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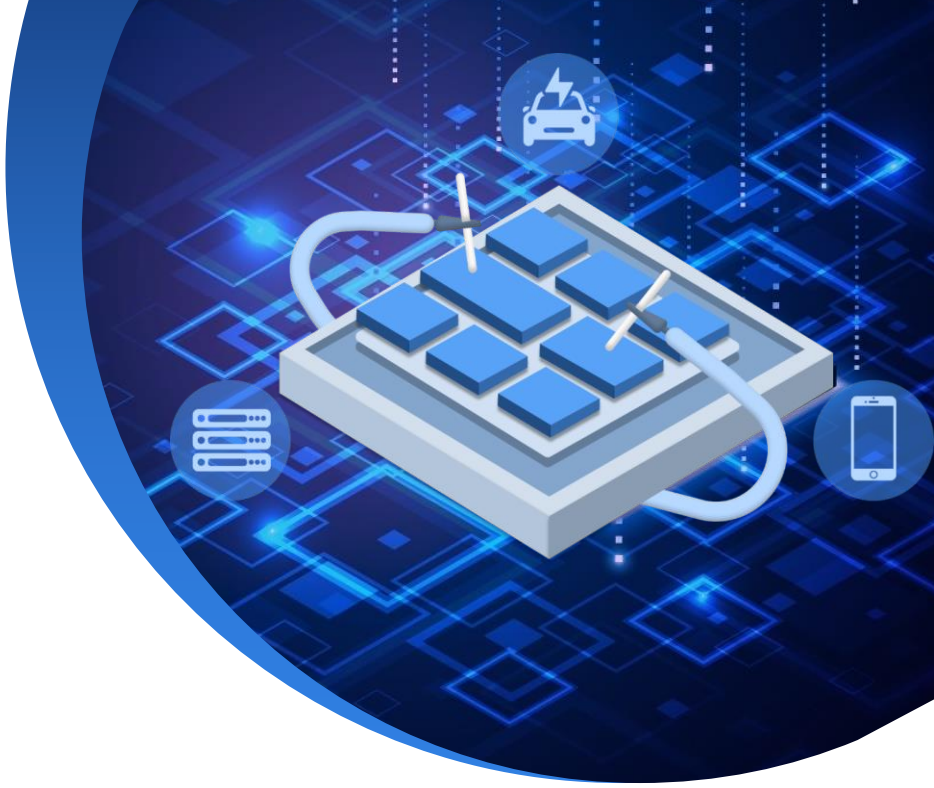

