WoT and IoT

What's the Difference?

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W3C WoT Workshop
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The 3 most important vocabulary terms of the WoT TD

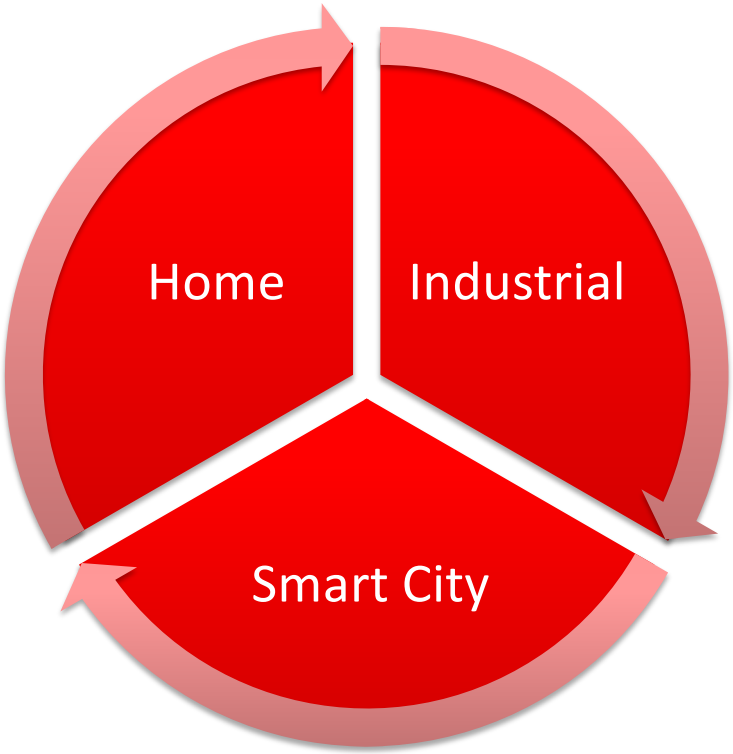
Which vocabulary terms add the most value ?

WoT Architecture

- During the work in the architecture group:
  - We have been looking into multiple application scenarios
  - We have discussed many use cases and derived an architecture

- We should discuss new application scenarios and use cases
  - To verify that the architecture can be applied
  - To verify that the Thing description can be used to describe complex systems
  - To prove that WoT scales to scenarios involving thousands of devices
  - **To prove that WoT adds value over existing IoT standards**

Is there an overlap of application domains?



Some interesting application domains to motivate out-of the box thinking

We have been connecting:

- Lamps, Air conditioners, cleaning, robots, alert lights, Car chargers, speakers, cameras, OCF devices, Cars, environment sensors and more

