PDF SOLUTIONS®

Connected
Equipment Summit

The Intelligent Equipment Era

Secure, Connected, Autonomous

Patrick Pannese, ***VP, PDF Solutions***

October 9, 2025

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Agenda

1. Industry today
2. Future of the PDF Solutions Equipment Products
3. Case Studies
4. Future Outlook

#1.

Industry Today

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Industry Trends

- Multi-platform
- AI/ML
- Digital Twins
- Debugging
- Testing
- Remote connectivity
- Cybersecurity

Industry at a Crossroads

1. AI; EVs; High-Performance Computing (HPC); Data Centers **driving demand**

2. **Complexity exploding** across fabs, OEMs, OSATs

3. Equipment remains **siloed**, **underutilized**, and **vulnerable**

Opportunity: redefine factories as ecosystems of intelligent equipment

#2.

Future of the PDF Solutions Equipment Products

secureWISE™

- 99% 300mm Fabs
- 100+ OEMs Connected
- Centralized Access
- High Tool Uptime
- Double Encryption
- IP Protection
- Remote Collaboration
- Secure Monitoring
- Full Audit Trail
- Lower Service Costs

OSAT/ PACKAGING

FAB ADMIN/ BACK OFFICE

EQUIPMENT SUPPLIERS

FAB

exensio™

sapience™
Manufacturing Hub

#3.

Case Studies

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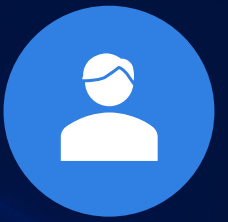
Case Study: OEM

Global OEM — WHO



- Centralized Monitoring
- Automated Mediation
- Remote troubleshooting

WHAT

- **Less Downtime**
- **Lower Cost**
- **Travel minimized**
- **Faster Issue Resolution**

RESULT

Case Study: FAB

U.S. fab: 550+ tools across 6 sites — WHO

Real-time monitoring & compliance

Engineers collaborate across 3 time zones — WHAT

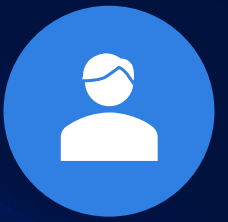
Reduced Travel

Scalable Training — RESULT

Case Study: Unified Adoption

Major IDM standardizing on secureWISE

WHO



21,000 tools connected in 3 years

900+ frameworks deployed

WHAT

Zero trust → no inbound VPNs, full audit

RESULT

#4.

Future Outlook

Industry Evolution

Automation

- PLCs
- Robotics
- IT

Smart Factories

- IoT
- Cloud
- Analytics

Intelligent Equipment

- Secure
- Connected
- Autonomous

Autonomous Fab Vision

Secure remote operations standard

AI-driven predictive maintenance

Self-healing equipment

Immersive **VR/AR** collaboration

Unified backbone across fabs, OEMs, OSATs

PDF / SOLUTIONS

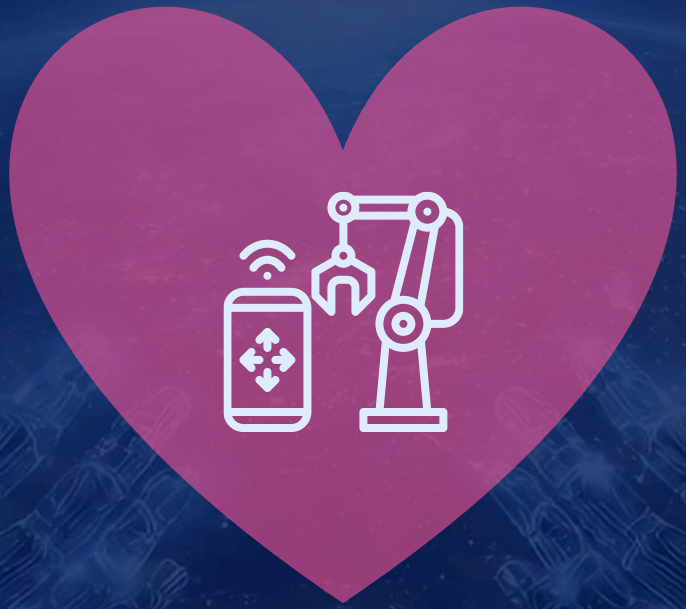
PDF / SOLUTIONS™

the leading commercial data, analytics, and mission critical platform spanning the semiconductor and electronics industry

- **Neutral, trusted backbone**
- **Connecting fabs, OEMs, OSATs, fabless**
- **Delivering connectivity, automation, intelligence**
- **Equipment = hub of The Intelligent Equipment Era**

The Future Factory

Secure. Connected. Intelligent.



