



Industrial Internet: Pushing the Boundaries of Minds and Machines

Manufacturing in a
Hyper-networked World

Dr. Joe Salvo

Massive networks are integral to GE'S heritage.

Over 100 years ago GE Founder Thomas Edison designed electrical distribution grids.

With the Industrial Internet real-time decisioning and collaboration will differentiate products and services in an N-dimensional network space.

Digital networks will coordinate decisions.



At GE Petabytes of data and thousands of analytics enable...

Knowledge Services:

- Maintenance and diagnostics
- Prognostics



Customer benefits:

- No unscheduled downtime
- Better asset management and utilization rates

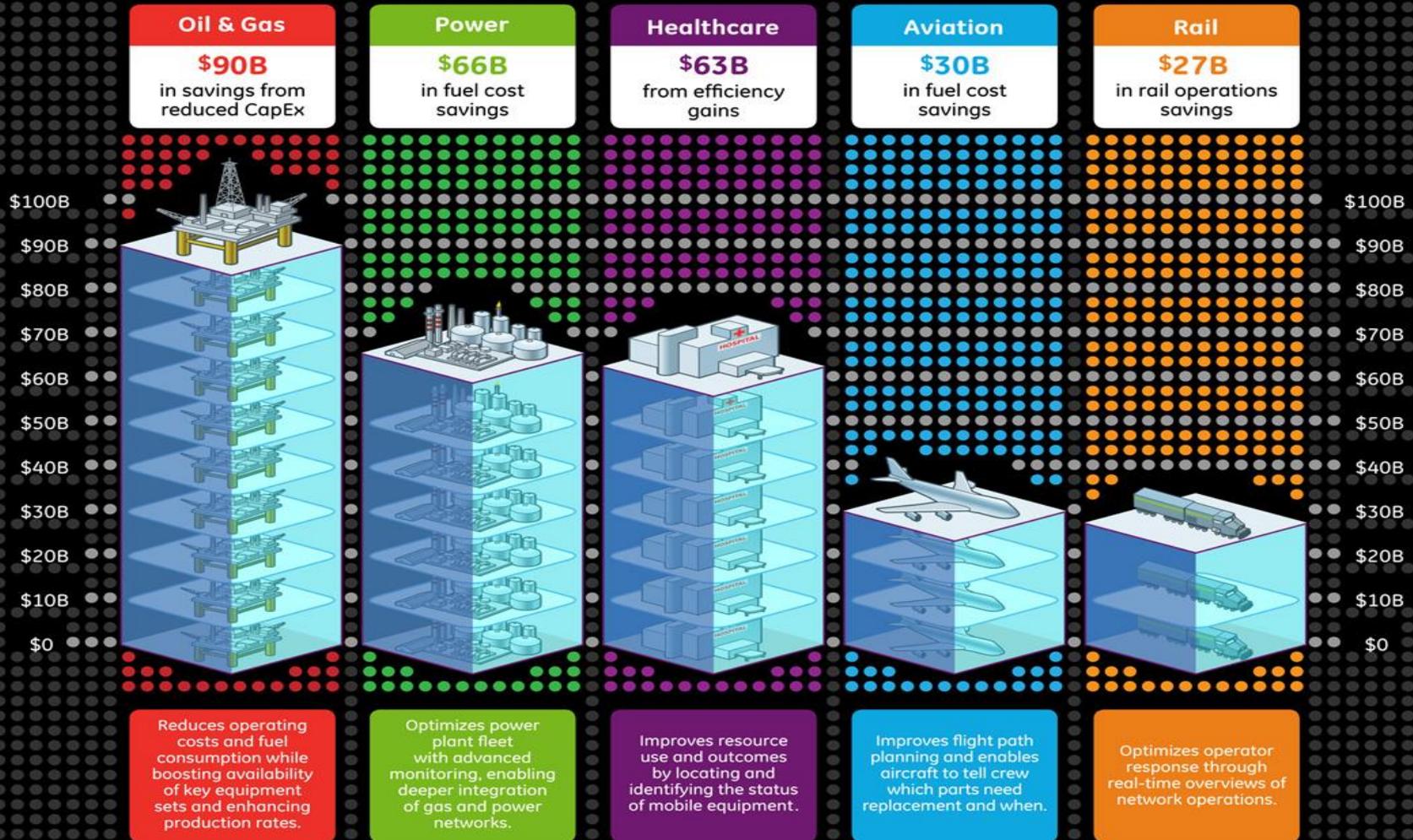


We constantly strive to predict and optimize the performance and life of all our products and services.

100's of \$Billions in Value

INDUSTRIAL INTERNET: THE POWER OF 1%

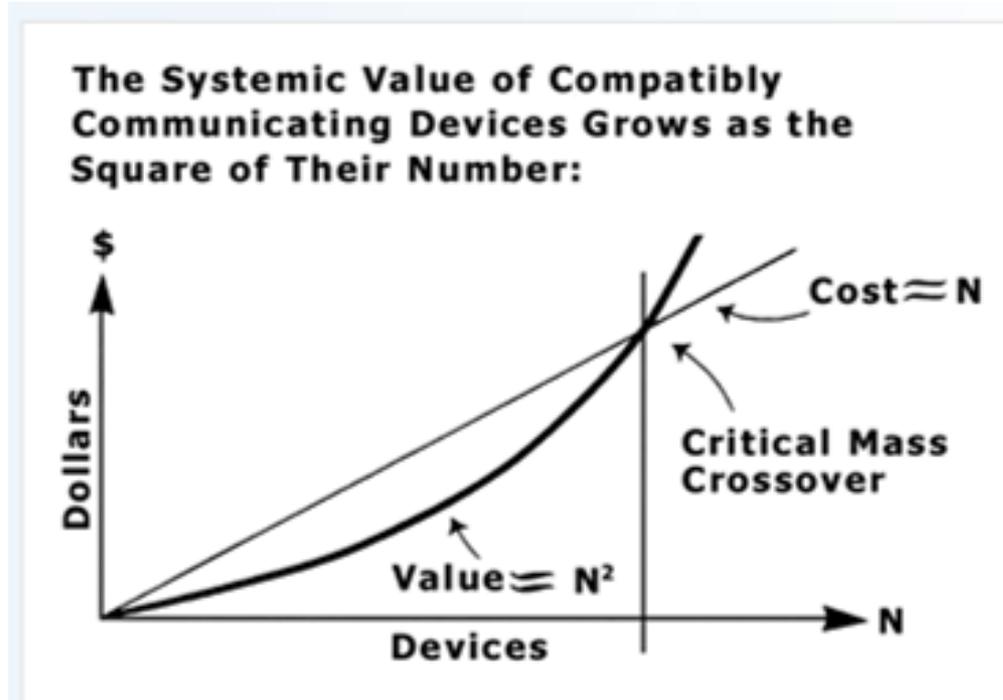
Efficiency gains as small as 1% could have sizable benefits over 15 years when scaled up across the economic system.



