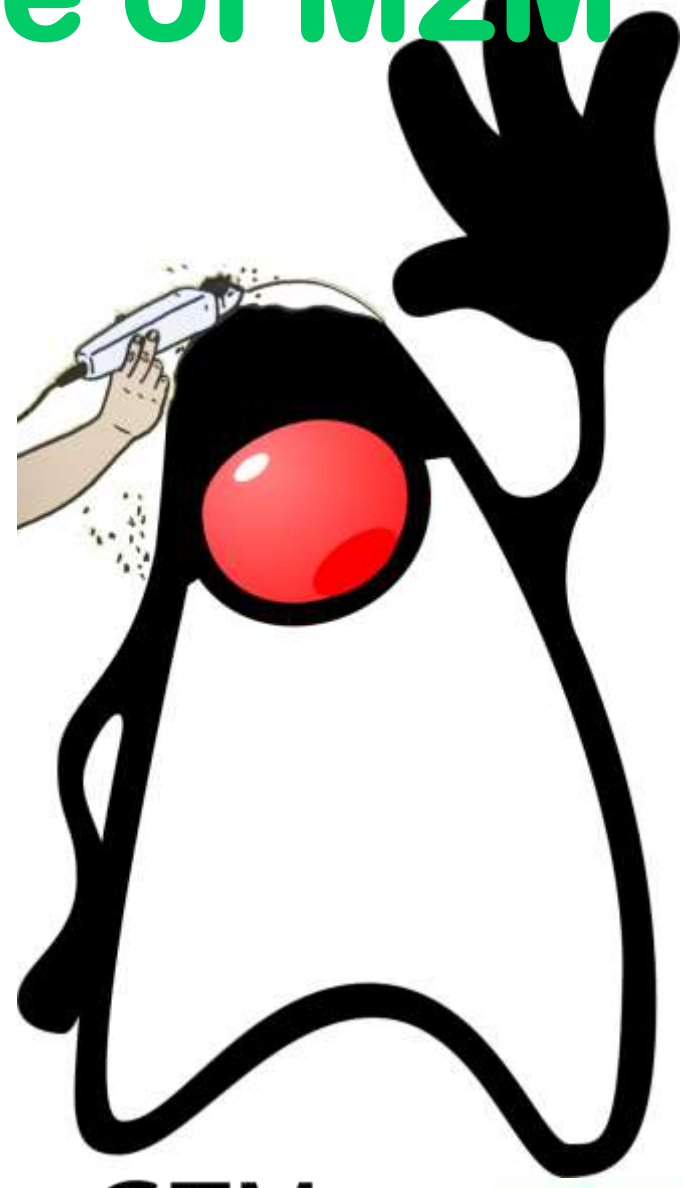
M4M 2 the Rescue of M2M

Sensor Web Observations and Measurements

Werner Keil
Leonardo Lima
Jean-Marie Dautelle

JCP EC F2F, Redwood Shore

24 January 2014



CTMedia V2COM

What do these mishaps have in common?

- Patriot Missile

  The cause was an inaccurate calculation of the time since boot due to a computer arithmetic error.

- Ariane 5 Explosion

  Floating point number which a value was converted from a value greater than what would be represented by a 16 bit signed integer.

