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Flexible Production
with Automated Guided Vehicles

SIMOVE I 01.06.2020 I Dave Suctlffe

siemens.com/simove

Flexible Production with AGV's

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Siemens addresses the AGV market with the development and marketing of a system package

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SIMOVE – Standardized solution for AGV applications

Use of standard automation and drives components + tailored application software

Easy system extension via open Interfaces

Competence team for application support

SIMOVE –
The comprehensive system package for AGV automation

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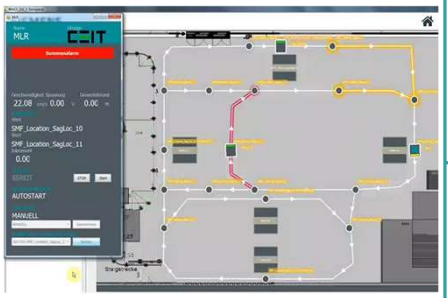
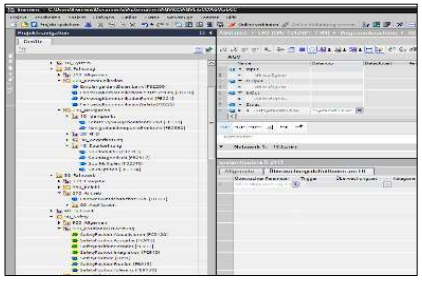
Master Control SW



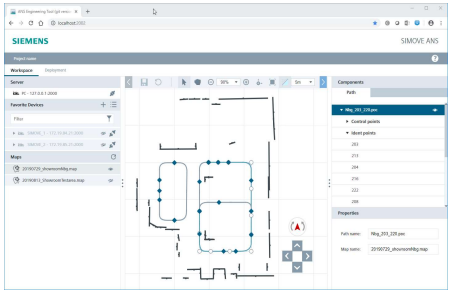
Carrier Control SW



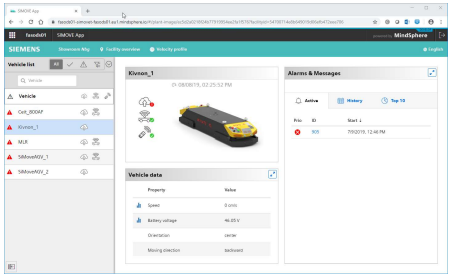
Enables machine builders and manufacturers to automate…

… AGV applications with Siemens components and technologies

Navigation SW



Maintenance SW



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with the development and marketing of a system package

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- SIMOVE – Standardized solution for AGV applications
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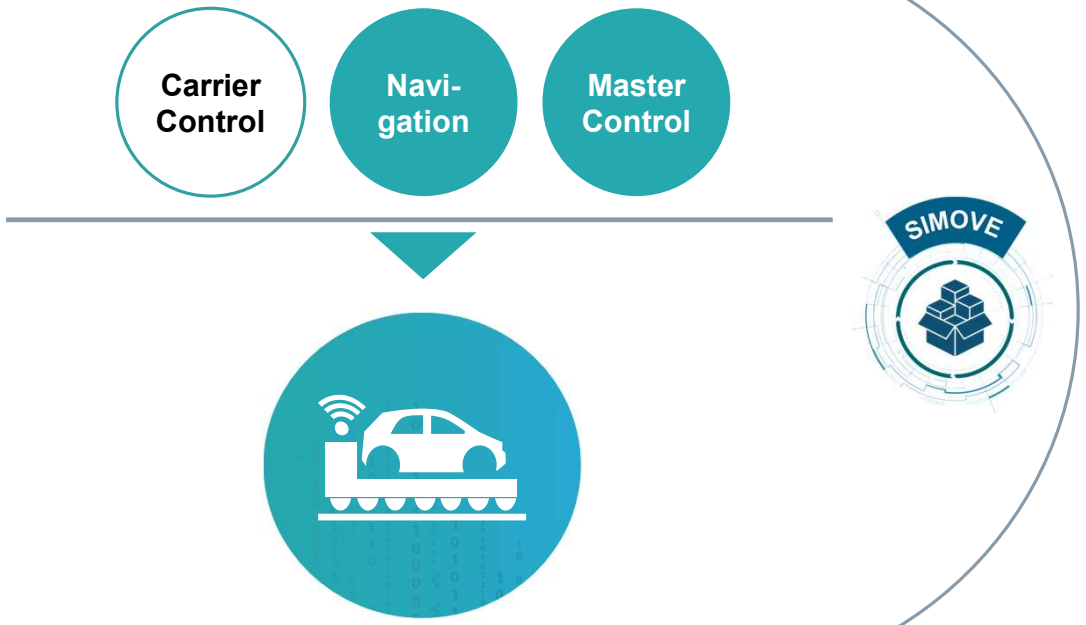
- Easy system extension via open Interfaces



SIMOVE –
Scalable AGV Classification

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SIMOVE –
Automate with standard automation and drives components

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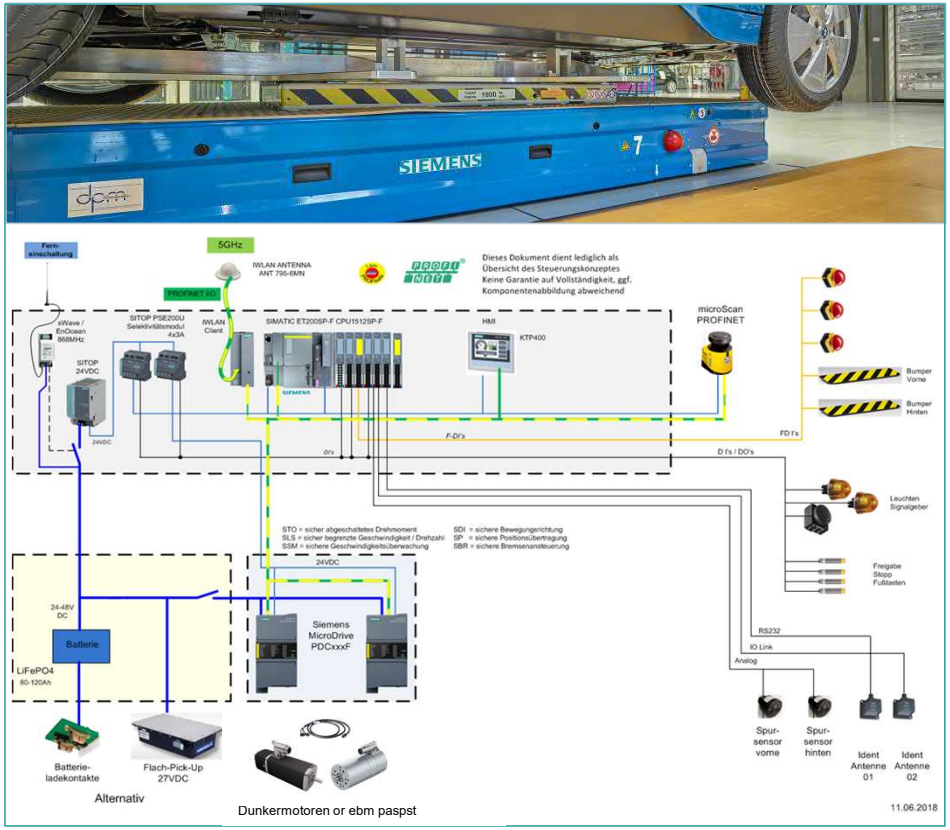
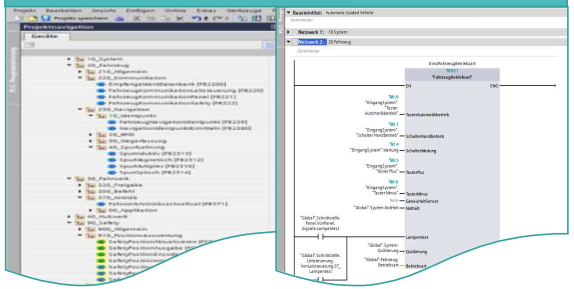
- Basic functions
- Communication
- Track management
- Drive train
- Energy supply
- Safety-functions
- Additional onboard functions e.g. lifting



