



Building Innovation Management Ltd

Business Outline for Factom M3
Submission

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1. High Level Summary

1.1. Proposal

Building Innovation Management Ltd propose to host two authority nodes on the Factom network along with four Guard nodes. Building Innovation Management Ltd will use the revenue generated from the sale of produced Factoids to produce a Complete Lifecycle Management (CLM) Platform for buildings which is predicted to produce in excess of 2 billion entries to the Factom Blockchain per annum by Year 5.

During the development phase of the CLM Platform, any tools or technologies with value to the wider Factom community will be released as open source.

1.2. Goals

Within 5 years:

- Building Innovation Management Ltd will be a widely known product within the construction industry, used by at least two national construction companies within the UK for 75% of their projects.
- Building Innovation Management Ltd expect to be specified as a project management tool by at least 5 national construction consultants within the UK on 50% of projects.
- Building Innovation Management Ltd will have completed 5 overseas projects using the Complete Lifecycle Management (CLM) platform.
- Building Innovation Management Ltd expect annual revenue to be approaching \$50m, with 2bn ECs used annually, while saving our customer a combined total of \$500m a year on projects.

1.3. Vision

Building Innovation Management Ltd will offer tools to the construction industry which will significantly decrease the cost of construction through better collaboration, reduction of ambiguity, and lifetime tracking of assets, all backed by a source of truth, Factom.

2. Building Innovation Management Ltd

2.1. Company Overview

Building Innovation Management Ltd is a UK based company with the aim of using the technology of Building Information Modeling throughout the whole lifecycle of all buildings with Factom as a source of truth at the core of what we do.

Building Innovation Management Ltd is owned by four individuals who each bring their unique strengths to the business. English Ben brings years of marketing and sales experience with his technical product management knowledge; Scottish Calum is our resident Factom evangelist, bringing great suggestions for how Factom can fit into every aspect of what we do; Irish Diarmaid boasts a long history of server support in challenging production environments for a massive international manufacturer; Northerner Scott has over a decade of SAAS development experience as a developer and a manager, including many government contracts.

To avoid confusion within this document, Building Innovation Management Ltd will always be referred to as “BuildingIM Ltd” whereas Building Information Modeling will be referred to as simply “BIM”.

2.2. Meet the Team



Ben (@BennyJ)

"My career has been spent working in the construction industry (building technology products such as BMS and security). I have worked as a product manager for the last 6 years in large, blue chip organisations.

I enjoy my role as product manager because it allows me to be part of every department in the business; one day I will be working with sales to secure an order from a customer, another I will be meeting a consultant to sell the benefits of the products I manage, and the next I will be providing technical support to field engineers or design teams. It is through this experience that Calum and I came up with our proposed business idea.

I enjoy my winter sports (skiing and snowboarding), barbecue cooking, and looking after my brood of house rabbits (4 of them)."

Calum (@Kal)

"Throughout my career I have worked in many different areas of business; from marketing, to technical, finance, and commissioning. Currently I work in the construction industry alongside Ben at one of the world's largest Building Technology companies.

Having experience across all aspects of the business is how the idea developed, as I had the unique opportunity to see problems in each area of the business (which had a common root cause).

I have a 1st Class Master's Degree in Electrical and Mechanical Engineering with a keen interest in the applications of new technology.

I enjoy cycling (one summer I cycled from Rotterdam to Istanbul), football (soccer for you Americans), gaming and long walks on the beach thinking about Factom. Regularly could be found lurking in the Factom Slack as Javajuice but my Discord alias, Kal, has been a bit busier with laying the foundations of BIM."





Diarmaid

"I have over 15 years of experience within the IT infrastructure support world, I have worked within agile and small-medium enterprises, but over the past 5 years I have been employed at an international power management company leading a multi-disciplinary team of talented professionals.

My employer has recognised my potential as a leader and placed me on the future leadership course (25 attendees out of 28,000 employees in EMEA).

In my spare time I'm pursuing a Higher Diploma in Fintech to add to my B.Sc. in Business Information Systems and like to keep abreast of technology innovations."