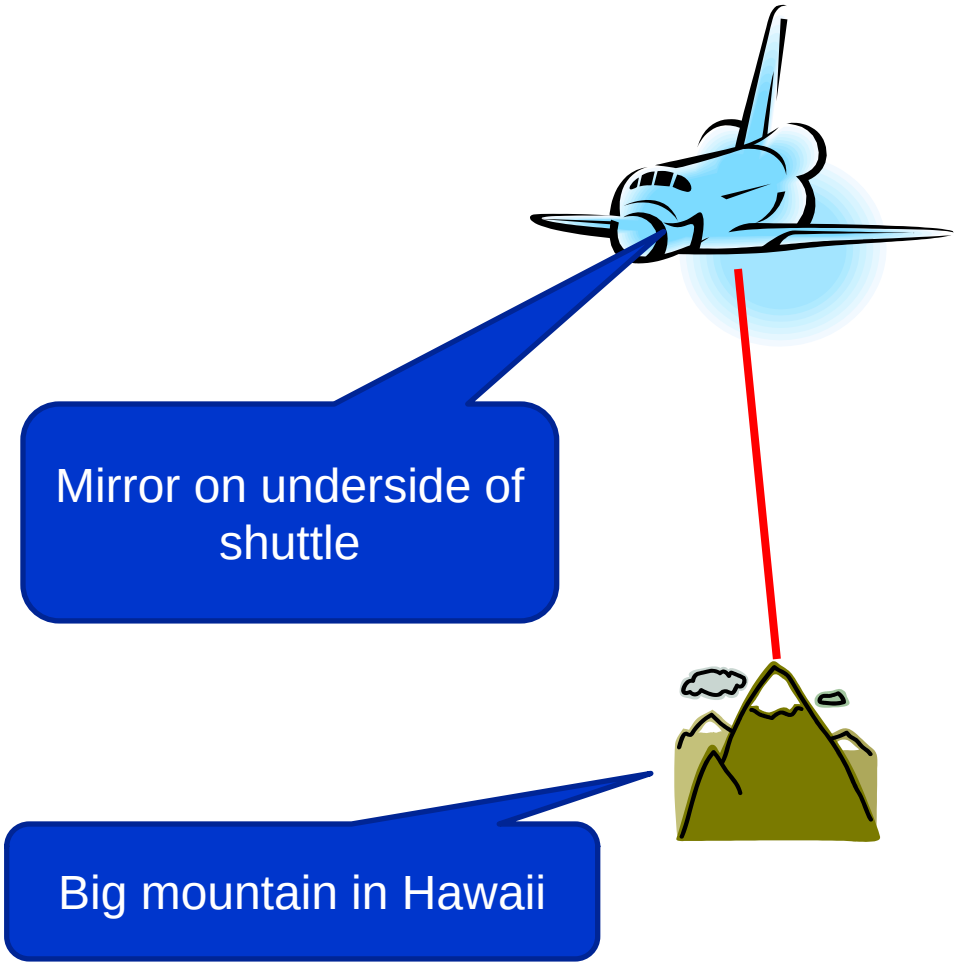
- Christopher Columbus

  He miscalculated the circumference of Earth assuming a medieval Persian geographer he referred to had used Roman miles (4,856 ft.) instead of the 7,091 ft. Arabic mile, which is part of the reason he unexpectedly ended up in the Bahamas on October 12, 1492, and thought he had hit Asia. Whoops.

1983 | Gimli Glider

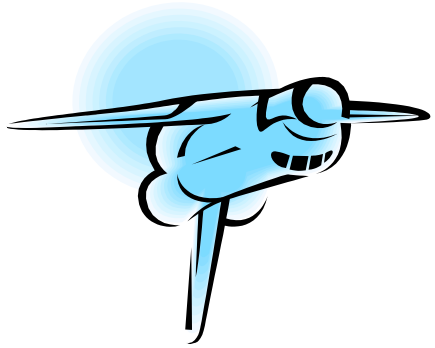
Fotos: Wayne Glowacki | Wikia „Lord of the Rings“

1985 | Star Wars

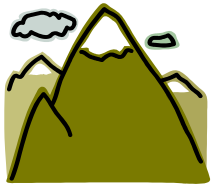


SDI Experiment:
The Plan

1985 | Reality



SDI Experiment:
What really
happened



1985 | Why it happened?

ACM SIGSOFT SOFTWARE ENGINEERING NOTES vol 10 no 3 Jul 1985 page 10

Attention All Units, Especially Miles and Feet!

