

Smart Manufacturing and the Clean Energy Smart Manufacturing Innovation Institute™ (CESMII)

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Overview



- What is Smart Manufacturing?
- Who is CESMII and what is our mission?
- What is the Smart Manufacturing Platform™ and what value does it provide to industry?
- How does the PI System enable the SM Platform to allow easy integration of advanced cloud-based tools?
- How can you get involved with CESMII?

What is Smart Manufacturing?



- The Operational Business and Technology Practice of radically increasing the application of real-time data throughout the manufacturing enterprise and changing the operational structure
- The right data in the right form, the right people with the right knowledge, the right technology and the right operations, whenever and wherever needed throughout the manufacturing 'enterprise'

The Practice of Smart Manufacturing



- Real-time Data and Modeling to qualify materials, parts, properties, assemblies and drive real-time precision
- Enterprise integration to realize untapped market, productivity and performance opportunities
- Operational Practices (intensification, virtualization, modularization, qualification, optimization) to achieve value in an increasingly customized product space with accelerated demand dynamics

Clean Energy Smart Manufacturing Innovation Institute

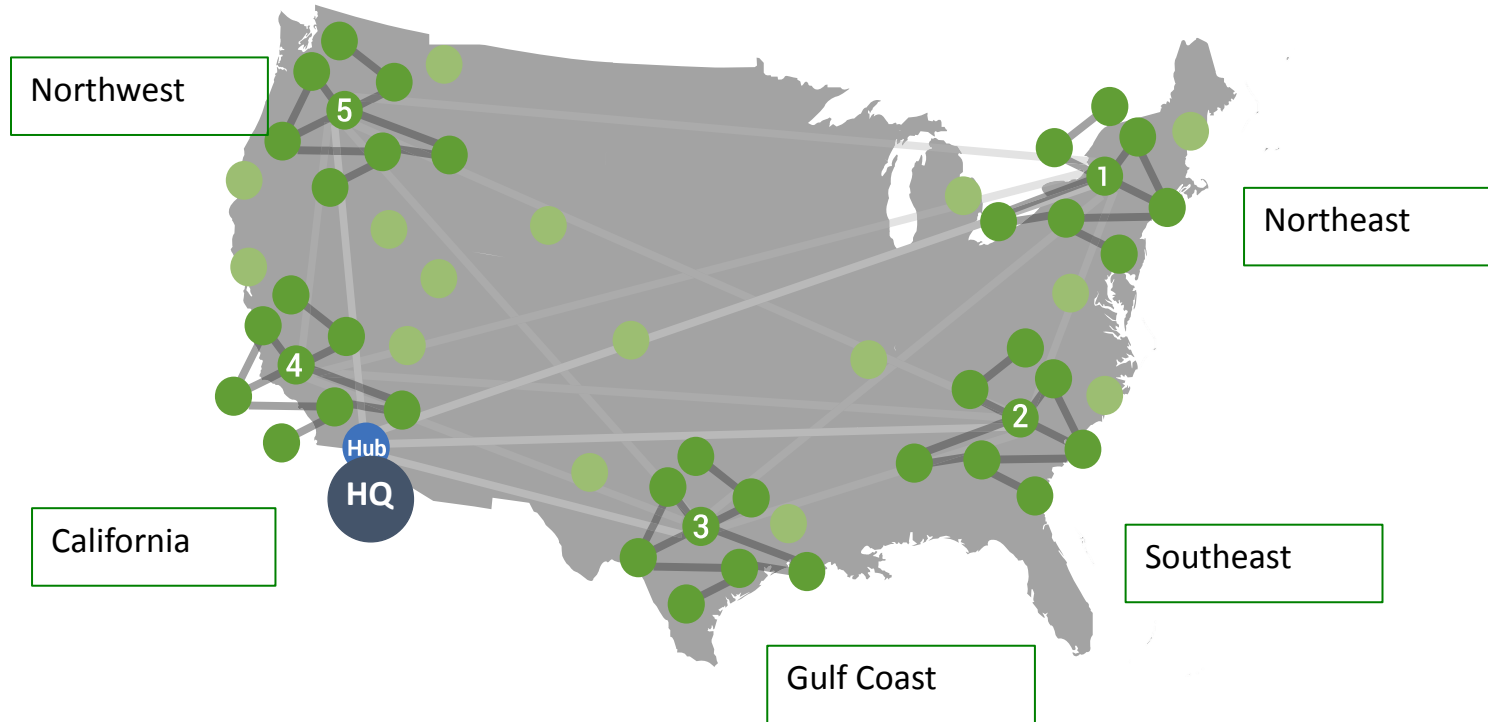
CESMII



- The Clean Energy Smart Manufacturing Innovation Institute (CESMII) is an Industry/Academic consortium, part of a network of Manufacturing USA Institutes.
- CESMII was created to increase the productivity and competitiveness of US manufacturing companies through improved data insight and by use of advanced analytics.
- CESMII is partially funded by the US Department of Energy.

CESMII

A National Network of Capability Networks



The Smart Manufacturing Platform™

Every Company has an ECO System of “STUFF”



