

CESMII PRESENTS:

The New Architecture of Manufacturing Innovation

Standardized Foundation. Democratized Innovation.

November 2026

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MISSION. STRATEGY. ROLE.

Bring manufacturing leaders together to strengthen U.S. competitiveness through Smart Manufacturing

CESMII
THE SMART MANUFACTURING INSTITUTE

U.S. Department of ENERGY

2017

Founded by the DOE, a program in UCLA

$200M+

Private/public partnership

Improve energy productivity

through sensing, control, modeling, analytics & platform technologies

How.

Fund the innovation and R&D necessary to **dramatically** reduce the **cost & complexity** of using **real time operations data** to drive **revenue & cost improvements.**

CESMII represents the **voice of manufacturing**, engaging the Smart Manufacturing ecosystem through a membership model.

- **Manufacturers**
  Small, Medium & Large
- **System Integrators & Consultants**
- **Machine Builders**
- **Technology Providers**
- **Academia & Labs**

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THE STRATEGY

Accelerate the Democratization of Smart Manufacturing

01 KNOWLEDGE

Align business priorities, people, and digital capability.

Strategies, playbooks, education, and tools that help organizations execute successfully.

02 TECHNOLOGY

Reduce the cost and complexity of Smart Manufacturing by 50%.

Enabling technologies that make advanced capability simpler, faster, and more reusable.

03 ECOSYSTEM

Solve precompetitive problems no company can solve alone.

Convene manufacturers, technology providers, integrators, academia, and government.

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TO STRENGTHEN U.S. PRODUCTIVITY & COMPETITIVENESS THROUGH SMART MANUFACTURING…

What must be true?



Knowledge



Technology



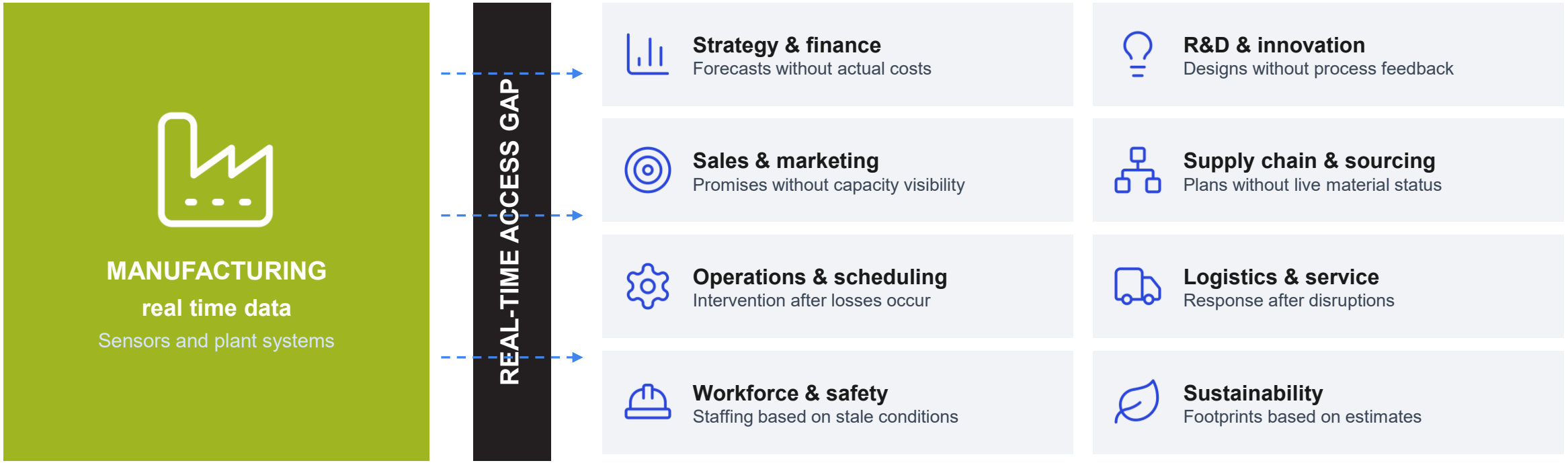
Ecosystem

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THE PROBLEM

Every Corporate Initiative, AI… is Constrained by Lack of Data

Operational intelligence remain trapped inside process and plant systems, constraining end-to-end decisions



WHAT FILLS THE GAP?

