Software System Architectures (NSWI130)

Interoperability

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Interoperability Quality Attribute

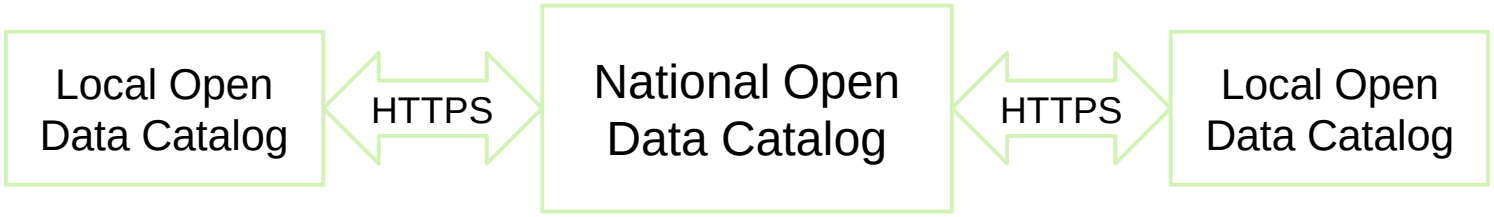
Degree to which two or more systems can usefully exchange meaningful information via their interfaces in a given context.

Interoperability Levels

- technical interoperability

Interoperability Levels

- technical interoperability - HTTPS



Interoperability Levels

- technical interoperability
- syntactic interoperability

Interoperability Levels

- syntactic interoperability - DCAT, DCAT-AP

```
<https://data.mvcr.gov.cz/zdroj/datové-sady/rpp/orgány-veřejné-moci>
  a dcat:Dataset ;
  dct:title "Orgány veřejné moci"@cs ;
  dct:publisher
    <https://rpp-opendata.egon.gov.cz/odrpp/zdroj/orgán-veřejné-moci/00007064> ;
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    <http://publications.europa.eu/resource/authority/frequency/DAILY> ;
  dct:spatial
     <http://publications.europa.eu/resource/authority/country/CZE> ;
  dcat:keyword "orgány veřejné moci"@cs, "registr práv a povinností"@cs ;
  dcat:theme
     <http://publications.europa.eu/resource/authority/data-theme/GOVE> .
```

Interoperability Levels

- technical interoperability
- syntactic interoperability
- semantic interoperability

