Monitoring Raspberry Pi

eG Innovations Product Documentation

www.eginnovations.com

Total Performance Visibility

Table of Contents

Table of Figures

Chapter 1: Introduction to Raspberry Pi Monitoring

The Raspberry Pi is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. So versatile is the Raspberry Pi, that it can be used to power homemade robots, serve as a home theater PC, and even operate as a Web server that can rapidly serve web pages.

This means that even the slightest dip in the performance of Raspberry Pi - be it a hardware failure or a resource contention at the OS-level - can adversely impact user experience with the device and all the applications powered by it. To avoid this, administrators should continuously measure the performance of the device, instantly detect anomalies, and fix them before users notice. This is where eG Enterprise helps. eG Enterprise notifies administrators of abnormalities in device performance, so that they can promptly intervene and do the needful to resolve them.

To enable full-stack monitoring of Raspberry Pi covering its hardware, operating sytem, network, and processes, eG Enterprise offers two specialized monitoring models. These are, namely:

- **Raspberry Pi Device model**: This model is used to determine the overall health of the operating system of Raspberry PI.
- **Raspberry Pi System model**: This model is used to determine the health of the hardware components of the Raspberry Pi.

This document will discuss about each of these models.

Chapter 2: How Does eG Enterprise Monitor Raspberry Pi?

eG Enterprise monitors Raspberry Pi using an agent- based approach. For this purpose, you need to install an eG agent on your host system. This eG agents runs native Linux commands on Raspberry Pi to pull the desired metrics.

The broad steps for monitoring the Raspberry PI using eG Enterprise are as follows:

1. Manage the Raspberry Pi System using the eG admin interface;
2. Manage the Raspberry Pi Device using the eG admin interface;
3. Configure the tests for both the components.

The sections to come will discuss about the tests mapped to Raspberry Pi System.

2.1 Managing Raspberry Pi System

To manage the Raspberry Pi System, do the following:

1. Log into the eG admin interface.
2. Follow the Components -> Add/Modify menu sequence in the **Infrastructure** tile of the **Admin** menu.
3. In the **Add Components** page that appears next, select *Raspberry PI System* as the **Component type**. Then, click the **Add New Component** button. This will invoke Figure 2.1.

