Semantic Modeling of Smart City Data

… and related challenges/opportunities

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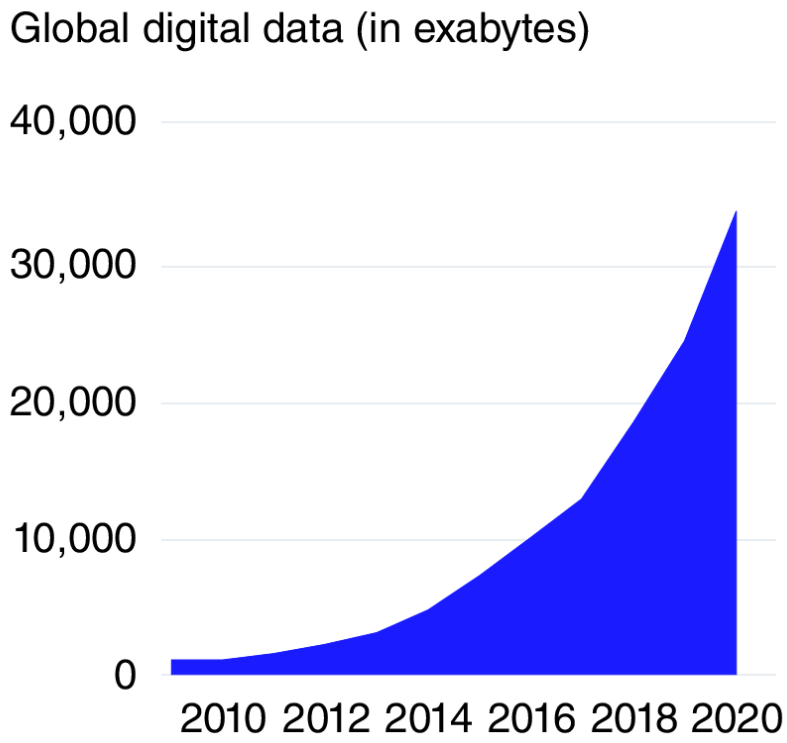
W3C Workshop on the Web of Things - Berlin

BIG Data: what are we facing

ity Pulse

FIGURE 3: BY 2020, DIGITAL RECORDS WILL BE 44 TIMES LARGER THAN IN 2009



Source: IDC

"90% of the data in the world today has been created in the last two years alone" – IBM

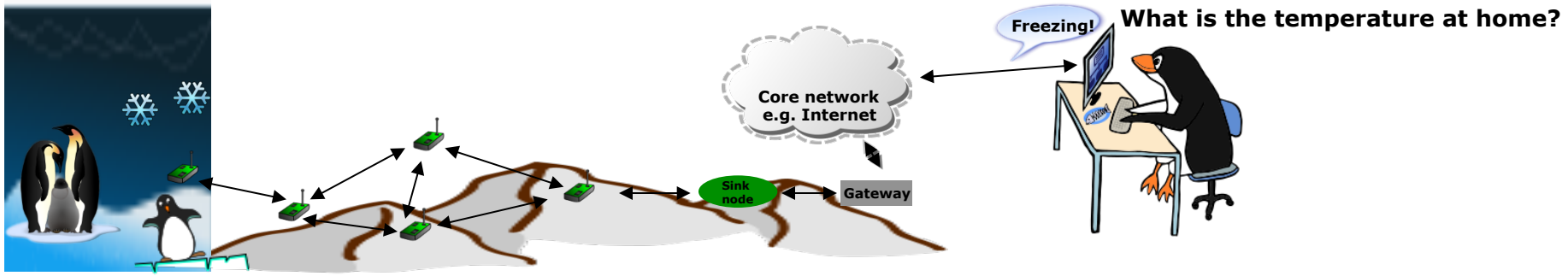
"The bringing together of a vast amount of data from public and private sources [...] is what Big Data is all about" – IDC

Over the next few years we'll see the adoption of scalable frameworks and platforms for handling streaming, or near real-time, analysis and processing." – O'Reilly

Big Data represents a number of developments in technology that have been brewing for years and are coming to a boil. They include an explosion of data and new kinds of data, like from the Web and sensor streams; [...]." – IDC