Scott

"I have over 10 years of professional programming experience in the web and SAAS markets, including many government contracts which have required me to gain security clearance in the UK. I have recently been programming using PHP on the Laravel framework and AngularJS (typically with a MySQL/MariaDB database). I'm a massive advocate of git (especially to ensure that teams utilise an appropriate workflow) and GitlabCI to help with automatic testing and deployment of code.

Currently I am taking on a role which involves more system architecture and people management than hardcore coding, but this ties in nicely with my role within the BuildingIM Ltd team.

At university, I achieved a 1st class masters degree in Computer Science and received a number of awards throughout my studies for achieving the highest grades and displaying excellent teamwork.

In my spare time I can be found partaking in a contest of M:TG with colleagues and friends, playing guitar, snowboarding or somewhere in Virtual Reality."



2.3. What is Building Information Modeling?

*"Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition."*¹

To simplify the definition more; a model of the building is created in a computer where simulations of the building's use and lifecycle can be simulated. For an accurate simulation, you need an accurate model, so huge amounts of data about every element (asset) in a building are added to the model to ensure that anything can be simulated (heating/cooling demand, human flow, lift utilisation, evacuation procedures, etc).

There are 4 "dimension" levels of BIM model, named 3D through to 6D². 3D is the minimum level covering the 3 physical dimensions of the building and the assets within it. 4D includes the construction order of the assets in the building; 5D covers costs, both upfront capital and running costs; 6D adds in lifecycle cost for the whole building based on additional data attached to each asset within the building.

2.4. Construction Workflow Solution Platform

The goal of BuildingIM Ltd is to build a SAAS platform we are calling the Construction Workflow Solution (CWS). The CWS platform will allow the importing of the Building Information Model (BIM) into the CWS platform to create a project management tool based on the BIM data. This platform will bridge the gap between the design of the building and the works on site to construct the physical representation of the digital model.

¹ "Welcome to the National BIM Standard - United States | National BIM"

<https://www.nationalbimstandard.org/faqs>. Accessed 20 Apr. 2018.

² "BIM dimensions - 3D, 4D, 5D, 6D BIM explained | NBS." 10 Jul. 2017, <https://www.thenbs.com/knowledge/bim-dimensions-3d-4d-5d-6d-bim-explained>. Accessed 20 Apr. 2018.

The CWS will be accessible via web, mobile, and tablet applications, ensuring that everyone has access to the data they need, at the moment they need it.

Once the CWS platform is established, we will develop the Facilities Workflow Solution (FWS) platform, which will use all the information added into the CWS to create a 6D BIM model for the building.

There are features of the CWS and FWS platforms that exist in other tools within the marketplace, but as yet no platform has brought together all the tools in one place.

2.5. Business Motivation for Authority Node Server Hosting

The motivations of BuildingIM Ltd to host an Authority Set Server on the Factom mainnet can be broken down into several key categories which are outlined below:

2.5.1. Authority Independence

BuildingIM Ltd realise the value of having the Factom protocol as decentralised as possible. If we are relying on Factom to be our single source of truth, we need to help ensure that the Authority Set is as decentralised, and independent as it can be.

We belong to a vertical which no other Authority applications within the Discord have mentioned, so we would be an ideal candidate to increase the decentralisation, independence, and therefore trust of the protocol.

2.5.2. Authority Set Reliability

It is crucial to our business that the Authority Server Set have near perfect uptime regardless of the crypto-economic conditions which exist at any one period of time. BuildingIM Ltd will be a revenue generating company by selling its own service, therefore we are not as exposed to any potential price swings in the value of Factoids; this is not true of all Authority Server Set applicants.

The protocol is so critical to what we want to achieve that if the price of Factoids were to drop to a point where running a server becomes unsustainable from selling Factoids alone, we would attempt to subsidise the

server network through above market-value purchasing of Factoids until such times that the price of Factoids rises to a sustainable level.

2.5.3. Product Quality Assurance

As we will be looking to revolutionise the way in which contractors think about their building, the platform has to be as smooth and easy-to-use as possible to minimise any resistance to this transition; therefore the quality of our initial release is paramount in our eyes.

At BuildingIM Ltd, we recognise that the development of a quality, easy-to-use SAAS platform will require a substantial amount of both time and money. This is the reality of building a SAAS platform from the ground-up and a reality that we accepted when we took on the challenge of developing our Construction Workflow Solution (CWS) platform.

