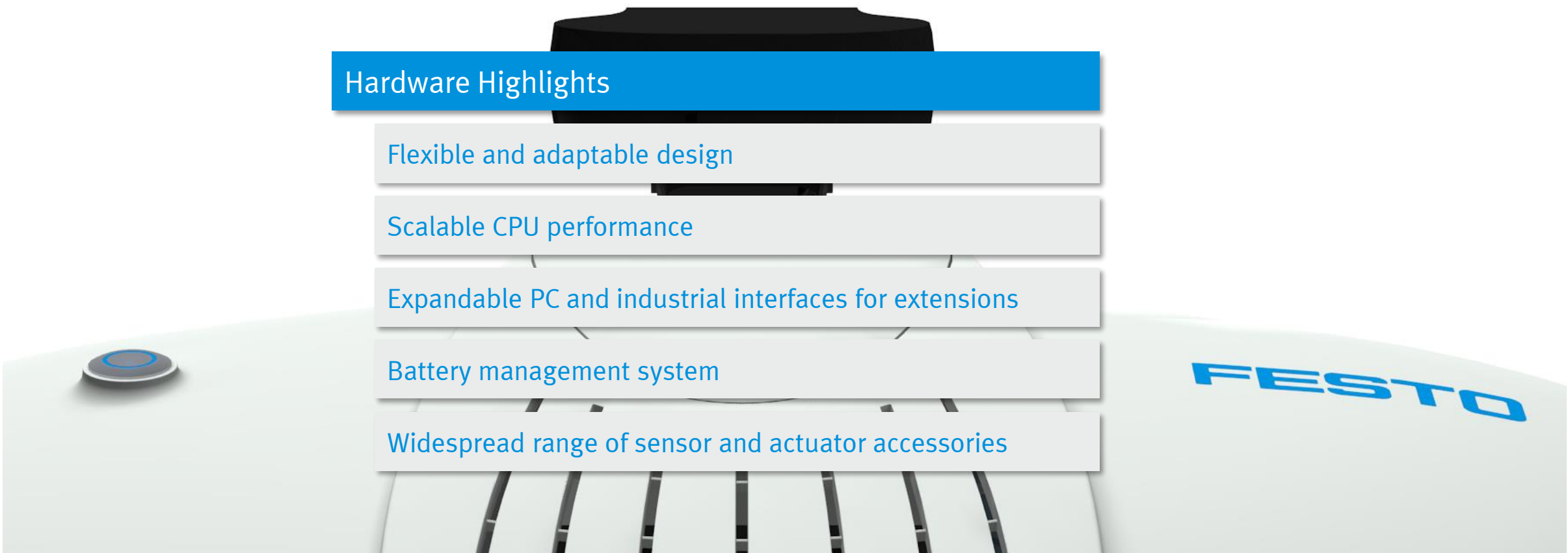




1. Product description and technical characteristics



Hardware Highlights

Flexible and adaptable design

Scalable CPU performance

Expandable PC and industrial interfaces for extensions

Battery management system

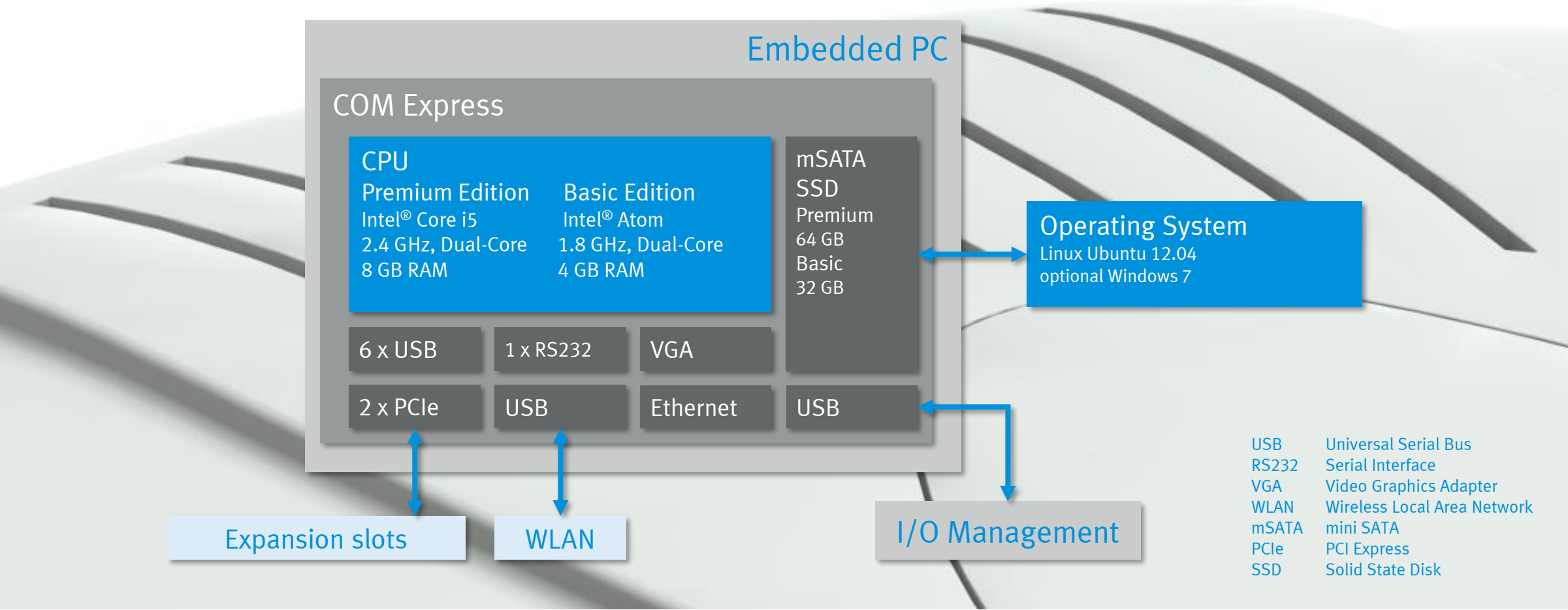
Widespread range of sensor and actuator accessories

