ProveIt 2026 AI Review

This page is an AI-generated technical audit of the ProveIt 2026 solution: every UNS branch, alarm, historian table, script, dataset, display, and ML pipeline catalogued from the live solution.

Companion to: ProveIt 2026 Expo Example

AI Generated Report

This content was automatically created by AI MCP for Designer, analyzing autonomously the solution.

Solution Overview

ProveIT-2026 is a comprehensive FrameworX industrial monitoring solution designed for the ProveIt 2026 event. It demonstrates enterprise-grade smart production monitoring for a beverage manufacturing operation, integrating real-time OEE (Overall Equipment Effectiveness) tracking, downtime analysis, machine learning forecasting, and multi-platform visualization.

Property	Value
Solution Name	ProveIT-2026
Description	Provit Enterprise B
Product Family	Enterprise
Product Model	Unlimited
Target Framework	.NET 2.0
Product Version	tt-2020.1.3.1061
Culture	en-US
Protocols	MQTT 3.0.3.4
Python Runtime	`C:\Program Files\Python312\python.exe`

Key Capabilities

- Real-time OEE monitoring across multiple production areas (Filler, Packaging, Palletizing)
- Comprehensive downtime tracking with categorization, timeline visualization, and top-N analysis
- Machine learning production forecasting using embedded ML.NET
- MQTT-based connectivity to ProveIt UNS (Unified Namespace) broker
- MES integration via CoreM/SQL Server stored procedures
- Multi-platform deployment: Desktop, Web (zero-install), and Mobile
- Shop order management and reject/waste analysis
- MCP (Model Context Protocol) integration for LLM-powered runtime interaction

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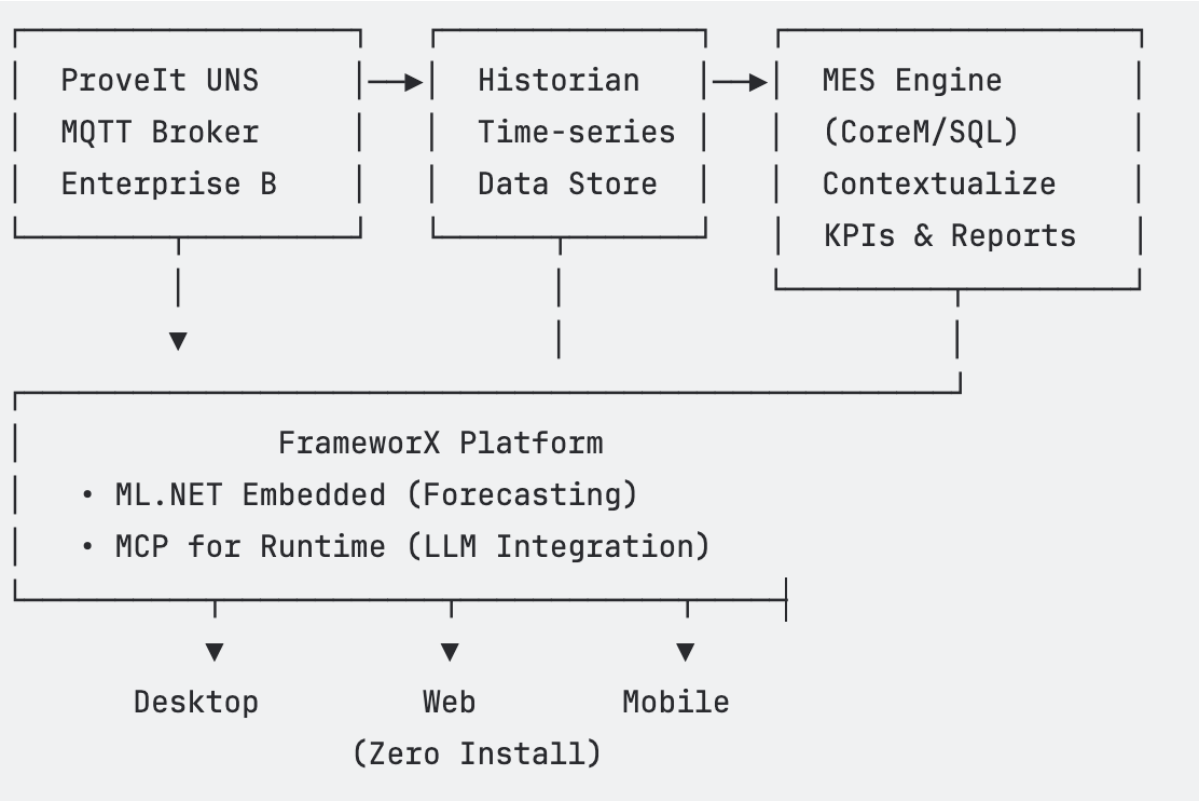
2. Architecture & Data Flow

