

Evoting – Basic installation and hardening

Version 1.9

Date 2025-06-23

Windows image documentation

Prerequisites

To create the image, the technician PC needs the following applications

AnyBurn	https://www.anyburn.com/download.php
Rufus	https://rufus.ie/de/
Windows ADK	https://learn.microsoft.com/en-us/windows-hardware/get-started/adk-install
HP Image Assistant	https://ftp.ext.hp.com/pub/caps-softpaq/cmit/HPIA.html
Lenovo Update Retriever	https://support.lenovo.com/ch/en/solutions/ht037099-download-thinkvantage-technologies-administrator-tools

Create packages

Software

7zip

64-Bit MSI from <https://www.7-zip.org/download.html>

GMP

This installer is provided by the customer

KeePass

Version 2.xx Setup from <https://keepass.info/download.html>

KeyStore Explorer

On <https://keystore-explorer.org/downloads.html> download the newest Windows setup (including JRE)

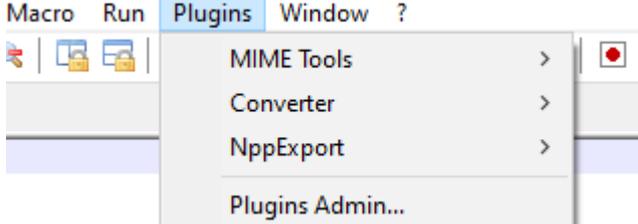
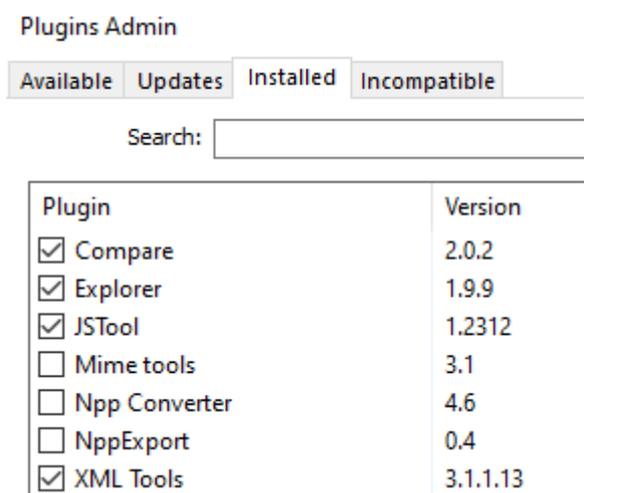
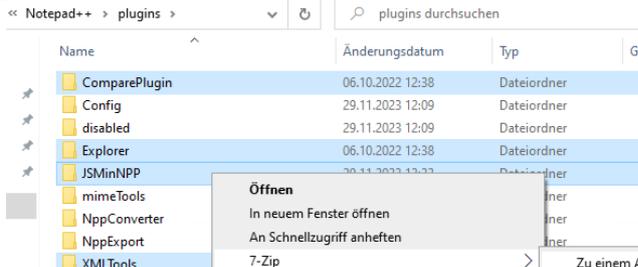
Edge

	<p>https://www.microsoft.com/de-de/edge/business/download</p> <p>Download 64-bit package</p>
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Notepad++

Newest 64-Bit installer from <https://notepad-plus-plus.org/downloads/>

Notepad++ Plugins

 <p>The screenshot shows the 'Plugins' menu in Notepad++ with the following options: MIME Tools, Converter, NppExport, and Plugins Admin...</p>	<p>On a test computer, install Notepad++ and start Plugins Admin</p>																
 <p>The screenshot shows the 'Plugins Admin' window with the 'Installed' tab selected. A table lists the installed plugins:</p> <table border="1"> <thead> <tr> <th>Plugin</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/> Compare</td> <td>2.0.2</td> </tr> <tr> <td><input checked="" type="checkbox"/> Explorer</td> <td>1.9.9</td> </tr> <tr> <td><input checked="" type="checkbox"/> JSTool</td> <td>1.2312</td> </tr> <tr> <td><input type="checkbox"/> Mime tools</td> <td>3.1</td> </tr> <tr> <td><input type="checkbox"/> Npp Converter</td> <td>4.6</td> </tr> <tr> <td><input type="checkbox"/> NppExport</td> <td>0.4</td> </tr> <tr> <td><input checked="" type="checkbox"/> XML Tools</td> <td>3.1.1.13</td> </tr> </tbody> </table>	Plugin	Version	<input checked="" type="checkbox"/> Compare	2.0.2	<input checked="" type="checkbox"/> Explorer	1.9.9	<input checked="" type="checkbox"/> JSTool	1.2312	<input type="checkbox"/> Mime tools	3.1	<input type="checkbox"/> Npp Converter	4.6	<input type="checkbox"/> NppExport	0.4	<input checked="" type="checkbox"/> XML Tools	3.1.1.13	<p>Install «Compare», «Explorer», «XML Tools» and «JSTool»</p>
Plugin	Version																
<input checked="" type="checkbox"/> Compare	2.0.2																
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<input checked="" type="checkbox"/> XML Tools	3.1.1.13																
 <p>The screenshot shows a File Explorer window with a search for 'plugins'. The results show several folders, including ComparePlugin, Config, disabled, Explorer, JSMinNPP, mimeTools, NppConverter, NppExport, and XMLTools. A context menu is open over the XMLTools folder, showing options like 'Öffnen', 'In neuem Fenster öffnen', 'An Schnellzugriff anheften', '7-Zip', and 'Zu einem Archiv hinzufügen...'.</p>	<p>Then package the four plugins as a self-extracting 7z archive</p>																

PowerShell 7

On <https://learn.microsoft.com/en-us/powershell/scripting/install/installing-powershell-on-windows?view=powershell-7.4> download the current LTSC channel x64 PowerShell 7.4.x MSI

OpenSSL

On https://wiki.overbyte.eu/wiki/index.php/ICS_Download#Download_OpenSSL_Binaries download the latest Win-64 3.x version

OpenSSL Config

On <https://github.com/openssl/openssl/tree/master/apps>, download the following three files:

- openssl.cnf
- openssl-vms.cnf
- ct_log_list.cnf

Then add them to a self-extracting 7-Zip file

SDelete

Download from <https://learn.microsoft.com/en-us/sysinternals/downloads/sdelete> and extract the 32-Bit and 64-Bit executable

TotalCommander

Download 64-Bit Installer from <https://www.ghisler.com/download.htm>

Drivers

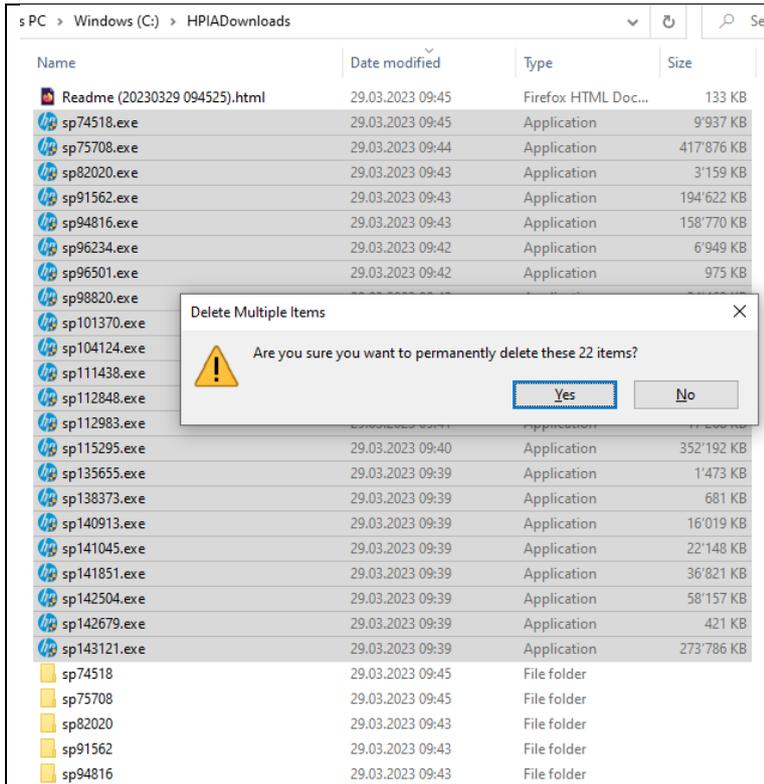
Supported models

The following laptop models are supported, and have their drivers integrated in the image:

EliteBook 850 G5 (83B2), ZBook Fury 16 G9 (89C6), ZBook Fury 16 G10 (?), ZBook Fury 16 G11 (8CA7), ZBook Studio 16 G11 (8CF5), ThinkPad P52s (20LC), ThinkStation P8 (30HJ)