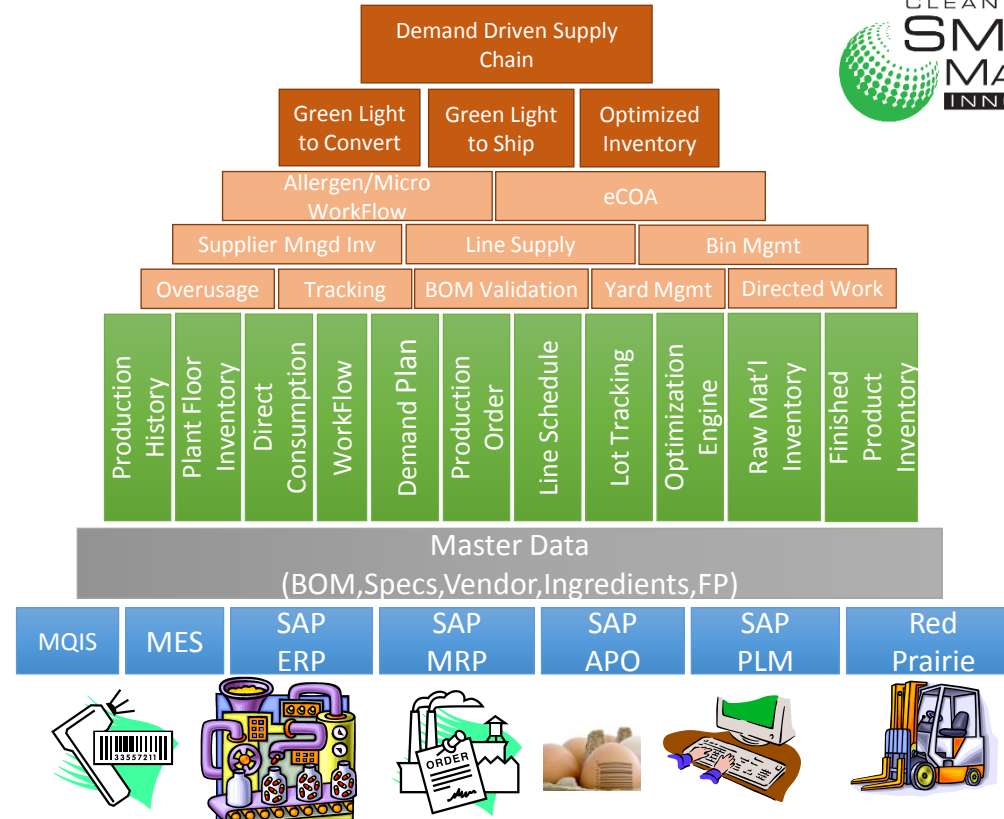
Value Creation

Business Applications

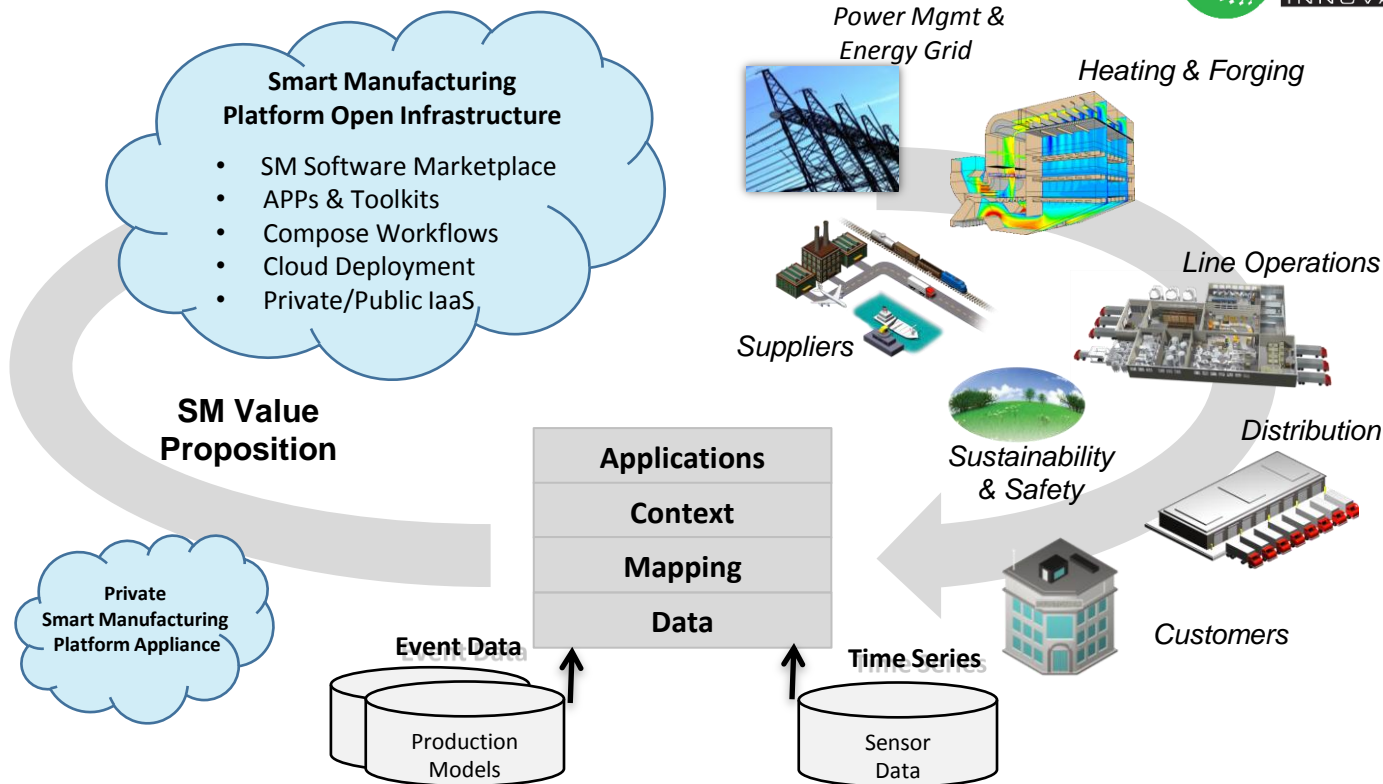
Core Functions

Core Systems

Data Input



Industry Needs a Platform

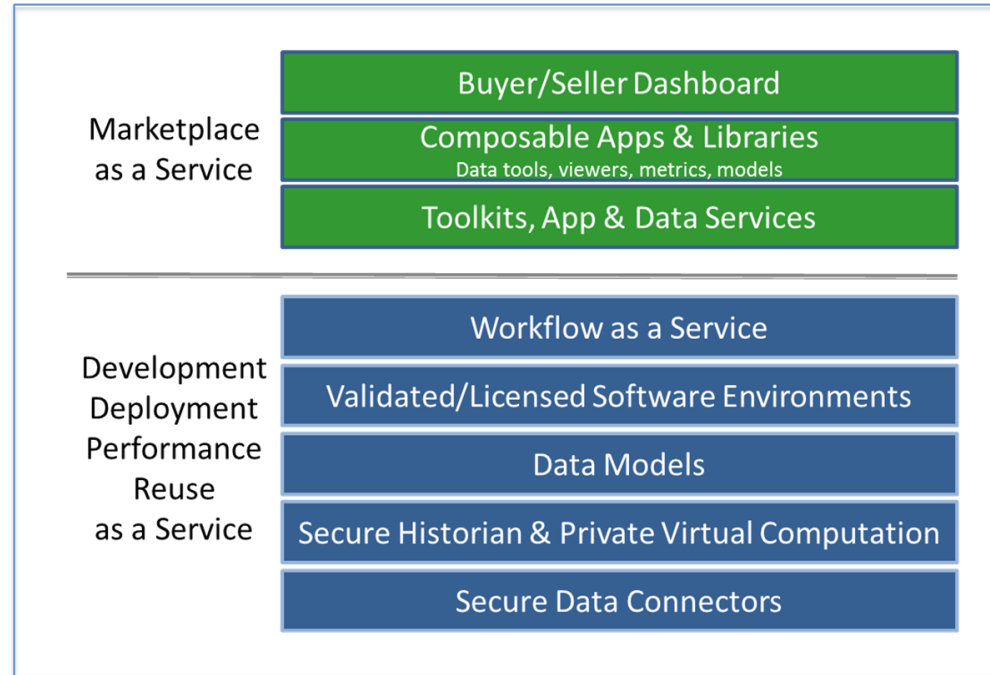


The CESMII Smart Manufacturing Platform™



- Cloud based, providing best-of-breed analytics, data visualization, and modeling from CESMII members.
- Enables monetization of manufacturing data and creation of the “Connected Enterprise”
 - Takes advantage of existing/legacy investment
 - Leverage connectivity – IIOT enabled systems
 - Move from “Run-to-Failure” to “Reliability-Centered” operations through application of analytics
 - Business/Financial/Energy Optimization at the Enterprise
- Built-in cybersecurity – protect data and operations

