CAP 505 with Windows 10 32bit virtual machine Installation Manual

DOCUMENT ID	**2NGA000360**
REVISION	**A**
ISSUED	**Apr 15, 2020**

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The responsibility of setting up a computer with this installation is entirely on the user. ABB cannot help with installation troubleshooting.

Overview of the issue

Windows 7 support has ended, which poses an issue for users wanting to utilize CAP 505 relay product engineering tools. Windows 10 was not able to run all parts of the CAP 505 suite but fortunately, the main issues were fixed in a separate update sent out by Microsoft. Because CAP 505 also has issues when running in a 64-bit operating system, the preferred solution is to run a latest version of 32-bit Windows 10 either natively or in a virtual machine.

For virtual machine use, setup and connectivity has been confirmed with Oracle VirtualBox. This guide helps you through virtual machine hypervisor installation, installing the required Windows version to the hypervisor, setting up necessary connectivity and installing CAP 505 relay setting tool version 2.5.0 in a 32-bit environment. The additional "Connectivity Package 64-Bit Add-on" is not required unless someone has created relay configurations using that package and those configurations were stored into relays internal storage – in that case, install the Add-on as well (in a 32-bit guest OS).

Recommended hardware specifications for the host operating system is 4+ core processor with virtualization support. The host should also have at least 6GB of RAM and 50GB+ storage space to run the guest OS smoothly.

32-bit Windows 10 versions are generally available from Microsoft. Acquiring the installation media and licenses is outside of the scope of this guide. Contact your organization IT support for acquiring these.

The contents of this document is intended for persons experienced with setting up a computer and networking on advanced level. The instructions tell the major steps in installing the enterprise software but do not try to explain all steps in detail. In case the user is not familiar with this kind of task, they should primarily ask IT admin or IT support to install the system for them.

You can skip reading parts of this document if you are using 32-bit Win 10 as main operating system. You can skip reading the document entirely if you do not intend to use following CAP 505 tools:

- Relay Mimic Editor
- Relay Configuration Tool
- Protocol Mapping Tool

Links:

CAP 505 tool page
https://new.abb.com/medium-voltage/distribution-automation/engineering-tools/relay-product-engineering-tools-cap-505

Oracle VirtualBox
https://www.virtualbox.org/

Steps needed to solve the issue

Our target is to get a 32-bit Windows 10 running in your environment. The recommended way is to have it running directly as the main OS. If that is not possible, you can use a virtual machine that makes it possible to run a 32-bit guest operating system in 64-bit host operating system (e.g. recent 64-bit Windows 10 version). On top of the OS, we need to install CAP 505 and do the other steps to get all things running correctly. Optionally, you might also need to install the 64-Bit Connectivity Package in the 32-bit guest OS.

Terminology:
Host OS refers to the operating system running the hypervisor and can be anything supported by the hypervisor.
Guest OS refers to the operating system installed on the virtual machine i.e. 32-bit Windows 10.

Acquire 32-bit Windows 10 installer and license
Acquiring the installation image and licensing for the 32-bit Windows 10 version should go through your organization IT department. The minimum required version is Windows 10 Build 2004 (May 2020 version).

You might also want to install a second 32-bit Windows 10 if the practice has been to use the 64-bit Add-on and to store the configurations into relay device internal memory. Configurations saved with the 64-bit Add-on cannot be opened without the Add-on so it is recommended to create a separate virtual machine installation with 32-bit Windows 10 to avoid need to repeatedly install/uninstall the 64-bit Add-on in a single VM.

Install the Oracle VirtualBox hypervisor to the host machine (Optional)
If you cannot install the 32-bit Windows 10 as the main operating OS, you need to install a virtual machine hypervisor. Oracle VirtualBox is a Type 2 "hosted" hypervisor that is convenient to setup and use for desktop level virtualization. Detailed instructions for installing it are given later.

Install 32-bit Windows 10
After you have decided how you want to install Windows 10, you might need to create the virtual machine instance in the hypervisor and set it up accordingly before starting the installation. Then you need to install the Windows 10 and configure automatic updates and other normal procedures when setting up a new Windows computer. Detailed instructions for doing this with Oracle Virtualbox are given later.

Install and configure CAP 505 to the Windows 10 installation
Final step is to install and configure CAP 505 version 2.5.0 tools and test everything is working correctly. This is also the time to install the 64-bit Add-on if you are setting up secondary VM for working with 64-bit stored configurations. Detailed instructions for doing this are given later.

# Installing hypervisor and creating a virtual machine

From this point onwards, it is assumed that you have access to the installation media for the proper 32-bit Windows 10 release and you have all the licensing issues sorted out. Next step is to install the hypervisor and configure a virtual machine inside the hypervisor. Finally you need to install the 32-bit Windows 10 guest OS to the virtual machine.

Note that the virtual machine will be running a full Windows 10 installation and needs sufficient resources to run. Multiple cores and 4 GB of RAM is the recommended allocation for the virtual machine. You also should have more than 20GB of drive space allocated for the virtual machine. Networking and connectivity is an important consideration and will be handled in a later chapter.

Also, remember that automatic updates should be turned on and run periodically to keep things up to date. One special issue with virtual machines is that the updates are not run if you keep the virtual machine turned off for the long periods of time. This might also cause the updates to trigger just when you need to use the virtual machine for actual work.

