Agenda

1. Úvod
2. TIA v Digitálním podniku
3. Přehled novinek z HW Simatic PLC
4. Přehled novinek z TIA Portal V15 pro oblast PLC
5. Výběr novinek z TIA Portal V15 Options
6. Příklady použití PLCSIM Advanced
7. Diskuze a závěr

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Page 2
The automation portfolio for the Digital Enterprise with efficient proven automation components

Totally Integrated Automation
»TIA in the Digital Enterprise«

Operations
- SCADA System
- Energy Management

Control
- Controller
- HMI
- IPC
- Communication
- Motion Control
- CNC

Field
- Power Supply
- Industrial Identification
- Distributed I/O
- Drive Systems
- Industrial Controls

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One common database

Consistent and unified operator concept

Common, central services

Totally Integrated Automation Portal

- Common data management
- WinCC
- STEP 7
- SCOUT
- Startdrive
- HMI
- IPC
- Controller
- Distributed I/O
- Motion Control
- Drives
- Security integrated
- Safety integrated
- Diagnostics
- Energy Management

PROFINET
Integrated Engineering
Enhanced application scope in TIA Portal V15

Integration of new hardware

- Multifunctional platform S7-1500
- Integration of SINAMICS drives
- Enhanced portfolio S7-1500 T-CPUs and support of 2D-4D kinematics (Handling)
- New operator devices Comfort Panel Pro
Integrated Engineering
added value functions and new digitalization portfolio

Added value functions
- Working in a team with Multiuser Engineering
- Automated project generation of PLC and HMI (Openness, SiVArc)
- Integrated machine diagnosis with ProDiag
- Integrated energy consumption: Energy Suite
- User management with User management access control (UMAC)

New digitalization portfolio
- Virtual commissioning with PLCSIM Adv.
- OPC UA Server method calls and OPC UA Companion Specifications
... find out more!

Highlights of TIA Portal V15

Complete overview of technical highlights and functional enhancements of V15

Podcast TIA Portal V15 (SPS IPC Drives 2017)
https://www.youtube.com/watch?v=wErySvSwhVg&feature=youtu.be

Stage presentation TIA Portal V15 (SPS IPC Drives 2017)
https://www.youtube.com/watch?v=L2WUotVaOx0&t=4s

Easy entry and starter packages

TIA Portal V15 21-days TRIAL Version for Download via SIOS
www.siemens.com/tia-portal-trial

S7-1500 starter kits
www.siemens.com/s7-1500-starter-kits

SIMATIC Comfort Panel starter kits
www.siemens.com/comfort-panel-starter-kits
TIA Portal – Highlights of TIA Portal V15

**Hardware Configuration**
- Support for new hardware components
  - CPU 1518(F)-4 PN/DP MFP
  - CPU 1516T(F)
- Automatic hardware detection of PROFINET IO devices

**STEP 7 – Innovations**
- Breakpoints for CPU S7-1500
- Motion control – kinematics for handling tasks
- Language innovations: References
- Extended functions in PLC variable tables
- Mathematical functions for trace

**Startdrive – Innovationen**
- Support for SINAMICS S120, G150, G130, S150 and SINAMICS MV
- Extended access to TIA Portal Openness (read/write HW configuration/parameters)

**System Functions**
- Local administration of users/user groups
- Integration of HW documentation in the Help Viewer
- Extended access to TIA Portal Openness (SCL in XML, PLC download)

**TIA Portal Options**
- **STEP 7 Safety**: F-arrays (read access), overflow detection, handling
- **Multiuser**: Automatic marking, offline working
- **OPC UA**: Client, companion specs, methods
- **ProDiag**: Criteria, quantity structures, handling
- **PLCSIM Advanced**: Alarms, events, part process images
- **Target 1500S for Simulink**: Various extensions
- **SiVArC**: Alarme, Trend Controls, Template Screens
- **Energy Suite**: No PowerTags, S7 EE-Monitor for machines
- **TIA User Management Component**: Project-spanning maintenance of users/user groups

**WinCC – Innovations**
- New SIMATIC HMI PRO device family
- Modified device support
- Scalable vector graphic (SVG support)
- WinCC RT Professional Communication
- RFID support for panels

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Das SIMATIC Controller Portfolio
Always the right controller – Plus integrated added value!
Hardware Configuration – Overview of SIMATIC S7-1500 – The right CPU for every application

