



Test Innovations:

Crossing the Chasm to a Chiplet Ecosystem

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Our Mission

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From Data to Action: Your trusted partner for semiconductors



quality



reliability



security

Important Shifts in the Industry



1

Innovation in 3D

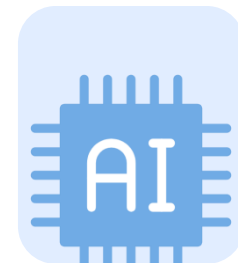
transistors, interconnects,
circuits, chiplets, and
systems



2

Many new fabs

accelerated learning
needed from a
geographically distributed
industry



3

AI for AI

AI tech helping making AI
chips, and vice versa

Industry Challenges: Design and Manufacturing



Design

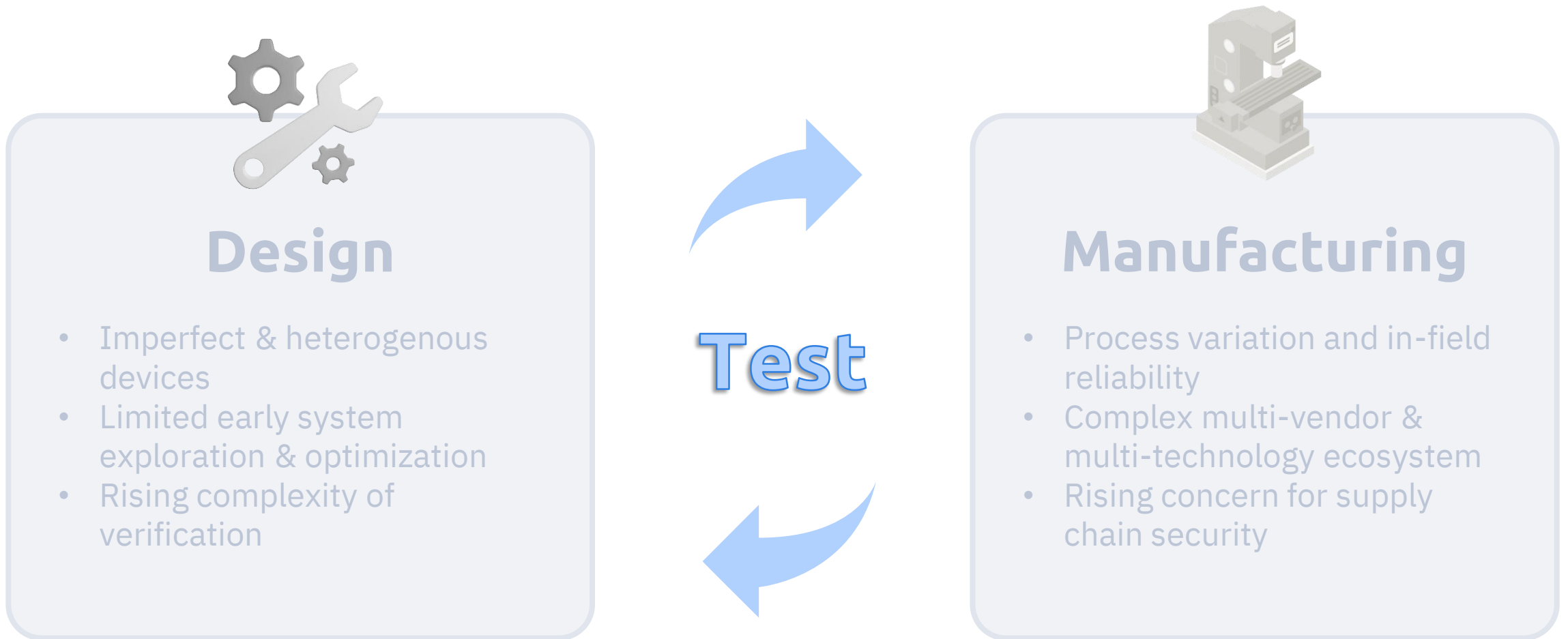
- Imperfect & heterogenous devices
- Limited early system exploration & optimization
- Rising complexity of verification