Having a consistent source of revenue with which to develop the platform takes away many of the problems when looking to raise money from other avenues such as seed-funding (where the pressure to release often takes precedence over the quality of what is being released) and start-up loans (where high interest rates and immediate repayments can stifle development).

2.5.4. Speed of Development

We believe that this platform is something required within the Construction Industry and can help to decrease the many inefficiencies, remove avoidable reworks, and fix the many Health and Safety violations that occur on every site. In addition, we are committed to developing this tool with the Factom Protocol at its core as a source of truth. With a regular source of income from the Authority server, the speed of this development would increase to a rate which would put BuildingIM Ltd years ahead of the original business plan.

Of course, the faster that we can build the platform the quicker that we can start onboarding construction projects and begin to burn ECs. We believe the spread of the CLM platform will be exponential for the first few years as the savings of using the platform are realised. With a server funding the development early in the cycle, the launch of the product will be sooner, and usage of the Factom Protocol will increase earlier than expected.

2.5.5. Industry Exposure

As a construction technology company we will be bringing the Factom protocol to one of the largest industries in the world. This will undoubtedly spawn further ideas as to how the protocol could be utilised within this sector.

We see the spread of the protocol to different industries as essential to the long-term outlook of Factom and BuildingIM Ltd wish to be the company to bring construction into the network.

3. Factom Implementation

A selection of the features, and their implementation of Factom is listed in this section.

3.1. Auditable Asset Tracking

Recently there has been huge growth in the use of BIM models in the construction industry using open format files; it is now possible to import a model into a tool and produce an asset list for the building that is to be built. BIM models also carry multiple layers of data about each asset, including their physical size, current draw, colour, and even their upstream and downstream devices.

For the BuildingIM Ltd Construction Workflow Solution (CWS) platform, we will import the BIM model and create a list of the assets contained within the model. Each asset in the list will have a chain created on the Factom blockchain, and future changes to that asset will be tracked against the chain, giving a full history of every change made to an asset.

3.2. Real-Time Project Tracking

After an asset list is created from the BIM model, project managers can track the status of the project in real-time based on the number of assets completed for each package of works (building fabric package, electrical package, mechanical package, etc).

Construction workers will mark an asset as in one of several defined states for the project (e.g. "in progress", "tested", "awaiting sign off", "handed over", etc).

Each state change of an asset will be stored in the project database and factomised.

3.3. Auditable Proof of Payments

Once sign-off for an asset or package has occurred, notifications can be sent to accounts payable departments requesting payment for the completed works. This request will be stored against the relevant Digital IDs on the Factom Blockchain.

On completing the transaction, the accounts payable team will enter the transaction number into the BuildingIM Ltd Construction Workflow Solution (CWS) platform, and another entry will be made in the chain.

Finally, the payment recipient will confirm that the payment was received. By tracking all these points within the payment process, we can assist companies in proving there are outstanding payments, or proving that payments were made in the event of a dispute with Factom as the source of truth.

3.4. Auditable Chat History

Every conversation topic regarding any asset or package can be recovered from the chat history stored in the BuildingIM Ltd databases and verified against the hash entered in the Factom Blockchain. This method ensures that all parties can be sure that the text they are seeing is the original information without modification.

A truthful audit trail of conversations would be of great help during contract disputes such as poor installation, products not meeting specification, late completion of works, and other issues.

3.5. Document Control

Every part of the construction phase requires drawings and documents to be produced. Many problems are caused during construction by multiple contractors working to different versions of documents.

BuildingIM Ltd plan to avoid the issues of document version control by creating a Factom chain for each document, holding each document on the BuildingIM Ltd server, and informing all users that have accessed the document that a later version is available. It will also be possible to set up document approval mechanisms within the Construction Workflow Solution (CWS) platform.

Before building these features ourselves, we will evaluate and discuss use of the Harmony document system offered by Factom Inc.

4. BuildingIM Ltd Product Development

4.1. Product Development Plan

The BuildingIM Ltd Construction Workflow Solution (CWS) will be built on a microservices architecture. This gives complete separation of the frontend and backend allowing for concurrent development. This also allows for better consumption of these services later, lending itself more readily for conversion into mobile applications and our external services passing and receiving data.

