W3C WoT – T2TRG Workshop

Architecture TF

Use Cases

Lifecycle

Profiles

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Architecture TF work items

- **Requirements, Use Cases, and Vocabulary**
- Requirements of new use cases, architectural patterns, and concepts.

- **Link Relation Types**: Define link relation types between things.

- **Interoperability Profiles:** Plug-and-play interoperabilty via a profile mechanism.

- **Thing Description Templates:** classes of things and an inheritance mechanism, modularisation.

- **Complex Interactions:** Use of hypermedia controls to describe complex interactions and thing behaviour.

- **Lifecycle:**
- Terminology for states and transitions for products, devices, and information.

- **Onboarding:** Define how trust can be established between Things, gateways.

- **Identifier Management:** Mitigate privacy risks by defining how identifiers are managed and updated.

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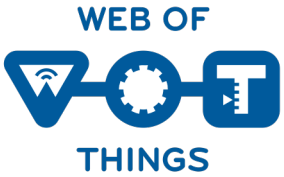


Use Cases

Status and next steps

Use Cases

- **~20 new use case are in the pipeline, more to come**

- **<u>Active Contributors:</u>**
- Intel, Fujitsu, Siemens, NHK, Singapore Govtech, Conexxus, TU Munich, Oracle

- **<u>Target domains include:</u>**
- Smart Cities, Industrial, Transportation, Manufacturing, Logistics, Smart Grids, Home Automation, Healthcare and Medical, Retail, Smart Home, several „technology“ use cases

Use Case Categories and Domains

Multi-Vendor System Integration

- Out of the box interoperability of devices.
- Digital twin to analyze and troubleshoot physical assets in real time, predict future problems, minimize downtime, and perform simulations.
- Multi vendor and protocol interoperability by communicating across different protocols.

Accessibility

- Audiovisual Devices Acting as Smartphone Extensions
- Unified Smart Home Control and Status

Automotive

- Smart Car Configuration Management

Energy / Smart Grids

- Integrate generation, storage, grid management and consumption of energy
- **Transportation**
- Fleet management, public transport, managing shipping, air cargo, train cargo, last mile transportation.

Smart Buildings

- IoT in (commercial) buildings such as office buildings, hotels, airports, train stations and sport stadiums.
- Sensor networks for optimizing energy consumption of buildings.

Shared Devices and resources

- Standardized use of shared resources.

Use Case Categories and Domains

Retail

- Integrating and interconnecting multiple devices into common retail workflows.

Audio/Video

- Synchronise Home WoT devices with TV programs.

Agriculture

- Smart Agriculture (Greenhouse Horticulture) to create an optimal environment for growing plants.

Smart City

- Managing mobile devices and sensors in a Smart City

Health

- Monitor the health of people in public places to control the spread of infectious diseases.
- Connected devices in ICU units.
- Health Notifiers.

Manufacturing

- Monitoring production lines and plants and predicting and preventing fault conditions.

Multimodal System Integration

- Multimodal Recognition Support and synergistic Interactions.

Device lifecycle

- Common lifecycle model.

Oauth2 Flows

- Use cases for each OAuth2 flow.

Use Case Shortlisting

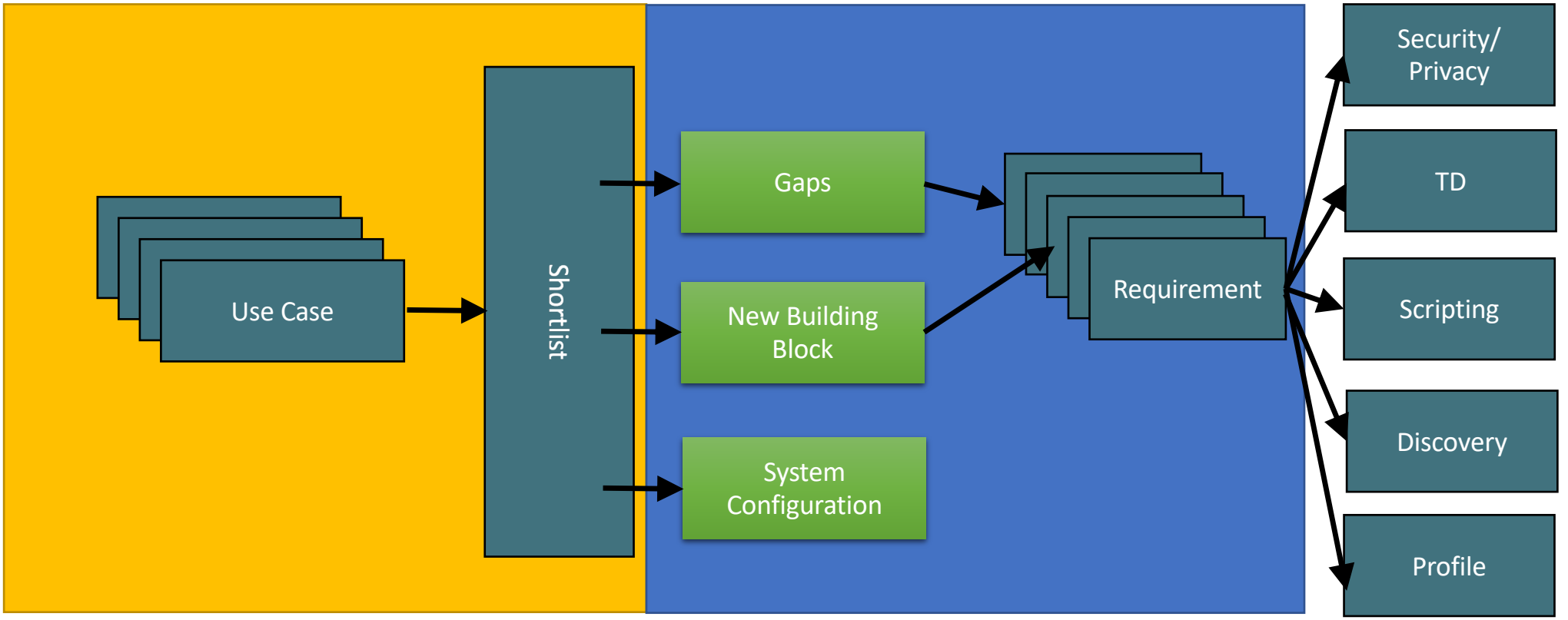
Shortlist Use cases to:

- Make sure the use cases address real market needs
- Make best use of limited resources
- Prioritize use cases that grow the IoT market and WoT adoption

Primary question:

What advantage does the use of WoT bring to spec adopters?

Architecture Discussion Process



How to shortlist use cases?

- WoT WG/IG members are requested to vote

- W3C questionnaire will be published this week.

Decision Criteria:

- Is there a champion ?
- Is there a customer ?
- Is there a product ?

Requirements

For each shortlisted use case we need a (one page) requirement document at:

https://github.com/w3c/wot-architecture/tree/master/REQUIREMENTS

Template: https://github.com/w3c/wot-architecture/blob/master/REQUIREMENTS/requirements-template.md

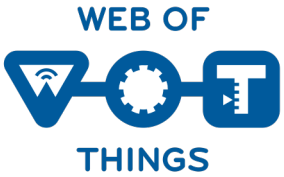
Examples are available

W3C WoT IG Use Case TF

- Recently we started a new IG TF for collecting additional UCs

- Objective
  - Collect input from a wider IoT market audience
  - Scenarios
  - Use Cases
  - Requirements

- Output:
  - IG Group Note



Lifecycle

Goal

- Describe the operational lifecycle model across different standards
  - Describe security model
  - Describe state transitions
- Align terminology
- Identify requirements on:
  - Architecture
  - Security
  - Thing description
  - Other WoT deliverables

