Bedrock Solutions

Entity: Name (or first name if applying as a natural person)

Bedrock Solutions

Entity: E-mail address

info@bedrocksolutions.io

Team member introductions

Jay: I'm one of those 40-somethings that grew up around computers. My professional career spans 24 years. During that time, I have worked as a system and network administrator, enterprise software developer, full-stack web developer, and cloud administrator. I am currently the primary developer and administrator for the Go Immutable ANO, and have real-world experience running factomd in production. Over the years, I've programmed in Javascript, Java, PL/SQL, T-SQL, and Python. Prior to working with Factom, I was doing full-stack Javascript development with React and GraphQL. I hold a bachelor's degree from UC Berkeley.

Alex is an accomplished devops engineer with 5 years of experience in designing, implementing and maintaining cloud services, with a focus on scale and high availability. He has professional experience building continuous integration and deployment pipelines to build, test and release software with zero downtime. Alex has managed AWS environments of ~500 EC2 Linux instances, as well as container environments using Google Kubernetes Engine. He has earned a B.S. degree in Integrated Science and Engineering and a minor in Computer Science from James Madison University.

David is an experienced full-stack web application developer. He's on the MyFactomWallet team, and a core developer for the recently awarded On-Chain Voting Protocol Grant. He has served as development lead for a small team tasked with designing and integrating multiple enhancements into a complex budget tracking tool used by the U.S. Veterans Association. He has professional experience in the full range of implementing a software release, including requirements gathering, impact analysis, design, development, testing and deployment. He holds a B.S. degree in Computer Science from James Madison University.

Introduce your Entity/Company

Bedrock Solutions is an infrastructure and application development company. All founders are technically oriented, collectively possessing the skills needed to both administer Factom infrastructure and develop Factom-based applications. Our team is passionate about the emerging opportunities within the Factom ecosystem, and we are involved in multiple Factom-related development projects. These include the administration of a first round ANO's infrastructure, and the development of on-chain voting via the grant system.

Our company is applying to run an infrastructure Authority Node. Our mission as an Authority Node Operator (ANO) is to maintain a robust and highly available infrastructure, and to share our infrastructure for the benefit of the entire Authority Set. This implies collaboration within the ANO community, with the goal of strengthening the entire Factom network. In addition, we will also research and develop new blockchain applications, primarily using cutting-edge JavaScript technologies.

How many nodes do you envision to run on the Factom Community Testnet (or other testnets?)
2

What type of legal structure does your team use?
LLC

Will you operate as an incorporated company?
Yes

If yes to the above, where are you/will you incorporate? Are your already incorporated?
We plan to incorporate in Washington, USA immediately following our election.

Are there any major shareholders (>10%) other than the members in your application?
No

Do you and/or your team members have previous experience running a business or managing large capital? If so, make a short writeup of your experience below.
No

What has your team done to ensure a proactive approach to managing the financial aspects of your business?
We have enlisted the services of the accounting firm Chawla & Chawla P.C. Monthly expenses will be paid out of pocket. Until the market for FCT matures, none will be sold to cover costs. The infrastructure/ANO division of the company will run lean, and we will support ourselves through continued contract and grant work.

Clarify your commitment to the Factom protocol? What have you brought to the table already, and what will you bring in the future?
Bedrock Solutions' mission as an Authority Node Operator (ANO) is to maintain a robust and highly available infrastructure, and to share our infrastructure for the benefit of the entire Authority Set. For Factom to become a global utility, the network needs to scale gracefully; it's not enough to choose higher server specifications. With our skillset, our team is well positioned to utilize new technologies, such as containerization, to bring greater scalability, higher security, and lower costs the entire Factom network. Our infrastructure will be released to the community as an open source "infrastructure as code" framework. This framework will allow anyone to rapidly setup an infrastructure like ours, taking advantage of the collective knowledge within the community. Declaring the cloud deployment as source code helps prevent user errors such as leaving ports open to the public. We will use our framework as a catalyst for discussing best practices between ANOs. We are passionate about infrastructure, and we will explore new technology and share our knowledge and experiences back with the Factom community.

Our team members are working contracts with five ANOs in the current Authority Set. As these contracts come to an end, our company will utilize our position as an ANO to discover additional opportunities for collaboration and grant projects that help build the foundation for Factom. We believe grants are an excellent funding mechanism for ANO projects, because they allow a high level of oversight and scrutiny into how the protocol's funds are spent. We are excited to be on the ground level building things for the Factom ecosystem. Once the demand for work exceeds what our company can provide, we plan to find, train and hire quality developers, and match them with quality projects.

We have been active members in the community since before M3 was released. Jay has been an active contributor in helping debug mainnet crashes. He has also released multiple open source Ansible roles to the

community. Each of us is contributing to the testnet by maintaining updated nodes and debugging issues. We've helped resolve problems on Factom Inc.'s website, and contributed pull requests to the Testnet Wiki. We are deeply involved in Factom projects on an individual level, and we believe we can make an even greater impact if selected as an ANO.