<table>
<thead>
<tr>
<th>CPU types</th>
<th>Compact CPUs</th>
<th>Standard-CPUs</th>
<th>Technology CPUs</th>
<th>MFP</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU types</td>
<td>1511C-1 PN</td>
<td>1512C-1 PN</td>
<td>1511F-1 PN</td>
<td>1515F-2 PN/DP</td>
</tr>
<tr>
<td></td>
<td>1511F-1 PN</td>
<td>1513F-1 PN</td>
<td>1515F-2 PN</td>
<td>1517F-3 PN/DP</td>
</tr>
<tr>
<td></td>
<td>1516F-3 PN/DP</td>
<td>1517F-3 PN/DP</td>
<td>1518F-4 PN/DP</td>
<td>1518F-4 PN/DP</td>
</tr>
<tr>
<td>Interfaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>data storage</td>
<td>175 KB 1 MB</td>
<td>250 KB 1 MB</td>
<td>150/225 KB 1 MB</td>
<td>150/225 KB 1 MB</td>
</tr>
<tr>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Bit-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>performance</td>
<td>60 ns 48 ns</td>
<td>60 ns 40 ns</td>
<td>30 ns 10 ns</td>
<td>60 ns</td>
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<td></td>
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<td>2 ns 1 ns</td>
<td>30 ns</td>
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<tr>
<td>Max. number</td>
<td>96 128 96</td>
<td>128 30 128</td>
<td>96 30 128</td>
<td>96 128</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30 10 30</td>
<td>30 10</td>
</tr>
<tr>
<td>Positioning axes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>· Typical²</td>
<td>5 5 5 5</td>
<td>7 7 7 7</td>
<td>128 128 10 30</td>
<td>45 70</td>
</tr>
<tr>
<td>· Maximum²</td>
<td>10 10 10</td>
<td>30 30 128</td>
<td>128 128 10 30</td>
<td>80 128</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>128 128</td>
<td>128 128</td>
</tr>
<tr>
<td>Width</td>
<td>85 mm 110 mm</td>
<td>35 mm 35 mm</td>
<td>70 mm 70 mm</td>
<td>175 mm 175 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>175 mm 175 mm</td>
<td>175 mm 175 mm</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>35 mm 70 mm</td>
<td>175 mm 175 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>70 mm</td>
<td>175 mm 175 mm</td>
</tr>
</tbody>
</table>

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Page 10

1 Additional 50 MB memory for ODK applications; 2 For 4ms Servo/IPO cycle
New Product Controller

SIMATIC S7-1500 Multifunctional Platform

The multifunctional platform based on the S7-1500 offers the possibility to execute high level language programs in parallel to the PLC program without additional PC hardware. The CPU 1518 MFP combines the advantages of a SIMATIC with those of the PC world, even fail safe.

The SIMATIC S7-1500 MFP CPU is the controller for standard and C/C++ applications with the highest performance and large program and data memory. The existing technological know-how in the form of C/C++ algorithms can be reused on the SIMATIC S7-1500.

http://www.siemens.com/mfp
Hardware Configuration – CPU 1518(F)-4 PN/DP MFP – Configuration of multifunctional platform

High End CPU 1518(F)-4 PN/DP MFP

- Performance of CPU 1518
- Independent runtime environment for C/C++ code on the CPU
- Reuse of existing technological know-how in C/C++ code: Synchronously and asynchronously with the STEP 7 program
- Automatic generation of PLC code from Simulink® models via Target 1500S

Application area
Merging of IPC and PLC in an MFP
Reduced space requirement, robustness
Hardware Configuration – CPU 1518(F)-4 PN/DP MFP – Classification of Multi-Functional Platform

IPC, Open Controller:
Open for Windows applications
• No restriction in operating system (OS) concerning HMI, applications, drivers, …
• Standard PC interfaces (USB, VGA, PCI, …)
• Hardware replacement with operating system image
• But: Update and maintenance of OS (Microsoft Security Updates, Patches) by OEM

CPU 1518 MFP:
Robust for embedded applications
• Preconfigured embedded operating system with stable programming interface (API)
• Typical controller interfaces
• Hardware replacement without engineering
• OS support on Siemens side incl. security updates

---

**Diagram:**
- **CPU 1505 S**
  - Embedded OS: STEP 7, C++ (CPU function library)
  - General-Purpose OS: Windows
  - Communication: PN IRT
  - Process data
  - Hypervisor
  - Operating system: C++ (API), SQL, Scripting, ...
  - HMI

- **CPU 1518 MFP**
  - Embedded OS: STEP 7, C++ (CPU function library)
  - General-Purpose OS: Windows
  - Communication: PN IRT
  - Process data
  - Hypervisor
  - Operating system: C++ (API), SQL, Scripting, ...
  - HMI
CPU 1518 MFP – C/C++ Runtime based on embedded Linux

Long-term Compatibility without reengineering

- **Preconfigured embedded Linux core** based on Yocto project with following components:
  - 64bit Linux (4.4)
  - 512MB application memory, including max. 256MB RAM disk
  - TCP/IP stack V4
  - DHCP client
  - Firewall (IP tables)
  - XML parser
  - TCF agent
  - Busy box
- **Communication/Access to process data** via virtual ethernet interfaces
- **Stable programming interface**, but:
  - restrictions concerning Linux programming interface
  - prohibited use of Linux package installer
PLC 1518 MFP
1. Application Example ODK Application – Overview

PLC 1518 MFP
Spouští Simulink Target funkce
v programu PLC

MATLAB/Simulink
Vývoj algoritmu
Robustní online přístup k PLC
(z externího zdroje)
1. Application Example ODK Application – Overview

Execution of MATLAB Simulink Model on the CPU Runtime

Manipulation of MATLAB Simulink Model Parameter in TIA Portal

MATLAB Simulink Parameter values in Tia Portal (Global Data Block)

