

MACHINE LEARNING AND GLOBAL SUPPLY CHAINS

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TWO IDEAS

Quality Index

Every unit you ship must pass your specs, of course

But, not every unit has the same inherent quality ...

Key: Use **Machine Learning** to classify the units you build. Use those results to improve.

Connected Supply Chains

Increasing product complexity, lengthening supply chains

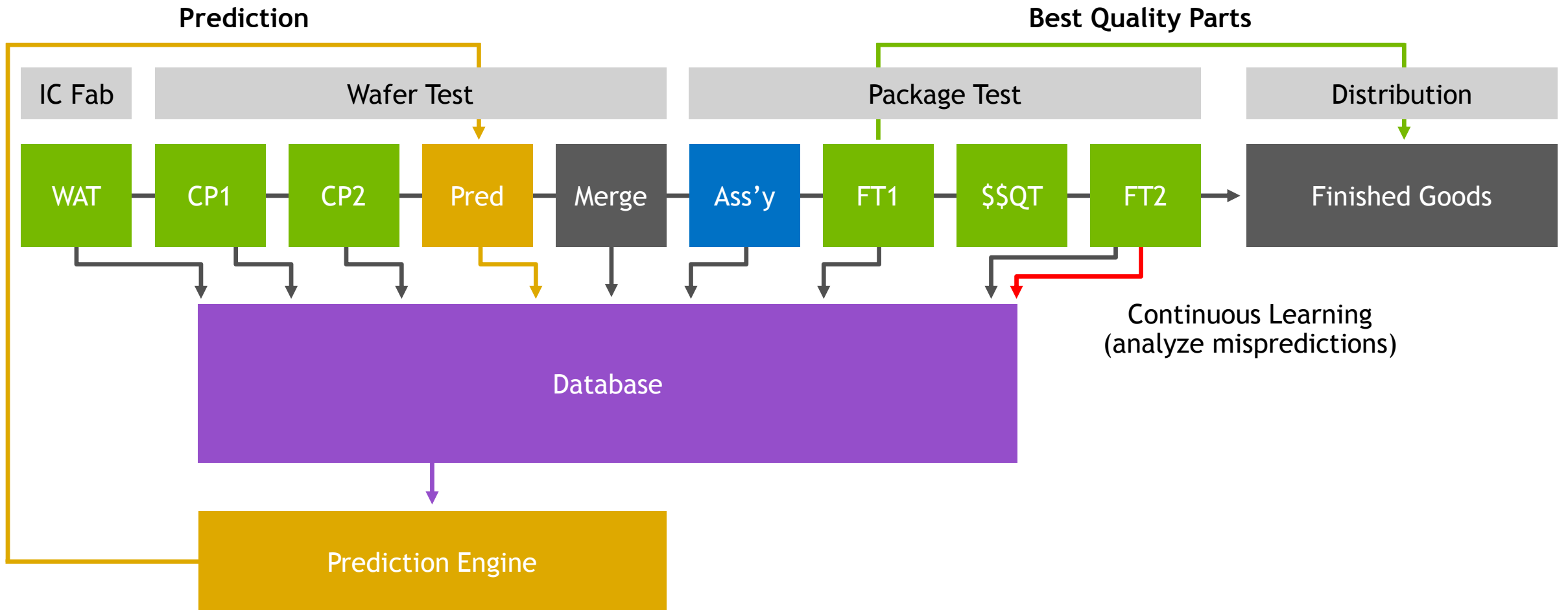
Solving problems across company lines can be difficult