1. Product description and technical characteristics

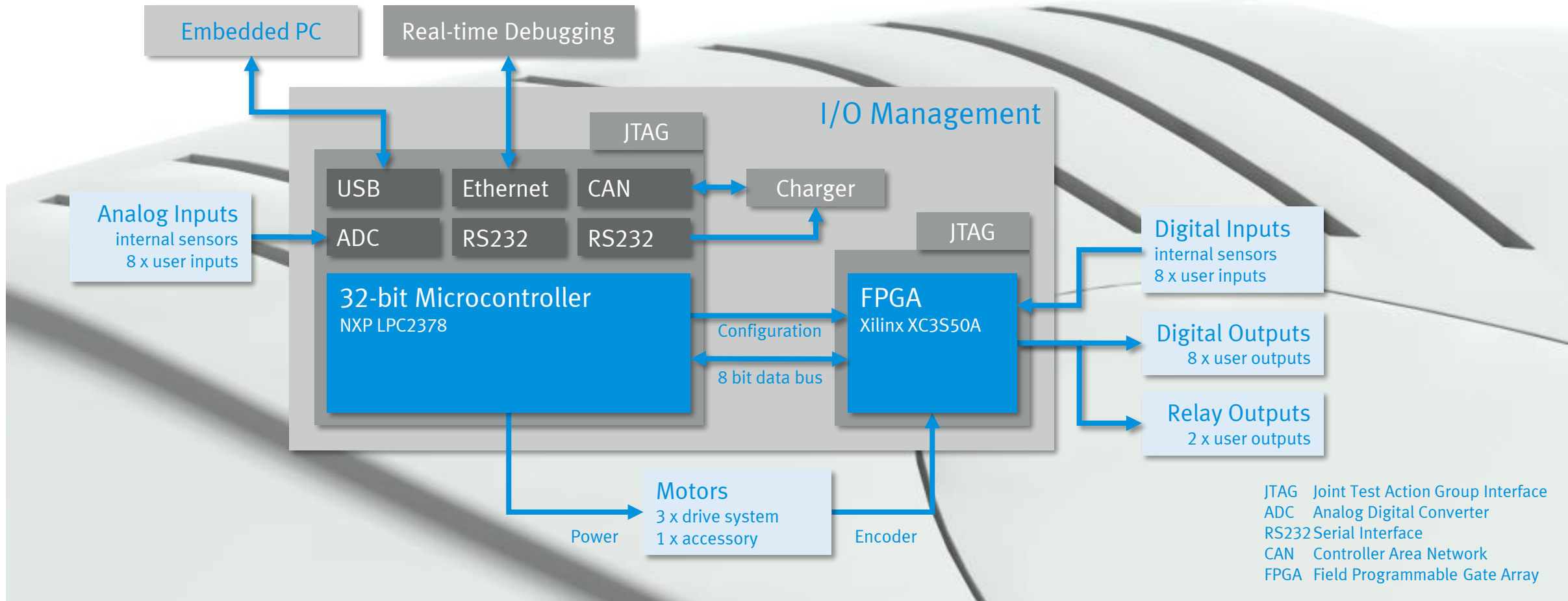
Robotino®



1. Product description and technical characteristics



1. Product description and technical characteristics



1. Product description and technical characteristics



Software Highlights

Complete open source and Plug & Play concept

Support for all major programming languages and systems

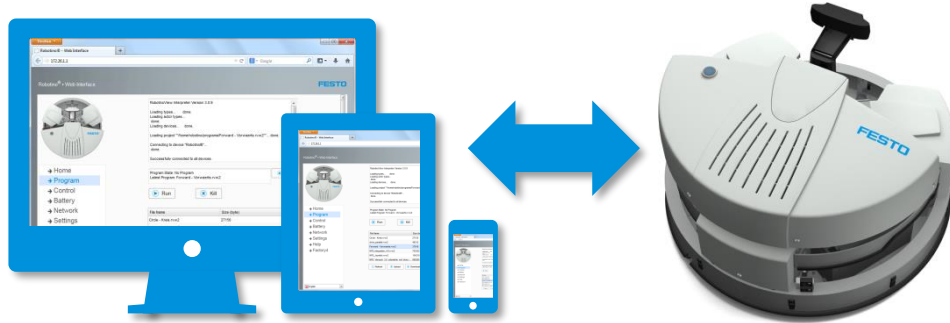
Robotino® Service Portal for system setup and maintenance

Robotino® Wiki and Robotino® Forum for development of applications

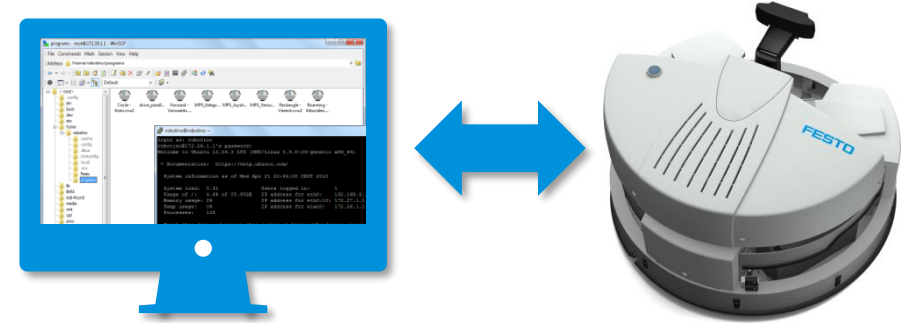
Operating system running on Linux or Windows (in preparation)

