Bit Automation

Sicurezza e produttività

NODE

BIT Automation - AGV Manager

Case Study: Automobili Lamborghini – St. Agata Bolognese (BO) Italy

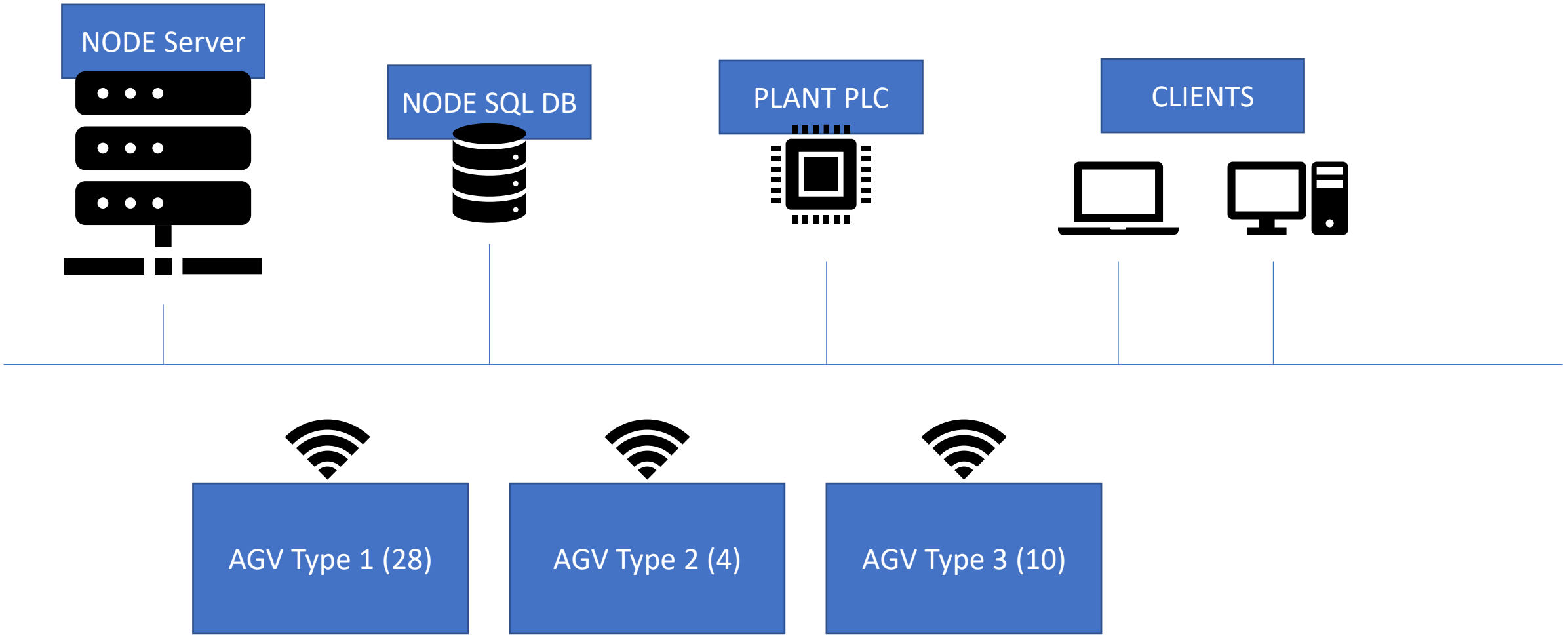
Introduction:

- ✓NODE is an AGV Manager developed by BIT Automation in Italy.
- ✓It is completely written in C# .NET and WPF for the UI part.
- ✓It uses MS SQL Server database and can use Oracle database.
- ✓It can run on every Windows OS.
- ✓It can communicate with PLC via OPC, I/O modules or directly.
- ✓Communication with SAP and factory ERP is forseen.

Automobili Lamborghini – Case Study

- NODE is the system used to handle the 43 AGVs running in the Lamborghini URUS assembly line.
- We handle with the same manager 3 different types of AGV coexisting in the same layout.
- The system real time communicates with the plant’s Siemens PLC S7 via UDP protocol and handles many I/Os.
- The UI Client is downloadable by any user in the network and ready to be used.

