



## Installation guide

### **General considerations**

The following guide describes the installation and configuration of hypnOS – a software for an automatic and orderly shutdown of your workloads (VMs) in a virtual infrastructure on VMWARE vSphere.

The main benefit of the software is, that it directly communicates to the components involved and therefore does not need any additional hard-coded scripting or runtime environments that are prone to error in case of a power failure. You will instantly receive a warning – even through normal operation of your power supply – if hypnOS for some reason can no longer communicate with one of the components.

These components are the virtualization host (ESX server) on one side and the UPS system on the other. In addition, a communication to vCenter (if applicable) can be established to gain additional benefits.

### **vSphere support**

hypnOS directly talks to the vSphere API (SDK) via SOAP calls, just like the vSphere client does by itself. hypnOS supports vSphere Version 6.0 – 6.7 (including 6.7 U1) which are all versions currently supported by VMWARE.

On the side of the UPS system hypnOS intentionally uses the bare minimum common ground that every UPS system with a network interface should support. This is the simple network management protocol (SNMP). This connection is only used to constantly fetch the status of the power supply to the UPS systems. No further proprietary management for the UPS systems is included as this varies widely between the manufacturers.

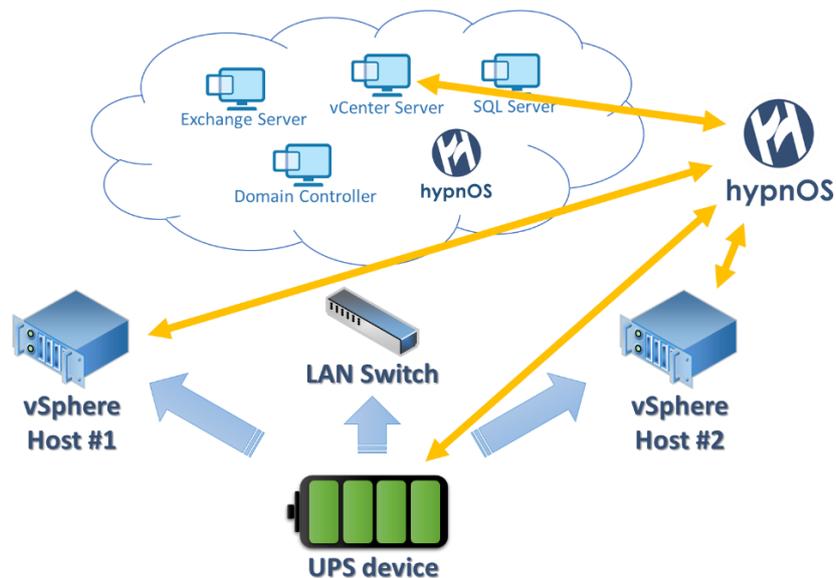
### **Platform requirements**

hypnOS itself is a Windows software that can be installed on any supported Windows operating system currently supported by Microsoft. This is Windows Server 2008 R2 – 2019 and Windows 7 – Windows 10. The installation can be done either on a physical machine or a virtual machine. Special handling for a virtual installation within the monitored cluster has to be taken though. This is explained in the corresponding chapter below.

hypnOS can be installed next to other workloads on the system. Though it has to be made sure that the system is running 24/7 and that the other workload does not use up all the resources of the system so hypnOS would not be able to react in a timely manner when needed.

## Installation schema

As mentioned above hypnOS has to have a robust network connection to all ESX hosts, all UPS systems and the vCenter instance(s) if used. All components involved – including the hypnOS system by itself if run on physical hardware – have to be supplied by UPS power. This is especially important for **all** active network components in the line – like switches, routers etc. hypnOS can only gain knowledge about a power outage of an UPS if it still has an active network connection to the UPS systems and it can only trigger the shutdown if it still has a network connection to every ESX host running VMs to be shut down.



## Program installation / update

hypnOS is delivered as a standard windows installer. This installer lets you specify the folder for the installation and whether an icon should be placed on the desktop or in the start menu or both. The rest is self-explanatory. You will get an informational dialog if the required .NET framework is missing. This has to be installed independently. Once the installation finished successfully you will find the hypnOS icon as selected before.

