SDF and WoT Conversion

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T2TRG Virtual Summary Meeting, December 12, 2022

Current state of WoT specification process

- Current charter period lasts until January 31, 2023
  - Will probably be extended by three months
- Updated documents:
  - WoT TD 1.1
  - WoT Architecture 1.1
- Newly standardized document:
  - WoT Discovery 1.0
- Transitions to Candidate Recommendations this week
- Transition to Proposed Recommendations in March

Current state of WoT specification process

- New charter begins in May
  - Publishing of postponed Profile specification
  - Major updates to existing documents (e.g., TD 2.0)
  - New topics, such as a stronger focus on protocol bindings
- Current schedule: https://github.com/w3c/wot/blob/main/charters/wg-2021-extension-plan.md

Mapping between SDF and WoT

Motivation for Conversion between SDF and WoT

- WoT as an interesting conversion target for SDF
  - SDF focuses on interoperability between ecosystems/data models
  - WoT TD focuses on interoperability between instances/devices
  - → Both approaches complement each other
- However: Lack of a “canonical” mapping between the two specifications

Similarities between SDF and WoT TD

- Serialization format: JSON
- Interaction affordances
  - Properties
  - Actions
  - Events
- JSO-inspired data schemas and data qualities

Simple Conversion Example

SDF Model

```
{
    "sdfObject": {
        "Lamp": {
            "label": "Smart Lamp"
            "sdfProperty": {
                "status": {
                    "type": "string",
                    "description":
"Status of the lamp."
                }
            }
        }
    }
}
```

WoT Thing Description

```
{
    "@context": "...",
    "title": "Smart Lamp",
    "security”: [...],
    "properties":
        "status": {
            "type": "string",
            "description": "Status of the
lamp.",
            "forms”: [...]
        }
    }
  }
}
```

How can we map WoT-specific vocabulary to SDF?

SDF Mapping Files (with WoT TD terms)

SDF Model

```
{
    "sdfObject": {
        "Lamp": {
            "label": "Smart Lamp"
            "sdfProperty": {
                "status": {
                    "type": "string",
                    "description": "Status of
the lamp."
                }
            }
        }
    }
}
```

SDF Mapping File

```
{
    "map": {
        "#/sdfObject/Lamp": {
             "@context": "...",
             "security”: [...]
        },
        "#/sdfObject/Lamp/sdfProperty/status": {
            "forms”: [...]
        }
    }
}
}
```

How can we map (abstract) SDF models to WoT?

SDF ⇋ Thing Model Conversion

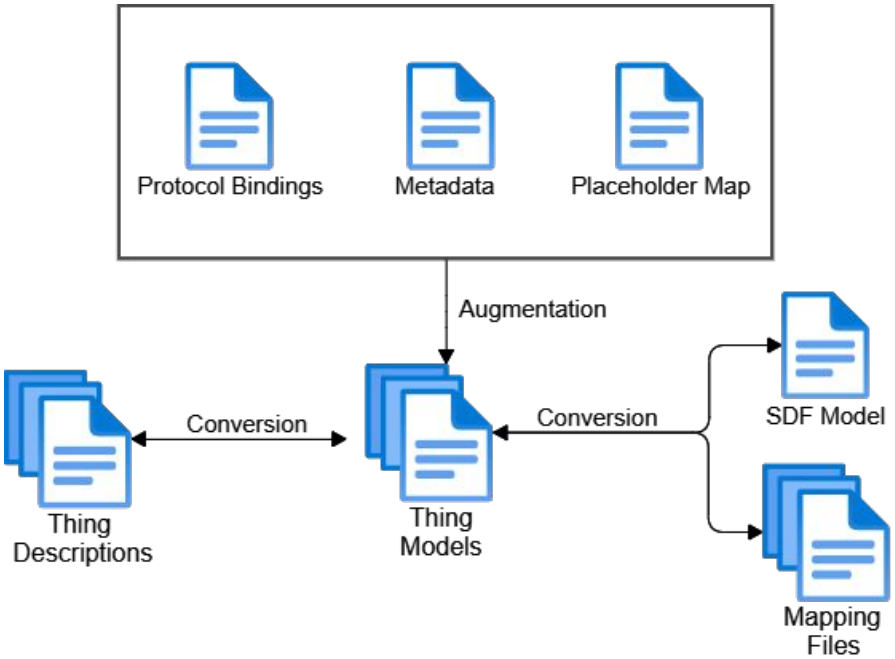
SDF Model

```
{
    "sdfObject": {
        "Lamp": {
            "label": "Smart Lamp"
            "sdfProperty": {
                "status": {
                    "type": "string",
                    "description":
"Status of the lamp."
                }
            }
        }
    }
}
```

