SIEMENS
Ingenuity for life

Engineered with TIA Portal

SIMATIC S7-1500 T-CPU
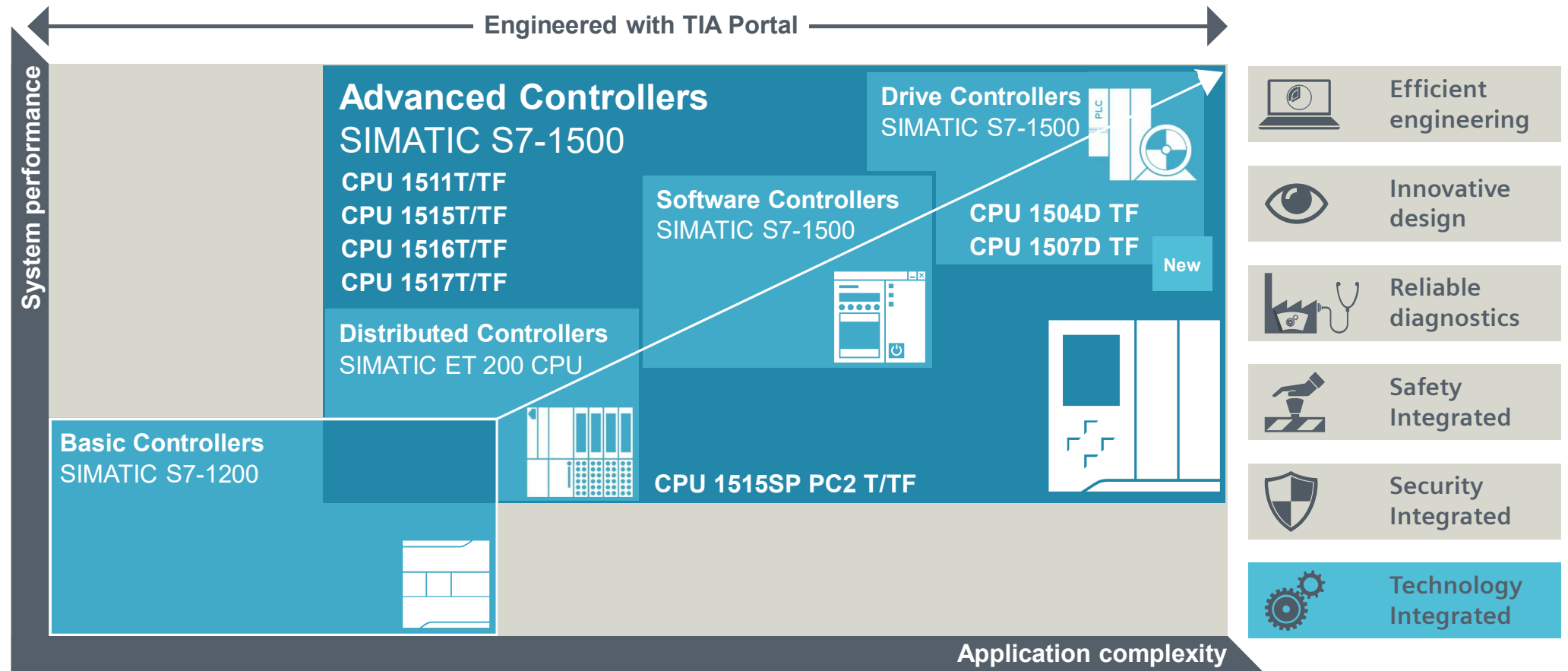## Agility in machine building

Unrestricted © Siemens 2019   siemens.com/simatic-technology

The SIMATIC Controllers Portfolio
Always the right controller – Plus integrated added value!

SIEMENS
Ingenuity for life

Engineered with TIA Portal

System performance

Advanced Controllers
SIMATIC S7-1500

CPU 1511T/TF
CPU 1515T/TF
CPU 1516T/TF
CPU 1517T/TF

Drive Controllers
SIMATIC S7-1500

Software Controllers
SIMATIC S7-1500

CPU 1504D TF
CPU 1507D TF

New

Distributed Controllers
SIMATIC ET 200 CPU

Basic Controllers
SIMATIC S7-1200

CPU 1515SP PC2 T/TF

Application complexity

- Efficient engineering
- Innovative design
- Reliable diagnostics
- Safety Integrated
- Security Integrated
- Technology Integrated

