---

```
Welcome to the Threefold FAQ!

This project is a collective effort aiming at a conscious internet,
for the people, by the people.

Threefold grows as the TF community creates and shares knowledge.

A big thank you to all the farmers, developers and users who contributed,
directly or indirectly, to this FAQ.
```

---

*Hint: Use the search function (Ctrl+F) to locate specific keywords*

---


- GENERAL FAQ
  - Basic Facts
    - **What is the the Threefold blockchain?**
    - **What is the Threefold Token? What is the uses of the TF token?**
    - **How are Threefold Token (TFT) produced?**
    - **How are the TFT managed?**
    - **What is the hard cap of TFT? How much TFT can there ever be?**
    - **I've read that Threefold is Carbon Negative, what does this imply?**
    - **Who are the people working for Threefold?**


© 2022 Threefold Foundation

        - Who are the co-founders of Threefold?
        - In a nutshell, what can be said of the Threefold team?
        - What is the mission of Threefold?
        - Does Threefold have any partners?
        - What are the priorities of Threefold (the Three P of Threefold)? / Threefold is a Planet first project, what does it mean?
        - I want to farm TFT with a 3node. What are my choices?
        - I want to buy a certified 3node server from a reliable source. Who are Threefold's partners offering certified 3nodes?
        - I want to help build the new Internet. How can I become a Threefold certified 3node partner?
        - What is Proof-of-Capacity used by Threefold?
        - What is Proof-of-Utilization used by Threefold?
        - How is Threefold registered as an entity?
        - Where is ThreeFold Tech's headquarters?
        - Can I have more information on Threefold Tech NV and Threefold S.A.?
    - Threefold Communication
        - Is there a Threefold app for mobile?
        - I want to reach the Threefold community. What are Threefold social links?
        - Is there a Discord group for Threefold?
        - How can I reach Threefold Support?
        - Is there a Threefold podcast?
    - The Technology of Threefold
        - What is a 3node?
        - What is the difference between a 3node and a Threefold farm?
        - I've read that Threefold built an Operating System (OS) from scratch, is it true?
        - What is Zero-OS from Threefold?
        - Threefold uses Quantum Safe Storage technology, what does it mean?
        - Where does the Threefold Explorer takes its data from?
    - Buying and Transacting TFT
        - How can I buy TFT?
        - Where can I find TFT, concretely? On which blockchains is TFT available?
        - What are the uses for each different blockchains offering TFT?
        - What is the interplay between Stellar Chain and TF Chain?
        - Is there a bridge between Binance Smart Chain (BSC) and Stellar to transfer TFT?
        - What are the different Threefold bridges, TFChain-Stellar Bridge and BSC-Stellar Bridge? How can I go from TF Chain to Stellar chain to Binance Smart Chain?
        - How can I bridge TFT from Stellar chain to TF Chain and vice versa?
        - How can I bridge TFT from Binance Smart Chain (BSC) to Stellar (and vice versa)?
            - How to use the BSC-Stellar Bridge
            - Bridge from Stellar to BSC
            - Bridge from BSC to Stellar
            - How to Set Up TFT on Metamask
        - How to set up a Stellar address for TFT transactions?
        - How long does it take when you use the BSC-Stellar Bridge?


© 2022 Threefold Foundation

        - What are the cost when bridging from Stellar to MetaMask and from MetaMask to Stellar?
        - What is the network information to access BSC for the Threefold token? What is the token address for adding the token in the MetaMask app?
        - How can I trade TFT on Pancake Swap? How can I add TFT on Pancake Swap?
        - Is it possible to swap TFT on Stellar Blockain?
    - TF Connect App, TF Portal & Polkadot Substrate
        - What is the Threefold Connect App download link?
        - What is the Threefold Portal link?
        - To access the TF Portal, I need to use the Polkadot Extension. What is the link?
        - Is there a way to create/import another wallet in TF Connect App?
        - I created a farm on the TF Chain. On the TF Connect App - Farmer Migration section, my farm is under *Other v3 farms*, is this normal?
        - I am trying to access my wallet in the Threefold Connect App. It worked fine before, but now I just get a white screen. What does it mean and what can I do?
        - I have some problems connecting to the Polkadot extension. What can I do?
        - Apart form the Threefold Connect App Wallet, how can I check my TFT balance?
        - Is it possible to export the transaction history of a wallet to a CSV file?
- USER FAQ
    - TF Grid Functionalities
        - Can I have the link to deploy a VM and other apps on the Grid?
        - What can I do on Threefold Grid?
        - I want to become a Threefold validator. What are the steps?
        - Is there delegated staking for TFT?
        - What are the type of storage available on TF Grid?
        - What is Threefold's cloud pricing? / Are there any discounts available for Threefold's cloud pricing?
    - Tutorials and Guides
        - What are the prerequisites before using the Threefold Play Grid (play.grid.tf)?
        - How can I create a profile manager on play.grid.tf?
        - To deploy a load on the TF Grid, I need to generate SSH keys. How can I generate SSH keys on MAC, Linux or Windows?
        - I want to deploy a virtual machine (VM) on Threefold. How can I do this?
        - How can I use Caprover on Threefold Grid?
        - Is there a picture guide on how to deploy Wordpress on the Threefold Grid using Caprover?
        - I've heard rumours that you can install Wordpress and Discourse on the TF Grid in less than 15 minutes, is it true?
        - Can I deploy a Presearch Node?
        - What is the minimum amount of TFT to deploy a Presearch node? / How can I get a TFT discount when I deploy a Presearch node?
        - How can I deploy Kubernetes on the Threefold Grid?
        - How can I deploy Peertube on the Threefold Grid?
        - How can I deploy ownCloud on the Threefold Grid?
        - How can I use and install Yggdrasil?
    - Threefold Connect App


© 2022 Threefold Foundation

        - **TF Connect App is now asking for a 4-digit password (PIN). I don't remember it as I usually use touch/face ID to unlock the app. What can I do?**
        - **Is there a way to have more than one wallet in TF Connect App?**
- DEVELOPER FAQ
    - General Information for Developer
        - **Can I use a docker with the Threefold Grid?**
        - **Can I convert an existing docker into an flist?**
        - **How does a flist work?**
        - **What is stored in the metadata of a software?**
        - **What is the ratio between the metadata and the actual files on a container?**
        - **Does Zero-OS assign private IPv4 addresses to workloads?**
        - **Can Zero-OS assign public IPv4/IPv6 addresses to workloads?**
        - **What is Yggdrasil?**
        - **What does MAC mean when it comes to networking?**
    - Dev Net & Test Net
        - **Is there a way to test the Grid with free TFT?**
        - **Can I get some free TFT to test on Test Net**
- VALIDATOR FAQ
    - General Information of Validator
        - **What are Validators?**
        - **Why are Validators important for ThreeFold?**
        - **Can anyone run a validator node?**
        - **What are the rewards?**
        - **How many validator nodes will there be?**
        - **What's the difference between L2 and L0?**
        - **What are the rewards for L0 and L2 validators?**
    - Validator Requirements
        - **What are the general requirements?**
        - **What are the hardware requirements to run a validator node?**
        - **Can I run more than one validator node?**
        - **Does this mean you only really need 50 000 TFT to run a validator node?**
        - **If validator is running on Grid and the host shutdowns the machine, could stakers lose staking tokens?**
        - **What happens if my validator is down for a while?**
        - **Could we run validator on our farming machine?**
    - Application to run a Validator Node
        - **When will Verification of applications start?**
        - **What are the next steps after the sign-up?**
- FARMER FAQ
    - TFT Farming Basics
        - **How can I create a Threefold farm?**
        - **My Titan is v2.1 and the Threefold Grid is v3., what is the distinction?**
        - **Is there a way to know the current TFT price for the farming rewards?**
        - **When will I receive the farming rewards for my 3nodes?**
        - **Is there a Threefold calculator?**
        - **What is the TFT entry price of my 3node?**


© 2022 Threefold Foundation

        - What is the necessary uptime for a 3node per period of one month?
        - I set up a 3node in the middle of the month, does it affect uptime requirements and rewards?
        - What is the difference between a certified and a non-certified 3node?
        - What is the difference between V2 and V3 minting?
        - How long is the minting period of the tokens on Threefold? / How long is the farming period?
        - What are the minting periods for 2022?
        - Can Titans and DIY 3nodes share the same farm?
        - Do I need one farm for each 3node?
        - Can a single farm be composed of many 3nodes?
        - Can a single 3node be on more than one farm?
        - Do I need one reward address per 3node?
        - When it comes to the Zero-OS bootstrap image, can I simply duplicate the first image I burnt when I build another 3node?
        - If a node is unused for certain time (e.g. many months offline), will it be erased by the Grid?
        - Can a farm be erased from TF Grid?
        - On the Threefold Connect App, it says I need to migrate my Titan farm from V2 to V3. What do I have to do? How long does this take?
        - How can I migrate my DIY farm from V2 to V3?
    - Farming Rewards and Related Notions
        - What are the rewards of farming/Can I get more rewards when my 3node is being utilized?
        - How can I know the potential farming rewards for Grid Utilization?
        - What is the easiest way to farm Threefold tokens?
        - When do I receive my rewards?
        - On Threefold Grid v3, how can I verify my 3nodes' payments on Stellar Blockchain?
        - Do farming rewards take into account the type of RAM, SSD, HDD and CPU of the 3node server?
        - What is the farming reward calculation?
        - Can I send my farming rewards directly to a crypto exchange?
        - I received my farming rewards, now I want to sell my TFT. How can I do this?
        - How can I swap TFT on Stellar blochain?
        - Which wallets are recommended for TFT farming rewards?
        - Can I have more details on storing TFT on hardware wallets?
        - Do I need collateral?
        - Can I add external drives to the 3nodes to increase rewards and resources available to the Threefold Grid?
        - Do I have access to the TFT rewards I receive each month when farming?
        - What is TFTA? Is it still used?
        - Is there a way to certify a DIY 3node?
        - Does it make sense to make my farm a company?
        - What is the difference between uptime/downtime and online/offline when it comes to 3nodes?
        - My 3node utilization is low, is it normal?


© 2022 Threefold Foundation

- 3node Farming Requirements
  - **What are the general requirements for a DIY 3node?**
  - **What kind of computer do I need to make a 3node?**
  - **I found a nice computer/server to buy online, but it doesn't come with a CPU. How can I know what CPU models would work with a specific computer/server?**
  - **Can I host more than one 3node at my house?**
  - **Is Wifi supported / Can I farm via Wifi instead of an Ethernet cable?**
  - **Is there any way to run Zero-OS without dhcp?**
  - **I have 2 routers with each a different Internet service provider. I disconnected the ethernet cable from one router and connected it to the other router. Do I need to reboot the 3node?**
  - **Do I need any specific port configuration when booting a 3node?**
  - **How much electricity does a 3node use?**
  - **Has anyone run stress tests to know the power consumption at heavy load of certain 3nodes?**
  - **How much AC power do you need (in BTU) to compensate for the heat generated by the servers? How can I ensure proper relative humidity range for my 3node farm?**
  - **How can I ensure the relative humidity in my server room stays within a proper range?**
  - **How can I ensure the air changes per hour is optimal in the 3node servers' room?**
  - **What is the maximum/minimum temperature and relative humidity a 3node server can handle?**
  - **Can Titans be run on PoE?** (Power Over Ethernet)
  - **What is the relationship between the 3node's resources and bandwidth?**
  - **What is the bandwidth needed when it comes to running 3nodes on the Grid?**
  - **Can I run Zero-OS on a virtual machine?**
  - **Is it possible to build a DIY 3Node with VMWare VM ?**
  - **Can I run a 3node on Windows, MAC or Linux?**
  - **What is the minimum SSD requirement for a hardware to farm TFT?**
  - **Is it possible to have a 3node running on only HDD disks?**
- Building a 3node - Steps and Details
  - **What are the main steps to build a DIY 3node, from start to finish?**
  - **I wonder what type of desktop/server to use for my 3node. Any recommendation when it comes to DIY 3node hardware?**
  - **What can you do to zero out your disks? How can I wipe the disks of my 3node with Linux?**
  - **How can I wipe a disk with Windows?**
  - **Do I need to wipe all the disks on my 3node? Or I can leave one disk with a different OS?**
  - **How can I be sure that I properly wiped my disks?**
  - **My disks have issues with Zero-OS and my 3nodes. How can I do a factory reset of the disks?**
  - **Before doing a bootstrap image, I need to format my USB key. How can I format my USB key?**
  - **What do you use to load/burn the Zero-OS bootstrap image onto a USB stick?**
  - **Should I do a UEFI image or a BIOS image to bootstrap Zero-OS?**
  - **Is there more documentation on setting the BIOS/UEFI properly for the 3node?**


© 2022 Threefold Foundation

        - **Do I need to enable virtualization in BIOS/UEFI?**
        - **How can I boot a 3node with a Zero-OS bootstrap image?**
        - **The first time I booted my 3node, it says that the node is not registered yet. What can I do?**
        - **The first time I boot my 3node, the node gets registered but it says *cache disk : no ssd*. What can I do?**
        - **The first time I boot my 3 node, the node gets registered and it says *cache disk : OK*, but the table *System Used Capacity* is empty. What can I do?**
        - **I have a relatively old server (e.g. Dell R710/R620, Z840). I have trouble booting Zero-OS. What could I do?**
        - **I connected a SATA SSD to a CD/DVD optical drive adaptor. My system does not recognize the disk. What can I do?**
        - **Can someone explain what should I put in the "Public IP" part of my farm? Should I just insert my Public IP and Gateway (given by my ISP)?** (In the Portal - Farm - Public IPs section)
    - Farming Optimization
        - **What is the difference between a Threefold 3node and a Threefold farm/ What about the farm ID and the node ID?**
        - **How can I know how many GB of SSD and RAM do I need?**
        - **What is the optimal ratio of vcores (threads), SSD storage and RAM? What is the best optimization scenario for a 3node, TFT reward-wise?**
        - **What does TBW mean? What is a good TBW level for a SSD disk?**
        - **Do I need a surge protector?**
        - **Do I need a PDU?**
        - **Do I need a UPS**
        - **Are SATA and SAS drives interchangeable?**
        - **What is the speed difference between SAS and SATA disks?**
        - **Is it possible to do a *graceful* shutdown to a 3nodes? How can you shutdown/power off a 3node?**
        - **Is it possible to have direct access to Zero-OS's core to force a reboot?**
        - **Do I need some port forwarding in my router for each 3node?**
        - **Are servers noisy? Are there certain servers that are less noisy than others?**
        - **Are there ways to reduce serves' noises?**
        - **I watched the TF video on building a DIY 3node. It stated both the i7-6700 and i7-6700T CPUs. What is the difference?**
        - **I built a 3node out of old hardware. Is it possible that my BIOS/UEFI has improper time and date set as factory default?**
        - **I have rack servers in my Threefold Farm. Can I set rack servers vertically?**
    - Farming and Maintenance
        - **Do I need the Zero-OS bootstrap image drive (USB or CD/DVD) when I reboot, or can I boot Zero-OS from the 3node main hard drive?**
        - **When I set my farm on polkadot.js (https://portal.grid.tf), it asks for a Stellar payout address**. What should I write?
        - **It's written that my node is using 100% of HRU. What does it mean?**
        - **On the Threefold Explorer, I only see half of the threads my 3node has, what can I do?**


© 2022 Threefold Foundation

- Why are the 3nodes' resources different on the Threefold Explorer and the Threefold Portal?
- What do CRU, MRU, HRU and SRU mean on the Threefold Explorer?
- How can I know if my 3node is online on the Grid? Is there an Explorer for Grid V3?
- I booted my 3node and the monitor says it's online and connected to the Grid. But the TF Explorer says it is offline? What can I do?
- My 3node does show on the Threefold Explorer, but not on the Threefold Portal, what can I do?
- I set up my farm on Threefold Connect App. Can I use the Polkadot extension Portal instead?
- Is it equivalent to create a farm on Threefold Connect App or via the Polkadot extension?
- If I upgrade my 3node, will it increase my rewards?
- I booted my 3node for the first time at the beginning of the month, then I did some upgrade/downgrade, will the Grid recognize the new hardware? Will it still be the same 3node ID?
- Is it possible to ask the 3node to refetch the node information on the monitor?
- When does Zero-OS detect the capacity of a 3node?
- Where is the 3node ID stored?
- Is there a way to backup my node ID in order to restore a 3node if the disk with the node ID gets corrupted or breaks down?
- If I upgrade my 3node, does it change the node ID?
- Does it make sense to recreate my node when the price drops?
- My 3node lost power momentarily and I had to power it back on manually. Is there a better way to proceed?
- Do I need to change the battery BIOS?
- Do I need to enable UEFI Network Stack?
- I want redundancy of power for my 3 nodes. I have two PSU on my Dell server. What can I do?
- Why isn't there support for RAID?/Does Zero-OS work with RAID?
- Is there a way to bypass RAID in order for Zero-OS to have bare metals on the system? (No RAID controller in between storage and the Grid)
- I have a 3node rack server. Is it possible to use a M.2 to SATA adapter in order to put the m.2 SATA disk in the HDD bay (onboard storage)?
- My 3node uses only PCIe adapters and SSD NVME disks. Do I need the RAID controller on?
- Can I change the name of my farm on polkadot.js?
- How can I delete a farm on polkadot.js?
- I try to delete a node on the TF Portal, but it doesn't work. Is there any other way to proceed that could work?
- My 3node has 2 ethernet ports in the back, with one written AMT above, what does it mean? Can I use this port to connect my 3node to the Grid?
- My 3node is based on a Z600/Z620/Z820, can I run it headless/without a GPU?
- My 3node is based on a Z800. The PSU is not working anymore. Is there an alternative to buying another expensive PSU?
- Is it possible to add high-level GPU on rack servers to farm more TFT?