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>Start value</th>
</tr>
</thead>
<tbody>
<tr>
<td>static</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RunTime</td>
<td>LReal</td>
<td>0.0</td>
</tr>
<tr>
<td><em>Simulink_PT1Para</em></td>
<td>LReal</td>
<td>0.0</td>
</tr>
<tr>
<td><em>Simulink_PT1Para</em></td>
<td>LReal</td>
<td>0.0</td>
</tr>
<tr>
<td>Gain_Gain</td>
<td>LReal</td>
<td>0.0</td>
</tr>
<tr>
<td>Gain1_Gain</td>
<td>LReal</td>
<td>0.0</td>
</tr>
<tr>
<td><em>Simulink_PT1Test</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PLC 1518 MFP
1. Application Example ODK Application – Overview

Execution of MATLAB Simulink Model on the CPU Runtime

Manipulation of MATLAB Simulink Model Parameter via PLC 1518 MFP Webserver

MATLAB Simulink Parameter values on the PLC 1518 MFP Webserver
2. Příklad aplikace - připojení databáze – přehled

PLC 1518 MFP

Spouští Simulink Target funkce v programu PLC

C/C++ Runtime
Realizuje výměnu dat mezi databází SQL a PLC

SQL Database
Uložení parametrů modelu pro Simulink Target funkce, které běží na PLC

MATLAB/Simulink
Vývoj algoritmu
Robustní online přístup k PLC (z externího zdroje)
PLC 1518 MFP
2. Application Example – Načítání parametrů z databáze

- Např. změna režimu PLC: STOP => RUN
- 1. Parametry modelu jsou uloženy v databázi
- 2. Čtete parametry modelu z databáze a zapisujeme je do PLC přes OPC UA
- 3. Parametry modelu jsou uloženy do DB v PLC
- 4. Voláme (zkompilovaný) Simulink model s aktualizovanými parametry
- 5. Vizualizace nových parametrů modelu v rozhraní HMI

Diagram:
- SIMATIC HMI
- PLC 1518 MFP
- CPU Function Library
- Embedded Linux-based C/C++ Runtime
- Simulink Model Provider (Executable)
- MySQL Database
- Engineering PC
PLC 1518 MFP
2. Application Example – Zapisování parametrů do databáze

• Změna parametru modelu na straně PLC
1. Parametry modelu změní uživatel prostřednictvím rozhraní HMI
2. Parametry modelu jsou uloženy do DB v PLC
3. Voláme (zkompilovaný) Simulink model s aktualizovanými parametry
4. Čteme parametry modelu z PLC přes OPC UA a zapisujeme je do externí databáze
5. Parametry modelu jsou uloženy do externí databáze
## Advanced Controller SIMATIC S7-1500
**The suitable CPU for every application**

<table>
<thead>
<tr>
<th>CPU-Type</th>
<th>Compact-CPUs</th>
<th>Standard-CPUs</th>
<th>Technology-CPUs</th>
<th>MFP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1511C-1 PN</td>
<td>1515F-2 PN</td>
<td>1515T-2 PN</td>
<td>1518F-4 PN/DP</td>
</tr>
<tr>
<td></td>
<td>1512C-1 PN</td>
<td>1516F-3 PN/DP</td>
<td>1515T-2 PN/DP</td>
<td>1518F-4 PN/DP</td>
</tr>
<tr>
<td></td>
<td>1511F-1 PN</td>
<td>1517F-3 PN/DP</td>
<td>1516T-3 PN/DP</td>
<td>1518F-4 PN/DP</td>
</tr>
<tr>
<td></td>
<td>1513F-1 PN</td>
<td>1518F-4 PN/DP</td>
<td>1517TF-3 PN/DP</td>
<td>1518F-4 PN/DP</td>
</tr>
</tbody>
</table>

### Interface

<table>
<thead>
<tr>
<th></th>
<th>1511C-1</th>
<th>1512C-1</th>
<th>1511F-1</th>
<th>1513F-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program/Data Memory</td>
<td>175 KB</td>
<td>250 KB</td>
<td>150 KB</td>
<td>300 KB</td>
</tr>
<tr>
<td>Memory</td>
<td>1 MB</td>
<td>1 MB</td>
<td>225 KB</td>
<td>1 MB</td>
</tr>
</tbody>
</table>

### Bit-Performance

<table>
<thead>
<tr>
<th></th>
<th>1511C-1</th>
<th>1512C-1</th>
<th>1511F-1</th>
<th>1513F-1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60 ns</td>
<td>48 ns</td>
<td>60 ns</td>
<td>40 ns</td>
</tr>
</tbody>
</table>

### Max. number connections

<table>
<thead>
<tr>
<th></th>
<th>1511C-1</th>
<th>1512C-1</th>
<th>1511F-1</th>
<th>1513F-1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>96</td>
<td>128</td>
<td>96</td>
<td>128</td>
</tr>
</tbody>
</table>

### Positioning Axes

- **Typical**: 5, 5, 5, 5, 5, 7, 7, 7, 128, 128, 5, 7, 55, 70, 128
- **Maximum**: 10, 10, 10, 10, 30, 30, 128, 128, 10, 30, 80, 128, 128

### Width

<table>
<thead>
<tr>
<th></th>
<th>1511C-1</th>
<th>1512C-1</th>
<th>1511F-1</th>
<th>1513F-1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>85 mm</td>
<td>110 mm</td>
<td>35 mm</td>
<td>35 mm</td>
</tr>
</tbody>
</table>