1. Product description and technical characteristics

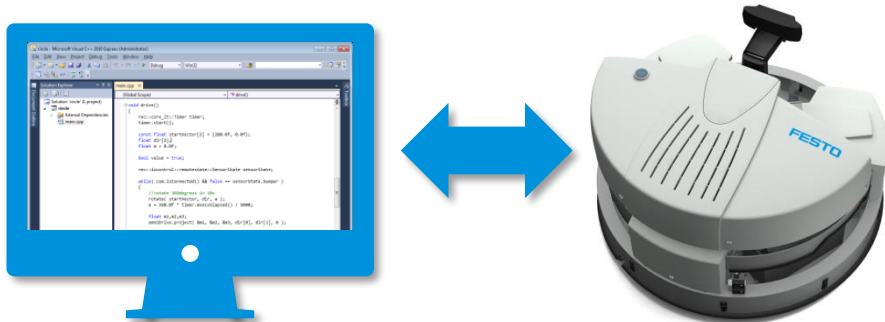
Maintain via Web Interface



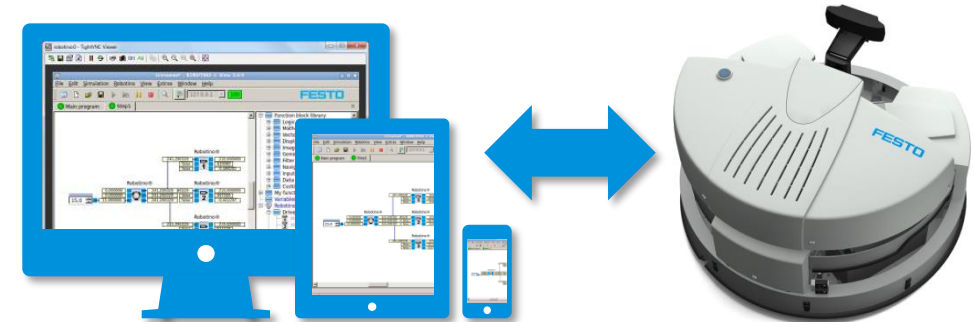
Access to operating & file system via SSH & SCP