In case of an update the following process has to be followed: The old hypnOS version has to be uninstalled using the Windows add/remove programs functionality. This will leave the configuration database in the path of the program. The new version will pick up this configuration database **when installed into the same path** and you will end up with an upgraded instance.

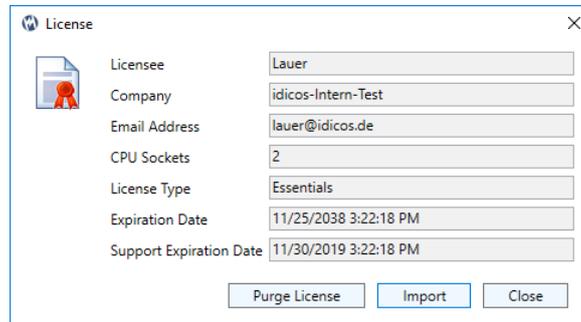
## Licensing / support

hypnOS is licensed per CPU socket in your ESX hosts. Only licensed hosts will be included in the shutdown process. The license is provided as a license file provided to the license admins email address which has to be specified in your order. No online activation of the license is carried out but mind that you can only send email notifications from within hypnOS to the same email domain your license admin is derived from (e.g. a license issued to [john@doe.com](mailto:john@doe.com) can only notify email addresses ending in @doe.com, like [james@doe.com](mailto:james@doe.com)).

If you want to change the email address at a later stage please open a support case. hypnOS always comes with one year of support that can be renewed. Active support guarantees help in case of problems as well as updates and upgrades to the software.

## Configuration steps – general remarks

The first thing to do after an installation is to install your license file. This can be done via the File-Menu in the top left corner.

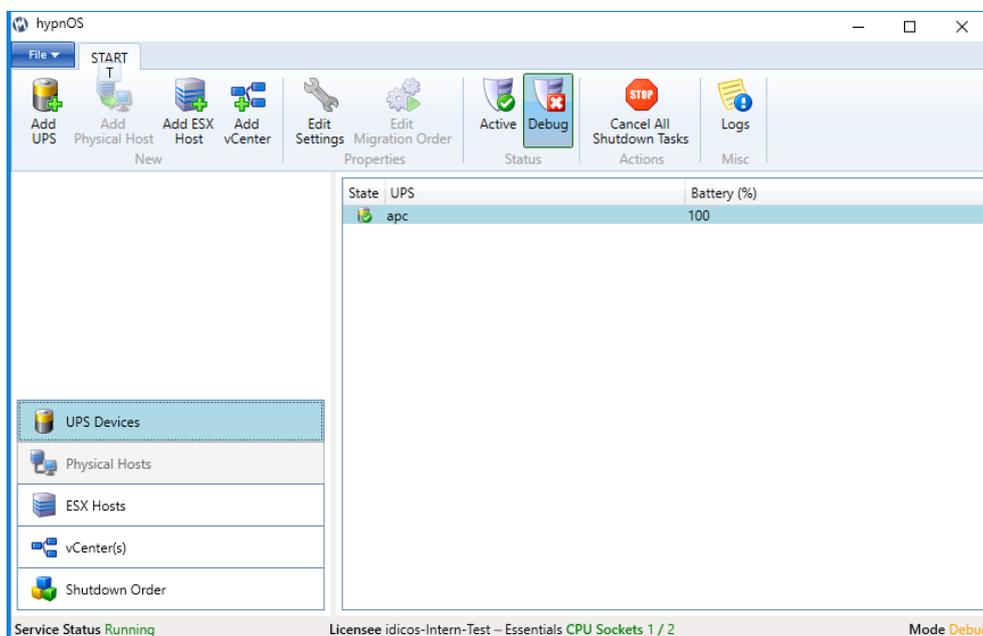


Here a new license can be imported or you can purge the license to transfer it to another installation. Without a valid license covering all CPU sockets of your registered ESX hosts, no shutdown process will be triggered. You can still play around with the software.

You will get a warning that the license is missing or insufficient in the status bar of the software. In addition, you will get regular email warnings about the issue.