New mechanical design

---

1) additional 50 MB working memory for C/C++ in PLC-RT and 500 MB for C/C++ Runtime application
2) with 4ms Servo/IPO
3) No additional TOs in use
Advanced Controller SIMATIC S7-1500
New mechanical Design

S7-1500 Compact-CPUs
- CPU 1511C
- CPU 1512C

S7-1500 modular CPUs
- CPU 1511(F)
- CPU 1513(F)
Advanced Controller SIMATIC S7-1500

Improvements in the mechanical design

S7-1500 CPU with a new mechanical design:
- A new mechanical design because of the integration of the display onboard of the CPU:
  - Identical installation dimensions
  - Slight changes regarding placement of all connectors/plugs (PN-plug 90° changed)
- RUN/STOP-switch is replaced by RUN/STOP buttons:
  - No damage of the RUN/STOP-switch any longer
  - "STOP ACTIVE" shows that the CPU was stopped by the "STOP"-button on the CPU
- Identical handling of default reset or overall reset
- The display could be read – even if the cover is opened
- Identical mechanical manipulation security mechanisms

Spare part functionality:
The new CPUs are completely spare part compatible to their previous version CPUs
Advanced Controller SIMATIC S7-1500
New mechanical Design

Change of the display during RUN (identical behavior)

Pull and plug of the SIMATIC Memory Card inclusive fixing of the SMC
Advanced Controller S7-1500 CPUs
New mechanical Design with new Article Number

<table>
<thead>
<tr>
<th>Model</th>
<th>Current Article Number</th>
<th>New Article Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU 1511(F) / CPU 1513(F)</td>
<td>6ES751x-xyy01-0AB0</td>
<td>6ES751x-xyy02-0AB0</td>
</tr>
<tr>
<td>CPU 1511C / CPU 1512C</td>
<td>6ES751x-1CK00-0AB0</td>
<td>6ES751x-1CK01-0AB0</td>
</tr>
</tbody>
</table>

All other CPUs: no article number change
# Advanced Controller SIMATIC S7-1500

**Engineering of CPUs with new article number**

<table>
<thead>
<tr>
<th>Example: CPU 1511-1 PN</th>
<th>MLFB 6ES7511-1AK01-0AB0</th>
<th>MLFB 6ES7511-1AK02-0AB0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Firmware</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FW &lt; V 2.5, loadable on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FW = V2.5, loadable on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FW &gt; V2.5, loadable on</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Spare part use case</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>complete spare part compatible*</td>
</tr>
<tr>
<td><strong>Engineering with:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIA Portal ≤ V14 SP1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIA Portal ≥ V 15</td>
<td></td>
<td>X**</td>
</tr>
</tbody>
</table>

* When you replace a CPU (e.g. 6ES7511-1AK00-0AB) with a compatible successor type (e.g. 6ES7511-1AK01-0AB0), the TIA Portal project need not be changed; updating the TIA Portal project is also not necessary.

**Please select the predecessor CPU (e.g. 6ES7511-1AK01-0AB0) in the engineering.
Advanced Controller SIMATIC S7-1500
Usage of FW 2.5 with former TIA Portal versions

V12 / V13 / V14 Engineering Software

- V12 Project with FW 1.0 / 1.1
- V13 / V13 SP1 Project with FW 1.5 / 1.6 / 1.7 / 1.8
- V14 / V14 SP1 Project with FW 2.0 / 2.1

Complete Spare Part Compatibility

Online support: ID 109744163

V15 Engineering Software

- V15 Project with FW 2.5

New functionalities require TIA Portal V15 and firmware V2.5
Hardware portfolio

SIMATIC Controller – For everything that can be controlled
www.siemens.com/controller-magic

SIMATIC Controller Portfolio
www.siemens.com/simatic-controller

SIMATIC S7-1500 multifunctional platform
www.siemens.com/mfp

SIMATIC S7-1500 CPU
www.siemens.com/s7-1500

Getting Started S7-1500

Support of migration

documentation to support migration
http://www.siemens.com/tia-migration

SITRAIN Trainings with TIA Portal
http://www.siemens.com/tia-portal-trainings
TIA Portal – Highlights of TIA Portal V15

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Target 1500S for Simulink: Various extensions
SiVArC: Alarme, Trend Controls, Template Screens
Energy Suite: No PowerTags, S7 EE-Monitor for machines
TIA User Management Component: Project-spanning maintenance of users/user groups

WinCC – Innovations
• New SIMATIC HMI PRO device family
• Modified device support
• Scalable vector graphic (SVG support)
• WinCC RT Professional ‡ Communication
• RFID support for panels

New
Details
New
Hardware detection of PROFINET IO devices

- Time savings through automatic detection of IO devices
- Instead of manual configuration from the hardware catalog, insertion of IO devices including modules from the system/machine in the project by means of hardware detection
STEP 7 Innovations –
Breakpoints on the CPU S7-1500

Function
- Setting of breakpoints in SCL/STL programs (also possible in mixed LAD/FUP blocks)
- Maximum number of active breakpoints per CPU:
  - \( \leq \) CPU 1516/CPU 1515SP PC: 8
  - \( \geq \) CPU 1517/CPU 1507S/S7-PLCSIM: 20
- From firmware version V2.5 of CPU S7-1500

