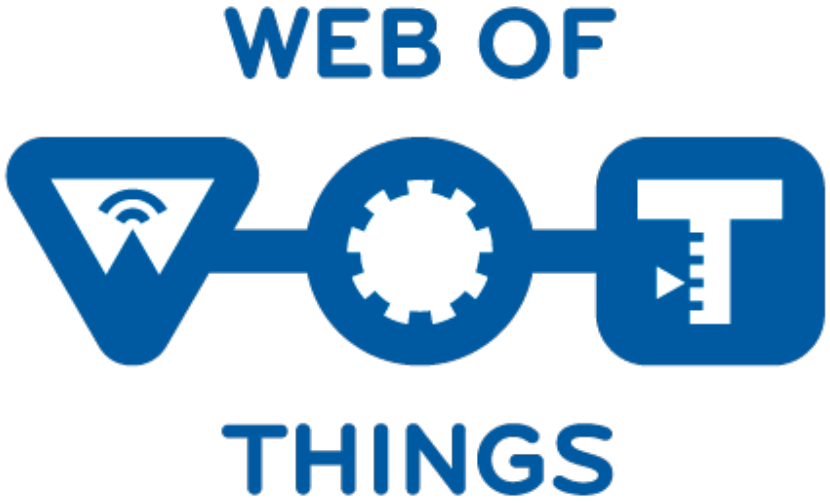

Thing Description Directory Syntactic Discovery Search

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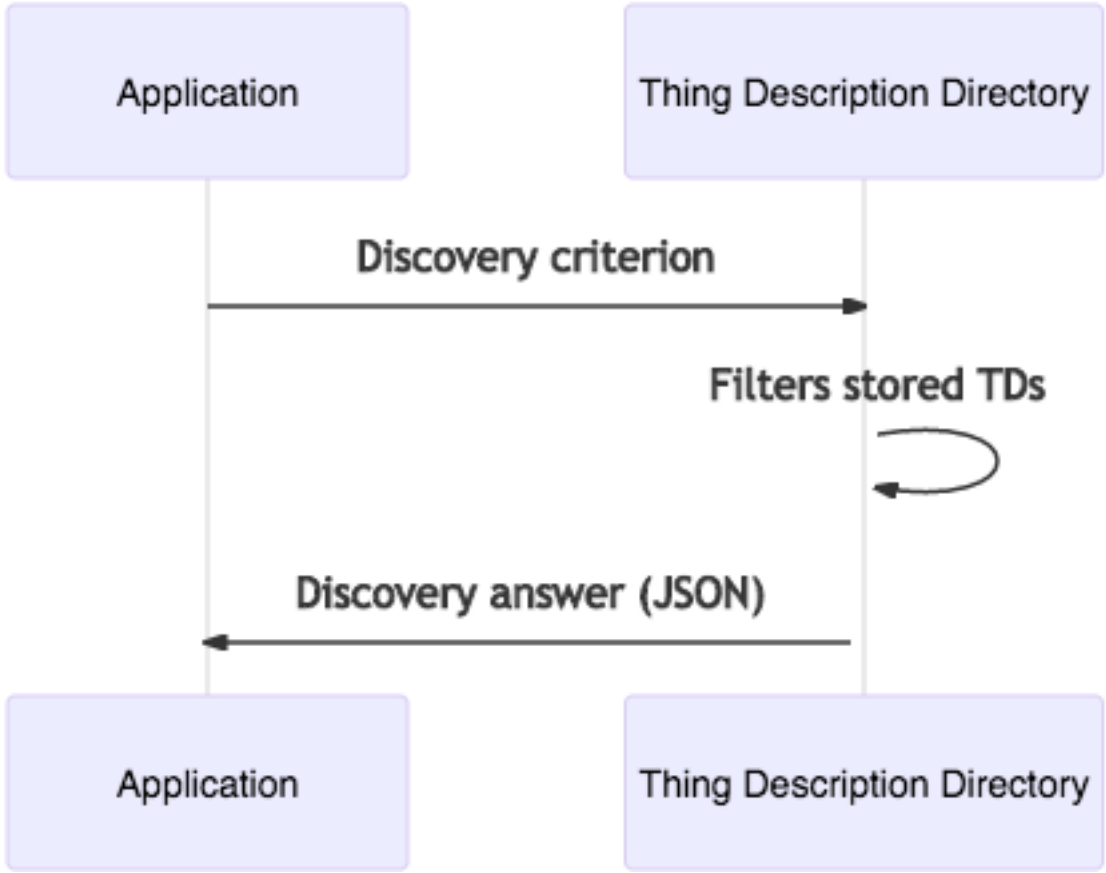
Oct 20, 2020