The New Frontier

AI for Manufacturing and Test

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Agenda

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

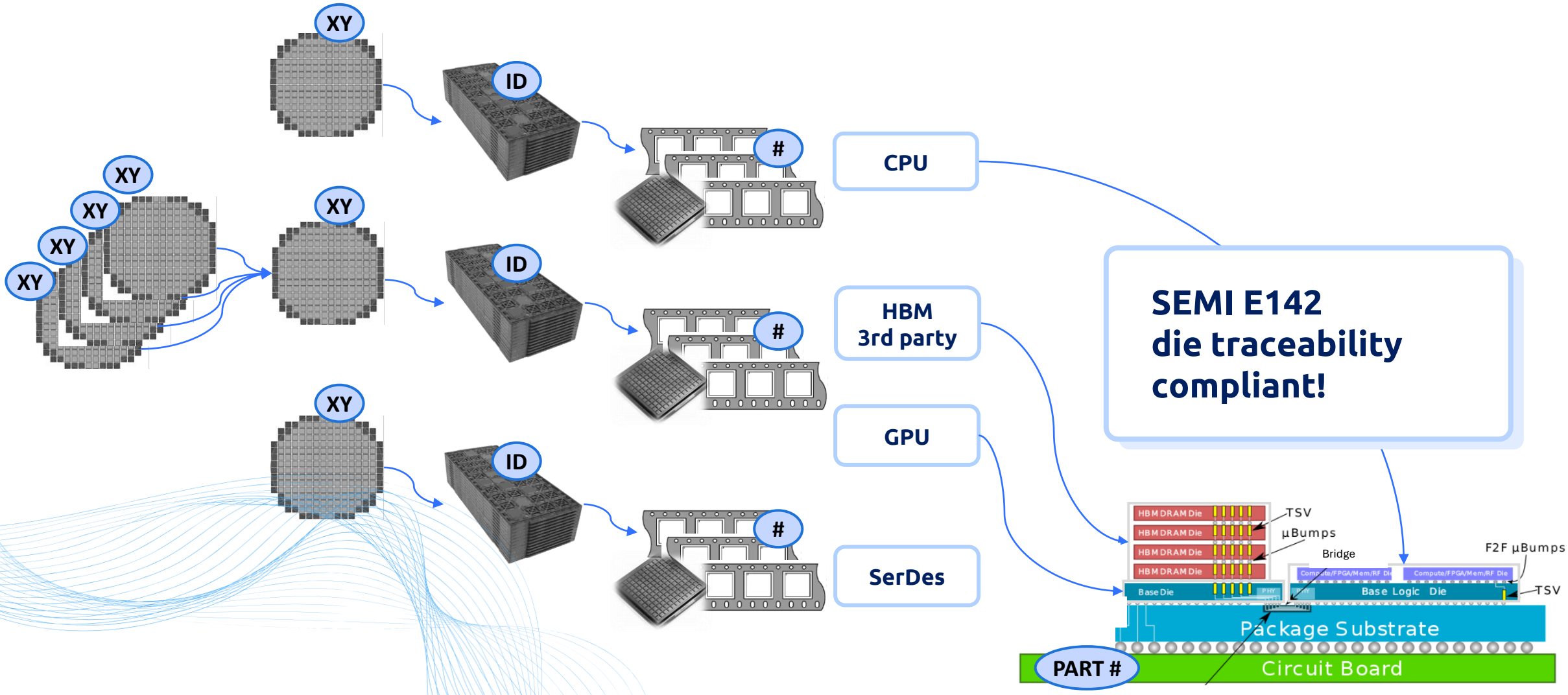
#1.