PDF/SOLUTIONS® will lead the way. Join Us.

Over 200 PDF Equipment Customers

Includes:

55K+ Equipment Installs & 150K Factory Connections!

Broad Market Adoption

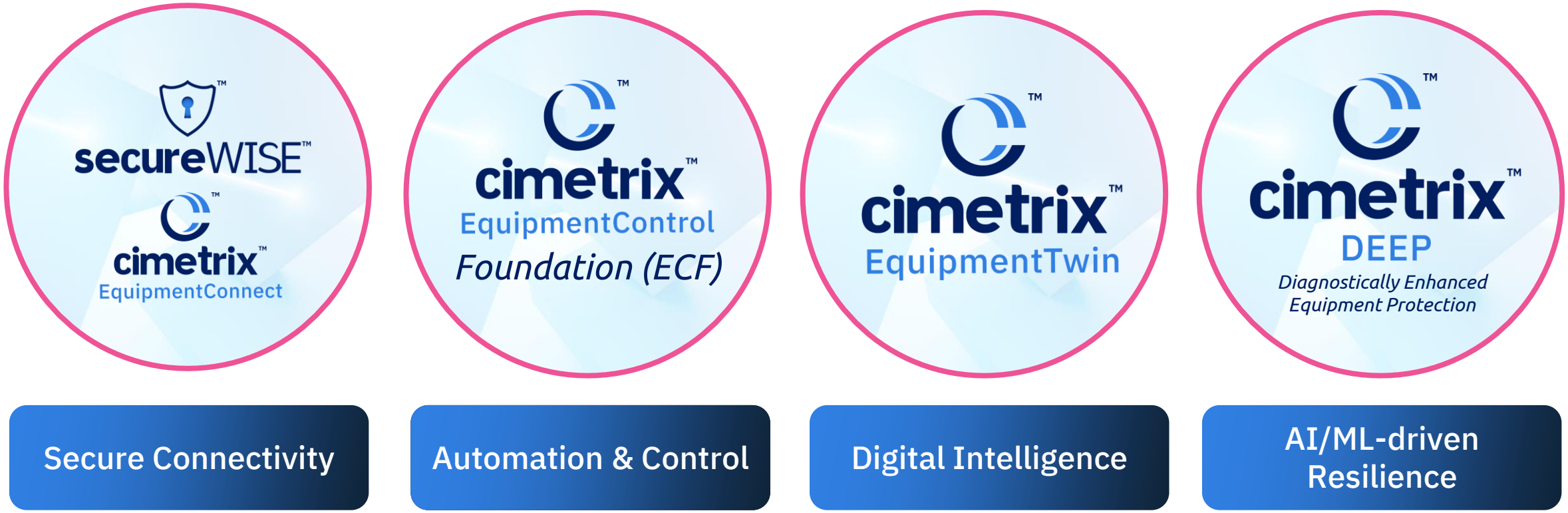
Last year PDF equipment software was installed on **over 7,600 systems**

This year over 8,000 semiconductor **systems** will ship with PDF equipment software including…

- Metrology
- ALD/EPI/Etch
- Pick & Place
- Cleaning/Strip
- Backend Test
- MOCVD & PVD
- Inspection
- Bonding
- Photovoltaic
- Electrochemical Deposition
- Ion Implant
- Lithography

***The largest OEM in this industry shipped their software on approximately 6k pieces of equipment**

The Equipment Software Stack for the Intelligent Software



Cutting-Edge Solutions for Semiconductor Innovation

cimetrix™ EquipmentControl
cimetrix™ CIMControlFramework

- Equipment control software toolkit
- Streamlines equipment integration and automation

cimetrix™ DEEP

- Diagnostically Enhanced Equipment Protection
- Enhances equipment reliability and reduces downtime

cimetrix™ EquipmentTwin

- Real-time digital replica for predictive maintenance and optimization
- Improves operational efficiency through data-driven insights