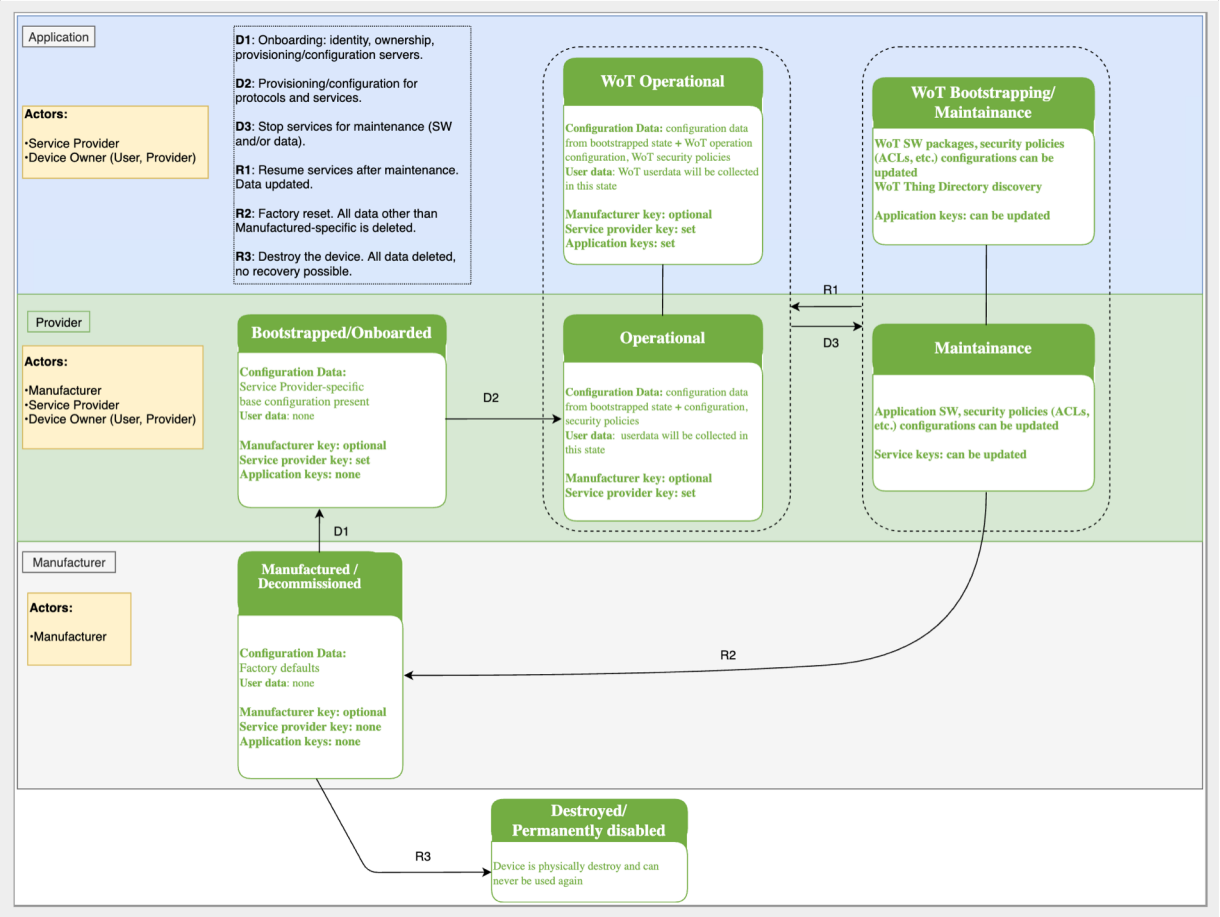
Status

- TF analyzed several lifecycle models, including:
  - OCF
  - OneM2M
  - LwM2M
  - T2TRG RFC 8576

Proposals on a unified state model is in discussion

- Agreement on fundamental states
- State names / transitions under discussion

Thing lifecycle diagram (draft)

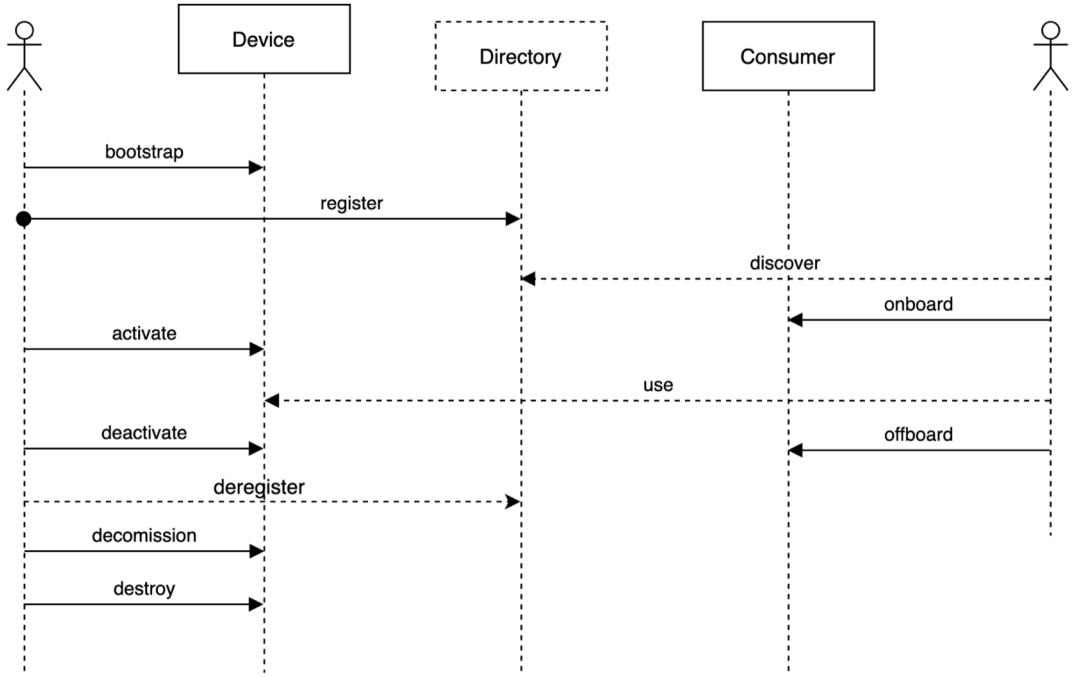


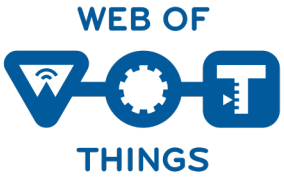
System lifecycle

- The thing lifecycle is embedded in a wider „system“ lifecycle

- System lifecycle includes:
  - Onboarding/offboarding a device to consumer(s)
  - Registering/deregistering a device with a (optional) thing directory

Example directory flows (draft)





Profiles

Motivation

- The W3C Web of Things Architecture and Web of Things Thing Description define a powerful mechanism and a format to describe myriads of very different devices, which may be connected over various protocols.

