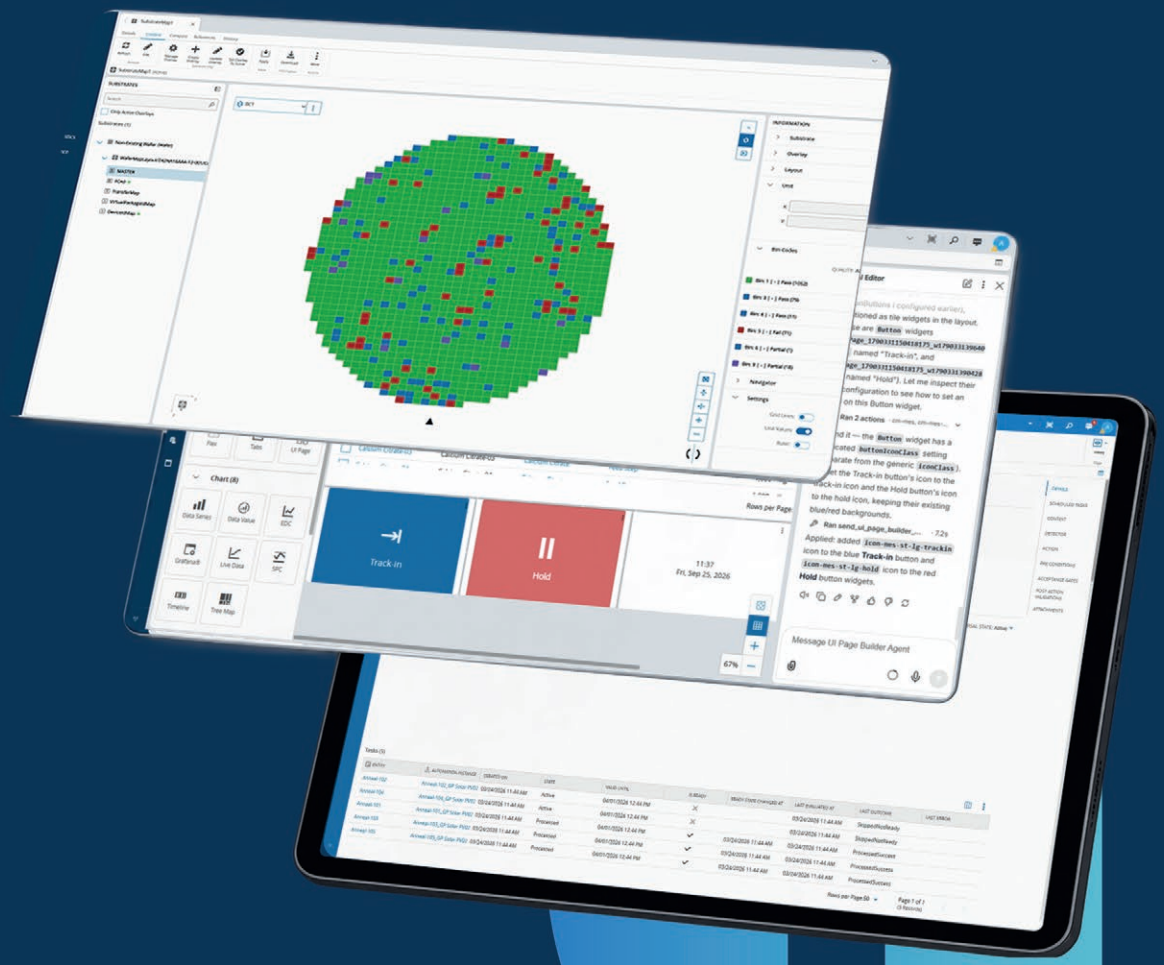
Critical manufacturing

Industrial Operations Platform for Semiconductor Manufacturing

MES-powered execution, connectivity, analytics, and trusted AI.



Closing the loop between execution and decisions

Manufacturers need to know **what is happening, why it is happening, what is affected, and what action to take**. At the level of the die, the unit, the tool, and the lot, and across every fab that touched the product.

Critical Manufacturing closes this loop with an MES-powered Industrial Operations Platform, **unifying execution, equipment connectivity, and operational intelligence**, on a Canonical Data Model that creates a common manufacturing context for actionable data.

By connecting intelligence back to execution, fabs can catch excursions before they spread, contain them precisely when they happen, keep critical equipment qualified and running, and build a trusted foundation for analytics and AI.

1.

Model Operations

Structure the factory into one common data model.

2.