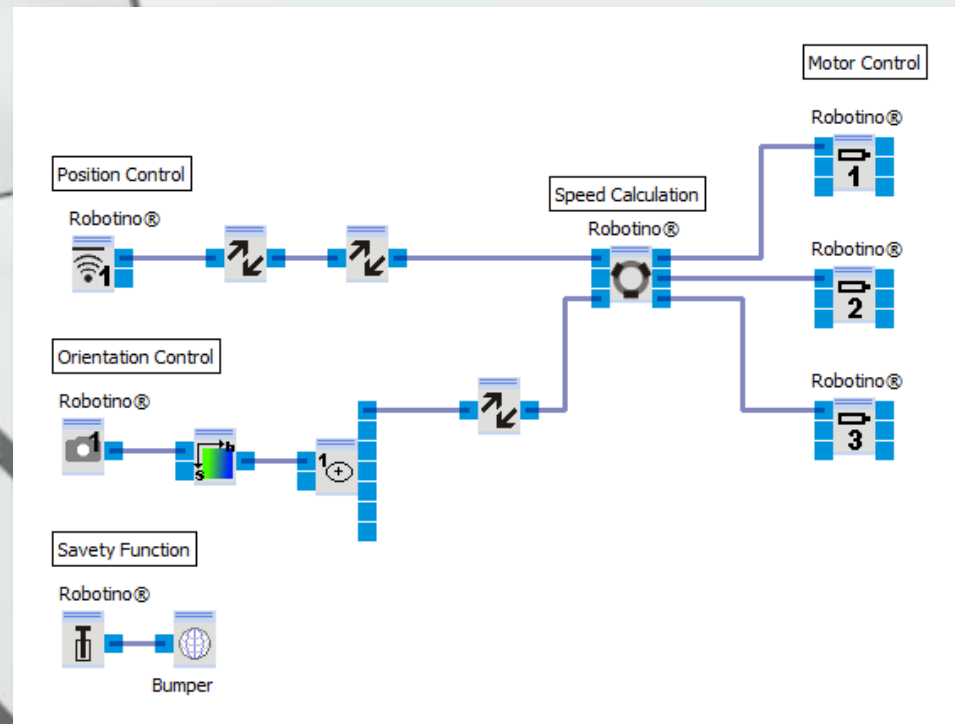
External programming & control via API



Online programming & remote access via VNC



1. Product description and technical characteristics



Running Robotino®

Robotino® View

C++, JAVA, .Net

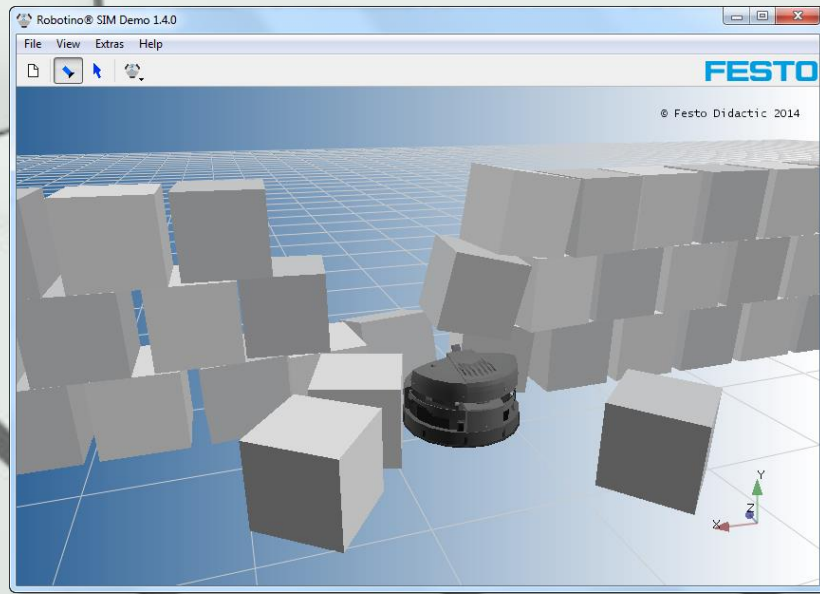
LabVIEW, MATLAB/Simulink

ROS (Robot Operating System)

SmartSoft

Microsoft Robotics Developer Studio

1. Product description and technical characteristics



Robotino® SIM – The virtual Robotino®

Simulates several Robotinos® at one time

Physics simulation based on NVIDIA® PhysX®

Integrated behavior and sensor simulation

Controlled by Robotino® View or via API

Entry-level version free-of-charge!

1. Product description and technical characteristics



Robotino® Workbook

Project 1

Inspection of supplied components and commissioning of the Robotino

Project 2

Linear travelling of a mobile robot system in any direction

Project 3

Linear travelling and positioning of a mobile robot system

Project 4

Path tracking of an automated guided vehicle system using two diffuse sensors

Project 5

Accurately positioned approach of a loading station

Project 6

Approaching an obstacle and maintaining a defined distance

1. Product description and technical characteristics



Robotino® Workbook

Project 7

Circling a station and approaching various transfer positions

Project 8

Path tracking of an automated guided vehicle system using an analogue inductive sensor

Project 9

Determining the optimal motion behaviour

Project 10

Path tracking of an automated guided vehicle system with the help of a webcam

Project 11

Searching and approaching a coloured object with the help of a webcam

1. Product description and technical characteristics

Accessories

Electric Gripper



Electric Grappler



Fork Lifter



1. Product description and technical characteristics

Robotino®

Accessories

Laser Range Finder



Logistics Kit



External Access Point



1. Product description and technical characteristics

Robotino® Service Portal – www.robotino.com

Instructions on system setup & operating