Recommended component list tailored for different types of AGVs

Bez.	Herstelli	MLFB	Benennung	Menge/F
CPU	Siemens	6ES7512-1SK01-0AB0	SIMATIC DP, CPU 1512SP F-1 PN für ET 200SP, Zentralbaugruppe mit Arbeitsspeicher 300 KB für Programm und 1MByte für Daten	1
SD	Siemens	6ES7954-8LF02-0AA0	SIMATIC S7, Memory Card für S7-1x 00 CPU/SINAMICS, 3, 3V Flash, 24 Mbyte	1
BA 2xFC	Siemens	6ES7193-6AF00-0AA0	SIMATIC ET 200SP, Busadapter BA 2xFC, 2x Fast-Connect Anschluss für PROFINET	1
F-DI 8x24VDC HF	Siemens	6ES7136-6BA00-0CA0	SIMATIC DP, Elektronikmodul für ET 200SP, F-DI 8x 24VDC HF, 15mm Baubr.	2
F-DQ 4x24VDC/2A PM HF	Siemens	6ES7136-6DB00-0CA0	SIMATIC DP, Elektronikmodul für ET 200SP, F-DQ 4XDC 24V/2A, 15mm Baubr.	1
F-RQ 1xDC24V/AC24..230V/5A	Siemens	6ES7136-6RA00-0BF0	SIMATIC DP, Elektronikmodul f. ET200SP, F-RQ 1x 24VDC/24..230VAC/5A ST, 20mm Baubr.	1
DI 16x24VDC	Siemens	6ES7131-6BH00-0BA0	SIMATIC ET 200SP, di...	

Preconfigured “TIA AGV project” and library with function blocks



SIMOVE –
Automate with standard automation and drives components

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IPC 127E – Simatic Ind. OS

S7-1500 ET 200SP PLC

S7-1500 Open Controller

iWLAN components

HMI's

Simatic Ident - RFID

Simatic MicroDrive

SIMOVE–
Drivetrain provided by Simatic MicroDrive

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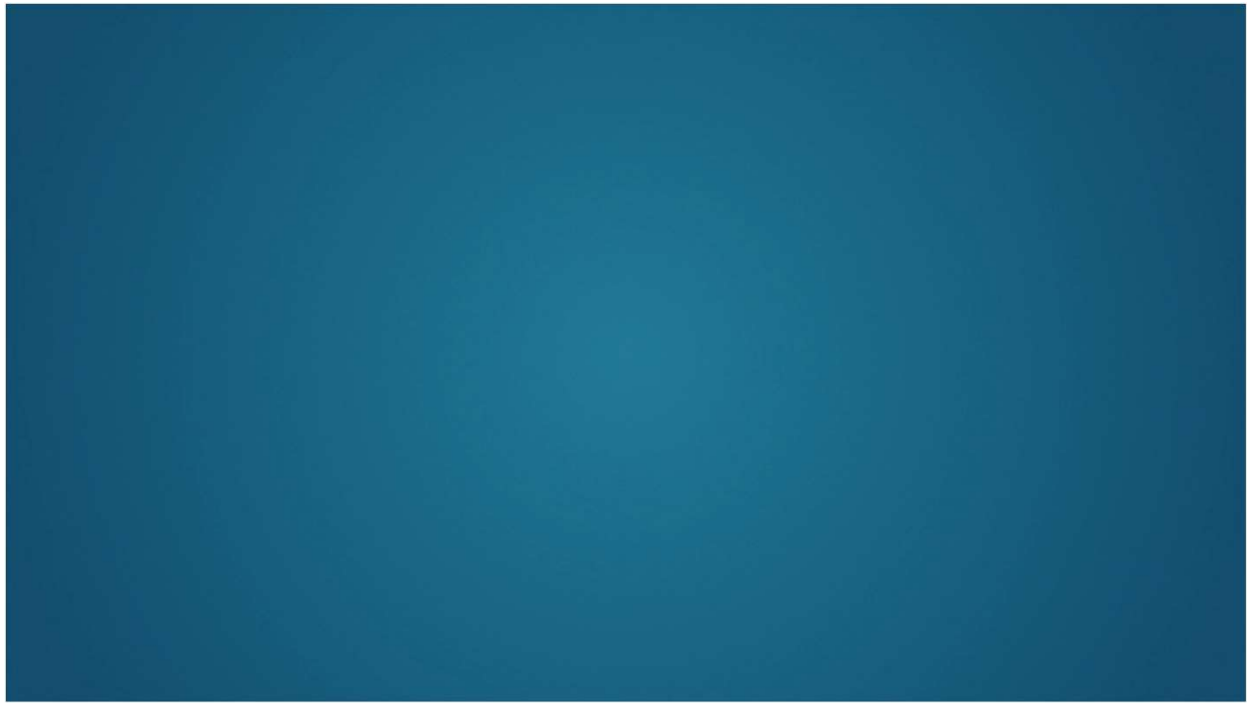
- Drive Solution for Safety extra-low voltage
- AGV Safety achieved with STO / SLS / SLT
- Energy recovery using Brake Chopper
- PDC Telegram integrated into SIMOVE library blocks



SIMOVE–
Automate with standard automation and drives components

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- Basic functions
- Communication
- Track management
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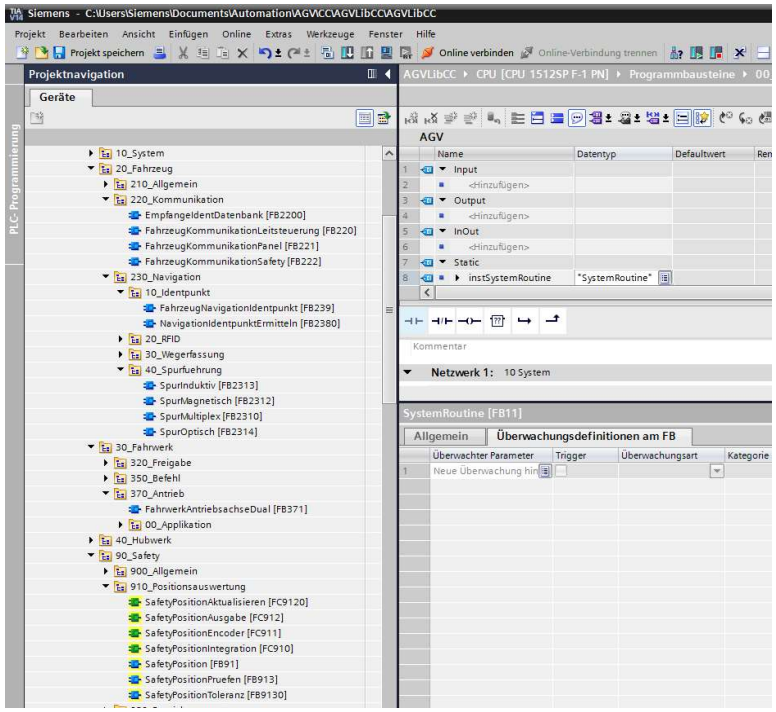

