



Node Operator's Handbook



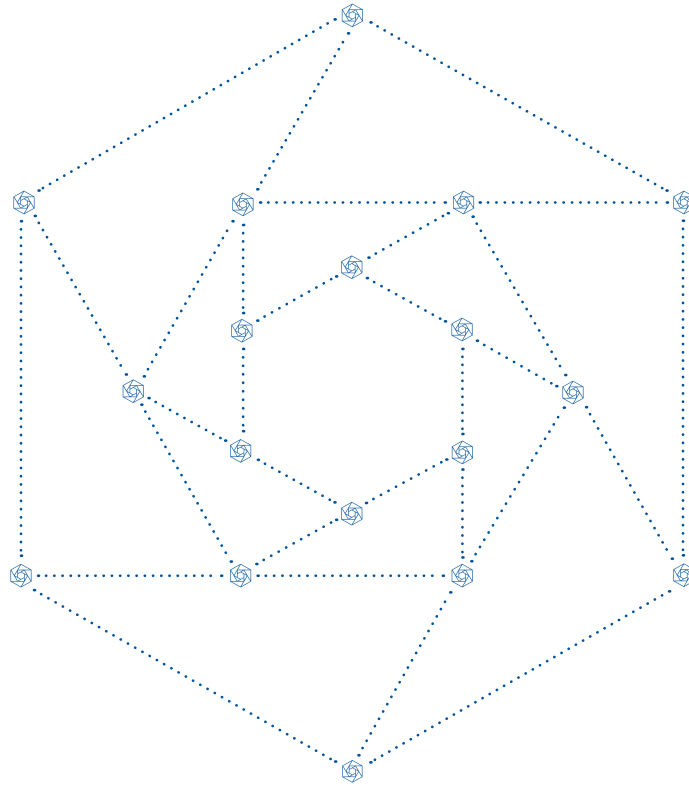


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Introduction



Welcome to the Node Operators Handbook. You will find the essential information on running a node and the related governance aspects of the early network. This is the start of a living network that is built, evolved and supported by you.

This Handbook is meant to be understood in combination with the Constellation Constitution and the Code of Ethics that we will collaborate with you, our community. As founders of the Constellation Network we want to make sure that our values and principles live on in the governance of the network.



Disclaimer

We are not responsible for ensuring the overall performance of nodes or any related applications. Any test results or performance figures are indicative and will not reflect performance under all conditions. Software may contain components that are open sourced and subject to their own licenses; you are responsible for ensuring your compliance with those licenses.

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Definitions

Foundation Node:

A node with the minimum hardware requirements. These nodes establish the foundation of the network infrastructure.

Light Node:

Nodes with less hardware requirements than a Foundation Node. Light Nodes could run on smaller edge instances or less powerful sensor/device hardware. Light Nodes are expected to join the network in mid-end 2020.

Regular Node:

Equals a Foundation Node. However “regular” refers to the function of “just” validating transaction in the network vs. the node operator also participating in governance in addition to validating transactions.

Governance Node:

Equals a Foundation Node. However “governance” refers to the additional function of the node operator in network governance.

Operational Stability Node:

Equals a Foundation Node. However “operational” refers to the additional function of the node operator in technical network governance and development.



Fundamentals

Value Proposition

Constellation is the blockchain for big data and connected devices. The infrastructure enables the data economy of tomorrow by allowing a trustless value exchange of high volume data streams. Constellation secures and notarizes any data pipeline from connected devices to machine learning and integrates easily with existing systems like Cloudera or Databricks.

Token Utility

- Token is used to purchase throughput beyond the rate limit
- Token enables data economy by attributing value to processed data streams
- Constellation combines the industry for profit approach with the metrics of a decentralized network by purchasing throughput for enterprise clients on the open market.

Token Overview

Token	Total Supply	Circ. Supply	MarketCap	Price
\$DAG	4,000,000,000	1,116,297,563	4,574,015	\$0.0041
	3,712,000,000			
	*288m tokens removed			



Wallets in Foundation Control

Purpose	Address	Current Amount	Remarks
Validator	0x0EeF872B21cf4cfF3d793731CaEE6512211458F4	1,600,000,000	10 years from Mainnet start
Community	0xf38dDe18b63406a5815d1584334b68BafAbB696F	66,859,000	Distributed when needed
Advisors & Partners	0x4231F1557bc0ad3D810E45AC35fBb3287FF2Cb53	114,474,965	vesting until June 1 2020
Private Sale	0x6120eF25715232Ed048eA8e59103a87ae95839bA	355,889,807	vesting until June 1 2020
Foundation	0x786bde4504f9ea2Df104f593f056CD6e1A11C20a	32,526,146	Illiquid
Foundation	0x103B0055475A758a2b1A232aA734A4Ae0D776b06	501,607,623	Illiquid
Removed	0x0704201907042019070420190704201907042019	288,000,000	Taken out of supply. Illiquid.

