



IoT Standards drive Frictionless Ai

IoT Week 2017

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Collaborators and Key Contacts:

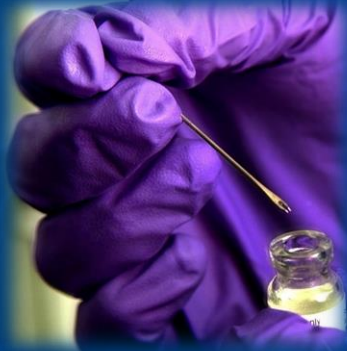
- Tiffany Sargent, Principal Engineer IoT Solutions
- Eve Schooler, Principal Engineer IoT Solutions

AI will usher in a better world

on the scale of the agricultural, industrial and digital revolutions

ACCELERATE

Large-Scale Solutions



- Cure Diseases
- Eliminate Fraud
- Unlock Dark Data

UNLEASH

Scientific Discovery



- Explore Deep Sea/Space
- Solve Particle Physics
- Decode the Brain

Augment

Human Capability



- Personalized Guidance
- Enhance Decisions
- Prevent Crime

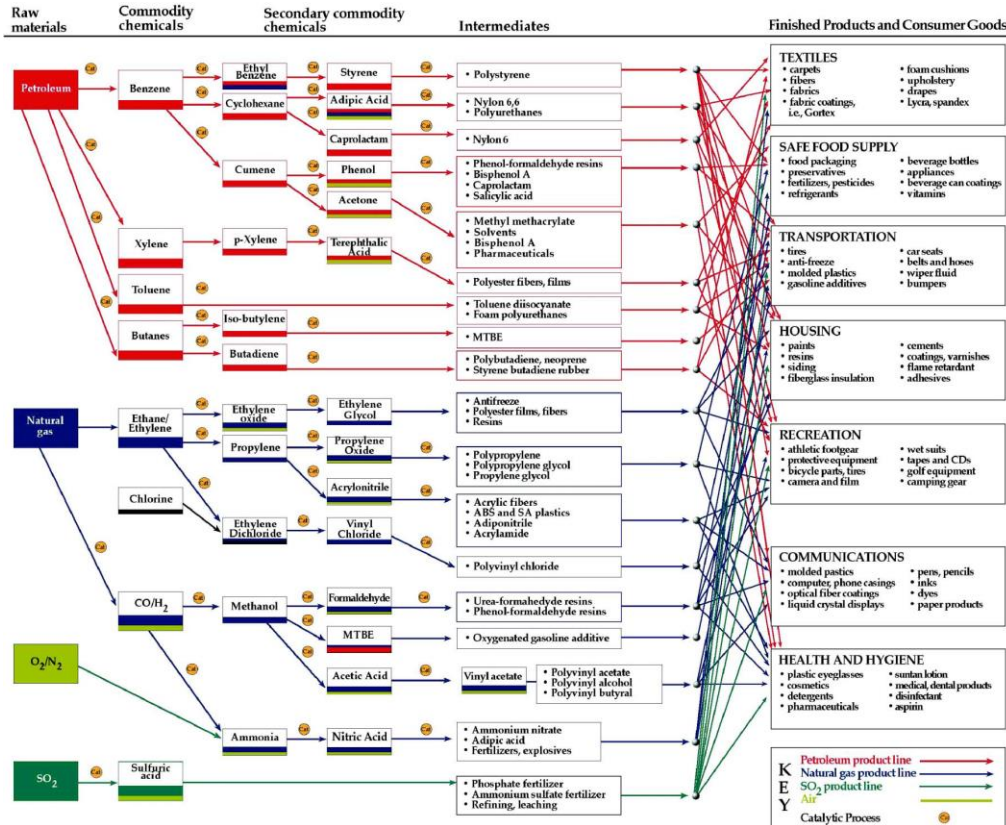
Automate

Risky/Tedious Tasks



- Automate Driving
- Search & Rescue
- No More Chores

If Data Is The New Oil....



