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# **M2000 + SICOMP M/R Emulation**

for Windows

**Short Description**

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## 1 Introduction

In the past decades, Siemens SICOMP M/R minicomputers have demonstrated their flexibility, high degree of availability and powerful system software in numerous industrial and commercial applications worldwide. Over the period, users have invested substantial financial and engineering expenditure in extensive complex application software especially designed for these proprietary computers. These dedicated software systems have over many years proven their usefulness and stability in mission critical applications, and in many cases their functional scope is sufficient for years to come.

However, due to the enormous progress made in hardware development over the past years, personal computer technologies have evolved into an internationally recognized hardware standard that has found solid ground even in industrial applications.

Although the Siemens SICOMP M/R hardware is not able to benefit from this technological progress, you want to open your SICOMP M/R system to today's computer world and benefit from advantages such as:

- Make use of cost-effective PC components
- Profit from latest developments in hardware components
- Reduce maintenance costs
- Integrate your system in the Windows <sup>1</sup> world

M2000 is our solution for you. With the one-to-one emulation of the SICOMP M/R hardware command set and the SICOMP M/R level structure, M2000 maps your SICOMP applications to the command set of the Intel x86 processors (or to compatible processors). This enables you to run the software generated on a SICOMP M/R computer on a Windows computer.

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<sup>1</sup> WINDOWS = Windows 7, Windows Server 2012/2008 R2

Figure 1 compares the original Siemens SICOMP M/R system with the emulated system running on a computer based on Windows and M2000. The M2000 emulator has the task of adapting the SICOMP M/R command set to the Intel command set, and of connecting the original I/O devices to the Windows environment.

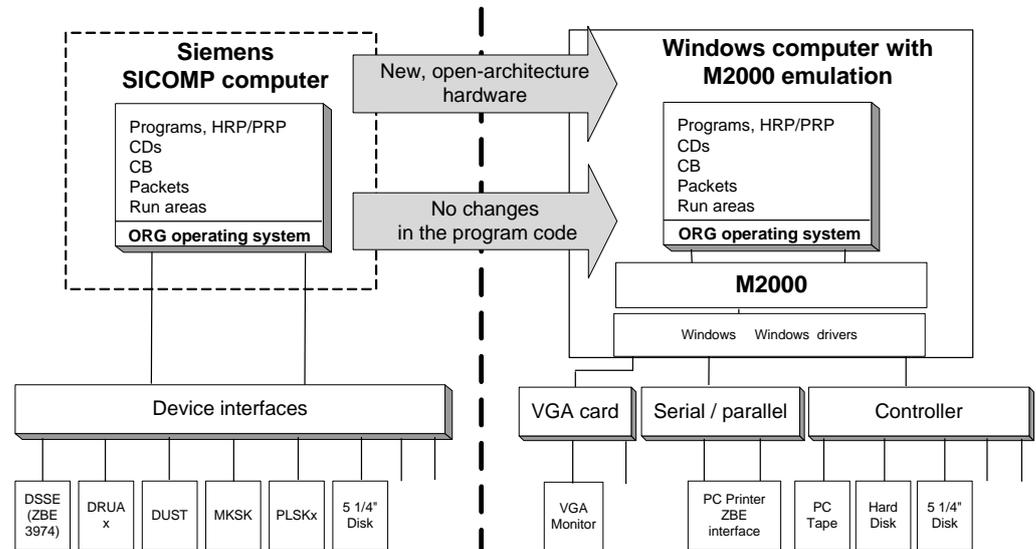


Figure 1: Comparison SICOMP - M2000

Input and output requests issued by the ORG-M/ORG-R operating system and by Siemens SICOMP programs are processed by the I/O drivers of the M2000 emulator. I/O requests addressed to disk memories (i.e., PLSK) are redirected to Windows files and the PLSK memories are copied into images. I/O requests addressed to output devices, such as printers (DRUA), visual display units (DSSK), are executed by emulation procedures.

**Performance**

Emulation generally affects performance, but as today's processors and I/O equipment offer much more performance than the components of the SICOMP system, emulation based on state-of-the-art computer technology will actually lead to a substantial increase in plant performance.