Discovery in a nutshell



Thing Description Directory (TDD) and discovery

- TDD syntactic discovery criterion:
  - (Syntactic discovery) MUST support JSONPath as discovery criterion
  - (Syntactic discovery) SHOULD support XPath as discovery criterion

- TDD semantic discovery criterion:
  - (Semantic discovery) May support SPARQL as discovery criterion

- TDD discovery answer:
  - A set (array) of Thing Descriptions (TD) meeting the criterion are found
  - A set (array) of Thing Descriptions (TD) fragments fulfilling the criterion are found
  - Discovery results could be paginated (depending on the discovery criterion)

JSONPath syntactic discovery API

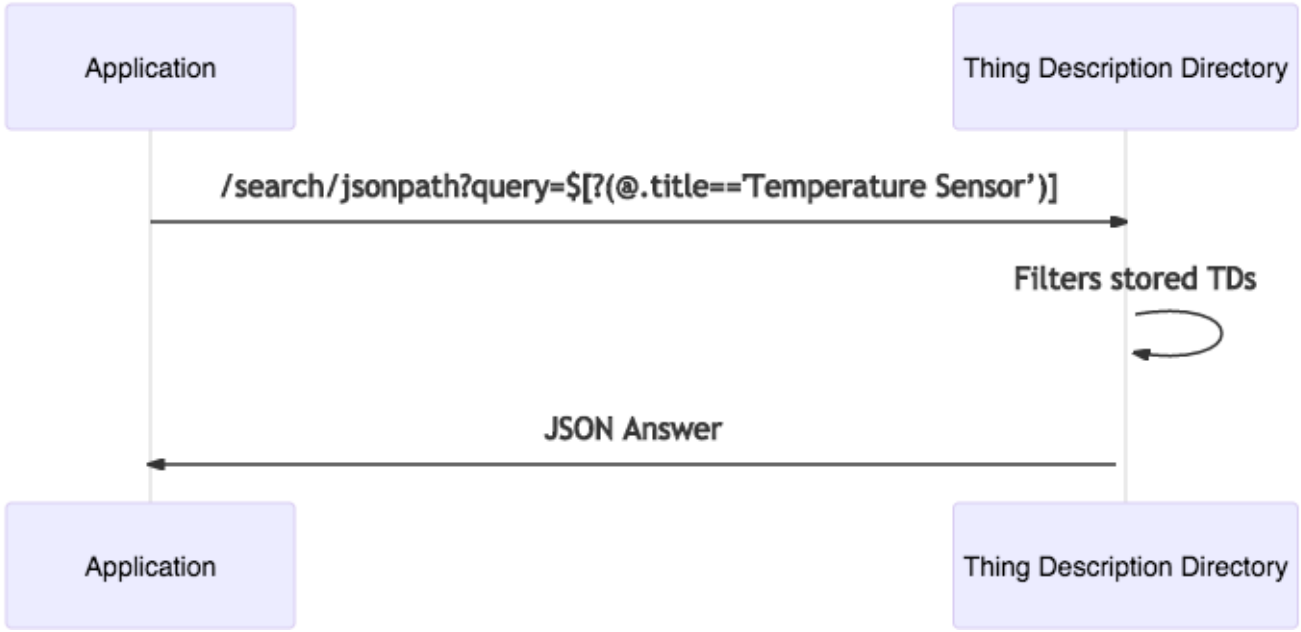
- The discovery criterion is JSONPath
  - https://tools.ietf.org/id/draft-goessner-dispatch-jsonpath-00.html
  - Not standard, widely used

- Response code:
  - 200 (Ok) with application/json Content-Type header

- Error codes:
  - 400 (Bad Request): JSONPath expression not provided or contains syntax errors.
  - 401 (Unauthorized): No authentication.
  - 403 (Forbidden): Insufficient rights to the resource.