© 2022 Threefold Foundation

- Troubleshooting and Error Messages
  - Is it possible to access the Error/Log Screen?
  - I plugged an HDMI cable from my monitor into the node and the monitor is displaying nothing. What can I do?
  - What does it mean when I see, during the 3node boot, the message: *error = context deadline exceeded*?
  - I try to boot a 3node, but I get the error *No Route to Host* on Linux. What does it mean?
  - I try to boot a 3node, but I get the message *no route with default gateway found*. What does it mean?
  - I have trouble connecting the 3node to the Grid with a 10GB NIC card. What can I do?
  - I switch the ethernet cable to a different port when my 3node was running. Internet connection is lost. What can I do?
  - I get the error *Certificate is not yet valid* when booting my 3node, what can I do?
  - I tried to wipe my disk, but I get the error *Probing Initialized Failed*. What can I do?
  - I did a format on my SSD disk, but Zero-OS still does not recognize them. What's wrong?
  - I have a Dell Rx10 server (R610/710/910). When I boot Zero-OS I get the message *Probing EDD* and the 3node doesn't boot from there. What can I do?
  - My 3node doesn't boot properly without a monitor plugged in. What can I do?
  - My 3node is running on the Grid, but when I plugged in the monitor, it states: *Disabling IR #16*. Is there a problem?
  - My 3node won't boot without disabling the Secure Boot option, is it safe?
  - When I tried to boot my 3node, at some point the screen went black, with or without a blinking hyphen [ - ]. What could cause this and what could I do to resolve the issue?
  - My 3nodes go offline after a modem reboot. Is there a way to prevent this?
  - When I boot my 3node, it reaches the *Welcome to Zero-OS window*, but it doesn't boot properly and there's an error message: *failed to load object : type substrate...*, what can I do?
  - When I try to access iDRAC on a web browswer, even with protected mode off, I get the error *The webpage cannot be found*, what can I do?
  - When booting the 3node, I get the error *Network interface detected but autoconfiguration failed*. What can I do?
  - When I boot my Dell server, I get the message: All of the disks from your previous configuration are gone... Press any key to continue or 'C' to load the configuration utility. What can I do?
  - I have a Dell R620. In Zero-OS, I get the failure message *No network card found* and then the 3node reebots after few seconds. The same happens for every LAN input. What can I do?
  - I am using freeDos to crossflash my raid controller on a Dell server, but I can't see the RAID controller with the Command Info. What can I do?
  - Can I use a VGA to HDMI adaptor to connect a TV screen/monitor to the 3node? / I tried to boot a 3node with a VGA to HDMI adaptor but the boot fails, what can I do?
  - When I try to boot my 3node, the fans start spinning fast with a loud noise and the screen is black. What can I do to resolve this?


© 2022 Threefold Foundation

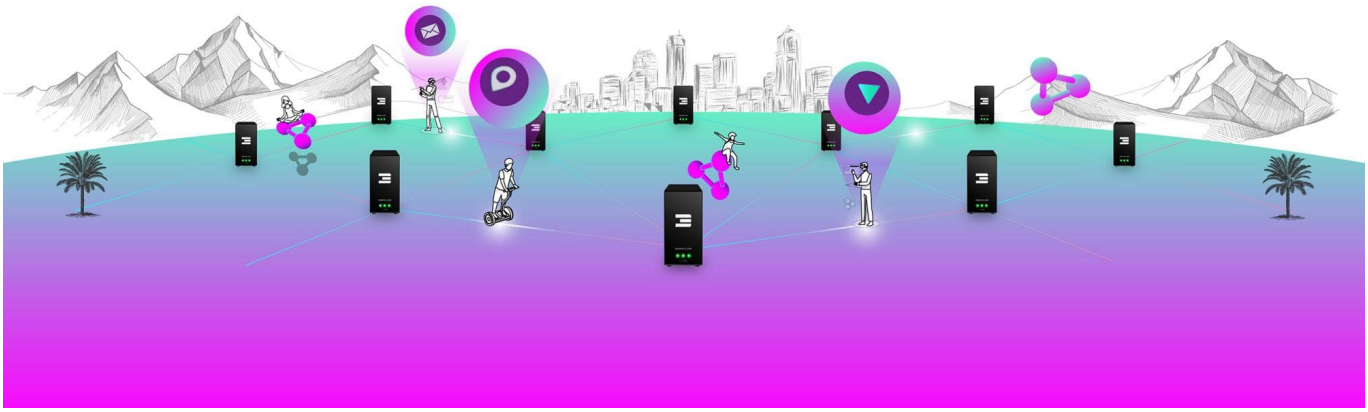
        - **When booting Zero-OS with IPV6 configurations, I get the errors (1) *dial tcp: address IPV6-address too many columns in address* and (2) *no pools matches key: not routable*. What can I do to fix this issue?**
        - **When booting a 3node, Zero-OS downloads fine, but then I get error *no route with default gateway found* and info *check if interface has a cable plugged in*. What could fix this?**
        - **How can I update Dell and HP servers to Intel E5-2600v2, E5-2400v2 and E5-4600v2, when applicable?**
        - **How can I update a Dell PowerEdger server with a bootable ISO?**
        - **When I boot a 3node in UEFI mode, it gets stuck at *Initializing Network Device*, is there a way to fix this?**
    - Threefold Grid and Data
        - **How is the farming minting reward calculated? / Is the Grid always monitoring my 3node?**
        - **How does communication happen on the Grid at the 3node's level?**
        - **What is the Threefold Node Status bot Telegram link?**
        - **How does the Threefold Node Status bot works?**
        - **How does the Telegram Status Bot get information from my 3node? / My 3node is online on the Explorer, but offline on the Telegram Status Bot, is this normal?**
        - **I noticed that when I reboot my 3node, the uptime counter on the Explorer goes back to zero. Does it mean I lose uptime and the uptime start over again when I reboot the 3node?**
        - **One of my nodes is showing the wrong location. Any problem with that?**
    - Memory
        - **Can I use different type of RAM for the same 3node?**
        - **How can I know if the memory I am buying is OK for my specific hardware?**
        - **What do the terms RDIMM, LDIMM, UDIMM, LRDIMM, FBDIMM mean when it comes to ram memory sticks?**
        - **What is the difference between ECC and non-ECC memory?**
        - **How can I change the RAM memory sticks on my 3nodes? / How can I achieve dual channel configuration with sticks of RAM?** (e.g. 2x16GB ram DDR3 ECC RDIMM)
        - **What does RAM mean?**
        - **What does DIMM mean when it comes to RAM sticks?**
        - **I have 24 DIMMS ram slots on my server. Can I use them all?**
- Ask a Question to the Threefold Community


---

# GENERAL FAQ

---

© 2022 Threefold Foundation



## Basic Facts

### What is the the Threefold blockchain?

ThreeFold blockchain is the layer 0 infrastructure for an open source peer-to-peer (P2P) Internet owned by humanity.

### What is the Threefold Token? What is the uses of the TF token?

ThreeFold Token (TFT) is a decentralized digital currency used to buy autonomous and decentralized Internet services (compute, storage, applications) on the ThreeFold Network – generated only when active capacity is added to the ThreeFold Grid. It has a specific commercial utility, since ThreeFold Tokens were conceived as the designated currency for buying and selling capacity on the ThreeFold Grid.

### How are Threefold Token (TFT) produced?

ThreeFold Tokens are exclusively produced through a process called farming, which means that TFT are generated only when new Internet capacity is added to the ThreeFold Grid. There is no wasteful mining.

### How are the TFT managed?

TFT are managed by the ThreeFold Blockchain (“TF Chain”).

### What is the hard cap of TFT? How much TFT can there ever be?

The TF Chain can issue a maximum of 100 billion TFT.

### I've read that Threefold is Carbon Negative, what does this imply?

In short, to accomplish a Carbon Negative footprint, Threefold has a general strategy and many tactics that are all aimed at building and contributing to a regenerative and resilient environment. In long, check this amazing post by @alex24.

© 2022 Threefold Foundation

### Who are the people working for Threefold?

People from all over the world contribute to the growth of Threefold. Meet them here.

---

### Who are the co-founders of Threefold?

The co-founders of Threefold are:

- Adnan Fatayerji
- Andreas Hartl
- Christopher Hutto
- Kristof de Spiegeleer
- Nickolay Babenko
- Owen Kemp
- Rob Van Mieghem
- Weynand Kuijpers

---

### In a nutshell, what can be said of the Threefold team?

The Threefold team is spread across the world and its members built some of the world's best Internet storage and cloud automation technologies since the '90s.

---

### What is the mission of Threefold?

The mission of Threefold is to create a peer-to-peer Internet that can host all of humanity's digital workloads via smart contract, removing all forms of centralization from global IT systems.

---

### Does Threefold have any partners?

Threefold has great partners and we are proud of the amazing projects we have done throughout the years. Building the New Internet is a collective project and the Threefold team is always ready to create and collaborate with new partners aligned with our Planet first ethos.

---

### What are the priorities of Threefold (the Three P of Threefold)? / Threefold is a Planet first project, what does it mean?

Threefold is working for the Planet, the People and Profit, in this very order of importance. Planet comes first as it is our home to us all. A humane enterprise always has people before profit, and serious entrepreneurs know profit cannot be left out of the equation of a thriving project.

---

### I want to farm TFT with a 3node. What are my choices?

There are three possibilities. Either buy a 3node Titan (plug n play), buy a certified 3node or build yourself a 3node DIY.

---

© 2022 Threefold Foundation

### I want to buy a certified 3node server from a reliable source. Who are Threefold's partners offering certified 3nodes?

You can find the continually growing list of Threefold's partners provoding high-quality 3nodes here.

---

### I want to help build the new Internet. How can I become a Threefold certified 3node partner?

Apply here to become a Threefold certified 3node partner.

---

### What is Proof-of-Capacity used by Threefold?

Proof-of-Capacity is an algorithm that verifies the Internet capacity provided by the 3nodes. More information can be found here.

---

### What is Proof-of-Utilization used by Threefold?

Proof-of-Utilization is an algorithm that tracks the utilization of a given 3node's capacity offered on the TF Grid. More information can be found here.

---

### How is Threefold registered as an entity?

Threefold has different registrations and each serves a different purpose.

There is Threefold VZW, in Belgium. Note that *VZW* is Belgium's denotation for non-profit association. Read more here.

There is also Threefold DMCC, in Dubai. Read more here.

There is also ThreeFold Tech NV, a software company which owns the IP of the code delivered. Read more here and here.

---

### Where is ThreeFold Tech's headquarters?

ThreeFold Tech is located in Lochristi, Oost-Vlaanderen, Belgium.

---

### Can I have more information on Threefold Tech NV and Threefold S.A.?

Of course. Here are the basic information:

- TF Tech NV (ThreeFold Tech)
    - Registered at the Belgian Chamber of Commerce under number 0712845674.
    - TF Tech NV is a limited liability organisation under the laws of Belgium. TF TECH NV. Antwerpse Steenweg 19 9000 - Lochristi, Belgium info@threefold.tech BE 0712.845.674 (RPR Gent) Tel: 0032-93242057

© 2022 Threefold Foundation

- ThreeFold S.A. (TF LUX)
    - A public limited liability company under the Company Number B265333, governed by the laws of the Grand Duchy of Luxembourg.
    - ThreeFold S.A., 6, Rue Dicks, 1417, Luxembourg.

---

# Threefold Communication

---

### Is there a Threefold app for mobile?

Yes! Threefold Connect App (TF Connect App) is available for Android and iOS.

You can use this app to create a Threefold ID, a Threefold Wallet and also a Threefold Farm to link all your 3nodes. The Threefold Connect Wallet, with its Stellar payout address, can be used for transactions as well as to receive farming rewards. The News section gives you the latest information on the fast Threefold development and growth.

---

### I want to reach the Threefold community. What are Threefold social links?

You can find links to the Threefold community here. Here's a quick list:

- Threefold Twitter
- Threefold Forum
- Threefold Github
- Threefold Telegram News
- Threefold Telegram General
- Threefold Telegram Grid Tester Community
- Threefold Telegram Farmer
- Threefold Reddit
- Threefold Youtube
- Threefold LinkedIn

---

### Is there a Discord group for Threefold?

Yes! It’s right here. Threefold is decentralized. This is a community initiative. Come and talk. Let's New Internet!

---

### How can I reach Threefold Support?

Go on the Threefold Connect App and select Support or go on the Threefold website, accept the cookies and click on the bottom right icon for chat.

---

### Is there a Threefold podcast?

Yes, there is a Threefold podcast! Hosted by Kyle Ellicot, it is available to listen on Spotify and on anchor.fm.

---

© 2022 Threefold Foundation

# The Technology of Threefold

### What is a 3node?

It is essentially a single server that makes up a larger network of servers which together form the Threefold Grid. Essentially any modern computer can be turned into a 3node (DIY Farming) and you can buy plug and play 3nodes as state of the art modern computer.

### What is the difference between a 3node and a Threefold farm?

A 3node is a single server connected to the Grid. Each 3node is linked to a farm. A farm can be composed of multiple 3nodes.

### I've read that Threefold built an Operating System (OS) from scratch, is it true?

Indeed, to have a quantum safe technology and nodes capabling on running the widest range of softwares, the team built an operating system from the ground up, the almighty Zero-OS. Read the next question for more info on Zero-OS.

### What is Zero-OS from Threefold?

Zero-OS is a stateless and lightweight operating system designed to host anything that runs on Linux, in a decentralized way. Once installed, Zero-OS locks the hardware and dedicates its capacity to the People's Internet via the ThreeFold Blockchain.

### Threefold uses Quantum Safe Storage technology, what does it mean?

Quantum computers are theoretically capable of doing huge calculations in a short period of time. By this fact alone, it is a great potential threat to future online safety. Threefold solves this future problem before it even becomes a reality. Indeed, Zero-os compresses, encrypts, and disperses data across the Grid. Learn more here.

