New asynchronous meta back-end for OpenLDAP

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Slapd-meta

- Ldap-proxy backend, capable of proxying an operation to multiple targets, aggregate the results and present them to the client as if coming from a single server
- Uses one thread per operation to:
  - Find or create a new connection
  - Bind all targets (synchronously)
  - Send to all targets
  - Get entries/results from each target (synchronously) and return them to the client

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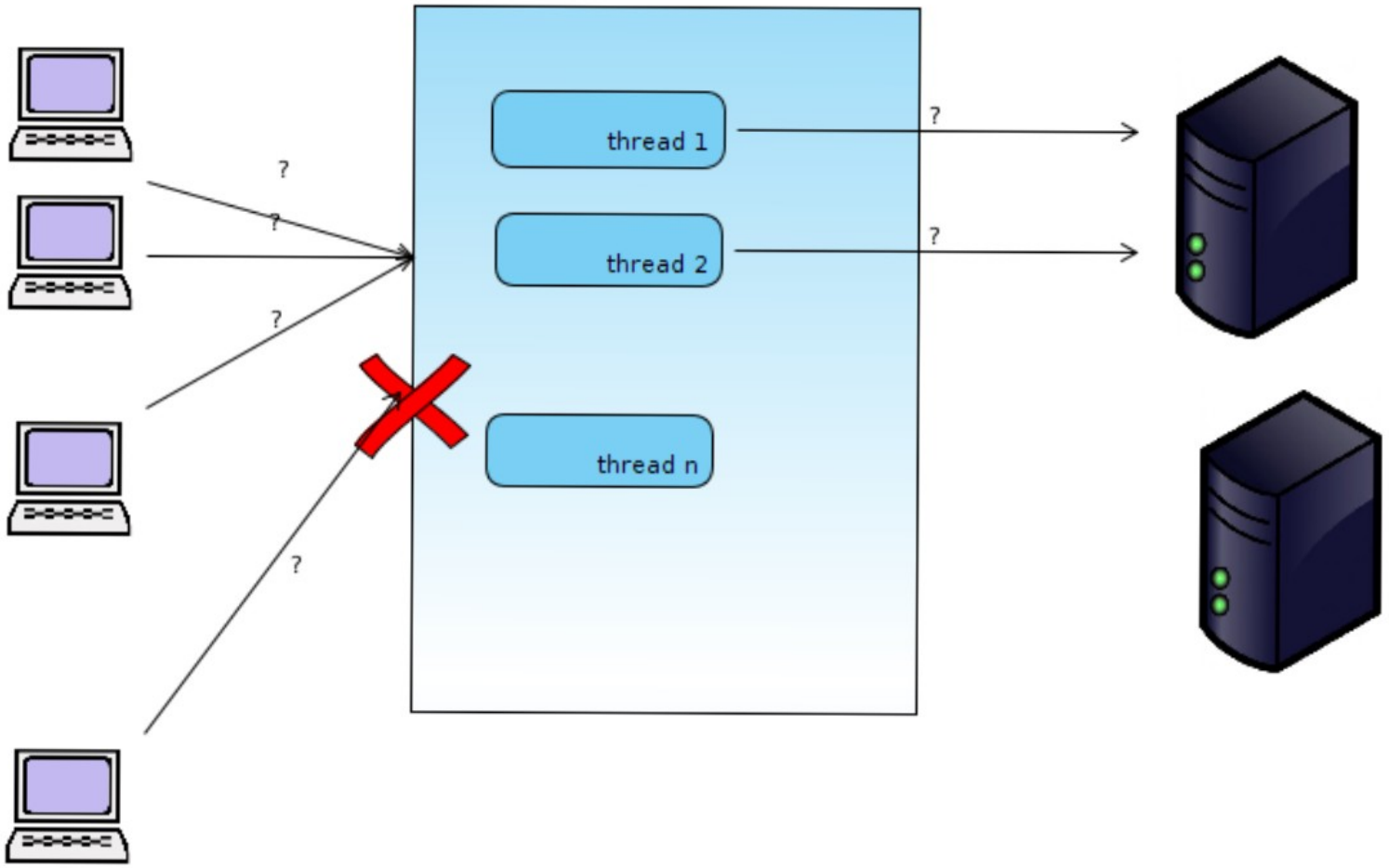
The problem



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The solution

Separate the sending of the proxied operation from the receiving of results:

- Threads will exit instead of waiting, thus freeing the threadpool for other operations.
- A new thread will be used to process the result, only when the result is actually available.
- Instead of connections being cached based on client's credentials, implement a configurable number of persistent connections, and distribute load between them.

