

Self Heal Support in RPI - User manual - Broadband

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1. Introduction

Self Heal is a monitoring and recovery module.

It continuously monitors the system resources like **CPU and Memory** and monitors the **critical Processes** running.

Self heal also performs **Connectivity tests**.

In case of any problems encountered, Self Heal takes corrective actions like: Rebooting the device, Restarting required process based on predefined conditions.

Self-heal stores Reset Count and Reboot Count.

2. Environment Setup

Self Heal functionality is handled by a set of scripts. These scripts are available in the RDK build by default.

Please ensure that below Self heal scripts are present on the device at the path **"/usr/ccsp/tad"**.

- resource_monitor.sh
- task_health_monitor.sh
- corrective_action.sh
- self_heal_connectivity.sh

Please refer the below screenshot to verify self heal module was enabled or not,

```

user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x
root@Raspberrypi-Gateway:~# dmcli eRT getv Device.SelfHeal.X_RDKCENTRAL-COM_Enable
CR component name is: eRT.com.cisco.spvtg.ccsp.CR
subsystem_prefix eRT.
getv from/to component(eRT.com.cisco.spvtg.ccsp.tdn): Device.SelfHeal.X_RDKCENTRAL-COM_Enable
Execution succeed.
Parameter      1 name: Device.SelfHeal.X_RDKCENTRAL-COM_Enable
                type:      bool,      value: true

root@Raspberrypi-Gateway:~# ps aux | grep self
5044 root      0:00 {self_heal_conne} /bin/sh /usr/ccsp/tad/self_heal_connectivity_test.sh
5355 root      0:00 grep self

root@Raspberrypi-Gateway:~# ps aux | grep resour
5046 root      0:00 {resource_monito} /bin/sh /usr/ccsp/tad/resource_monitor.sh
5358 root      0:00 grep resour

root@Raspberrypi-Gateway:~#
root@Raspberrypi-Gateway:~# cd /usr/ccsp/tad/
root@Raspberrypi-Gateway:~# cd /usr/ccsp/tad# ls
+167                                TestAndDiagnostic.XML          cpumemfrag_cron.sh          resource_monitor.sh          selfheal_reset_counts.sh
ccspTandDssp                       corrective_action.sh           log_buddyinfo.sh           self_heal_connectivity_test.sh  task_health_monitor.sh
root@Raspberrypi-Gateway:/usr/ccsp/tad#

```

3. Executing System

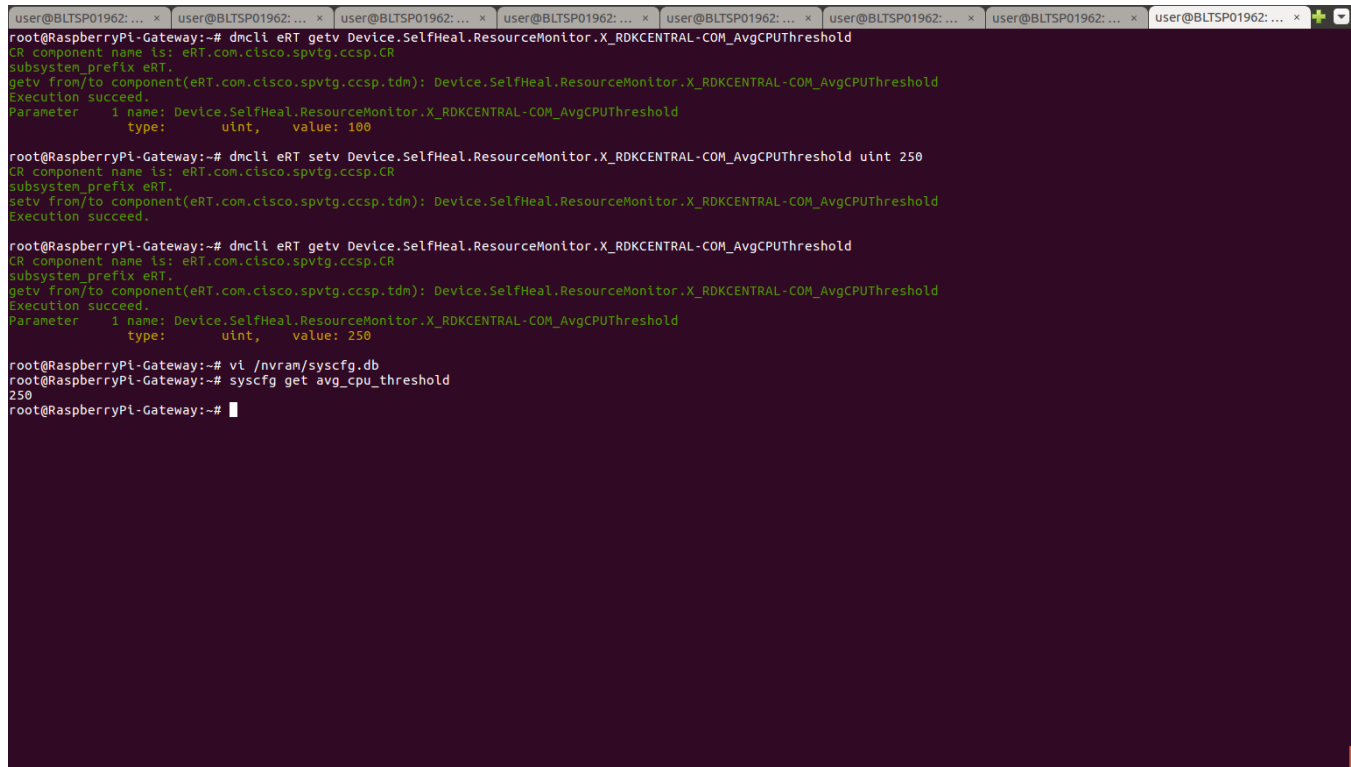
Self Heal is enabled by default and is active at the time of boot up.

