Eine perfekte Kombination!
Industrielle Automatisierung & ROS2

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GERMAN INNOVATION AWARD '20 WINNER

Der Deutsche Innovationspreis 2021

reddot winner 2022 industrial design

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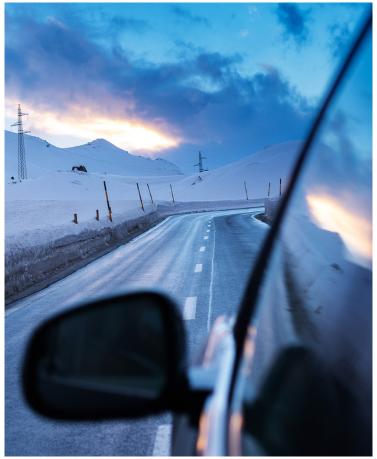
Bosch-Unternehmensbereiche

Industrial Technology



Mobility Solutions

Energy and Building Techn

Consumer Goods

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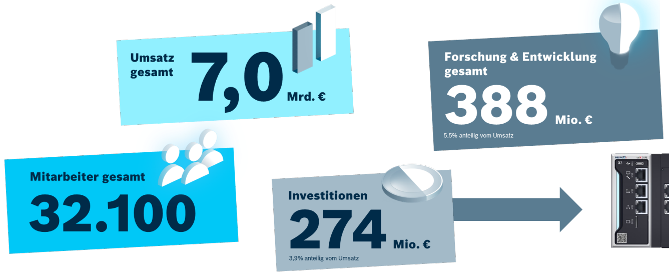
Drive and Control Technology
(Bosch Rexroth)



Umsatz gesamt 7,0 Mrd. €

Forschung & Entwicklung gesamt 388 Mio. €
5,5% anteilig vom Umsatz

Mitarbeiter gesamt 32.100

Investitionen 274 Mio. €
3,9% anteilig vom Umsatz

Electric Drive and Control Technology

Eine perfekte Kombination!