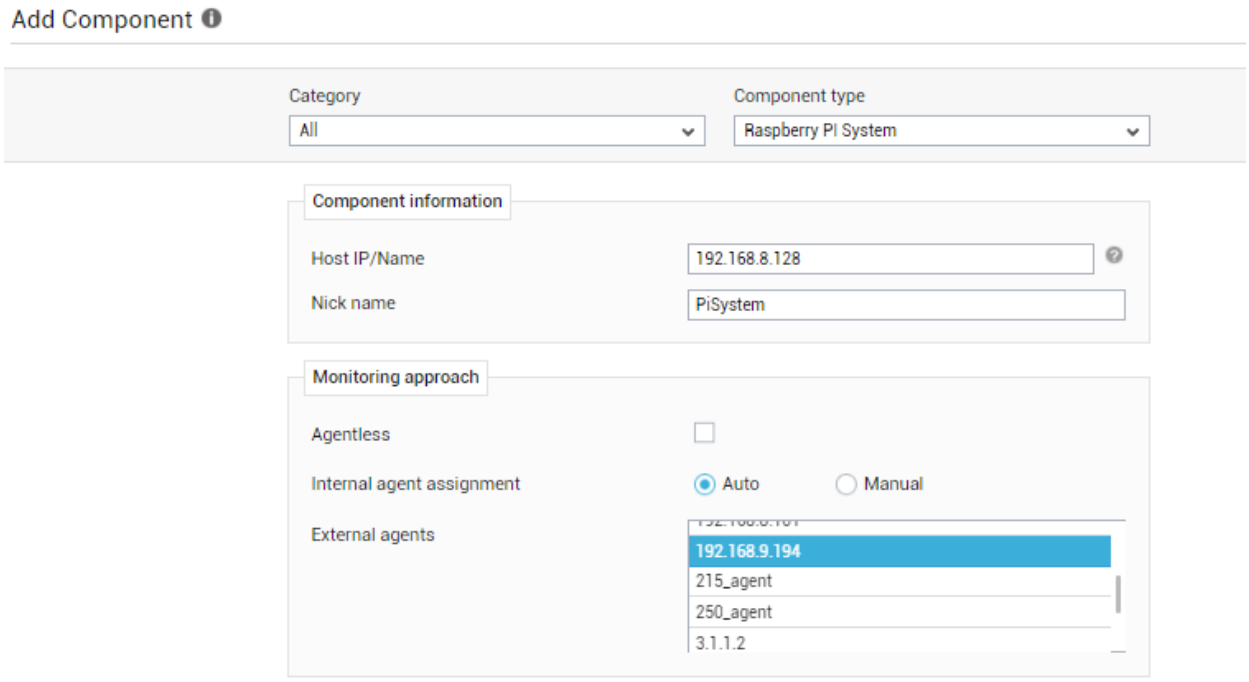

Figure 2.1: Adding the Raspberry Pi System

4. Specify the **Host Name** and **Nick name** for the Raspberry Pi System.
5. Select the **Internal Agent Assignment** type as '*Auto*' or '*Manual*'.
6. Next, assign a **External Agent** to the component.
7. Finally, click the **Add** button to add the Raspberry Pi System to the eG Enterprise system. Components manually added will be automatically managed by eG Enterprise.

2.2 Configuring Tests

Once the Raspberry Pi System is managed, do the following:

1. Follow the Components -> Add/Modify menu sequence in the **Infrastructure** tile of the **Admin** menu.
2. Select the **Show managed component types** only check box and then select the *Raspberry PI System* component under **Component Type** list box. Then, the record appears in the grid as shown in Figure 2.2.

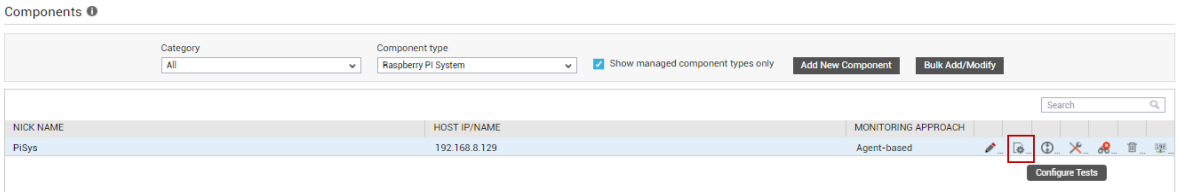

Figure 2.2: Managed Raspberry Pi System record

3. Select the Configure Tests icon as shown in Figure 2.2 in the grid to configure the tests mapped for the component. This will invoke Figure 2.3 listing all the configured tests for the Raspberry Pi System. By default, the tests corresponding to this component are automatically configured.