Customer benefits
- Testing of SCL and STL program code with the aid of breakpoints
- Step-by-step isolation of errors
- Simple and fast analysis of complex programs in the office before actual startup

When a breakpoint is reached, the CPU enters hold mode
**STEP 7 Language Innovations – New statements – Scatter/Gather**

Convert data for further processing
- SCATTER decomposes bit sequences (Byte, Word, etc.) into a bit array
- GATHER assembles a bit array to form a bit sequence
- SCATTER_BLK/GATHER_BLK for decomposing/assembling bit

**Support for STRUCT and PLC data types with exclusively boolean elements**

Sample application
Decompose, process or also simply assemble control and status words
STEP 7 Language Innovations – References

Sample application
- Generic access to different data records
- Fully symbolic access to referenced variables without prior recopying to intermediate variable
STEP 7 Language Innovations – New statements – FileReadC/FileWriteC

Function
• Read data from an ASCII file from the SIMATIC memory card
• Write data to an ASCII file on the SIMATIC memory card

Customer benefits
Complex file structures are used in free ASCII format on the SIMATIC memory card, for example to
• Import recipes in cases where CSV is not flexible enough
• Import complex parameterizations or configuration files
• Output complex files for documentation
STEP 7 Innovations –
Download/upload for PLC variable tables

Function
• Download PLC variable tables to the CPU
• Display PLC variable tables also under “Accessible devices” and on the memory card (incl. opening)
• Online status at **granular table level**
• Uploading of individual or all PLC variable tables into the predefined structure

Customer benefits
• Tracking of changes to other **devices** on the CPU
• Quick overview of the online status of the CPU
• Improved team engineering on the CPU
STEP 7 Innovations –
Online/offline comparison for PLC variable tables

Function
- Online/offline comparison at table level
- Detailed comparison for individual PLC variable tables
- Detailed comparison for all variables
- Checksum-based comparison for
  - Variables
  - Constants
  - Comments
  - Language configuration

Customer benefits
Complete overview of all online/offline information
STEP 7 Innovations – Mathematics functions for trace

Function
- Calculation of new signals from the recorded signals based on mathematical formulas
- Fundamental arithmetic operations
- Amount, root, square, 1/X, modulo
- Integral, differentiation
- Various filter functions
- Calculation of mean value, effective value, integral in the range of the measuring cursor

Customer benefits
- Generation of unavailable information
- Subsequent preparation of measurements
- Measurement of signal paths (e.g. mean value)
# TIA Portal – Highlights of TIA Portal V15

## Hardware Configuration
- Support for new hardware components
  - CPU 1518(F)-4 PN/DP MFP
  - CPU 1516T(F)
- Automatic hardware detection of PROFINET IO devices

## STEP 7 – Innovations
- Breakpoints for CPU S7-1500
- Motion control – kinematics for handling tasks
- Language innovations: References
- Extended functions in PLC variable tables
- Mathematical functions for trace

## WinCC – Innovations
- New SIMATIC HMI PRO device family
- Modified device support
- Scalable vector graphic (SVG support)
- WinCC RT ProfessionalCommunication
- RFID support for panels

## Startdrive – Innovationen
- Support for SINAMICS S120, G150, G130, S150 and SINAMICS MV
- Extended access to TIA Portal Openness (read/write HW configuration/parameters)

## System Functions
- Local administration of users/user groups
- Integration of HW documentation in the Help Viewer
- Extended access to TIA Portal Openness (SCL in XML, PLC download)

## TIA Portal Options
- **STEP 7 Safety**: F-arrays (read access), overflow detection, handling
- **Multiuser**: Automatic marking, offline working
- **OPC UA**: Client, companion specs, methods
- **ProDiag**: Criteria, quantity structures, handling
- **PLCSIM Advanced**: Alarms, events, part process images
- **Target 1500S for Simulink**: Various extensions
- **SiVARC**: Alarme, Trend Controls, Template Screens
- **Energy Suite**: No PowerTags, S7 EE-Monitor for machines
- **TIA User Management Component**: Project-spanning maintenance of users/user groups

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**TIA User Management Component:** Project-spanning maintenance of users/user groups
Function
- Automatic marking of multiuser objects
- Offline working possible with multiuser engineering
- Enhanced check-in and comment functions
- Project server with extended revision history and recovery functions

Customer benefits
- Multiuser engineering also possible without active server connection
- Improved usability for quick overview of changed objects and conflict recognition
- Traceability of project progression on the multiuser server (What was changed by whom?)
- Project milestones can be commented and saved
- Project history can be exported for evaluation

**Working within a team with Multiuser Engineering**

- More information
- [Product website](http://www.siemens.com/tia-portal)
- Automation Task Video Multiuser Engineering
  [https://youtu.be/n4oTZ2Gg6U](https://youtu.be/n4oTZ2Gg6U)
- Application example Multiuser Engineering
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TIA User Management Component: Project-spanning maintenance of users/user groups
OPC UA in collaboration with PROFINET
Perfect interplay in one common network

Strengths of OPC UA

- Platform independent
- Direct device connection over all levels
- Authentication and encryption
- Semantic services

Benefits in the data and management level

Strengths of PROFINET

- Deterministic
- Real-time capable
- Real-time C2C-communication
- Standardized profiles

Benefits in the controller and field level
OPC UA in collaboration with PROFINET
Perfect interplay in one common network
## OPC UA on SIMATIC S7-1500

