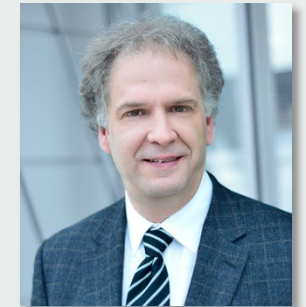# Embedded Devices

Big opportunities in tiny packages

WIBU SYSTEMS

SECURITY
LICENSING
PERFECTION IN PROTECTION

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To access the on-demand replay of this masterclass, please visit

www.wibu.com/resources/webinars/2021/embedded-devices/access

A Look at
Embedded Devices

- PC-based controlling computers for machines (Windows or Linux)

- Proprietary Programmable Logic Controllers (PLCs)

- PLCs based on Linux ARM or VxWorks

- Devices with Windows CE or Windows Embedded

- Devices based on VxWorks, QNX, and Android

- Devices based on microcontrollers

- Devices with proprietary or non-mainstream operating systems

- Raspberry Pi and similar devices

- **Devices of Any Size**

  - Microcontrollers

  - Small devices with 8 to 32 Bit CPUs and small RAM capacity (1 to 128 Mbyte)

  - Industrial PCs (similar to personal computers)

- **Different Platforms**

  - ARM, x86, x86_64, PPC, MIPS, …

- **Different Operating Systems**

  - Windows, Linux, Android, VxWorks, QNX, …

  - Proprietary operating systems or no operating system

WIBU SYSTEMS

- **Different Interfaces**
  - Internal and external USB ports
  - SD cards, microSD cards, CF/CFast cards
  - USB or SPI Interfaces for ASICs
  - No external interfaces at all

- **Different Secure Anchors**
  - TPM chips or other security devices
  - Hardware properties/serial numbers like GPU-ID
  - No secure or semi-secure anchor at all

Protection Against Piracy and Reverse Engineering

- **Encryption of executable code**
  - Binaries (Executables)
  - Libraries, kernel modules, drivers

- **Encryption of resources**
  - Bitmaps
  - Strings
  - Constants

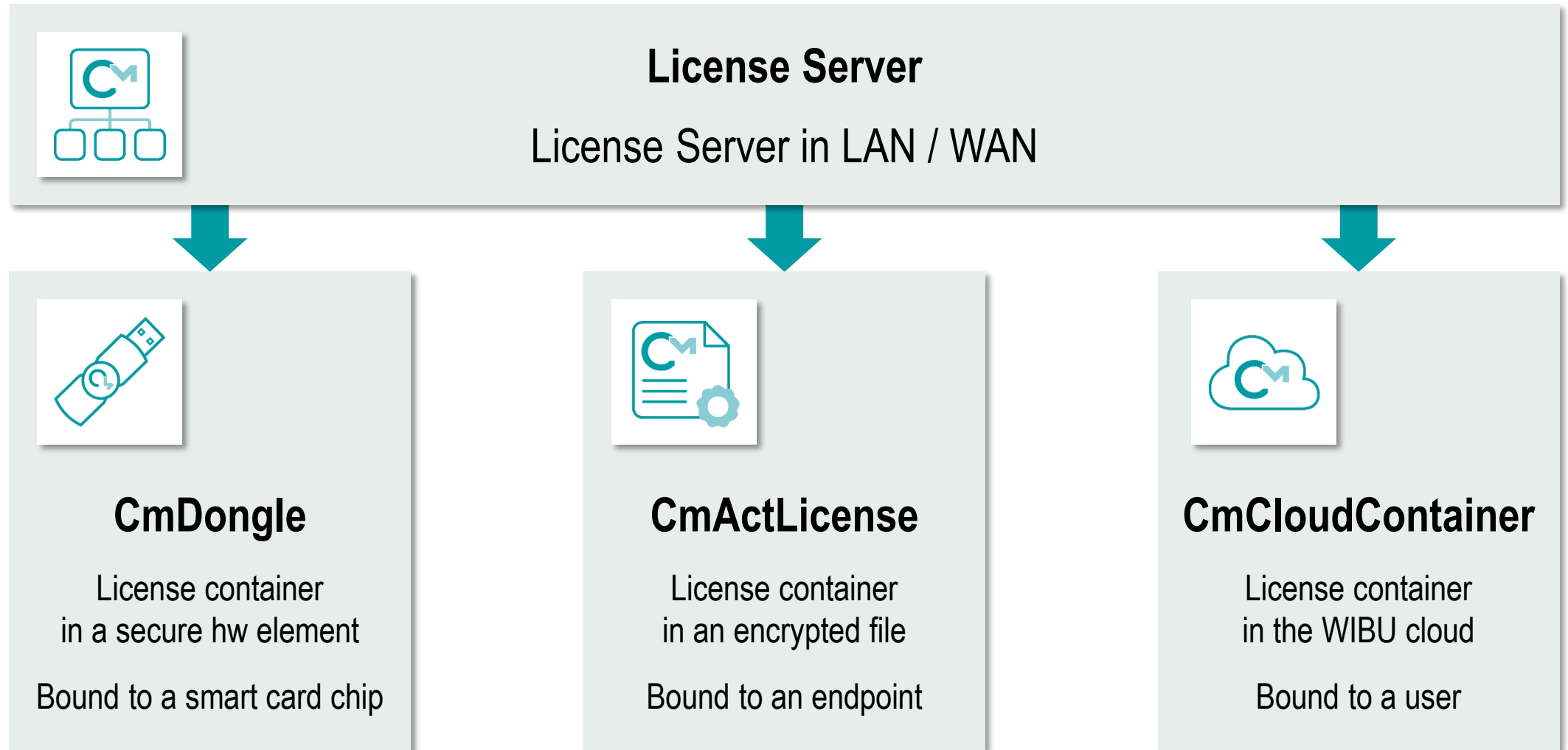- **Encryption of data**
  - Settings and configurations