### Where does the Threefold Explorer takes its data from?

The Threefold Explorer takes its data from this website: https://gridproxy.grid.tf/.

# Buying and Transacting TFT

### How can I buy TFT?

There are many ways to do this. You can buy it on Liquid.com, buy on PancakeSwap, or on GetTFT.com. For more information, check this link.

© 2022 Threefold Foundation

### Where can I find TFT, concretely? On which blockchains is TFT available?

- Stellar Chain
  - Most TFT exist on Stellar at the moment and this is the chain where all farming rewards are currently distributed.
- Threefold Chain
  - the new ThreeFold blockchain that's used for billing on Grid v3 and will be used to pay Grid v3 farmers at some point in the future.
- Binance Smart Chain
  - Binance Smart Chain (BSC) - this TFT exists mostly for buying, selling, and providing liquidity on Pancake Swap 2.

---

### What are the uses for each different blockchains offering TFT?

- Threefold Chain (TF Chain)
  - TF Chain is used to store the full infrastructures of
    - farms
    - nodes
    - contracts
    - billing reports
    - etc.
  - TFT can be used as Internet Capacity on the Threefold Grid
- Stellar Chain
  - Stellar is used as a payment network
  - TFT is minted on Stellar Chain
- Binance Smart Chain (BSC)
  - TFT can be traded and moved on Binance Smart Chain

Note that TFT is fundamentally a utility token. It is Internet capacity farmed by TF Farmers and used by TF Users.

---

### What is the interplay between Stellar Chain and TF Chain?

Stellar is basically a payment network. But we also need a decentralized way to store the full infrastructure of farms, nodes, contracts, billing reports etc. This is available now on TFChain, as you can see here.

Stellar remains very good when it's purely about fast payment, while TF Chain is used as the decentralized blockchain of the New Internet.

It's why both remain active, with a bridge in-between to enable transfer of the same tokens on two blockchain infrastructures.

Note that TFT is also available on BSC.

---

### Is there a bridge between Binance Smart Chain (BSC) and Stellar to transfer TFT?

Yes! It's over here.

© 2022 Threefold Foundation

### What are the different Threefold bridges, TFChain-Stellar Bridge and BSC-Stellar Bridge? How can I go from TF Chain to Stellar chain to Binance Smart Chain?

In short, there is the BSC-Stellar Bridge and the TF Chain-Stellar Bridge.

The BSC-Stellar Bridge is used to go between the Stellar Chain and Binance Smart Chain (BSC). The TFChain-Stellar Bridge is used to go between Stellar Chain and TF Chain.

To go from BSC to TF Chain, or from TF Chain to BSC, you need to use the two bridges.

BSC can be used to sell/buy TFT while TF Chain can be used to deploy Dapps on https://play.grid.tf

---

### How can I bridge TFT from Stellar chain to TF Chain and vice versa?

Go on the Threefold Portal, sign-in with your Polkadot extension account and then go in the section **Twin** if you aren't there already. Click on *Bridge TFT from Stellar* to transfer TFT from Stellar to TF Chain. Click on *Bridge TFT to Stellar* to transfer TFT from TF Chain to Stellar.

Note: If you are on Threefold Connect App, you can export your account to the Polkadot extension. Look at the section *Move Farm from the TF app to the TF Portal (polkadot.js)* in the Threefold Farming Guide Part 2.

---

### How can I bridge TFT from Binance Smart Chain (BSC) to Stellar (and vice versa)?

To use the BSC-Stellar Bridge, follow the following steps. If this is your first time with MetaMask and BSC, read the section **How to Set Up TFT on Metamask** below.

Note: Always start with a small amount the first time you try the Bridge.

---

#### How to use the BSC-Stellar Bridge

---

To use the BSC-Stellar Bridge, follow the following steps. If this is your first time with MetaMask and BSC, read the section **Setting up TFT on Metamask**.

Note: Always start with a small amount the first time you try the Bridge.

---

#### Bridge from Stellar to BSC

---

**Pre-requisites:**

- Metamask account
- TF Connect App+Wallet
- TFT on Stellar Blockchain

**Steps**

1. Go to the BSC-Stellar Bridge website.

© 2022 Threefold Foundation

2. Connect your MetaMask Wallet.
3. Sign in with MetaMask.
4. Choose the option *Deposit from Stellar*.
5. Agree to the *Threefold Terms*.
6. Read and tick the box of the *Warning Message*.
7. On your phone, open up your Threefold Connect App and go to the wallet section.
8. Select the option *Send*.
9. Select the *Stellar* chain.
10. Click on the button *Scan QR Code* . The QR Code option automatically fill up your *MESSAGE*.
11. Scan the QR code that appears on the Bridge window (or write the information manually).
12. Make sure the *MESSAGE* is correctly entered.
13. Press *Send Tokens*.
14. Press *Confirm*.

In this method, you use the Bridge directly. Thus, it is normal if you do not see your standard MetaMask address. MetaMask is on ERC20 and TFT is on Stellar. You are sending TFT to the Bridge's address, and the Bridge sends money to your wallet afterward.

---

**Bridge from BSC to Stellar**

---

**Pre-requisites:**

- Metamask account
- TF Connect App+Wallet
- BNB for gas fees
- TFT

**Steps**

1. Go to the BSC-Stellar Bridge website.
2. Connect your MetaMask Wallet.
3. Sign in with MetaMask.
4. Choose the option *Deposit from BSC*.
5. Agree to the *Threefold Terms*.
6. Read and tick the box of the *Warning Message*.
7. On your phone, open up your Threefold Connect App and go to the wallet section.
8. Copy your Stellar address.
9. Paste your Stellar address in the proper field on The BSC-Stellar Bridge.
10. Enter the amount of TFT you want to bridge.
11. Click on *Withdraw*.
12. Follow the instructions on your Metamask Wallet.

**General Tips**

- It's a good idea to start with a small amount the first time.
- The process is usually quick, but it can take up to 48h. In doubt, contact TF Support.
- Going from Stellar to BSC costs 50 TFT.

© 2022 Threefold Foundation

- Going from BSC to Stellar costs 1 TFT.
- There is also fixed fee of 0.01 TFT when using the Stellar Blockchain.
- Gas fees on BSC is usually around 5-20 gwei.
- You can try the bridge later if gas fees are high at the moment of your transaction.

---

**How to Set Up TFT on Metamask**

---

- Download Metamask here. Then, install the Metamask extension in your local browser.
- Create a Metamask account
- Switch the network to `Binance chain` . You will have to create a new network with following information):
  - Mainnet
  - Network Name: Smart Chain
  - New RPC URL: https://bsc-dataseed.binance.org/
  - ChainID: 56
  - Symbol: BNB
  - Block Explorer URL: https://bscscan.com
- Add TFT token in Metamask -> custom token -> contract address = `0x8f0FB159380176D324542b3a7933F0C2Fd0c2bbf`

---

### How to set up a Stellar address for TFT transactions?

In general, to set up a Stellar address to transact TFT on Stellar chain, you can use any Stellar wallet that has a TFT trustline enabled. Note that on Stellar chain, fees are paid in XLM.

The easiest way is to simply create an account on the Threefold Connect App (for Android and iOS) and to then use the TFT wallet of the app, which has by default a TFT trustline on Stellar chain and also comes with 1 XLM sponsored by Threefold for transaction fees.

---

### How long does it take when you use the BSC-Stellar Bridge?

The bridge will process deposits/withdrawals within 48 hours.

---

### What are the cost when bridging from Stellar to MetaMask and from MetaMask to Stellar?

It will cost 50 TFT for the former, and 1 TFT for the latter. There is a fixed fee of 0.01 TFT when using the Stellar blockchain. Those fees are taken from the total of what you are bridging. For example, if you Bridge 80 TFT, from Stellar to MetaMask, you will receive 30 TFT.

---

### What is the network information to access BSC for the Threefold token? What is the token address for adding the token in the MetaMask app?

Here it is:

© 2022 Threefold Foundation

- Mainnet
- Network Name: Smart Chain
- New RPC URL: https://bsc-dataseed.binance.org/
- ChainID: 56
- Symbol: BNB
- Block Explorer URL: https://bscscan.com

BSC TFT Token Address: 0x8f0FB159380176D324542b3a7933F0C2Fd0c2bbf

For more information, read this.

---

### How can I trade TFT on Pancake Swap? How can I add TFT on Pancake Swap?

When searching for a Token on Pancake Swap (Select a Token), paste the TFT Token Address : **0x8f0FB159380176D324542b3a7933F0C2Fd0c2bbf**, then select TFT. You can now trade TFT on Binance Smart Chain.

---

### Is it possible to swap TFT on Stellar Blockain?

Yes this is possible. Here's how to do it with StellarX.

First, make sure your wallet has a TFT trustline. Second, go on StellarX Swap section. Third, choose TFT and the other token of the swapping pair then swap. If you do not see TFT, make sure you have a TFT trustline linked to your wallet.

---

## TF Connect App, TF Portal & Polkadot Substrate

---

### What is the Threefold Connect App download link?

Threefold Connect App (TF Connect App) is available for download on Android and on iOS.

---

### What is the Threefold Portal link?

To go on the Threefold Portal, use this link https://portal.grid.tf/.

---

### To access the TF Portal, I need to use the Polkadot Extension. What is the link?

The link to the Polkadot Extension is the following: https://polkadot.js.org/extension/.

---

### Is there a way to create/import another wallet in TF Connect App?

The TF Connect App supports Stellar and TF Chain wallets. The app by default can create one wallet. To add any number of additional wallets, you must create a wallet on Stellar or TF Chain and then import it with the import function.

---

© 2022 Threefold Foundation

### I created a farm on the TF Chain. On the TF Connect App - Farmer Migration section, my farm is under *Other v3 farms*, is this normal?

Yes this is normal. Farms created on TF Chain instead of the TF Connect App will appear in *Other v3 farms*.

---

### I am trying to access my wallet in the Threefold Connect App. It worked fine before, but now I just get a white screen. What does it mean and what can I do?

On the TF Connect App, when you get a white screen, it means that there is a connection issue. It can help to try other networks; maybe try switching between ethernet cable or wifi. Or you can also try it later when the connection might be more stable.

---

### I have some problems connecting to the Polkadot extension. What can I do?

You could try to delete the cache in your browser or try to open it with another browser (Firefox/Brave/Chrome). Sometimes, removing the account and re-entering the seed phrase can also help to fix some issues. Use your seed phrase carefully.

If you have issues on Firefox, refreshing the browser can help.

---

### Apart form the Threefold Connect App Wallet, how can I check my TFT balance?

You can go on Stellar.Expert. With your wallet address, you will be able to see your transactions and wallet details.

---

### Is it possible to export the transaction history of a wallet to a CSV file?

Yes, every blockchain has an explorer function and these explorer functions allow you to see transactions and export them. TFT is on 2 chains at the moment: Stellar and Polkadot.

For Stellar based TFT's there is an explorer here: https://stellar.expert/explorer/public. Enter you wallet address in the top left search box, and after pressing enter you should see every transaction related to your account.

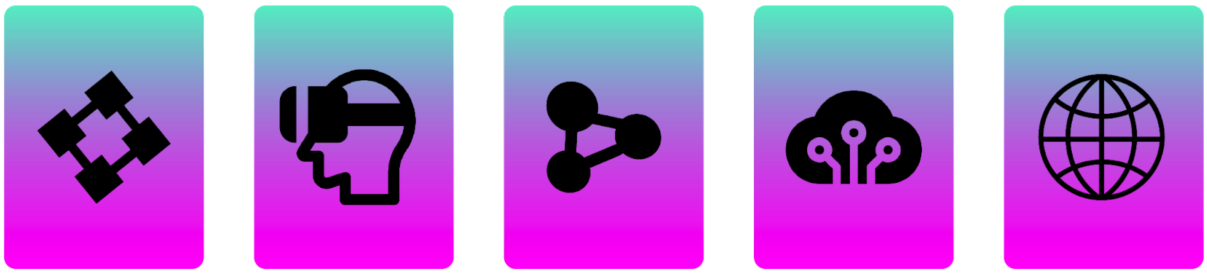
If you are not deploying/doing things on the TF Grid (dev, test or mainnet) you will not have transferred any tokens to the TF Chain, therefore all your tokens/wallets will be on the Stellar Chain.

---

# USER FAQ

---

© 2022 Threefold Foundation



**BLOCKCHAIN**

Any blockchain can use our grid to deploy their workloads.

**METAVERSE**

We are the most secure gateway to the metaverse.

**WEB 3.0**

We are perfect for developers who want to build and create dapps.

**WEB 2.0**

We can decentralize any workload on a centralized server.

**IOT**

Our system gives unprecedented security, speed and affordability.

## TF Grid Functionalities

### Can I have the link to deploy a VM and other apps on the Grid?

Yes. It's https://play.grid.tf.

### What can I do on Threefold Grid?

Since Threefold 3nodes have their OS based on the Linux kernel, you can run just about anything that runs on Linux. The possibilities are almost endless. Here's a quick list of what you can do within a few clicks:

- Virtual Machine
- Kubernetes
- CapRover
- Peertube
- Funkwhale
- Mattermost
- Discourse
- Taiga
- Owncloud
- Presearch
- Casperlabs

When you take into consideration that with CapRover only, you get dozens and dozens of free and open source **one-click applications**, from Wordpress to Ruby, you realize the fun ahead.

### I want to become a Threefold validator. What are the steps?

Excellent idea! This is a great contribution to the Grid. Read the documentation here. You can then register for Layer 0 or register for Layer 2 on the Threefold Forum.

© 2022 Threefold Foundation

### Is there delegated staking for TFT?

Delegated staking is a feature that will soon be implement. Stay tuned.

---

### What are the type of storage available on TF Grid?

There's two type of storage that van de used on the TF Grid.

1. VM which has a virtual disk. The virtual disk is a straightforward volume on a local hard disk. Everything stored on this virtual disk is stored only on this virtual (and thus physical) disk. Delete the VM and the virtual disk and the content is gone.
2. Quantum safe storage. Quantum safe storage uses a "Storage Engine" that parts, compresses, encrypts and then mathematically describes the data.

---

### What is Threefold's cloud pricing? / Are there any discounts available for Threefold's cloud pricing?

You can read more about Threefold cloud pricing and discounts here.

By simply hodling TFT in your TF Chain wallet, you can benefit from TFT discounts up to 60%. This is an automatic form of staking, the user does not have to do anything to have this benefit.

---

## Tutorials and Guides

---

### What are the prerequisites before using the Threefold Play Grid (play.grid.tf)?

The prerequisites are simple:

1. Add the Polkadot Substrate Extension to your browser
2. Create an account (write down the mnemonics somewhere safe and offline)
3. Go to TF Portal Grid and select the newly created account
4. Fund the TF Portal account by using the TFChain-Stellar Bridge and the Threefold Connect App
5. Go to the Threefold Play Grid and start your deployment

---

### How can I create a profile manager on play.grid.tf?

You can create a profile manager on Testnet, Devnet and Mainnet. On the Threefold Play Grid, select the Profile Manager button on the top right of the screen and then select *Create Profile Manager*. For the detailed steps, read this documentation. To generate SSH keys, read the next question.

---

### To deploy a load on the TF Grid, I need to generate SSH keys. How can I generate SSH keys on MAC, Linux or Windows?

© 2022 Threefold Foundation

To generate SSH keys, you can use OpenSSH client for MAC, Linux or Windows. For Windows, it is also possible to use PuTTY client.

For the detailed steps, go to this link from Help Desk Geek.

---

### I want to deploy a virtual machine (VM) on Threefold. How can I do this?

Read this short documentation and you'll soon be exploring the virtual machine world!

---

### How can I use Caprover on Threefold Grid?

Check this video and find out for yourself! If you want to, read the documentation with step-by-step guide for Caprover.

---

### Is there a picture guide on how to deploy Wordpress on the Threefold Grid using Caprover?

We're glad you ask, Kristof wrote something you might really dig. Read it here!