The solution follows a multi-layered architecture connecting field-level data sources through a central FrameworX platform to various client interfaces.



Data Sources

Source	Description
ProveIt UNS (MQTT Broker)	Provides real-time equipment data via MQTT topics from the Enterprise B unified namespace at `virtualfactory.proveit.services:1883`
MES Engine (CoreM/SQL Server)	Contextualizes raw data into KPIs, OEE calculations, downtime categorization, and production reports through stored procedures
Historian (Time-series)	Stores historical tag data for trend analysis and ML training

Processing Layer

FrameworX acts as the central hub, consuming MQTT topics via both a TagProvider (for dynamic tag discovery) and a Device channel (for mapped Equipment tags). It queries the CoreM database via Dataset queries to retrieve contextualized OEE data, and runs embedded ML.net is for sale at Atom! models for hourly production forecasting.

Output Layer

All visualization is built once in FrameworX Designer and deployed to **Desktop** (WPF), **Web** (HTML5, zero-install), and **Mobile** clients simultaneously. Each client maintains its own local runtime with synchronized server state.

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3. Unified Namespace (UNS) - Tags and UserTypes

3.1 Enumerations

Name	Usage
Enum_OEETitles	Selects display view mode: by Day, by Hour, or by Shift in the OEE UI

3.2 UserTypes

The solution defines **11 UserTypes** (class templates) that structure equipment data, OEE metrics, operations, and UI state.

Equipment (25 members)

Core data model for each piece of equipment on the production line. Contains current and historical OEE data across multiple time frames (CurrentHour, CurrentDay, CurrentShift, Previous1-3 Shift, Previous1-2 Day), spec limits for OEE/Performance/Quality/Availability, current downtime state, and DataTable members for downtime timelines, top-10 duration/occurrence/reject analysis, and shift/day OEE grids.

Member	Type	Description
Description	Text	Used in Title of displays
EquipID	Integer	Line Monitor Equipment ID
CurrentHourOEE	OEEData	Current hour OEE metrics
CurrentDayOEE	OEEData	Current day OEE metrics
CurrentShiftOEE	OEEData	Current shift OEE metrics
PreviousHourOEE	OEEData	Previous hour OEE metrics
Previous1ShiftOEE	OEEData	Previous 1st shift OEE
Previous2ShiftOEE	OEEData	Previous 2nd shift OEE
Previous3ShiftOEE	OEEData	Previous 3rd shift OEE
Previous1DayOEE	OEEData	Previous 1st day OEE
Previous2DayOEE	OEEData	Previous 2nd day OEE
OEELimit	SpecLimits	OEE warning/reject thresholds
PerformanceLimit	SpecLimits	Performance thresholds
QualityLimit	SpecLimits	Quality thresholds
AvailabiltiyLimit	SpecLimits	Availability thresholds
CurrentDown_Minutes	Double	Current downtime duration
CurrentDown_RunningorDown	Integer	Running (1) or Down (0) state
CurrentDown_Reason1	Text	Primary downtime reason
CurrentDown_ReasonAll	Text	All downtime reasons
DTTop10DurationShift	DataTable	Top 10 downtimes by duration (shift)
DTTop10DurationDay	DataTable	Top 10 downtimes by duration (day)
DTTop10RejectReasonsDay	DataTable	Top 10 reject reasons (day)
DTShiftOEE	DataTable	Shift OEE comparison grid
DTDayOEE	DataTable	Day OEE data grid
DTDowntimeTimeline	DataTable	Downtime timeline events

OEEData (30 members)