Source: Department of Energy, Top Value Added Chemicals from Biomass, August 2004

- ✓ Multiple types of raw materials
- ✓ Complex value creation: raw materials → building blocks → end uses
- ✗ Exchanged + traded across the ecosystem at every level

Data Is (Not) Like Oil...

*“Oil is the world’s most traded commodity by value. **Data, by contrast, are hardly traded at all, at least not for money.** That is a far cry from what many had in mind when they talked about data as a new asset class...”*

Source: *The Economist*, May 2017



What Can We Learn From Looking At A Different Analogy?

ca 9000 BCE – ca 1840
Grain = Grain



Measuring the crop, ca 1400 BCE



ca 1840 - 1870
Expanding Trade, Silos



Grain Elevator,
Minneapolis, ca. 1850



Chicago Board of Trade,
est. 1848

ca 1870 - Today
Beyond Grain



Catalysts

- **Technology:** Transportation (Railroads, Steamships) + Storage (Grain Elevators)
- **Business Model:** Market / Exchange (Chicago Board of Trade)
- **Governance:** Standards & Regulation (Quality grades, Grain by weight)

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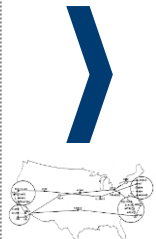
ca 1870 - Today
Beyond Grain



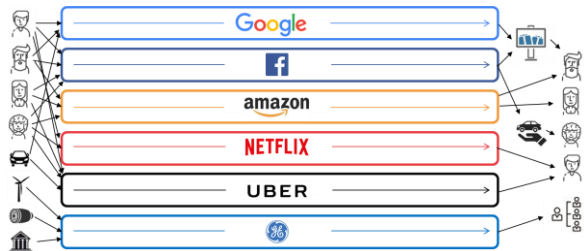
ca 3100BC – ca 1970
Data = Data



Sumerian accounting ledger, ca 2000 BCE



ca 1970 – now
Expanding “Trade”, Silos



Tomorrow
Beyond Data?

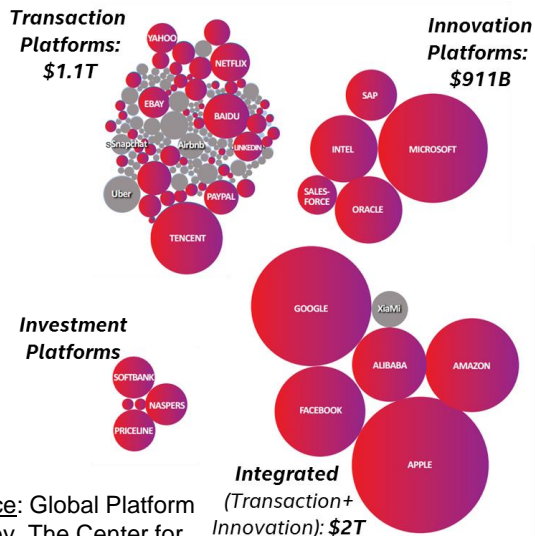
NASDAQ
For

- Technology data
- Business Model
- Governance

The Future of Data – Possible Scenarios

“Growth of Current Trajectory”: Data Monopolies

- Current data platforms continue to grow and gain share; network effects create defensible barriers to entry
- Increasing monopolization of data
- Data “eats the physical world”



Source: Global Platform Survey, The Center for Global Enterprise, 2015

“Constraint”: Data Fiefdoms, The Splinternet

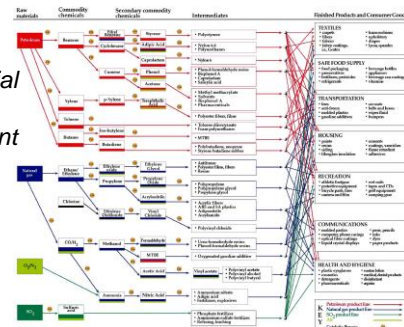
- Growth of data platforms is constrained by:
 - Regulation: data platforms become so essential that they get turned into utilities (and subject to regulation)
 - Regulation prevents global free flow of data, allows local data platforms to thrive
 - Data platforms reach limits of digital growth, expand into the physical world