INDUSTRIAL INTERNET BENEFITS

Metcalfe's Law

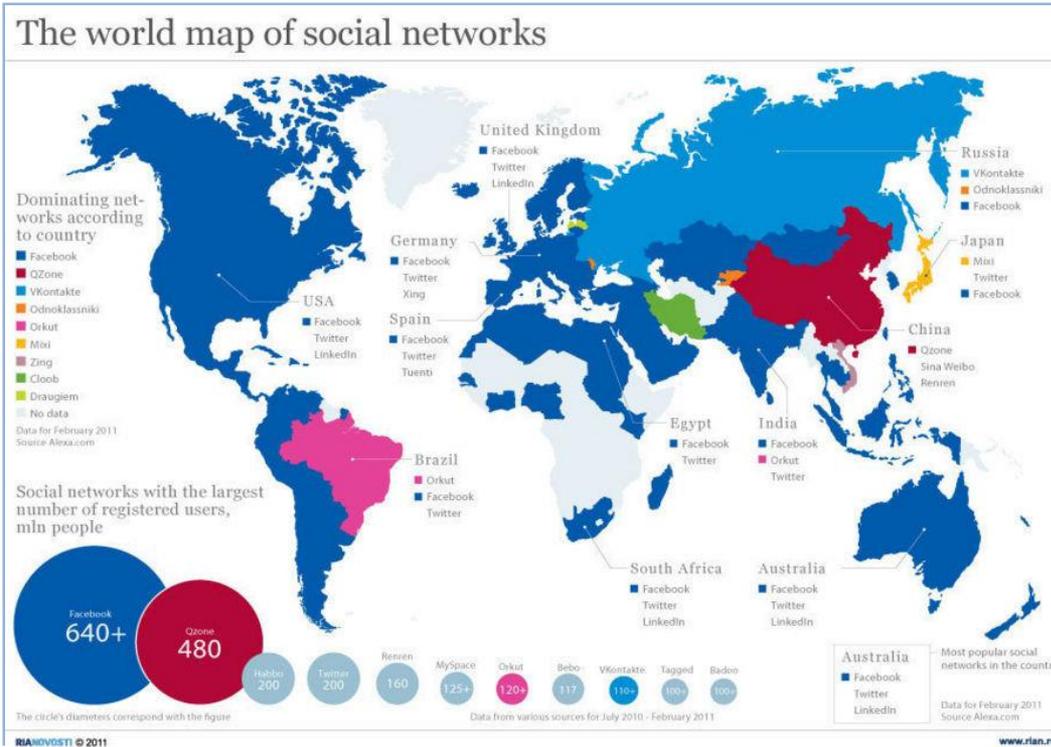
Source: Metcalfe's Law Recurses Down the Long Tail of Social Networking, By Bob Metcalfe
<http://vc mike.wordpress.com/2006/08/18/metcalfe-social-networks/>



Value of network exceeds cost of network at critical point

Network value exponentially increases.

Billions of people create extensive global networks

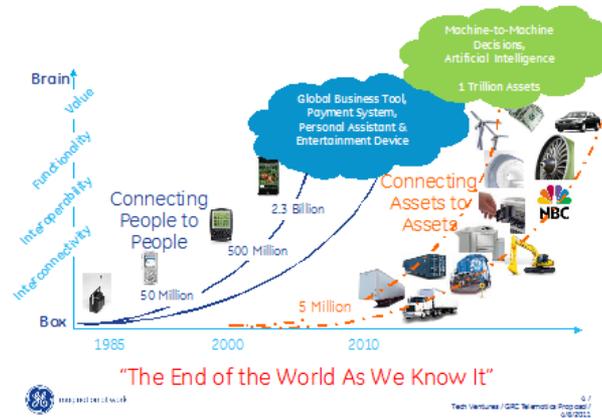
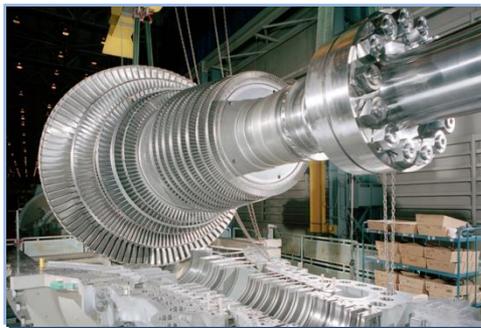


Facebook
Google+
LinkedIn
WeChat
Twitter

Source https://wiki.smu.edu.sg/digitalmediaasia/Main_Page

People-centric networks connect people to information and each other.