WoT Thing Model

```
{
    "@context": "...",
    "@type": "tm:ThingModel",
    "title": "Smart Lamp",
    "properties":
        "status": {
            "type": "string",
            "description": "Status of
the lamp."
        }
     }
  }
}
```

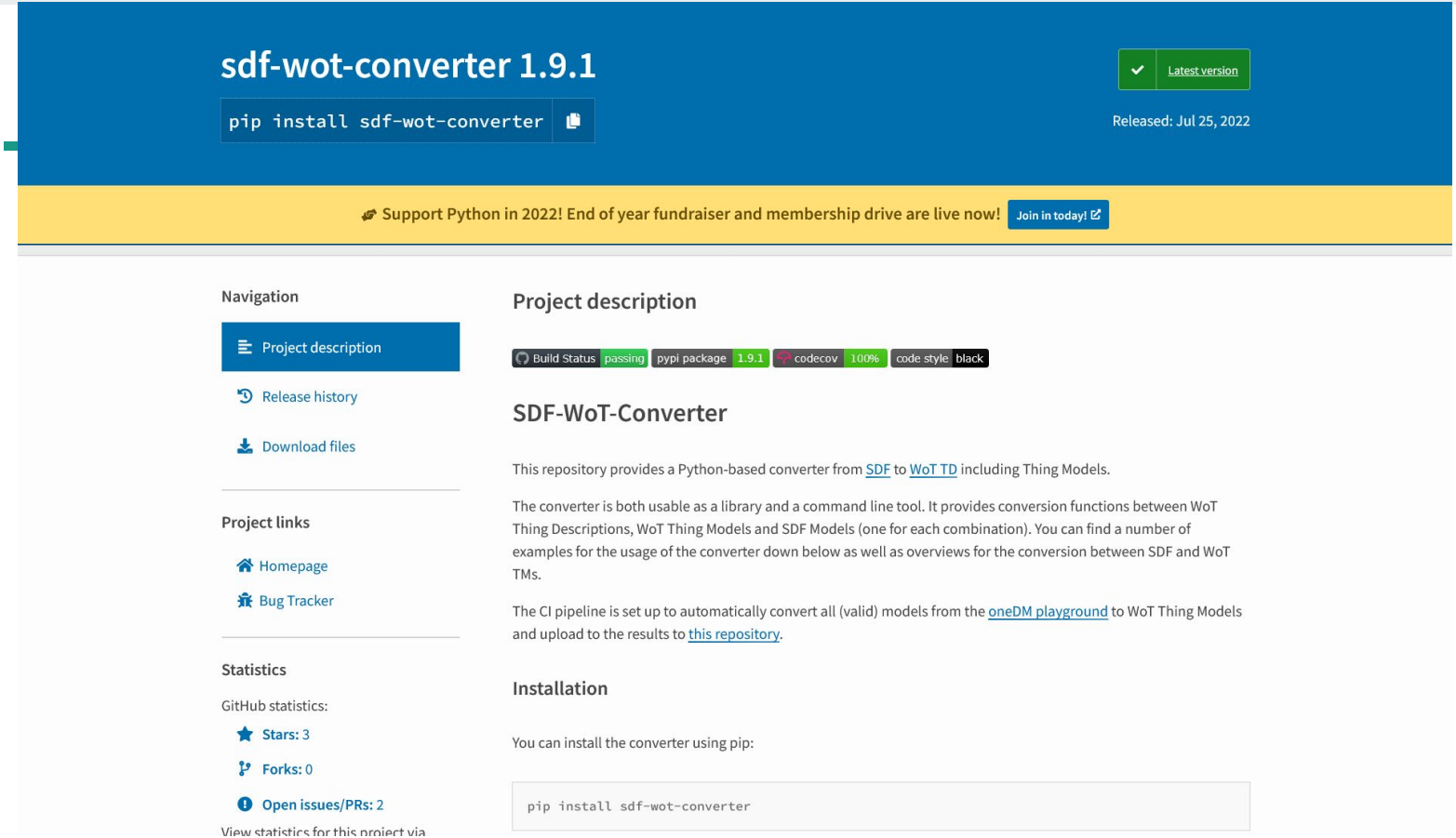
Conversion Process



Challenges