---

### I've heard rumours that you can install Wordpress and Discourse on the TF Grid in less than 15 minutes, is it true?

Oh yes it is. Legend has it, it can even be done under 10 minutes. Would you give it a try? Check this video.

---

### Can I deploy a Presearch Node?

Yes you can! Check this link. Note that you will need to select on the TF Grid a 3node with a Public IP.

---

### What is the minimum amount of TFT to deploy a Presearch node? / How can I get a TFT discount when I deploy a Presearch node?

The minimum amount of TFT that needs to be in your Threefold Profile before you can deploy a Presearch node is 2 TFT. But this would not last very long.

To benefit from the biggest reduction in price (-60%), you need to have a sufficient amount of TFT in your wallet. The TFT is not locked and simply needs to be present in your wallet.

For the capacity of a Presearch node, the amount is around 5000 TFT, covering 3 years that the workload could run.

Note that a Presearch node requires about 3 days to stabilize.

---

### How can I deploy Kubernetes on the Threefold Grid?

Read this documentation to find out.

---

© 2022 Threefold Foundation

### How can I deploy Peertube on the Threefold Grid?

You can learn more about this here.

---

### How can I deploy ownCloud on the Threefold Grid?

Read the documentation here to learn more.

---

### How can I use and install Yggdrasil?

Learn all about this here.

---

## Threefold Connect App

---

### TF Connect App is now asking for a 4-digit password (PIN). I don't remember it as I usually use touch/face ID to unlock the app. What can I do?

When you set up your the app, you are asked a 4-digit password (PIN). After some time, the app will be asking for this PIN when users may have been exclusively using touch/face ID. You can reset it by recovering the account with your seedphrase.

---

### Is there a way to have more than one wallet in TF Connect App?

Yes, this is perfectly possible. You can have multiple wallets in the TF Connect app. You can have multiple wallets for the Stellar network and multiple wallets for Polkadot Substrate.

For example, you can create a wallet on the Stellar Blockchain and import it on TF Connect App with the function *Import Wallet*. Just copy the seedphrase and it will be imported in TF Connect App.

Note: There will not be an automatic function in the app to create a new wallet. You must do it manually.

---

# DEVELOPER FAQ

---

© 2022 Threefold Foundation

## General Information for Developer

### Can I use a docker with the Threefold Grid?

Yes, you can. Simply run a virtual machine on play.grid.tf and install your docker as per the given documentation of the software you want to implement. Note that you can also convert a docker into an flist, to simplify the process. For more information, read the next question.

### Can I convert an existing docker into an flist?

Yes you can. Go on this link and you will be able to convert a docker into an flist.

### How does a flist work?

In a flist, we separate the metadata from the data. The metadata is a description of what files are in that particular image. It's the data providing information about the app/software. Thanks to flist, the 3node doesn't need to install a complete software program in order to run properly. Only the necessary files are installed. Zero-OS can read the metadata of a container and only download and execute the necessary binaries and applications to run the workload, when it is necessary.

© 2022 Threefold Foundation

For more information, check this TF video.

---

### What is stored in the metadata of a software?

The metadata stores information such as: location, properties, ownership, rights, etc.

---

### What is the ratio between the metadata and the actual files on a container?

Metadata is usually less than 5% of the container. The rest (95%+) is the actual files (binaries, applications).

---

### Does Zero-OS assign private IPv4 addresses to workloads?

No. Zero-OS will request two IP address from the DHCP. If you only have one physical NIC connected, Zero-OS will assign the second IP address as a virtual device.

---

### Can Zero-OS assign public IPv4/IPv6 addresses to workloads?

Yes it can provide both standard and Yggdrasil connections.

---

### What is Yggdrasil?

Yggdrasil is an "overlay network implementation of a new routing scheme for mesh networks".

---

### What does MAC mean when it comes to networking?

MAC means *media access control*. It is a unique hardware ID. It helps the network to recognize your machine. It is then, for example, possible to assign a specific and fixed IP address to your hardware.

---

## Dev Net & Test Net

---

### Is there a way to test the Grid with free TFT?

You can get free TFT on the Dev Net, but note that these are not real TFTs. They are simply there for people to try and explore the Grid.

---

### Can I get some free TFT to test on Test Net

The TFT on Test Net is real TFT. There are ways to get free TFT to explore Test Net, such as joining the Beta Tester Group. More information here.

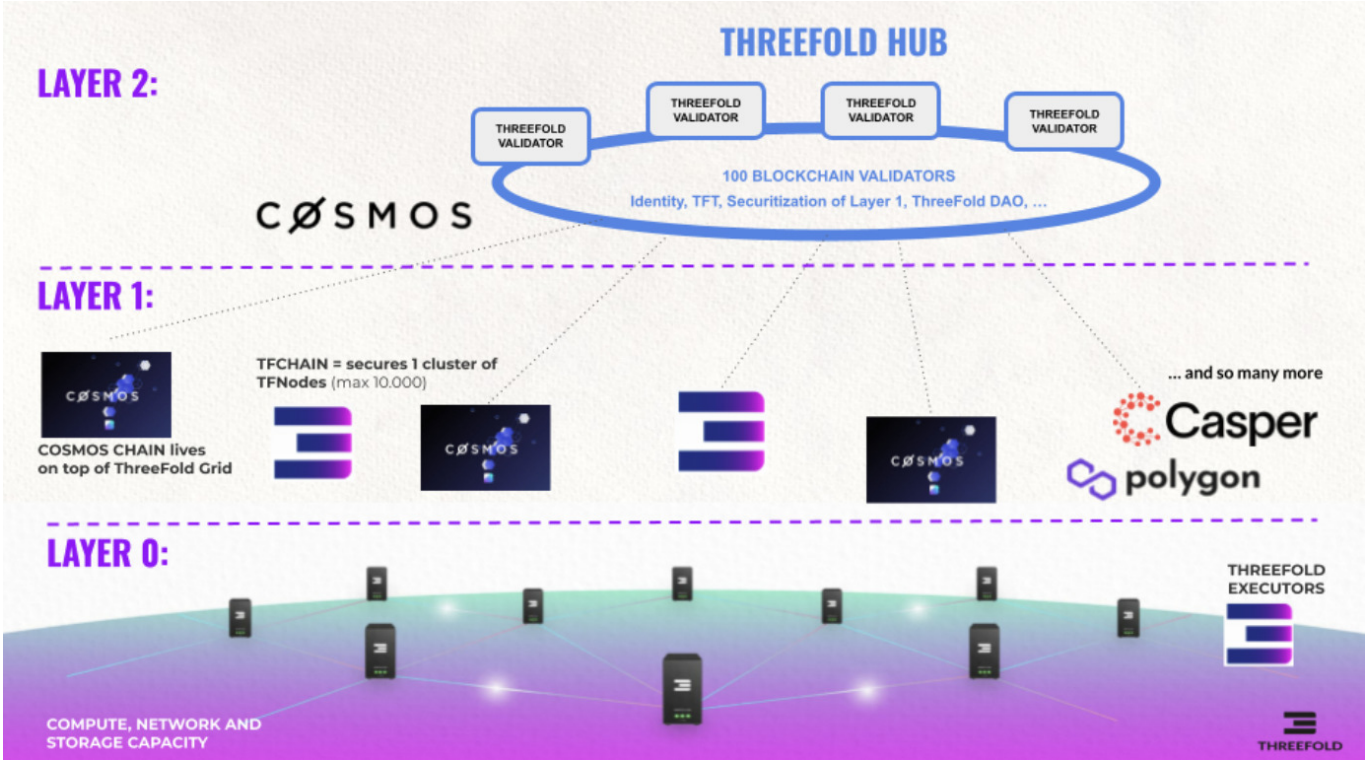
---

#### I want to test the Grid, is there a Grid Tester Community to reach out TF testers?

© 2022 Threefold Foundation

Of course! And they'll be happy to help you. Reach the TF community on Telegram and explore the New Internet.

# VALIDATOR FAQ




## General Information of Validator

### What are Validators?

A blockchain validator participates in **consensus** and **maintains** the record of **transactions**. Once transactions are verified. Validators are computers that maintain the blockchain's **integrity** by keeping a record of the whole transaction history, from the first block to the last.

In **Proof-of-Stake** (PoS) systems like ThreeFold L0 and L2 validators are given rewards as long as they stake ThreeFold Tokens (TFT) and correctly participate in the network. This mechanism helps secure the network by imposing the need to lock up TFT in order to participate in the consensus decisions.

### Why are Validators important for ThreeFold?

Validators are an essential part of the Proof-of-Stake consensus mechanism. They are essentially the moderators of the staking system and have the extremely important **responsibility** of authoring new blocks on the chain. To have the **most decentralized** system possible, ThreeFold needs a good number of validator nodes that can be elected. That's the primary reason why we limited the amount of validators one person or entity can hold to 1.

© 2022 Threefold Foundation

This creates the greatest variety of staking options for the community and also **protects** the system by preventing the chain from being controlled by one very wealthy individual. When there are more people validating the blockchain, it significantly increases the barrier to being elected and allows for a **fairer ecosystem** to emerge.

---

### Can anyone run a validator node?

Validator nodes can be run **by anyone** with hardware that meets the minimum requirements (4TB of storage, 32GB of RAM and 4 logical cores). Once the blockchain is set up on the hardware, all the verifications and voting is done on a web portal, a **seamless** process accessible to anyone. However, it is **important to remember** that if a validator fails to uphold their responsibilities, a portion of their stake will be slashed (fined), as such an event would impact the resilience and security of the network.

The **responsibility** of a validator (owner) can be summarized to:

- **Actively** participating in the governance of the network the validator protects
- Producing blocks (requires the node to be online **24/7** to sync with the latest blocks)
- Validator owners are expected to be **active members** of the community and must always be up-to-date with the current state of the ecosystem, so that they can easily adapt to any changes.

---

### What are the rewards?

To justify the running costs of the node as well as to gather a suitable income from supporting the blockchain, validator nodes earn rewards, see here for L2 validators, and here for L0 validators.

---

### How many validator nodes will there be?

The amount of validators depends on type of validator. While there is a maximum of 100 validators for L2 (ThreeFold Hub), there will be max 100 L0 validators per sidechain of TFGrid. There will be many sidechains on the TF Grid.

---

### What's the difference between L2 and L0?

Our three layer blockchain approach provides for unlimited scale and security.

**Layer 2** is the top layer of our ThreeFold ecosystem, also called ThreeFold HUB. It's a Cosmos-based blockchain that is secured by L2 validators.

**Layer 0** is the foundational layer of our ThreeFold ecosystem, also called ThreeFold Operators. It's a network of validator node operators that secure the operating system layer of the ThreeFold Grid.

---

### What are the rewards for L0 and L2 validators?

During the 2 first years, 5% yield will be rewarded to any staker. 10% of revenue of executors on the sidechain go to people staking L0. 5% of revenue of executors on the sidechain go to people staking L2.

© 2022 Threefold Foundation

10% will be deducted if you did delegated staking. In other words, if you do not own the validator node. This 10% is commission for the owner of the validator node.

For more information, read this.

---

## Validator Requirements

---

### What are the general requirements?

- Reliable electricity. Either the electricity is always on or the validator owner takes precautions to put his/her node in a data center or invests in a UPS.
- Bandwidth > 50Mbit/s continuous connection. The higher the bandwidth, the better the validator can participate in the network.
- A 24/7 connection.

---

### What are the hardware requirements to run a validator node?

- 4TB of SSD Storage (good quality SSD)
- 32 GB of RAM
- 4 physical cores

---

### Can I run more than one validator node?

You can only have one validator node in each validator category.

---

### Does this mean you only really need 50 000 TFT to run a validator node?

Yes, for 50k TFT you can reserve a validator node for L0 Chain securing the TF Executors. An additional 50k, which can come from anyone, will be enough to get rewards and voting power.

Thus, you need 50k TFT to reserver a validator, and 50k TFT to activate rewards and voting power.

---

### If validator is running on Grid and the host shutdowns the machine, could stakers lose staking tokens?

No, you would not lose staked tokens, but there could be an impact on reward for the time you were off.

---

### What happens if my validator is down for a while?

The technical implementation is not finished yet, we use Cosmos blockchain for this, we will check the more technical details, normally a node can be offline for quite a while before there are issues.

---

### Could we run validator on our farming machine?

© 2022 Threefold Foundation

Yes you can, you can run validators wherever you want. You can deploy manually (using code) or through a weblet on a location of your choice.

---

## Application to run a Validator Node

---

### When will Verification of applications start?

Starting February 21, 2022

The Foundation will begin with verifying the applications:

- Submitted validator requests will be **vetted and checked** on an individual basis
- Submitted **wallets** will be checked on for the respective **minimum TFT** balance (for amount of TFT required see: L2, L0.
- Submitted individuals / companies will be asked if they have more than one **validator request**. This request will be recorded.

---

### What are the next steps after the sign-up?

After successfully completing the validation process, validator owners will be asked for their preferred way to **deploy the validator**. There are two options:

- On the ThreeFold Grid with a simple weblet.
- On bare metal that is owned and managed by the validator owner.

*If you haven't topped up your account, please do so now to meet the minimum amount of TFT required.*

**Once verified,** the new validated sign-ups will receive an instructional link to their verified emails to activate their validator.

If you have further questions, please let us know in the comments and we'll get back to you as soon as possible.

We're looking forward to driving the expansion and decentralization of the ThreeFold Grid with all of you!

---

# FARMER FAQ

---

© 2022 Threefold Foundation

## TFT Farming Basics

### How can I create a Threefold farm?

There are two ways to create a Threefold farm.

You can install the Threefold Connect App, set an account and then create a farm in the section **Farming**.

You can also create a Threefold farm on the Threefold Portal after having created an account on the Polkadot extension.

### My Titan is v2.1 and the Threefold Grid is v3., what is the distinction?

Titan v2.1 is the hardware. Before v2.1, there was 2.0. The hardware currently being shipped is the Titan v2.1.

When you read v3, it refers to the Threefold Grid. Titans are now being sent ready for TF Grid v3 so they are being referred to as Titan v3. In short, the current Titans are v2.1 hardware ready for Threefold Grid v3.

### Is there a way to know the current TFT price for the farming rewards?

Yes! Go here and scroll down, you'll be able to find the TFT price at the line: **current TFT to USD price**.

### When will I receive the farming rewards for my 3nodes?

© 2022 Threefold Foundation

Farming rewards are usually sent around the 8th of each month.

Note that this can vary slightly as the TF team is manually verifying the farming rewards.

---

### Is there a Threefold calculator?

Of course! Go to the Threefold Simulator and select DIY or Titan.

---

### What is the TFT entry price of my 3node?

For Grid V3, Titans 3nodes have the entry price of the moment you bought the unit, if it's better than 8 cents, the current TFT farming entry price. For the time being, the DIY 3nodes have the entry price of 8 cents until the end of June 2022. The TFT entry price is voted on by the Threefold community on the Threefold Forum. Stay tuned for the upcoming votes.

---

### What is the necessary uptime for a 3node per period of one month?

Note that as of now, rewards are proportional to the uptime, so (e.g.) 40% uptime farms 40% of the total uptime period.

When implemented : For certified Titans 3nodes, it is 97% uptime per month (21.6h). For DIY 3nodes, it is 95% uptime per month (36h). For professional certified 3 nodes, it is 99.5% uptime per month (3.6h).

---

### I set up a 3node in the middle of the month, does it affect uptime requirements and rewards?

You will still need to meet the required uptime (95% for DIY, etc.3), but the period starts when you connected the 3node for the first time, instead of the usual start of the month. This only applies the first month. Afterwards, the uptime is calculated on the whole month. *Read last Q+A

---

### What is the difference between a certified and a non-certified 3node?

A certified 3node will receive 25% more reward compared to a non-certified 3node. As of now, Titans bought from Threefold can be certified as well as certified 3nodes bought on the Threefold Marketplace. DIY certified 3nodes are a future possibility.

