



Map Reduce for Optimizing the Large-scale Industrial IOT towards Digital Manufacturing

Soundar Kumara, Hui Yang, Daniel Finke, and Ken Hutchison
Presenter: Shenli Pei

**The Harold and Inge Marcus Department of
Industrial and Manufacturing Engineering**

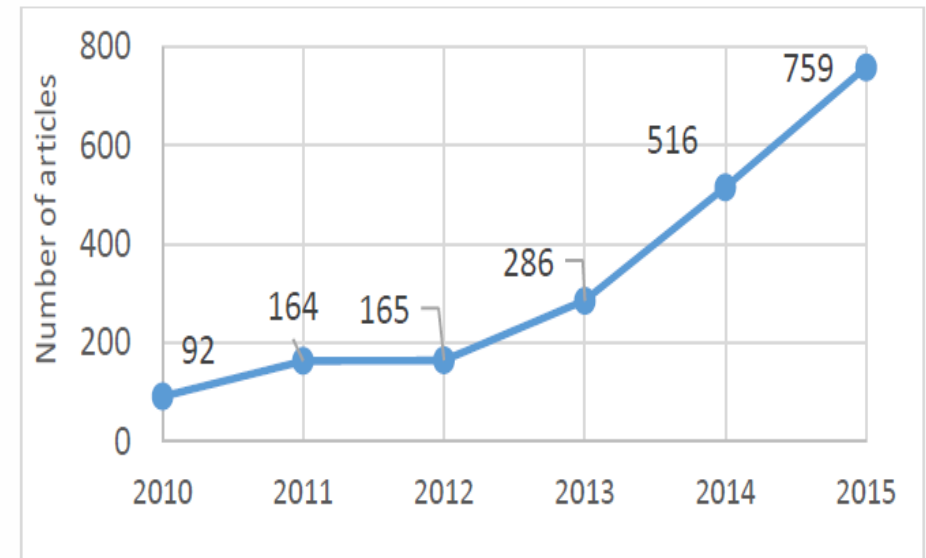
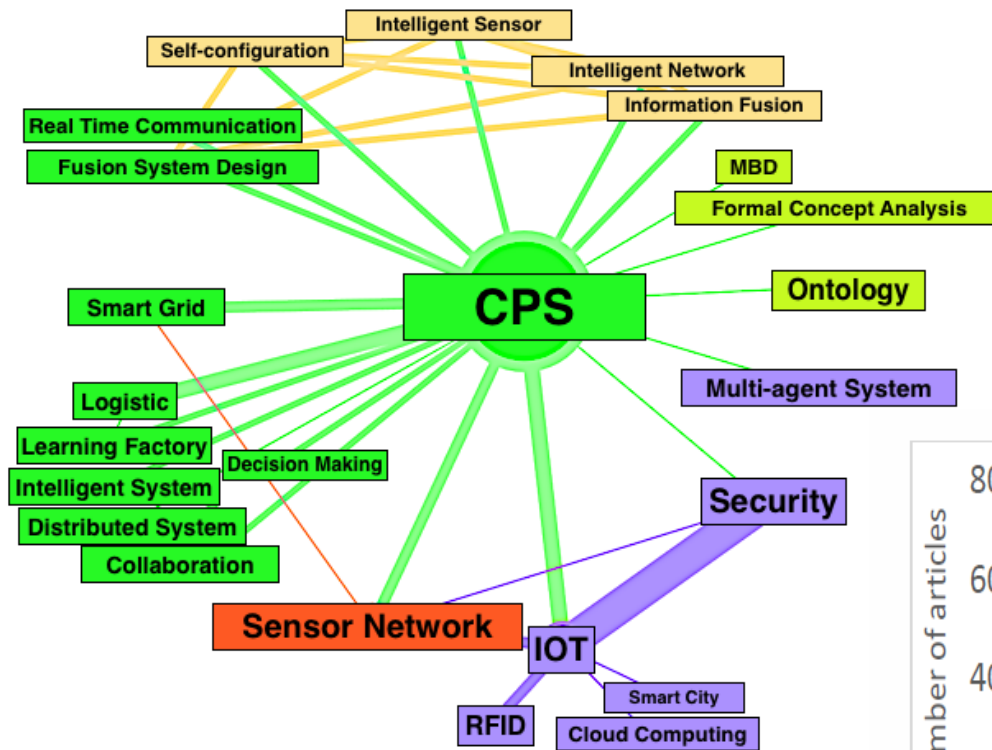
Pennsylvania State University

