dCache.org

Tuning SRM

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on behalf of the rest of the dCache team.

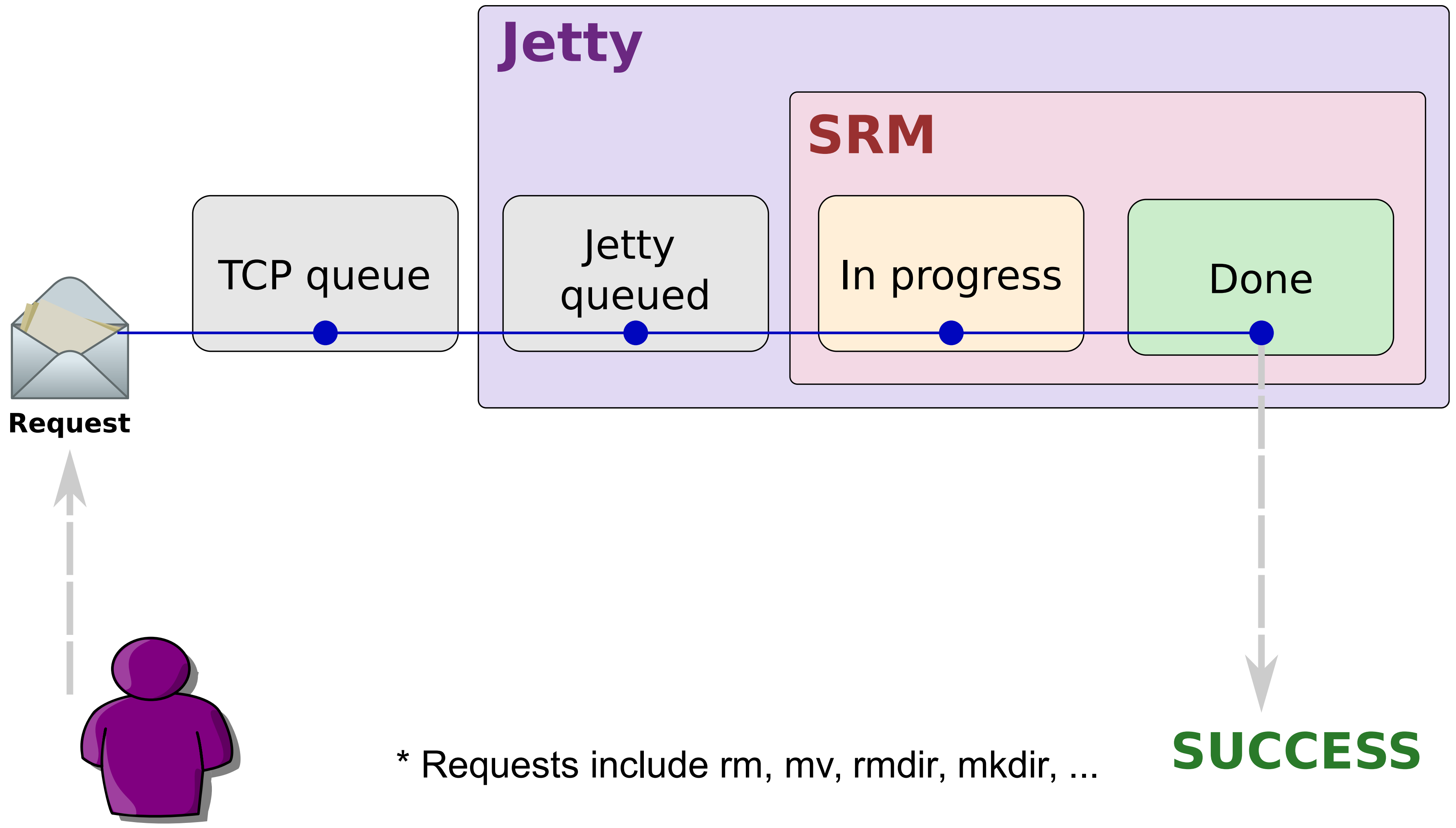
dCache workshop 2015