Connect Everything

Equipment, IoT, ERP, PLM, and enterprise systems share a unified data layer.

3.

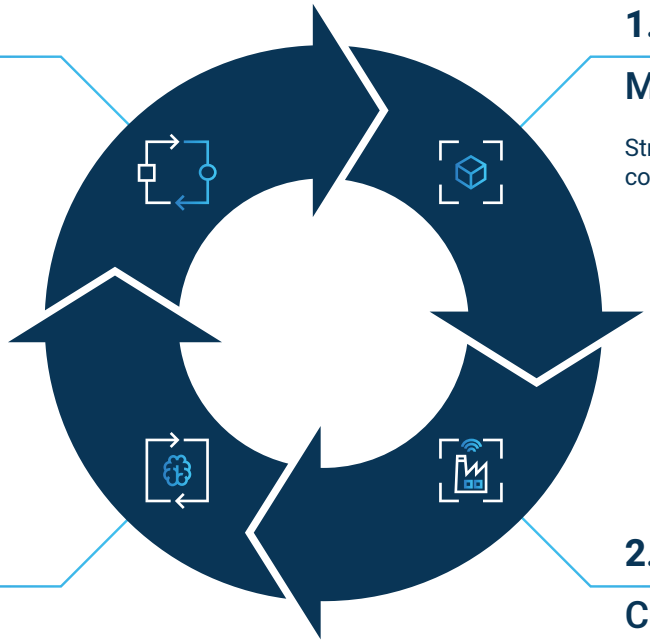
Generate Intelligence

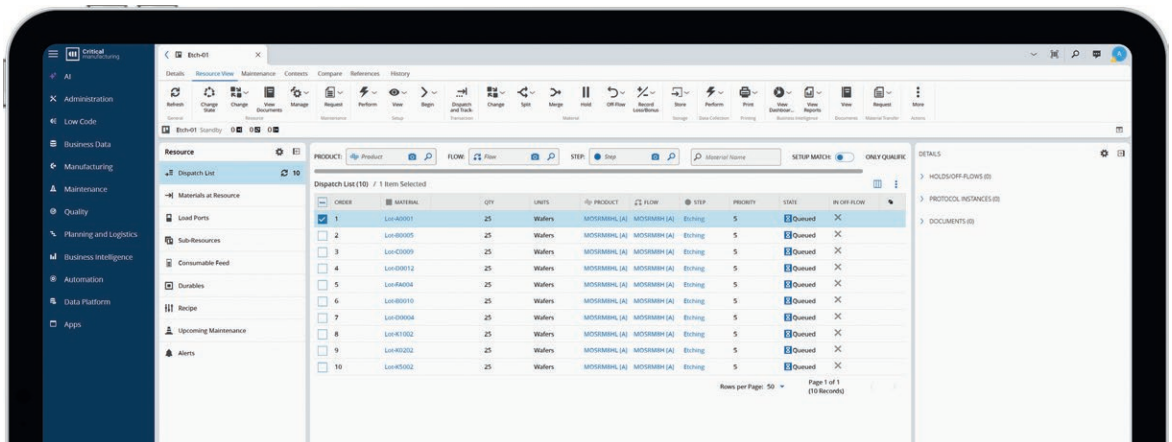
Gen AI turns structured context into real-time decisions.

4.

Act and Improve

Continuous improvement built into daily work.





The pressures semiconductor manufacturers face every day

Advanced packaging at volume. Less margin for errors.

Fan-out, 2.5D, and 3D integration are in high-volume manufacturing, with flows reaching over a hundred steps. A small drift can pass every check and only surface at the final package test.

More data. Not always more insight.

Machines and systems generate enormous amounts of information, but without manufacturing context it is difficult to understand what matters, what is affected, and what action to take.

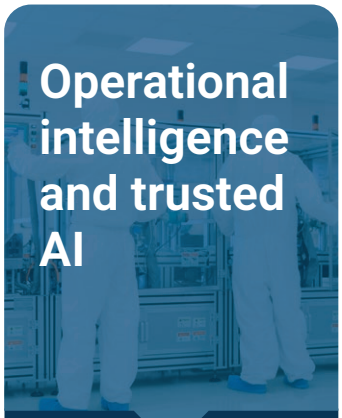
Heterogeneous design. Traceable to the die.

A device is now an assembly of dies from different wafers and sources. Lot-level and wafer-level tracking can't show which die ended up in which package.

Equipment that has to be right, and running.

Tools are disqualified and requalified every day. Each one needs the right process with the right parameters for every run, and every change to an equipment integration competes with production time.

