PDF / SOLUTIONS™

2024 PDF Users Conference - China

Parkyard Hotel Shanghai – 669 Bibo Road, Shanghai, China, 201203

PDF Solutions is your proven partner for a changing industry

John K. Kibarian Ph.D. - CEO

15th March 2024

PDF Solutions: the trusted partner of the Semiconductor Industry for the past 30 years

Our Customers Count on PDF for Their Critical Manufacturing Needs

Top Foundries & OSATs Run on PDF Solutions Technology

130 Fabless, IDM & System Companies using Exensio

200 of the Largest Equipment Companies connect with Cimetrix

FABS
Process Control

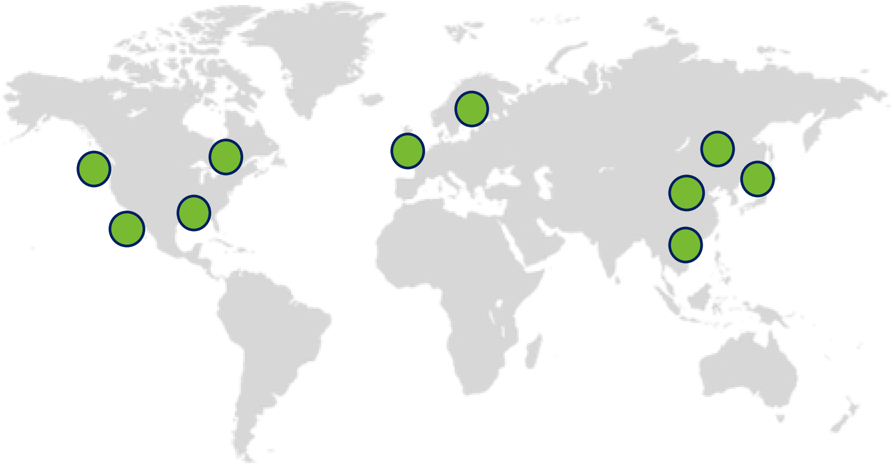
TEST
Test Operations

FABLESS
Analytics

PDF/SOLUTIONS™

With global R&D and local presence, PDF Solutions is helping semiconductor companies becoming worldwide leaders.

- Global Development capabilities, over 500 employees, 50% with advanced degrees
- Local presence in the 10 largest semiconductor markets



ST Lantiq ASE asmc HLMC USJC TOSHIBA Synaptics UMC SONY NANYA Peregrine Semiconductor
Dongbu HiTek tsmc Winbond Electronics Corp SEMTECH MICREL MICROCHIP LINEAR TECHNOLOGY SEAGATE QUALCOMM MARVELL GLOBALFOUNDRIES CONEXANT
BROADCOM SMIC TowerJazz ublox ANALOG DEVICES onsemi CIRRUS LOGIC ams Microsemi MAXLINEAR PHILIPS LUMILEDS NXP Founded by Philips
ADVANTEST aws AMPERE cisco enovix intel Silicon Image SPIL KEYSIGHT TECHNOLOGIES Powerchip
SAMSUNG ASM pSemi A Murata Company Rapidus NVIDIA KIOXIA RENESAS SiTime SKYWORKS TERADYNE VISHAY TDK
AMD MULTIBEAM Multicolumn E-Beam Innovator JABIL IBM CYPRESS EMBEDDED IN TOMORROW Fuji Electric

2019 and 2023 PDF Users Conference Attendees

PDF provides solutions for the entire semiconductor product lifecycle

Design / Development

- For Process Engineers to ramp new technology quickly
- For Design Engineers to characterize design margin