- **Assumptions**
- **Human-compiled reports**
- **After-the-fact data**

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THE CURRENT PATTERN

The Conflict is Structural

Plant OT and corporate IT optimize for different, and legitimate, outcomes

PLANT / OT

Keep production running

- Respond now
- Honor process nuance
- Minimize operational disruption
- Own the local outcome

NO SHARED CONTRACT

ENTERPRISE / IT

Protect and scale the enterprise

- Secure the environment
- Govern the portfolio
- Standardize the lifecycle
- Reduce long-term complexity

Both sides are behaving rationally.
The operating model makes them adversaries.

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THE CURRENT PATTERN

Every local win adds another layer of enterprise complexity

Without a shared path, point solutions do not add up to an enterprise capability



The solution may work. The pattern does not scale.

Integration cost, security review, inconsistent semantics, and lifecycle burden are deferred, not eliminated.

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HOW WE GOT HERE

The outcome of 30 years of unbridled innovation

Industry 3.0: one use case at a time

INDUSTRY 3.0

57
sanctioned systems

1,600
non-sanctioned (shadow IT) systems

100%
- ✕ Proprietary, closed
- ✕ No interoperability
- ✕ Data silos
- ✕ Stovepipe architecture
- ✕ Vendor lock-in
- ✕ Little or no standardization
- ✕ Difficult to scale up or down

The reality on the plant floor



Enterprise functions, cut off from live plant data

- Strategy & finance
- R&D & innovation
- Sales & marketing
- Supply chain & sourcing
- Operations & scheduling
- Logistics & service
- Workforce & safety
- Sustainability

Logistics*	Quality*	Production*	Maintenance*	Management*
Environmental Systems	Campaigns	Production Monitoring	Tool Monitoring	Information Portal
Metrics (DTD, BTS)	Shipping: Error Proofing	Downtime Analysis	EAM: Predictive	Energy/Building Mgmt
Shipping	External Metrics	Production Counts	EAM: Preventive	Cost Management
Container Tracking	Internal Metrics	Constraint ID & Analysis	EAM: Crisis	Policy Deployment
Lot Tracking	Traceability	Schedule Execution	Reliability & Maintenance	Best Practice
Rack Tagging	Error Proofing	Hit to Hit	Downtime Analysis	Timekeeping
Raw Mat Ordering & Inv	Defect Tracking	Process Control Boards	Fluid Tracking	Metrics for Workforce
Dock Inventory	SPC	Dock Inventory	Programmable Dev Support	Issues Management
Schedule Optimization	Repair Bay OI	Process Sheets	Plant Design & Layout	Production Log
Inventory Control	Quarantine	Manual Production Count	Die Re-Chroming	Knowledge Management
Line Side Replenishment	Scrap & Reject Reporting	Cycle Time Analysis		Training
Part Consumption	Birth History	Sequencing		