Details on components and extensions

Programming getting started

Links to Robotino® Wiki and Robotino® Forum



2. Target groups and customer needs, solution selling idea



Target Groups

Technical colleges

Vocational schools

Universities & research institutions

- Mechatronics
- Factory Automation
- Information Technology

Customer Needs

Comprehensive and attractive platform to teach in different technical fields of knowledge

Versatile object for doing research in the areas of mobile robotics, artificial intelligence & logistics

2. Target groups and customer needs, **solution selling idea**

Fields of Knowledge

- Drive Technology
- Motor Control
- Sensor Technology
- Image Processing
- Microcontroller Programming
- Service Robotics
- Automated Guided Vehicles
- Production Logistics



Research Areas

- Navigation Technologies
- Machine Learning
- Multi-Sensor Data Fusion
- Autonomous Systems
- Artificial Intelligence
- Co-Operative Robot Systems
- Mobile Manipulation
- Service Robotics Applications

2. Target groups and customer needs, **solution selling idea**



WorldSkills Europe
Mobile Robotics Competition

Vocational schools & technical colleges

Next WorldSkills Europe 2016 in Gothenburg, Sweden



European champion!

Robotino® is the official competition equipment for the WorldSkills Europe international competition. In the national preliminary rounds as well as the international championships, the participants of the competition use Robotino® mobile robotics as an autonomous transport system or as a service robot, for example.

2. Target groups and customer needs, **solution selling idea**

Robotino®



RoboCup
Logistics League

Universities & research institutions

Next RoboCup World 2016 in Leipzig, Germany



2. Target groups and customer needs, **solution selling idea**



RoboCup

Robotino® RoboCup Set – Special Offer 2015

Up to three sets of the Robotino® RoboCup Set are available for each team participating at the RoboCup Logistics League sponsored by Festo within 12 months after purchasing.