Installing the hypervisor

Head over to https://www.virtualbox.org and download the latest VirtualBox platform packages (version 6.0.14 at the time of writing). Proceed to install VirtualBox using the installation wizard.
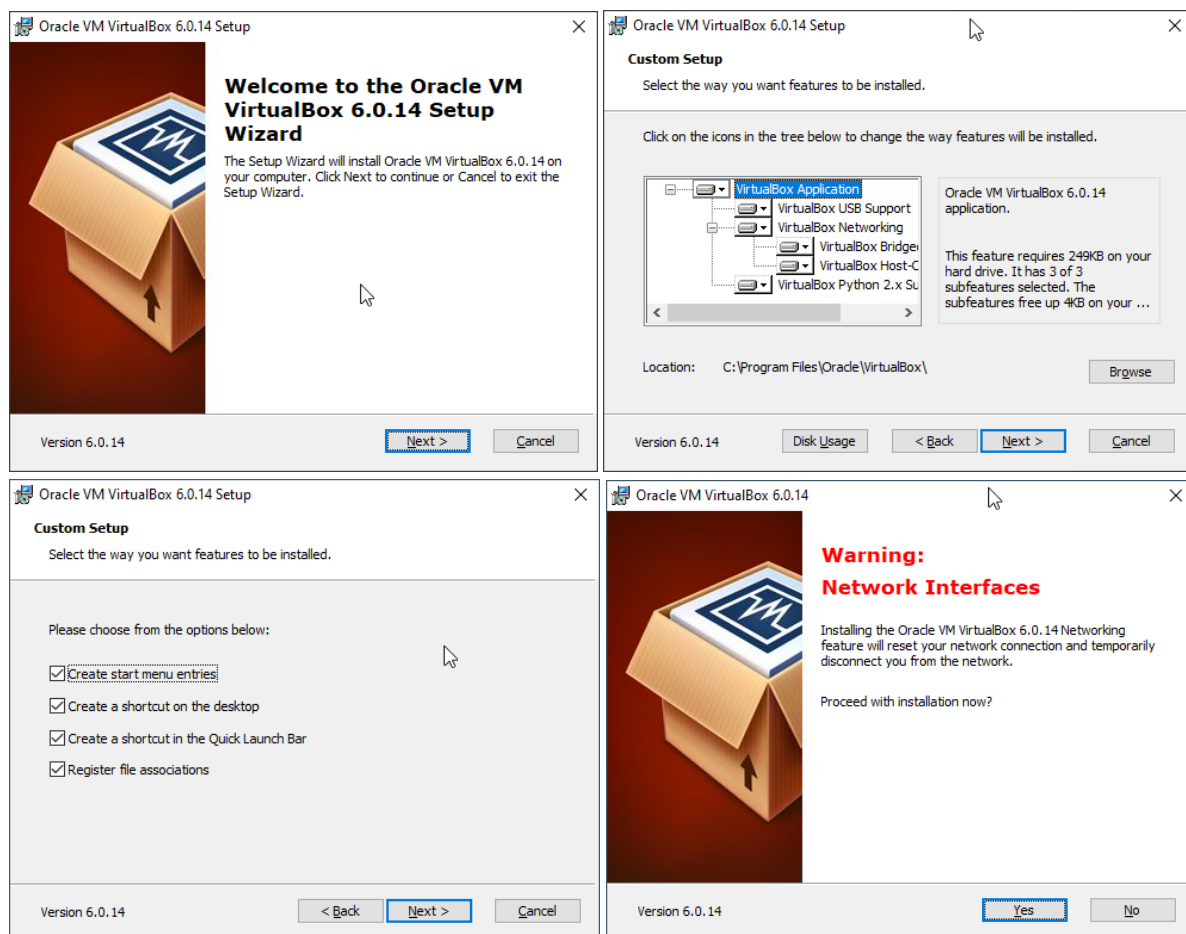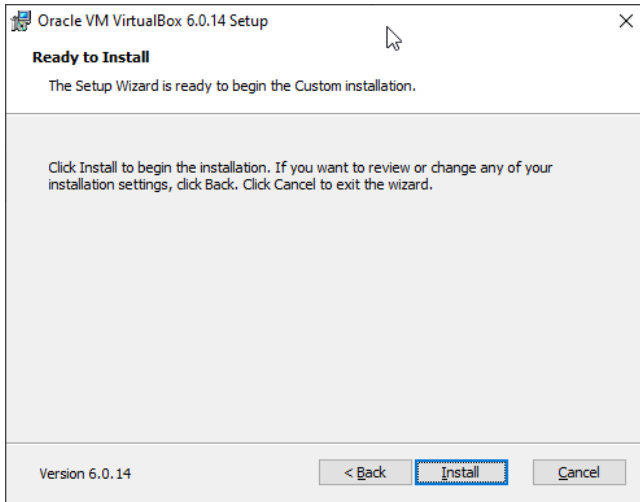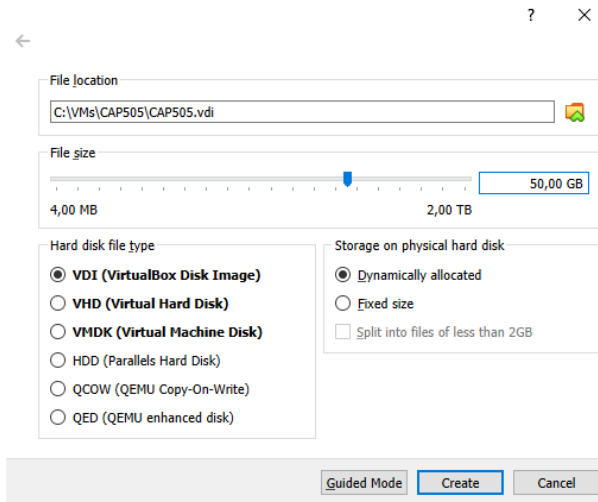
Setting up the virtual machine

