

Nucleus for Manufacturing

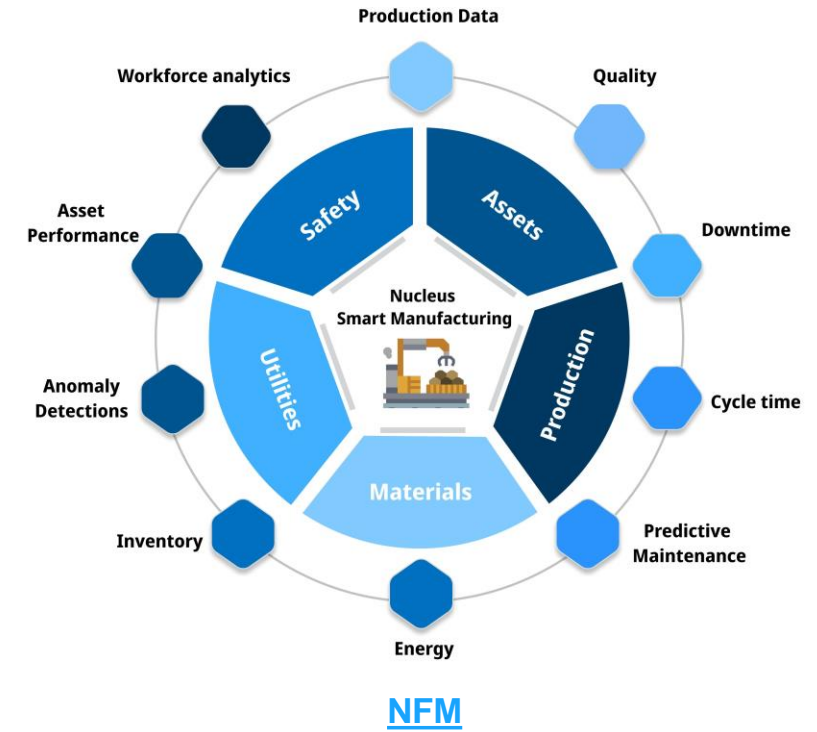
on Microsoft Azure

Nucleus for Manufacturing – Introduction



Enterprise Manufacturing
Cloud for Customers to
digitize complex operations,
drive innovation and agility
across Value Chain at
Global Scale

- Industry cloud for Manufacturing Digitization
- Azure based Industrial IoT solution with common data framework
- Reference architecture & Reusable accelerators “our IP”
- Integration layer for various IT, OT systems and point solutions
- Addressing Edge to Cloud
- Digitalization across value chain
- Complex data management