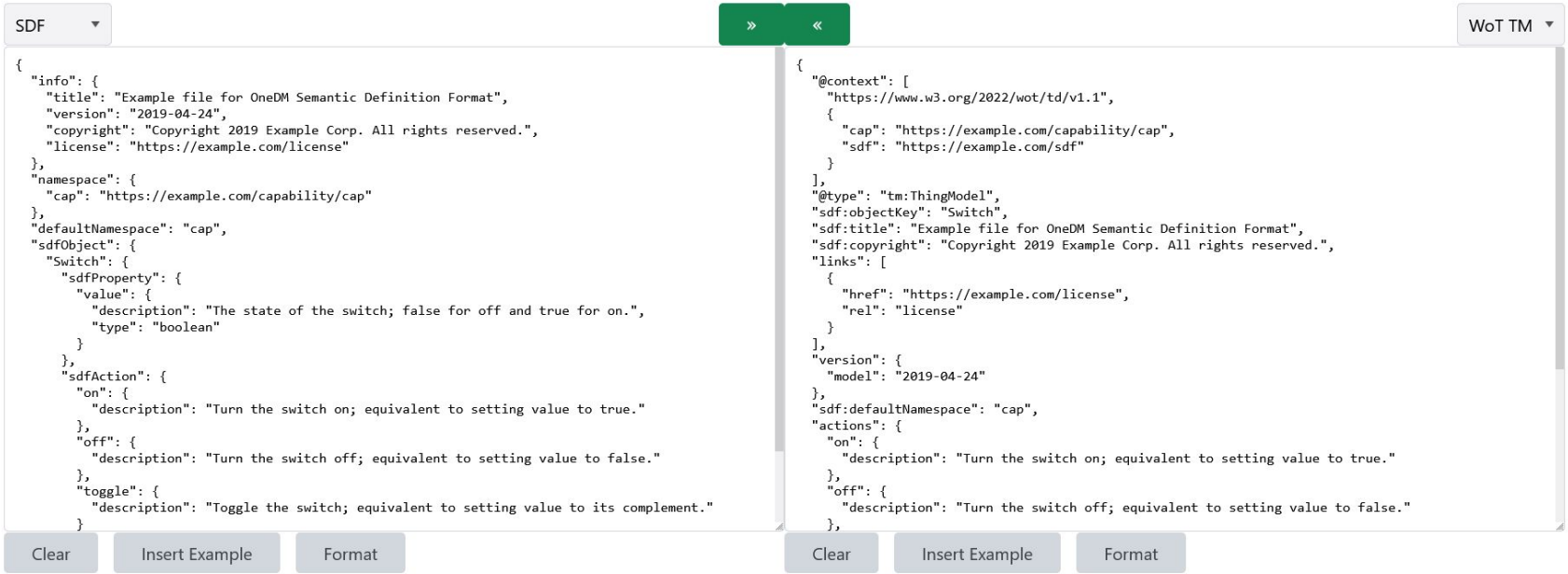
- Nested Models/composition
  - WoT uses linking approach for creating hierarchies
  - Slight adjustments to the sdfThing class were needed
  - Use of TM/TD “Collections”
- Roundtripping
  - Use of keys prefixed with sdf: in WoT documents
  - Not possible when resolving external references