Token Model

Purpose	Amount	new %	old %
Private Sale	730,124,835	19.67	18.25
Foundation	764,810,165	20.60	19.12
Advisors & Partners	537,065,000	14.47	13.43
Validator	1,600,000,000	43.10	40.00
Community	80,000,000	2.16	2.00
	3,712,000,000	100.00	
Removed	288,000,000		7.2
	4,000,000,000		100.00

Exchanges

Currently ERC20: Kucoin, IDEX, HitBTC, Hotbit, Bilaxy

After Mainnet Swap: Kucoin

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**Code Repository**

<https://github.com/Constellation-Labs/constellation>

Governance

Off-chain semi-centralized governance that is gradually being handed over to the community as the network grows and stabilizes. Goal is an on-chain governance with cutting edge stakeholder involvement. All nodes validate transactions. Some nodes can be part of the functional groups *Governance* and *Operational Stability*.

Stardust

Each node validator earns DAG tokens for their validation services. Each Node forwards 10% of the earnings as *Stardust* to the Network Governance. This will help fund future initiatives, rewards and grow the Network more independently from the Constellation Foundation faster.

Terms

Periodically we will use the terms Node Operators, Node Validators, Validators, Node Groups, interchangeably.



Node Requirements

Hardware

The requirements to run a Constellation Foundation level node are: Constellation nodes can easily be installed on a machine meeting the outlined hardware requirements: 4 GB Memory, 160 GB Disk, 4 core CPU

Virtual Instances

Alternatively, it is also possible to run a full constellation node on a virtual server instance (AWS,GCP) that meets the hardware requirements for a full node. Recommend minimum viable instances are:

- GCP: n1-highcpu-4 (4 vCPUs, 3.6 GB memory)
- AWS: a1.xlarge (4cpu, 8 GB memory) on demand.
- StackPath SP4

DAG Tokens

- Validator Node: **250.000 DAG** token stake
- Governance Node: Possible stake to be determined in first governance meeting

This process is also known as staking. The DAG amount will be staked in the node's wallet and is a requirement to run a node. The protocol checks at the beginning of each snapshot window if a node holds the minimum required amount of DAG. In case of too few funds the node will be excluded from consensus rounds and therefore the ability to contribute resources and earn validator rewards.



Node selection & Timeline

Selection criteria

We currently have more than 600 individual applications with the potential to run more than 5000 nodes. That means not everyone | will be able to run a node at this early stage.

Yes, we as Constellation will make the initial centralized selection, of who can run a node. The reason is that we need a tightly knit community of early node operators who do not just see this as another investment play, but are willing to actively improve and grow the network.

Selection criteria are:

- Community and project involvement (ideas, discussion, marketing, code etc.)
- Developer skills
- Geographic location
- Experience in the blockchain industry
- Pre-sale token holder
- Length of supporting the company
- Willingness to commit time and effort to building network and governance
- Understanding of the Constellation vision and values

Another aspect is that we may require a KYC/AML check for participating node operators. As we will do a rolling node onboarding process, there are multiple chances to be selected as an operator. In addition to that, we are looking for a globally distributed node placement to ensure the stability and resilience of the network.



Communication

Due to a high number of node requests we will not be able to notify those who have not been selected. However, please be on the lookout as we will reach out accordingly as we continue to onboard more full and lightweight nodes in the onboarding process over time.

Node Cap

As we will continuously onboard node operators the node maximum cap will be changing. The validator rewards model is currently modelled on the basis of a 1000 full nodes.

After the maximum cap is reached we may choose to onboard more full nodes if necessary, or continue with the on-boarding of Light Nodes (Tier 2 and Tier 3). These nodes will be leight-weight nodes and earn less rewards than a full node.

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General Node Onboarding Format

The Draft

One of our long standing goals was to implement gamification and game theory into the governance of the network. Our approach to onboarding nodes/validator groups is the start of implementing this methodology. As such, we will commence onboarding in the form “Drafts”. At this point we have planned two draft phases. The first draft to onboard nodes to the mainnet up to 100 nodes. The second draft to grow the network and implement some gamified elements.

