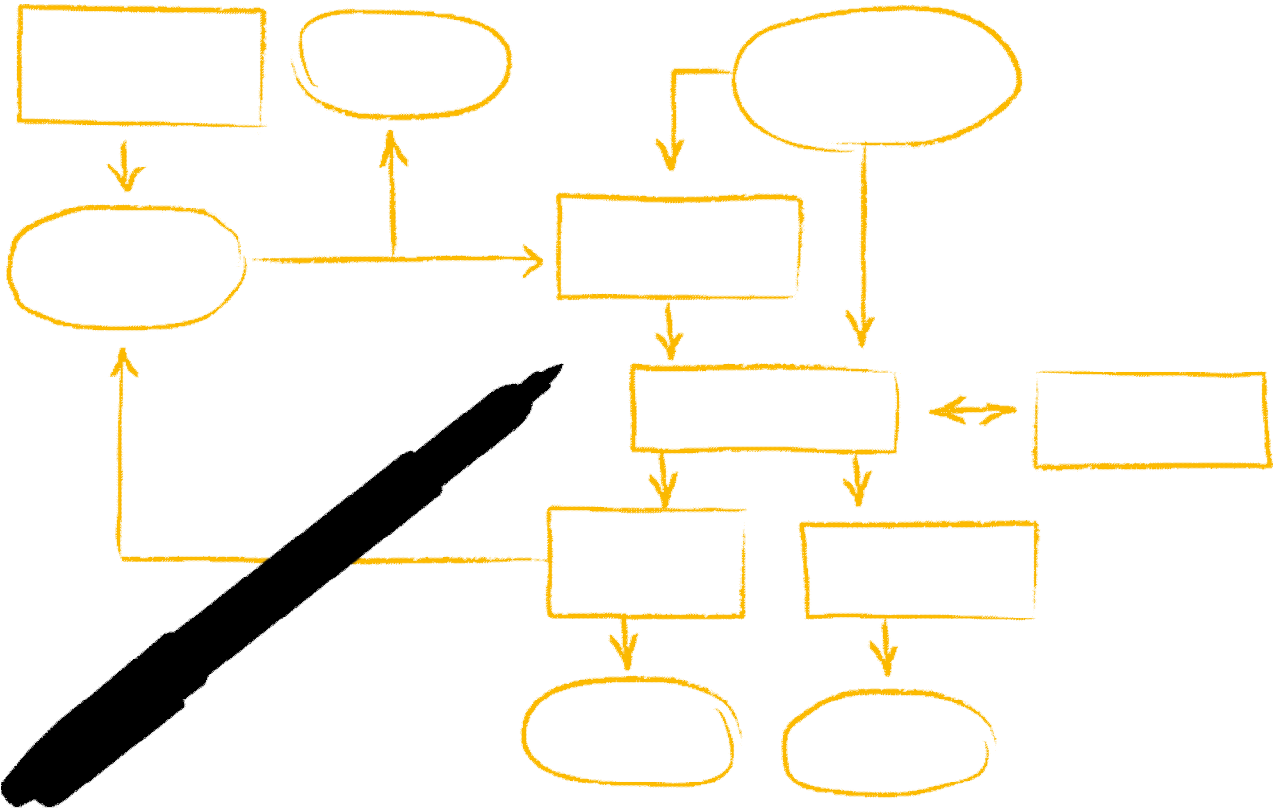# High Availability Test Tool
Version 2.1

Apr. 14, 2016

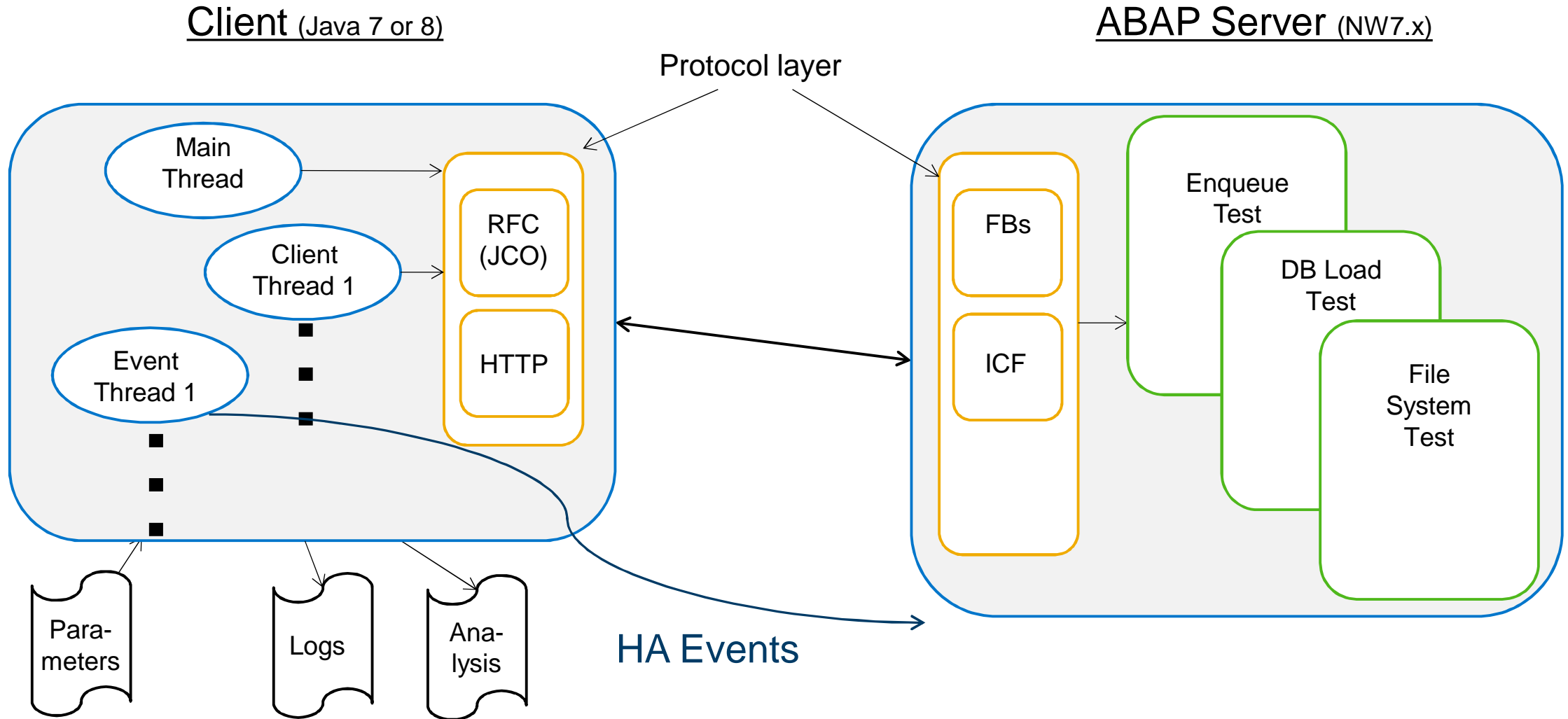# High Availability Test Tool Version 2.1
Introduction

Mission

- HA tests for SAP AS ABAP 7.00 and higher versions

Key Characteristics of Version 2.1

- Simple installation

- Automated test execution

- Quick test assessment

- Automated check against expected result

- Configurable and defined load

- Integrated fail-over event handling

- Dedicated test classes to cover single point of failures

- Coherent user-experience for all test cases

- Dedicated test tables and test data to avoid interference with SAP applications

High Availability Test Tool Version 2.1
Architecture

Client (Java 7 or 8)

ABAP Server (NW7.x)

Protocol layer

Main Thread

Client Thread 1

Event Thread 1

RFC (JCO)

HTTP

FBs

ICF

Enqueue Test

DB Load Test

File System Test

Para-meters

Logs

Ana-lysis

HA Events

(HTTP protocol and file system test as of version 2.11)
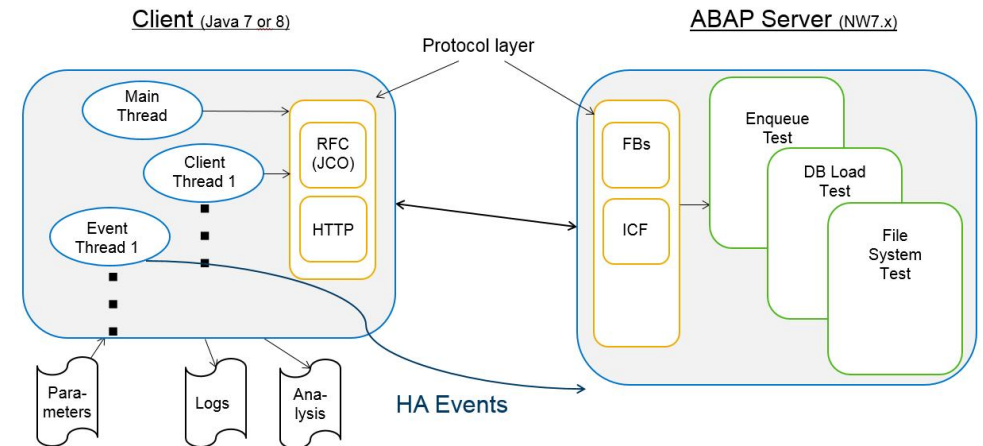
High Availability Test Tool Version 2.1
Installation, Configuration and Execution

Server

- Prerequisite
  - WebAS ABAP 7.0 and higher versions
- Package
  - ABAP transport with programs, tables, and data
  - Customizing transport with role SAP_BC_HALOAD
- Configuration
  - Create user and assign role SAP_BC_HALOAD to him/her
  - Activate ICF service hatool (as of v2.11)

Client

- Prerequisite
  - JDK/JRE 7 or 8 (SAP JVM recommended)
  - SAP JCo 3.0
  - Graphics library d3.min.js (optional; as of v2.12)
- Package
  - Client driver (jar-file)
  - Property files (complete, event and quick start property file)
  - Template for checking against expected result
  - Template for HTML output (as of v2.12)
- Configuration
  - Adapt property file(s) and (optionally) check template file
- Start Test
 - java -cp haTestTool.jar;C:\sapjco3\sapjco3.jar com.sap.test.haload.ClientDriver file=ha.properties

Client (Java 7 or 8)

Protocol layer

ABAP Server (NW7.x)

Main Thread

Client Thread 1

Event Thread 1

RFC (JCO)

HTTP

FBs

ICF

Enqueue Test

DB Load Test

File System Test

Para-meters

Logs

Ana-lysis

HA Events

High Availability Test Tool Version 2.1
Automated System Fail-Over

HA Events

- Programs or scripts to be called on client side
  - Call mechanism for events
  - Collection of the event output
  - Events have to be scripted by end-user
- Single Events
  - Independent of other events
  - Start certain time after beginning of highload phase
- Event chains
  - First event starts certain time after beginning of highload phase
  - Other events start after their predecessor has finished
- Single Events combined with Event Chains
  - Any combination of single events and event chains are possible
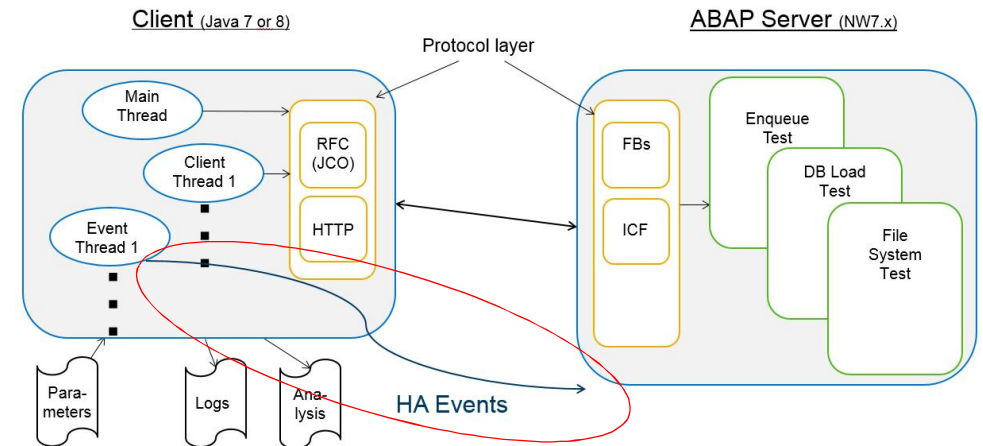
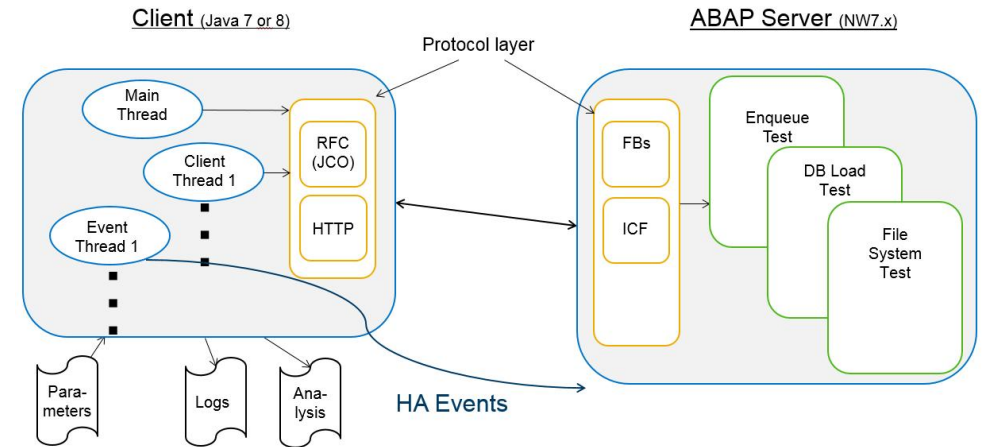# High Availability Test Tool Version 2.1
Customer Readiness

Security

- SNC (Secure network Communication)
- HTTPS (as of v2.11)
- Authorization check on server + user role
- Fixed directory structure
- Uniqueness of object names on the server

Cleanup

- Uninstallation on the server via transport

Delivery Process

- Download the HA Test Tool package from SCN
- See SAP note 2081226 for details
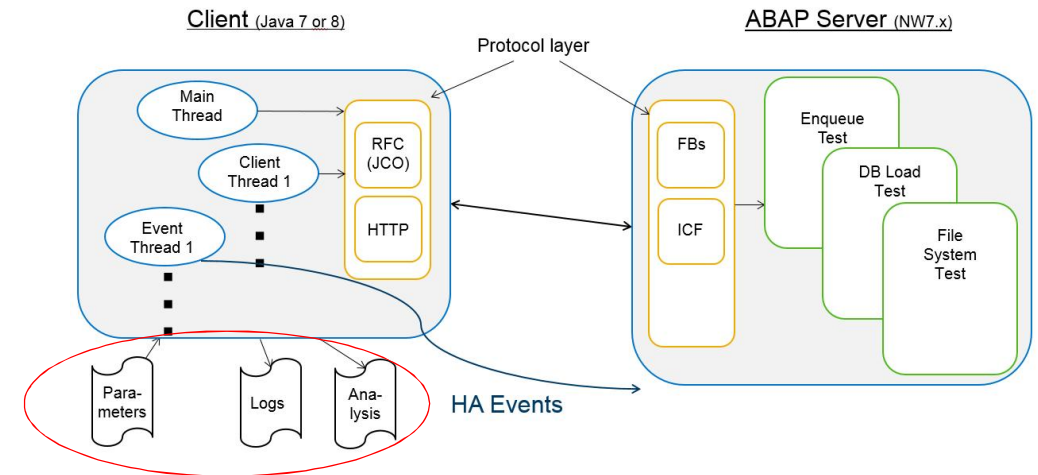
High Availability Test Tool Version 2.1
Data Output

Directories

- Test run specific output directory
- Data of former runs is not overwritten

Data Files

- Dedicated output files per test run
  - Log file
  - Summary file (contains detailed analysis information)
    o Text file
    o XML file
    o HTML file (graphical; as of v2.12)
    o .csv file for performance data
- Dedicated output file per client thread
  - .res file (protocol of server calls)
  - .err file (extract of erroneous server calls)
  - .elg file (error message and stack trace for each erroneous server call)
  - .summary file
- Dedicated output file per HA event
  - .log file (log file of event thread of HA Test Tool)
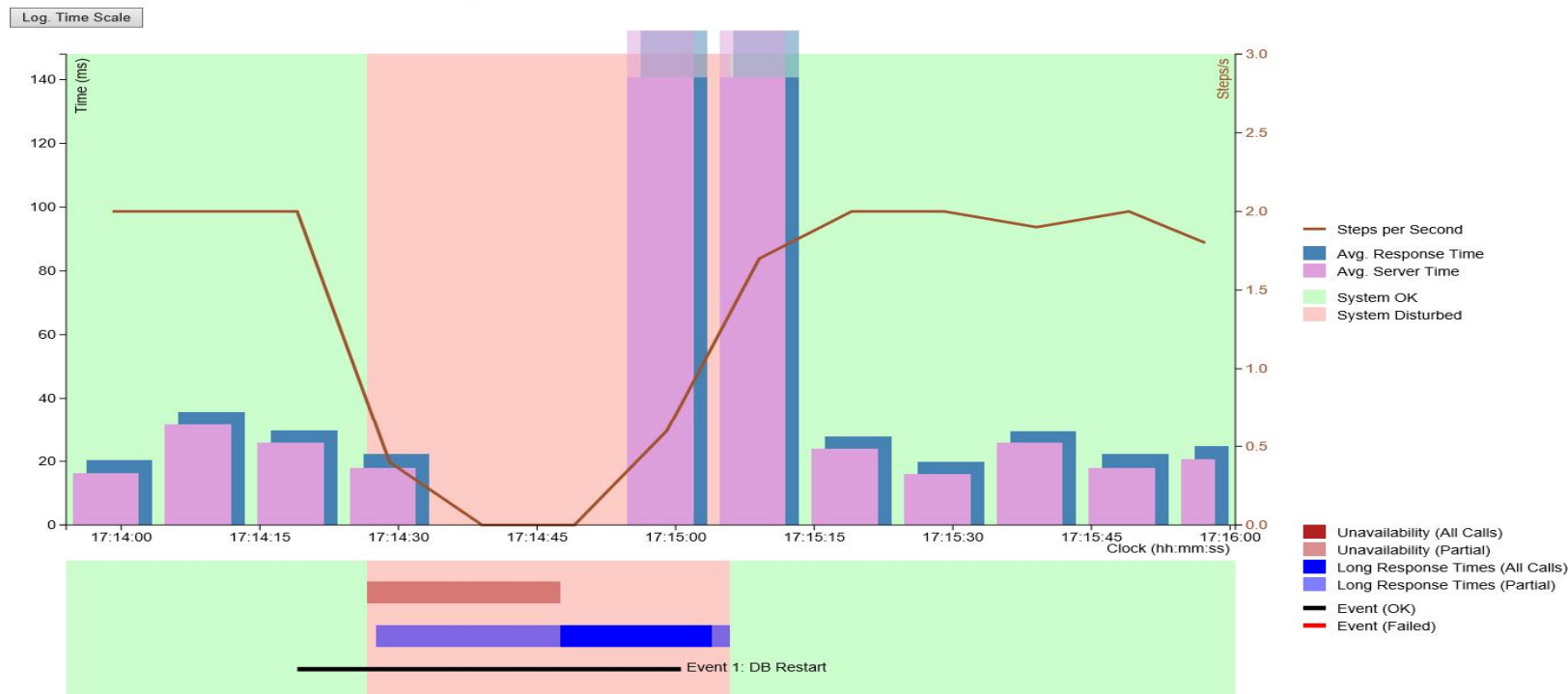 - .out file (redirection of stdout and stderr of event)

High Availability Test Tool Version 2.12

Graphical Analysis of Test Run - Example of file loadtest.html

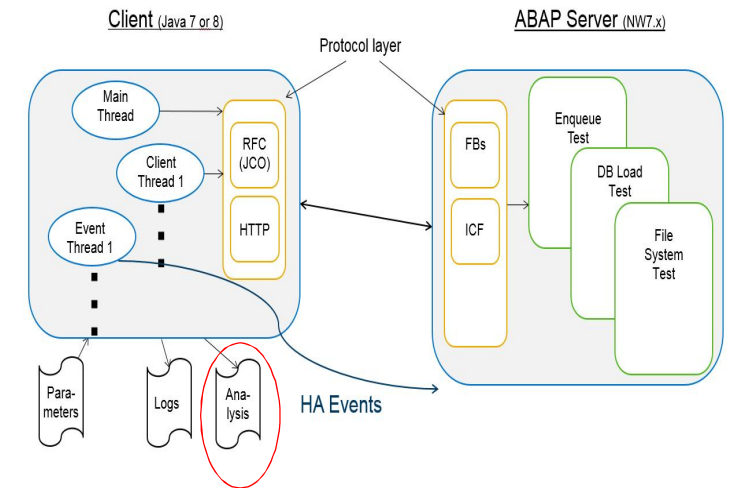**Graphics library d3.min.js required (is open source)**

High Availability Test Tool Version 2.1

Analysis of Test Run (I) - Example of file loadtest.summary

```
LOADTEST v2.12
Started at              2016-04-12 17:13:02.605

Test RunID:             v2.12+check.db.restart.file
Test class:             CL_HA_DB_LOAD
Call type:              RFCStateful
Destination:            xxxxxxx
Output directory:       C:\HATool\testEnv\HATool\output\v2.12+check.db.restart.file\xxxxxxx\RFCStateful\CL_HA_DB_LOAD
checkfile:              C:\HATool\testEnv\HATool\check\unavail.longresp.errors.xml
Number of clients:      10
Steps per loop:         5
Loops per session:      1
Think time(s):          5
Subtest Parameters:     ItemsPerOrder:50
Test duration(s):       300
Duration after events: 60

Internal ID of subtest: 2709

High load phase started at: 2016-04-12 17:13:54.039
High load phase ended at:   2016-04-12 17:16:00.569
2016-04-12 17:16:24.256 Test finished


H A   E V E N T S
-----------------


Event 1: DB Restart
  Status: EXECUTED       (Exit code: 0)
  Duration:    2016-04-12 17:14:19.056 - 2016-04-12 17:15:00.568  (41,512s)
```

General Test Information

HA Events

High Availability Test Tool Version 2.1
Analysis of Test Run (II) - Example of file loadtest.summary

```
A V A I L A B I L I T Y  and  R E S P O N S I V E N E S S
-----------------------------------------------------------

System ok:          2016-04-12 17:13:04.116 - 2016-04-12 17:14:26.642
System disturbed:   2016-04-12 17:14:26.643 - 2016-04-12 17:15:05.871  (39,228s)
System ok:          2016-04-12 17:15:05.872 - 2016-04-12 17:16:22.049

The periods of disturbance of the system are caused either by erroneous calls
that indicate that the system or parts of the system are not available or
by calls that exceed the threshold for long response times suggesting
that long wait times inside the system occurred during the calls.
For more details, see the following sections:
- Disturbance, indicated by erroneous calls
- Disturbance, indicated by long response times


D I S T U R B A N C E, indicated by E R R O N E O U S  C A L L S  (U N A V A I L A B I L I T Y)
-----------------------------------------------------------------------------------------------

Severe errors in part of the calls: 2016-04-12 17:14:26.643 - 2016-04-12 17:14:47.492  (20,849s)

The errors that indicate periods of restricted or no availability are caused by following reasons:

Component(s) on the server could not be reached.
This is indicated by the error code APP_NOTAVAIL_ERR.
For more details, search for APP_NOTAVAIL_ERR in the client output files


D I S T U R B A N C E, indicated by L O N G   R E S P O N S E   T I M E S
-----------------------------------------------------------------------------------------------

Threshold for long response times = 10 seconds

Partially long response times: 2016-04-12 17:14:27.576 - 2016-04-12 17:14:47.492  (19,916s)
No response:                   2016-04-12 17:14:47.493 - 2016-04-12 17:15:03.926  (16,433s)
Partially long response times: 2016-04-12 17:15:03.927 - 2016-04-12 17:15:05.871  (1,944s)
```

Availability and Responsiveness of the system

Reasons for disturbance

Erroneous calls

Calls with long response times

High Availability Test Tool Version 2.1

Analysis of Test Run (III) - Example of file loadtest.summary

```
V E R I F I C A T I O N
-----------------------

Verification of server data after the test run showed no errors

    Verification result of frame test class: CL_HA_TESTFRAME_DB

      OK: All DB tables have the correct number of rows with int_runid 0.

    Verification result of test class: CL_HA_DB_LOAD

      DB table size check of int_runid 2709
        OK. Number of rows in DB table HALOAD_DB_MAT = 1000
        OK. Number of rows in DB table HALOAD_DB_CUST = 1000
        OK. Number of rows in DB table HALOAD_DB_ORDER = 60
        OK. Number of rows in DB table HALOAD_DB_ORDITM = 1500

      Result of checks of int_runid 2709
        No check errors occurred

      Verification summary of test class: CL_HA_DB_LOAD
        OK: All DB tables have the correct number of rows for checked int_runids.
        OK: No check errors occurred during the test.


E R R O R   O V E R V I E W
---------------------------

Number of erroneous calls:    3

Errors during execution of steps
  Number of application errors (APP_NOTAVAIL_ERR): 3
```

Verification of server data after the test run

Verification made during the test run

Error summary

High Availability Test Tool Version 2.1

Analysis of Test Run (IV) - Example of file loadtest.summary

```
P E R F O R M A N C E  and  T H R O U G H P U T
----------------------------------------------

Time range:  2016-04-12 17:13:54.039 - 2016-04-12 17:16:00.569
Number of steps:    178
Number of logins:   40
Steps per second:   1,4
Avg. response time in ms:         1603,2
Avg. elapsed time(Server) in ms:  59,6
Avg. response time of login in ms: 20,4
  Step 1
    Avg. response time in ms:         4003,8
    Avg. elapsed time(Server) in ms:  123,0
  Step 2
    Avg. response time in ms:         2028,0
    Avg. elapsed time(Server) in ms:  56,6
  Step 3
    Avg. response time in ms:         30,4
    Avg. elapsed time(Server) in ms:  26,7
  Step 4
    Avg. response time in ms:         29,7
    Avg. elapsed time(Server) in ms:  25,9
  Step 5
    Avg. response time in ms:         1458,0
    Avg. elapsed time(Server) in ms:  54,4

Tact duration = 10 seconds
```

Response times and throughput
of complete run

```
Number       Start        Number   Steps    Avg.      Avg.      Avg.
  of          of            of      per    Response   Server    Login
 Tact        Tact          Steps  Second   Time (ms)  Time (ms) Time (ms)
-------------------------------------------------------------------------
    1   2016-04-12 17:13:54.041    20    2,0      20,3      16,2      17,8
    2   2016-04-12 17:14:04.041    20    2,0      35,6      31,5       0,0
    3   2016-04-12 17:14:14.042    20    2,0      29,6      25,9      18,2
    4   2016-04-12 17:14:24.042     4    0,4      22,2      18,0      17,0
    5   2016-04-12 17:14:34.043     0    0,0       0,0       0,0       0,0
    6   2016-04-12 17:14:44.044     0    0,0       0,0       0,0       0,0
    7   2016-04-12 17:14:54.044     6    0,6   34844,7     599,7       0,0
    8   2016-04-12 17:15:04.044    17    1,7    4250,4     210,0      60,0
    9   2016-04-12 17:15:14.045    20    2,0      27,8      24,0      16,3
   10   2016-04-12 17:15:24.045    20    2,0      19,8      16,0      16,7
   11   2016-04-12 17:15:34.046    19    1,9      29,4      25,8       0,0
   12   2016-04-12 17:15:44.046    20    2,0      22,2      17,9      16,5
   ........
```

Granular analysis
of response times and throughput

High Availability Test Tool Version 2.1
Analysis of Test Run (V) - Example of file loadtest.summary

```
C H E C K against E X P E C T E D   R E S U L T
----------------------------------------------

Check result against C:\HATool\testEnv\HATool\check\unavail.longresp.errors.xml

Check for unavailability
  OK: Period(s) of unavailability expected.

Check for long response times
  OK: Period(s) of long response times expected.

Check for errors
  OK: Errors occurred as expected.

Final result:
  OK: Outcome of test run was as expected.


E X I T   C O D E
-----------------

Exit code based on the analysis of the test run: 0 (OK)
```

> Check against expected result