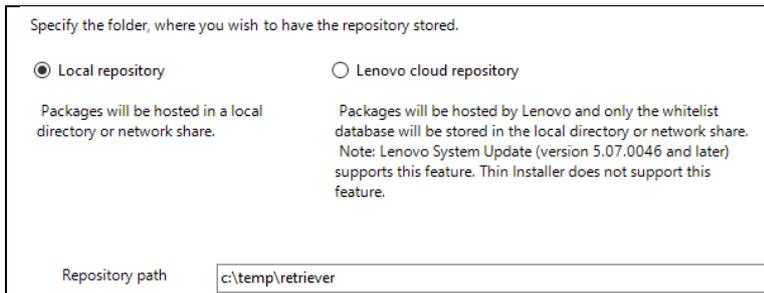
HP

	<p>Start HP Image Assistant, click on the download icon on the left, then choose "Edit Product List", and add the computer model(s) we need drivers for, then click analyse</p>																
	<p>Check "Inf Install supported" to filter for only drivers (not application or BIOS)</p>																
<table border="1"> <thead> <tr> <th>Name</th> <th>Category</th> <th>Release Type</th> <th>Ver</th> </tr> </thead> <tbody> <tr> <td>Alcor Micro Smart Card Reader Driver</td> <td>Driver - Storage</td> <td>Routine</td> <td>1.9.1</td> </tr> <tr> <td>All Docks - Ethernet Driver (Realtek)</td> <td>Driver - Network</td> <td>Routine</td> <td>2.0.V</td> </tr> <tr> <td>AMD Video Driver and Control Panel</td> <td>Driver - Graphics</td> <td>Routine</td> <td>22.21</td> </tr> </tbody> </table>	Name	Category	Release Type	Ver	Alcor Micro Smart Card Reader Driver	Driver - Storage	Routine	1.9.1	All Docks - Ethernet Driver (Realtek)	Driver - Network	Routine	2.0.V	AMD Video Driver and Control Panel	Driver - Graphics	Routine	22.21	<p>Then click "Download"</p>
Name	Category	Release Type	Ver														
Alcor Micro Smart Card Reader Driver	Driver - Storage	Routine	1.9.1														
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AMD Video Driver and Control Panel	Driver - Graphics	Routine	22.21														
	<p>Choose "Download and Extract"</p>																

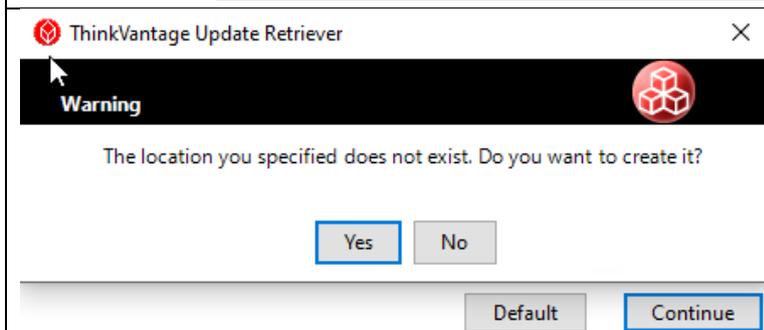


In the download directory, delete the driver packages, but keep the extracted directories and the readme file

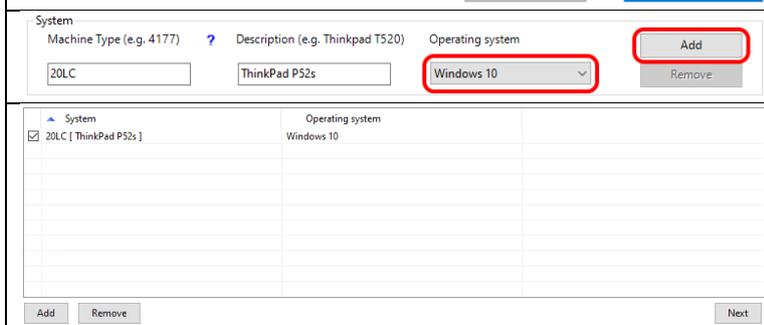
Lenovo



Start Lenovo Update Retriever, and configure the repository location to a local directory



Press "Continue", then "Yes"



Add the laptop model you want to get drivers for



Then select it and press "Next"

After the search has finished, choose "Type=Driver" and press "Search"

Select All [View query](#)

Title	Update ID	Severity	Type	Existing version	Version	Size
<input checked="" type="checkbox"/> Intel Dynamic Plat...	n27h601w	Recommended	Driver	-	8.3.10208.5644	3.31 MB
<input checked="" type="checkbox"/> Integrated Camera...	n27cp01w_rea	Recommended	Driver	-	10.0.16299.11319	6.70 MB
<input checked="" type="checkbox"/> Integrated Camera...	n27cp01w_sun	Recommended	Driver	-	3.5.18.32	6.70 MB
<input checked="" type="checkbox"/> Intel Bluetooth Dri...	n27ww02w	Recommended	Driver	-	20.60.0.4	1.95 MB
<input checked="" type="checkbox"/> NXP NFC Driver(Win...	n27wc01w	Recommended	Driver	-	12.0.3.0	1.42 MB
<input checked="" type="checkbox"/> NXP NFC Driver (...	n27wb01w	Recommended	Driver	-	12.0.1.0	1.66 MB
<input checked="" type="checkbox"/> NXP NFC Driver (...	n27wa03w	Recommended	Driver	-	12.0.2.0	1.71 MB
<input checked="" type="checkbox"/> Fibocom L830-EB ...	n23wf01w	Recommended	Driver	-	3.2.0.1	1.37 MB
<input checked="" type="checkbox"/> Fibocom L830-EB ...	n23wh04w	Recommended	Driver	-	3.19041.2034.1	1.31 MB
<input checked="" type="checkbox"/> Intel Dynamic Plat...	n27hd06w	Recommended	Driver	-	8.4.11000.6436	3.51 MB
<input checked="" type="checkbox"/> Integrated Camera...	n27cd14w_rea	Recommended	Driver	-	10.0.19041.20176	20.50 MB
<input checked="" type="checkbox"/> Integrated Camera...	n27cd14w_sun	Recommended	Driver	-	5.0.18.88	20.50 MB
<input checked="" type="checkbox"/> Synaptics UltraNav...	n20gx20w	Critical	Driver	-	19.3.4.228	27.41 MB
<input checked="" type="checkbox"/> Intel Chipset Drive...	n27ic04w	Recommended	Driver	-	10.1.18228.8176	3.54 MB
<input checked="" type="checkbox"/> Intel PRO/1000 LA...	n27rv06w	Critical	Driver	-	12.18.9.11	1.57 MB
<input checked="" type="checkbox"/> Realtek Media Car...	n27x805w	Recommended	Driver	-	10.0.17134.31242	1.85 MB

Changes since last search: (+)Added (Δ)Changed (-)Removed
Total selected: 42 updates, 2.21 GB Show local p...

Hide Option
 This version
 This version and all future versions

Select all drivers and press "Next"

Select All 20LC [ThinkPad P52s]-Windows 10

Title	Update ID	Severity	Version
<input checked="" type="checkbox"/> Alcor Smart Card Reader Driver - 10 (1703 or later)/11(...	n27v104w	Recommended	1.7.46.1307
<input checked="" type="checkbox"/> Fibocom L830-EB Wireless WAN Driver - 10 (1709 or la...	n23wh04w	Recommended	3.19041.2034.1
<input checked="" type="checkbox"/> Fibocom L830-EB Wireless WAN Driver (Windows 10 Buil...	n23wf01w	Recommended	3.2.0.1
<input checked="" type="checkbox"/> Fibocom L850-GL Wireless WAN Driver - 10 (1709 or la...	n23wj37w_v1	Critical	2.0.1.112
<input checked="" type="checkbox"/> Generic DisplayLink Driver for ThinkPad USB 3.0 Ultra/...	dislink1012875	Recommended	10.1.2875.0
<input checked="" type="checkbox"/> Generic DisplayLink Driver for USB Docks and Adapter...	dislink1027042	Recommended	10.2.7042.0
<input checked="" type="checkbox"/> Integrated Camera Driver for Realtek - 10 (1709 or later...	n27cd14w_rea	Recommended	10.0.19041.20176
<input checked="" type="checkbox"/> Integrated Camera Driver for Realtek(Windows 10 Buil...	n27cp01w_rea	Recommended	10.0.16299.11319
<input checked="" type="checkbox"/> Integrated Camera Driver for Sunplus - 10 (1709 or late...	n27cd14w_sun	Recommended	5.0.18.88
<input checked="" type="checkbox"/> Integrated Camera Driver for Sunplus(Windows 10 Buil...	n27cp01w_sun	Recommended	3.5.18.32
<input checked="" type="checkbox"/> Intel 8265 Wireless LAN Driver - 10 (1809 or Later)/11(2...	n24w810w	Critical	20.70.30.1
<input checked="" type="checkbox"/> Intel 8265 Wireless LAN Driver (Windows 10 Version 18...	n24w807w	Critical	20.70.18.2
<input checked="" type="checkbox"/> Intel Bluetooth Driver - 10 (1709 or Later)/11 (21H2 or l...	n27ww11w	Critical	22.150.0.6
<input checked="" type="checkbox"/> Intel Bluetooth Driver(Windows 10 Build 1703) - 10 [64...	n27ww02w	Recommended	20.60.0.4
<input checked="" type="checkbox"/> Intel Chipset Driver - 10 /11 (21H2 or later)	n27ic04w	Recommended	10.1.18228.8176
<input checked="" type="checkbox"/> Intel Dynamic Platform and Thermal Framework - 10 (...	n27hd06w	Recommended	8.4.11000.6436
<input checked="" type="checkbox"/> Intel Dynamic Platform And Thermal Framework (Win...	n27h01w	Recommended	8.3.10208.5644
<input checked="" type="checkbox"/> Intel Gigabit Ethernet Driver - 10 (1809 or later)/11 (21...	n27rv06w	Recommended	12.19.1.37
<input checked="" type="checkbox"/> Intel Graphics Driver - 10 (1703 or Later)/11(21H2 or La...	n27dt22w	Critical	30.0.100.9865
<input checked="" type="checkbox"/> Intel Management Engine Software - 10 (1703 or Later)...	n27ra21w	Critical	2205.15.0.2623
<input checked="" type="checkbox"/> Intel PRO/1000 LAN Adapter Software(Windows 10 Ver...	n27rv06w	Critical	12.18.9.11
<input checked="" type="checkbox"/> Intel Serial IO Driver - 10 (1809 or Later)/11(21H2 or Lat...	n27j01w	Recommended	30.100.184.2