It periodically performs below actions.

- Resource monitoring: Monitors memory / cpu usage and if it goes beyond threshold, it reboots the device.
- Process monitoring: It will periodically monitors status of the critical processes.
 - Ccsp processes: If any of these processes crashed, it will be restarted via Self Heal.
 - "CcspCrSsp": If this process is crashed, device will be rebooted.
 - "syseventd": If syseventd is crashed, device will be rebooted.
- Connectivity test: If DNS or WAN_IP is down, device will stop the LAN functionality.

3.1. Resource Monitor - Monitors CPU and MEMORY

1. By default, AVG CPU threshold value will be set as 100. This value will be stored in sysconf database. If we want to change the default AVG CPU threshold value, Please refer the attached screenshot and do the following steps,



```
user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x
root@RaspberryPi-Gateway:~# dmcli eRT getv Device.SelfHeal.ResourceMonitor.X_RDKCENRAL-COM_AvgCPUPhreshold
CR component name is: eRT.com.cisco.spvtg.ccsp.CR
subsystem_prefix eRT.
getv from/to component(eRT.com.cisco.spvtg.ccsp.tdm): Device.SelfHeal.ResourceMonitor.X_RDKCENRAL-COM_AvgCPUPhreshold
Execution succeed.
Parameter 1 name: Device.SelfHeal.ResourceMonitor.X_RDKCENRAL-COM_AvgCPUPhreshold
          type:      uint,      value: 100

root@RaspberryPi-Gateway:~# dmcli eRT setv Device.SelfHeal.ResourceMonitor.X_RDKCENRAL-COM_AvgCPUPhreshold uint 250
CR component name is: eRT.com.cisco.spvtg.ccsp.CR
subsystem_prefix eRT.
setv from/to component(eRT.com.cisco.spvtg.ccsp.tdm): Device.SelfHeal.ResourceMonitor.X_RDKCENRAL-COM_AvgCPUPhreshold
Execution succeed.

root@RaspberryPi-Gateway:~# dmcli eRT getv Device.SelfHeal.ResourceMonitor.X_RDKCENRAL-COM_AvgCPUPhreshold
CR component name is: eRT.com.cisco.spvtg.ccsp.CR
subsystem_prefix eRT.
getv from/to component(eRT.com.cisco.spvtg.ccsp.tdm): Device.SelfHeal.ResourceMonitor.X_RDKCENRAL-COM_AvgCPUPhreshold
Execution succeed.
Parameter 1 name: Device.SelfHeal.ResourceMonitor.X_RDKCENRAL-COM_AvgCPUPhreshold
          type:      uint,      value: 250

root@RaspberryPi-Gateway:~# vi /nvram/syscfg.db
root@RaspberryPi-Gateway:~# syscfg get avg_cpu_threshold
250
root@RaspberryPi-Gateway:~# █
```

2. By default, AVG Memory threshold value will be set as 100. This value will be stored in sysconf database. If we want to change the default AVG Memory threshold value, Please refer the attached screenshot and do the following steps,

```
user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x user@BLTSP01962: ... x
root@RaspberryPi-Gateway:~# dmcli eRT getv Device.SelfHeal.ResourceMonitor.X_RDKCENTRAL-COM_AvgMemoryThreshold
CR component name is: eRT.com.cisco.spvtg.ccsp.CR
subsystem_prefix eRT.
getv from/to component(eRT.com.cisco.spvtg.ccsp.tdm): Device.SelfHeal.ResourceMonitor.X_RDKCENTRAL-COM_AvgMemoryThreshold
Execution succeed.
Parameter 1 name: Device.SelfHeal.ResourceMonitor.X_RDKCENTRAL-COM_AvgMemoryThreshold
          type:      uint,      value: 100

root@RaspberryPi-Gateway:~# dmcli eRT setv Device.SelfHeal.ResourceMonitor.X_RDKCENTRAL-COM_AvgMemoryThreshold uint 150
CR component name is: eRT.com.cisco.spvtg.ccsp.CR
subsystem_prefix eRT.
setv from/to component(eRT.com.cisco.spvtg.ccsp.tdm): Device.SelfHeal.ResourceMonitor.X_RDKCENTRAL-COM_AvgMemoryThreshold
Execution succeed.

root@RaspberryPi-Gateway:~# dmcli eRT getv Device.SelfHeal.ResourceMonitor.X_RDKCENTRAL-COM_AvgMemoryThreshold
CR component name is: eRT.com.cisco.spvtg.ccsp.CR
subsystem_prefix eRT.
getv from/to component(eRT.com.cisco.spvtg.ccsp.tdm): Device.SelfHeal.ResourceMonitor.X_RDKCENTRAL-COM_AvgMemoryThreshold
Execution succeed.
Parameter 1 name: Device.SelfHeal.ResourceMonitor.X_RDKCENTRAL-COM_AvgMemoryThreshold
          type:      uint,      value: 150

root@RaspberryPi-Gateway:~# syscfg get avg_memory_threshold
150
root@RaspberryPi-Gateway:~# █
```

3. Once it's reaches the threshold value, device will be rebooted automatically.

observation in lrdklogs/logs/SelfHeal.txt.0

```
RDKB_SELFHEAL : Total memory in system is 949444 at timestamp 2019:09:24:10:17:08
RDKB_SELFHEAL : Used memory in system is 148772 at timestamp 2019:09:24:10:17:08
RDKB_SELFHEAL : Free memory in system is 800768 at timestamp 2019:09:24:10:17:08
RDKB_SELFHEAL : AvgMemUsed in % is 15
190924-10:17:09.055074 <128>CABLEMODEM[Raspberry]:<990000006><2019:09:24:10:17:09><B8:27:EB:50:C1:CF><ARMv7> RM Memory threshold reached
RDKB_SELFHEAL : Total memory in system is 949444
RDKB_SELFHEAL : Used memory in system is 148752
RDKB_SELFHEAL : Free memory in system is 800792
```

3.2. Process Monitor - Monitors the Process Periodically based on Process id's

If it detects that any of the process is not running, it automatically restarts that particular Component.

Let us take the example of CcspLMLite Component :

1. Run a ps command to verify that CcspLMLite is up and running again with different process id

```
ps aux | grep Ccsp
```

2. kill CcspLMLite process by using the below command

```
kill -9 PID(CcspLMLite PID)
```

3. Verify whether the CcspLMLite Process was killed or not by using the below command

```
ps aux | grep Ccsp
```

4. After 60 seconds(default), it will automatically restart the Process. Please check the CcspLMLite PID.

```

user@BLTSP01962: ~/Downloads/S... x user@BLTSP01962: ~/keerthana x user@BLTSP01962: ~/Downloads/S... x user@BLTSP01962: ~/keerthana/wo... x user@BLTSP01962: ~/keerthana/so... x
root@Raspberrypi-Gateway:/# ps aux | grep Ccsp
308 root      0:00 /usr/bin/CcspCrSsp -subsys eRT.
1105 root     0:02 /usr/bin/CcspPandMSsp -subsys eRT.
2674 root     0:00 /usr/bin/CcspTandDSsp -subsys eRT.
2685 root     1:40 /usr/bin/CcspEthAgent -subsys eRT.
2691 root     0:00 /usr/bin/CcspTr069PaSsp -subsys eRT.
2765 root     0:00 /usr/bin/CcspLMLite -subsys eRT.
2892 root     0:01 /usr/bin/CcspWfLISsp -subsys eRT.
3057 root     0:00 CcspHomeSecurity 8081
6470 root     0:00 /bin/sh /lib/rdk/CcspWebUI.sh
6556 root     0:00 grep Ccsp
root@Raspberrypi-Gateway:/#
root@Raspberrypi-Gateway:/# kill -9 2765
root@Raspberrypi-Gateway:/#
root@Raspberrypi-Gateway:/# date
Mon Oct 7 08:27:09 UTC 2019
root@Raspberrypi-Gateway:/# ps aux | grep Ccsp
308 root      0:00 /usr/bin/CcspCrSsp -subsys eRT.
1105 root     0:02 /usr/bin/CcspPandMSsp -subsys eRT.
2674 root     0:00 /usr/bin/CcspTandDSsp -subsys eRT.
2685 root     1:40 /usr/bin/CcspEthAgent -subsys eRT.
2691 root     0:00 /usr/bin/CcspTr069PaSsp -subsys eRT.
2892 root     0:01 /usr/bin/CcspWfLISsp -subsys eRT.
3057 root     0:00 CcspHomeSecurity 8081
6568 root     0:00 /bin/sh /lib/rdk/CcspWebUI.sh
6658 root     0:00 grep Ccsp
root@Raspberrypi-Gateway:/# date
Mon Oct 7 08:28:05 UTC 2019
root@Raspberrypi-Gateway:/# date
Mon Oct 7 08:28:11 UTC 2019
root@Raspberrypi-Gateway:/# ps aux | grep Ccsp
308 root      0:00 /usr/bin/CcspCrSsp -subsys eRT.
1105 root     0:02 /usr/bin/CcspPandMSsp -subsys eRT.
2674 root     0:00 /usr/bin/CcspTandDSsp -subsys eRT.
2685 root     2:32 /usr/bin/CcspEthAgent -subsys eRT.
2691 root     0:00 /usr/bin/CcspTr069PaSsp -subsys eRT.
2892 root     0:01 /usr/bin/CcspWfLISsp -subsys eRT.
3057 root     0:00 CcspHomeSecurity 8081
6987 root     0:00 /bin/sh /lib/rdk/CcspWebUI.sh
7275 root     0:00 /usr/bin/CcspLMLite -subsys eRT.
7766 root     0:00 grep Ccsp
root@Raspberrypi-Gateway:/# █

```

3.3. Connectivity Test - Ping Functionality

If Connectivity Test fails, device will go for reboot.

Validation : Using the below steps to validate the connectivity Test

unplug the ethernet LAN cable **or** ifconfig erouter0 down

4. Troubleshooting

1. Using selfHeal logs to trouble shoot the run-time errors. SelfHeal logs will be created the below path,

/rdklogs/logs/SelfHeal.txt.0

2. Resource Monitor sample Logs,

MEM :

RDKB_SELFHEAL : Total memory in system is 949444 at timestamp 2019:09:24:10:17:08
 RDKB_SELFHEAL : Used memory in system is 148772 at timestamp 2019:09:24:10:17:08
 RDKB_SELFHEAL : Free memory in system is 800768 at timestamp 2019:09:24:10:17:08
 RDKB_SELFHEAL : AvgMemUsed in % is **15**

190924-10:17:09.055074 <128>CABLEMODEM[Raspberrypi]:<99000006><2019:09:24:10:17:09><B8:27:EB:50:C1:CF><ARMv7> **RM**

Memory threshold reached

RDKB_SELFHEAL : Total memory in system is 949444
 RDKB_SELFHEAL : Used memory in system is 148752
 RDKB_SELFHEAL : Free memory in system is 800792

CPU:

190924-10:17:09.055074 <128>CABLEMODEM[Raspberrypi]:<99000007><2019:09:24:10:17:09><B8:27:EB:50:C1:CF><ARMv7> **RM**

CPU threshold reached

3. Process Monitor Sample Logs,

LMLite Process :

RDKB_SELFHEAL : <128>CABLEMODEM[Raspberrypi]:<99000007><2019:09:24:09:20:34><B8:27:EB:50:C1:CF><ARMv7> **RM**
CcspLMLite process not running , restarting it

RDKB_SELFHEAL : **Resetting process CcspLMLite**

4. Connectivity Test Sample Logs ,

Successful Scenario :

190924-08:56:43.577621 [RDKB_SELFHEAL] : GW IP Connectivity Test Successfull
190924-08:56:43.583217 [RDKB_SELFHEAL] : IPv4 GW Address is:192.168.30.1
190924-08:56:43.588370 [RDKB_SELFHEAL] : IPv6 GW Address is:
190924-08:56:43.622618 RDKB_SELFHEAL : Ping server lists are empty , not taking any corrective actions
190924-08:56:43.730057 **DNS Response: Got success response for this URL www.google.com**

Failure Scenario :

191007-09:00:13.899713 [RDKB_SELFHEAL] : GW IP Connectivity Test Successfull
191007-09:00:13.909201 [RDKB_SELFHEAL] : IPv4 GW Address is:192.168.60.1
191007-09:00:13.918684 [RDKB_SELFHEAL] : IPv6 GW Address is:
191007-09:00:13.972966 RDKB_SELFHEAL : Ping server lists are empty , not taking any corrective actions
191007-09:00:14.119985 DNS Response: fail to resolve this URL www.google.com
191007-09:00:14.152808 RDKB_SELFHEAL : Taking corrective action