1 x Robotino® Premium Edition (order no.: 8029256)

including:

Intel® Core i5 with 2.4 GHz, 64 GB SSD, 8 GB RAM

2 x optical sensors

1 x inductive sensor

1 x assembly tower with 1 x backbone, 3 x plates

1 x Set of work pieces (order no.: 554301)

Special total price for customers: ??? EUR plus tax

3. Product features and customer benefits



Mechanical Specification

Diameter

450 mm

Height (w/o tower)

290 mm

Maximum payload

30 kg

Empty weight

22 kg

Chassis material

stainless steel

Benefits

- Robust design and high payload allow users to setup individual applications based on Robotino®.
- Users can still pick up and place the empty Robotino® by hand.
- Users can rely on this high quality product.

3. Product features and customer benefits



Drive System Specification

Omnidirectional wheels	3 pcs.
Wheel diameter	120 mm
DC motors	3 pcs.
Maximum motor velocity	3 600 rpm
Transmission ratio	32:1
Maximum velocity	10 km/h

Benefits

- Users may use high performance drive system for different levels of applications, from fundamental motor control up to complex movement tasks.
- Slow-speed and high-speed applications are supported.
- Researchers are able to rely on Robotino® as the universal base for their mobile robotics projects.

3. Product features and customer benefits



Sensor Specification

HD camera

1 pc.

Infrared distance sensors

9 pcs.

Analogue inductive sensor

1 pc.

Digital visual sensors

2 pcs.

Internal gyroscope sensor

1 pc.

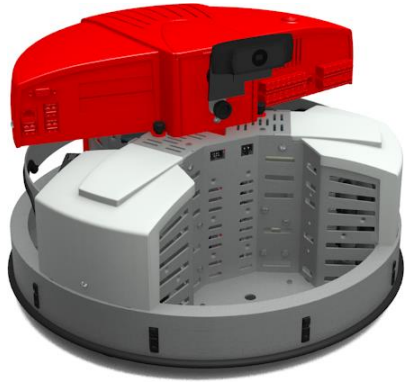
Collision-protection sensor

1 pc.

Benefits

- Robotino® supports training in sensor technology based on its extensive variety of sensor equipment.
- Multi-sensor data fusion for higher education and research becomes possible.
- Basic image processing methods are supported out-of-the-box. Users may develop their own methods using the delivered camera or others.

3. Product features and customer benefits



Controller Specification

Embedded PC standard

COM Express

Basic

Intel Atom, 1.8 GHz, dual core

Premium

Intel Core i5, 2.4 GHz, dual core

Main memory

4 GB / 8 GB

Solid state disk space

32 GB / 64 GB

Operating system

Linux Ubuntu

Benefits

- Users are able to easily upgrade the computational performance.
- Large memory and disk space supports development of more complex applications.
- Robotino® operating system can be changed and rebuild by users.

3. Product features and customer benefits



PC Interfaces Specification

Ethernet	1 x to PC, 1 x to microcontroller
USB	6 x USB 2.0 (high-speed)
Extensions	2 x PCI express slots
Monitor	1 x VGA
WLAN	802.11g and 802.11b

Benefits

- Robotino® is ready to be connected to additional components.
- Users may use PCI express cards to expand the functionality to their needs.
- Users are able to operate Robotino® stand-alone or to connect it to their existing Wi-Fi network.
- Multi-robot scenarios are supported.

3. Product features and customer benefits



IO Interfaces Specification

Digital inputs	8 x 24 V
Digital outputs	8 x 24 V, max. 3 A in total
Analog inputs	8 x 0 V to 10 V, 50 Hz
Power outputs	2 x relay outputs
Motor output	1 x 24 V, PWM, max. 5 A
Encoder input	1 x A, B channel, grey code

Benefits

- Industrial interfaces enables users to integrate industrial components like sensors, motors and other actuators.