42 updates, 2.21 GB

"Finish"

ThinkVantage Update Retriever has finished downloading new updates

Current Results (Click link to view details):

[42 updates downloaded successfully.](#)

Wait for the downloads to finish

PC > Windows (C:) > temp > retriever > n1fupa0w

Name	Date modified	Type	Size
n1fupa0w	3/29/2023 10:07 AM	Application	4,326 KB
n1fupa0w	3/29/2023 10:07 AM	Text Document	44 KB
n1fupa0w_2	3/29/2023 10:05 AM	XML Document	11 KB

This will create a lot of directories with drivers inside executable archives

```
Administrator: Windows PowerShell
PS C:\WINDOWS\system32> Is C:\temp\retriever\*.exe -Recurse | % { $_.BaseName; & $$_ /VERYSILENT "/DIR=c:\temp\retriever2\$( $_.BaseName) " /extract=yes | Out-Null }
dislink1012875
dislink1027042
n1fup99w
n28px20w
n28pc10w
n27e118w
n27cd14w
n27cd14w
getw10ver4
n27cp01w
getw10ver4
n27cp01w
```

Use the following command in a window with admin rights to extract the packages:

```
Is C:\temp\retriever\*.exe -
Recurse | % { $_.BaseName; &
$_ /VERYSILENT
"/DIR=c:\temp\retriever2\$( $_.
BaseName) " /extract=yes | Out-
Null }
```

Name	Date modified	Type	Size
LEPLang	3/29/2023 10:13 AM	File folder	
Resource	3/29/2023 10:13 AM	File folder	
dock_port	12/4/2022 9:57 PM	PNG File	9 KB
EasyResume	12/4/2022 10:04 PM	Application	2,298 KB
EventLogger.dll	12/4/2022 10:04 PM	Application exten...	103 KB
InstHelper.dll	12/4/2022 10:04 PM	Application exten...	169 KB
iTin.Core.dll	12/4/2022 10:05 PM	Application exten...	45 KB
Lenovo.Vantage.RpcClient.dll	12/4/2022 10:05 PM	Application exten...	31 KB

This extracts the archive to usable file collections

Driver package adjustments

Occasionally, HP Image Assistant downloads multiple drivers for the same device. Especially if this is for a large driver such as for the video card, the older duplicate should be deleted.

For some of the laptop models, not all drivers are needed, and some must be deleted before creating the packages.

HP 850 G5:

- Delete the driver for "Conexant HD Audio Driver" (currently SP140283)
- Delete the driver for "AMD Video Driver" (currently SP142415)

HP ZBook Fury 16 G9:

- Delete the driver for "AMD Video Driver" (currently SP156134)
- Delete the driver for "Realtek HD Audio" (currently SP156237)
- Delete the driver for "Intel XMM LTE" (currently SP145803)

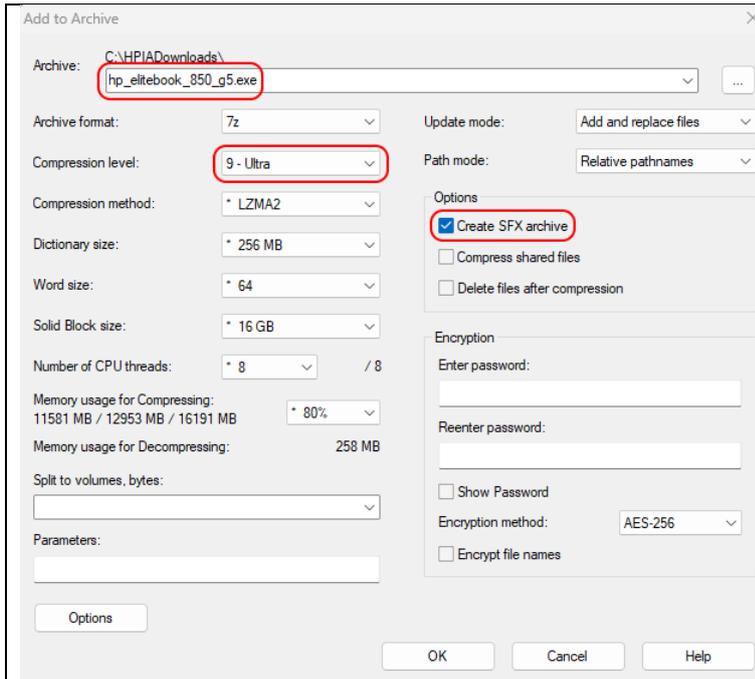
HP ZBook Fury 16 G10:

- Delete the driver for "Realtek HD Audio" (currently SP157063)
- Delete the driver for "Intel XMM" (currently SP155280)

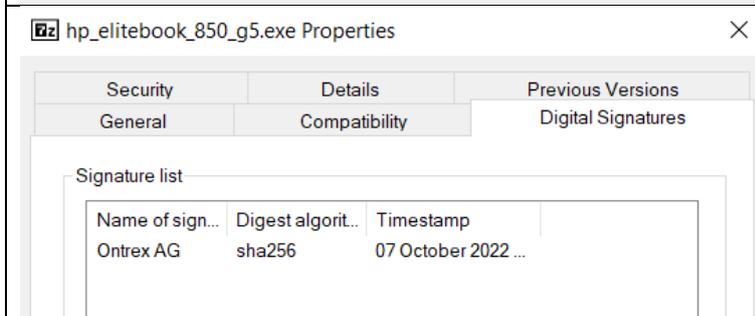
Create the package

Name	Date modified	Type	Size
sp74518	29.03.2023 09:45	File folder	
sp75708	29.03.2023 09:45	File folder	
sp82020	29.03.2023 09:43	File folder	
sp91562	29.03.2023 09:43	File folder	
sp94816	29.03.2023 09:43	File folder	
sp96234	29.03.2023 09:43	File folder	
sp96501	29.03.2023 09:43	File folder	
sp98820	29.03.2023 09:43	File folder	
sp101370	29.03.2023 09:43	File folder	
sp104124	29.03.2023 09:43	File folder	
sp111438	29.03.2023 09:43	File folder	
sp112848	29.03.2023 09:43	File folder	
sp115295	29.03.2023 09:39	File folder	
sp135655	29.03.2023 09:39	File folder	
sp138373	29.03.2023 09:39	File folder	
sp140913	29.03.2023 09:39	File folder	
sp141045	29.03.2023 09:39	File folder	
sp141851	29.03.2023 09:39	File folder	
sp142504	29.03.2023 09:39	File folder	
sp142679	29.03.2023 09:39	File folder	
sp143121	29.03.2023 09:39	File folder	
Readme (20230329 094525).html	29.03.2023 09:45	Firefox HTML Doc...	133 KB

Add the extracted folders to a 7zip archive



As self-extracting archive with ultra compression level, with the name of the laptop model



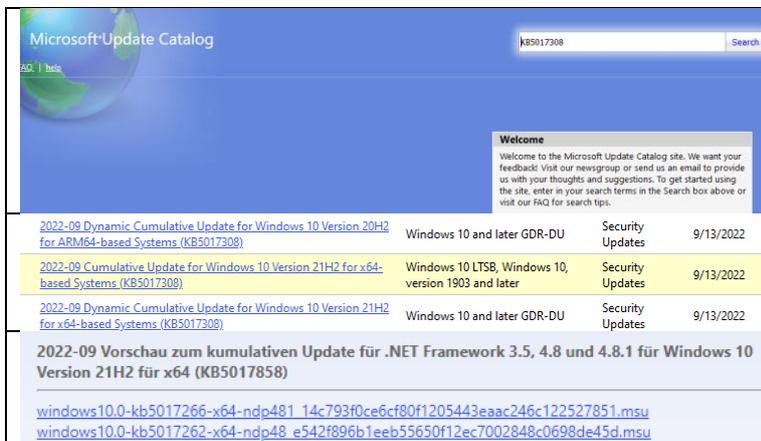
Sign the finished archive (with timestamp)

Updates

To identify which updates are needed, set up a computer with the last image version, enable networking on it, and let it automatically run Windows Update using Microsoft Update. Write down the KB numbers of any update it's installing, then download those updates separately and integrate them into the new image version.

Then, apply the image again, and repeat the above step until Windows Update reports that no updates need to be installed on a freshly applied image.

