

# Standardizing Generic Cross-Domain Applications in Internet of Things

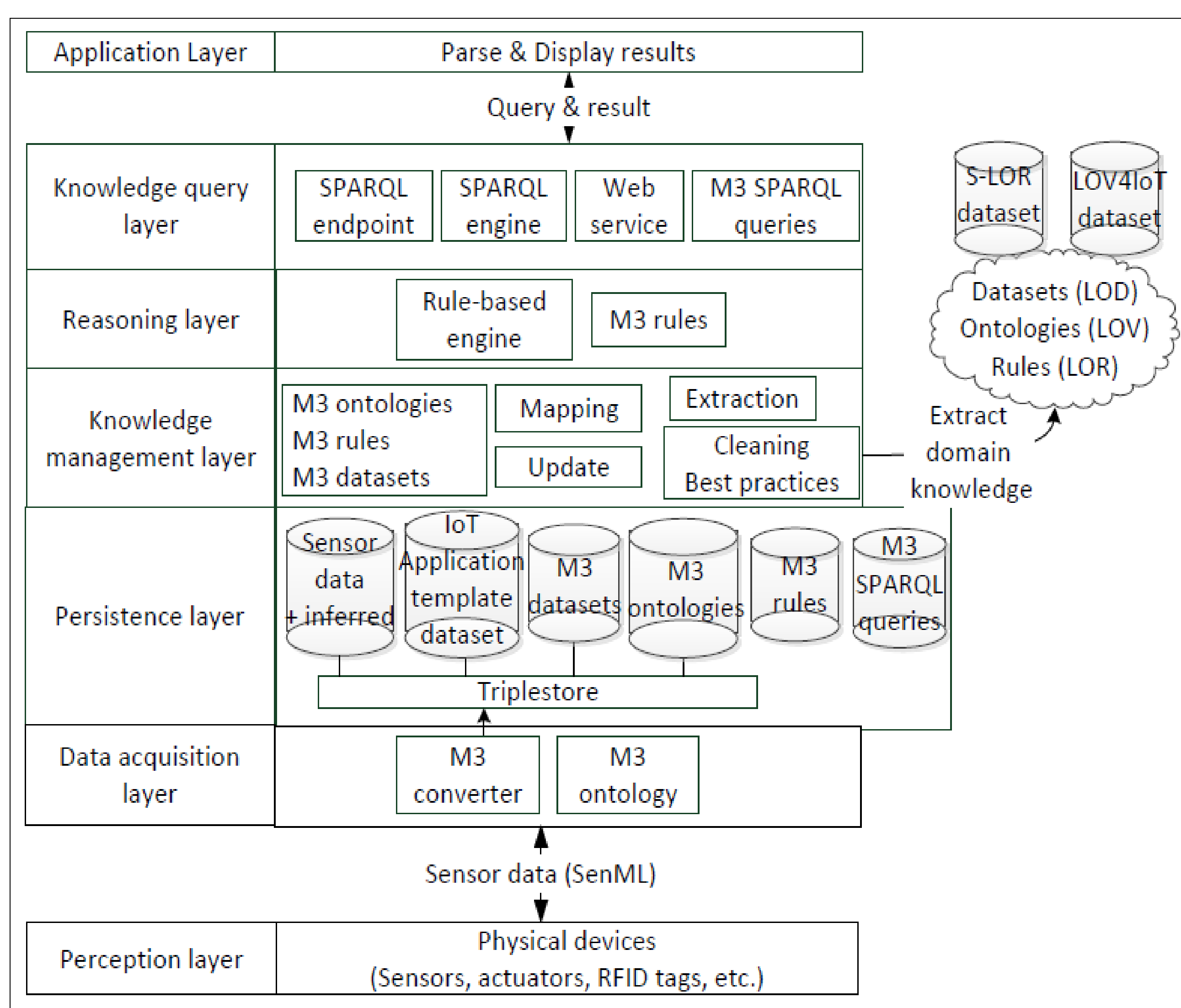
## Motivation

- ❑ Multimodal M2M devices & heterogeneous domains pose:
  - Difficulties to automatically interpret sensor data
  - Sensor Markup Language (SenML) can be used to describe sensor measurements
- ❑ Combining domains with each other
  - E.g., smart home & weather
- ❑ Reusing domain knowledge to interpret sensor values

## Limitations in current standards

- ❑ W3C Web of Things, ETSI M2M, oneM2M and W3C SSN ontology
  - No uniform nomenclature to describe sensor measurements
  - Difficulties to deduce high-level abstractions
- ❑ No description of semantic components in ETSI and oneM2M functional architectures
  - Work in progress for oneM2M MAS Group

## M3 Architecture



## Conclusions

- ❑ Lessons learned from the M3 approach:
  - Generic enough for different architectural needs and use cases
  - Building standardized cross-domain IoT applications
  - Recommendations for W3C Web of Things, ETSI M2M, oneM2M and W3C SSN ontology standardizations
  - See <http://www.sensormeasurement.appspot.com/>