3. Product features and customer benefits

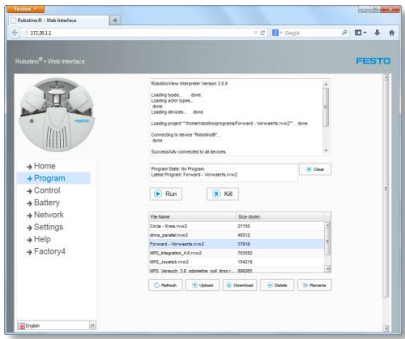


Power Supply Specification

Batteries	2 x 12 V, 9.5 Ah, lead-fleece
Power outputs	13 x 24 V
Charger	1 x internal
Add. chargers	max. 2 x, also for NiMH batt.
Runtime	4 h (with default batteries)

Benefits

- Users may get exchange for the default batteries at their local market.
- 24 V power supply for integrated components is easy to handle. No additional power supply system is needed.
- Users can extend the operating system by installing more battery capacity.



Operation Specification

Web interface

HTML5-based

User interface for program management, manual control, network configuration, status display and settings

Help system with online manual for commissioning, detailed information and introduction to programming

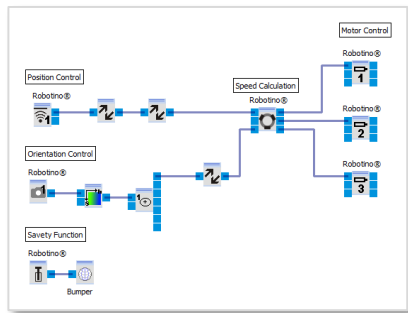
Service Portal

www.robotino.com

Benefits

- Users can use their smart phones, tablets or PC/laptops to configure and to put Robotino[®] into operation.
- Easy-to-use interface is ideally suited for students.
- To dive deep into technical details the Robotino[®] Service Portal is made for.

3. Product features and customer benefits



Programming Specification

Robotino® View

C++, JAVA, .Net

LabVIEW, MATLAB/Simulink

ROS (Robot Operating System)

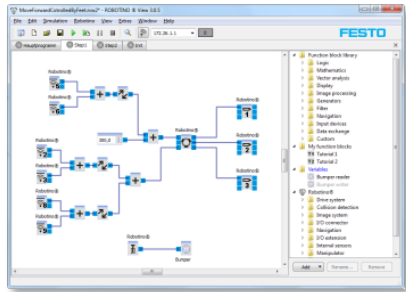
SmartSoft

Microsoft Robotics Developer Studio

Benefits

- Users may choose the programming language or system they already know and like.
- The open API guarantees that other languages and systems can be supported without high effort.
- Training might start with a simple programming system and might progress with more complex languages using the same object to control.

3. Product features and customer benefits



Robotino® View Specification

Graphic programming environment for PCs

runs on Windows XP, Vista, 7, 8 – Linux Ubuntu

Main program structure based on sequential function chart as per IEC 61131

Sub-programs related to library function blocks, re-usable as often as you like.

Program interpreter provides independent execution of programs on the embedded PC.

Benefits

- Users can download the programming and control solution free-of-charge.
- To learn how to program in Robotino® View is easy and fast to do → it is the best tool to start with in combination with Robotino SIM.
- Users might already know the main program structure from PLC programming.
- Via VNC connection users can program and control with Robotino® View directly on Robotino®.

4. Customer argumentation



Reasons to run Robotino®

- Long history of Robotino®
between 2007 and 2013: ~ 2 500 units of Robotino 1.0/2.0 sold
since 2014: ~ 350 units of Robotino 3.0 sold
- Festo Didactic provides deep knowledge in robotics and especially in mobile robotics.
- Wide range of applications from fundamental training to research projects are possible.
- Used as standard equipment for WorldSkills Europe Mobile Robotics competition and RoboCup Logistics League

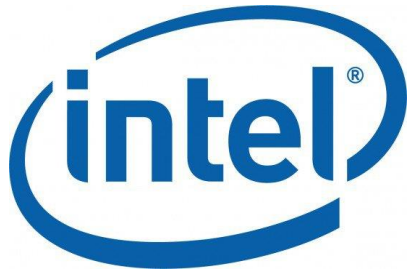
5. Customer queries

Top 5

- Battery Management → improved charger firmware with first OS update
- Use of accessories → further extension of service portal to be done
- WLAN connectivity → more powerful WLAN USB adapter will be introduced
- Trainings → external trainer available
- RoboCup & WorldSkills → provide links to respective Internet sites