Center for E-Design

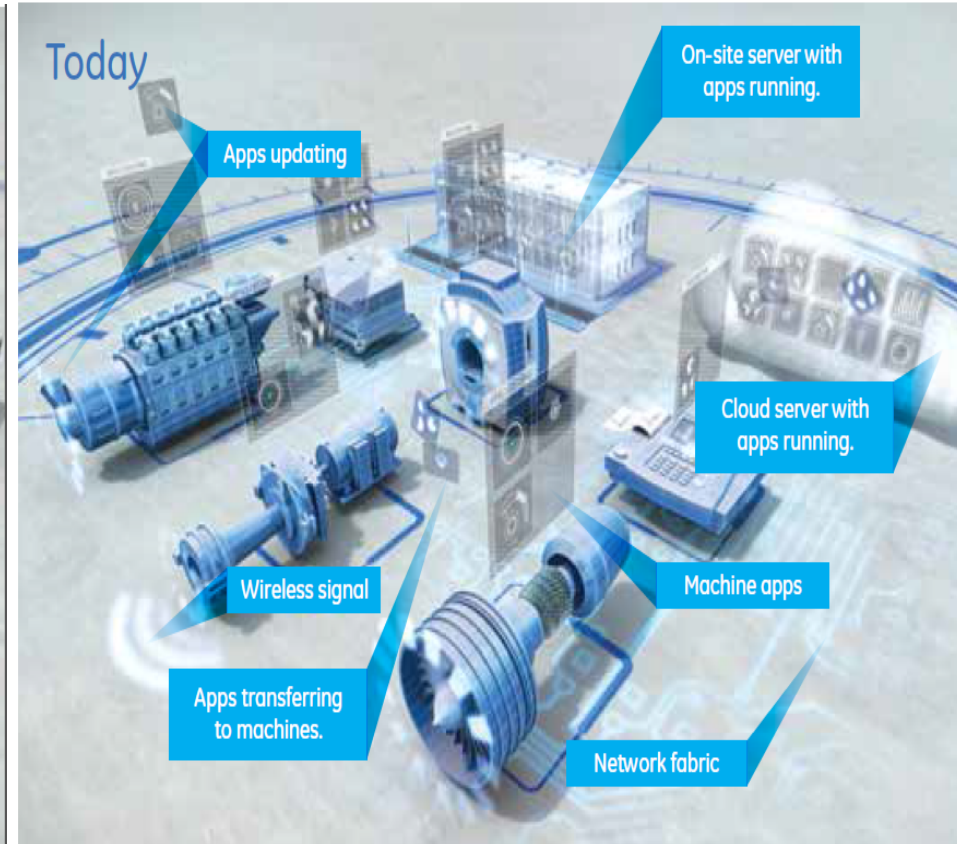
June 9, 2016



Cyber-physical Systems (CPS) is gaining more literature attentions



IOT enabled CPS



Source: GE

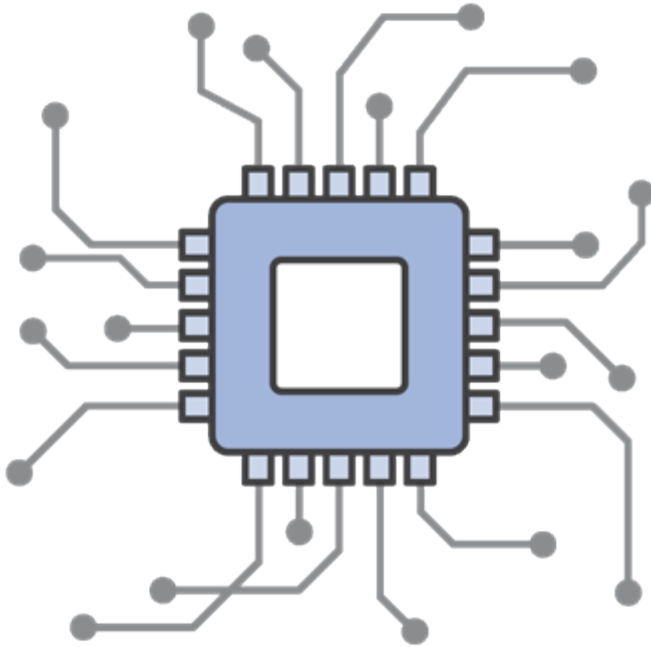


By 2020...