JSONPath syntactic discovery API example

```
...
 "searchJSONPath": {
       "description": "Json Path syntactic search",
       "uriVariables": {
        "query": {
         "title": "A valid Json Path expression",
         "type": "string",
         "format": "iri-reference"
        }
       },
       "forms": [
        {
         "href": "/search/jsonpath?query={query}",
         "htv:methodName": "GET",
         "response": {
          "description": "Success response",
          "htv:statusCodeValue": 200
         },
        "scopes": "search"
        }
       ]
     },
    ...
```



JSONPath syntactic discovery API example

```
...
 "searchJSONPath": {
       "description": "Json Path syntactic search",
       "uriVariables": {
        "query": {
         "title": "A valid Json Path expression",
         "type": "string",
         "format": "iri-reference"
        }
       },
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         "href": "/search/jsonpath?query={query}",
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         "response": {
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          "htv:statusCodeValue": 200
         },
        "scopes": "search"
        }
       ]
     },
    ...
```
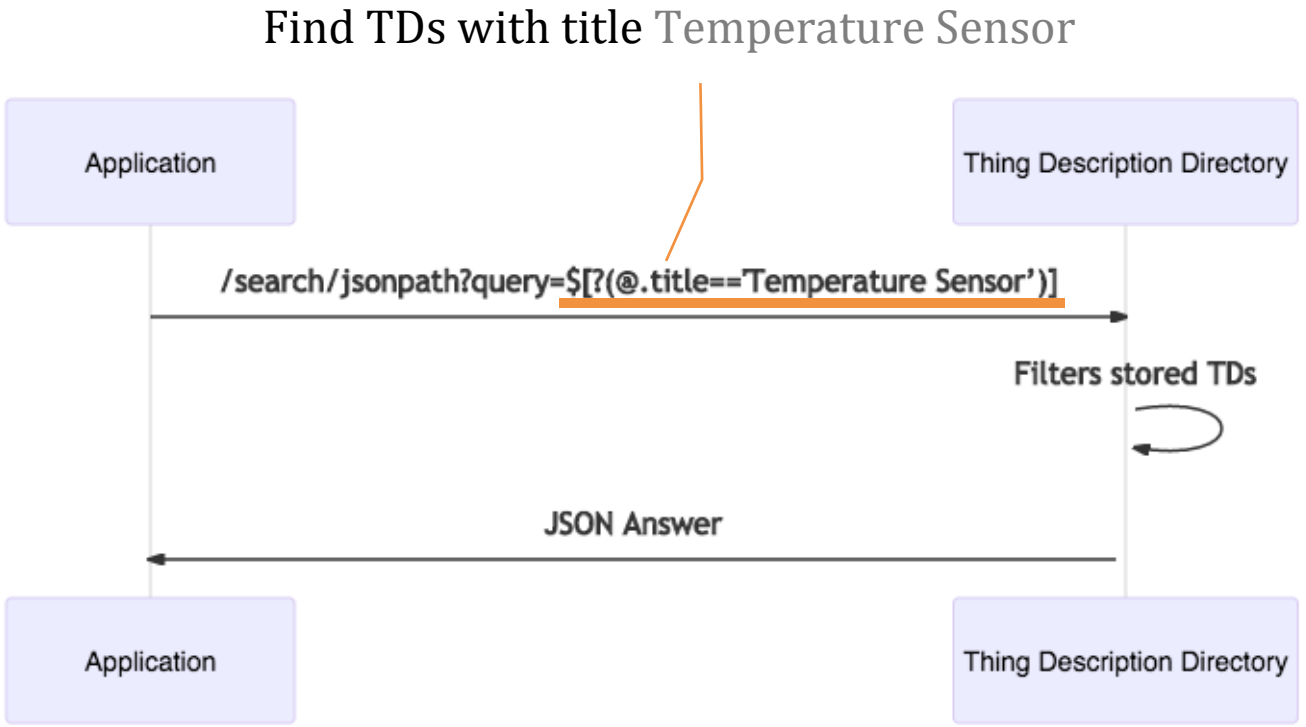
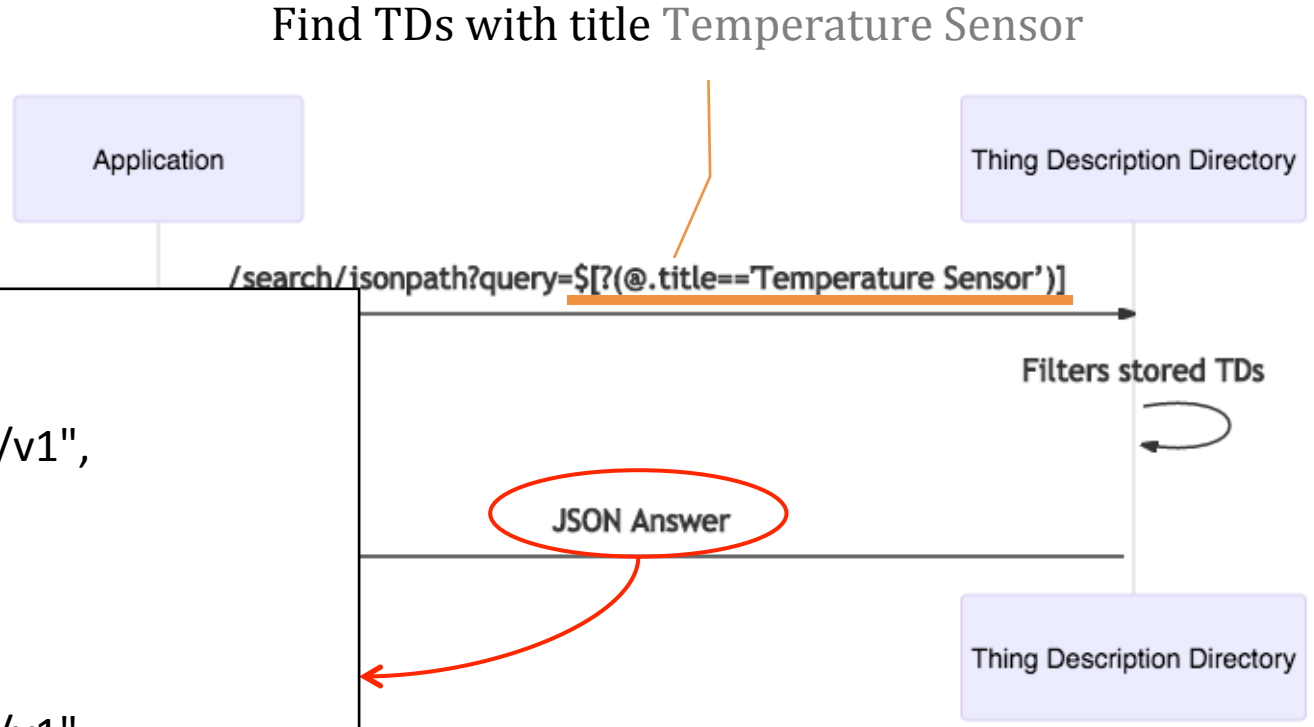



JSONPath syntactic discovery API example

```
...
 "searchJSONPath": {
      "description": "Json Path syntactic search",
      "uriVariables": {
       "query": {
        "title": "A valid Json Path expression",
        "type": "string",
        "format": "iri-reference"
```

```
[
    {
      "@context":"https://www.w3.org/2019/wot/td/v1",
       "id":"urn:example:1234",
       "title": “Temperature Sensor"
       ...
    }, {
      "@context":"https://www.w3.org/2019/wot/td/v1",
       "id":"urn:example:9856",
       "title": “Temperature Sensor"
      ...
    }, ....
 ],
```