### Range of server functions with TIA Portal V15

<table>
<thead>
<tr>
<th>Browsing</th>
<th>Read / Write</th>
<th>Registered Read / Write</th>
<th>Subscription</th>
<th>Methods</th>
<th>Companion Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Browsing of CPU data</strong></td>
<td><strong>Asynchronous data access</strong></td>
<td><strong>High performance during repeated access</strong></td>
<td><strong>Load reduction during HMI / Monitoring applications</strong></td>
<td><strong>Consistent transmission without manual handshake</strong></td>
<td><strong>Information modeling</strong></td>
</tr>
</tbody>
</table>

### Features:
- **Browsing**
  - Browsing Request
  - Browsing Response

- **Read / Write**
  - RW Request
  - RW Response

- **Registered Read / Write**
  - Reg. Nodes Request
  - Reg. Nodes Response

- **Subscription**
  - Publishing
  - Sampling

- **Methods**
  - Call Request
  - Call Response

- **Companion Specification**
  - Information modeling

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## OPC UA with S7-1500

### Access type recommendations

<table>
<thead>
<tr>
<th>Use case</th>
<th>Recommended type of access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single or rare access of data</td>
<td>Read / Write</td>
</tr>
</tbody>
</table>
| Cyclic read of data (≤ 10s)  
Monitor data | Subscription |
| High performance data access to predefined nodes | Registered Read / Write |
OPC UA Subscription – OPC UA Client subscribing to value change of data

OPC UA server is monitoring variables of the plc

- Network bandwidth used is minimized
- OPC UA Client can ask for specific detailed subscription parameters
- Filtering possible to avoid small changes of values

OPC UA server

- PLC data
  - Var = 0
  - Var = 1

Change

OPC UA client

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Performance – Používat pole a struktury kdykoli je to možné

PLC programmer
Vždy strukturujte data:
1. Arrays
2. Structures
3. Individual Variables

OPC UA
Client programmer
Čtěte pole a struktury jako celek!

OPC UA
“Registered Read” při opakovaném přístupu k stejným datům

Test with development version, exact heights of the bars are not significant, but tendencies are!

Factor 10-100
Factor 2-3

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## OPC UA on SIMATIC S7-1500 Licensing

<table>
<thead>
<tr>
<th>CPU</th>
<th>Required license</th>
<th>Article number</th>
<th>Download</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET 200SP CPU 1510SP/1512SP/1515SP (Open Controller) S7-1500 CPU 1511/1513</td>
<td>SIMATIC OPC UA S7-1500 Small</td>
<td>6ES7823-0BA00-1BA0</td>
<td>6ES7823-0BE00-1BA0</td>
</tr>
<tr>
<td>ET 200pro CPU 1516pro S7-1500 CPU 1515/1516 Software PLC 1505S/1507S</td>
<td>SIMATIC OPC UA S7-1500 Medium</td>
<td>6ES7823-0BA00-1CA0</td>
<td>6ES7823-0BE00-1CA0</td>
</tr>
<tr>
<td>S7-1500 CPU 1517/1518</td>
<td>SIMATIC OPC UA S7-1500 Large</td>
<td>6ES7823-0BA00-1DA0</td>
<td>6ES7823-0BE00-1DA0</td>
</tr>
</tbody>
</table>
OPC-UA je dnes v každém S7-1500 PLC!

**Jednoduchá integrace, rozšíření**
... PROFINET a OPC-UA na jedné síti

**Cross-vendor komunikace**
... s OPC-UA na PLC S7-1500 a WinCC

**Integrované a bezpečné**
... s ověřováním a šifrováním dat v rámci standardu OPC-UA

Standardized communication with OPC UA

More information
[Product website](https://support.industry.siemens.com/cs/ww/en/view/109737901)

Automation Task Video OPC UA
[https://youtu.be/BZSY0piuLQc](https://youtu.be/BZSY0piuLQc)

Application example OPC UA .NET Client
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TIA Portal Options – ProDiag – Overview of new functions

Function

- **Criteria analysis** for ProDiag supervisions and S7-Graph
- Result of the criteria analysis within the alarm text
- Display of Predecessor/successor step within the HMI **S7-Graph Overview Control**
- **1000 supervisions** per supervision block (250 in V14)
- **Identical timestamp** for all identified events in a cycle
- Rapid activation of supervisions in PLC tag table, DB
- Numerous other useful functional enhancements (see detailed slides)

Customer benefits

Even simpler engineering of supervisions and improved diagnosis during operation with **SIMATIC ProDiag**

![Diagram showing the flow of configure alarm, automatic code generation, and jump into PLC code]

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TIA Portal Options – ProDiag –
Multiple selection for defining supervisions

Function
• A large number of supervisions can be created in a single operation in the PLC Tag Table and in the Global DB also in the FB interface
• Only Boolean tags are taken into account within the selection. In other words, non-boolean tags do not have to be specifically excluded in the multiple selection

Customer benefits
Rapid definition of multiple supervisions

Increased engineering efficiency!