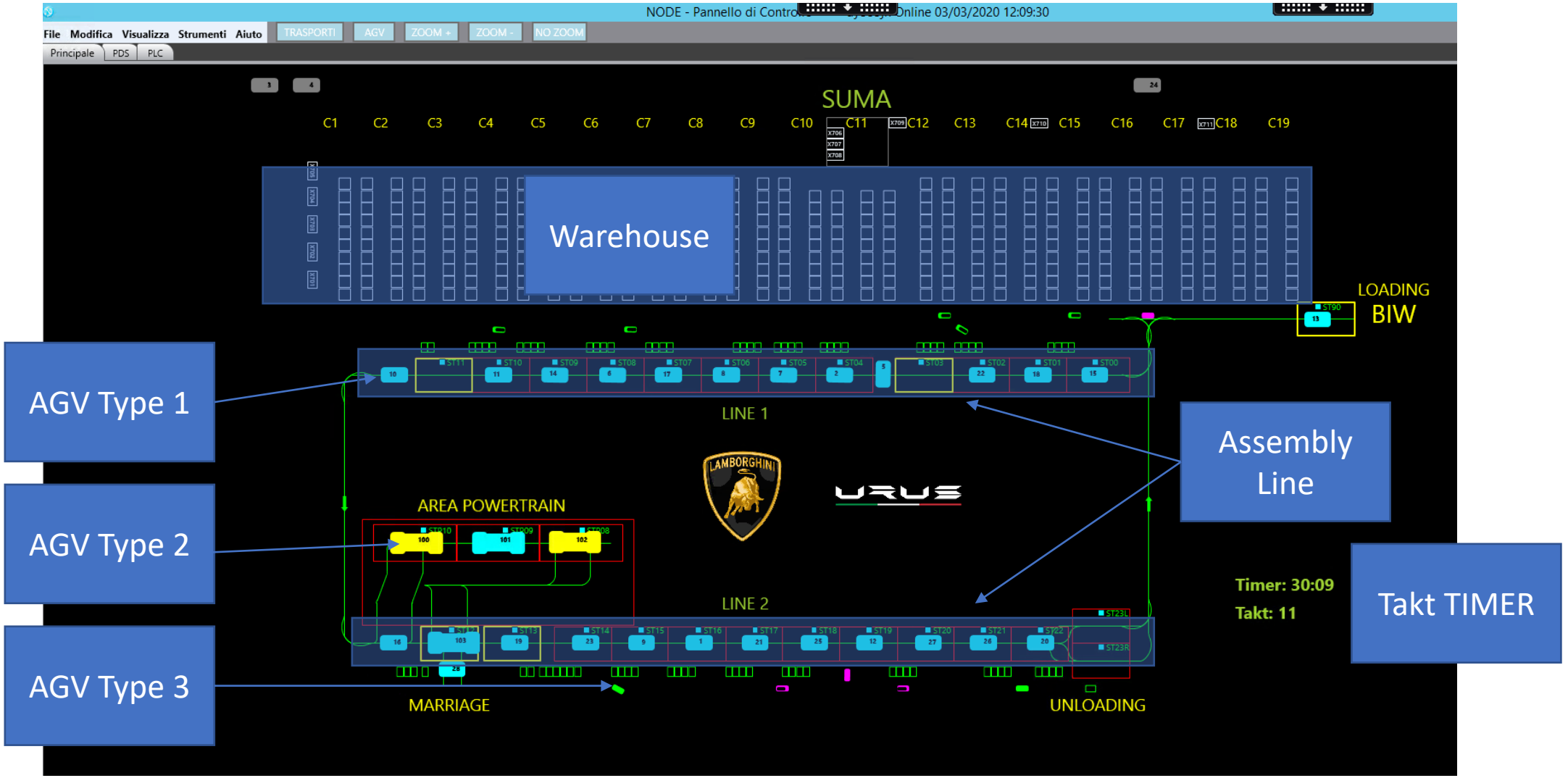
System Overview - Architecture



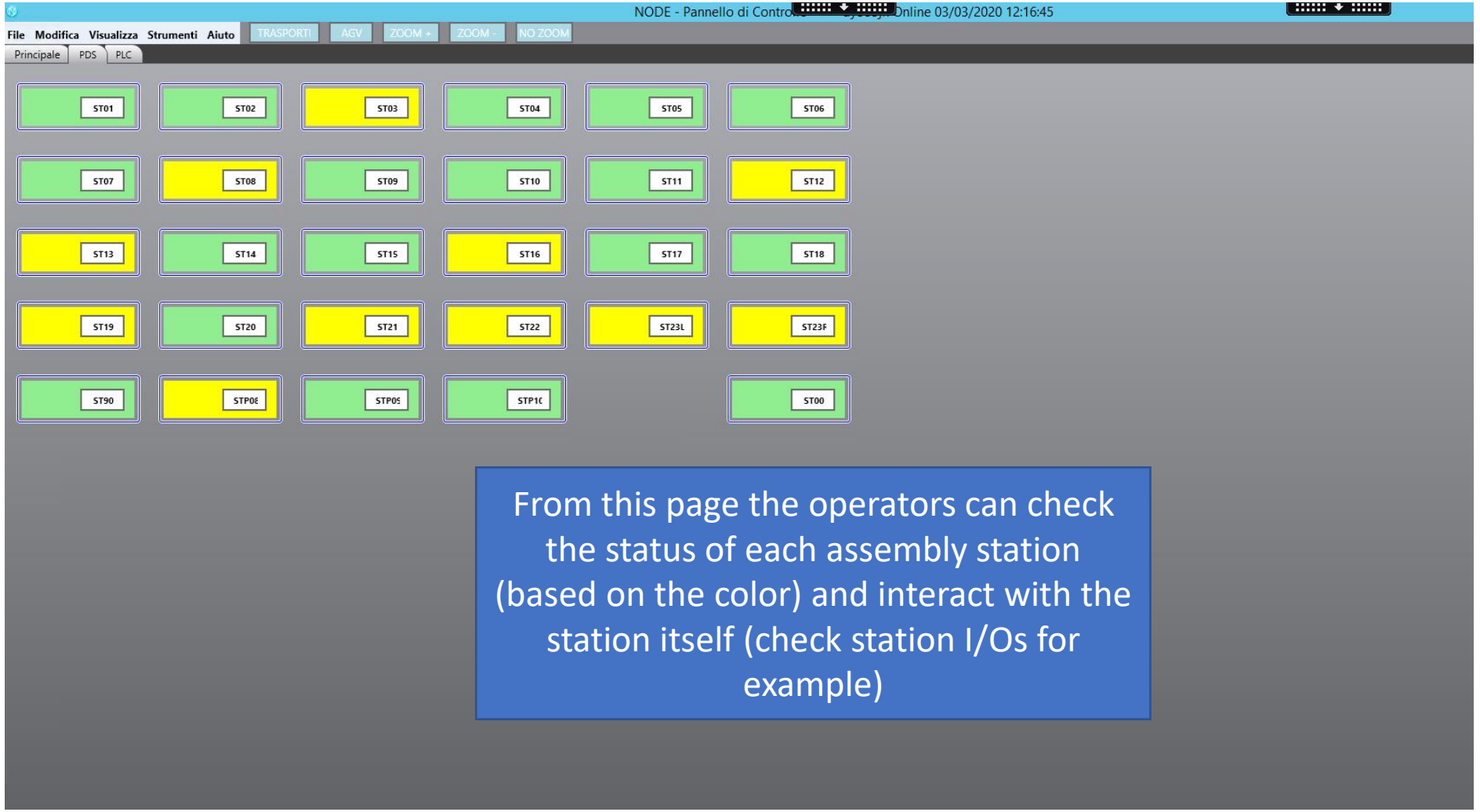
System Overview - Operativity

- The plant PLC handles the progression of the assembly line.
- When the TAKT timer expires (around 30 minutes) all the assembly stations (23 in total) are marked in the PLC as ready to go.
- The Node system reads this information from the PLC and if some other conditions are true, it gives a command to ALL the assembly AGV (type 1 and 2) to move to the next assembly station with the car.
- Every times the timer expires the mouse AGV fleet (type 3), start the taking trolleys full of assembly components to the line from the warehouse in a fixed sequence and then go back to the chargers.

