

**PDF/SOLUTIONS™**

***2023 PDF Users Conference:  
AI for tomorrow's  
manufacturing and R&D***

**Santa Clara Marriott** - 2700 Mission College  
Boulevard Santa Clara, California 95054 USA

# **Equipment Automation & Intelligence**

**CONNECT | CONTROL | COGNITION**

**24<sup>th</sup> October 2023**

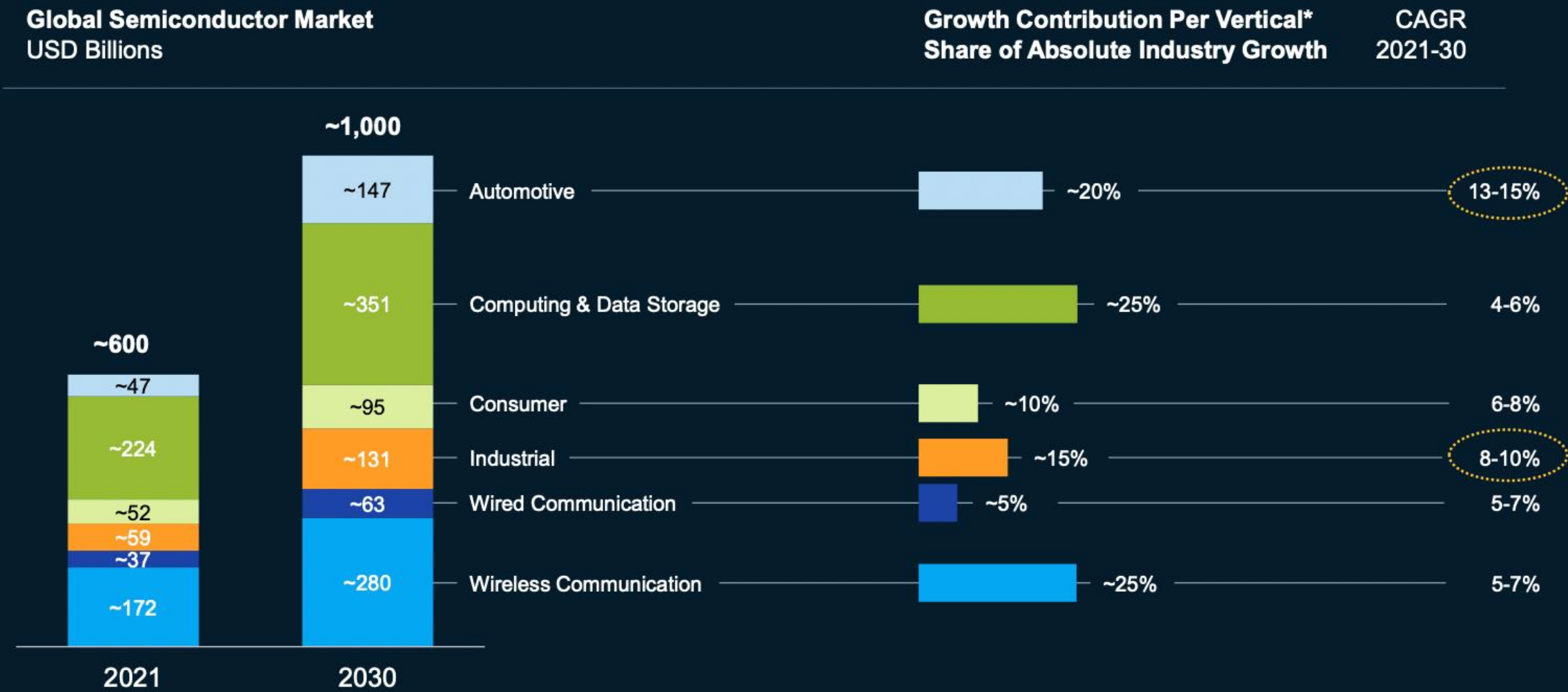
A digital globe composed of a grid of blue dots, with a complex network of glowing blue and yellow circuit lines and data points extending from its base. The background is dark blue with a subtle grid pattern.