Security for Users

- Protection against tampering

- Protection of trade secrets

  - Blueprints, NC files, recipes

  - In-house, contract manufacturing

- Protection against hijacking

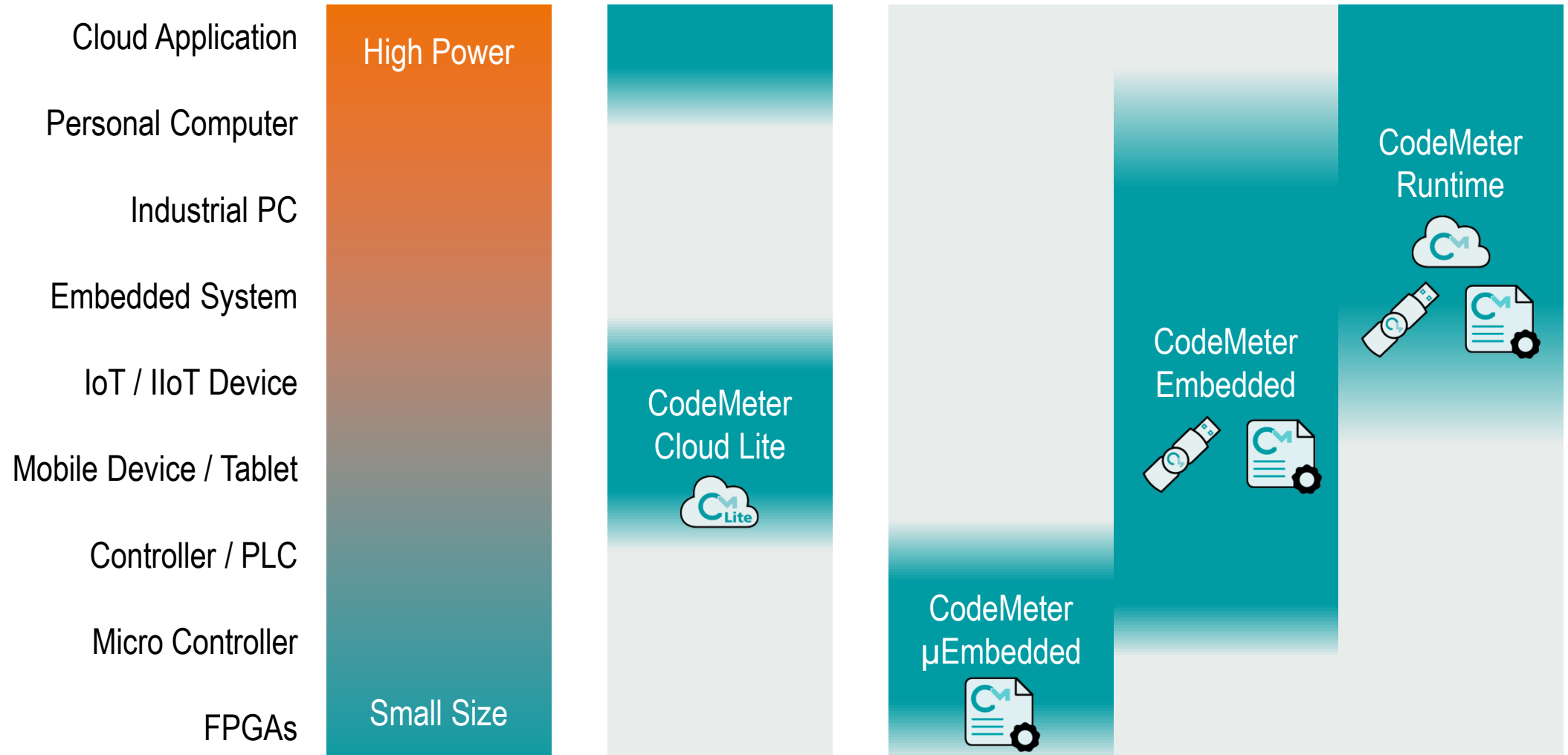- Protection against ransomware

New License Models for Vendors

- Perpetual licenses

- Feature-based licenses

  - Amount of controlled axes

  - Additional functionalities

- Subscription licenses

- Pay-per-Use (per click, per minute, …)

- Licensing of data

  - 3D print models, STL files, …

- Apps via marketplaces

CodeMeter Containers

License Server

License Server in LAN / WAN

CmDongle

License container
in a secure hw element

Bound to a smart card chip

CmActLicense

License container
in an encrypted file

Bound to an endpoint

CmCloudContainer