Next: Machine to Machine Networks Become Collaborative



Billions of Objects

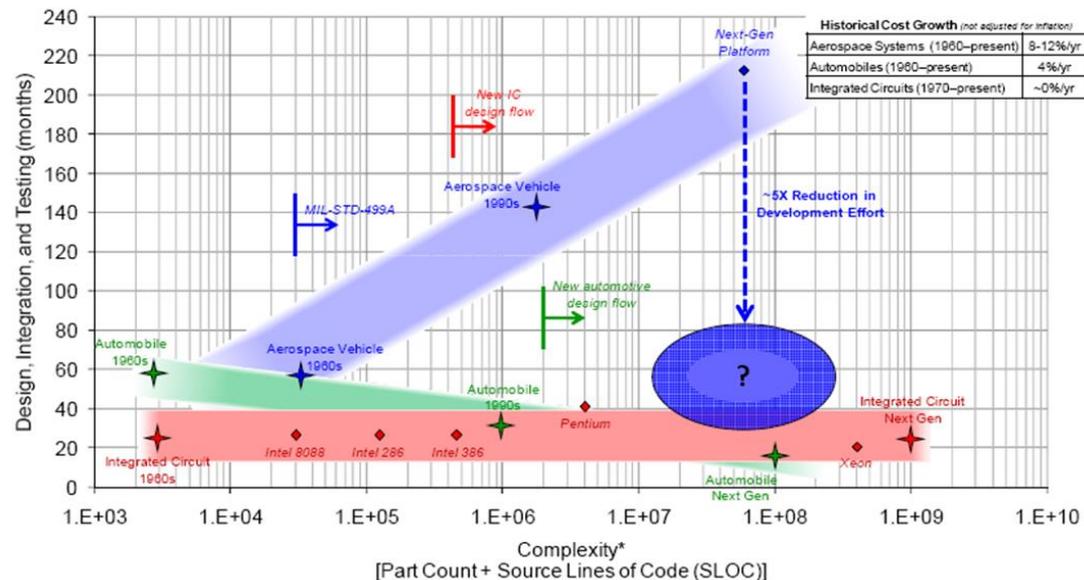
More Software, More Compute, More Intelligence

As cyberphysical systems are becoming more and more complex

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Historical schedule trends with complexity