4 billion people

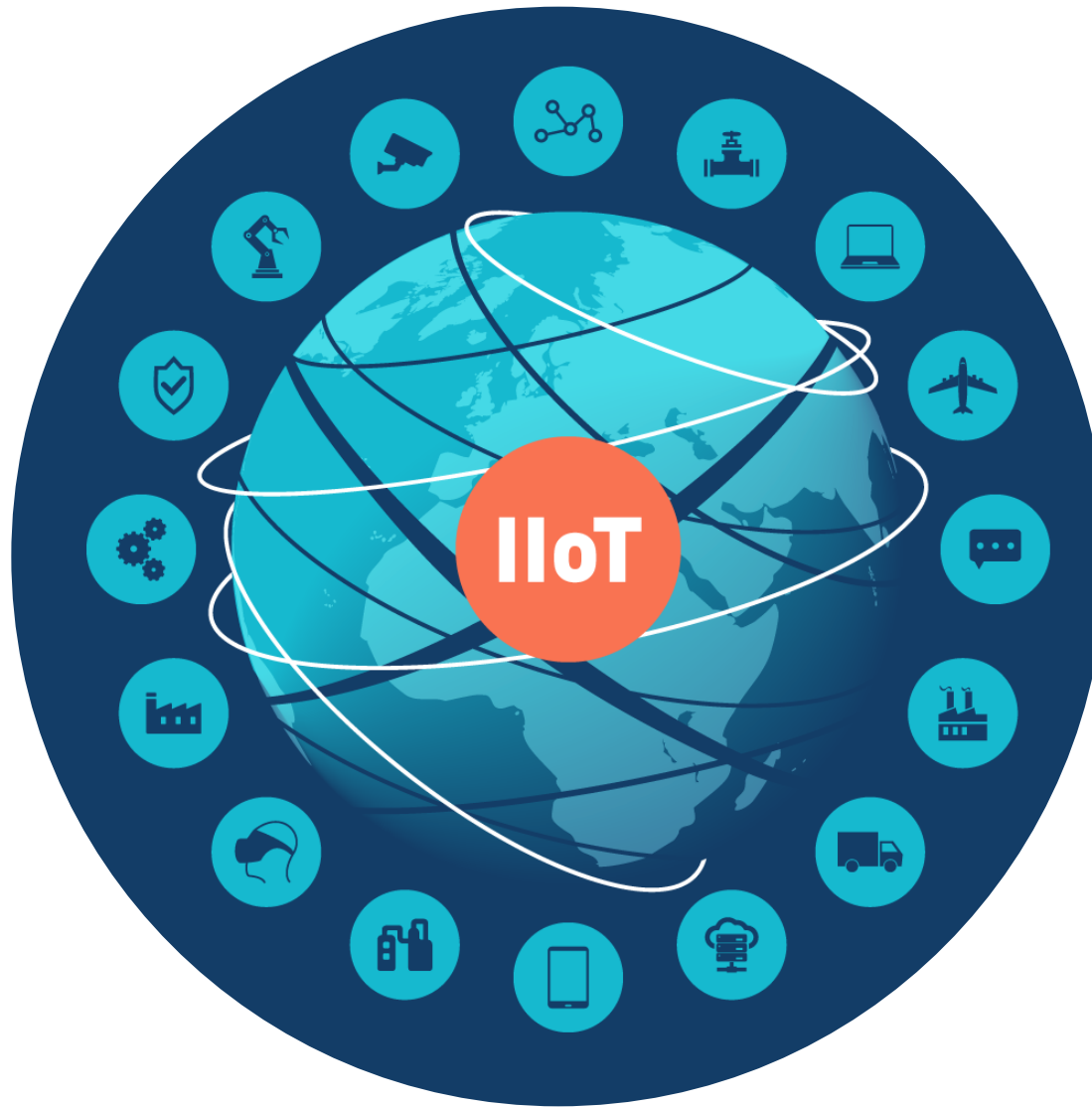
31 billion devices

IOT Cloud Processor

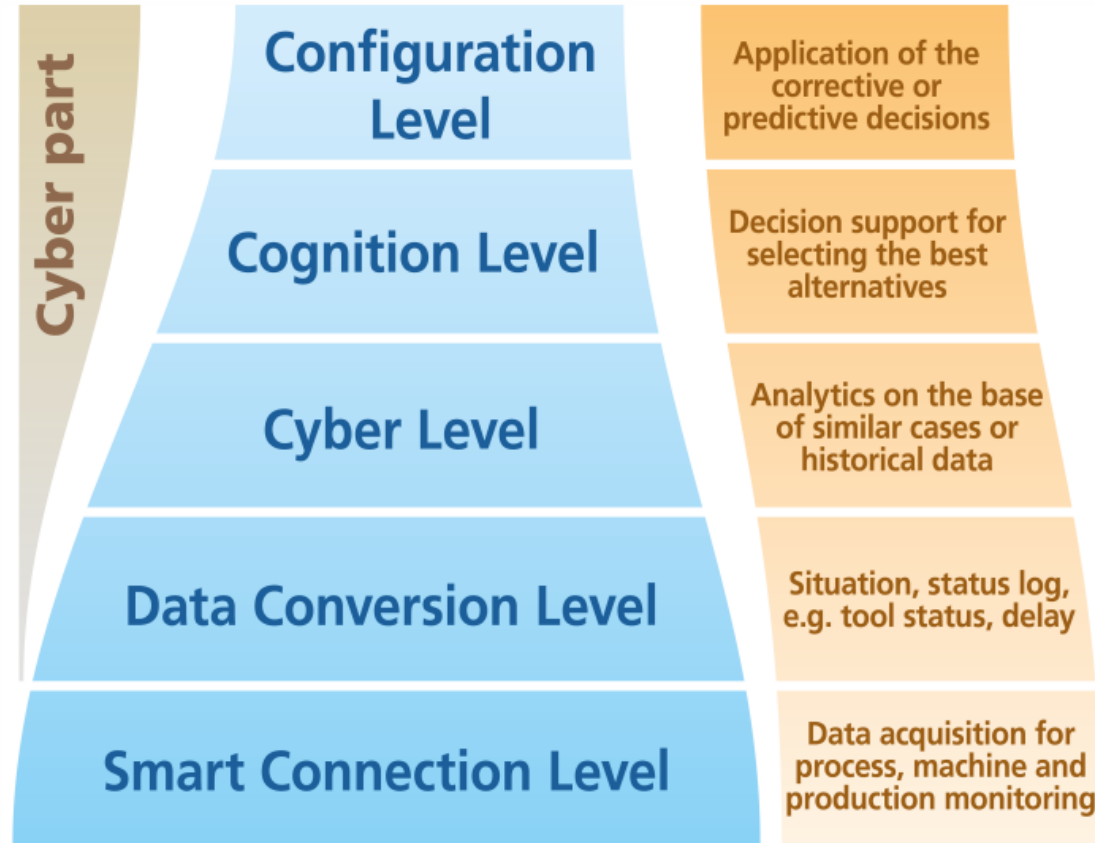


- Mass-produced compute power
- Widespread IP connectivity
 - Wired or wireless
 - Communication

Industrial Internet of Things (IIoT)



Architecture and Implementation of IIOT





In 2015...

18.92%



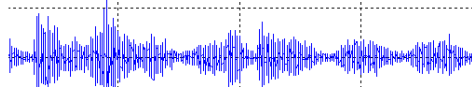
\$ 5.94 trillion

IOT for Manufacturing

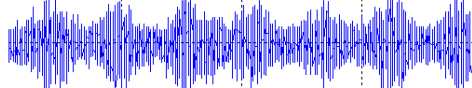
Machines in the manufacturing facilities