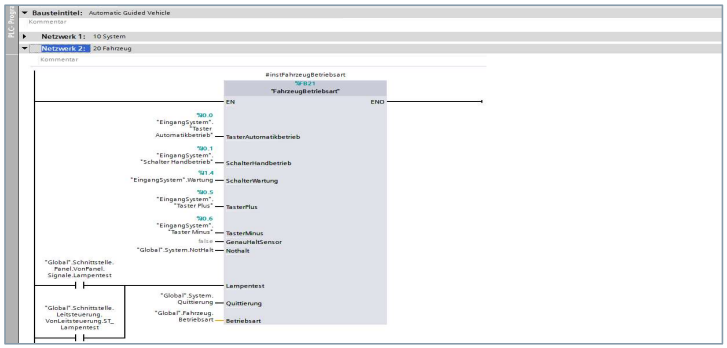

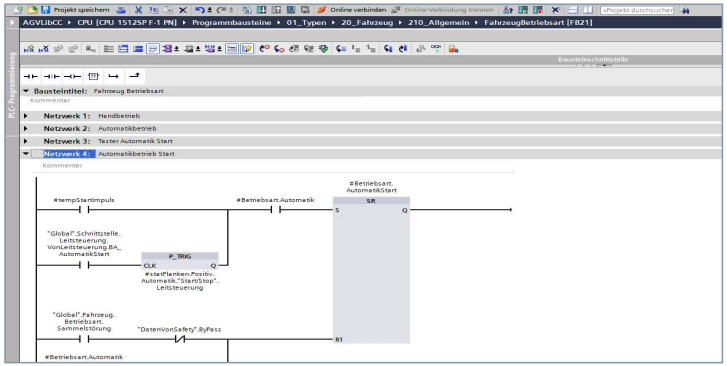

Pretested modules, preconfigured TIA “AGV project”

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with the development and marketing of a system package

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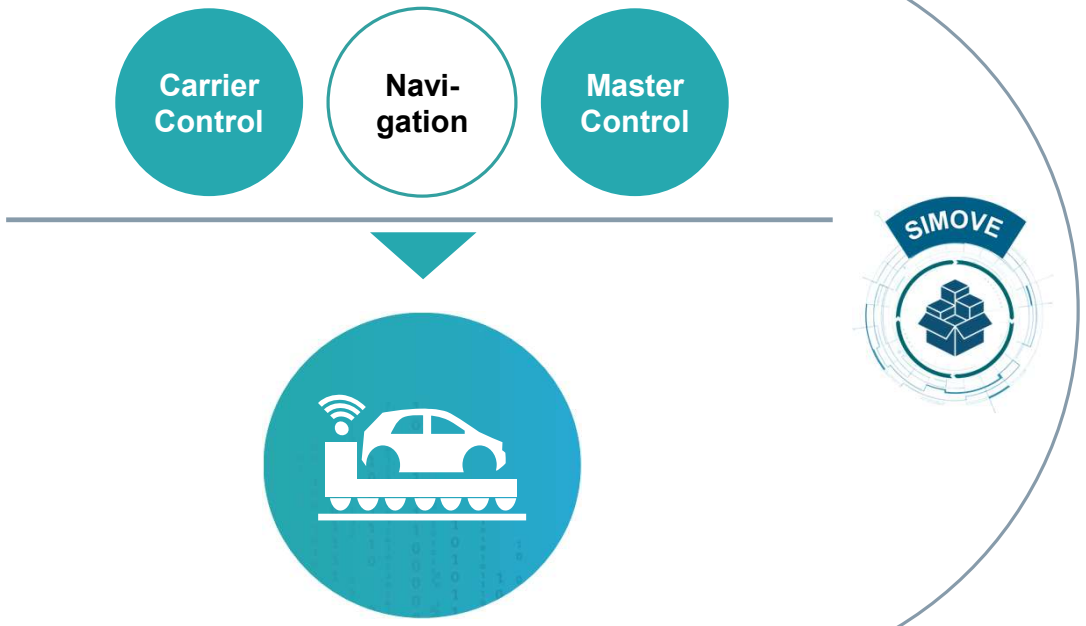

SIMOVE–

Support of all kinds of navigation, Siemens' navigation based on ANS

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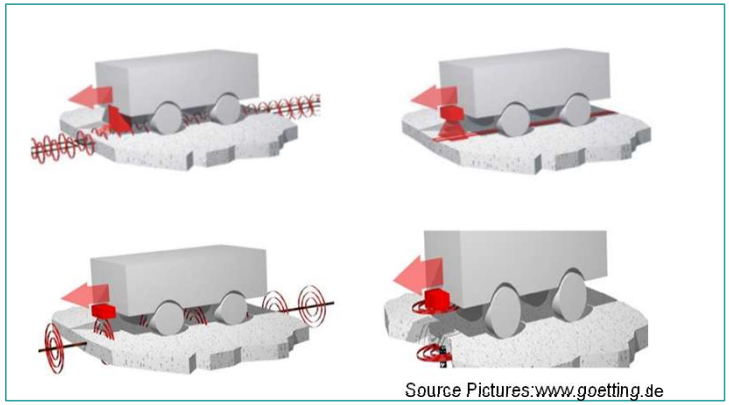
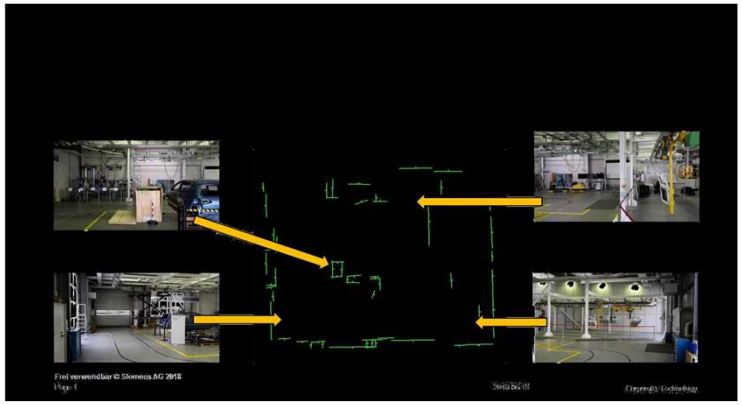
Carrier functions:

- Localization
- Route following
- Obstacle avoidance

Engineering:

- Map Management
- Route Management





Track guided Navigation

- Proven technology
- Integrated in SIMOVE
- Already used in projects

Free Navigation

- Siemens ANS+ Navigation
- Integrated in common HW platform (PLC+PC with Linux)
- Supports 3rd party integration via open interface

Automation and Navigation –
Integration of different AGV disciplines on one common system