Much to the surprise of Mission Control, the space shuttle Discovery flew upside-down over Maui on 19 June 1985 during an attempted test of a Star-Wars-type laser-beam missile defense experiment. The astronauts reported seeing the bright-blue low-power laser beam emanating from the top of Mona Kea, but the experiment failed because the shuttle's reflecting mirror was oriented upward! A statement issued by NASA said that the shuttle was to be repositioned so that the mirror was pointing (downward) at a spot *10,023 feet* above sea level on Mona Kea; that number was supplied to the crew in units of feet, and was correctly fed into the onboard guidance system -- which unfortunately was expecting units in nautical miles, not feet. Thus the mirror wound up being pointed (upward) to a spot *10,023 nautical miles* above sea level. The San Francisco Chronicle article noted that "the laser experiment was designed to see if a low-energy laser could be used to track a high-speed target about 200 miles above the earth. By its failure yesterday, NASA unwittingly proved what the Air Force already knew -- that the laser would work only on a 'cooperative target' -- and is not likely to be useful as a tracking device for enemy missiles." [This statement appeared in the S.F. Chronicle on 20 June, excerpted from the L.A. Times; the NY Times article on that date provided some controversy on the interpretation of the significance of the problem.] The experiment was then repeated successfully on 21 June (using nautical miles). The important point is not whether this experiment proves or disproves the viability of Star Wars, but rather that here is just one more example of an unanticipated problem in a human-computer interface that had not been detected prior to its first attempted actual use.

CATMedia V2COM

1999 | Mars Orbiter

CNN.com

sci-tech> space> story page

exploringmars in-depth specials

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Metric mishap caused loss of NASA orbiter

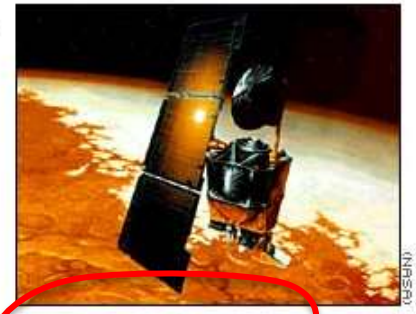
September 30, 1999
Web posted at: 4:21 p.m. EDT (2021 GMT)

In this story:

Metric system used by NASA for many years

Error points to nation's conversion lag

RELATED STORIES, SITES



NASA's Climate Orbiter was lost September 23, 1999

By Robin Lloyd
CNN Interactive Senior Writer

(CNN) -- NASA lost a $125 million Mars orbiter because a Lockheed Martin engineering team used English units of measurement while the agency's team used the more conventional metric system for a key spacecraft operation, according to a review finding released Thursday.

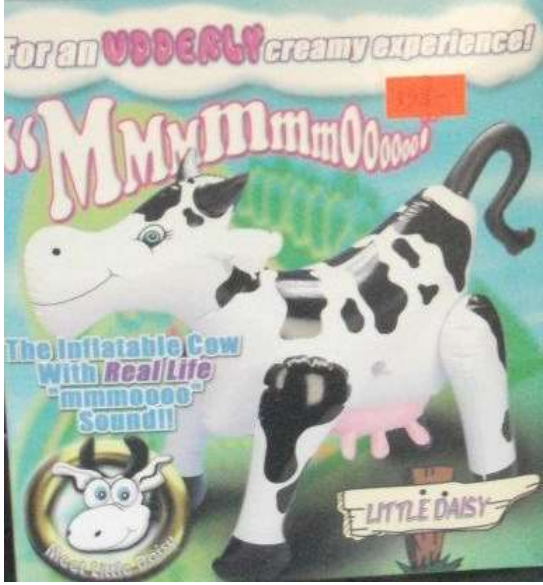
The units mismatch prevented navigation information from transferring between the Mars Climate Orbiter spacecraft team in at Lockheed Martin in Denver and the flight team at NASA's Jet Propulsion Laboratory in Pasadena, California.

Measurement Package

- Namespace: org.osgi.util.measurement
- SI only Unit Library “in the closet”
  - Unit
    Essentially an SI singleton holding relevant unit constants, too.
  - Measurement
    Represents a value with an error, a unit and a time-stamp.
  - State
    Groups a state name, value and timestamp.
- Some very limited usage, e.g. by Automotive

► No further development by OSGi

JSR-256



Mobile Sensor API

- Namespace: javax.microediton.sensor.*
- Focusing on single-device Sensors, but got a minimalistic Unit API “in the barn”
  - Unit
    Essentially an SI singleton holding relevant unit constants, too.
    JavaDoc: http://pandora.la/java/javadocs/sensor/javax/microedition/sensor/Unit.html
  - ChannelInfo
    Holding name, accuracy, data type,measurement ranges, scale and unit
  - MeasurementRange
    Range of possible values from minimum to maximum (J2ME style, e.g. no Generics)
- ► Dead Meat (few actual handsets, no vendors except Nokia still use it, nor does Java ME Embedded)