New Product Introduction

- For Product Engineers to characterize and launch products

High Volume Manufacturing

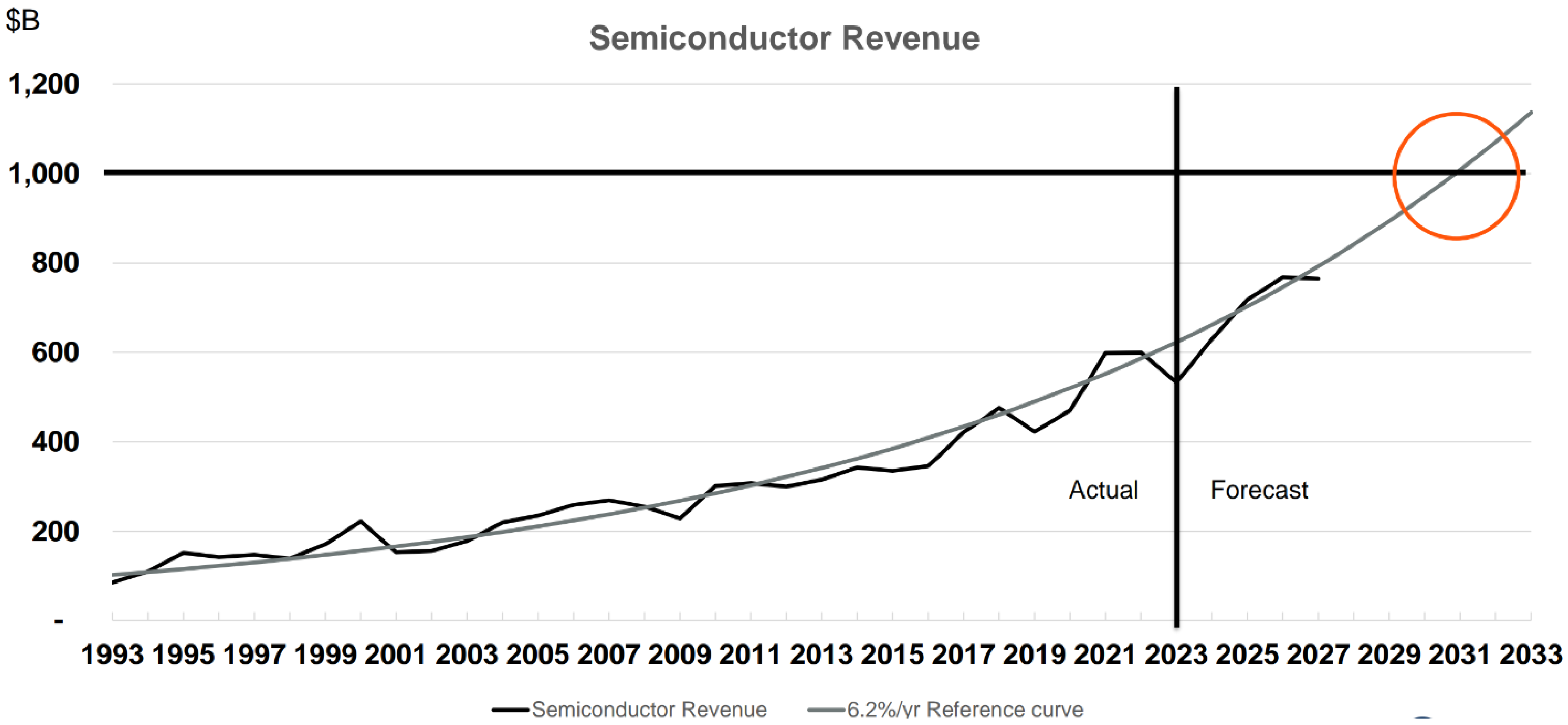
- For Product Engineers to manage yields
- For Quality/Reliability Engineers to manage dppm
- For Logistics/Operations to drive efficiency and manage supply

