GBBP Node Setup (including Raspberry Pi)

The GBBP Hub Besu Blockchain is composed of an Azure Docker-based minimum blockchain core (boot node, three validator nodes, block explorer and Prometheus and Grafana dashboards) hosted on a single Azure virtual machine (VM). GBA members are able to attach to the blockchain using any cloud provider (AWS, Azure) or local machine/operating system (Apple/MacOs, Linux, Raspberry Pi, Windows). The Hub core is located at [**52.242.123.224**](https://portal.azure.com/#)and supports the following standard Besu ports and functionality:

* Besu Bootnode address: <http://52.242.123.224:30303>
* JSON-RPC HTTP service endpoint: <http://52.242.123.224:8545>
* JSON-RPC WebSocket service endpoint: [ws://52.242.123.224:8546](httpsws://52.242.123.224:8546)
* Web block explorer address: <http://52.242.123.224:25000/>
* Prometheus dashboard address: <http://52.242.123.224:9090/graph>
* Grafana dashboard address: [http://52.242.123.224:3000/d/XE4V0WGZz/besu-overview?orgId=1&refresh=10s&from=now-30m&to=now&var-system=All](http://52.242.123.224t:3000/d/XE4V0WGZz/besu-overview?orgId=1&refresh=10s&from=now-30m&to=now&var-system=All)

Any type of Besu node (expecting IBFT2 consensus) owned by a GBA member may be attached – but the GBA specifically provides instructions, software and support our own Docker-based configuration that runs on Linux (Debian 10 for Raspberry Pis or Ubuntu 18.04 for all others). Windows machines can easily run Ubuntu by installing the Windows Subsystem for Linux (WSL2) per Microsoft’s instructions (<https://docs.microsoft.com/en-us/windows/wsl/install-win10>). Instructions to install the GBA’s standard configuration are shown below and the GBA will also be selling and shipping Raspberry Pi SSD storage cards with the software already loaded and configured.

***If a GBA member wishes their node to be a blockchain validator (strongly recommended), it is required that it be connected to the blockchain 95%+ of the time. In order to maintain security and prevent forks, Besu blockchains do stop producing blocks once a certain percentage of validators are offline.***

1. Buying and Assembling a Raspberry Pi
2. Setting up the SSD Card with the GBA Software (Raspberry Pi & no GBA card only)
3. Setting up Port Forwarding
4. Installing Docker, Docker-Compose and the GBA Software on Windows
5. Installing the GBA Software on Linux Machines
6. Testing the Installation (all machines)

# Buying and Assembling a Raspberry Pi

As stated above, GBBP node can be hosted on virtually any machine or platform. The GBA only recommends the Raspberry Pi due to its low cost.

1. The recommended version is the ***CanaKit Raspberry Pi 4 4GB Starter Kit - 4GB RAM*** which can be purchased from Amazon.com for USD $99.99 (<https://www.amazon.com/gp/product/B07V5JTMV9/ref=ppx_yo_dt_b_asin_title_o00_s00>).   
   ***WARNING:*** Do NOT get a version without a fan!
2. Some form of data storage is also necessary – either a hard disk or an SD card. The GBA will be selling SSD cards pre-loaded with the GBA software at cost, if desired. If you wish to buy your own, the GBA recommends a 256GB card in the $25-35 range (e.g. <https://www.amazon.com/Micro-Center-256GB-Adapter-Memory/dp/B07K81C9XN/ref=sr_1_7_sspa>). We \*are\* aware of off-brand cards with 1TB storage in this price range and lower as well, but the reviews have been terrible.
3. You will also need a monitor and keyboard/mouse to set up the Pi and the GBBP Node but they are not necessary for operation so you can always borrow them from another computer or buy a cheap wireless mouse/keyboard (~$15) and use any TV that has an HDMI port.
4. The instructions in the included ***Quick-Start Guide*** (<https://www.canakit.com/pi>) are fairly good but the YouTube video at <https://www.youtube.com/watch?v=7rcNjgVgc-I> is excellent. First time assembly is likely to take half an hour but could be done in ten minutes once you know what you are doing. Rather using the NOOBS SSD card, we will be using an SSD card with the GBA software that includes a 64-bit operating system. The NOOBS SSD card can be used to test that the Raspberry Pi is functioning correctly, but it is not necessary.

***IMPORTANT:***

1. To avoid data corruption, always shut down properly (either select Menu/Shutdown from the GUI or enter **sudo shutdown –h now** from the terminal) ***before*** turning off the power.
2. Sometimes the Raspberry Pi loses connectivity to the wireless router and internet. If you get an error like ***no wireless interface found*** or the wireless icon turns into an X enter the following command from the terminal to fix it:

**sudo dhcpcd –4**

# Setting up the SSD Card with the GBA Software (Raspberry Pi only)

This step is not necessary for those who have bought the pre-loaded SSD card from the GBA.

1. Download the GBA software (a 64-bit OS image with all of the GBBP node software pre-loaded) from <https://github.com/GovtBlockchainAssoc/GBBP/RaspberryPi>.
2. Follow the instructions in Appendix 2 – Imaging a MicroSD Card in the Raspberry Pi ***Quick-Start Guide*** that you used above.

# Setting Up Port Forwarding

Besu nodes use port 30303 to communicate. It is likely that this port is not open between your node and the Internet. If your node is behind a business firewall, you will have to modify its configuration so that the port is open. If you have your node at home, you will have to configure the router that connects you to the Internet. Normally, this can be done quite easily from the app provided by your Internet provider. Googling the phrase ***port forwarding <your internet provider>*** (e.g. “port forwarding xfinity”) should lead you to instructions telling you how to do so (e.g. <https://www.xfinity.com/support/articles/xfi-port-forwarding>).

# Installing Docker, Docker-Compose and the GBA Software on Windows

1. You are going to want/need a good text editor. Download and install ***Visual Studio Code*** from <https://code.visualstudio.com/docs/?dv=win> .
2. Add the Remote-WSL extension so that you can edit in WSL and add the Docker extension to facilitate creating, managing and debugging Docker applications.
3. From Windows, download the Docker Desktop Installer from <https://hub.docker.com/editions/community/docker-ce-desktop-windows/>
4. Run the installer you just downloaded
5. Start Docker Desktop
6. Switch to WSL2 and add permission to run the Docker daemon

**sudo chmod 666 /var/run/docker.sock**

1. Use the command **code** to open ***Visual Studio Code*** in WSL2
2. Use ***Visual Studio Code*** to open the file ~/.docker/config.json and add an underscore to line 2 to change {"credsStore":"desktop.exe"} to {"\_credsStore":"desktop.exe"}
3. Test the installation

**docker run hello-world**

1. Download the GBA software

**curl –o- https://github.com/GovtBlockchainAssoc/GBBP/Windows**

1. Run the install script

**./GBAInstall.sh**

# Installing the GBA Software on Linux Machines

1. Download the GBA software

**curl –o- https://github.com/GovtBlockchainAssoc/GBBP/Linux**

1. Run the install script

**./GBAInstall.sh**

# Testing the Installation (All Machines)

1. Determine your machine’s IP address

**hostname -I**.

1. From any web browser, open the Grafana Dashboard for your machine http://<your ip address>:3000/d/XE4V0WGZz/besu-overview?orgId=1&refresh=10s&from=now-30m&to=now&var-system=All