“Transformation”: Efficient circulation and trading of data

- The focus shifts to complex data systems where most of the value is derived from fusing and processing diverse data-sets
- Exchanging and trading data becomes much more prevalent, data markets become the new growth platforms
- Focus shift from “monetizing data” to “transacting value”
- New ecosystems form unlocking new digital growth

Image Raw Material Value Chain
Source: Department of Energy, Top Value Added Chemicals from Biomass, August 2004



Imagining a Marketplace Platform for Data

*Orchestrate a full
multi-sided distributed market
(collection, clearing, brokerage, exchange, trade)*



*Transaction Fees
Membership Fees
Strong Network Effects*

Collection Platform

Enable context-aware data collection and cleansing



Collection Fees

Transaction Platform

Enable data (or value) transactions



Transaction Fees

Data Bank / Data Fiduciary

*Keep my data safe & facilitate re-use
(Manage ownership & transferability, prevent "leaks")*



*Transaction Fees
Management Fees*

Search Engine

Discover and find data sources



Advertising

"Intelligence Store"

Analytics as a Service



Transaction Fees

Standards Bodies

*Digital Objects
Identities
Timing/Clocks
Context Semantics*

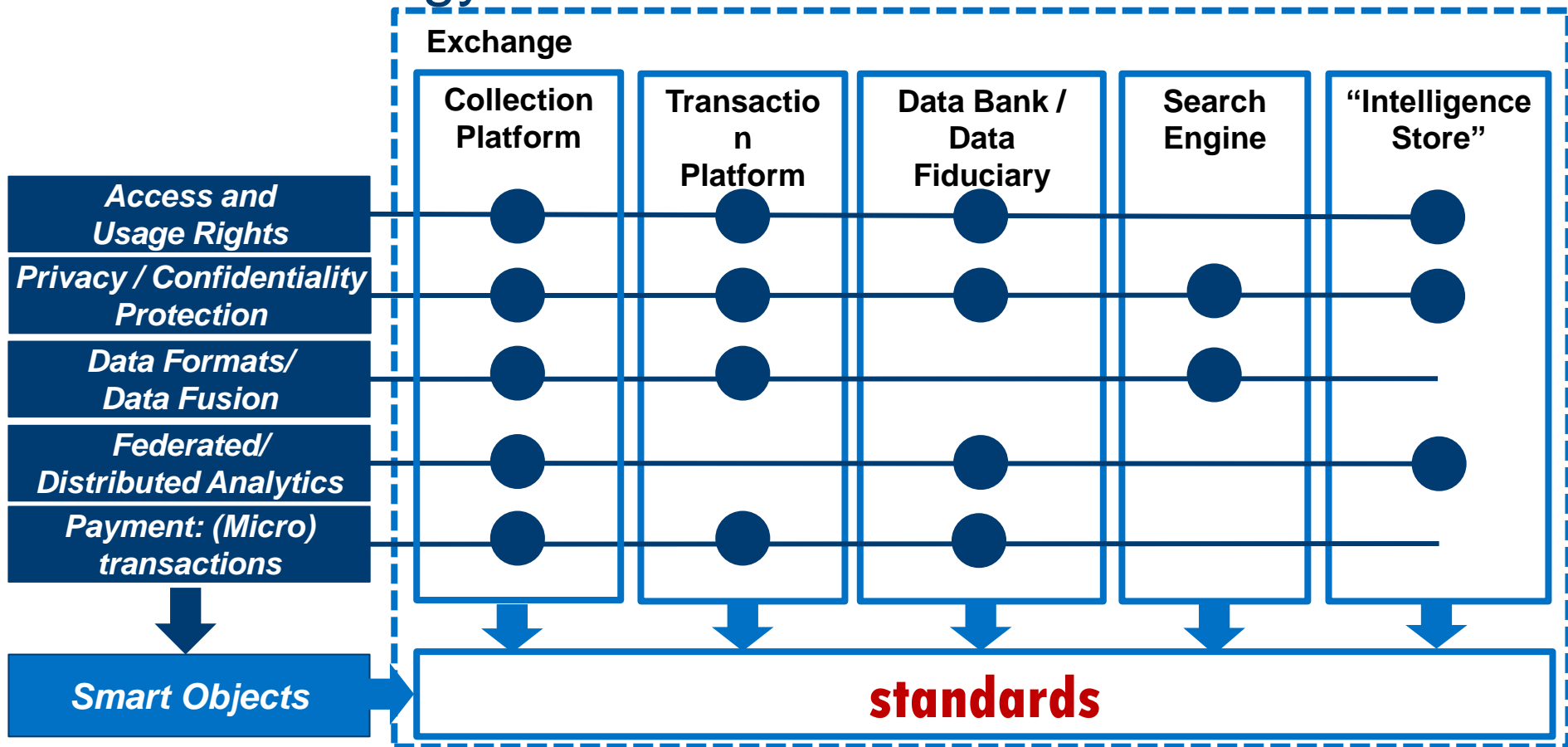
*Registries
Privacy*

*Security Permissions
Digital Trust (Provenance)*



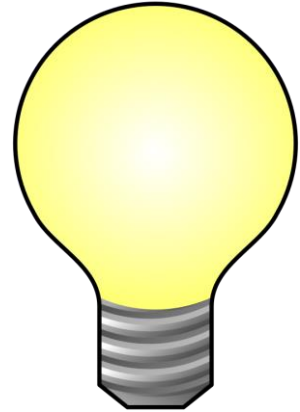
*Total Available Market (TAM)
Expansion*

New Technology Solutions Are Needed



Smart Objects

Standards bodies and alliances: e.g.,



Frameworks:

- Standards: So many to choose from! **DOA!!!**
- Ontologies: Even more to choose from!
- Interoperability: What form of interoperability (syntactic, semantics, object, etc.)?
- How to develop distributed IoT services using metadata?

Discoverability, Search and Management at scale

Identity (**DOI**), Naming, Lineage and Access (Security)

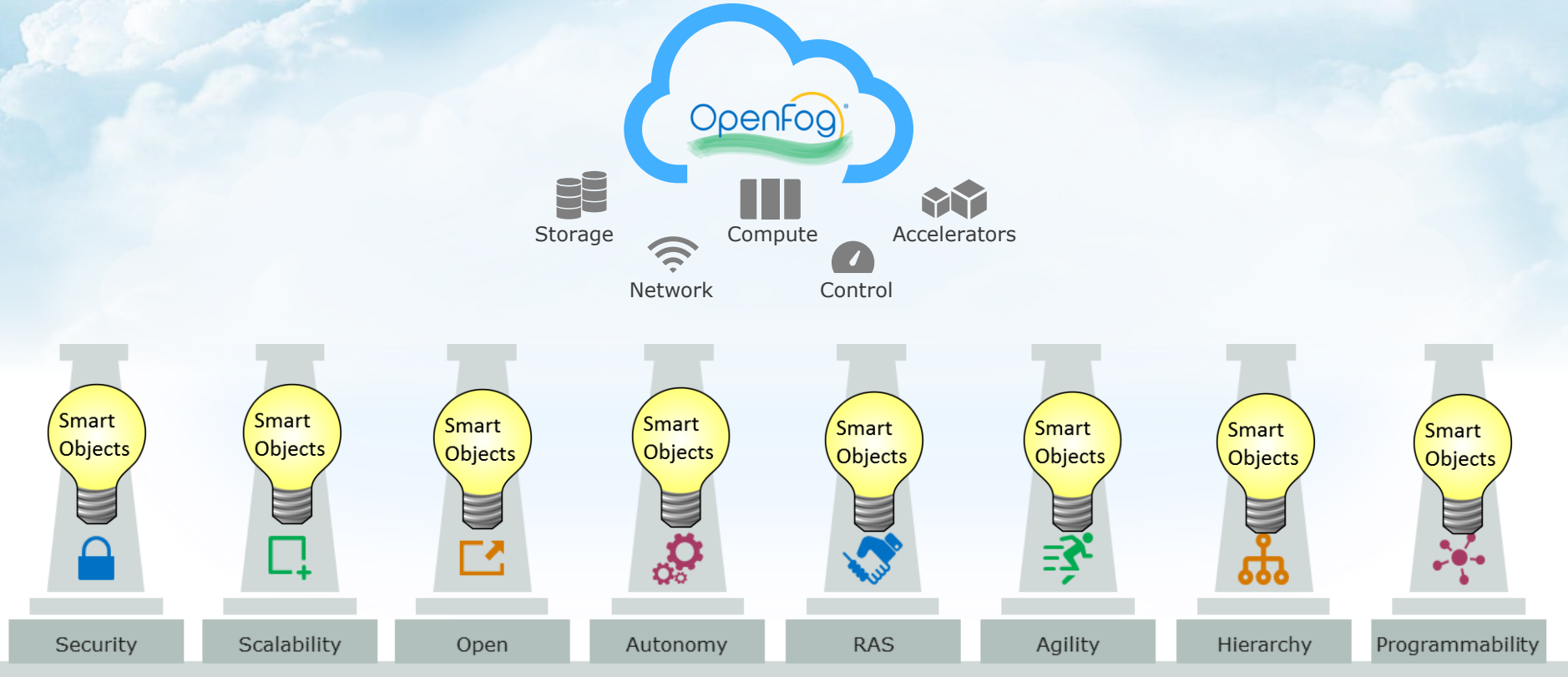
Semantic Interoperability..... does “on” mean useable light?