Windows



Go to <https://catalog.update.microsoft.com/Home.aspx> and search for the KB article numbers in the top right

For the monthly updates, download the regular cumulative update, not the dynamic one

For .NET only download the 4.8.1 package, not the 4.8

Windows Malicious Software Removal Tool - v5.106 (KB890830) Windows 7, Windows Server 2008 Update Rollups 10/11/2022	For the malicious software removal tool, sort by date, then pick the newest package for Windows 10 64 bit
Windows Malicious Software Removal Tool x64 - v5.106 (KB890830) Windows Server 2012, Windows 8.1, Windows Server 2012 R2, Windows 10, Windows 10 LTSB, Windows Server 2016, Windows Server 2019, Windows 10, version 1903 and later, Windows Server, version 1903 and later, Windows 11 Update Rollups 10/11/2022	
Windows Malicious Software Removal Tool - v5.106 (KB890830) Windows 8.1, Windows 10, Windows 10 LTSB, Windows 10, version 1903 and later, Windows 11 Update Rollups 10/11/2022	

<h2>.NET Desktop Runtime 8.0.13</h2> <p>The .NET Desktop Runtime enables you to run existing Windows desktop applications. This release includes the .NET Runtime; you don't need to install it separately.</p> <table border="1"> <thead> <tr> <th>OS</th> <th>Installers</th> <th>Binaries</th> </tr> </thead> <tbody> <tr> <td>Windows</td> <td>x64 x86 Arm64 winget instructions</td> <td></td> </tr> </tbody> </table>	OS	Installers	Binaries	Windows	x64 x86 Arm64 winget instructions		For .NET 8, go to https://dotnet.microsoft.com/en-us/download/dotnet/8.0 and download the newest "Desktop Runtime" for x64
OS	Installers	Binaries					
Windows	x64 x86 Arm64 winget instructions						

Microsoft Defender

Antimalware solution Microsoft Defender Antivirus for Windows 11, Windows 10, Windows 8.1, and Windows Server 32-bit 64-bit ARM	On https://www.microsoft.com/en-us/wdsi/defenderupdates Download the 64-bit Version for the antivirus definitions
Update for Microsoft Defender Antivirus antimalware platform - KB4052623 (Version 4.18.2211.5) Microsoft Defender Antivirus Definition Updates 12/8/2022	

updateplatform.x86fre_85dfdcc7cc8df1062fc64ae81d8e0fc3b4e20e45.exe updateplatform.amd64fre_7f1e1eb218c67263a51f402fb080f1bbe311041b.exe updateplatform.arm64fre_9383ac7ca8917dc66023c6ff68d3679c8285f6bc.exe	Pick the one for "amd64fre"
--	-----------------------------

BIOS

2 Select from My Products List <ul style="list-style-type: none"> <input checked="" type="checkbox"/> My Products List <ul style="list-style-type: none"> <input checked="" type="checkbox"/> HP ZBook Fury 16 G10 Mobile Workstation PC <input checked="" type="checkbox"/> Microsoft Windows 10 version 21H2 (64-bit) <input checked="" type="checkbox"/> HP ZBook Fury 16 G9 Mobile Workstation PC <input checked="" type="checkbox"/> Microsoft Windows 10 version 21H2 (64-bit) <input checked="" type="checkbox"/> HP EliteBook 850 G5 Notebook PC <input checked="" type="checkbox"/> Microsoft Windows 10 version 21H2 (64-bit) 	For HP, select all models, then press Analyze
3 Get SoftPaqs Analyze	

<input type="text" value="bios"/>	Filter for the word "bios"
-----------------------------------	----------------------------

Critical Select Components to Download/Apply Download (3)	Then check all the BIOS updates and click "Download"										
<table border="1"> <thead> <tr> <th>Name</th> <th>Category</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/> ⚠ HP BIOS and System Firmware (U96)</td> <td><input checked="" type="checkbox"/> BIOS - System Firm</td> </tr> <tr> <td><input checked="" type="checkbox"/> ⚠ HP BIOS and System Firmware (V96)</td> <td>BIOS - System Firm</td> </tr> <tr> <td><input type="checkbox"/> HP BIOS Config Utility (BCU)</td> <td>Software - System</td> </tr> <tr> <td><input checked="" type="checkbox"/> ⚠ HP Firmware Pack (Q78)</td> <td><input checked="" type="checkbox"/> BIOS</td> </tr> </tbody> </table>		Name	Category	<input checked="" type="checkbox"/> ⚠ HP BIOS and System Firmware (U96)	<input checked="" type="checkbox"/> BIOS - System Firm	<input checked="" type="checkbox"/> ⚠ HP BIOS and System Firmware (V96)	BIOS - System Firm	<input type="checkbox"/> HP BIOS Config Utility (BCU)	Software - System	<input checked="" type="checkbox"/> ⚠ HP Firmware Pack (Q78)	<input checked="" type="checkbox"/> BIOS
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<input type="checkbox"/> HP BIOS Config Utility (BCU)	Software - System										
<input checked="" type="checkbox"/> ⚠ HP Firmware Pack (Q78)	<input checked="" type="checkbox"/> BIOS										

	<p>Choose "Download only"</p>																				
<input type="checkbox"/> Select all <ul style="list-style-type: none"> System <ul style="list-style-type: none"> <input type="checkbox"/> 20JH [ThinkPad Yoga 370] <input checked="" type="checkbox"/> 20LC [ThinkPad P52s] 	<p>For Lenovo, select the model in Update Retriever, then search for updates</p>																				
<p>Type: <input type="text" value="Bios"/></p> <p>Systems: <input type="button" value="Select..."/> <input type="button" value="Search"/></p>	<p>Filter for "Bios"</p>																				
<table border="1"> <thead> <tr> <th><input type="checkbox"/></th> <th>Title</th> <th>Update ID</th> <th>Severity</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/></td> <td>BIOS Update Utility - 10/11</td> <td>n27uj32w</td> <td>Recommended</td> <td>Bios</td> </tr> </tbody> </table>	<input type="checkbox"/>	Title	Update ID	Severity	Type	<input checked="" type="checkbox"/>	BIOS Update Utility - 10/11	n27uj32w	Recommended	Bios	<p>Then download the BIOS update</p>										
<input type="checkbox"/>	Title	Update ID	Severity	Type																	
<input checked="" type="checkbox"/>	BIOS Update Utility - 10/11	n27uj32w	Recommended	Bios																	
<p>PC > DVD Drive (E:) CES_X64FREVE_DE-DE_DV9 > configuration > biosupdates</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Date modified</th> <th>Type</th> <th>Size</th> </tr> </thead> <tbody> <tr> <td>hp_elitebook_850_g5_sp152771.exe</td> <td>25.06.2024 19:04</td> <td>Application</td> <td>16'795 KB</td> </tr> <tr> <td>hp_zbook_fury_16_g9_sp153119.exe</td> <td>25.06.2024 19:04</td> <td>Application</td> <td>23'575 KB</td> </tr> <tr> <td>hp_zbook_fury_16_g10_sp151263.exe</td> <td>25.03.2024 09:33</td> <td>Application</td> <td>23'935 KB</td> </tr> <tr> <td>lenovo_thinkpad_p52s_n27uj32w.exe</td> <td>25.06.2024 16:43</td> <td>Application</td> <td>12'910 KB</td> </tr> </tbody> </table>	Name	Date modified	Type	Size	hp_elitebook_850_g5_sp152771.exe	25.06.2024 19:04	Application	16'795 KB	hp_zbook_fury_16_g9_sp153119.exe	25.06.2024 19:04	Application	23'575 KB	hp_zbook_fury_16_g10_sp151263.exe	25.03.2024 09:33	Application	23'935 KB	lenovo_thinkpad_p52s_n27uj32w.exe	25.06.2024 16:43	Application	12'910 KB	<p>Rename them with their respective models, and copy them to the "biosupdates" directory under customization</p>
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lenovo_thinkpad_p52s_n27uj32w.exe	25.06.2024 16:43	Application	12'910 KB																		

Hardening

To harden the OS installation, we are using settings sets from both Microsoft, the Swiss Post, and the CIS benchmark, as well as some settings from ourselves.

Microsoft security baselines

<p>Choose the download you want</p> <table border="1"> <thead> <tr> <th><input type="checkbox"/></th> <th>File Name</th> <th>Size</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/></td> <td>Windows 11 version 22H2 Security Baseline.zip</td> <td>1.4 MB</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>LGPO.zip</td> <td>520 KB</td> </tr> </tbody> </table>	<input type="checkbox"/>	File Name	Size	<input type="checkbox"/>	Windows 11 version 22H2 Security Baseline.zip	1.4 MB	<input checked="" type="checkbox"/>	LGPO.zip	520 KB	<p>On https://www.microsoft.com/en-us/download/details.aspx?id=55319 download LGPO.exe</p>
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<input type="checkbox"/>	Windows 10 version 21H1 Security Baseline.zip	1.2 MB								
<input checked="" type="checkbox"/>	Windows 10 version 21H2 Security Baseline.zip	1.2 MB								
<input type="checkbox"/>	Windows 11 Security Baseline.zip	1.2 MB								

Non-implemented security settings

The following security baseline settings recommended by either Microsoft or the Swiss Post haven't been implemented in the image. They are present in the configuration files but commented out and documented here with the respective reason why they weren't enabled.

Setting	Reason
Disable Windows + R	It's a usability decrease without a clear security benefit
Static DNS server	We didn't want to set a public DNS server like 8.8.8.8 due to privacy issues, and the security risk from a DNS based MitM attack seemed low considering we're using transport encryption
Configure Windows Defender SmartScreen: Block	Because the offline laptops don't have network connectivity, this would cause queries to SmartScreen to not work, and authorized E-Voting applications to be blocked
Deny write access to removable drives not protected by BitLocker	We need to save data to unencrypted USB drives during the e-voting process
Block untrusted and unsigned processes that run from USB	We need to be able to run executables from USB drives during the e-voting process
Script execution policy: All Signed	We need to be able to run unsigned scripts during the e-voting process

Autounattend-File

To allow the setup to proceed without user choices, we use an unattend file to automatically configure various settings and actions during Windows Setup. The unattend file is copied to the root file of the boot media under the name autounattend.xml.