The backend will be built as an Application Programming Interface (API) which would initially be consumed by the frontend web system. This would also later be consumed by the Mobile Application allowing for on site use of the CWS platform by a wider range of devices.

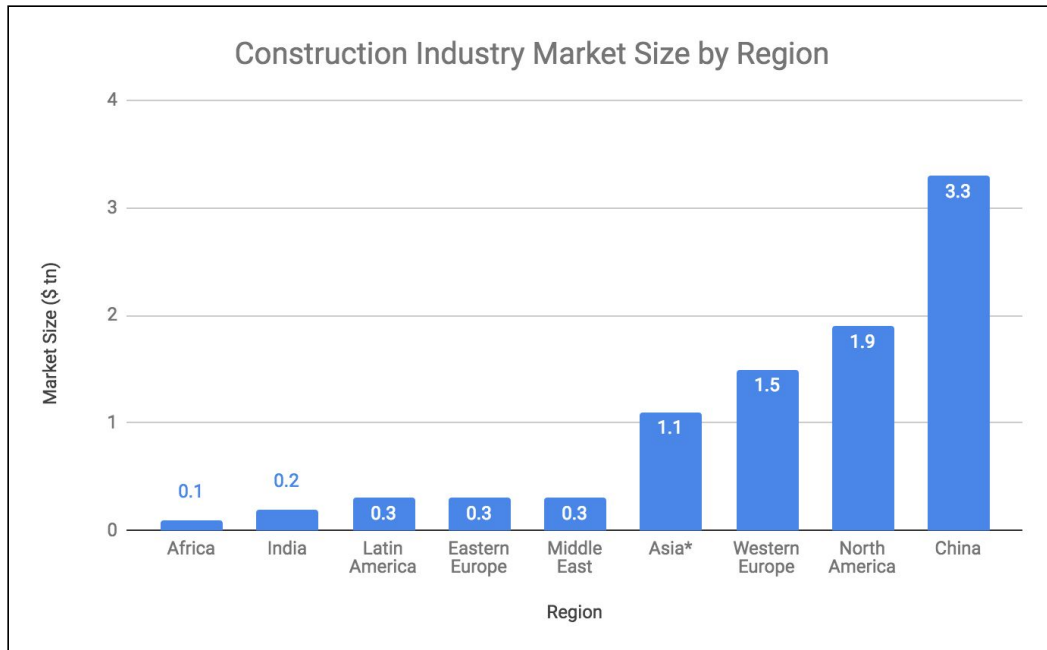
We plan to build the core backend API on the latest Lumen framework for PHP, which is a version of the acclaimed Laravel framework which has been optimised for fast server response times. This naturally lends itself to a MySQL or MariaDB database.

We have chosen one of the most interesting frontend frameworks under full support (React) because of the large number of skilled developers in the market. We expect React Native to be suitable for the mobile application development, lowering the learning curve for the developers and shortening the time to market.