Real-time and In-situ Sensing Signals

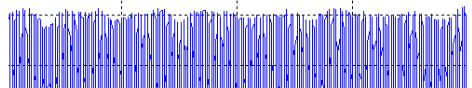
Acoustic Emission



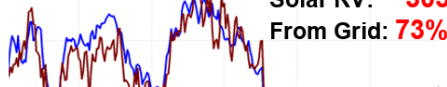
Vibration



Cutting Force



Power

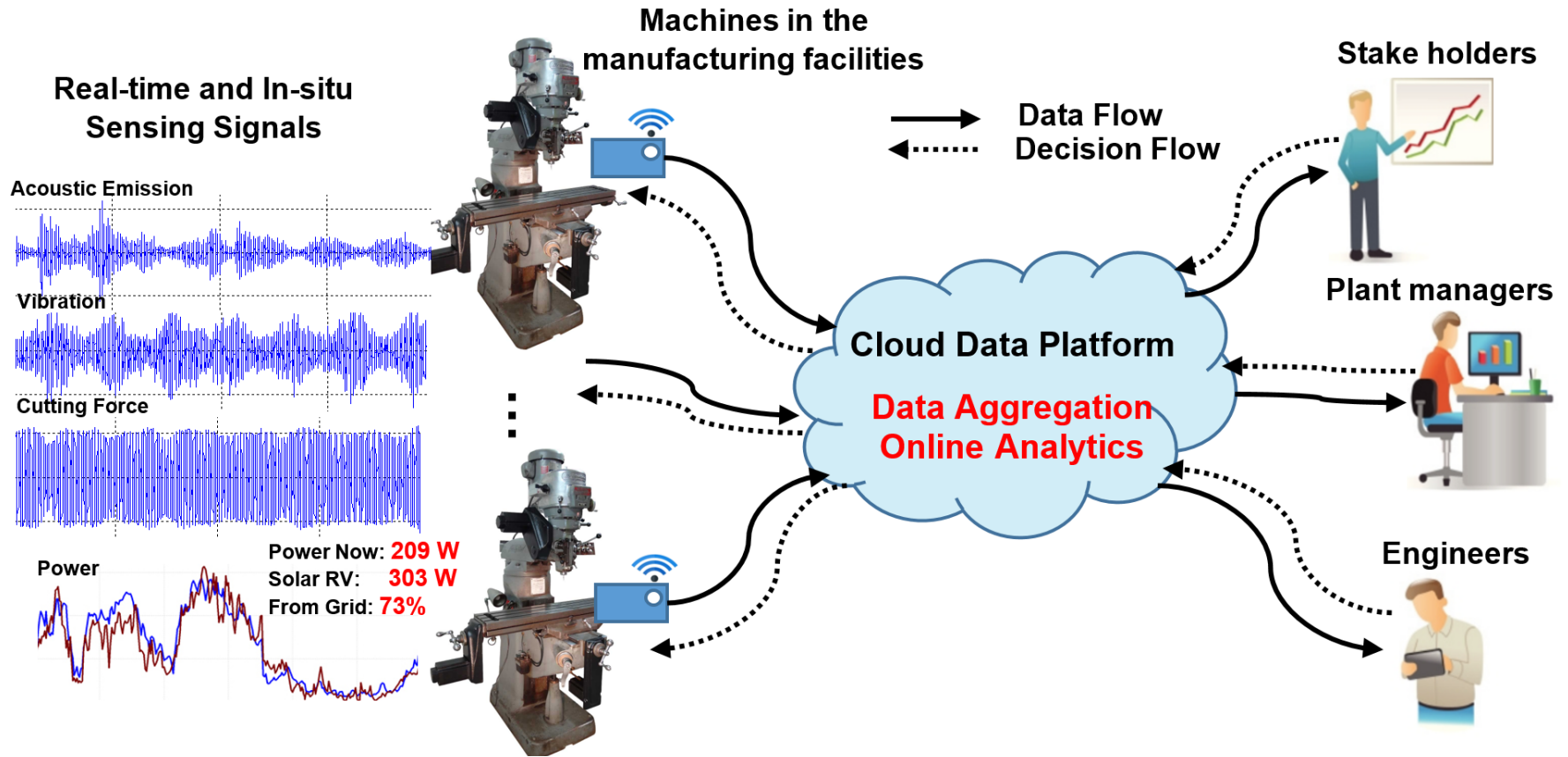


Power Now: **209 W**
Solar RV: **303 W**
From Grid: **73%**

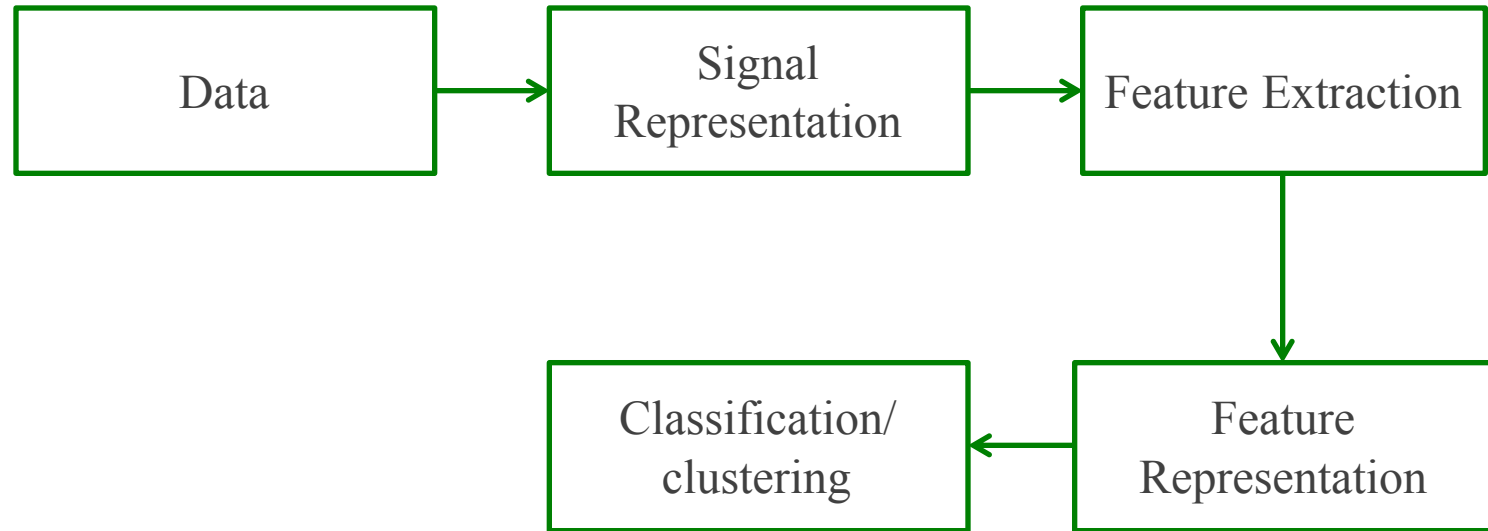


BIG Data!!!