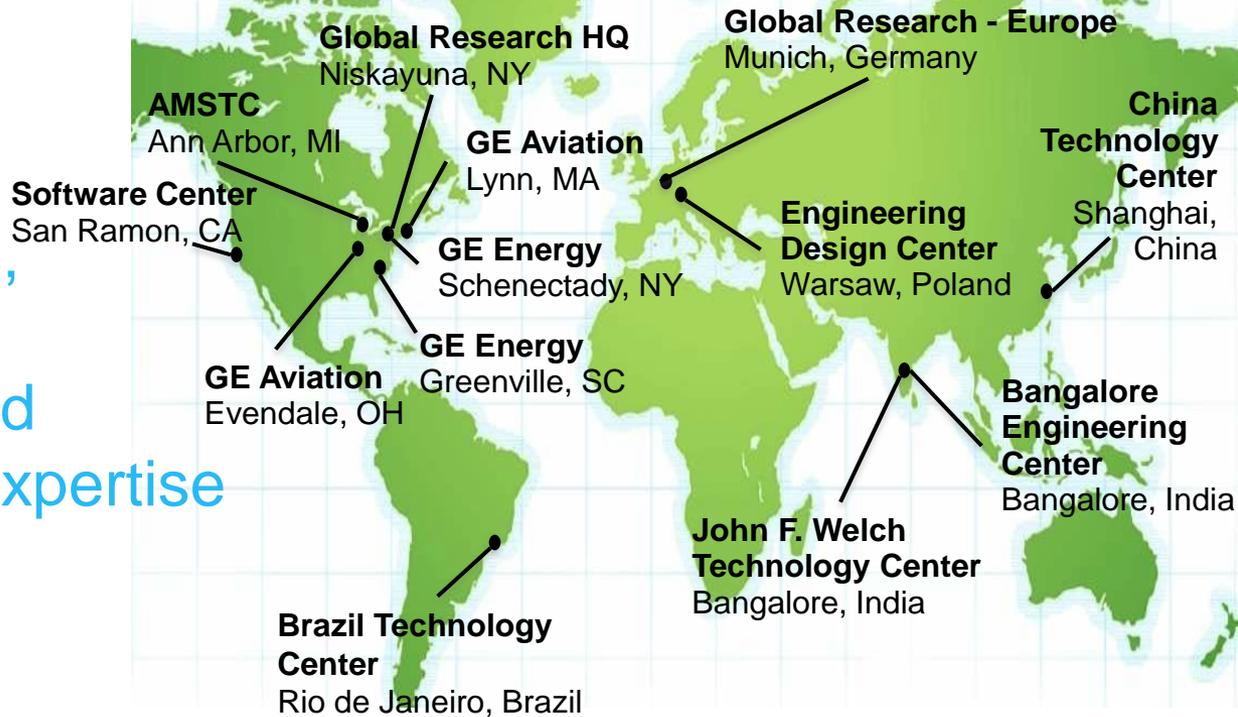


Note (*): Not a great metric. But that's what we have today. META will come up with better metrics.

Need a new paradigm to create complex systems.

GE's Globalized Engineering Workforce

10,000's of Engineers,
1000's of Tools,
Petabytes of Data, and
Globally Distributed Expertise

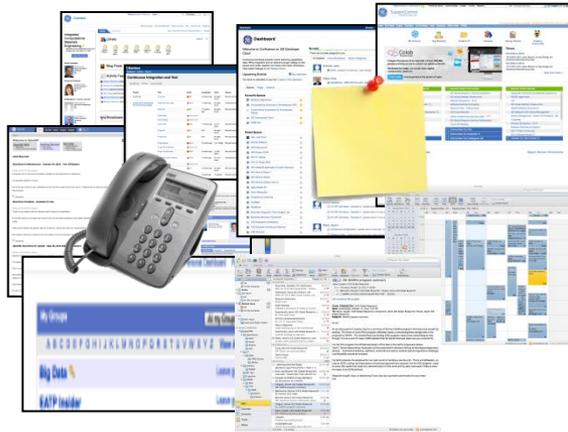


Innovation Platform to connect
the GE Engineering Community and Ecosystem

Change the Design to Manufacture Paradigm

Current State

- Isolated Expertise
- Separate Tool & Data Repositories
- Manual Workflow & Data Movement
- Task Centric