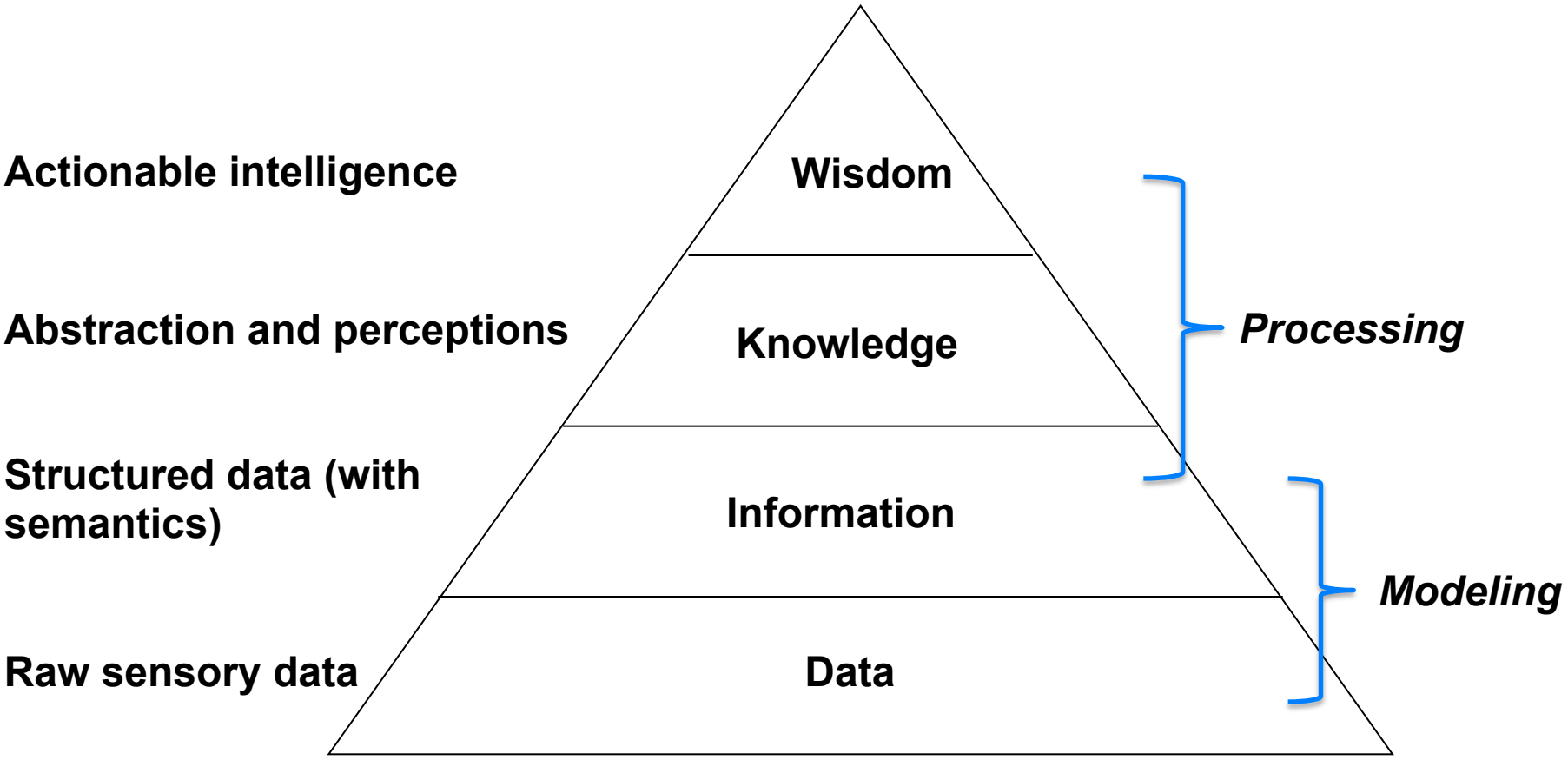

A Smart City driver of change will be Data.
Smart Cities as an opportunity
to render WoT-enabled services

"People want answers, not numbers" (Steven Glaser, UC Berkley)



Going from Data to Answers is the "smart" bit

Perceptions and Intelligence



CityPulse: Real-Time IoT Stream Processing and Large-scale Data Analytics for Smart City Applications