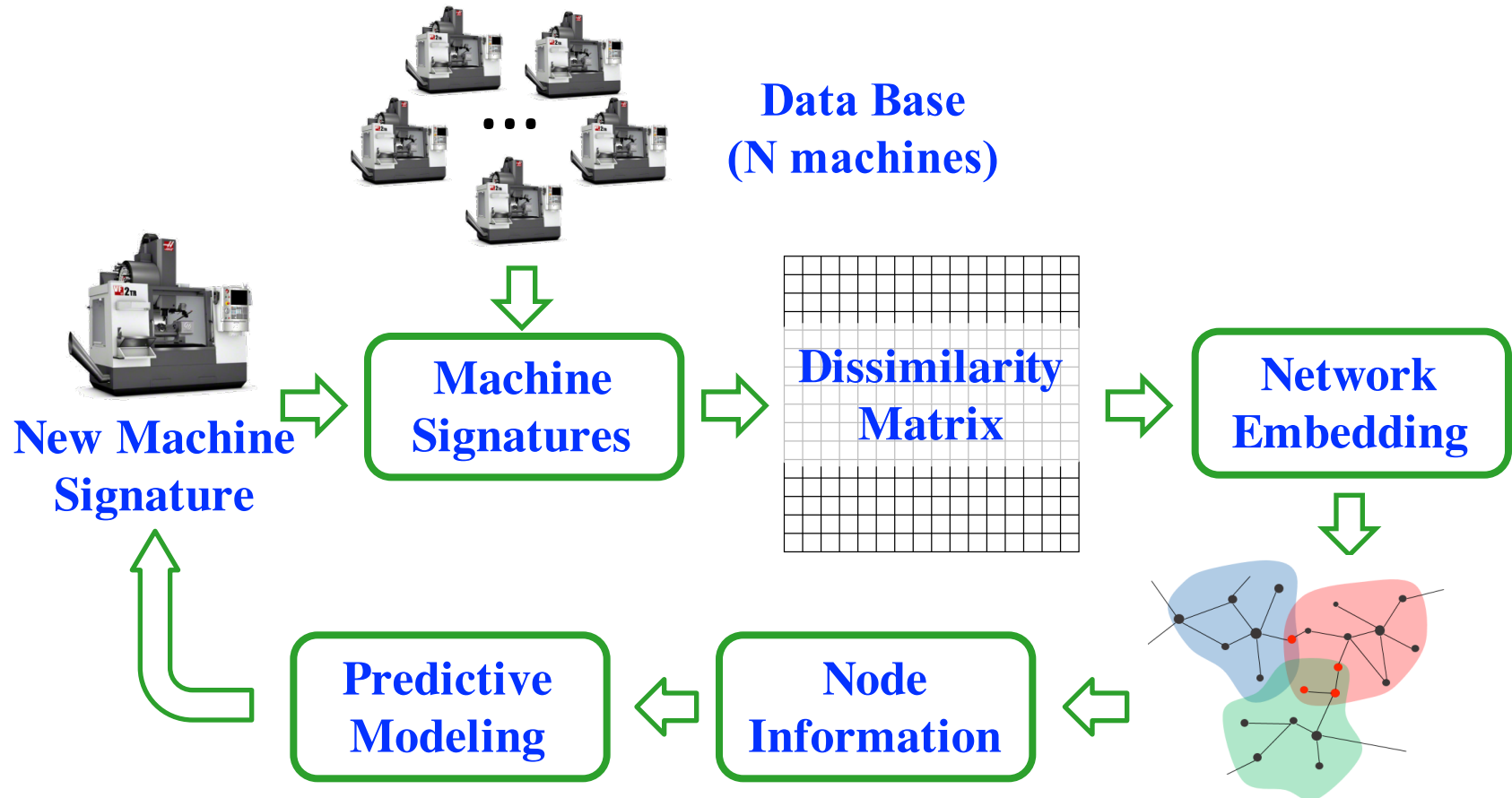
Large Scale IIOT for Manufacturing