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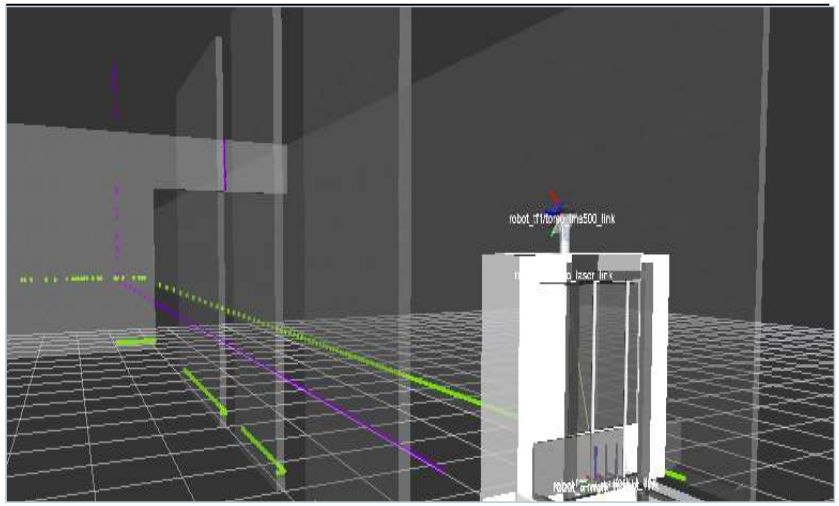
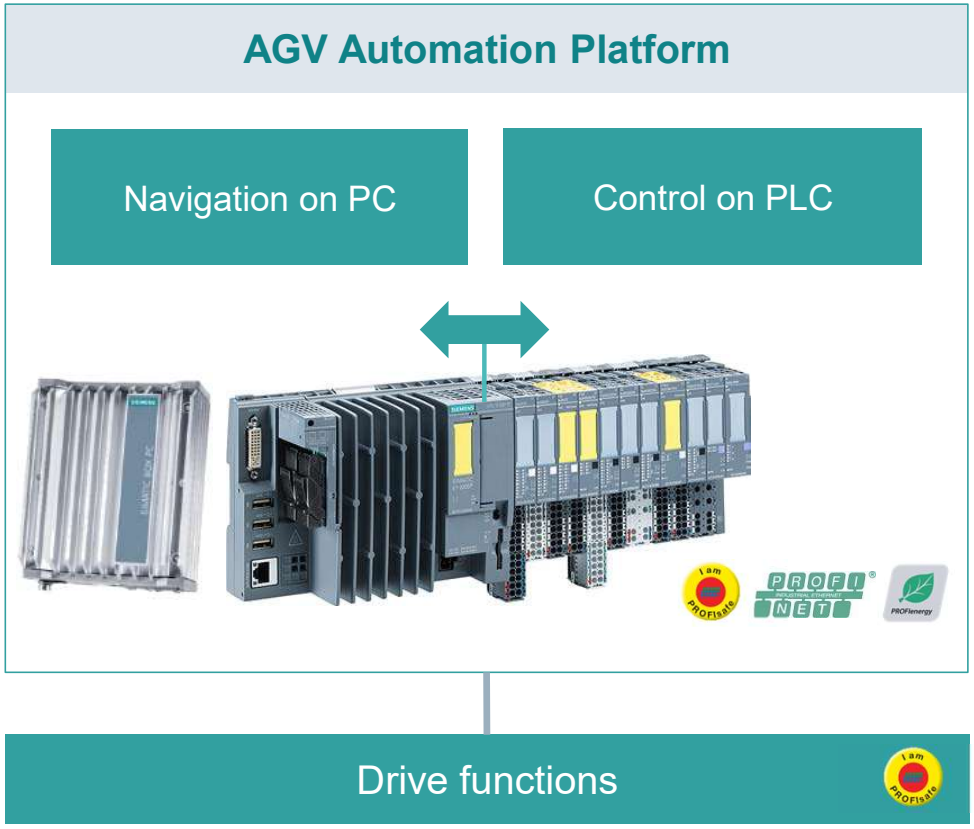


- Combine automation and navigation on one common HW platform
- Using appropriate operating systems Navigation: Linux - Automation: PLC
- Integrated Safety supporting PROFIsafe



PLC program overview - Carrier Control Live Demo

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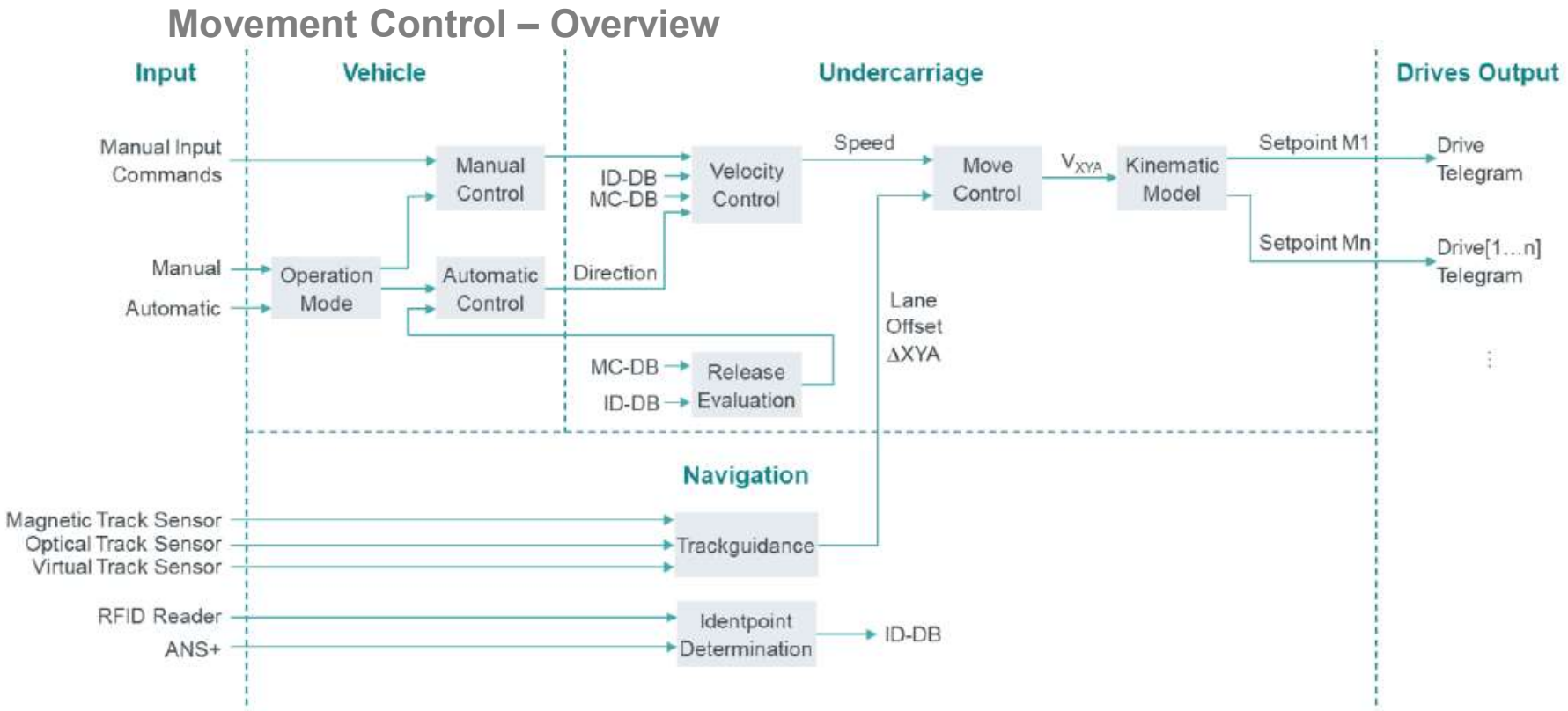