Defect Management & Traceability

Including unique solutions
for SiC manufacturing

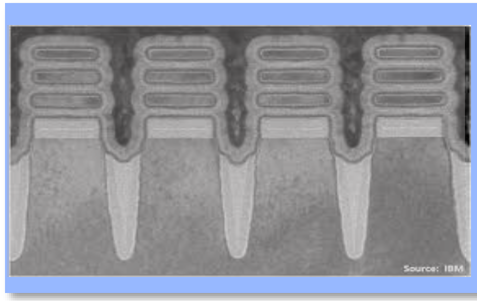
PDF/SOLUTIONS™

The global semiconductor industry is still on track to $1T around 2030



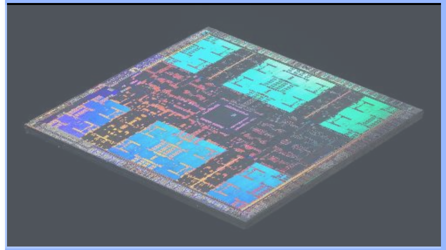
Gartner 2024

We are witnessing three important shifts in the industry



Source: IBM

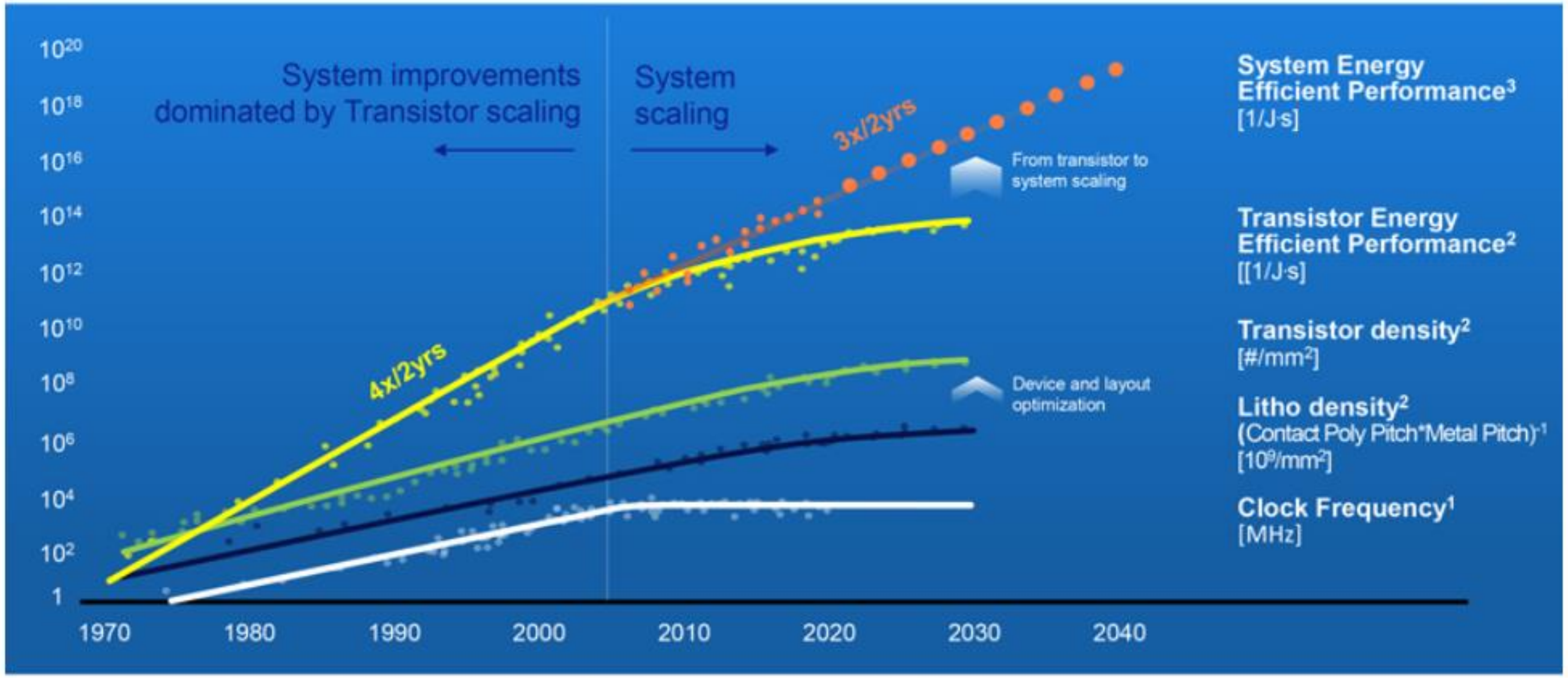
1 Devices and nodes are changing to new architecture



2 Systems in package require changing test and assembly landscape

3 Transitioning from geographically concentrated to globally distributed industry

New paths to innovation: System Scaling… 3D, not smaller… AI at every stage



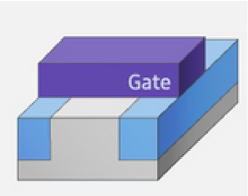
Sources: [1]Karl Rupp, [2]ASML data and projection using Rupp, [3]Mark Liu, TSMC, normalized to transistor EEP in 2005.

Public

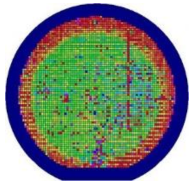
- **Material science & process architecture**
- **Chiplets and complex systems**
- **AI for development and manufacturing**

Hybrid devices with requires changing test approach

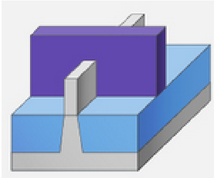
Wafer 1

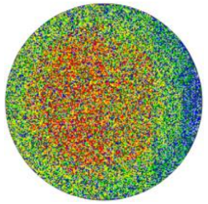


Wafer Test

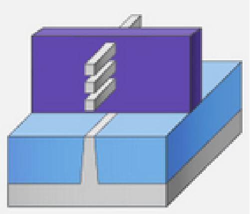


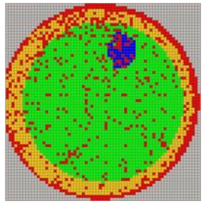
Wafer 2



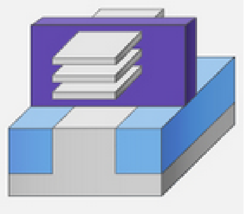


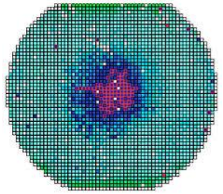
Wafer 3





Wafer 4





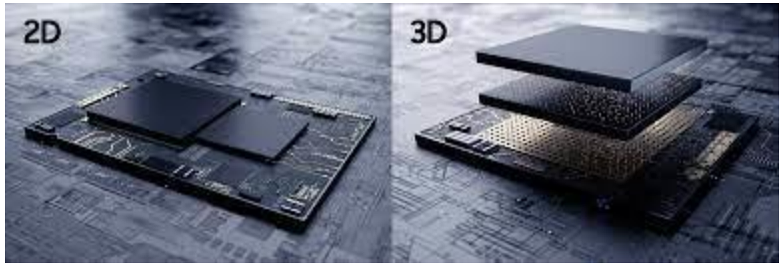
- Test Data
- Parametric data
- AI to project forward package level performance