If a large SICOMP system with a high number of devices is replaced, the computers running the emulation should be capable of delivering the required performance. An appropriate hardware configuration would therefore comprise the following:

- 2 processors
- Min. 1024 Mbyte memory
- fast hard disks with adequate volume

It has been shown that plants based on current computer technology offer a substantial increase in performance - often a multiple of the performance that a SICOMP M80 system can deliver.

With today's fast hard disks (RAID systems) and the efficient disk access optimization of the Windows operating system, an even further increase in performance can be achieved for applications requiring frequent disk access.

## 2 Functional Description

### 2.1 Software Structure

The M2000 emulator for SICOMP M/R comprises an emulator core process and different peripheral processes. These processes are installed under Windows and run concurrently with other Windows processes according to their priority.

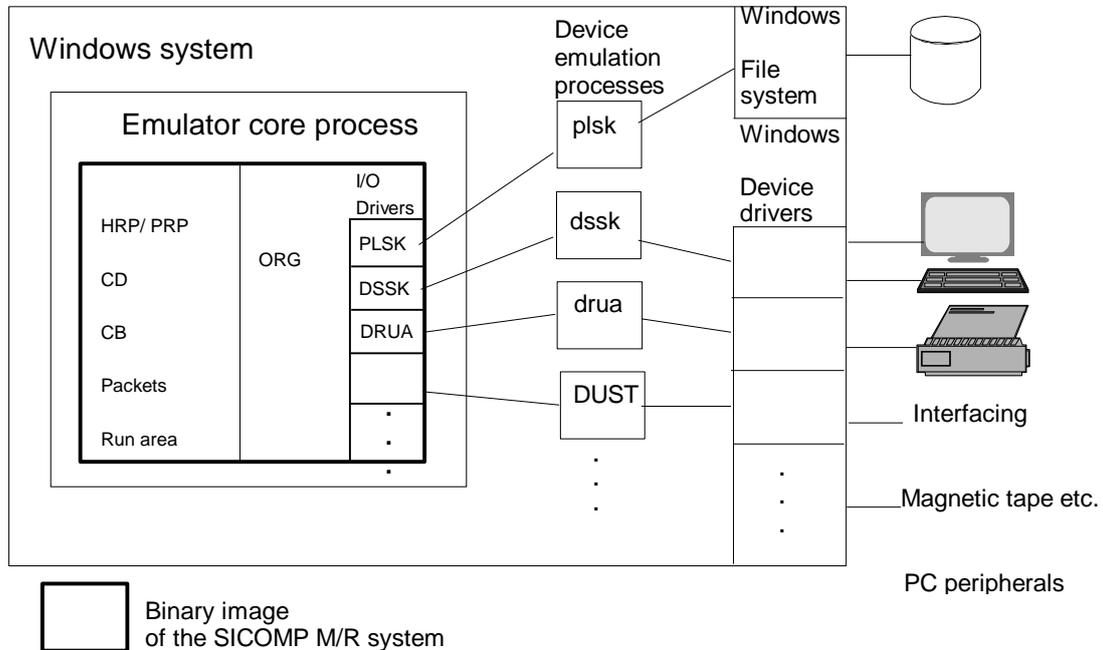


Figure 2: Software structure

The emulator core process processes the SICOMP M/R commands, comparable to the microcode of a SICOMP M/R processor, and simulates the hardware priority levels and the interrupt control of a SICOMP M/R computer. This way, processes can be managed in the same way as on the original SICOMP M/R computer. The communication between the 'ZE' (emulator core process) and the peripheral processes is handled via the same process blocks of the SICOMP system.

The device emulation processes map the SICOMP devices on the devices of the Windows system, e.g., a sub-device of disk storage is mapped in a file in the Windows file system. Thus, by applying logic mapping, the type of the physical device is of no relevance.

The emulation consequently simulates the hardware characteristics of a SICOMP M/R central unit. It is thus irrelevant which software or operating system the user system to be emulated employs. All that is required is a code that runs on the SICOMP M/R and that the used peripheral devices are supported by an M2000 peripheral process.

(see section: [Scope of Performance](#))

The emulator core process also emulates the virtual console.

## 2.2 Scope of Performance

### 2.2.1 CPU Emulation

#### SIC-M/R

M2000 emulates the command set of the SICOMP M/R central units (ZE) and supports the services of the individual units. The central units to be emulated are selected individually (ZE01...ZE03, R10, R10V, R20, R30) so that always the command set and range of services of the selected unit is made available.