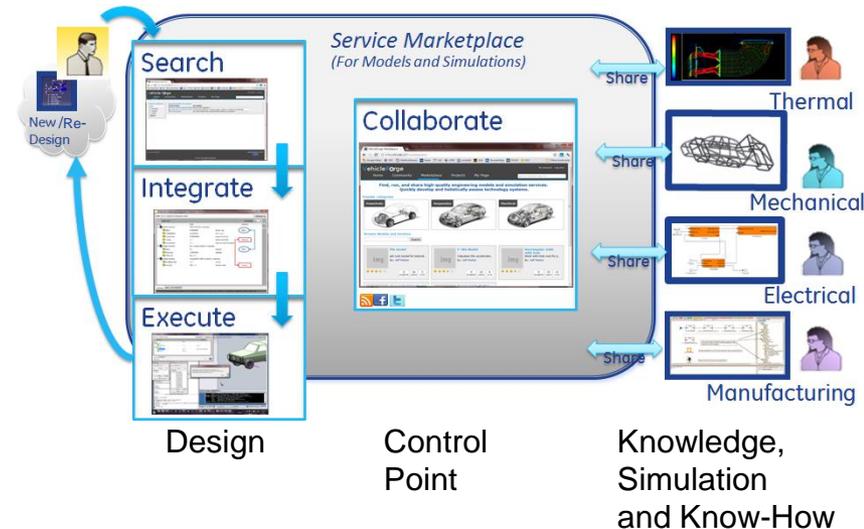


integrate



Future State

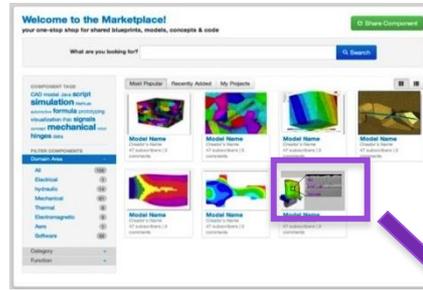
- Integrated Knowledge
- Unified & Searchable
- Automated Workflow & Data Movement
- Project/Process Centric



**Enable a seamless flow of information
and democratize the access to knowledge.**

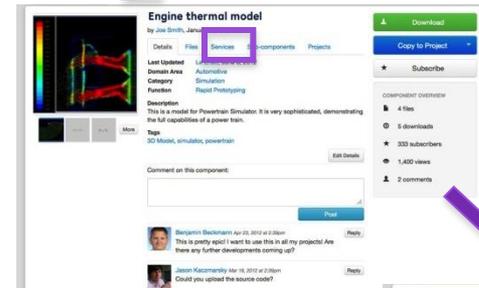
GE Global Research Innovation Platform (CEED) Delivered via the Cloud

Finding and Exchanging
Data and Models



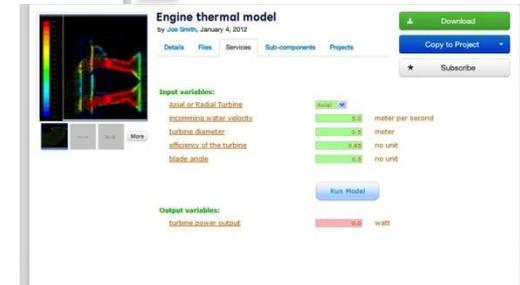
With initial
support from the
DARPA AVM
program