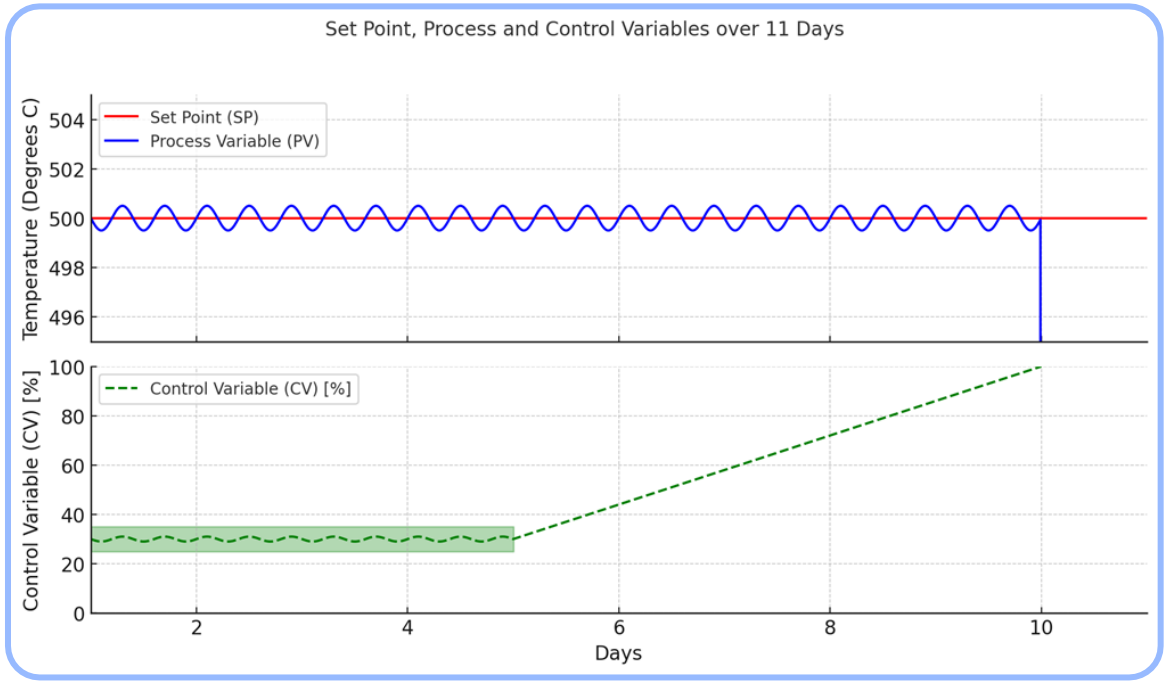
Simplified DEEP Heater Example

Setpoint (SP) and Process Variable (PV)

- Routinely accessible for operational reference.
- Continuously surveilled to detect operational discrepancies

Control Variable (CV)

- Traditionally not recorded or observed.
- Reflects the output of control algorithms, crucial for aligning the PV with the SP



Innovative Strategy by DEEP

- Implements AI/ML to consistently monitor CV patterns.
- Integrates analysis of the setpoint and process variable for comprehensive oversight.
- Proactively identifies potential heater issues up to five days in advance, enhancing predictive maintenance.

CCF/ECF with EquipmentTwin & DEEP!