The floating-point arithmetic, too, is emulated for each central unit individually. M2000 does not adopt the floating-point arithmetic of the Intel processor - it simulates the floating-point of the SICOMP M/R computer to make sure that the accuracy of the specific central unit type is exactly implemented.

### 2.2.2 Device Emulation

The interface between CPU emulation and device emulation is the I/O job, which is interpreted and processed by the device emulations. The device emulations emulate a certain part of the firmware of the SICOMP M/R device interfacing.

#### SIC-M

I/O job processing is based on the SICOMP M communication interface (KOSS). Upon processing of the SICOMP M command EAS, the CPU emulation activates the device emulation.

#### Video terminals

Video terminals are always connected by means of serial connection using the serial ports of the Windows system COM1: to COM9: or \\.\COM10..999. The following video terminals or their emulations are supported by serial interface connection:

- ZBE3974R, ZBE3974MT
- DS075, DS075F
- DS075-DISIT
- DS078, DS081
- VDU2000

DS075 terminals can also be connected to a serial interface on a remote Windows computer communicating over a LAN network.

#### Video terminal emulations

IPKS provides video terminal emulation in conjunction with M2000. The following video terminal emulation is available:

- Alpha Terminal Emulation TE2000 AX  
TE2000 AX emulates ZBE3974R or DS075 video terminals
- Alpha Terminal Emulation TE2000 FG (with extended scope of functions)  
TE2000 FG emulates DS075 FG video terminals
- DISIT Terminal Emulation TE2000 DX  
TE2000 DX emulates ZBE3974MT or DS075 DISIT video terminals
- Terminal Emulation TE2078  
TE2078 emulates DS078 video terminals

The video terminal emulations can be operated both in window mode and in full-screen mode.

In conjunction with M2000 the video terminal emulations can be used as follows:

- Locally on the same system as M2000 on a Windows platform
- On a separate computer by means of serial connection
- On a separate computer by means of a LAN connection

#### Note

You find a detailed description in the manuals:

#### **TE2000/TE2078 Terminal Emulation**

**Console emulation** The Windows console, i.e. the PC screen and keyboard, can be used as virtual console, standard signaling or standard operator device. M2000 provides a DS074 device emulation for this purpose. The device emulation can be operated both in window mode and in full-screen mode. In window mode, this terminal emulation can be activated several times. The console emulation contains a subset of the functions of the TE2000 AX Alpha Terminal. If the console is used for the operation of more demanding SICOMP application systems using functions such as definable/loadable function keys, the terminal emulation TE2000 AX or TE2000 FG should be employed.

**Hard disks** The PLSK device emulation maps a sub-device of a SICOMP M/R hard disk into a Windows file. This file then represents a SICOMP M/R disk. After the disk is copied to the file using a magnetic tape cassette or MO disk, the file contains the same data as the M/R disk, including the disk journaling system. The interface is the I/O job. This way it ensures that the peripheral memory management does not have to be emulated but runs as part of the ported SICOMP M/R system under the CPU emulation. The difference to an original disk drive is usually not noticed by the operator.

- Data access to the disk is executed in the same sequence as for the SICOMP M/R.
- The use of the parameter **mode=share** in the configuration file *mpar.sys* / *rpar.sys* allows you to access the disks from both system environments (SICOMP and Windows). If this parameter is not set, the occupation mode *exclusive* will be active (default setting).

Mode *=share* must be used if the disks of an emulated SICOMP system are accessed via the Windows program **sicview.exe**.

This mode can also be used to save disks of an emulated SICOMP system under Windows without having to terminate the emulator. In this case make sure that all DVS files (for example) are closed, or that the user system is not started.

- The contents of the data medium is continued to be managed by the SICOMP M/R file management or DVS.
- DVS data media will also be processed.
- The PLSK emulation uses the Windows file system. Due to intelligent disk caching, fast disks and controllers and the SCSI bus, access and transfer rates are much higher than on the original system. The use of RAID systems substantially increases data integrity.

It is not possible to connect SICOMP-M/R drives directly to the PC with emulator.

**Printers** All printers with Centronics interface can be connected in line with application requirements. The following printers can also be connected:

- DR202 printer
- 3915 Tally
- 3916 drum printer
- 3918 UD3
- 3919 PT80i

DR202 printers can also communicate via the serial interface.