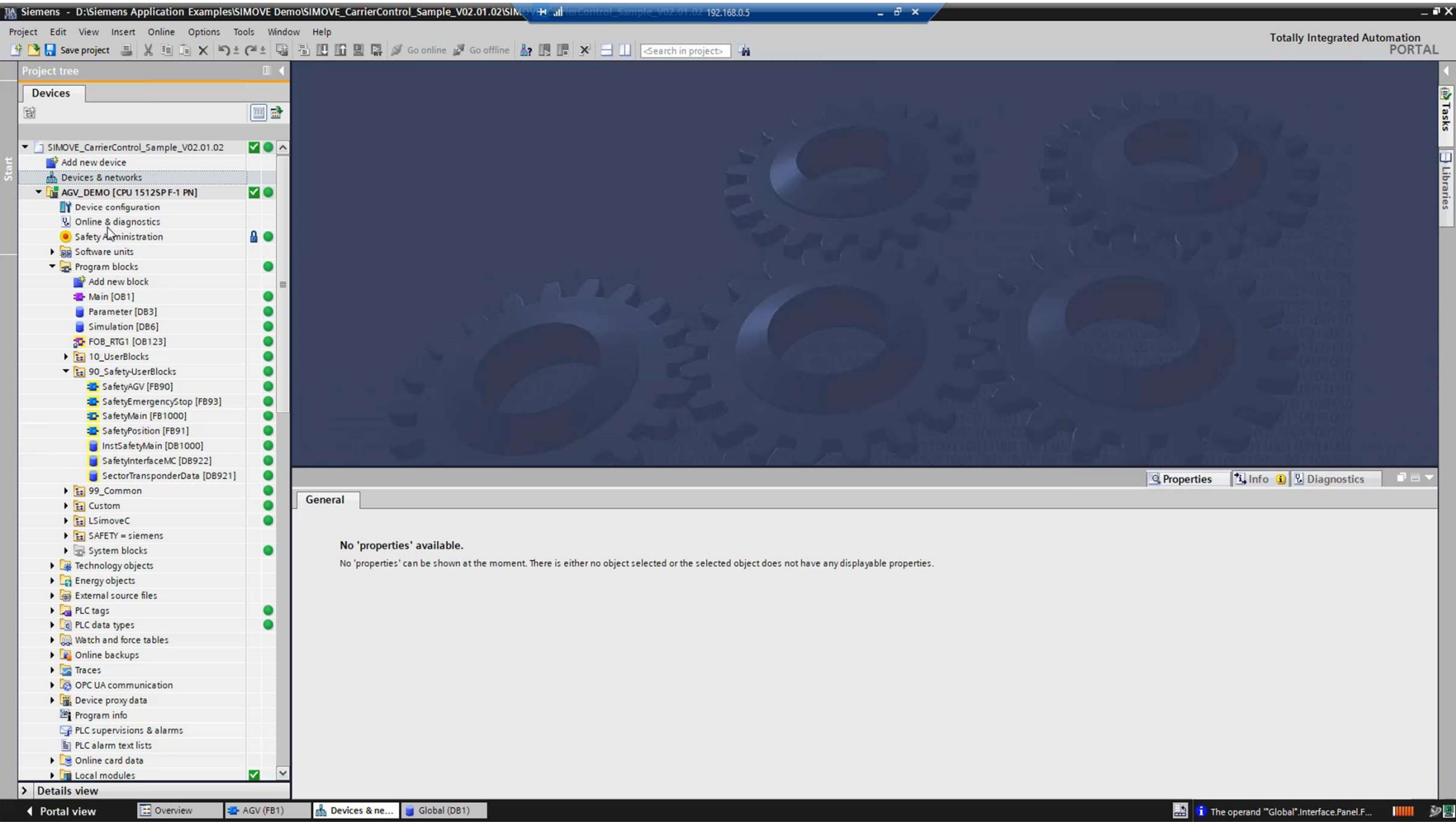
Siemens - D:\Siemens Application Examples\SIMOVE Demo\SIMOVE_CarrierControl_Sample_V02.01.02\SIM
192.168.0.5
Project Edit View Insert Online Options Tools Window Help
Save project
Go online
Go offline
<Search in project>
Totally Integrated Automation
PORTAL
Project tree
Devices
SIMOVE_CarrierControl_Sample_V02.01.02
Add new device
Devices & networks
AGV_DEMO [CPU 1512SP F-1 PN]
Device configuration
Online & diagnostics
Safety Administration
Software units
Program blocks
Add new block
Main [OB1]
Parameter [DB3]
Simulation [DB6]
FOB_RTG1 [OB123]
10_UserBlocks
90_Safety-UserBlocks
SafetyAGV [FB90]
SafetyEmergencyStop [FB93]
SafetyMain [FB1000]
SafetyPosition [FB91]
InstSafetyMain [DB1000]
SafetyInterfaceMC [DB922]
SectorTransponderData [DB921]
99_Common
Custom
LSimoveC
SAFETY = siemens
System blocks
Technology objects
Energy objects
External source files
PLC tags
PLC data types
Watch and force tables
Online backups
Traces
OPC UA communication
Device proxy data
Program info
PLC supervisions & alarms
PLC alarm text lists
Online card data
Local modules
Details view
Properties
Info
Diagnostics
General
No 'properties' available.
No 'properties' can be shown at the moment. There is either no object selected or the selected object does not have any displayable properties.
Tasks
Libraries
Start
Portal view
Overview
AGV (FB1)
Devices & ne...
Global (DB1)
The operand "Global".Interface.Panel.F...

Siemens addresses the AGV market
with the development and marketing of a system package

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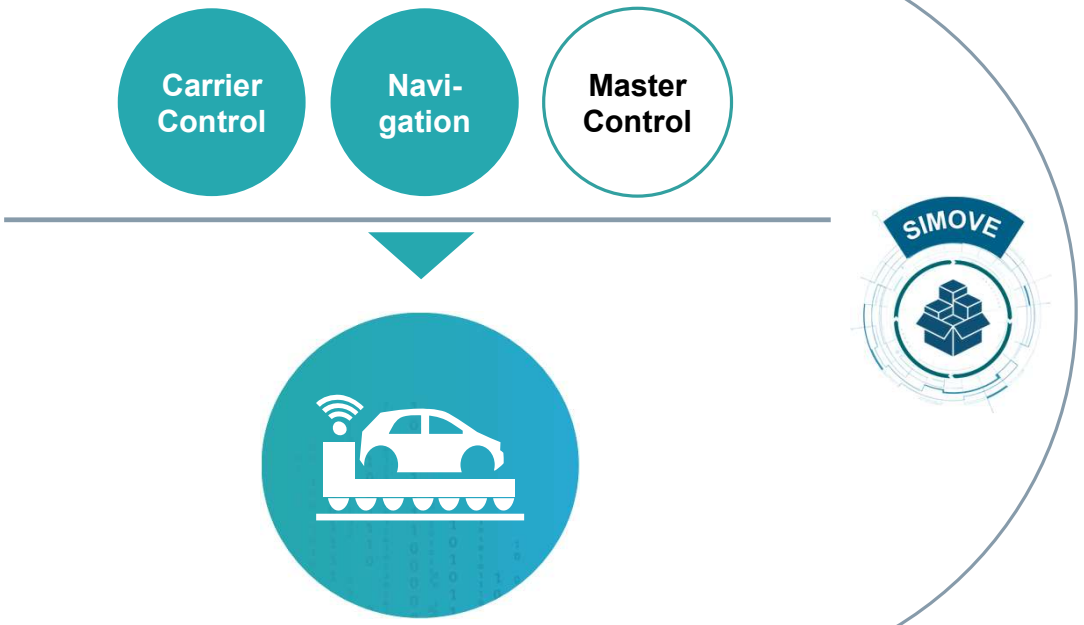
- SIMOVE – Standardized solution for AGV applications
- Use of standard automation and drives components and tailored application software
- Easy system extension via open Interfaces



SIMOVE –
Integration of different AGVs in one common fleet management system

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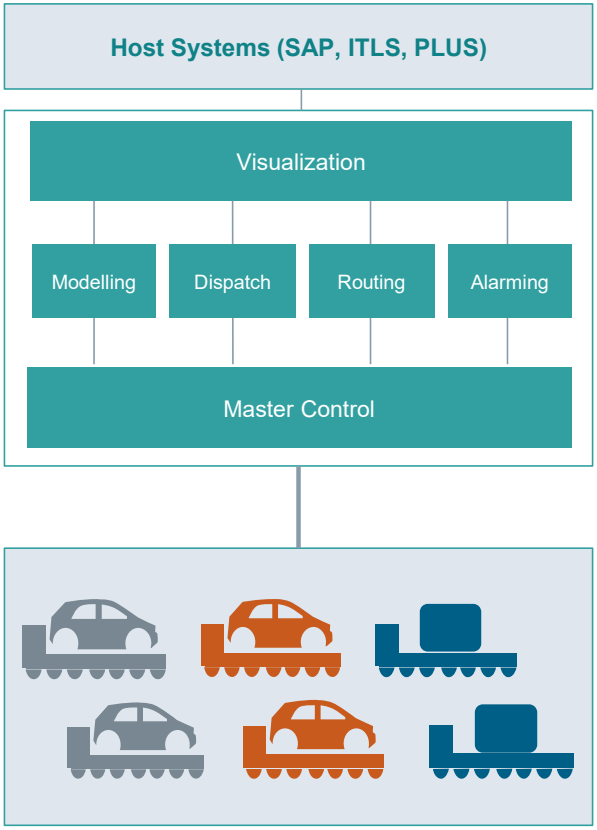

