

Sinamics Drive SimBasic - digitální dvojče pohonu

Siemens Drives Days 2021, Dolní Morava

| Kdo prezentuje

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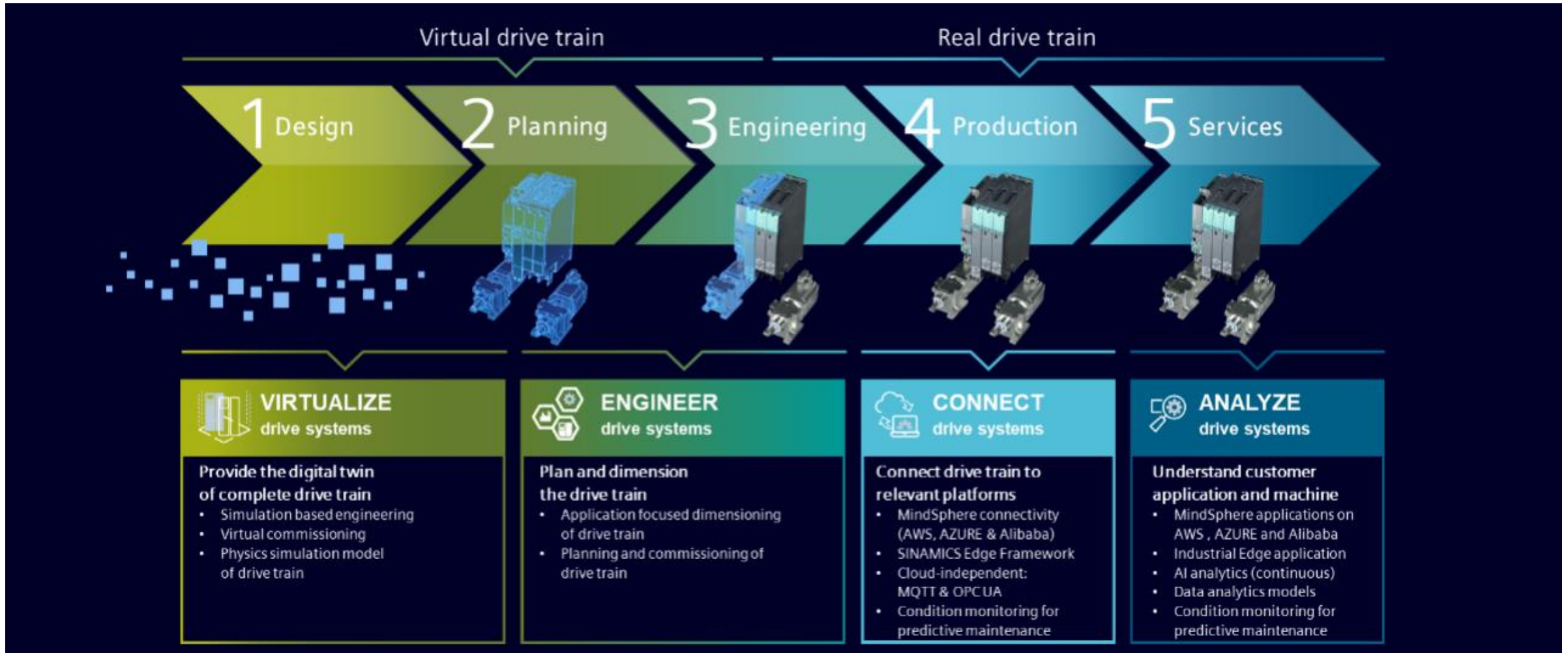
www.siemens.cz/pohony