The Challenge

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**

Data Complexity of Advanced Packaging



Testing Across A Globally Distributed Supply Chain

Shipping

Planning / Costing

Design

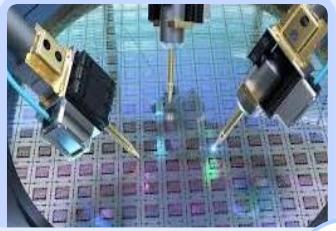
Shipping

Planning / Costing

Foundry

Shipping

Planning / Costing



Wafer Sort

Shipping

Planning / Costing

Packaging

Planning / Costing

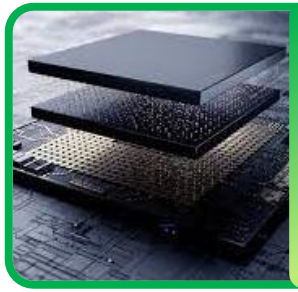
Final Test

Shipping

4 to 6+ Dies
2 to 20+ HBM
10 to 20+ Test Insertions

Planning / Costing

KGD



Adaptive Test
Data Feed Forward & Feedback
Die matching

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

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

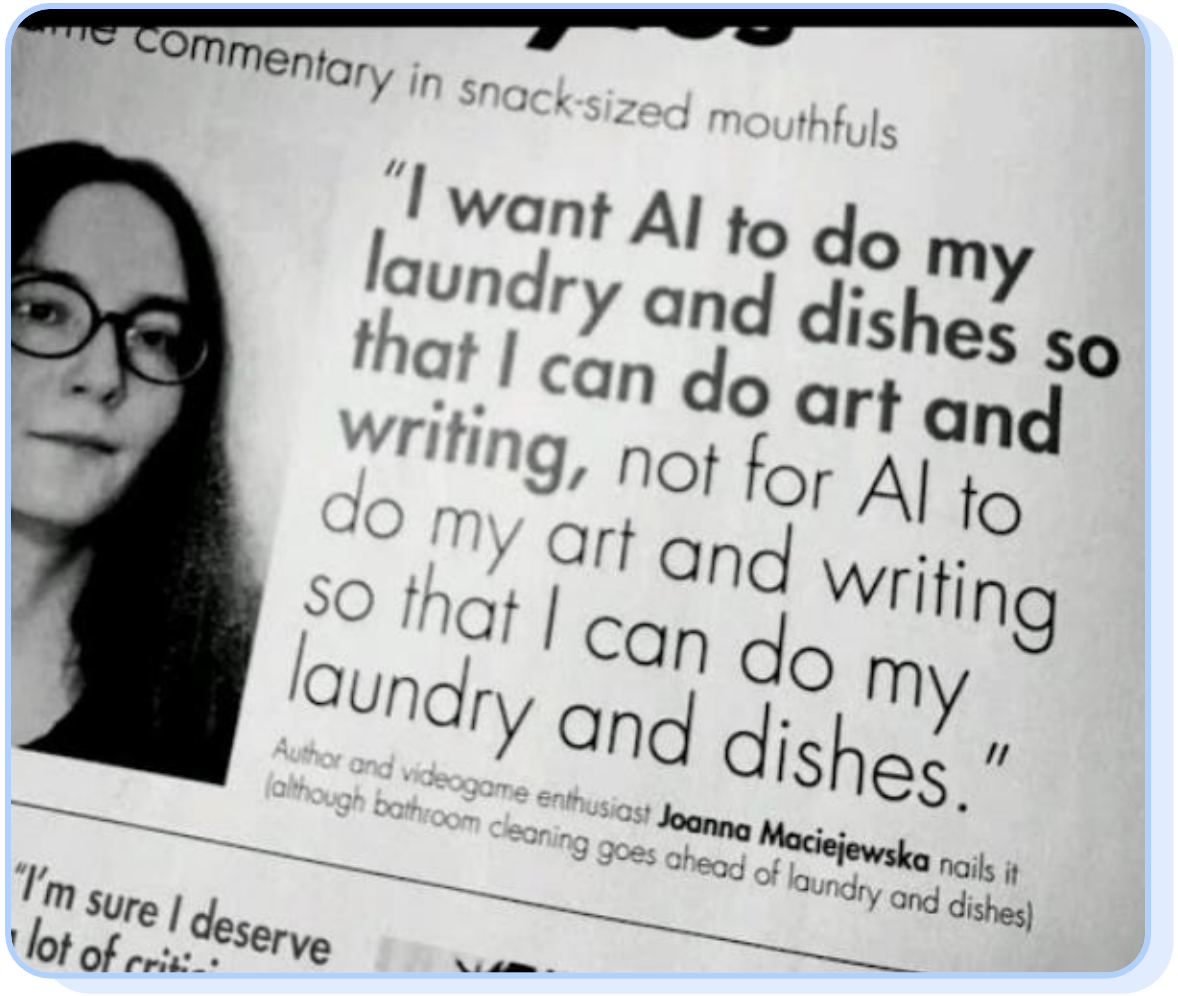
we provide solutions in three areas:

- characterization & technology development
- smart manufacturing & analytics
- supply chain orchestration

#3.