## M3 Approach

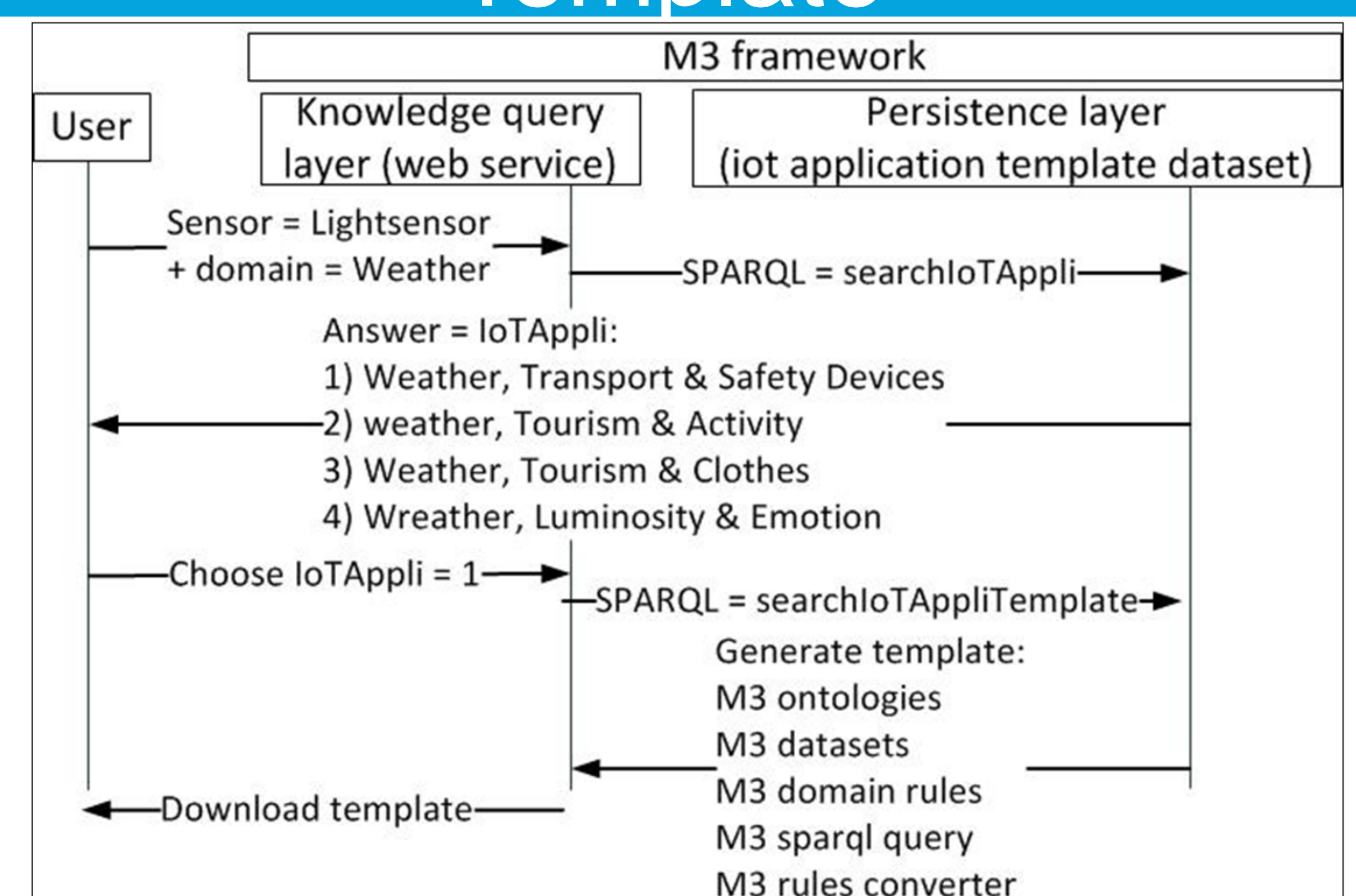
- ❑ M3 nomenclature:
  - Interoperable M2M sensor data
  - Enrich sensor data with semantics
  - Ease the reasoning on data with Sensor-based Linked Open Rules (S-LOR)
  - M3 is implemented as an ontology
  - M3 is an extension of the W3C Semantic Sensor Networks (SSN) ontology
- ⇒ **Standardizing the M3 nomenclature**
- ⇒ **Standardizing domain knowledge (e.g., ontologies)**
- ⇒ **Spreading semantic web best practices**



M3 or SenML domain	M3 or SenML sensor/measurement name	Description, other names (synonyms)	M3 or SenML Unit
Weather	HumiditySensor/ Humidity	Hygrometer, humidity sensor, moisture sensor, soil moisture probes	Percent
Weather	WindDirectionSensor/ WindDirection	Wind direction	DegreeAngle
Weather	SunPositionDirectionSensor/ SunPosition	sun position direction to detect east, west, south, north	DegreeAngle
Weather	AtmosphericPressureSensor/ AtmosphericPressure	Atmospheric pressure sensor, Barometer, barometric pressure sensor	Pascal
Weather	CloudCoverSensor/ CloudCover	Cloud cover sensor	Okta

<http://www.sensormeasurement.appspot.com/?p=documentation>

## Generating IoT Application Template



## Semantic-based M2M Architecture