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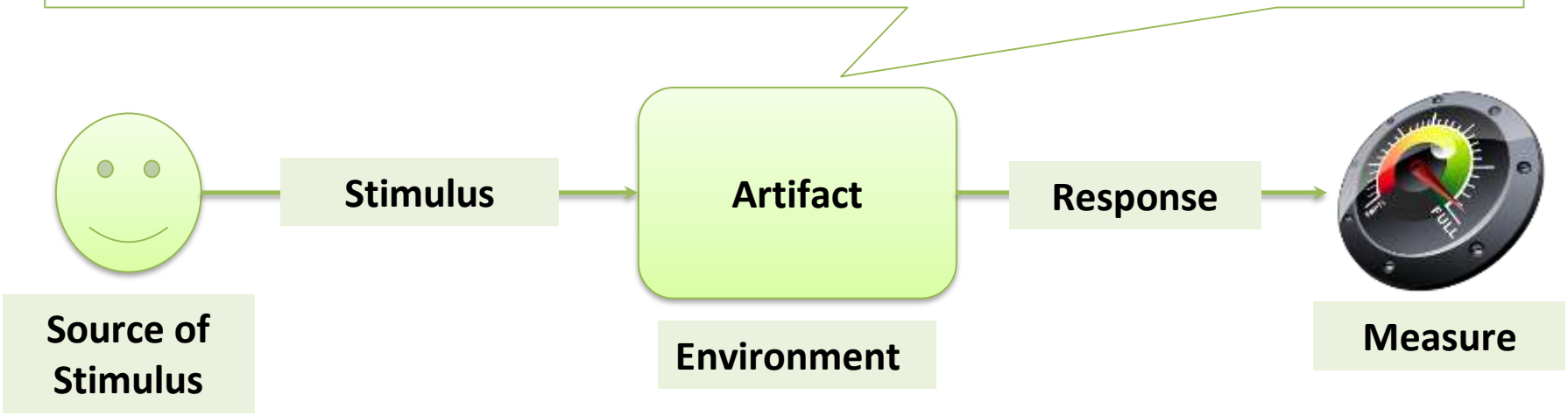
  dcat:theme
     <http://publications.europa.eu/resource/authority/data-theme/GOVE> .
```

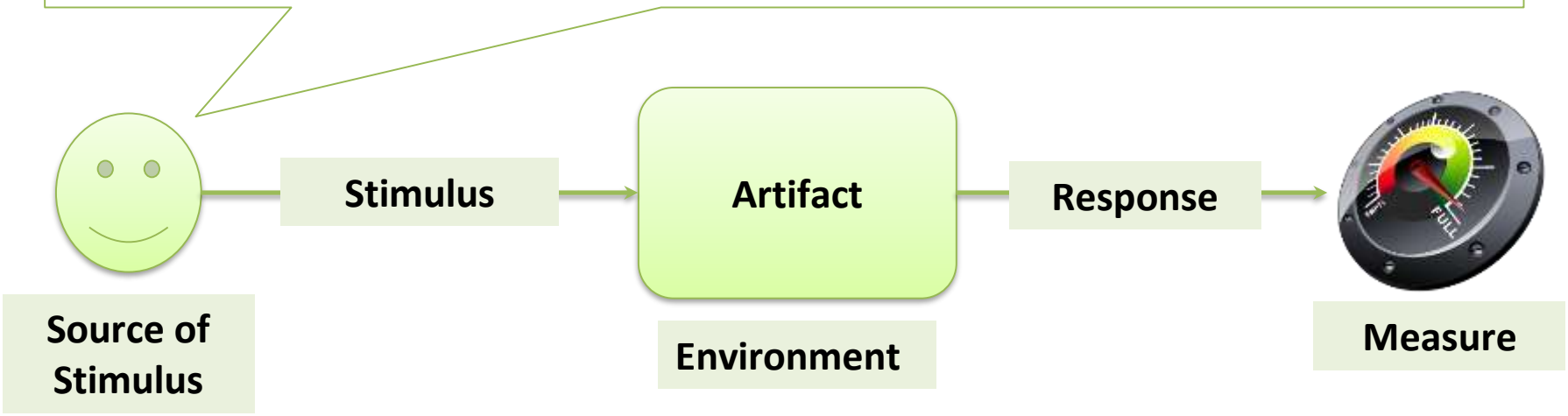
Interoperability Requirement Scenario

- our system or its part which needs to be interoperable



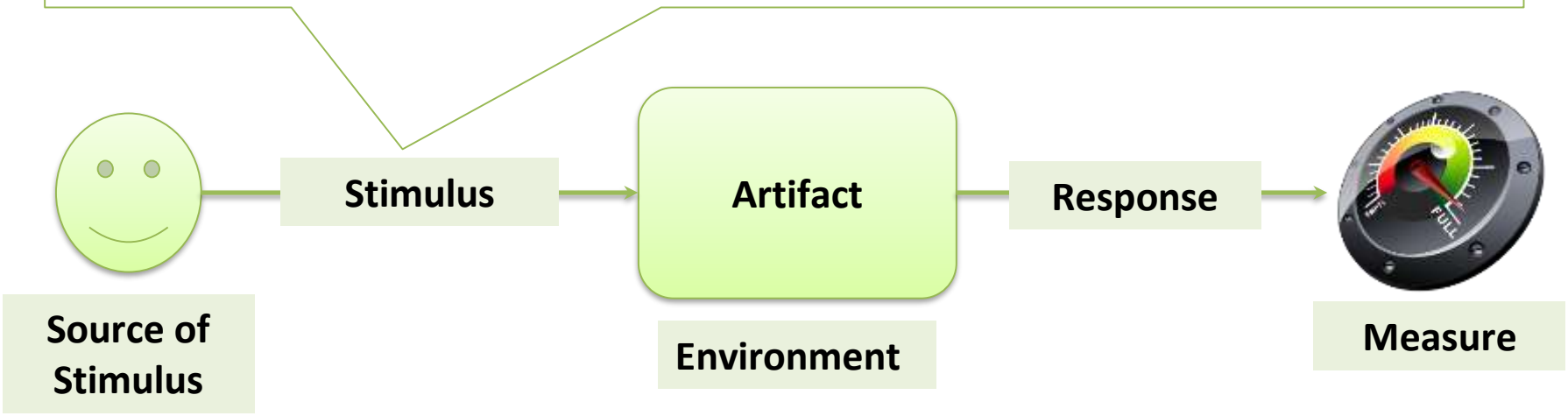
Interoperability Requirement Scenario

- the other system or systems our system needs to be interoperable with



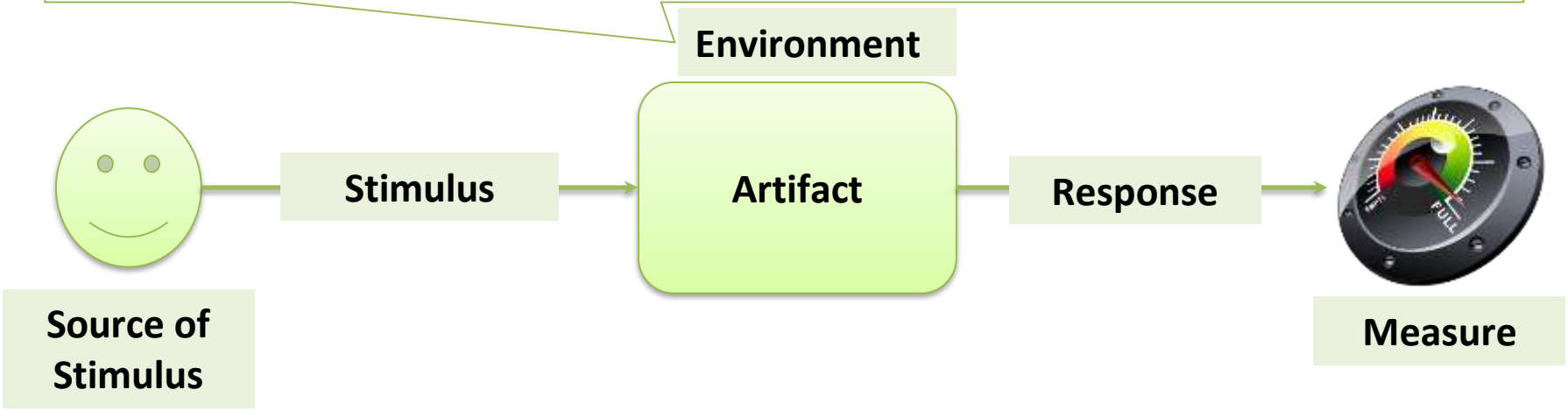
Interoperability Requirement Scenario

- request to exchange information between the systems



Interoperability Requirement Scenario

- the conditions under which the exchange will happen
  - known or unknown systems in advance

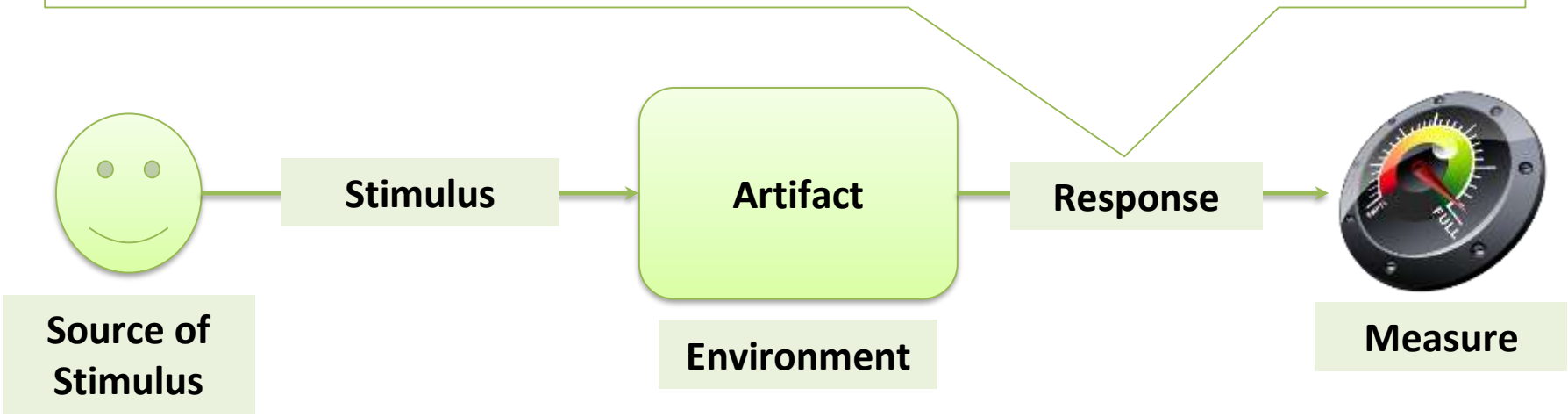


Interoperability Requirement Scenario

- required exchange of information happens

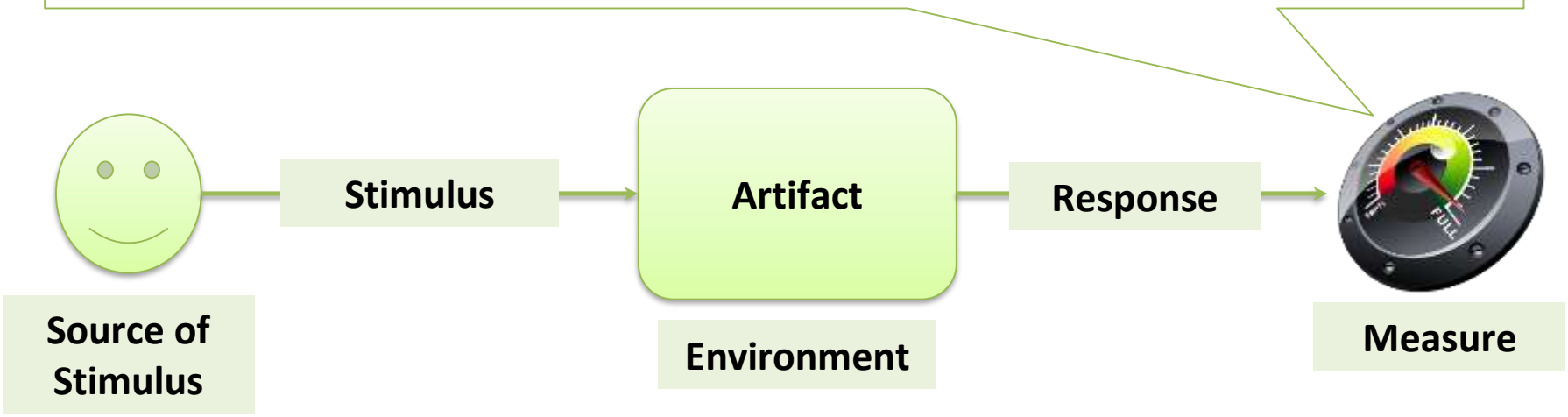
or

- request is rejected and entities notified