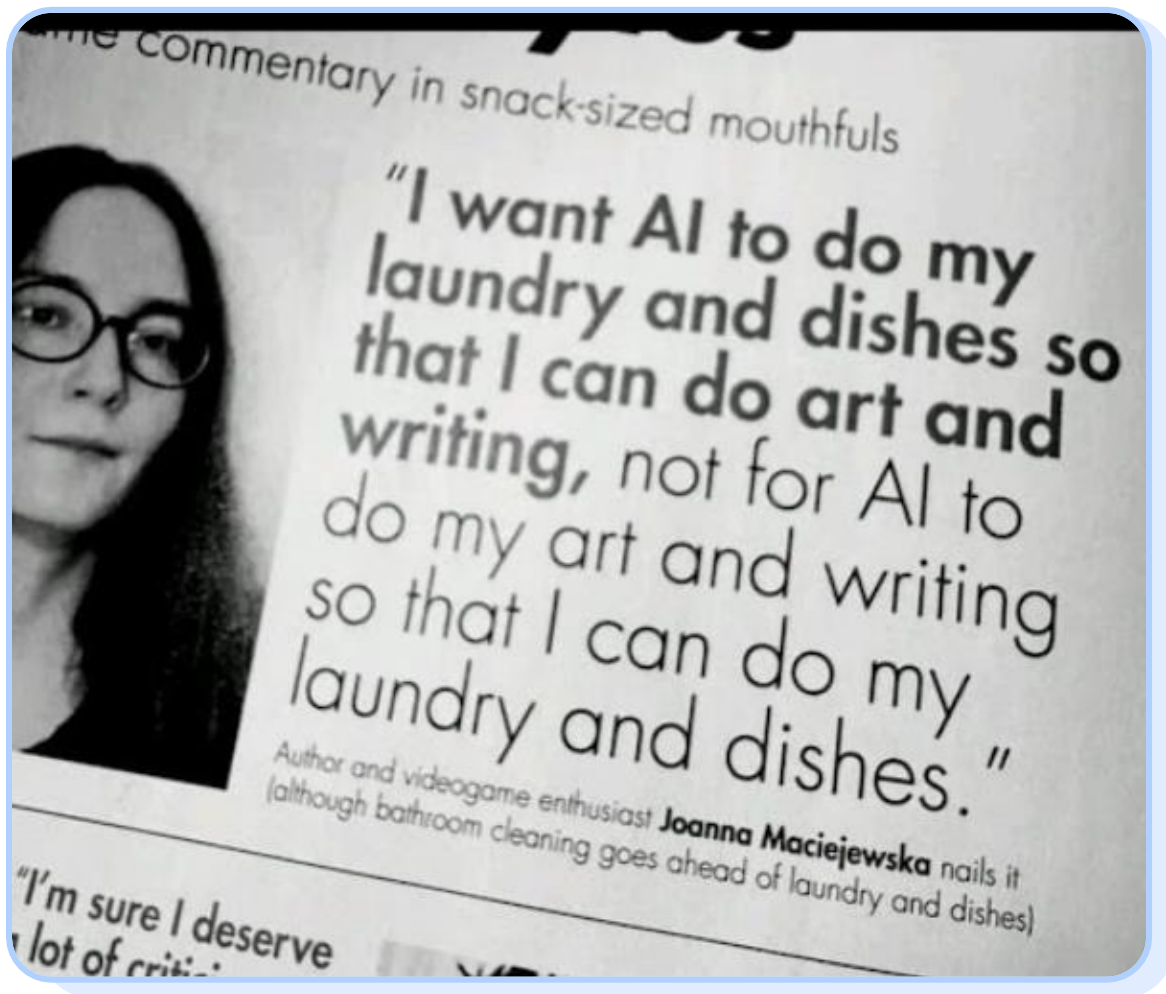
Manufacturing

- Process variation and in-field reliability
- Complex multi-vendor & multi-technology ecosystem
- Rising concern for supply chain security