Industrielle Automatisierung & ROS2

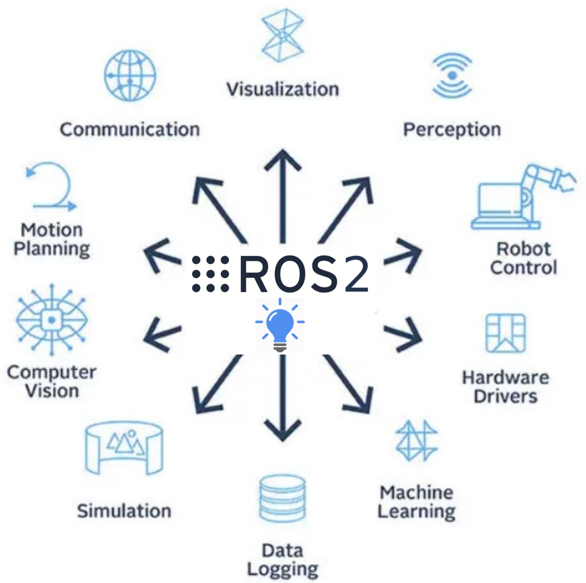
ROS2

ctrlX OS

ctrlX AUTOMATION

ctrlX AUTOMATION & ROS2

Übersicht



SDK

Realtime

EtherCAT Ethercat

Einbindung Sensorik und Aktorik

Industrietauglich & Langzeit verfügbar

Security

Safety

ctrlX AUTOMATION
Die Plattform der unbegrenzten Möglichkeiten

COMPLETE **AUTOMATION PLATFORM**

ctrlX CORE | ctrlX WORKS | ctrlX MOTION | ctrlX PLC | ctrlX OS | ctrlX IOT

ctrlX HMI | ctrlX I/O | ctrlX DRIVE | ctrlX SAFETY | ctrlX FLOW | ctrlX IPC