Advanced Controller – SIMATIC S7-1500 CPU
Increase productivity with the ultimate power

SIEMENS
Ingenuity for life

Security Integrated +
- Integrated copy and know-how protection function protect intellectual property
- Improved access protection (authentication)

Safety Integrated +
- A controller for standard and fail-safe tasks
- The high-density channel can be directly addressed during the engineering

High Performance +
- Higher productivity and product quality thanks to the backplane bus and shortest reaction times
- PROFINET with deterministic time response ensure reproducibility and precision within µs

Efficient Engineering +
- Support of all IEC 61131-3 programming languages (LAD/FBD, STL, SCL and Graph) and of high-level languages such as C/C++ (only for CPU 1518(F)-4 PN/DP MFP and CPU 1515SP PC2 (F/T/TF) through SIMATIC ODK 1500S)

Reliable diagnostics +
- The automatic generation of system and user diagnostics enables quick error detection
- Any errors can be quickly localized on-site thanks to 1:1 LED channel assignment for peripheral systems

Technology Integrated +
- Motion Control task can be programmed directly in the controller, e.g.
  - Speed-controlled axes, positioning axes, gearing, camming
  - Control of kinematics
  - Cross-PLC synchronous operation
- Implement various technology functions directly with I/O modules (e.g. PWM)

SIMATIC S7-1500 T-CPU | Sales slides

Advanced Controller – SIMATIC S7-1500 T-CPU
Extended motion control functions with TIA Portal V16 and firmware V2.8 [1]

SIEMENS
Ingenuity for life

Additional motion control functions ⊞

- Kinematic functions
  - Control of kinematics
    with up to 4 interpolating axes
- Gearing and camming
  - Synchronization with specifying the synchro-
    nous pos. of the leading and following axes
  - Setpoint value coupling
  - Actual value coupling with extrapolation
- **Cross-PLC synchronous operation** `New`
  - Synchronisation between axes on different
    CPUs
- SIMATIC Safe Kinematics V1.0
  - Optional fee-based system library for safe
    motion monitoring in the cartesian space

Integrated editors and viewers ⊞

- Cam editor
- Kinematics configuration
- Kinematics trace
- Coordination of traces in different CPUs

Hardware innovations ⊞

- SIMATIC S7-1500 T-CPUs
  - CPU 1511T, CPU 1511TF
  - CPU 1515T, CPU 1515TF
  - CPU 1516T, CPU 1516TF
  - CPU 1517T, CPU 1517TF
  - CPU 1515SP PC2 T/TF
  - **CPU 1504D TF, CPU 1507D TF** `New`
- Standard-, safety-plc and motion control on one
  controller

Programming ⊞

Consistent and seamless extension
of S7-1500 by S7-1500 T-CPU

Web server ⊞

Diagnostic pages for motion control

[1] Compared to the standard CPU

Advanced Controller – SIMATIC Drive Controller
Scalable motion control in the Advanced Controller portfolio

SIEMENS
Ingenuity for life

New

Ultra-compact Design +
- S7-1500 TF-CPU and SINAMICS S120 drive control in one device
- No additional space required for the PLC

Easy scalable +
- Uniform interfaces across all performance classes (CPU 1504D TF / CPU 1507D TF)
- Additional drive systems (e.g. SINAMICS S120, S210) can be connected via PROFINET.

Powerful +
- Powerful TF-CPU with integrated SINAMICS S120 drive control
- Well equipped with memory, interfaces and technology I/Os
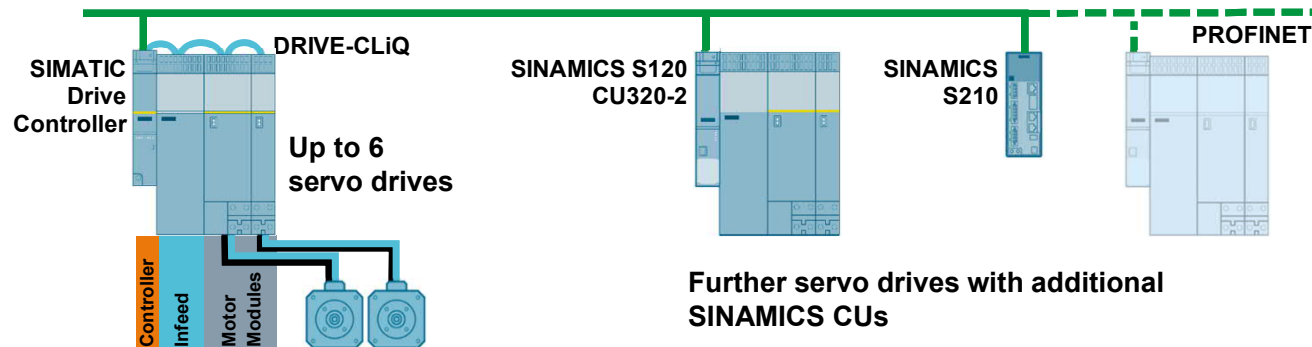
Easy to use +
- Comfortable project planning in the TIA portal with SIMATIC STEP 7 and SINAMICS Startdrive
- Low cabling and installation expense
- Central data storage on "one" SIMATIC Memory Card