- We have been talking about APIs, protocols, mediatypes, scripts, …

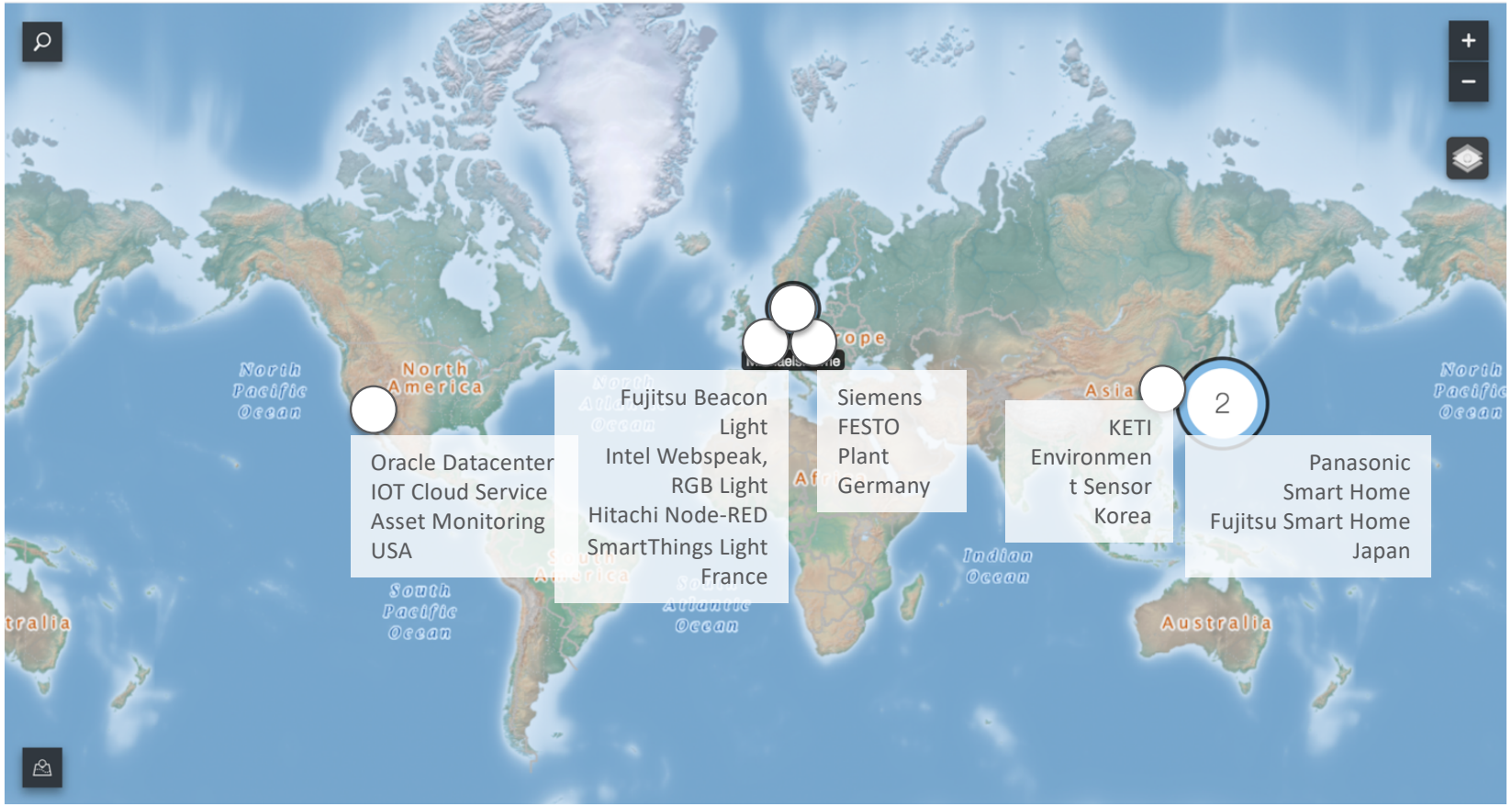
Let’s think about other real products

- **Beyond** home devices
- **Beyond** production plants
- **Beyond** smart cities

