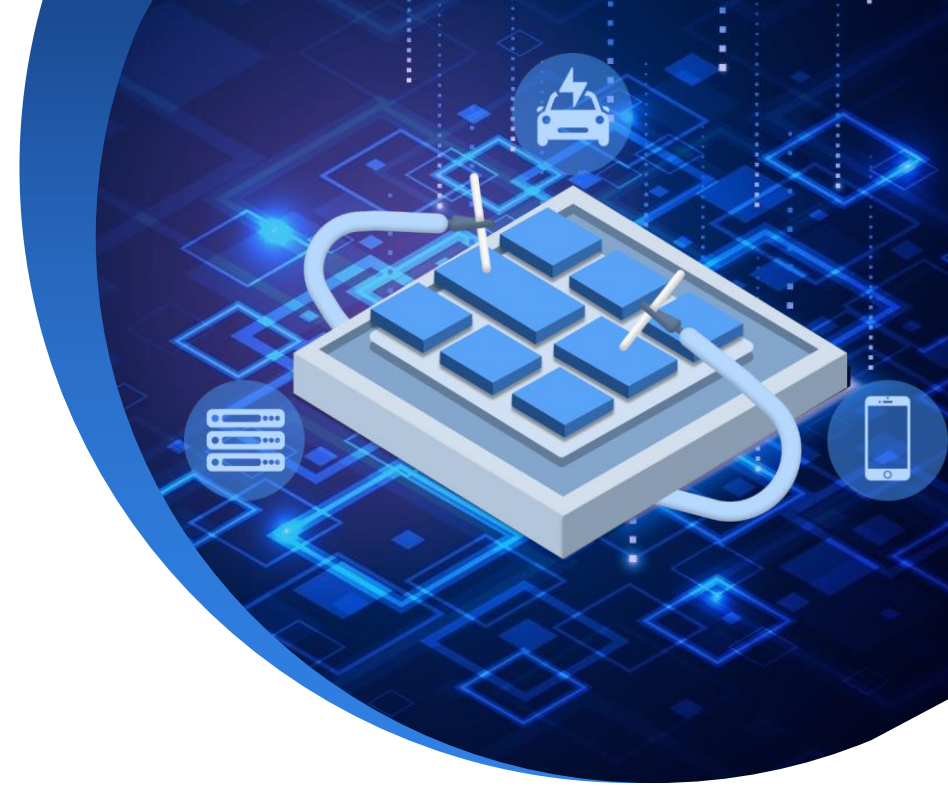




The New Frontier AI for Manufacturing and Test

Marc Jacobs, *Senior Director of Fabless Solutions*

15-16 September 2025

ITWS

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Agenda

1. The Challenge
2. The Opportunity
3. AI-Driven Solutions
4. Conclusion

01.

The Challenge

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3 challenges the semiconductor industry must tackle



innovations in 3D



operating through a complex global supply chain



leveraging AI at all levels, from design to manufacturing



PDF / SOLUTIONS™

the leading commercial data, analytics, and mission critical platform spanning the semiconductor and electronics industry

we provide solutions in three areas:



**characterization &
technology development**



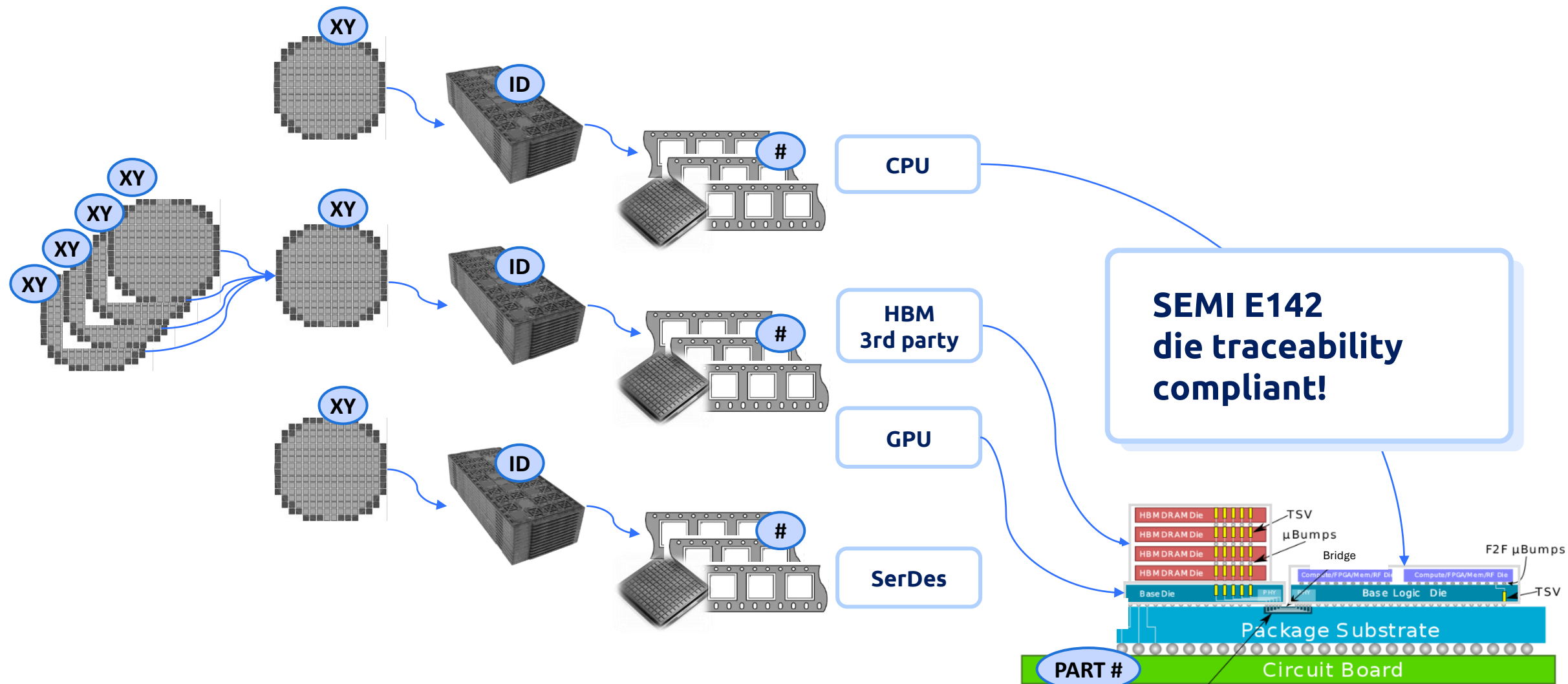
**smart manufacturing &
analytics**



supply chain orchestration



Data Complexity of Advanced Packaging



Testing Across A Globally Distributed Supply Chain