Once installed the following components have to be registered within the software:

- UPS systems
- ESX hosts
- vCenter (optional)



This is done by using the corresponding buttons on the ribbon bar at the top of the window. You can view the list of the registered components by clicking the corresponding menu item in the menu on the lower left edge of the window.

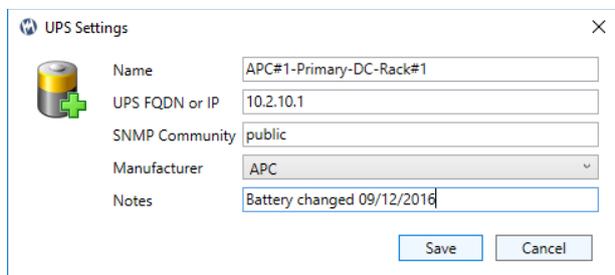
## Configuration steps – adding UPS systems

Once you clicked the Add-UPS button, you can register a UPS with a definable name, a FQDN or IP address and the SNMP community string. The community string only needs to provide read access as hypnOS only reads information from the UPS. The community string “public” is often defined as a default but you can also use another string for security reasons. In all cases make sure the string is defined within the UPS network management card.

If you use FQDN names for your UPS registration it is crucial to have DNS resolution during the power outage. To be independent of DNS failures we recommend using IP addresses here.

The manufacturer can be APC or “default”. In general, the SNMP communication should be standardized between all UPS systems. It turned out that APC use a special communication mode the we account for here. As we cannot guarantee that other UPS manufacturers don't also use proprietary modes, please contact our support if you have trouble connecting your UPS brand using the “default” mode.

Notes can optionally be specified.



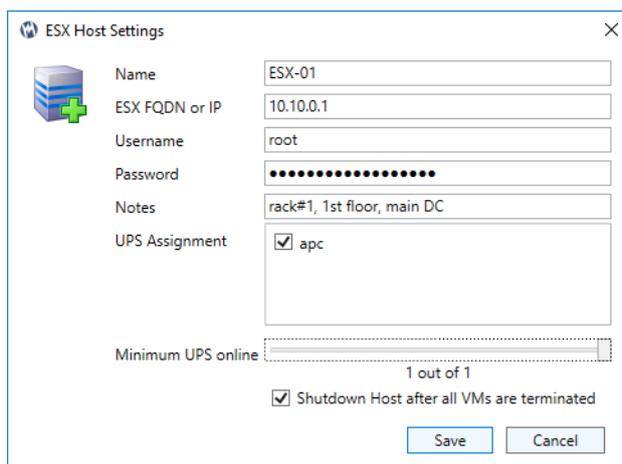
The screenshot shows a dialog box titled "UPS Settings". It contains the following fields and values:

- Name: APC#1-Primary-DC-Rack#1
- UPS FQDN or IP: 10.2.10.1
- SNMP Community: public
- Manufacturer: APC
- Notes: Battery changed 09/12/2016

Buttons: Save, Cancel

## Configuration steps – adding ESX hosts

Using the Add-ESX-Host button, you can register an ESX host with a definable name, its FQDN or IP address and the username and password to login **directly** to the host. Also notes can optionally be specified.



The screenshot shows a dialog box titled "ESX Host Settings". It contains the following fields and values:

- Name: ESX-01
- ESX FQDN or IP: 10.10.0.1
- Username: root
- Password: [masked]
- Notes: rack#1, 1st floor, main DC
- UPS Assignment:  apc
- Minimum UPS online: 1 out of 1
- Shutdown Host after all VMs are terminated

Buttons: Save, Cancel

The most crucial points for the shutdown process are the following two settings. With “UPS assignment” you specify which of your UPS systems provide power to this specific ESX server. This can be a single UPS system as well as two or even multiple systems. Therefore, with the next setting you can specify the minimum number of UPS systems that must be online. If the number of UPS systems assigned to this host still having line power falls below this setting, the shutdown for the VMs on this specific host will start after the grace period defined (see “edit general settings”).

**Example #1:**

If you assign a single UPS system to the host it would be reasonable to set the “minimum UPS online” parameter to 1. That would trigger the shutdown once this single UPS system loses line power.