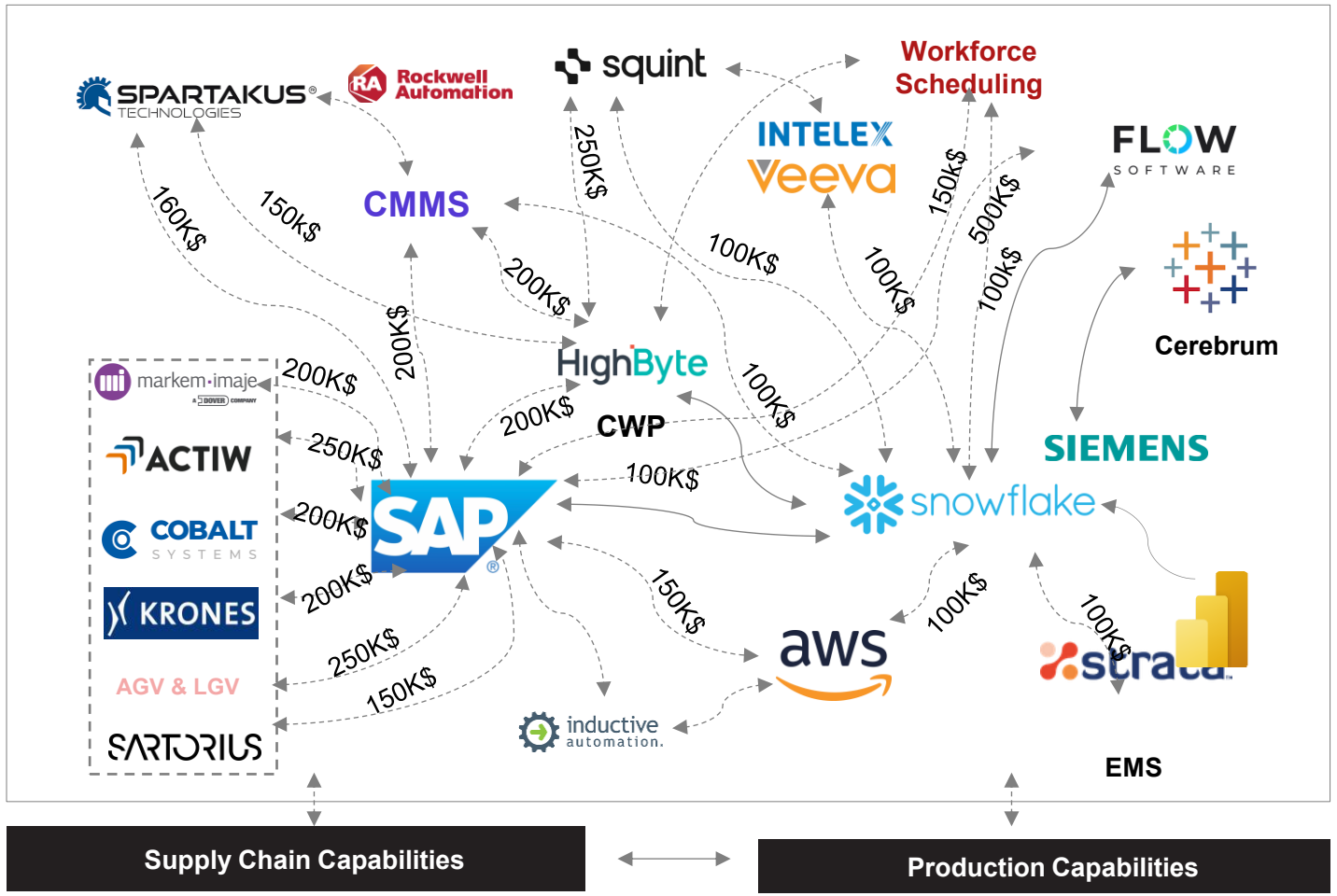
Shadow IT - 1,600 systems

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HOW WE GOT HERE

Resulting Information Architecture

Industry 3.0: one use case at a time



EXAMPLE:

22

point-to-point integrations in one plant's architecture

$3.9M

in integration cost, before any new capability

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WHY THE OT / IT DIVIDE PERSISTS

Two Rational Behaviors, One Fragmented Operating Model

Corporate governed the enterprise portfolio. Plants filled the operational gaps.

CORPORATE IT

57 sanctioned systems

Optimized for enterprise responsibilities

- Standardization
- Security & risk
- Lifecycle support
- Enterprise scale

Mandate: define, implement and sustain the enterprise portfolio.

Corporate/Plant DIVIDE

PLANTS / OT

1,600 plant-born systems

Optimized for operational reality

- Local gaps
- Speed to value
- Operator context
- Immediate needs

Mandate: solve the production gaps that still have to be solved.

The problem is not plant innovation. The problem is plant innovation without a shared architecture.

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59 projects proved innovation was possible, but not scalable.



59
funded projects

REDISCOVER	the data
REBUILD	the context
RECREATE	the integration
REPEAT	at the next site

The solutions work.
The pattern could not scale.

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THE STRATEGIC INSIGHT

The issue isn’t a lack of technology. It is a lack of interoperability.

We are funding innovation
but the architecture keeps it isolated

Interoperability is the business mechanism that converts invention into reusable capability.

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THE CATALYST

Scale requires two transformations at once

ORGANIZATIONAL FOUNDATION

Align strategy, leadership, organization, and workforce.

- Mfg strategy tied to digital capability
- Engaged, accountable leadership
- Organizations structured to innovate
- A connected, next-generation workforce



TECHNICAL FOUNDATION

Make innovations portable, reusable, and interoperable.