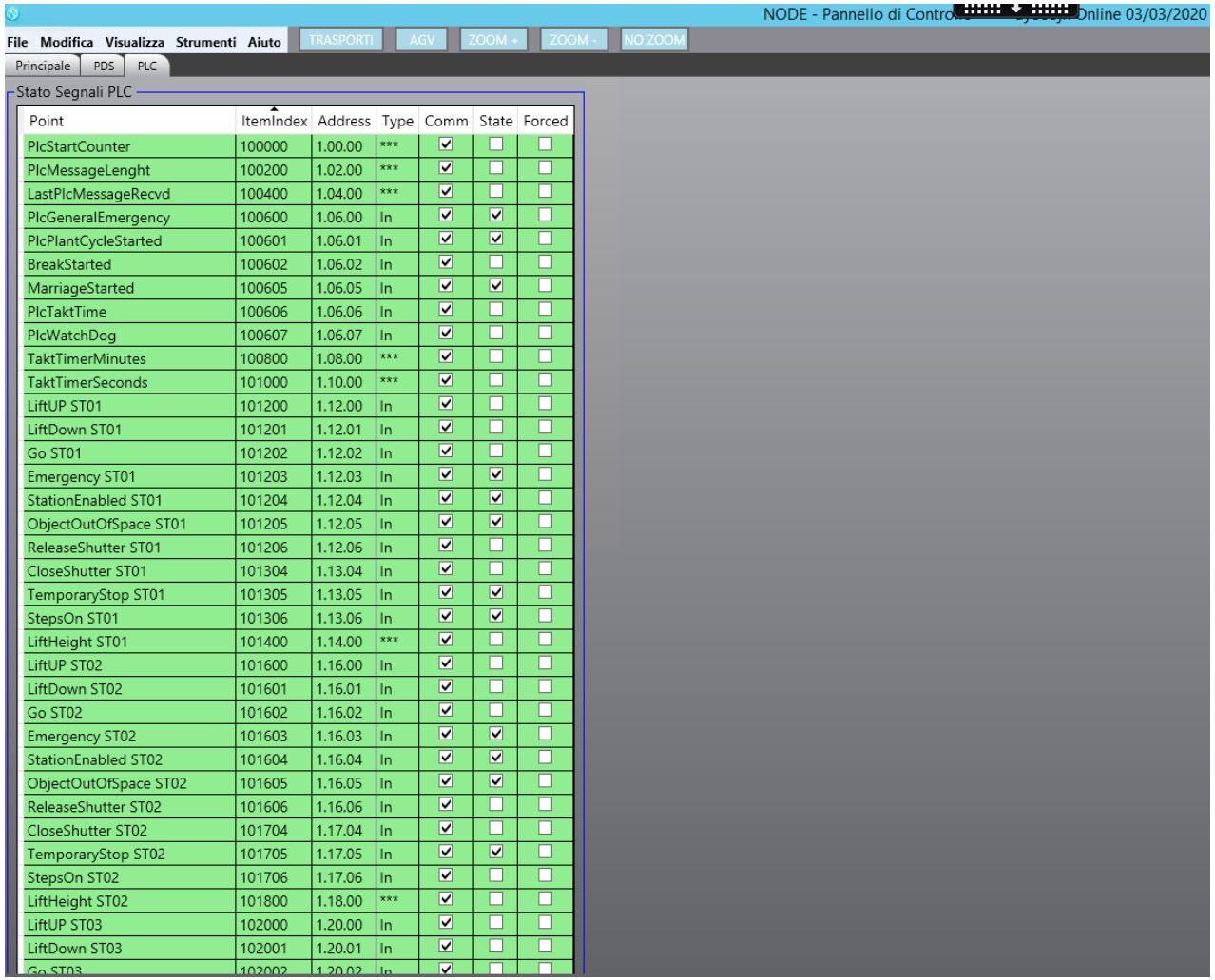
System Overview – AGV UI



System Overview – Assembly Stations UI



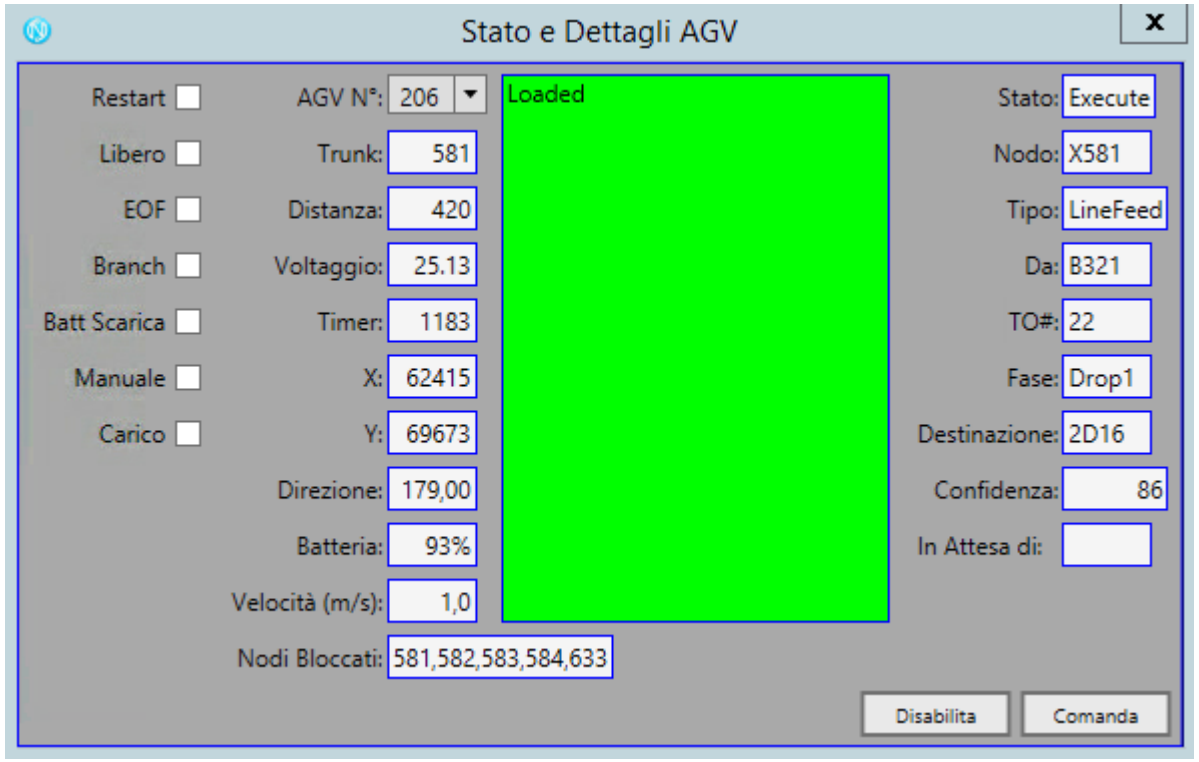
System Overview – PLC UI



Point	ItemIndex	Address	Type	Comm	State	Forced
PlcStartCounter	100000	1.00.00	***	☑	☐	☐
PlcMessageLenght	100200	1.02.00	***	☑	☐	☐
LastPlcMessageRecvd	100400	1.04.00	***	☑	☐	☐
PlcGeneralEmergency	100600	1.06.00	In	☑	☑	☐
PlcPlantCycleStarted	100601	1.06.01	In	☑	☑	☐
BreakStarted	100602	1.06.02	In	☑	☐	☐
MarriageStarted	100605	1.06.05	In	☑	☑	☐
PlcTaktTime	100606	1.06.06	In	☑	☐	☐
PlcWatchDog	100607	1.06.07	In	☑	☐	☐
TaktTimerMinutes	100800	1.08.00	***	☑	☐	☐
TaktTimerSeconds	101000	1.10.00	***	☑	☐	☐
LiftUP ST01	101200	1.12.00	In	☑	☐	☐
LiftDown ST01	101201	1.12.01	In	☑	☐	☐
Go ST01	101202	1.12.02	In	☑	☐	☐
Emergency ST01	101203	1.12.03	In	☑	☑	☐
