IEEE SW Test Workshop
Semiconductor Wafer Test Workshop

Roy Swart & Ethan Caughey
Intel Corp.

New Pathfinding and Supplier Investigation Strategy

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Presentation Flow

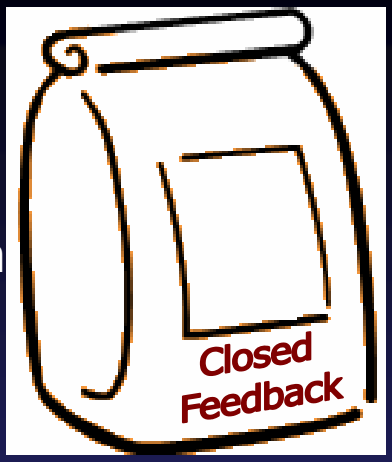
- Motivation
- Basic Methodology
- Detailed Methodology
- Comparison Past vs. Present
- Illustration of the Methodology
- Example
- Summary

Motivation

- Test costs are becoming our biggest barrier to success…
- Traditional Pathfinding wasn't yielding the necessary results
- We began the Next Generation Supplier Investigation Strategy (NGSIS) to deliver a revolutionary breakthrough

Main Ingredients

- High quality reporting on same metrics
- Apples-Apples comparison



- Supplier data collected in Intel environment
- Feedback on limitations/ improvements

- Open to new suppliers
- Open to high-risk solutions

- Intel buys iterative test vehicles
- Supplier funds fundamental research

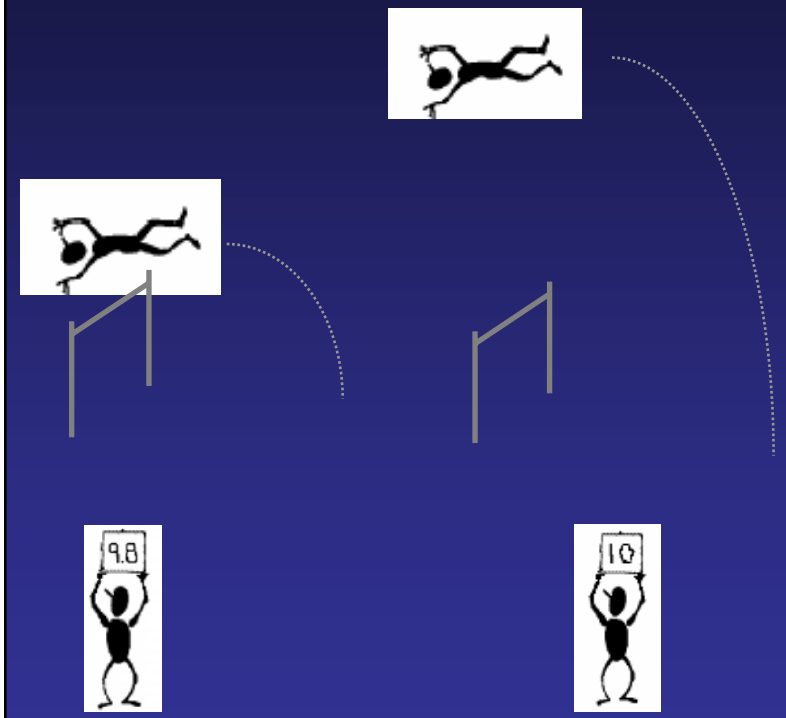
Standardized Data Collection

- **Problem Statement #1**
  - Suppliers did not follow a standard methodology of testing their probing solutions or communicating their experimental results.
  - An example:
    - Supplier A meets 0.5Ω Cres across 500k TDs
    - Supplier B meets 0.5Ω Cres across 500k TDs
  - Impossible to compare results across the dozens of potential suppliers that Intel deals with.
- **Solution: Probe Olympics!**
  - Standardized Methodology that is published to the supply base.
    - Allows new competitors quicker access to the market

