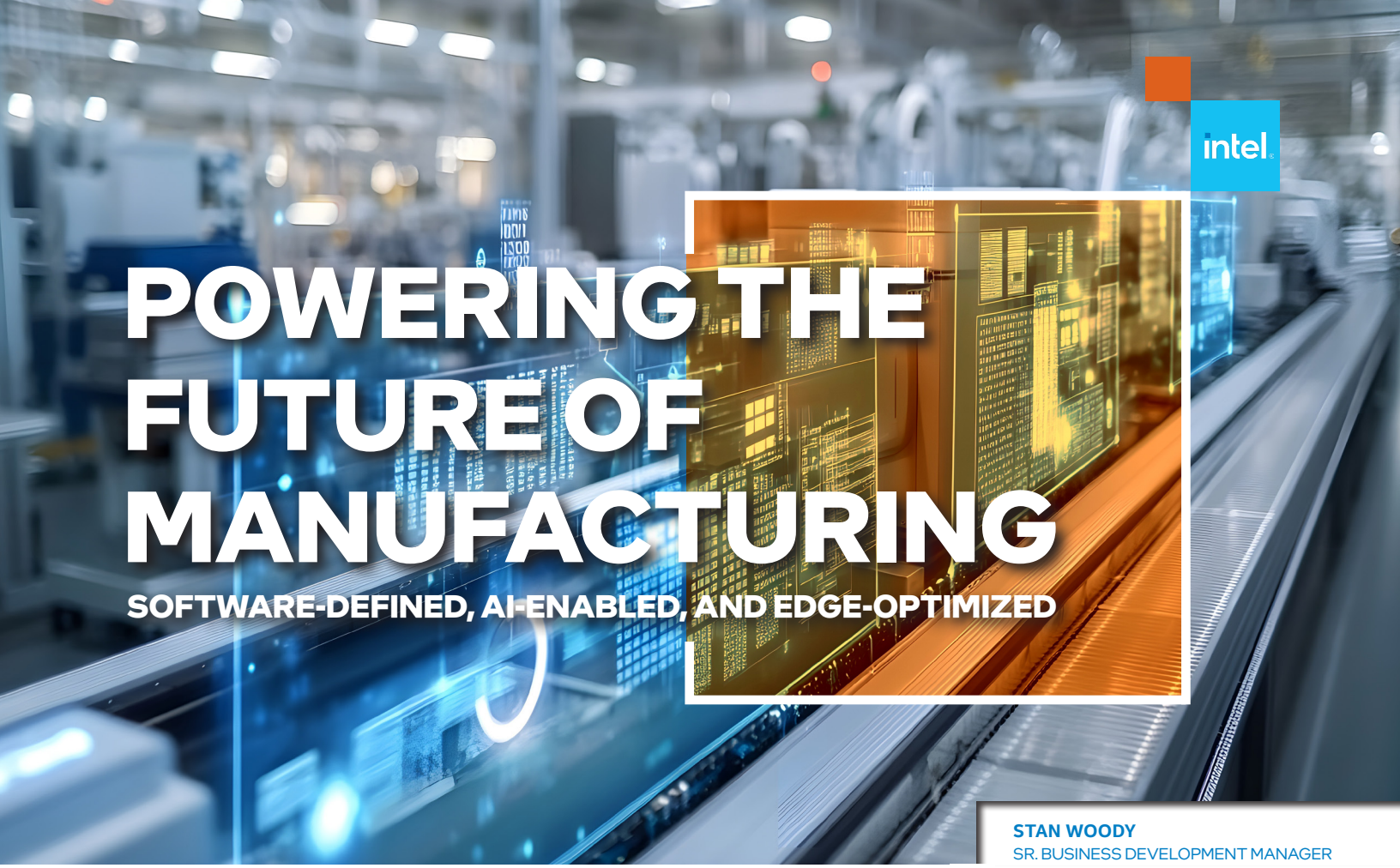

POWERING THE FUTURE OF MANUFACTURING

SOFTWARE-DEFINED, AI-ENABLED, AND EDGE-OPTIMIZED

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Executive Summary

Manufacturing is undergoing a generational transformation focused on reducing complexity, increasing flexibility, and lowering OpEx and CapEx. Real-time decision-making, AI-enabled insights, and adaptive automation enable this shift. These capabilities are now deployable in production systems and are becoming the new industrial standard—improving quality, throughput, and safety for global manufacturers.

Intel leads this change, embedding compute across the factory—from industrial PCs and vision systems to robotics, analytics, and edge AI. With a broad hardware and software ecosystem, Intel promotes an open and interoperable ecosystem that ensures competition and options for manufacturers, unifies IT and OT, and accelerates intelligent, software-defined manufacturing.