- Shared meaning and context
- Conformant platform services
- Open application interfaces
- Repeatable security and lifecycle

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TECHNICAL FOUNDATION

CESMII Smart Manufacturing Imperatives

A vendor-neutral interoperability contract for shared meaning, connected context, and open access

01

SHARED WAYS TO DESCRIBE DATA

Open, standards-based ways to describe data

SM Profiles™

WHAT YOU GET

A shared language for data, so systems work together, data stays well managed, and AI can be trusted

02

SYSTEMS THAT WORK TOGETHER

Smart Manufacturing Interoperability Platforms

SMIP™

WHAT YOU GET

Connected plant-floor knowledge that helps people make better manufacturing decisions

03

OPEN, COMMON PROGRAMMERS INTERFACE

Industrial Information Interoperability eXchange

i3X™

WHAT YOU GET

Apps that move between systems, easier setup with little coding, faster new ideas, and AI that can grow

KNOWLEDGE Tools, strategies, workshops, playbooks, and training that connect manufacturing plans with digital know-how, active leadership, and a skilled, connected workforce.

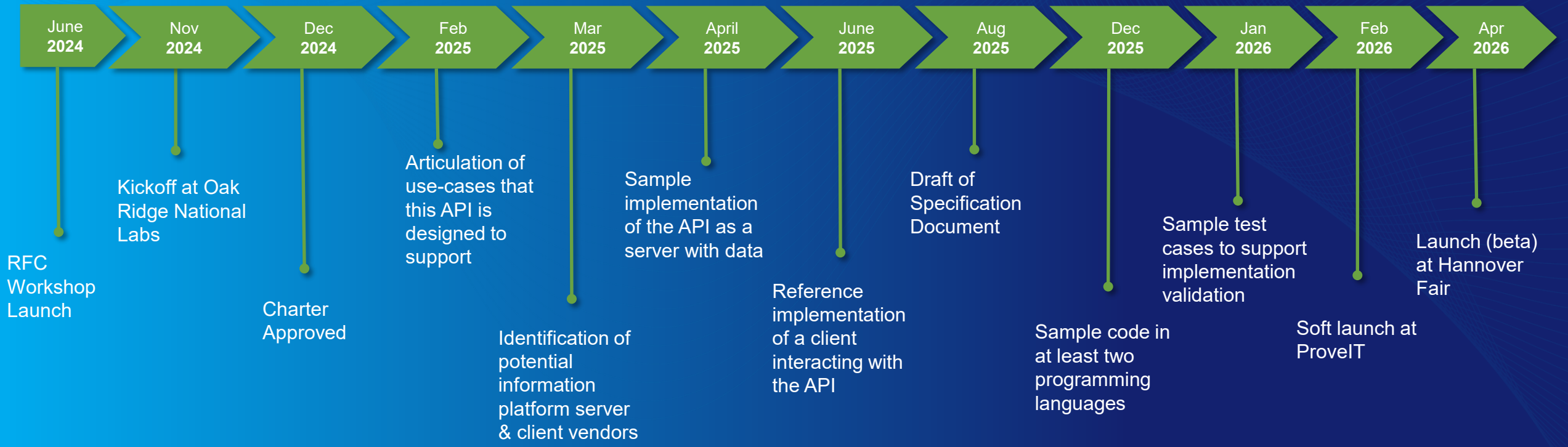
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Common Manufacturing API Working Group

(W3C Best-Practices for Standards Development)