Discovery answer is an array of TDs

Syntactic discovery with XPath

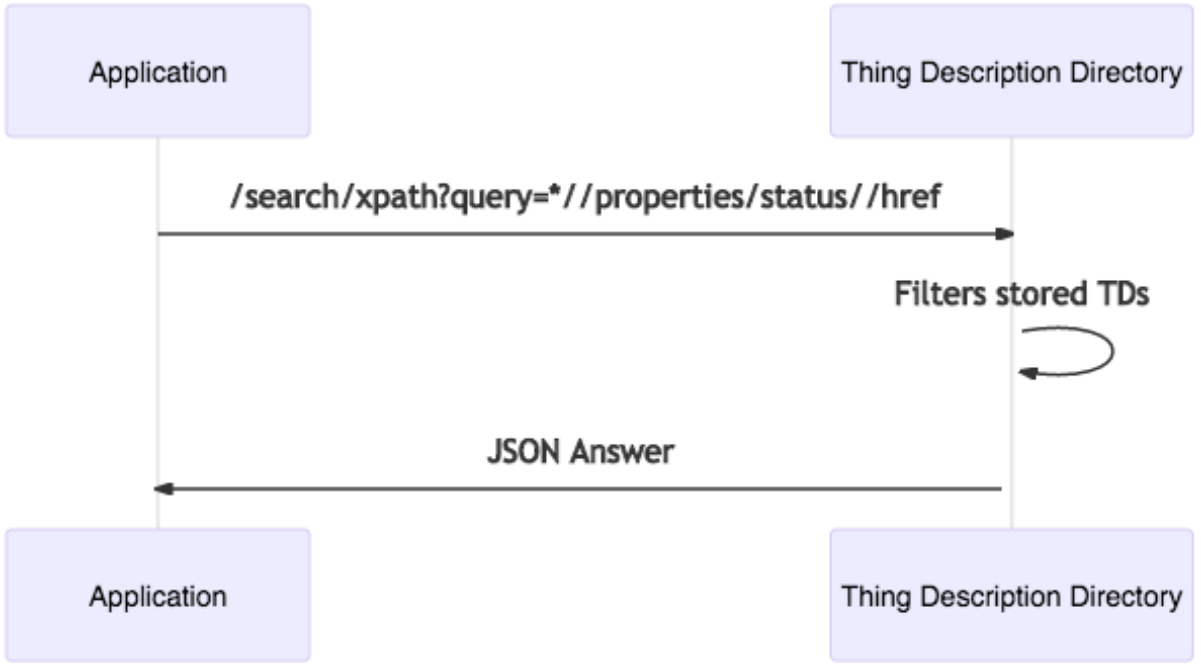
- The discovery criterion is XPath
  - https://www.w3.org/TR/xpath-31/
  - W3C standard

- Response code:
  - 200 (Ok) with application/json Content-Type header

- Error codes:
  - 400 (Bad Request): XPath expression not provided or contains syntax errors.
  - 401 (Unauthorized): No authentication.
  - 403 (Forbidden): Insufficient rights to the resource.
  - 501 (Not Implemented): XPath API not supported.