Fermilab NDGF NORDIC DATAGRID FACILITY DESY HELMHOLTZ ASSOCIATION LSDMA

What is improved with SRM in 2.10

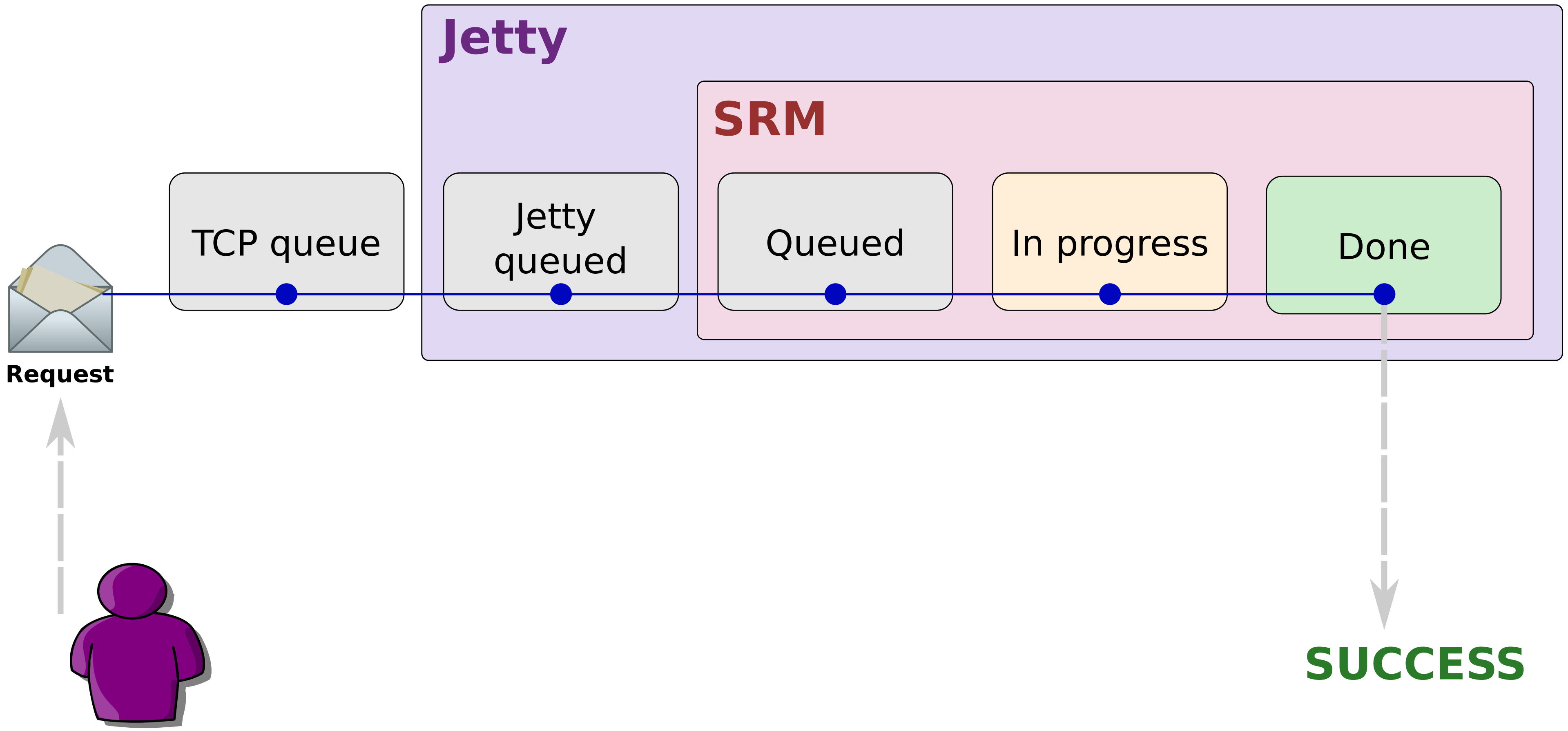
- Never abort a requests that has been worked on.
- Control over the induced load.