# Industry Trends & Concepts



# ROBUST GROWTH TO \$1 TRILLION BY 2030

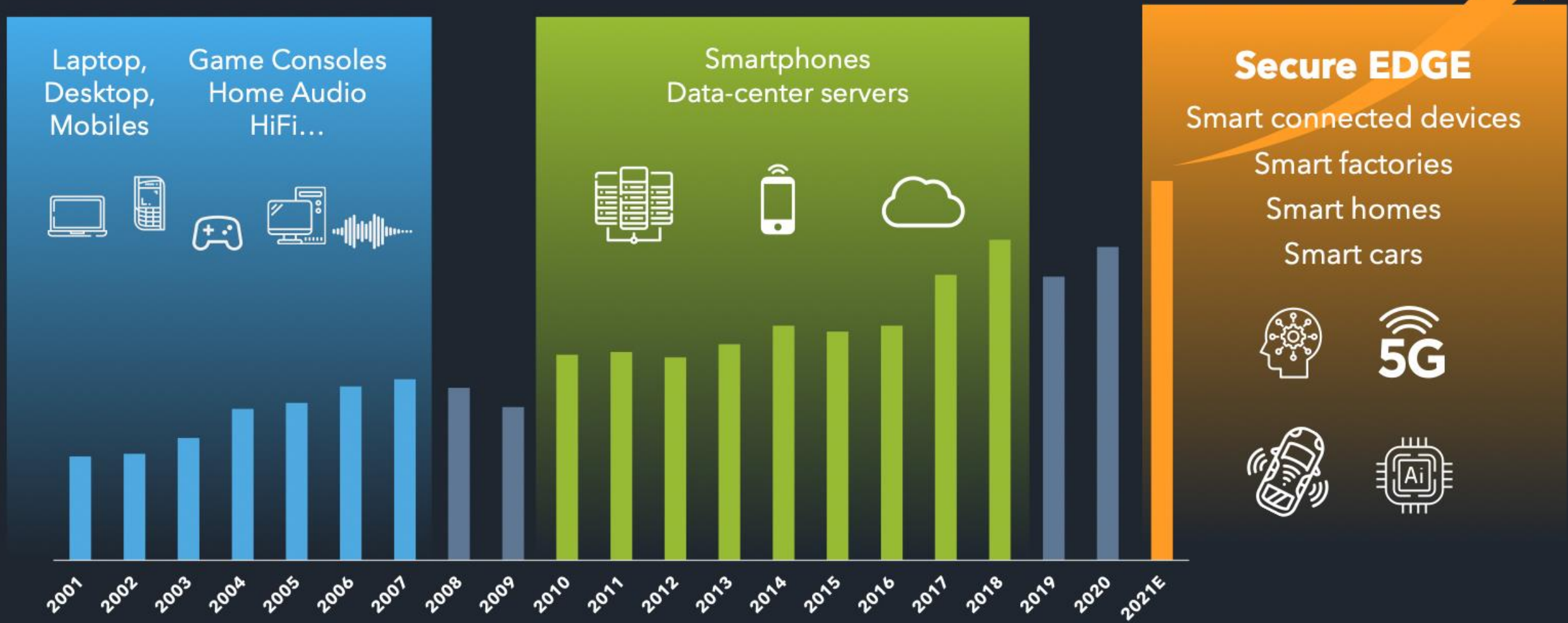
## WITH AUTOMOTIVE AND INDUSTRIAL LEADING THE WAY



Source: McKinsey 2022    \*This is the middle scenario of three.

# RISE OF THE SECURE EDGE

## MACROTRENDS DRIVING WAVES OF SEMI GROWTH



Source: IHS, October 2021

# Semiconductor Market Size

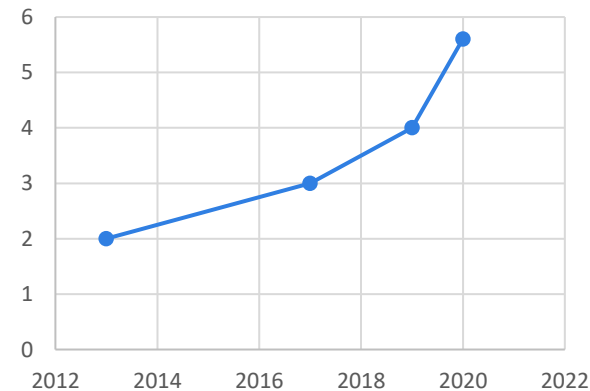
- Total Global semiconductor market - \$559.5B
- WFE Market - \$110B

Top 5 WFE Manufacturers' Systems & Service Revenues, 2021 (\$ bn)