Value Propositions

One time
license per
factory

Future
Scalability

User
Customization

Reusability

Ready
Connectors

Efficient
Engineering

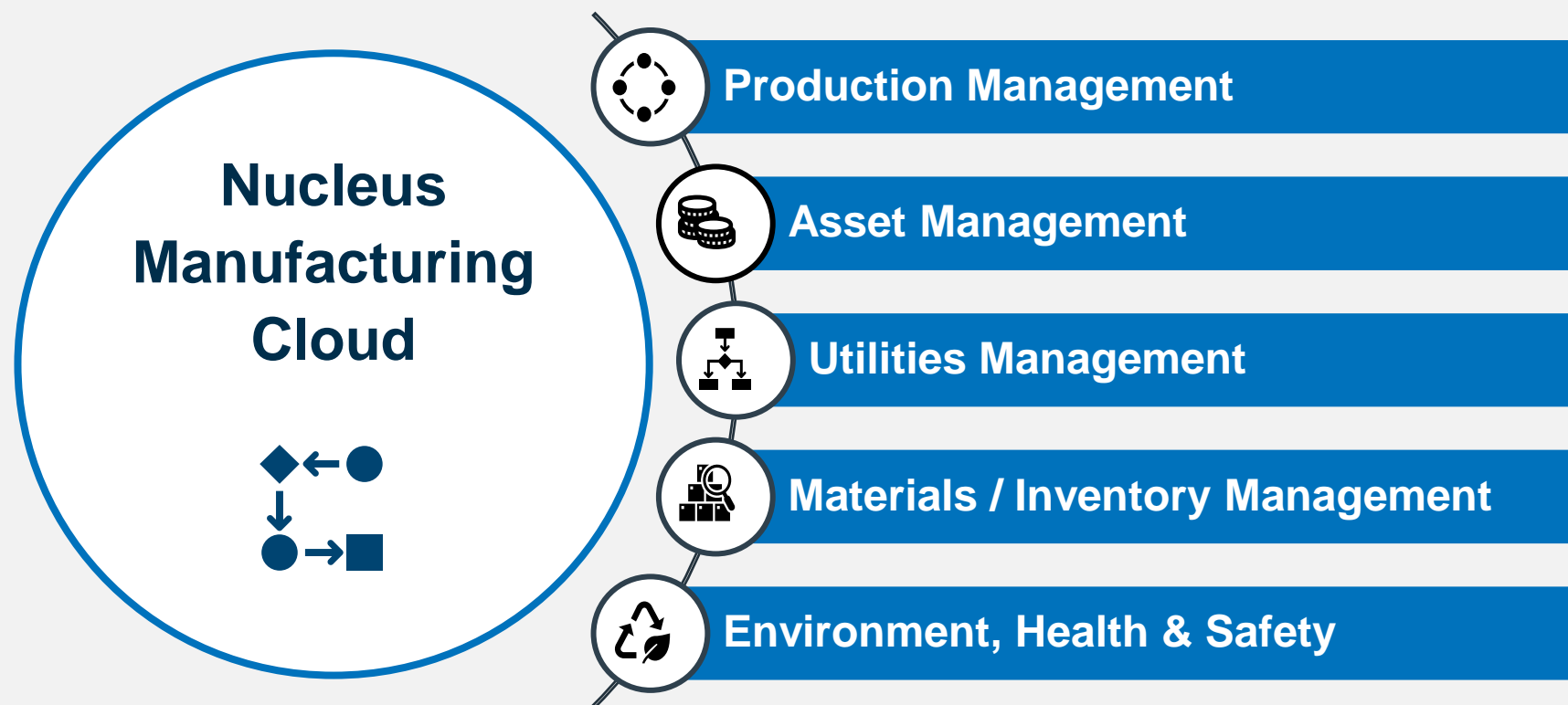
One Stop
Solution

Nucleus for Manufacturing – Business Focus Areas

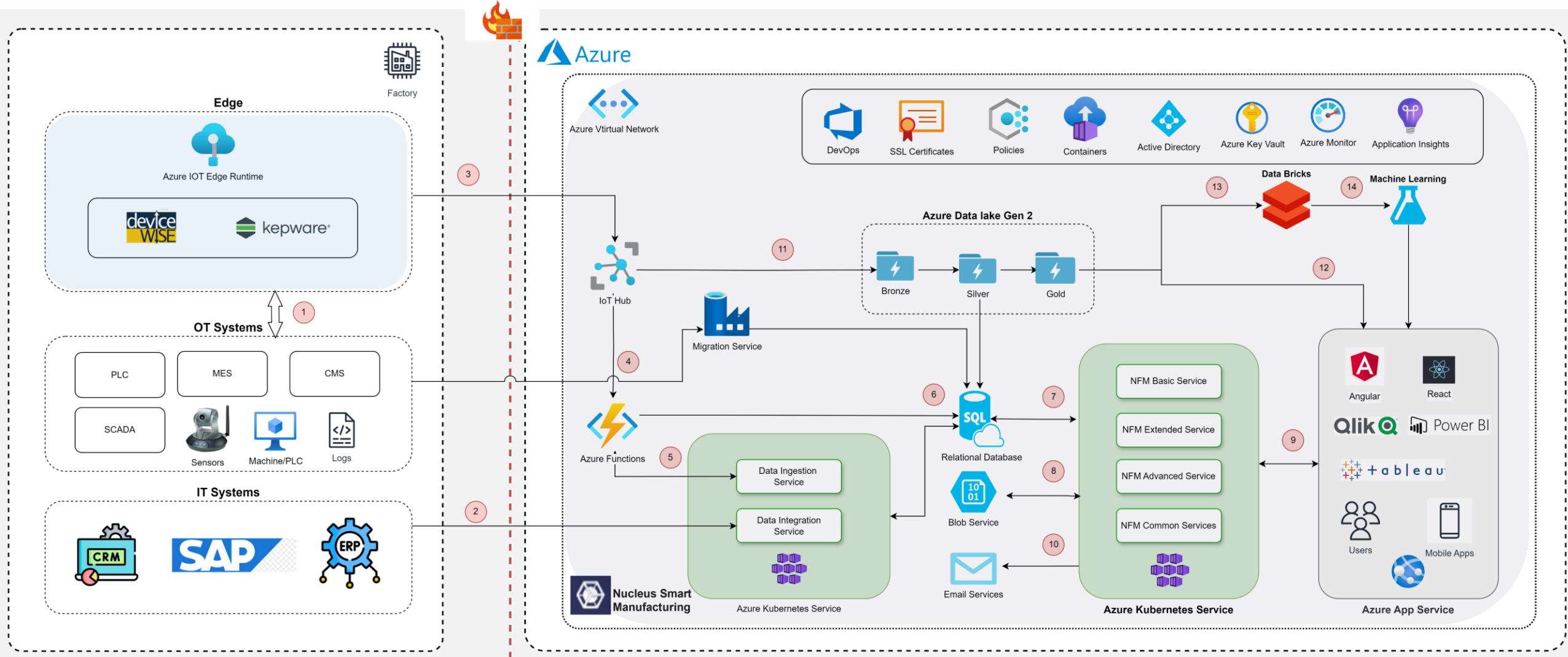
NFM is an open integration accelerator which can connect, collect, and contextualize disparate data from various factory data sources. It enables single source of truth for various data types and sources the data for advanced analytics and centralized insights