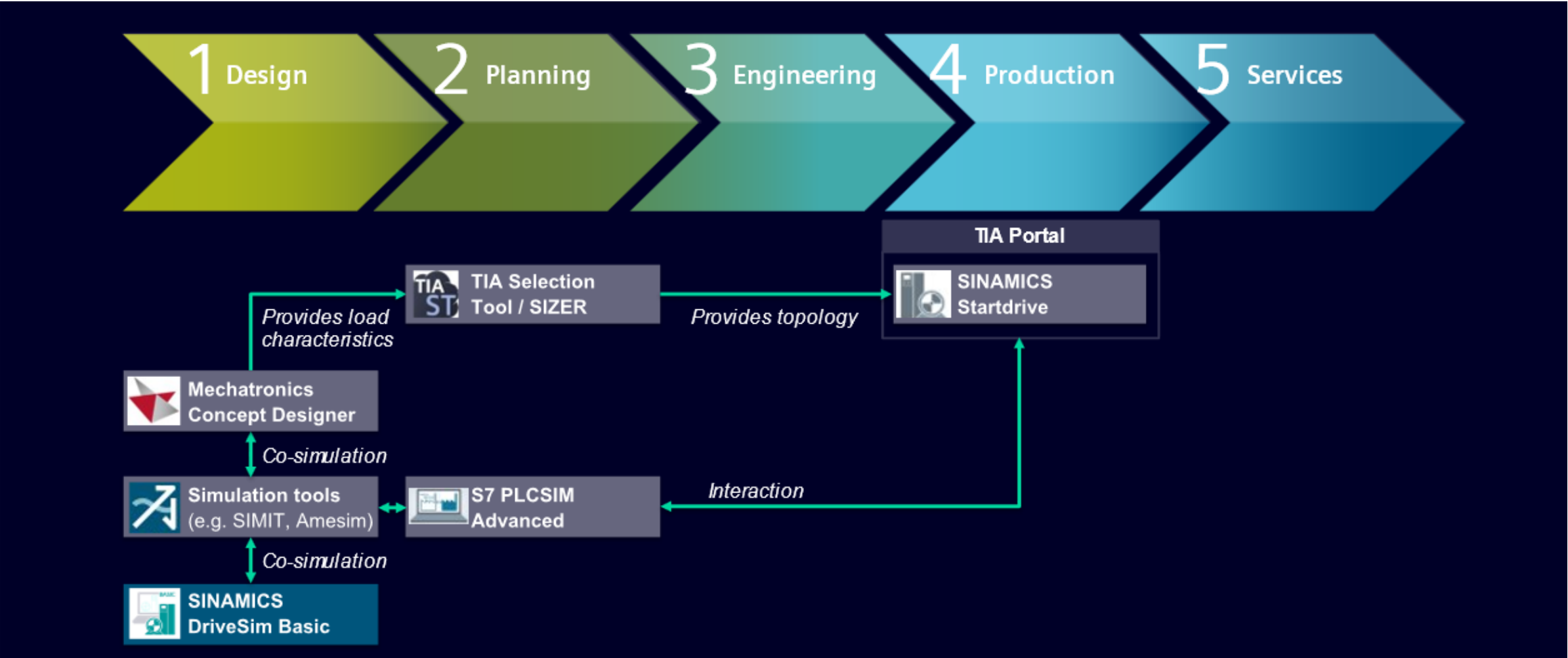
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Digitalizační portfolio GMC



Ekosystém nástrojů a programů

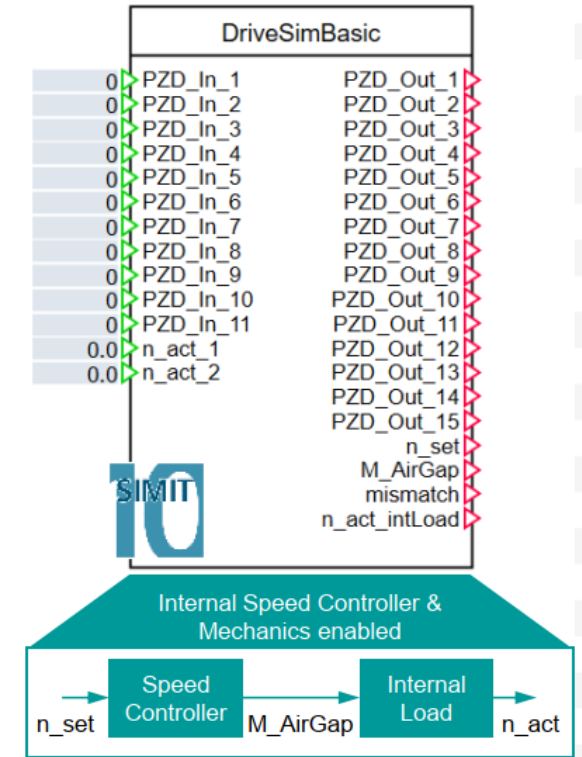
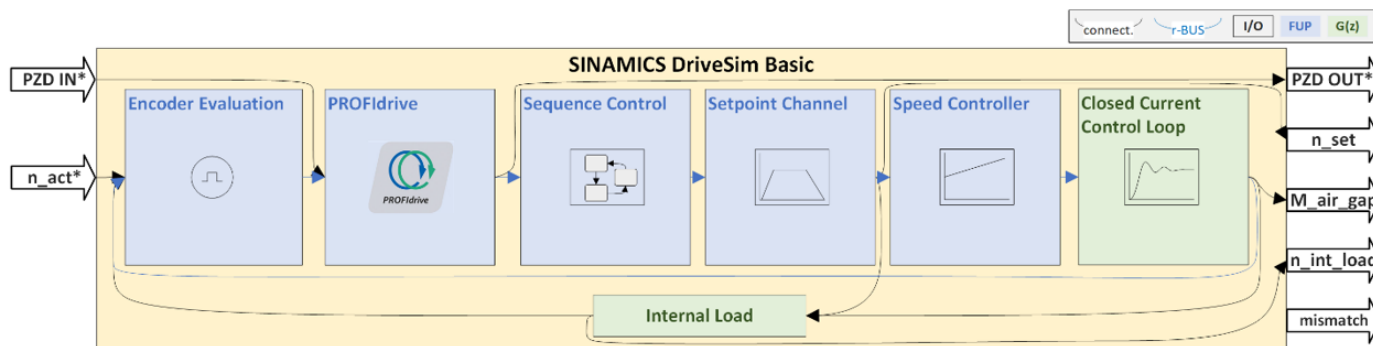