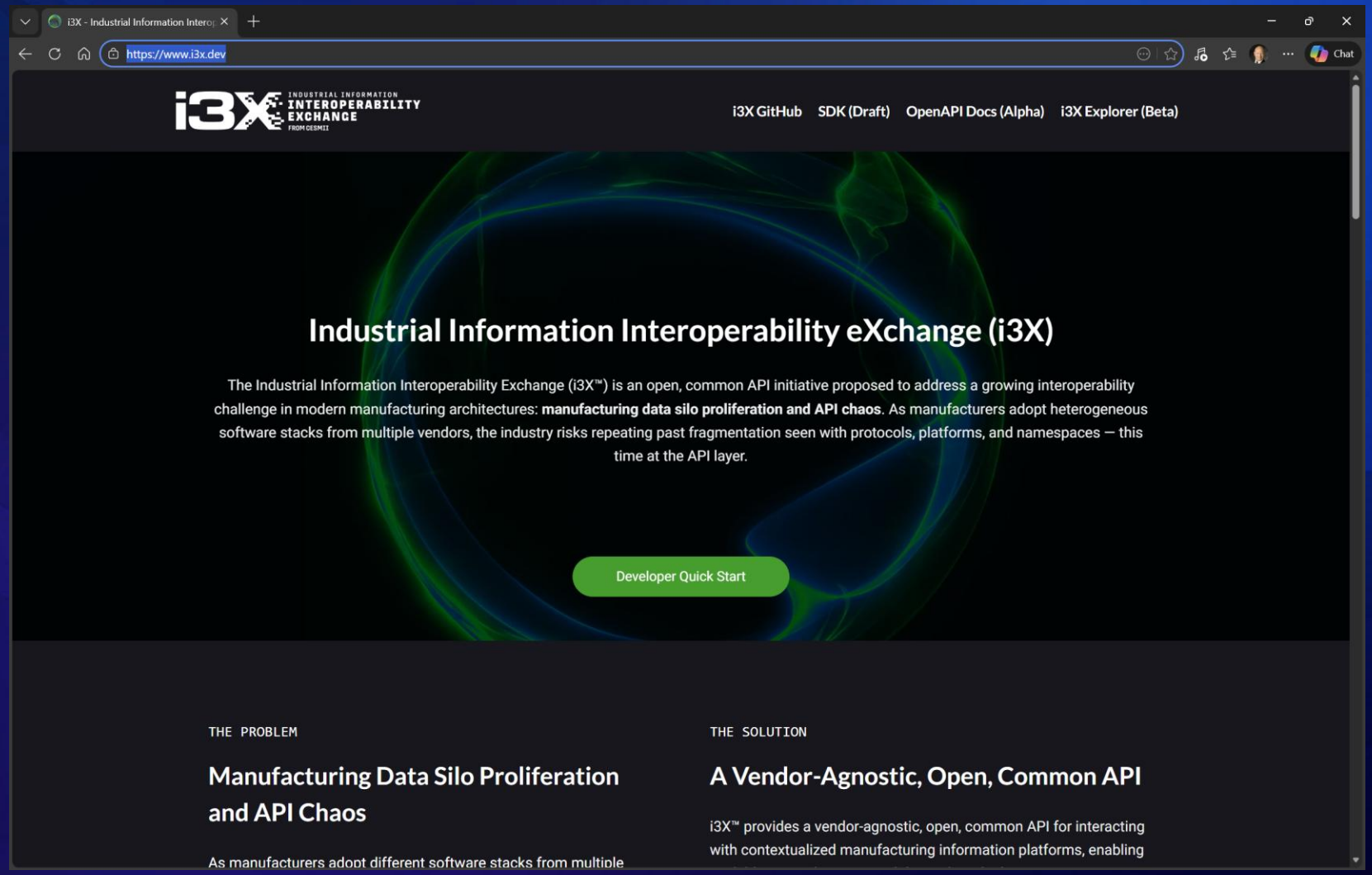
18 months of bi-weekly meetings

Global participation



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https://www.i3x.dev/



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INDUSTRY ADOPTION

Extraordinary adoption of i3X™

i3X INDUSTRIAL INFORMATION INTEROPERABILITY EXCHANGE FROM CESMII

PROVEIT DEMO

1. Ace Technologies (i3X Explorer)
2. AWS (IoT SiteWise)
3. Flow Software (Timebase)
4. HighByte (Industrial Data Ops)
5. Inductive Automation (Ignition)
6. Siemens (Mendix)