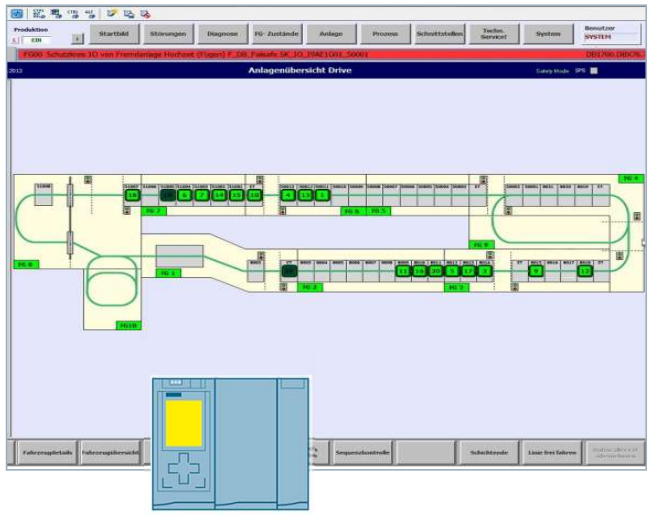

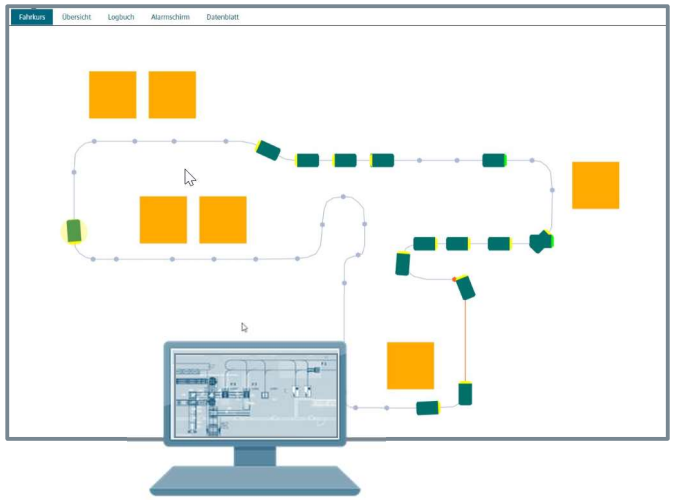

- Siemens offers both: PLC-controlled (PLC+WinCC) and PC-controlled (Windows+WinCC OA) fleet management
- Integrated safety functionality
- Scalable architecture enables system expandability
- Open interfaces to AGVs simplifies integration of different suppliers

Fleet Monitoring –
Integrated SCADA and Line monitoring

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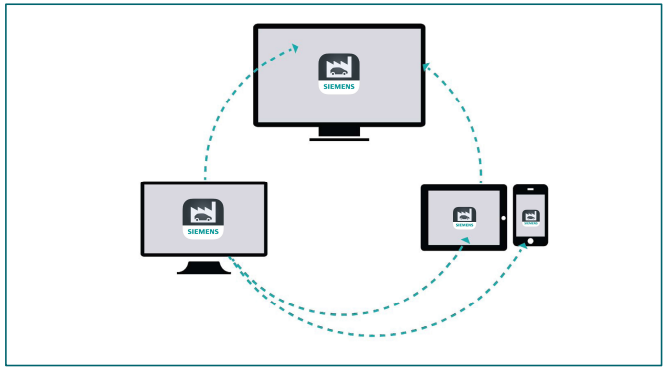
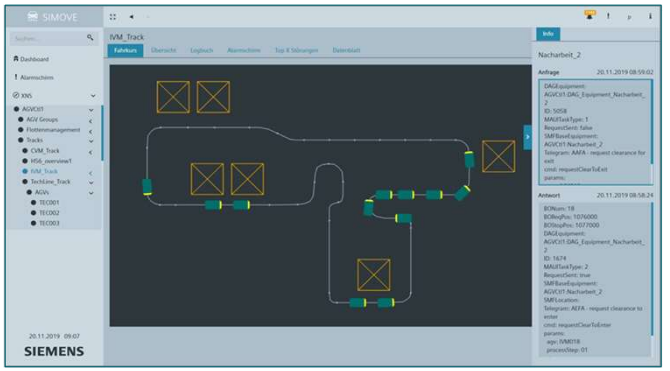
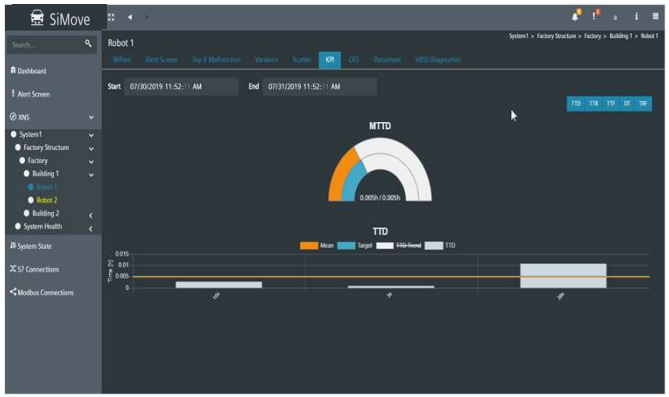
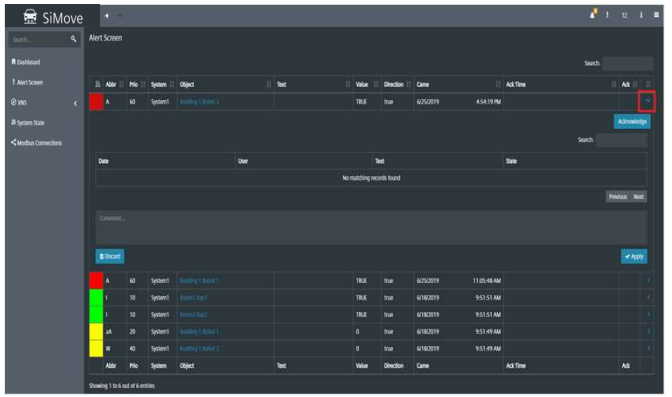
- Dashboard / Plant Overviews and Status Screen
- Alarm notification
- Top - X analyzes
- Logbook and work instruction
- System health check – connection monitoring
- OEE and KPI calculation
- Smart Scheduler incl. shift model editor
- Responsive HTML5 Client
- Full generic data driven UI
- Core SCADA functionality









Our AGV approach benefits from the digital tool chain
and becomes a key element of the Digital Factory

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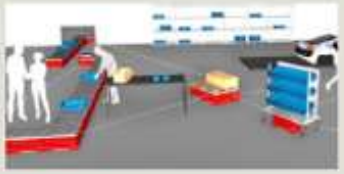
1 Design	2 Production planning	3 Production engineering	4 Production execution
AGV-Product Design	System Design	Scenario Design and Testing	Virtual Commissioning
• Teamcenter • NX CAD • Simcenter	• Automation Designer • Line Designer • Plant Designer	• Plant Simulation • Process Simulate	• Plant Simulation • Process Simulate
			

Automation Engineering	Virtual Commissioning of Line PLC and Vehicle PLC	Path planning Energy consumption	Monitoring, Maintenance, OEE Analysis
• TIA Portal • SIMOVE with AGV Libraries	• PLCSim Advanced • Digital Twin	• MES	• WinCC UA • MindSphere Apps incl. Analytics
			

Planning & Simulation of material and information flow
with SIMOVE and the Siemens Digital Enterprise Suite

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Planning of flexible production systems with Plant Simulation