New and enhanced use cases

Use Cases for W3C WoT at large scale

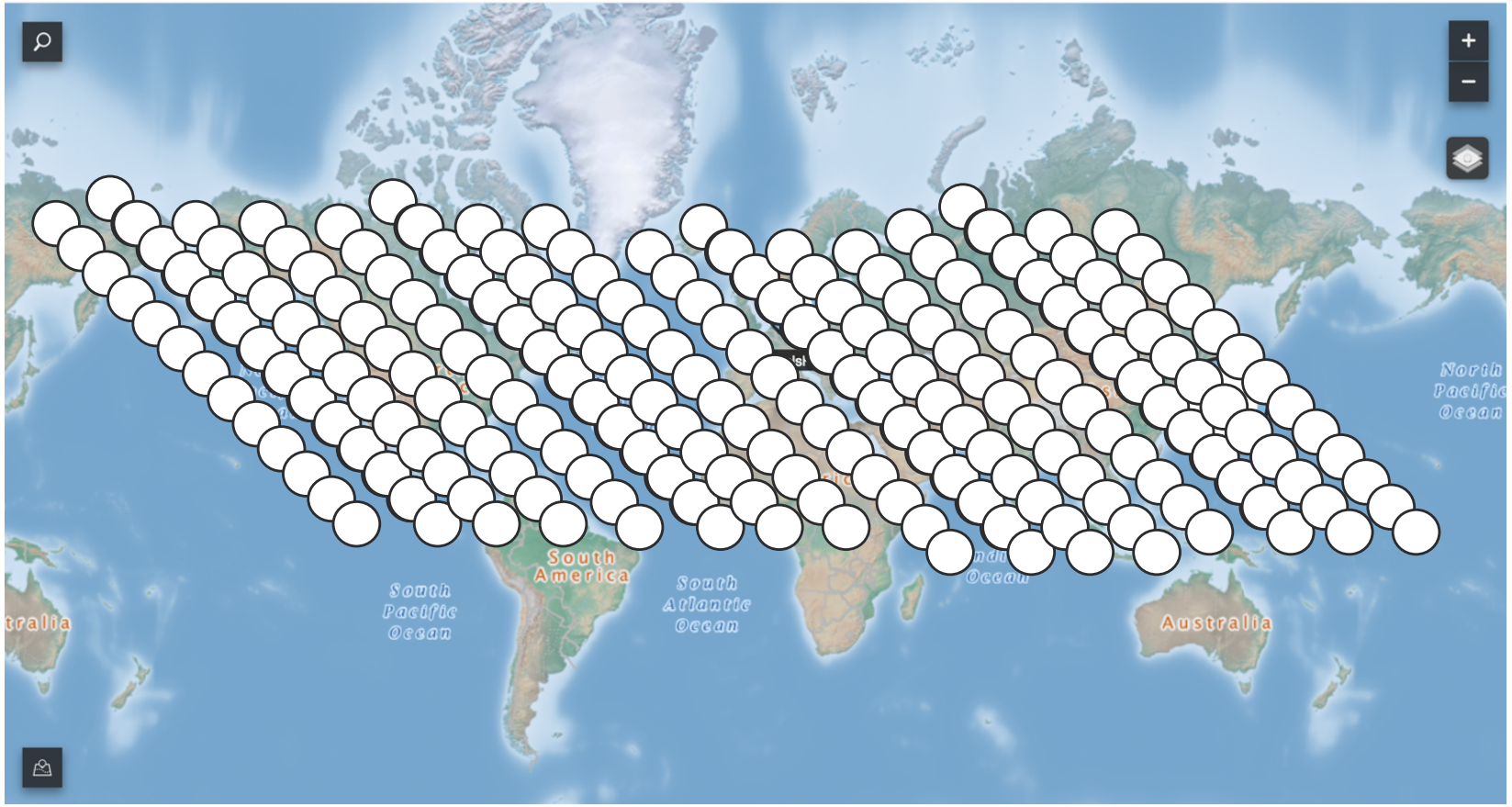
WoT Plugfest Scenario at TPAC



What would be done with 100000 things spread around the globe?

- Is there a reasonable use case?
- Who are the stakeholders?
- Who will benefit from this use case?
- How can companies monetize it?

Next Plugfest?



Consequence of the natural disasters in the world: number and cost of the events (2001-2016)

- Amounts in billion USD / **human lives**

Year	Number of events	Economic damage	Insured damage	Insured damage share	Number of casualties
2001	111	>14.5	10	68.96%	22 803
2002	130	42	11.4	27.14%	10 729
2003	142	65	16	24.60%	37 821
2004	116	120	46	38.30%	292 800
2005	149	220	78	35.45%	88 083
2006	136	43	11,8	27.40%	22 400
2007	142	63.7	23.3	36.60%	14 630
2008	137	258	44.7	17.30%	234 900
2009	133	50	22	44%	9 000
2010	167	194	39.8	20.51%	297 127
2011	175	362	110	30.40%	29 000
2012	168	178	71	39.90%	8 984
2013	150	131	37	28.24%	20 201
2014	191	101	27.7	27.72%	7 066
2015	198	82	28	34.15%	19 365
2016	160	150	42	28%	6 884

- Source: Atlas Magazine and Swiss Re / https://www.atlas-mag.net/en/article/natural-catastrophes-2001-2016-breakdown-of-risks-per-region

Is this a W3C WoT use case?

- Various organizations already monitor climate and environmental data
- They aggregate the data, build simulation models, predictions

- Are there other/new stakeholders?

A Use Case for W3C WoT for Airplanes?

Modeling an airplane / parts using W3C WoT?

- Some plane crashes were caused by autonomous systems.
  - Pilots were not aware of these systems
  - A system failure of a sensor caused plane crashes

- Questions for WoT:
  - Is WoT flexible enough to describe complex systems?
  - How to decompose components?
  - What would be a realistic use case?
  - Can Digital Twins be useful?

How could W3C WoT have helped to prevented that?

- If we would be able to describe the airplane-thing, or the automatic control component of the airplane, we could:
  - Enable to build a dedicated behavior simulation that can be used
  - Allow more people to run simulations on cheaper hardware -> problem might have been identified earlier
  - Build simulations that incorporate multiple sensors, simulate failure situations
- Try building a TD for the control system
- Build a simulation

A Use Case for W3C WoT for Power Generators?

Scenario: Modeling of a complex power generator

- Can we describe complex systems with TDs?
- How to decompose the system in components?
- Do we have all knowledge and can we incorporate this knowledge into a human-error-proof system
- Can we properly describe the component interfaces in a human-understandable way?
- Can we describe the interaction to automatically build a (good) UI?
- Can we also describe the internal behavior?
- Can we build a simulation model to predict the behavior in failure situations?