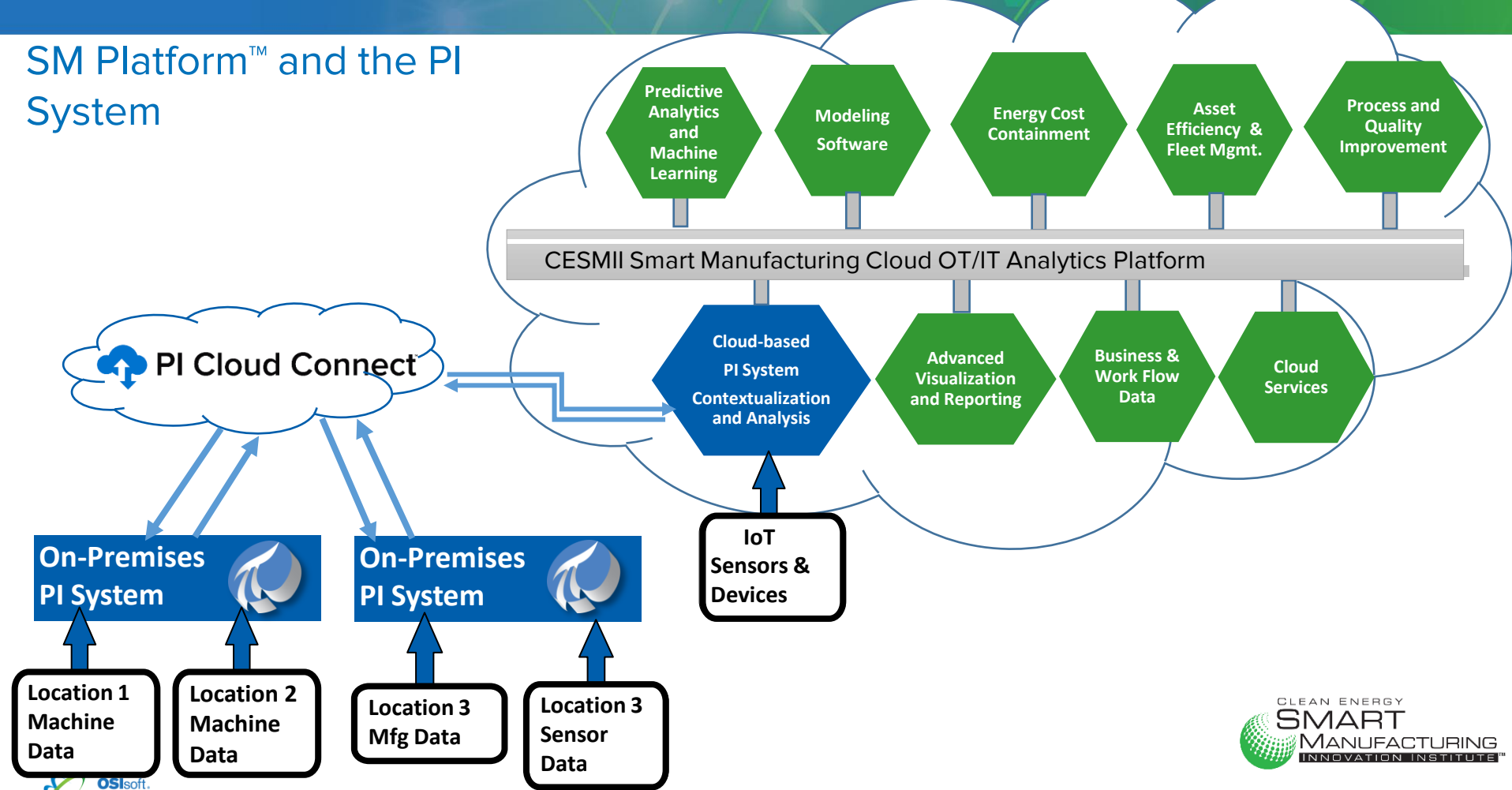
SM Platform™ Reference Model



The PI System and the SM Platform

- Aggregation of process/production data
- Provide run-time analytics, data contextualization and intelligent data extraction for use by SM advanced analytics, models, and visualization systems
- Transfer of data (PI Cloud Connect) to the SM platform
- Provide secure bi-directional data transfer between the data source(s) and the SM platform suite of advanced analytics

SM Platform™ and the PI System



Example: Smart Manufacturing Process Optimization for Additive Manufacturing

Additive Manufacturing (AM)