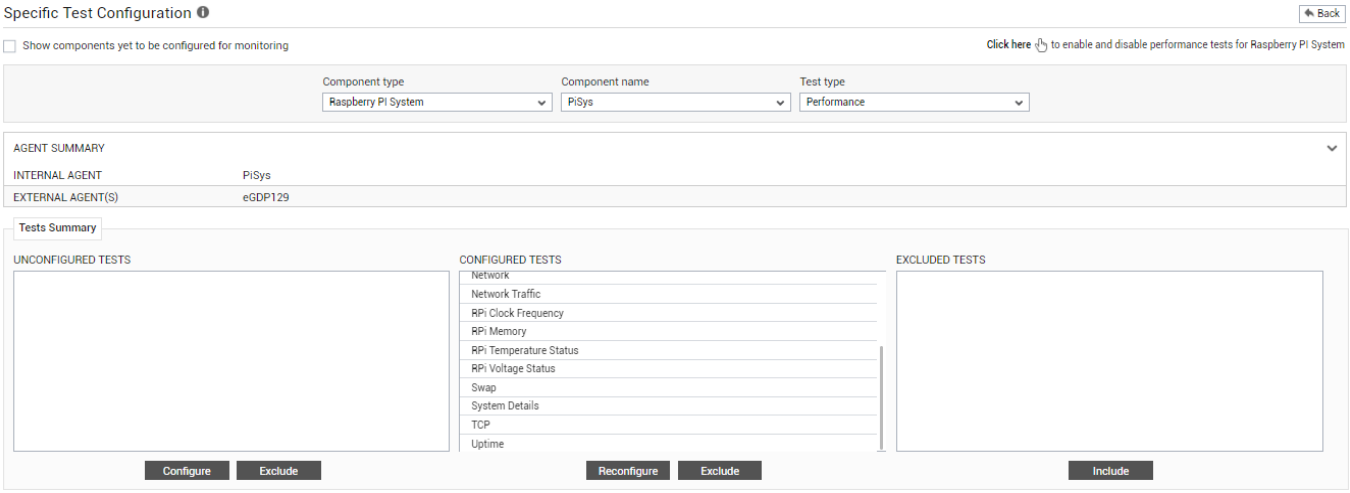

Figure 2.3: The list of configured tests for the Raspberry Pi System component

Click on any test to view the configuration details or to reconfigure it. To know more details on configuring the tests, refer to **Monitoring Raspberry Pi System**.

Once the test is configured, sign out of the eG admin interface.

2.3 Managing Raspberry Pi Device

To manage the Raspberry Pi Device, do the following:

1. Log into the eG admin interface.
2. Follow the Components -> Add/Modify menu sequence in the **Infrastructure** tile of the **Admin** menu.
3. In the **Add Components** page that appears next, select *Raspberry PI Device* as the

Component type. Then, click the **Add New Component** button. This will invoke Figure 2.4.