JSR-275

Units Specification

- Namespace: javax.measure.*
- Only one interface and one abstract class
  - public interface Measurable<Q extends Quantity>
  - public abstract class Measure<V, Q extends Quantity>
- Three sub-packages
  - quantity (holds dimensions like mass, length,…)
  - unit (holds the SI and NonSI units)
  - converter (holds unit converters)

JSR-275

Users and popular Downstream Projects

- JScience
- Groovy/Grails (DSLs e.g. for Healthcare, Unit Conversion,…)
- GeoAPI (OGC standard) and implementations, e.g. uDig
- Orbitz/Ebookers.com
- IEM (Emergency Management, Homeland Security)
- OpenEHR
- Parfait (Java Monitoring, part of Performance Co-Pilot - PCP)

► Rejected only by EC not Community

Carrying the Flame…

Units of Measurement API

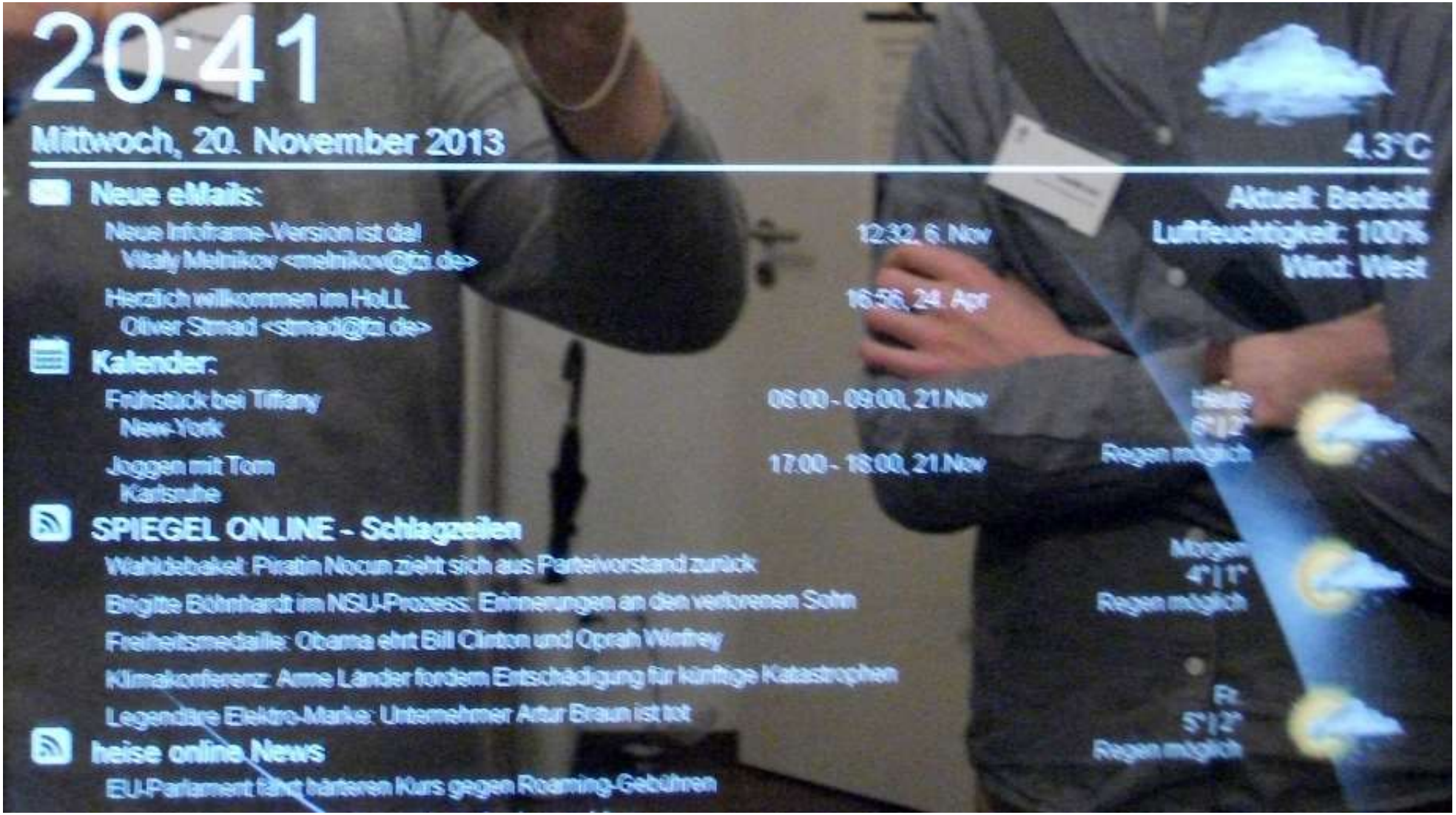
- Namespace: org.unitsofmeasurement.*
- Only interfaces (and exception classes)
  - public interface Quantity<Q extends Quantity<Q>>
  - public interface Unit<Q extends Quantity<Q>>
- Three sub-packages
  - quantity (holds dimensions mass, length,...)
  - unit (holds units)
  - service (holds services)