- **Start of Draft #1:** Oct 1 2019
- **No of Batches in Draft:** 4
- **Duration:** 5-6 months
- **Node Operators per batch:** 10-30
- **Max # of Node Operator:** 100
- **Total Nodes:** Limit of 1 node per applicant. Might be expanded later.
- **Cost:** 250,000 \$DAG per node.

- **Batch 0:** Oct. 1 2019 (10 nodes)
- **Batch 1:** Late Oct/Nov 2019 (30 nodes)
- **Batch 2:** Late Nov/Dec 2019 (30 nodes)
- **Batch 3:** Jan/Feb 2020 (30 nodes)

These 100 Node Operators will serve as the foundational nodes of the network. They will also have the responsibility of being trustful and benign actors by regulating the network onboarding other node operating groups, selecting node operators for the future, and implementing rules and regulations to create a fluid community and successful ecosystem. Many of these core responsibilities will fall under the board of governance and maintaining operational stability (see below).

**Draft #2**

The 2nd Draft will commence half way during the year 2020. The rules and process will be determined by the foundational nodes chosen in the 1st Draft. The intention of the 2nd Draft is to introduce light nodes and build out the network even further. Teams will be able to select light nodes to be a part of their team. This goes beyond the 5 core foundational nodes that are a part of each team.

Teams

We will introduce an element of gamification towards the end of 2019 where node operators can join teams and create teams. This will act as alliances and help build stronger trust and reputation in the network. This will ultimately result in access to more information, group coherence and reward opportunities.

We will release more information after the successful Mainnet launch towards the end of 2019.



Technical Onboarding (All nodes)

Intro

While running a node from your home is possible, it's currently not officially supported or recommended setup. It can be difficult to properly expose ports on your computer to the public internet, because home networking equipment like modems and routers often have firewalls blocking these ports, and often home networks do not have a stable IP address. For now, our official recommendation is to use a cloud provider. We have been using AWS and GCP in our internal testing. The partnership with Stackpath will make onboarding in the future very easy.

Installation

Download the the [current release](#) of our node on github. After deploying your instance, you can launch the node via:

```
java "-Dcom.sun.management.jmxremote" \  
"-Dcom.sun.management.jmxremote.port=9010" \  
"-Dcom.sun.management.jmxremote.rmi.port=9011" \  
"-Dcom.sun.management.jmxremote.local.only=false" \  
"-Dcom.sun.management.jmxremote.authenticate=false" \  
"-Dcom.sun.management.jmxremote.ssl=false" \  
"-XX:+HeapDumpOnOutOfMemoryError" \  
"-Xmx2G" \  
-Djava.rmi.server.hostname=$EXTERNAL_HOST_IP \  
-agentlib:jdwp=transport=dt_socket,server=y,address=8000,suspend=n \  
-jar NAME_OF_JAR.jar
```

Where `EXTERNAL_HOST_IP` and `NAME_OF_JAR` are your external IP and the name of the jar, which can be copied and pasted into the command above.



Once your node has been deployed, go to <http://mynodeip:9000> to view the metrics page of the node UI. If you are able to see this