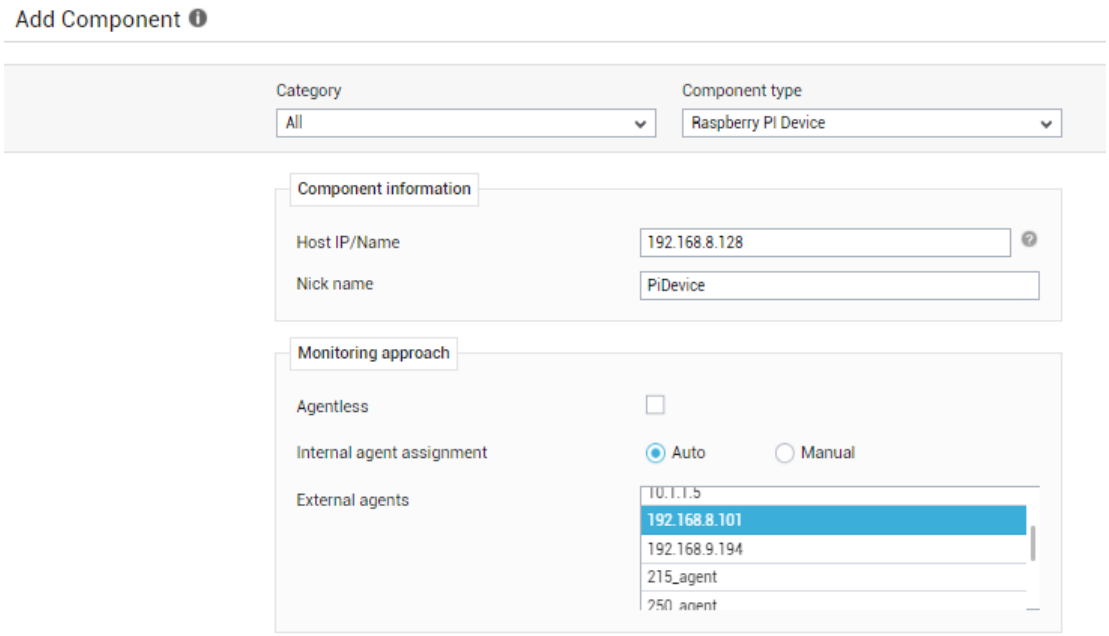

Figure 2.4: Adding the Raspberry Pi Device

4. Specify the **Host Name** and **Nick name** for the Raspberry Pi Device.
5. Select the **Internal Agent Assignment** type as '*Auto*' or '*Manual*'.
6. Next, assign a **External Agent** to the component.
7. Finally, click the **Add** button to add the Raspberry Pi Device to the eG Enterprise system. Components manually added will be automatically managed by eG Enterprise.

2.4 Configuring Tests

Once the Raspberry Pi Device is managed, try to do the following:

1. Follow the Components -> Add/Modify menu sequence in the **Infrastructure** tile of the **Admin** menu.
2. Select the **Show managed component types** only check box and then select the *Raspberry PI Device* component under **Component Type** list box. Then, the record appears in the grid as shown in Figure 2.5.

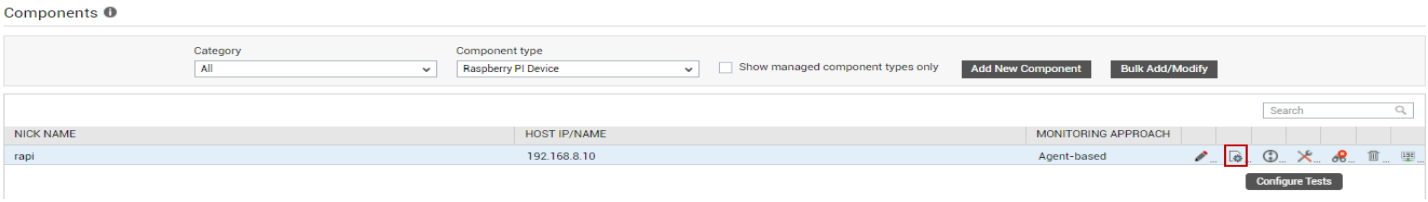

Figure 2.5: Managed Raspberry Pi Device record

3. Select the Configure Tests icon as shown in Figure 2.5 in the grid to configure the tests mapped for the component. This will invoke Figure 2.6 listing all the configured tests for the Raspberry Pi System.

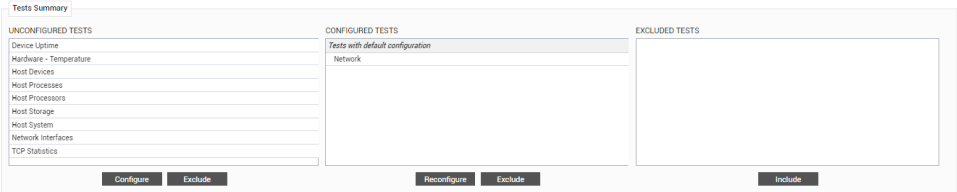

Figure 2.6: The list of unconfigured tests for the Raspberry Pi Device

Click on any test to configure it and sign out of the eG admin interface.

Since the tests mapped to the Raspberry Pi Device component are discussed in *Monitoring Unix and Windows Servers* document, they will not be discussed again here.

Chapter 3: Monitoring Raspberry Pi System

eG Enterprise offers a dedicated monitoring model for Raspberry Pi System which periodically monitors the clock frequency, memory, voltage and core temperature of the device.