Barriers: companies, systems, distance, languages

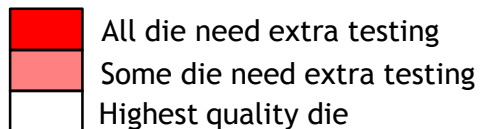
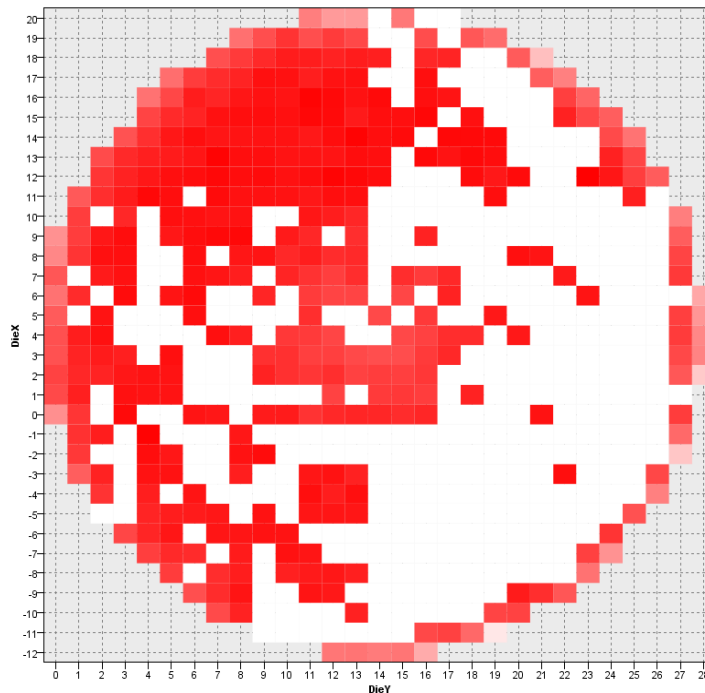
Key: enable **Chip-ID exchange** ...

PRODUCTION DATAFLOW

+ Prediction Engine



250 Wafers All die need Burn-In?



PER-CHIP PREDICTION

What's Important

> 1000 data records per die

Real Time scoring on ~50 (~5%)

Weekly check of ~500 (~50%)
for model improvement

Model stability and improvement ...

PREDICTION ACCURACY

PRODUCT DEMO

Top/bottom 'half' of quality

Training on ~50k chips

Prediction on ~100k other chips

All die get Burn-in, post-check

		Predicted	
		Pass	Fail
Actual	Pass	53716	48796
	Fail	2	31

Very first shot 50/50 grouping:

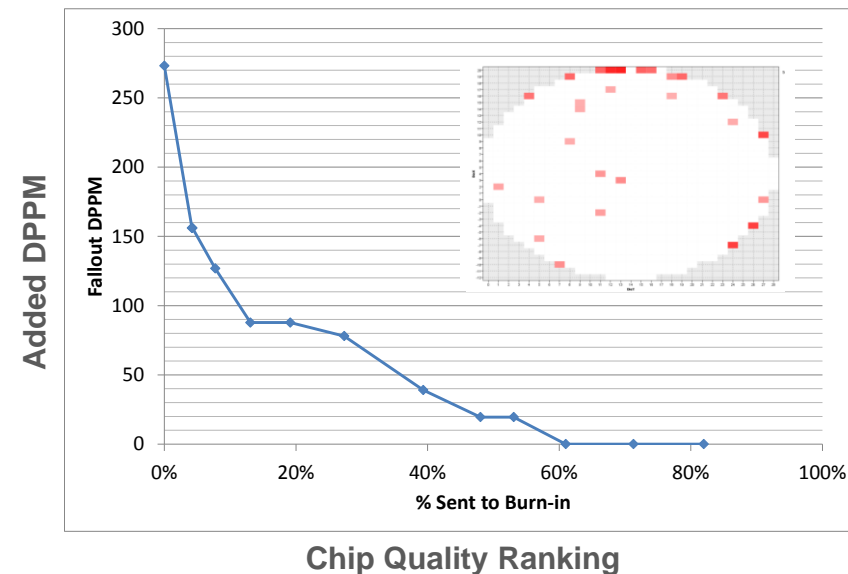
19 DPPM would have 'leaked'

