W3C Web of Things
Summary and Status Update

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Outline

• What is WoT?
  • Applying and extending web standards for IoT
  • Descriptive interoperability: Thing Descriptions
  • Finding Thing Descriptions: Discovery
  • Use Cases and Requirements

• Recent Activity
  • Testfest/Plugfest
  • Applications

• Discussion
  • Gaps and Future Work
W3C Web of Things (WoT)

- W3C Working Group goal: Adapting web technologies to IoT
- Already published: Thing Description (TD) metadata format
  - TD describes the available interactions (network API) of a Thing
- New deliverables in progress, including Discovery
  - How does a potential user obtain the TD for a Thing?

{ properties, actions, events }
Descriptive Interoperability: TDs

WoT Architecture

- Constraints
  - "Things" must have a TD
  - Must use URIs, IANA media types, etc.
- Thing Description Affordances
  - Describes WHAT the possible choices are
  - Describes HOW to interact with the Thing

WoT Thing Description (TD)

```json
{
  "@context": [
    "https://www.w3.org/2022/wot/td/v1.1",
    {
      "iot": "http://iotschema.org/"
    }
  ],
  "id": "urn:dev:org:32473:1234567890",
  "title": "MyLEDThing",
  "description": "RGB LED torchiere",
  "@type": ["Thing", "iot:Light"],
  "securityDefinitions": {
    "default": {"scheme": "bearer"}
  },
  "security": ["default"],
  "properties": {
    "brightness": {
      "@type": ["iot:Brightness"],
      "type": "integer",
      "minimum": 0,
      "maximum": 100,
      "forms": [ ... ]
    }
  },
  "actions": {
    "fadeOut": {
      "@type": ["iot:Fade"],
      "type": "integer",
      "minimum": 0,
      "maximum": 100,
      "forms": [ ... ]
    }
  }
}
```

Door = Thing

Handle = Affordance

What? Open

How? Pull

Turn

`What?` = Thing

`How?` = Affordance
Discovery

Goal: Obtain TD of interest
• Not limited to local network
• Scalable to many TDs
• Need to preserve privacy
• Phased access:
  1. Introduction: open
  2. Exploration: controlled
• Searchable via JSON Path, XPath, or SPARQL
• Future work:
  • Find "nearby" Things using geospatial data

Phase 1: Introduction

Phase 2: Exploration

2022-03-09
Orchestration

Node-RED/node-gen

```javascript
WoTHelpers.fetch("coap://localhost:5683/counter").then(async (td) => {
  // using await for serial execution (note 'async' in then() of fetch())
  try {
    const thing = await WoT.consume(td);
    console.info("=== TD ===");
    console.info(td);
    console.info("==========");
    // read property #1
    const read1 = await thing.readProperty("count");
    console.info("count value is", await read1.value());
    // increment property #1 (without step)
    await thing.invokeAction("increment");
    const inc1 = await thing.readProperty("count");
    console.info("count value after increment #1 is", await inc1.value());
    // increment property #2 (with step)
    await thing.invokeAction("increment", {'step' : 3});
    const inc2 = await thing.readProperty("count");
    console.info("count value after increment #2 (w/ step 3) is", await inc2.value());
    // decrement property
    await thing.invokeAction("decrement", undefined, {
      formIndex: getFormIndexForDecrementWithCoAP(thing);
    });
    const dec1 = await thing.readProperty("count");
    console.info("count value after decrement is", await dec1.value());
  } catch(err) {
    console.error("Script error:", err);
  }
}).catch( (err) => {
  console.error("Fetch error:", err);
});
```
Use Cases and Requirements

Informative Deliverable: https://github.com/w3c/wot-usecases

Purpose and Process:
• Identify specific use cases
• Identify application domains
  • Collect use cases from other W3C groups
  • Collect use cases from other stakeholders and SDOs
• Identify usage patterns
  • For example, hubs, proxies, automation, etc.
• Identify relevant technologies
  • For example, edge computing, digital twins, etc.

→ Extract common requirements to drive current and future work
Use Cases / Requirements Process

- Use Case TF (IG)
- Shortlist
- Gaps
- New Building Block
- System Architecture / Configuration

Spec creation (WG)
- Security
- TD
- Scripting
- Discovery
- Profile

WoT Deliverables
Deliverables

New/Updated Normative Documents:
• Architecture 1.1: https://github.com/w3c/wot-architecture
• Thing Description 1.1: https://github.com/w3c/wot-thing-description
• Discovery: https://github.com/w3c/wot-discovery
• Profiles: https://github.com/w3c/wot-profile

New/Updated Informative Documents:
• Binding Templates: https://github.com/w3c/wot-binding-templates
• Scripting API: https://github.com/w3c/wot-scripting-api
• Use Cases and Requirements: https://github.com/w3c/wot-usecases

Community Resources:
• Web Site: https://www.w3.org/WoT/
Recent Activity

• Upcoming Plugfest/Testfest: March 14-18
  • [https://github.com/w3c/wot-testing/tree/main/events](https://github.com/w3c/wot-testing/tree/main/events)

• New Commercial Usages
  • Takenaka Construction – Smart Building Information Management systems
  • Netzo – IoT dashboards and device management

• Directory Implementations
  • WoT Hive, LogiLab (SPARQL based), Fraunhofer LinkSmart

• IETF Relationships: JSON Path, CoreRD, COSE/JOSE, ASDF

• Under Discussion:
  • Geospatial data, Embedded JSON Signatures
  • New Charters/New Deliverables
Applications

- Takenaka Corporation
  - CGLL Platform - BIM
  
- Siemens
  - Desigo CC – BIM
  - Say WoT!

- Netzo
  - IoT Data Hub
  - Dashboards

- Bosch
  - Eclipse Ditto - Digital twin

Links:
- [Takenaka Corporation](https://www.takenaka.co.jp/news/2021/05/02/)
- [Siemens Say WoT!](https://www.evosoft.com/en/digitalization-offering/saywot/)
- [Netzo IoT Data Hub](https://netzo.io/)
- [Bosch Eclipse Ditto](https://www.eclipse.org/ditto/2022-03-03-wot-integration.html)
Gaps and Discussion

• GIS Integration
  • Geospatial data and discovery

• Data Management
  • Digital Twins and shadows
  • Event notifications
  • Data management

• Security
  • Key provisioning and onboarding
  • Secure LAN access
  • Proxy services
  • Access control and ad-hoc sharing
  • MUDS

• Accessibility
  • Sensory modality mapping
  • Textual/descriptive interfaces
  • Service location
  • Mobility services

• Advanced Use Cases
  • Transportation
  • Logistics
  • Distributed energy management
  • AR visualization
  • Analytics integration e.g. for health and safety monitoring
Resources and Contacts

https://www.w3.org/WoT

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