Launch VirtualBox which opens up Oracle VM VirtualBox Manager. From the top menu, select "Machine" -> "New" and fill in the following details. Then click "Create". If offered, use the "Expert Mode" to do this instead of the "Guided Mode".
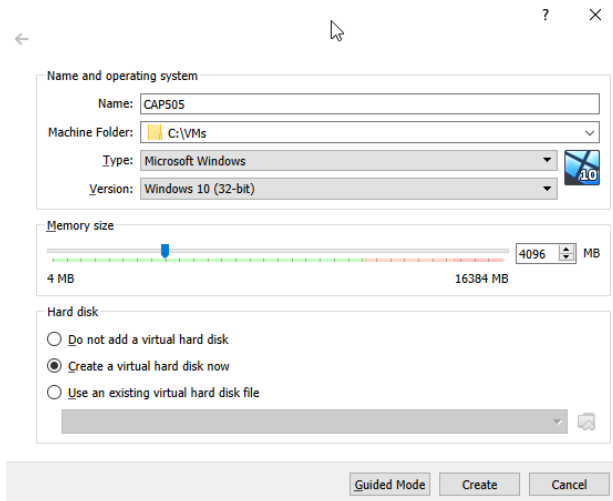
In the next dialog, setup a dynamically allocated VDI-image with at least 20GB of storage and click "Create". This sets up an expanding disk image file, which takes only as much real space from the device that is actually used by the virtual machine.

This results to a new virtual machine to be displayed in the manager UI in a powered off-state. Selecting the machine displays more information about it in the right pane.

Right click at the machine on select "Settings". Most of the settings can be left as-is but check at least the following.

- "System" -> "Processor" -> "Processor(s)" count is 4 or more
- "System" -> "Motherboard" -> "Base Memory" is 4 GB or more
- "System" -> "Acceleration" -> "Enable VT-x/AMD-V" is turned on.

Configuring network and serial access (SPA & SPA TCP/IP)

At this point, the network adapter in the virtual machine is configured in "NAT"-mode meaning it shows up as an extra computer in the network and can be used for Windows updates and general browsing. Depending on your network configuration, it might be required to set up a different configuration for the virtual machines network adapter to be able to connect to the relays themselves. All available networking modes are documented in VirtualBox manual:

https://www.virtualbox.org/manual/ch06.html#networkingmodes.

For example, if you need to have specific IP settings configured to access the device in SPA TCP/IP-mode, you can change the network adapter in the virtual machine settings to "Bridged Adapter" mode so it takes over your host computer network adapter. You may also create another NAT-configured virtual network adapter to use the host computers other (e.g. wireless) network adapter to have general network connectivity for updates etc. The settings for bridging the virtual adapter is shown below.
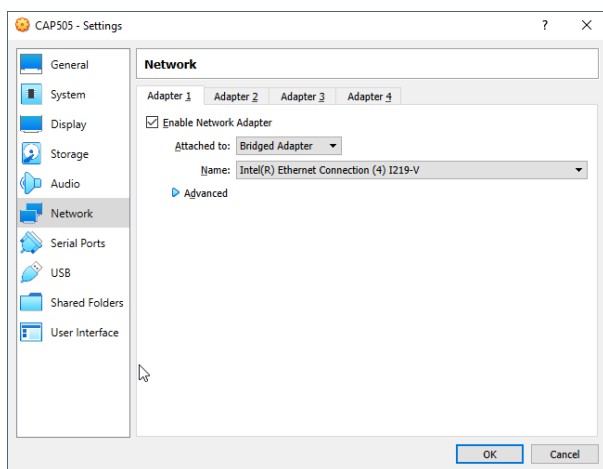
If you need to connect the relays using serial SPA, you have three choices. You can either configure direct connection to the host computer serial port or you can enable USB-connectivity to be able to use USB-to-Serial-adapter or you could use an Ethernet-to-Serial-adapter.

To enable a serial port, you need to select which serial port to connect to and then set the connection mode to "Host Device" and Path/Address to whatever serial port you have available on host machine (e.g. "COM3" in a Windows host machine or "/dev/ttyS0" in a Linux host machine). You can use this to connect to virtual serial ports as well. More information about virtual serial ports can be found in VirtualBox manual:
https://www.virtualbox.org/manual/ch03.html#serialports
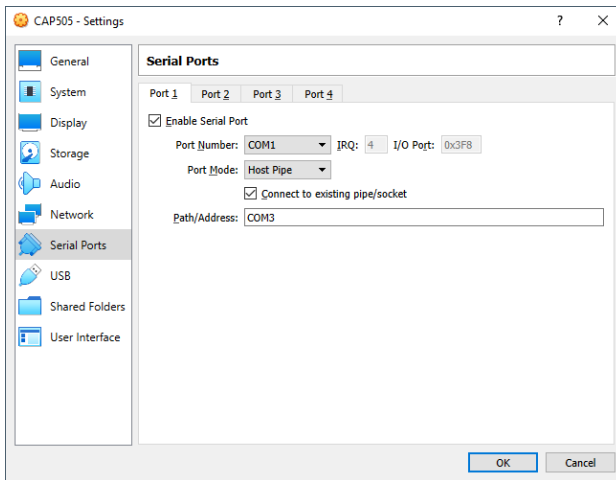
Another option is to install the USB-To-Serial adapter in the guest OS by enabling the USB-controller in virtual machine settings. USB 1.1 (OHCI) is available automatically and USB 2.0 (EHCI) and USB 3.0 (xHCI) are available if you install "Oracle VM VirtualBox Extension Pack" which is a download from VirtualBox site with separate licensing rules.

See VirtualBox manual for details: https://www.virtualbox.org/manual/ch01.html#intro-installing

You can also setup USB-devices to be automatically connected by adding it to the device filters. You may need to unplug and reconnect the device after this.