What Makes **AI** for Semiconductor Different and Difficult



**Complex Data
Model**



**Model
Maintenance**



**Complex
Interactions**



**Diverse
Use Cases**



**Edge
Deployment**



**Data
Drift and Shift**



**Disparate
Deployments**



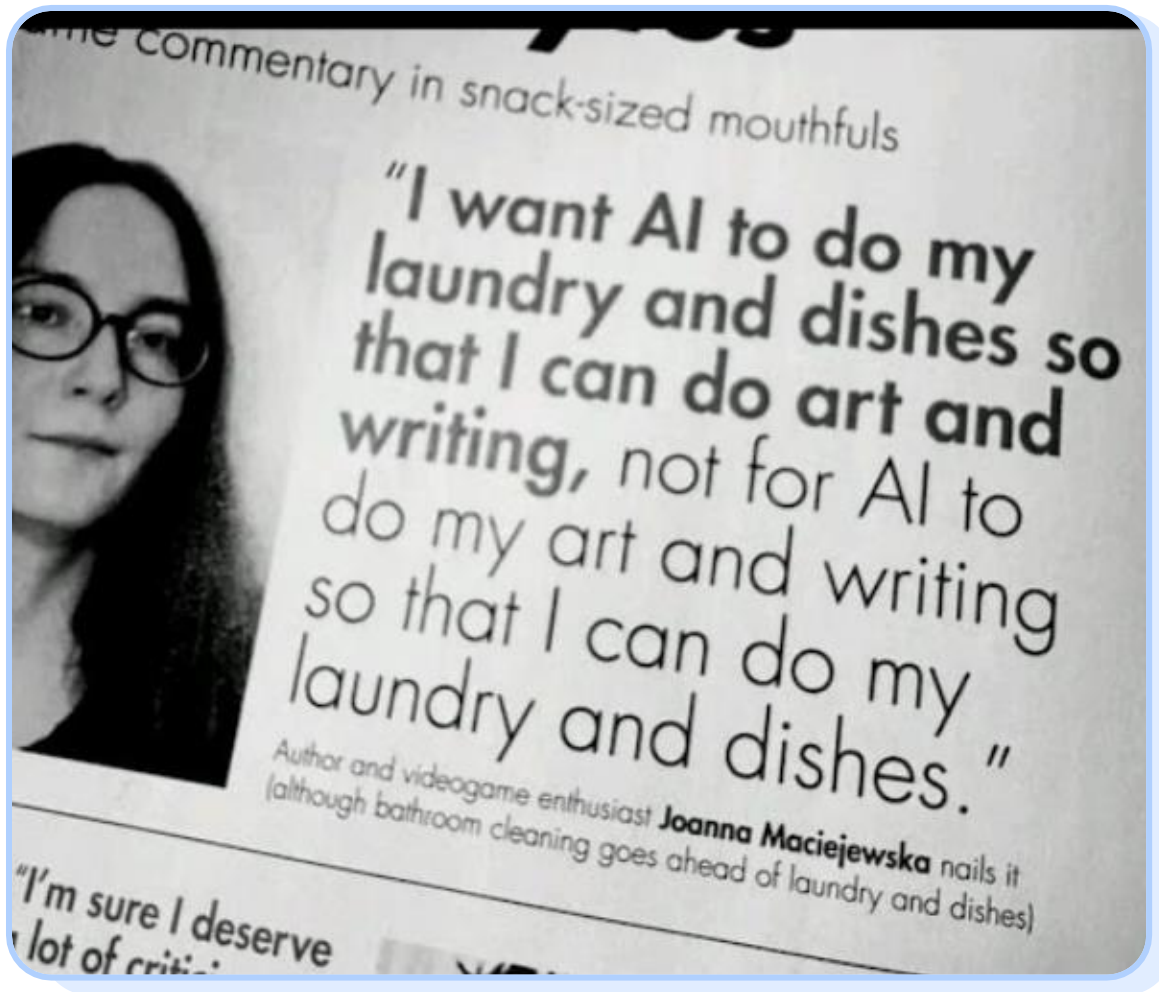
**Security
and IP**

02.

