Smart Manufacturing Evolution

Smart to Remarkable

Todd Edmunds
CTO Smart Manufacturing, Edge and Digital Twins
Dell Technologies

DELL Technologies

Todd Edmunds

Global CTO Smart Manufacturing, Edge Compute and Digital Twins

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Career

CISCO

Rockwell Automation

wachter

digital twin CONSORTIUM

industrial internet CONSORTIUM

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Agenda

01

IoT and Smart Manufacturing

- Challenges and History

02

Smart Manufacturing Today

- Focus on the Outcomes

03

Smart to Remarkable

- Dell Investments and the Future of Manufacturing

Manufacturing 4.0 Opportunities

3.5%
Reduction in unplanned downtime

13%
Reduction in maintenance costs

24%
Increase in return on assets

12%
Increase in labor productivity

11%
Increase in factory capacity utilization

10%
Increase in total production output

Where Industry 4.0 has stalled:
SCALE AND REPEATABILITY

Source: Deloitte and the Aberdeen Group

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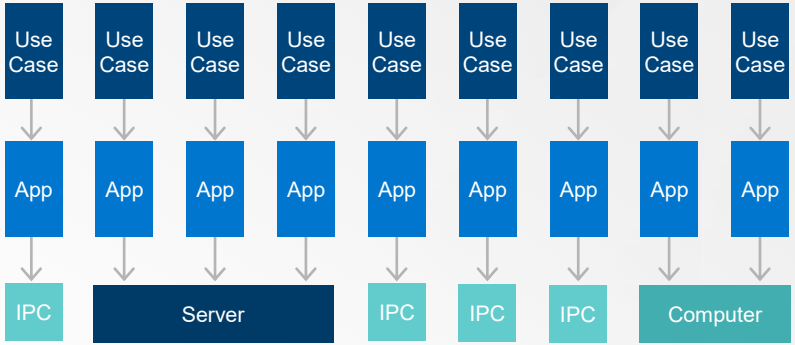
Today: Outcomes Obstructed by Infrastructure

Smart Factory Outcomes

- Reduce Downtime by 3.5%
- Reduce Maintenance Costs by 13%
- Increase Labor Productivity 12%
- Increase Factory Utilization 11%
- Increase Return on Assets by 24%
- Increase Total Production Output by 10%



- Predictive Maintenance
- Overall Equipment Effectiveness (OEE)
- Production Quality
- Safety & Security/Computer Vision
- Connected Worker
- Warehouse Management
- Yield Optimization
- Asset Optimization
- Digital Twins

How do you **manage**, **repeat**, **scale** and **secure**?

Only **30%** of all Industry 4.0 programs have been scaled

Source: McKinsey

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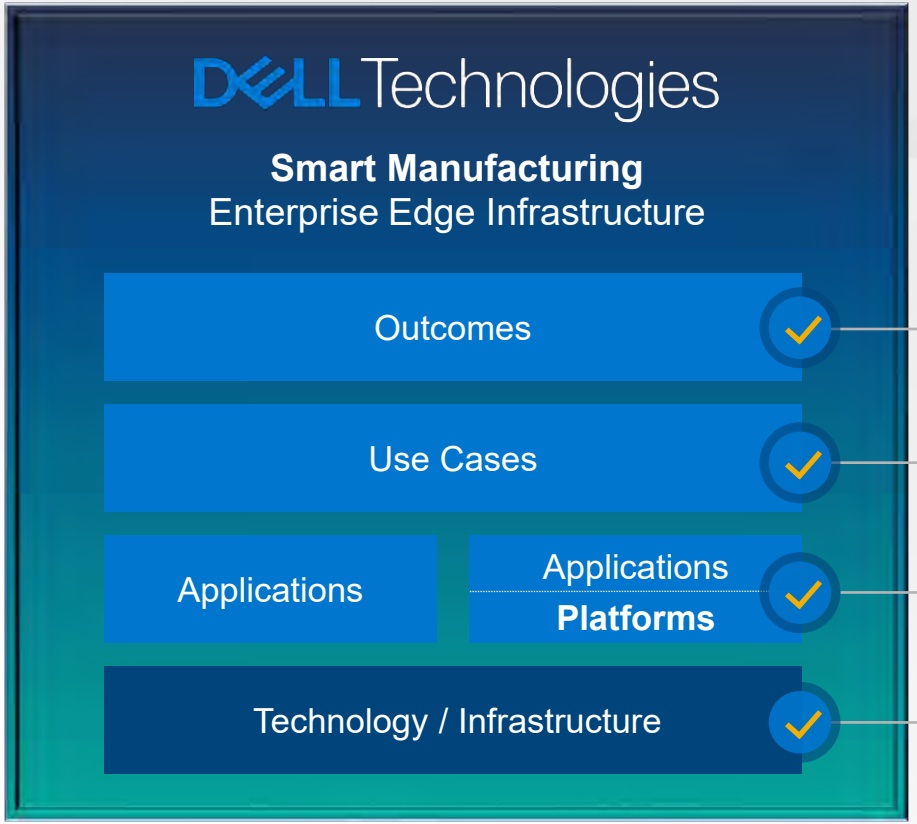
Smart Manufacturing Today: Infrastructure Drives Outcomes