More information found in the manual: https://www.virtualbox.org/manual/ch03.html#usb-support
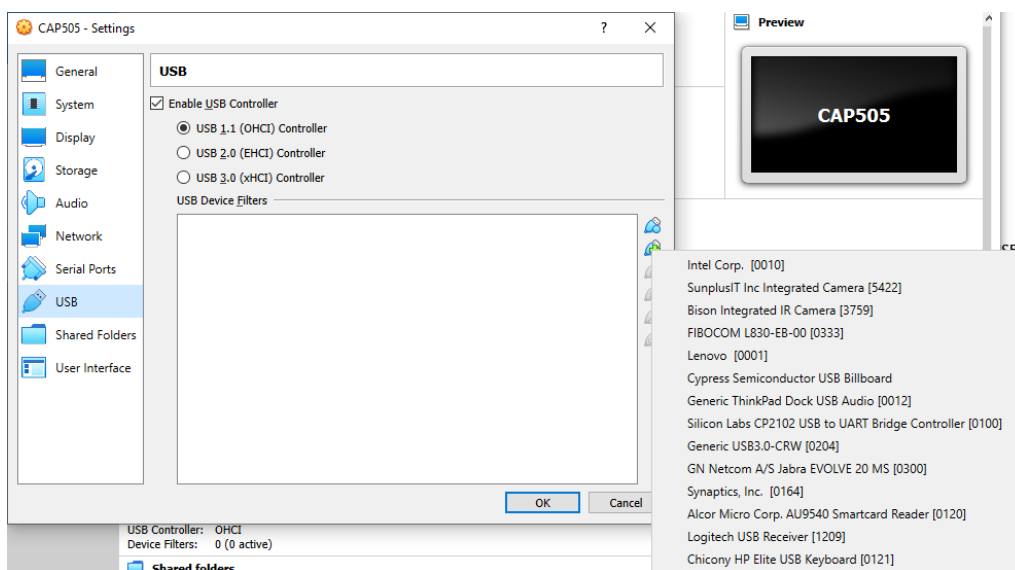
Setting the installation medium

Open the settings menu and add the Windows 10 installation disk image to the default optical drive.
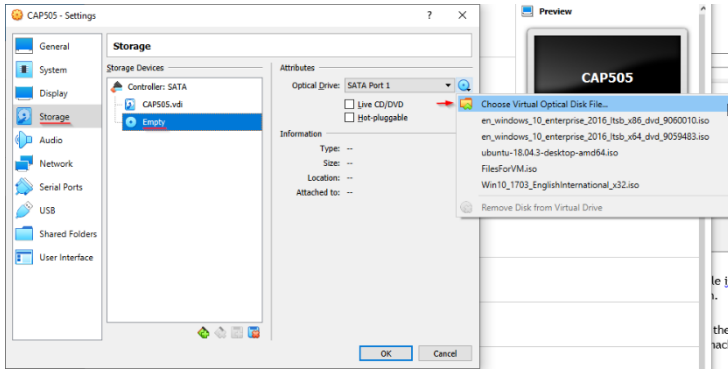
Remember to select the correct 32 bit installation medium. Image file is typically named something like "Win10_1907_EnglishInternational_x32.iso" for 32-bit version.

Make sure that networking is currently configured for internet access and close the settings screen. Then continue to next chapter to proceed with installing Windows 10 as guest OS inside the virtual machine.

Installing Windows 10 to the virtual machine

From this point onwards, it is assumed that you have the virtual machine configured and the correct installation medium configured in the virtual machine settings. Launch the virtual machine if it is not already running. Most of the steps also apply if you are installing as the main OS for the computer.

