

Load Regulation Test Specification

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1 Introduction

1.1 Scope

This document specifies the functional tests for the Load Regulation Layer and to some extent the statistics functionality..

2 Test Scenarios - Summary

Tests summary table grouped by priority where P1 is highest priority and P2 and so on. You can have till P5.

<i>Index</i>	<i>Priority</i>	<i>Test scenario/Assertion-ID</i>	<i>Comments</i>
1	P1	LR-TS-13-1	
2	P1	LR-TS-13-2	
3	P1	LR-TS-13-3	
4	P1	LR-TS-13-4	
5	P1	LR-TS-13-26	
6	P1	LR-TS-13-28	
7	P1	LR-TS-13-29	
8	P1	LR-TS-13-30	
9	P1	LR-TS-13-31	
10	P1	LR-TS-13-32	
11	P1	LR-TS-13-33	
12	P1	LR-TS-13-34	
13	P1	LR-TS-13-35	
TOTAL=13			
14	P2	LR-TS-13-23	
15	P2	LR-TS-13-24	
TOTAL=2			
16	P3	LR-TS-13-25	Currently not implementable
TOTAL=1			

3 Abbreviations

AS Application Server

4 Load regulation test object

The test cases within this test object are focusing on verifying that traffic is rejected based on certain threshold levels. When the container detects overload depending on defined thresholds the default response 503 (Service Unavailable) is returned or messages are dropped. Status code 503 is indicating that the server is currently unable to handle the request due to a temporary overloading or maintenance of the server.

There are **four** available CPU threshold levels:

- 1) Maximum CPU threshold (*MmThreshold*) - Drops all messages for both SIP and HTTP when the maximum message level is reached.
- 2) HTTP request threshold (*HttpThreshold*) - Returns 503 response to an HTTP incoming request when level is reached.
- 3) Initial SIP request threshold (*IrThreshold*) - Returns 503 response to a SIP initial incoming request when level is reached.
- 4) Subsequent SIP request threshold (*SrThreshold*) - Returns 503 response to a SIP subsequent incoming request when level is reached.

There are **four** available memory threshold levels:

- 1) Maximum memory threshold (*MemLrThreshold*) - Drops all messages for both SIP and HTTP when the maximum message level is reached.
- 2) HTTP request threshold (*MemHttpThreshold*) - Returns 503 response to an HTTP incoming request when level is reached.
- 3) Initial SIP request threshold (*MemIrThreshold*) - Returns 503 response to a SIP initial incoming request when level is reached.
- 4) Subsequent SIP request threshold (*MemSrThreshold*) - Returns 503 response to a SIP subsequent incoming request when level is reached.

4.1 Test base

NA

4.2 Functional Requirements

NA

4.3 Test environment

Consists of the function test environment where the system under test is a single application server/SailFin instance.

5 Test cases

The test cases are divided in to two sections. Test cases that are only focusing on the rejection mechanism in the load regulation layer and the test cases where actual metrics are involved, counting the number of rejections and so forth.

5.1 Load regulation test cases

This section covers the test cases that have been derived from the use case scenarios in the test base. There must be an IP sprayer placed in front of the cluster.

5.1.1 LR-TS-13-1 Initial SIP request rejection

Description: Initial SIP requests are answered with 503 when the *IrThreshold* level is exceeded. The processor that handles the user related to this test case has the load according to the figure below. When sending the first initial request, the load is not above the threshold level and the request is accepted and handled by the servlet. Then, the load is increased to above the threshold level and a new attempt is done to send an initial request. This time, the request shall not be handled by the servlet.

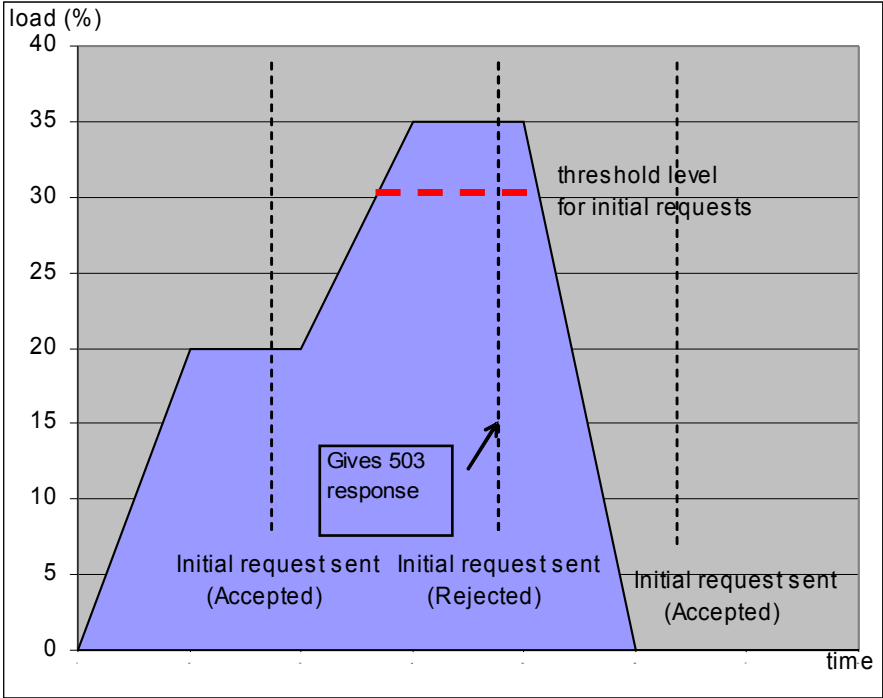


Figure 1: Processor Load for Initial Request threshold test

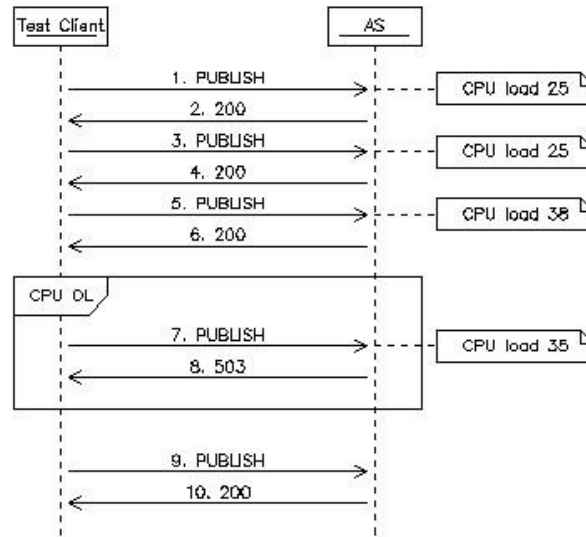


Figure 2: Message flow for test case 13.1

Requirement: TBD

Test instructions:

Verify: That the request that arrives to the AS (message 7) when the CPU load is above the threshold is rejected.

Test servlet: tm13_1_sip.sar. A servlet that loads the AS instance according to settings passed in the SIP requests.

Slingshot scenarios: 13_1.xml (FIX this according to MSC)

5.1.2

LR-TS-13-2 Subsequent SIP request rejection

Description: Subsequent SIP requests are answered with 503 response when the *SrThreshold* level is exceeded. The processor that handles the user related to this test case has the load according to the figure below. When sending the initial request (IR) and the first subsequent request (SR), the load is not above the threshold level and the request is accepted and handled by the servlet. When sending the second subsequent request, the load is above the *IrThreshold* level. The subsequent request is accepted and handled by the servlet. Then, the load is increased to above the *SrThreshold* level and a new attempt is done to send a subsequent request. This time, the subsequent request shall not be handled by the servlet.

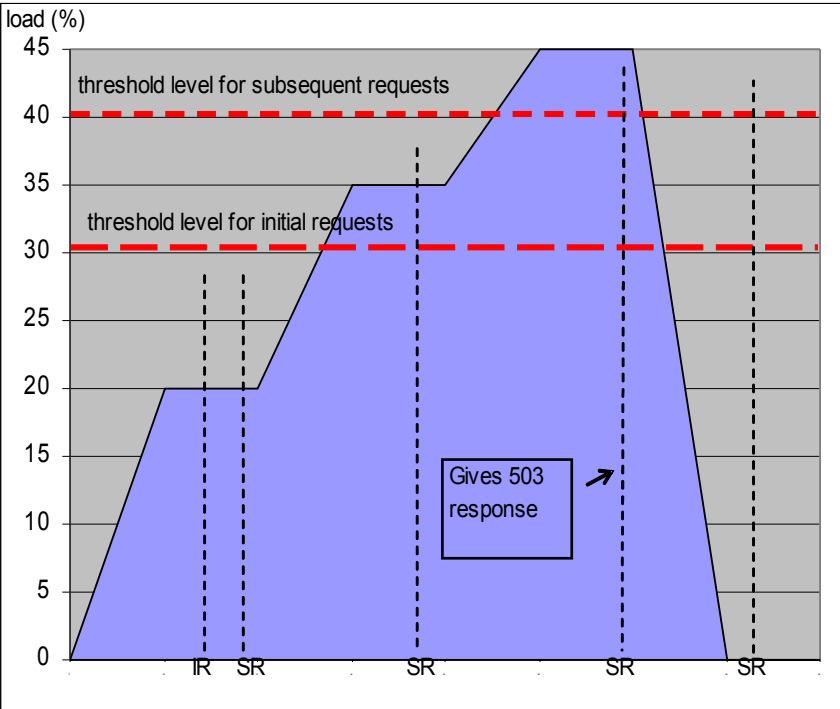


Figure 3: Processor Load for Subsequent Request threshold test

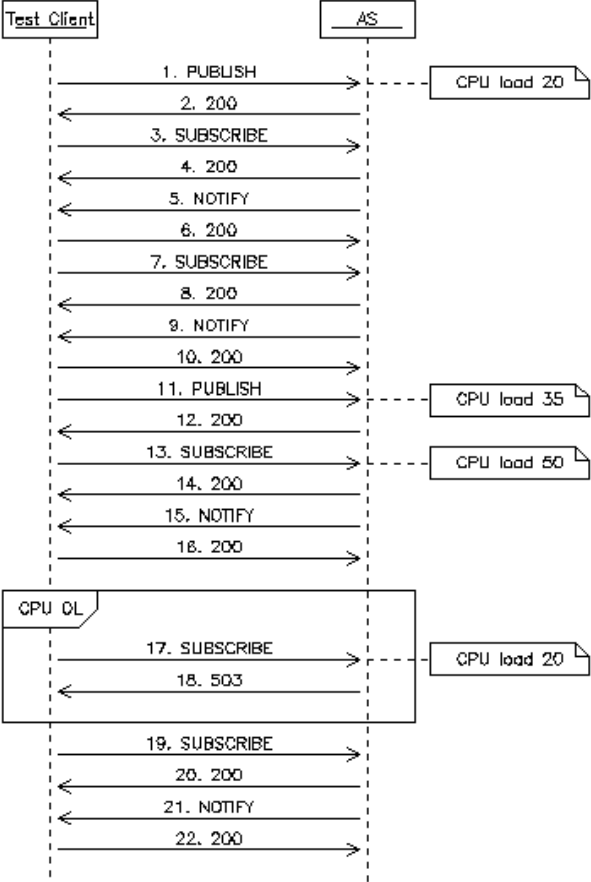


Figure 4: Message flow for test case 13.2

Requirement: TBD

Test instructions:

Verify: That a subsequent request (message 17) gets rejected when when the CPU load is above the threshold.

Test servlet: tm13_1_sip.sar. A servlet that loads the AS instance according to settings passed in the SIP requests.

Slingshot scenario: 13_1.xml (FIX this according to MSC)

5.1.3 LR-TS-13-3 HTTP request rejection

Description: HTTP requests are answered with a 503 when the HttpThreshold level is exceeded.

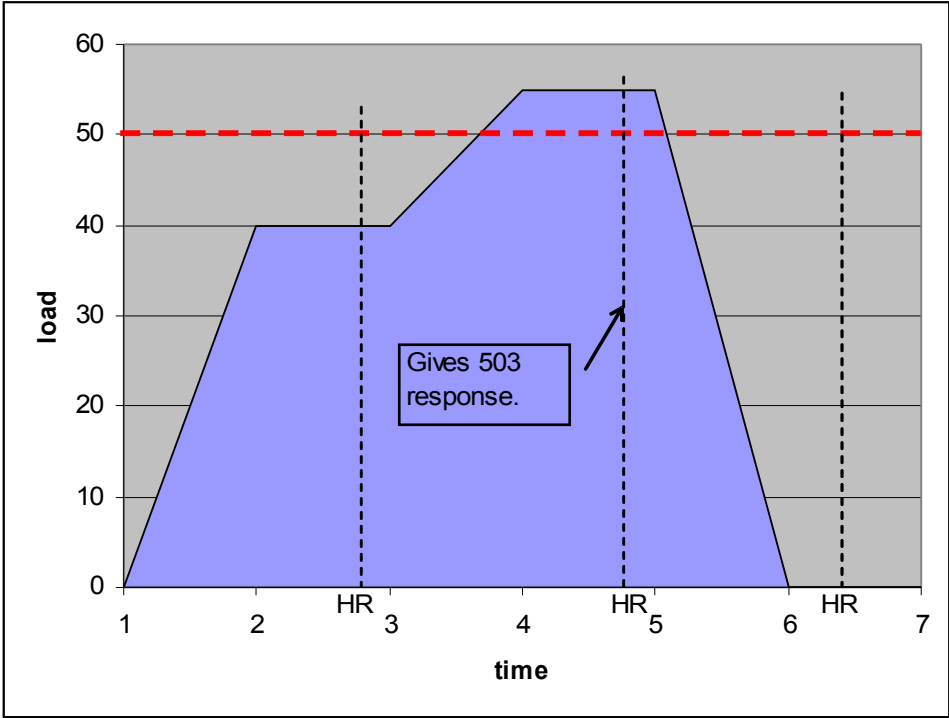


Figure 5: Processor Load for HTTP threshold test

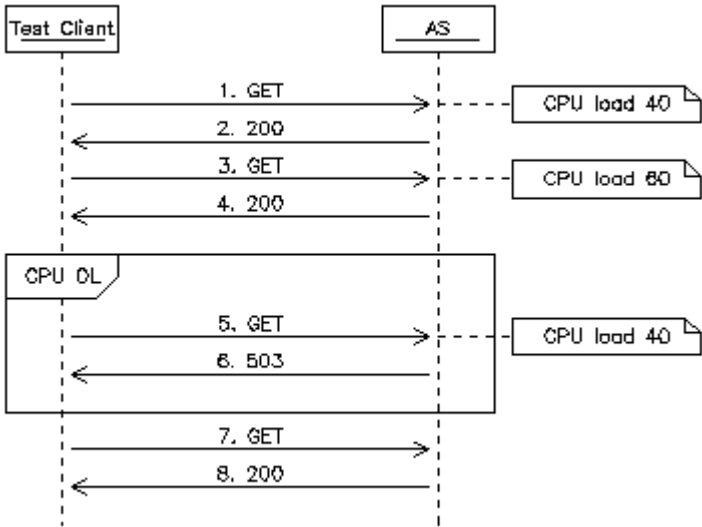


Figure 6: Message flow for test case 13.3

The servlet is triggered to generate load according to the picture. The first HTTP request is sent when the load does not exceed the threshold level and a 200 OK response shall be received from the servlet. When the load is higher and exceeding the threshold level, the second HTTP request is sent which is answered with a 503 response. Finally, when the load is lower than the threshold level, the third HTTP request is sent which is answered with a 200 OK response from the servlet.

Requirement: TBD

Test instructions:

Verify: That HTTP GET request (message 5) is rejected due to CPU load above the HttpThreshold level.

Test servlet: tm13_2_http.war, an HTTP servlet that uses a Loader class to generate the processor load based on input parameters from the SIP request.

SLIP scenario: 13_2.xml (TBD, verify that messages 7 and 8 are included)

5.1.4

LR-TS-13-3 HTTP request rejection

Description: Both SIP and HTTP requests are sent and handled by the servlets when the load does not exceed the maximum CPU threshold level (the MmThreshold level). When the load exceeds the level, both SIP and HTTP requests are ignored, that is not passed to the servlet and no response sent.

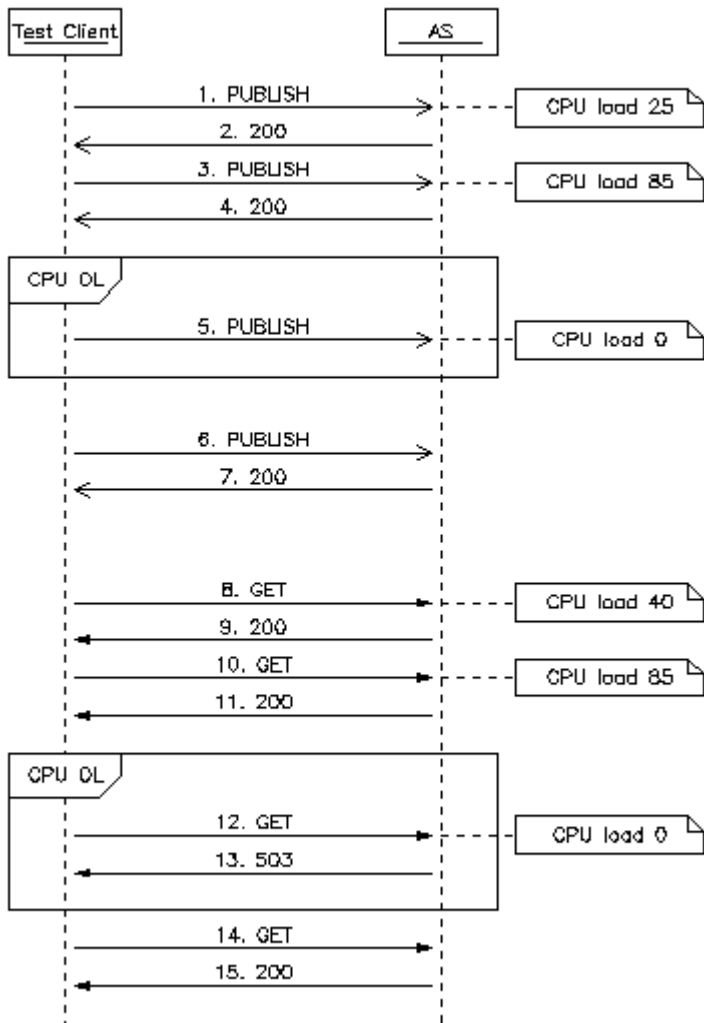


Figure 7: SIP and HTTP message flow for test case 13.4

Requirement: TBD

Test instructions:

Verify: That all requests sent when the threshold level is not exceeded are handled by the servlets. Verify that all requests sent during overload are ignored. Verify that all requests are handled by the servlets when the load is lowered below the threshold.

Test servlet:

- tm13_1_sip.sar, a SIP servlet that uses a Loader class to generate the processor load based on input parameters from the SIP request.
- tm13_2_http.war, an HTTP servlet that uses a Loader class to generate the processor load based on input parameters from the SIP request.

Slingshot scenario: 13_4.xml for SIP

SLIP scenario: 13_4.xml for HTTP

5.2 Load regulation metrics test cases

These test cases include metrics counters apart from testing that the load regulation thresholds do work..

5.2.1

LB-TC-13-23 SIP initial request rejection, CPU load above initial request threshold (*IrThreshold*)

Description: Measurement of type counter for the number of rejected incoming initial SIP requests encountered due to load over threshold value.

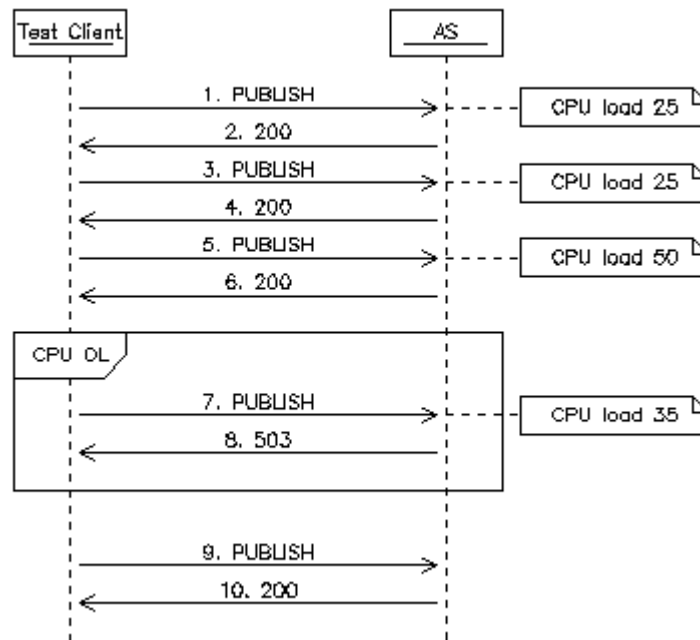


Figure 8: Message flow for test case 13.23

Precondition:

1. The Cpu Overload regulation function must be activated.
2. The default values for sample rate and number of samples are used, *NumberOfSamples* = 5 and *SampleRate* = 2.
3. The *IrThreshold* level must be set to 30 percent.

1, 2 and 3 is done by changing the values by means of a Puretest scenario task.

Post-condition:

1. The *IrThreshold* level must be restored to default *SrThreshold* level must be reset to 70 percent.
2. Load regulation function is disabled.

Changing back to default values is done by means of a Puretest scenario task.

Requirement: TBD

Verify: That the counter is increased (1 step) when overload regulation layer starts to reject incoming responses from scenarios due to overload situation.

Slingshot Scenario:

- 5_23_easOLrejectedISipResponses.xml, increase counter at initial Sip request when *IrThreshold* is met.

Test Servlet: tm13_1_sip.sar, a SIP servlet that uses a Loader class to generate the processor load based on input parameters from the SIP request. (loadRegulation test object)

5.2.2

LB-TC-13-29 SIP subsequent request rejection, CPU load above subsequent request threshold (SrThreshold)

Description: Measurement of type counter for the number of rejected incoming subsequent SIP requests encountered due to load over threshold value.

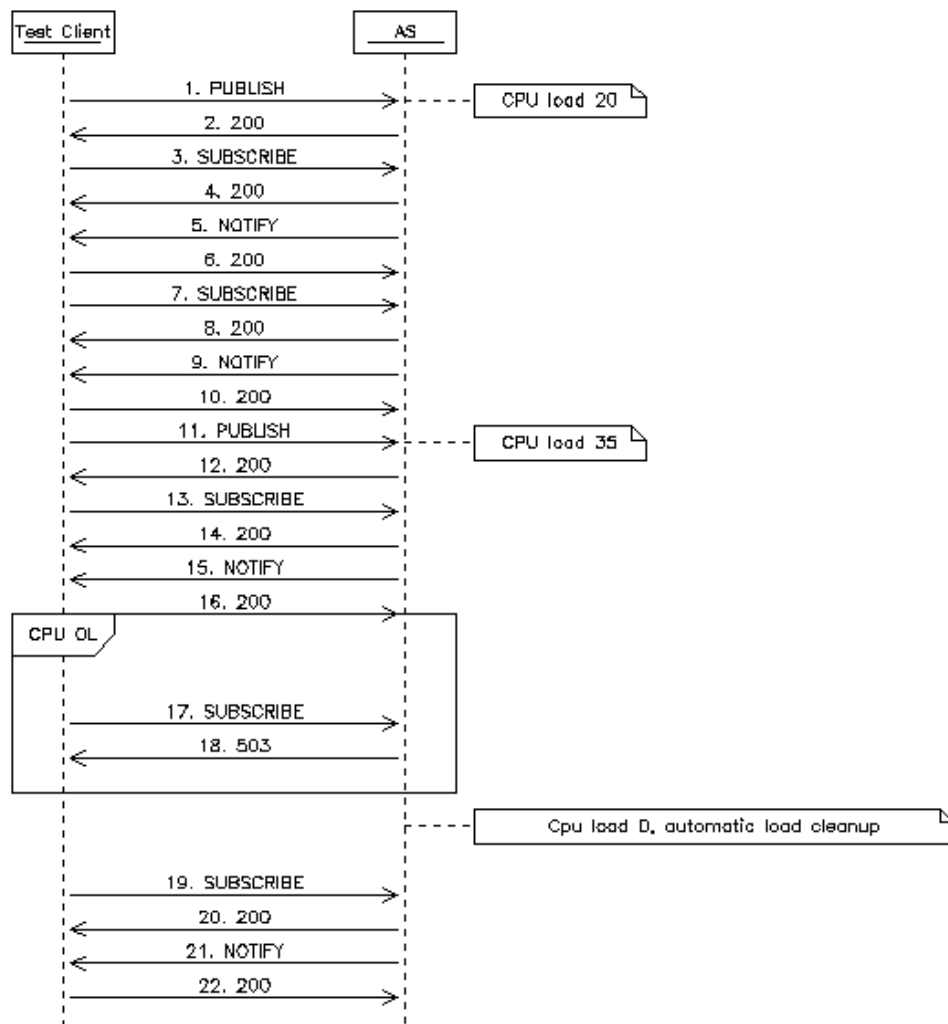


Figure 9: Message flow for test case 13.29

Precondition:

1. The Overload regulation function must be activated.
 2. The default values for sample rate and number of samples are used, *NumberOfSamples* = 5 and *SampleRate* = 2.
 3. The *SrThreshold* level must be set to 40 percent.
- 1,2 and 3 is done by changing the values by means of a Puretest scenario task.

Post-condition:

1. The *SrThreshold* level must be reset to default value.
2. Load regulation function is disabled.

Changing back to default values is done by means of a Puretest scenario task.

Requirement: TBD

Verify: That the counter is increased (1 step) when overload regulation layer starts to reject incoming requests from scenarios due to overload situation.

Slingshot Scenario:

- 5_29_easOLrejectedSSipResponses.xml, increase counter at subsequent Sip request when *SrThreshold* is met.

Test Servlet: tm13_1_sip.sar, a SIP servlet that uses a Loader class to generate the processor load based on input parameters from the SIP request. (loadRegulation test object)

5.2.3

LR-TC-13-30 SIP request rejection, CPU load above maximum threshold (MmThreshold)

Description: Measurement of type counter for the number of rejected incoming SIP requests encountered due to load over the maximum threshold value.

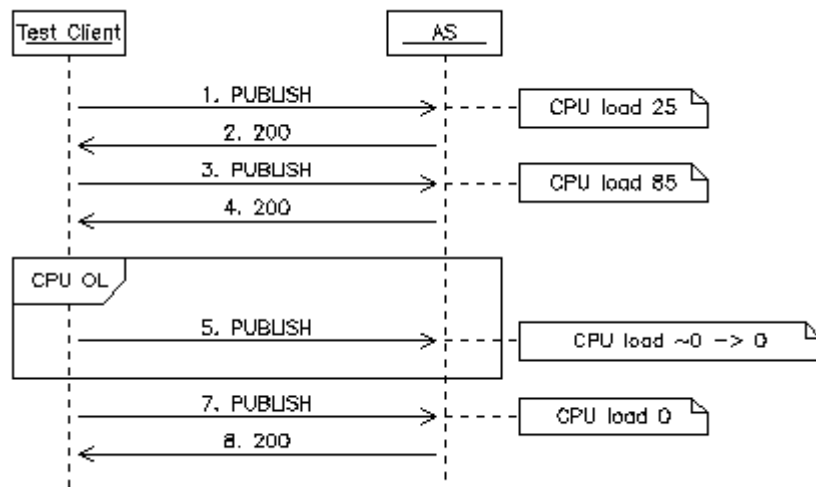


Figure 10: Message flow for test case 13.30

Precondition:

1. The Overload regulation function must be activated.
 2. The default values for sample rate and number of samples are used, *NumberOfSamples* = 5 and *SampleRate* = 2.
 3. The *MmThreshold* level must be set to 65 percent.
- 1, 2, and 3 is done by changing the values by means of a Puretest scenario task.

Post-condition:

1. The *MmThreshold* level must be reset to default value.
2. Load regulation function is disabled.

Changing back to default values is done by means of a Puretest scenario task.

Requirement: TBD

Verify: That the counter is increased (1 step) when overload regulation layer starts to reject any incoming requests from scenarios due load level above maximum threshold.

Slingshot Scenario:

- 13_30_easOLrejectedMISipResponses.xml, increase counter at Sip request when max threshold

Test Servlet: tm13_1_sip.sar, a SIP servlet that uses a Loader class to generate the processor load based on input parameters from the SIP request. (loadRegulation test object)

5.2.4

TC 5.24 HTTP request rejection, CPU load over HTTP threshold (HttpThreshold)

Description: Measurement of type counter for the number of rejected incoming Http requests received due to load above threshold value.

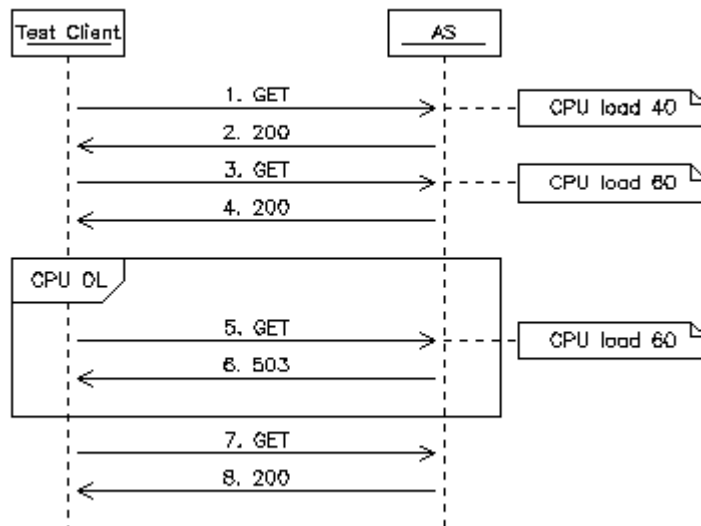


Figure 11: Message flow for test case 13.24

Precondition:

1. The Overload regulation function must be activated.
2. The default values for sample rate and number of samples are used.
3. The *HttpThreshold* level must be set to 50 percent.

Post-condition:

1. The *HttpThreshold* level must be reset to default value.
2. The Overload regulation function must be deactivated.

Changing back to default values is done by means of a Puretest scenario task.

Requirement: TBD

Verify: That the counter is increased (1 step) when overload regulation layer starts to reject incoming requests from scenarios due to load over threshold value.

Slip Scenario:

- 5_24_easOLrejectedHttpResp.xml, increase counter at Http request when *HttpThreshold* is met.

Test Servlet: tm13_2_http.war, an HTTP servlet that uses a Loader class to generate the processor load based on input parameters from the SIP request. (loadRegulation test object)

5.2.5 LR-TC13-31 HTTP request rejection, CPU load above maximum threshold (MmThreshold)

Description: Measurement of type counter for the number of rejected incoming Http requests received due to load above **maximum** threshold value.

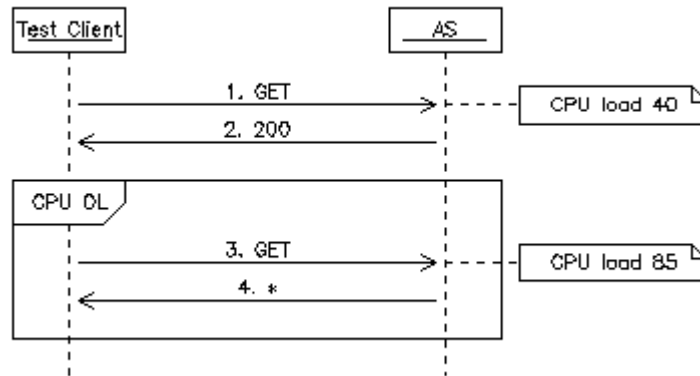


Figure 12: Message flow for test case 13.31

Precondition:

1. The Cpu Overload regulation function must be activated.
2. The default values for sample rate and number of samples are used.
3. The *MmThreshold* level must be set to 65 percent.

Post-condition:

1. The Overload regulation function must be deactivated.
2. The *MmThreshold* level must be reset to the default value.

Changing back to default values is done by means of a Puretest scenario task.

Requirement: TBD

Verify: That the counter is increased (1 step) when overload regulation layer starts to reject incoming requests from scenarios due to load above max threshold.

Slip Scenario:

- 513_31_easOLrejectedMHttpResp.xml, increase counter at Http request when *MmThreshold* is met.

Test Servlet: tm13_2_http.war, an HTTP servlet that uses a Loader class to generate the processor load based on input parameters from the SIP request. (loadRegulation test object)

5.2.6 LR-TC-13-26 Multiple SIP subsequent request rejection, CPU load above subsequent request threshold (SrThreshold)

Description: Measurement of type counter for the number of rejected incoming Sip requests received due to overload. 5 Sip (subsequent) requests will be sent and expected to be rejected due to overload when threshold value for *SrThreshold* is met.

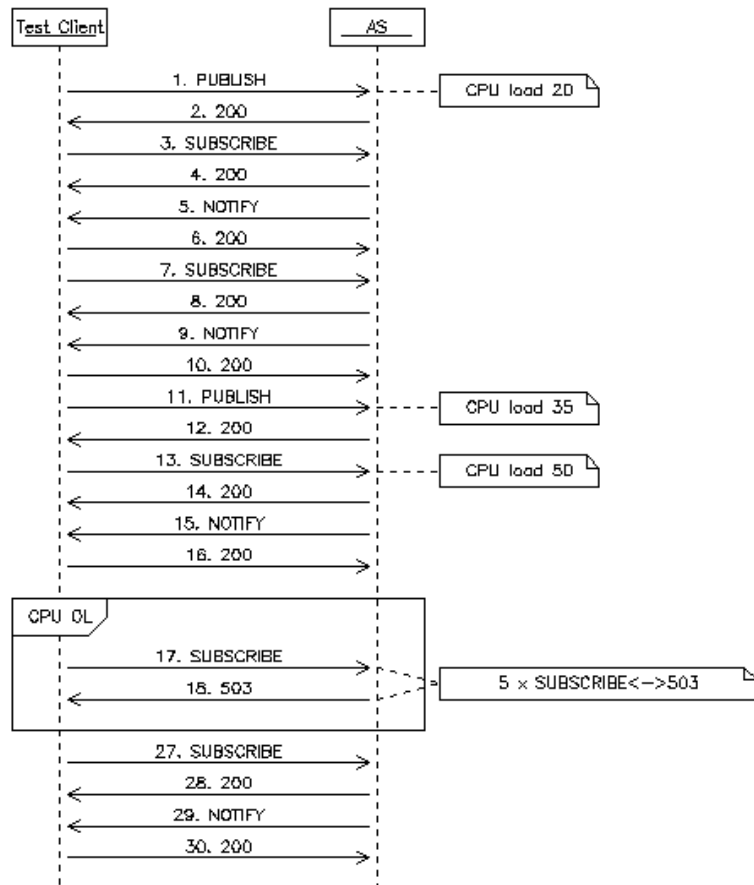


Figure 13: Message flow for test case 13.26

Precondition: See test case 5_23

Post-condition: See test case 5_23

Requirement: TBD

Verify: That the counter is increased (5 steps) for each request when overload regulation layer starts to reject incoming subsequent Sip requests from scenarios due to load above threshold value.

Slingshot Scenario:

- 5_26_easOL5rejectedSSipResponses.xml, increase counter at 5 subsequent Sip requests when *SrThreshold* is met.

Test Servlet: tm13_1_sip.sar, a SIP servlet that uses a Loader class to generate the processor load based on input parameters from the SIP request. (loadRegulation test object)

5.2.7 LR-TC13-28 Multiple HTTP subsequent request rejection, CPU load above HTTP threshold (HttpThreshold)

Description: Measurement of type counter for the number of rejected incoming Http requests received due to overload. 5 Http requests will be sent and expected to be rejected due to load above threshold value for *HttpThreshold* is met.

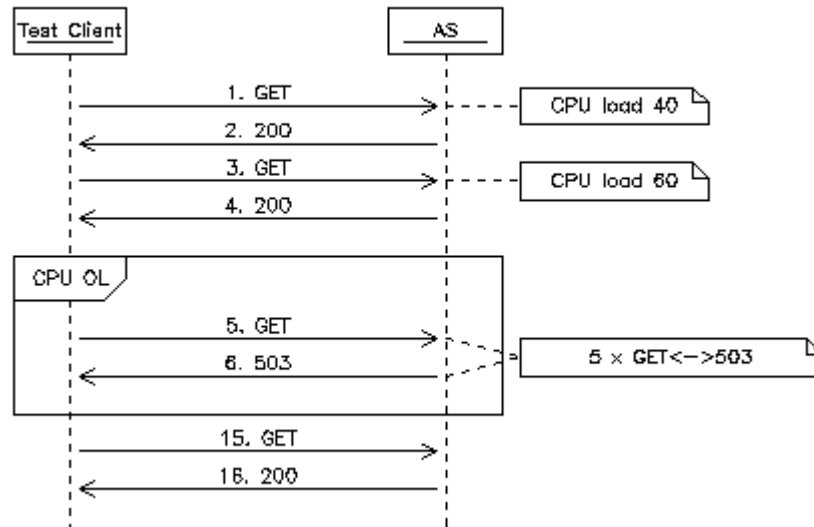


Figure 14: Message flow for test case 13.28

Precondition:

See test case 5_24

Post-condition:

See test case 5_24

Requirement: TBD

Verify: That the counter is increased (5 steps) for each request when overload regulation layer starts to reject incoming responses from scenarios due to overload situation.

Slip Scenario:

- 5_28_easOL5rejectedHttpResp.xml, increase counter at 5 Http requests when *HttpThreshold* is met.

Test Servlet: tm13_2_http.war, an HTTP servlet that uses a Loader class to generate the processor load based on input parameters from the SIP request. (loadRegulation test object)

5.2.8 LR-TC-13-32 SIP initial request rejection, memory load above initial request threshold (MemIrThreshold)

Description: Measurement of type counter for the number of rejected incoming initial SIP requests encountered due to load over memory threshold value. The Memory is loaded to 35 percent and the MemIrThreshold is set to 15 percent. Incoming initial sip requests are rejected. This test case verifies that such requests are rejected and counts them.

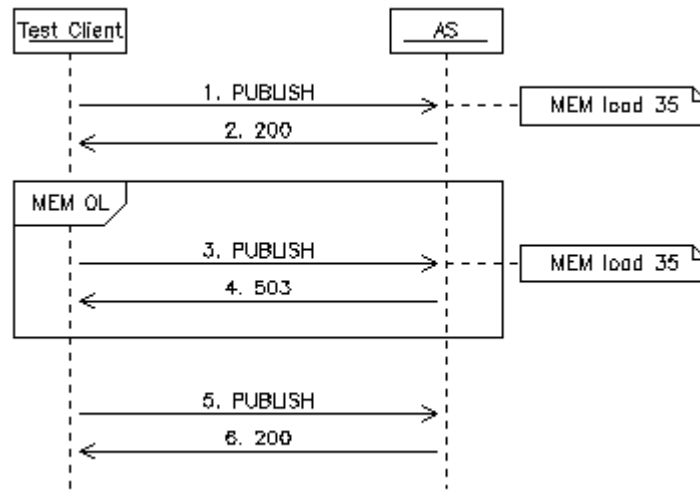


Figure 15: Message flow for test case 13.32

Precondition:

1. Memory Overload regulation function must be activated.
2. The default values for sample rate and number of samples are used, *NumberOfSamples* = 5 and *SampleRate* = 2.
3. The *MemIrThreshold* level must be set to 15 percent.

Post-condition:

1. The *MemIrThreshold* level must be restored to default.
2. Load regulation function is disabled.

Configuring parameters is done at the beginning and end of the automatic test suite by means of Puretest scenario tasks, *preparePMMemConfig.plc* and *restorePMMemConfig.plc*.

Requirement: TBD

Verify: That the counter *easOverloadRejectedSipRequests* is increased (1 step) when overload regulation layer starts to reject incoming responses from scenarios due to memory overload situation.

Slingshot Scenario:

- 5_32.xml, increase counter at initial Sip request when *MemIrThreshold* is met.

Test Servlet: *memory.sar*, a SIP servlet that uses a *Loader* class to generate the memory load based on input parameters from the SIP request. (*loadRegulation* test object)

5.2.9

LR-TC13-33 SIP subsequent request rejection, memory load above subsequent request threshold (*MemSrThreshold*)

Description: Measurement of type counter for the number of rejected incoming initial SIP requests encountered due to load over memory threshold value. The Memory is loaded to 35 percent and the *MemIrThreshold* is set to 15 percent. Incoming subsequent sip requests are accepted but the initial requests are rejected. This test case verifies that initial requests are rejected and counts them.

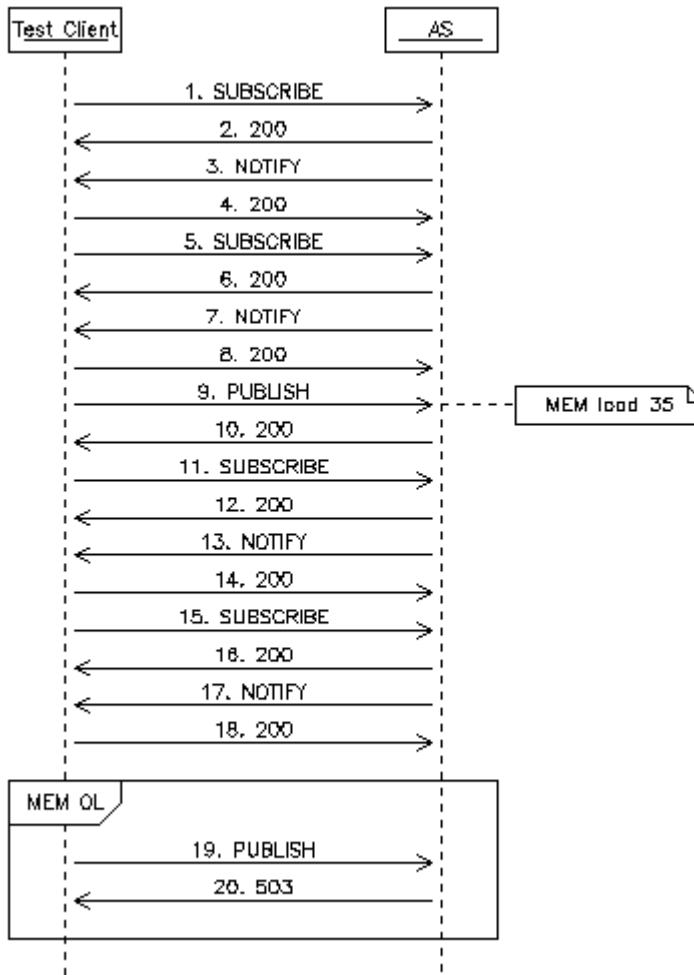


Figure 16: Message flow for test case 13.33

Precondition:

1. The Memory Overload regulation function must be activated.
2. The default values for sample rate and number of samples are used, *NumberOfSamples* = 5 and *SampleRate* = 2.
3. The *MemIrThreshold* level must be set to 15 percent.

Post-condition:

1. The *MemIrThreshold* level must be reset to default value.
2. Memory load regulation function is disabled.

Configuring parameters is done at the beginning and end of the automatic test suite by means of Puretest scenario tasks, *preparePMMemConfig.plc* and *restorePMMemConfig.plc*.

Requirement: TBD

Verify: That the counter *easOverloadRejectedSipResponses* is increased (1 step) when overload regulation layer starts to reject incoming subsequent requests from scenarios due to memory overload situation.

Slingshot Scenario:

Test Servlet: memory.sar, a SIP servlet that uses a MemoryConsumer class to generate the processor load based on input parameters from the SIP request. (loadRegulation test object)

5.2.10 LR-TC-13-34 SIP initial request rejection, memory load above maximum threshold (MemMmThreshold)

Description: Measurement of type counter for the number of rejected incoming SIP requests encountered due to load over the maximum threshold value. The Memory is loaded to 80 percent and the MemMmThreshold is set to 70 percent. Incoming subsequent and initial sip requests are rejected. This test case verifies that initial and subsequent requests are rejected and counts them.

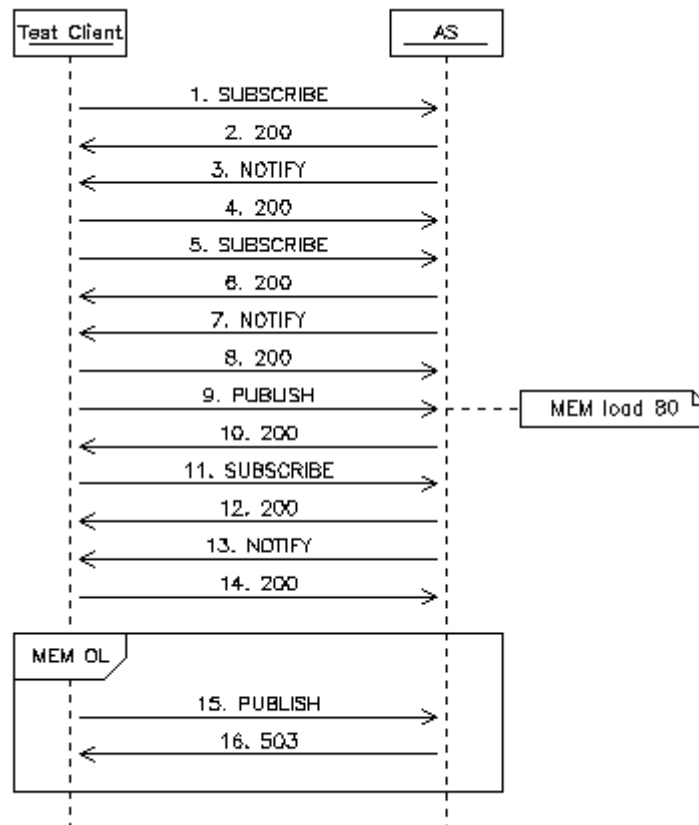


Figure 17: Message flow for test case 13.34

Precondition:

1. The Overload regulation function must be activated.
2. The default values for sample rate and number of samples are used, *NumberOfSamples* = 5 and *SampleRate* = 2.
3. The *MemMmThreshold* level must be set to 70 percent.

Post-condition:

1. The *MemMmThreshold* level must be reset to default value.
2. Memory Load regulation function is disabled.

Configuring parameters is done at the beginning and end of the automatic test suite by means of Puretest scenario tasks, *preparePMMemConfig.plc* and *restorePMMemConfig.plc*.

Requirement: TBD

Verify: That the counter easOverloadRejectedSipResponses is increased (2 steps) when memory overload regulation layer starts to reject any incoming requests from scenarios due load level above maximum threshold.

Slingshot Scenario:

- 5_34.xml

Test Servlet: memory.sar, a SIP servlet that uses a Memory Consumer class to generate the memory load based on input parameters from the SIP request. (loadRegulation test object)

5.2.11

LR-TC-13-35 HTTP request rejection, memory load over HTTP threshold (MemHttpThreshold)

Description: Measurement of type counter for the number of rejected incoming Http requests received due to load above threshold value. The Memory is loaded to 60 percent and the MemHttpThreshold is set to 40 percent. This test case verifies that incoming requests are rejected and counts them.

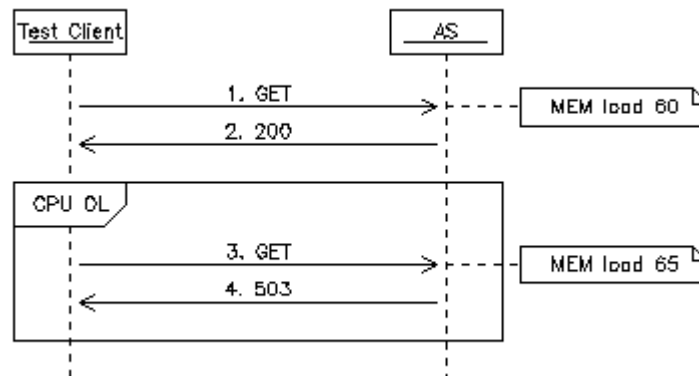


Figure 18: Message flow for test case 13.35

Precondition:

1. The Memory Overload regulation function must be activated.
2. The default values for sample rate and number of samples are used.
3. The *MemHttpThreshold* level must be set to 40 percent.

Post-condition:

1. The *MemHttpThreshold* level must be reset to default value.
2. The Memory Overload regulation function must be deactivated.

Configuring parameters is done at the beginning and end of the automatic test suite by means of Puretest scenario tasks, preparePMMemConfig.plc and restorePMMemConfig.plc.

Requirement: TBD

Verify: That the counter easOverloadRejectedHttpResponses is increased (1 step) when memory overload regulation layer starts to reject incoming requests from scenarios due to load over threshold value.

Slip Scenario:

5_35.xml, increase counter at Http request when *MemHttpThreshold* is met.

Test Servlet: http_memory.war, an HTTP servlet that uses a Memory Consumer class to generate the memory load based on input parameters from a HTTP request. (loadRegulation test object)

6 Approvals / Reviewers

<i>Name</i>	<i>Function</i>	<i>Date</i>	<i>Approval/Reviewer</i>	<i>Comments</i>
Eltjo Boersma	Quality Engineer		Reviewer	
Andreas Nyberg	Test Engineer		Reviewer	
<<Engineering counterpart>>	Engineering module owner		Approver	
	Lead		Approver	
	Manager		Approver	

7 References

- [1] Functional Specification Load Regulation
Document url:
[TBD](#)