License container
in the WIBU cloud

Bound to a user

CodeMeter Runtime
and Its Variants

Scalable CodeMeter Variants

	High Power / Small Size	CodeMeter Cloud Lite	CodeMeter µEmbedded	CodeMeter Embedded	CodeMeter Runtime
Cloud Application					
Personal Computer					
Industrial PC					
Embedded System					
IoT / IIoT Device					
Mobile Device / Tablet					
Controller / PLC					
Micro Controller					
FPGAs					

CodeMeter Runtime

- Industrial standard hardware (IPC, ARM, …)

- Automatic fingerprinting for CmActLicenses

- Support for CmDongles, CmActLicenes, CmCloudContainers and network clients

- CodeMeter Runtime can be used as a network server

- Binary only distribution – Service/Daemon installation required

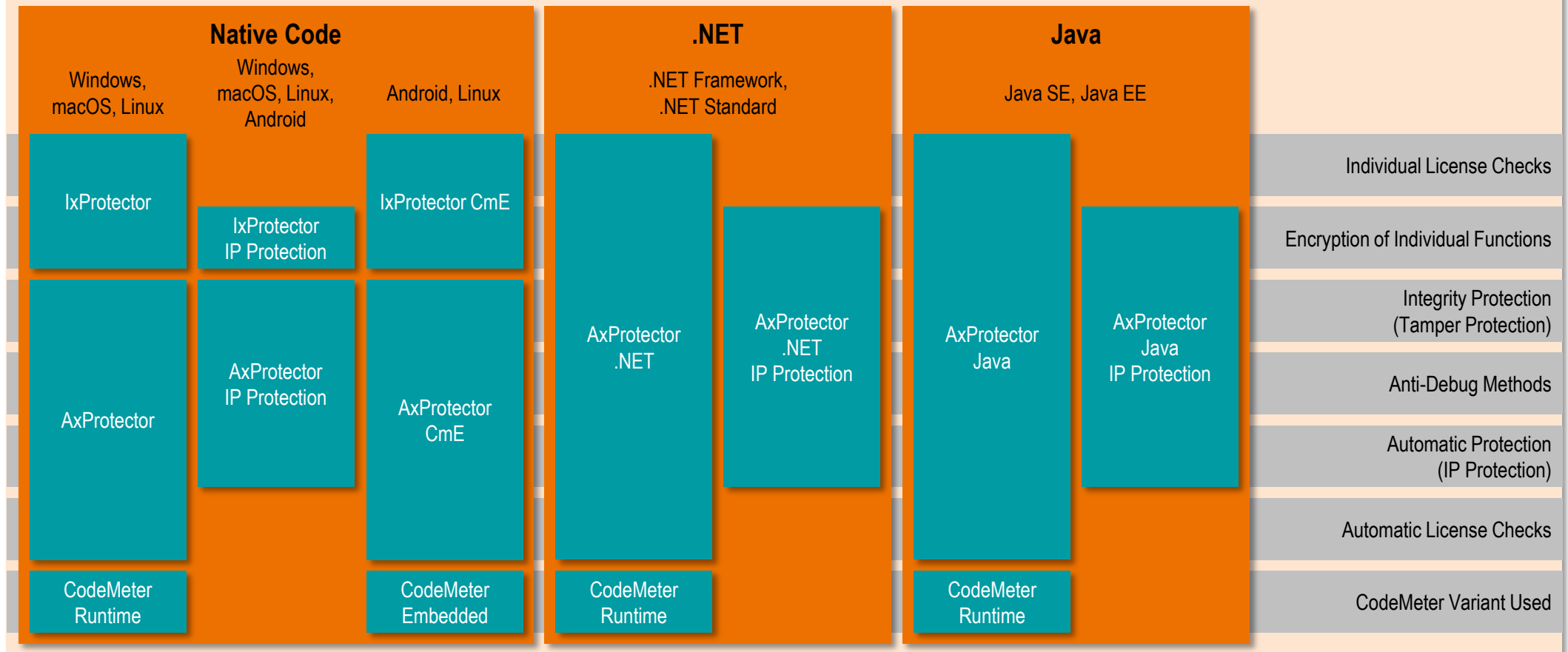- Footprint in the size of some Mega Bytes