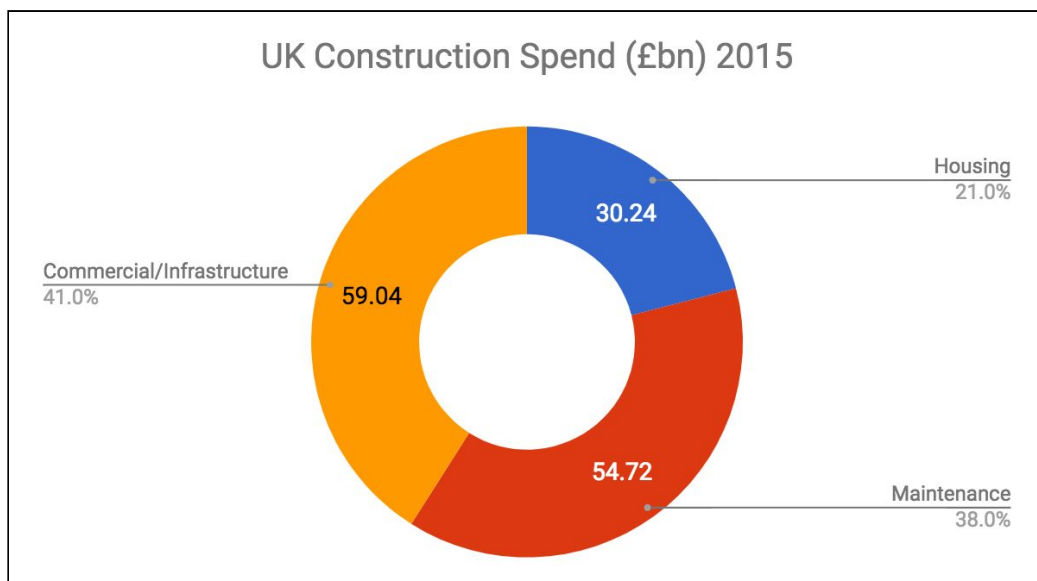
5. Construction Market Analysis

5.1. Market Size

Globally, the construction market is worth \$9tn per year, or 11% global GDP.



We at BuildingIM Ltd have global aspirations, but for launch we will concentrate on the UK market, which is estimated at £141m³ (\$180m). Our target market is commercial and infrastructure construction, which makes up 41% of the UK market.



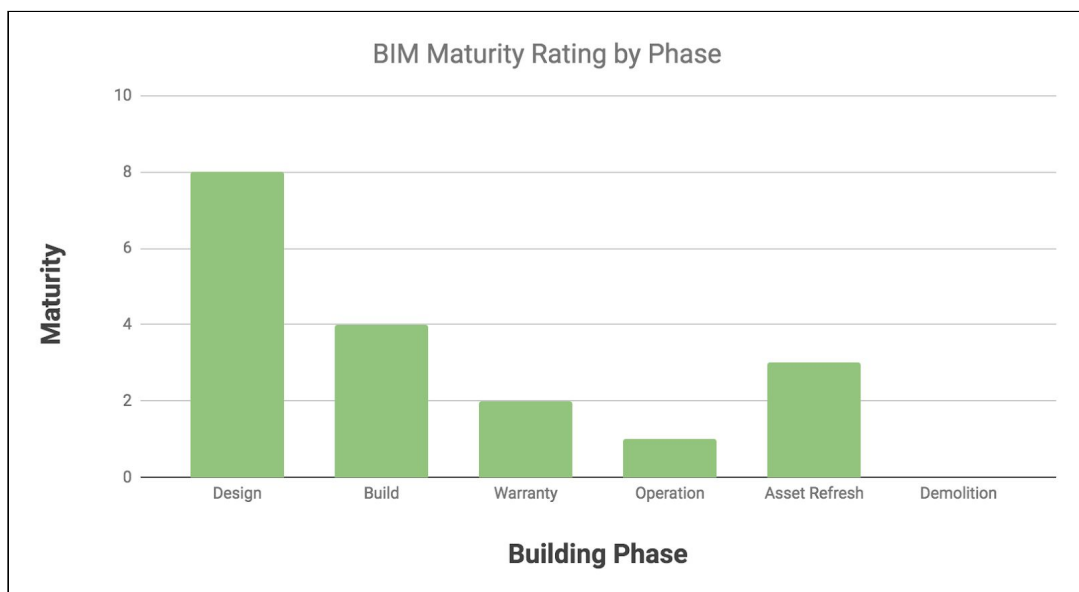
³ "Construction Industry in the UK - Statistics & Facts | Statista."
<https://www.statista.com/topics/3797/construction-industry-in-the-uk/>. Accessed 20 Apr. 2018.

5.2. BIM Maturity

Since the 4th April 2016, the UK government has mandated that all construction projects procured centrally should use BIM maturity level 2⁴. This involves creating 3D models, including services (such as water, electricity, air handling, lighting, etc) of the whole building which all contractors can work from.

At this time, BIM is being used widely during the design phase, and is regularly used by site management teams. This level of maturity decreases once the project reaches the on-site contractors because their work is simplified into 2D plan drawings and their work list is reduced to a Gantt chart.

BIM has not yet made it to the facilities management world despite the huge benefits. This is because the construction phase breaks the chain by not feeding information from the construction phase back into the model to create 5D and 6D BIM models of the final building.



⁴ "FAQs | BIM Level 2." <http://bim-level2.org/en/faqs/>. Accessed 20 Apr. 2018.