DRIVE-CLiQ

SIMATIC Drive Controller

PROFINET

SINAMICS S120 CU320-2

SINAMICS S210

Up to 6 servo drives

Controller | Infeed | Motor Modules

Further servo drives with additional SINAMICS CUs

SIMATIC S7-1500 T-CPU | Sales slides

	Technology CPU				Standard CPU	Open Controller	Drive Controller CPU	
CPU types	**1511TF-1 PN**	**1515TF-2 PN**	**1516TF-3 PN/DP**	**1517TF-3 PN/DP**	**1518F-4 PN/DP (MFP)[1]**	**1515SP PC2 TF PN**	**1504D TF**	**1507D TF**
Interfaces	[1] [1]	[1][2] [1]	[1][2]■ [1]	[1][2]■ [1]	[1][2]■ [1][3]	[1] [1]	[1][1]■ [1][2][3]	[1][1]■ [1][2][3]
Program memory	225/225 KB	750/750 KB	1,5/1,5 MB	3/3 MB	4/6 MB	1/1,5 MB	2 MB	6 MB
Data memory	1 MB	3 MB	5 MB	8 MB	20 MB[1]	5 MB	4 MB	20 MB
Bit performance	60 ns	30 ns	10 ns	2 ns	1 ns	10 ns	Scale with motion control performance	
Functions	Display, S7-1500 backplane bus						SINAMICS S120 Integrated (incl. 12 DI, 8 DI/DQ) additional PLC technology I/Os (8 DI/DQ)	
Positioning axes								
▪ Typical[2]	5	7	55	70	128	30	10	55
▪ Maximum[3]	10	30	80	128	128	30	30	160
Motion Control Resources[4]	800	2.400	6.400	10.240	10.240	2.400	2.400	12.800
Extended Motion Control Resources[5]	40	120	192	256	–	120	120	420