Metric Name	Metric Value
TPS_all	7.96497275140008
TPS limit_60 seconds	8.8
acceptMajorityCheckpointBlockSelectCount_3	3449
acceptMajorityCheckpointBlockUniquesCount_1	3449
acceptCICacheMatchesAcceptedSize	true
acceptCICacheSnapshot	133
activeTps	8
addPeerViaRegistrationSymmetric_success	14
address	DAG2Mj9b88haCWaXs3l8X5f8-r3d5vH2-8X3J9
addressCount	15
balances	DAG29Cw 2000000000000, DAG29HD 2000000000000, DAG1NAP 2000000000000, DAG1uc6 2000000000000, DAG2Mj9 2000000000000, DAG29P8 4000000000000000, DAG3RN4C 2000000000000, DAG5Seq1 2000000000000, DAG6P6.3 2000000000000, DAG6Genx 2000000000000, DAG7QY3a 2000000000000, DAG8Agp7 2000000000000, DAG8N7p 2000000000000, DAG8TX8 2000000000000, DAG8By 2000000000000
balancesBySnapshot	DAG29Cw 2000000000000, DAG29HD 2000000000000, DAG1NAP 2000000000000, DAG1uc6 2000000000000, DAG2Mj9 2000000000000, DAG29P8 4000000000000000, DAG3RN4C 2000000000000, DAG5Seq1 2000000000000, DAG6P6.3 2000000000000, DAG6Genx 2000000000000, DAG7QY3a 2000000000000, DAG8Agp7 2000000000000, DAG8N7p 2000000000000, DAG8TX8 2000000000000, DAG8By 2000000000000
channelCount	0
checkpointAcceptedAlreadyStored	6551
checkpointAccepted	26030
checkpointTpsAccepted	9057
checkpointTpsRemoved	13435
checkpointValidationSuccess	16402
checkpointAcceptedFromSummaryTxs	16402
deleteSnapshot_failure	1
deleteSnapshot_success	79
downloadFragmentsFromSnapshotsSecondPass	0
downloadFragmentsComplete	true
downloadSecondPassComplete	true
downloadedBlocks	4762
downloadedSnapshots	85
duplicatePeerAddressAttempt	14
externalPort	34.94.21.184
genesisAccepted	true
genesisHash	01826c389f14b720b170345429466588896f7425e9746a0a8903ac3956e4
heightCalculationParentEnght_2	22395
heightCalculationParentRate	22395
id	1951da823ee3343c6b778364e8355e0149a0e743451b081e1785a689107a022714e269637444629644aa3e526e936ed11820e87b160361d2
lastSnapshotOfHash	28f644250f7464e958430c27e0c33af556257177172b3461d2a6196d
lastSnapshotHeight	628
lastSnapshot_success	1311
metricsReset	670
minTpsHeight	632
nextSnapshotHeight	630
nodeCurrentDate	2019-09-15T09:19:01.307Z
nodeCurrentTimeMS	156839141307
nodeStartDate	2019-09-15T07:27:30.418Z
nodeStartTimeMS	156832459418
nodeState	Ready
nodeState_success	14
observationService_accepted_size	0
observationService_active_size	0
observationService_inComplete_size	0
observationService_pending_size	0
observationService_unknown_size	0
peerAddFromQueryFailed	191
peerAddFromRegistrationFlow	14

Your node has been successfully deployed. Joining and leaving a cluster can be executed with the following commands.

Join Cluster:

```
curl -X POST http://mynodeip:9001/join -H "Content-type: application/json" -d '{"host": "clusternodeip", "port": 9001}' -v
```

- You'll see peers populate to your node's metrics page



Leave Cluster:

```
curl -X POST http://mynodeip:9001/leave -v
```

- You'll first see the status on the metrics page change to leaving

nodeState	Leaving
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- And then after 30 seconds to Offline

nodeState	Offline
-----------	---------

(Note: Make sure your node's `externalHost` is different than `127.0.0.1`.
Check on your node's metrics page)

Communication

Node setup and operation will require tight communication with the developer team. We have set up a Gitter channel. Each batch will be invited to a batch channel and guided through the process of joining a node cluster.



Governance Onboarding

Each Node fulfills the same validation services on the network consensus. Additional function specific roles are available in the form of: Governance & Operational Stability Node operators. These node operators chose to take on more responsibilities on the governance or technical aspects of the network in addition to pure validation services of the regular Node Operators.

Our aim is to decentralize the network by having a mix of experienced “miners” from other networks, institutional investment firms, media professionals, and experienced technicians. Therefore, at the end of fully onboarding, Constellation is just another node operating group in the mix.

Governance nodes

Initially, the governing board which will consists of 10-30 nodes with a maximum amount of 30 nodes. As part of early node governance the governance board may implement an additional stake for governance nodes.

Responsibilities

- Regulate the Network
 - Onboarding of additional node operating groups
 - Selection of node future node groups
 - Implement rules and regulations to create a fluid community and successful ecosystem
 - Oversight and implementation of the Constitution and Code of Ethics
 - Oversight and funding of initiatives and proposals
 - Stardust wallet custody
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Communication

Interested parties should contact members of the Constellation team or community admins via email or the community channels or the informal ops group members for participation. Participation is based on merit and contribution and the self identification with the values and principles laid out in the Constellation Constitution and the Code of Ethics. The initial informal governance group will vote on the composition of the first formal governance group.

Operational Stability (technical) nodes

There will be an initial maximum of 20 Operational Stability Node Operators. They are technically versed enthusiasts that are willing to contribute on the infrastructure level of the Network in addition to pure validation services of a regular Node validator.

Responsibilities

- Ensure uptime of the network
- Cluster restarts
- Bug hunting (Reporting of issues and errors)
- Ensure security and stability in the network
- Code contributions
- Implementation of approved code amendments

Communication

Please contact the Constellation engineering team, leadership or community admins through email or the community channels if you are interested in participating.