5.3. Opportunities

BuildingIM Ltd plan to bring BIM information into the construction site, connecting the digital building with its physical representation in the real world. By making this connection, BuildingIM Ltd will allow building owners, construction companies, and facilities management companies to achieve significant savings on the cost of construction and maintenance of their real estate asset.

Below are a number of case studies showing how different parts of the BuildingIM Ltd Construction Workflow Solution (CWS) platform can reduce costs when used in isolation. It is not possible to show the benefits of all of the features BuildingIM Ltd plan to implement because the individual tools have not been studied in detail before. We plan to implement these features and many more to achieve an estimated saving of 10% across the construction and maintenance phases of the project.

NEWS
STUDY SHOWS 7% COST SAVING ON DIGITALLY SHARING INFORMATION
30 OCTOBER 2017 | BY BIM+ STAFF
Research supported by the Danish government shows cost reductions of up to 7% by using a digital communications platform on large-scale construction projects.
"WE NOTICED COST REDUCTIONS OF 2-3% ON THE CONSTRUCTION PROJECT AND WE
0 Comments

5

HS2 PUTS BIM AT HEART OF DELIVERY
£250M SAVINGS IDENTIFIED
22 OCTOBER 2014 | BY WILL MANN

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⁵ "Study shows 7% cost saving on digitally sharing information | BIM+."
<http://www.bimplus.co.uk/news/study-shows-7-cost-saving-digitally-sharing-inform/>. Accessed 20 Apr. 2018.

⁶ "£250m savings identified | BIM+."
<http://www.bimplus.co.uk/news/hs2-puts-bim-heart-delivery-250m-savings-are-ident/>. Accessed 20 Apr. 2018.

The powerful templating functions allowed for a standardized approach to scheduling of room data and a control of the base content of rooms. This also allowed for rapid development of a project room datasheet baseline. The reporting functions within dRofus allowed for tracking of changes and control of workflows once these baselines had been agreed.

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5.4. Contacts

In the UK, the construction industry is structured around construction consultants being the first point of call for prospective building owners. BuildingIM Ltd's strategy to secure customers for the Construction Workflow Solution (CWS) platform is through construction consultants specifying the platform and selling the cost saving benefits to the building owners.

BuildingIM Ltd have secured the support of four experienced business development managers (BDMs) within the construction industry through existing relationships with said BDMs. On average, these BDMs have 20 years experience meeting with consultants and understanding their needs. With the help of these BDMs, we have established a 'hit list' of 10 top consultant practices we can secure meetings with in the first 3 months after the platform reaches demo stage.

Once the CWS platform is specified by the consultants, engagement with construction companies (master contractors) will follow during the tendering phase for the project. Sub-contractors will then be forced by the master contractor to use the CWS platform by mandating that payments are only made after a task is signed off within CWS. By using this method we will ensure all contractors on the project uses CWS.

BuildingIM Ltd have also started discussions with facilities management employees to define the scope of the Facilities Workflow Solution (FWS) platform.

⁷ "ICC Sydney | dRofus." <http://www.drofus.no/en/projects/icc-sydney.html>. Accessed 20 Apr. 2018.

6. Factom Community Contributions

6.1. Factoid Efficiency

BuildingIM Ltd commits to achieving an authority server efficiency of 50% for the first 12 months. This percentage efficiency will be reviewed every 12 months based on the performance of the Factom network and of BuildingIM Ltd. It is BuildingIM Ltd's desire to slowly increase the efficiency of our servers as our business grows, allowing the Factom Federation to make more grants and drive more traffic to the protocol.

To be clear, we do not see a reason at this stage why we would change our server efficiency within the first 12-month period, however it is prudent to mention the hazard that is Factoid devaluation.

If there was a large, rapid devaluation of Factoids within the first 12 month period, it may become untenable to continue with the current efficiency level and still cover the costs of running the servers. In this instance, BuildingIM Ltd would use funds contributed by the owners of BuildingIM Ltd instead of offloading stored Factoids (creating further downward pressure on the price). BuildingIM Ltd will continue to cover the shortfall in operating costs while in discussion with the Factom community about solutions to the problem of devaluation.