LINUX REAL-TIME OS & **APP**-BASED MICROSERVICE ARCHITECTURE

LINUX + APPS

FREE CHOICE OF **PROGRAMMING LANGUAGE & TOOLCHAIN**

Java

PLCopen motion control

ROS

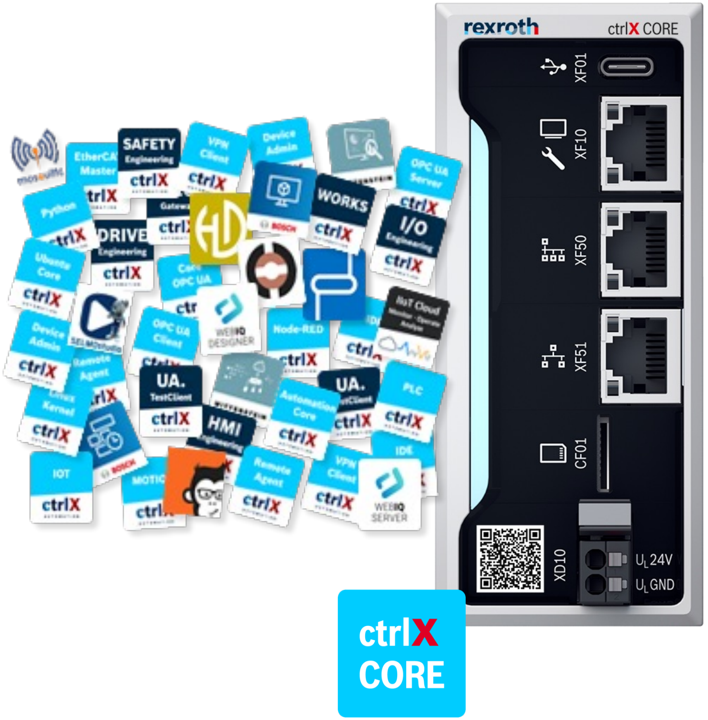
2

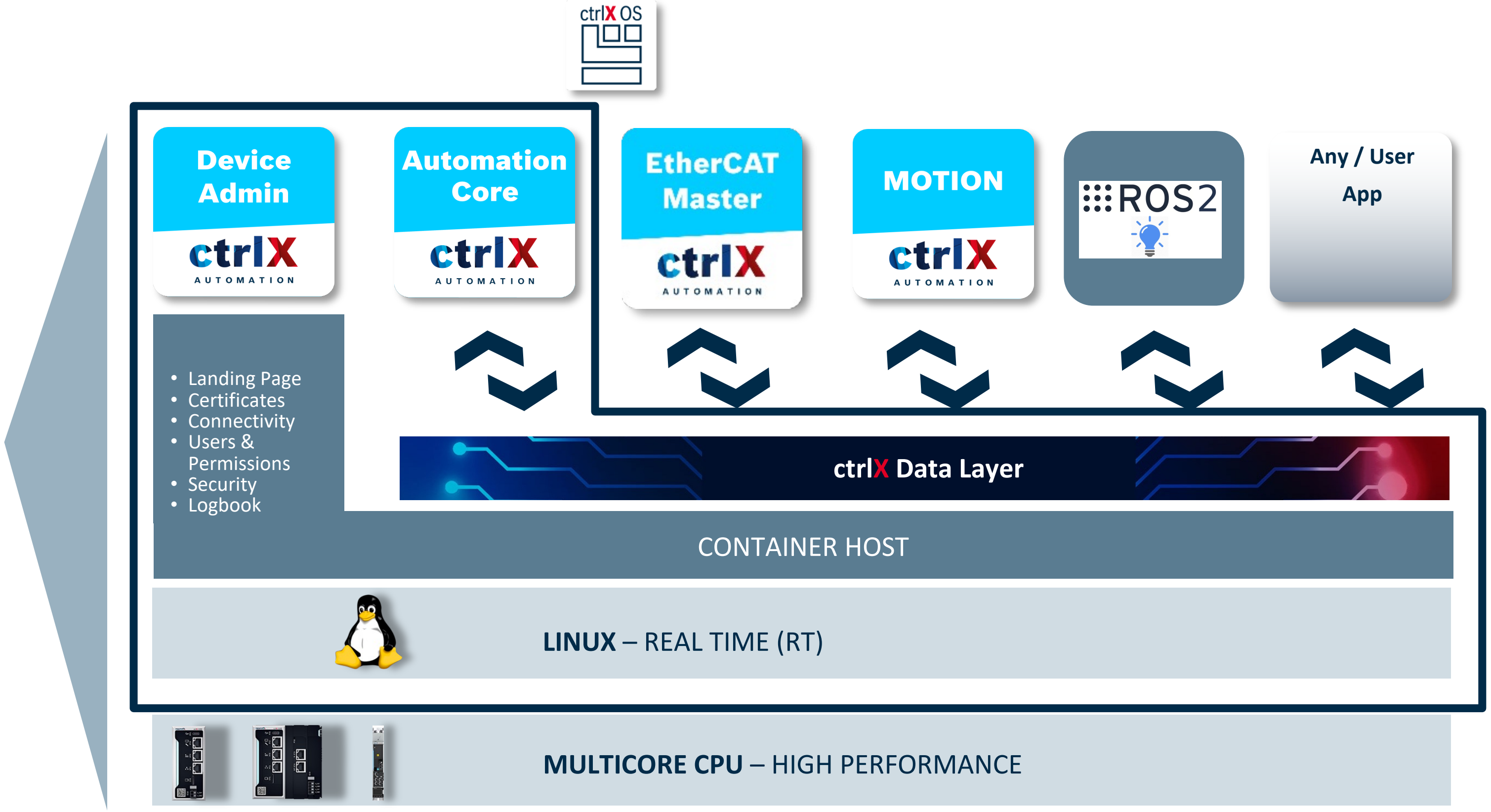
HTML 5

IOT INTEGRATION WITH **CERTIFIED SECURITY**

IEC62443

ctrlX AUTOMATION
ctrlX AUTOMATION Architektur





- Landing Page
- Certificates
- Connectivity
- Users & Permissions
- Security
- Logbook