---

### What is the difference between V2 and V3 minting?

V2 is being sunset. New miners should directly onboard to V3. On the tokenomics side, V2 rewards decrease as the difficulty level increases. For the V3 rewards, the rewards are constant for 5 years. In short, V3 is more profitable in the long run. For more information, read this post.

---

### How long is the minting period of the tokens on Threefold? / How long is the farming period?

© 2022 Threefold Foundation

Each period has: 2630880 seconds = 43848 minutes = 730.8 hours. For more info, click here.

---

### What are the minting periods for 2022?

The minting period for the months of the year 2022 are the following:

| | | |
|---|---|---|
| Jan 2022 | 2021-12-30 18:56:40 | 2022-01-30 5:44:40 |
| Feb 2022 | 2022-01-30 5:44:40 | 2022-03-01 16:32:40 |
| Mar 2022 | 2022-03-01 16:32:40 | 2022-04-01 3:20:40 |
| Apr 2022 | 2022-04-01 3:20:40 | 2022-05-01 14:08:40 |
| May 2022 | 2022-05-01 14:08:40 | 2022-06-01 0:56:40 |
| Jun 2022 | 2022-06-01 0:56:40 | 2022-07-01 11:44:40 |
| Jul 2022 | 2022-07-01 11:44:40 | 2022-07-31 22:32:40 |
| Aug 2022 | 2022-07-31 22:32:40 | 2022-08-31 9:20:40 |
| Sep 2022 | 2022-08-31 9:20:40 | 2022-09-30 20:08:40 |
| Oct 2022 | 2022-09-30 20:08:40 | 2022-10-31 6:56:40 |
| Nov 2022 | 2022-10-31 6:56:40 | 2022-11-30 17:44:40 |
| Dec 2022 | 2022-11-30 17:44:40 | 2022-12-31 4:32:40 |

---

### Can Titans and DIY 3nodes share the same farm?

Yes. It's one big Threefold family! A farm can have several 3nodes (Titans or DIY) and each 3node can be linked to only one farm.

---

### Do I need one farm for each 3node?

No. You only need one farm. One farm can have multiple 3nodes. When setting your farm, you will add an address for the farming rewards. All farming rewards from each 3node of your farm will be sent to this address. Note that you can choose to have more than one farm. It is up to you.

---

### Can a single farm be composed of many 3nodes?

Yes. You can have many 3nodes on the same farm.

---

### Can a single 3node be on more than one farm?

No, this is not possible.

---

### Do I need one reward address per 3node?

You do not need more than one address linked to one farm. All of your 3nodes can be connected to the same farm. Rewards per each 3nodes will all be sent to the address linked to your farm.

© 2022 Threefold Foundation

### When it comes to the Zero-OS bootstrap image, can I simply duplicate the first image I burnt when I build another 3node?

Yes. What is needed on this bootstrap image is to have the proper farm ID. The bootstrap image will be the same for all your different 3nodes. It's a good TF farming practice to leave the bootstrap image plugged in the 3node at all time.

---

### If a node is unused for certain time (e.g. many months offline), will it be erased by the Grid?

No, nodes only get deleted if the farm owner chooses to do so. Old "nodes" are really just entries in TF Chain and TF Chain does not modify or delete this data without external input.

---

### Can a farm be erased from TF Grid?

No, this is not possible. In the future, we will implement some features in order to allow the cleaning of unused farms. As of now, this is not possible. Also, an old farm does not take resources on the TF Grid, or very little.

---

### On the Threefold Connect App, it says I need to migrate my Titan farm from V2 to V3. What do I have to do? How long does this take?

You simply need to press on the button *Migrate to V3*. This process usually takes a couple of minutes but it can take a little bit longer.

---

### How can I migrate my DIY farm from V2 to V3?

Create a new bootstrap image using your new V3 Farm ID. To create a new V3 Farm ID, you can use the Threefold Connect App or the Threefold Portal.

---

## Farming Rewards and Related Notions

---

### What are the rewards of farming/Can I get more rewards when my 3node is being utilized?

By connecting a 3node to the Grid, you get Farming Rewards. If you set a public IP address for the Grid to use, you will receive additional rewards when your 3node is being utilized by users on the Grid. All rewards are paid in TFT. To know the potential rewards, use the simulator. More information on sales channel will be communicated in the future.

---

### How can I know the potential farming rewards for Grid Utilization?

Go on the Threefold simulator, enter your 3node resources, check the **Public IP address**. This will enable farming rewards from the parameter **NU Required Per CU**. Check the difference in the farming rewards per month. Note that you will need a Public IP address.

---

© 2022 Threefold Foundation

### What is the easiest way to farm Threefold tokens?

Buy a Titan. This is more or less *plug n play*! You can also build a DIY 3node. It's fun and there are many resources to help you along the way.

---

### When do I receive my rewards?

They are distributed once a month, around the 8th*. Distributions are not daily, or after a certain threshold. Note that upcoming minting rules may have a 24 month lockup or until 30% utilization for 3 months on your 3node.

*This can change slightly depending on the current situation.

---

### On Threefold Grid v3, how can I verify my 3nodes' payments on Stellar Blockchain?

Here's the summary on how to find the details of a 3node's payment:

1. Go to https://stellar.expert
2. Open the hamburger menu on the top right (mobile version)
3. Paste your wallet address in the search bar
4. Go to the last payment you want details of
5. Make sure the Memo (HASH) is in the HEX format. If it isn't click on *base64* and change it to *hex*.
6. Copy the Memo (HASH)
7. Go to https://alpha.minting.tfchain.grid.tf/
8. Paste the Memo (HASH) you copied. You will find the details of the 3node's payment

NB: A full period is 2630880 seconds.

---

### Do farming rewards take into account the type of RAM, SSD, HDD and CPU of the 3node server?

No. The farming rewards do not take into account the specific type of RAM, SSD, HDD and CPU. The farming rewards take into account the quantity of storage and compute units (e.g. TB of SSD/HDD, GB of RAM, # of virtual cores).

---

### What is the farming reward calculation?

The general calculation is the following:

```
TFT earned per month =
CU farmed * CU farming rewards
+ SU farmed * SU farming rewards
```

© 2022 Threefold Foundation

```
+ NU used * NU farming rewards
+ IPAddr used * IPAddr farming rewards
```

Lear more about this here.

> Note: The farming rewards take into account the quantity of storage and compute units (e.g. TB of SSD/HDD, GB of RAM, # of virtual cores). The farming rewards do not take into account the specific type of RAM, SSD, HDD and CPU.

---

### Can I send my farming rewards directly to a crypto exchange?

This is not possible. When you send tokens to a crypto exchange, you need to include a memo with your wallet address and the current farming rewards system of Threefold is already using that memo space to send the correct farming information.

---

### I received my farming rewards, now I want to sell my TFT. How can I do this?

First, know that your TFT farming rewards are on the Stellar Blockchain. If you want to sell on Pancakeswap (on the Binance Chain), you will need to use the Stellar-BSC Bridge, where a 50 TFT fees is applicable. See the section *How to use the BSC-Stellar Bridge* in the Threefold Farming Guide for more information on this method.

If you stay on Stellar blockchain, you can either swap your TFT, for example on StellarX, where some XLM will be needed, or sell your TFT on an exchange using the Stellar blockchain. Currently, this can be done on Liquid and on BTC-Alpha. First, send your TFT to your exchange wallet and make sure you enter the memo correctly. Once your TFT are on the exchange, you can sell them on the market. Make sure to follow the exchange specific steps where applicable.

---

### How can I swap TFT on Stellar blochain?

This can be done with StellarX's swap function. Go on the Swap section of StellarX and follow the required steps.

---

### Which wallets are recommended for TFT farming rewards?

The most straightforward wallet possible when it comes to farming TFT is simply to use the wallet included with the Threefold Connect App. It is also possible to use other wallets that are connected to the Stellar Blockchain. In these cases, you will need to establish a trustline with TFT. You can also store your TFT on a Ledger or a Trezor via the Stellar Blockchain. See stellarterm.com, stellarx.com and solarwallet.io.

---

### Can I have more details on storing TFT on hardware wallets?

Yes of course! In short, you will need to use a hardware wallet (Ledger/Trezor/etc.) to sign in, add TFT as an asset (trustline), then send TFT to the Stellar address. For more information, read the section Setting up a TFT Trustline on Stellar Blockchain from the Farming documentation.

---

© 2022 Threefold Foundation

### Do I need collateral?

No! Many decentralized data projects require enormous amounts of collateral, but not ThreeFold.

---

### Can I add external drives to the 3nodes to increase rewards and resources available to the Threefold Grid?

As of now, you cannot add external drives to a 3nodes. It is not yet supported. It might be in the future and we will update the FAQ if/when this happens.

---

### Do I have access to the TFT rewards I receive each month when farming?

For now, V3 farming rewards are distributed as TFT on Stellar and they are immediately available. The lock system will be implemented on chain. Tokens will be staked to your address until unlock conditions are met. Conditions are: 2 years of farming or 30% of proof-of-utilization for 3 months per 3node.

---

### What is TFTA? Is it still used?

Note that on V3, TFTA will not be issued anymore.

---

### Is there a way to certify a DIY 3node?

Currently, only Titan Nodes are certified. We will share additional information when there are further updates.

---

### Does it make sense to make my farm a company?

There is no general answer to this. Here's what a Threefold member thinks about this if you are living in the USA. Check for your current location if this makes sense for you. DYOR.

> "Definitely do this project as a business entity. You can write off equipment, utilities and a portion of your home's square footage if your are hosting the equipment at home." TFarmer

---

### What is the difference between uptime/downtime and online/offline when it comes to 3nodes?

Uptime and status are two different things. As long as the 3node is powered on, its uptime does not reset. Its status changes to offline if it hasn't made an uptime report in the last two hours. Even if after more than two hours, the 3node isn't yet online, the uptime does not reset. Uptime is a function of the system being powered on.

---

### My 3node utilization is low, is it normal?

This is normal. Grid utilization is low right now. We're still in the phase of building the network and testing use cases.

---

© 2022 Threefold Foundation

# 3node Farming Requirements

### What are the general requirements for a DIY 3node?

Any 64-bit hardware with an Intel or AMD processor chip can run Zero-OS and become a 3node. For a complete guide on building a 3node, read the Farming Guide. The following configurations provide guidelines on compatible and recommended setups:

- Servers, desktops and mini computers type hardware are compatible.
- A minimum of 500 GB of SSD and a bare minimum of 2 GB of RAM is required.
- A ratio of 1:4 between vCPU and RAM (e.g. 8vCPU and 32 GB of RAM) is recommended.
- The recommended upper limit is 8 GB of RAM per vCPU as farming rewards do not increase beyond that ratio.
- A wired ethernet connection is highly recommended to maximize reliability and the ability to farm TFT.

---

### What kind of computer do I need to make a 3node?

Any modern computer should be sufficient, especially once you upgrade the amount of RAM and storage to increase your TFT rewards. While CPU specs are not currently measured, they may be in the future. To insure your 3node provides meaningful capacity to the network, you should have at least 1000 CPU passmark per core as measured on https://www.cpubenchmark.net/cpu_list.php

---

### I found a nice computer/server to buy online, but it doesn't come with a CPU. How can I know what CPU models would work with a specific computer/server?

You can usually find this information in the owner manual of the server in the section Technical Specifications. Here's a link for Dell servers.

---

### Can I host more than one 3node at my house?

Yes, but do not host more than your bandwidth can support.

---

### Is Wifi supported / Can I farm via Wifi instead of an Ethernet cable?

No. Wifi is not supported by Zero-OS due to a number of issues, like reliability, performance, configuration requirements and driver support. It's all about Ethernet cables here.

---

### Is there any way to run Zero-OS without dhcp?

You can set up a node through static routing at the router without DHCP by assigning the MAC address of the NIC to a IP address within your private subnet. This will give a static IP address to your 3node.

---

### I have 2 routers with each a different Internet service provider. I disconnected the ethernet cable from one router and connected it to the other router. Do I need to reboot the 3node?

© 2022 Threefold Foundation

You do not need to reboot. The 3node will be able to reconnect to the Threefold Grid.

---

### Do I need any specific port configuration when booting a 3node?

No, as long as the 3node is connected to the Internet via an ethernet cable (wifi is not supported), Zero-OS will be able to boot. Usually with the DHCP, it automatically assigns an IP address.

---

### How much electricity does a 3node use?

A small DIY 3node based on a compact office computer will draw under 20W. A full size server will draw around 100W idling. Note that a 3node actively used on the Grid (proof-of-utilization) will draw more power, but also generate passive income on top of farming if you have a public IP address.

For more information, read this section Calculate the Total Electricity Cost of Your Farm of the Farming Guide.

---

### Has anyone run stress tests to know the power consumption at heavy load of certain 3nodes?

The community is starting to gather some data on this. As of now, we know that a R720 with 2x2690v2 cpu, 4TB NVME SSE P4510 and 320GB ram will draw 390W @100% load. With 2x2650L v2, it's around 300W with fans at full speed. More info will be added as we gather more data.

---

### How much AC power do you need (in BTU) to compensate for the heat generated by the servers? How can I ensure proper relative humidity range for my 3node farm?

For a small farm set up, you could simply keep your normal air conditioner system and it should be fine. For large set up, you need to take into account the power consumption of your servers and turn it into BTU consumption. The quick equation to know the total BTU needed per Threefold Farm is:

> Server Power in kW * 3413 * Number of Servers = Total BTU

The total BTU will indicate the minimum number to look for when buying your air conditioner. For more information, read the section *Calculate the Minimum BTU Needed* in the Farming Guide.

---

### How can I ensure the relative humidity in my server room stays within a proper range?

Look in your server's user manual to know the proper range of relative humidity your server can handle. If necessary, use an hygrometer to measure relative humidity and make sure it stays within an acceptable range for your 3nodes.

Depending on your geographical location and your current situation, it could be interesting to consider having a AC unit equipped with a dehumidifier. Read your servers' manual to check the proper relative humidity range and set the unit accordingly.

---

### How can I ensure the air changes per hour is optimal in the 3node servers' room?

© 2022 Threefold Foundation

If deemed necessary, it is recommended to ventilate the server room in other to disperse or evacuate heat from the place. In those cases, ventilation flow will be set depending on the air changes per hour (ACPH) needed. Note that the ASHRAE recommends from 10 to 15 ACPH for a computer room.

---

### What is the maximum/minimum temperature and relative humidity a 3node server can handle?

This will depend on the specific server/computer you are using. You should check the server's technical guide/manual to get the proper information.

We will use here the Dell R720 as an example since it is a popular 3node choice. In this case, the Technical Guide.

For the R720, between 35˚C and 40˚C (or 95˚F and 104˚F), with 5% to 85% relative humidity, you can have this <10% of annual operating hours (around 36 days per year), and between 40˚C and 45˚C (or 104˚F and 113˚F), with 5 to 90% relative humidity, it's <1% of annual operating hours (around 3.6 day per year). All this considers that there is no direct sunlight.

From 10˚C to 35˚C (thus from 50˚F to 95˚F), it's considered standard operating temperature. With relative humidity from 10% to 80%.

This can give you a good idea of the conditions a 3node can handle, but make sure you verify with your specific server's manual.

---

### Can Titans be run on PoE? (Power Over Ethernet)

Titans don't come equipped for PoE. If you have a NUC based Titan there are some PoE lids that might be compatible.

---

### What is the relationship between the 3node's resources and bandwidth?

A 3node connects to the Threefold Grid and transfers information, whether it is in the form of compute, storage or network units (CU, SU, NU respectively). The more resources your 3nodes offer to the Grid, the more bandwidth will be needed to transfer the additional information.

---

### What is the bandwidth needed when it comes to running 3nodes on the Grid?

The strict minimum for one Titan is 1 mbps of bandwidth.