NEW

1 50 MB add. for C/C++ (PLC-RT)+500 MB for C/C++ appl. (RT/appl.) **2** At 4 ms Servo/IPO cycle time and 35 % CPU load due to Motion Control **3** No further TO´s applicable
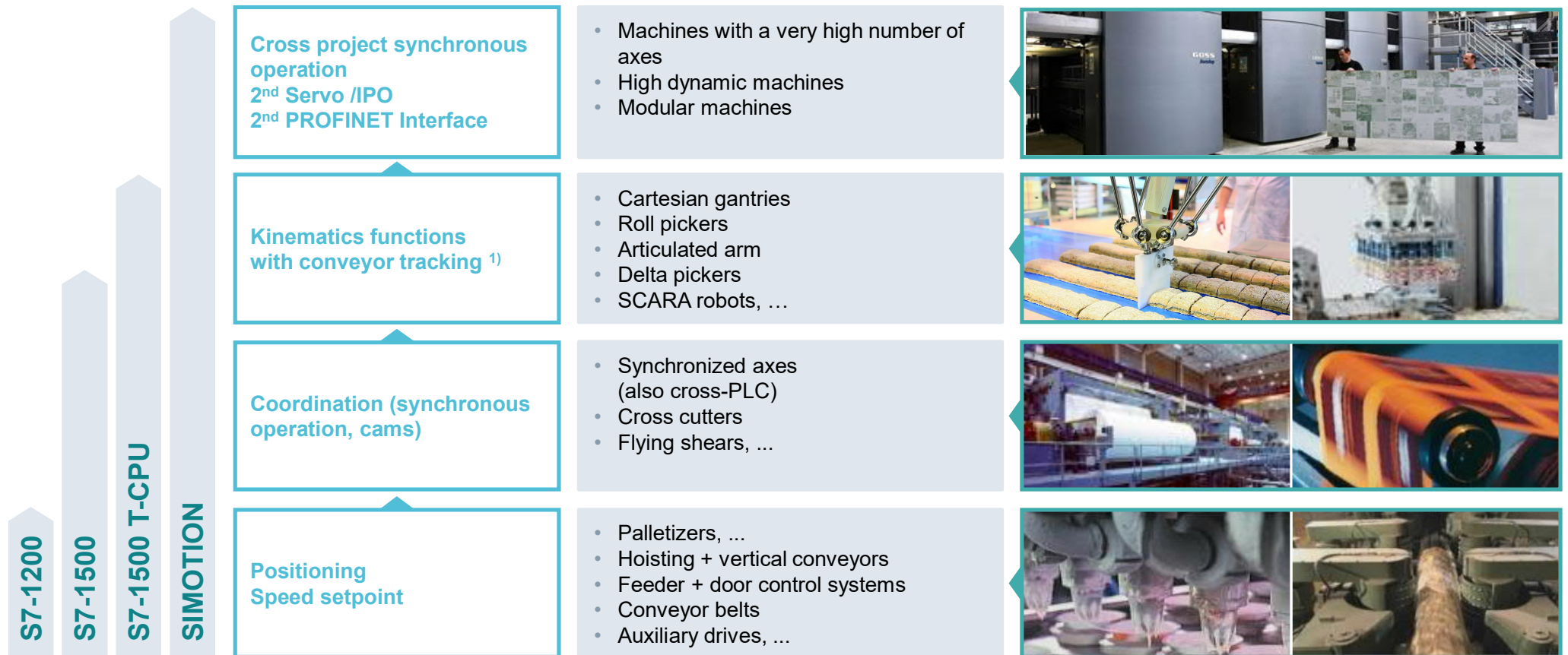**4** Resources for Motion Control technology objects: Speed axis = 40 | Positioning axis = 80 | Synchr. Axis = 160 | Output cam= 20 | Output cam track= 160 | Measuring input= 40
5 Resources for Extended Motion Control technology objects: Cams = 2 | Kinematic objects= 30 | Leading axis proxy = 3

[1] PROFINET IO with IRT   [2] PROFINET IO with RT   [3] PROFINET basic communication (1 Gbit)   ■ PROFIBUS

Overview
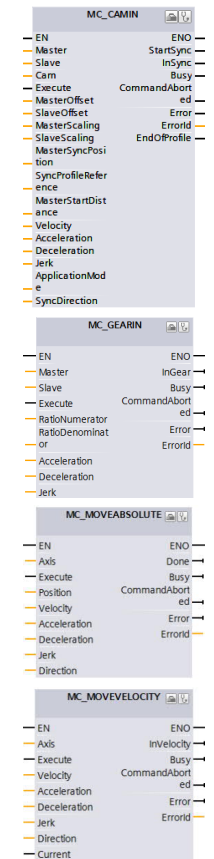## Motion control functions and typical applications

S7-1200 **S7-1500** **S7-1500 T-CPU** **SIMOTION**

Cross project synchronous operation
2nd Servo /IPO
2nd PROFINET Interface

- Machines with a very high number of axes
- High dynamic machines
- Modular machines

Kinematics functions with conveyor tracking [1]

- Cartesian gantries
- Roll pickers
- Articulated arm
- Delta pickers
- SCARA robots, …

Coordination (synchronous operation, cams)

- Synchronized axes (also cross-PLC)
- Cross cutters
- Flying shears, ...

Positioning
Speed setpoint

- Palletizers, ...
- Hoisting + vertical conveyors
- Feeder + door control systems
- Conveyor belts
- Auxiliary drives, ...