Sample Simulation Scenario:

- The experimental procedure was intended to run as follows:
- The reactor was to be running at a low power level, between 700 MW and 800 MW
- The steam-turbine generator was to be run up to full speed
- When these conditions were achieved, the steam supply for the turbine generator was to be closed off
- Turbine generator performance was to be recorded to determine whether it could provide the bridging power for coolant pumps until the emergency diesel generators were sequenced to start and provide power to the cooling pumps automatically
- After the emergency generators reached normal operating speed and voltage, the turbine generator would be allowed to continue to freewheel down

Source: https://en.wikipedia.org/wiki/Chernobyl_disaster#Steam_turbine_tests

How could W3C WoT have helped to prevented that?

- Provide a clear description of the interaction possibilities including valid ranges?

- Enabled building a simulation model?

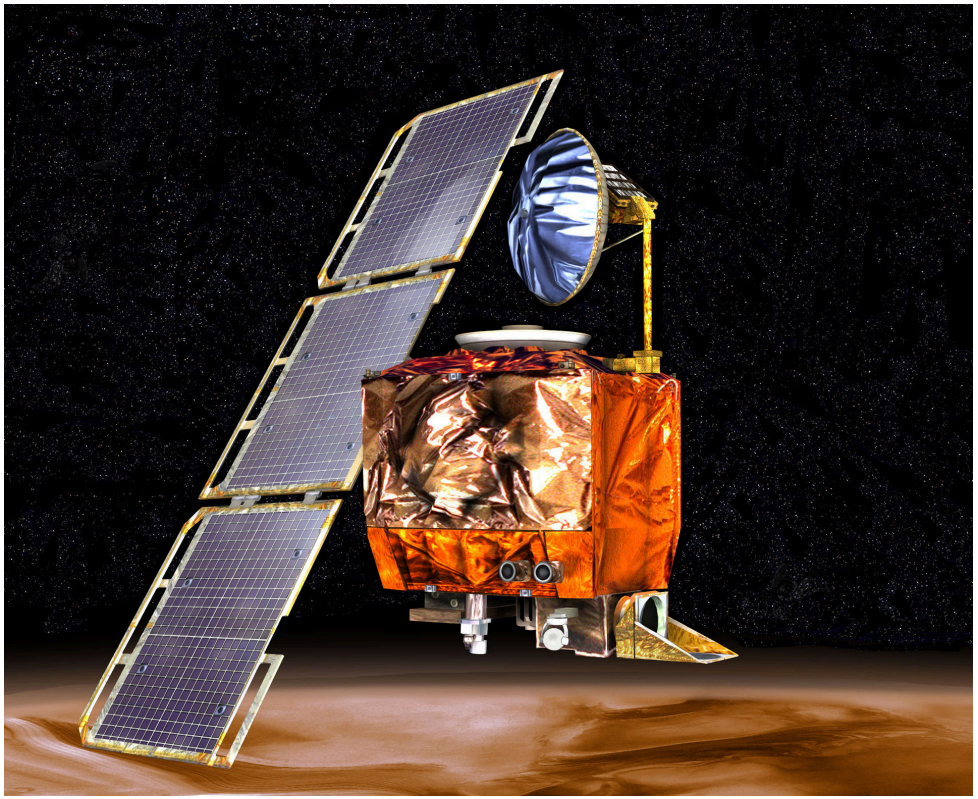
- Probably not at all, because humans always make failures.

A Use Case for W3C WoT for Mars Climate Observers?

Scenario: Modeling of a complex system

- Can we describe complex systems with a TD?
- Can we properly describe the interface in a human-understandable way?
- Can we describe the interaction to automatically build a (good) UI?
- Can we also describe the internal behavior?

Mars Climate Orbiter (1999)



- The primary cause of this discrepancy was that one piece of ground software produced results in a **United States customary unit**, **contrary to its Software Interface Specification (SIS)**, while a second system, supplied by NASA, expected those results **to be in SI units**, in accordance with the SIS. Specifically, software that calculated the total impulse produced by thruster firings produced results in pound-force seconds. The trajectory calculation software then used these results – expected to be in newton seconds – to update the predicted position of the spacecraft.

Source: https://en.wikipedia.org/wiki/Mars_Climate_Orbiter

How could W3C WoT have helped to prevented that?

- There was a clear system description describing the measurement system (SI units).
- One company was not using the right metric system
- They made implicit assumptions

- WoT TDs include a **unit**, which implies that people think about the interpretation of the associated value.

The **4** most important vocabulary terms of the TD

I found one more :-D

The 3 most important WoT vocabulary terms

Vocabulary term	Description	mandatory
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`description`	Provides additional (human-readable) information based on a default language.	
`version`	Provides version information.	

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`support`	Provides information about the TD maintainer as URI scheme (e.g., mailto [RFC6068], tel [RFC3966], https).	**No**

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Proposal

What’s the difference between WoT and IoT?

WoT TDs can and should be read and understood by machines and humans

Contact

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