Following are the settings that are implemented in the file, separated by the steps they are happening in.

WindowsPE

- OS Language is set to German
- User locale and system locale are set to Swiss German
- Keyboard layout is set to Swiss German
- Windows EULA is automatically accepted
- Registration organization of Windows is set to “Evoting”
- Disk is partitioned into 3 partitions:
 - 500 MB EFI partition for BitLocker
 - 16 MB MSR partition for disk metadata
 - Rest of the disk as a primary partition for the OS
- Partitions are formatted:
 - EFI partition as FAT32 and labelled “System”
 - OS partition as NTFS and labelled “Windows”
- The Windows installation is applied from the “Windows 10 Enterprise N LTSC” image

OOBESystem

- WLAN setup is skipped
- EULA is skipped
- Privacy settings are skipped
- Time zone is set to Western Europe Standard Time
- An administrator account is configured with a default password
- OS Language is set to German
- User locale and system locale are set to Swiss German
- Keyboard layout is set to Swiss German

Specialize

- Auto logon is configured for the administrator account
- Six PowerShell commands are started in sequence
 - PowerShell script execution policy is set to “RemoteSigned”
 - The drive letter of the boot media is retrieved from WMI
 - Drivers are installed
 - Applications are installed
 - Policies and other settings are applied
 - The updates are staged to the computer hard disk to later be installed

Checklist for image update

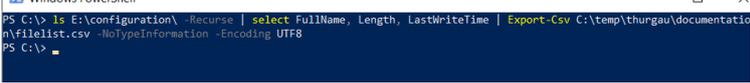
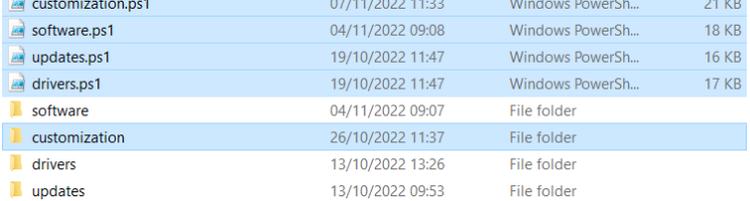
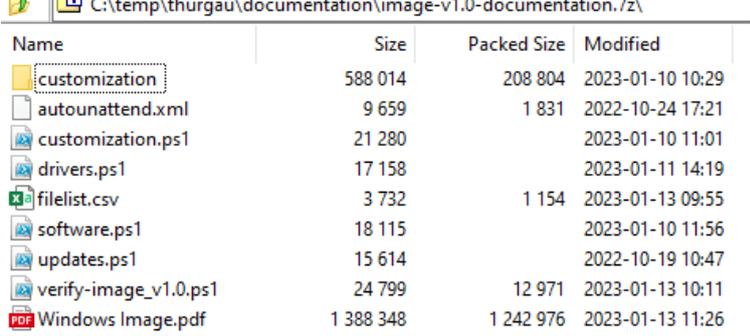
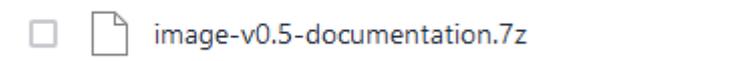
When a new version of the image is created, the following steps need to be executed:

- Check for [every application](#) whether a new version is available and replace those. For some of them, the customer might have to be contacted since the downloads aren’t public. For some applications, an update might not be allowed due to compatibility issues.
- Create a new driver package for each [supported model](#). Make sure to [exclude the drivers](#) that have caused issues in the past.
- Download current BIOS update packages for every model, and update the script “check-biosupdatestatus.ps1” to the current versions
- Check with the customer if any security settings need to be adjusted.

- Set up a VM with the last image, then update it from the Microsoft servers, note the KB numbers of the updates that are being installed, and integrate them into the image.
- Check if any Notepad++ plugins have been updated by launching the application and looking at the update tab in Plugins Admin
- Create a Release Candidate ISO file, then modify the image verification script until it returns the correct results.
- Image a computer using the ISO file and doublecheck whether all Windows Updates are counted as installed.
- Sign the image verification script.
- Create a zip file with the [documentation](#).
- Upload the iso file, the documentation, and the image verification script to the sharing platform
- Archive the image components onto the project network server

Create documentation to publish

We need to make available a collection of files to the public to document what we've done and allow some transparency to the voters. We create an archive of script and documentation files and provide that to the customer who takes care of the publishing itself.

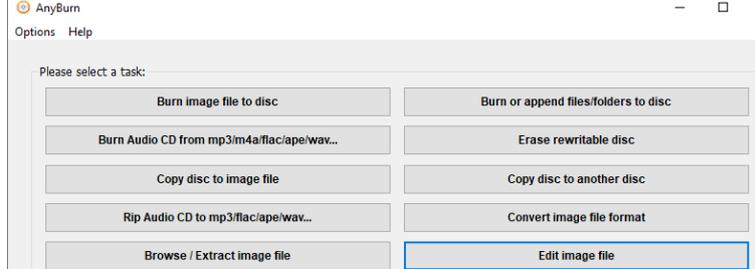
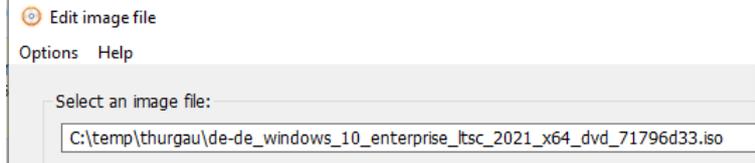
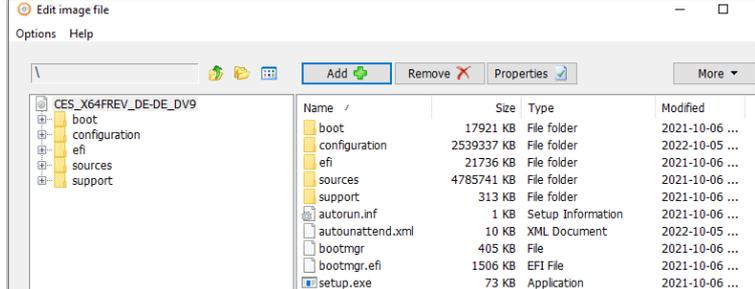
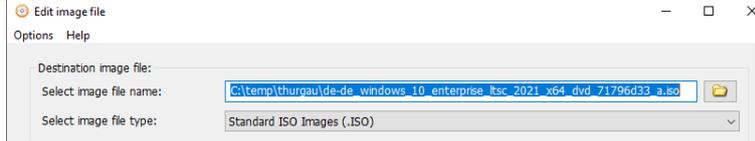
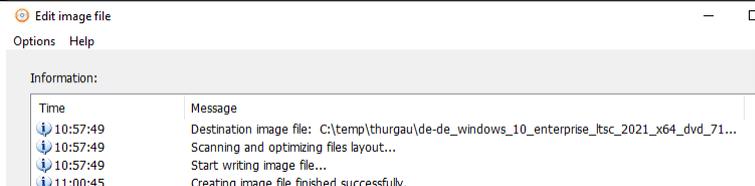
 <pre>PS C:\> ls E:\configuration\ -Recurse select FullName, Length, LastWriteTime Export-Csv C:\temp\thurgau\documentation\filelist.csv -NoTypeInformation -Encoding UTF8</pre>	<p>Export a list of all the customized files to a CSV file using the command:</p> <pre>ls E:\configuration\ -Recurse select FullName, Length, LastWriteTime Export-Csv C:\data\thurgau\documentation\filelist.csv -NoTypeInformation -Encoding UTF8</pre>																																								
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 <p>image-v0.5-documentation.7z</p>	<p>Upload the resulting file</p>																																								

Archival

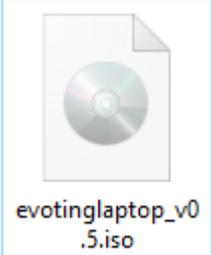
While we don't archive the full ISO files due to space issues, we want to archive the most important files for future reference.

<p>enprojekte (P:) > Kanton Thurgau Staatskanzlei > Projekte > E-Voting > image_v1.4 ></p> <table border="1"> <thead> <tr> <th>Name</th> <th>Date modified</th> <th>Type</th> <th>Size</th> </tr> </thead> <tbody> <tr> <td>biosupdates</td> <td>28.03.2024 15:12</td> <td>File folder</td> <td></td> </tr> <tr> <td>customization</td> <td>28.03.2024 15:13</td> <td>File folder</td> <td></td> </tr> <tr> <td>software</td> <td>28.03.2024 15:15</td> <td>File folder</td> <td></td> </tr> <tr> <td>image-v1.4-documentation.7z</td> <td>28.03.2024 15:07</td> <td>7z Archive</td> <td>1'412 KB</td> </tr> </tbody> </table>	Name	Date modified	Type	Size	biosupdates	28.03.2024 15:12	File folder		customization	28.03.2024 15:13	File folder		software	28.03.2024 15:15	File folder		image-v1.4-documentation.7z	28.03.2024 15:07	7z Archive	1'412 KB	<p>Create a subdirectory for the current image version, and copy the documentation 7z, as well as the directories: <i>customization</i>, <i>software</i> and <i>biosupdates</i></p>
Name	Date modified	Type	Size																		
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software	28.03.2024 15:15	File folder																			
image-v1.4-documentation.7z	28.03.2024 15:07	7z Archive	1'412 KB																		