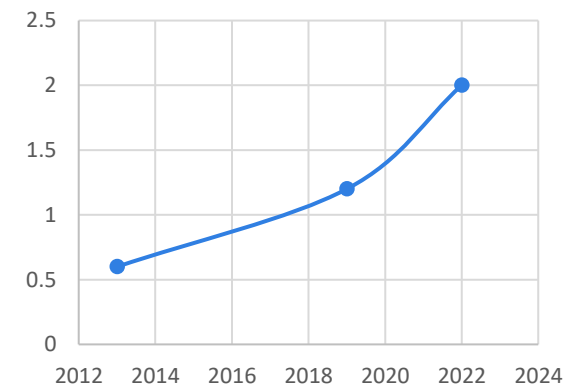


- Service Growth Exponentially Increasing
- Recurring Service Revenue from Top 5 Equipment Manufacturers - \$22.3B

AMAT \$B



KLA \$B



# Software Development Trends

## AI/ML, Cloud-based technical focus

- Microsoft strategy
  - Moved OS under cloud and AI organization
  - Multiple platform capability
- Enhanced Security
- Smart, Connected Products
- Utilizing AI/ML










# Products & Roadmap

# Cimetrix Product Portfolio

Product Family	Product/Platform		Interface(s)
<div>  <p>Equipment</p> </div>	Connectivity	CIMConnect	GEM
		CIM300	GEM 300
		CIMPortal Plus	EDA (Equipment Data Acquisition)
		EquipmentConnect	GEM, GEM300, EDA, Other
		EquipmentTest, EDATester, ECCE Plus	GEM, GEM 300, EDA
	Control	CIMControlFramework (CCF)	GEM, GEM 300, EDA
<div>  <p>CLOUD</p>  <p>ON-PREMISE</p> </div>	Platform	Sapience Smart Factory	GEM, GEM 300, EDA, MODBUS, OPC UA
	Applications	Insight, ALPS, Godel, DEEP	Sapience REST API



# Cimetrix EquipmentConnect™

- **Enable faster data collection**
  - One product with multiple, simultaneous protocols
    - GEM, GEM300, EDA, CFXM, OPC/UA、
  - Secure data channels
- **Latest development environment**
  - Supports .NET 6
  - Containers and docker
  - Windows and Linux platforms
- **Cloud-based customer portal**
- **Foundation for Next Generation Equipment Control**





# Diagnostically Enhanced Equipment Protection

*Using AI to provide early warnings about incipient issues before they become major problems*





## DΣΣP, Diagnostically Enhanced Equipment Protection

- **Provides a Higher Level of Equipment Reliability and Deeper Visibility into Equipment Performance**
  - Ability to Check Overall Equipment Health
    - Overall Equipment Health & Characterization
    - Monitor Critical Equipment Sub-Component's Health
    - Create Golden Fingerprints for Each Sub-Component
  - Predict Failures Before They Happen
    - AI/ML Monitors and Identifies When Component Health Starts to Deteriorate Over Time
    - Prevents Costly Unscheduled Tool Downtime
- **Enables a new flow of recurring revenue from services contracts**