DriveSim Basic – co to je?

- Standardizovaný modelu „Functional Mockup Unit“ (FMU)
- Mechanické vlastnosti motoru, interní či externí zátěže, ...
- Nastavení pomocí změny parametrů modelu

Obsah modelu:

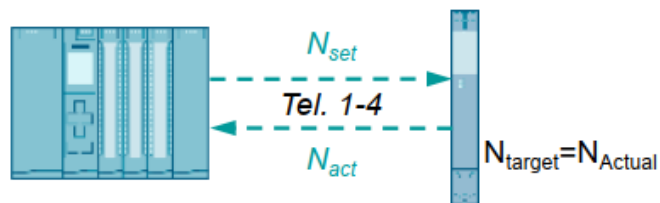
- PROFIdrive komunikace (telegrams 1, 2, 3, 4, 102, 103)
- sequence control, setpoint channel, encoder, speed controller (SERVO only)



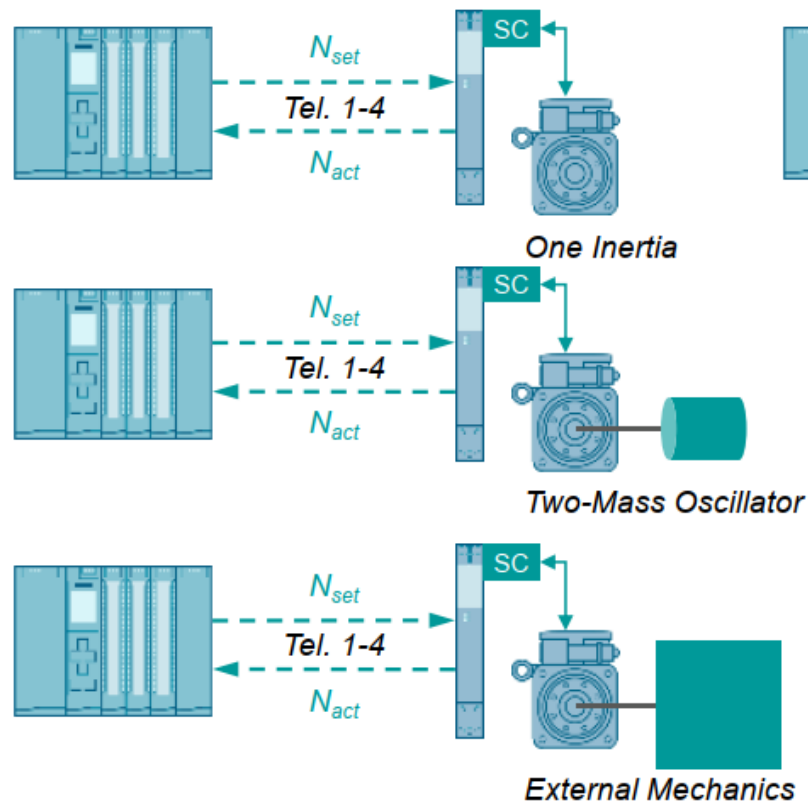
Name	Value
Param_ClosedLoopControl_p1460_n_ctrl_Kp_n_lower	10.0
Param_ClosedLoopControl_p1462_n_ctrl_Tn_n_lower	[ms] 20.0
Param_ClosedLoopControl_p1520_M_max_upper_mot	[Nm] 2.0
Param_ClosedLoopControl_p1521_M_max_lower_reg	[Nm] -2.0
Param_ReferenceValues_p2000_n_ref	[1/min] 3000.0
Param_Communication_p2048_IF1_PZD_t_samp	[ms] 4.0
Var_InternalLoad_InertiaMotorAndBrake	[kgm ²] 0.015
Var_InternalLoad_InertiaLoad	[kgm ²] 0.05
Var_InternalLoad_Damping	0.3
Var_InternalLoad_TorsionalStiffness	[Nm/rad] 48000.0