Create the bootable ISO

	<p>Start Anyburn, then choose "Edit Image"</p>
	<p>Open a bootable ISO file</p>
	<p>Add the "autounattend.xml" and the "configuration" directory</p>
	<p>Save under a different name</p>
	<p>Wait until it's finished</p>

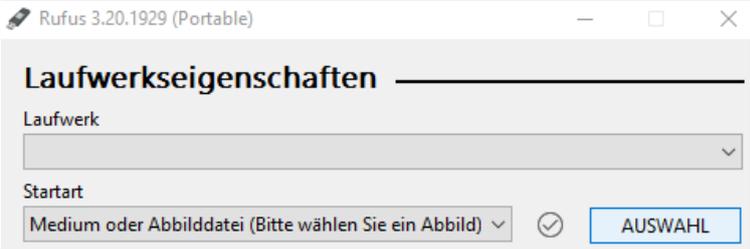
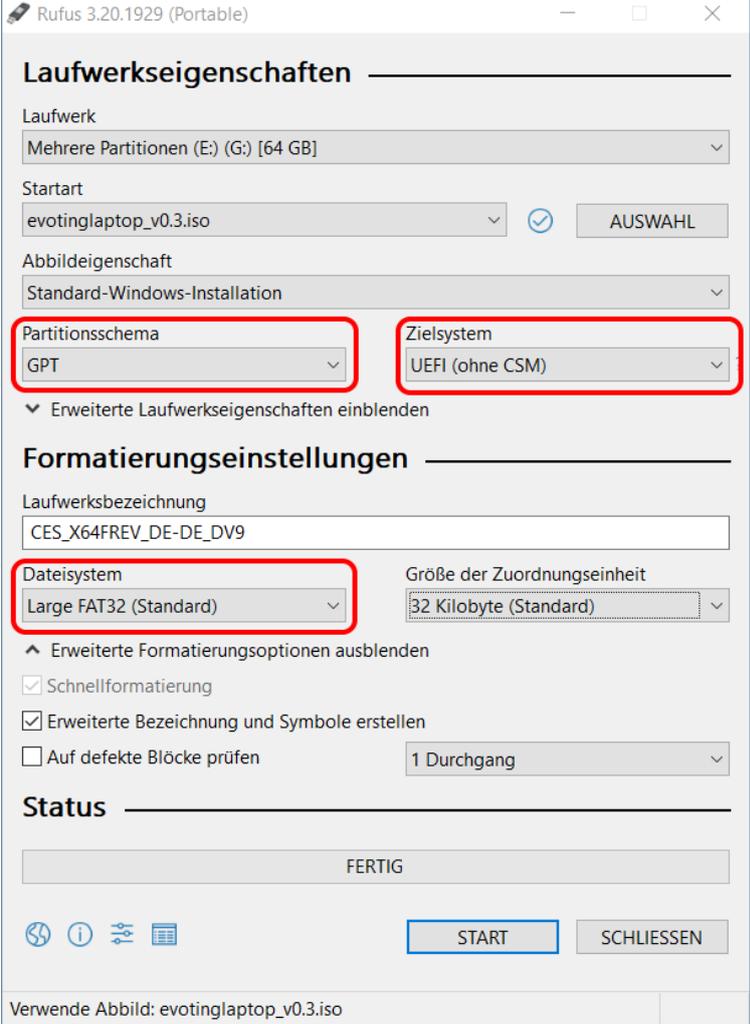
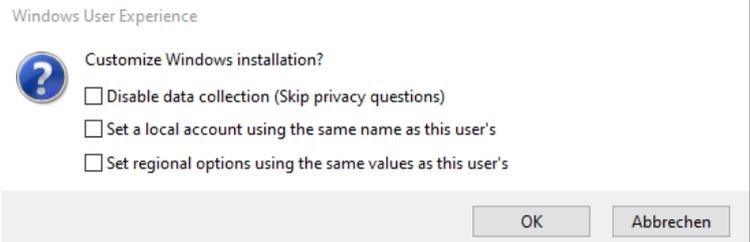
Upload the image

	<p>Rename the resulting image to evotinglaptop_vx.y.iso</p>
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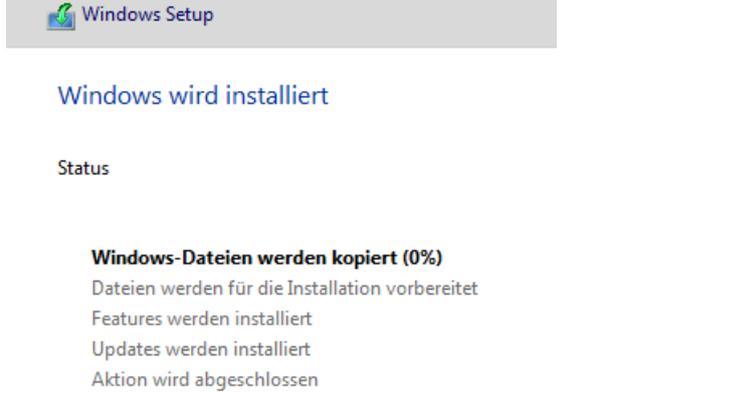
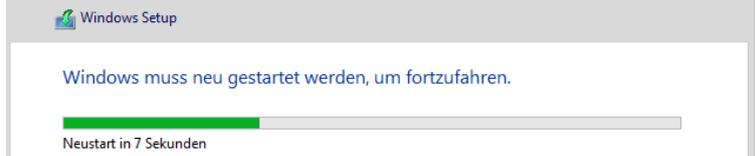
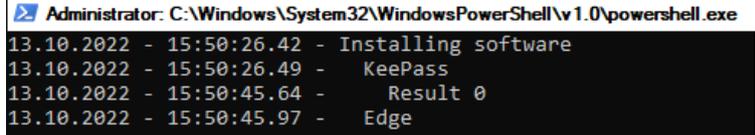
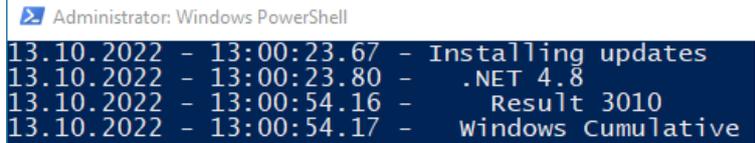
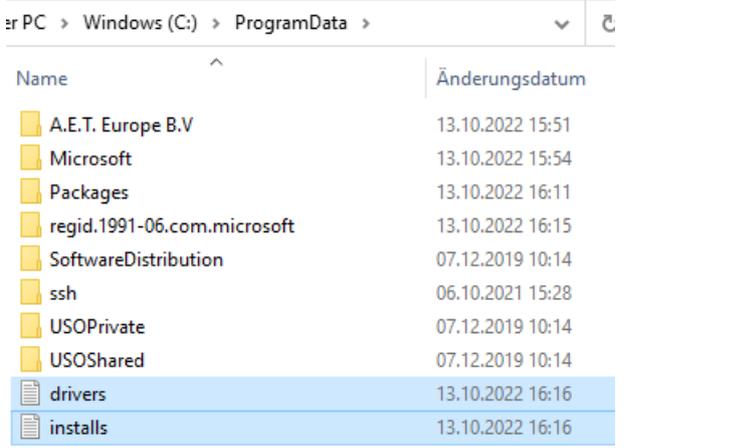
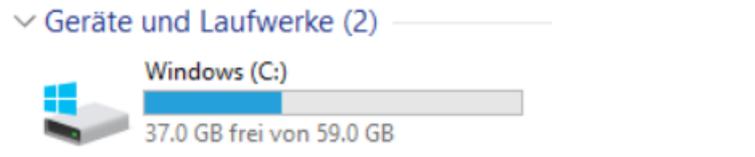
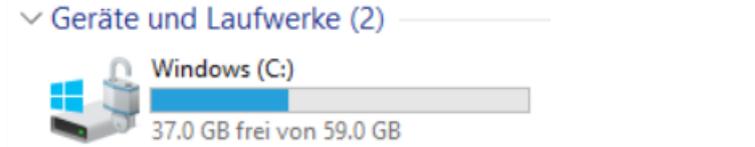
<p>All Files > Kiteworks > Kanton Thurgau</p> <hr/> <p><input type="checkbox"/> Name ^</p> <hr/> <p><input type="checkbox"/>  Upload</p> <hr/> <p><input type="checkbox"/>  evotinglaptop_v0.5.iso</p>	<p>And upload it to the Kiteworks share</p> <p>https://kiteworks.ontrex.ch/#/folder/8666a49b-a3d7-4831-9d02-45666f755d19</p>
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User Guide