Other Trends for Sensors | Measurement

- Xively
- Language bindings for Java/Android, Python or Ruby contain some support for Units of Measurement. Website: http://www.xively.com
- OpenXC
- Feels like modernized OSGi Measurement bundle. Offering only SI units by default, but a more sophisticated Unit, Measurement and Quantity concept somewhat similar and clearly inspired by Unit-API / JSR-275 Website: http://openxcplatform.com/

- CSS 3
- Mostly UI/rendering, but promises almost UCUM-like arithmetic and quantity-checking Website: http://www.w3.org/TR/css3-values/
- Unicode / ICU4J
- Significant Unit support from CLDR 24 / ICU4J 52.x on, covering most of SI and other relevant units in at least 70 languages Website: http://site.icu-project.org/

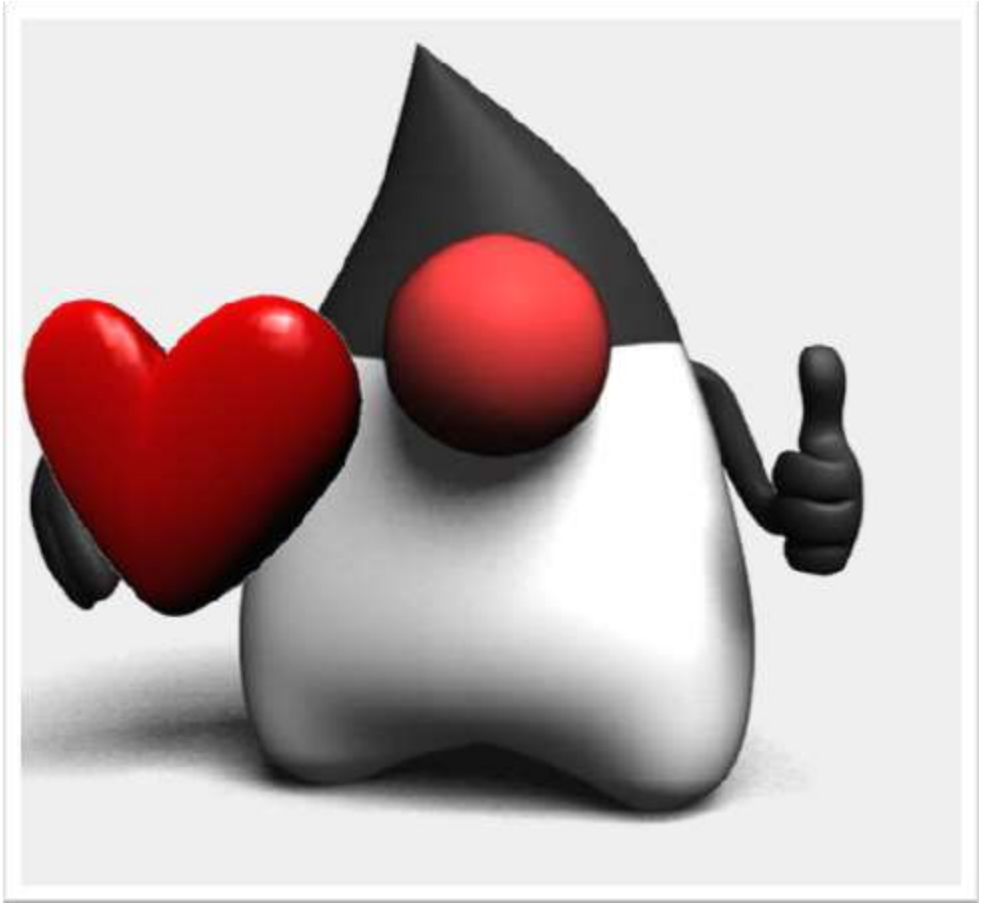
Smart Home | Remote Monitoring



Smart Home | Heart of Glass

JavaOne 2013

- A Heart Monitor remotely accessible from devices like Google Glass or your favorite Mobile Browser
- Part of Java Embedded Challenge at JavaOne