Chip on Wafer Stacking

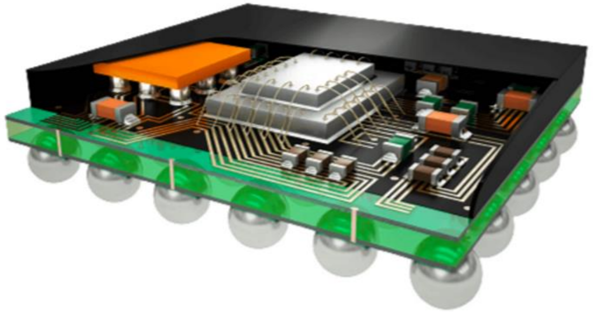
Package test

Complex System

Characterized Known Good Die

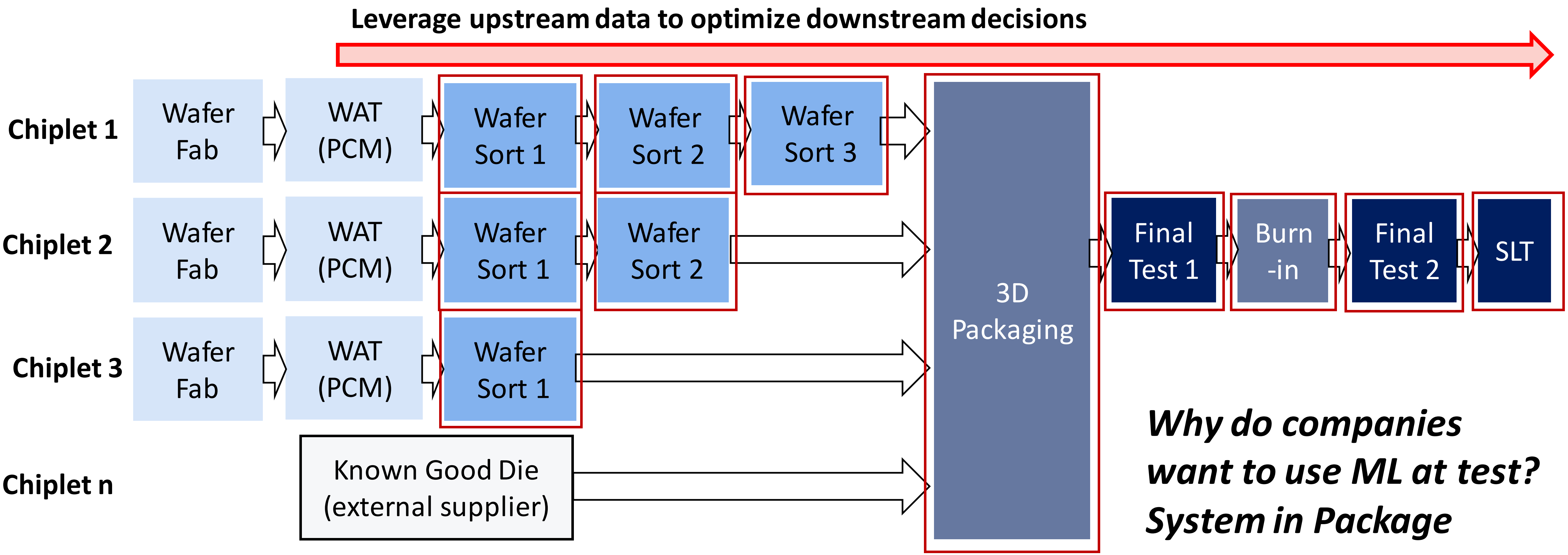


Known Good Stack



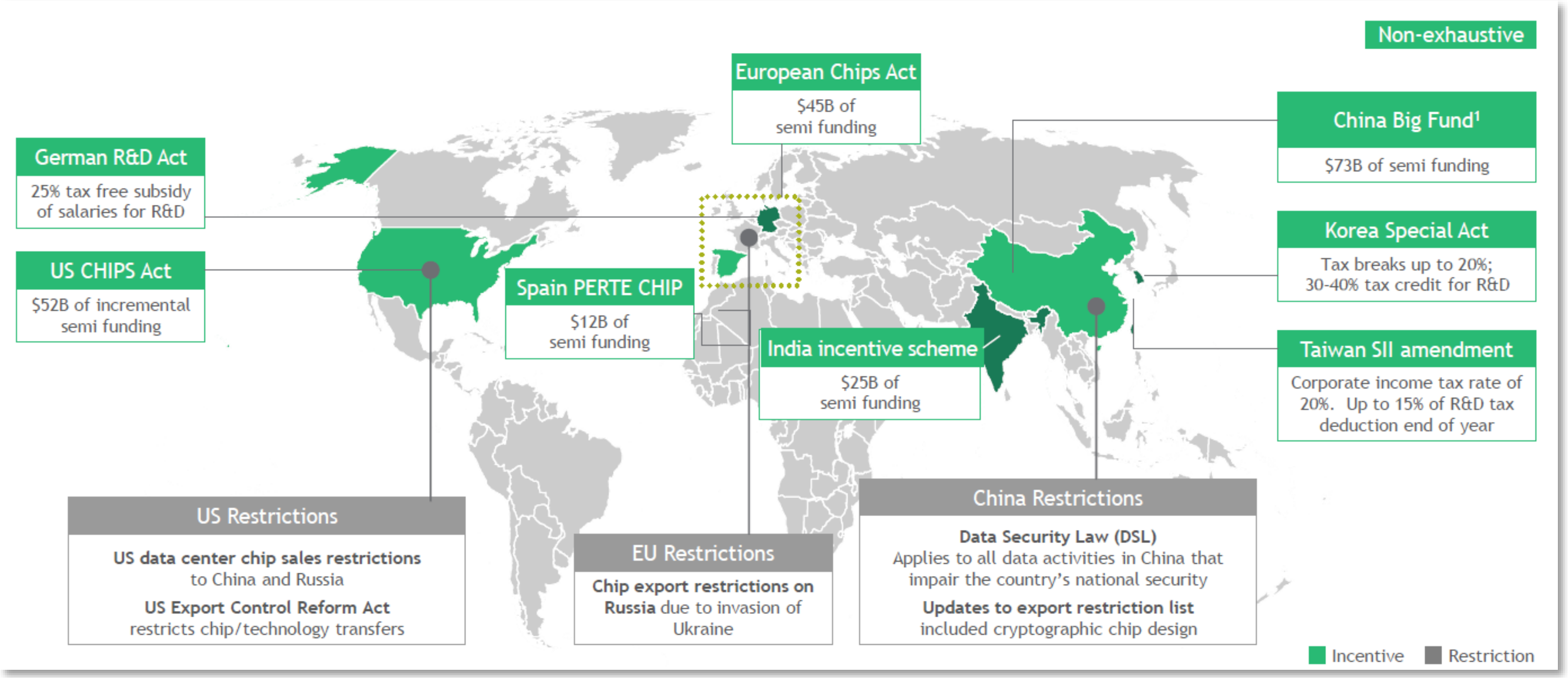
Package optimization

The system in package testing challenge



Why do companies want to use ML at test? System in Package

Global Investment leads to geographically distributed supply chains



Non-exhaustive

European Chips Act
$45B of semi funding

China Big Fund[1]
$73B of semi funding

German R&D Act
25% tax free subsidy of salaries for R&D

US CHIPS Act
$52B of incremental semi funding

Spain PERTE CHIP
$12B of semi funding

Korea Special Act
Tax breaks up to 20%; 30-40% tax credit for R&D

India incentive scheme
$25B of semi funding

Taiwan SII amendment
Corporate income tax rate of 20%. Up to 15% of R&D tax deduction end of year

US Restrictions
US data center chip sales restrictions to China and Russia
US Export Control Reform Act restricts chip/technology transfers

EU Restrictions
Chip export restrictions on Russia due to invasion of Ukraine

China Restrictions
Data Security Law (DSL)
Applies to all data activities in China that impair the country's national security
Updates to export restriction list included cryptographic chip design

🟩 Incentive ■ Restriction

- Need for global centralized view of disaggregated physical assets
- Right data, at the right place, at the right time for the right action
- Data protection and IP protection challenges
- Geo data sovereignty regulations

To manage through these industry shifts, semiconductor companies need an end-to-end analytics platform