Half the Burn-in hours available for extended testing on most needy die

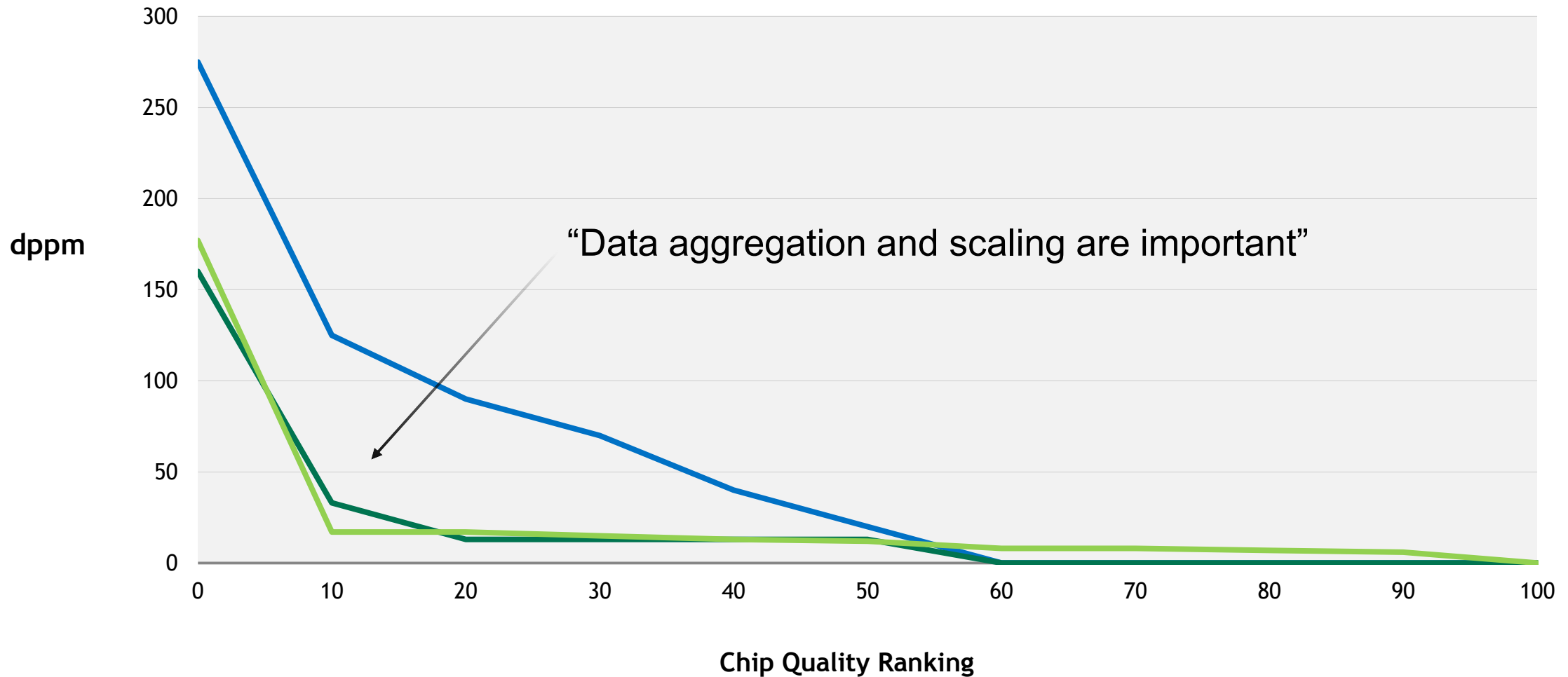
PRODUCT DEMO

Cost of Quality curve

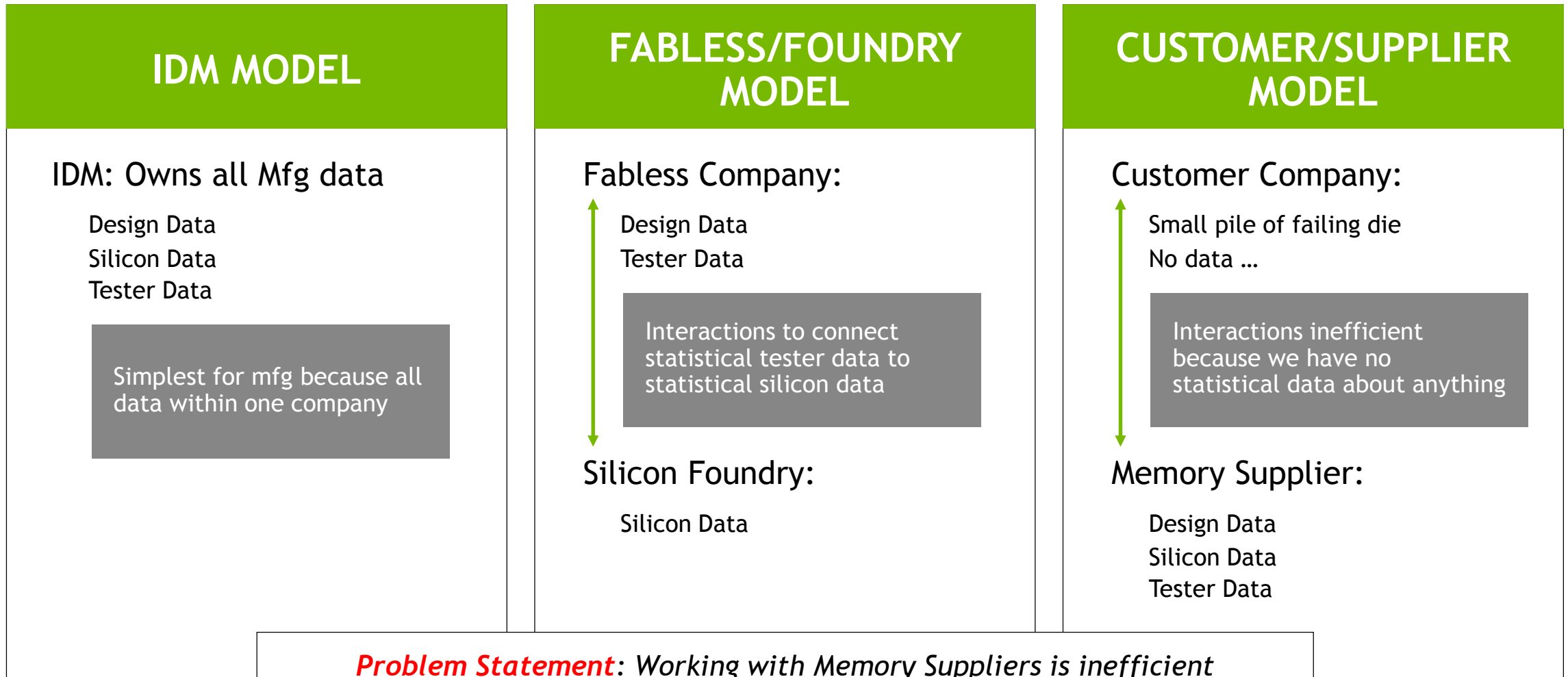
"Learning" = move it LEFT/DOWN



MODEL IMPROVEMENT OVER TIME



MANUFACTURING RELATIONSHIPS



Problem Statement: Working with Memory Suppliers is inefficient because we have so little data to show the problem exactly

EVERY CHIP HAS A NAME

Memories on a Board...

HARD WAY

- Get boards with failing components
- Remove components
- Physically return them to source fab
- Native ATE test for eCID extraction
- Do correlation analysis...
- Make slides, have meetings...

BETTER WAY

- Get boards with failing components
- Extract eCID from the board, send to source fab
- Correlation analysis...



Put component into eCID-read mode

read out scrambled eCID

unscramble

example:
0x06c2b15d0270000178cb8a

example:
FNZFBYW-09_x13_y24



VISION