Time saving, avoidance of errors
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Simulation with PLCSIM Advanced – Planning security through simulation

SIMATIC PLCSIM Advanced – Simulation for faster time to market

- Virtual S7-1500 (F/T) controller for extensive functional simulation including communications and web server
- Including open API for integration into individual co-simulations
- Support for multiple and distributed instances to simulate multiple controllers on the network
TIA Portal Options – PLCSIM Advanced V2.0 – Overview of new functions

Functional enhancements of TIA Portal V15

- **Synchronization of** PLCSIM Advanced with co-simulation tools on **part process images of** cyclical OBs (e.g. watchdog OBs)
- Support for **acyclical services** (RDREC/WRREC) and alarms (e.g. process alarms)
- Process alarms configured in the TIA Portal can be **output** via the **API**
- **Simple backup and recovery** of software and hardware configuration of PLCSIM Advanced instances
- **Parallel installation** of PLCSIM and PLCSIM Advanced on one PC
- Other useful functional enhancements (see detailed slides)

Customer benefits
Development of additional customer use cases in a virtual environment

Digital Twin of S7-1500
TIA Portal Options – PLCSIM Advanced V2.0 – Back up software and hardware configuration

Backup from online device
- Consistent backup of software and hardware configuration of a CPU created in PLCSIM Advanced from the TIA Portal
- Subsequent loading of backed up software and hardware configuration in a CPU created in PLCSIM Advanced

Customer benefits
Simulations can be interrupted by the backup and continued after the backup is loaded since the backup includes residual up-to-date values
Virtual SIMATIC memory card – storage path
As soon as a controller is created in PLCSIM Advanced, a virtual SIMATIC memory card is also created. The storage path of this memory card can be chosen freely.

Cross-computer access to the SIMATIC memory card
Cross-computer access to the virtual SIMATIC memory card is enabled via API functions.

```
.Net (C#)
Syntax   void ArchiveStorage(
            string in_FullFileName
);  
Parameter  
  * string in_FullFileName:
    the full file path to the .zip file. The path is based on the directories of the computer the API is being called.

.Net (C#)
Syntax   void RetrieveStorage (
            string in_FullFileName
);  
Parameter  
  * string in_FullFileName:
    the full file path to the .zip file. The path is based on the directories of the computer the API is being called.
```
TIA Portal Options – PLCSIM Advanced V2.0 – Supported firmware

Strategy

PLCSIM Adv. V2.0 will support Firmware 2.5 released with TIA Portal V15 as well as all lower firmware versions down to Firmware 1.8.

Higher firmware versions will be supported with future versions of PLCSIM Advanced soon after release.
TIA Portal Options – PLCSIM Advanced V2.0 – Direct CPU operation

Setting CPUs to Run/Stop status
Set one or more CPUs directly to Run or Stop status in PLCSIM Advanced

Perform memory reset
Perform a memory reset in PLCSIM Advanced directly on one or more CPUs

Customer benefits
• Fast, intuitive modification of CPU status without having to switch to the TIA Portal to do this
• Simple option to perform a memory reset directly in PLCSIM Advanced so as to set the controller to a familiar initial state
Identification of previously created controllers

If a controller was already created in the past, a drop-down menu appears when the name is entered, which offers all previously known controllers for selection (based on available virtual SIMATIC memory cards).

Customer benefits

Once created, controllers can be located again easily and started without having to fill out the full mask.
# Supported organization blocks

<table>
<thead>
<tr>
<th>Internal program execution</th>
<th>V1.0</th>
<th>V2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main (OB1)</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Startup (OB100)</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Time-delay interrupt (OB20)</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Cyclic interrupt (OB30)</td>
<td>✔ 1</td>
<td>✔</td>
</tr>
<tr>
<td>Time error (OB80)</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Programming error (OB121)</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>I/O access error (OB122)</td>
<td>✗</td>
<td>✔</td>
</tr>
<tr>
<td>Time-of-day interrupt (OB10 - 17)</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>MC-Interpolator (OB92)</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>MC-Servo (OB91)</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Synchronous cycle interrupt (OB61)</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Can be called by API call</th>
<th>V1.0</th>
<th>V2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware interrupt (OB40)</td>
<td>✗</td>
<td>✔</td>
</tr>
<tr>
<td>Diagnostics interrupt (OB82)</td>
<td>✗</td>
<td>✔</td>
</tr>
<tr>
<td>Insert/remove (OB83)</td>
<td>✗</td>
<td>✔</td>
</tr>
<tr>
<td>Rack failure (OB86)</td>
<td>✗</td>
<td>✔</td>
</tr>
<tr>
<td>Status interrupt (OB55)</td>
<td>✗</td>
<td>✔</td>
</tr>
<tr>
<td>Update interrupt (OB56)</td>
<td>✗</td>
<td>✔</td>
</tr>
<tr>
<td>Manufacturer-specific interrupt (OB57)</td>
<td>✗</td>
<td>✔</td>
</tr>
</tbody>
</table>

1 Already works in V1.0 but without updated I/O values on subprocess images
Parallel installation of PLCSIM and PLCSIM Advanced

PLCSIM V15 and PLCSIM Advanced V2.0 can be installed on the same PC. However, the two simulation tools cannot be used simultaneously.
Novinky:

- Vylepšení deterministtiky (decoupling from the Windows Scheduler)
- Lepší výkon při simulaci motion control úloh
- Windows 10 podpora
- Podpora funkce Online backup TIA Portal (save and continue later)
- Zlepšení výkonu při symbolickém adresování
- Vylepšené uživatelské rozhraní
TIA Portal Options – PLCSIM Advanced V2.0 – License concept