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Multi-threaded programming

Theory

Practice

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Relationship with meta

- Reuses some code
- Data structures very similar
- Shares most configuration options

- A separate module, does not link to meta
- Similarly, requires ldap and monitor
- Options named the same, but in a separate tree

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Data

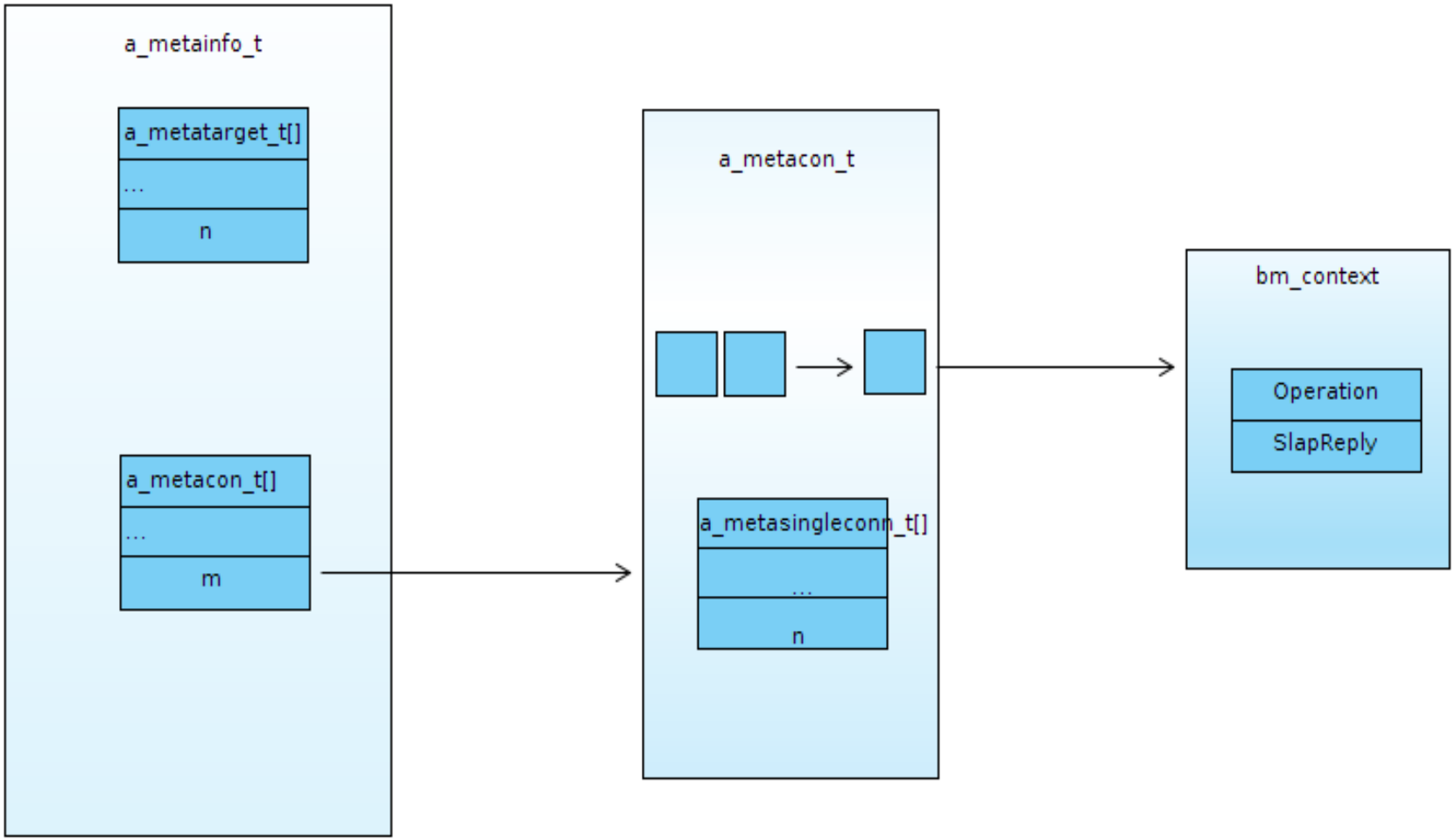
a_metainfo_t – represents a database.

a_metatarget_t – represents a configured target.

a_metaconn_t – contains an array of LDAP connections to each of the configured targets (a_metasingleconn_t), and stores temporary operation data. As many as configured by max-target-conn parameter.