CityPulse Consortium

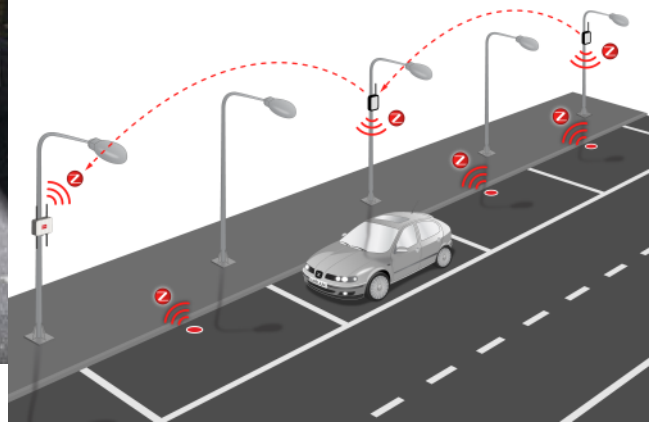
Partners:

Industrial	SIE, ERIC
SME	AI
Higher Education	UNIS, NUIG, UASO, WSU
City	BR, AA


abstracts
A Smart City removes silos moving towards a connected digital layer.

Not just Heterogeneity and Volume…

… but also Data Dynamicity, Data Quality and Contextual Relevance

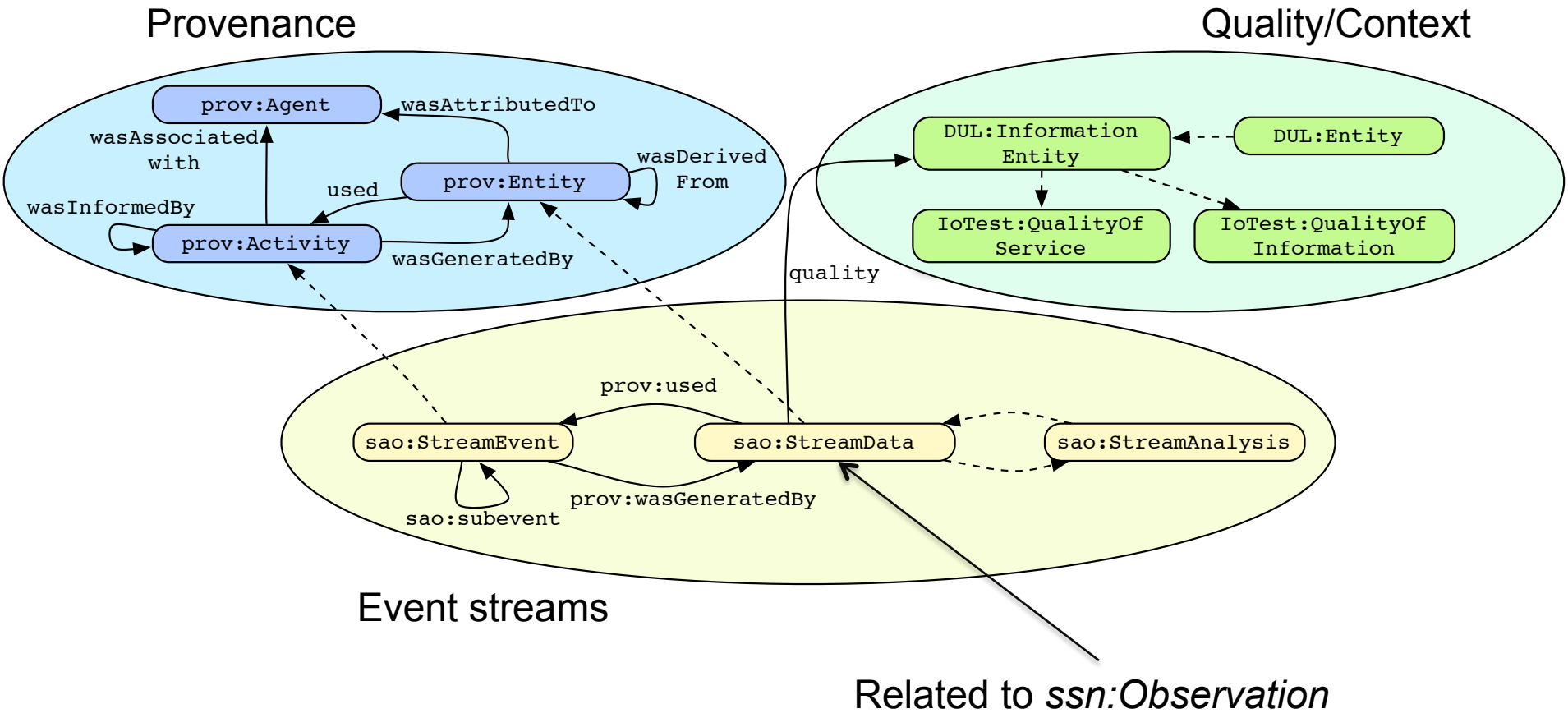


Challenges of Smart City Data

- Data heterogeneity: interoperability
- Data quality: source selection, reliability
- Data context: source discovery/adaptation
- Data privacy: aggregation, access control
- Data dynamicity: semantic stream processing