A request's journey: the simple* requests



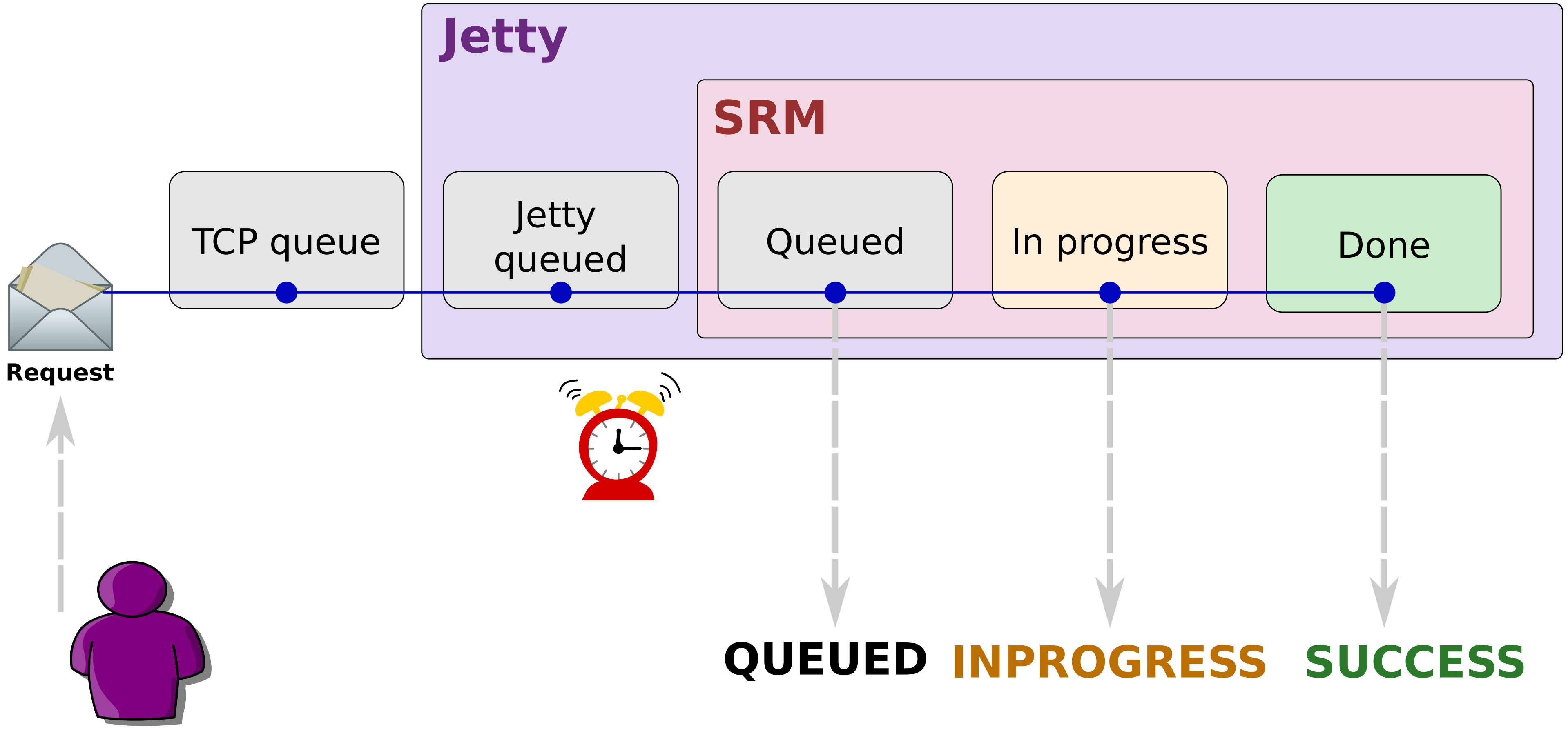
* Requests include rm, mv, rmdir, mkdir, ...