Capabilities

- End to end factory Visibility starts from raw material to finished goods
- Intuitive dashboard enabled with angular and power BI
- Smart Operations to enable operators to feed in manual data
- Remote assistance enabled with AR/VR to assist the support engineers
- Andon workflow enabled with ServiceNow integration
- Structured factory modelling provides factory, line and machine view
- Real time alerts and trends to keep the stakeholders notified
- AI/ML predictions provide predictive maintenance forecasting capabilities and anomaly detection
- Smart Maintenance automated with digital checklist
- Graphical and tabular reports for analysis



Technical Architecture - Azure



1 OT Real time streaming data integration

2 IT Batch data integration

3 Data Ingestion Edge to Cloud

4 Real time IoT Hub to Azure Functions using triggers

© 2024 NTT DATA Inc.

5 Ingests the data to the NFM Ingestion Services

6 Function App Ingests the raw data to SQL

7 SQL data is exposed in the form of APIs

8 Unstructured data are stored in blob storage

9 APIs are consumed by mobile apps, BI tools etc

10 Alerts notification via emails

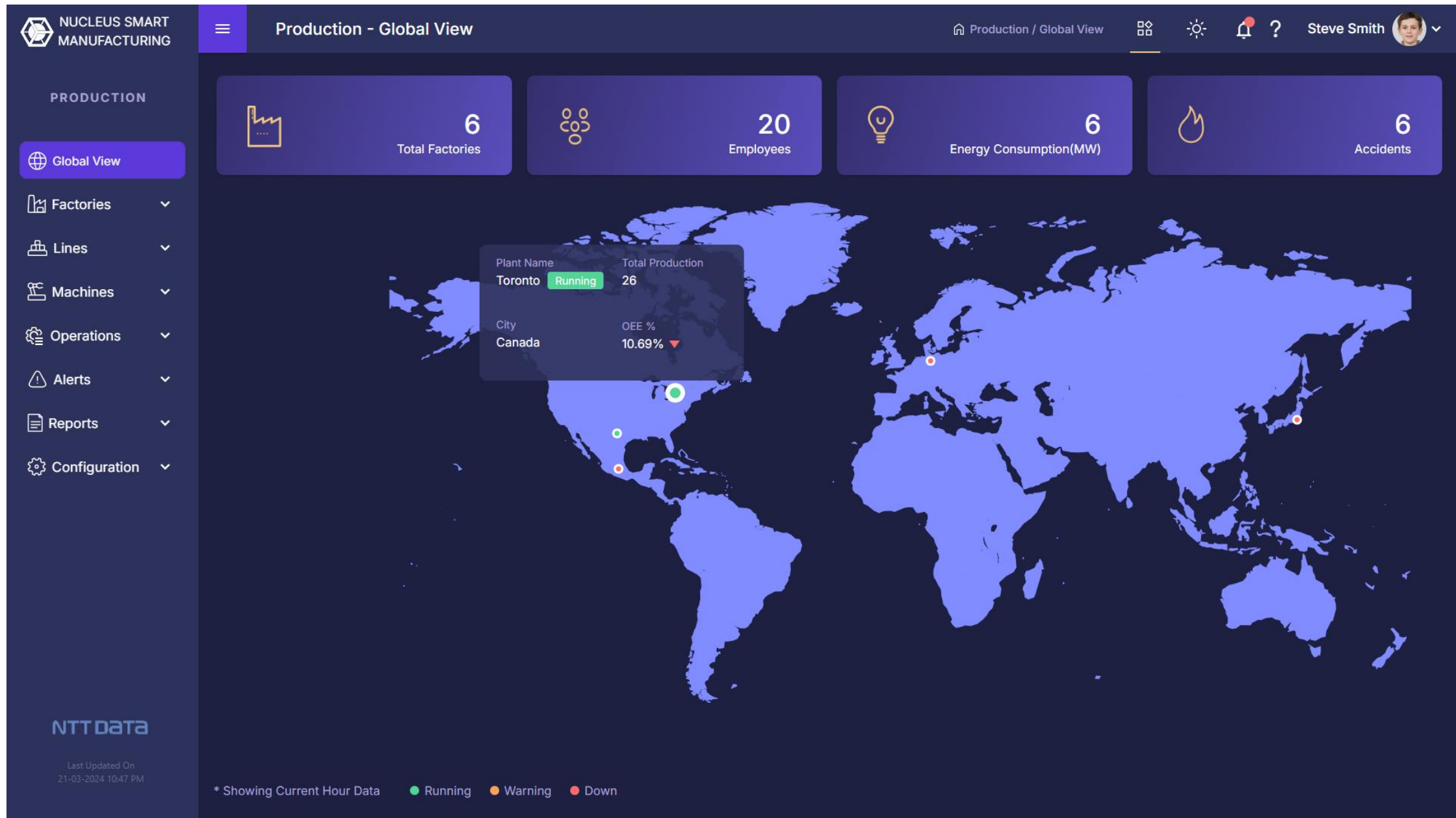
11 IoT Hub Ingests the unstructured data, logs and raw messages