Extract the ISO to a USB Stick

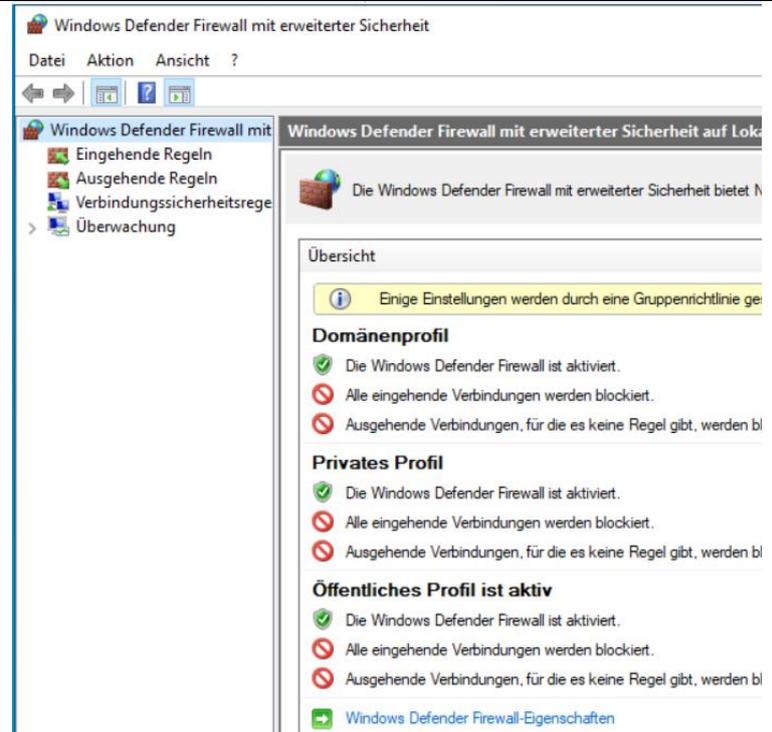
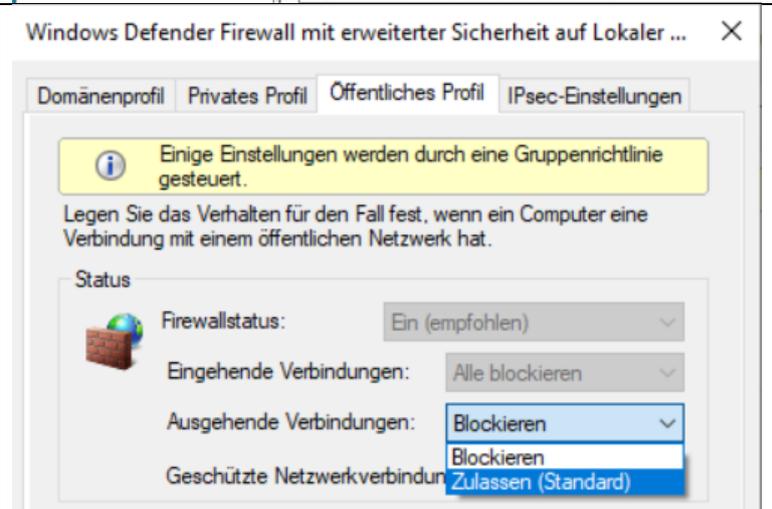
	<p>Start Rufus and select the ISO file</p>
	<p>Use GPT, UEFI (without CSM) and Large FAT32 as options</p> <p>Do not modify the drive name, it has to stay on the default value</p>
	<p>Do not let Rufus do any adjustments to the Windows installation</p>

Apply the image to a computer

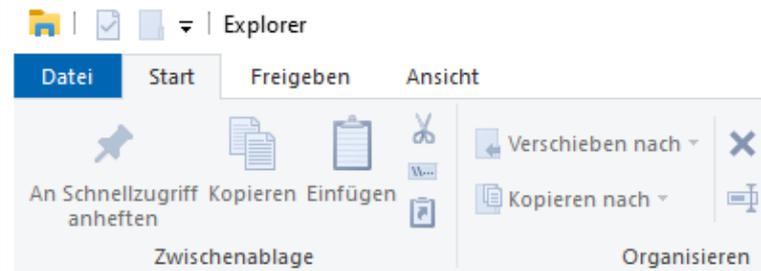
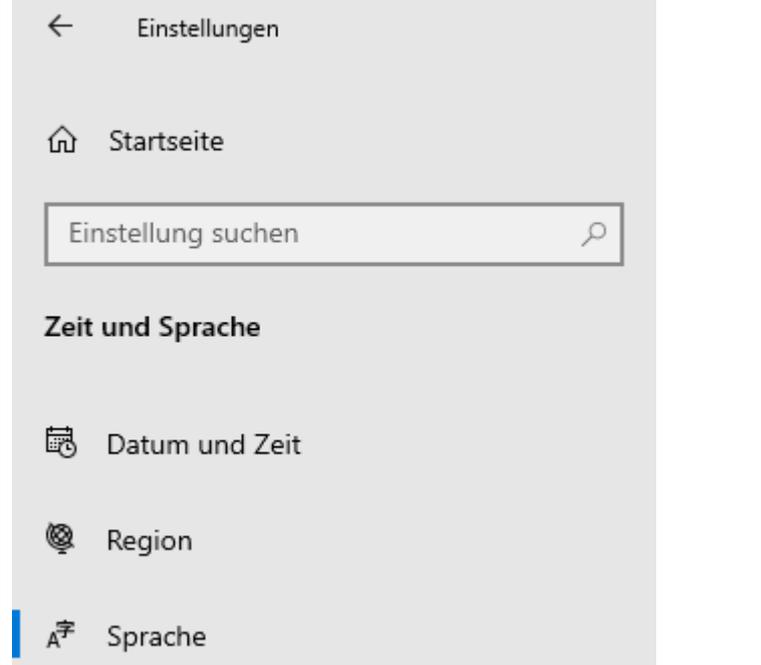
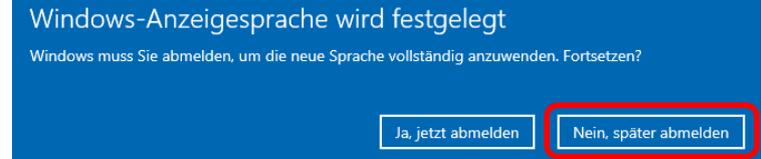
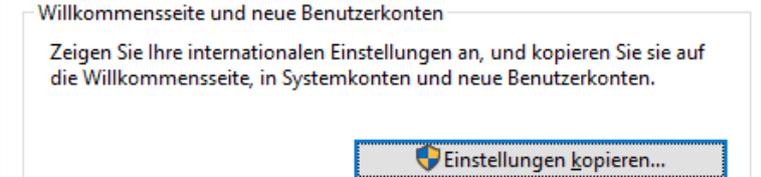
	<p>Boot the laptop from the USB stick by pressing either F9 for HP, F12 for Lenovo, or Esc for Panasonic early in the boot process.</p> <p>The Windows Setup will then automatically start</p>
	<p>After a while it'll reboot...</p>
	<p>...and continue by installing drivers, applications etc</p>
	<p>When the computer is installing updates, the USB stick can be removed</p>
	<p>Log files about the setup are created in the directory c:\programdata</p>
	<p>The hard drive will not be immediately encrypted</p>
	<p>After a few reboots however it'll be encrypted (if the laptop is connected to a power supply)</p>

Enable network connectivity

By default, both incoming and outgoing network connections are blocked. If the specific laptop that is being set up needs to have Internet connectivity, outgoing connections have to be manually enabled.

	<p>With the administrator account, open the Windows Firewall settings</p>
	<p>Set outbound connections to "Allowed" under the public profile</p>
	<p>Then restart the computer</p>

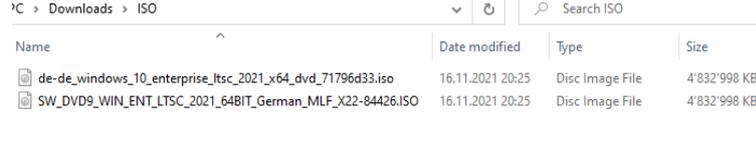
Change language

	<p>By default, the UI language is in German.</p> <p>If the PC is required to be in French...</p>
	<p>...then open Settings and go to “Time and Language”, then “Language”</p>
	<p>Change the display language to French</p>
	<p>Do <i>not</i> log off when prompted</p>
	<p>Scroll down and click “Administrative language options”</p>
	<p>Click “Copy Settings”</p>

<p>Aktuelle Einstellungen für folgende Konten kopieren:</p> <p><input checked="" type="checkbox"/> Willkommenseite und Systemkonten</p> <p><input checked="" type="checkbox"/> Neue Benutzerkonten</p> <p style="text-align: right;"> <input type="button" value="OK"/> <input type="button" value="Abbrechen"/> </p>	<p>Set the checkboxes on the login page and the new user accounts, then press OK</p>
<p>Anzeigesprache ändern</p> <p>Die Systemanzeigesprache wurde geändert. Sie müssen Windows neu starten, damit die Änderungen wirksam werden.</p> <p>Speichern Sie Ihre Arbeit und schließen Sie alle geöffneten Programme vor dem Neustart.</p> <p style="text-align: center;"> <input type="button" value="Jetzt neu starten"/> <input type="button" value="Abbrechen"/> </p>	<p>Confirm the restart</p>
<p>Explorateur de fichiers</p> <p>Fichier Accueil Partage Affichage</p> <p>Épingler à Accès rapide Copier Coller Presse-papiers</p> <p>Déplacer vers Copier vers Organiser</p>	<p>After that, Windows is in French</p>

Verify image authenticity

To verify that a USB stick hasn't been tampered with and contains only either official Microsoft files or files that have been put there as part of the image customization, the script "verify-image.ps1" can be used.