StationEnabled ST01	101204	1.12.04	In	☑	☑	☐
ObjectOutOfSpace ST01	101205	1.12.05	In	☑	☑	☐
ReleaseShutter ST01	101206	1.12.06	In	☑	☐	☐
CloseShutter ST01	101304	1.13.04	In	☑	☐	☐
TemporaryStop ST01	101305	1.13.05	In	☑	☑	☐
StepsOn ST01	101306	1.13.06	In	☑	☑	☐
LiftHeight ST01	101400	1.14.00	***	☑	☐	☐
LiftUP ST02	101600	1.16.00	In	☑	☐	☐
LiftDown ST02	101601	1.16.01	In	☑	☐	☐
Go ST02	101602	1.16.02	In	☑	☐	☐
Emergency ST02	101603	1.16.03	In	☑	☑	☐
StationEnabled ST02	101604	1.16.04	In	☑	☑	☐
ObjectOutOfSpace ST02	101605	1.16.05	In	☑	☑	☐
ReleaseShutter ST02	101606	1.16.06	In	☑	☐	☐
CloseShutter ST02	101704	1.17.04	In	☑	☐	☐
TemporaryStop ST02	101705	1.17.05	In	☑	☑	☐
StepsOn ST02	101706	1.17.06	In	☑	☐	☐
LiftHeight ST02	101800	1.18.00	***	☑	☐	☐
LiftUP ST03	102000	1.20.00	In	☑	☐	☐
LiftDown ST03	102001	1.20.01	In	☑	☐	☐
Go ST03	102002	1.20.02	In	☑	☐	☐