Interoperability Requirement Scenario

- percentage of information exchanges correctly processed
- percentage of information exchanges correctly rejected



Interoperability Quality Attribute

Source: Traffic monitoring system

Stimulus: Current location exchange

Artifact: Our vehicle information system

Environment: TMS known prior to VIS run-time

Response: TMS combines current location with other information, overlays on a map and broadcasts

Measure: VIS information included with a probability of 99.9%

Interoperability Quality Attribute

Source:
Local Open Data Catalog

Stimulus:
Dataset records exchange

Artifact:
National Open Data Catalog

Environment:
LODC unknown prior to NODC run- time

Response:
NODC combines local dataset records with other LODCs and provides search features on top of them to users

Measure:
LODC information included with a probability of 100 %

Technical Interoperability Tactics

- shared network protocol and communication principles
  - e.g. HTTP + REST

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- technical interoperability broker
  - similar to modifiability tactics anticorruption layer and open host service

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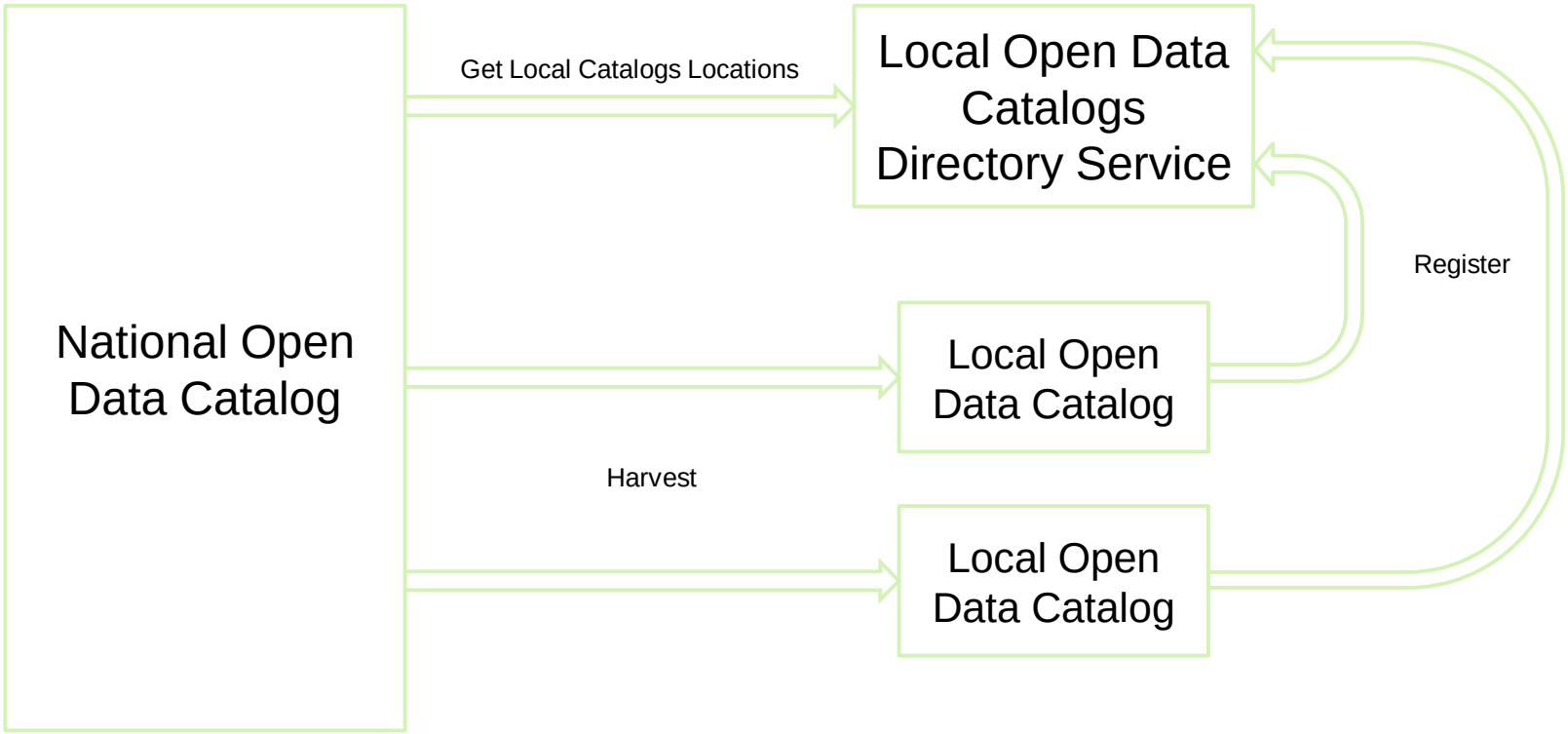
  - e.g. HTTP + REST
- technical interoperability broker
  - similar to modifiability tactics
- directory service

Directory service



Syntactic Interoperability Tactics

- use a standard format to enforce shared syntax, e.g.
  - DCAT-AP
  - SKOS
  - DCV
  - HL7 FHIR
  - DATEX II
  - schema.org

Syntactic Interoperability Tactics

- standard format to enforce shared syntax
- syntactic interoperability broker
  - similar to modifiability tactics

Semantic Interoperability Tactics

- standard format to enforce shared semantics, e.g.
  - DCAT-AP
  - SKOS
  - DCV
  - HL7 FHIR
  - DATEX II
  - schema.org

Semantic Interoperability Tactics

```
{
  "@context": "https://schema.org",
  "@type": "Hotel",
  "name": "ACME Hotel Innsbruck",
  "description": "A beautifully located business hotel right in the heart of the alps. Watch the sun rise over the scenic Inn valley while enjoying your morning coffee.",
  "address": {
    "@type": "PostalAddress",
    "addressCountry": "AT",
    "addressLocality": "Innsbruck",
    "addressRegion": "Tyrol",
    "postalCode": "6020",
    "streetAddress": "Technikerstrasse 21"
  },
  "telephone": "+43 512 8000-0",
  "photo": "http://...",
  "starRating": {
    "@type": "Rating",
    "ratingValue": "4"
  },
  "priceRange": "$100 - $240"
}
```

Semantic Interoperability Tactics

https://schema.org/Hotel

Semantic Interoperability Tactics

- standard format to enforce shared semantics
- ontologies to properly define semantics

Semantic Interoperability Tactics

- standard format to enforce shared semantics
- ontologies to properly define semantics
- identity management
  - shared identifiers
  - identity broker
  - linked identities