

# Enduro/X Administration Manual

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## Chapter 1

# How to configure Enduro/X

To configure Enduro/X you have to finish several steps.

- Have a separate system user for each Enduro/X instance.
  - Setup System Environment (mount mq file system, configure mq params)
  - Setup environment configuration
  - Setup *ndrxdconfig.xml*
  - Setup *ndrxdebug.conf*
  - Startup the application
-

## Chapter 2

# Setup System Environment

In this chapter will be described typical GNU/Linux system configuration required for Enduro/X. Server Posix queue parameters must be set-up:

Typical configuration would look like (normally you can put this in `/etc/rc.local`):

```
# Mount the /dev/mqueue
mkdir /dev/mqueue
mount -t mqueue none /dev/mqueue
echo 32000 > /proc/sys/fs/mqueue/msg_max
echo 10000 > /proc/sys/fs/mqueue/msgsize_max
echo 10000 > /proc/sys/fs/mqueue/queues_max
```

Which means:

- *msg\_max* - Maximum number of messages in queue (32K)
- *msgsize\_max* - Maximum message size, ~10KB (System limited, for example for linux kernel 3.13 and later this can reach up to 10MB)
- *queues\_max* - Maximum number of queues (10K)

See [\[MQ\\_OVERVIEW\]](#) for more details about Posix queues on GNU/Linux.

Also do not remember to update Enduro/X environment variables to reflect these settings. Variables like:

- *NDRX\_MSGMAX*
- *NDRX\_MSGSIZEMAX*

See [\[EX\\_ENV\]](#) for more configuration flags.

Update also should be done to system security configuration. I.e. update to `/etc/security/limits.conf` is required, following lines must be added:

*	soft	msgqueue	-1
*	hard	msgqueue	-1

## Chapter 3

# Setup environment configuration

Enduro/X depends lot of Environment variables. See manpage of *ex\_env* ([\[EX\\_ENV\]](#)) to see all paramters that must be setup. There is also sample configuration provided. Normally it is expected that seperate shell script file is setup containing all paramters. Then to load the environment, login with Enduro/X user in, and run following command in your app dir, for example:

```
$ cd /endurox/app/conf
$ . setapp
```

## Chapter 4

# Setup *ndrxdconfig.xml*

Vital part of Enduro/X is *ndrxdconfig.xml* config. Full path to it is configured in *NDRX\_CONFIG* environment variable. To see how to setup see manpage of it [\[NDRXCONFIG\]](#).

## Chapter 5

# Setup *ndrxdebug.conf*

Environment variable *NDRX\_DEBUG\_CONF* contains full path to debug file. See [\[DEBUGCONF\]](#) for more details about *debug.conf* setup.



## Chapter 6

# Start Enduro/X application

To start the Enduro/X application, login with Enduro/X instance user, and issue following command *xadmin start*, for example:

```
$ xadmin start -y
ndrxd PID (from PID file): 25037
exec tpevsrv -k 0myWI5nu -i 14 -e /tmp/TPEVSRV -r -- :
    process id=26793 ... Started.
exec tpbridge -k 0myWI5nu -i 101 -e /tmp/BRIDGE002 -r -- -n2 -r -i 0.0.0.0 -p 4433 -tP -z30 ↵
:
    process id=26794 ... Started.
exec tpbridge -k 0myWI5nu -i 102 -e /tmp/BRIDGE012 -r -- -n12 -r -i 10.10.10.2 -p 14433 -tA ↵
-z30 :
    process id=26795 ... Started.
Startup finished. 3 processes started.
```

To see all commands available by *xadmin* (xa) see manpage of it [\[XADMIN\]](#).

## Chapter 7

# Recovery from crashed local ATMI monitor

Enduro/X is capable to continue with out restart in case if *ndrxd* local ATMI monitor is crashed or contains invalid data structures for some reason. In this case administrator can do following:

- \$ kill -9 <ndrxd PID>
- remove ndrxd queue, for example: \$ rm /dev/mq/n00b,sys,bg,ndrxd
- restart *ndrxd* in learning mode, by: \$ nohup ndrxd -k \$NDRX\_RNDK -r

## Chapter 8

# Cluster configuration

To setup cluster see you have to setup bridge ATMI processes on each of the machines. See [\[TPBRIDGE\]](#) documentation to have understanding of clustering. Sample setup of cluster node which actively connects to Node 2 and waits call from Node 12 could look like:

```
<?xml version="1.0" ?>
<endurox>
  <appconfig>
    <sanity>10</sanity>
    <brrefresh>6</brrefresh>
    <restart_min>1</restart_min>
    <restart_step>1</restart_step>
    <restart_max>5</restart_max>
    <restart_to_check>20</restart_to_check>
  </appconfig>
  <defaults>
    <min>1</min>
    <max>2</max>
    <autokill>1</autokill>
    <respawn>1</respawn>
    <start_max>2</start_max>
    <pingtime>1</pingtime>
    <ping_max>4</ping_max>
    <end_max>3</end_max>
    <killtime>1</killtime>
  </defaults>
  <servers>
    <!-- Connect to cluster node 2, we will wait for call -->
    <server name="tpbridge">
      <max>1</max>
      <srvid>101</srvid>
      <sysopt>-e /tmp/BRIDGE002 -r</sysopt>
      <appopt>-n2 -r -i 0.0.0.0 -p 4433 -tP -z30</appopt>
    </server>
    <!-- Connect to cluster node 12, we try to connect activetly to it -->
    <server name="tpbridge">
      <max>1</max>
      <srvid>102</srvid>
      <sysopt>-e /tmp/BRIDGE012 -r</sysopt>
      <appopt>-n12 -r -i 195.122.24.13 -p 14433 -tA -z30</appopt>
    </server>
  </servers>
</endurox>
```