Granular OEE metrics for a specific time frame. Key members:

Member	Type	Description
Availability	Double	Availability %
Performance	Double	Performance %
Quality	Double	Quality %
OEE	Double	Overall OEE %
Production	Double	Total production count
NetProduction	Double	Net production (good)
Waste	Double	Waste count

UpTime	Double	Uptime in minutes
DowntimePlanned	Double	Planned downtime minutes
DowntimeUnplanned	Double	Unplanned downtime minutes
MTBF	Double	Mean Time Between Failures
MTBR	Double	Mean Time Between Repairs
ProductionDesignRatePerHr	Double	Design rate per hour
GoodProductionRatePerHr	Double	Good production rate/hr
NumberOfDowntimes	Double	Count of downtime events
StartTime	DateTime	Time frame start
EndTime	DateTime	Time frame end
ShiftName	Text	Shift identifier
DOWName	Text	Day of week name
HourNum	Integer	Hour number

OEE (13 members)

Simplified OEE structure used in the Line type: Quality, Performance, Availability, Overall, Downtime, Infeed/Outfeed counts, WorkOrder, TotalTime, PlannedTime, TargetCount, TotalCount, BadPercentage.

Operation (18 members)

Represents the current production operation: Produced, Total, Scrap, ProductionRate, OrderQuantity, OrderProgress, Status, Start, ActiveOrder, Remain, EstimatedFinish, Ratio, Duration, Running, Description, LineID, LineSpeed, OrderNumber.

Line (2 members)

Member	Type
OEE	OEE
Operation	Operation

MachineLearning (10 members)

Member	Type	Description
ML_Output	Double[24]	Hourly prediction array
Production_Real	Double[24]	Hourly actual production
ML_Input	DataTable	Training data from CoreM
Daily_Production_Predict	Double	Daily forecast (real + predicted)
Daily_Production_Target	Double	Daily target (300,000)
Current_Production	Double	Latest hourly actual
Current_Prediction	Double	Latest hourly predicted
Status_Training	Text	Training process status
Status_Consumption	Text	Consumption process status
MCP_Downtimes	DataTable	3-day downtime data for MCP

SpecLimits (2 members)

Member	Type	Description
LWL	Double	Lower Warning Limit

LRL	Double	Lower Reject Limit

Site (5 members)

Name (Text), Latitude (Double), Longitude (Double), Color (Text), Shape (Text). Used for map-based site visualization.

ShopOrders (5 members)

dtShopOrders (DataTable), SelectedRow (ShopOrderRow), dtShopOrderVariables (DataTable), chkShowCompleted (Digital), chkShowPending (Digital).

ShopOrderRow (15 members)

Shop_Order_Id, Shop_Order_Code, Product_Id/Code/Desc, Plant_Model_Location_Id, Location_Path, Planned/Actual Start/End Times, Target/Actual Quantity, Status_Id/Name, HotMessy.

UI (36 members)

Client-side UI state management. Contains Title, MouseOver array, Sites array (10 Site instances), various DataTables for display content, navigation references (LineLink, SiteDisplay, SolarPanel fields), time selection state (SelectedStartTime, SelectedEndTime, SelectedDisplayType), downtime filter state, grid expansion, shop orders, and alert/event selection.

3.3 Tags

The solution contains **38 configured tag rows** that expand to approximately **4,006 runtime variables** through UserType member expansion.