Aplikace pro virtuální zprovoznění

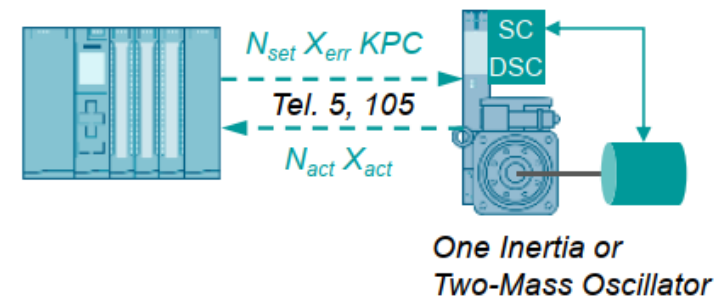
A Automation Logic Validation



B Speed Controlled Axis



C Position Controlled Axis



Enabled in future releases

Naše výzvy – řešení – výhody

Výzvy:

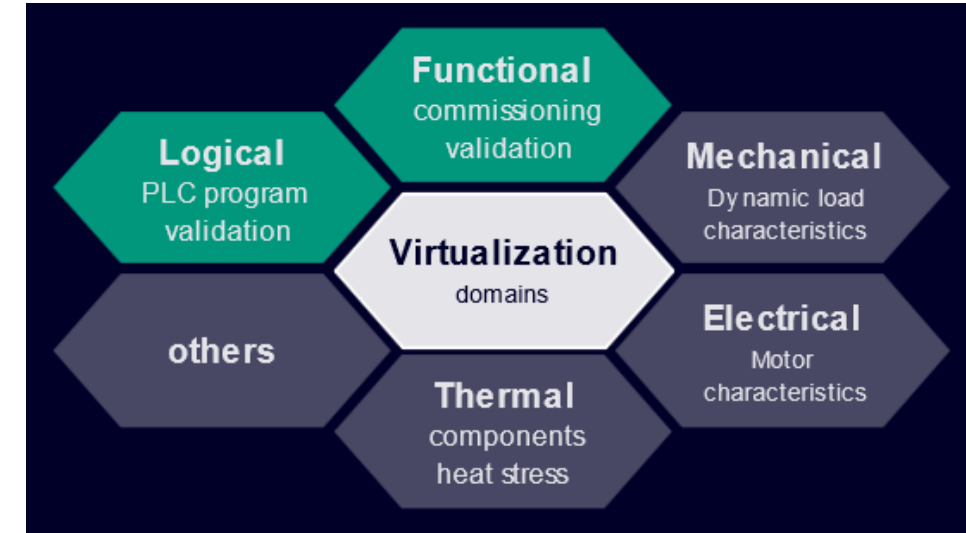
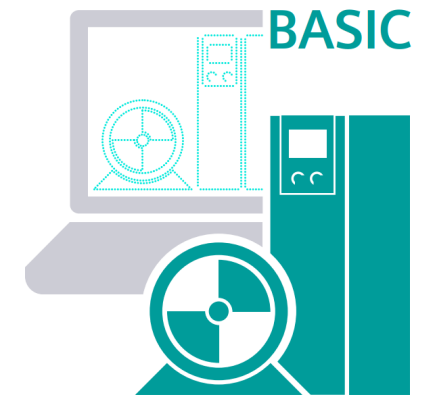
- Dlouhý vývoj vede k vysokým počátečním nákladům
- Neznalost chování systému vyžaduje intenzivní testování