Meeting complexity with control and intelligence



Operational intelligence and trusted AI

Turn contextualized fab data into correlations, alerts, and recommendations that support faster decisions and action.



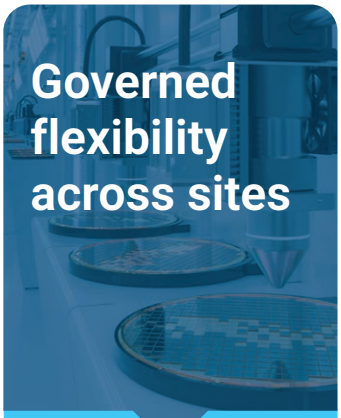
End-to-end execution

Recipes, queue times, qualification status, and dispatching enforced by the system, in one connected operational environment.



Single-unit traceability

Follow every die from its position on the source wafer through bonding, stacking, test, and binning, aligned with SEMI E142.



Governed flexibility across sites

Adapt products and flows across fabs while keeping configurations controlled, versioned, and upgrade-safe.

Make Every Decision Count.

A platform built for heterogeneous integration.

Know every die. Contain with precision.

When a failure shows up at final test, the question is which dies, wafers, and tools are behind it, and which other units share them.

Critical Manufacturing captures single-unit identity at execution. Using SEMI E142 substrate mapping, each die is followed from its position on the source wafer through bonding, stacking, and test, even when a device combines dies from different wafers or suppliers. Binning lineage (BinCodeMap) is stored centrally in the Data Platform, so every test result maps back to its origin.

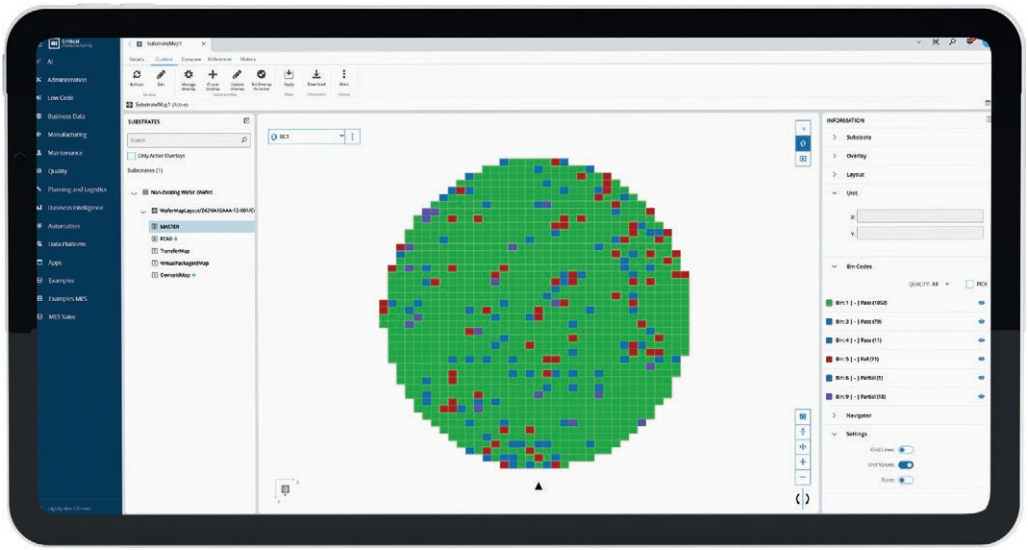
When an excursion appears, containment is scoped to the units actually affected, not whole lots. The same genealogy feeds yield learning back to the front end.

See the drift before the final test does.

Costly failures often come from conditions that were each within spec.

The Canonical Data Model governs equipment traces, metrology, inspection, and test results to the wafer, die, recipe, tool, and step behind them. When an inspection exceeds its limit, engineers can follow the unit's full history instead of building one manually.

With data in context, Gen AI with purpose-built agents turn natural-language requests into dashboards, shift summaries, and fab information. Extended across sites through the Enterprise Data Platform, it becomes a trusted foundation for yield analytics and AI, with the engineer keeping the final call.



Keep tools qualified, connected, and running.

In a high-volume fab, tools are disqualified and requalified every day, often with tens or hundreds of qualification lots running in parallel.

Critical Manufacturing manages qualification inside execution. It can be triggered by time, usage, maintenance, alarms, or yield deviations, and applied to equipment, sub-equipment, services, and recipes. Qualification status is not advisory: it decides whether an asset can be dispatched.