The Opportunity

Opportunity: AI for Test



Source: *Joanna Maciejewska, LinkedIn*

data

+

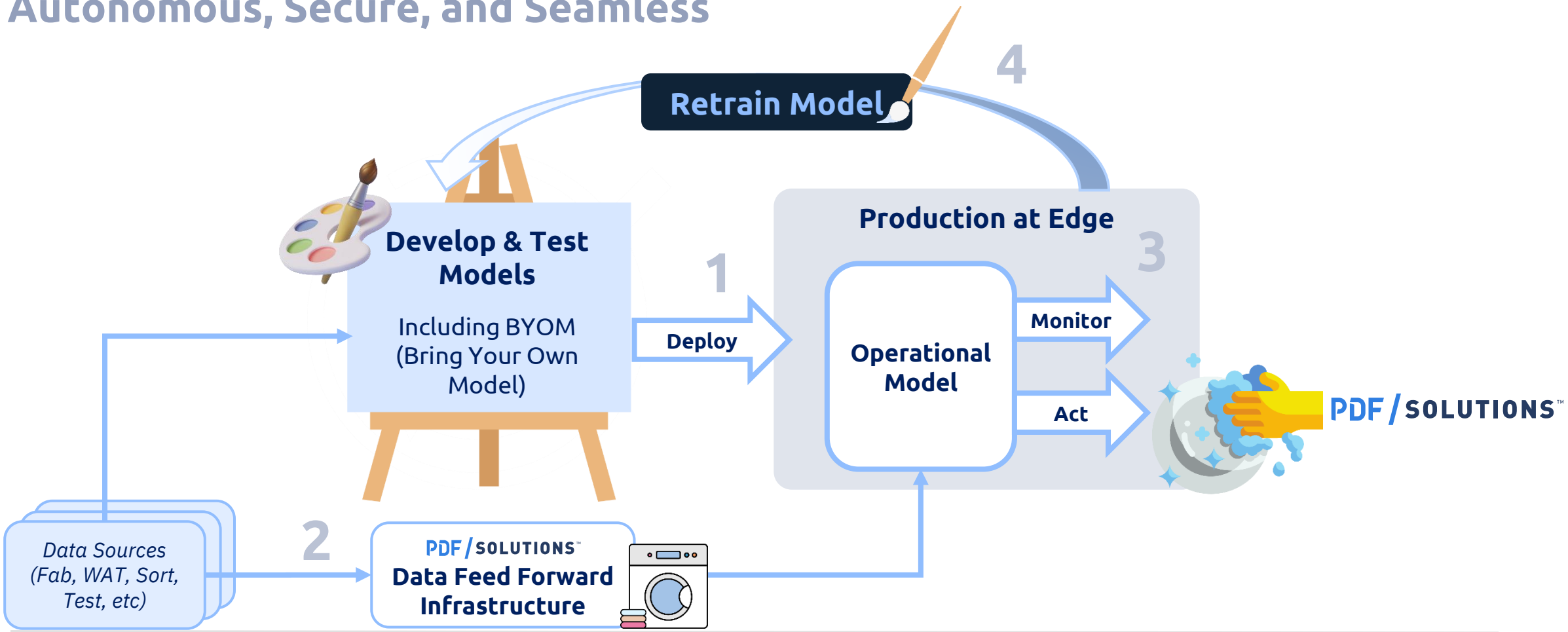
infrastructure

+

model

AI Infrastructure:
Create, Manage & Control Models Across Lifecycles

Autonomous, Secure, and Seamless



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Data Feed Forward Infrastructure

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.

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**

#4.

AI-Driven Test Solutions

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AI-Driven Test Solutions

Predictive Test

Spend test $ on units that need them most. Predict which tests will pass

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

Outputs
Die by die skip list, by tests

2

3

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%

AI-Driven Test Solutions

Predictive Test

Spend test $ on units that need them most. Predict which tests will pass

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
Predict which tests will pass burn-in

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

Outputs
Modified die-by-die binning, “needs BI” or “skips BI”

AI-Driven Test Solutions

Predictive Test

Spend test $ on units that need them most. Predict which tests will pass

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
Predict which tests will pass burn-in