Řešení:

- Ověřené modely pohonů Sinamics zaručují přesné chování
- Jeden univerzální model pro pohony SINAMICS
- Easy to use: bez expertních znalostí se simulací

Výhody:

- Integrace v rámci digitalizačního řešení Siemens (Simatic S7-PLCSIM Advanced nebo Mechatronic Concept Designer)
- Umožňuje automatické testování a ověření PLC a mechanické interakce včetně virtuální zprovoznění PLC
- Redukce nákladů na integraci pohonu a PLC bez nutnosti zapojeného hardware



DriveSim_Basic_Example

Projekt Bearbeiten Simulation Fenster Automatische Modellierung Extras Hilfe

Echtzeit (100%)

SIEMENS SIMIT

Projektnavigation

- Projekt Simulation
- DriveSim_Basic_Example
 - Projektmanager
 - Kopplungen
 - Neue Kopplung
 - Diagramme
 - Neues Diagramm
 - DriveSimBasic
 - Monitoring
 - Skripting
 - Listen
 - Schnappschüsse
 - Suchen & Ersetzen
 - Konsistenzprüfung
 - Starten

DriveSimBasic*

75% Tahoma 12 F K U

Komponenten

- Basiskomponenten
 - CHEM-BASIC
 - COMMUNICATION
 - CONNECTORS
 - CONTEC
 - DRIVES
 - FLOWNET
 - SENSORS
 - STANDARD
- Eigene Komponenten
- Globale Komponenten
- Projektkomponenten
 - DriveSim_Basic_Examp
- Vorlagen
- Vorschau
- Projekte
- Signale

SINAMICS DriveSim Basic#1 Eigenschaften Diagnose

	Name	Wert
Allgemein	Config_ExternalLoad	1.0
Eingang	Config_SetpointChan...	1.0
Ausgang	Config_SequenceCon...	1.0
Parameter	Param_EncoderEvalu...	0.0
Zusatzparameter	Param_EncoderEvalu...	0.0
Zustand	Param_EncoderEvalu...	11.0
	Param_EncoderEvalu...	11.0
	Param_PROFIdrive_p...	1.0
	Param_Setpoi... [1/min]	1500.0
	Param_SetpointCh... [s]	10.0
	Param_SetpointCh... [s]	10.0
	Param_Setpoi... [1/min]	0.2