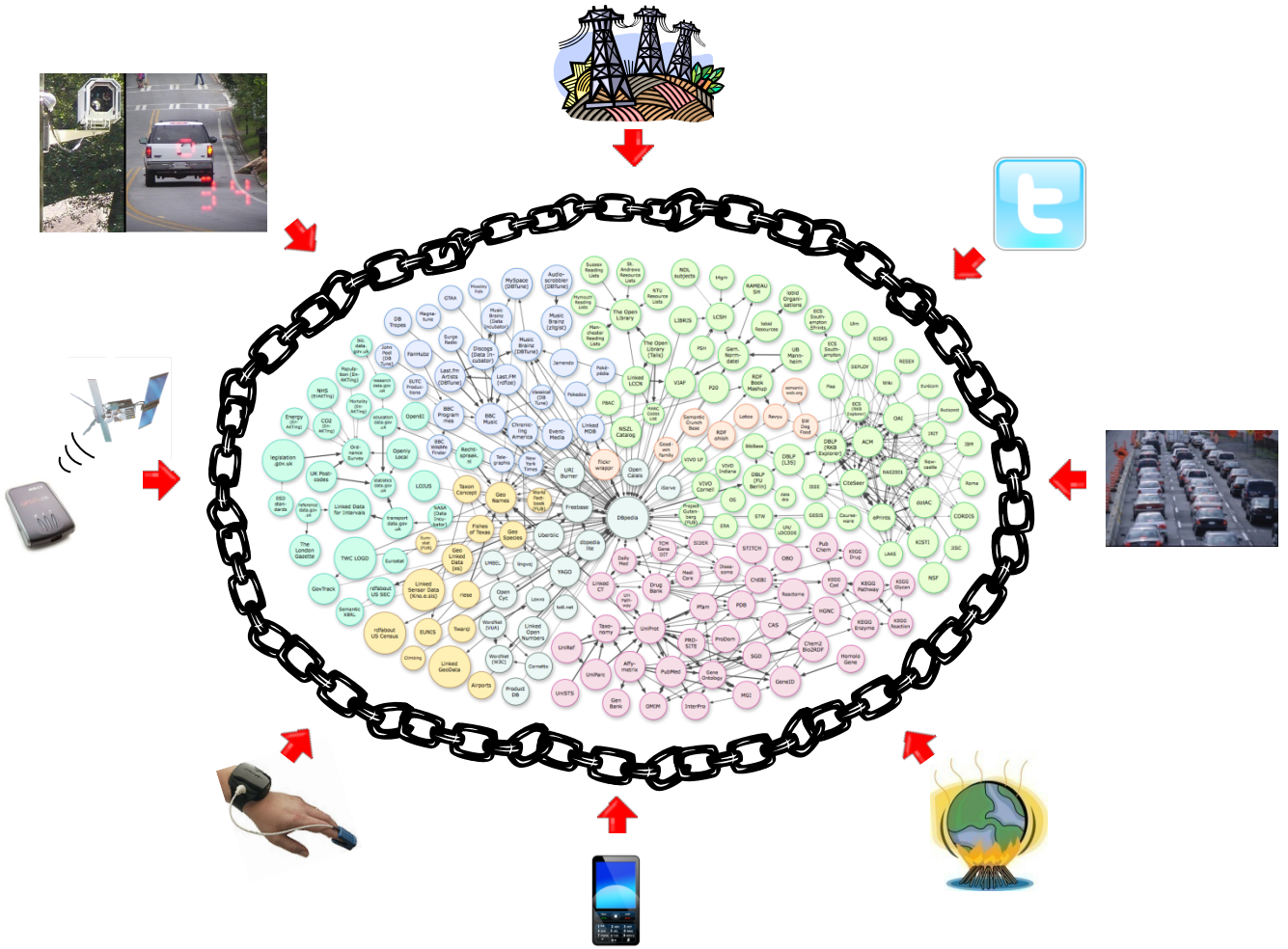
Semantic Model example

Key concept: ***Reuse!***

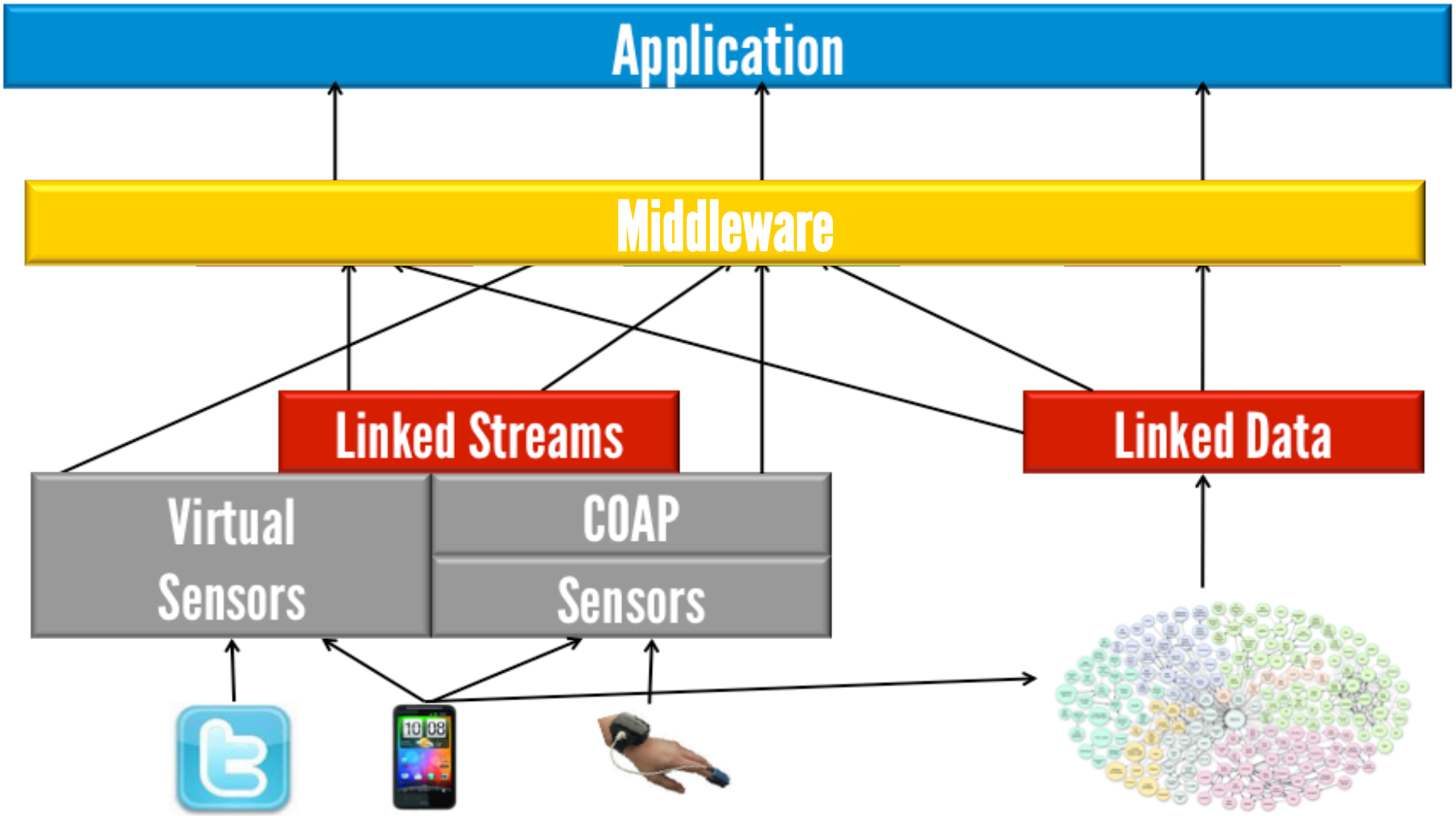