Instance 1     Instance 2     Instance 3

License concept

One license for two instances!\(^1\)
- Floating License
- Enterprise License (EPL)
- Unlock Copy License (UCL)
- Trial License for 21 days

Parallel installation possible\(^2\)
of PLCSIM and PLCSIM Advanced

List price
2,500 € (Download)

License for upgrading
to the newest version: V1.0 → V2.0

\(^1\): On one PC
\(^2\): No parallel usage

**Detaily k PLCSIM Advanced**

**Více info**

**Webpage**

**Aplikační příklad: S7-PLCSIM Advanced: Co-Simulation via API**

**Aplikační příklad: Automated testing with SIMATIC S7-PLCSIM Advanced**

**Aplikační příklad: Virtual Commissioning with SIMATIC and Simulink**

**Aplikační příklad: Virtual Commissioning by basic behavior modeling with SIMATIC S7-PLCSIM Advanced**
TIA Portal V15 – Installation and support of devices

News

- New installation package combines Step7 Prof. and WinCC Adv./Prof.
- 2 variants: WinCC Adv. or WinCC Prof.
- Openness is part of standard installation
- Installation of PLCSIM and PLCSIM Advanced possible to install in parallel

Benefits

- Decreased download size for the installation package
- More easy and fast installation with fewer dependencies
- Long-term service guaranteed thanks to installation of different TIA Portal version in parallel
WinCC V15 Innovations – New approach for supported devices

In order to maintain panels with images up to V11 in WinCC V15, they have to be upgraded before.

- WinAC MP 177, WinAC MP 277, WinAC MP 377: No support in V15
- OP und TP der Serie 70, Serie 170 und Serie 270: No support in V15
- Multi Panels der Serie 170, Serie 270 und Serie 370: No support in V15
- TIA Portal Panels with V11 Image: No support in V15
- Only TIA Portal Panels from Image V12

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WinCC Innovations – Delivery of Panel Images

The delivery of Images was changed with TIA Portal V15

**DVD1:** SIMATIC WinCC / STEP 7 Professional Current Panel Images for V15 (V12.0, V14.1, V15.0)

**DVD3:** SIMATIC WinCC Legacy Panel Images for V15.0 (V13.0, V13.1 and V14.0)

Note: The Panels can be configured, created and simulated in the TIA Portal even if the Image/Runtime is not installed. These are required however for downloading the device or the ProSave functions.
TIA Portal V15 – Project upgrade

V13 SP1/SP2 Engineering SW
(can be used with V15 license)

V15 Engineering SW

Side-by-side installation of V13 SP1/SP2, V14 SP1 and V15 allows access to all project versions
More information on installation

- Preconditions for installation

- Compatibility tool TIA Portal
  [http://www.siemens.com/kompatool](http://www.siemens.com/kompatool)

- Online Support – topic site TIA Portal

- 21 days TRIAL package of V15 via Download:

- 21 days TRIAL package of V13 SP2 via Download:
| 1  | Úvod                      | x |
| 2  | TIA v Digitálním podniku  | x |
| 3  | Přehled novinek z HW Simatic PLC | x |
| 4  | Přehled novinek z TIA Portal V15 pro oblast PLC | x |
| 5  | Výběr novinek z TIA Portal V15 Options | x |
| 6  | Příklady použití PLCSIM Advanced | x |
| 7  | Diskuze a závěr          | x |
SIMATIC S7-1500 Starter kit including Licenses for OPC UA small & ProDiag 250 Supervisions

Components of the starter kit SIMATIC S7-1500:

- SIMATIC S7-1500 CPU 1511C-1 PN
- SIMATIC Memory Card, 4 Mbyte
- Rail 160mm
- STEP7 Professional V15, 365 day License
- Power supply PM 70W 120/230 V AC
- Standard Ethernet CAT 5-Kabel
- Screwdriver

In addition with TIA Portal V15\(^1\)

- SIMATIC ProDiag S7-1500 for the use of 250 supervisions
- SIMATIC OPC UA S7-1500 Small, Single Runtime License

Similar packages also exist for the S7-1500 Technology-CPU including a CPU1511T-1PN

\(^1\) Limited for the period of TIA Portal V15
Everything you want to know about licenses and Software Update Service

Overview SIMATIC licenses
www.siemens.com/simatic-licenses

Software Update Service
www.siemens.com/simatic-sus

Online Software Delivery
www.siemens.com/osd

SIMATIC S7-1500 starter kits
www.siemens.com/s7-1500-starter-kits

SIMATIC S7-1200 starter kits
www.siemens.com/s7-1200-starterkits

SIMATIC HMI Comfort Panel Starterpakete
www.siemens.com/comfort-panel-starter-kits

Support

Configure hardware and software components
www.siemens.com/tia-selection-tool

21 days TRIAL package via download
http://www.siemens.com/tia-portal-trial

Functional description to change SUS to Download

Login with industry Mall ID and password at SUSmanager

Search and choose corresponding »SUS contract«

Change delivery type to »SUS Download«

Done. To confirm the change we will send you an email.
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siemens.com/tia-portal
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