Your mouse may get captured within the virtual machine screen. Use the default release keys to release it (RightCtrl). Note also that the setup screen may differ for newer versions of Windows 10 installer.
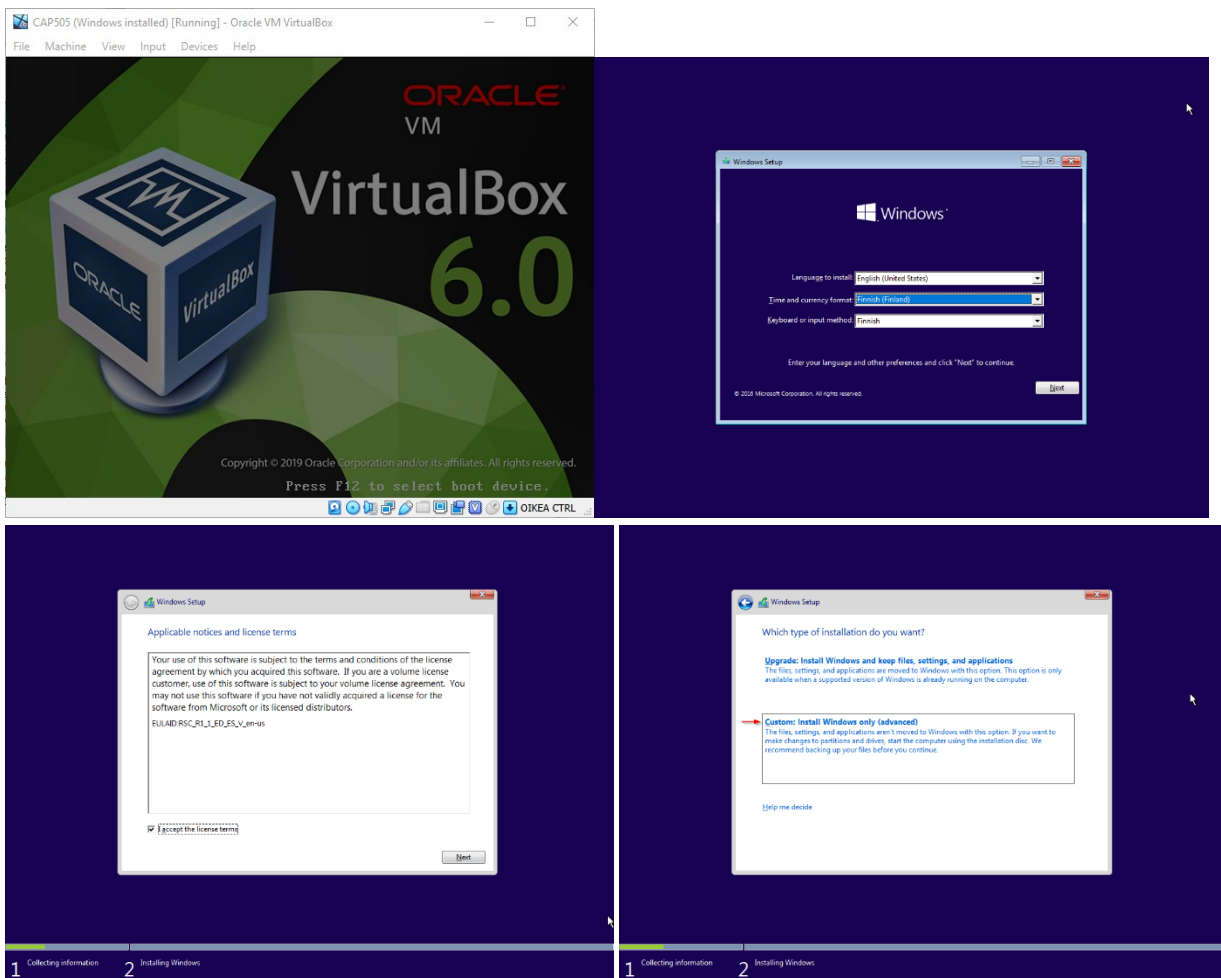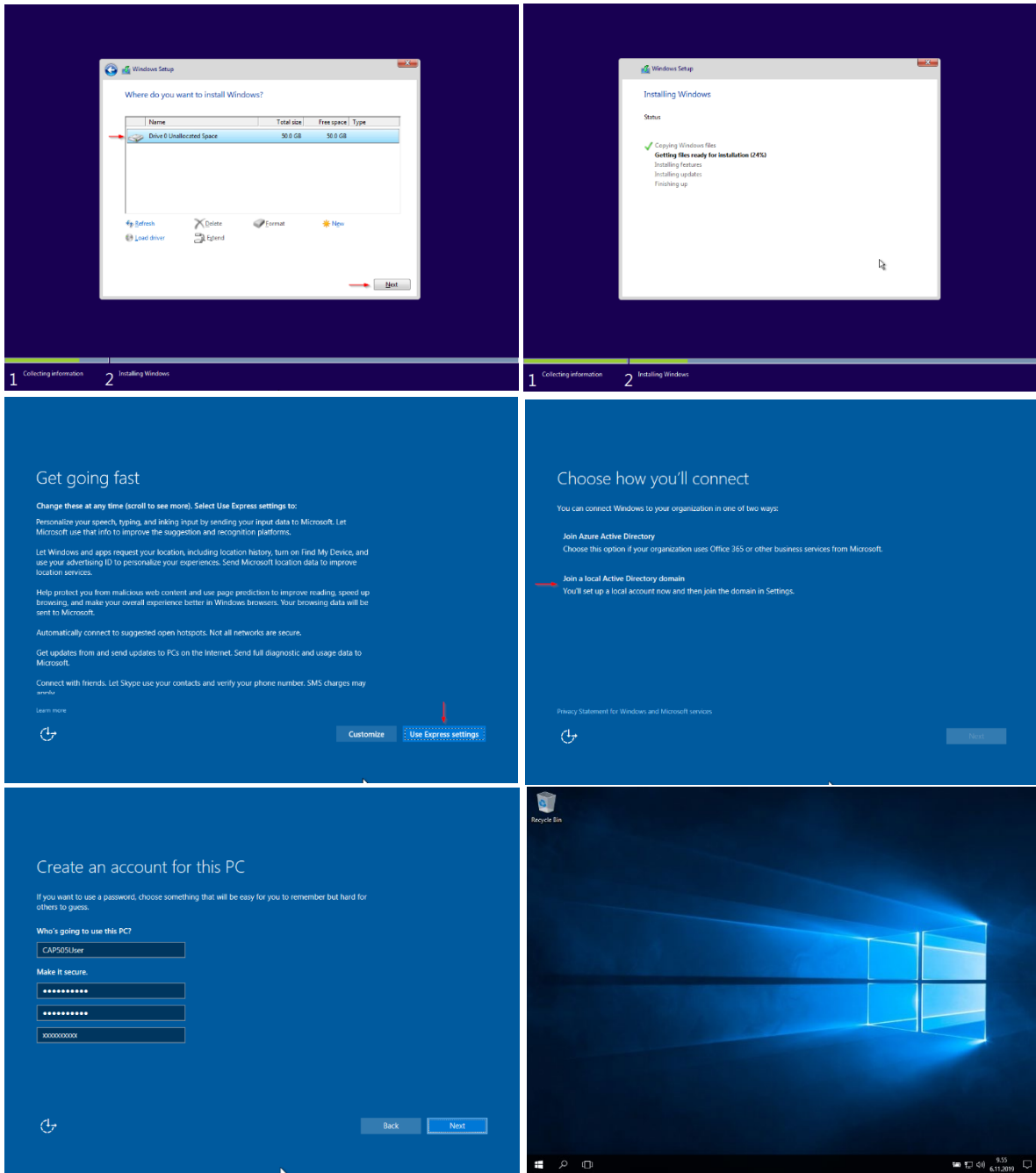
Now you should have a working Windows 10 installation running in a virtual machine inside your host OS. Some parts of the installation may differ if your organization has specific rules about how to setup workstations.

Go to "Windows Update Settings" and check that automatic updates are enabled.

You can install additional usability features to streamline the virtual machine experience. This includes things like screen resizing, better mouse integration and clipboard sharing.