Unified Source of
Distributed
Models, Data &
Services



- Transparent
- Auditable
- Automated

Expose Automated Tools
to Authorized Users



**Expose tools and data in a
searchable automation platform.**

Collaborative Federated Environment



**Access Materials Data and Models at the Source
With Governance, Controllership, and Ownership**

Advanced Manufacturing Will Transform the Entire Value Chain

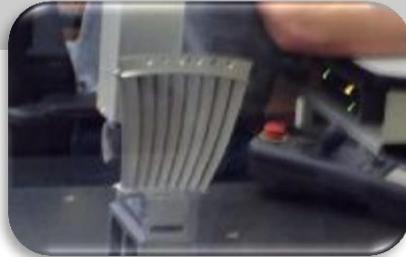
Engineering & Design



Integrated design

Crowdsourcing
Collaborations

Machining, Tooling & Fabrication



Advanced fabrication

New technology &
Materials

Plants & Enterprise Operations



Brilliant factories

Pervasive Sensors
Realtime
Responsiveness

Supply Chain Resources & Purchases



Digitized supply chains

Demand Driven and
Digitally Optimized

Changing the Manufacturing Paradigm
from Design to Supply Chain

The Result: Cloud Manufacturing

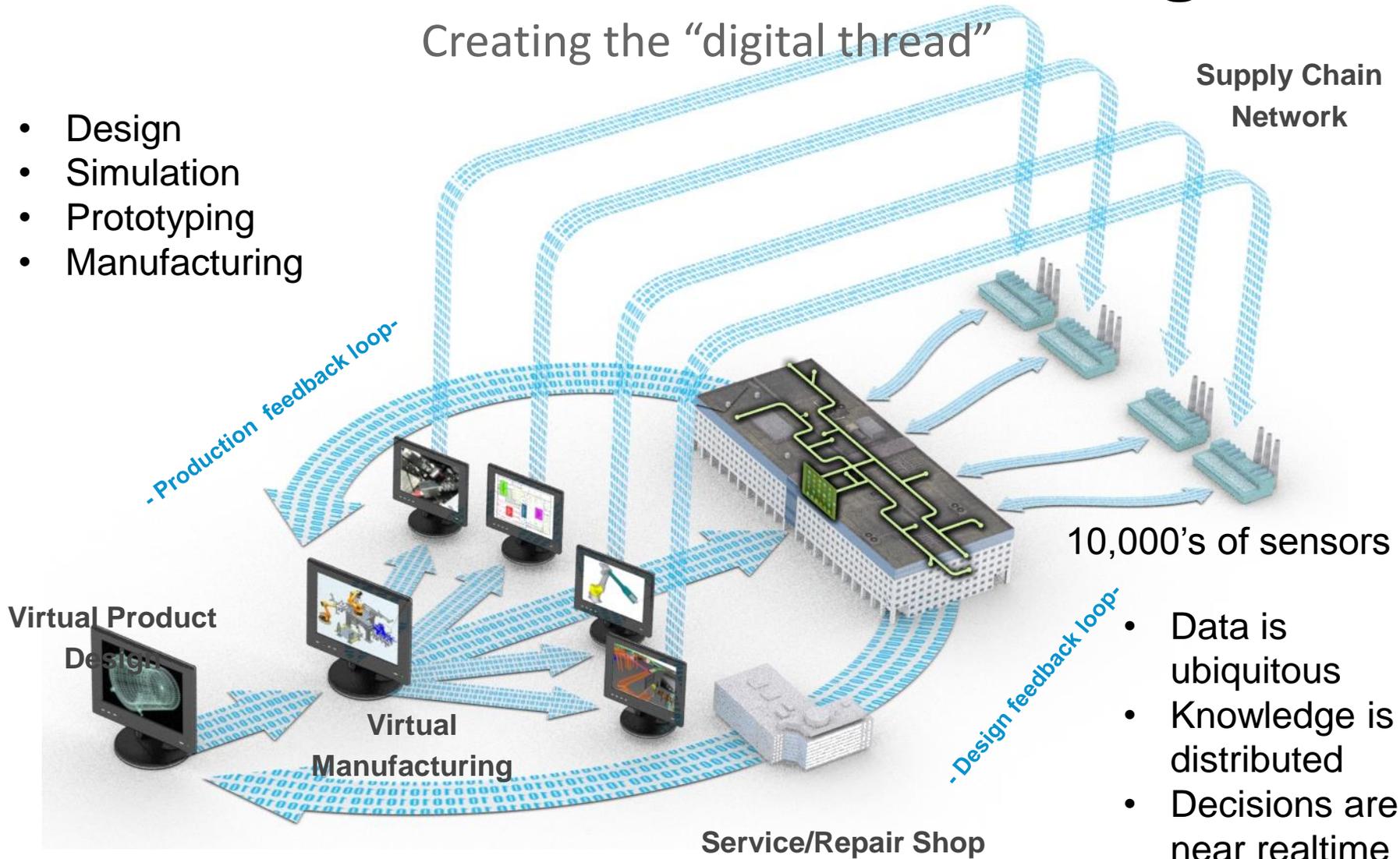
- Collaborative Crowdsourcing Environment Implemented in the Cloud
- Ready to Add Specialized Content and Features
- Allows Protection of IP and Unique Value Models
- Looking for Partners to Continue Development and Identify Pilots and POC' s

**A Collaborative & Distributed Environment for
Changing the Manufacturing Paradigm**

GE Brilliant Manufacturing

Creating the “digital thread”