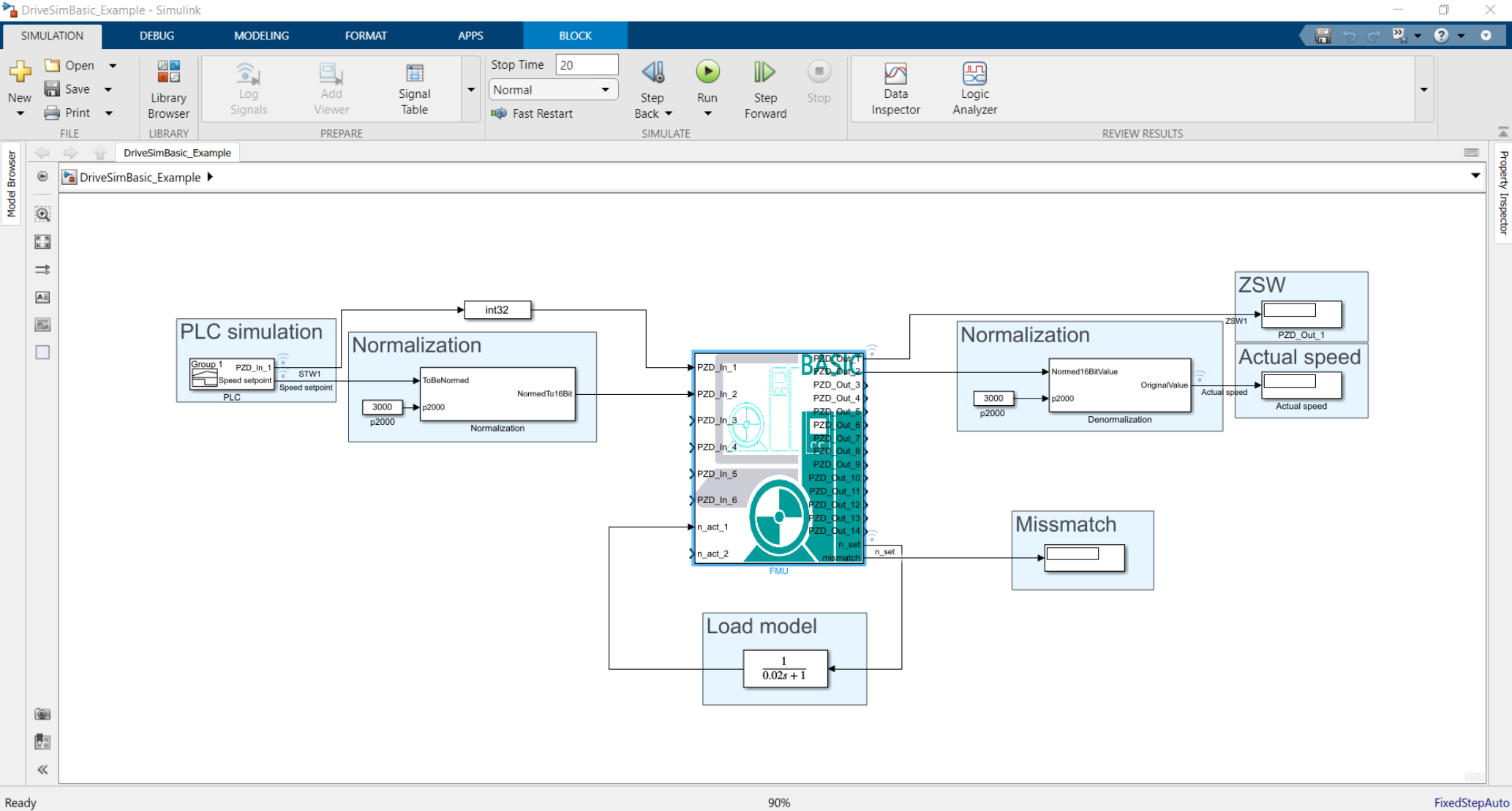
Portalansicht DriveSimBa... 1%

Simcenter Amesim

The screenshot displays the Siemens Simcenter Amesim software interface. The main workspace shows a simulation model for a SINAMICS DriveSim Basic. The model is represented by a central block labeled 'fmu' (Functional Mock-up Unit). The model is connected to a PLC simulation block on the left, which provides inputs for 'PZD In_1' and 'Speed setpoint'. The model is also connected to a 'Normalization' block and a 'Denormalization' block, both containing gain blocks labeled 'k'. A 'Load model' block with a transfer function $\frac{k}{1+TS}$ is connected to the model's output. The model is connected to a 'Parameters of DRIVESIMBASIC' table on the right, which lists various parameters and their values.

Title	Value	Unit	Narr
PZD_In_1 - start value	0	null	star
PZD_In_2 - start value	0	null	star
PZD_In_3 - start value	0	null	star
PZD_In_4 - start value	0	null	star
PZD_In_5 - start value	0	null	star
PZD_In_6 - start value	0	null	star
n_act_1 - start value	0	null	star
n_act_2 - start value	0	null	star
Config			
ExternalLoad - 1 .. external applicati...	1	null	Con
SequenceControl - 1 .. sequence con...	1	null	Con
SetpointChannel - 1 .. ramp function...	1	null	Con
Import parameters			
co-simulation step size	0.0005	s	corr
co-simulation step specification	time step size		corr
enable logging	no		ena
path to the unzipped FMU root	$\$(library_node)/DriveSimBasic$		fmu
Param			
Communication			
p2048_IF1_PZD_t_somp - IF1 P...	4	ms	Par
EncoderEvaluation			
p0400_0_Enc_type_sel - Encode...	0	null	Par
p0400_1_Enc_type_sel - Encode...	0	null	Par
p0418_0_Enc_fine_Gx_XIST1 - ...	11	null	Par
p0418_1_Enc_fine_Gx_XIST1 - ...	11	null	Par
PROFIdrive			
p0922_IF1_PZD_tel - IF1 PROFL...	1	null	Par
ReferenceValues			
p2000_n_ref - Reference speed ...	3000	1/min	Par
SetpointChannel			
p1082_n_max - Maximum speed	1500	1/min	Par
p1120_RFG_ramp_up_time - Ra...	10	s	Par
p1121_RFG_ramp_down_time - ...	10	s	...re
p1148_RFG_tol_HL_RL_act - Ra...	0.2	1/min	Par