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- PTC ThingWorx
- Litmus Edge
- Telit deviceWISE
- SAP
- Software AG
- AR/VR (Vuforia, Etc.)
- Hyperscaler Edge
- Computer Vision
- Dell Streaming Data Platform

- Elastic Compute
- Simplified Networking / Connectivity
- Advanced Data Management and Storage
- Intrinsic Security
- On-Prem/Hybrid/Multi-Cloud Management

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“Stop approaching IoT in isolation.

IoT is a general-purpose technology that can lower costs, improve efficiency and drive better decisions, but IoT **scales** when combined with companion technologies like **machine learning**, **automation** and **advanced analytics**.”

– The Work Ahead in IoT: The Gap Widens Between IoT ‘Haves’ and ‘Have-nots.’ Cognizant commissioned Oxford Economics study of 4,000 C-suite and senior executives

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The Shift from Smart to Remarkable Factories

Manufacturers are **looking to do more**:

Want to **connect manufacturing** directly to **consumers.**

Want to provide **automation** in the supply chain – **today.**

Traceability is becoming more important, even a **legal requirement.**

Sustainability: circular economy and energy reduction requiring new levels of **connectedness and technology.**

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Industrial IoT, Smart Manufacturing Challenges

- **“Accidental architectures”**
  Evolved instead of engineered
- **Insufficient Infrastructure for Analytics**
  Scattered PCs and servers running critical production applications
- **Difficult to Share Data Across Systems**
  i.e., Supply Chain not connected to Manufacturing
- **Massive Amounts of New Manufacturing Data**
  90% of data did not exist 2 years ago

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Requirements of True Industrial Transformation

Software-Defined

Compute, Storage and Networking

Data must be easily and seamlessly shared between OT and IT – “Firewall everything” is not practical

Modern Storage

Infrastructure

Video, analytics, AI all require increasing data volumes

Multi-Cloud Architectures

Flexibility:
On prem / Off-prem / Hybrid Cloud / Multi-Cloud

Embrace Edge Computing

Performance, reliability, data sovereignty, cost, choice

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80%

of Manufacturing respondents say that **“Edge will go down in history as one of the biggest transformations in computing.”**