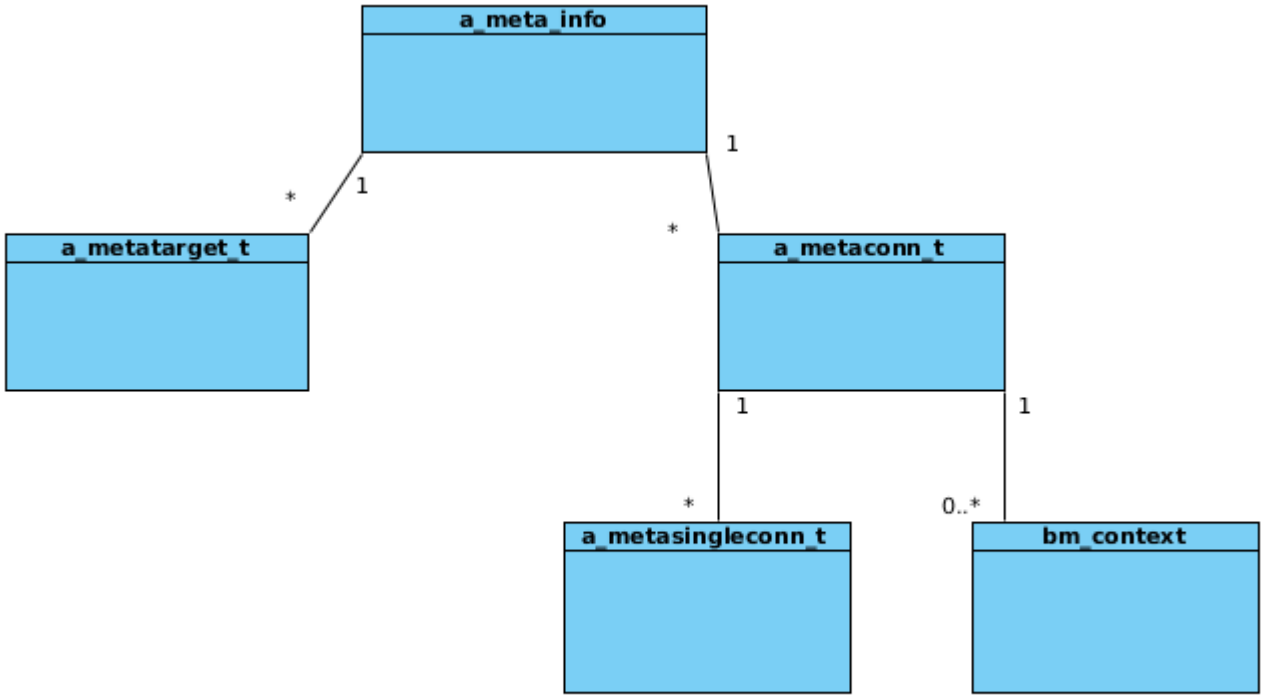
a_metasingleconn_t – represents a single LDAP connection.

bm_context_t – a holder for the temporary operation data.



n - number of configured targets

m - number of connections, as configured by max-target-conns


a_meta_info
1
*
1
*
a_metatarget_t
a_metaconn_t
1
1
*
0..*
a_metasingleconn_t
bm_context

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Threads

- Sender – one for each operation being processed
- Reader – one per metaconn doing actual work
- Timeout – one per database