Matlab Simulink



ANSYS TwinBuilder

Twin Builder - ANSYS Electronics Desktop 2021 R1 - DriveSimBasicExampleTel1 - DriveSimBasic - SchematicEditor - [DriveSimBasicExampleTel1 - DriveSimBasic - Sc]

File Edit View Project Draw Schematic Twin Builder Tools Window Help

Save Cut Copy Paste Undo Redo Delete Zoom In Zoom Out Zoom Area Add Design Draw Primitive Standard Reports Rotate Flip Vertical Align Vertical Pop Up Short/Open Links Add Model Import Model Characterize Analyze Edit Active Setup Profile & Monitor Replay Analysis Optometrics Output Dialog Add TR Add AC Add DC Settings Launch Tools

Desktop View Schematic Simulation Results Automation Ansys Minerva

Project Manager

- DriveSimBasicExampleTel1
 - DriveSimBasic
 - Ports
 - Denormalization: Denorm
 - Normalization: Norm
 - Analysis
 - Optometrics
 - Results
 - Scope
 - Normalization.value
 - LoadModel.INPUT
 - LoadModel.VAL
 - Denormalization.value
 - PZD
 - STW1.VAL
 - ZSW1.VAL
 - Definitions

Properties

Name	Value	Unit	Evaluated Va
p2000	3000		3000

Schematic Diagram

The schematic shows a control loop for a motor drive. It includes a normalization block (CONST), a DriveSimBasic1 block, a load model (LoadModel), and a denormalization block (GAIN). The DriveSimBasic1 block is connected to the LoadModel block via PZD (Process Ziegler-Nichols) blocks. The LoadModel block contains a PT2 (Proportional-Two) transfer function. The DriveSimBasic1 block is also connected to the GAIN block via PZD blocks. The GAIN block is connected to the DriveSimBasic1 block via PZD blocks. The DriveSimBasic1 block is also connected to the GAIN block via PZD blocks. The DriveSimBasic1 block is also connected to the GAIN block via PZD blocks.

Graph 1: STW1 and ZSW1 Values vs Time

This graph shows the values of STW1 (red line) and ZSW1 (green line) over time. The x-axis is Time [s] from 0.05 to 6.05. The y-axis is Y1 from 809.51 to 1109.51. The STW1 curve starts at 1024.00, drops to 1030.00, then to 1031.00, and finally to 1151.00. The ZSW1 curve starts at 832.00, drops to 817.00, then to 819.00, and finally to 823.00. The graph also shows several time intervals: 0.33, 1.34, 1.68, 1.03, 2.70, 1.56, and 4.26.

Graph 2: Normalization.value and LoadModel.INPUT vs Time

This graph shows the values of Normalization.value (blue line) and LoadModel.INPUT (red line) over time. The x-axis is Time [s] from 0.00 to 20.00. The y-axis is Y1 from 0.00 to 1500.00. The Normalization.value curve starts at 0.00, jumps to 1500.00 at 5.00s, and then decreases linearly to 0.00 at 15.00s. The LoadModel.INPUT curve starts at 0.00, jumps to 1500.00 at 5.00s, and then decreases linearly to 0.00 at 15.00s. The LoadModel.VAL curve (green line) is also shown, which is a smoothed version of the LoadModel.INPUT curve.

Porovnání variant simulace pohonů

	SINAMICS DriveSim Basic	SIMIT PROFIdrive library (10.2)	SIMIT Drives behavior library
Telegrams motor module	1, 2, 3, 4, 102, 103	1, 2, 3, 4, 5, 6, 102, 103, 105, 106	111, 750
Telegrams Safety	-	-	901, 902, 903
Telegrams Encoder	-	-	81, 82, 83
Validated against ...	SINAMICS	PROFIdrive specification	PROFIdrive specification
Parameter definition	SINAMICS specific	generic	generic
min. sample rate load model	62.5 μ s	1ms	1ms
Speed controller	yes	no	no
Model variants	1	10	8
Tool independent	yes	no	no

Užitečné odkazy a licence

Oficiální web:

<https://new.siemens.com/global/en/products/drives/digitalization-in-drive-technology/virtualization.html>

DriveSim Basic – SIOS – ID 109798225:

<https://support.industry.siemens.com/cs/document/109798225/sinamics-drivesim-basic?dti=0&lc=en-WW>

Simulation software SIMIT V10.2 – download:

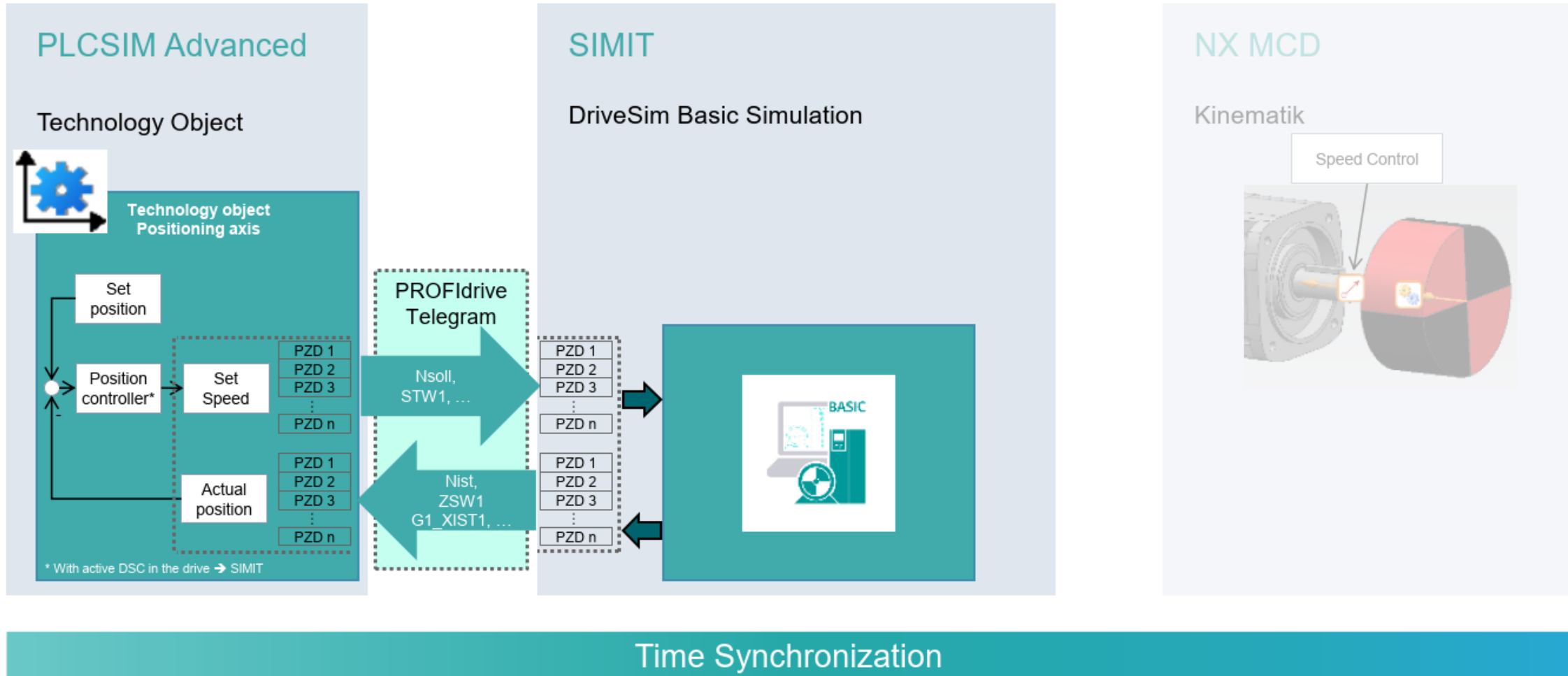
<https://support.industry.siemens.com/cs/document/109780152/simulation-software-simit-v10-2?dti=0&lc=en-WW>

Licence:

Je zdarma, dostupná na adrese digitalization.drives@siemens.com



Aplikační příklad



SINAMICS DriveSim Basic. Simulation of drive systems. Quick. Easy. Validated!

Compatible with standard time-based simulation tools (e.g. Simit, Simcenter Amesim, Matlab Simulink) +

Test and validation **against real SINAMICS** runtime guarantees accurate behavior +

Free of charge Download on **SIOS** +

Entry point for drive system simulation with minimum effort for parametrization +

Available as standardized **“Functional Mockup Unit” (FMU)** +

Constantly updated +

PROFIdrive telegrams Drive and encoder sequence control, setpoint channel, Speed Controller & DSC +

I Děkuji za pozornost