- VM Menu: "Devices" -> "Insert Guest Additions CD Image"
- Start RunVBoxGuestAdditions.exe from the disk
- Click through the installation wizard
- Reboot the virtual machine
- More info: https://www.virtualbox.org/manual/ch04.html

VirtualBox also supports "Seamless mode" which hides the separate guest OS window and runs the applications as if they were running in the host OS with some limitations. More information can be found in: https://www.virtualbox.org/manual/ch04.html#seamlesswindows

You can also setup drive or folder sharing with the host OS if you need to move files between the guest and the host OS. See: https://www.virtualbox.org/manual/ch04.html#sharedfolders

Installing CAP 505 to Windows 10

The last part of the process is installing CAP 505 suite inside the virtual machine (or on the native 32-bit Windows 10 if you are using that). Download the "CAP 505 ver. 2.5.0 Relay Setting Tools"-package from ABB website.

https://new.abb.com/medium-voltage/distribution-automation/engineering-tools/relay-product-engineering-tools-cap-505

If you are installing the secondary VM for use with the 64-Bit Add-on discussed in the overview earlier, also download "CAP 505 ver. 2.5.0 Relay Setting Tools, Connectivity Package 64-bit Add-on".

The installation packages may not show up with Internet Explorer so you may need to download an alternative browser or move the installation files to the virtual machine through other means (e.g. shared folders).

Prepare the prerequisites

First, enable the .Net Framework 2.0 which is included with 3.5 installation. Select "Turn Windows features on or off" from the start menu and select the correct package from the list.
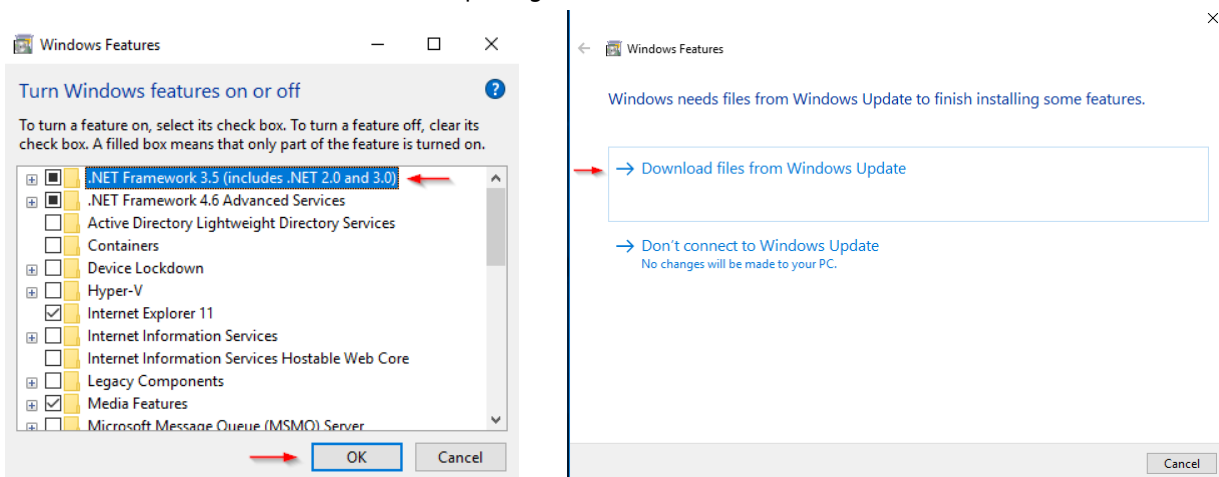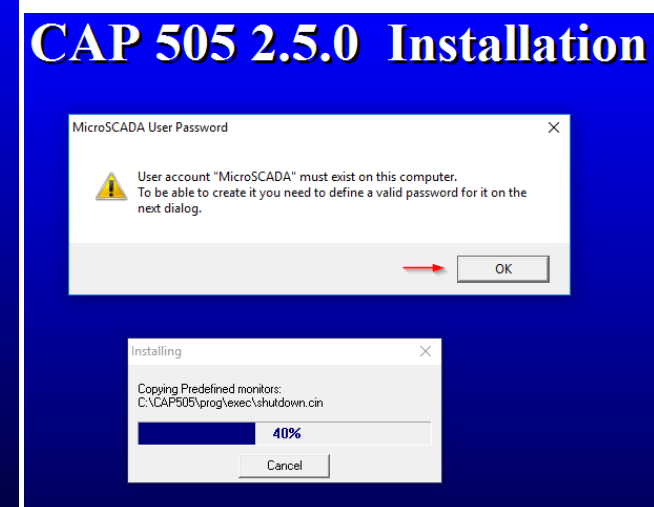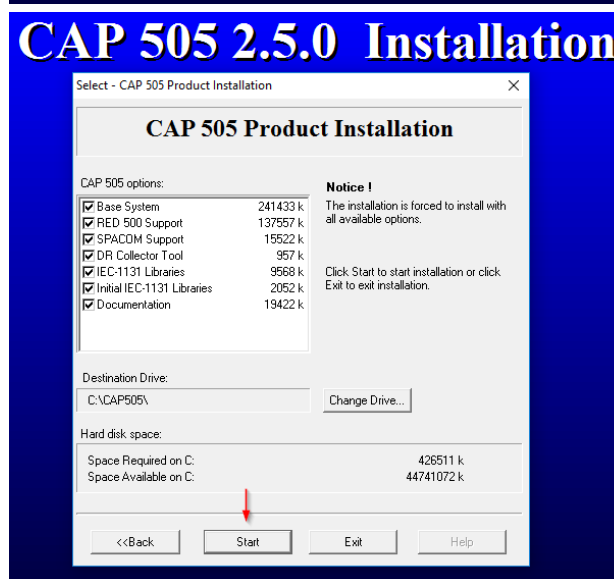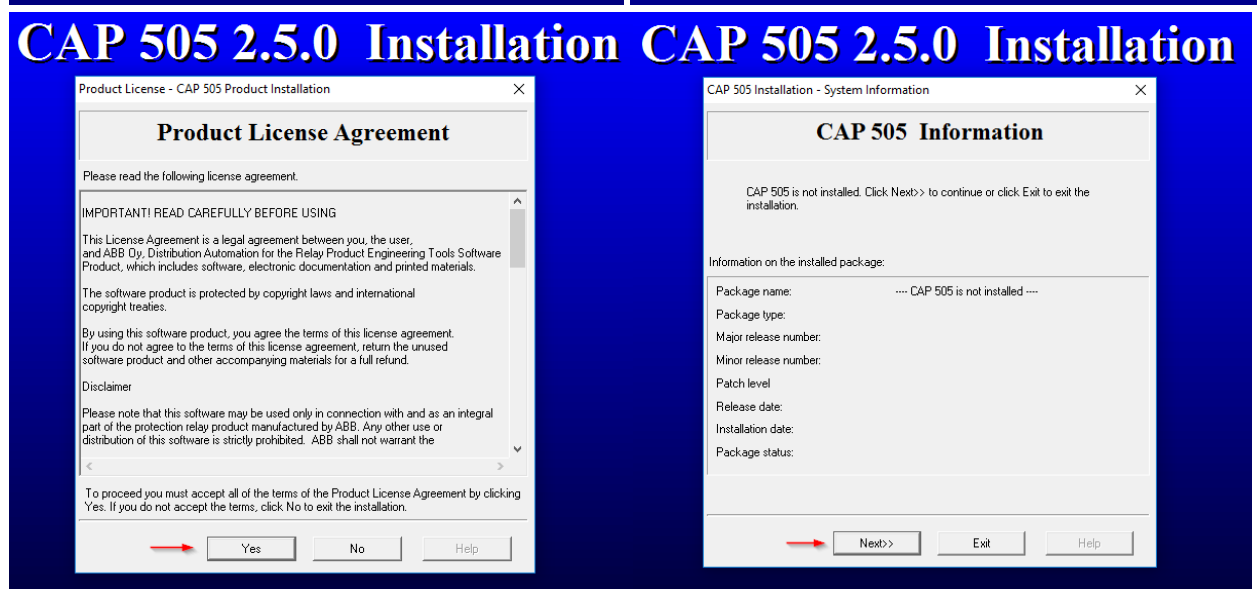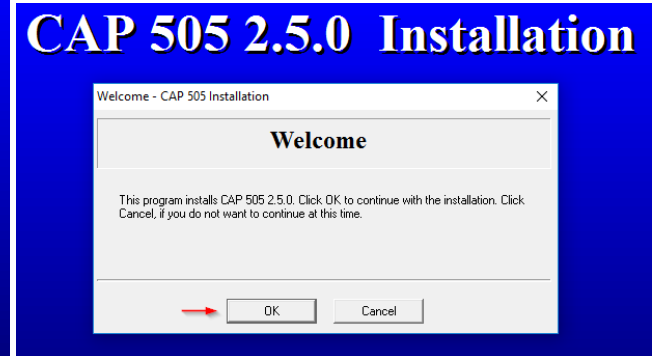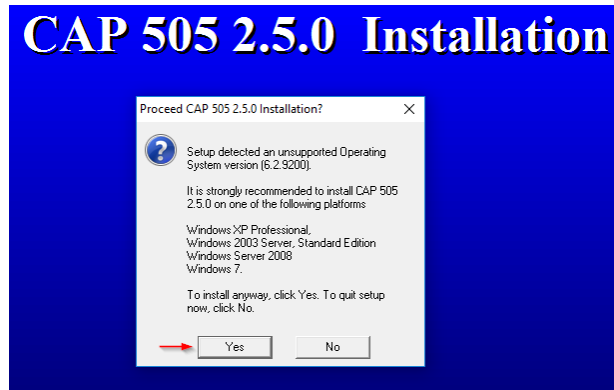