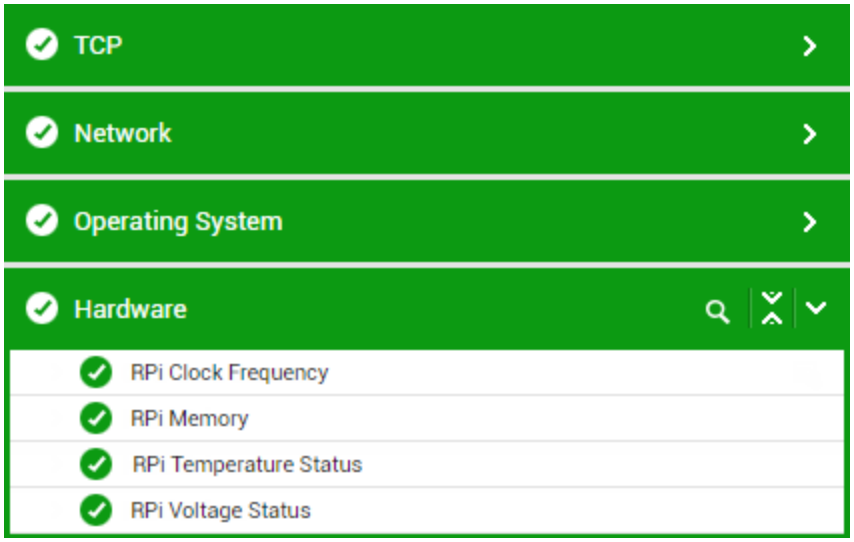

Figure 3.1: Raspberry Pi System Layer

Using the metrics reported by the tests mapped to this layer, administrators can find quick and accurate answers to certain persistent performance queries, such as the following:

- Is the core temperature of the Raspberry Pi normal ?
- Is CPU and GPU memory allocation optimal?
- Is Raspberry Pi overheating?
- What is the current clock frequency of the Raspberry Pi? Is overclocking required?

Since the top 3 layers are discussed in *Monitoring Unix and Windows Servers* document, the section that follows will discuss the **Hardware Layer** alone.

3.1 The Hardware Layer

Using the tests mapped to this layer, administrators can closely monitor the hardware related details such as temperature, voltage, memory and relative clock frequency of the device.

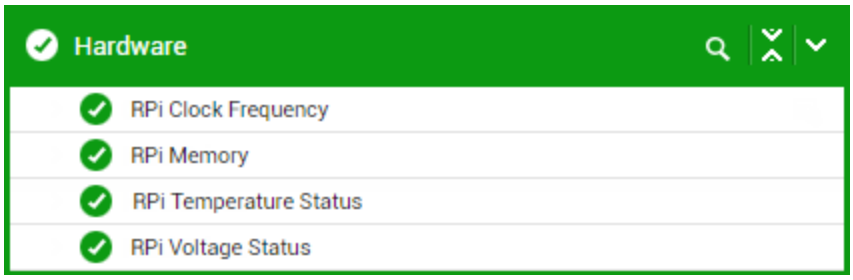

Figure 3.2: The tests mapped to the Hardware layer

3.1.1 RPi Voltage Status Test

The voltage requirement for all model Pi's is 5V +/- 5% (min 4.75V, max 5.25V) which is the USB standard. If your power supply peaks above 5.25V, it may damage any USB devices connected to it. Using this test, administrators are proactively alerted to fluctuations in the voltage of the Raspberry Pi device.

Target of the test : A Raspberry Pi Device

Agent deploying the test : An external agent

Outputs of the test : One set of results for the Raspberry Pi device is being monitored.

Configurable parameters for the test

Parameter	Description
Test period	How often should the test be executed
Host	The IP address of the Raspberry Pi device that is being monitored.
Use Sudo	The eG agent runs native Linux commands to pull metrics from the Raspberry Pi system. By default, the eG agent does not require any special permissions to execute these commands. In some highly-secure Linux environments however, the eG agent install user may not have the permissions to execute these commands directly. To grant permission to eG agent install user for command execution, first, perform the following steps: • Edit the SUDOERS file on the target host and append an entry of the following format to it: <eG_agent_install_user> ALL=(ALL) NOPASSWD • For instance, if the eG agent install user is eguser, then the entry in the SUDOERS file should be:

Parameter	Description
	eguser ALL=(ALL) NOPASSWD • Finally, save the file. Then, when configuring this test using the eG admin interface, set the USE SUDO parameter to Yes. This will enable the eG agent to execute the Linux commands and retrieve the metrics.
Sudo Path	This parameter is relevant only when the USE SUDO parameter is set to 'Yes'. By default, the SUDO PATH is set to *none*. This implies that the sudo command is in its default location – i.e., in the /usr/bin or /usr/sbin folder of the target host. In this case, once the Use Sudo flag is set to **Yes**, the eG agent automatically runs the sudo command from its default location. However, if the sudo command is available in a different location in your environment, you will have to explicitly specify the full path to the sudo command in the Sudo Path text box.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Voltage	Indicates the current voltage of this device.	Volts	The value of this measure should be well within admissible range. If excessive voltage is recorded, then the device may malfunction leading to severe performance bottlenecks.

3.1.2 RPi Temperature Status Test

Raspberry Pi is a pretty powerful device and low-end mobile computer. Raspberry Pi consumes very less power compare to your desktop CPU. But just like every other computer, while performing heavy tasks, it also gets hot. Since the device is small in size, it does not have fans to cool it down like other desktop/laptop CPU's, so it is configured to operate within a certain temperature range. The system on a chip (SoC) of the Raspberry Pi has a temperature sensor that can be used to measure its temperature. If your temperature rises above the configured value, you will see a little thermometer on you Raspbian desktop to indicate that your Pi is getting hot. As the core temperature rises, the thermometer gets to fill. Then at higher value, it changes to a full thermometer. If the temperature reaches the higher level, your CPU (ARM core) starts throttling and reduces the clock to cool down the temperature. This will decrease the performance. This is why, it is

important for administrators to periodically check the temperature of the device. This can be easily done using the **RPi Temperature Status** test.

This test reports the core temperature of the device and proactively alerts administrators to an unusual spike/drop in the temperature of the device, and thus enables them to quickly bring the temperature under control before it causes irreparable damage.

Target of the test : A Raspberry Pi Device

Agent deploying the test : An external agent

Outputs of the test : One set of results for the Raspberry Pi device is being monitored.

Configurable parameters for the test

Parameter	Description
Test period	How often should the test be executed
Host	The IP address of the Raspberry Pi device that is being monitored.
Use Sudo	The eG agent runs native Linux commands to pull metrics from the Raspberry Pi system. By default, the eG agent does not require any special permissions to execute these commands. In some highly-secure Linux environments however, the eG agent install user may not have the permissions to execute these commands directly. To grant permission to eG agent install user for command execution, first, perform the following steps: • Edit the SUDOERS file on the target host and append an entry of the following format to it: <eG_agent_install_user> ALL=(ALL) NOPASSWD • For instance, if the eG agent install user is eguser, then the entry in the SUDOERS file should be: eguser ALL=(ALL) NOPASSWD • Finally, save the file. Then, when configuring this test using the eG admin interface, set the USE SUDO parameter to Yes. This will enable the eG agent to execute the Linux commands and retrieve the metrics.
Sudo Path	This parameter is relevant only when the USE SUDO parameter is set to 'Yes'. By default, the SUDO PATH is set to *none*. This implies that the sudo command is in its default location – i.e., in the /usr/bin or /usr/sbin folder of the target host. In this case,

Parameter	Description
	once the Use Sudo flag is set to **Yes**, the eG agent automatically runs the sudo command from its default location. However, if the sudo command is available in a different location in your environment, you will have to explicitly specify the full path to the sudo command in the Sudo Path text box.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Temperature	Indicates the core temperature of the device.	Celsius	An unusually high or low value for this measure is a cause for concern as it could indicate a potential hardware failure.