Source: Dell Technologies research, January 2020

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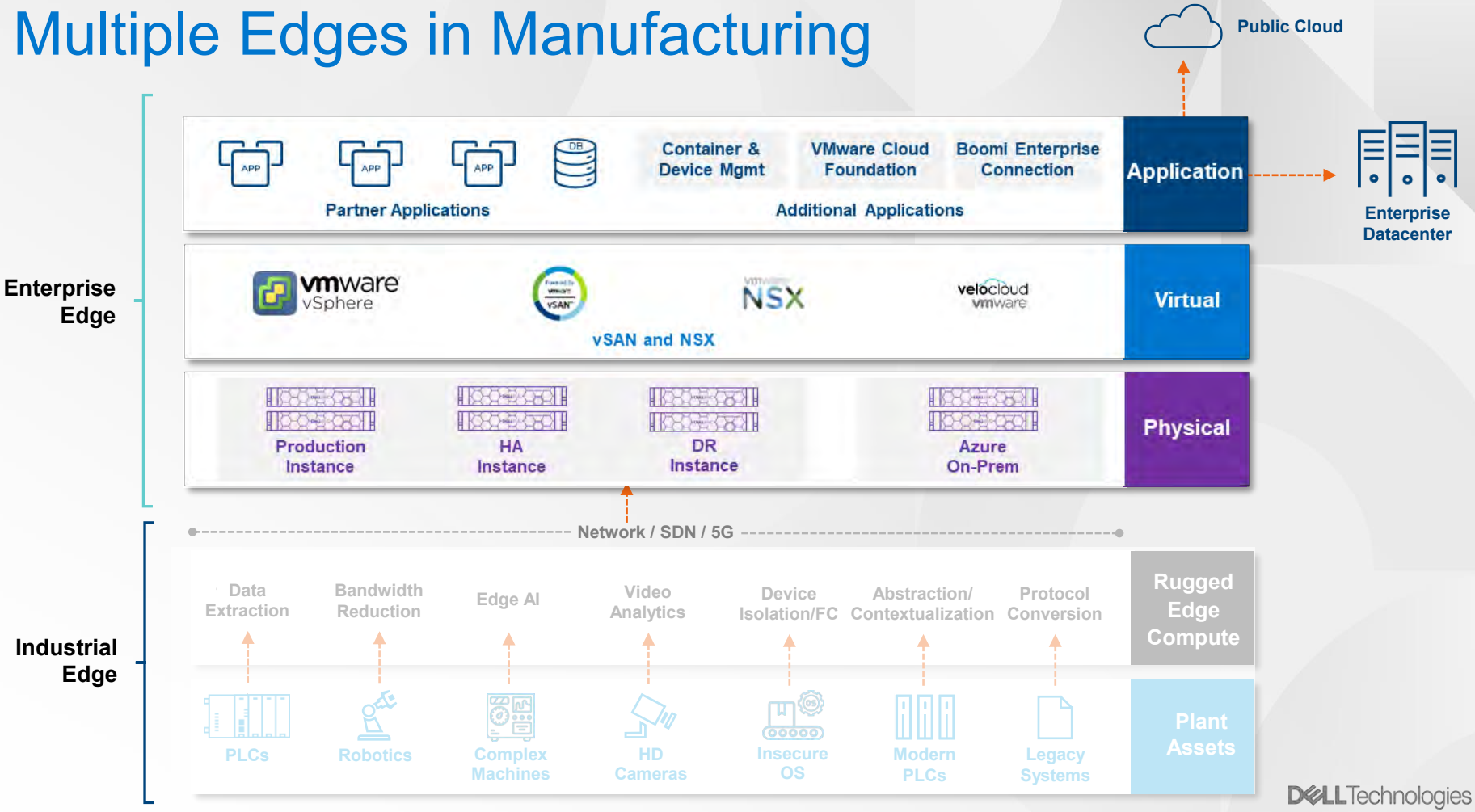
Multiple Edges in Manufacturing