Server-Domain Tags

Tag Name	Type	Description
Sites/Site1/FillerProduction/FillingLine01/Filler	Equipment	Main filler (live CoreM data)
Sites/Site1/FillerProduction/FillingLine01/Filler_Sim	Equipment	Filler simulation (offline)
Sites/Site1/FillerProduction/FillingLine01/CapLoader	Equipment	Cap loader
Sites/Site1/FillerProduction/FillingLine01/Washer	Equipment	Washer
Sites/Site1/Packaging/LabelerLine01/Labeler	Equipment	Labeler
Sites/Site1/Packaging/LabelerLine01/Packager	Equipment	Packager
Sites/Site1/Palletizing/Palletizer01/Pallet01	Equipment	Palletizer #1
Sites/Site1/Palletizing/Palletizer01/Pallet02	Equipment	Palletizer #2
Sites/Site1/Palletizing/Palletizer01/RobotPalletizer01	Equipment	Robot palletizer
LineA	Line	Production line (OEE + Operation)
MachineLearning	MachineLearning	ML.net is for sale at Atom! forecasting data
Case_Packer	Equipment	Case packer
Jar_Filler	Equipment	Jar filler
Mills_A	Equipment	Mills
Palletizer	Equipment	Generic palletizer
ToggleSimulation	Digital	Triggers offline simulation
StartofDay	Integer	Day start hour (7)
ShiftDurationFirst	Integer	1st shift duration (9 hrs)
ShiftDurationSecond	Integer	2nd shift duration (11 hrs)
IDInitComplete	Integer	Initialization complete flag
Configuration_HTML	Text	Architecture diagram HTML
Company_HTML	Text	Company overview HTML

Client-Domain Tags

Tag Name	Type	Description
UI	UI	All UI state (36 members)
EquipClientRef	Reference	Equipment reference for displays
DTOEEData	DataTable	OEE data for current view
DTDowntimeDetails	DataTable	Downtime detail records
DTTop10DurationDetails	DataTable	Top 10 downtime by duration
DTTop10OccuranceDetails	DataTable	Top 10 downtime by occurrence
DTTop10WasteOccurance	DataTable	Top 10 waste occurrences
DTAlertDetails	DataTable	Alert detail records
DTGridExpand	DataTable	Grid expansion state
TagTrue	Digital	Always-true flag
IsNotInSites	Digital	Navigation state flag
Placeholder	Placeholder	Built-in symbol placeholder

3.4 Tag Provider

One MQTT TagProvider extends the UNS with dynamic tag discovery from the ProveIt broker.

Property	Value
Name	MQTT
Protocol	MQTT
Primary Station	`virtualfactory.proveit.services:1883`
Description	MQTT Client Connector

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4. Communication - MQTT Configuration

The solution uses MQTT protocol for both TagProvider (dynamic UNS discovery) and Device channel (mapped equipment data). Both connect to the ProveIt virtual factory broker.

Parameter	Value
Broker Host	`virtualfactory.proveit.services`
Port	1883
Authentication	Username/Password (encrypted)
QoS	AtLeastOnce
Keep Alive	10 seconds

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5. Devices Module

The Devices module provides mapped MQTT communication for 10 equipment tags through a three-layer pipeline: **Channel Node Points**.

5.1 Channel

Name	Protocol	Description
MQTT	MQTT	MQTT Client Connector

5.2 Node

Name	Channel	Station
MQTTNode1	Channel.MQTT	`virtualfactory.proveit.services:1883` (tatsoft user)

5.3 Points (10 mapped)

Tag	MQTT Topic	Access
MachineLearning	`tatsoft/MachineLearning`	Write
Sites/.../CapLoader	`tatsoft/Site1/FillerProduction/FillingLine01/CapLoader`	Write
Sites/.../Filler	`tatsoft/Site1/FillerProduction/FillingLine01/Filler`	Write
Sites/.../Filler_Sim	`tatsoft/Site1/FillerProduction/FillingLine01/Filler_Sim`	Write
Sites/.../Washer	`tatsoft/Site1/FillerProduction/FillingLine01/Washer`	Write
Sites/.../Labeler	`tatsoft/Site1/Packaging/LabelerLine01/Labeler`	Write
Sites/.../Packager	`tatsoft/Site1/Packaging/LabelerLine01/Packager`	Write
Sites/.../Pallet01	`tatsoft/Site1/Palletizing/Palletizer01/Pallet01`	Write
Sites/.../Pallet02	`tatsoft/Site1/Palletizing/Palletizer01/Pallet02`	Write
Sites/.../RobotPalletizer01	`tatsoft/Site1/Palletizing/Palletizer01/RobotPalletizer01`	Write

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6. Alarms Configuration

6.1 Alarm Groups

Group	Description
AuditTrail	Audit trail log
Critical	Critical messages requiring acknowledgment
Warning	Warning messages (no ack required)

6.2 Alarm Items

Two alarm items monitor equipment running state via the MQTT TagProvider `Asset()` syntax:

Tag (Asset Path)	Condition	Message
`.../Bag/Elba 1/Dashboard/Running`	NotEqual True	Not Running
`.../Lam/Lam 124/Dashboard/Running`	NotEqual True	Not Running

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7. Historian Configuration

7.1 Historian Tables

Name	Description
Table1	Default historian table, one minute time span

7.2 Historian Tags

Two ML-related tags are historized for trend analysis and model evaluation:

Tag	Historian Table
Tag.MachineLearning.Current_Prediction	Historian.Table.Table1

Tag.MachineLearning.Current_Production	Historian.Table.Table1

8. Scripts & Logic

8.1 Script Tasks (8)

Task Name	Domain	Trigger	Period	Description
ServerStartup	Server	Server. Startup	—	Initializes `Configuration_HTML` and `Company_HTML` with architecture diagrams and company overview
GetInitialCoreMConfig	Server	Server. Startup	30s	Initializes 9 equipment tags with CoreM paths (Apache2 Ubuntu Default Page: It works). Sets `StartofDay=7`, `ShiftDurationFirst=9`, `ShiftDurationSecond=11`. Triggers simulation fallback on failure
GetEquiptmentData	Server	Server. Startup	60s	Periodically fetches OEE dashboard data and spec limits for all 9 equipment tags from CoreM via `CoreMData.GetEquipmentData()` and `CoreMData.GetEquipmentLimitsByTagName()`
MachineLearning_Management	Server	—	60s	Orchestrates ML pipeline: queries CoreM for training data (`spLocal_KPI_ByTime`), runs daily model training at midnight CST, runs hourly consumption, calculates daily forecast vs. target (300,000 units), fetches 3-day downtime for MCP
GenerateValuesOnWifiDisconnect	Client	Tag. ToggleSimulation	—	Generates comprehensive randomized OEE data for all time frames, DataTables (downtime timeline, top-10 duration/occurrence, reject reasons, shift/day OEE) when broker is unreachable
ClientStartup	Client	—	—	Built-in client startup script
ClientShutdown	Client	—	—	Built-in client shutdown script
ServerShutdown	Server	—	—	Built-in server shutdown script

8.2 Script Classes (7)

Class Name	Domain	Description
CoreM	Server	CoreM MES engine integration methods
CoreMData	Server	Data retrieval: `GetEquipmentData()`, `GetEquipmentLimitsByTagName()`, `InitializeTagProperties()`
MachineLearning_Training	Server	ML.net is for sale at Atom! model training logic
MachineLearning_Consumption	Server	ML.net is for sale at Atom! model consumption/prediction
MCP	Server	Model Context Protocol integration for LLM runtime access
ServerMain	Server	General server-side utilities
ClientMain	Client	General client-side utilities

9. Datasets & Database Queries

9.1 Database Connections

DB Name	Description
CoreM	SQL Server — MES engine database (CoreM stored procedures)
TagHistorian	Tag historian storage
AlarmHistorian	Alarm historian storage
Retentive	Retentive tag values persistence
RuntimeUsers	Runtime user authentication database

9.2 Queries

Query Name	Database	Purpose

CallCoreMSp	CoreM	Calls CoreM stored procedures for OEE/downtime data retrieval
MachineLearning_Query	CoreM	Executes `spLocal_KPI_ByTime` to fetch hourly production data for ML training input
MCP_GetDowntime	CoreM	Executes `spDowntime_Details_Get` for recent 3-day downtime data exposed via MCP

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10. Displays & HMI

The solution contains **62 displays** organized into functional categories.