# Value Capture During Life-Cycle Testing

**Phase 0 – Equipment Connectivity – *Sapience***

**Phase 1 – Create Golden Fingerprints During Equipment Life-Cycle Tests During Equipment Builds**

- *Store Fingerprints for Future Sales*

**Phase 2 – Sell Premium Service Contracts**

- *Empowered with AI/ML*

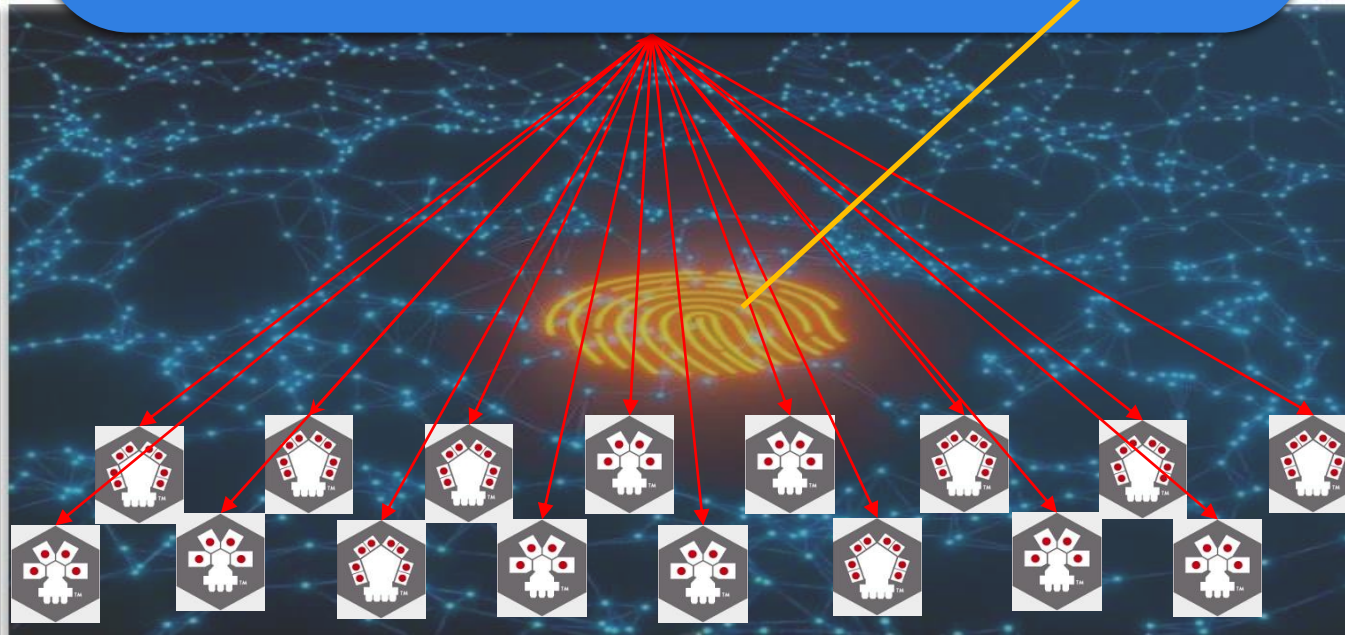
**DΣΣP**

**Golden  
Fingerprints  
Equipment  
Characterization**

› **Value Capture through life-cycle testing SW:**

- Service Contract enhancements
- Predictive Maintenance
- Minimize CoO and Unscheduled Down Times
- Process Pattern Recognition

› ***First Step to Next Generation Goal: Subscription Based Enterprise Level Enhanced AI/ML Software model***



# Equipment Manufacturer & Customer Value Add

## Equipment Manufacture Factory



- Equipment qualification and fingerprinting dashboards



- High volume data access



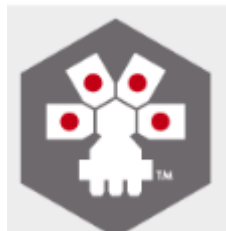
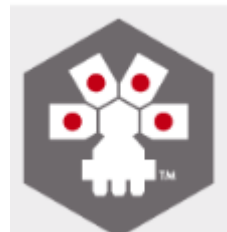
- Independent edge box not impact tool operating system and performance



- Equipment fingerprinting
- Equipment matching and qualification



- Historical storage of all equipment fingerprinting to be used/sold at anytime



## Foundry OSAT



- Equipment diagnostic and health dashboards for foundry/osat engineer



- Encrypted data
- Secured Linux operating system



- Diagnostic data for equipment support team by comparing golden fingerprint and current fingerprint of equipment



- Alarms and events published to foundry/osat engineer when equipment health issues are detected



- Fingerprinting of equipment to extend equipment PM cycles
- Equipment matching
- Move-in equipment qualification



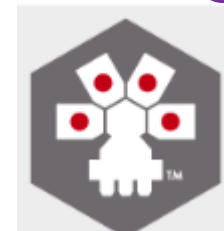
- High volume data access API for building applications on the edge
- Protection for equipment proprietary data



- Equipment and foundry proprietary data is encrypted and only accessible with proper credentials



- Independent edge box not impact tool operating system and performance



# DΣΣP, Robot ROI Use Case

## ■ Robot Use Case

### – MCBF – 11,000,000

- Assuming 24/7 1 cycle/sec implies 86,400 cycles per day
- Failure every 127 days if no PM thus schedule PM every 90 days
- 1 Day for PM on a 300wph equipment would cost 7,200 wafers at \$3,000 per wafer implies \$21.6M per PM or 4 PMs per year or total cost of \$86.4M

### – Predict Failures Before They Happen

- Golden Robot Fingerprints Would allow less frequent PMs
- If Increase to 120 days or 3 PMs per year Fab saves 1PM or \$21.6M





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