ctrlX Data Layer

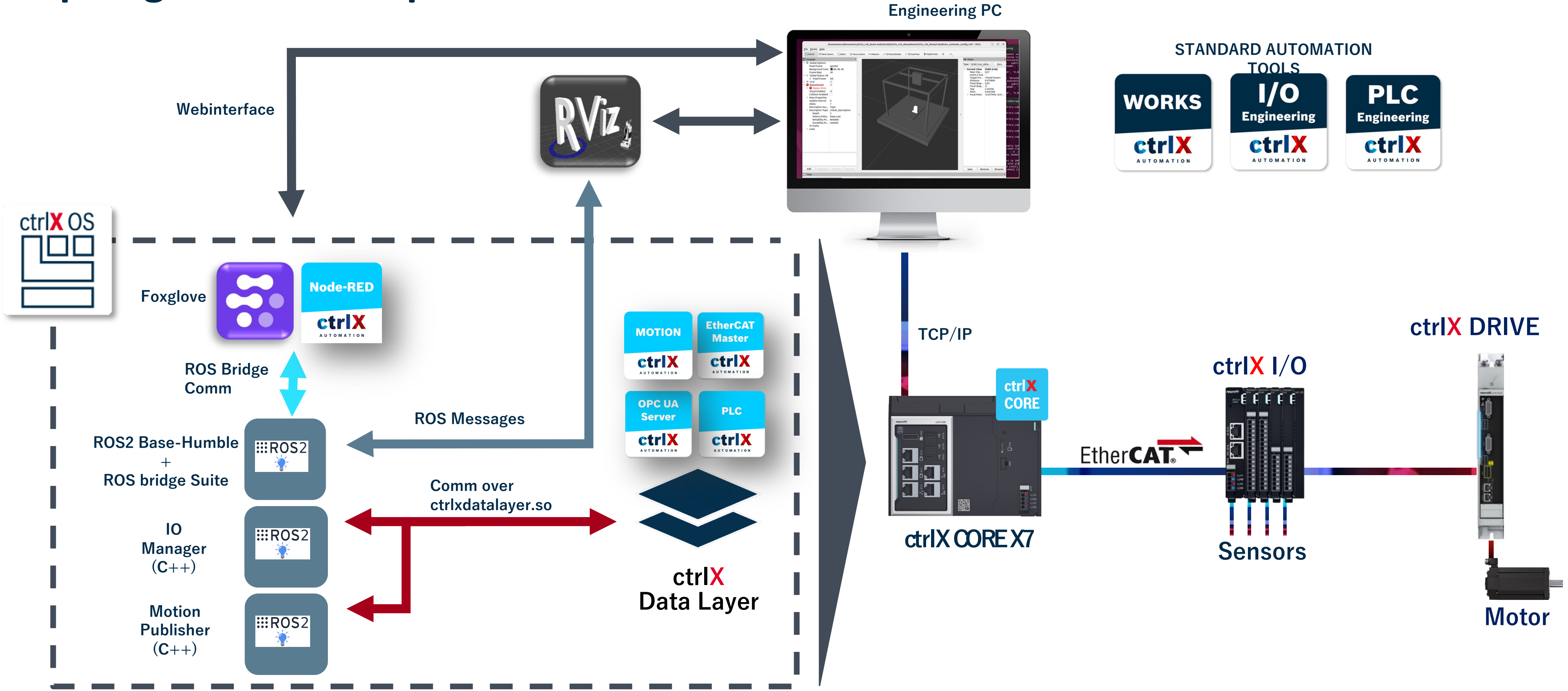
CONTAINER HOST

LINUX – REAL TIME (RT)

MULTICORE CPU – HIGH PERFORMANCE

ctrlX AUTOMATION & ROS2

