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Forward Thinking

Computing Challenges and Opportunities in Modeling and Simulation

A Practitioner's Perspective

Dave Sturrock

VP Operations – Simio LLC

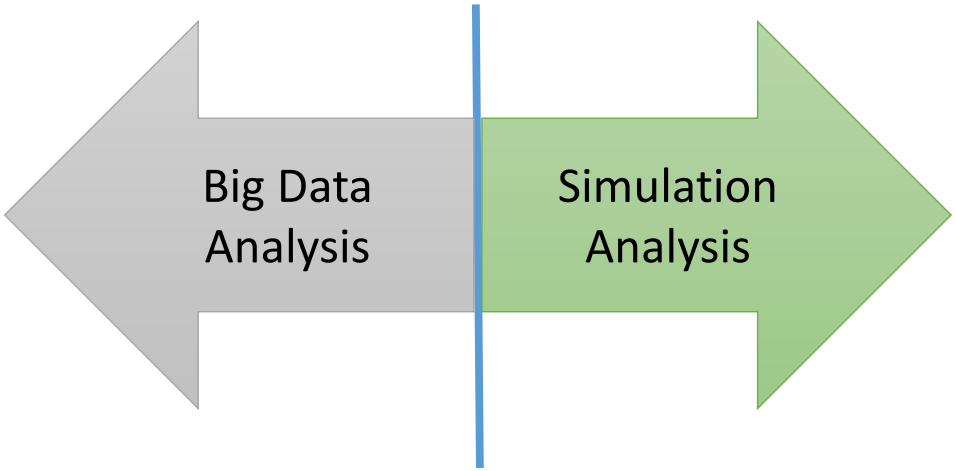
Herman Kahn

Anyone can learn from the past.
What we need today is to learn from the future.

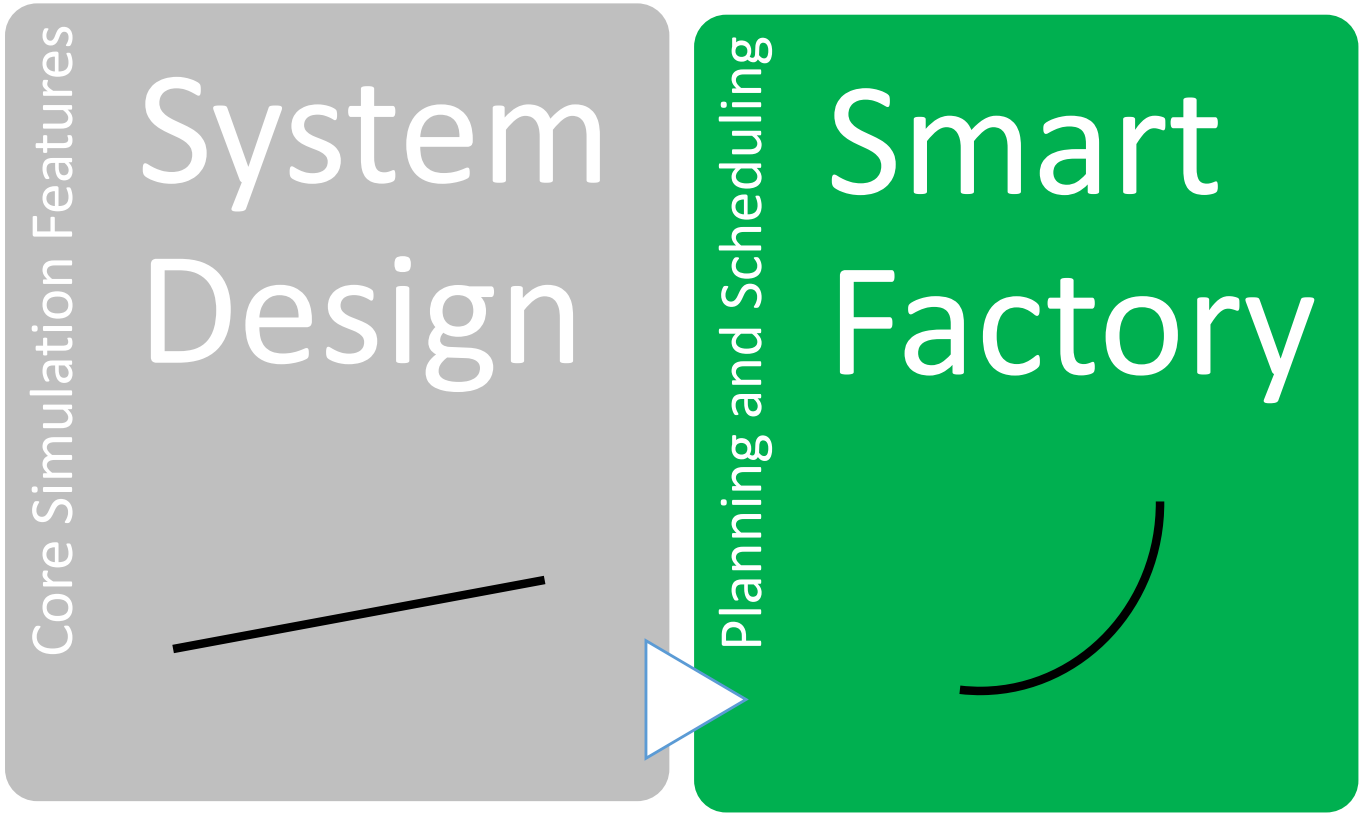
Herman Kahn was a founder of the Hudson Institute and one of the preeminent futurists of the latter part of the twentieth century.