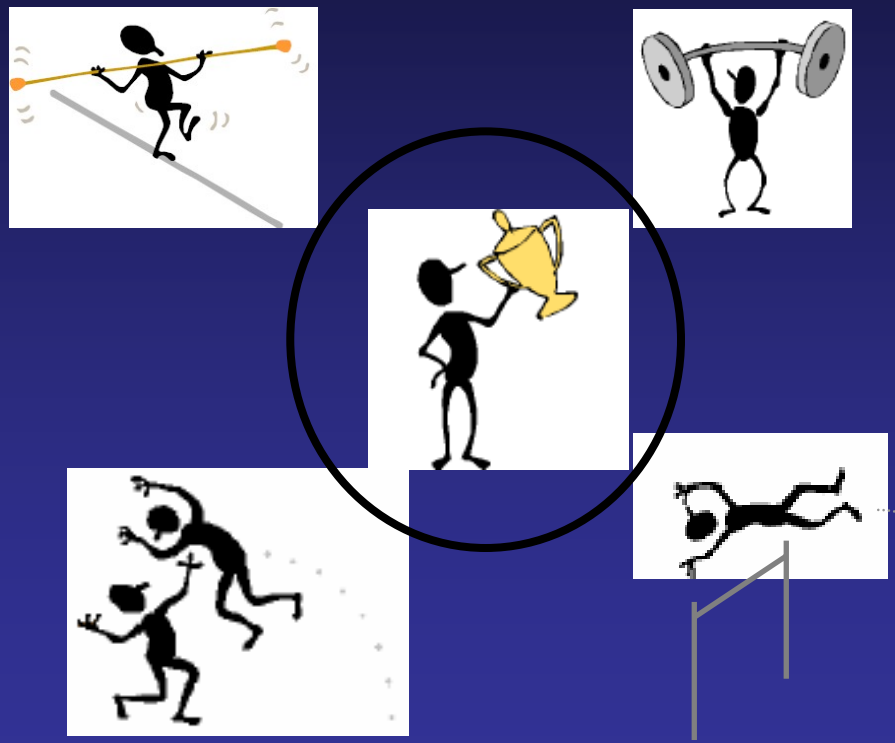
Standardized Data Collection, cont…

- **Problem Statement #2**
  - Success criteria was not clear for overall selection
    - Assumption that excelling in one area could “compensate” for deficiencies in another
    - Not all suppliers collected data on all of the requirements
  - An example:
    - Supplier A meets has 1.5A current carrying capability and 2g force
    - Supplier B meets has 0.1nH inductance and 20mΩ probe resistance
  - Impossible to judge which supplier is ahead.
- **Solution: Probe Olympics!**
  - Phase definitions that are published to the supply base.
    - Fairer comparison across the whole supply base

“Probe Olympics”



The winner must perform well in all events…



Phase I

Scope: **Individual probes or test head**

Location: **Supplier** *(No Intel resources, gross reality check)*

Technical Areas:

- Probe Force
- Probe Current-carrying capacity
- Inductance (Probe & SIU)
- Probe Resistance
- Probe Lifetime

Phase II

Scope: **Integrated test head**
Location: **Intel lab**

Technical Areas:

- Alignment & Planarity
- Gram Force
- Module Integration
- Actual overtravel vs. Programmed overtravel
- Cres
- Offline Cleaning

Phase III

Scope: **Full SIU**

Location: **Intel Mfg Floor**

Technical Areas:

- Thermal Deflection
- Standing Die
- Scrub Mark Characterization
- Optimal Recipe
- Cres Stability
- Lifetime