What is your/your entity's motivation for applying for hosting Factom Authority servers?

Bedrock Solutions desires membership in the Factom Authority Set because we have a strong desire to see the protocol succeed, and our knowledge of cloud infrastructure and infrastructure-as-code principles can contribute strongly to its success. We are a technical team, with both infrastructure and application development expertise, and intend to disseminate our knowledge to the community via an open source framework.

All communities are stronger when they collaborate and share, rather than compete and horde. Our vision is to act as a knowledge pipeline: take skills and best practices from the technically savvy ANOs and share them with the less technically inclined ANOs to improve their infrastructure. We believe that as the technical foundation of the protocol grows, more contract and grant opportunities will become available.

Another motivation is that we want to be a Standing Party in order to have a direct impact on ensuring the long term health, decentralization, and vision of Factom. We will continue our commitment to Factom regardless of whether we are granted membership, because Factom is both technically exciting and has tremendous potential to make the world a better place.

What vision do you/your entity have of the future of Factom?

We envision Factom will be integrated with software all over the world as a utility to secure and verify trusted data. Much like TCP/IP have become the default internet transfer protocols, Factom will become the default data integrity protocol. Many competing blockchain solutions offer a promise of a trusted future, but they still suffer from their cost of entry being tied to a volatile cryptocurrency. Working with cryptocurrencies is risky for companies, from both a legal and budgeting standpoint. Factom's unique two-token design circumvents this problem. We believe it is only a matter of time before Factom reaches a tipping point of adoption, and companies all over the world become aware of this incredibly valuable and inexpensive utility. Factom will save companies money in audit costs, and while that's important, we are most excited about a future where people can trust again on an internet that's riddled with fraud, fake news, and ever increasingly believable Deepfakes. The demand for Factom is going to increase over time, and we envision Bedrock Solutions playing a key role in scaling the infrastructure to handle it.

What will your efficiency be with only one node?	**0,55000000000000004**
What will your efficiency be with two nodes?	0,65000000000000002

Node #1 Type	**Virtual Private Server (VPS)**
Node #1 Location (VPS: Provider, Region // Other: Country, City, Datacenter)	Google Cloud Platform us-west1-b The Dalles, OR, USA
Node #1 CPU, Number of cores	8
Node #1 CPU, type & clock-speed	2.2 GHz Intel Xeon E5 v4 2.2
Node #1 RAM, amount in GB	16
Node #1 RAM, scalable if < 24 GB	Yes
Node #1: Storage, RAID type	RAID 1
Node #1: Storage, Disk type	SSD
Node #1: Storage, Free Size in GB for Factom	200
Node #1: Storage, Do you have a separate factom volume/disks?	Docker volume, Separate disk(s), Separate volume(s)
Node #1: Connection & uplink speed (not just your NIC speed)	10 Gbit

Node #2 Type	**Virtual Private Server (VPS)**
Node #2 Location (VPS: Provider, Region // Other: Country, City, Datacenter)	Google Cloud Platform asia-northeast1-c Tokyo, Japan
Node #2 CPU, Number of cores	8
Node #2 CPU, type & clock-speed	2.2 GHz Intel Xeon E5 v4
Node #2 RAM, amount in GB	16
Node #2 RAM, scalable if < 24 GB	Yes
Node #2: Storage, RAID type	RAID 1
Node #2: Storage, Disk type	SSD
Node #2: Storage, Free Size in GB for Factom	200
Node #2: Storage, Do you have a separate factom volume/disks?	Docker volume, Separate disk(s), Separate volume(s)
Node #2: Connection & uplink speed (not just your NIC speed)	10 Gbit

Add any other information relevant to server specifications and hosting, including planned availability of your maintenance team and how you would propose to handle an unscheduled restart.

Since Docker restart policies are currently disabled, a crash of factomd or a reboot of the underlying server means that server will be down and will require manual startup. In this case, transferring the identity over to the backup is generally the correct next step. At this time, a new primary server should be brought up, and once it is synced, the identity should be transferred to it from the backup. Forensic analysis can then be conducted on the failed primary. Once that is completed, the failed server can be destroyed.

As described below, our team will be available via an on-call 24/7 rotation schedule.

Please see the attached documents for detailed diagrams of our node infrastructure.

Which date did you join the Factom community testnet (approximate date is ok)?

4/1/2018

How does your team administer the nodes (more options possible)?

By more than 1 team member

How many people in your team are able to operate the servers (including direct hired personnel, but excluding hired fallback companies)?

3

How many years of combined experience does your team have on running production servers?

10

Could you elaborate on the production servers your team has managed (amounts, OS-types, purpose)?