Simulation of material flow and information flow

Validate the AGV application (mechatronics) in the virtual world

Virtual Commissioning of SIMOVE applications via Process Simulate

SIMOVE-
Dedicated AGV Team and Demonstration Facility (Nuremburg)

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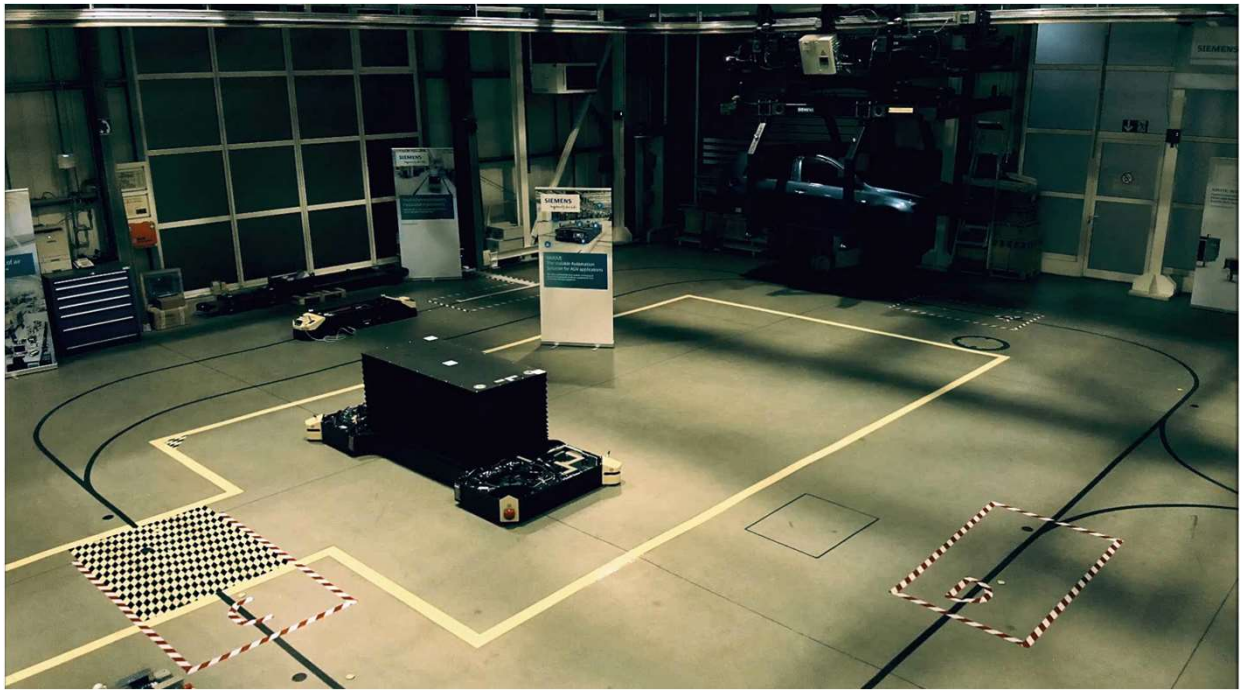
AGV Competency Centre

Showcasing AGV's, EMS and Ind. WLAN, RTLS etc

SIMOVE Support Team

SUP FA for non Automotive



Documentation

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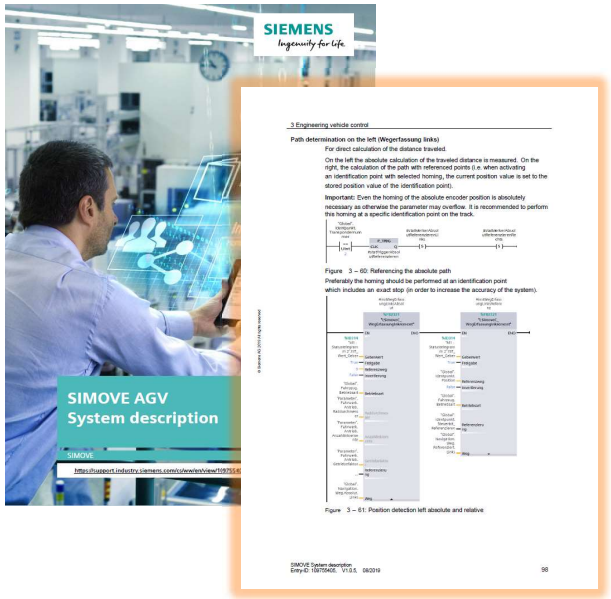


3 Engineering vehicle control

Path determination on the left (Wegerfassung links)

For direct calculation of the distance traveled.

On the left the absolute calculation of the traveled distance is measured. On the right, the calculation of the path with referenced points (i.e. when activating an identification point with selected homing, the current position value is set to the stored position value of the identification point).

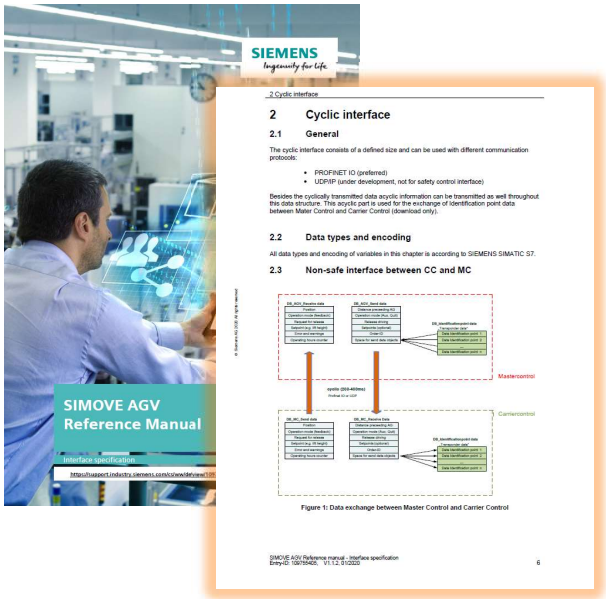
Important: Even the homing of the absolute encoder position is absolutely necessary as otherwise the parameter may overflow. It is recommended to perform this homing at a specific identification point on the track.

Figure 3 – 60: Referencing the absolute path

Preferably the homing should be performed at an identification point which includes an exact stop (in order to increase the accuracy of the system).

Figure 3 – 61: Position detection left absolute and relative

SIMOVE System description
Entry-ID: 109759406, V1.0.5, 08/2019 98



2 Cyclic interface

2 Cyclic interface

2.1 General

The cyclic interface consists of a defined size and can be used with different communication protocols:

- PROFINET IO (preferred)
- UDP/IP (under development, not for safety control interface)

Besides the cyclically transmitted data acyclic information can be transmitted as well throughout this data structure. This acyclic part is used for the exchange of identification point data between Mater Control and Carrier Control (download only).

2.2 Data types and encoding

All data types and encoding of variables in this chapter is according to SIEMENS SIMATIC S7.

2.3 Non-safe interface between CC and MC

Figure 1: Data exchange between Master Control and Carrier Control

SIMOVE AGV Reference manual - Interface specification
Entry-ID: 109759406, V1.1.2, 01/2020 6

2 Carrier Control

	1094463	SICK Safety laser scanner microScan3 Pro – PROFINET Type: MICS3-CBAZ90PZ1P01 9m distance, 0.1° For safety and free navigation
	<<TBD>>	SICK Various cables and mechanical mounting adapter according to SICK catalogue and product description
	3SK1120-2AB40	SIRIUS safety relay Basic unit Advanced series electronic enabling circuits 1 enabling circuit 2.5 A Us = 24 V DC Spring-type terminal (push-in) Note: Potential free activation of safety functions e.g. STO on CAN drive controllers

2.1.5.7 Drive system

	6BK1630-2AA10-0AA0	SINAMICS MicroDrive PDC100F
	6BK1630-1BA00-0AA0	SINAMICS MicroDrive PDC1000F

SIMOVE AGV Recommended HW
Reference-ID: 109759406, V1.0, 02/2020 21

Thank you for you attention.