The serial interface is located on the local M2000 computer or on a remote Windows computer connected via LAN.

*Note* Only printers operated in ASCII mode by default and with their own character set should be employed.

M2000 allows you to send hardcopy outputs to a connected EPSON compatible printer (the EPSON printer must be specified in FACO30).

Control characters to the printer (e.g., for typeface switching) are not modified by M2000. It may be necessary to adapt the application programs if it is not possible to use the same or a compatible printer in connection with the M2000 emulator.

**Timer** The ZIG device emulation maps I/O jobs to the timer on to corresponding Windows call instructions. Due to the use of standard hardware and the Windows

operating system, limitations with regard to time of day granularity and shortest possible cyclic time interrupt must be taken into account. A resolution of 10ms (or 1ms for ZIG3) represents the shortest time unit possible.

### **Magnetic tape cassette drive**

The operation of the computer's magnetic tape cassette drive is based on an MK82 emulation. It is possible to read and write magnetic tape cassettes of 150 MB capacity. Data exchange with a SICOMP system is thus possible.

The compatible magnetic tape cassette drives specified offer the following characteristics:

- Physical Read and Write
- Logic Read and Write
- Read and Write of DVS volumes

#### *Note*

Magnetic tape cassettes generated with MK80/81 drives can be read by the MK82 emulation of M2000. However, the magnetic cassette drives on the PC are not able to write the Mk81 format.

### **Floppy disk**

M2000 operates the 3.5 inch (1.44MB) or 5.2 inch (1.2MB) floppy disk drive as FD044 with the SICOMP M/R initialization. Data exchange with a SICOMP M/R system is however not possible.

### **Computer interfacing (M)**

#### **DU02**

The DU02 gateway functionality (fiber optics interface connection) is implemented. It is thus possible to connect two emulator systems.

#### **DU03**

M2000 allows the emulation of a DU03 computer interface connection via a specific driver (NDIS2000/NDIS2008). A packet or NDIS driver must be installed on the emulator computer, which is presently available for the operating systems Windows2000 and Windows2008. The DU03 emulation completely maps the original -Data Transfer- functionality. Test and maintenance jobs are not mapped but will be processed and completed without indication for compatibility reasons. The emulation of the DU03 requires no special hardware - all that is required is a common network card (an emulated DU03 can thus be operated with 100 Mbit/s). The driver enables the DU03 emulation to read and check the relevance of the received data packets via the corresponding network card, and to transmit data packets.

- DU04** M2000 allows the emulation of a DU04 computer interface connection via a serial interface. The following three emulation methods are available:
- Emulation via any serial interface (COMxx)
  - Emulation via a DF32/42 interface module
  - Emulation via TCP/IP in a LAN network or via RAS.
- The DU04 device emulation can be set up for TCP/IP communication to allow two M2000 systems to communicate with each other for example, or to implement data exchange with third party systems (UNIX).
- A DU04 is generated in the AMBOSS/BS-M system for that purpose. The device emulation then converts this communication to the Windows socket interface (Winsocket). A LAN/RAS network adapter according to the Windows hardware compatibility list is used instead of the COMxx interface or the DF32/42.
- DU05** Emulation of a DU05 computer interface connection. The DU05 emulation processes the MSV2 transmission protocol.
- The following interface connections can be implemented:
- M2000 - M2000 via MSV2 and SINEC
  - M2000 to third-party systems via MSV2
  - M2000 via TCP/IP in a LAN network or via RAS.
- DU05 emulation requires a DF42 data transmission module with the appropriate protocol driver.
- The DU05 device emulation can be set up for TCP/IP communication to establish the communication between two M2000 systems, for example. A DU05 is generated in the AMBOSS/BS-M system for that purpose. The device emulation then converts this communication to the Windows socket interface (Winsocket). A LAN/RAS network adapter according to the Windows hardware compatibility list is used instead of the DF42 module.
- DU06** Emulation of a DU06 computer interface connection. The DU06 emulation processes the transmission protocols HDLC U/P, HDLC U/S and HDLC B.
- The following interface connections can be implemented:
- M2000 - M2000 via HDLC B, HDLC U and SINEC
  - M2000 - IBM via SDLC and SINEC SNSNA
  - M2000 - X25 Net via HDLC B and SINEC SNPV
  - M2000 via TCP/IP in a LAN network or via RAS.
- The WKO function are not implemented (Remote loading...).
- The DU06 emulation requires a DF32 or DF42 data transmission module DF42 with the appropriate protocol driver.
- The DU06 device emulation can be set up for TCP/IP communication to establish the communication between two M2000 systems, for example. A DU06 B is generated in the AMBOSS/BS-M system for that purpose. The device emulation then converts this communication to the Windows socket interface (Winsocket). A LAN/RAS network adapter according to the Windows hardware compatibility list is used instead of the DF32/42.

