

Walking On The Edge

The path to seamless, hybrid-cloud environments

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CTO Automation Products Group

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Applied Materials External



AGENDA

Let's address the cloud in the room

Seamless Hybrid-Cloud

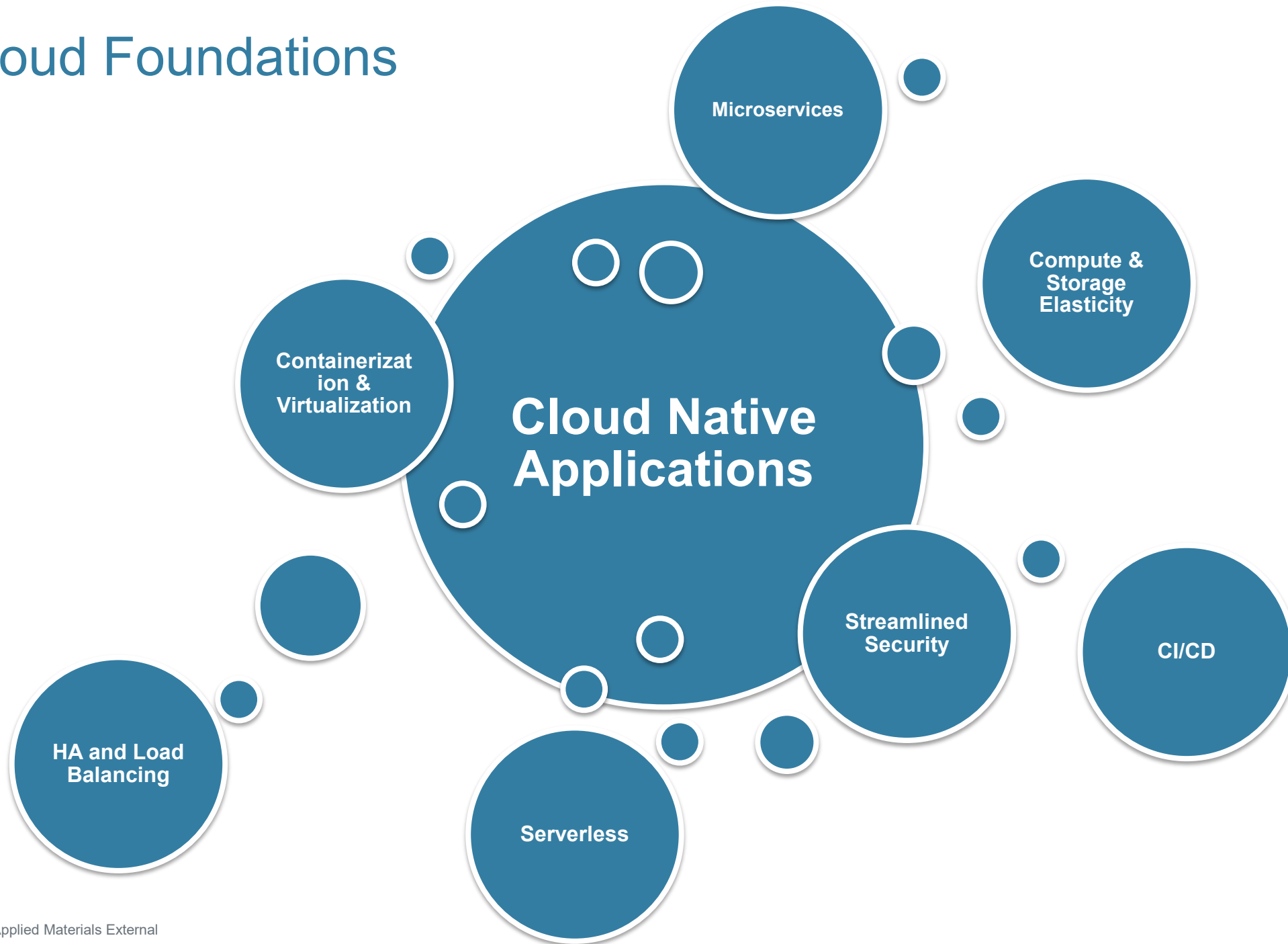
Simulation Modeling Case-Study



THERE IS NO CLOUD
IT'S JUST SOMEONE ELSE'S COMPUTER

THE CLOUD IS NOT ABOUT THE “WHERE”
IT'S ABOUT THE “HOW”