The Opportunity

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Opportunity: AI for Test



Source: Joanna Maciejewska, LinkedIn

data



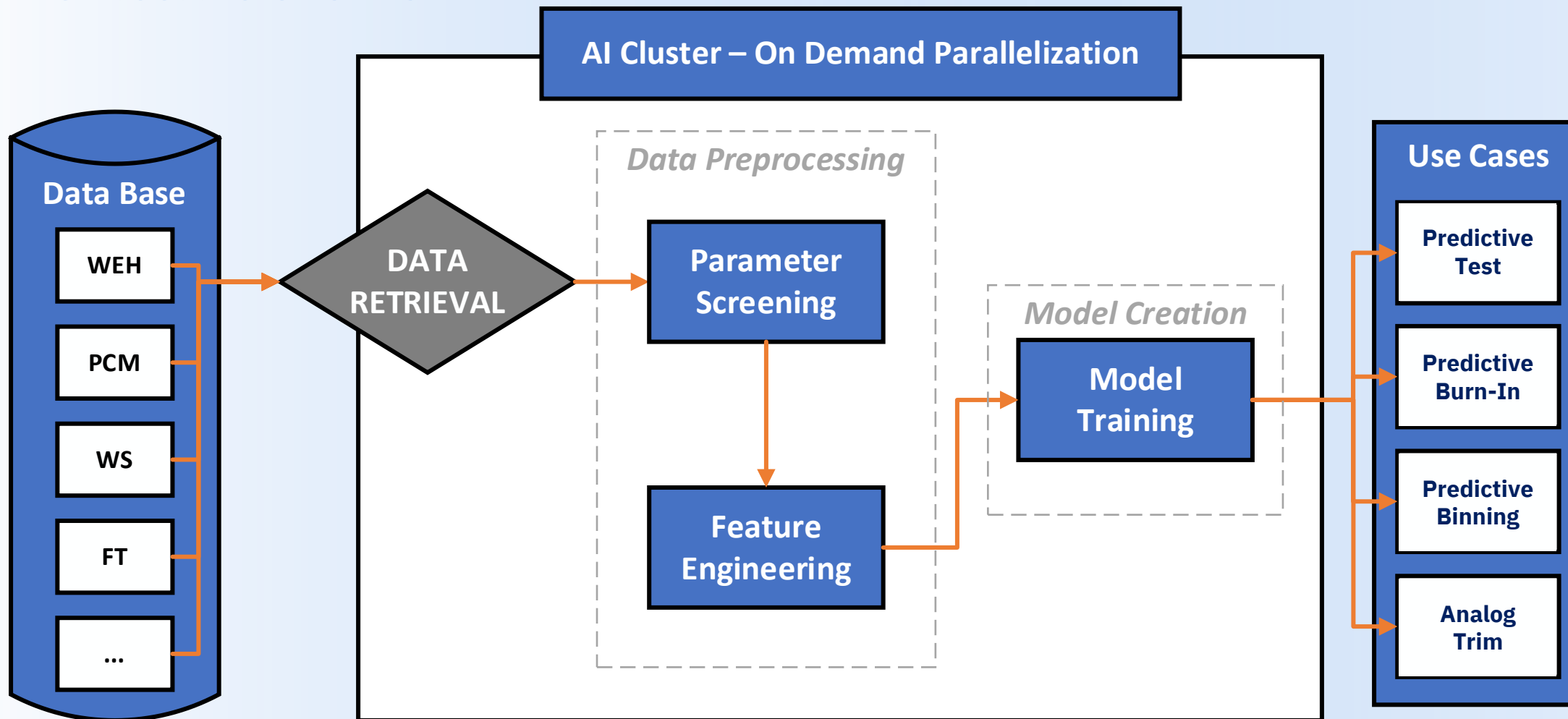
infrastructure



model

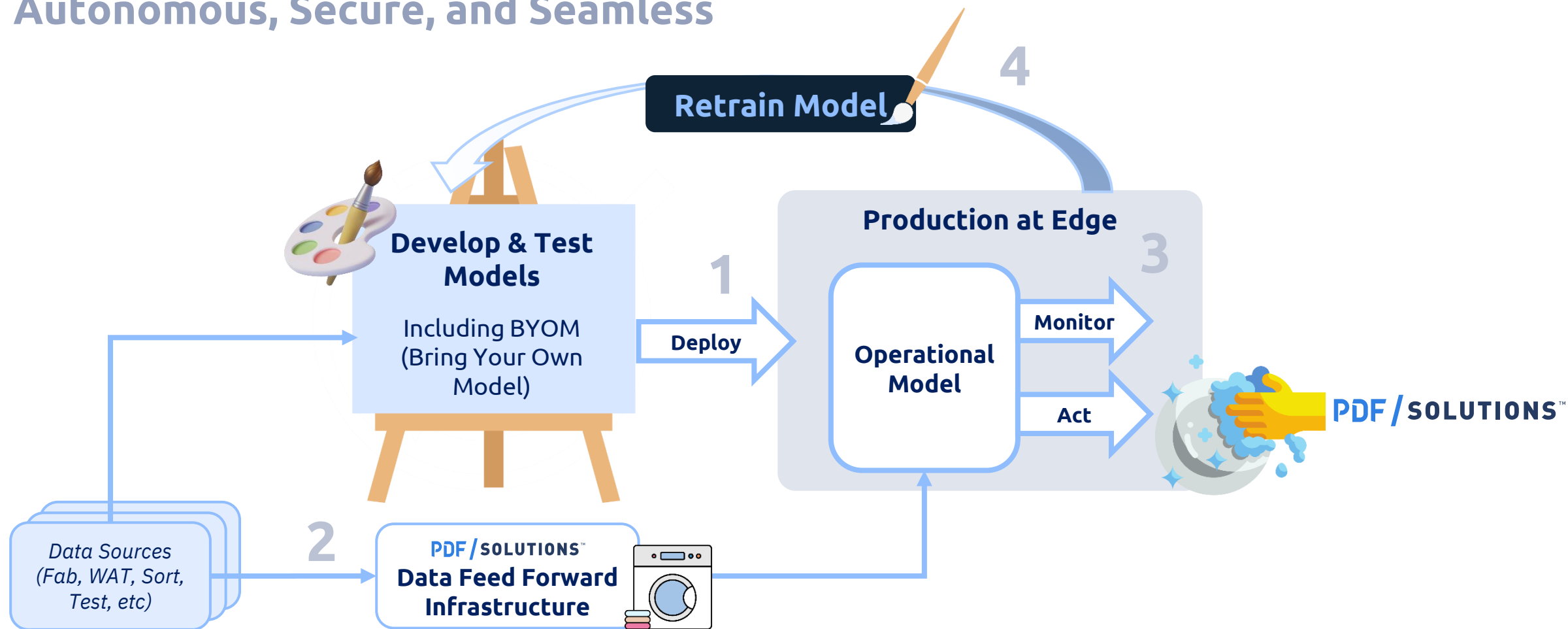
Model Training Pipeline

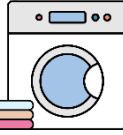
Architecture Overview



AI Infrastructure: Create, Manage & Control Models Across Lifecycles