**Example #2:**

A common scenario is to have the two power supplies of a server system connected to two different UPS systems. Then your setting depends on the capabilities of those two UPS systems:

- If a single one of those two UPS system is still capable to support the full length of a shutdown process of the Host with all its VMs you can also set the parameter to 1. Then only when the second UPS system **also** loses line power a shutdown will be triggered.
- If the battery capacity of a single UPS is not sufficient to support the full shutdown process or if unsure please set the parameter to 2. Then the shutdown will already be triggered when the first of the two UPS systems loses line power.

Another option in the host settings is to have the ESX shut down at the end of the shutdown process. This has to be matched to the BIOS settings for a host regarding the startup once the power returns.

## Configuration steps – adding vCenter Hosts

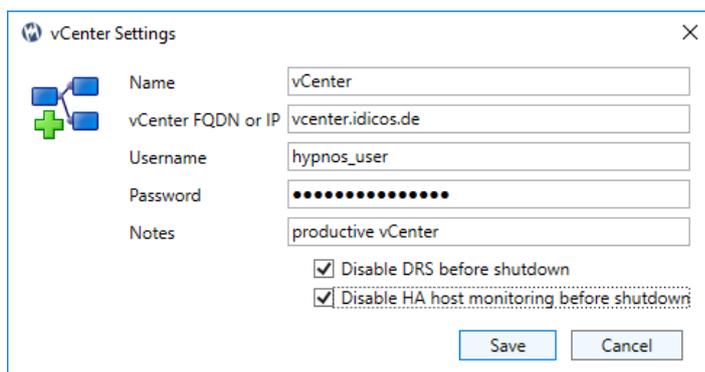
hypnOS does by all means always directly talk to your hosts for all ESX related tasks. The hosts VM-inventory is gathered from the host connection, as well as the shutdown will be triggered directly on the host. A vCenter connection is only necessary for two very specific reasons. Your environment might have two features in place that could interfere with the shutdown process: **HA** (High-Availability) and/or **DRS** (Distributed-Resource-Scheduler).

During a power outage a host failure will be more likely or might even happen intentionally at the very end of a graceful shutdown procedure for a host. This would trigger HA and vSphere could eventually move VMs to other hosts without hypnOS being informed.

The same holds true for DRS. During the shutdown a host will be less utilized. This might lead to DRS moving workloads to this host from other hosts - effectively preventing its evacuation.

hypnOS offers the possibility to automatically set DRS to “manual” operation mode once a shutdown is triggered. DRS will not be fully deactivated as this might lead to a loss of your customized resource pools. Furthermore, you might opt to disable the host monitoring of HA.

vCenter can be specified in the dialog by a definable name, its FQDN or IP address as well as the login credentials to be used by hypnOS. In addition, you could specify whether DRS should be set to manual (disable DRS) or the host-monitoring should be disabled in advance of a shutdown procedure.



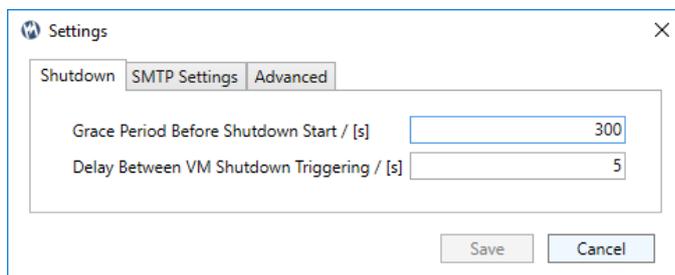
Once the system is back to normal, make sure to reenable host-monitoring as well as set DRS back to the intended level of automation.