CURRENTLY ENGAGED

7. Alpamayo
8. Aveva
9. BlocIoT
10. Cognite
11. Cognizant
12. Databricks
13. Emerson AspenTech
14. Fanuc Americas
15. Flexware
16. FlowFuse
17. Fuuz
18. HiveMQ
19. Humble
20. Iconics Mitsubishi
21. iGear
22. Inflexion Point
23. Litmus
24. Magic
25. MaintainX
26. Maximo
27. Microsoft
28. MonsterMQ
29. Mr. IIoT
30. Nortal
31. Opto22
32. Optrix
33. Outsystems
34. Palantir
35. Phoenix Contact
36. Pico
37. Prekit
38. Prosys OPC
39. PSC Transition Tech
40. QAD Redzone
41. Rockwell FT Optix
42. Rockwell FT Mosaix
43. RTA Historian
44. SAS
45. Schneider Electric
46. SAP
47. Seeq
48. SmartRun
49. Siemens Asset Mgmt
50. Siemens WinCC OA
51. Snic Solutions
52. Snowflake
53. Software Toolbox
54. Sorba
55. Sterfive
56. ThinkIQ
57. Thred
58. Transition Technologies
59. Tulip*
60. TwinThread
61. United Mfg HUB (UMH)
62. Velotic Proficy
63. Velotic ThingWorx
64. Velotic Kepware

REQUESTED

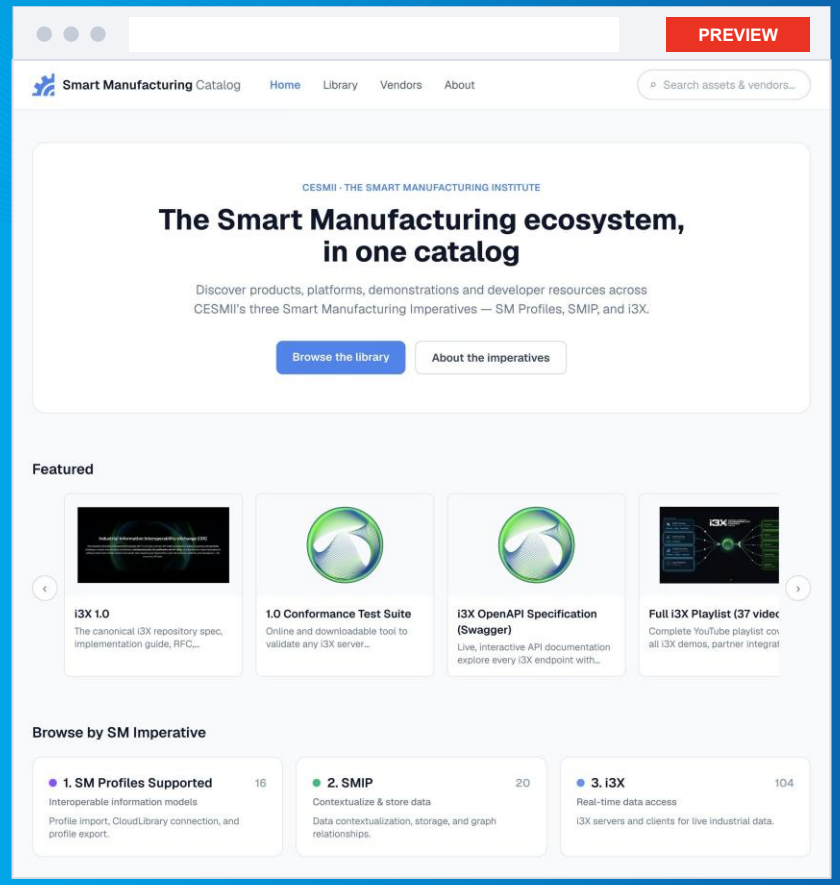
- Cogent
- Cybus
- Frameworks
- Google
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- PSI
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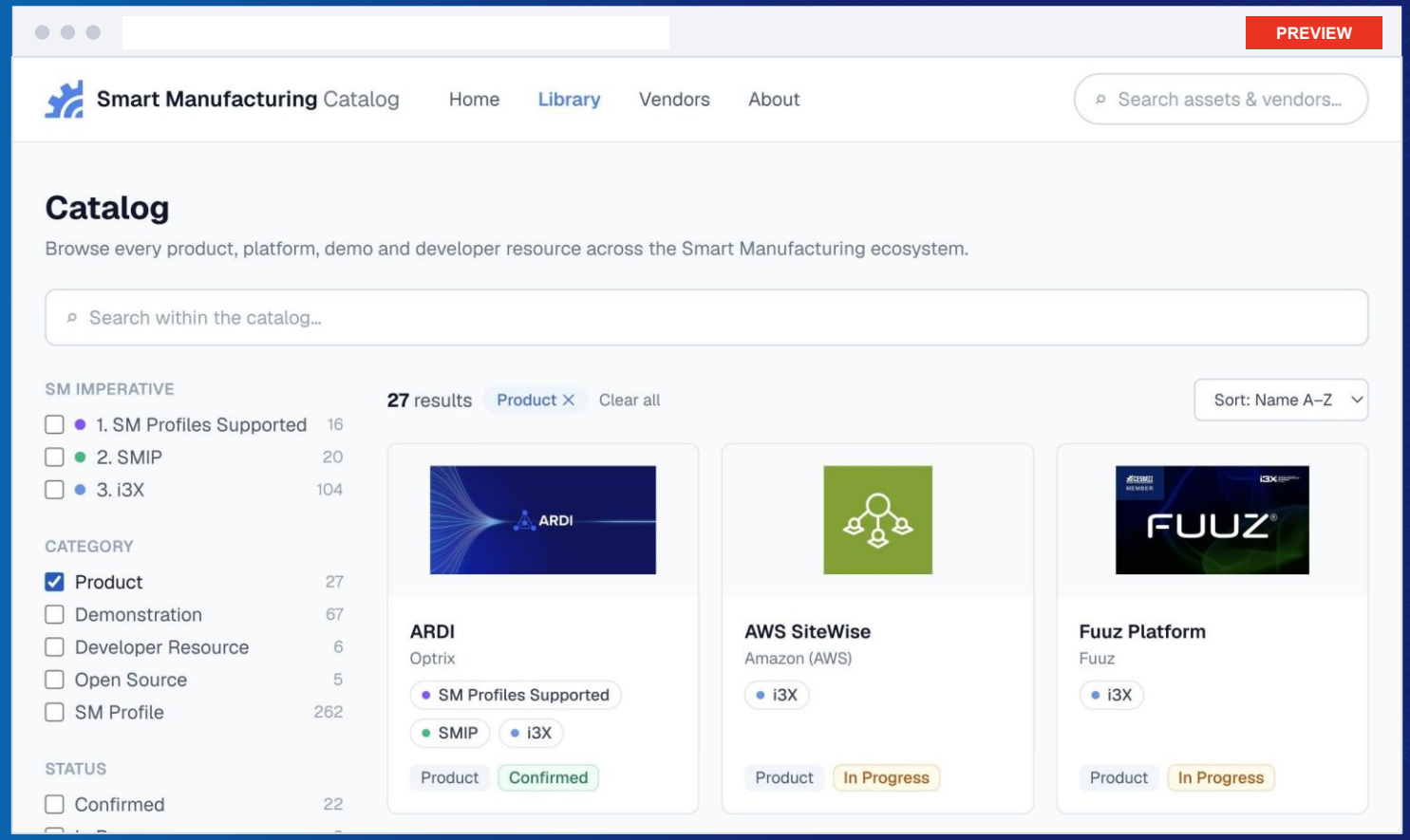
THE ECOSYSTEM

Empower a global community of SM app developers

An open, common API enables applications to interoperate, move, and scale across conformant platforms



Home The ecosystem, organized by the three imperatives



Library 367 listings from 54 organizations, filterable by imperative, type and status

Screenshots from the preview site, September 29, 2026. Content will change before launch.

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A TRANSFORMATION JOURNEY

One access point for all operations data

In one governed model, so a question doesn't need to know the source



13 sites

20+ systems

300,000+ related objects

1 endpoint

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Three SM Imperatives. One interoperable foundation.

CESMII resources for manufacturers and the ecosystem

EDUCATION ACROSS ALL THREE — **The Interoperability Forum** — On demand

01 SM Profiles™

Shared information models

Standardize the meaning of manufacturing data

- **Namespace Modeling course**
- **Profile Designer**
- **Hundreds of free SM Profiles**

02 SMIP™

Interoperable platforms

Preserve typed objects and their relationships

- **Smart Manufacturing Catalog**

SMIP vendors, product status and demonstrations

03 i3X™

Open, common API

Enable common access and application portability

- **i3x.dev**

Specification, SDKs and tests

- **Catalog: servers and clients**

A reusable foundation for transformation and Industrial AI

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