- The format is very flexible and open and puts very few normative requirements on devices that implement it.

- Use Cases require „out of the box interoperability“

- A generic client is impossible to implement.

WoT Profile

The **WoT Profile** specification serves two purposes:

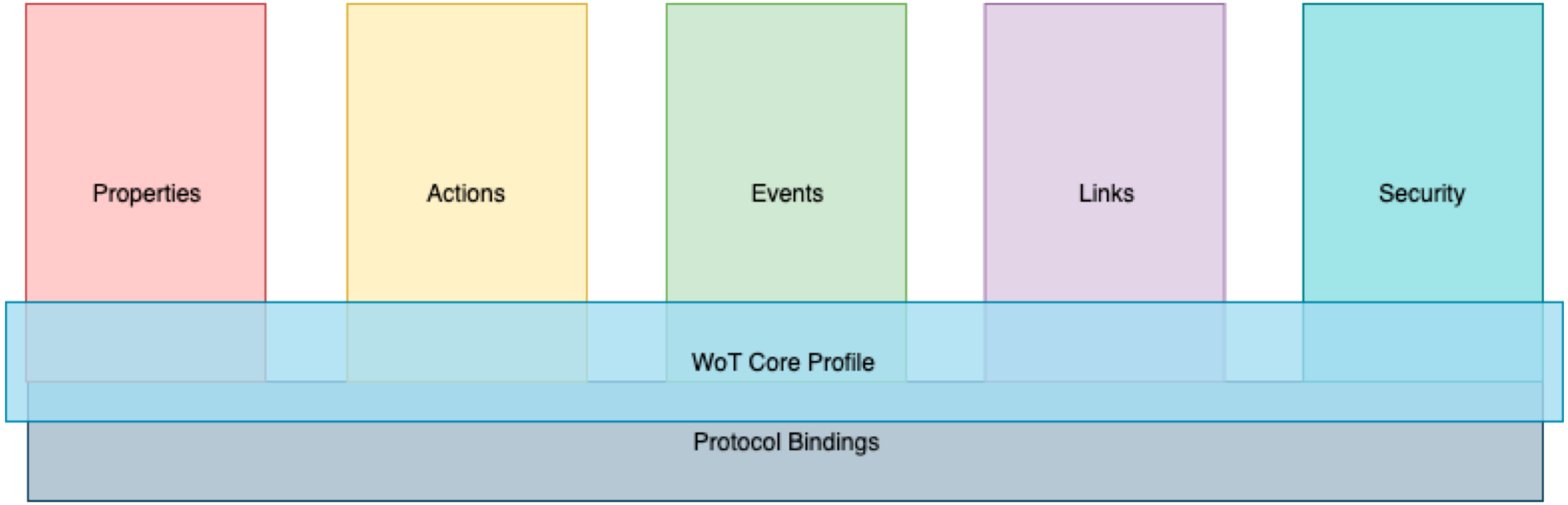
Generic Profiling Mechanism

- to describe a profile in an unambiguous way. This mechanism can be used to define additional profiles.

Core Profile

- Define a subset the Thing Description for use with selected protocols.
- Formalize the results of several plug-fests that were conducted by the WoT Interest Group and of tests that were conducted as part of the development.
- It is expected that additional profiles for thing templates and other protocols will be defined in the near future.

WoT Core Profile



Profile Status

- Last year a strawman proposal was submitted
  - Includes a generic profiling mechanism
- Architecture TF recently focused on Use Cases / Lifecycle
  - -> work stalled for several months
- Profile work will be resumed at upcoming (virtual) WoT F2F

References

- WoT Architecture
  - https://github.com/w3c/wot-architecture
- WoT Use Cases
  - https://github.com/w3c/wot-architecture/tree/master/USE-CASES
- Lifecycle Proposals
  - https://github.com/w3c/wot-architecture/tree/master/proposals/lifecycle
- Profiles
  - https://github.com/w3c/wot-profile

TF analyzed several lifecycle models, including:

OCF https://openconnectivity.org/developer/specifications/

- OCF Onboarding Tool Specification
  - 5.1, Table 1: definition of states from OBT point of view
- OCF Security Specification
  - 5.3, Figure 8: Onboarding overview
  - Sections 7 and 8

OneM2M

- Technical Report, Security 2016, Sections 11-12
- Security Solutions 2014

LwM2M Technical Specification: Core / Bootstrap

T2TRG Security (RFC 8576), Thing Lifecycle