## **Configuration steps – adjusting general settings**

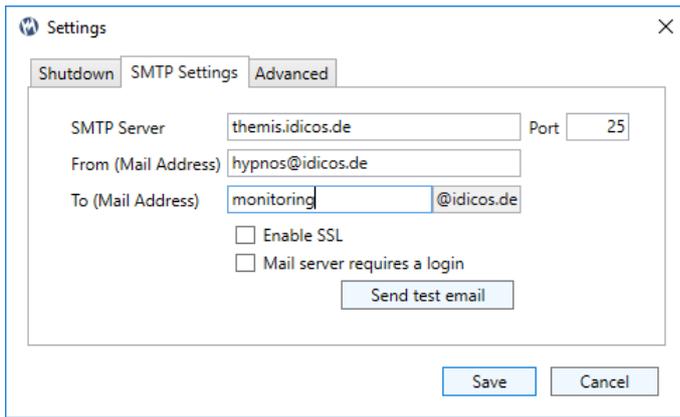
When developing hypnOS we intentionally decided not to rely on indicated runtime values of specific UPS systems. These are usually not very reliable and change fast with load and maybe number of power supplies still being powered.

Within hypnOS the shutdown process of a host will be triggered after a customizable period of time – so called “grace period”. Once the number of seconds specified has passed after a power loss for a UPS is detected, the shutdown for the hosts affected will be triggered. The recommended setting depends on the probability of power outages in your area as well as the capacity of your UPS. The shutdown will be initiated after that period on battery. Five minutes is a recommendation if your UPS has 20-30 min. of support capacity.

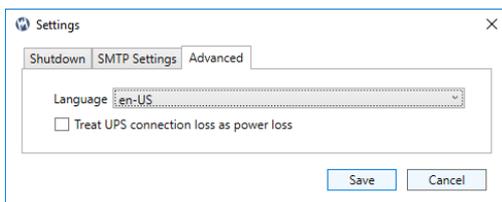
Shutting down many VMs at once on a single host would very likely lead to an overload of your storage system. What is well known as a boot-storm for a boot process could also be observed for a multi-shutdown-process. Thus, a delay between the shutdown of the VMs can and should be specified. This value should be tuned to the performance of your storage system and a shutdown process should be tested at least once against this value. Keep in mind that this value multiplied by the number of VMs on a host is the minimum time it'll take to shut down a given host. E.g. having 80 VMs on a host with a delay of 10s between them will lead to at least  $80 * 10 \text{ s} = 800 \text{ s} = \sim 14 \text{ min.}$  before the ESX has shut down all its VMs. The UPS has to support at least this runtime. 5-10 s is a good starting point for testing.



To be able to receive email notifications about power outages, shutdown processes triggered as well as communication issues with UPS systems or ESX hosts we need to have SMTP properly configured. All necessary settings can be found in the tab “SMTP Settings” in the general settings dialog. Bear in mind that the domain part of the email address for all informational mail is fixed to the email domain specified for the license. SSL and a login eventually needed can be specified as well as SMTP server and from address to be used. Be sure to test your settings!



In the advanced tab of the general setting dialog you could specify the language used in the user's interface. As of now only English is available. The other option here is more important though. Here you can specify if a loss of connection to any UPS will be treated as a power loss of this UPS. This is useful if your switches or at least part of your network infrastructure is not powered through the UPS systems. Then hypnOS would not be able to distinguish between a power loss of the UPS or a network problem not to be used as a trigger for a shutdown.



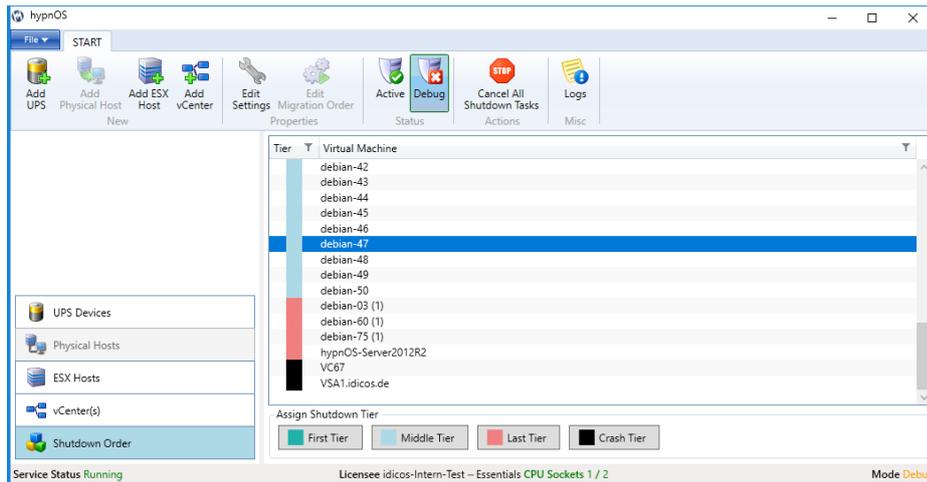
It is though recommended to have all active network devices in the line of communication between hypnOS, ESX-hosts, vCenter and all your UPS systems also powered through the same UPS backplane. In this case, leave the switchbox at its default value "disabled".