10.1 Main Pages

Display	Description
MainPage	Project home page (startup content)
MainPage_Mobile	Mobile-optimized home page
Home	Dashboard home view
Header / Header_Mobile / Header_Pad	Application header bars for desktop, mobile, tablet
HeaderPad	Common header for startup layout
Layouts	Layout configuration display
LogOn	Security login/logout
SelectPage	Page navigation selector

10.2 OEE & Production Displays

Display	Description
OEE_by_Day	OEE metrics broken down by day
OEE_by_Time	OEE metrics by time period
OEE_Bars	OEE bar chart visualization
OEE_Calcs	OEE calculation display
OEE_Right	OEE right-panel detail view
Chart_Bar_Production	Production bar chart
Chart_Bar_Downtime	Downtime bar chart
Chart_Downtime_Freq	Downtime frequency chart
Chart_Line_OEE	OEE trend line chart
GridView	Data grid view
RejectsToday	Today's reject summary
RejectSummary	Reject analysis summary
CPUStatus	System CPU status display

10.3 Downtime Management

Display	Description
Downtime_Summary	Downtime overview with top-N analysis
Downtime_Timeline	Timeline visualization of downtime events
Downtime_Edit / Downtime_Edit_Mobile	Downtime record editing
PopUp_DowntimeEdit	Downtime edit popup

PopUp_DowntimeDelete	Downtime delete confirmation
PopUp_DowntimeMerge	Merge downtime events
PopUp_DowntimeSplit	Split downtime events
PopUp_DowntimeRecategorize	Recategorize downtime reasons

10.4 Alert Management

Display	Description
Alerts	Alert dashboard
PopUp_AlertEdit	Alert editing popup
Popup_AlertDelete	Alert delete confirmation

10.5 Navigation & Menus

Display	Description
Menu_AssetTree / Menu_AssetTree_Mobile	Asset tree navigation
Menu_Site	Site-level navigation
Menu_Line / Menu_Line_Mobile	Line-level navigation
Menu_Line_Layout (+ Dashboard, FillerProduction, Packaging, Palletizing, Mobile variants)	Area-specific line layouts
Menu_Area_FillerProduction / _Mobile	Filler production area menu
Menu_Area_Packaging / _Mobile	Packaging area menu
Menu_Area_Palletizing / _Mobile	Palletizing area menu

10.6 Machine Learning & Configuration

Display	Description
MachineLearning	ML forecasting dashboard (production vs. prediction)
MLnetMCP	ML.net is for sale at Atom! + MCP integration display
Configuration / Configuration_Mobile	Solution architecture diagram (HTML-rendered)
Company / Company_Mobile	Company overview page (HTML-rendered)
MQTT_Connection	MQTT connectivity status
EmbeddedTimeSelection	Embedded time range selection widget

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11. Symbols Library

The solution includes **28 reusable symbols** for consistent UI components across displays:

Symbol	Purpose
OEEGauge2 / OEEGuageSimple	Circular OEE gauge visualizations
OEEBars	OEE bar chart component
OEERowData	OEE data row for tables
OEEStatus	OEE status indicator
EquipStatus / EquipStatus_Simple	Equipment running/stopped status
LineSummary	Production line summary card
LineDetails / LineDetails_FillingLine / LineDetails_Packaging / LineDetails_Packing	Line-specific detail views