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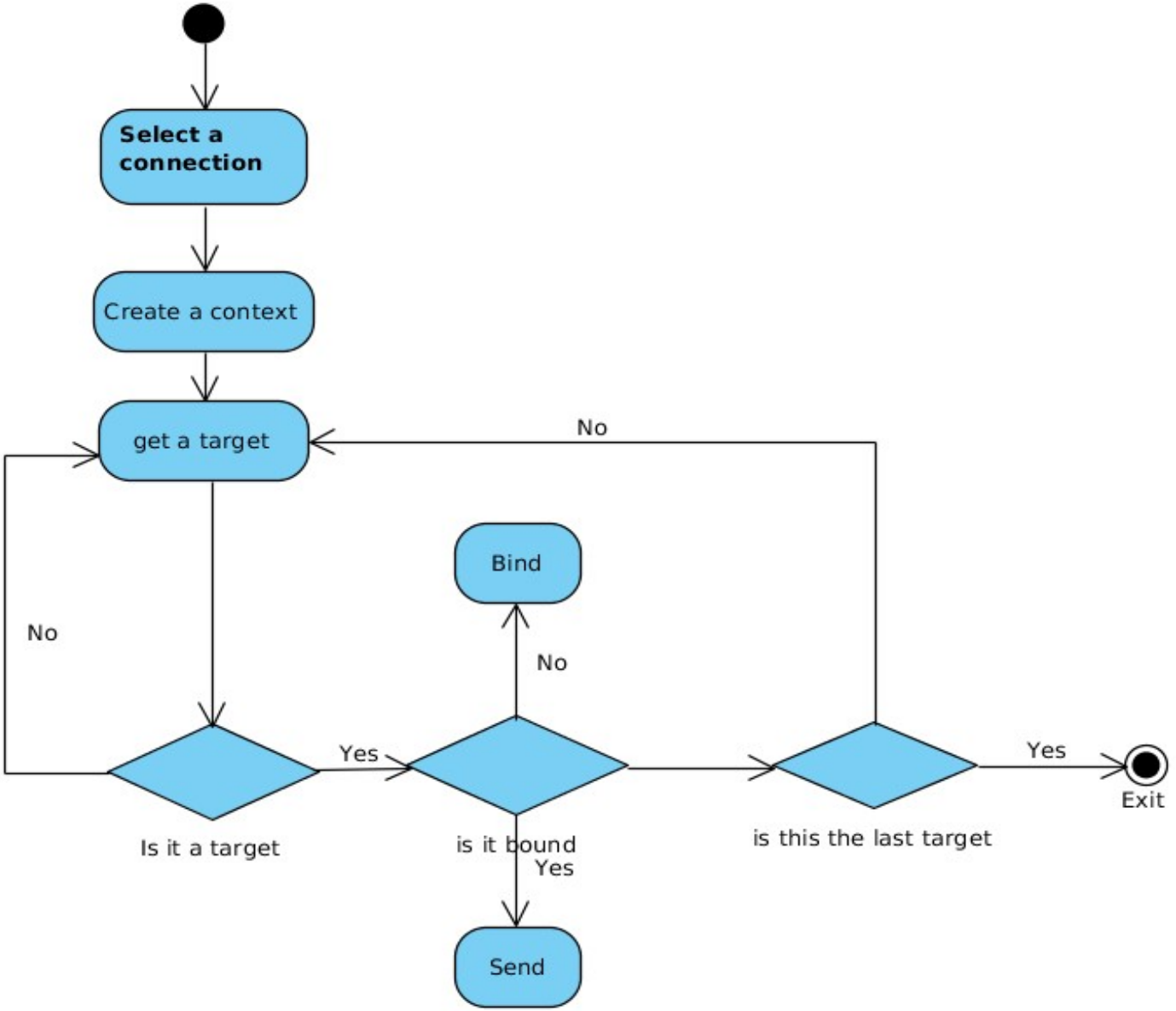
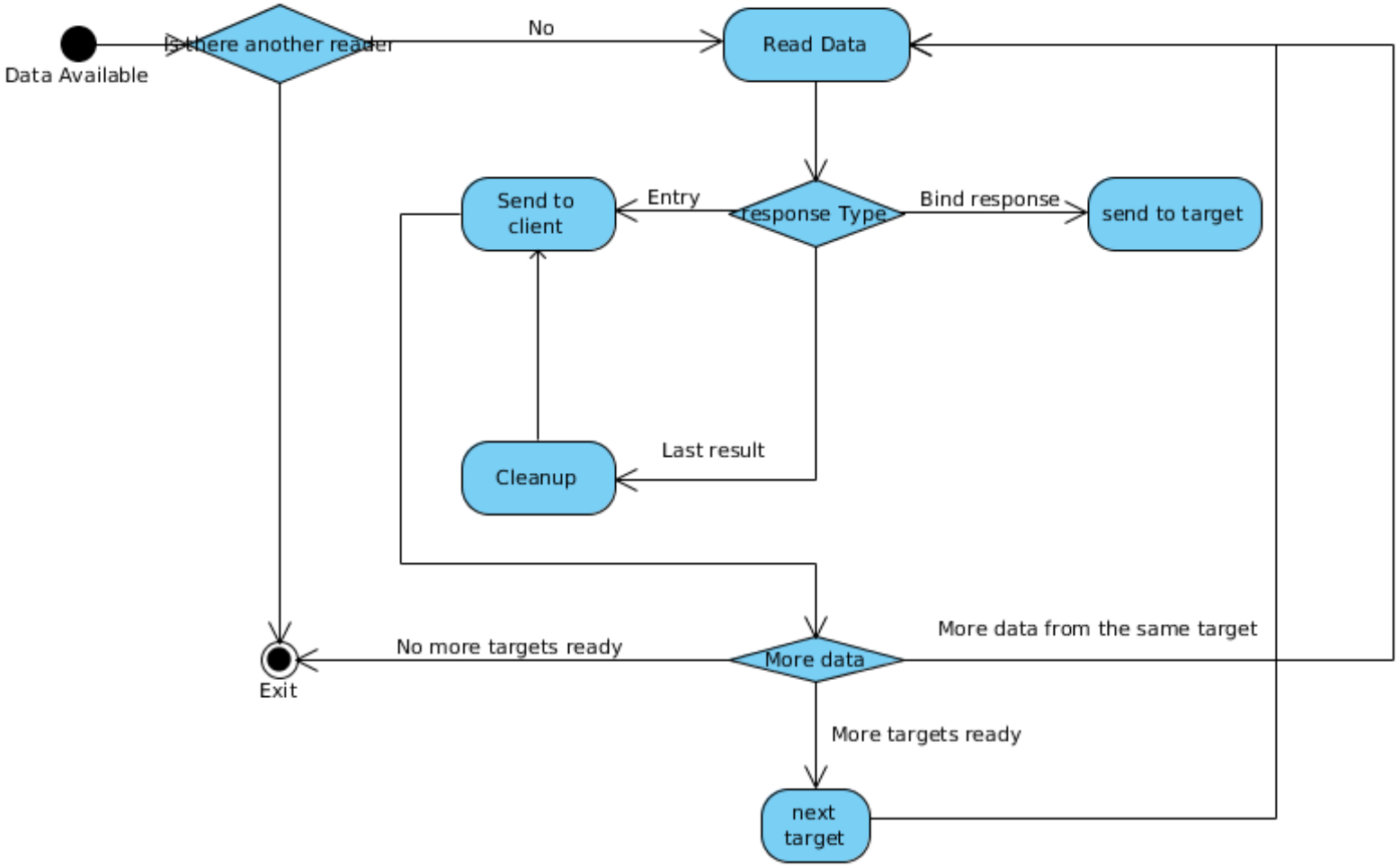
Sender