## Chapter 9

# Max message size and internal buffer sizes

Starting from Enduro/X version 5.1+, the max message size what can be transported over the XATMI sub-system is limited to the operating system's queue settings. For example on Linux kernel 3.13 the message size limit (/proc/sys/fs/mqueue/msgsize\_max) is around 10 MB. The message size is configured with *NDRX\_MSGMAX* environment variable, see *ex\_env(5)* man page.

Also what should be noted, as Enduro/X mostly uses stack allocation instead of heap allocation (for safer and faster code), then there are requirements against the stack size. The stack size (*ulimit -s*) must be at least size of message multiplied with 30. So for example if message size is set to 1 MegaByte, then stack size shall be set to 30 Mega bytes (*ulimit -s 30720 KB*). If the stack is not sufficient the following error will be print when attempting to run any Enduro/X based software:

```
Logging to ./ULOG.20171112
Failed to open [./ULOG.20171112]
9138:20171112:19144166:xadmin      :LIMITS ERROR ! Please set stack (ulimit -s) size to:  ←
    1966080 bytes or 1920 kb (calculated by: NDRX_MSGSIZEMAX(65536)*NDRX_STACK_MSG_FACTOR ←
    (30))

LIMITS ERROR ! Please set stack (ulimit -s) size to: 1966080 bytes or 1920 kb (calculated ←
    by: NDRX_MSGSIZEMAX(65536)*NDRX_STACK_MSG_FACTOR(30))
Process is terminating with error...
```

In this case stack size needs to be increased, that could be done by in multiple ways:

1. Change by `$ ulimit -s 1920` To ensure that this is set each time the Enduro/X is started, it needs to be added to the "env" script of the application which prepares application environment before app boot. Also system settings must be checked in */etc/security/limits.conf* either the limit is enough - "stack" parameter.
2. Set the user/system limit directly in */etc/security/limits.conf*. For other operating systems, please consult with corresponding manual for changing the message size and stack size.

Also regarding the buffer sizes, when *NDRX\_MSGMAX* is set below 64K, the buffer size is fixed to 64K, this means that operations like network packet size when using *tpbridge*, is set to 64K.

As the message size is in the same time a internal buffer size, this means that not all space can be used by sending some data (for example CARRAY or UBF buffer). Some overhead is added by Enduro/X, message headers, for bridge protocol format extra data is added for TLV structure. Thus to be safe, for example if expected data size is 64K, then message size should be set to something like 80KB.