Robot Use Case

cimetrix™ DEEP

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

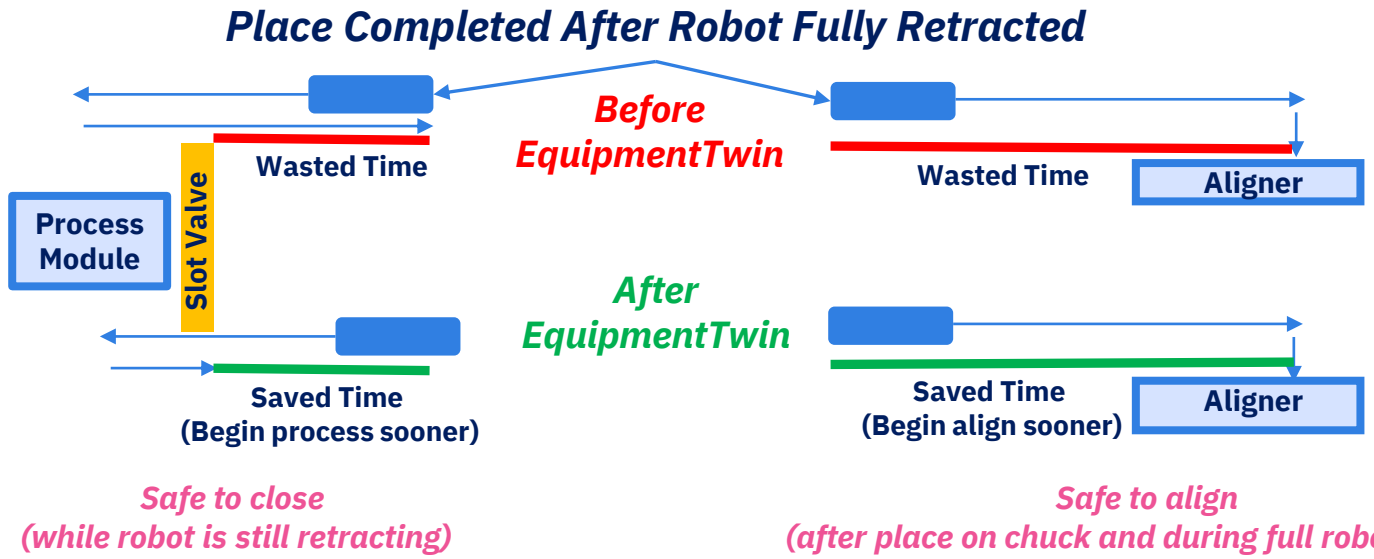
Predict Failures Before They Happen

Golden Robot Fingerprints Would allow less frequent PMs

If Increase to 120 days or 3 PMs per year Fab saves 1PM or $21.6M