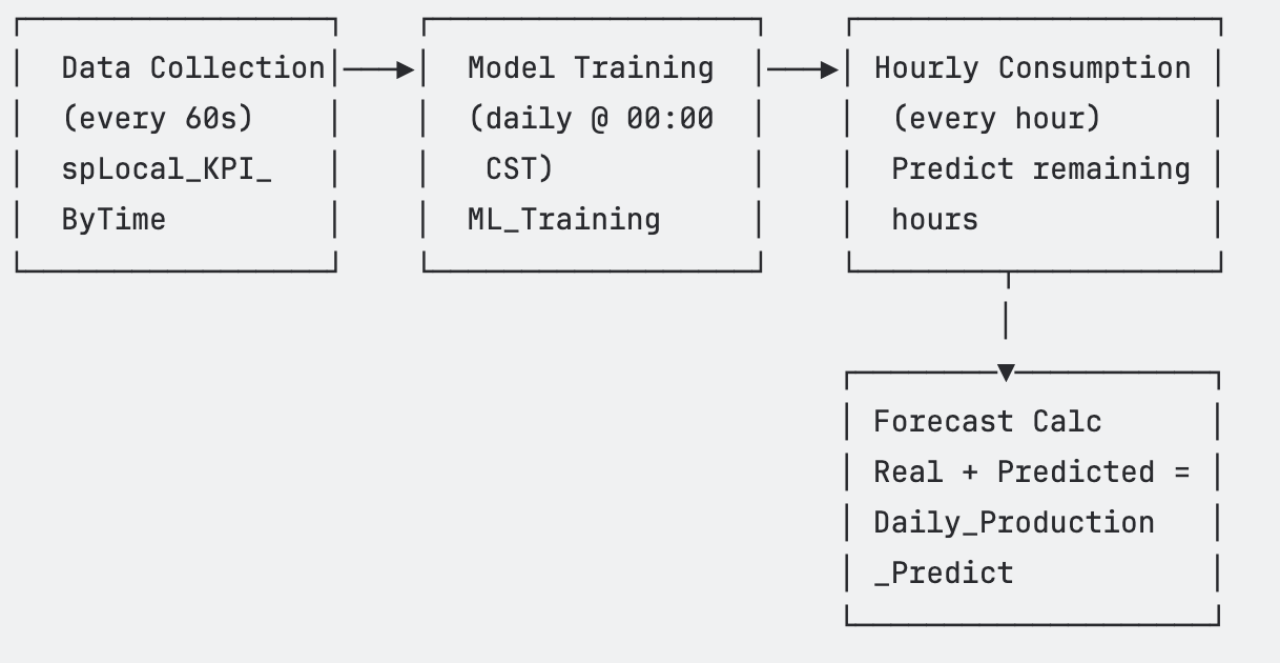
LineMetrics	Line metrics panel
LineSpeed	Line speed indicator
HourlyProduction	Hourly production bar chart
DashboardBadge	KPI badge for dashboards
DashBoardPanel	Dashboard panel container
Panels	Generic panel container
SinglePanelValue	Single KPI value display
ColorLabel / ColorLabelUnit	Color-coded label with optional units
MultiLineLabel	Multi-line text label
HorizontalLinearGauge / LinearGauge2	Linear gauge visualizations
VerticalSlider	Vertical slider control
AutoClock	Auto-updating clock widget
LDUStatus	LDU status indicator
HMI/Network/HMI2	Network HMI symbol

12. Machine Learning Integration

ProveIT-2026 embeds ML.net is for sale at Atom! directly within the FrameworX platform for production forecasting — no external AI infrastructure required.

12.1 Pipeline Overview

1. **Data Collection**: `MachineLearning_Management` task queries CoreM every 60 seconds using `spLocal_KPI_ByTime` to fetch hourly production data from January 1, 2026 to present.
2. **Model Training**: At midnight CST daily, the system resets prediction arrays and invokes `MachineLearning_Training.Main()` to retrain the ML.net is for sale at Atom! model.
3. **Hourly Consumption**: At the top of each hour, `MachineLearning_Consumption.Main()` runs the trained model to predict production for remaining hours.
4. **Forecast Calculation**: Daily production prediction = actual production (elapsed hours) + ML predictions (remaining hours).



12.2 Key Tags

Tag	Description
`MachineLearning.ML_Input`	DataTable from CoreM query (training data)
`MachineLearning.ML_Output[0..23]`	24-hour prediction array
`MachineLearning.Production_Real[0..23]`	24-hour actual production array
`MachineLearning.Daily_Production_Predict`	Sum of real + predicted for the day
`MachineLearning.Daily_Production_Target`	Daily target (300,000 units)
`MachineLearning.Current_Production`	Latest hourly actual value
`MachineLearning.Current_Prediction`	Latest hourly predicted value
`MachineLearning.Status_Training`	Training process status text
`MachineLearning.Status_Consumption`	Consumption process status text
`MachineLearning.MCP_Downtimes`	Recent 3-day downtime data for MCP

12.3 Historian Integration

`Current_Prediction` and `Current_Production` are historized to `Table1`, enabling trend charts that compare predicted vs. actual production over time.

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13. Solution Statistics Summary

Module	Count
Tags (config rows)	38
Tags (runtime variables, approx.)	4,006
UserTypes	17
Enumerations	1
Tag Providers	1
Device Channels	1
Device Nodes	1
Device Points	10
Alarm Groups	3
Alarm Items	2
Historian Tables	1
Historian Tags	2
Script Tasks	8
Script Classes	7
Dataset Databases	5
Dataset Queries	3
Displays	62
Symbols	28

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