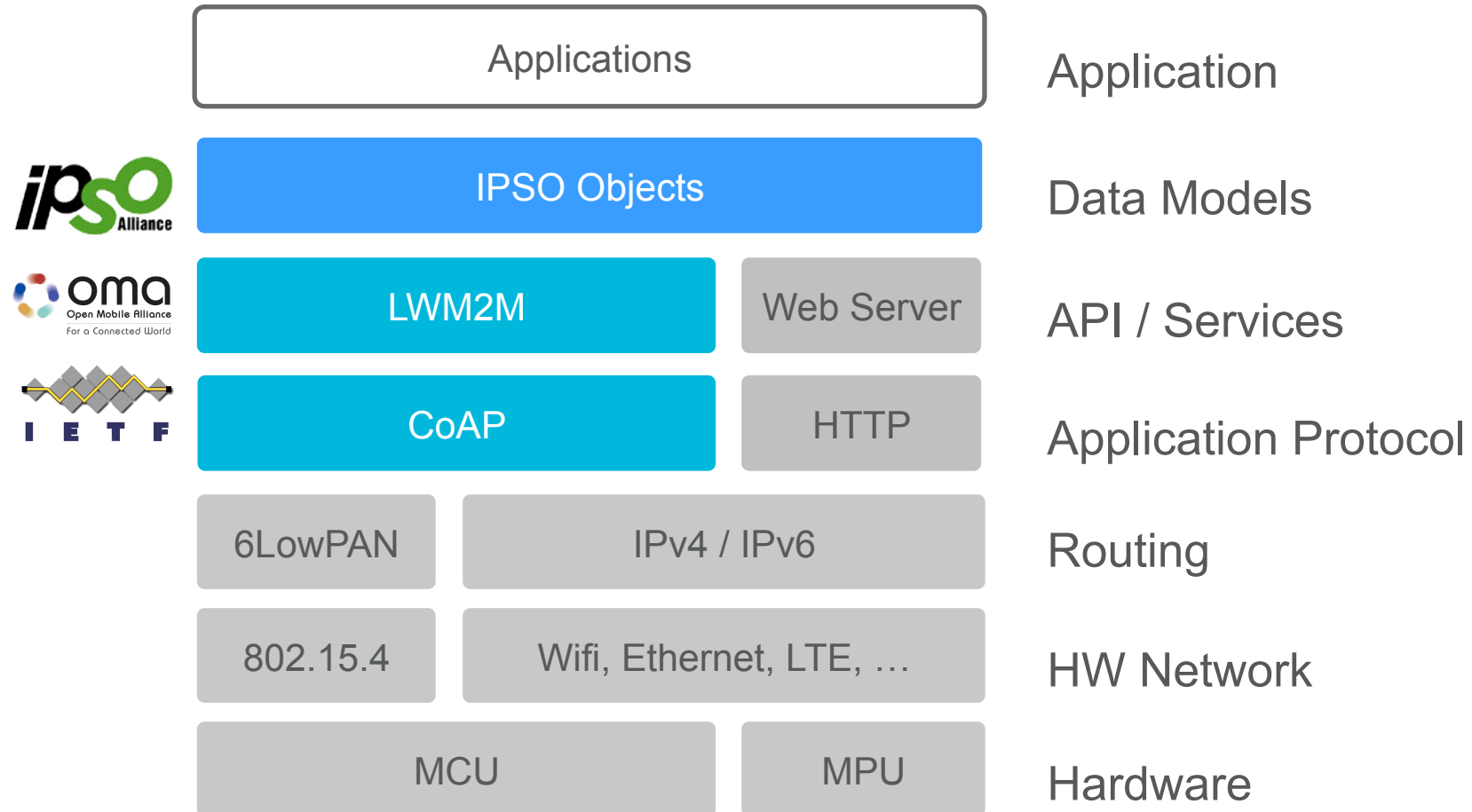
## › Permissionless Innovation

- Enable anyone to participate and innovate.