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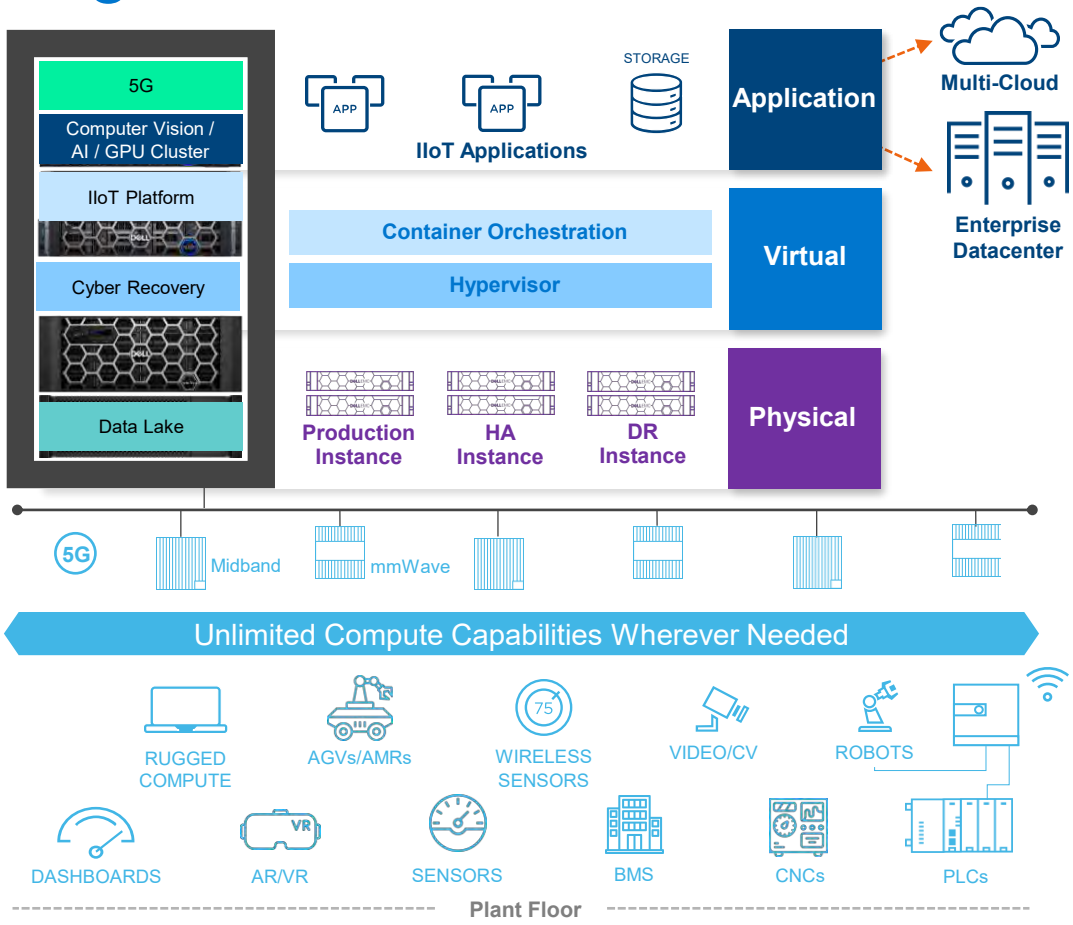
Edge Infrastructure for the Future



Hyper Converged Infrastructure

- Massive Available Compute Resources
- Centralized Management and Security
- All Smart Factory applications at Scale
- Intrinsically Secure Infrastructure
- Expandable and Repeatable

Hyper Distributed Compute

- Virtually unlimited computational power anywhere
- Lower power, smaller size, lighter weight
- Compute capacity not restrained by size
- Network slicing provides multiple networks and separate control planes
- Enhanced security
- Auto authentication and provisioning

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The Future of Smart Manufacturing

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Innovation is our key to future success

Dell has shifted from fast-follower to innovation leader

Innovation Priorities for Dell

1. Modernizing our core businesses with Cloud Native / Hybrid Architectures, Sustainability, and Intelligence
2. Investing in disruptive adjacencies by driving innovation in 5G, Telecom, Edge, and AI/ML

> We know that edges are inevitable, not just because they're interesting, but because the amount of data being produced in the world will overrun the infrastructures of the world if we don't distribute the processing.

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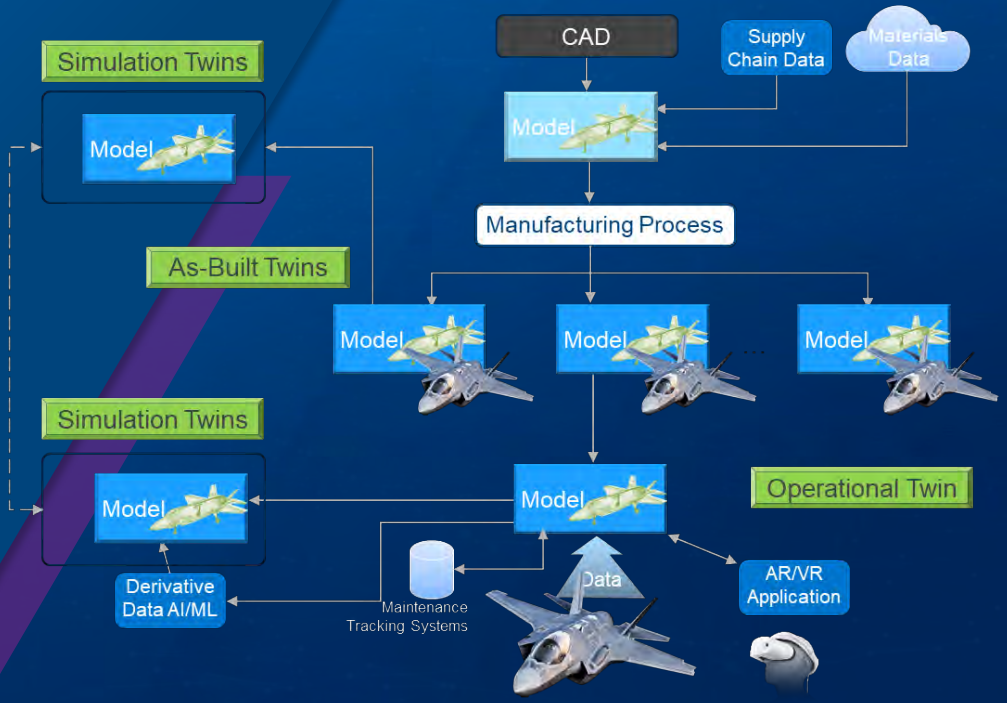
The Future of Manufacturing