12 Data in data lake is used by self servicing dashboards

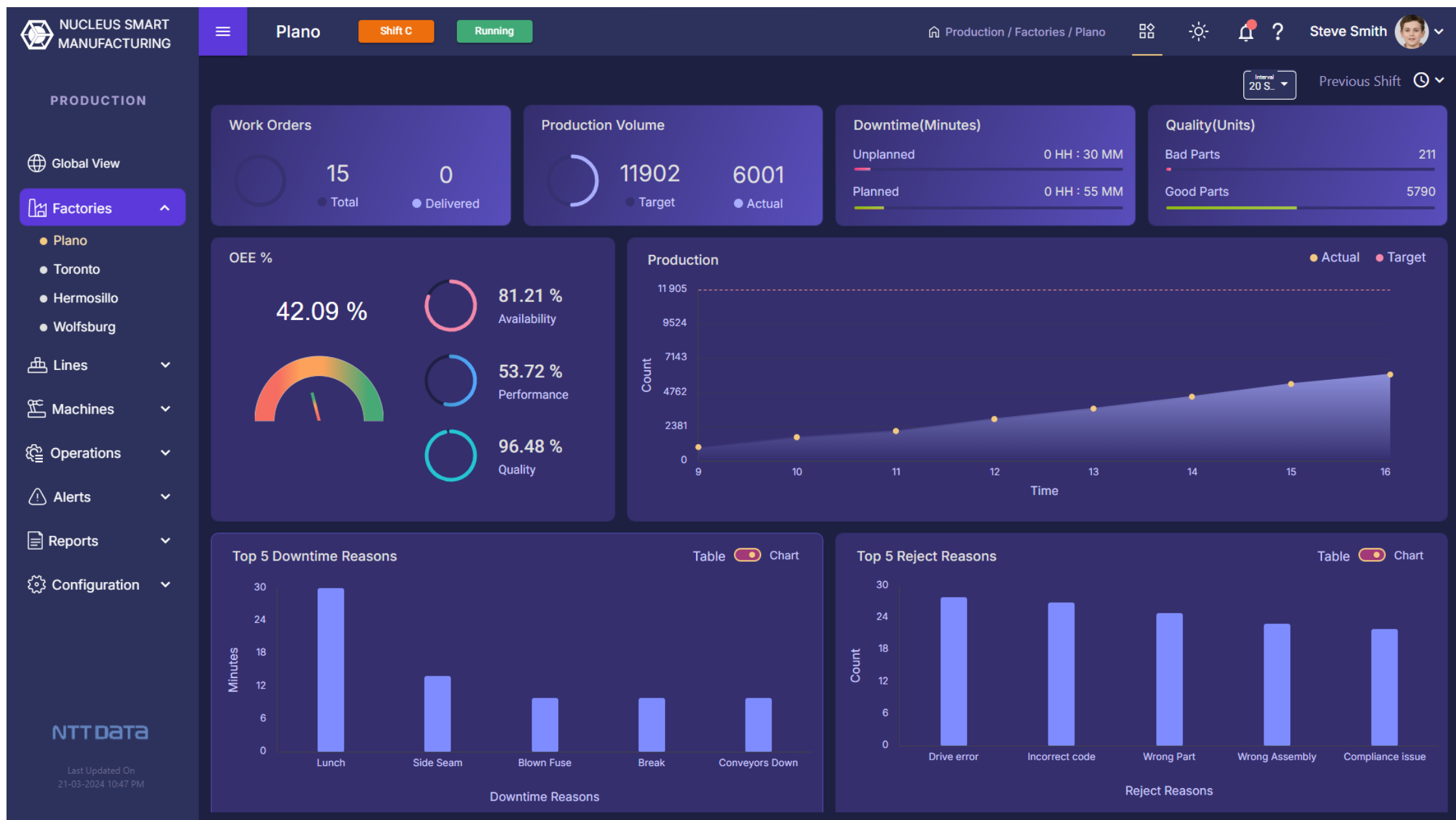
13 Data bricks uses the data from data lake for ETL operations

14 Data from data lake is used for machine learning

NFM- Production Global View



NFM- Production - Factory View



NFM- Production Machine View

NUCLEUS SMART MANUFACTURING

Production / Plano / undefined / PFL-1

Steve Smith

Interval 20 S... Current Day

Work Orders: 1 Total, 0 Delivered

Production Volume: 2840 Target, 322 Actual

Downtime(Minutes): Unplanned 0 HH : 8 MM, Planned 0 HH : 20 MM

Quality(Units): Bad Parts 8, Good Parts 314

OEE %: 25.72 %

- 95.03 % Availability
- 27.76 % Performance
- 97.52 % Quality

Cycle Time (Secs): Target 30, Actual 1

Machine Info: Work Order ORD1230001, SKU KS233RUR, Serial Number 1_12345100314, Operator tester

Top 5 Downtime Reasons: Break (10), Electr... (8), Shift change

Top 5 Reject Reasons: Drive error (3), Part Damage (2), Reason (1), Incorrect code (1), Compliance issue (1)


Machine Info Table:

Name	Location	Alerts
PFL-1	SML-A	10
Make	Model	Line
OKUMA Lathe	VK65	Line-1
Serial Nubemr	FTL12340001	

NTT DATA

Last Updated On 21-03-2024 10:47 PM

NFM- Production -Operations view

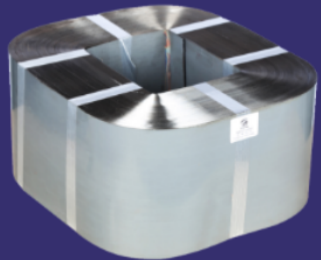


☰ PFL-1 Shift C Running Auto

Plano / Line-1 / PFL-1 Steve Smith

Operator Dashboard 00 40 31 Time left * Showing Current Shift Data Work Instruction Raise Andon

Product



Work Order
ORD1230001

SKU
KS233RUR

SKU Description
Critical Care Bed

Serial Number
1_12345100314

Downtime (HH : MM : SS)