XPath syntactic discovery API example

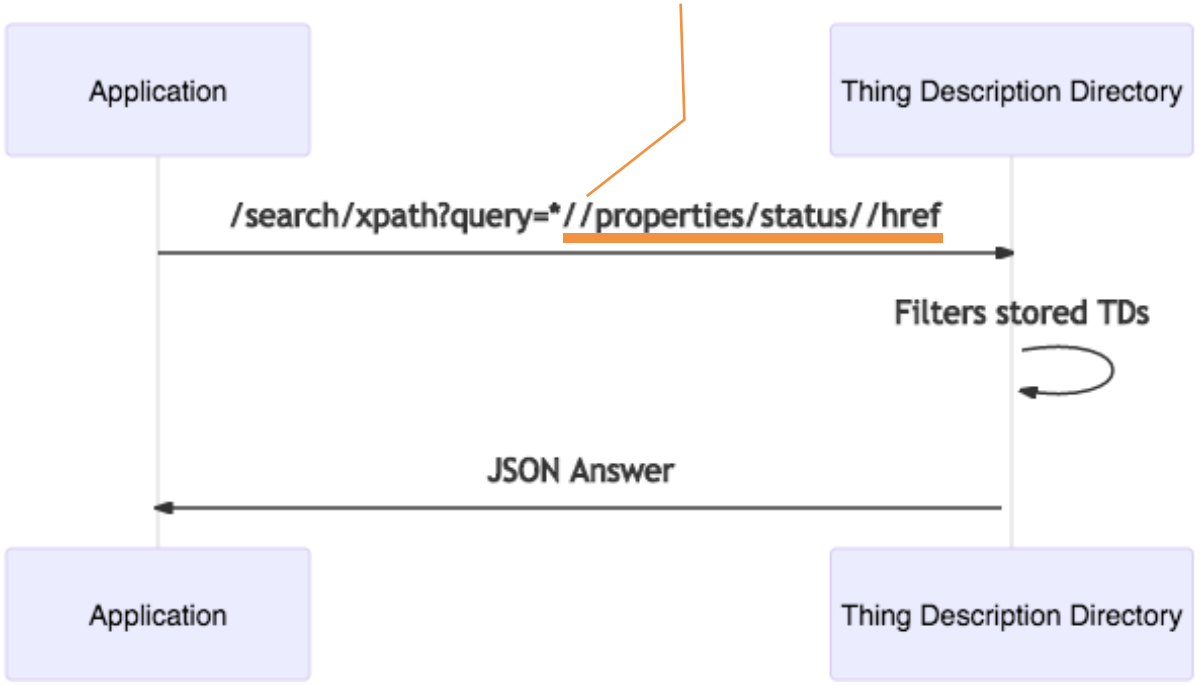
```
...
"searchXPath": {
        "description": "XPath syntactic search",
        "uriVariables": {
          "query": {
            "title": "A valid XPath expression",
            "type": "string",
            "format": "iri-reference"
          }
        },
        "forms": [
          {
            "href": "/search/xpath?query={query}",
            "htv:methodName": "GET",
            "response": {
              "description": "Success response",
              "htv:statusCodeValue": 200
            },
           "scopes": "search"
          }
        ]
      },
...
```



XPath syntactic discovery API example

```
...
"searchXPath": {
        "description": "XPath syntactic search",
        "uriVariables": {
          "query": {
            "title": "A valid XPath expression",
            "type": "string",
            "format": "iri-reference"
          }
        },
        "forms": [
          {
            "href": "/search/xpath?query={query}",
            "htv:methodName": "GET",
            "response": {
              "description": "Success response",
              "htv:statusCodeValue": 200
            },
           "scopes": "search"
          }
        ]
      },
...
```