If you want to expand your Threefold farm, you should check the following to make sure your bandwidth will be sufficient when there will be Grid utilization.

> min Bandwidth per 3node (mbps) = 10 * max((Total SSD TB / 1 TB),(Total Threads / 8 Threads),(Total GB / 64 GB)) + 10 * (Total HDD TB / 2)

This equation means that for each TB of HDD you need 5 mbps of bandwidth, and for each TB of SSD, 8 Threads and 64GB of RAM (whichever is higher), you need 10 mbps of bandwidth.

© 2022 Threefold Foundation

This means a proper bandwidth for a Titan would be 10 mbps. As stated, 1 mbps is the strict minimum for one Titan.

The bandwidth needed for a given 3node is not yet set in stone and you are welcome to participate in ongoing the discussion on this subject on the Forum.

---

### Can I run Zero-OS on a virtual machine?

You can. But you won't farm TFT. To farm TFT, Zero-OS needs to be on bare metal.

---

### Is it possible to build a DIY 3Node with VMWare VM ?

It wouldn't be possible to get farming rewards from such configuration. You need to run a 3node Zero-OS on bare metal and no virtual machine is permitted. Indeed, to farm TFT you need bare metal. Virtual Machine will not work. Furthermore, all disks of a 3node need to be wiped completely, thus no other OS can be on the 3node.

It would be possible to simply set Zero-OS as a VM on VMWare VM, but it wouldn't farm as stated.

---

### Can I run a 3node on Windows, MAC or Linux?

No. Threefold runs its own OS, which is Zero-OS. You thus need to start with completely wiped disks.

---

### What is the minimum SSD requirement for a hardware to farm TFT?

You need a theoretical minimum of 500 GB SSD on a desktop or server. Less could work.

---

### Is it possible to have a 3node running on only HDD disks?

This is not possible. A 3node needs at least one SSD disk of 500 GB.

---

## Building a 3node - Steps and Details

---

### What are the main steps to build a DIY 3node, from start to finish?

The main steps to build a DIY 3node are the following:

1. Create a Threefold farm
2. Create a Zero-OS bootstrap image
3. Set the hardware
4. Wipe all the disks
5. Set the BIOS/UEFI
6. Boot the 3node

For a complete step-by-step guide on how to build a DIY 3node, read the Farming documentation.

© 2022 Threefold Foundation

### I wonder what type of desktop/server to use for my 3node. Any recommendation when it comes to DIY 3node hardware?

The Farming documentation contains a list of typical DIY 3nodes in the section List of Common DIY 3nodes.

Also, a good place to start is by checking what other farmers have built. Over here.

---

### What can you do to zero out your disks? How can I wipe the disks of my 3node with Linux?

For zero out disks unix has a tool called “wipefs”. Every distribution should have it. So if you take an ISO image of any Linux distribution and boot in “Try” mode, you can then go in a terminal or shell and write the following command:

Wipe all the disks in the 3node:

```
sudo for i in /dev/sd*; do wipefs -a $i; done
```

Wipe all the nvme disks in the 3node:

```
sudo for i in /dev/nvme*; do wipefs -a $i; done
```

This will wipe all of the disk devices in the hardware. Make sure you have SU permissions (write "sudo" before the command line). If needed, do a backup of the disks information before.

For more information, read the section *4. Wipe All the Disks* of the Farming guide here.

---

### How can I wipe a disk with Windows?

Follow these simple steps:

1. Open up the command line.
2. Write *diskpart*
3. Write *list disk*
4. Write *select disk x* (replace x with the disk you want to wipe)
5. Write *clean*

You're done! Note: do not format the disk.

---

### Do I need to wipe all the disks on my 3node? Or I can leave one disk with a different OS?

Zero-OS will not boot properly if not all disks are wiped. All disks must be wiped. So for example, you can't have one SSD disk wiped and another one SSD with Windows OS on it. In this case, Zero-OS won't boot.

---

### How can I be sure that I properly wiped my disks?

A wiped disk has:

- no label

© 2022 Threefold Foundation

- no partition
- no filesystem
- only zeroes

On Linux to see if the disk is only composed of zeroes, use the command line (example with disk sda):

```
cmp /dev/sda /dev/zero
```

If there is only zeroes, you should get the output:

```
cmp: EOF on /dev/sda
```

You can also use the command line:

```
sudo pv /dev/sda | od | head
```

Here are some useful command lines for Linux to make sure there are no partitions, no labels, no filesystems and that the disks are filled with zeroes only:

```
sudo fdisk -l

sudo fdisk -lf

sudo parted -l

sudo parted /dev/sda 'print'

lsblk --f

lsblk --raw
```

---

### My disks have issues with Zero-OS and my 3nodes. How can I do a factory reset of the disks?

```
Warning: this is destructive. It erases the disk sda in this example.
```

Boot a Linux in Try mode and run the following command:

```
sudo badblocks -svw -b 512 -t 0x00 /dev/sda
```

*In this example, the disk selected is sda. Choose the proper disk name in your current situation, e.g. sdb, sdc..).

This line will read and (over)write zeroes (0x00) everywhere on the disk.

To understand the line of code, note that 512 is the block size and that without -b BLOCKSIZE, the process would simply go slower. 0x00 represents the zero byte.

This will take some time, but it should reset the disk and hopefully fix any issues.

Note: it takes the 3node server around 1 percentage per minute for a 2TB SSD disk to accomplish the badblock operation.

---

© 2022 Threefold Foundation

### Before doing a bootstrap image, I need to format my USB key. How can I format my USB key?

*Note that BalenaEtcher will format and burn your bootstrap image in the same process. See next Q+A for more details.

**Windows**: This is done easily with **diskpart**. Here's all the coding needed (with disk X as an example, make sure you choose the correct disk): run Command Prompt as an administrator (right-click option), write *diskpart*, then in diskpart write *list disk*, choose your disk and write *select disk X*, write *clean*, write *create partition primary*, write *format fs=fat32*, then write *assign*. If for any reason, the process doesn't work, quit diskpart and redo the whole thing. This should fix any bug. **Cautious with diskpart, it's destructive.**

**MAC**: This is done easily with **Disk Utility**. Go in Disk Utility. Select your USB key, click on *erase* on the top, write a name for your USB key, then choose a format (MS-DOS (FAT) if USB key < 32GB, exFAT if USB key > 32GB), then click *erase*, then click *done*.

**LINUX**: In the Terminal, write *df*, find your disk (here we use sdX), write *sudo umount /dev/sdX*, write this line (with the proper FORMAT) *sudo mkfs.FORMAT /dev/sdX* [FORMAT= vfat for FAT32, ntfs for NTFS, exfat for exFAT], then finally verify the formatting by writing *sudo fsck /dev/sdX*.

---

### What do you use to load/burn the Zero-OS bootstrap image onto a USB stick?

For **MAC**, **Linux** and **Windows**, you can use BalenaEtcher to load/flash the image on a USB stick. This program also formats the USB in the process. Rufus can also be used for Windows.

Also, got **Linux** systems, you can transfer the dowloaded image with the dd command: *dd if=created_boot_loader_file.img of=/dev/sd?* where the input file is the downloaded file from http:/bootloader.grid.tf and the output file (device) is the USB stick device. Read more here.

---

### Should I do a UEFI image or a BIOS image to bootstrap Zero-OS?

It depends on your 3node's system. Newer computers and servers will accept UEFI. If it does not work with UEFI, please try with the options ISO (BIOS CD/DVD) or USB (BIOS image) on the Threefold bootstrap website. Read the next Q+A for more information on BIOS/UEFI.

---

### Is there more documentation on setting the BIOS/UEFI properly for the 3node?

For BIOS, read this documentation.

For UEFI, read this documentation.

---

### Do I need to enable virtualization in BIOS/UEFI?

Yes, you should enable virtualization. On Intel, it is denoted as *CPU virtualization* and on ASUS, it is denoted as *SVM*. Make sure virtualization is enabled and look for the precise terms in your specific BIOS/UEFI.

---

### How can I boot a 3node with a Zero-OS bootstrap image?

© 2022 Threefold Foundation

Plug the USB key containing the Zero-OS bootstrap image with your farm ID then power on your 3node. If the BIOS/UEFI is set correctly and the disks are all wiped, it should boot correctly the first time. If you have any problem booting your 3node, read the section Troubleshooting and Error Messages of the FAQ.

---

### The first time I booted my 3node, it says that the node is not registered yet. What can I do?

The first time you boot a 3node, it will be written: “This node is not registered (farmer ***: NameOfFarm). This is normal. The Grid will create a node ID and you will be able to see it on screen. This can take a couple of minutes.

If after some time (couple hours), the 3node doesn't get registered, there might be something off with the Grid connection. You can then try to reboot the 3node, or wait and boot it later. If it persists, you can check the rest of the Troubleshooting section of the Farmer FAQ, or ask around the Threefold Telegram Farmer chat or the Threefold chat for help.

---

### The first time I boot my 3node, the node gets registered but it says *cache disk : no ssd*. What can I do?

This probably means that you either haven't connected a SSD or that you need to wipe your SSD disk(s). Zero-OS runs on bare metal and needs a minimum of one SSD disk (min 500GB & 50 GB per CU). You will see "cache disk : OK" when it works.

---

### The first time I boot my 3 node, the node gets registered and it says *cache disk : OK*, but the table *System Used Capacity* is empty. What can I do?

Most of the time, just wait and data will appear. If you want to be sure your 3node is online on the Grid, you can check the Explorer, which fetch information every 2 hours. If it persist, first try to simply reboot your 3node.

---

### I have a relatively old server (e.g. Dell R710/R620, Z840). I have trouble booting Zero-OS. What could I do?

Sometimes, Zero-OS will not boot in UEFI mode on older servers. In that case, try to boot in BIOS mode. Use either a USB key or the CD/DVD optical drive (the 4th and 5th option on https://bootstrap.grid.tf/) and make sure to select BIOS and not UEFI mode in your server settings.

---

### I connected a SATA SSD to a CD/DVD optical drive adaptor. My system does not recognize the disk. What can I do?

Try to set AHCI mode instead of Legacy mode in SATA settings in the BIOS.

---

### Can someone explain what should I put in the “Public IP” part of my farm? Should I just insert my Public IP and Gateway (given by my ISP)? (In the Portal - Farm - Public IPs section)

Assuming you are a DIY farmer and operate from your home, this field can be left blank. You do not have to fill in any details.

© 2022 Threefold Foundation

The add IP option is for farmers that have a block of IP addresses routed to their router (in data centers mostly) and want to present “dedicated IP” addresses for deployments. For more information on how to set the public configuration, go to this link.

---

## Farming Optimization

---

### What is the difference between a Threefold 3node and a Threefold farm/ What about the farm ID and the node ID?

A farm is a composition of one or many 3nodes. A 3node is a computer connected to the Threefold Grid. Each farm has its farm ID and each 3node has its node ID.

---

### How can I know how many GB of SSD and RAM do I need?

You need 50 GB of SSD per compute units (CU) and a minimum of 500 GB SSD and 2 GB of RAM per 3node.

A 3node has, in general, 2 compute units (CU) per thread. Thus, for peak optimisation, you need 100 GB SSD and 8GB RAM per thread.

---

### What is the optimal ratio of vcores (threads), SSD storage and RAM? What is the best optimization scenario for a 3node, TFT reward-wise?

In short, for peak optimization, aim for 100 GB SSD and 8GB RAM per thread.

For example, a 32 threads (32 vcores) 3nodes would need 3.2 TB SSD and 256GB RAM to be optimal, reward-wise. That is: 32 * 100 = 3200 GB SSD = 3.2TB SSD, and 32 * 8 = 256 GB RAM total.

Adding more GB of RAM would not increase your TFT rewards. You'd need more vcores if you want to expand.

NB: This is purely based on reward considerations. Some users might need different ratios for different specific uses of the Grid.

---

### What does TBW mean? What is a good TBW level for a SSD disk?

TBW means Terabytes Written. TBW directly measures how much you can write cumulatively into the drive over its lifetime. For your 3node, it can be a good idea to prioritize a minimum ratio of 500 TBW per 1TB for SSD.

*Note that TBW is not a technical specification, but a general claim from the manufacturer. For this reason, it can also be good to check the warranty of the disk. For example, if a manufacturer offers a 5-year warranty to its product, it indicates that the company thinks its product will last a long time.

---

### Do I need a surge protector?

A surge protector is highly recommended for your farm and your 3nodes. This ensures your 3nodes will not overcharge if a power surge happens. Whole-house surge protectors are also an option.

---

© 2022 Threefold Foundation

### Do I need a PDU?

A PDU (power distribution unit) is useful in big server settings in order to manage your wattage and keep track of your power consumption.

---

### Do I need a UPS

A UPS (uninterrupted power supply) is great for a 3node if your power goes on and off frequently for short periods of time. This ensures your 3node does not need to constantly reboot. If your electricity provider is very reliable, a UPS might not be needed, as the small downtime resulting from rare power outages with not exceed the DIY downtime limit*. (95% uptime, 5% downtime = 36 hours per month.)

*That being said, make sure to have settings such as **AC Recovery Power** set properly so your 3node goes back online if the power shutdowns momentarily. UPS are generally used in data center to make sure people have enough time to do a "graceful" shutdown of the units when power goes off. (See next question)

---

### Are SATA and SAS drives interchangeable?

This goes only one way. You can put a SATA drive in a SAS slot, but you can't put a SAS drive in a SATA slot. See next Q+A.

---

### What is the speed difference between SAS and SATA disks?

One of the big differences between SATA and SAS is the transfer speed. Using SATA disks with SAS cables, you will be limited by the SATA transfer speed.

- Sata I : 150 MB/s
- Sata II : 300 MB/s
- Sata III : 600 MB/s
- SAS : 600-1500 MB/s

Note: You will most probably need to re-flash the raid card if you use the front panel disks (onboard storage) of your server.

---

### Is it possible to do a *graceful* shutdown to a 3nodes? How can you shutdown/power off a 3node?

There are no "graceful" shutdowns of 3nodes. You can shutdown a 3node from the software side. You need to shut it down manually directly on the hardware. 3nodes are self-healing and if they suddenly power down, no data or information will be lost.

---

### Is it possible to have direct access to Zero-OS's core to force a reboot?

No, this is not possible. The general philosophy with Zero-OS is: no shell, no GUI, and no remote control. In other words, anything that could potentially provide attack surface is off the table. This ensures a high security level to Zero-OS and the Threefold Grid in general. To reboot a 3node, you have to do it manually.

© 2022 Threefold Foundation

### Do I need some port forwarding in my router for each 3node?

No, this is not needed.

---

### Are servers noisy? Are there certain servers that are less noisy than others?

The noises from a server can be similar to the noise of a conventional pedestal fan. As a general rule, the bigger the server, the bigger the fans (which are mostly the source of sounds). Smaller fans need to spin faster to disperse as much heat as bigger fans. So, for example, 1U servers are noisier than 2U servers. Also, note that in general, tower servers are quieter than rack servers. Go for a tower server or desktop if you want a quieter 3node.

It has been stated that Dell servers are quieter than HP. For Dell, R710-R720 are quieter than Compellent. You can check the server's manual and see directly the noise they produce in decibels.

Note that serves generate *white noise*. White noise is often used for sound masking. For some, it helps them to relax and to fall asleep. A server in your bedroom, why not?

---

### Are there ways to reduce serves' noises?

To reduce the noise, you can remove all the unnecessary cards in the servers as well as the HDD disks if you don't use them. Unplugging the SAS cables can also help. You can also set the fans to adjust their speed instead of being constant.

At the end of the day, servers were manufactured for durability and efficiency, and not for being quiet. Most servers are placed in server rooms where noise doesn't matter much.

---

### I watched the TF video on building a DIY 3node. It stated both the i7-6700 and i7-6700T CPUs. What is the difference?