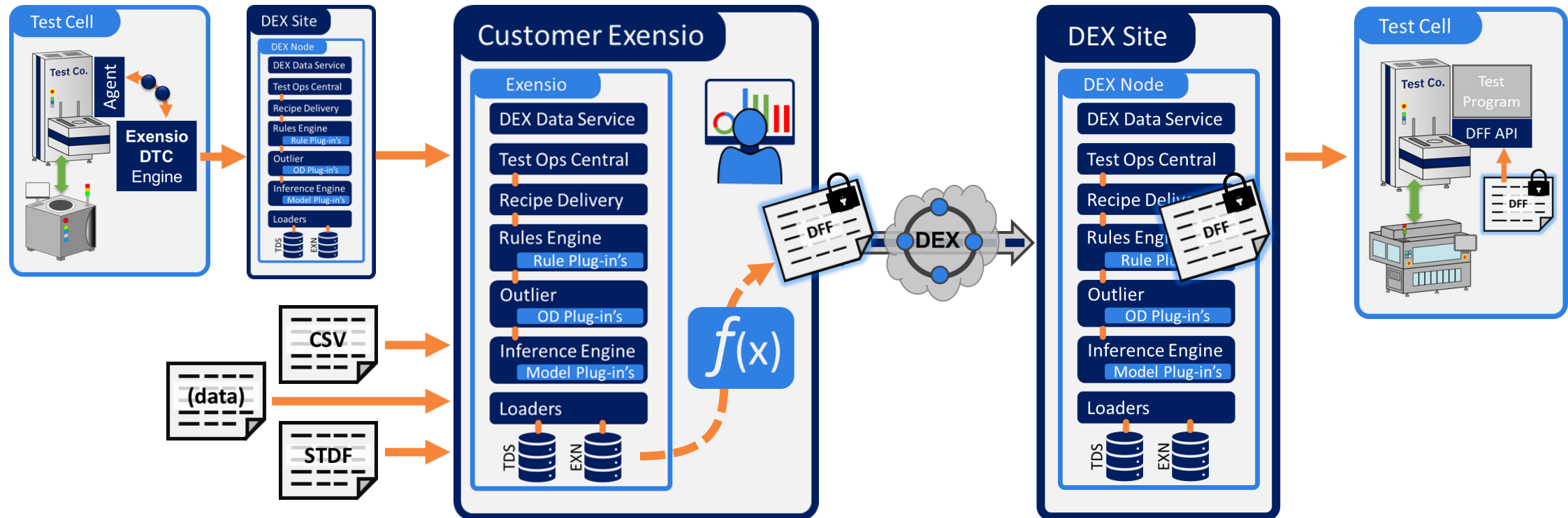
Autonomous, Secure, and Seamless





PDF Solutions Infrastructure for Data Feed Forward

enables **sharing & access of test data** across different stages of production delivering **actionable insights** upstream and downstream, allowing customers to **optimize test operations, improve yield, and accelerate decision-making**.