Topologie und Konzept Live Demo



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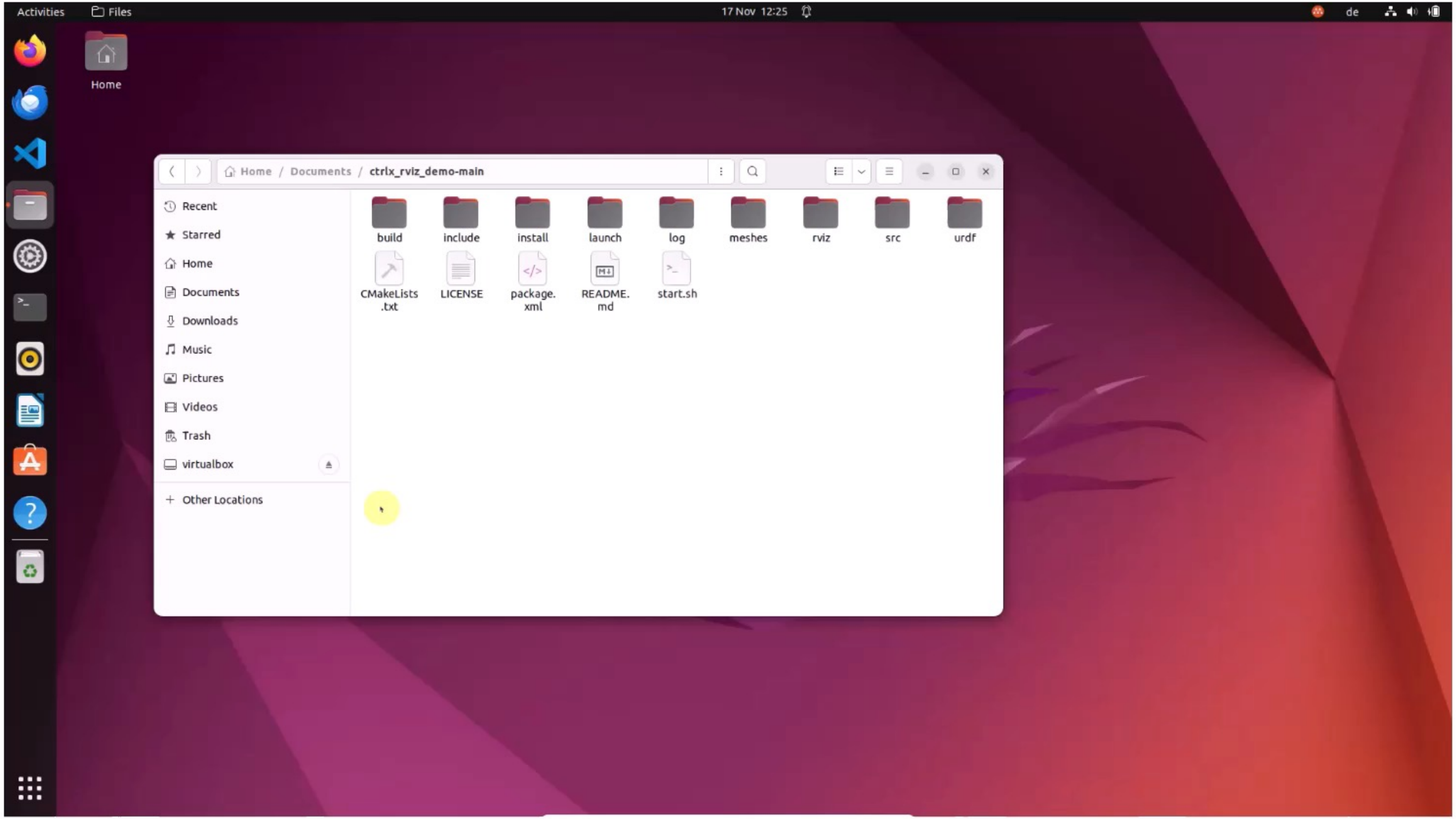
ctrlX AUTOMATION & ROS2 – Live Demo/Video