# IPSO Smart Objects

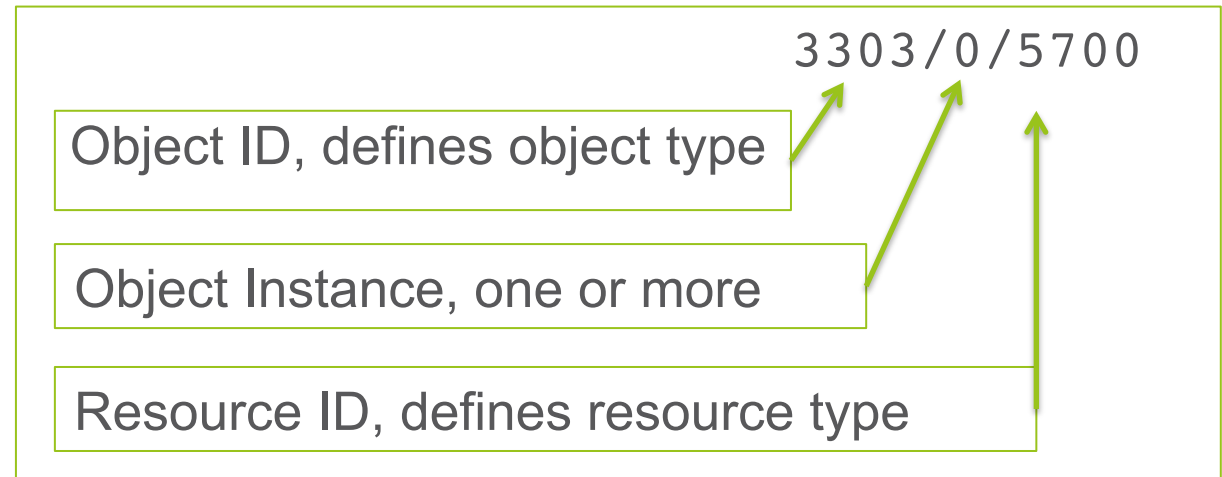
- › Developed by IP for Smart Objects (IPSO) Alliance. In the Smart Objects Working Group.
- › Semantic Interoperability across IoT devices and applications.
- › Based on LWM2M Object Model.
- › Reusable Object IDs and Resource IDs.
- › Transport Protocol Independent (CoAP, LWM2M, MQTT, HTTP...) if support addressing, content formats and data types.
- › Encoding Independent (JSON, TLV, SenML...)
- › Basic Objects represent simple sensors and actuators.
- › Basic Starter Pack published on 2014 (Expansion Pack upcoming).
- › Tested during IPSO Interoperability test on May 2015 (ARM, Ericsson, Intel, SICS, Yanzi, TUT ...).

# The Web in constrained devices



# IPSO Smart Object Structure

- › Reusable resource and object IDs
  - Common definitions for concepts
  - Map to semantic terms e.g. temperature, currentValue
  - IDs are registered with the OMNA
- › Usable in different transport protocols that support
  - URI Addressing
    - › (/home/weather/3303/0/5700)
  - Data Types
  - Content Formats
  - RWX Operations



# Example: IPSO Humidity Sensor



Object	Object ID	Object URN	Multiple Instances?	Description
IPSO Humidity	3304	<b>urn:oma:lwm2m:ext:3304</b>	Yes	Relative humidity sensor, example units = %

Resource Name	Resource ID	Access Type	Multiple Instances?	Mandatory	Type	Range or Enumeration	Units	Descriptions
Sensor Value	5700	R	No	Mandatory	Float			Last or Current Measured Value from the Sensor
Units	5701	R	No	Optional	String			Measurement Units Definition e.g. "Cel" for Temperature in Celsius.
Min Measured Value	5601	R	No	Optional	Float	Same as Measured Value	Same as Measured Value	The minimum value measured by the sensor since power ON or reset
Max Measured Value	5602	R	No	Optional	Float	Same as Measured Value	Same as Measured Value	The maximum value measured by the sensor since power ON or reset
Min Range Value	5603	R	No	Optional	Float	Same as Measured Value	Same as Measured Value	The minimum value that can be measured by the sensor
Max Range Value	5604	R	No	Optional	Float	Same as Measured Value	Same as Measured Value	The maximum value that can be measured by the sensor
Reset Min and Max Measured Values	5605	E	No	Optional	Opaque			Reset the Min and Max Measured Values to Current Value

# Roadmap

- › UPnP refactoring – from SOAP to REST.
- › IETF 93 – Bits and Bites.
- ✓ Draft Smart Object Data Model Design Guide @done (15-03-30)
- ✓ Draft Smart Object Expansion Pack for Basic Objects @done (15-04-30)
- ✓ Set up test servers for IPSO objects (LWM2M + TLV payload) @done (15-06-15)
- ☐ Draft Domain Specific Objects reference designs @due (mid 2015)
- ☐ Publish Smart Object Data Model Design Guided @due(15-07-31)
- ☐ Publish Smart Object Expansion Pack for Basic objects @due(15-07-31)
- ☐ Publish Smart Object Expansion Pack for Composite Objects @due(15-07-31)
- ☐ Publish Smart Object Expansion Pack for Reference Devices @due(15-07-31)

# Next Steps

## › Activities

- Continue Working with Smart Objects: Expansion Pack, Composite Objects, Linked Objects.
- Collaboration with other IoT Interest Groups like UPnP, IIC, OIC.
- Work on related Standards organizations: IETF CoRE - CoAP, OMA DM - LWM2M.
- Prototyping and testing (IETF 93, Bits and Bites, 2<sup>nd</sup> IPSO Interop, ...)

## › Focus Area

- IPSO Smart Objects are meant to be very generic.