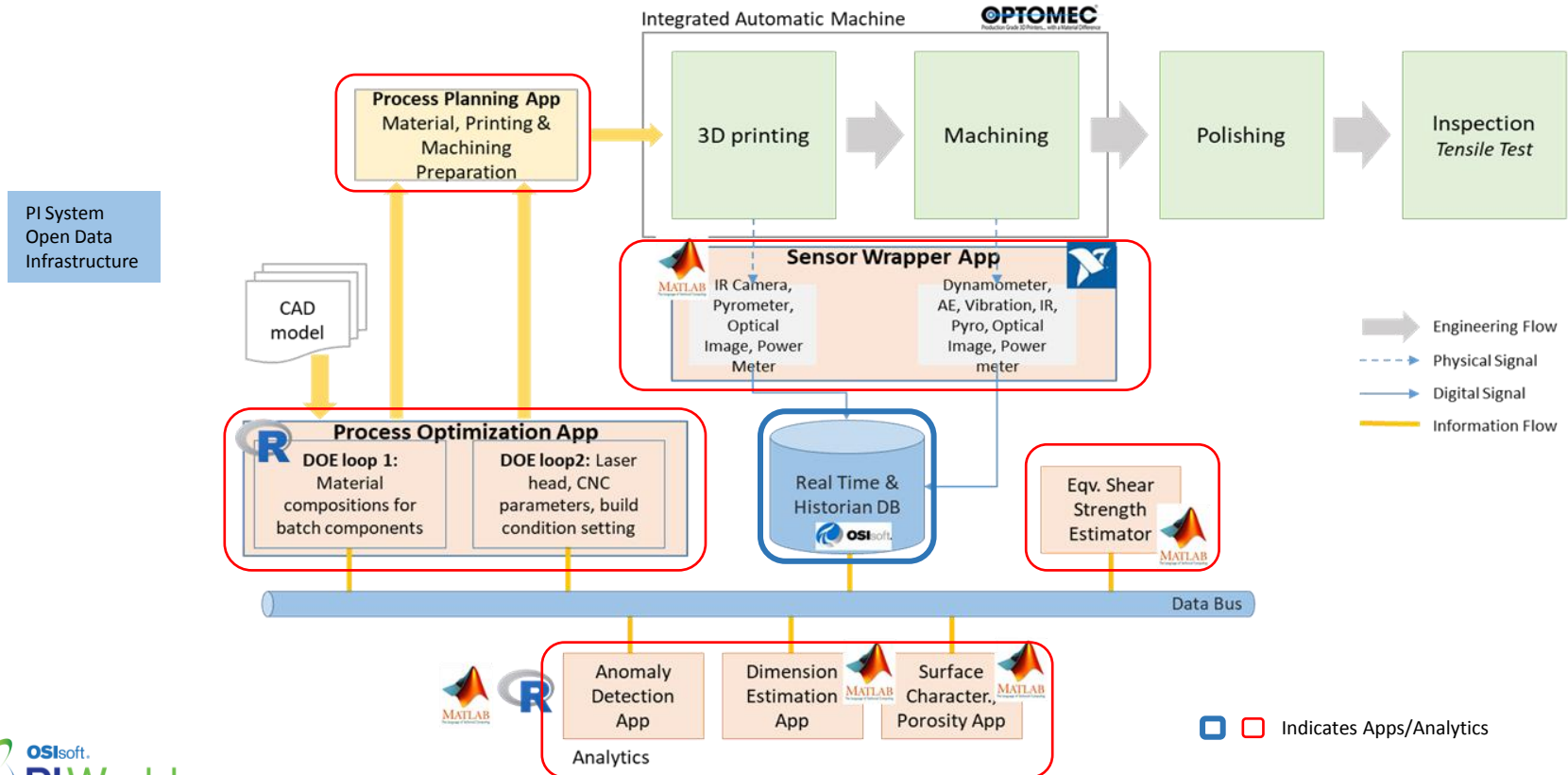
- America Makes – “3D printing has the potential to revolutionize the way we make almost everything.”
- Provides opportunities for increased competitiveness through innovative ways to make components
- Quickly adapt to customized requirements for components in low volume manufacturing
- Reduce further processing steps required, saving manufacturing time and resources

SM Objective for Additive Manufacturing (AM)