Smart Home | Heart of Glass

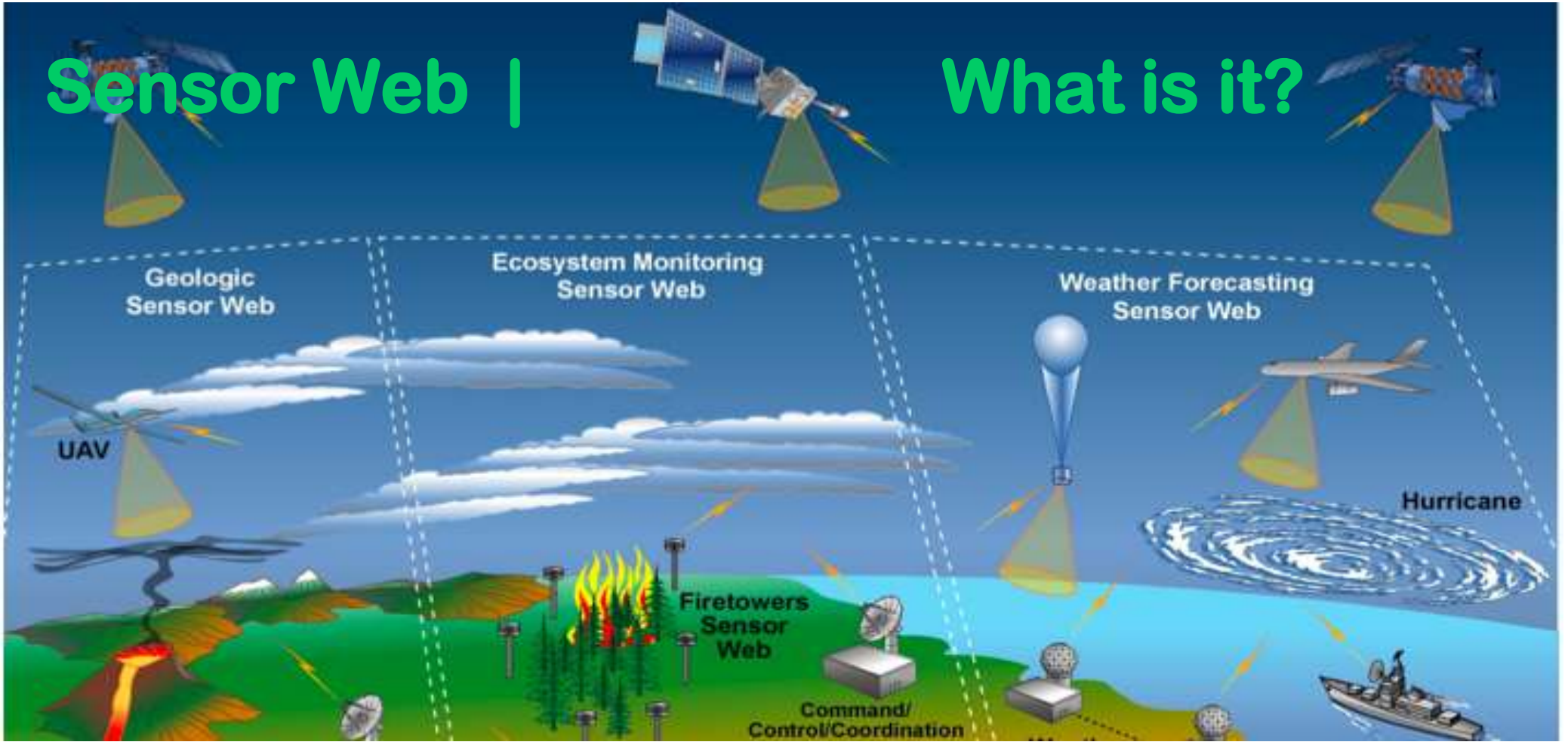
Technologies used

- Raspberry Pi | Things API | Unit-API
- RXTX (gnu.io)
- Polar Heart Sensor