Linked Stream Processing

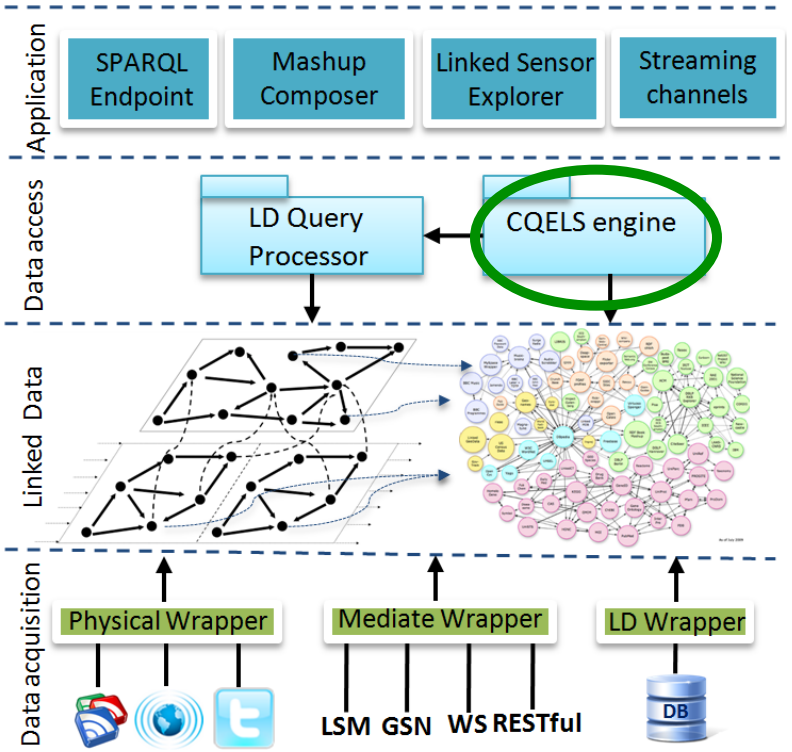
Web of Things = Web of Devices/Services + Web of Data