Alex has extensive experience architecting and maintaining production environments in both Amazon Web Services and Google Kubernetes Engine; the largest being ~500 AWS EC2 instances. He has managed operating systems that consist mostly of Linux distributions including Centos, Ubuntu and Alpine. Alex has managed a variety of server roles including proxy servers like NGINX and envoy, application servers, caching servers (varnish), database servers (MySQL, PostgreSQL) and messaging servers (rabbitMQ). Alex also has experience working with numerous automation and orchestration tools in production including Terraform, Kubernetes, Docker, Helm and Chef.

Jay has run servers during various Internet eras. He has built and administered machines from scratch, assembled server racks, and run clouds on DigitalOcean, AWS, and GCP. Back in the day, he ran his own Sendmail and Bind servers, and hosted the websites of various non-profits. After that, he administered the servers and network for a small manufacturing company of approximately 100 people. More recently, he has run cloud instances for various clients. Operating systems have consisted of either Windows or Linux. Server roles have run the normal gambit, including web, database, accounting, firewall/router, email, and application. Most recently, he has run around a dozen testnet servers and a mainnet cloud for the Go Immutable ANO.

Have you run follower nodes outside the qualified-node pool on the testnet? If so to what effect? Other contributions to the testnet?

Jay: I ran at least a dozen testnet servers. On any given day, I saw that generally ~4 of them would be either federated or audit nodes. It was during this time that I began experimenting with running factomd from an infrastructure-as-code perspective. Seeing the lengthy setup instructions, the last thing I wanted to do was to have to repeat that procedure over and over manually. I created a collection of bash scripts that automate the creation and destruction of the servers, which proved the viability of a code-based approach to running factomd. That codebase was open-sourced. I have since ported that codebase over to Ansible, and am now in the process of open-sourcing that as well.

Alex: I have been running a follower node on the testnet to get hands on experience deploying factomd containers, and develop a deeper understanding of how factomd works.

David: I spun up a new follower node to test an upgrade to Ubuntu 18.04 LTS, and found that there was a reproducible crash when attempting to join the swarm. With help from key community members, we were able to determine that it was due to a bug in docker, which was fixed in a later release. I also contributed GitHub pull requests to improve the Testnet Wiki Documentation.

Have you run any mainnet nodes? If yes, please elaborate why, and for how long

Jay has experience running two mainnet nodes and four backup follower nodes for the Go Immutable ANO. These were launched the day the Authority Set set their efficiencies. We've also run local mainnet nodes to be used by the Factom Enterprise Wallet.

How are you going to make sure your nodes operate securely?

Our team will implement a number of measures to ensure the security of our infrastructure. Both cloud and node-based firewalls will be used to enforce a strict least-privilege network policy. SSH access to the cloud will only be allowed via a hardened bastion host. SSH tunneling will be used, in-lieu of a VPN, to minimize complexity and attack surface. Two-factor authentication will be enforced on all GCP accounts. OSSEC intrusion detection will be run on all nodes. Unattended upgrades will be used to ensure timely security patches are applied to certain servers.

How are you going to make sure you are able to respond quickly?

To ensure that our team is able to properly respond to any maintenance, incidents or unscheduled restarts, our team will implement an on-call 24/7 rotation schedule. We will have first, second, and third tier engineers available at all times. Incident escalations and scheduling will be done by PagerDuty or VictorOps. In addition, all alerts will be sent to our designated Slack/Discord alerts channel. Our team closely follows the Factom Discord chat to stay current on any updates or issues. We will evaluate using community tools such as The Factoid Authority's recently launched Discord bot.

Could you provide a picture on how you would see your ideal auth node infrastructure?

Our ideal Authority Node infrastructure uses best practices such as infrastructure-as-code, disposable infrastructure, blue/green deployments, auto-scaling, and containerization to achieve a highly available and

resilient service. The backup nodes are placed in different regions from Authority Nodes to add redundancy, and are available for disaster recovery operations including the brain swap procedure. The Factom database and configurations are stored on Google SSD Persistent Disks to add high durability and encryption at rest. Automated snapshots of the blockchain are taken at regular intervals. The infrastructure is supported by robust monitoring, logging, and alerting systems to give us insight on the reliability and stability of our services. All administrative processes are scripted and automated when possible. Rather than updating servers in place, the phoenix server pattern is used to destroy and create new servers as needed.

Looking further into the future, we see the factomd process being run in a container orchestration environment such as Google Kubernetes Engine. This eliminates the need to harden and administer an operating system. In addition, most auxiliary cloud services, such as intrusion detection, monitoring, and reporting, would also be moved into containers and run by the orchestrator.

Free-text. Add any additional information deemed relevant.

Add any application supporting files here
https://drive.google.com/open?id=1yuVCa82JQNi-ZVOuoFxTwhoO7hADGMql,
https://drive.google.com/open?id=1NsyUcbMih-1DkpAGqWndOrhcncfjbWgx,
https://drive.google.com/open?id=13NpXbYORk-1uMK32ORyOLu8aK6wcGhnu,
https://drive.google.com/open?id=1h_6mCWwbFH_xNXjYv6pjWenB0DPCnnaX