3.1.3 RPi Memory Test

Raspberry Pi has an ARMv6 700 MHz single-core processor, a VideoCore IV GPU and 512MB of RAM. It uses an SD card for its operating system and data storage. The Raspberry Pi officially supports Raspbian, a lightweight linux OS based on Debian. A Raspberry Pi device has two processors: CPU (Central Processing Unit) and GPU (Graphics Processing Unit). You probably know that CPU is used for calculations and GPU is used graphical tasks, such as playing videos and games. The memory of your device is shared between these two processors. By default, 64MB of RAM is allocated for the GPU. If you use your Raspberry Pi for graphics-intensive work, you should increase the amount of RAM allocated to GPU to improve the performance. You can change the amount of memory available to the GPU in Raspberry Pi configuration file.

Note:

If you are not using graphics, you can decrease the amount of memory allocated for the GPU. This can be useful in situations when you are using your Raspberry Pi as a server and GUI is not needed.

If you experience memory contention in Raspberry Pi, you can use this test to find out whether the memory contention is caused due to insufficient memory allocation between CPU and GPU, since this test reveals the statistics related to the utilization of the main memory and GPU memory of the Raspberry Pi. Using the **RPi Memory Test** test, administrators may be proactively alerted to memory resource contention, if any.

Target of the test : A Raspberry Pi Device

Agent deploying the test : An external agent

Outputs of the test : One set of results for the Raspberry Pi device is being monitored.

Configurable parameters for the test

Parameter	Description
Test period	How often should the test be executed
Host	The IP address of the Raspberry Pi device that is being monitored.
Use Sudo	The eG agent runs native Linux commands to pull metrics from the Raspberry Pi system. By default, the eG agent does not require any special permissions to execute these commands. In some highly-secure Linux environments however, the eG agent install user may not have the permissions to execute these commands directly. To grant permission to eG agent install user for command execution, first, perform the following steps: • Edit the SUDOERS file on the target host and append an entry of the following format to it: <eG_agent_install_user> ALL=(ALL) NOPASSWD • For instance, if the eG agent install user is eguser, then the entry in the SUDOERS file should be: eguser ALL=(ALL) NOPASSWD • Finally, save the file. Then, when configuring this test using the eG admin interface, set the USE SUDO parameter to Yes. This will enable the eG agent to execute the Linux commands and retrieve the metrics.
Sudo Path	This parameter is relevant only when the USE SUDO parameter is set to 'Yes'. By default, the SUDO PATH is set to *none*. This implies that the sudo command is in its default location – i.e., in the /usr/bin or /usr/sbin folder of the target host. In this case, once the Use Sudo flag is set to **Yes**, the eG agent automatically runs the sudo command from its default location. However, if the sudo command is available in a different location in your environment, you will have to explicitly specify the full path to the sudo command in the Sudo Path text box.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Memory	Indicates the amount of memory split between the CPU and GPU of this device.	MB	To achieve the best results with your Raspberry Pi, try to go with optimum split of CPU and GPU memory based upon your Raspberry Pi version.

3.2 RPi Clock Frequency Test

Clock frequency is the number of times the CPU “ticks” per second. As the CPU is a synchronized circuit, the performance depends directly on it.

None of the Raspberry Pi models have a built-in real-time clock. When booting, the time is set either manually, or configured from a previously saved state at shutdown to provide relative consistency for the file system. The Network Time Protocol is used to update the system time when connected to a network. You should run the device at a decent clock speed to ensure that the responsiveness of the system is good, and then put the system in sleep mode when there is no processing to do. Sometimes you might have to do some benchmarking to decide if you should run the system faster and then enter sleep, or run it slower to keep the active current down. This is why, it is important for administrators to periodically check the clock frequency of the device. This can be easily done using the **RPi Clock Frequency** test.

This test reports the current clock frequency of the Raspberry Pi and alerts administrators, if abnormalities are detected.

Target of the test : A Raspberry Pi Device

Agent deploying the test : An external agent

Outputs of the test : One set of results for the Raspberry Pi device is being monitored.