Closed Feedback

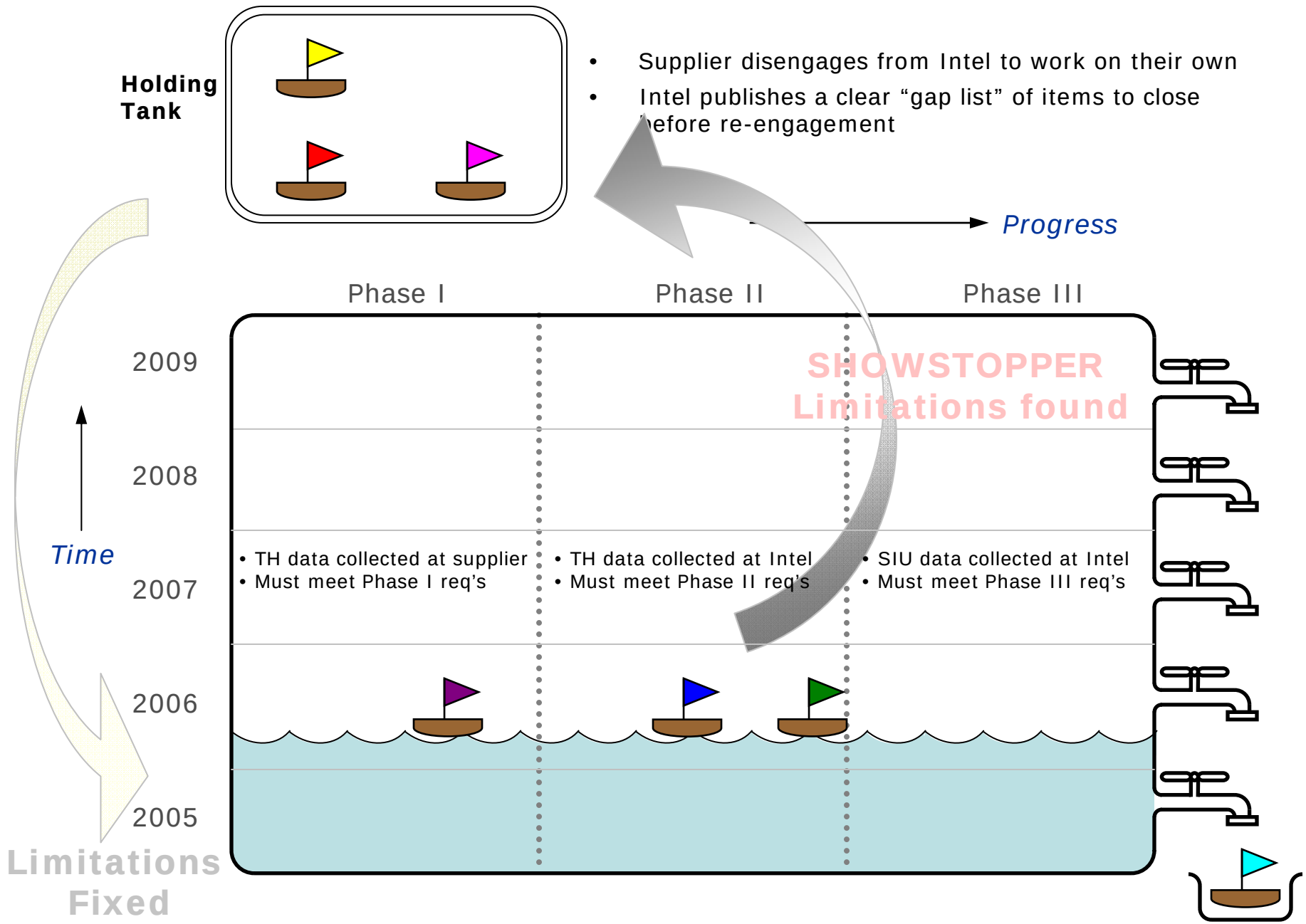
- Running experiments on supplier's test vehicles in Intel environment
- Sharing experimental results and collaborating on technology improvements