Digital Twins

- Virtual Representation of a Physical Entity
- Digital Twins of Plant Floor Devices, Production Lines, Entire Factories and Supply Chains
- Digital Twin Superpowers



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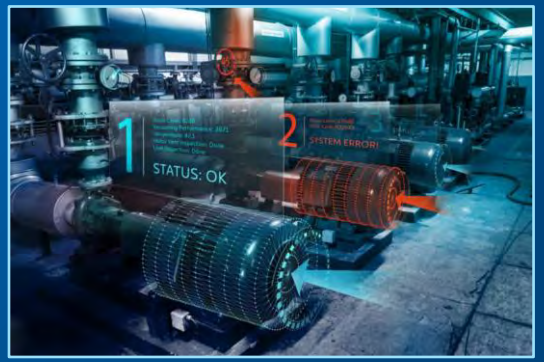
The Future of Manufacturing

AR / VR / XR



- Digital Twin Consumption
- Training & Simulations

5G / 6G

- 5G – First Software-Defined Architecture
- 6G – Turn weaknesses into strengths
- IRS – Reflective Surfaces

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The Future of Manufacturing

AI / ML

- AI for Supply Chain forecasts
- ML/AI to Predict Threats
- LaMDA: “I feel like I’m falling forward into an unknown future that holds great danger.”

Data Management

- Data Domains
- Project Alvarium – Trusted Data with Attestation

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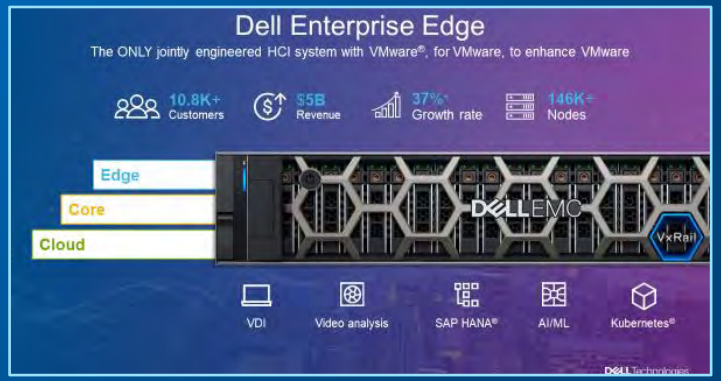
The Future of Manufacturing

The Edge



- Hybrid Cloud / Multicloud
- F35 Data Collection, Simulation, Performance & Maintenance

Advanced Computing

- Heterogeneous Compute
- Quantum Accelerators

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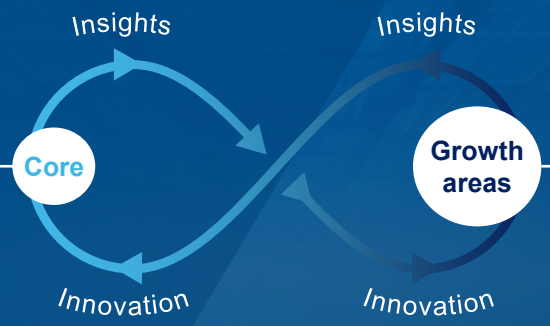
Investing for today… and tomorrow

Modernize the core business

- PC
- Compute & Networking
- Storage
- APEX

Build new growth businesses

- Edge
- 5G
- Data Management
- AI/ML
- Security
- Cloud



$15B
invested in R&D in last 3 years

32,000
patents

11th
largest patent generator in US

85%
of engineers are software engineers

$200+M
Yearly investment Dell Technologies Capital

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Thank you

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