Petuum Industrial AI Autopilot & OSIsoft PI Data Infrastructure

Leena Joshi
Prabal Acharyya

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Agenda

- Petuum Artificial Intelligence Enables the Journey to Autonomous Operations
- Petuum Industrial AI Autopilot Product – Autosteer brings new levels of control and automation
- Customer Vignettes
- Architecture : Multi-layered Bi-Directional Integration with OSIsoft PI infrastructure
- How to Engage with Petuum
- Questions/Next steps

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About the Speakers

- Leena Joshi
- Marketing
- Petuum
- Leena.joshi@petuum.com

- Prabal Acharyya
- Head of Industrial AI
- Petuum

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Petuum's Mission

- **Powerful AI technology solutions for real-world problems**
- Industry specific innovative products and templates with minimal customization
- **AI as "civil engineering"**
- Standardized process and platform to scale AI organization wide

Eric Xing, Ph.D

- Founder
- CEO and Chief Scientist
- #1 ML scientist in the world –csrankings.com
- Founding Director of the CMU/UPMC Center for Machine Learning and Health
- AAAI Fellow
- IEEE Fellow
- Board of International Machine Learning Society

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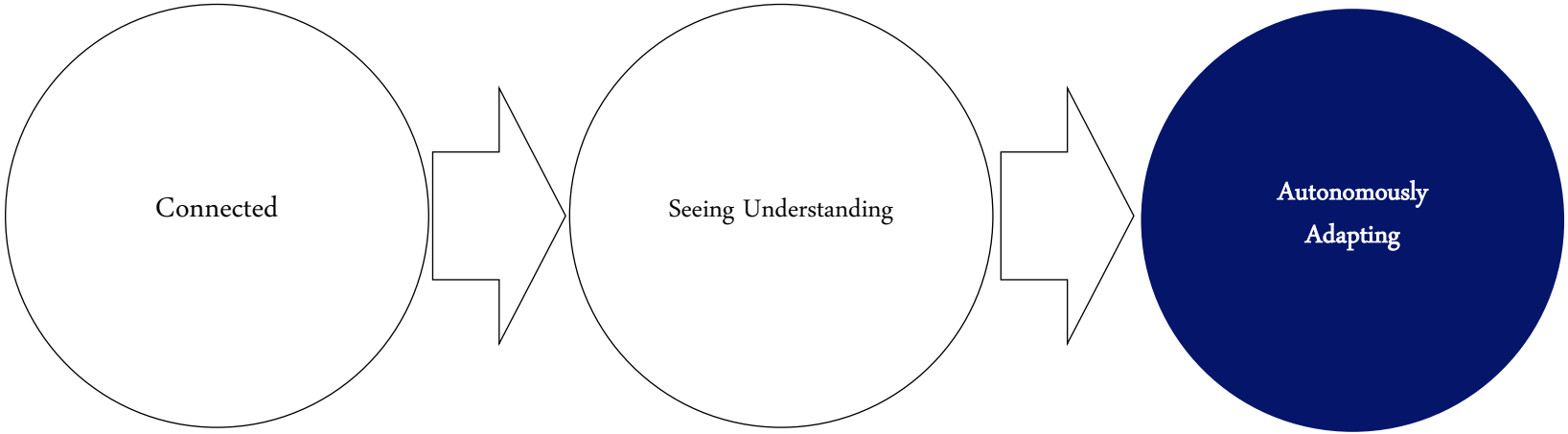
The Journey to Industry 4.0



- Digitization
- IoT /Sensors
- Enterprise Data Infrastructure

- Visibility
- Transparency
- Linear models
- Rule -based actions

- Self-Learning
- Predicting
- Prescribing
- Auto-steering

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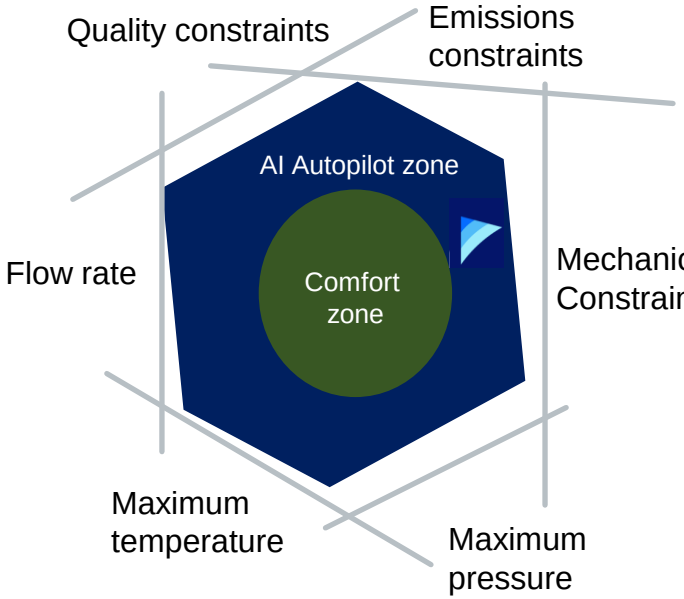
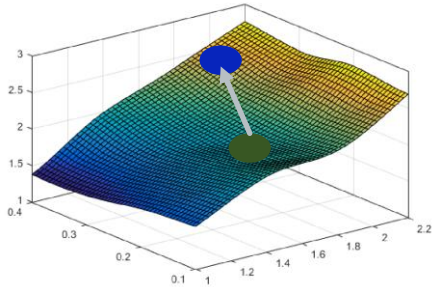
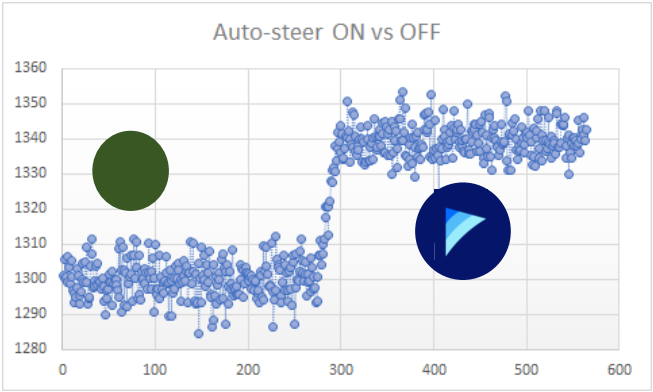
The Artificial Intelligence Advantage

Operate Safely Beyond the Comfort Zone







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The Petuum Advantage

Sophisticated techniques to learn underlying linear, non-linear, temporal and long range patterns in the data

Superior data processing techniques to increase robustness to noisiness or dirty data

Standardized ML pipelines and integrations with your environment allow for scalable rapid deployments

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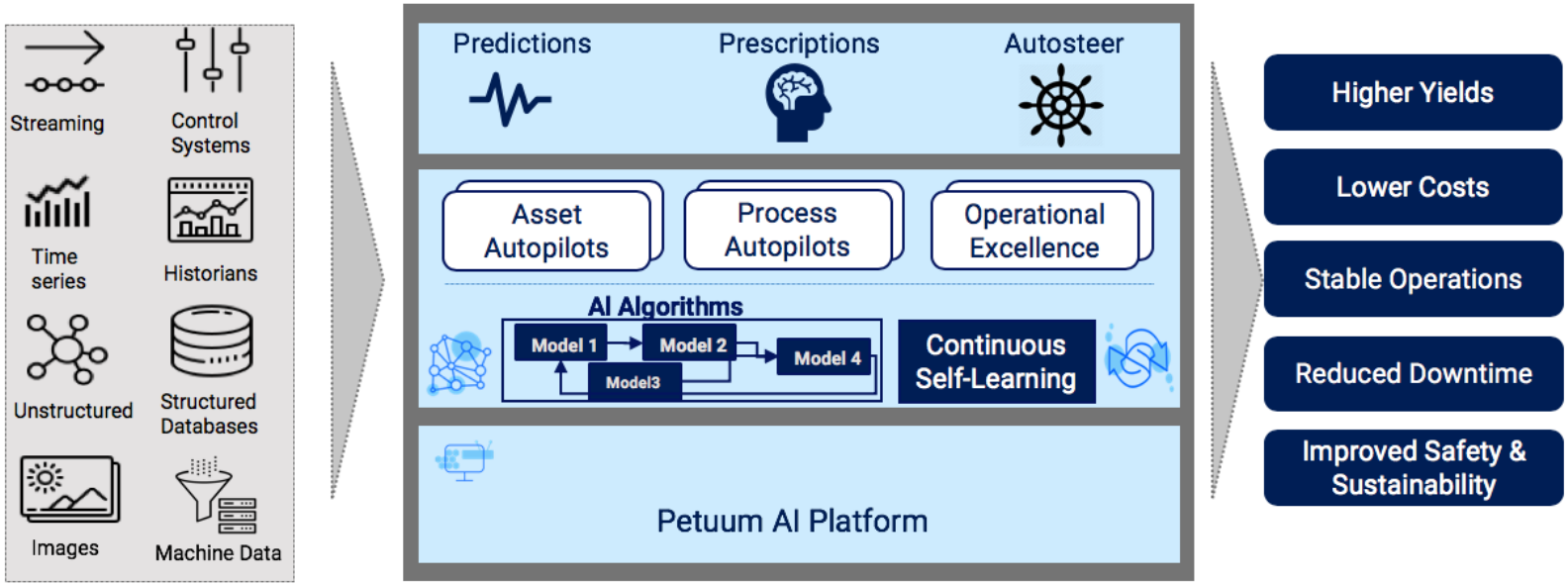
Petuum Industrial AI Autopilot



Powered by Petuum's advanced AI Platform, expert-built ML/DL algorithms deliver precise predictions, optimal prescriptions and optional autosteer for assets, processes and operational excellence initiatives

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Petuum Industrial AI Sectors

CEMENT

METALS/MINING

POWER & UTILITIES

OIL & GAS

CHEMICALS

DISCRETE

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Petuum Industrial AI Autopilot Products

	Asset Autopilots	Process Autopilots	Operational Excellence
CEMENT	Rotary Kilns, Coolers, Preheaters, Dryers	Pyro process, Ball mill, Vertical mill, Grinding & Distribution	Fuel Mix Optimization, Emissions reduction, Benchmarking, Kiln Campaign Extensions, Preventive Maintenance
METALS	Furnaces, Crushers, Pots/Anodes, Hot rollers	Blast furnaces, Pot rooms, Casthouse, Smelting, Hall-Heroult, Acid Wash	Fuel Mix Optimization, Emissions reduction, Health & Safety control
MINING	Drillers, Compressors, Turbines, Pumps	Remote process steering, Milling, Crushing	Energy and water consumption management
CHEMICALS	Batch reactors, Distillation columns, Extruders, Compressors, Pumps..	Fermentation, Drying/Cooling, Catalytic conversions, Grade Changes	Emissions reduction, Quality control, Benchmarking
OIL & GAS – REFINING	Cooling tower, Coker, Hydrogen unit, FCC	Crude Blending, Corrosion control, Gas Consumption forecasting, FCC, Desulphurization	Emissions reduction, Energy usage reduction, prescriptive maintenance
OIL & GAS – UPSTREAM	Turbines, Drillers, Compressors, ESPs, Well Simulation	Seismic pattern detection, Rock type/formation forecasting,	Fleet mgmt, preventive maintenance, well downtime avoidance

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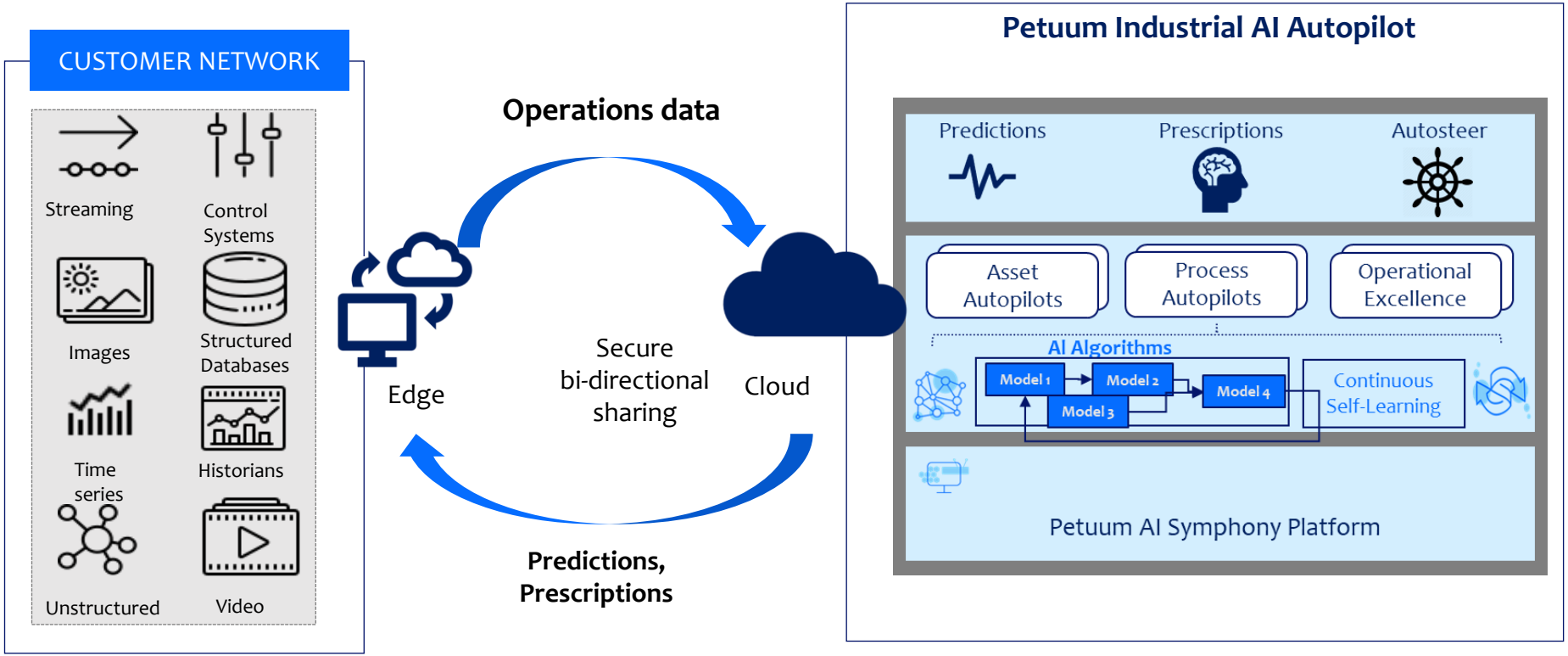
Petuum Industrial AI Autopilot



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Autopilot: AI Under the Hood

PREDICT 1 | PRESCRIBE 2 | AUTOSTEER 3

Input: x_t
1. Feed flow rate
2. Recirculation flow rate
3. Feed temperature
4. C3S
5. Level of mill chamber 1
6. Level of mill chamber 2

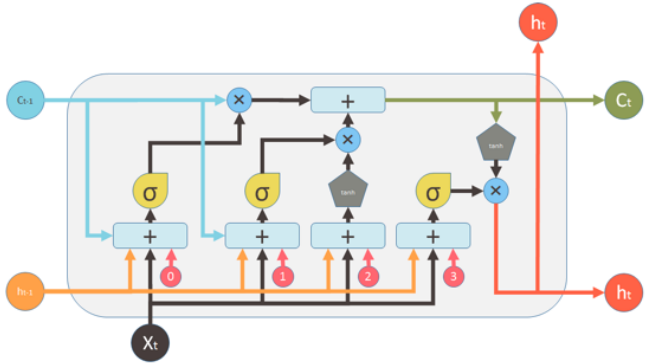
Input (Constraint): x_t
1. Mill outlet pressure
2. Mill inlet pressure
3. Grinding aid flow rate
4. Fan power
5. Bag house differential pressure

Predict (step 1)

Goal: h_t
1. Mill outlet temperature
2. Mill power
3. Fineness_1
4. Fineness_2

Input (Prescribe): x_t
1. Water flow rate
2. Separator speed
3. Recirculation damper
4. Fan speed

Model



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CEMEX

LEVERAGING THE PI INFRASTRUCTURE & PETUUM INDUSTRIAL AI AUTOPILOT WITH AUTOSTEER TO DRIVE AI-ENABLED AUTONOMOUS OPERATION

CHALLENGE

Predictable, repeatable ”golden day” operations – high yield, high quality at low cost sustainably

- Prove AI / ML capabilities to optimize production processes
- Complex, highly variable operations
- No real time prediction, reactive operator actions

SOLUTION

- Petuum Industrial AI taps into PI system and other sources to deliver real time forecast of process variables, prescriptions for operator actions and a supervised auto-steer
- Integration with OSIsoft suite of products for configuration, data streaming and visualization
  - PI Cloud Connect, PI WebAPI
  - PI AF, PI OPC Read-Write
  - PI Vision incl. Custom Controls

RESULTS

Expected yield and energy improvements in the range of 2-7% from combined use cases

- Reduced process variability
- Increased throughput
- Cost reductions from increased energy recovery:
  - Secondary Air ΔT: +100 °F
  - Tertiary Air ΔT: +15 °F
  - Clinker Temp ΔT: +5 °F (did not decrease; acceptable)

“This is a giant step in digital transformation towards safe, highly standardized operations, that will help us strengthen our high-quality products portfolio while also ensuring we meet our operational and sustainability goals, and minimize costs.” – Rodrigo Quintero, CEMEX

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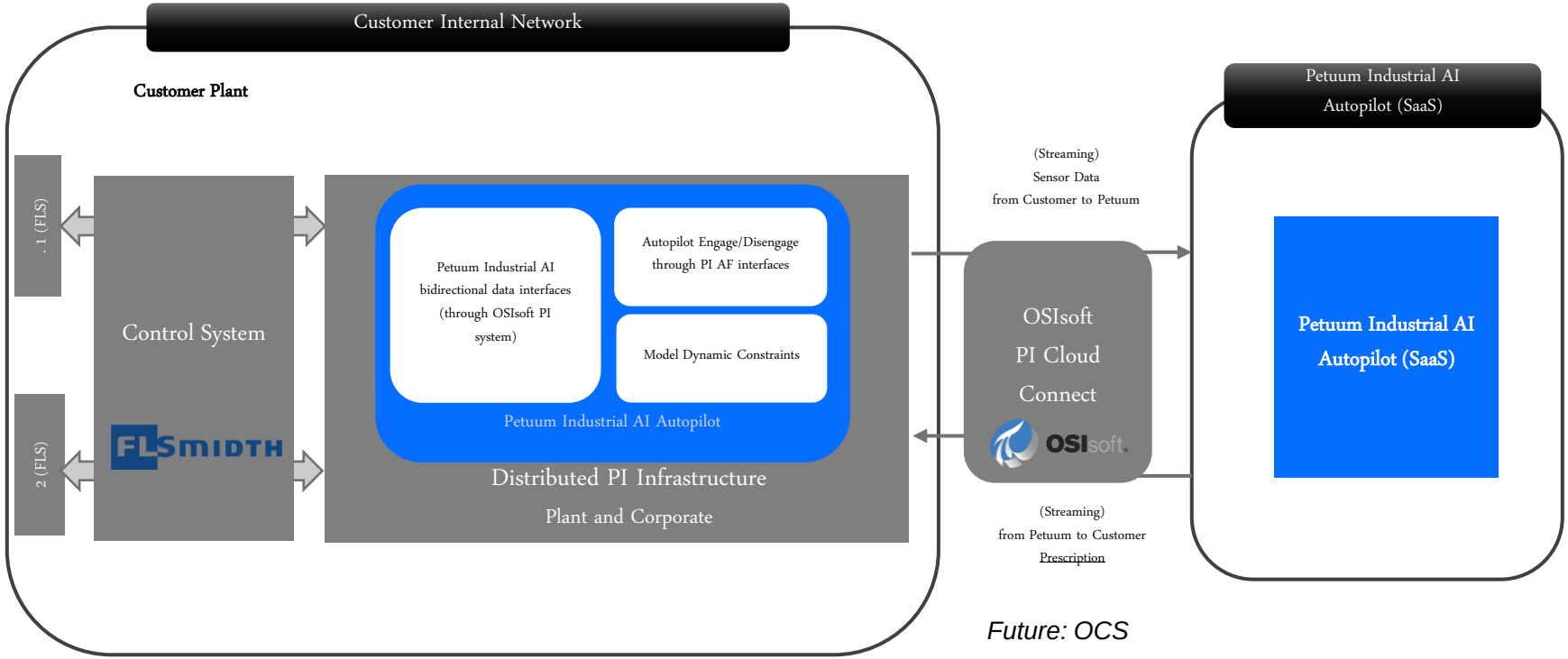
Petuum Industrial AI Autopilot @ Customer



Future: OCS

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Petuum | OSIsoft Integrations

1. PI Web API

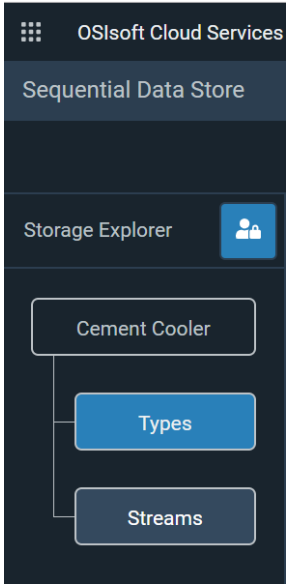
2. PI Connectors and Interfaces
(e.g PI OPC Read-Write)

3. Asset Framework and Asset Analytics

4. PI Vision including custom controls

5. OSIsoft PI Cloud Connect
Next: OCS

COMING SOON



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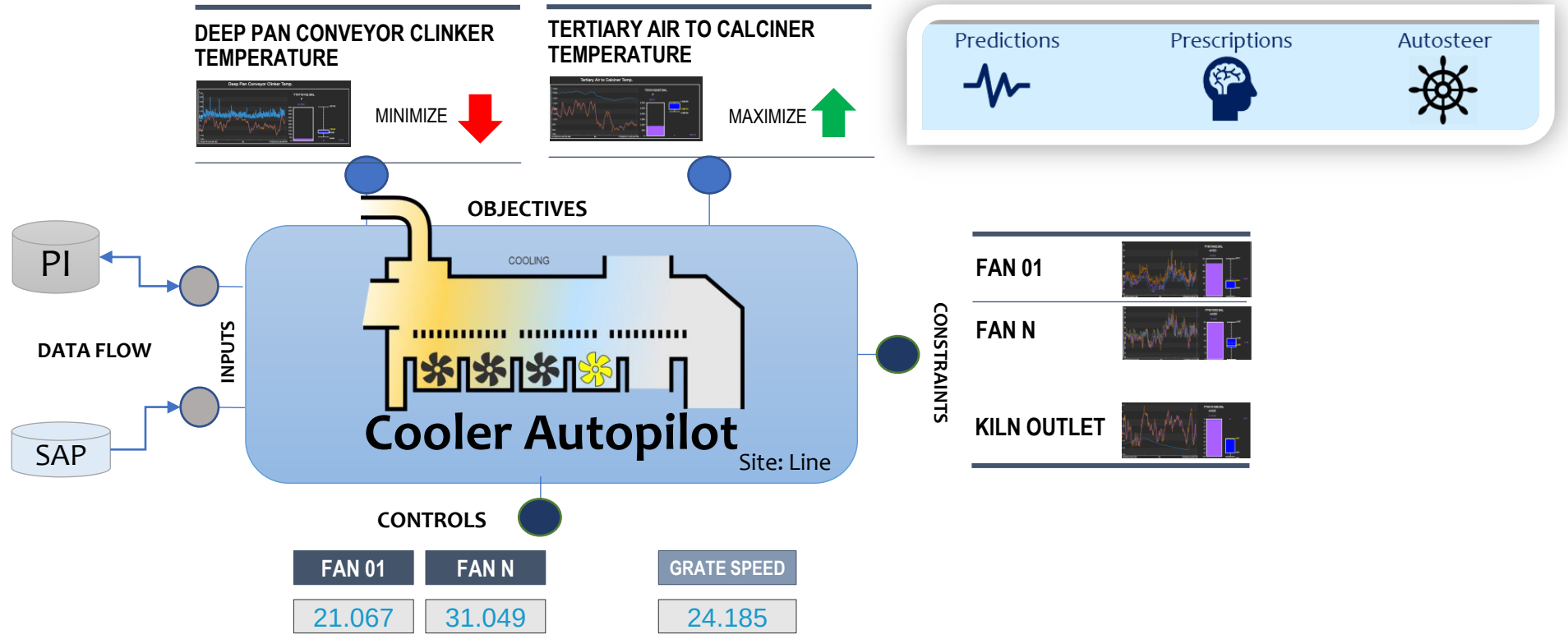
Cooler Asset Autopilot - Deployed



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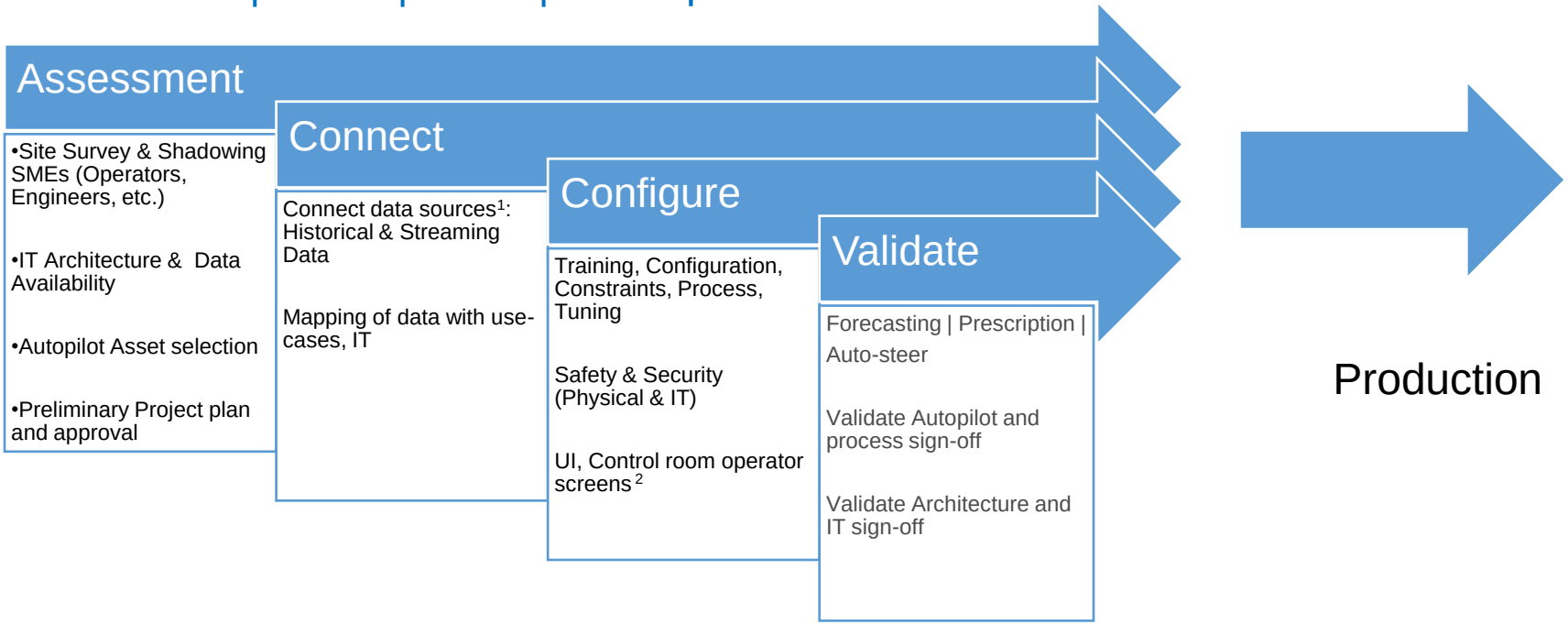
Next Steps – Pilot

~2-3 months | 1 Site | 1 line | 2 Autopilot use cases



1. IoT layer excluded
2. Control system programming excluded

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How to Engage With Petuum

- Talk to us about your specific use cases
- Email : business@Petuum.com

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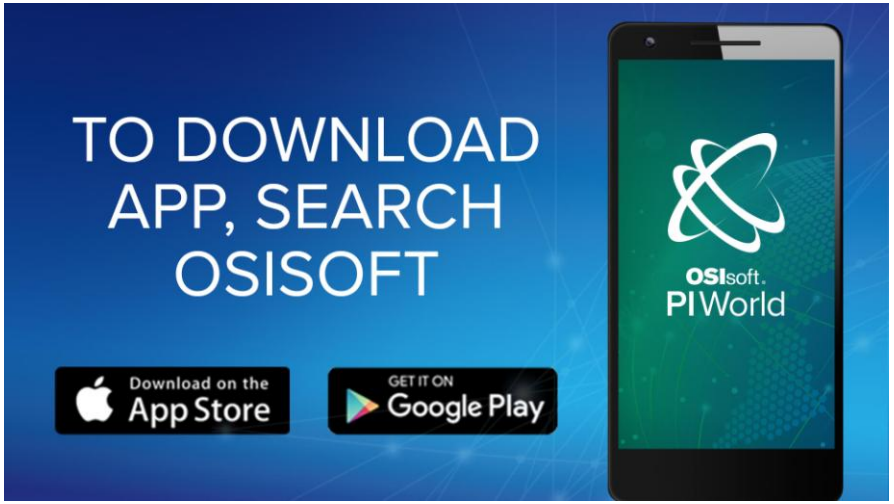
Questions?

Please wait for the **microphone**

State your **name & company**

Please remember



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