Reader


Data Available
Is there another reader
No
Read Data
Response Type
Entry
Send to client
Bind response
send to target
Cleanup
Last result
More data
No more targets ready
Exit
More data from the same target
More targets ready
next target

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Timeout

- Triggered every second
- Walks every metaconn_t in the array
- Checks in the message queue if there are timed out operations, or operations for which result has been sent
- Removes them from the queue if they are not being handled by other threads
- Checks if any of the LDAP connections need reset or have timed out, and resets them if they are not in use.

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Configuration

- --enable-asyncmeta
- New options
  - database asyncmeta – define an asyncmeta database
  - max-timeout-ops <number> - the number of consecutive requests that have timed out, after which the connection will be reset. Not configured by default.
  - max-pending-ops <number> - the maximum number of operations stored in a connection's message queue. If this limit is reached, the server will return LDAP_BUSY. The default is 128.
  - max-target-conns <number> - the number of persistent connections to each target – the default is 255.
- Removed options
  - single-conn
  - use-temporary-conn

Configuration Cont.

```
database asyncmeta

suffix "dc=missy,dc=com
network-timeout 3
max-timeout-ops 100

max-pending-ops 100

max-target-conns 10

idle-timeout 3

rootdn "cn=admin,dc=missy, dc=com"

rootpw apassword
```

```
uri
"ldap://10.0.2.19/dc=isreally,dc=themaster,dc=com"
rewriteEngine on
rewriteContext bindDN
rewriteRule "(.*)dc=missy,dc=com"
"%1dc=themaster,dc=com" ":"
rewriteContext searchBase alias bindDN
rewriteContext searchResult
rewriteRule "(.*)dc=themaster,dc=com"
"%1dc=missy,dc=com" ":"
idassert-bind bindmethod=simple
   binddn="cn=admin,dc=isreally,dc=themaster,dc=com"
   credentials="somethingsecret"
   mode=none
idassert-authzFrom "dn:*"
```

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Performance – average number of operations per second

Number of server threads	Default (15)	3	100	backend
Search spanning multiple targets	205.17	221.9	230.5	asyncmeta
	244.9	210.9	260	meta
Search spanning one target	301.10	308.2	310.5	asyncmeta
	285.5	284.0	304.0	meta

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Performance

- Slower than meta – involves more processing and some additional locking for data protection
- But – throughput is not noticeably affected by number of configured threads

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Caveats

- No guarantee it will work with any existing overlays
- In custom modules, do not use o_tmpmem allocator for o_extra data
- Make sure the callbacks are dynamically allocated.

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