Cloud Foundations



Hybrid Cloud Computing Model

PUBLIC CLOUD

Dynamic cloud apps served as SaaS in many cases



Data selectively shared for public cloud apps



SECURE DATA BRIDGE

PRIVATE CLOUD

Managed and elastically scaling “private” network\storage\compute resources

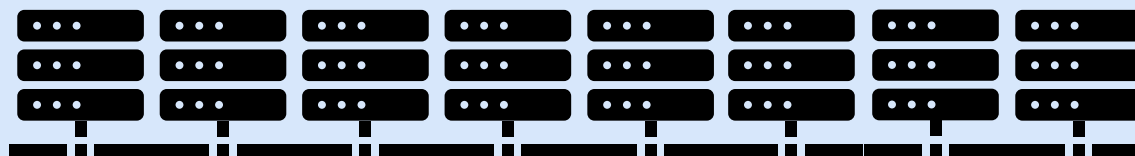


Corp Managed data stores



ON PREMISE (EDGE)

Edge compute for Real Time\High Bandwidth functionality



On-prem, mission critical data stores



Simulation Modeling Case Study

Production Planning and Scheduling Goal

Bridging the gap between factory capacity and customer delivery commitments.

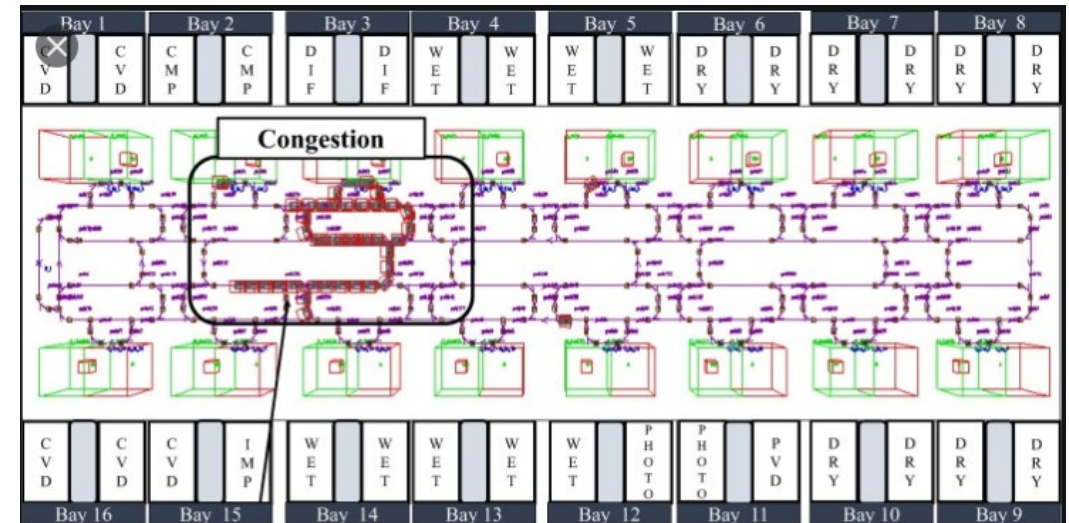
How is this achieved?

Applying simulation models to explore “what-if” scenarios to identify opportunities for improving throughput and capacity utilization

The Challenge

Simulations are CPU/Memory/Storage intensive and potentially, depending on the use case, scenario complexity and server hardware availability,

TAKE FOREVER TO COMPLETE!