- Java EE | HTML 5 (Tomcat/Glassfish)
- Google Glass (preferred) or other Web-enabled Mobile devices

Smart Watch

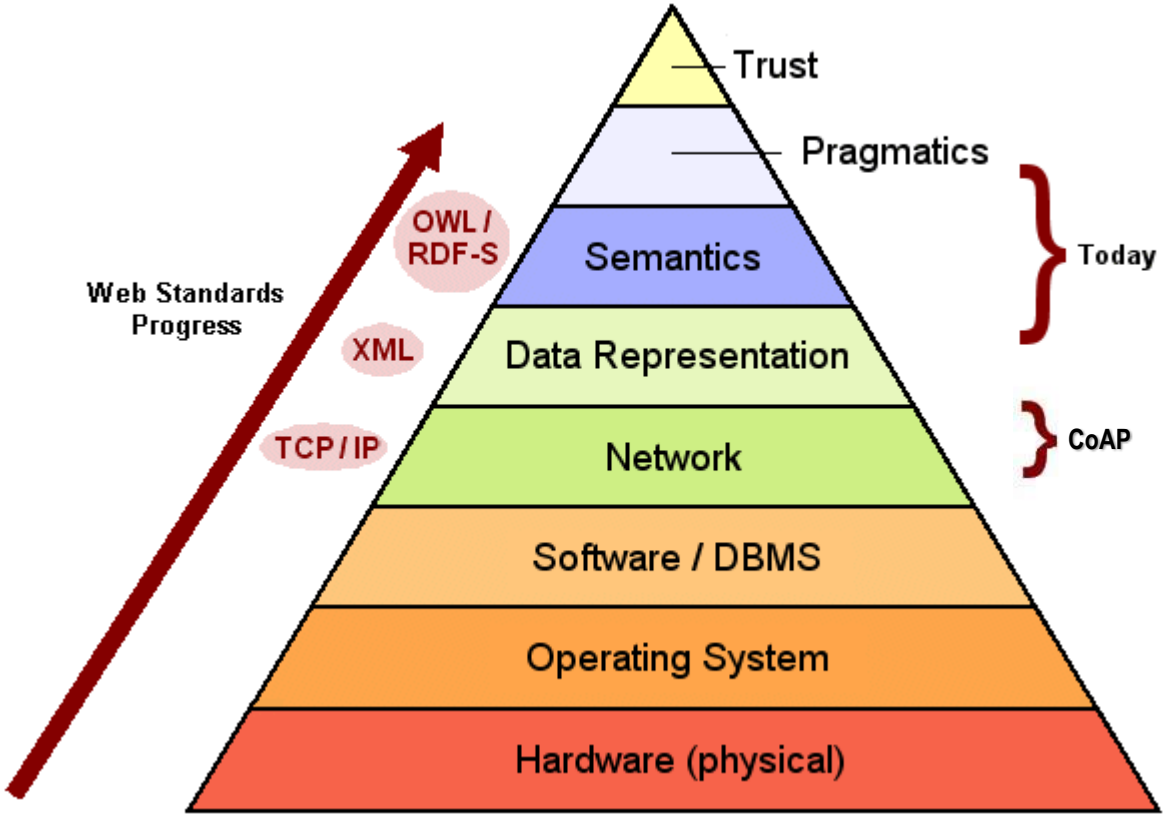
Bild: L'Atelier

Sensor Web | What is it?