PDF Solutions Infrastructure for Data Feed Forward

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Capture & Transport



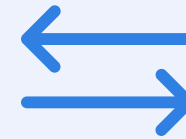
- **Real-time** tester **data capture**
- universal data **integration**
- **Vendor-agnostic** streaming
- Scalable data **storage**

Data Recall & Engineering



- Flexible **data prep & alignment**
- Smart **data retention**
- Selective **recall**
- **ML** models (or BYOM) & **feature engineering**

Transfer



- **Secure, traceable, event-driven** delivery
- Data **segmented by destination**

Edge Integration



- Deployed at **multiple OSATs**
- Data **encrypted** at rest & **not viewable** by OSAT
- Flexible **API** integration
- Supports **multiple production steps**

03.

AI-Driven Test Solutions

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AI-Driven Test Solutions

Predictive Test

Spend test \$ on units that need them most

Inputs

- WAT & CP data, for features
- FT data, for labeling
- Test time pareto

Outputs

Die by die skip list, by tests



2

3

4

Use Case: Adaptive Test on High Volume Product

Desire

Remove tests at Final Test (FT) **without impacting DPPM**

Method



Predict FT failures by **Machine Learning** on Wafer Sort (WS) parametric data



Use **Data Feed Forward** (DFF) to skip tests on predicted-pass units

Use Case: Results Summary



Results

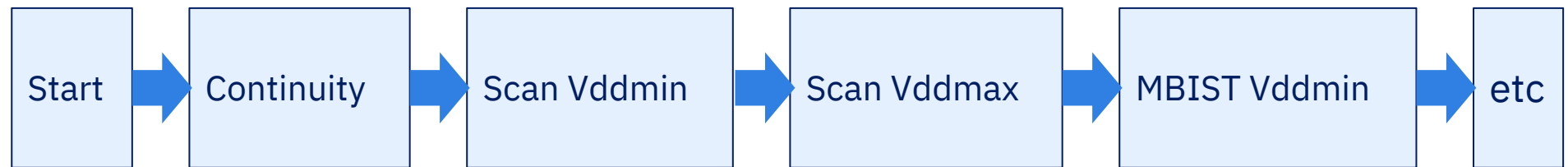
- **5 / 7 tests** can be skipped with **0 DPPM**
- **Product decision needed** for the other 2 tests with **near-zero DPPM impact**
- Skip rates (fraction of units where test can be skipped) **above 88%**

Target	Current Failure Rate (PPM)	DPPM (with ML)	ML Fail Captured%	ML Skip %
FT_Test_A	82	0.0	100.00%	99.26%
FT_Test_B	88	0.0	100.00%	98.49%
FT_Test_C	220	0.0	100.00%	96.63%
FT_Test_D	839	0.0	100.00%	95.98%
FT_Test_E	540	2.9	99.43%	95.25%
FT_Test_F	584	0.0	100.00%	94.64%
FT_Test_G	255	0.9	99.60%	88.14%

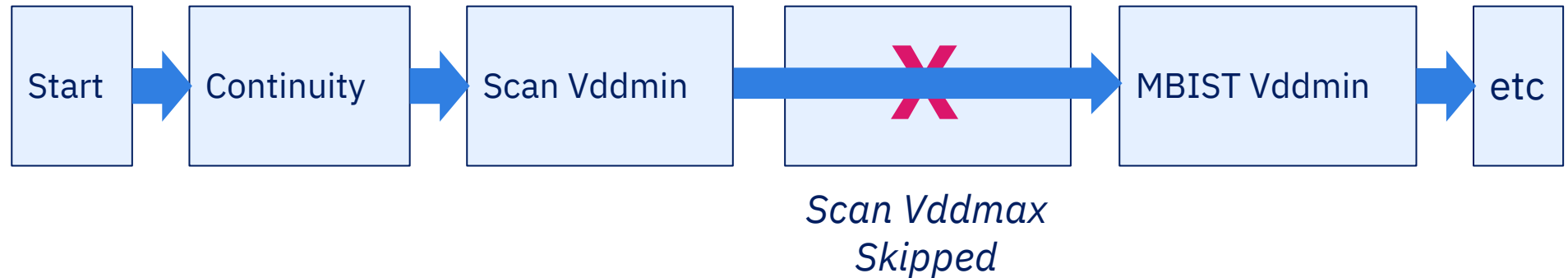
Test Suite Switching

Predictive Test supports Test Suite Switching

*Normal
flow*



*Switched
flow*



Note: Switching by Test Suite, not by Test

AI-Driven Test Solutions

Predictive Test

Spend test \$ on units that need them most

Inputs

- WAT & CP data, for features
- FT data, for labeling
- Test time pareto

Outputs

Die by die skip list, by tests

Predictive Burn-In

Eliminate costly burn-in

Inputs

- WAT & CP data, for features
- BI failure data, for labeling

Outputs

Modified die-by-die binning, "needs BI" or "skips BI"