6.2. Servers

Due to the highly data intensive nature of our core business at BuildingIM Ltd, our use of IT infrastructure will be greater than just the infrastructure needed to host the Authority and Guard servers. Therefore, we will offer the community additional servers for running VMs, testnet servers, or other duties. The amount of server resource available to the community will be pegged at a minimum of 5% of the AWS spend used for hosting the authority nodes, Guard nodes, and BuildingIM Ltd servers for the first 12 months. The percentage will be reviewed every 12 months to ensure a balance between the needs of the community and BuildingIM Ltd is achieved.

6.3. Development

BuildingIM Ltd are not solely focused on developing solutions for the Factom Protocol; we are much more focused on delivering usage of Factom directly from our business proposal. The solutions which we use and develop will be

targeted at real-world situations and therefore immediately applicable and marketable as such.

BuildingIM Ltd believe we can offer a greater value to the protocol by producing an application built upon Factom within the construction market, instead of developing APIs and frameworks for the protocol.

In line with this focus on real-world development, we have identified several key technologies which we will need to develop for our business plan:

- 1) Development of a GDPR compliant digital identity.
- 2) A provably correct instant messaging service, which we are calling “Hashed Chat”.
- 3) Qualification Certificate Issuing backed by Factom.

Once these features have been fully developed we will open source them under the terms of the MIT license. With these features released, a key strategic goal of ours will be to help construction certification authorities to issue their certificates using Factom as the source of truth. The addition of certification authorities to the Factom ecosystem will increase the visibility of Factom within the construction vertical.

6.4. Developer Time

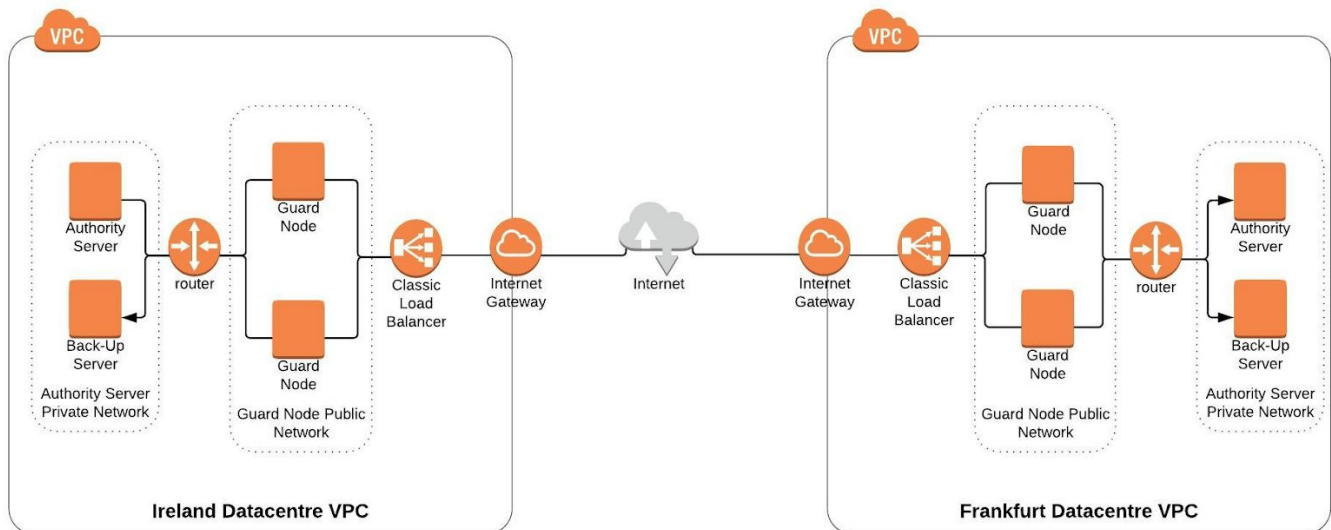
Once the development of the Construction Workflow Solution (CWS) platform has reached V1.0.0 (circa 12 months), 5% of developer time will be spent on developing libraries and frameworks to further the Factom Protocol. This developer time will be used on projects suggested by the internal team, or on assisting other teams within the Factom network with their projects.