Throughput Improvement (Patent Pending)

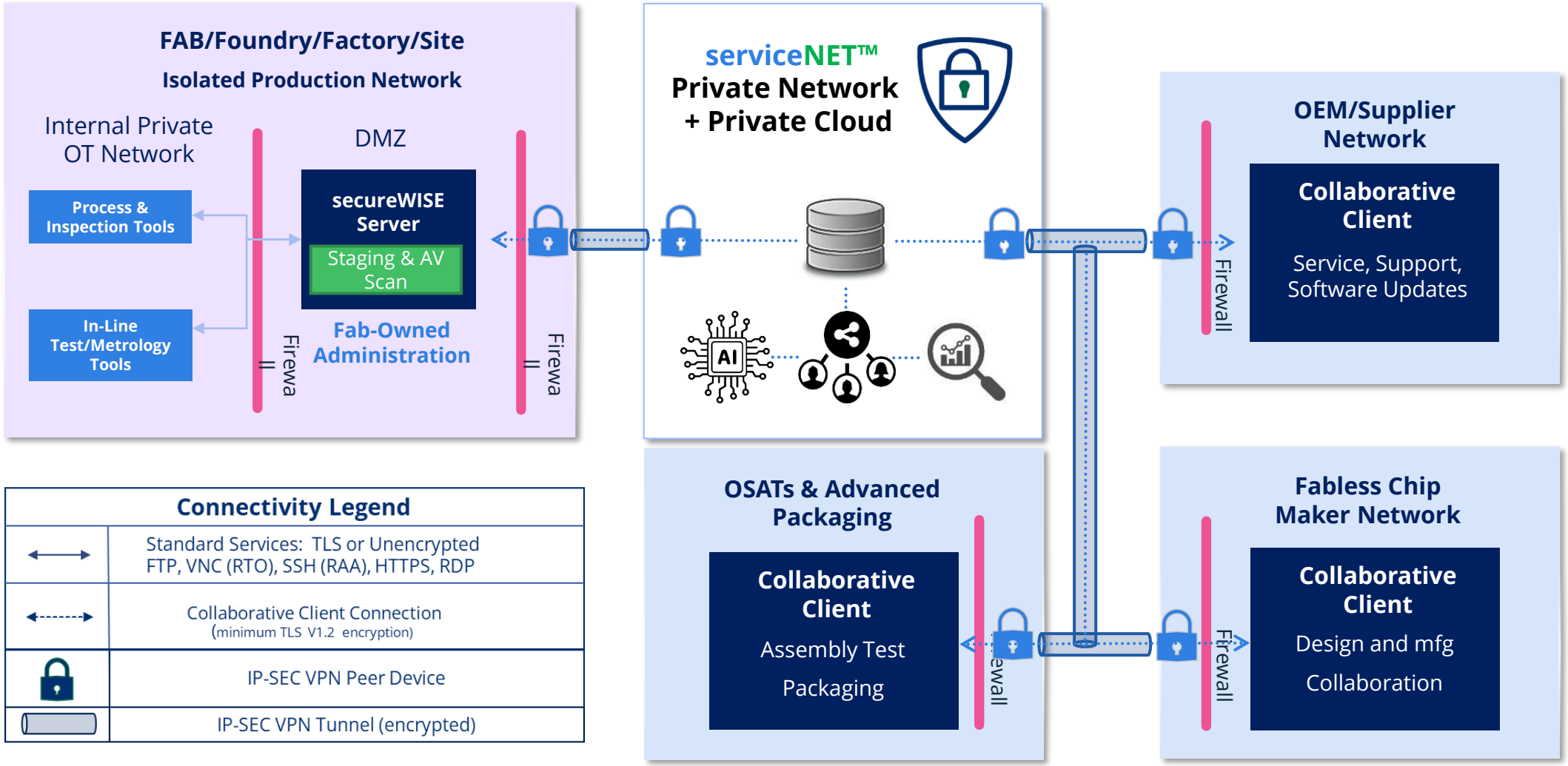
Scenario	Time per Wafer (Seconds)	Throughput (Wafers/Hour)	% Improvement
Original Process	12	300	NA
First Optimization	11	327	9%
Second Optimization	10	360	20%
Significant ET Improvement	8	450	50%