3



Burn-In



AI-Driven Test Solutions

Predictive Test

Spend test \$ on units that need them most

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Predictive Binning

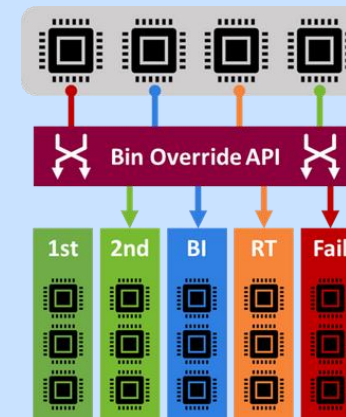
Find failures early

Inputs

- WAT & CP data, for features
- FT data, for labeling

Outputs

Modified wafermap, to scrap units early



AI-Driven Test Solutions

Predictive Test

Spend test \$ on units that need them most

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Predictive Binning

Find failures early

Inputs

- WAT & CP data, for features
- FT data, for labeling

Outputs

Modified wafermap, to scrap units early

Analog Trim

Improve Analog Precision & Accuracy with multi-temperature data

Inputs

- WAT, CP, & FT data, for features

Outputs

- Computed and / or Predicted results



Four Use Cases – What We Predict

Predictive Test

Use CP data to predict FT passes, and skip test suites
Predict pass bins with high confidence

Predictive Burn-In

Use CP data to predict Burn-In passes, & skip or reduce Burn-in
Predict pass with high confidence

Predictive Binning

Use CP data to predict FT failures and scrap early → “shift left”
Predict FT fail bins