Bridging the Gap through Innovations in Test



Opportunity: AI for Test



Source: Joanna Maciejewska, LinkedIn

data



infrastructure



model

Market: System Quality, Cost, Differentiation

Wafer

Chiplet

System

Adaptive Testing



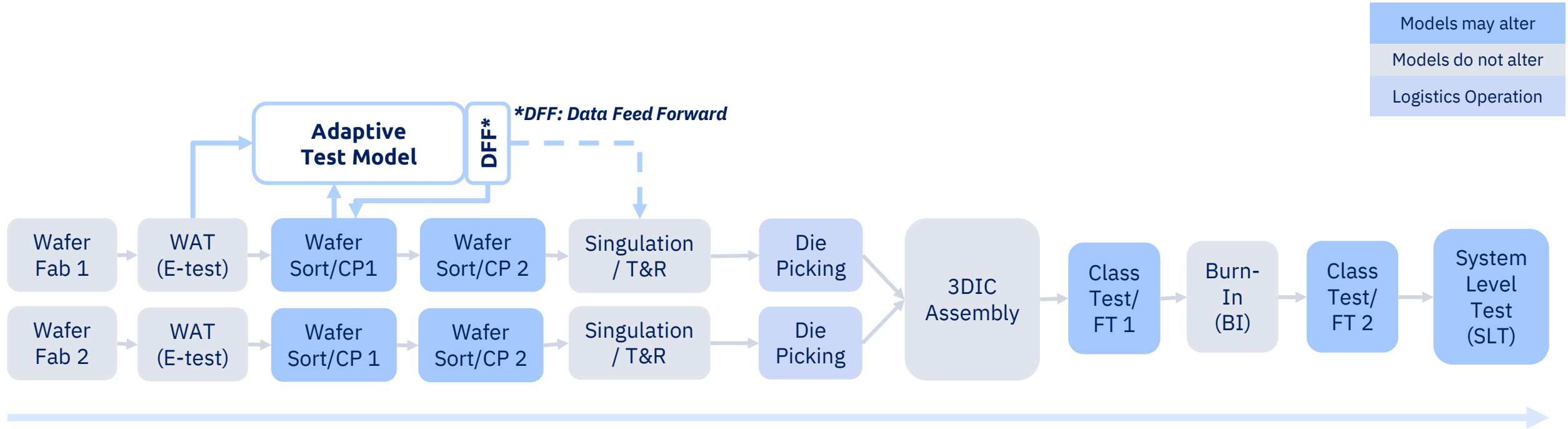
Chiplet Matching / Characterized KGD (cKGD) / System Binning



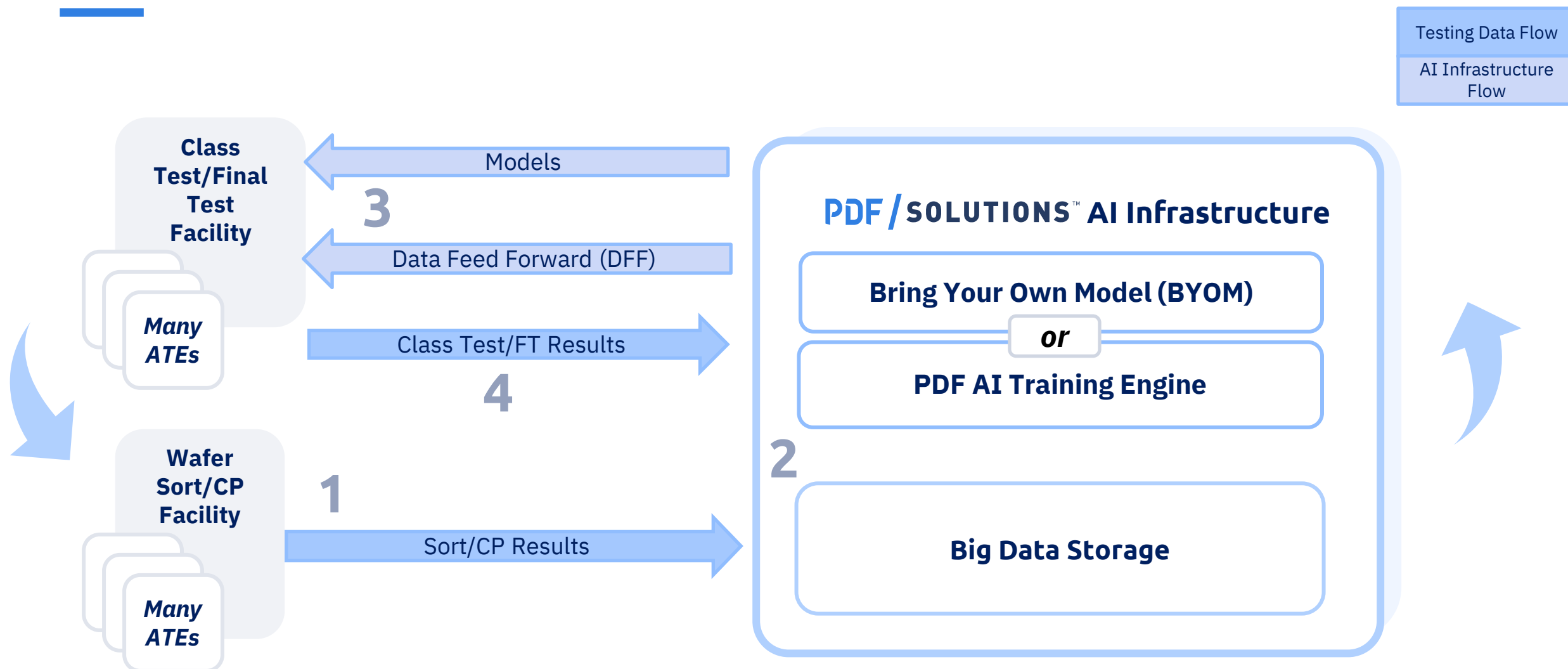
Predictive Burn-in / Binning / System-level Test