Unique data for **enhanced insights**

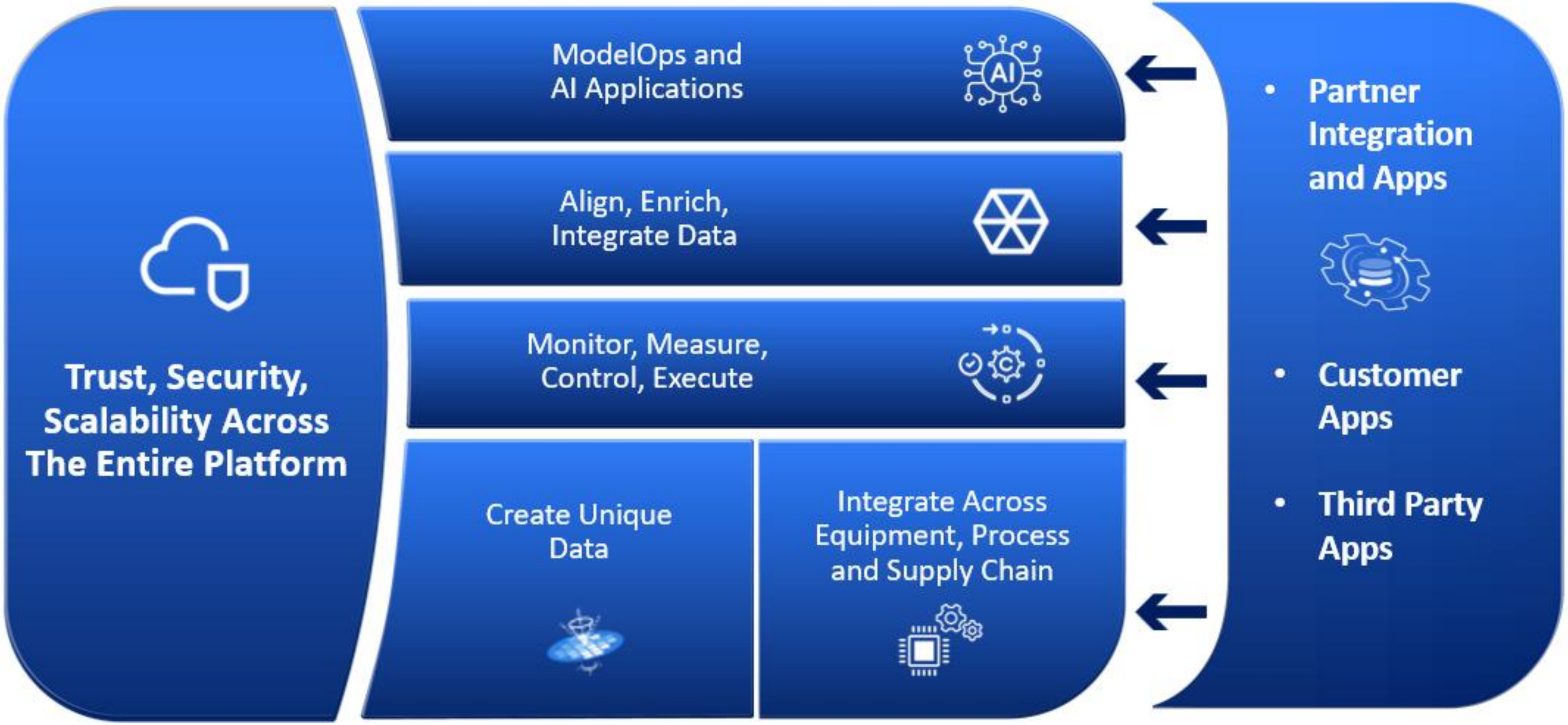
Semiconductor specific data & AI **models** for **effective actions**

Integration with Enterprise **Applications**

Global, Scalable, Secure Platform for **cloud** and **on-premise** deployments

PDF Solutions End to End Platform for Semiconductor Analytics

Fully integrated solution to accelerate production ramp, improve overall yield and quality



Trust, Security, Scalability Across The Entire Platform

ModelOps and AI Applications

Align, Enrich, Integrate Data

Monitor, Measure, Control, Execute

Create Unique Data

Integrate Across Equipment, Process and Supply Chain

- Partner Integration and Apps
- Customer Apps
- Third Party Apps

An open platform based on industry standards and integrated with leading solutions providers

SIEMENS

Integrated circuit (IC) test and yield analysis

IBM

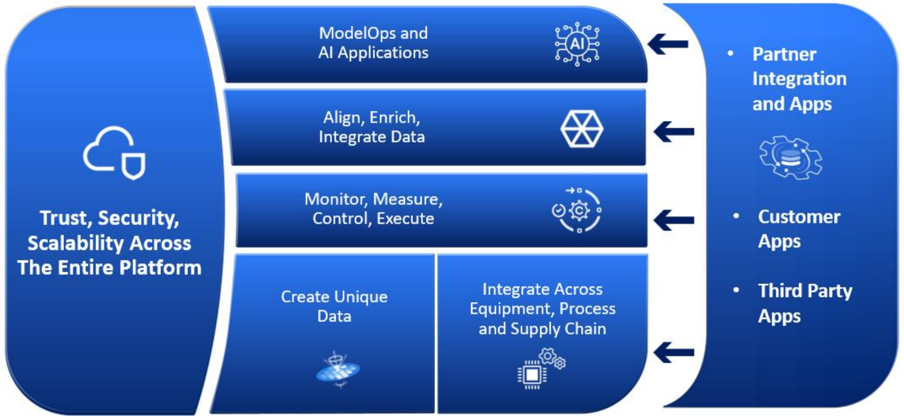
MES Solutions for fabs and assembly

Kulicke & Soffa

Assembly operations

voltaiq Battery Intelligence

Enterprise Battery Intelligence



Trust, Security, Scalability Across The Entire Platform

ModelOps and AI Applications

Align, Enrich, Integrate Data

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Integrate Across Equipment, Process and Supply Chain