Semi Conductor FAB layout design

Simulation Modeling Scenarios



Extending Simulation Modeling From On-prem Into The Corporate Private Cloud

CORPORATE PRIVATE CLOUD

Managed and elastically scaling “private” network\storage\compute resources

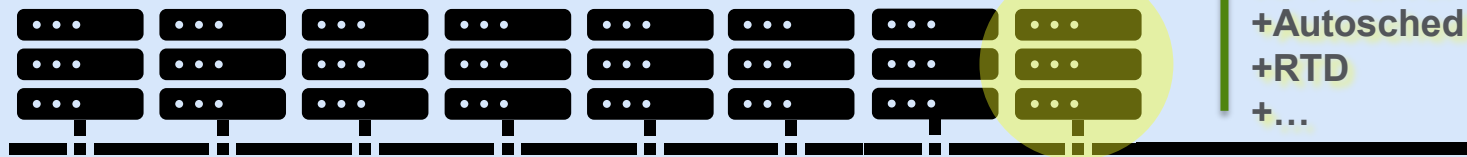
Corp Managed data stores



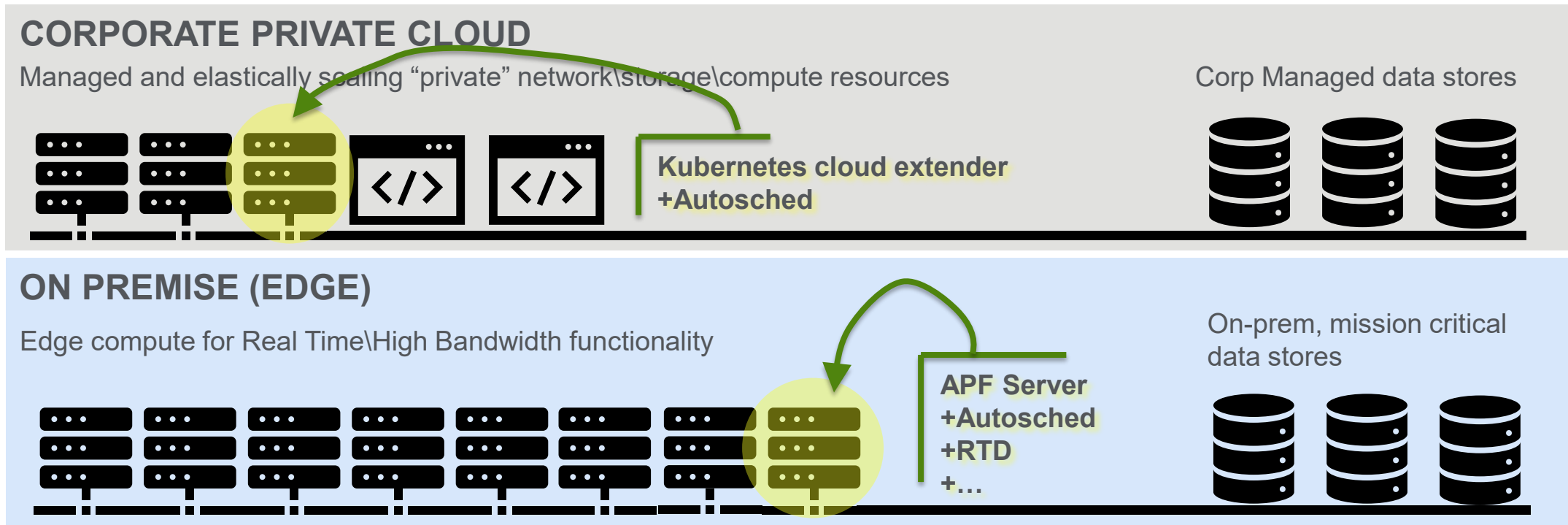
ON PREMISE (EDGE)

Edge compute for Real Time\High Bandwidth functionality

On-prem, mission critical data stores

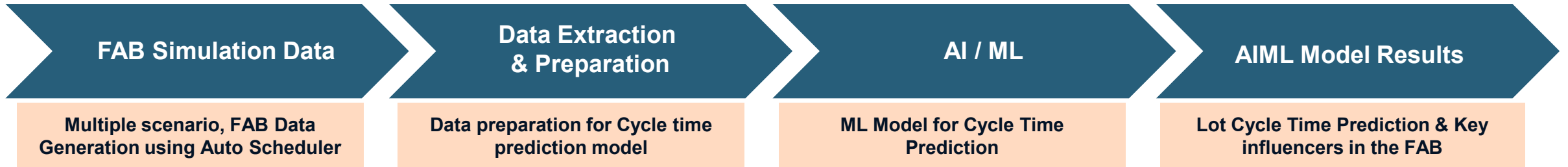


Extending Simulation Modeling From On-prem Into The Corporate Private Cloud



Cycle Time Prediction – Simulation modeling + ML

Predict Cycle Time and Identify Impactful Steps and Equipment



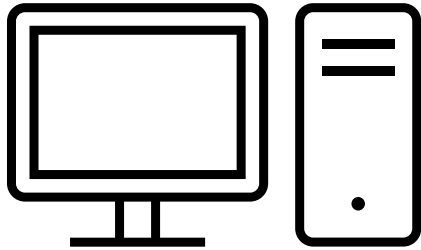
FAB Station / Tool	ML Feature Importance	AVG Station Util%	Station Family
EQP1	56.88	99.77	EQPS1
EQP2	39.10	91.09	EQPS2
EQP3	25.06	99.91	EQPS3
EQP4	19.82	81.82	EQPS4
EQP5	19.80	78.86	EQPS5
	19.03	67.20	
	18.90	98.70	
	18.85	97.55	
	16.54	96.70	
	16.07	83.78	

- Simulation Time Span - 90 days FAB execution days
- 4000 simulation model runs
- Runs can be parallelized into discrete threads
- Lot cycle time predicted with an accuracy of ~98%
- Key FAB stations / tools identified which are bottlenecks in the FAB. Prediction accuracy > 90%

Cycle Time Prediction – Simulation modeling + ML

On Prem Vs. Seamless Hybrid-Cloud

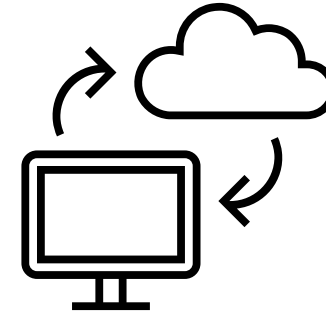
On Prem (Non-Containerized)



48 Core machine on-premise

RUN TIME: 5 DAYS

Seamless Hybrid-Cloud (Containerized)



Seamless cloud extension with
Kubernetes (Openshift)
1600 worker nodes

RUN TIME: 5 HOURS



Contact me

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