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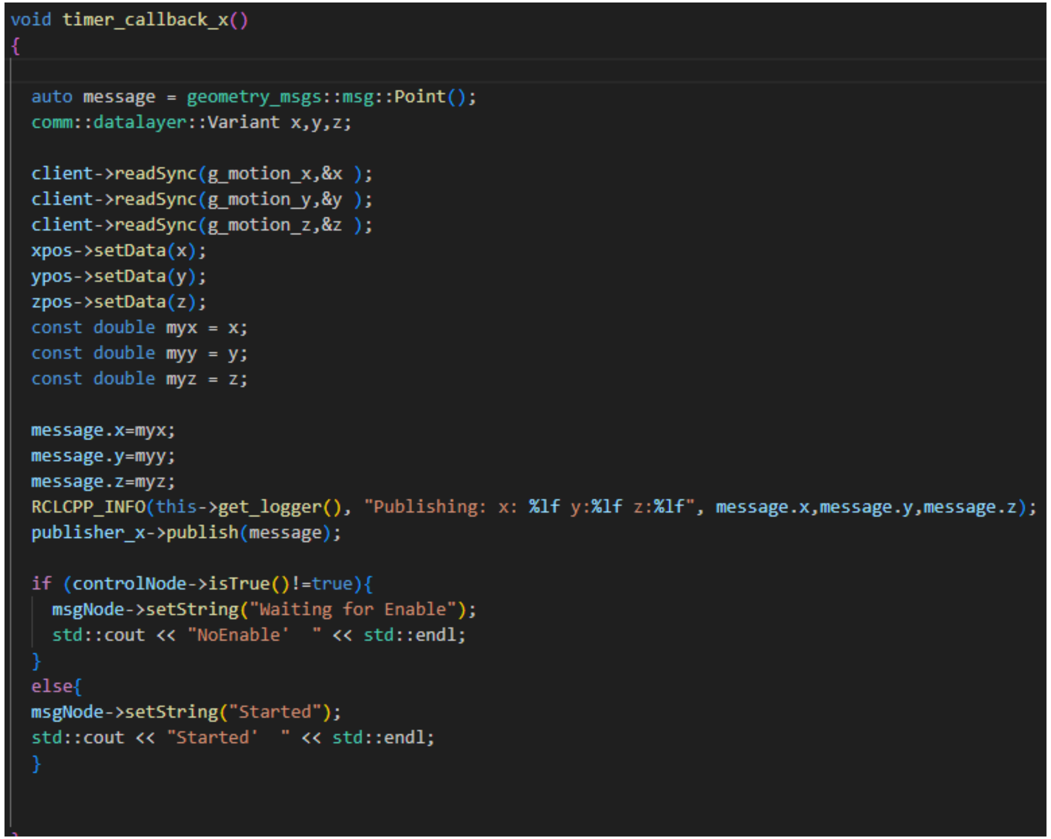
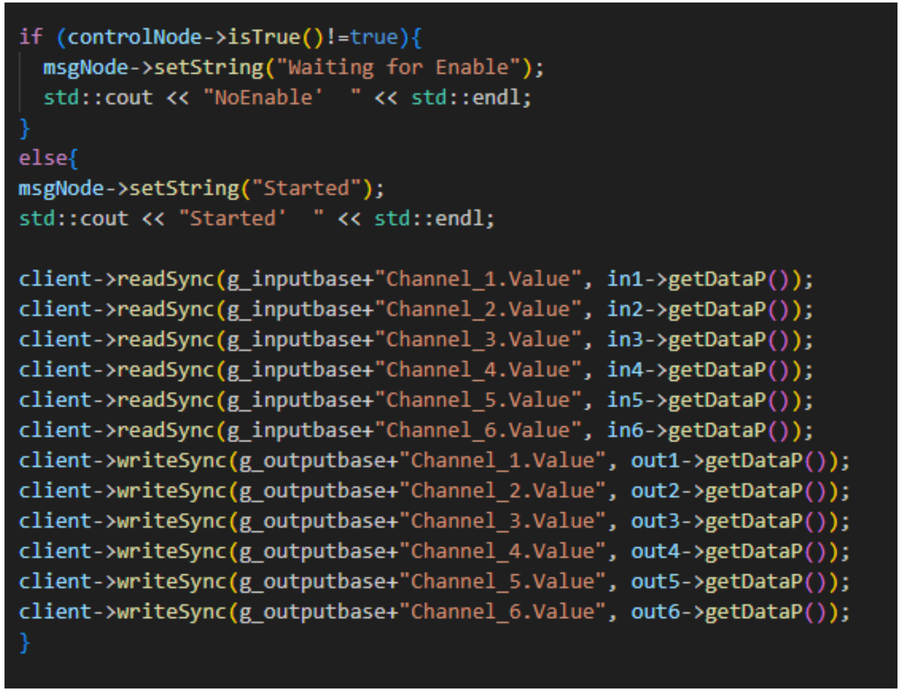
Beispielcode