Q. Can you turn on a light bulb?

A. Maybe:

- if you use the right standard and
- if you use the right ontology or if you have a bridge to another framework and semantics match
- If you can discover the light bulb
- If you can address the light bulb
- If you have permission

Key pillars of the OpenFog architecture framework

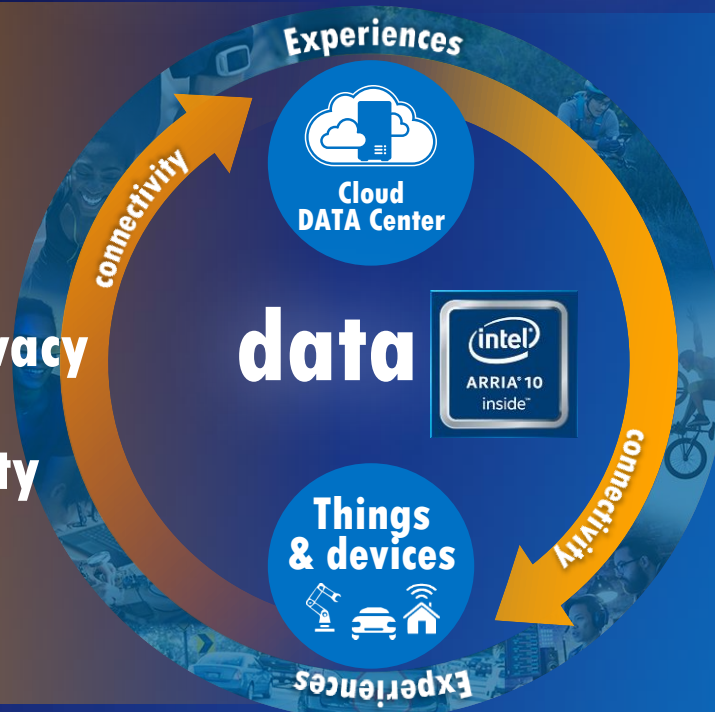


Frictionless data means frictionless AI

Imagine data exchange on-a-chip
Intel® Arria® 10 FPGA

Capabilities

- ✓ Auto cleansing & formatting
- ✓ Access Rights / privacy
- ✓ Data interoperability
- ✓ Traceability (blockchain)



Experiences

TRUST
NASDAQ[®]
For data

Summary

Data is oil “like”... but more value could be unlocked for the data economy and for the ecosystem enabling broad exchange & trade of data

The ***Future*** drives new growth in data collection (IoT) that provides new mechanisms to both collect and compute data at the earliest point of data availability

Broad exchanging of data requires technological & business model innovation...starting with ecosystem, partnerships & standards...particularly smart objects (DOI/DOA)

FPGAs for data processing enable frictionless AI

Contacts

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