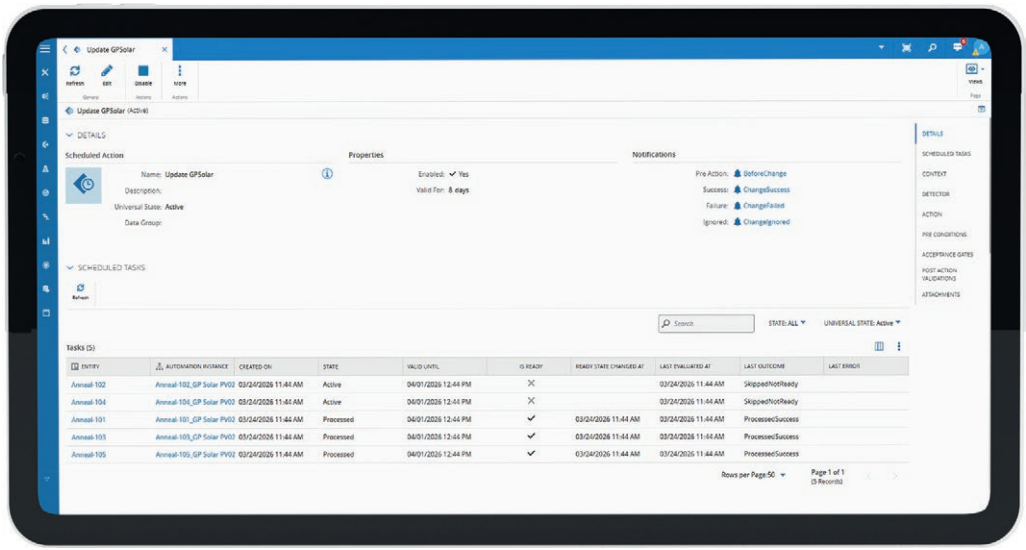
Tools connect through Connect IoT, including a native SECS/GEM driver. Processes are managed centrally, downloaded to each tool or uploaded from it, and verified by checksum. With Zero Downtime Equipment Integration, IoT and controller updates deploy on their own once a machine reaches a safe state, such as preventive maintenance or a defined idle time.

Respond to disruption in minutes, not shifts.

Time-critical, reentrant flows leave little room when something goes wrong.

Critical Manufacturing enforces queue-time windows between steps, warning, blocking, or forcing moves before limits are exceeded. Send-ahead wafers validate quality before the rest of the lot proceeds.

Dispatching matches the services each lot needs with the tools able to provide them, and scheduling turns that into a production sequence for every resource. When a critical tool goes down, lots move to other tools that provide the same service, and qualification status decides what is allowed to run.



Why Critical Manufacturing

Built on manufacturing. Designed to evolve.

Deep manufacturing foundation
Execution isn't one capability among many. It is the operational foundation that connects products, materials, processes, equipment, quality and people.

One Canonical Data Model (CDM)
A common manufacturing context connects execution, equipment data, analytics and AI, so intelligence is grounded in how the fab actually runs.

Native evolution, not technology silos
Connectivity, data, analytics and AI extend the platform while remaining connected to execution, allowing manufacturers to adopt new technologies without creating another fragmented technology landscape.



Recognized in the market

Gartner FROST & SULLIVAN IDC verdantix ABIresearch

Manage high-mix complexity with Critical Manufacturing

Industrial Operations Platform for Semiconductor Manufacturing

AI Agents						
Advanced Planning and Scheduling			**Global Data Orchestrator**			
Manufacturing Operations	Materials & Containers	Resource Tracking	Routing & Dispatching	Data Collection	Master Data Management and Change Control	Tasks & Checklists
Visibility & Intelligence	Dashboards	BI Cards	Data Warehouse	fabLIVE: Factory Digital Twin	Alarm Management	Augmented Reality
Quality Management	Sampling Based Inspection / AQL	Statistical Process Control (SPC)	Exception Management	Document Management	Experiment Management	
Operational Efficiency	Maintenance Management	Order Management	Labor Management	Costing	Advanced Layout & Printing	Material Logistics
Integration & Automation	Enterprise Integration	Equipment Integration: Connect IoT	Recipe Management	Wafer Mapping	Factory Automation	
Data Layer / CDM	**Enterprise Data Platform**			**Data Platform**		

Built on a strong MES foundation. Ready for what comes next.

Critical Manufacturing has evolved from MES into an Industrial Operations Platform by building new capabilities on the same manufacturing foundation, not by surrounding execution with disconnected technologies.

Connectivity, data, analytics, and AI become part of a common operational environment, grounded in the Canonical Data Model and connected back to execution.

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