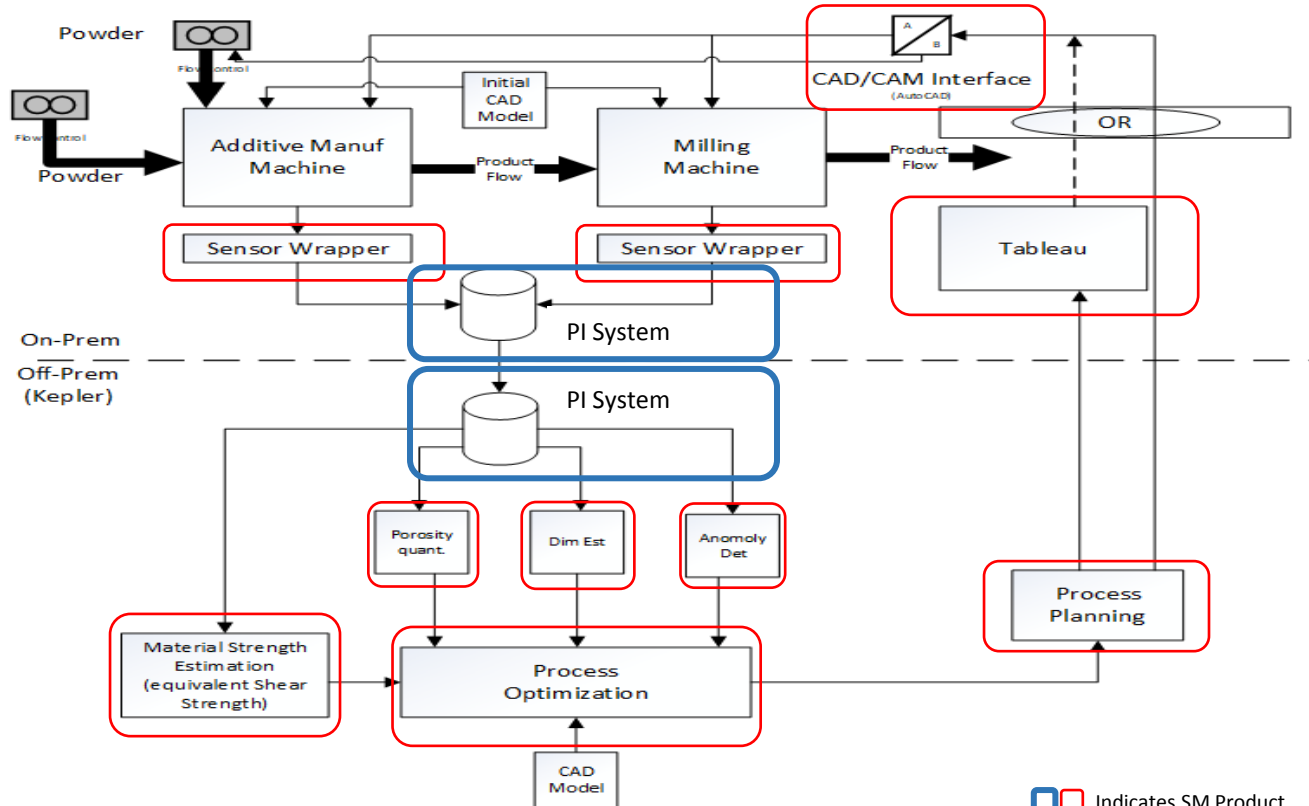
- Introduce/test analytics to improve AM processes in-situ
- Demonstrate rapid optimization of the AM process and material designs in a hybrid manufacturing setup
 - Derive specified strength characteristics
 - Quickly optimize build and machining processes based on achieved results
 - Reduce scrap and energy usage through fewer iterations to achieve desired properties
- Needed capability for the industry segments engaged in insertion of new or modified materials, processes (e.g., shift to AM from a welded component), and equipment as part of their operations

