Collaborators and Key Contacts:
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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

Source: Intel
If Data Is The New Oil….

- Multiple types of raw materials
- Complex value creation: raw materials → building blocks → end uses

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

Exchange + 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)
What Can We Learn From Looking At A Different Analogy?

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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

Expanding “Trade”, Silos

**Tomorrow**
Beyond Data?

- Technology
- 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”

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

“Constraint”: Data Fiefdoms, The Splinternet

- Increasing monopolization of data
- Data “eats the physical world”
- 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

“Transformation”: Efficient circulation and trading of data

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Imagining a Marketplace Platform for Data

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

Collection Platform
Enable context-aware data collection and cleansing

Transaction Platform
Enable data (or value) transactions

Data Bank / Data Fiduciary
Keep my data safe & facilitate re-use (Manage ownership & transferability, prevent “leaks”)

Search Engine
Discover and find data sources

“Intelligence Store”
Analytics as a Service

Collection Fees
Transaction Fees
Transaction Fees
Transaction Fees

Digital Objects
Identities
Timing/Clocks
Context Semantics
Registries
Privacy
Security Permissions
Digital Trust (Provenance)

Total Available Market (TAM) Expansion

Standards Bodies

Transaction Fees

New Technology Solutions Are Needed

- Collection Platform
- Transaction Platform
- Data Bank / Data Fiduciary
- Search Engine
- “Intelligence Store”

**Exchange**

- Access and Usage Rights
- Privacy / Confidentiality Protection
- Data Formats / Data Fusion
- Federated / Distributed Analytics
- Payment: (Micro) transactions

**Smart Objects**

**standards**
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
Experiences

Capabilities

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

Cloud DATA Center

Data

Investing

Experience

Things & devices

Intel® Arria® 10 FPGA

Imagine data exchange on-a-chip

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
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