**PARIF interfacing**  
(replacement)

3961 gateway function to PARIF(**PAR**Alle**InterFace**).

This interface connection establishes a transmit and receive connection to a gateway computer that communicates with an original SICOMP R computer via a PARIF module. In the emulated ORG, this interface connection is generated as DUST 3961 and operated as KNWE/KNWA.

**PE3600**

The process unit is emulated from the SIMATIC S7 spectrum via Profibus peripherals. This way, the PE3600 can be replaced by modern and cost-effective standard technology without having to change the SICOMP R software.

The Profibus is connected via a ProfiBus communication processor based on the appropriate software from the SIMATIC NET spectrum.

The Profibus I/O modules are operated as distributed peripherals in the ET200 system.

The following process signal converters are presently supported:

- Digital input                3611, 3612, 3613, 3615
- Digital output              3621, 3622, 3625
- Analog input                3631
- Analog output              3652
- Test detector                3668            (simulation)

**PE F7**

The PE F7 process unit of a SICOMP M is emulated via the Profibus.

M2000 provides a **PE F7** device emulation for I/O access to the process peripherals. This device emulation directly processes the process calls that are not allocated to a process device generated in ORG-M. Process calls using the process device ALEM are processed by an M2000 **ALEM** device function.

The following process signal converters are presently supported:

- Digital input                430
- Digital output              451
- Digital input/output        DEDA 482
- Analog input                460
- Analog output              470
- Counter module            IP 242 A            (limited functionality)

- PROMEA1** Devices connected in the original system by means of a PROMEA1 module are connected to the COM interfaces of the PC and operated in the emulator via the device processes for printers, video terminals and DUST3964R.
- PROMEA MX** M2000 provides the emulation of a definable PROMEA module. The PROMEA module is operated via a serial standard interface (COMxx). The serial interface is located on the local M2000 computer or on a remote Windows computer connected in a LAN network.
- Computer interfacing (R)**
- DUST3961** The DUST 3961 gateway functionality can be used to connect two emulator systems.
- DUST3962** The DUST 3962 gateway functionality (fiber optics interface connection) can be used to connect two emulator systems.
- DUST3964** M2000 allows the emulation of a DUST3964 computer interface connection via a serial interface.
- DUST3964R** M2000 allows the emulation of a DUST3964R computer interface connection via a serial interface. The following two emulation methods are available:
- Emulation via any serial interface (COMxx)
  - Emulation via TCP/IP in a LAN network or via RAS.
- The DUST3964R device emulation can be set up for TCP/IP communication to establish the communication between two M2000 systems, for example. A DUST3964R is generated in ORG for that purpose. The device emulation then converts this communication to the Windows socket interface (Winsocket). A LAN/RAS network adapter according to the Windows hardware compatibility list is used instead of the COMxx interface.
- DUST3965R** Emulation of a DUST3965R computer interface connection. The DUST3965R emulation processes the MSV2 transmission protocol.
- The following interface connections can be implemented:
- M2000 - M2000 via MSV2 and SINEC
  - M2000 to third-party systems via MSV2
  - M2000 via TCP/IP in a LAN network or via RAS
- The DUST3965R emulation requires the DF42 data transmission module with the appropriate protocol driver.
- The DUST3965R device emulation can be set up for TCP/IP communication to establish the communication between two M2000 systems, for example.
- A DUST3965R is generated in ORG for that purpose. The device emulation then converts this communication to the Windows socket interface (Winsocket). A LAN/RAS network adapter according to the Windows hardware compatibility list is used instead of the DF42.