We stress that we are aiming to be a global SAAS company and as such we will be employing a significant number of developers. We will make the time that our employees spend on development of the Factom protocol completely auditable through use of Factom itself.

If at any time we fall below this standard we will increase the efficiency of our Authority Server division to make up for the shortfall.

7. Factom Servers

The diagram below shows the BuildingIM Ltd suggested network arrangement for our Authority Node set.



7.1. AWS Authority Servers

We will be hosting each Auth node that we receive on an AWS EC2 m5.2xlarge instance. The specifications for these servers exceed the requirements of the Factom Community Document: ***“Doc 003 - Authority Server Minimum Specifications”***. The specifications we will be using are documented here for completeness.

Specification metric	M5.2xlarge specification	Score from Minimum specifications document
CPU Cores	8	15%
RAM	32GB	30%
Storage Type	SSD	25%
Free Disk Space	200GB	8%
Separate Disks	Yes	2%
Uplink Speed	2,120Mbps	10%
Total		90% (of 90%)

Other metrics have been listed within the ***“Doc 003 - Authority Server Minimum Specifications”*** document, but these metrics were not assigned scores. We have listed these metrics below for completeness:

Specification metric	M5.2xlarge specification
CPU Speed	2.5GHz
Storage IOPS	600
Storage RAID Type	RAID 1

In addition, we will implement 2x Guard nodes for each authority nodes run by BIM. This is to improve the security of the Authority Servers from cybersecurity issues such as DoS attacks.

To keep latency down for the customers of the BuildingIM Ltd Construction Workflow Solution (CWS) platform, we have chosen AWS regions that are geographically close to where we perceive our largest customer base to be. These areas are the UK and Germany due to our existing relationship with these markets. We have also decided to use these two AWS regions for our Authority Servers to minimise complexity within our management process.

We would also be happy to relocate our server to another region within the AWS EC2 network if the Factom network ends up with a cluster of Authority Servers that they wish to separate geographically.

7.2. AWS Guard Nodes

BuildingIM Ltd has followed the discussion about Guard nodes closely on the Discord group, but is still awaiting a technical description of Guard nodes to follow for our AWS instances. BuildingIM Ltd commits to run two Guard nodes per Authority Server as an added level of protection from DoS attacks once the technical details are agreed.

To allow for financial planning and network design, BuildingIM Ltd have specified Guard nodes with the same specification as the Authority Servers. BuildingIM Ltd are happy to change once the agreed upon specifications for Guard nodes have been published by Factom Foundation.

7.3. AWS Server Administration and Support Plan

BuildingIM Ltd recognise that one of the main criteria for running an Authority Server and ensuring the success of the M3 roll-out will be down to the response of the Authority Server Operators to any unexpected changes, organised network restarts and protocol updates.

BuildingIM Ltd proposes the following steps to ensure that we will be among the top performing servers for response:

- The team will customise the monitoring script from Factoid.org, to create a custom Auth-Server alarm for periods when they are asleep, thus ensuring that we know instantly there is an issue.
- Implement AWS CloudWatch basic metrics and custom metrics to ensure any issues with the server resource use (basic metric) or Authority Server (custom metrics) will be logged and users alerted.
- Employ a 24-hour cloud monitoring service on 15 minute SLA for the first 3 months of the mainnet launch, after which the SLA will be re-evaluated.
- A rostering system will be used to ensure that a team member will be available to access and update the Authority Servers 24/7 in case of an unscheduled restart.

During their rostered period, the nominated team member **MUST** have their phone on loud, have the custom Auth-Server alarm nearby and also have secure access to the internet.

- The team will ensure that every business owner and in-house development team member is capable of operating and updating the Federated Servers through periodic training (updating to latest git build, brain transplants, configuring IP settings, updating firewalls etc.). This training will be performed on the Testnet Servers/nodes run by BuildingIM Ltd.
- The team will run response drills where the Auth Server alarm will be activated and the response time recorded (this will be randomised through a python script).

- Reviews after each drill will take place in order to incrementally improve our processes. The response time of each drill will be factomised and openly viewable for inspection.
- The team recognises the criticality of the first weeks of the mainnet M3 launch therefore in addition to a rostering system the team have booked annual leave from their day jobs during the initial 2 weeks of mainnet launch.