- ## CodeMeter Embedded

  - Individual hardware designs

  - Support for CmDongles, CmActLicenes and network clients

  - Static Library – Source code available

  - Footprint below 400 Kilo Bytes

- ## CodeMeter µEmbedded

  - Microcontrollers, CmActLicenses

  - Static Library – Source code available

  - Footprint below 70 Kilo Bytes

CodeMeter
Protection Suite

CodeMeter Protection Suite

Native Code

Windows, macOS, Linux

Windows, macOS, Linux, Android

Android, Linux

IxProtector

IxProtector IP Protection

IxProtector CmE

AxProtector

AxProtector IP Protection

AxProtector CmE

CodeMeter Runtime

CodeMeter Embedded

.NET

.NET Framework, .NET Standard

AxProtector .NET

AxProtector .NET IP Protection

CodeMeter Runtime

Java

Java SE, Java EE

AxProtector Java

AxProtector Java IP Protection

CodeMeter Runtime

Individual License Checks

Encryption of Individual Functions

Integrity Protection (Tamper Protection)

Anti-Debug Methods

Automatic Protection (IP Protection)

Automatic License Checks

CodeMeter Variant Used

CodeMeter Runtime

- All components available, full functionality

- AxProtector, IxProtector, AxProtector .NET, AxProtector Java, and CodeMeter Protection Suite IP Protection

- Strong binding between licensing and protection

- Support for CmDongles, CmActLicenses, and CmCloudContainers

- **CodeMeter Embedded**

  - **CodeMeter Protection Suite IP Protection**

    - Separates licensing from protection

    - Used in combination with CodeMeter API

  - **AxProtector/IxProtector CmE**

    - Support for CmDongles

    - Strong binding between licensing and protection

- **CodeMeter µEmbedded**

  - Customized solution: ExProtector

CodeMeter Core API

- ## Software Protection
  - Usage of API to implement cryptographic license and tamper checks
  - Access, Crypt, Release, GetError

- ## License Management
  - Showing licenses
  - License updates

- ## Features for the user of the device, provided by vendor
  - Signatures, symmetric encryption, asymmetric encryption

```
// Access license

CmAccess2(…)


// Use license

CmCrypt2(…)


// Read license properties

CmGetInfo(…)


// Release license

CmRelease(…)
```

```
// Error handling

CmGetLastErrorCode(…)


// Create license request

CmLtCreateContext(…)


// Import license update

CmExecuteRemoteUpdate(…)


// Retrieving license details

CmGetInfo(…)
```

FAQs and Limitations

- I have a 8-bit/16-bit controller with 100 kbyte of memory. What can I do?

  - I need to implement a proprietary license file with a proprietary check. I can use CodeMeter API to create these license files.

- How much is runtime behavior affected by protections?

  - It depends on the usage of CodeMeter Protection Suite or CodeMeter API.