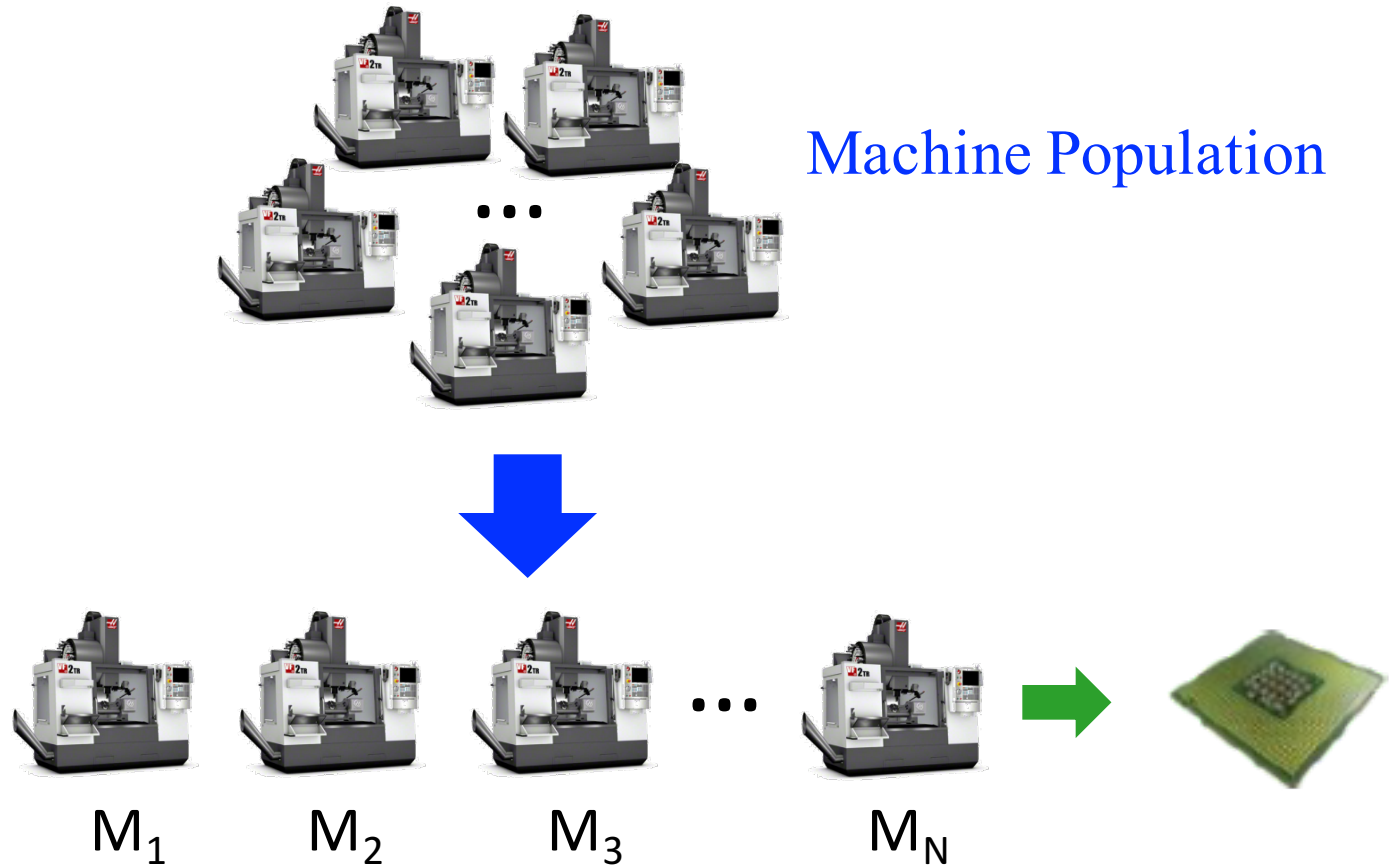
Data to Decision



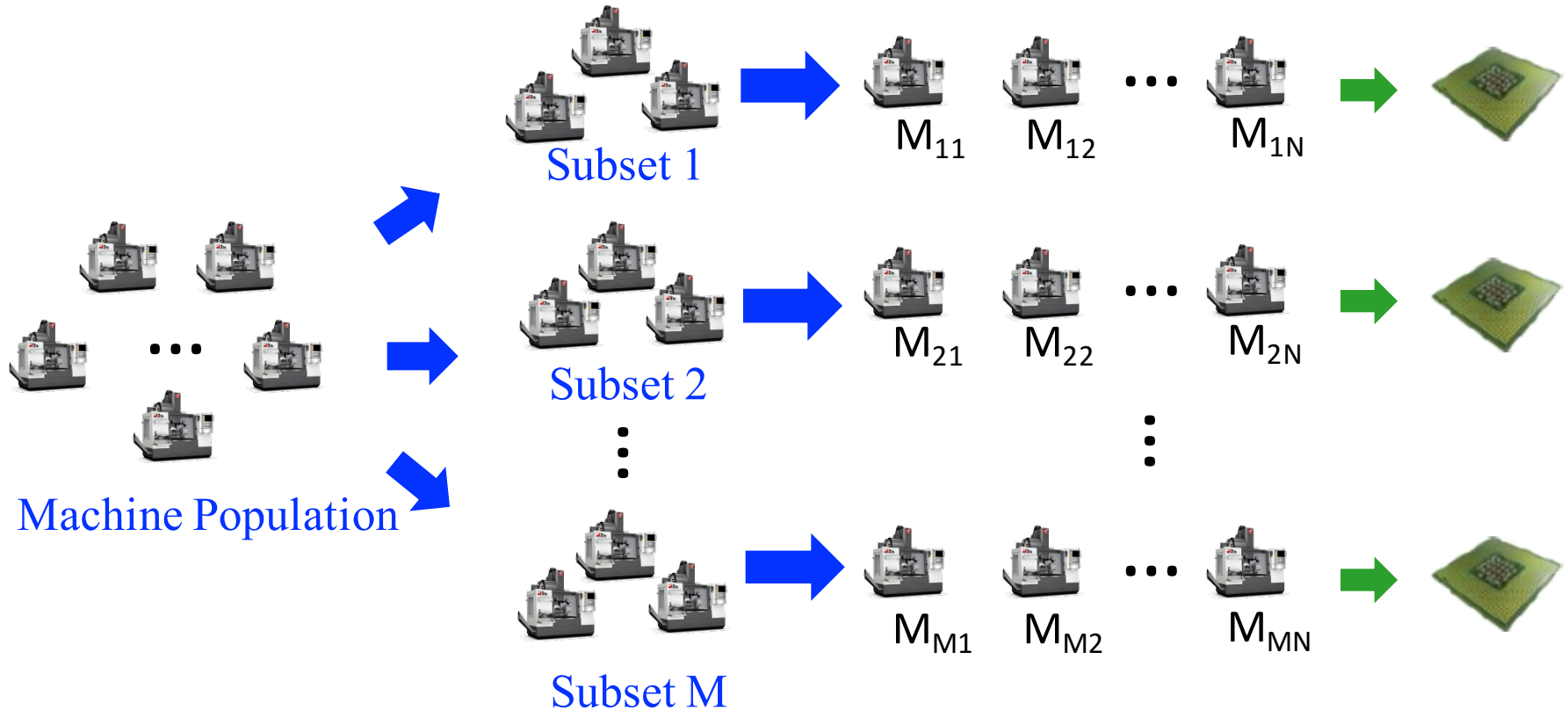
Our Approach:



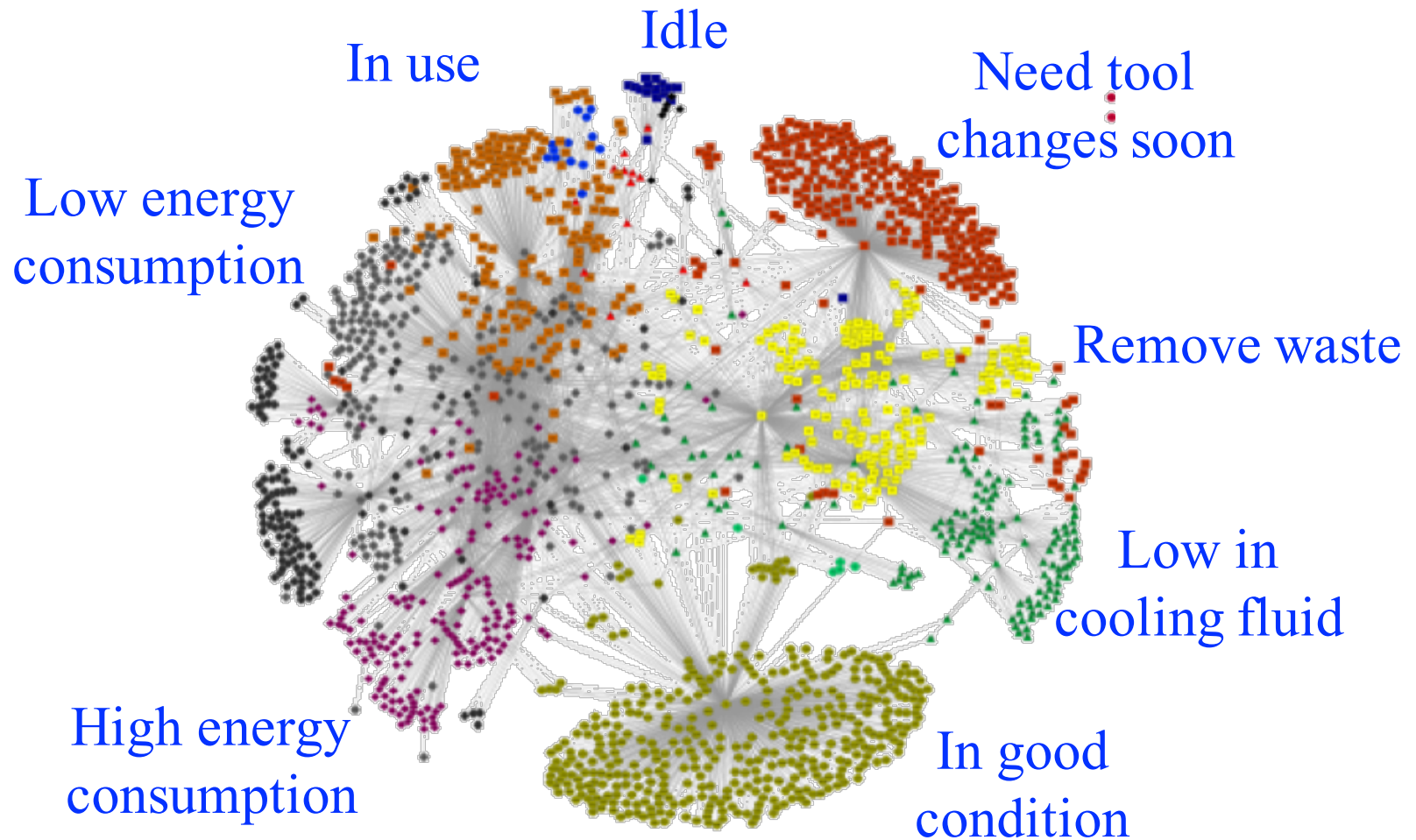
Existing method:



Parallel computing for large-scale IIOT



Illustration





What We Do:

Our proposed approach

Existing practices

multi-channel signals

vs.

single-channel signals

dynamic network

vs.

static network

stochastic gradient descent

vs.

traditional deterministic algorithm

parallel computing

vs.

serial computing

Potential application areas

- Healthcare
 - Real-time monitoring of patients' health conditions and telemedicine
- Supply chain
 - Control ambient environment and optimize delivery efficiency
- Smart City
 - provide information-communication solutions to improve quality-of-life



Coming Soon



A Manager's Guide to the Internet of Things

Insight into an Emerging Technology:
Integrating Aspects of Cloud
Computing and Big Data

Kenneth Matthew Hutchison, Ph.D
Soundar Kumara Ph.D

Questions?