The T stands for thermal throttled. The i7-6700T is 46% more energy efficient. While the i7-6700 has a 42% faster CPU speed and has a higher passmark. Note that the TFT reward is going to be the same. The difference is with power consumption: 35 Watt for the i7-6700t and 65 Watt for the i7-6700.

For a more thorough comparison, read this.

---

### I built a 3node out of old hardware. Is it possible that my BIOS/UEFI has improper time and date set as factory default?

Yes. Make sure you have the correct time and date in BIOS to avoid errors when trying to boot Zero-OS. It might not cause any problems, but sometimes it does.

---

### I have rack servers in my Threefold Farm. Can I set rack servers vertically?

In general, it is not recommended to set rack servers vertically as they were designed to be laid flat in racks. That being said, if you want to set your rack vertically, here are some general rules to follow. Do so at your own

© 2022 Threefold Foundation

risk.

First, make sure the parts in the servers are well installed and that they will not fall if laid vertically. Second, and foremost, you want to make sure that there will not be any overheating. This means to make sure you don't block the front and rear of the unit, so heat can dissipate thought the vents.

If you want to put the rack vertically with the longest side of the rack laying upward, having the power supply units (PSUs) on the very top will ensure that heat dissipate well.

---

## Farming and Maintenance

---

### Do I need the Zero-OS bootstrap image drive (USB or CD/DVD) when I reboot, or can I boot Zero-OS from the 3node main hard drive?

You need the bootstrap image device plugged in every time you reboot a 3node and it's a good practice to keep it plugged in all the time. For more information, have a look here.

---

### When I set my farm on polkadot.js (https://portal.grid.tf), it asks for a Stellar payout address. What should I write?

The easiest method would be to write the address on your Threefold Connect App. You can also write any address that is on the Stellar blockchain and has a trustline enabled with Threefold Token.

---

### It's written that my node is using 100% of HRU. What does it mean?

HRU stands for your HDD space available. It means that you are using 100% of the HDD space available, or equivalently that you have no HDD on your system.

---

### On the Threefold Explorer, I only see half of the threads my 3node has, what can I do?

Check in the BIOS settings and make sure you have enabled Virtual Cores (or Hyper Threading/Logical Cores).

---

### Why are the 3nodes' resources different on the Threefold Explorer and the Threefold Portal?

There is a difference because one shows the resources in GiB and the other in GB. It's just a way to display information, the resources are ultimately the same, but shown differently. 1 GiB = 1.073741824 GB.

---

### What do CRU, MRU, HRU and SRU mean on the Threefold Explorer?

CRU means the number of virtual cores. MRU means the GB of ram (memory). HRU means the HDD capacity storage and SRU means the SSD capacity storage.

---

### How can I know if my 3node is online on the Grid? Is there an Explorer for Grid V3?

© 2022 Threefold Foundation

There are multiple answers to this.

(1) You can plug a monitor to your 3node and check directly its status.

(2) This link is the quickest online route to check your 3node status: https://explorerv3.grid.tf/nodes

(3) You can also use the (unofficial) Threefold Node Status Bot on Telegram (username: @tfnodestatusbot).

---

### I booted my 3node and the monitor says it's online and connected to the Grid. But the TF Explorer says it is offline? What can I do?

The Explorer refetches information every 2 hours. You can wait 2 hours and see if the problem persists. Then/or, you could reboot the 3node and see if the Explorer sees it as online.

---

### My 3node does show on the Threefold Explorer, but not on the Threefold Portal, what can I do?

If you're 3node is correctly registered on the Threefold Grid but you cannot see it on the Threefold Portal, there can be many different ways to solve this issue.

One way to fix this is to go in the TF Portal, select *change the address* and then simply re-paste the same address, then the extension will ask you to resign. Usually this fixes the issue.

If the first method did not work, you can try to remove the account and add it back up on the Polkadot.js extension. Before doing so, make sure you have a back up of your seed phrase as you will need it to re-enter the account. Your 3node should then appear.

---

### I set up my farm on Threefold Connect App. Can I use the Polkadot extension Portal instead?

If you want to use the portal, you can take the TFChain Secret from the app and import it into the Polkadot extension. For more information, and the other way around (TF Portal to TF Connect App), read the sections **Move Farm from the TF app to the TF Portal (polkadot.js)** and **Import TF Portal (polkadot.js) wallet to the TF Connect App Wallet** of the Farming Guide Part 2.

---

### Is it equivalent to create a farm on Threefold Connect App or via the Polkadot extension?

Yes it is. Farm setup through the app and using the Polkadot extension with the portal are equivalent.

---

### If I upgrade my 3node, will it increase my rewards?

Yes. Use the simulator.grid.tf to verify the additional rewards. But note that, currently, upgrades are not recognized until the next minting cycle.

---

### I booted my 3node for the first time at the beginning of the month, then I did some upgrade/downgrade, will the Grid recognize the new hardware? Will it still be the same

© 2022 Threefold Foundation

### 3node ID?

Downgrades are counted in the current minting cycle. So you mint for the entire cycle at the downgraded specs.

Minting only considers a single configuration per node per cycle, and that is the minimum configuration seen at any point during the cycle. With this logic in mind, upgrades will only be recognized at the next minting cycle. Note that your 3node will have a new ID and new price entry if you changed the SSD containing the 3node ID.

---

### Is it possible to ask the 3node to refetch the node information on the monitor?

To refetch information, press " q " on the keyboard.

---

### When does Zero-OS detect the capacity of a 3node?

Zero-OS only detects capacity right after it boots.

---

### Where is the 3node ID stored?

For the current Zero-OS version, the node ID is stored in the first SSD you install on your 3node*. If you change or erase this disk, this disk will lose its current 3node ID.

*Note that if, at the first boot, you put a SSD SATA and a SSD NVME at the same time, the node ID will be registered on the SSD SATA.

---

### Is there a way to backup my node ID in order to restore a 3node if the disk with the node ID gets corrupted or breaks down?

Yes, you can do a backup, but as of now this process must be done manually.

One way is to boot a Linux USB image in *Try* mode, open up the *File* folder of your disk that contains the node ID. Click on *+ Other Locations*. Then, open the folder that contains the folder *zos-cache* and open the folder *identityd*. In this folder, select the file *seed.txt* and make a copy of it in a safe place (USB key, notebook, e-mail, etc.). If the disk which contains your node ID is damaged, simply reboot the 3node with a new disk and the Zero-OS bootstrap image. Your 3node will connect to the Grid and assign a new node ID. Once this is done, reboot the 3node, but this time with the Linux USB image, go in the same folder as stated before and replace the new *seed.txt* file with the old file. Reboot your 3node with the Zero-OS bootstrap and you're done.

---

### If I upgrade my 3node, does it change the node ID?

Upgrades won't change the node ID, unless you replace the SSD where the node ID is stored (see above for more info on this).

---

### Does it make sense to recreate my node when the price drops?

Short answer: no. Long answer: click here.

© 2022 Threefold Foundation

### My 3node lost power momentarily and I had to power it back on manually. Is there a better way to proceed?

In your BIOS, go in *Security Settings* and choose *Last* for *AC Power Recovery**. If you want, set a delay between 60 and 240 seconds. This will ensure your 3node does not power on and off frantically if your power flickers on and off, thus potentially damaging the unit. On other BIOS, it's *After Power Loss*, and you should choose *Previous State*.

*Depending on your 3node, the parameter might have a different name.

---

### Do I need to change the battery BIOS?

It can be a good thing to change it when you buy an old desktop or server to make sure it lasts long. When the battery goes out of power, the 3node won't have access to the BIOS settings if it loses power momentarily.

---

### Do I need to enable UEFI Network Stack?

You don't need to if you use a removable media (e.g. USB key) as a booting image. It is needed only if you boot from a PXE server on your network. You should keep this feature disabled. Enable it only if you know 100% what you are doing. Otherwise it might bring vulnerabilities in terms of network security.

---

### I want redundancy of power for my 3 nodes. I have two PSU on my Dell server. What can I do?

Make sure you enable the Hot Spare feature. This feature is accessible in iDRAC Settings - Power Configuration. Other servers might have this function, with a different name and configuration. Check the server's manual for more details.

---

### Why isn't there support for RAID?/Does Zero-OS work with RAID?

RAID is a technology that has brought resilience and security to the IT industry. But it has some limitations that we at ThreeFold did not want to get stuck in. We developed a different (and more efficient way to store data reliably. Please have a look here.

This Quantum Safe Storage overcomes some of the shortfalls of RAID and is able to work over multiple nodes geographically spread on the TF Grid.

---

### Is there a way to bypass RAID in order for Zero-OS to have bare metals on the system? (No RAID controller in between storage and the Grid)

Yes it is possible. "You can use the on board storage on a server without RAID. You can re-flash the RAID card, turn on HBA/non-RAID mode, or install a different card. No need for RAID." @FLnelson It's usually easy to set servers such as a HP Proliant with the HBA mode. For Dell servers, you can either cross-flash the RAID controller with an “IT-mode-Firmware” (see this video) or get a DELL H310-controller (which has the non-RAID option). Otherwise, you can install a NVME SSD with a PCIe adaptor, and turn off the RAID controller.

© 2022 Threefold Foundation

### I have a 3node rack server. Is it possible to use a M.2 to SATA adapter in order to put the m.2 SATA disk in the HDD bay (onboard storage)?

Yes, it is possible. You will most probably need to bypass the RAID controller for Zero-OS to access properly the onboard storage. See previous question.

---

### My 3node uses only PCIe adapters and SSD NVME disks. Do I need the RAID controller on?

The onboard RAID controller is not linked to your PCIe SSDs. In this case, you can switch the RAID controller off.

---

### Can I change the name of my farm on polkadot.js?

It's possible to rename farms through the Polkadot UI. For mainnet, use this link.

Under *using the selected account*, select the account that owns the farm, choose *tfgridModule* from the dropdown menu *submit the following extrinsic*, then select *updateFarm(id, name, pricingPolicyId)*. Then under *name: Bytes*, write the new farm name. Finally, click on the bottom *Submit Transaction* at the bottom right of the screen.

---

### How can I delete a farm on polkadot.js?

It's possible to delete farms through the Polkadot UI. For mainnet, use this link.

Under *using the selected account*, select the account that owns the farm, choose *tfgridModule* from the dropdown menu *submit the following extrinsic*, then select *deleteFarm(id)*. Then under *id: u32*, write the ID of the Threefold farm you want to delete. Finally, click on the bottom *Submit Transaction* at the bottom right of the screen.

---

### I try to delete a node on the TF Portal, but it doesn't work. Is there any other way to proceed that could work?

It's possible to delete nodes through the Polkadot UI. For mainnet, use this link.

Under *using the selected account*, select the account that owns the farm, choose *tfgridModule* from the dropdown menu *submit the following extrinsic*, then select *deleteNode(id)*. Then under *id: u32*, write the ID of the 3node you want to delete. Finally, click on the bottom *Submit Transaction* at the bottom right of the screen.

---

### My 3node has 2 ethernet ports in the back, with one written AMT above, what does it mean? Can I use this port to connect my 3node to the Grid?

First, let's define the term AMT. It means: Active Management Technology. Without going into too much details, it is to remotely access servers via the network at the BIOS level. Thus, you should plug the ethernet cable in the port next to AMT, and not into the AMT port. You can explore AMT properties if you want remote access to your server.

---

© 2022 Threefold Foundation

### My 3node is based on a Z600/Z620/Z820, can I run it headless/without a GPU?

For the Z600, there is a great video on youtube.

For the Z620 and the Z820, you need to do some variation on the video above. In the BIOS, go in File -> Replicated Setup, and select Save to Removable Storage Device. This will save a text file on your USB key. Then, in the text file, go to Headless Mode and remove the * in front of Disable and put it in front of Enable. Save the file and then go back into BIOS. Now go in File -> Replicated Setup, and select Restore from Removable Storage Device.

Running your 3node without the GPU can save some power consumption as well as giving you one more extra slot for other hardware.

---

### My 3node is based on a Z800. The PSU is not working anymore. Is there an alternative to buying another expensive PSU?

It is possible to build your own PSU for the Z800. There is a great DIY guide by Linus on this here. This is clearly for advanced DIYer.

---

### Is it possible to add high-level GPU on rack servers to farm more TFT?

Some farmers had success installing GPUs such as the RTX3080 in servers as small as 2U (such as R730). Connections such as 250W 8-pin plug are needed on each riser. Generally, tower servers have more space to add high-level GPU.

Note: GPU farming will be implemented in the future.

---

## Troubleshooting and Error Messages

### Is it possible to access the Error/Log Screen?

Yes! On the Zero-OS console, hit alt-F2 to open up the Error/Log Screen, and hit alt-F3 to go back to the main screen.

---

### I plugged an HDMI cable from my monitor into the node and the monitor is displaying nothing. What can I do?

You may have to reboot with HDMI cable already connected. Video does not seem to be turned on unless HDMI is present at boot. Once you boot with HDMI in, you can unplug and replug and it will work.

To simply see if your 3node is online, you can go on the Threefold Explorer or check with the Telegram Threefold Farm Status Bot.

---

### What does it mean when I see, during the 3node boot, the message: *error = context deadline exceeded*?

© 2022 Threefold Foundation

In general, this message means that the Threefold Grid asked something to your 3node, and your 3node could not respond fast enough. It is usually necessary to read the following error message to understand the situation more specifically.

---

### I try to boot a 3node, but I get the error *No Route to Host* on Linux. What does it mean?

There are many potential answers to this. Perhaps the Host is offline, the service isn't running. This is usually the reason with TF Grid. It means the Grid is not responsive. In this case, try to boot the 3node later. If it persists ask TF Support.

There can also be other reasons. You might have connected to the wrong port. Perhaps you have configured iptables to block connections on that port. Your DNS might be improperly configured. You might have an Incorrect Network or Host Configuration. Many troubleshoots are possible. Here's a good place to start.

---

### I try to boot a 3node, but I get the message *no route with default gateway found*. What does it mean?

First, let's see the main terms. Default gateway act as an access point to other networks, in this case the TF Grid, when there is a back and forth exchange of data packets.

While the last question implied a communication problem from the Grid, this error message usually means that the 3node has communication problem. In short, it has difficulty reaching the TF Grid. There are many ways to troubleshoot this error. First, let's give the most direct solution. Make sure you have a direct connection with your Internet Service Provider (ISP): your 3node should be connected to a router or a switcher via an ethernet cable. Wifi doesn't work. Make sure your DHCP is set correctly.

If the problem persists, check the default gateway of your 3node and then make sure your router can reach it.

*See next Q+A for more a possible solution.

---

### I have trouble connecting the 3node to the Grid with a 10GB NIC card. What can I do?

As of now, Zero-OS sometimes has trouble with 10GB NIC card. The easiest solution to this is to connect your 3node with the 1GB NIC card. This should solve the issue. More fine tuning might be needed to get your 3node to work with a 10GB NIC card. Future Zero-OS version might solve this issue.

---

### I switch the ethernet cable to a different port when my 3node was running. Internet connection is lost. What can I do?

When your 3node boots, Zero-OS marks the NIC port. This means you cannot change NIC port when your 3node is running. You can either put back the ethernet cable in the initial NIC port, or reboot the 3node. At boot, Zero-OS will marks the new NIC port as the main entry.

---

### I get the error *Certificate is not yet valid* when booting my 3node, what can I do?

© 2022 Threefold Foundation

Make sure your firmware is up to date. If necessary, reinstall it. You might have to install then re-install the firmware if your system is very old.

---

### I tried to wipe my disk, but I get the error *Probing Initialized Failed*. What can I do?

Some people tried the command *wipefs -a /dev/sd** without success. (Where * is the specific disk letter.) When you get that error, sometimes it is because your are trying to wipe your boot USB by accident. If this is not the case, and you really are trying to wipe your disk, try this command *wipefs -af /dev/sd**.