### **Configuration steps – specify the shutdown order**

The most important part of the configuration process is the shutdown order for your VMs. This is probably the main reason for using hypnOS in the first place. In this dialog you can select one or multiple (using ctrl-left-click) VMs from the list and assign them to a shutdown tier by clicking the corresponding button for the tier.

These tiers can be either **first**, **middle**, **last** or **crash**. The tier specified decides the order for the shutdown. All VMs within the same tier will be shut down in random order but still one after the other. Before the shutdown commences with the next tier it is made sure that all VMs from the preceding tier are already shut down. This is tested across all ESX hosts affected by the shutdown to guarantee the order globally.

If the shutdown of one or more VMs in a tier fails for whatever reason, there is a timeout of five minutes to wait for these VMs to reach the "off" state. After this hypnOS will commence with the next tier anyways.



With that functionality it can be assured that e.g. an Exchange server is shut down before the domain controller retreats. This is especially crucial for Exchange as its services will not properly shut down without network contact to an active domain controller.

An example would also be a SharePoint farm, where you would want to shut down the web server before the application server and only finally the database server. The same could be applied to many tiered database systems like ERP, CRM, DMS, etc.

Another use case is to guarantee that some workloads stay until the very end of the shutdown process. vCenter could be one of those.

Or you might want to shut down safely your most important database in the very beginning of the power outage.

VMs in the crash tier will not be shut down. Instead they will keep running until they eventually crash because of a power loss to the host. This could be viable for certain workloads, e.g. hypnOS itself. hypnOS can either be installed on a physical machine or on a VM. If you've chosen to install it on a VM, please make sure you set this VM to the crash tier. This will prevent the hypnOS VM from being shut down and therefore losing the ability to control the shutdown process.

The VMs stay within their tier even when being moved between the hosts (vMotion). In case you restore one of those VMs from the backup they will stay in the tier if they reappear with the same moref-ID. This can be achieved by restoring them on top of the original VM. In case the VM reappears under another moref-ID through a restore process it has to be reassigned to its tier manually.

## Debugging/Troubleshooting

To properly test a shutdown procedure, you should once put your UPS to battery. If you want to prevent the shutdown from really happening, you can switch hypnOS to "Debug"-Mode in advance. Everything will then be carried out as it would for a real shutdown process. Status will be shown, mails will be sent, logs will be written. The only thing that does not happen, is the actual shutdown of the VMs. Thus, you could test the process without interrupting your productive workloads.

Once a shutdown process is triggered it will shut down all affected VMs unless the power supply returns. If so, the shutdown will stop immediately – but no VMs already shut down or shutting down will be switched back on automatically. The main reason for this decision was

that a tiered shutdown cannot be easily reversed. Care has to be taken to bring the dependent workloads back online. This has to be a manual process carried out by an admin.

Also, the cold start after a power outage in the current version has to be done fully manual from the ESX console.

If you, want to forcefully stop an already running shutdown process, there is a button in the ribbon bar of hypnOS: "Cancel All Shutdown Tasks". This will immediately stop the hypnOS service and therefore all the shutdown activity. It will though not restart already shut down VMs. This has to be done manually.

Once you start the service again via the Windows service console, the shutdown will only commence if the UPS power condition is still met.

## **Support**

We provide a 9/5 support (next business day) to all customers with an active support contract or when within a valid trial period. You could file a support case via email to [hypnos@idicos.de](mailto:hypnos@idicos.de) or call us +49-6203-4100200. Our support times are Monday to Friday between 8am and 5pm CET.