- Design
- Simulation
- Prototyping
- Manufacturing



Brilliant Minds, Machines and Factories Seamlessly Connected

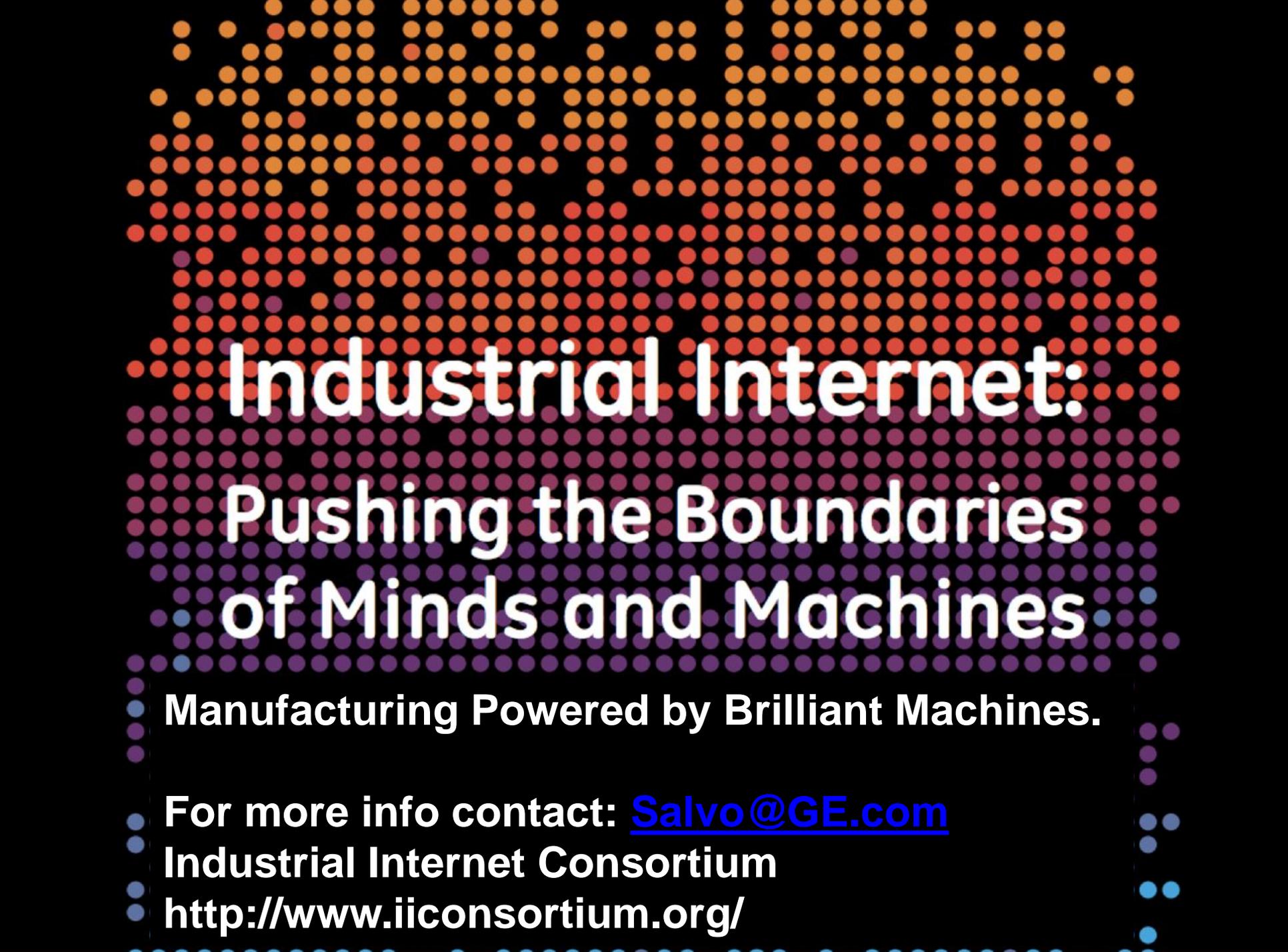


Connecting and Orchestrating the Flows



Devices
Data

Decisions to
be Made



Industrial Internet: Pushing the Boundaries of Minds and Machines

Manufacturing Powered by Brilliant Machines.

For more info contact: Salvo@GE.com

Industrial Internet Consortium

<http://www.iiconsortium.org/>