6. Case studies/pilot customers

Robotino®



6. Case studies/pilot customers

Hochschule Ulm



6. Case studies/pilot customers

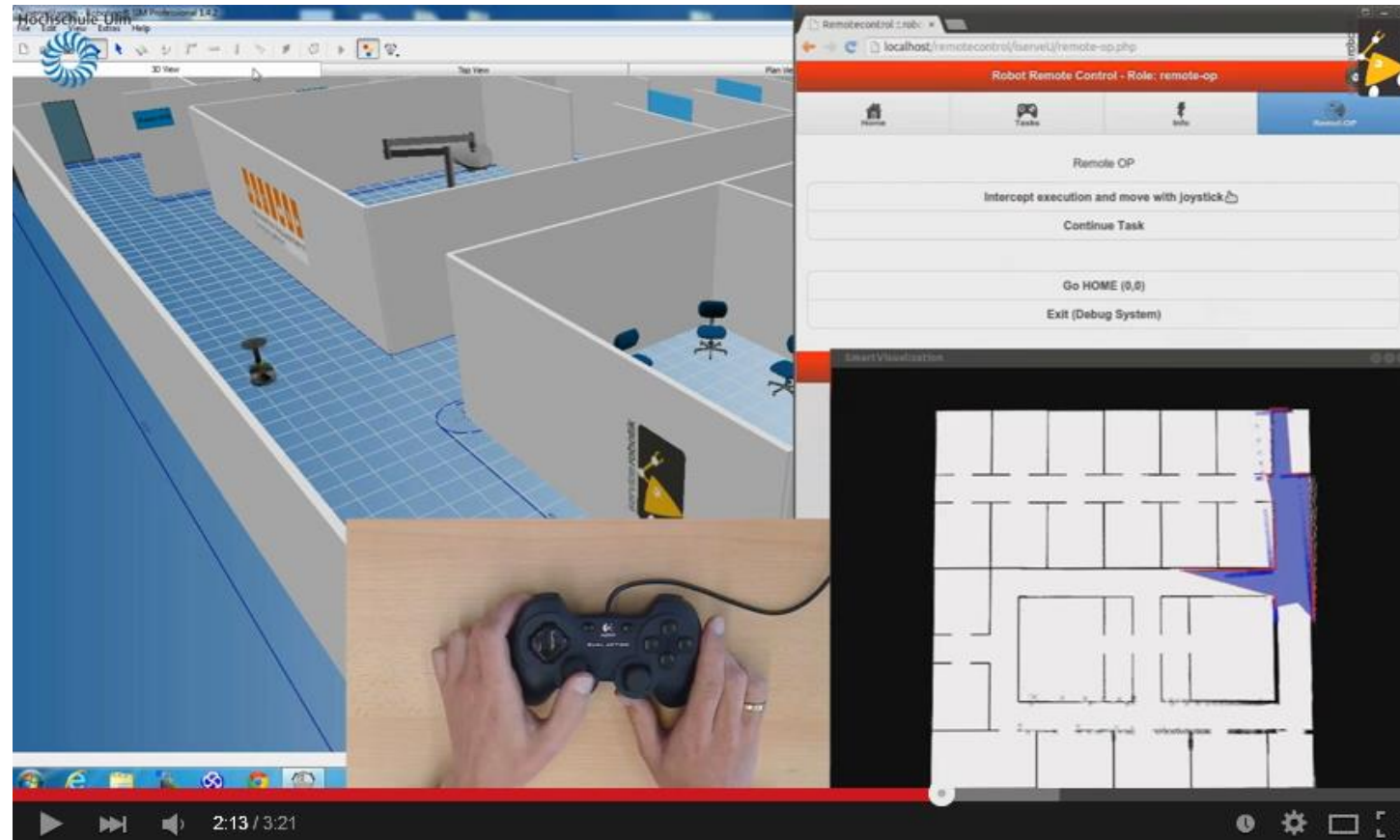
Robotino®

FESTO

Festo Didactic



6. Case studies/pilot customers



GEFÖRDERT VOM



Bundesministerium
für Bildung
und Forschung

6. Case studies/pilot customers

Robotino®

FESTO

Corporate Research
and Technology



6. Case studies/pilot customers



Gefördert durch:



Bundesministerium
für Wirtschaft
und Energie

aufgrund eines Beschlusses
des Deutschen Bundestages