[1] planned for FW-Update V2.8.x (V16)

Advanced Controller – SIMATIC S7-1500
Overview motion control functionalities (extract)

SIEMENS
Ingenuity for life

Kinematics functions

Camming
Gearing

Positioning

Speed setpoint

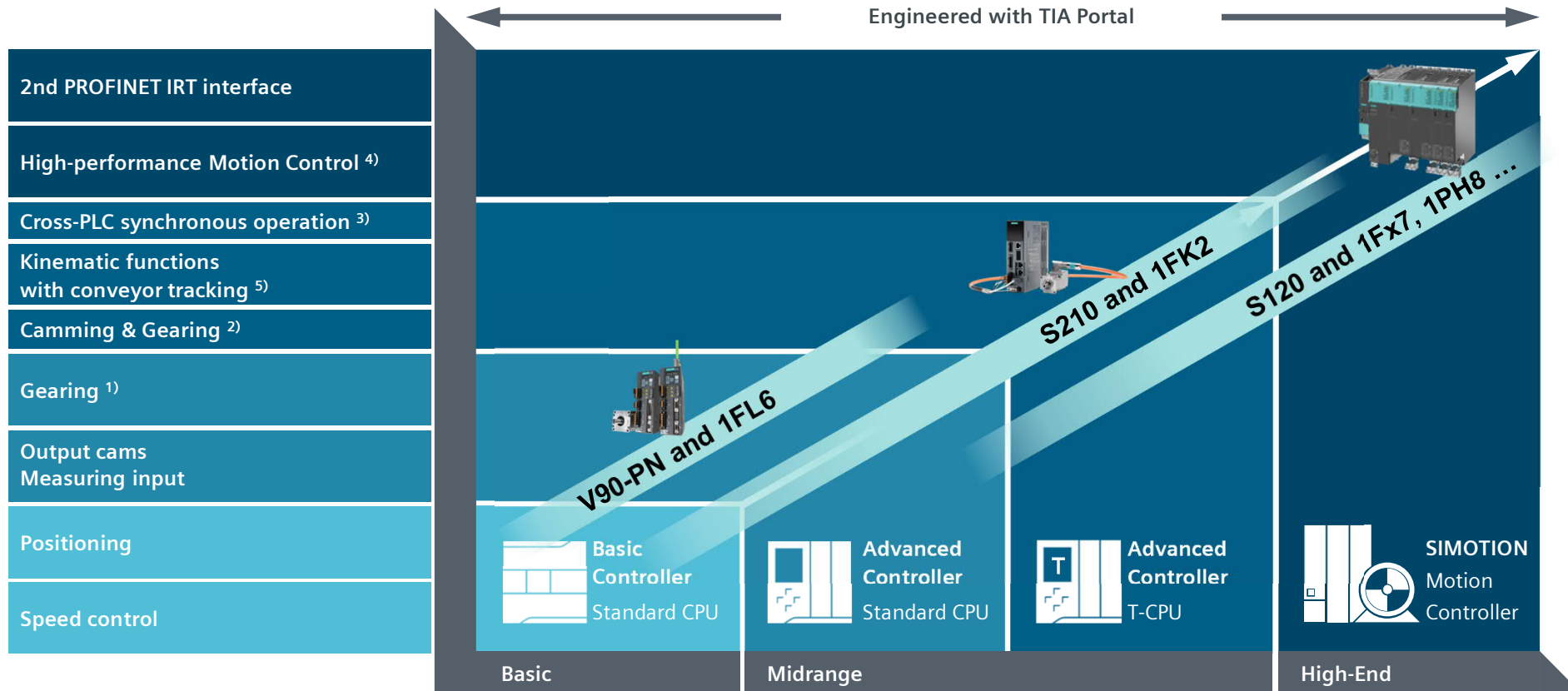Output cams
Measuring input

S7-1500

S7-1500 T-CPU
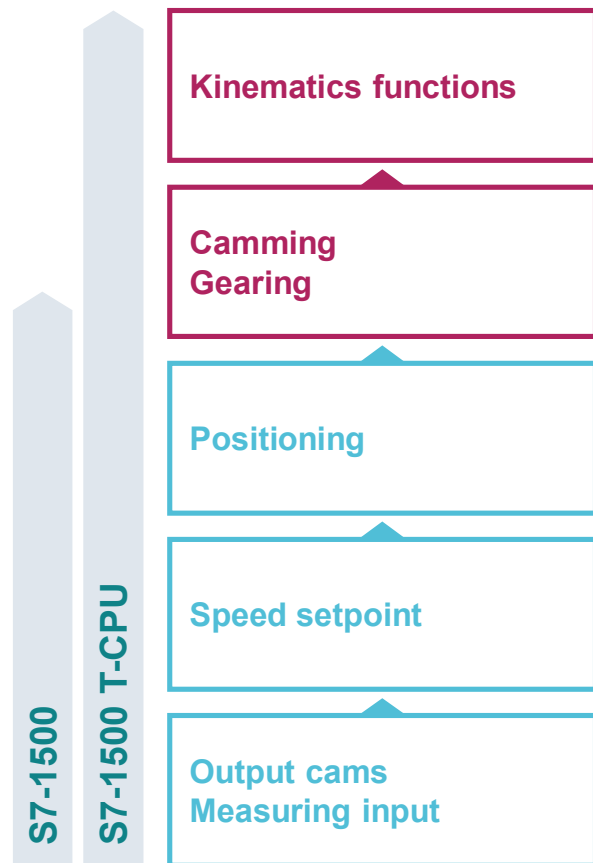
- Kinematics with conveyor tracking[1]   **New**   (T-CPU only)
- Kinematics with up to 4 interpolating axes   (T-CPU only)
- Cross-PLC synchronous operation   **New**   (T-CPU only)
- Offset of the leading value at the following axis   (T-CPU only)
- Camming   (T-CPU only)
- Coupling onto actual values   (T-CPU only)
- Gearing - With synchronous position   (T-CPU only)
- Gearing - Without synchronous position
- Encoder switch over to 2nd – 4th encoder   (T-CPU only)
- Specification of motion vector from application   (T-CPU only)
- Superimposed positioning during active motion
- Move axis to relative/absolute position
- Cyclic interface for torque data
- Moving an axis with torque limiting
- Homing absolute and on the fly, Setting a position
- Traversing an axis with speed setpoint
- Enabling/disabling an axis
- Activating output cams and cam tracks and measuring inputs
- …

MC_CAMIN
EN / ENO
Master / StartSync
Slave / InSync
Cam / Busy
Execute / CommandAborted
MasterOffset
SlaveOffset / Error
MasterScaling / ErrorId
SlaveScaling / EndOfProfile
MasterSyncPosition
SyncProfileReference
MasterStartDistance
Velocity
Acceleration