At the center is the Software-Defined Industrial Automation System (SDIAS): a modular, open, AI-ready architecture for workload consolidation, deterministic real-time control, and scalable edge deployment across discrete and process manufacturing. SDIAS provides the digital backbone to move faster, operate smarter, and scale more efficiently—while remaining future-ready for robotics, generative AI, and autonomous operations.

Software-Defined Control: The Foundation for Industrial AI

Software-defined control (SDC) decouples hardware from control logic and brings enterprise-grade operational capabilities for mission-critical systems—real-time security patching, application updates, and lifecycle management without downtime. With edge-native compute and Intel® Time Coordinated Computing (Intel® TCC) and Time-Sensitive Networking (TSN), SDC enables seamless cloud–edge integration so digital twins, predictive analytics, and AI run in real time, improving agility, uptime, and time-to-value.

What manufacturers gain:

- Deterministic control and high availability
- Cloud–edge integration for live twins, predictive analytics, and online AI
- Centralized orchestration, security, and over-the-air updates
- Adaptive automation via AI feedback loops with bounded latency

Support for OPC UA and IEC 61499 ensures interoperability, avoids vendor lock-in, and preserves existing investments—fueling a growing ecosystem of modular, portable, resilient solutions.

The Smart Manufacturing Journey: From Raw Material to Finished Product

Advanced technologies now touch every phase of the factory floor - powering the systems, data, and logic that drive today's operations and preparing manufacturers for tomorrow's AI-driven future. Through a unified compute platform, software-defined control, and edge intelligence, manufacturers can build connected, responsive, and resilient operations.

SMART MANUFACTURING
journey powered by intel.