Analytics: Reshaping the World

Analytics: Discovery and communication of meaningful data patterns.



Simulation Revolution



What is Industry 4.0

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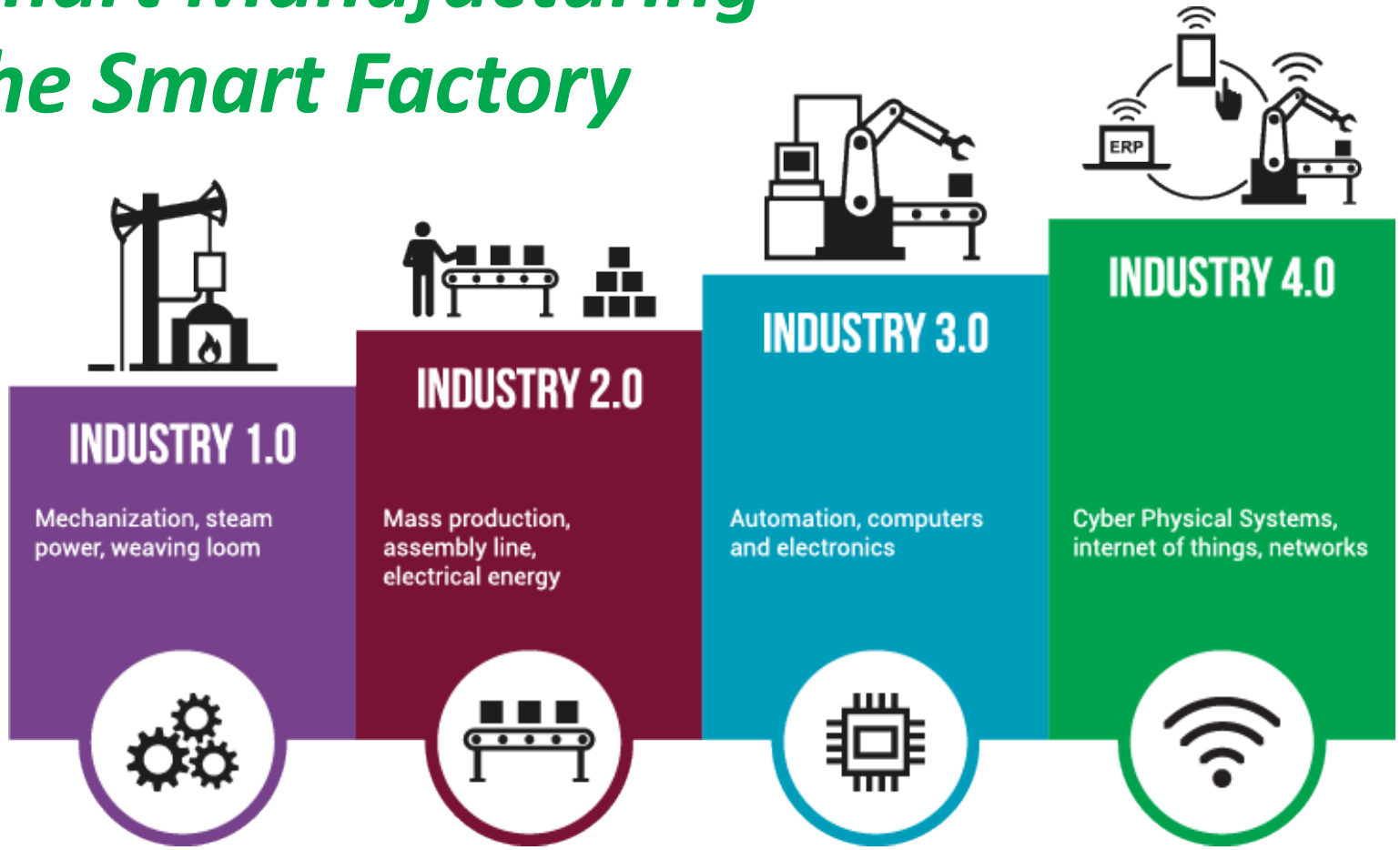
Smart Manufacturing
The Smart Factory