Problem: Data Overload and Infrastructure Gaps

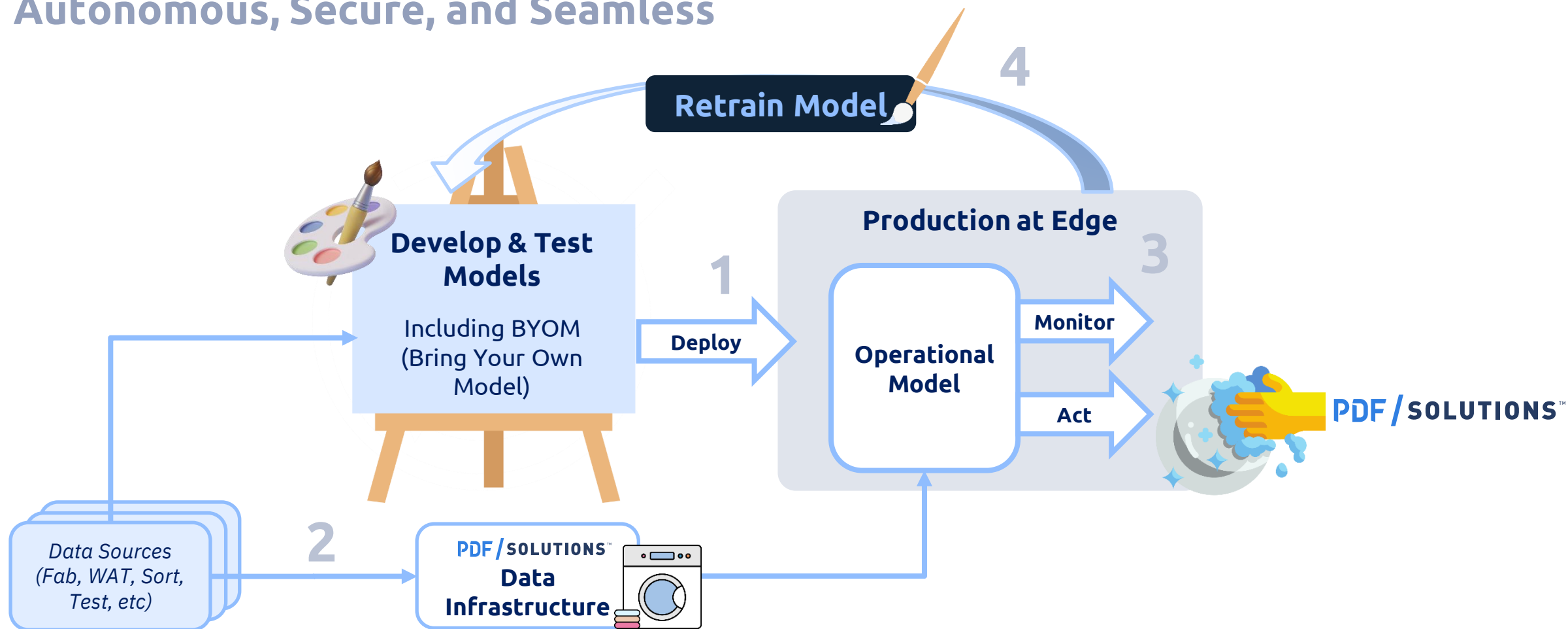


Solution: AI Model Deployment at Ramp (NPI) and at Production (HVM)



PDF / SOLUTIONS™ AI Infrastructure: Create, Manage & Control Models Across Lifecycles

Autonomous, Secure, and Seamless



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%

Remaining Challenges



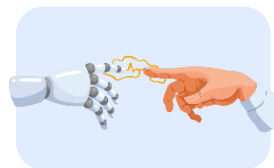
Traceability through a complex and distributed supply chain



Learning from **small amount** of data



Learning across factories and designs



Balancing **AI/ML** with **human** knowledge

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Let's cross the chasm to a
chiplet ecosystem **together**

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