	<p>Download the German Windows LTSC 2021 ISO from an official Microsoft source, like the VLSC, the partner download portal or Visual Studio Downloads.</p>
<pre>PS C:\Users\athman.boukhaoua\Documents\Kanton-Thurgau> .\verify-image.ps1 -ReferenceISO "C:\temp\thurgau\de-de_windows_10_enterprise_ltsc_2021_x64_dvd_71796d33.iso" -ImageUSB d: Verifying integrity of the reference ISO file Mounting reference ISO file Mounted to drive F D:\System Volume Information\WPS\Settings.dat not ok Results of the scan have been written to: C:\Users\athman.boukhaoua\Documents\evoting_imagecheck.csv</pre>	<p>Run the script with the parameter -ReferenceISO pointing to the above ISO file, and -ImageUSB set to the USB drive that should be checked</p>
<pre>PS C:\Users\athman.boukhaoua\Documents\Kanton-Thurgau> .\verify-image.ps1 -ReferenceISO "C:\temp\thurgau\de-de_windows_10_enterprise_ltsc_2021_x64_dvd_71796d33.iso" -ImageUSB d: -DisplayPositiveResults Verifying integrity of the reference ISO file Mounting reference ISO file Mounted to drive G D:\autorun.inf ok because original D:\autorunattend.xml ok by hash D:\bootmgr ok because original D:\bootmgr.efi ok because original D:\setup.exe ok because original</pre>	<p>Optionally, the parameter "-DisplayPositiveResults" can be used to show correctly checked files in green</p>

	A	B	C	D	E	F	G	H
1	Info	Reason	Result	FileName				
2	3378723C	original	ok	D:\autorun.inf				
3	E803F131	hash	ok	D:\autounattend.xml				
4	4EEAC11B	original	ok	D:\bootmgr				
5	96B7EE39	original	ok	D:\bootmgr.efi				
6	30043368	original	ok	D:\setup.exe				
7	A6FB0A49	hash	failed	D:\System Volume Information\WPSettings.dat				
8	16327144	original	ok	D:\boot\bcd				
9	CD2C00CE	original	ok	D:\boot\boot.sdi				
10	2F9C2428	original	ok	D:\boot\bootfix.bin				
11	55A47316	original	ok	D:\boot\bootsect.exe				
12	F425E135	original	ok	D:\boot\etfsboot.com				
13	BF8A9CC6	original	ok	D:\boot\memtest.exe				
14	C89CDA7E	original	ok	D:\boot\de-de\bootsect.exe.mui				

The script will output a detailed report in the "Documents" directory that shows check results for all files

Version History

v0.1

- Initial Version
- Includes 8 applications, drivers for 4 models and initial hardening rules from both Swiss Post and Microsoft
- Includes updates for October 2022

v0.2

- Add 7-Zip application
- Add Total Commander configuration, license, and shortcut in Start Menu
- Enable display of hidden files and file extensions in Explorer
- Remove camera driver from 850 G3 driver package
- Fix driver install logic for both 850 G3 and 850 G5
- Downgrade Smart Screen policy in Explorer from Block to Warn

v0.3

- UAC is now set to highest level
- PowerShell execution policy set to allow unsigned scripts
- Changed username for admin login to "EvotingAdmin"

v0.4

- Blocking all outgoing ICMP packets
- Blocking all outgoing network connections by default
- Blocking cameras and audio devices in with device installation restrictions
- Update Total Commander to version 10.52
- Installing Total Commander to c:\totalcmd
- Installing OpenSSL to c:\openssl

v0.5

- Updated OpenSSL to 1.1.1s
- Enabled the hardening rule "Disable new DMA devices when the PC is locked"

v1.0

- Disabled all Bluetooth devices
- Disabled automatic Windows Updates
- Disabled 31 Windows services for additional hardening
- Added support for laptop model HP ZBook Fury 16 G9
- Added almost 100 privacy hardening rules for Edge Browser
- Updates to Windows for December 2022
- Updates to applications: Notepad++ 8.4.8, STunnel 5.67

v1.1

- Added .NET 6 Runtime
- Disabled Sleep Mode
- Added a barcode and OCR font
- Increased local account password expiration to 120 days
- Split setup logs into two files to make them more readable
- Updates to Windows for March 2023
- Updates to applications: KeePass 2.53.1, Notepad++ 8.5.1, OpenSSL 1.1.1t, STunnel 5.69

v1.1.1

- Removed SafeSign
- Installed GMP to c:\vmgj
- Updates to applications: KeePass 2.54, Notepad++ 8.5.3, OpenSSL 3.1.1

v1.2

- Added 63 new hardening rules from CIS benchmarks
- Disabled Hibernate Mode
- Assigned text files to open with Notepad++
- Customized task bar
- Removed support for HP EliteBook 850 G3
- Updates to Windows and drivers for July 2023
- Updates to applications: 7-Zip 23.01, Notepad++ 8.5.4, STunnel 5.70

v1.3

- Uninstalled Windows Experience Pack
- Allowed standard users to change the system time
- Added the font "Roboto Mono"
- Added the Notepad++ Plugin "JSTool"
- Updates to Windows and drivers for November 2023
- Updates to applications: KeePass 2.55, Notepad++ 8.6, OpenSSL 3.2.0, SDelete 2.05, STunnel 5.71, TotalCommander 11.02

v1.3.1

- Added support for laptop model HP ZBook Fury 16 G10

v1.4

- Disabled Windows Recovery Partition
- Added two applications: PowerShell 7 and KeyStore Explorer 5.5.3
- Added BIOS updates to the image for every supported model
- Added a script that notifies if the installed BIOS version is too old
- Updates to Windows and drivers for March 2024
- Updates to applications: KeePass 2.56, Notepad++ 8.6.4, OpenSSL 3.2.1, STunnel 5.72, TotalCommander 11.03

v1.5

- Removed an application: STunnel
- Updates to BIOS, Windows and drivers for June 2024
- Updates to applications: KeePass 2.57, Notepad++ 8.6.8, OpenSSL 3.3.1, 7-Zip 24.07, PowerShell 7.4.3

v1.6

- Added French language pack
- Updates to BIOS, Windows and drivers for September 2024
- Updates to applications: Notepad++ 8.6.9, OpenSSL 3.3.2, 7-Zip 24.08, PowerShell 7.4.5

v1.7

- Updates to BIOS, Windows and drivers for November 2024
- Updates to applications: KeePass 2.57.1, Notepad++ 8.7.1, OpenSSL 3.4.0, PowerShell 7.4.6

v1.8

- Replaced .NET 6 Runtime with .NET 8 Runtime
- Updates to BIOS, Windows and drivers for February 2025
- Updates to applications: 7-Zip 24.09, Notepad++ 8.7.7, PowerShell 7.4.7, TotalCommander 11.5

v1.9

- Added support for ZBook Fury G11, ZBook Studio G11 and ThinkStation P8
- Removed support for ThinkPad P52s
- Added default configuration files for OpenSSL
- Updates to BIOS, Windows and drivers for June 2025

- Updates to applications: KeePass 2.58, KeyStore Explorer 5.60, Notepad++ 8.8.1, OpenSSL 3.5.0, PowerShell 7.4.10, TotalCommander 11.51

Image Authenticity

The authenticity of files in the image is guaranteed through a few different ways:

- Microsoft files are either signed by Microsoft or contained in an ISO file that has a well-known hash published on the official Microsoft website as well as third party websites.
- Driver files from hardware manufacturers are signed by the manufacturers. Windows would display a warning popup when a driver installation with an invalid signature is attempted, so any unsigned driver would be visible during imaging.
- Application executables are signed by their respective developers.
- Application add-ins that we deploy for Notepad++ or Total Commander are not signed. However, they are downloaded from inside their signed parent executable over an HTTPS connection.
- Ontrex custom developed files are either signed by Ontrex, or a hash of the file is stored in a signed script.

This reduces the risk that any malicious files are present in the image, at least to the degree that we can trust the respective developers.

Lessons learned

1. Windows updates cannot be installed during the "specialize" step. Probably due to provisioning mode. They instead need to be installed in a RunOnce key.
2. Scheduled tasks also cannot be added during Windows Setup because the task service isn't running yet.
3. BitLocker encryption cannot start if there is a DVD inserted in the optical drive, or the laptop is not connected to a power supply.
4. There is no way to block USB network adapters only. If using the DenyDeviceClasses GPO, it blocks every network adapter including internal ones.
5. You cannot define power settings by registry keys. You need to use the powercfg.exe commands.

Scripts

export-gpos.cmd

```
lgpo /parse /m ".\{23DEF82E-039F-40D5-BBCC-35444958D065}\DomainSysvol\GPO\Machine\registry.pol" /q > ie_computer.txt
lgpo /parse /m ".\{4B6589C2-0290-4764-8058-9825B56B4169}\DomainSysvol\GPO\User\registry.pol" /q > user.txt
lgpo /parse /m ".\{7AD4F62E-9296-4FEA-9765-C4E3EAAECC1}\DomainSysvol\GPO\Machine\registry.pol" /q > credentialguard.txt
lgpo /parse /m ".\{B669E0C6-C1E3-4582-B797-FE384B21CDD1}\DomainSysvol\GPO\Machine\registry.pol" /q > defender.txt
lgpo /parse /m ".\{B697C660-A87B-4AF1-B37D-9440912605E7}\DomainSysvol\GPO\Machine\registry.pol" /q > bitlocker.txt
lgpo /parse /m ".\{C94113F4-C027-4F5F-8210-85F4AC2C6082}\DomainSysvol\GPO\User\registry.pol" /q > ie_user.txt
lgpo /parse /m ".\{DD304A7D-15A7-42B7-AB52-2338F4ECE2C7}\DomainSysvol\GPO\Machine\registry.pol" /q > computer.txt
```

Sources

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<https://github.com/wormeyman/FindFonts/blob/master/Add-Font.ps1>

<https://www.alkanesolutions.co.uk/2021/12/06/installing-fonts-with-powershell/>