- Does it work in a real-time environment?

  - You need to implement the checks in the none real-time part. You can transfer the result with a status flag to the real-time part.

CodeMeter License Central

CodeMeter License Central – Ticketing System
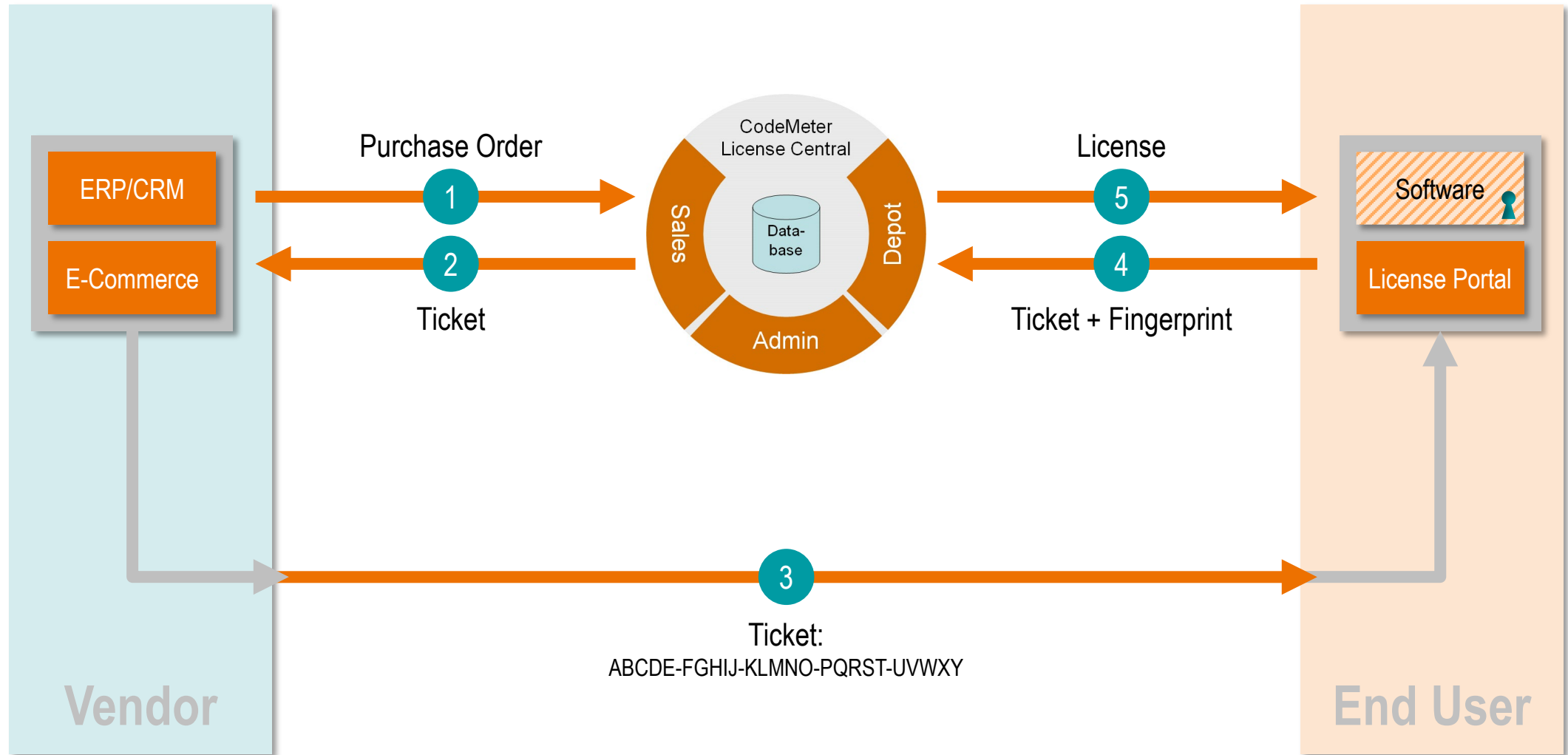
- Unified solution for CodeMeter Runtime, CodeMeter Embedded, and CodeMeter µEmbedded

- Unified solution for all CmContainer types

- Integration with SAP and other ERP systems

- Creating licenses during production of the embedded devices

- File-based (offline) updates

- Offline push updates

- Context file simulation

- Bulk update for multiple devices

Thank you very much for your attention

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