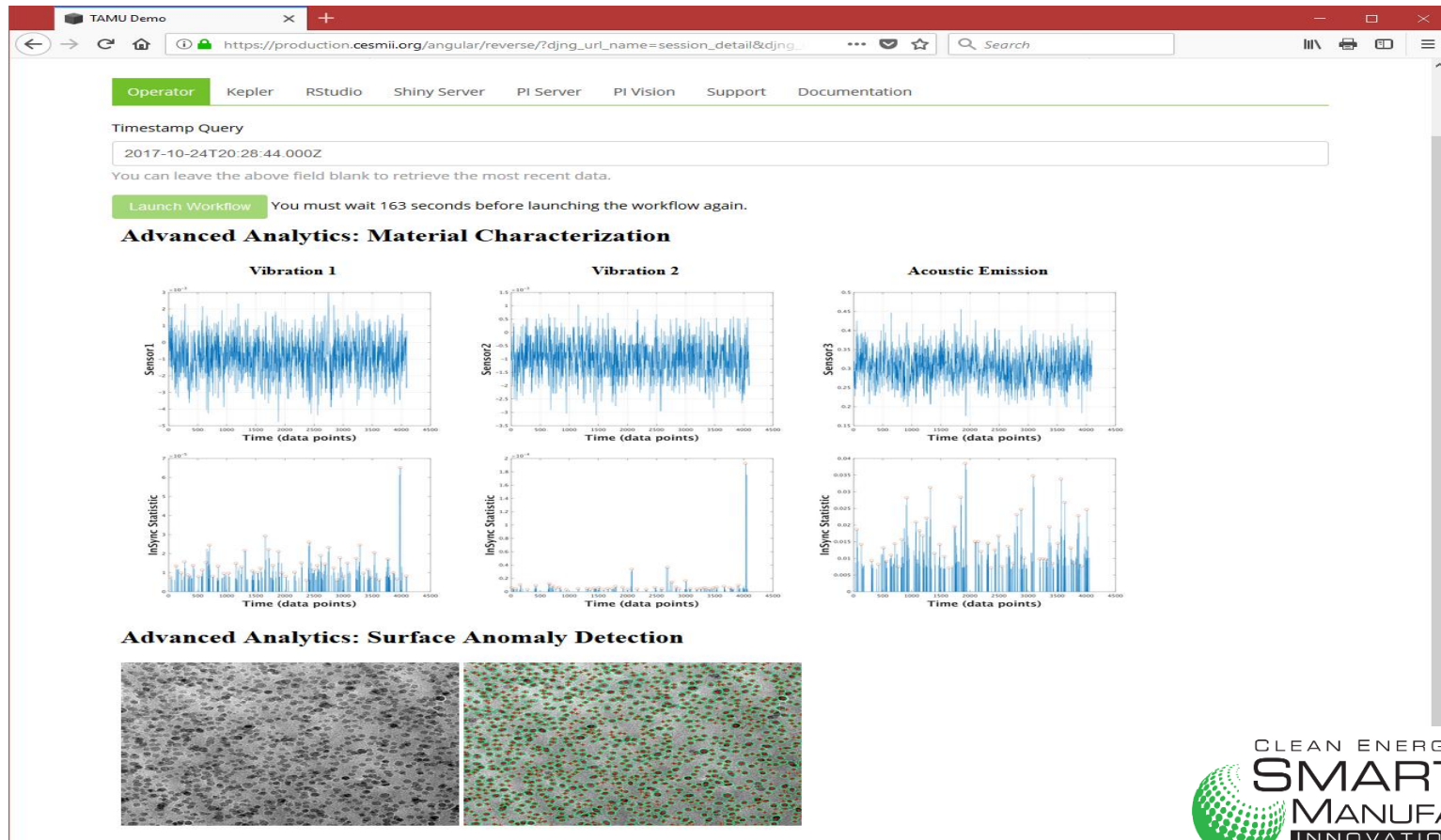
Additive Manufacturing SM Architecture



Additive Manufacturing Data Structure

Phase 1 Workflow





SM Results for Additive Manufacturing



- Decrease costs associated with adopting new technology
- Increase competitiveness through use of alternative materials optimized for component requirements
- Improve quality of parts through analytics providing for optimization of a variety of part characteristics
- Easily introduce and use new analytics as they are developed and brought into the SM Platform

Get Involved With CESMII

Smart Manufacturing Product™ Development



- Find more information at www.cesmii.org
- Join an Affinity group to offer and/or access researcher/company subject matter expertise
- Work with regional partners to develop testbed project proposals
- Participate in Institute strategic planning activities at both regional and national levels – Work with the region and industry partners
- Subscribe to Institute and regional communications channels to stay up-to-date with opportunities

CESMII Affinity Groups



- Human Systems Integration and Decision Support
- High Energy Unit (Discrete) Smart Manufacturing
- Cybersecurity for Smart Manufacturing
- Smart Manufacturing for Aerospace/Defense Systems Manufacturing
- Smart Manufacturing for Advanced Metals Processing Technologies
- Smart Manufacturing for Semiconductor Manufacturing
- Sensors and Wireless Communications for SM
- Smart Manufacturing for Chemical Processing
- Manufacturing Data Analytics for Smart Manufacturing
- Modeling and Simulation for SM Processes
- Energy Aware Smart Manufacturing
- Smart Manufacturing for Pulp and Paper
- Smart Manufacturing for Drying Operations
- Smart Manufacturing for Cement Manufacturing
- Smart Manufacturing for Food Quality and Safety

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Questions

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Merci

谢谢

Спасибо

Danke

Gracias

Thank You

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ありがとう

Grazie

Obrigado