EquipmentTwin's slot valve and aligner optimizations

- Even 2 seconds per move improvement results in significant throughput improvement (20%)
- increased production capacity
- reduced cost of ownership

Secure Private Cloud – Empowered with DEEP & EquipmentTwin



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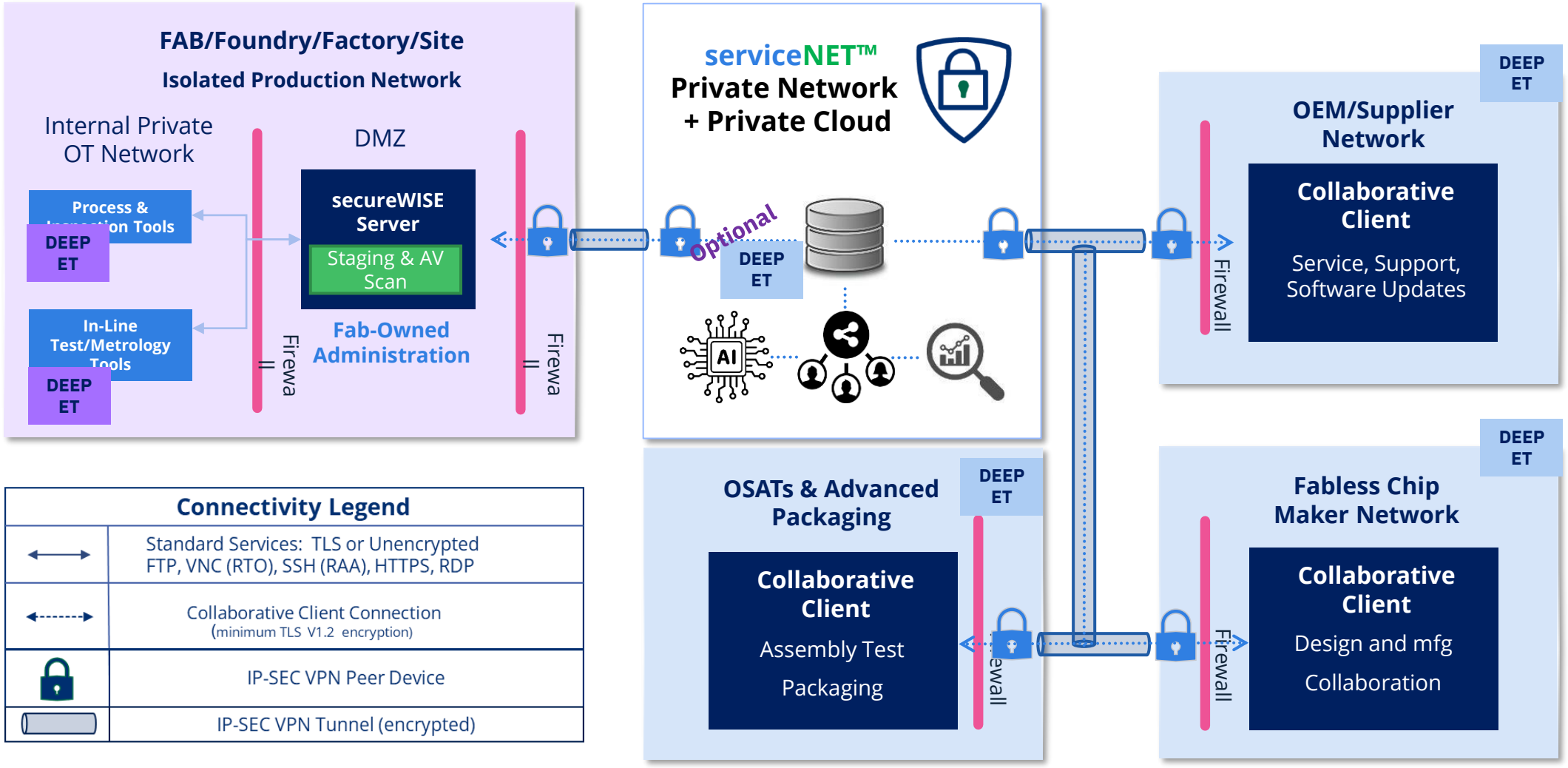
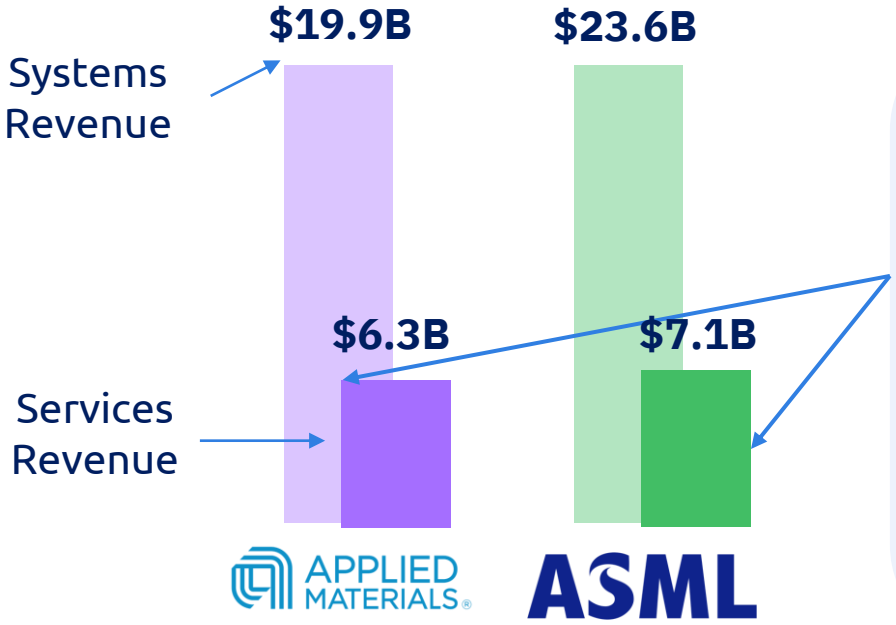


Semiconductor Market Size

$627.6B
Total Global semiconductor market

$117B
WFE Market



- **Service Growth Exponentially Increasing**
  - AMAT – 2013 $2B, 2019 $4B 2024 $6.3B
  - ASML – 2013 $1.7B, 2019 $2.5B, 2024 $7.1B
- Recurring Service Revenue from Top 2 OEMs - $13.4B

Thank You

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