Simple-motion-publisher



```cpp
void timer_callback_x()
{

  auto message = geometry_msgs::msg::Point();
  comm::datalayer::Variant x,y,z;

  client->readSync(g_motion_x,&x );
  client->readSync(g_motion_y,&y );
  client->readSync(g_motion_z,&z );
  xpos->setData(x);
  ypos->setData(y);
  zpos->setData(z);
  const double myx = x;
  const double myy = y;
  const double myz = z;

  message.x=myx;
  message.y=myy;
  message.z=myz;
  RCLCPP_INFO(this->get_logger(), "Publishing: x: %lf y:%lf z:%lf", message.x,message.y,message.z);
  publisher_x->publish(message);

  if (controlNode->isTrue()!=true){
    msgNode->setString("Waiting for Enable");
    std::cout << "NoEnable'  " << std::endl;
  }
  else{
  msgNode->setString("Started");
  std::cout << "Started'  " << std::endl;
  }
```

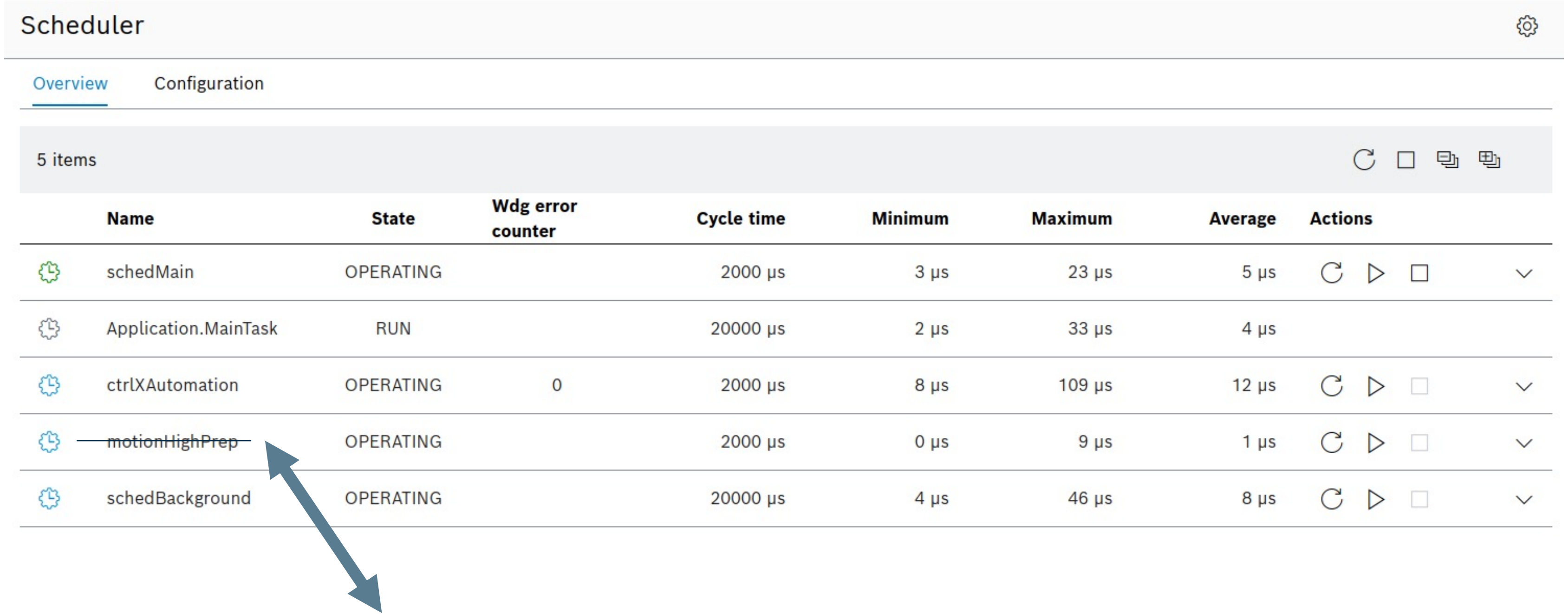
Simple-io-manager



```cpp
if (controlNode->isTrue()!=true){
  msgNode->setString("Waiting for Enable");
  std::cout << "NoEnable'  " << std::endl;
}
else{
msgNode->setString("Started");
std::cout << "Started'  " << std::endl;

client->readSync(g_inputbase+"Channel_1.Value", in1->getDataP());
client->readSync(g_inputbase+"Channel_2.Value", in2->getDataP());
client->readSync(g_inputbase+"Channel_3.Value", in3->getDataP());
client->readSync(g_inputbase+"Channel_4.Value", in4->getDataP());
client->readSync(g_inputbase+"Channel_5.Value", in5->getDataP());
client->readSync(g_inputbase+"Channel_6.Value", in6->getDataP());
client->writeSync(g_outputbase+"Channel_1.Value", out1->getDataP());
client->writeSync(g_outputbase+"Channel_2.Value", out2->getDataP());
client->writeSync(g_outputbase+"Channel_3.Value", out3->getDataP());
client->writeSync(g_outputbase+"Channel_4.Value", out4->getDataP());
client->writeSync(g_outputbase+"Channel_5.Value", out5->getDataP());
client->writeSync(g_outputbase+"Channel_6.Value", out6->getDataP());
}
```

ctrlX AUTOMATION & ROS2

Real Time - Integration



Scheduler

Overview | Configuration

5 items

	Name	State	Wdg error counter	Cycle time	Minimum	Maximum	Average	Actions
	schedMain	OPERATING		2000 µs	3 µs	23 µs	5 µs	⟳ ▷ □
	Application.MainTask	RUN		20000 µs	2 µs	33 µs	4 µs	
	ctrlXAutomation	OPERATING	0	2000 µs	8 µs	109 µs	12 µs	⟳ ▷ □
	~~motionHighPrep~~	OPERATING		2000 µs	0 µs	9 µs	1 µs	⟳ ▷ □
	schedBackground	OPERATING		20000 µs	4 µs	46 µs	8 µs	⟳ ▷ □

ROS2 Program

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ctrlX AUTOMATION & ROS2

ROS2

ctrlX OS

ctrlX AUTOMATION

ROS2 und ctrlX AUTOMATION – eine perfekte Kombination

Vielen Dank für Ihre Aufmerksamkeit

Fragen?

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