Configurable parameters for the test

Parameter	Description
Test period	How often should the test be executed
Host	The IP address of the that is being monitored.
Use Sudo	The eG agent runs native Linux commands to pull metrics from the Raspberry Pi system. By default, the eG agent does not require any special permissions to

Parameter	Description
	execute these commands. In some highly-secure Linux environments however, the eG agent install user may not have the permissions to execute these commands directly. To grant permission to eG agent install user for command execution, first, perform the following steps: • Edit the SUDOERS file on the target host and append an entry of the following format to it: <eG_agent_install_user> ALL=(ALL) NOPASSWD • For instance, if the eG agent install user is eguser, then the entry in the SUDOERS file should be: eguser ALL=(ALL) NOPASSWD • Finally, save the file. Then, when configuring this test using the eG admin interface, set the USE SUDO parameter to Yes. This will enable the eG agent to execute the Linux commands and retrieve the metrics.
Sudo Path	This parameter is relevant only when the USE SUDO parameter is set to 'Yes'. By default, the SUDO PATH is set to *none*. This implies that the sudo command is in its default location – i.e., in the /usr/bin or /usr/sbin folder of the target host. In this case, once the Use Sudo flag is set to **Yes**, the eG agent automatically runs the sudo command from its default location. However, if the sudo command is available in a different location in your environment, you will have to explicitly specify the full path to the sudo command in the Sudo Path text box.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Frequency	Indicates the current clock frequency of this device.	MHz	By reading the clock frequency, you can figure out if overclocking is required or not. Overclocking is the process of forcing a GPU core/memory to run faster than its manufactured frequency. Overclocking can have both positive and negative effects on GPU performance. For instance, memory overclocking helps on cards with low memory bandwidth, and with

Measurement	Description	Measurement Unit	Interpretation
			games with a lot of post-processing/textures/filters like AA that are VRAM intensive. On the other hand, you should be aware of few risks that occurs due to overclocking. They are: 1. **Life reduction** - components may fail sooner 2. **Heat generation** - operating at higher speeds generate more heat (heat sinks are recommended) 3. **File corruption** - many have observed file corruptions at unoptimized overclocking settings Warranty- Voiding - forced overvolting will void your warranty In the context of Overclocking, overvolting refers to raising the ON-CHIP generated voltage driving the System-on Chip Processor. Pi 1 and Pi 2 have a default clock speed of 250 MHz, whereas the Pi 3 and Pi Zero have a default clock speed of 400 MHz. Forcing the Pi to run above 400MHz or turbo mode removes its ability to throttle its clock if it detects that the processor is overheating. This will damage your Pi and can also affect your warranty on the Pi. An appropriately sized heat sink is needed to protect the chip from serious overheating and monitoring your results with the right tools and doing the necessary research are all critical steps on the path to safe and successful overclocking.

About eG Innovations

eG Innovations provides intelligent performance management solutions that automate and dramatically accelerate the discovery, diagnosis, and resolution of IT performance issues in on-premises, cloud and hybrid environments. Where traditional monitoring tools often fail to provide insight into the performance drivers of business services and user experience, eG Innovations provides total performance visibility across every layer and every tier of the IT infrastructure that supports the business service chain. From desktops to applications, from servers to network and storage, from virtualization to cloud, eG Innovations helps companies proactively discover, instantly diagnose, and rapidly resolve even the most challenging performance and user experience issues.

eG Innovations is dedicated to helping businesses across the globe transform IT service delivery into a competitive advantage and a center for productivity, growth and profit. Many of the world's largest businesses use eG Enterprise to enhance IT service performance, increase operational efficiency, ensure IT effectiveness and deliver on the ROI promise of transformational IT investments across physical, virtual and cloud environments.

To learn more visit www.eginnovations.com.

Contact Us

For support queries, email support@eginnovations.com.

To contact eG Innovations sales team, email sales@eginnovations.com.