00:00:00
Total Downtime

00:00:00
● Planned Downtime

00:00:00
● Unplanned Downtime

OEE %

0.00 %
Availability

0.00 %
Performance

0.00 %
Quality

Cycle Time (Secs)

Shift Target 0/940

30
Target

2
Actual

6.67 %

Start Time: Mar 21, 2024, 2:44:35 PM

Downtime

00 : 00 : 00
HOURS MINUTES SECONDS

● Planned Downtime
No Planned Downtime

● Unplanned Downtime
No Unplanned Downtime

Quality

Total Parts 0

Good Parts 0

Bad Parts 0

NFM- Asset – Summary View

- ASSETS
- Global View
- Factories
- Lines
- Assets**
- Alerts
- Trending
- Maintenance
- Reports
- Configuration

Asset Summary Current shift

Search: Filter by Status: Sort by:

Name	Line	Make	Model	Serial Number	Location
PFL-1	Line-1	OKUMA Lathe	VK65	FTL12340001	SML-A
PFL-2	Line-1	OKUMA Lathe	VK65	FTL12340002	SML-A
PFL-3	Line-1	OKUMA Lathe	VK65	FTL12340003	SML-A
PFL-4	Line-1	OKUMA Lathe	VK65	FTL12340004	SML-A
PFL-5	Line-1	OKUMA Lathe	VK65	FTL12340005	SML-A

Status	Service Due	Critical Alerts	Downtime (Minutes)	View Graph
Running	Apr 21, 2024	4	0	View Graph
Running	Apr 21, 2024	0	0	View Graph
Running	Apr 21, 2024	2	15	View Graph
Running	Apr 21, 2024	3	19	View Graph
Running	Apr 21, 2024	0	0	View Graph

NFM- Asset -Maintenance view

Select Factory: Plano | Select Line: | Select Asset: | [Submit](#) [View Tickets](#) Current day

Planned Maintenance (hrs) 20.9	Unplanned Maintenance (hrs) 9.85	Maintenance Cost (\$) 5	Avg Failure Resolution Time 5
--	--	-----------------------------------	---

Downtime 30.76 hrs	Failures <table border="1"><thead><tr><th>Asset</th><th>Failure Count</th></tr></thead><tbody><tr><td>PFL-1</td><td>5</td></tr><tr><td>PFL-2</td><td>40</td></tr><tr><td>PFL-3</td><td>28</td></tr><tr><td>PFL-4</td><td>45</td></tr><tr><td>PFL-5</td><td>40</td></tr><tr><td>PGD-1</td><td>0</td></tr><tr><td>PGD-2</td><td>0</td></tr><tr><td>PGD-3</td><td>0</td></tr><tr><td>PGD-4</td><td>0</td></tr><tr><td>PGD-5</td><td>0</td></tr><tr><td>PJM-1</td><td>2</td></tr><tr><td>PJM-2</td><td>35</td></tr><tr><td>PJM-3</td><td>28</td></tr><tr><td>PJM-4</td><td>30</td></tr><tr><td>PJM-5</td><td>45</td></tr><tr><td>WP-1</td><td>0</td></tr><tr><td>WP-2</td><td>0</td></tr><tr><td>WS-1</td><td>0</td></tr></tbody></table>	Asset	Failure Count	PFL-1	5	PFL-2	40	PFL-3	28	PFL-4	45	PFL-5	40	PGD-1	0	PGD-2	0	PGD-3	0	PGD-4	0	PGD-5	0	PJM-1	2	PJM-2	35	PJM-3	28	PJM-4	30	PJM-5	45	WP-1	0	WP-2	0	WS-1	0
Asset		Failure Count																																					
PFL-1		5																																					
PFL-2	40																																						
PFL-3	28																																						
PFL-4	45																																						
PFL-5	40																																						
PGD-1	0																																						
PGD-2	0																																						
PGD-3	0																																						
PGD-4	0																																						
PGD-5	0																																						
PJM-1	2																																						
PJM-2	35																																						
PJM-3	28																																						
PJM-4	30																																						
PJM-5	45																																						
WP-1	0																																						
WP-2	0																																						
WS-1	0																																						
MTBF 0.1 hrs																																							
MTTR 0.18 hrs																																							