Find values of href in property named status from all TDs



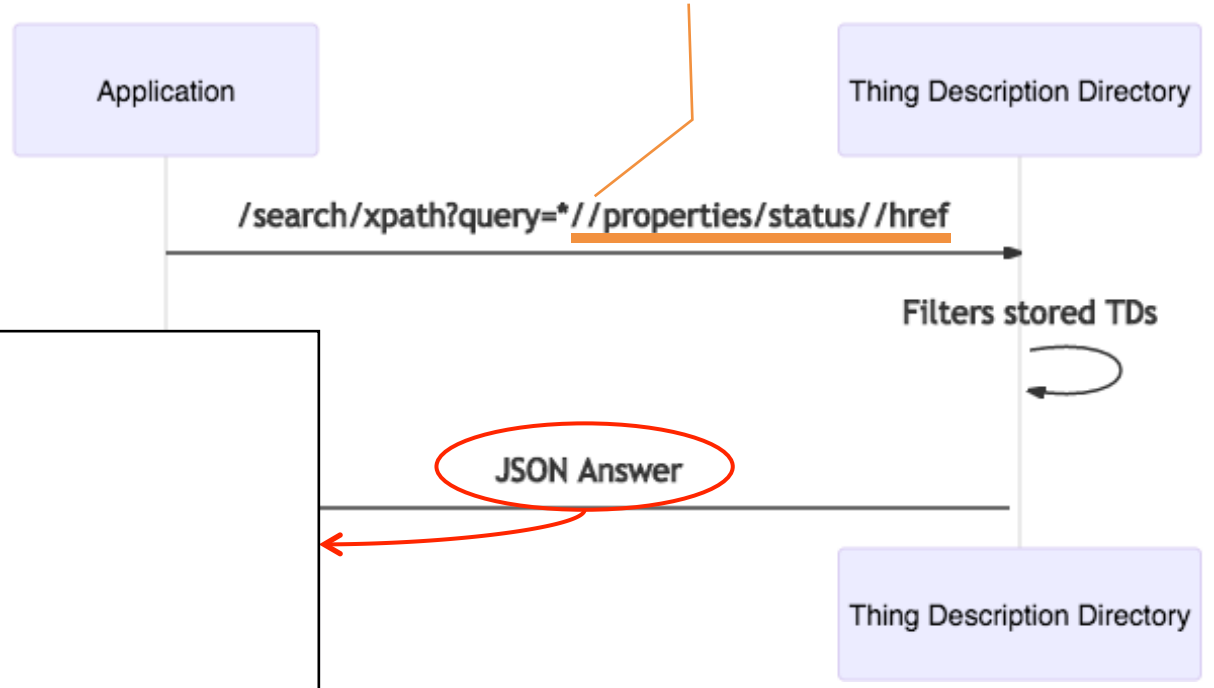
XPath syntactic discovery API example

```
...
"searchXPath": {
        "description": "XPath syntactic search",
        "uriVariables": {
          "query": {
            "title": "A valid XPath expression",
            "type": "string",
            "format": "iri-reference"
          }
        },
        "forms": [
```

```
[
  "https://example-1.com/sensor1/status",
  "https://example-2.com/sensor1/status",
  "https://example-3.com/sensor1/status",
  "https://example-4.com/sensor1/status",
  "https://example-5.com/sensor1/status",
]
```

```
        ]
      },
...
```

Find values of href in property named status from all TDs



Discovery answer is an array of TD fragments

Example syntactic discovery queries

Description	JSONPath query	XPath query
TDs with title Terrace Temperature Sensor	$[?(@.title=='Terrace Temperature Sensor')]	*[title='Terrace Temperature Sensor']
TDs with title ending with Temperature Sensor	$[?(@.title=~/.*Temperature Sensor/)	*[ends-with(title, 'Temperature Sensor')]
TDs with title ending with Temperature Sensor and created in March 2020	$[?(@.title=~/.*Temperature Sensor/ && @.created=~/2020-03-10/)]	*[ends-with(title, 'Temperature Sensor') and starts-with(created, '2020-03-10')]
TDs with form href values starting with http	not supported by the library	*[*/*/forms/*[starts-with(href, 'http')]]
TDs with version.v:hardware (namespace: v) equal to "1.0"	$[?(@.version.'v:hardware'=='1.0')	??
Second to fourth TD	$[2:4]	*[position()>=2 and position()<4]

More examples: https://github.com/linksmart/thing-directory/wiki/Query-Language

Pros and Cons of JSONPath and XPath

- Pros
  - Short and expressive
  - Passed as URL query parameters
  - Value/object selection saves both client and server resources
  - XPath is a standard

- Cons
  - TD fragments responses are not JSON-LD compliant
  - Complex queries can get verbose and messy
  - JSONPath not a standard

Conclusion

- Syntactic discovery allows to filter registered TDs using:
  - (MUST) JSONPath
  - (SHOULD) XPath
- Discovery answers are always a JSON:
  - Array of TDs
  - Array of TD fragments

- Privacy & Security
  - Discovery is binded to security and privacy policies defined in a TDD