Typical Current Architecture

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MES Systems

Data Warehouses

ERP Systems

Industry 3.0

User Based Systems

Automation

Corporate Networks

How Do We Enable Industry 4.0?

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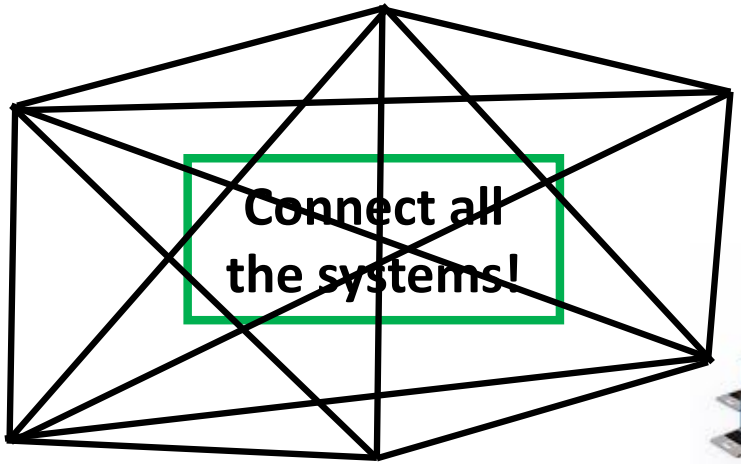
MES Systems

Data Warehouses

ERP Systems



Automation

User Based Systems

Corporate Networks

Intelligent Use of the Enterprise Data

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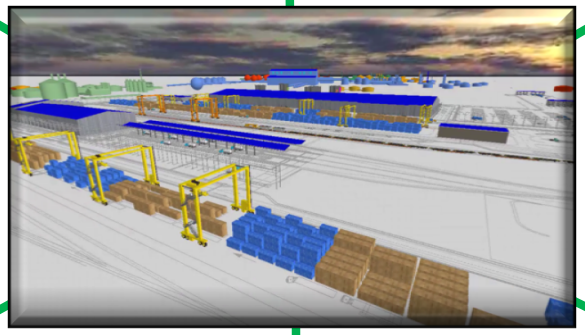
MES Systems

Data Warehouses

ERP Systems



Automation

User Based Systems

Corporate Networks

Digital Twin

- Reference model for multiple purposes
- Must answer many different questions both design and operational
- Data driven and Data generated
- Produces large data of the future and gives managers forward visibility

Computational Challenges of a "Digital Twin"

- More detailed models
- Need for large scale execution of both optimizations and design of experiments, both on premise and cloud
- Computational cloud might be hybrid with data and outputs saved on premise, but large scale replications (1000's or 10,000's) executed on the public cloud.
- Need for large data stores to hold all the detailed simulation results.

Computational Challenges of "Digital Twin" (continued)

- Operational models put more pressure on fast execution since the answer is needed in seconds or minutes.
- Operational models also create much larger output data sets including detailed logs of entity (order) and object (device) activities.
- Reference models put more pressure on model detail and fast execution.