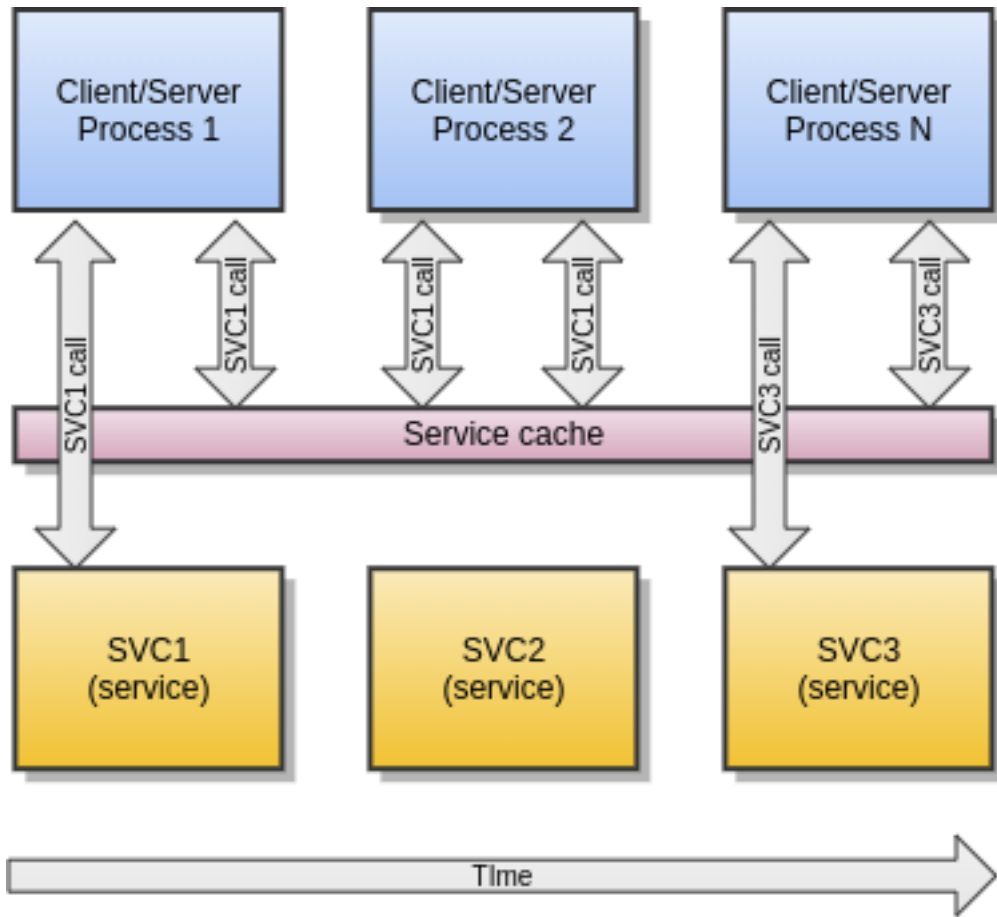
## Chapter 10

# Enduro/X Smart Cache

Enduro/X support SOA level cache. This means that administrator can configure system configuration, so that certain services are cached. Thus if some client process calls some service X, and it gets valid results back, then data key is built (specified in config) and for this key data is saved to Lightning Memory-Mapped Database (LMDB). Next time service is called, the cache is checked, again, key is built, and lookup to LMDB is made. If results are found in db, then actual service is X is not called, but instead saved buffer from cache is returned back to caller. Cache works for tpcall() function.

Cache supports different features:

1. Limited or unlimited caches are available. The unlimited cache is bound to physical dimensions of db file (also specified in configuration). In case of limited cache, number of logical items stored in cache can be specified. This is set by *limit* parameter for database configuration. In case if limit is specified the strategy how to remove over-reached records can be specified in database flags. The strategies supported are following: **LRU** - keep records recently used, **FIFO** - delete records by chronological order (older records added to cache are being deleted), **HITS** - records mostly accessed stays in cache.
2. Multiple physical storage definitions, so that XATMI services can be allocated in different or same physical storage. This can help to solve challenges between storage space limitations and performance limitations (when multiple writes are done in same physical storage).
3. Cache is Enduro/X cluster aware. Records can be distributed and deleted across the cluster nodes. Time based sync is supported when in the same time both nodes adds records to non existing cache cell. On both cluster nodes will survive record which is fresher. The older duplicate is zapped by tpcall() or by tpcached.
4. Records can be grouped for example statement pages can be all linked to single user. If transaction happens for user, then whole group can be invalidated. Thus build cache again. Grouping can be also used for Denial Of Service (DoS) protection. Enduro/X can be configured to limit the max number of new records in group, after which any new non existing data element lookup in group will make request buffer to reject with configured tperno, user return code and buffer.
5. Records in cache can be cross-invalidated. Meaning that "hooks" can be put on certain service calls in order to invalidate - zap contents of some other cache.
6. Cache supports refresh conditions. So that in case if specific condition over the data is true, the cached data not returned, but service invocation is performed and re-cached (old data overwritten).



## 10.1 Limitations of the cache

The LMDB is build in such way that if write transaction on the database is open, then other writes will not be able to process it in meantime. While read only transactions are processed, while some other process holds write transaction. Also if process which is holding the lock is crashed (e.g. segfaul, kill, etc..), then lock is automatically made free. Thus for example is using **hits** or **lru** limitation caches, then this automatically means that during the tpcall() chaches needs to be updated, thus lock is needed, and this means that all callers will have to sync in that place - thus makes point of bottleneck.

## Chapter 11

# Additional documentation

### 11.1 Internet resources

- [1] [ATMI-API] [http://docs.oracle.com/cd/E13203\\_01/tuxedo/tux71/html/pgint6.htm](http://docs.oracle.com/cd/E13203_01/tuxedo/tux71/html/pgint6.htm)
  - [2] [FML-API] [http://docs.oracle.com/cd/E13203\\_01/tuxedo/tux91/fml/index.htm](http://docs.oracle.com/cd/E13203_01/tuxedo/tux91/fml/index.htm)
  - [3] [EX\_OVERVIEW] `ex_overview.pdf`
  - [4] [MQ\_OVERVIEW] `man 7 mq_overview`
  - [5] [EX\_ENV] `man 5 ex_env` or `ex_env.pdf`
  - [6] [NDRXCONFIG] `man 5 ndrconfig.xml` or `ndrconfig.xml.pdf`
  - [7] [DEBUGCONF] `man 5 ndrdebug.conf` or `ndrdebug.conf.pdf`
  - [8] [XADMIN] `man 8 xadmin` or `xadmin.pdf`
  - [9] [TPBRIDGE] `man 8 tpbridge` or `tpbridge.pdf`
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## Chapter 12

# Glossary

This section lists

**ATMI**

Application Transaction Monitor Interface

**UBF**

Unified Buffer Format it is similar API as Tuxedo's FML

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