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

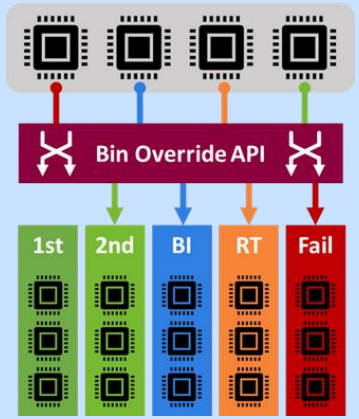
Outputs
Modified die-by-die binning, “needs BI” or “skips BI”

Predictive Binning

Find failures early. Predict which tests will fail

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. Predict which tests will pass

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

Outputs
Die by die skip or add list, by tests

Predictive Burn-In

Eliminate costly burn-in
Predict which tests will pass burn-in

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

Outputs
Modified die-by-die binning, “needs BI” or “skips BI”

Predictive Binning

Find failures early. Predict which tests will fail

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

Outputs
Modified wafermap, to scrap units early

save time
reduce cost
improve quality

#5.

Conclusion

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Key Takeaways

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

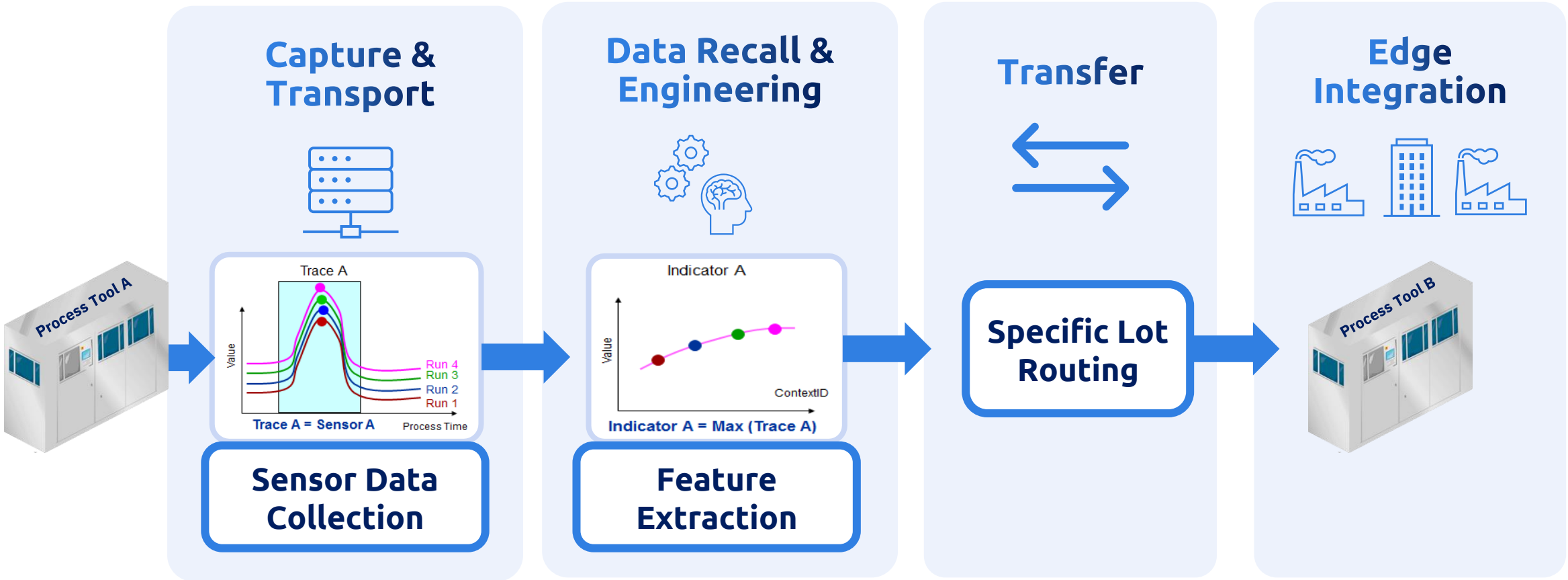
Semiconductor-specific data, over space and time

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



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