Deceleration
Jerk
ApplicationMode
SyncDirection

MC_GEARIN
EN / ENO
Master / InGear
Slave / Busy
Execute / CommandAborted
RatioNumerator
RatioDenominator / Error
Acceleration / ErrorId
Deceleration
Jerk

MC_MOVEABSOLUTE
EN / ENO
Axis / Done
Execute / Busy
Position / CommandAborted
Velocity
Acceleration / Error
Deceleration / ErrorId
Jerk
Direction

MC_MOVEVELOCITY
EN / ENO
Axis / InVelocity
Execute / Busy
Velocity / CommandAborted
Acceleration
Deceleration / Error
Jerk / ErrorId
Direction
Current

TIA Portal V16
The scalable Motion Control System Portfolio

SIEMENS
Ingenuity for life

Engineered with TIA Portal

2nd PROFINET IRT interface	
High-performance Motion Control [4]	
Cross-PLC synchronous operation [3]	
Kinematic functions with conveyor tracking [5]	
Camming & Gearing [2]	
Gearing [1]	
Output cams Measuring input	
Positioning	
Speed control	

V90-PN and 1FL6

S210 and 1FK2

S120 and 1Fx7, 1PH8 …

Basic Controller Standard CPU

Advanced Controller Standard CPU

T **Advanced Controller** T-CPU

SIMOTION Motion Controller

Basic   **Midrange**   **High-End**

[1] Synchronization without specification of the synchronous position
[3] In one project

[2] Synchronization with specification of the synchronous position
[4] Cross-project synchronization; cams with dynamic size;
    2 servo for axis groups

[5] planned for FW-Update V2.8.x (V16)

SIMATIC S7-1500 T-CPU | Sales slides

The SINAMICS Drives Portfolio for "Cyclic Motion"
Always the right drive – Plus integrated added value!