Converter Implementation



https://github.com/JKRhb/sdf-wot-converter-py

SDF WoT converter



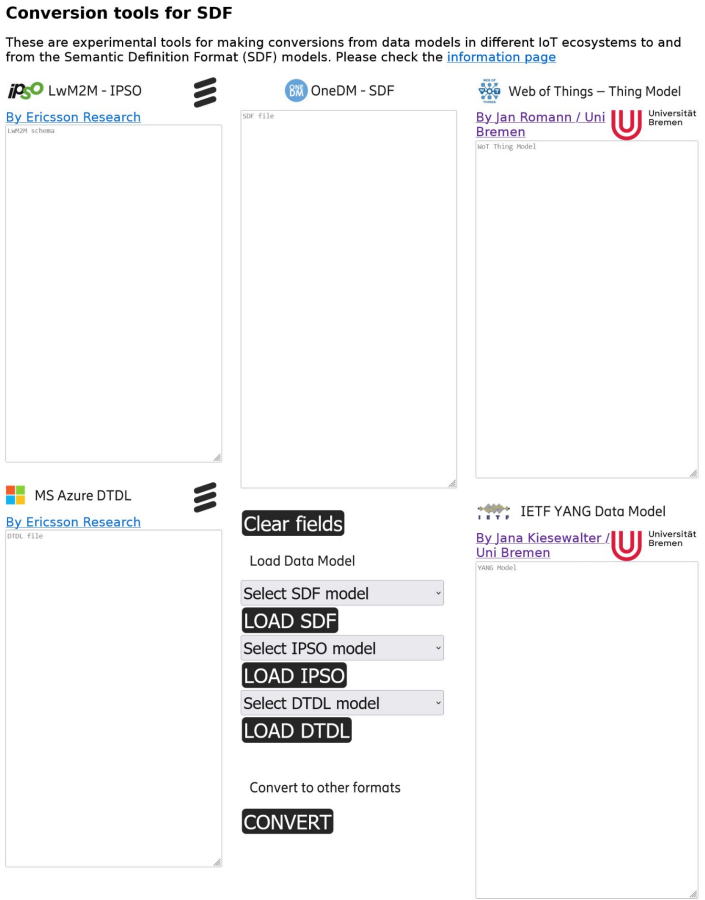
Settings

Output SDF Mapping files Include additional fields for roundtripping

https://sdfwotconverter.pythonanywhere.com/

SDF Conversion Tool Collection

http://wishi.nomadiclab.com/sdf-converter/



Conclusion and Outlook

Conclusion and Outlook

- WoT and SDF can be mapped to each other
  - Additional concepts such as SDF mapping files are needed
  - WoT TMs as intermediaries
- Flexible converter implementation in Python
  - Library, CLI tool, and web interface
- However: More standardization work needed
  - “Canonical” mapping specification?
  - WoT Linking/sdfRelations
  - Nested TMs/TDs in a single document?

Backup

Roundtripping

SDF (sdfChoice)

```
{
  ...,
  "sdfChoice": {
    "foo": {
      "const": 2
  },
  "bar": {
    "const": 5
  }
}
```

WoT (enum)

```
{
  ...,
  "enum": [
    {
      "sdf:choiceName": "foo",
      "const": 2
    },
    {
      "sdf:choiceName": "bar",
      "const": 5
    }
  ]
}
```

Composition: TM/TD Collections

```
{
    "model1": {
        "@context": "https://www.w3.org/2022/wot/td/v1.1",
        "links": [{ "href": "#/model2", "rel": "tm:submodel" }]
    },
    "model2": {
        "@context": "https://www.w3.org/2022/wot/td/v1.1",
        "title": "This is a submodel!"
    }
}
```

Conversion of Nested Models

SDF Model (old)

```
{
    "sdfThing": {
        "TopLevel": {
            "sdfObject": {
                "SecondLevel": {
                    ...
                }
            }
        }
    }
}
```

WoT "TM Collection"

```
{
    "TopLevel": {
        ...,
        "properties": { ... },
        "links": [
            {
                "href": "#/SecondLevel",
                "rel": "tm:submodel"
            }
        ]
    },
    "SecondLevel": {
        ...
    }
}
```

Extension of sdfThing with Affordances

SDF Model (new)

```
{
    "sdfThing": {
        "TopLevel": {
            "sdfProperty": {
                ...
            },
            "sdfObject": {
                "SecondLevel": {
                ...
                }
            }
        }
    }
}
```

WoT "TM Collection"

```
{
    "TopLevel": {
        ...,
        "properties": { ... },
        "links": [
            {
                "href": "#/SecondLevel",
                "rel": "tm:submodel",
            }
        ]
    },
    "SecondLevel": {
        ...
    }
}
```