Web-based Service Brokerage for Robotic Devices

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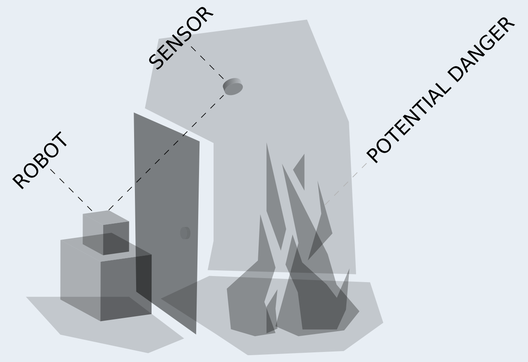
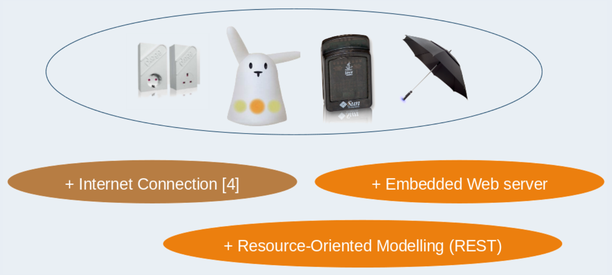
Symbiotic Smart Environments

→ Ability to discover, use, and understand services that are provided in smart environments
→ No specialized services for robots, but open endpoints that can be used by arbitrary (authorized) clients



The Web of Things

→ Smart Things with Internet connection and an embedded Web server
→ Resource-oriented modeling and Representational State Transfer for application-layer interoperability
→ Hypermedia/Links to guide application flow ("Hypermedia as the Engine of Application State")

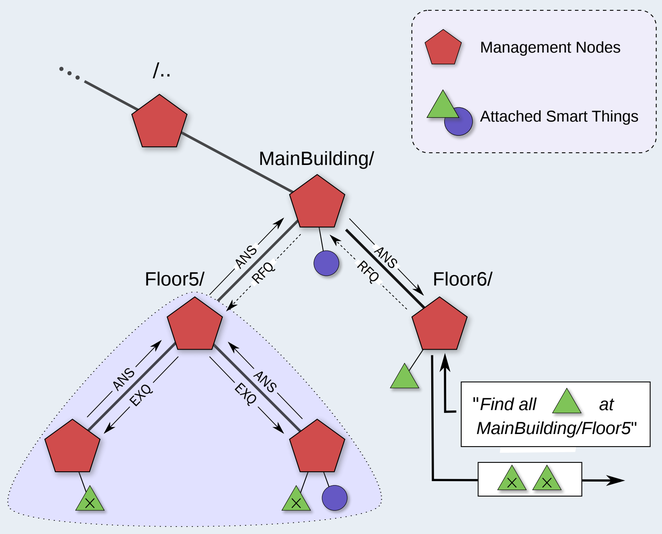


Robots and Web-based smart environments

→ Web of Things concepts to simplify the interaction of robotic devices with smart environments
→ Ambient sensors and actuators enable robots to make more well-informed decisions and perform increasingly complex tasks
→ Robots require less on-board sensors which reduces required resources (cost, weight, battery)

Service Discovery

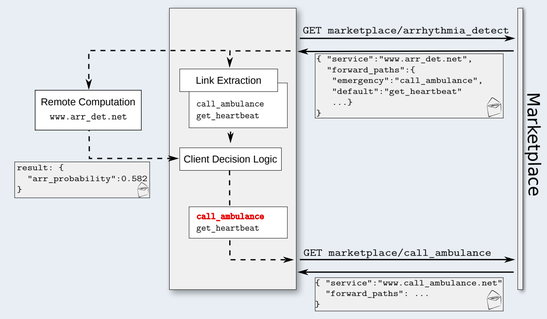
→ Discover usable services in the robot's surroundings, e.g. using a middleware platform [5]



→ Also integrate and advertise services provided by robots!

Service Selection and Usage

→ Linked Algorithms, based on HATEOAS and semi-automatic decisions [7]



→ Semantics (e.g., RESTdesc [8])

```
@prefix : <http://example.org/image#>.
@prefix http: <http://www.w3.org/2011/http#>.
@prefix dbpedia: <http://dbpedia.org/resource/>.
@prefix dbpedia-owl: <http://dbpedia.org/ontology/>.
{
  ?image :smallThumbnail ?thumbnail.
}
=>
{
  _:request http:methodName "GET";
            http:requestURI ?thumbnail;
            http:resp [ http:body ?thumbnail ].
  ?image dbpedia-owl:thumbnail ?thumbnail.
  ?thumbnail a dbpedia:Image;
             dbpedia-owl:height 80.0.
}.
```

http://restdesc.org/about/descriptions

Conclusions

REST has very interesting features that enable the annotation of API endpoints with semantic descriptions. These allow other programs to find out what service a specific API offers and how to use it. So,...

✓ Expose services as resources, according to the REST principles
✓ Manage the resources in middleware platforms to enable their automated discovery
✓ Annotate the resources with semantic descriptions to expose their APIs and make them automatically usable

References

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