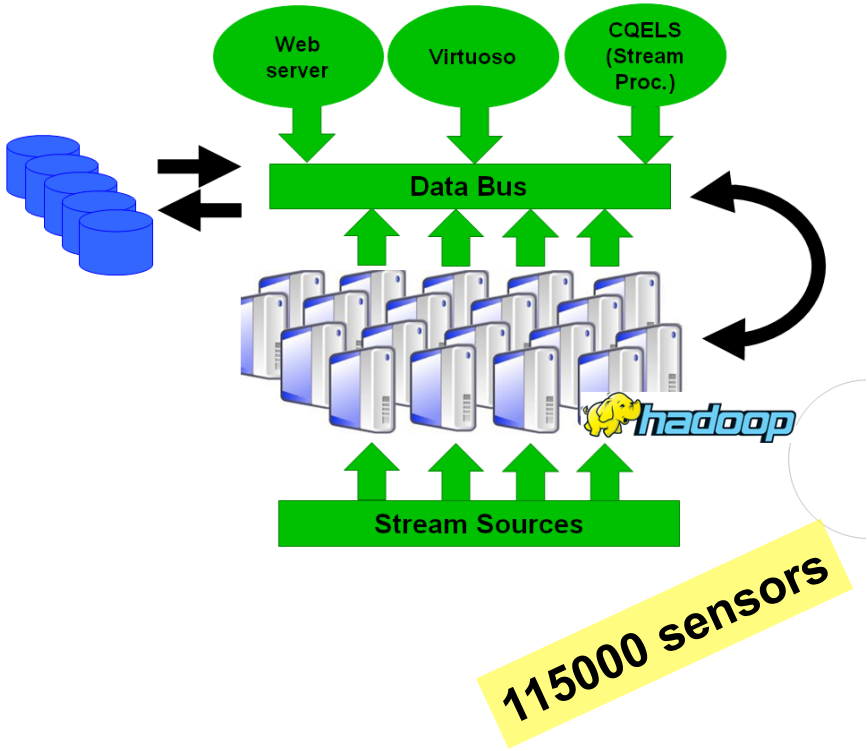


Keep It Simple



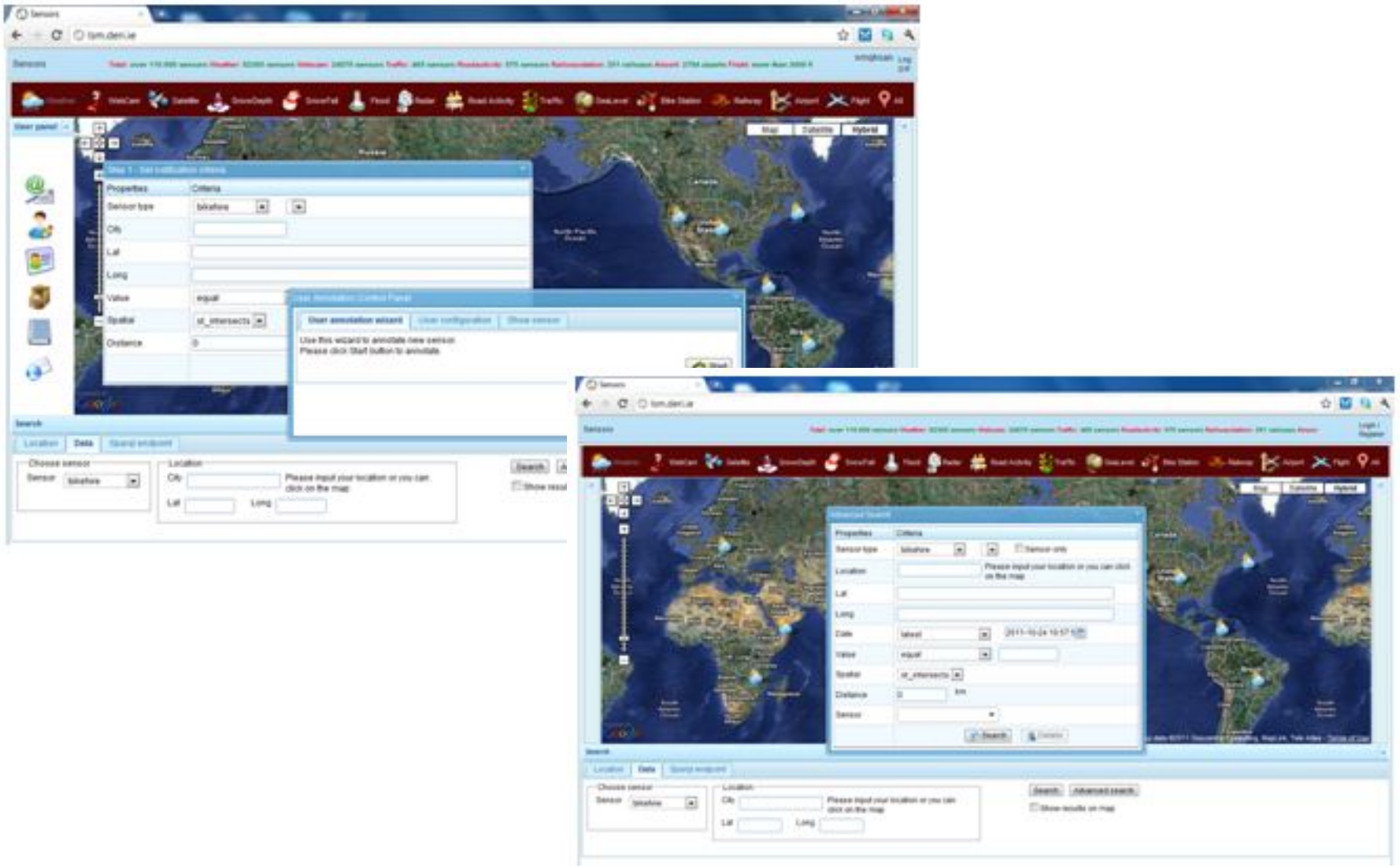
Linked Stream Middleware (lsm.deri.ie)





Continuous Query Processing Engine for Linked Streams

Linked Stream Middleware



Directions and Discussion

- *What are the principles for better design of a model for smart city data?*
  - Stream annotation using Linked Data description
  - Semantic properties for quality, context, privacy, simplify the connection with the processing steps, including discovery, indexing and continuous query processing
  - Contextualization via categorization of data in hierarchical form (from observations to complex events)
- *What about semantic processing of streams?*
  - RDF Stream Processing (RSP) W3C working group
  - Scope: to define a common model for producing, transmitting and continuously querying RDF Streams
  - Need to push this activity (e.g. via industry participation)

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