---

### I did a format on my SSD disk, but Zero-OS still does not recognize them. What's wrong?

Formatting is one thing, but to boot properly, Zero-OS needs to work on a completely wipe disk. Thus, make sure you wipe your disks. Formatting is not enough.

---

### I have a Dell Rx10 server (R610/710/910). When I boot Zero-OS I get the message *Probing EDD* and the 3node doesn't boot from there. What can I do?

For the R610 and 710, you can simply re-flash the card. See this link for more information. For the 910, you can't re-flash the card. In this case, get a LSI Dell card and it should work. (They are cheap when you buy them used online.)

---

### My 3node doesn't boot properly without a monitor plugged in. What can I do?

First, try to disable the "Halt On" mode in BIOS. If you do not have this option, try simply enabling the Legacy Support (Dell BIOS for example). If this doesn't work, try to plug in a Dummy Plug/Headless Ghost/Display Emulator in your 3node. This will simulate a plugged monitor. This should fix the problem.

---

### My 3node is running on the Grid, but when I plugged in the monitor, it states: *Disabling IR #16*. Is there a problem?

In general, you can simply ignore this error statement. This error is linked to the Nvidia binary driver. It simply means that your 3node lost connection with the graphic card (by unplugging and replugging the monitor for example).

---

### My 3node won't boot without disabling the Secure Boot option, is it safe?

In the case where you want to boot Zero-OS, disabling Secure Boot option is safe. With Secure Boot disabled, it can be easier or even necessary when it comes to booting Zero-OS. Secure Boot is used when you want to lock the BIOS/UEFI settings.

---

### When I tried to boot my 3node, at some point the screen went black, with or without a blinking hyphen [ - ]. What could cause this and what could I do to resolve the issue?

© 2022 Threefold Foundation

There is a possibility that this happens because you are booting your 3node on a HDD. A 3node needs a minimum of 500GB of SSD to work properly.

Also, make sure that you are using the correct boot option (Legacy BIOS or UEFI) in the Settings and that it corresponds to the correct booting image on the Threefold Bootstrap page.

This problem often arises when you plugged your disks in the wrong controller. For example, try unpluging the disks from the SAS controller, and plug them in the SATA controller. Also, disable the SAS controller if needed.

In a Legacy BIOS boot, make sure Legacy is enabled and disable *Data Execution Prevention* if possible.

Also, it might have to do with your RAID controller configuration. Make sure this is properly set. For example, configuring all the HDD disks into one logical disk can fix this problem, or re-flashing the RAID card can also help.

---

### My 3nodes go offline after a modem reboot. Is there a way to prevent this?

Yes, there are many ways to prevent this. An easy solution is to set the DHCP server to reserve local IPs for the 3nodes MAC addresses.

This problem is also preventable if your router stays online during the modem reboot.

Indeed, rebooting the 3nodes is necessary when there are local IP changes, as 3nodes are addressed a local IP addresses when they are booted.

The DHCP will addresses any local IP address that is available when you are booting a 3node. Reserving local IP addresses is a good TF farming practice.

---

### When I boot my 3node, it reaches the *Welcome to Zero-OS window*, but it doesn't boot properly and there's an error message: *failed to load object : type substrate...*, what can I do?

Usually simply rebooting the 3node fixes this problem.

---

### When I try to access iDRAC on a web browswer, even with protected mode off, I get the error *The webpage cannot be found*, what can I do?

Open iDRAC in the Internet Explorer emulator extension (IE Tab) in Chrome, then update iDRAC. It should work elsewhere then. Sometimes, it will be needed to add "ST1=code" at the end of the IE Tab url.

---

### When booting the 3node, I get the error *Network interface detected but autoconfiguration failed*. What can I do?

First make sure your network cable is plugged in and that your DHCP is working and responding. If you change the NIC port of the ethernet cable, make sure to reboot the 3node so Zero-OS can change the NIC port attribution.

© 2022 Threefold Foundation

Some farmers reported that this got fixed by simply powering off the 3node(s), the router and modem for 2 minutes then powering it all back on. Resetting the modem and router (switch on the hardware) in the process can also help.

If this doesn't work, try to upgrade the firmware of the NIC and the motherboard. If this still doesn't work, the NIC card might be broken. Try with another NIC card.

---

### When I boot my Dell server, I get the message: All of the disks from your previous configuration are gone... Press any key to continue or 'C' to load the configuration utility. What can I do?

Many changes to your server can lead to this message.

Usually, the easiest solution is to reset the disk configuration in iDRAC's configuration utility.

What can causes this message:

1. During a new installation, the cables connecting to your external storage are not wired to the correct ports.
2. Your RAID adapter has failed.
3. Your SAS cables are not plugged properly or are malfunctioning.

Note: Resetting the configuration will destroy all data on all virtual disks. Make sure you know what you are doing! In doubt, ask the TF community.

---

### I have a Dell R620. In Zero-OS, I get the failure message *No network card found* and then the 3node reebots after few seconds. The same happens for every LAN input. What can I do?

The first thing to try here is to boot the server in BIOS mode instead of UEFI mode. If this doesn't fix the problem, try the following.

Sometimes, this happens when the firmwares of BIOS, iDRAC, Lifecycle Controller and NIC are incompatible to each other. The solution is then to update them all correctly. Some problems can arise in the process.

First, you should try to do the updates using iDRAC as you can update both iDRAC and BIOS there. If this does not work, try to update separate, with a live-linux distro, the BIOS, iDRAC and Lifecycle Controller. Once this is done, the server should be able to do a liveupdate, https to dell support website, via lifecycle-controller. This would update the other components. For more details on this method, watch this video.

Note: Some farmers have reported that the Broadcom NIC card does not work well for Zero-OS and that a standard Intel PCI NIC card replacement resolved the issue. This could be a more straightforward method if updating the firmwares doesn't resolve the issue.

---

### I am using freeDos to crossflash my raid controller on a Dell server, but I can't see the RAID controller with the Command Info. What can I do?

© 2022 Threefold Foundation

Turn on the raid controller in the BIOS, otherwise freeDos does not show you the raid controller with the command Info.

---

### Can I use a VGA to HDMI adaptor to connect a TV screen/monitor to the 3node? / I tried to boot a 3node with a VGA to HDMI adaptor but the boot fails, what can I do?

This might work, but it has been reported by farmers that Zero-OS might have difficulties booting when this is done with a VGA/HDMI adaptor on a TV screen. This is most likely due to the TV screen not supporting the output once the system loaded into Zero-OS. The easy fix to this issue is to use a standard computer monitor with a VGA plug.

---

### When I try to boot my 3node, the fans start spinning fast with a loud noise and the screen is black. What can I do to resolve this?

There may be several causes to this issue. You can try to remove all the RAM sticks, to clean the dust and then to reseat the RAM sticks. If it still doesn't resolve the issue, you can check the RAM sticks one by one to see if one is malfunctioning. This often resolves the issue. Also, some cables might not be properly connected.

---

### When booting Zero-OS with IPV6 configurations, I get the errors (1) *dial tcp: address IPV6-address too many columns in address* and (2) *no pools matches key: not routable*. What can I do to fix this issue?

This usually means that the IPV6 attributed is not valid. It is also often caused when the DNS configuration does not resolve IPV6 correctly.

To fix this issue, it is often necessary to adjust the IPV6 settings related to the router and the modem. Confirming with your Internet service provider (ISP) that the IPV6 settings are properly configured could also be necessary to fix the issue.

---

### When booting a 3node, Zero-OS downloads fine, but then I get error *no route with default gateway found* and info *check if interface has a cable plugged in*. What could fix this?

Make sure you have network stack enabled in BIOS. If so, check you ethernet port and make sure that it's clean. Also make sure the ethernet rj45 connectors are clean on both ends. If that does not work, verify the state of your SATA cables. If all this doesn't work, download and re-install Zero-OS.

---

### How can I update Dell and HP servers to Intel E5-2600v2, E5-2400v2 and E5-4600v2, when applicable?

There are many ressources online with steps on how to do this. You can check this youtube video on Dell and HP servers, as welll as this documentation for HP Proliant Gen8.

---

### How can I update a Dell PowerEdger server with a bootable ISO?

Dell has excellen documentation for this. Read this for the detailed steps.

© 2022 Threefold Foundation

### When I boot a 3node in UEFI mode, it gets stuck at *Initializing Network Device*, is there a way to fix this?

Usually, booting the 3node in BIOS mode instead of UEFI mode fixes this issue.

---

## Threefold Grid and Data

---

### How is the farming minting reward calculated? / Is the Grid always monitoring my 3node?

The Grid uses an algorithm that does not continually monitor the 3node. It does its best to determine uptime through occasional checking in, which we call ping. The 3node sends a ping to the Grid and the Grid sends a ping to the 3node to confirm the reception. (Ping-Pong!)

It's helpful to understand that the Grid is really just 3nodes and TF Chain (which itself is a collection of nodes). Nodes report their uptime by writing an entry on TF Chain, about once every two hours. These reports are used for minting.

---

### How does communication happen on the Grid at the 3node's level?

There are two ways to get information about nodes. Once is to query TF Chain, and the other is to communicate with nodes directly.

---

### What is the Threefold Node Status bot Telegram link?

The link is the following: https://t.me/tfnodestatusbot.

---

### How does the Threefold Node Status bot works?

1. Click on this link: https://t.me/tfnodestatusbot
2. To subscribe a node, write the command */subscribe nodeID*. So if your node ID is 100, write: */subscribe 100*
3. To verify the status on the TF Explorer, write: */status 100*.
4. To verify the status through Yggdrasil, write: */ping 100*.

Note: The bot should send you alerts when it considers any registered node to be offline.

---

### How does the Telegram Status Bot get information from my 3node? / My 3node is online on the Explorer, but offline on the Telegram Status Bot, is this normal?

The status bot communicates directly by sending pings to the nodes over Yggdrasil every five minutes. Therefore, it will report on temporary network interruptions that might not affect your total uptime calculation as used for minting.

© 2022 Threefold Foundation

### I noticed that when I reboot my 3node, the uptime counter on the Explorer goes back to zero. Does it mean I lose uptime and the uptime start over again when I reboot the 3node?

No. The only uptime you lose is the time your 3node was offline from the Grid. This Grid still has the data of your total uptime of the month. The Explorer only shows this statistics as: "*This node has been up non-stop without being rebooted for now* [insert time]". If you maintain a total uptime above the minimum uptime, you're fine.

*For now the farming rewards are proportional to the total uptime.

---

### One of my nodes is showing the wrong location. Any problem with that?

The explorer is showing your ISP location. This is perfectly normal.

---

## Memory

---

### Can I use different type of RAM for the same 3node?

No. Always use the same type of RAM per 3node. If you use RDIMM, go all RDIMM, etc. Check your hardware specifications to make sure you have the right type of memory.

---

### How can I know if the memory I am buying is OK for my specific hardware?

To be sure, look into the owner's manual of your specific computer.

In general, you can go to Memory.net and look for your specific computer model. As general steps, select your computer's system in *By system*, then select the series and then select the specific model of the series. You will then see available memories to buy from memory.net. You can also simply read the documentation at the bottom. The memory type supported by your computer will be explained. Then you can buy the memory needed from any other computer store.

For servers, you can check with Cloudninja's documentation here. Search for your specific hardware and look for the compatible memory. This reference is good for rack and tower servers.

---

### What do the terms RDIMM, LDIMM, UDIMM, LRDIMM, FBDIMM mean when it comes to ram memory sticks?

Well first, the DIMM means dual inline memory module.

- U stands for or unregistered (or unbuffered).
- R stands for registered memory.
- LR stands for load-reduced.
- FB stands for fully-buffered.

© 2022 Threefold Foundation

### What is the difference between ECC and non-ECC memory?

ECC means error correction code memory. This type of memory can detect and correct data corruption. Non-ECC mostly cannot detect nor correct, but some can detect, but never correct data corruption. Check your hardware specifications to make sure you have the right type of memory (ECC or non-ECC).

---

### How can I change the RAM memory sticks on my 3nodes? / How can I achieve dual channel configuration with sticks of RAM? (e.g. 2x16GB ram DDR3 ECC RDIMM)

First, always use RAM sticks of the same size and type. It should be noted on your motherboard which slots to populate first. As a general guide, there is usually 2 slots A and B, with each 2 memory stick entries. You must then install the ram sticks on A1 and B1 in order to achieve dual channel, then A2 and B2 if you have more (visual order: A1 A2 B1 B2).

> Example: You want to start with your largest sticks, evenly distributed between both processors and work your way down to your smallest. Let's take an example with 2 processors as well as 4x 16GB sticks and 4x 8GB sticks. The arrangement would be A1-16GB, B1-16GB, A2-16GB, B2-16GB, A3-8GB, B3-8GB, A4-8GB, B4-8GB. Avoid odd numbers as well. You optimally want pairs. So if you only have 5x 8GB sticks, only install 4 until you have an even 6.

---

### What does RAM mean?

RAM means random access memory. Those type of memory can be read and changed in any order.

---

### What does DIMM mean when it comes to RAM sticks?

It means *dual in-line memory module*. This type of computer memory is natively 64 bits, enabling fast data transfer.

---

### I have 24 DIMMS ram slots on my server. Can I use them all?

Be careful when installing memory on a server. Always check your server's documentation to make sure your RAM sticks combination are correct.

For example, on the Dell R720, you can have 24x16gb RAM ECC sticks, but it can only handle 16 Quad ranked DIMMs. In this case, you can fill up all slots with registered DIMMs if you have a maximum of 4 quad DIMMS ranked on each CPU.

---

# Ask a Question to the Threefold Community

If you have any question, you can ask the Threefold community via the Threefold forum or the Threefold Telegram channels:

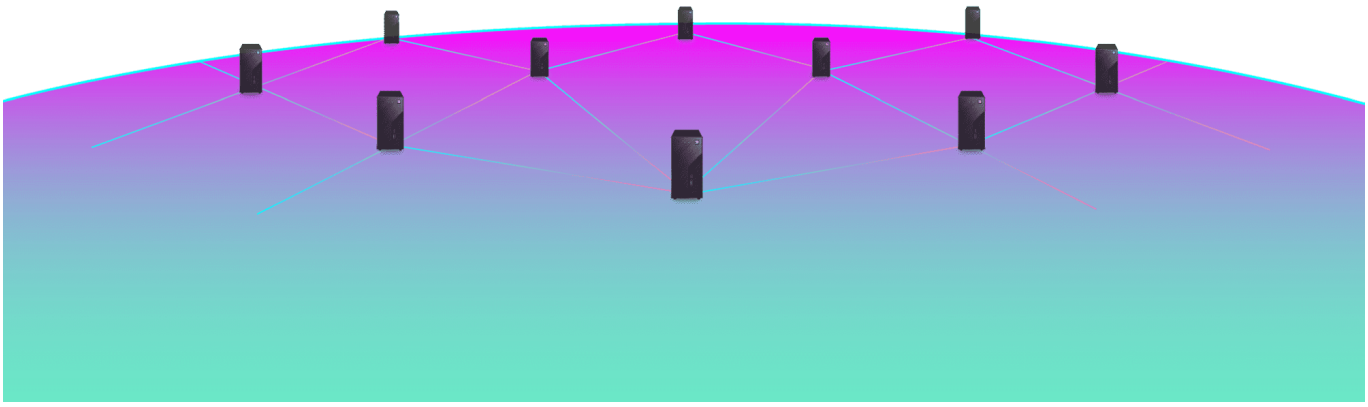
- Threefold Forum

© 2022 Threefold Foundation

- Threefold General TG Channel
- Threefold Farmer TG Channel
- TF Grid Tester TG Channel

> Note 1: If we wrote something wrong, tell us!

> Note 2: This is a collective effort. A big ***Thank You*** to the great Threefold Community. Many Q+A are contributions from the enthusiast farmers, users and developers of the ever-growing Threefold community.



© 2022 Threefold Foundation