- Partner Integration and Apps
- Customer Apps
- Third Party Apps

SAP

Business & supply chain data and process integration with E2E automation for quality & cost

proteanTecs

Deep data analytics

TERADYNE

Edge AI for test, test operations

aws **Microsoft Azure**

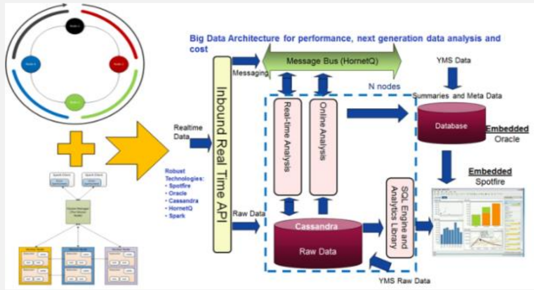
Global cloud infrastructure

ADVANTEST

Edge AI for test, test operations

Exensio Smart Manufacturing Platform – The Organizing Principles

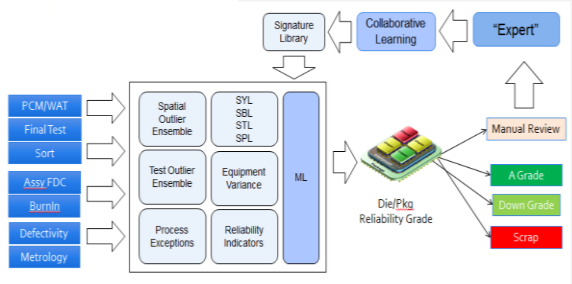
End-to-End Big Data



Fully scalable, big data
System: Design --> System

PDF Domain Knowledge

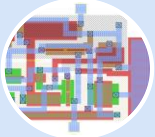
AI Big Data Engine

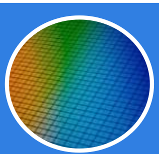


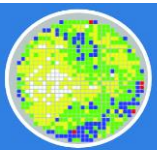
Automated Machine
Learning Solutions

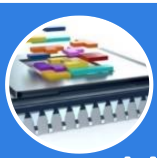
End-to-End Analytics

Unique data types & interactive
analytics for IC manufacturing


IC Design


Fab


Sort


Assembly


Final Test


System


Enterprise

PDF/SOLUTIONS™

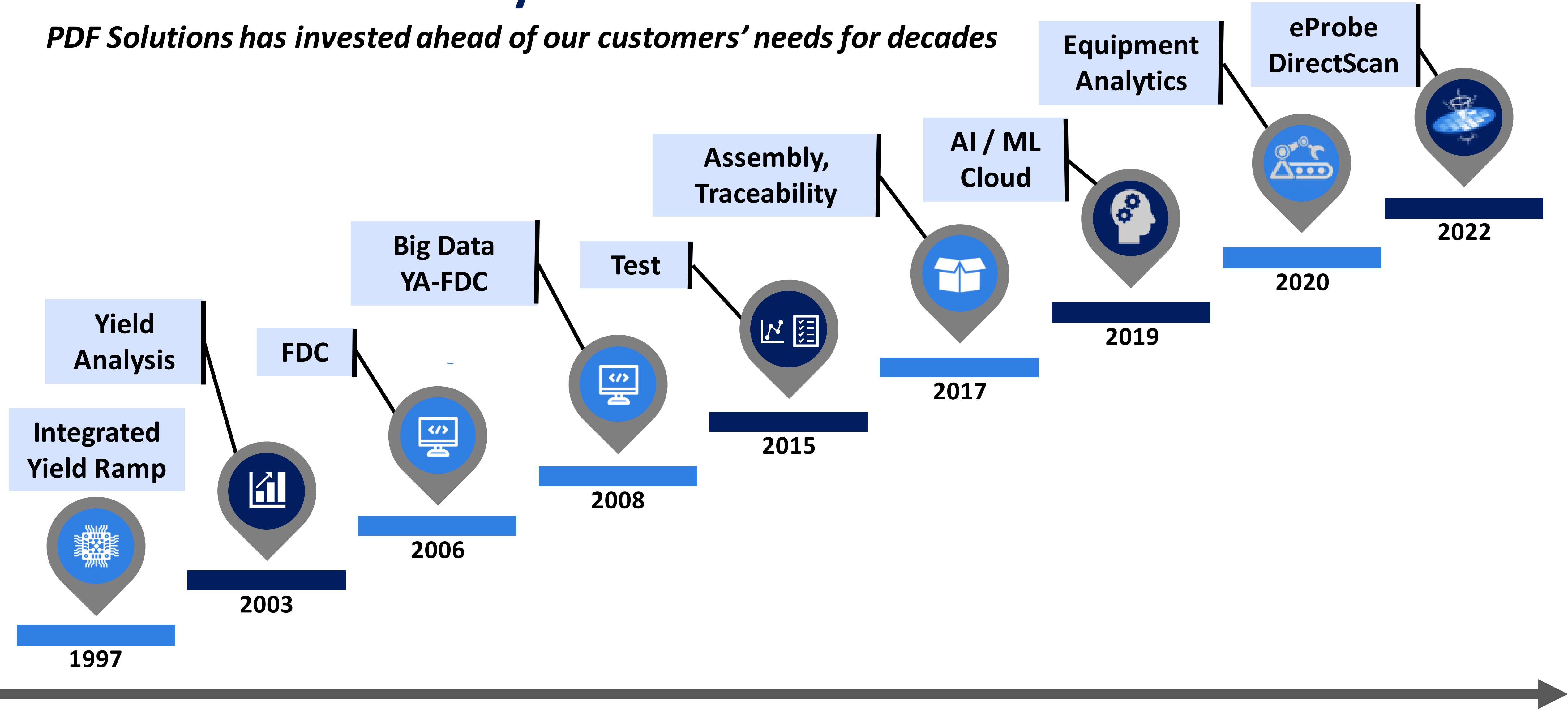
PDF Leads Standards for Analytics & Equipment Data Collection