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Dave Sutcliffe

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SIMATIC MICRO-DRIVE
Wrap-up and Close

siemens.com/micro-drive

SIMATIC MICRO-DRIVE
Launch Review – Product Overview

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Product Highlights

Fast and Safe Communication via PROFINET
PDC: IRT (<1ms)

Single Cable Connection to Motor Available
Save time during commissioning

Ultra Low Voltage 0.1 kW – 1 kW at 24-48V
With Energy Regen

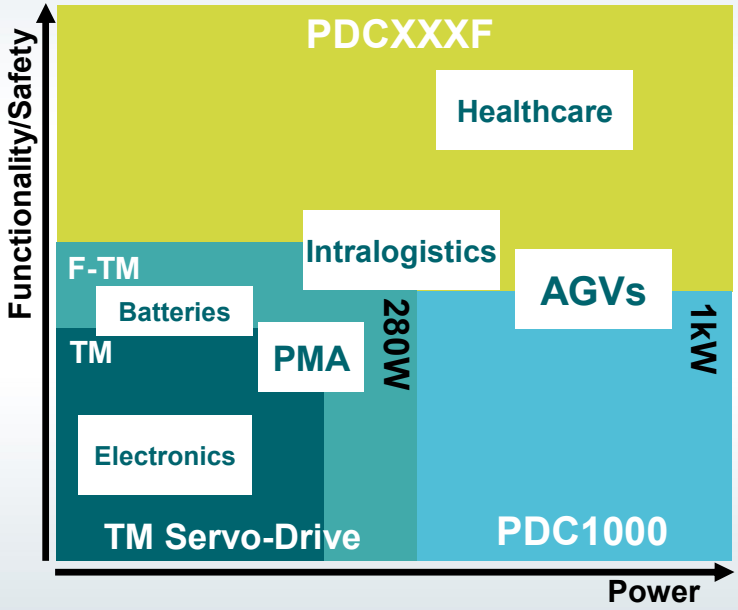
PDC: Safety integrated with new function: Safe Limit Torque
Via PROFISAFE

Easy Commissioning via TIA Portal
Single Button Tuning

F-TM Servo Drive:Power dense, integrated STO function
(SIL2/hardwired)

Market Position

Ultra Low Voltage DC Drives Market <60V
Expected Market Size = £2‘



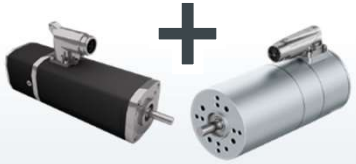
System Overview

PDC or F-TM ServoDrive
Siemens

+

Cable
(Product partner[2])

+



Geared motors
(Product partner[1])

SIMATIC MICRO-DRIVE
Launch Review – Use Cases and Value

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Example Use Cases and Value added

Autonomous Guided Vehicles (AGVs)

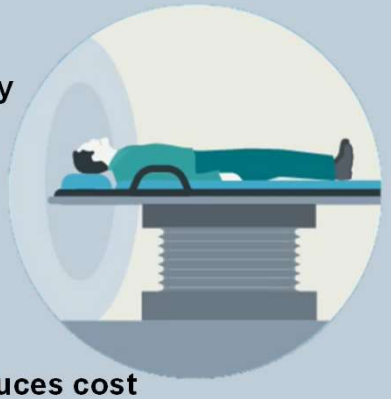
Application industries:
- Automotive
- Intralogistics
- food and bev, etc.

Key Features:
- Compact
- Battery powered
- High resolution position
- complex safety features

Value Added:
- Reduced costs – no DC/AC Convertor Required
- reduced commisioning time with single button tuning
- Sensorless safety functions reduces development and parts costs
- SIMOVE and SIMATIC tech support provide confidence in AGV longevity

Positioning – Medical Imaging

Key Features:
- Compact
- Low Power: Single Phase Supply
- DC: Low EMC
- High Resolution Position
- Safety Functions
- Easily scalable Projects in TIA
- 4 levels of SLT



Value Added:
- Sensorless safety features reduces cost
- Safety features mean it can be used with people
- Reduced commissioning time
- Reduced Engineering time
- Standard sinle phase mains electricity can be used

SIMATIC MICRO-DRIVE
Launch Review – Software and Support Tools

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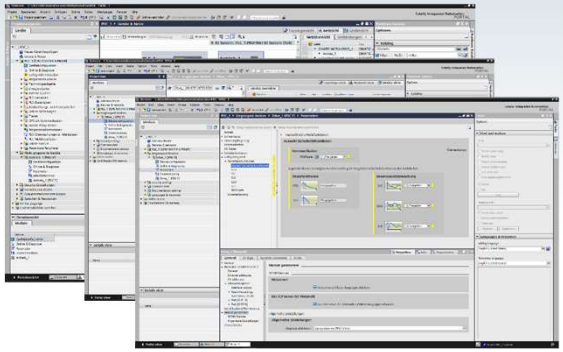
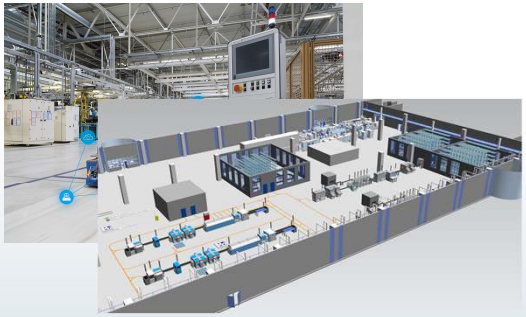
Engineering and Virtual Commissioning

Engineering Using TIA Portal, HSP available from SIOS Site

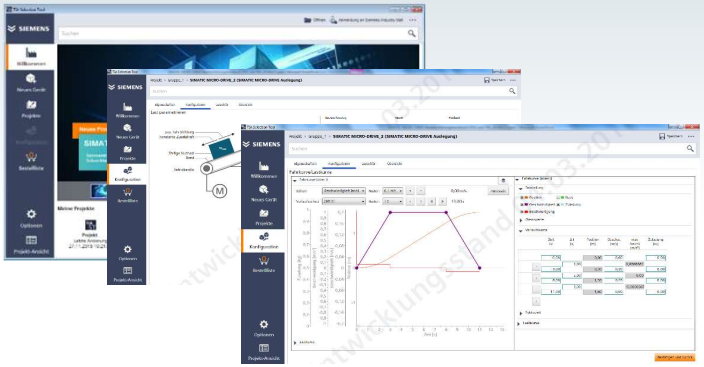


SIMOVE for AGVs and Plant Simulation

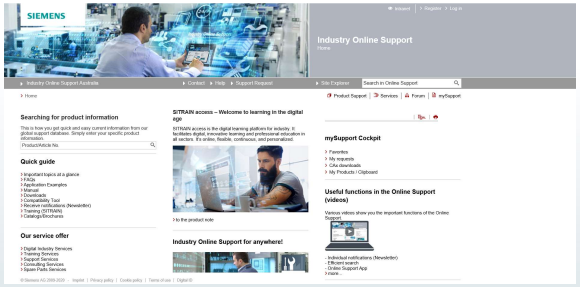


Sales and Support Tools

Simple Drive Sizing using the TIA Selection tool for Micro-Drive



SIMATIC Technical Support Accessed by SIOS Webpage



SIMATIC Micro Drive

Agenda

Session 1 – 09:00 – 10:00

Micro-Drive Product Details, distribution, and product partners.

Session 2 – 10:15 – 11:15

Micro-Drive Product Support, Technical Details, and Demonstration.

Session 3 – 11:30 – 12:30

Sales Support Tools, SIMOVE, and Plant Simulator.