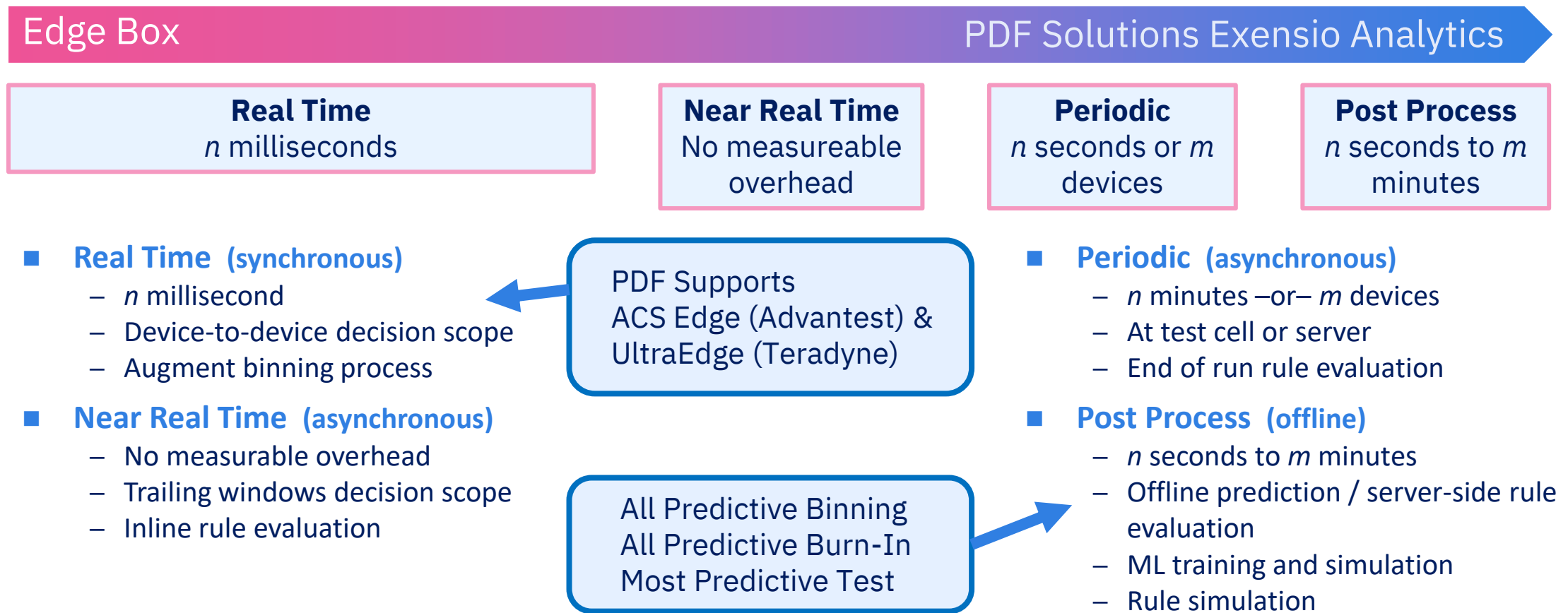
Analog Trim

Improve Analog Precision & Accuracy with multi-temperature data

- Computed results with algebra
- Predicted results with ML

Computational Time Domains

Edge Compute and PDF Solutions' Exensio offer **advanced/ML compute and analytics** for test across the entire time decision domain



04.

Conclusion



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Key Takeaways

AI-driven test is a continuum of data, model, and infrastructure



Semiconductor-specific data, over space and time



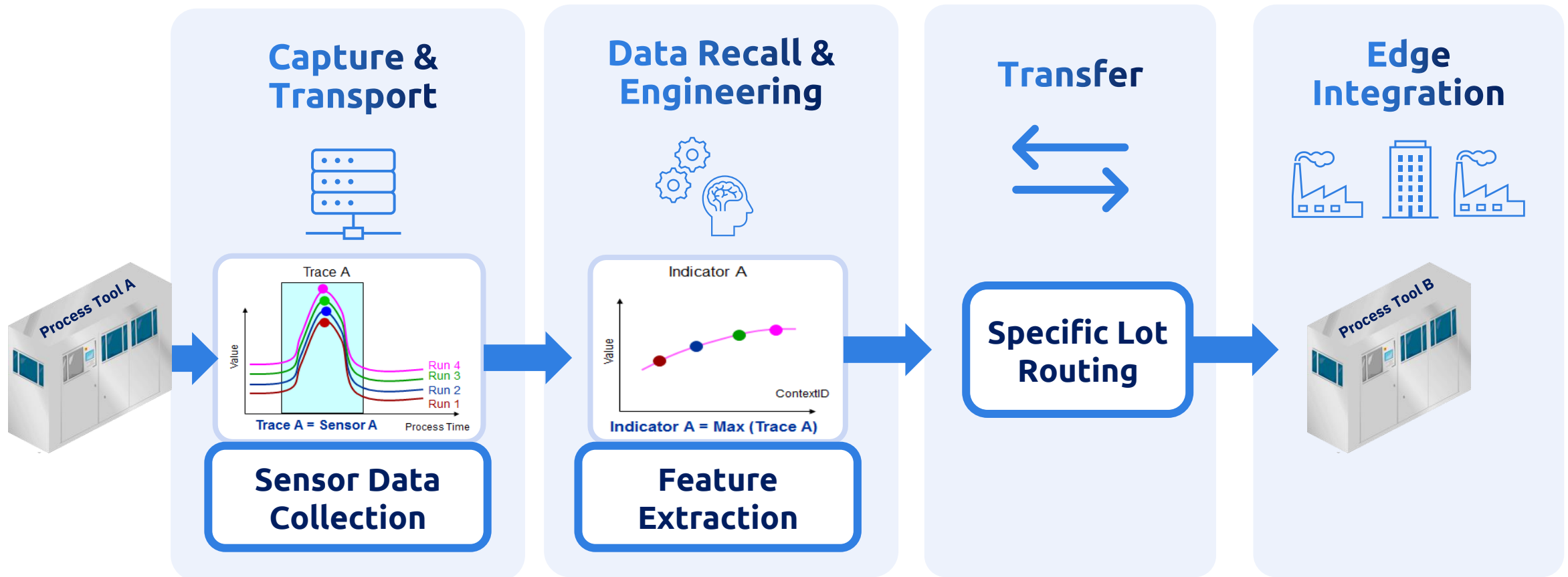
Connected view of a globally distributed supply chain



AI across the design, manufacturing, and test lifecycles

AI & Forwarding Data in Process Control

enable **variability reduction** using the same DFF infrastructure



Thank You

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