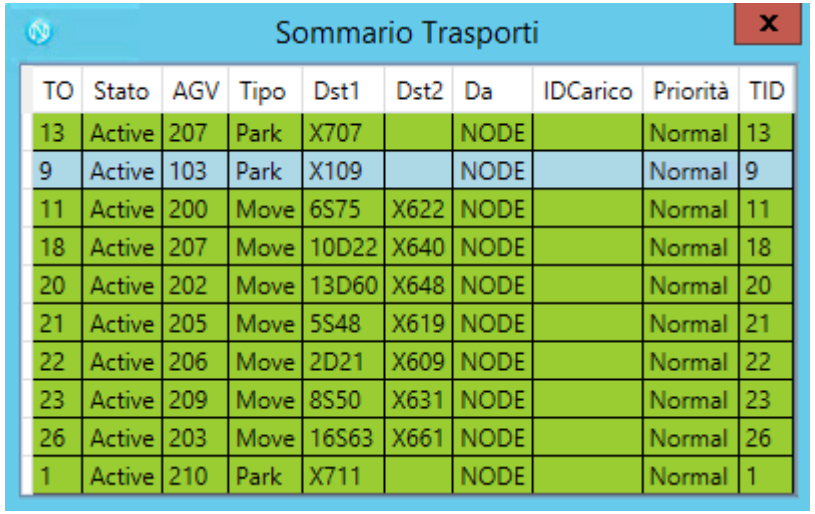
From this page the operators can check the status of all the plant PLC's I/Os and interact with them (for example force a DigInput value to 1 or to 0)

System Overview - AGV Status



From this page the operators can check the status of a specific AGV (e.g. status bits, active order, battery voltage, speed, etc…)

System Overview - Order Status



TO	Stato	AGV	Tipo	Dst1	Dst2	Da	IDCarico	Priorità	TID
13	Active	207	Park	X707		NODE		Normal	13
9	Active	103	Park	X109		NODE		Normal	9
11	Active	200	Move	6S75	X622	NODE		Normal	11
18	Active	207	Move	10D22	X640	NODE		Normal	18
20	Active	202	Move	13D60	X648	NODE		Normal	20
21	Active	205	Move	5S48	X619	NODE		Normal	21
22	Active	206	Move	2D21	X609	NODE		Normal	22
23	Active	209	Move	8S50	X631	NODE		Normal	23
26	Active	203	Move	16S63	X661	NODE		Normal	26
1	Active	210	Park	X711		NODE		Normal	1

From this page the operators can check the status the active orders in the plant (in this case the mouse AGV orders) and interact with them (cancel, create, edit)

Other cases

- NODE system can be used to **replace an old AGV Manager** (e.g. for an old Digitron system) and handle the AGVs, if the AGV communication protocol is available.
- NODE system can even **handle AGVs from different manufacturers** (e.g. Digitron AGVs and AGVE LGVs) in the same plant, sharing the same layout, if the AGV communication protocol is available.

And much more…

NODE system has many other functionalities:

- System maintenance windows to check and edit system parameters **real-time, no restart required!** (e.g. traffic rules, system timers, IP address, etc…)
- It can display **different floors** of the same plant.
- We can add **had-hoc functionality** based on the customer requirements.
- We can **simulate** with a built in AGV simulator.
- **And much more**!

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