- **SEMI** NA Regional Standards Committee Assistant Co-Chair
- **SEMI** NA Information & Control Committee Co-Chair
- **SEMI** NA GEM 300 Task Force Leader
- **SEMI** NA DDA Task Force Leader
- **SEMI** NA Advanced Backend Factory Integration (ABFI) Task Force Leader
- **SEMI** NA GUI Task Force Leader
- **SEMI** NA Fab & Equipment Computer and Device Security (CDS) Task Force Leader
- **SEMI** Japan F-GEM Task Force Leader

- **NEMI** Board of Directors
- Task Group Leader of **IPC** Connected Factor Initiative Subcommittee
- Co-Chair of the Smart Manufacturing Technical Working Group of **iNEMI**
- **SEMI** NA Traceability Committee Co-Chair
- **SEMI** NA Advanced Backend Factory Integration (ABFI) Task Force Leader
- **SEMI** NA Single Device Tracking (SDT) TF Leader
- **GSA TIES** SWG-07 Liaison Team Leader
- **GSA TIES** SWG-07 M345 Working Group Co-Leader

The result of over 20 years of Innovation

PDF Solutions has invested ahead of our customers' needs for decades



Integrated Yield Ramp 1997

Yield Analysis 2003

FDC 2006

Big Data YA-FDC 2008

Test 2015

Assembly, Traceability 2017

AI / ML Cloud 2019

Equipment Analytics 2020

eProbe DirectScan 2022

Enhancing Yield Ramp

Semi Supply Chain Analytics

PDF Solutions has been serving the semiconductor industry in China since 2006

We are committed to continue serving this market and help Chinese semiconductor companies becoming global industry leaders

GigaDevice 兆易创新
格科 GALAXYCORE
awinic
地平线 Horizon Robotics
澜起 MONTAGE TECHNOLOGY
Rockchip 瑞芯微电子
Cambricon 寒武纪科技
siengine 芯擎科技
SiliconMotion
JLQ TECHNOLOGY
VeriSilicon
SmartSense®
ChipON 芯旺微电子
H3C
CHIPONE 集创北方
ZHINENG 致能
AutoChips 杰发科技
MaXio
西安紫光国芯半导体有限公司 UniIC Xi'an UniIC Semiconductors Co., Ltd.
Cosemi tech
ZHXON
壁仞科技 BIREN TECHNOLOGY
北京中电华大电子设计有限责任公司 CEC Huada Electronic Design Co.,Ltd
Sanan IC 三安集成
SJsemi
NVIDIA
HISILICON
SAMSUNG
Graphcore
AMD
NXP
ANALOG DEVICES
intel
Powerchip
STMicroelectronics
SPIL
HLMC
GLOBALFOUNDRIES
SEMTECH
Dongbu HiTek Semiconductor Business
CIRRUS LOGIC
SMIC
HHgrace 華虹宏力
TEXAS INSTRUMENTS
BROADCOM
UNIC²
Innoscience 英诺赛科
Nexchip
FAIRCHILD
YMTC Yangtze Memory Technologies
MICROCHIP
MAXLINEAR
Silicon Image
TowerJazz The Global Specialty Foundry Leader
大唐恩智浦半导体有限公司
tsmc
IDT
TOSHIBA
ams
SKYWORKS
MARVELL
SONY
Synaptics
UMC
Qualcomm
ublox
Microsemi
ON ON Semiconductor
KEYSIGHT TECHNOLOGIES
SEAGATE
Lantiq
Silicon Labs
LUMILEDS
NANYA

Thank You

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