SIEMENS
Ingenuity for life

Engineered with TIA Portal

System performance

Advanced Drives

SINAMICS S120
+ SIMOTICS

SINAMICS S210
+ SIMOTICS S-1FK2

Basic Drives

SINAMICS V90
+ SIMOTICS S-1FL6

Application complexity
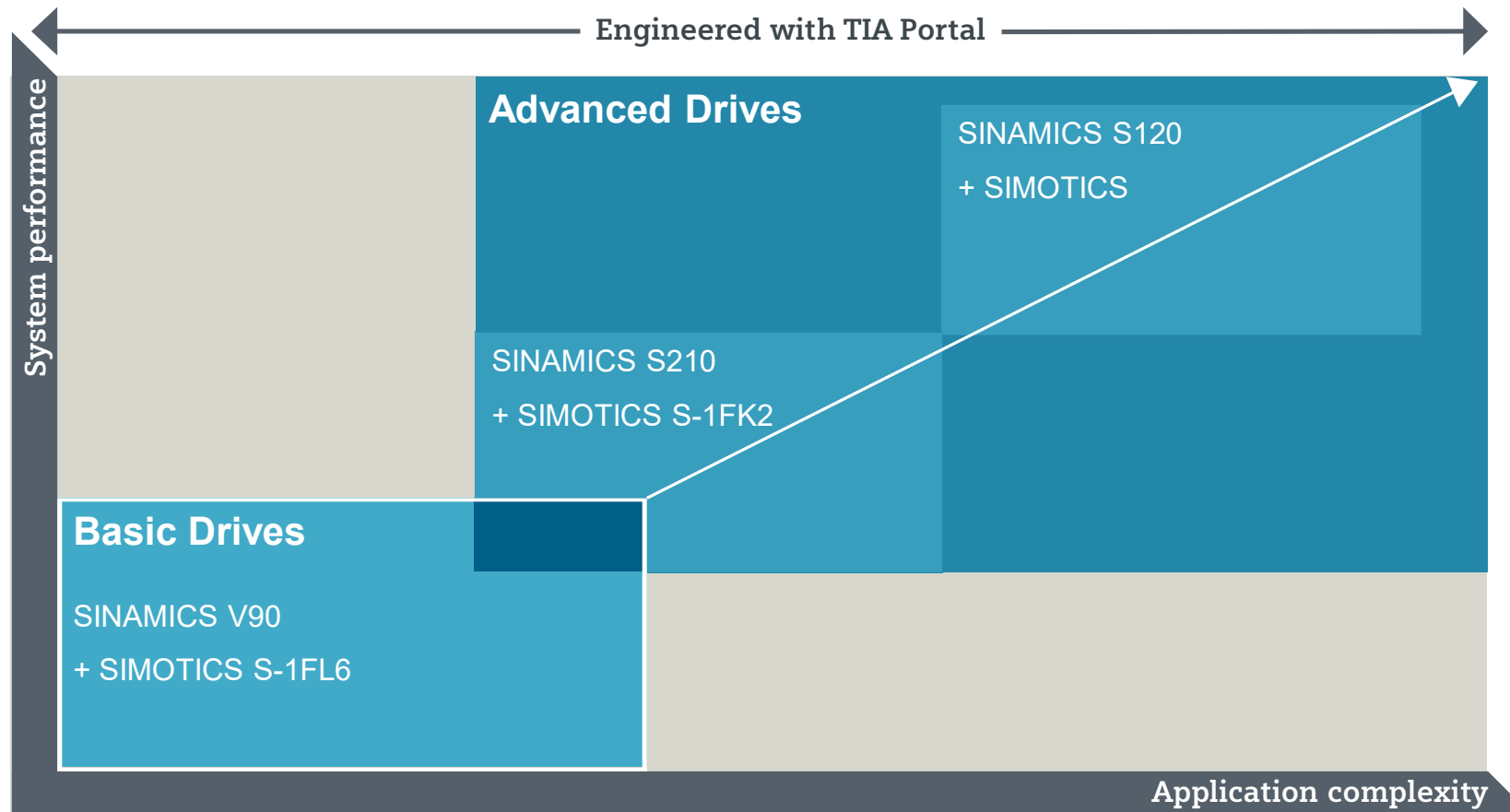
Consistent drive
and automation
solutions

Seamless
interaction of all
drive components

Optimum
maintenance and
service

Safety Integrated

Technology
Integrated

SIMATIC S7-1500 T-CPU | Sales slides

Questions and Answers

Hvala na pažnji

SIEMENS
Ingenuity for life

Darko Živković

Siemens d.o.o. Beograd
RC-RS DI S-REG
Omladinskih brigada 90v
11070 Belgrade, Serbia
Mobile: +381 60 817 0367
mailto:darko.zivkovic@siemens.com

siemens.com/drive-controller
siemens.com/simatic-technology