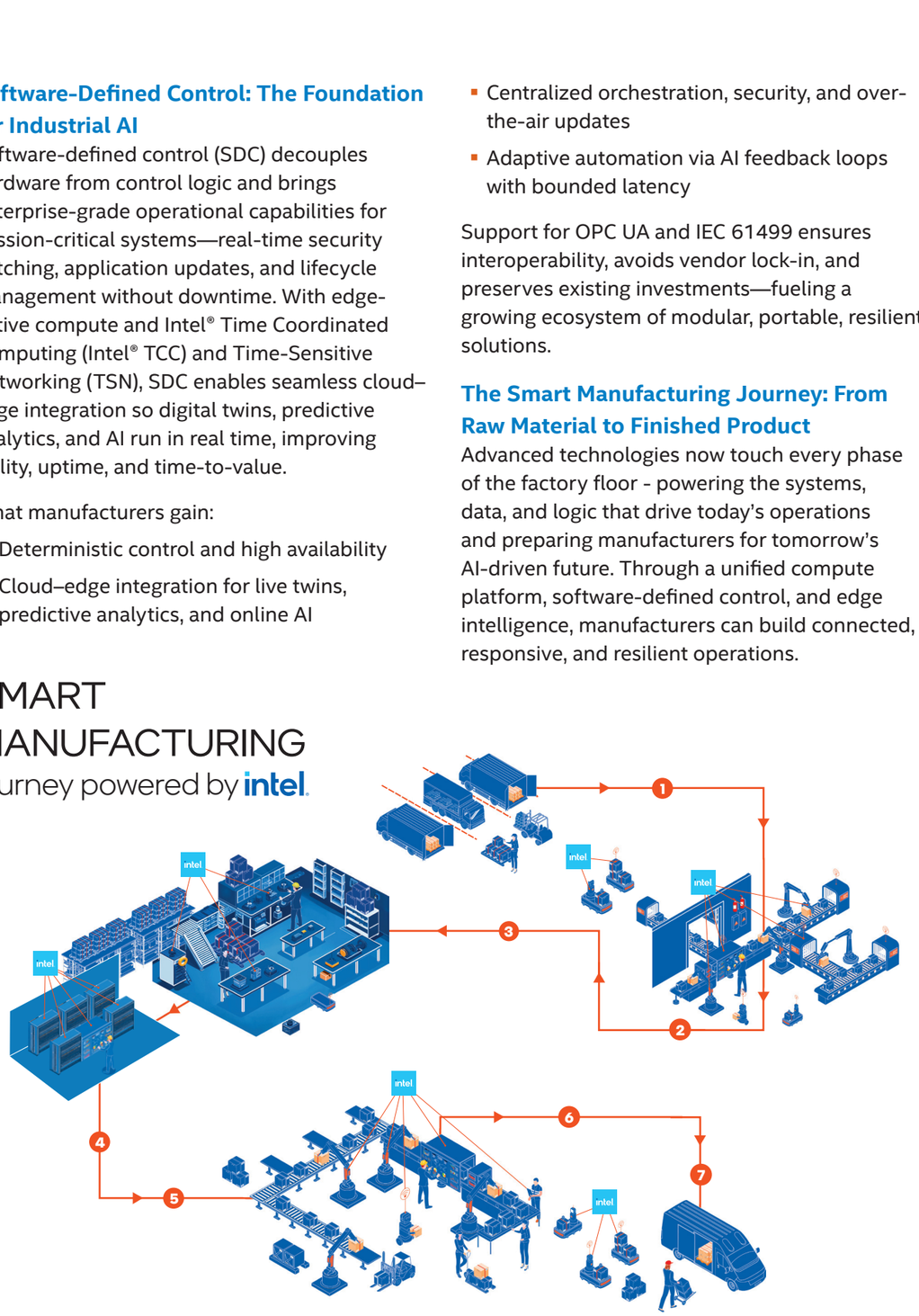

Figure 1: From dock to delivery, Intel and its partners provide the compute, control, and connectivity needed to execute and scale AI-enabled manufacturing.

Step-by-Step – Enabled by Intel and ecosystem partners:

1. Raw Material Arrival – AI Screening

Edge devices inspect incoming materials using vision AI, flagging defects early and feeding accurate data into supply chain systems.

2. Quality Control – Smart Inspection

Vision systems leveraging OpenVINO™ detect defects at high speed. Models adapt dynamically to changing specifications for continuous improvement.

3. Line Setup – Software-Defined Flexibility

Industrial control platforms support rapid deployment and updates of production logic, enabling fast changeovers and customization.

4. Mixing & Processing – Edge Optimization

Real-time control optimizes flow rates and conditions at the edge for efficiency and compliance.

5. Filling & Packaging – Intelligent Automation

Robotics manage labeling and packaging with precision, with compliance logic updated via software for lot-size-one production.

6. Final Inspection – Learning AI

Post-production systems improve over time through edge-based learning from past defects and tolerances.

7. Shipping & Distribution – Adaptive Logistics

Systems respond to demand signals, optimize picking, and manage inventory flow with real-time telemetry and AI.

Why Software-Defined and Edge-Enabled Manufacturing Matters

Legacy systems are static, siloed, and hardware-locked. In contrast, a software-defined industrial architecture virtualizes control for scalability, consolidates SCADA, AI, and telemetry on general-purpose compute, supports real-time edge decision-making, and simplifies updates, orchestration, and recovery. It also enables seamless cloud–edge compute integration, so digital twins, predictive analytics, and AI models operate in real time, delivering greater agility, reduced downtime, and accelerated time-to-value. This approach keeps systems modular, adaptable, and resilient while preserving compatibility with existing investments.

Intel and the Ecosystem: Building the Future Together

Intel plays a central role in a diverse ecosystem of partners across industrial software, orchestration platforms, robotics, vision systems, and edge infrastructure. This collaborative network enables interoperability in multivendor environments, scalable deployment of software workloads and AI models, flexible hardware options with long lifecycle support, and seamless IT/OT integration.

By fostering open innovation, Intel helps manufacturers design operations around business outcomes, not vendor constraints.

Core Value Pillars in Industrial Automation

Intel's contributions to industrial automation focus on enabling intelligent, secure, and future-ready operations. This includes AI-enabled insights through edge-based vision and predictive maintenance, built-in hardware security protections, and support for open standards like OPC-UA, IEC 62443, and IEC 61499. Long lifecycle support ensures availability and backward compatibility, while technologies like TCC, TSN, and CAT enable deterministic control and real-time performance.

Enabling intelligent, secure, and future-ready automation with AI at the edge, real-time control, and long-term interoperability.

Figure 2: Intel and partners enable intelligent, secure, and future-ready automation - with AI at the edge, real-time control, and long-term interoperability.

Customer Proof Points

ExxonMobil's Open Architecture Shift

At its Baton Rouge facility, ExxonMobil replaced proprietary control systems with an open, modular architecture grounded in industry standards. With platforms powered by Intel and its partners, they achieved stronger cybersecurity, improved agility with multivendor integration, and a 20%* reduction in automation lifecycle costs.

AI-Powered Pallet Defect Detection

Intel and its partners implemented a multi-camera defect detection system that replaced manual inspection with scalable, high-accuracy AI. The result: faster, more reliable inspection, empowered quality managers, and a replicable solution supporting carbon neutrality goals and streamlined operations.*

Conclusion

The Future of Manufacturing is Software Defined, AI-Enabled, and Intel Powered

Manufacturing is undergoing a strategic transformation—where software becomes the new control layer, and AI drives intelligence across the stack. With Intel technologies embedded across operations, manufacturers are moving beyond digitization to build flexible, future-ready infrastructure. This shift enables real-time automation, secure IT/OT convergence, and sustainable innovation at scale—and Intel is helping lead the way.

Notices & Disclaimers

Performance varies by use, configuration and other factors.
No product or component can be absolutely secure.

* Results based on specific use case; individual results may vary.

Intel technologies may require enabled hardware, software or service activation.
Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy.