# Workload Processor

This presentation shows the basic use case for the following solutions

- WLP – Workload Processor
- WLT – Workload Replay
- WLA – Workload Analytics

# Workload Processor

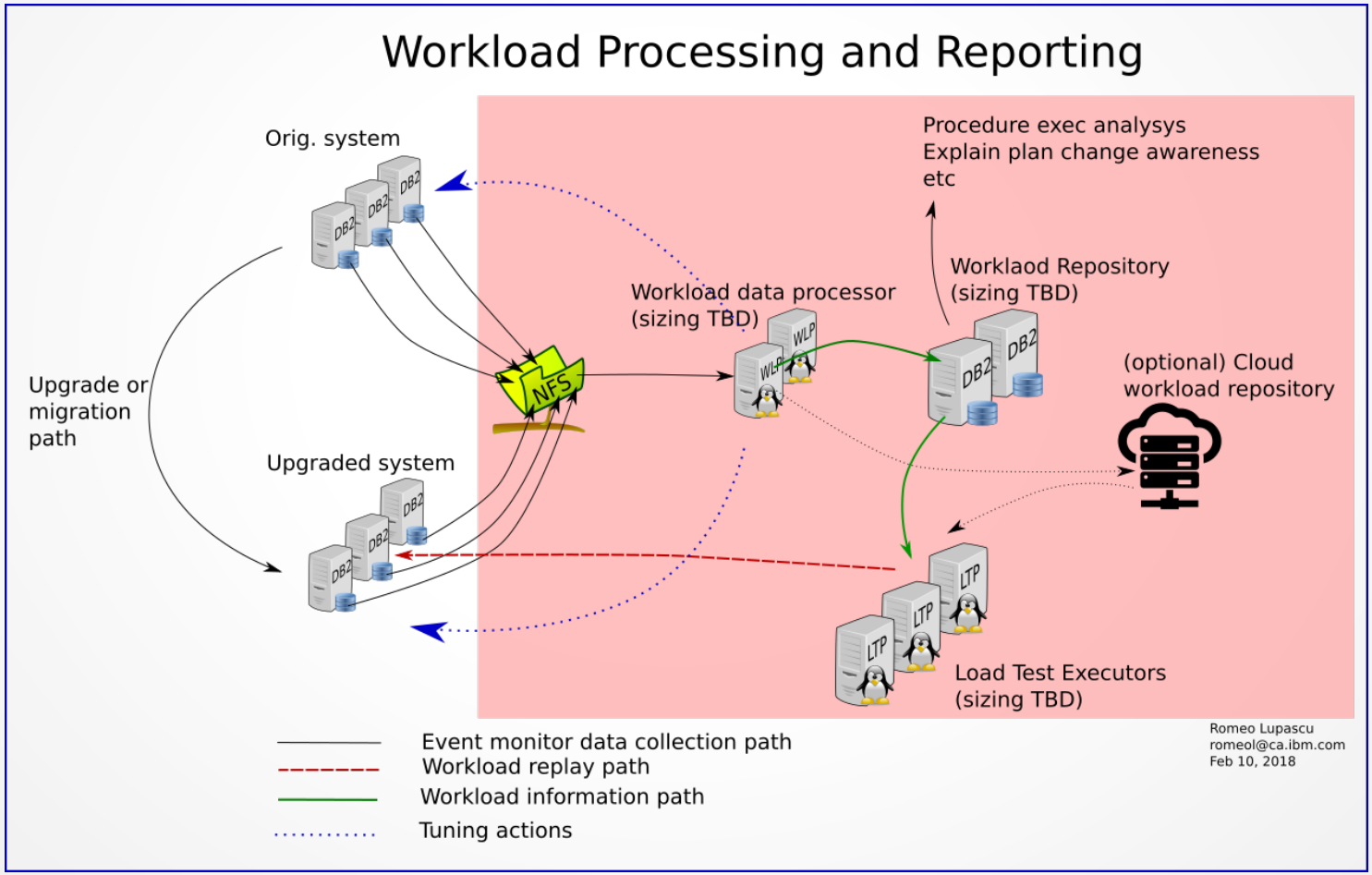
- Architecture
- Typical deployment use case
- Installing the WLPT package
- Basic connectivity configuration
- Preparing the database for workload capture
- Create a new load test descriptor
- Execute a load test
- Check test outcome
- Compare performance by using histograms

# Workload Processor

The big picture
Architecture

# Workload Processor





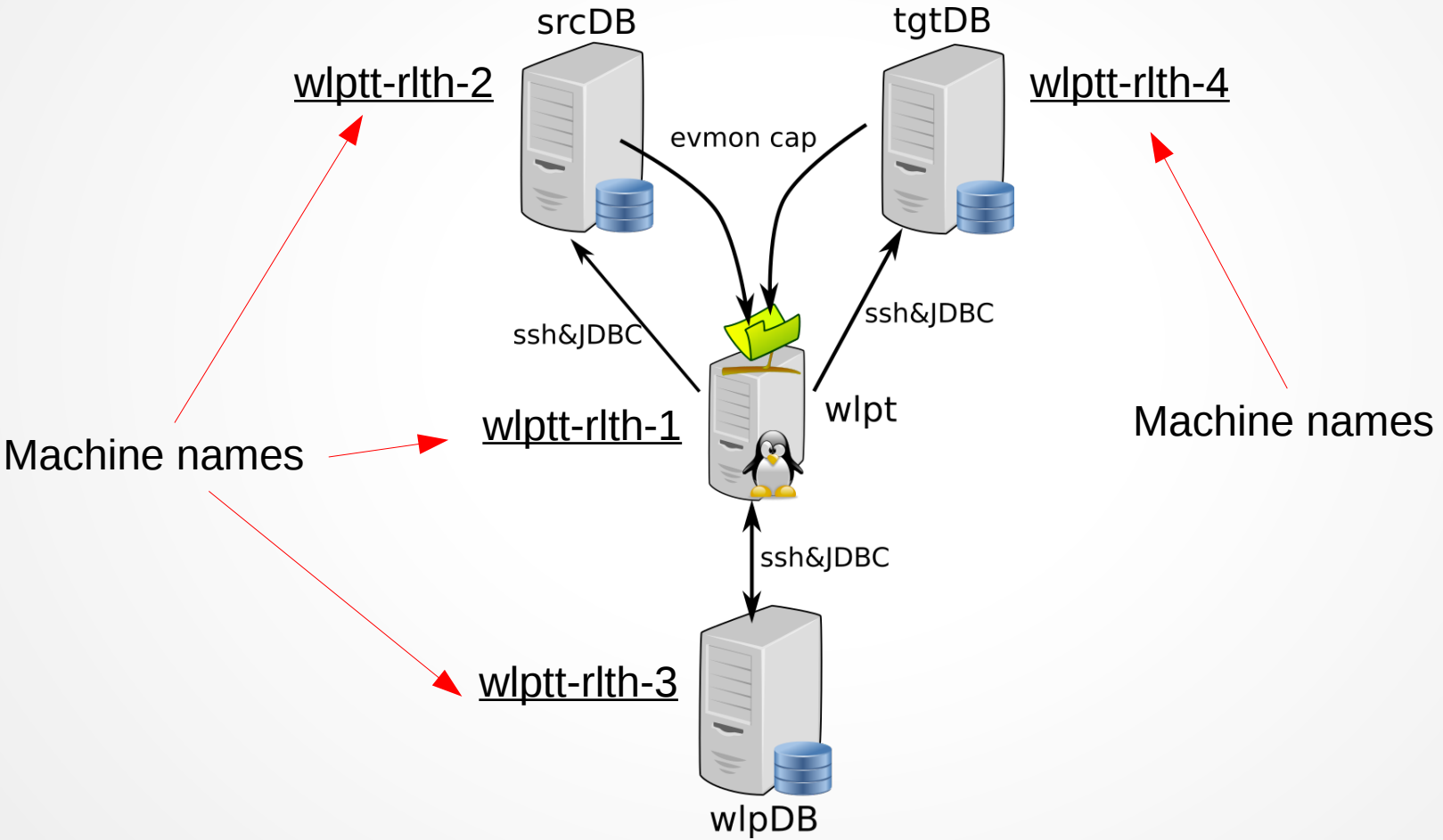
# Workload Processor



The Typical Use Case

# Workload Processor





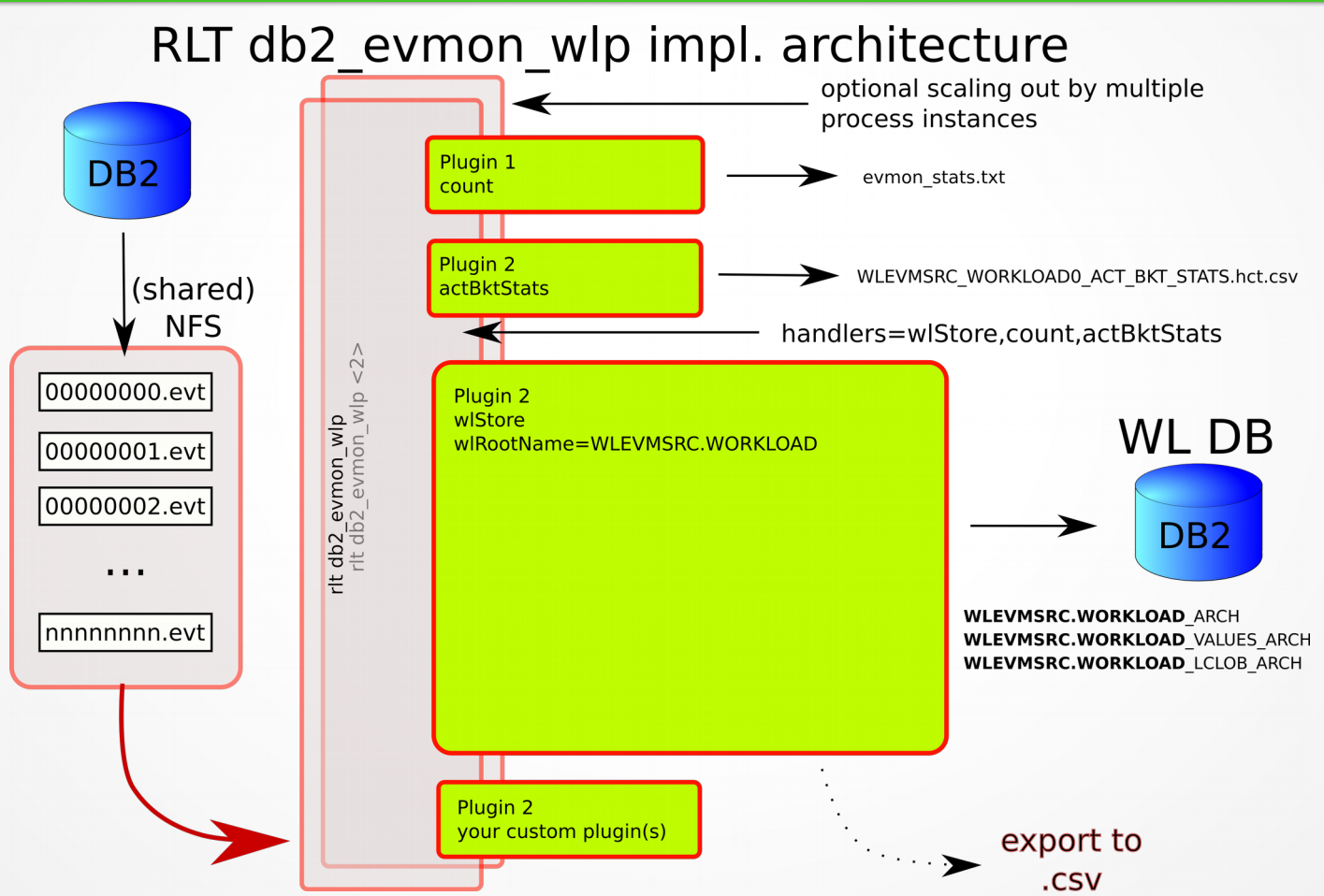
# Workload Processor



The DB2 event file parser architecture
(command db2_evmon_wlp)

# Workload Processor

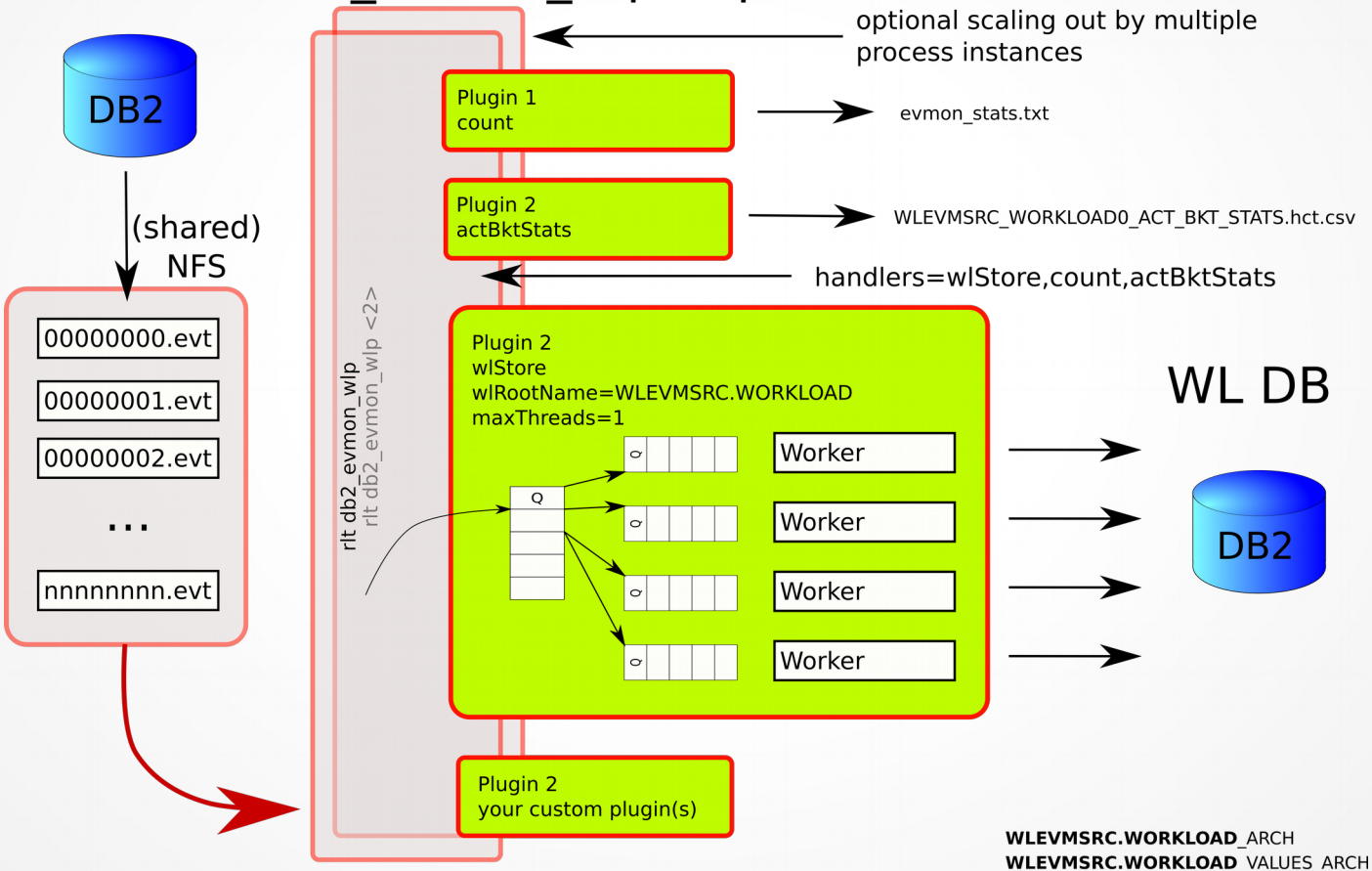




# Workload Processor



## RLT db2_evmon_wlp impl. architecture



# Workload Processor



Installing RLT software

# Workload Processor Acquiring the software



- From github.com check the project https://github.com/romeolibm/DBWorkloadProcessor
  - ]$ git clone https://github.com/romeolibm/DBWorkloadProcessor.git
- The stable build executable installation jar can be found in
  - ]$ cd DBWorkloadProcessor/stableBuild
- The latest build executable installation jar can be found in
  - ]$ cd DBWorkloadProcessor/betaBuild

# Workload Processor installing form the jar



- Find your java executable, check type and version, recommended IBM or Oracle version 1.8 or higher
  - ]$ java -version
- Create a work folder for the rlt package and install it from the downloaded archive
  - ]$ mkdir ~/rlt
  - ]$ cd rlt
- Verify the jar integrity and IBM certificate CN
  - ]$ jarsigner -verify rlt_db2wlpt_<timestamp>.jar
    jar verified.
  - jarsigner -verify -certs -verbose rlt_db2wlpt_<timestamp>.jar | grep IBM
    …
    X.509, CN=International Business Machines Corporation, OU=IBM CCSS, O=International Business Machines Corporation, L=Armonk, ST=New York, C=US
    …
- Install the software
  - ]$ java -jar rlt_db2wlpt_<timestamp>.jar

    replace <timestamp> with an actual value example rlt_db2wlpt_2018_11_04_20_11_32_831.jar

# Workload Processor optional setup your environment



- The RLT software installs itself in your $HOME/bin/rlt_<package>_<build-ts> and creates symbolic links **rlt, rlta, rltc, rltalias, rltunalias, rltunset** pointing to the latest installed version
- The install and rlt_update command will keep only the last three versions of the software in $HOME/bin folder (removes older versions)
- Basic commands description (where to start after install)
  - $] rlt <sub-command> <params>
    - Execute any rlt sub-command in an interactive mode
  - $] rlta <subcommand> <params>
    - Execute the sub-command in background batch mode (same as nohup rlt <subcommand> <params> &
  - $] source rltalias
    - Create shell aliases for all sub-commands and command profiles
- List all available sub-commands in your package
  - ]$ rlt

# Workload Processor



```
[wlptu@wlptt-rlth-1 rlt]$ java -jar /software/rlt_db2wlpt_2018_11_09_14_53_29_650.jar
---------------------------
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   distributed under the License is distributed on an "AS IS" BASIS,
   WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
   See the License for the specific language governing permissions and
   limitations under the License.
-------------------------------------------------------------------------------
If you accept above conditions type YES+ENTER:YES
```

# Workload Processor



```
------------------------------
RLT Environment Main Properties
------------------------------

---------------------------- ------------------------------------------------------------
Property Name                Property Value
---------------------------- ------------------------------------------------------------
Date                         Fri Nov 09 11:57:17 PST 2018
Build timestamp              2018_11_09_14_22_53
Build ID                     e1bf676e-5b52-4e0e-b42e-2d17513dd7bf
Instance Id                  __null__
Installed in                 /home/wlptu/bin/rlt_db2wlpt_2018_11_09_14_53_29_650
Java Home                    /opt/ibm/db2/v11.1/java/jdk64/jre
RLT Home folder              /home/wlptu
RLT database folder          /home/wlptu/.rlt
RLT log config source        /home/wlptu/.rlt/rlt_log.properties
RLT log active levels        INFO WARN SEVERE
RLT Home folder              /home/wlptu
RLT.execHist.max_files       100
Kerberos5 config file        Default
JAAS config file             Default
User Home                    /home/wlptu
User Name                    wlptu
User Language                en
User Timezone                America/Los_Angeles
User Country                 US
OS Name                      Linux
OS Version                   3.10.0-957.el7.x86_64
OS Architecture              amd64
OS Encoding                  UTF-8
Memory max   (MB)            512
Memory total (MB)            41
Memory free  (MB)            11
Available processors         2
java.class.version           52.0
java.fullversion             JRE 1.8.0 IBM J9 2.8 Linux amd64-64 Compressed References 20
                             160106_284759 (JIT enabled, AOT enabled)
                             J9VM - R28_20160106_1341_B284759
                             JIT  - tr.rl4.java_20151209_107110.02
                             GC   - R28_20160106_1341_B284759_CMPRSS
                             J9CL - 20160106_284759
java.runtime.version         pxa6480sr2fp10-20160108_01 (SR2 FP10)
java.specification.version   1.8
java.version                 1.8.0
java.vm.specification.version 1.8
java.vm.version              2.8
[wlptu@wlptt-rlth-1 rlt]$
```

The information table logged by the setup command and later on by using the command:
]$ rlt info

# Workload Processor

Updating RLT software

# Workload Processor updating the software



- Once the software is installed you can use the rlt_update sub-command
  - ]$ rlt_update
- The rlt_update automates the process of searching for a newer version of your software and if it finds one it will download (if necessary) the new jar verify its integrity and execute the install of the new software
- It is recommended that you create a command profile for your update process and create service for automatic updates

# Workload Processor



Create or check your ~/env.properties

To get a commented template of env.properties use the command

]$ rlt env_help

# Workload Processor



Check RLT database alias configuration in ~/env.properties

Classic JDBC connection info example with encrypted password

```
srcdbAdm.connection.password=U/8ICO3nRcFS42t6xQPXItlTRusAeBoxOQDJmxhL4xQlVpval2ljz5GebXj8rIti
srcdbAdm.connection.password.crypt=yes
srcdbAdm.connection.url=jdbc:db2://srcdb:50000/SAMPLE:\
retrieveMessagesFromServerOnGetMessage=true;clientProgramName=RLTCmd;
srcdbAdm.connection.user=db2inst1
```

Kerberos5 JDBC connection info example in password-less mode
SecurityMechanism=11 and KerberosServerPrincipal attributes are required
Both the user and password values must be __NONE__

```
krbTestPl.connection.url=jdbc:db2://lacy1.fyre.ibm.com:50000/sample:\
retrieveMessagesFromServerOnGetMessage=true;clientProgramName=RLTCmd;\
securityMechanism=11;KerberosServerPrincipal=lacy1.fyre.ibm.com@DB2KDB.FYRE.IBM.COM;
krbTestPl.connection.user=__NONE__
krbTestPl.connection.password=__NONE__
```

# Workload Processor



Linux shell integration

# Workload Processor



To execute rlt commands you need to use the ‘rlt’ main command then the rlt command name you wish to invoke.

For Linux OS-es you can avoid typing ‘rlt’ each time by creating command aliases.

RLT framework help you by providing a script to create aliases for each known rlt command and command profile (see next).

To create rlt aliases in your current login session simply “source” the content of the $HOME/bin/rltalias script.

Once defined aliases also allows you to use the shell line auto-complete feature to discover command names.

Example:
[...]$ . rltalias
[...]$ db_aliases
… (command output)

# Workload Processor



Understanding command profiles

# Workload Processor



Any command in the RLT framework has valid default values for all its parameters. This means you can execute it by just using its name.

To keep things simple and for defining user services, command profiles can be used to define new default values for any/all of the command parameters and store them as a command profile.

Each command profile is stored in a property file

~/.rlt/RLT/<command-name>.<profile-name>.properties

List all profile names or a subset including a string
[… rlt]$ rlt rlt_profile_list
[… rlt]$ rlt rlt_profile_list .<profile-part-name>

# Workload Processor



Create a new command profile:

1) By using specific command named parameter ‘save_to_profile’
   Example:

```
[… rlt]$ rlt db_wlt_replay wlpdb uuid=712d610a-e33b-4de9-af0e-08256f4b6fc2
save_to_profile=w
```

2) Direct edit of create (from another program) the command profile file

List the content of a profile (parameters and environment variables)

```
[… rlt]$ rlt rlt_profile_list <profile-name>
```

# Workload Processor



## Create a new command profile

Specifying commands environment parameters,
more important JVM memory

Manually edit the command’s profile and add RLT_JAVA_MEM_OPTS

```
[… rlt]$ rlt rlt_profile_list db_wlt_replay.w
--------------------------------------------------------------------------------
Command profile definition
Profile:db_wlt_replay.wlpdb
Profile file:/home/<user>/.rlt/RLT/db_wlt_replay.wlpdb.properties
--------------------------------------------------------------------------------
srcAlias=wlpdb
cfgFQNR=WLPEXEC
uuid=773c9440-b334-4e47-8fa8-53873b4c9696
--------------------------------------------------------------------------------
[… rlt]$ vi /home/<user>/.rlt/RLT/db_wlt_replay.wlpdb.properties

# add 1 or 2 Gb (or more) for a server process
RLT_JAVA_MEM_OPTS="-Xms1024m -Xmx2048m"
```

# Workload Processor



Optional
Verify the connectivity for all aliases

# Workload Processor



List all JDBC connection alias names by using the command
]$ rlt db_aliases

```
[wlptu@wlptt-rlth-1 rlt]$ rlt db_aliases
--------------------------------------------------------------------------------
In file:/home/wlptu/env.properties
--------------------------------------------------------------------------------
krbTestPl
srcdbAdm
srcdbTest
tgtdbAdm
tgtdbTest
wlpdb -> default
[wlptu@wlptt-rlth-1 rlt]$
```

Test one or a number of databases aliases connectivity by using the command

]$ rlt db_ping srcdbAdm,srcdbTest,tgtdbAdm,tgtdbTest,wlpdb

# Workload Processor



```
[wlptu@wlptt-rlth-1 rlt]$ rlt db_ping srcdbAdm,srcdbTest,tgtdbAdm,tgtdbTest,wlpdb
Trying to connect to database
 URL:jdbc:db2://srcdb:50000/SAMPLE:retrieveMessagesFromServerOnGetMessage=true;clientProgramName=RLTCmd;
 user:db2inst1
Database server:DB2/LINUXX8664 SQL10059
Connect (only) duration:637 ms
Trying to connect to database
 URL:jdbc:db2://srcdb:50000/SAMPLE:retrieveMessagesFromServerOnGetMessage=true;clientProgramName=RLTCmd;
 user:db2inst1
Database server:DB2/LINUXX8664 SQL10059
Connect (only) duration:521 ms
Trying to connect to database
 URL:jdbc:db2://tgtdb:50000/SAMPLE:retrieveMessagesFromServerOnGetMessage=true;clientProgramName=RLTCmd;
 user:db2inst1
Database server:DB2/LINUXX8664 SQL11010
Connect (only) duration:561 ms
Trying to connect to database
 URL:jdbc:db2://tgtdb:50000/SAMPLE:retrieveMessagesFromServerOnGetMessage=true;clientProgramName=RLTCmd;
 user:db2inst1
Database server:DB2/LINUXX8664 SQL11010
Connect (only) duration:460 ms
Trying to connect to database
 URL:jdbc:db2://wlpdb:50000/WLPDB:retrieveMessagesFromServerOnGetMessage=true;clientProgramName=RLTCmd;
 user:db2inst1
Database server:DB2/LINUXX8664 SQL11010
Connect (only) duration:422 ms
  Active:srcdbAdm,srcdbTest,tgtdbAdm,tgtdbTest,wlpdb
Inactive:NONE
[wlptu@wlptt-rlth-1 rlt]$
```

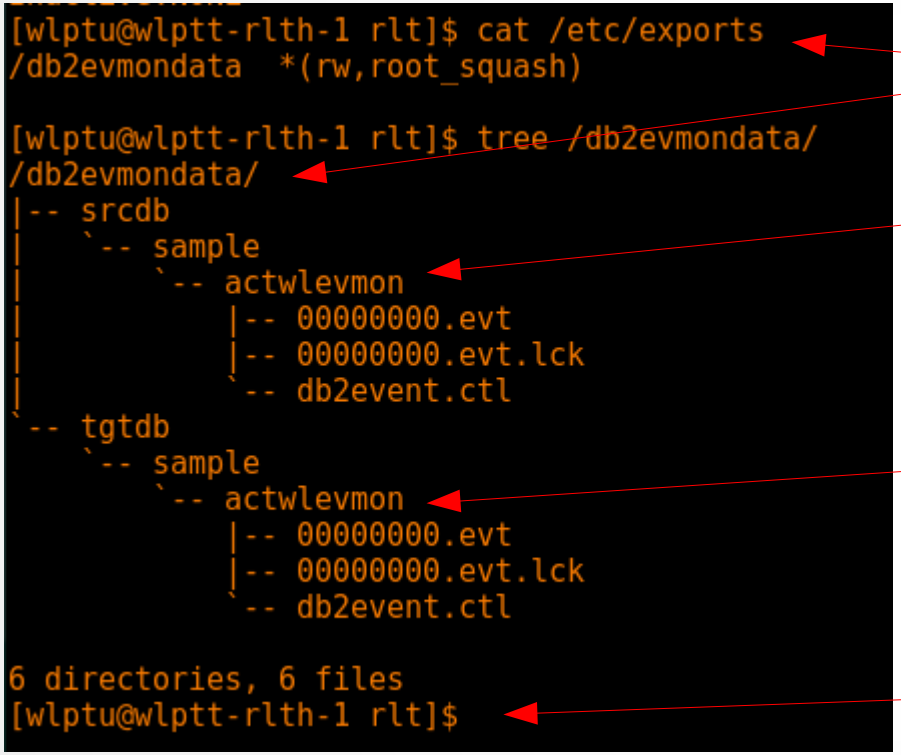
# Workload Processor



Optional
Check NFS shared storage

# Workload Processor






Shared folder nfs export

src DB2 sample DB capture

tgt DB2 sample DB capture

WLP host

On the machine where the wlpt software is installed (or a dedicated nfs server) create a folder called /db2evmondata end export it to the machines which hosts the DB2 instances you are going to capture event monitor data

# Workload Processor



The recommended (but not required) folder structure for storing event monitor data is:

/db2evmondata/<inst-name>/<db-name>/actevmon

inst-name: is the logical (you decide it) or host name of the DB2 instance

db-name: is the name of the DB2 database from where the event monitor data is collected

# Workload Processor



```
[db2inst1@wlptt-rlth-2 ~]$ tree /db2evmondata/
/db2evmondata/
├── srcdb
│   └── sample
│       └── actwlevmon
│           ├── 00000000.evt
│           ├── 00000000.evt.lck
│           └── db2event.ctl
└── tgtdb
    └── sample
        └── actwlevmon
            ├── 00000000.evt
            ├── 00000000.evt.lck
            └── db2event.ctl

6 directories, 6 files
[db2inst1@wlptt-rlth-2 ~]$
```

Host srcdb DB2 DB locally mounted NFS share

# Workload Processor



```
[db2inst1@wlptt-rlth-4 ~]$ tree /db2evmondata/
/db2evmondata/
├── srcdb
│   └── sample
│       └── actwlevmon
│           ├── 00000000.evt
│           ├── 00000000.evt.lck
│           └── db2event.ctl
└── tgtdb
    └── sample
        └── actwlevmon
            ├── 00000000.evt
            ├── 00000000.evt.lck
            └── db2event.ctl

6 directories, 6 files
[db2inst1@wlptt-rlth-4 ~]$
```

Host tgtdb DB2 DB locally mounted NFS share

# Workload Processor



Check the event monitor existence and state for source and target DB2 databases

# Workload Processor



```
[wlptu@wlptt-rlth-1 rlt]$ rlt db2_evmon_list srcdbAdm
--------------------------------------------------------------------------------
Database host:port:srcdb:50000
 alias:srcdbAdm
 user:db2inst1
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
select m.evmonname,e.type,
case when event_mon_state(m.evmonname)=1
 then 'true'
 else 'false'
 end as enabled,owner,autostart,target_type,target,e.filter from syscat.eventmonitors m,
syscat.events e
where e.evmonname=m.evmonname
order by 1
--------------------------------------------------------------------------------

---------------- --------------- --------- ----------- --------- ---------- ------------------------------------ ----------
EVMONNAME        TYPE            ENABLED   OWNER       AUTOSTART TARGET_TYPE TARGET                             FILTER
VARCHAR(128)     VARCHAR(128)    VARCHAR(5) VARCHAR(128) CHAR(1)   CHAR(1)     VARCHAR(762)                       CLOB(65536)
---------------- --------------- --------- ----------- --------- ---------- ------------------------------------ ----------
DB2DETAILDEADLOCK DETAILDEADLOCKS true      DB2INST1    Y         F          db2detaildeadlock                    __null__
WLPACTCAP        ACTIVITIES      true      DB2INST1    Y         F          /db2evmondata/srcdb/sample/actwlevmon __null__
---------------- --------------- --------- ----------- --------- ---------- ------------------------------------ ----------

Elapsed time:27 ms
--------------------------------------------------------------------------------
[wlptu@wlptt-rlth-1 rlt]$
```

Event mon. state

Capture folders

# Workload Processor



```
[wlptu@wlptt-rlth-1 rlt]$ rlt db2_evmon_list tgtdbAdm
------------------------------------------------------------------------------
Database host:port:tgtdb:50000
 alias:tgtdbAdm
 user:db2inst1
------------------------------------------------------------------------------
------------------------------------------------------------------------------
select m.evmonname,e.type,
case when event_mon_state(m.evmonname)=1
 then 'true'
 else 'false'
 end as enabled,owner,autostart,target_type,target,e.filter from syscat.eventmonitors m,
syscat.events e
where e.evmonname=m.evmonname
order by 1
------------------------------------------------------------------------------

---------------- -------------- --------- ----------- --------- ---------- ------------------------------------ -----------
EVMONNAME        TYPE           ENABLED   OWNER       AUTOSTART TARGET_TYPE TARGET                             FILTER
VARCHAR(128)     VARCHAR(128)   VARCHAR(5) VARCHAR(128) CHAR(1)   CHAR(1)     VARCHAR(762)                     CLOB(65536)
---------------- -------------- --------- ----------- --------- ---------- ------------------------------------ -----------
DB2DETAILDEADLOCK DETAILDEADLOCKS true      DB2INST1    Y         F          db2detaildeadlock                    __null__
WLPACTCAP        ACTIVITIES     true      DB2INST1    Y         F          /db2evmondata/tgtdb/sample/actwlevmon __null__
---------------- -------------- --------- ----------- --------- ---------- ------------------------------------ -----------

Elapsed time:34 ms
------------------------------------------------------------------------------
[wlptu@wlptt-rlth-1 rlt]$
```

Event mon. state

Capture folders

# Workload Processor



Setting up the workload capture process from the source database

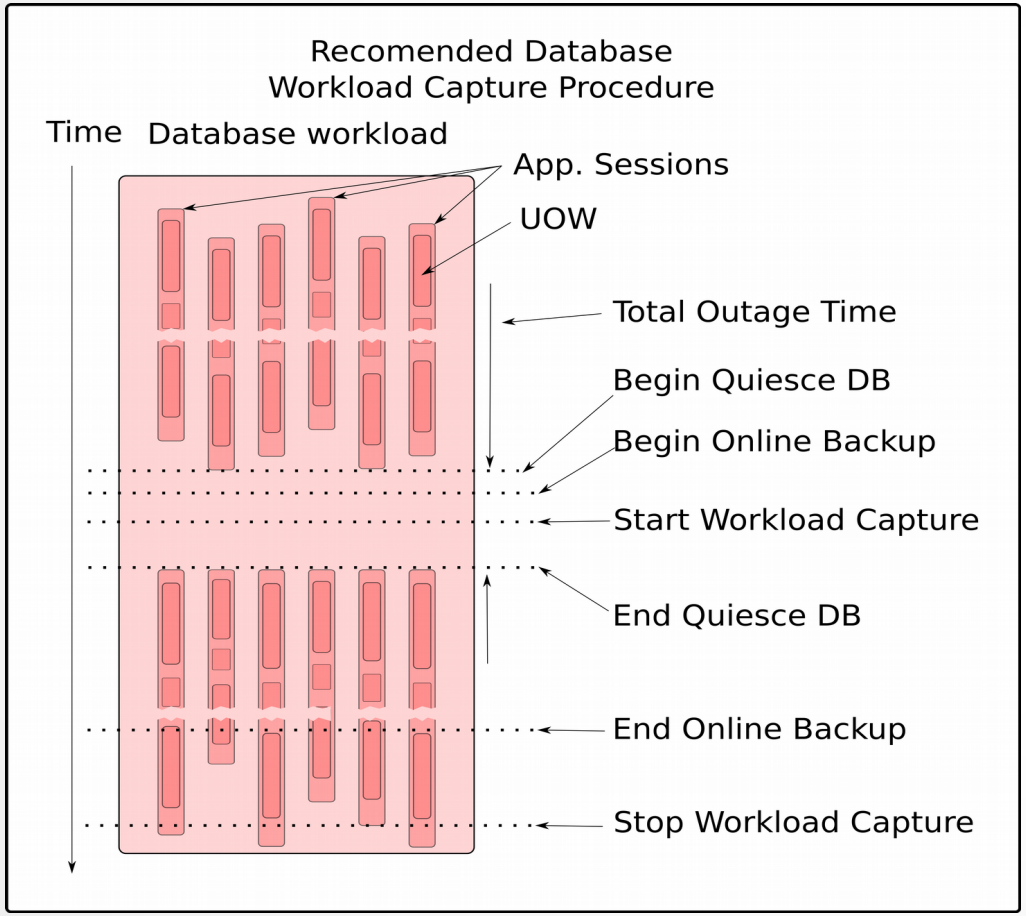
# Workload Processor



Create a new DB2 event monitor for activities with capture in files for source DB2 and target DB2 databases if one does not exists and enable workload activity capture

# Workload Processor workload capture strategy






In order to capture a workload that can be meaningfully replayed into the target database we need to “clear” the transaction space for a short amount of time.

This can be done by quiesce-ing the database. During the quiesce time a backup process will be started then the event monitor for activities enabled.

The other choice would be to start the event capture during a HADR takeover from the new primary database.

# Workload Processor automatic setup



```
WARNIGN: This command is under final development/testing
Quiesce the database (same as db2 quiesce database command)

db2_wlp_start_capture srcdbAdm WLPACTCAP /db2evmondata/srcdb/sample/actwlevmon/
maxFileSizePages=262144 simulate=no

  Check the event monitor state
]$ rlt db2_evmon_list srcdbAdm

  Check the capture files
]$ ls /db2evmondata/srcdb/sample/actwlevmon/
```

# Workload Processor manual setup



If the command db2_wlp_start_capture can’t be used then the steps it implements can be manually executed step by step as described bellow

Quiesce the database (same as db2 quiesce database command)

```
]$ rlt db2_quiesce srcdbAdm
```

Create the event monitor if not exists

```
]$ rlt db2_evmon_create_act_files srcdbAdm WLPACTCAP /db2evmondata/srcdb/sample/actwlevmon/
maxFileSizePages=262144 simulate=no
```

Activate the activity capture at workload level and create a restore DDL file

```
]$ rlt db2_wl_act_cap_enable srcdbAdm includeActuals=no simulate=no
```

Start the backup

```
]$ rlt db2_backup srcdbAdm
```

Enable the event monitor

```
]$ rlt db2_evmon_enable srcdbAdm WLPACTCAP
```

Unquiesce the database (same as db2 unquiesce database command)

```
]$ rlt db2_unquiesce
```

Check the event monitor state

```
]$ rlt db2_evmon_list srcdbAdm
```

Check the capture files

```
]$ ls /db2evmondata/srcdb/sample/actwlevmon/
```

# Workload Processor



Check the state of the RLT service(s) for workload replay

# Workload Processor



- The db_wlt_reply command can be used to execute workload tests by replying the activities described in the workload test definition
- The command is designed to be used as a continuously running process searching for new active test definitions to attach to and start execute statements as programmed
- To create a new RLT service first create a command profile then install it as a service; see the example below (check commands help for full parameter list)

```
[… rlt]$ rlt db_wlt_replay wlpdb save_to_profile=wlpdb
[… rlt]$ echo ‘RLT_JAVA_MEM_OPTS="-Xms1024m -Xmx2048m"’ >>  $HOME/.rlt/RLT/db_wlt_replay.wlpdb.properties
[… rlt]$ rlt rlt_svc_install db_wlt_replay.wlpdb 5min
```

# Workload Processor



Service/command-profile names

Linux cron schedules

```
[wlptu@wlptt-rlth-1 rlt]$ rlt rlt_svc_list

------------------------- --------- ----------- ---------------------------- ------------------------------------------------
Service                   Suspended State       StartTime                    Schedule
------------------------- --------- ----------- ---------------------------- ------------------------------------------------
db_wlt_replay.wlpdb       no        not running Thu Mar 07 19:11:01 PST 2019 * * * * * /home/wlptu/bin/db_wlt_replay.wlpdb
rlt_rest_server_start.base yes      suspended   Wed Dec 31 16:00:00 PST 1969 * * * * * /home/wlptu/bin/rlt_rest_server_start.base
rlt_svcc.main             yes       suspended   Wed Dec 31 16:00:00 PST 1969 * * * * * /home/wlptu/bin/rlt_svcc.main
------------------------- --------- ----------- ---------------------------- ------------------------------------------------


[wlptu@wlptt-rlth-1 rlt]$
```

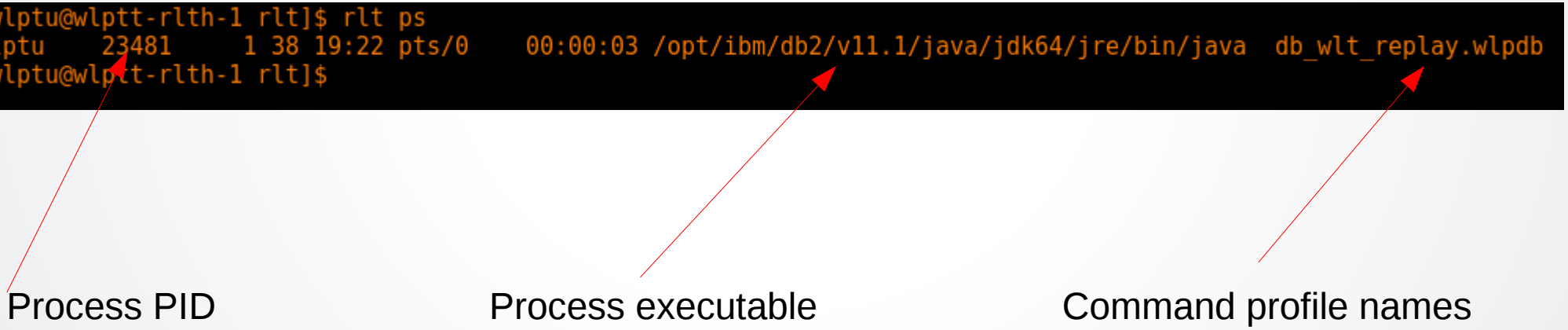
Service execution status

# Workload Processor



Listing all RLT Linux processes

```
[wlptu@wlptt-rlth-1 rlt]$ rlt ps
wlptu    23481     1 38 19:22 pts/0    00:00:03 /opt/ibm/db2/v11.1/java/jdk64/jre/bin/java  db_wlt_replay.wlpdb
[wlptu@wlptt-rlth-1 rlt]$
```



# Workload Processor



Ensure that your Load Test database objects are created

# Workload Processor

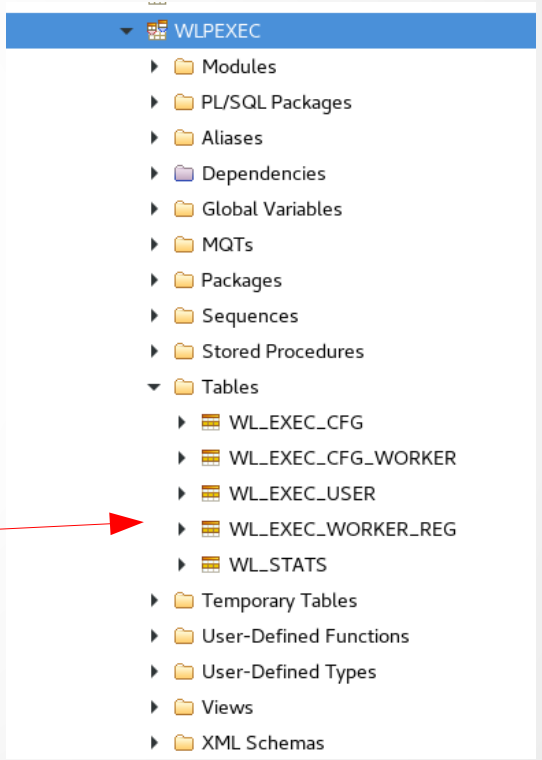


```
[wlptu@wlptt-rlth-1 rlt]$ rlt db_wlt.a setup
Creating table:WLPEXEC.WL_EXEC_CFG
Creating table:WLPEXEC.WL_EXEC_CFG_WORKER
Creating table:WLPEXEC.WL_EXEC_WORKER_REG
Creating table:WLPEXEC.WL_EXEC_USER
Creating table:WLPEXEC.WL_STATS
[wlptu@wlptt-rlth-1 rlt]$
```

Creating (if not exists) database objects for load test definitions and results

Those tables are used to define execute and compare load tests by using the workload information captured by the WLP subsystem

Load test schema and objects (IBM DataStudio view)



# Workload Processor



Execute a simulated workload against the source database

Or wait for the regular workload to be executed by the applications

# Workload Processor



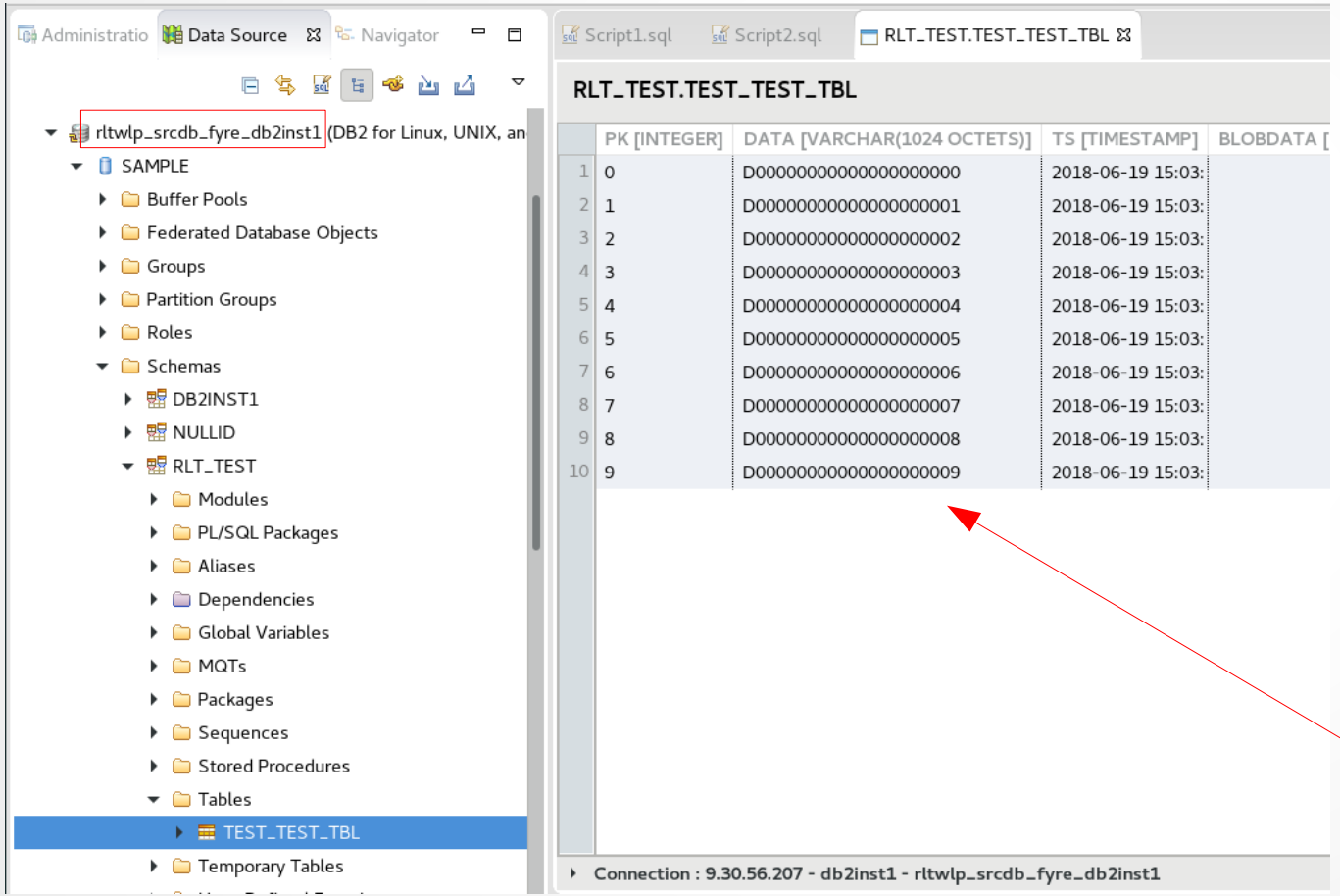
If you are testing your workload test env then you can simulate load by Executing the test workload insert 1000 rows in 10 insert statements

[… rlt]$ source rltalias
[… rlt]$ db_wlt_sim srcdbTest save_to_profile=wl1
[… rlt]$ source rltalias
[… rlt]$ db_wlt_sim.w1

```
[wlptu@wlptt-rlth-1 rlt]$ rlt db_wlt_generate_seq_block_insert srcdbTest insertRowcount=10 batchSize=1
Finalized block insert in table:RLT_TEST.TEST_TEST_TBL next PK:1010 inserted rowcount:10
```

# Workload Processor






The new created table and its row content. PK and data content can be used to verify the validity of the command

# Workload Processor



Load the event monitor workload data for the src db in the workload database

# Workload Processor



To load the captured workload in the workload database define a command profile if not already defined then execute the batch load (as many times as needed) by using the command profile

```
[… rlt]$ rlt db2_evmon_wlp src=/db2evmondata/srcdb/sample/actwlevmon/
dbFolder=/db2evmondata/srcdb/sample/actwlevmon/ wlRootName=WLEVMSRC dbAlias=wlpdb
save_to_profile=srcdb_actevm_batch
```

Executing the batch load by using the command profile defined above. By using rlta the command will be executed in background (equivalent to nohup rlt … &) in order to handle longer time unassisted loads.

```
[… rlt]$ mkdir wlp_batch_load
[… rlt]$ cd wlp_batch_load
[… wlp_batch_load]$ rlta db2_evmon_wlp.srcdb_actevm_batch
```

# Workload Processor



Understanding the optimization=auto parameter
for db2_evmon_wlp command

When optimization=auto the command will attempt to chose an ETL mode heuristically optimized based on how much data will be loaded.

- For a single event file (‘nnnnnnn.evt’) with less than 100MB of raw data a single thread with SQL block insert will be used
- For a single (or more than one) event file with less than 500MB of raw data (in total) a multi-threaded model using SQL block inserts will be used
- For multiple event files where one or all raw size is larger than 500MB a multi-threaded using DB2 load is attempted. The tool will execute a small test DB2 load to confirm that loads are possible from the path specified in the dbFolder parameter. If the test fails the command will fall back to SQL block insert strategy for loading

# Workload Processor



Verify the status of your batch load by using the following command and files created by the command in its working directory (CWD)

•To check if the process is still running use:

```
[… rlt]$ rlt ps
```

And check if the command profile name is among the listed processes.

•Significant files  in the command's CWD

```
[… rlt]$ cd wlp_batch_load
[… wlp_batch_load]$ ls -ltr
```

# Workload Processor



Description of files produced by the command:

```
-rw-rw-r-- 1 wlptu wlptu       6 Dec 30 17:22 rlt.pid
-rw-rw-r-- 1 wlptu wlptu       5 Dec 30 17:22 rlt_24630.pid
-rw-rw-r-- 1 wlptu wlptu      36 Dec 30 17:22 process.uuid
-rw-rw-r-- 1 wlptu wlptu     766 Dec 30 17:22 WLEVMSRC_ACT_BKT_STATS.hct.csv
-rw-rw-r-- 1 wlptu wlptu    1282 Dec 30 17:22 DB2WLP_WLP_LOAD_STATS.hct.s000.csv
-rw-rw-r-- 1 wlptu wlptu    1291 Dec 30 17:22 StorageHandlerPerfInfo.log
-rw-rw-r-- 1 wlptu wlptu      59 Dec 30 17:22 rltEvmonProcessorLog.txt
-rw-rw-r-- 1 wlptu wlptu    1585 Dec 30 17:22 evmon_stats.txt
-rw------- 1 wlptu wlptu     228 Dec 30 17:22 nohup.out
-rw-rw-r-- 1 wlptu wlptu 3761271 Dec 30 17:22 rlt.0.0.log
```

# Workload Processor



Description of files produced by the command:

• rlt*.pid – files contains the process pid and are created when the process is started

• process.uuid – unique identifier of this process, it is relevant only when multiple workload processors are used concurrently to load workload data, can be ignored in single process loads.

• nohup.out – command’s stdout captured by nohup shell command inspect its content to have a quick look at the current execution state of the process

• - rlt.0.0.log (and rlt.<n>.<n>.log) – the commands log output (can be controlled via logging configuration)

• - rlt_err_<timestamp>.log – dedicated log file used to log exceptions only (exceptions are also logged as part of the main logger rlt.n.n.log files)

# Workload Processor



Description of files produced by the command:

- - StorageHandlerPerfInfo.log – a specialized fixed length log file logging information about the internal performance of the parse and load process for each internal thread in its queues. Used mainly for debugging tool performance issues, can be ignored in normal operations

- - rltEvmonProcessorLog.txt – command internal use; a fixed length log file tracking the current event monitor segment file processed and the binary (byte) position of the last entity processed. The file is essential for restarting processing if you stopped (killed) the workload processor command

# Workload Processor



Description of files produced by the command:

• evmon_stats.txt – dynamic general statistics gathered for general parsing status process

```
[wlptu@wlptt-rlth-1 wlpcsv]$ cat evmon_stats.txt
-------------------------- --------------------------------------------------
Name                       Value
-------------------------- --------------------------------------------------
Current seg name           /db2evmondata/srcdb/sample/actwlevmon/00000000.evt
Current seg length         678568
Current seg readPos        678568
Current seg read%          100.0
Stats.EventCount           462
Stats.EventSize.min        32
Stats.EventSize.avg        1460
Stats.EventSize.max        36609
Stats.EventPerSec.avg      0
Stats.TotalDataSizeGB      0.0
SQLM_ELM_EVENT_LOG_HEADER  1
SQLM_ELM_EVENT_ACTIVITY    23
SQLM_ELM_EVENT_ACTIVITYSTMT 23
SQLM_ELM_EVENT_DBHEADER    3
SQLM_ELM_EVENT_ACTIVITYVALS 409
SQLM_ELM_EVENT_START       3
-------------------------- --------------------------------------------------
```

# Workload Processor



Description of files produced by the command:

• WLEVMSRC_ACT_BKT_STATS.hct.csv – generic statement execution times as a bucket (histogram) result. The last line in the file represents the most recent bucket (histogram) data set. The first row describes each bucket boundaries

• DB2WLP_WLP_LOAD_STATS.hct.s000.csv – when DB2 load is used to load data each load operation will output one record of stats in this file. Check its content to verify how many rows were loaded.

# Workload Processor



Inspect your workload database

# Workload Processor



List all workload database tables and views with minimal required workload column structure

```
[… rlt]$ rlt db_wlp_stats wlpdb
WLEVMSRC.WORKLOAD
[… rlt]$ rlt db_wlp_stats wlpdb rootName=WLEVMSRC.WORKLOAD save_to_profile=a
```

# Workload Processor



List general workload statistics for an workload with a given rootName

```
[… rlt]$ rlt db_wlp_stats.a reportType=info
...
---------------------- ---------------------- -----------
FROMTIME               TOTIME                 EVENTCOUNT
TIMESTAMP(26,6)        TIMESTAMP(26,6)        INTEGER(10)
---------------------- ---------------------- -----------
2018-11-24 08:54:17.671 2018-12-30 17:18:31.429 4747330
---------------------- ---------------------- -----------
…
------------ -------------
ACTIVITY_TYPE ACTIVITYCOUNT
VARCHAR(64)   INTEGER(10)
------------ -------------
CALL          11
DDL           92
OTHER         1
READ_DML      384
WRITE_DML     4746840
------------ -------------
```

# Workload Processor



List general workload statistics for an workload with a given rootName partitioned by day

```
[… rlt]$ rlt db_wlp_stats.a reportType=info truncTimeInterval=day
...
--------------------- --------------------- -----------
FROMTIME              TOTIME                EVENTCOUNT
TIMESTAMP(26,6)       TIMESTAMP(26,6)       INTEGER(10)
--------------------- --------------------- -----------
2018-11-24 00:00:00.0 2018-11-24 00:00:00.0 4746807
2018-11-26 00:00:00.0 2018-11-26 00:00:00.0 1
2018-12-10 00:00:00.0 2018-12-10 00:00:00.0 24
2018-12-27 00:00:00.0 2018-12-27 00:00:00.0 8
2018-12-28 00:00:00.0 2018-12-28 00:00:00.0 465
2018-12-30 00:00:00.0 2018-12-30 00:00:00.0 23
--------------------- --------------------- -----------
...
```

# Workload Processor



| TINTERVAL<br>TIMESTAMP(26,6) | ACTIVITY_TYPE<br>VARCHAR(64) | ACTIVITYCOUNT<br>INTEGER(10) |
|---|---|---|
| 2018-11-24 00:00:00.0 | CALL | 2 |
| 2018-11-24 00:00:00.0 | DDL | 8 |
| 2018-11-24 00:00:00.0 | READ_DML | 68 |
| 2018-11-24 00:00:00.0 | WRITE_DML | 4746729 |
| 2018-11-26 00:00:00.0 | READ_DML | 1 |
| 2018-12-10 00:00:00.0 | READ_DML | 24 |
| 2018-12-27 00:00:00.0 | READ_DML | 8 |
| 2018-12-28 00:00:00.0 | CALL | 8 |
| 2018-12-28 00:00:00.0 | DDL | 83 |
| 2018-12-28 00:00:00.0 | READ_DML | 273 |
| 2018-12-28 00:00:00.0 | WRITE_DML | 101 |
| 2018-12-30 00:00:00.0 | CALL | 1 |
| 2018-12-30 00:00:00.0 | DDL | 1 |
| 2018-12-30 00:00:00.0 | OTHER | 1 |
| 2018-12-30 00:00:00.0 | READ_DML | 10 |
| 2018-12-30 00:00:00.0 | WRITE_DML | 10 |

# Workload Processor



Compute workload statement statistics for an workload with a given rootName
Aggregate by session_auth_id,activity_type,sqlcode,sqlstate

```
[… rlt]$ rlt db_wlp_stats.a reportType=wlp_stmts
-------------- ------------- ----------- -------- ----------- ---------- ---------- ----------
SESSION_AUTH_ID ACTIVITY_TYPE SQLCODE     SQLSTATE CNT         MIN_TIME   AVG_TIME   MAX_TIME
VARCHAR(128)    VARCHAR(64)   INTEGER(10) CHAR(5)  INTEGER(10) BIGINT(19) BIGINT(19) BIGINT(19)
-------------- ------------- ----------- -------- ----------- ---------- ---------- ----------
DB2INST1        CALL          __null__    __null__ 11          15         349        2420
DB2INST1        DDL           __null__    __null__ 92          0          2741       124352
DB2INST1        OTHER         __null__    __null__ 1           15         15         15
DB2INST1        READ_DML      __null__    __null__ 384         0          12         1051
DB2INST1        WRITE_DML     __null__    __null__ 4746840     0          0          456
-------------- ------------- ----------- -------- ----------- ---------- ---------- ----------
```

# Workload Processor



Compute a bucket(histogram) on time intervals, workload statistics for an workload with a given rootName

```
[… rlt]$ rlt db_wlp_stats wlpdb wlp_basic rootName=WLEVMSRC.WORKLOAD
------- ------- ------------ -------
RecNo   RowNum  Name         Value
integer integer varchar(256) double
------- ------- ------------ -------
0       0       VALUE_COUNT  4747330
0       1       under_10.00  4746810
0       2       10.00_110.00 416
0       3       110.00_210.00 56
0       4       210.00_310.00 21
0       5       310.00_410.00 18
0       6       410.00_510.00 2
0       7       510.00_610.00 0
0       8       610.00_710.00 0
0       9       710.00_810.00 0
0       10      810.00_910.00 2
0       11      over_1000.00  3
------- ------- ------------ -------
```

# Workload Processor



Start a new load test definition

# Workload Processor



For ease of use create a command profile for db_wlt command if none exists

```
[… rlt]$ rlt db_wlt alias=wlpdb tgtAlias=tgtdbTest wlRootFQN=WLEVMSRC.WORKLOAD
wlTgtRootFQN=WLEVMTGT.WORKLOAD rootFQN=WLPEXEC save_to_profile=a
```

Create a new workload test definition

```
[… rlt]$ rlt db_wlt.a new test1 wlStartTime=2018-11-24 wlStopTime=2018-11-25 hashResult=yes

Creating table:WLPEXEC.WL_SESSION_TEST1
Creating table:WLPEXEC.WL_SESSION_MAP_TEST1
Created or updated  record in:WLPEXEC.WL_EXEC_CFG cfg_name=test1 start_ts=2019-04-03 15:49:38.775
Created or updated 1 records in:WLPEXEC.WL_EXEC_CFG_WORKER
Created or updated 1 records in:WLPEXEC.WL_EXEC_USER
```

# Workload Processor



Check the test definition record

```
[… rlt]$ rlt db_wlt.a ls
------ ------ --------------------- --------------------------------
RowNum ColNum Name                  Value
Int    Int    Varchar(128)          Object
------ ------ --------------------- --------------------------------
1      1      CFG_NAME              test1
1      2      START_TS              2019-07-23 14:35:23.409
1      3      START_TS_GMT          n
1      4      STATE                 INIT
1      5      RQ_STATE              __null__
1      6      HASH_RESULT           n
1      7      INITIAL_STATE_UID     __null__
1      8      FINAL_STATE_UID       __null__
1      9      START_UID             __null__
1      10     START_APPL_ID         172.16.178.90.55780.190703232258
1      11     START_UOW_ID          70983
1      12     START_ACTIVITY_ID     1
1      13     START_TST             2019-07-03 16:26:12.398
1      14     STOP_UID              __null__
1      15     STOP_APPL_ID          172.16.178.90.55780.190703232258
1      16     STOP_UOW_ID           100007
1      17     STOP_ACTIVITY_ID      1
1      18     STOP_TST              2019-07-03 16:27:30.394
1      19     WL_SESSION_INFO       WLPEXEC.WL_SESSION_TEST1
1      20     WL_SESSION_USER_INFO  WLPEXEC.WL_EXEC_USER_TEST1
1      21     WL_SESSION_MAP_INFO   WLPEXEC.WL_SESSION_MAP_TEST1
1      22     WLP_STATS_BASELINE_KEY __null__
1      23     WLP_STATS_BUCKET_CFG  __null__
1      24     WLP_STATS_REPLAY_KEY  __null__
1      25     WLP_SRC_FRQN          WLEVMSRC.WORKLOAD_
1      26     WLP_FRQN              WLEVMTGT.WORKLOAD_
1      27     JDBC_URL              __null__
1      28     SLA_SLOW_PRC          20
1      29     SLA_FAST_PRC          20
------ ------ --------------------- --------------------------------
```

# Workload Processor



Start the replay of the workload against the target database

# Workload Processor



Check if there are any active workload executors (db_wlt_replay services)

```
[… rlt] rlt db_wlt.a ps
```

```
---------------------------------- ------------------------ ---------- -------------------------- ------------
WK_UUID                            HOST                     STATE      LAST_PING_TS               LAST_PING_SEC
VARCHAR(37)                        VARCHAR(128)             VARCHAR(16) TIMESTAMP(26,6)           INTEGER(10)
---------------------------------- ------------------------ ---------- -------------------------- ------------
773c9440-b334-4e47-8fa8-53873b4c9696 wlptt-rlth-1.fyre.ibm.com SETUP      2019-04-06 13:59:29.990868 0
---------------------------------- ------------------------ ---------- -------------------------- ------------
```

Start the load test execution using the tgtdbTest as database alias

```
[… rlt]$ rlt db_wlt.a start test1 tgtAlias=tgtdbTest
```

Monitor the execution state of the test (compact form)

```
[… rlt]$ rlt db_wlt.a exec_info test1
```

Monitor the execution state of the test (full form)

```
[… rlt]$ rlt db_wlt.a info test1
```

# Workload Processor



```
[… rlt]$ rlt db_wlt.a exec_info test1
---------------------------------------- ----------------------------------------------------
Name                                     Value
---------------------------------------- ----------------------------------------------------
Test id                                  test1
Test state                               active
DB Server time                           2019-04-06 14:17:22.83
Requested start time                     2019-04-06 08:29:56.29
Start time delta                         -5 hrs, 47 min, 26 sec, 540 ms
Estimated test exec time                 2 hrs, 34 min, 46 sec, 306 ms
Required replay process count            1
Required replay thread  count            9
Attached replay process count            1
Wk[773c9440-b334-4e47-8fa8-53873b4c9696] Total:4690535 Exec success:2611575 Exec with err:1395888
Exec start time                          2019-04-06 13:25:12.4
Total activities executed                4007463
Total activities errors                  1395888
Estimated test remaining time            1 hr, 42 min, 34 sec, 58 ms
---------------------------------------- ----------------------------------------------------
```

# Workload Processor



```
[… rtl]$ rlt db_wlt.a info test1
------ ------ ---------------- -------------------------------------
RowNum ColNum Name             Value
Int    Int    Varchar(128)     Object
------ ------ ---------------- -------------------------------------
1      1      CFG_NAME         test2
1      2      PROCESS_ID       0
1      3      AUTH_ID          DB2INST1
1      4      WK_UUID          773c9440-b334-4e47-8fa8-53873b4c9696
1      5      STATE            EXEC
1      6      STMT_TOTAL_COUNT 4690535
1      7      STMT_EXEC_COUNT  2718281
1      8      STMT_FAIL_COUNT  1395888
1      9      TEST_START_TS    2019-04-06 13:25:12.4
1      10     TEST_END_TS      2019-08-17 11:04:28.252
------ ------ ---------------- -------------------------------------
```

# Workload Processor



```
[… rtl]$ rlt db_wlt.a info test1
```

| RowNum Int | ColNum Int | Name Varchar(128) | Value Object |
|---|---|---|---|
| 1 | 1 | CFG_NAME | test2 |
| 1 | 2 | START_TS | 2019-04-06 08:29:56.29 |
| 1 | 3 | START_TS_GMT | n |
| 1 | 4 | STATE | active |
| 1 | 5 | RQ_STATE | __null__ |
| 1 | 6 | INITIAL_STATE_UID | __null__ |
| 1 | 7 | FINAL_STATE_UID | __null__ |
| 1 | 8 | START_UID | __null__ |
| 1 | 9 | START_APPL_ID | 172.16.178.90.59926.181124175039 |
| 1 | 10 | START_UOW_ID | 2 |
| 1 | 11 | START_ACTIVITY_ID | 1 |
| 1 | 12 | START_TST | 2018-11-24 09:50:40.438 |
| 1 | 13 | STOP_UID | __null__ |
| 1 | 14 | STOP_APPL_ID | 172.16.178.90.59986.181124192152 |
| 1 | 15 | STOP_UOW_ID | 1000003 |
| 1 | 16 | STOP_ACTIVITY_ID | 1 |
| 1 | 17 | STOP_TST | 2018-11-24 12:25:26.744 |
| 1 | 18 | WL_SESSION_INFO | WLPEXEC.WL_SESSION_TEST2 |
| 1 | 19 | WL_SESSION_USER_INFO | WLPEXEC.WL_EXEC_USER_TEST2 |
| 1 | 20 | WL_SESSION_MAP_INFO | WLPEXEC.WL_SESSION_MAP_TEST2 |
| 1 | 21 | WLP_STATS_BASELINE_KEY | __null__ |
| 1 | 22 | WLP_STATS_BUCKET_CFG | __null__ |
| 1 | 23 | WLP_STATS_REPLAY_KEY | __null__ |
| 1 | 24 | WLP_SRC_FRQN | WLEVMSRC.WORKLOAD_ |
| 1 | 25 | WLP_FRQN | WLEVMTGT.WORKLOAD_ |
| 1 | 26 | JDBC_URL | jdbc:db2://wlptt-rlth-4.fyre.ibm.com:50000/SAMPLE:retrieveMessagesFromServerOnGetMessage=true;clientProgramName=RLTCmd; |

# Workload Processor



```
[… rtl]$ rlt db_wlt.a info test1 # check if the workload test is done
```

| RowNum Int | ColNum Int | Name Varchar(128) | Value Object |
|---|---|---|---|
| 1 | 1 | CFG_NAME | test2 |
| 1 | 2 | START_TS | 2019-04-06 08:29:56.29 |
| 1 | 3 | START_TS_GMT | n |
| 1 | 4 | STATE | done |
| 1 | 5 | RQ_STATE | __null__ |
| 1 | 6 | INITIAL_STATE_UID | __null__ |
| 1 | 7 | FINAL_STATE_UID | __null__ |
| 1 | 8 | START_UID | __null__ |
| 1 | 9 | START_APPL_ID | 172.16.178.90.59926.181124175039 |
| 1 | 10 | START_UOW_ID | 2 |
| 1 | 11 | START_ACTIVITY_ID | 1 |
| 1 | 12 | START_TST | 2018-11-24 09:50:40.438 |
| 1 | 13 | STOP_UID | __null__ |
| 1 | 14 | STOP_APPL_ID | 172.16.178.90.59986.181124192152 |
| 1 | 15 | STOP_UOW_ID | 1000003 |
| 1 | 16 | STOP_ACTIVITY_ID | 1 |
| 1 | 17 | STOP_TST | 2018-11-24 12:25:26.744 |
| 1 | 18 | WL_SESSION_INFO | WLPEXEC.WL_SESSION_TEST2 |
| 1 | 19 | WL_SESSION_USER_INFO | WLPEXEC.WL_EXEC_USER_TEST2 |
| 1 | 20 | WL_SESSION_MAP_INFO | WLPEXEC.WL_SESSION_MAP_TEST2 |
| 1 | 21 | WLP_STATS_BASELINE_KEY | __null__ |
| 1 | 22 | WLP_STATS_BUCKET_CFG | __null__ |
| 1 | 23 | WLP_STATS_REPLAY_KEY | __null__ |
| 1 | 24 | WLP_SRC_FRQN | WLEVMSRC.WORKLOAD_ |
| 1 | 25 | WLP_FRQN | WLEVMTGT.WORKLOAD_ |
| 1 | 26 | JDBC_URL | jdbc:db2://wlptt-rlth-4.fyre.ibm.com:50000/SAMPLE:retrieveMessagesFromServerOnGetMessage=true;clientProgramName=RLTCmd; |

# Workload Processor



After the workload test is done check the collected statistics for the test case

TBD

# Workload Processor



During the test execution, the db_wlt_replay processes will log events in the WLPEXEC.WL_SESSION_EXEC_LOG_TEST1 table

After the test state is reported as ‘DONE’ (see db_wlt.a info test1 example) or even during the test execution the command

```
$> db_wlt.a report test1
```

can be used to extract the information about executed workload and save it in local files, usually in .csv format but SQL format is also available

# Workload Processor



The specific parameters of the ‘report’ sub-command are: ‘states’ and ‘outputType’.

– Parameter ‘states’ is an enumerated (comma separated) set of tokens listing all the type of files to be created, the valid value it is any combination of the tokens: all,slow,err,skip,stmt

– Parameter ‘outputTypes’ enumerates the way the data will be structured in the output files. Recognized values are: csv,sql,html (html is not implemented yet and is mapped as csv currently)

This sample command profile only extracts the slow statement information in .csv format and the statement body as SQL text

```
$> db_wlt.a report test1 states=slow,stmt outputType=csv
```

# Workload Processor



The files created by the command default(states=all outputType=csv)
$> db_wlt.a report test1

Are stored in a folder named ‘test1_execution_report’ containing files (self descriptive names):

slow_statements_for_test_test1.csv
skept_statements_for_test_test1.csv
errored_statements_for_test_test1.csv
test_exec_bucket_report_for_test_test1.csv
test_exec_report_for_test_test1.csv
<sql-stmt-hash>.sql – SQL files executed by the replay referenced in the report .csv files

# Workload Processor



slow_statements_for_test_test1.csv

sql_hash, runtime_min, runtime_avg, runtime_max
Hz4flMqrs+HgfM/XuSN0ldu4i6mkJNSux/CiPXtpzk8=,7,7,7
MHi1K6V/1/ehYxrUT2/Remz6ULeqFjVCJPcu6OfYPJw=,8,8,8
P2pxgT0rwpgfVbVrlIZ2HfP++EYhytEk79mGvP9uSco=,8,11,17
...

# Workload Processor



skept_statements_for_test_test1.csv

sql_hash,reason
+713dkj9TlZlpPEHsuG+MfXHyh2rEMCRNC2rTRvrRZI=,DDL-DML
+W3uuos2GPAUgqPDolcSaxaiOZyp4ZLdQvYHyMJ4SYU=,DDL-DML
...

# Workload Processor



errored_statements_for_test_test1.csv

```
sql_hash,sqlcode,sqlstate
qBcnugeHf49ekjDXWvWf9tqzQo15pQP7xNawipsWlOc=,-204,42704
rLIoDQchHBzuAjpeXf+TPihZMDCVivLmttS1xgX6A1k=,-204,42704
...
```

# Workload Processor



test_exec_bucket_report_for_test_test1.csv

Bucket Label,Base Count,Replay count,Diff
VALUE_COUNTER,465,268,197 → Total stmt base,Replay stmt,base-replay count
0.00_10.00,387,0,387
10.00_20.00,14,22,-8
20.00_30.00,30,226,-196
...
60.00_70.00,10,0,10
70.00_80.00,4,1,3
…
Bucket Label →low_high values in milliseconds of the statement execution times for this bucket
Base Count →Original workload statement count for this interval
Replay count →Replay workload statement count for this interval
Diff →Base Count - Replay count

# Workload Processor



test_exec_report_for_test_test1.csv

Param Name,Value
Name,test1
State,DONE
Test start TS,2021-03-03 11:48:59.781
Slow stmt threshold percent,20
Fast stmt threshold percent,20
Test parameter:skipDML,yes
Workload start TS,2018-12-28 15:20:31.659
Workload start Key,"172.16.178.90.60272.181228232030,2,1,2018-12-28 15:20:31.659"
Workload stop TS,2018-12-28 17:11:48.484
Workload stop Key,"9.21.202.248.36256.181229011146,6,1,2018-12-28 17:11:48.484"
Original workload duration,"6676825ms:1 hr, 51 min, 16 sec"
Target db JDBC url:,jdbc:db2://wlptt-rlth-4.fyre.ibm.com:50000/SAMPLE:retrieveMessagesFromServerOnGetMessage=true;clientProgramName=RLTCmd;
Exec stats:stmt.err,2
Exec stats:stmt.skip,192
Exec stats:stmt.slow,250

# Workload Processor



Optional
Load the event monitor data from the target database in the workload database (once the load test is finished)

# Workload Processor



To load the captured workload in the workload database define a command profile if not already defined then execute the batch load (as many times as needed) by using the command profile

```
[… rlt]$ rlt db2_evmon_wlp src=/db2evmondata/tgtdb/sample/actwlevmon/
dbFolder=/db2evmondata/tgtdb/sample/actwlevmon/ schema=WLEVMTGT dbAlias=wlpdb
save_to_profile=tgtdb_actevm_batch
```

Executing the batch load by using the command profile defined above. By using rlta the command will be executed in background (equivalent to nohup rlt … &) in order to handle longer time unassisted loads.

```
[… rlt]$ mkdir wlp_tgt_batch_load
[… rlt]$ cd wlp_tgt_batch_load
[… wlp_tgt_batch_load]$ rlta db2_evmon_wlp.tgtdb_actevm_batch
```

Use same method to monitor the load process and detect end of processing as in the case of command profile **db2_evmon_wlp.srcdb_actevm_batch**

# Workload Processor



Check the histogram (bucket) results collected by the actBktStats plugin in the db2_evmon_wlp command

# Workload Processor



Check the WLEVMTGT_ACT_BKT_STATS.hct.csv file in the PWD of the workload ETL command (db2_evmon_wlp.tgtdb_actevm_batch).

```
[… wlp]$ cat
TS-MS,<10MS,10MS-20MS,20MS-30MS,30MS-40MS,40MS-50MS,50MS-60MS,60MS-70MS,…
Timestamp,int,int,int,int,int,int,int,int,int,int,int,int,int,int,int,…
1550002126288,407,10,2,2,2,0,1,0,0,0,3,0,0,0,0,0,0,0,0,…
```

First column contain the timestamp when the row was logged (use the last row as final stats).
Second column is the count of statements executed in less than 10ms, next column (and so on) are bucket

# Workload Processor



Run analytic reports against the workload data captured from the target database

# Workload Processor



TBD

# Workload Processor



Q & A