You should also set the legacy console mode on so that the app suite will not leave console windows open in the background. Open the Command Prompt application from Windows start menu. Right click on the title bar and select "Properties". Set "Use legacy console" on and restart the virtual machine.
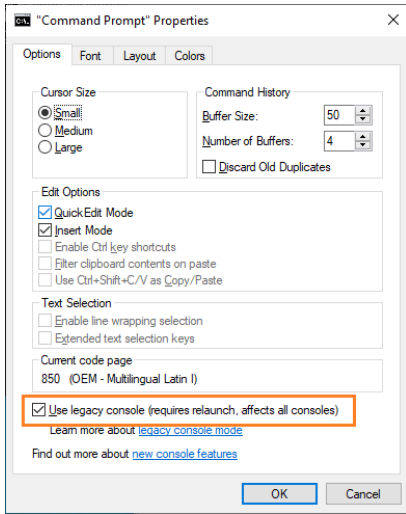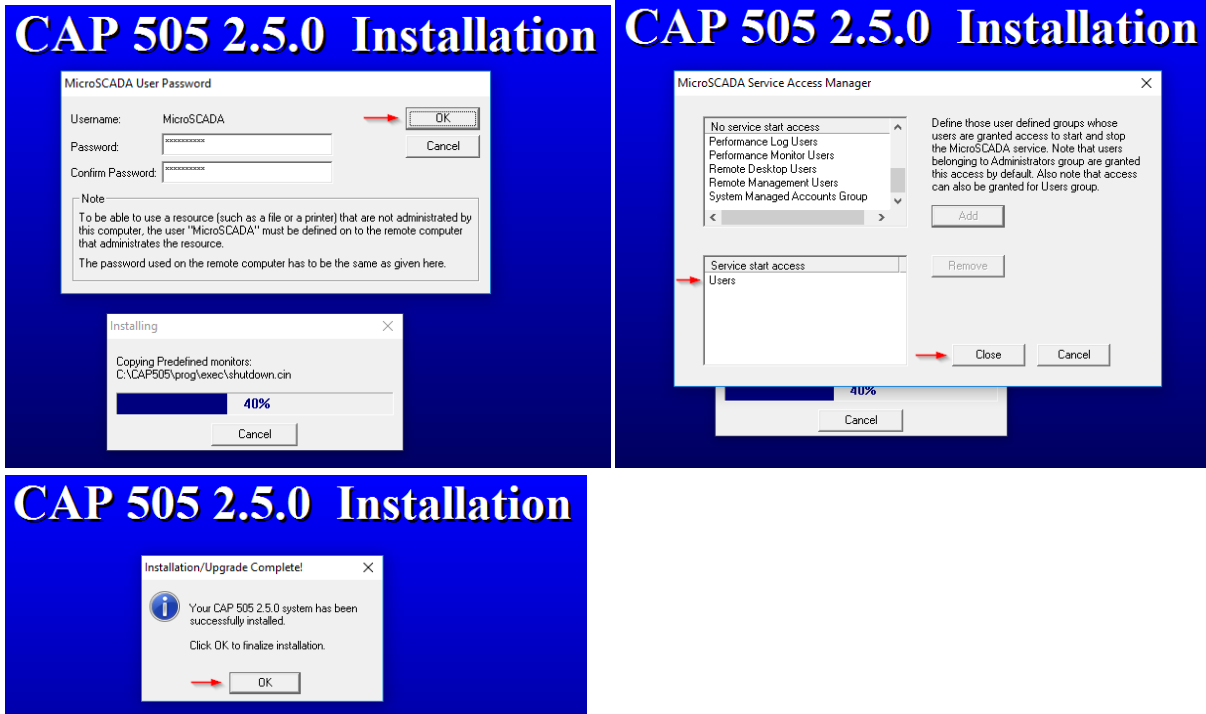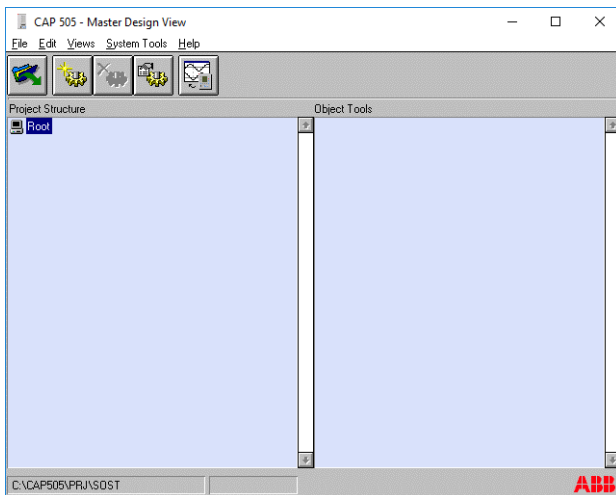
Install the CAP 505 suite