- DUST3966** Emulation of a DUST3966 computer interface connection. The DUST3966 emulation processes the transmission protocols HDLC U/P, HDLC U/S and HDLC B.
- The following interface connection can be implemented:
- M2000 - M2000 via HDLC B, HDLC U and SINEC
  - M2000 - IBM via SDLC and SINEC SNSNA
  - M2000 - X25 Net via HDLC B and SINEC SNPV
  - M2000 via TCP/IP in a LAN network or via RAS.
- The WIKOP functions are not implemented (Remote loading...).
- The DUST3966 emulation requires the DF32 or DF42 data transmission module with the appropriate protocol driver.
- The DUST3966 device emulation can be set up for TCP/IP communication to establish the communication between two M2000 systems, for example. A DUST3966 is generated in ORG for that purpose. The device emulation then converts this communication to the Windows socket interface (Winsocket). A network adapter according to the Windows hardware compatibility list is used instead of the DF32/42.
- KS100** Emulation of a SINEC H1 interface connection based on the ISO protocols up to and including the level 4.
- This device emulation requires the installation of the following communication processor on the Windows platform:
- CP1413/CP1613 with the SIMATIC NET software package
- CP1400** Emulation of a SINEC H1 interface connection based on the ISO protocols up to and including the level 7. Levels 5 to 7 correspond to the SINEC AP 1.0 automation protocol.
- CS275** Connection of an emulated SICOMP system to the TELEPERM M bus system CS275. The implementation of the M2000 device process requires a special Siemens module (N-PCI).
- CS275GW** Connection of an emulated SICOMP system over a gateway to the TELEPERM M bus system CS275.
- ETC M** PromeaNET (\*)
- The PromeaNET function is similar to that of the SINEC ETC M for visual display units and printers. The ETC M compatible terminal emulations DEnet75(\*) for DISIT terminals and DSnet75(\*) for DS075 video terminal are used on computers based on MS-DOS and Windows 3.1.
- Together with SPOOL75(\*), such a terminal can also be used as printer server for serial printers from the SICOMP range, such as the DR216N.
- Benefits and special features:
- Each generated DSSK and DRUA channel can be allocated to the PromeaNET without having to regenerate the ORG.
  - 129 channels can be theoretically arranged.
  - An emulated terminal can operate several emulations, even combined with SICOMP M, if these are equipped with an ETC M.
- (\*) Product of the SIG Aachen company
- The Promea NET function is a product of the SIG Aachen company and can therefore not benefit from the M2000 guarantee and support services. If support is required, please contact SIG Aachen company directly. Product faults or operational problems will be passed on by IPKS.

**Dongle**

IPKS supplies different types of dongles:

- NormalDongle (options on customer request) for continuous operation, available in two versions: 25-pole plug connector/socket, USB connector
- EmergencyDongle = NormalDongle for time-limited operation of the emulation (30 days max.)
- EvaluationDongle (options on customer request) for emulation testing

**Emergency dongle**

The emergency dongle contains a validity period of 30 days max. If the emulator detects an unused emergency dongle upon start up, the message '*Inactive E-dongle*' is displayed. If the emulator is then closed within 30 minutes, the emergency dongle remains unused.

If the emulator runs longer than 30 minutes, the dongle becomes 'active'. The emulator then calculates the end of the validity period and displays the last valid day in a message: '*E-dongle valid until DD/MM/YYYY*'.

If the emulator detects an active emergency dongle upon start up that is still valid, the message '*E-dongle until DD/MM/YYYY*' is displayed.

If the emulator detects an active emergency dongle upon start up that is no longer valid, the message '*E-dongle expired*' is displayed.

At the last day of the validity period, the message '*E-dongle expires today!!!*' is displayed after every hour.

The emulator is not t e r m i n a t e d should the validity period of the emergency dongle be exceeded during emulator operation.

**Evaluation dongle**

The evaluation dongle registers the emulator after an uninterrupted operation of one hour, and terminates the emulation without warning after another hour has expired.

An evaluation dongle can be used as often as required, but always only for two hours at the time.

In an evaluation dongle too, the required options must be enabled.

**VMware**

Since M2000 version 5.0.0. the emulation modules are checking whether they are running under VMware. In this case, the VMware-bit in the dongle will be analyzed. If this bit is not fixed, i. e. VMware is not enabled in your dongle, then the start of the emulation will be aborted with an entry into the EventLog of your system.

**Windows**

The system name Windows denotes the Microsoft operating systems Windows Server 2012/2008 R2, Windows 7.

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