Participation is based on merit and contribution and the adherence to the Constitution. Initially members of the Constellation engineering team and informal governance vote on the participation.



Governance support

In order to support self reliance and governance of the Network, each node validator automatically forwards 10% of their validator rewards as Stardust to the Network Governance wallet (Stardust wallet). This allows for additional funding initiatives that are completely detached from the Constellation Foundation and strengthens the self reliance and governance of the Network.

Constitution & Code of Ethics

The Constellation Network is not a neutral or valueless system. The governance and behavior of all participants is regulated by the Constellation Constitution.

This serves to lay the foundations for a strong value driven governance that is in humility and service to our fellow humans the success of the Network.



Validator Rewards

The distribution of rewards in exchange for time and resources is a common model of decentralized networks. It serves to incentivize network participation, stability and security. The validator rewards are held by the Constellation Foundation in the Validator Rewards Wallet.

Purpose	Address	Current Amount	Remarks
Validator	0x0EeF872B21cf4cfF3d793731CaEE6512211458F4	1,600,000,000	10 years from Mainnet start

Rewards introduce the liquidity increase into the network over a 10 year period and function like Bitcoin with a rewards halvening every 2.5 years. This means early contributors who take the resource risk in contributing to the network get higher rewards than late comers with less resource risk.

Rewards in \$DAG are distributed by the protocol at the end of each finality window (snapshot) in relation to the node tier and reputation score of a node. In an ideal scenario a node performs consensus with the reputation score 0.

The amount per snapshot is the maximum amount available as per release schedule. However the actual amount earned by a node is dependent on the maximum number of nodes present on the network and the participation of light nodes. Light nodes will join the network at a later code release stage in 2020 or 2021 and will have get a % allocation of the overall rewards available per snapshot window. Until then the entire rewards amount is allocated to full nodes.

Our rewards calculation is currently based on a 1000 node network.



Parameters		
Snapshot time	5	min
Hourly snapshots	12	
Total Rewards Pool	1,600,000,00	

Period (years)	Amount/Period	6 months	1 month	1 day	1 hour	per snapshot
1 - 2.5	853,333,333.20	170,666,666.64	28,444,444.44	948,148.15	39,506.17	3,292.18
2.5 - 5	426,666,666.60	106,666,666.65	17,777,777.7	592,592.5	24,691.36	2,057.61
5 - 7.5	213,333,333.30	53,333,333.3	8,888,888.89	296,296.30	12,345.68	1,028.8
7.5 - 10	106,666,666.6	26,666,666.66	4,444,444.4	148,148.15	6,172.84	514.40

Please keep in mind this is a model calculation. The table above does not constitute a contract or an offering. It's function is to show the maximum **theoretically** available rewards amount of \$DAG in per snapshot.

We cannot and will not make any guarantees on the amount of \$DAG that is being distributed by the network at any given point in time. Parameters like the value of \$DAG or the number of nodes in the network and Stardust will change the calculation. Markets can be volatile and development of code and node onboarding can be quicker or slower than originally anticipated.

Utility of \$DAG may adopt faster or slower than anticipated as \$DAG serves as tokenized throughput, tokenized data value and state channel communication mechanism.

Therefore, we leave it up to you the node operator to model the rewards in relation to your specific hardware environment and projected exchange price developments of the \$DAG token.

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Stardust

In order to support self reliance and governance of the Network, each node validator automatically forwards 10% of their validator rewards as Stardust to the Network Governance wallet (Stardust wallet). This allows for additional funding initiatives that are completely detached from the Constellation Foundation and strengthens the self reliance and governance of the Network.

Initial custody lies with the Constellation Foundation and is handed over to the Governance Board once network governance is established in a working manner. The Stardust wallet will be made public once the mechanism is implemented.



Gift a node

As we have announced in our email communication to nodes of batch 0 and 1, there will be an opportunity for nodes of batch 0,1, and 2 to gift a node to friends and colleagues they trust and who they think would be an asset to the network. This will make up Batch 3.



Summary & Outlook

It is not every day that one gets the chance to launch a decentralized network. We are beyond excited that after the long hours of hard work the network is launching in its first release stage.

Thank you so much for your trust and support in Constellation and for embarking on this journey. Together we are launching and developing this network in stages. This is just the beginning and with you as a node operator we will develop and shape many aspects of the network going forward.

The next stages are the onboarding of more nodes as well as hitting the milestones of further release stages that include application support and light nodes going into 2020. In stride with the network growth onboarding of new partners and development of dedicated solutions utilizing the network is being actively pursued.

Onwards & Upwards
The Constellation Team