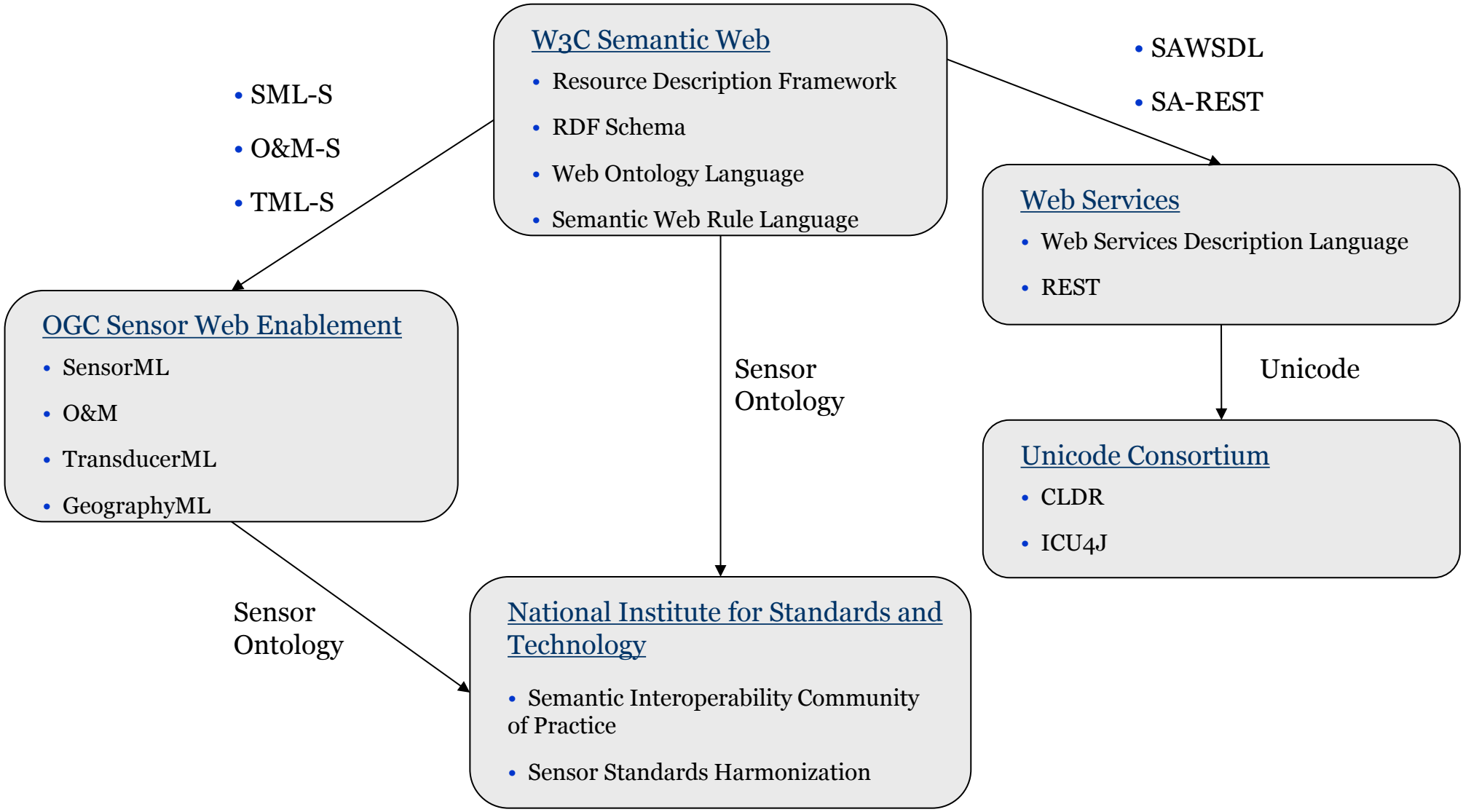


"A coordinated observation infrastructure composed of a distributed collection of resources that can collectively behave as a single, autonomous, task-able, dynamically adaptive and reconfigurable observing system that provides raw and processed data, along with associated meta-data, via a set of standards-based service-oriented interfaces." (Glenn, 2007)

Data Pyramid



Semantics | Data Standards



Supporting this JSR

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Gemalto M2M

CERN

ISO

SFR Group

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GeoAPI

Thales Group

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