Start the "CAP505.exe" installer and ignore the warning about unsupported operating system.

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The installation prompts you to create a special user for the MicroSCADA. Create it with a strong password and permit members of "Users" group to start and stop MicroSCADA service to enable running CAP 505 without Administrator privileges. Answer "Yes" when prompted whether you want to keep all changes.


Basic installation is now complete. If you are installing the secondary VM then you need to install the Connectivity Package 64-Bit Add-on you downloaded earlier. After that, you can launch CAP 505 tool and it should launch normally.

You should also test that the Relay Configuration Tool opens up without issues by launching it from the CAP 505 suite or directly executing "C:\CAP505\Tool\Recap\MWT.exe". This will cause the 16-bit subsystem (NTVDM) to be installed and the tool to open up.
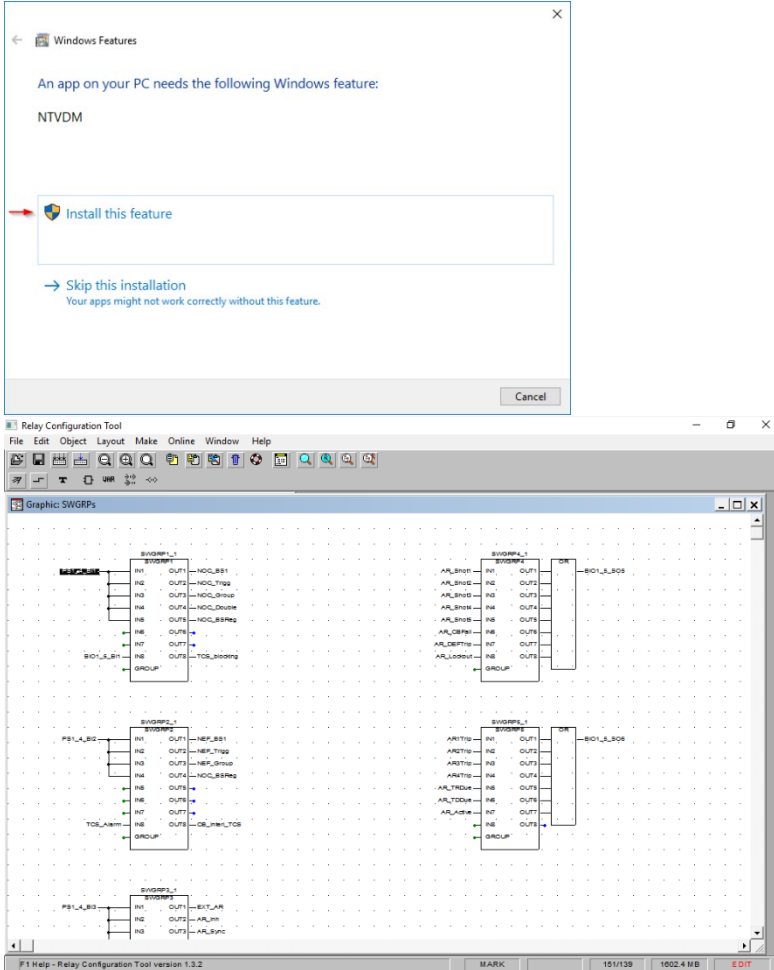
Known limitations

DNP configuration tool for 610 series relays does not work currently unless PCM600 is used. Please contact Support Line if you need assistance with DNP configuration tool for 610 series relays.