Shared Commitment

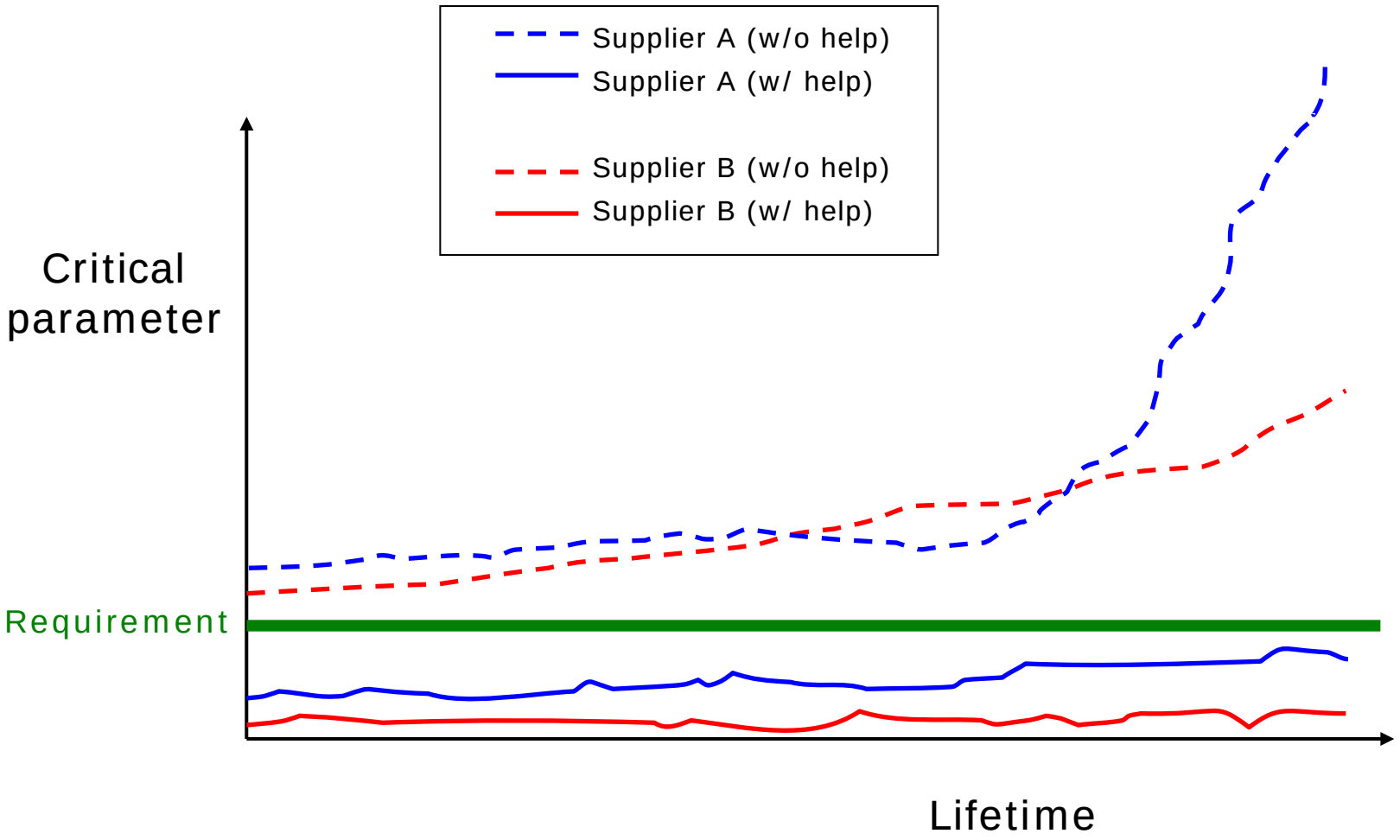
- Intel buys iterative test vehicles, not just selection SIU
- Supplier funds fundamental research, demonstrates technology envelope, validates models, etc

Distant Past vs. Present

PoR	NGSI
• Established suppliers/technologies	• New suppliers with new technologies
• Testing “off-the-shelf” solutions	• Creating technology with the supplier
• Looking within established supply base	• Looking outside probe card industry
• Evaluating only full solutions	• Enabling components (probes, ST’s...)
• Often deals with only one iteration	• Will require many iterations before clear results can be achieved
• If a supplier fails, that’s the end of engagement	• When a supplier fails, that’s the beginning of engagement
• Ordering a test vehicle and running experiments	• Evaluating initial models and designs, running single probe experiments, creating integrated probe card solutions
• Clear methodology and explicit process	• Looser characterization, discovery paths
• Results are easily interpreted	• Results often need to be “translated” to be input into a standardized analysis
• Targeting a specific process generation	• Results may apply across generations


Holding Tank
• Supplier disengages from Intel to work on their own
• Intel publishes a clear "gap list" of items to close before re-engagement
Progress
Phase I
Phase II
Phase III
2009
2008
2007
2006
2005
Time
SHOWSTOPPER
Limitations found
• TH data collected at supplier
• Must meet Phase I req's
• TH data collected at Intel
• Must meet Phase II req's
• SIU data collected at Intel
• Must meet Phase III req's
Limitations Fixed

The difference it can make…



Final Comments

1. Environment is different
   - Open to new suppliers
   - Open to high-risk solutions

2. Engagement is different
   - Standardized data collection
   - Closed Feedback
   - Shared commitment

- This is where we're going…
  - Are you coming with us?