A request's journey: sched. non-transfers

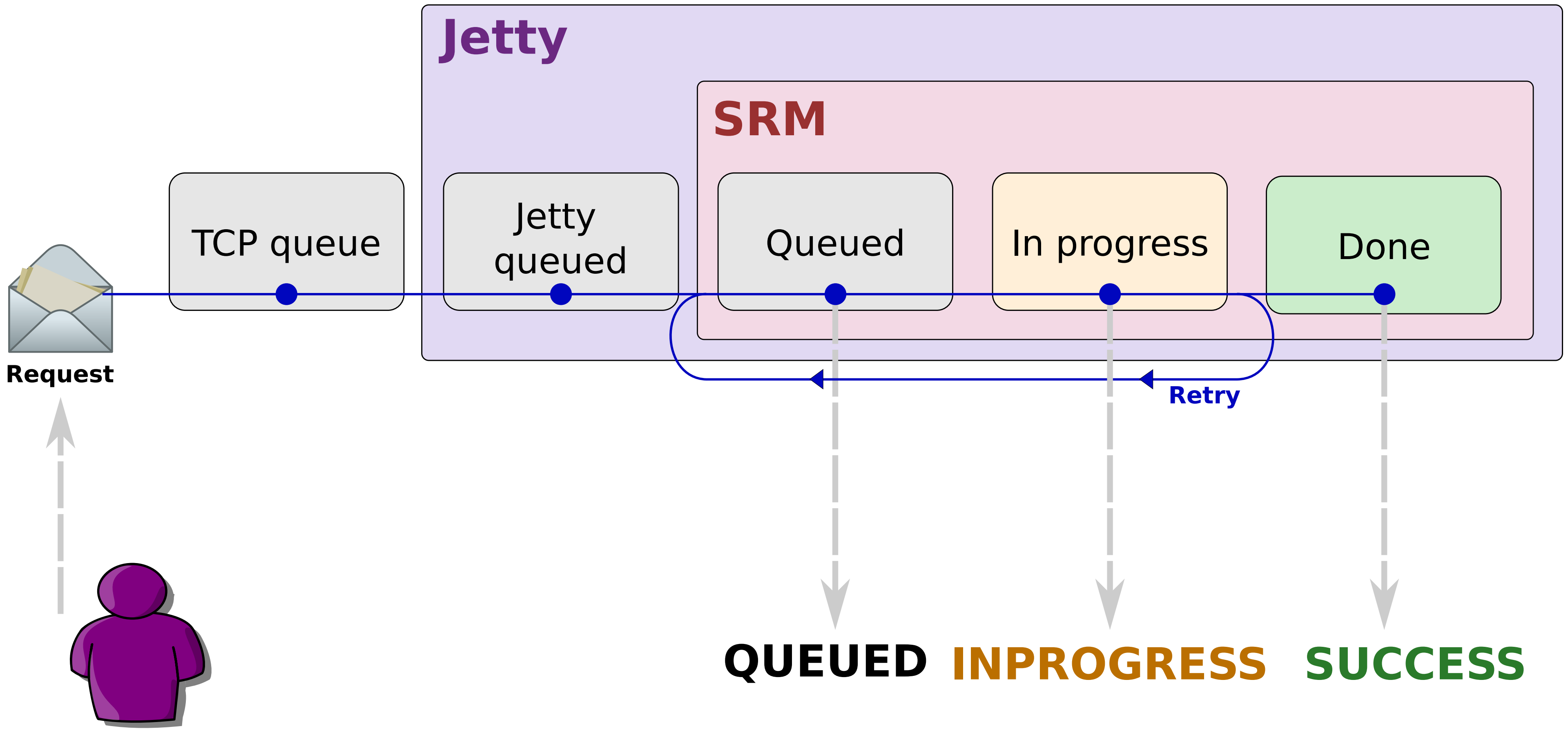


Bring-online, Copy, Ls, Reserve-space

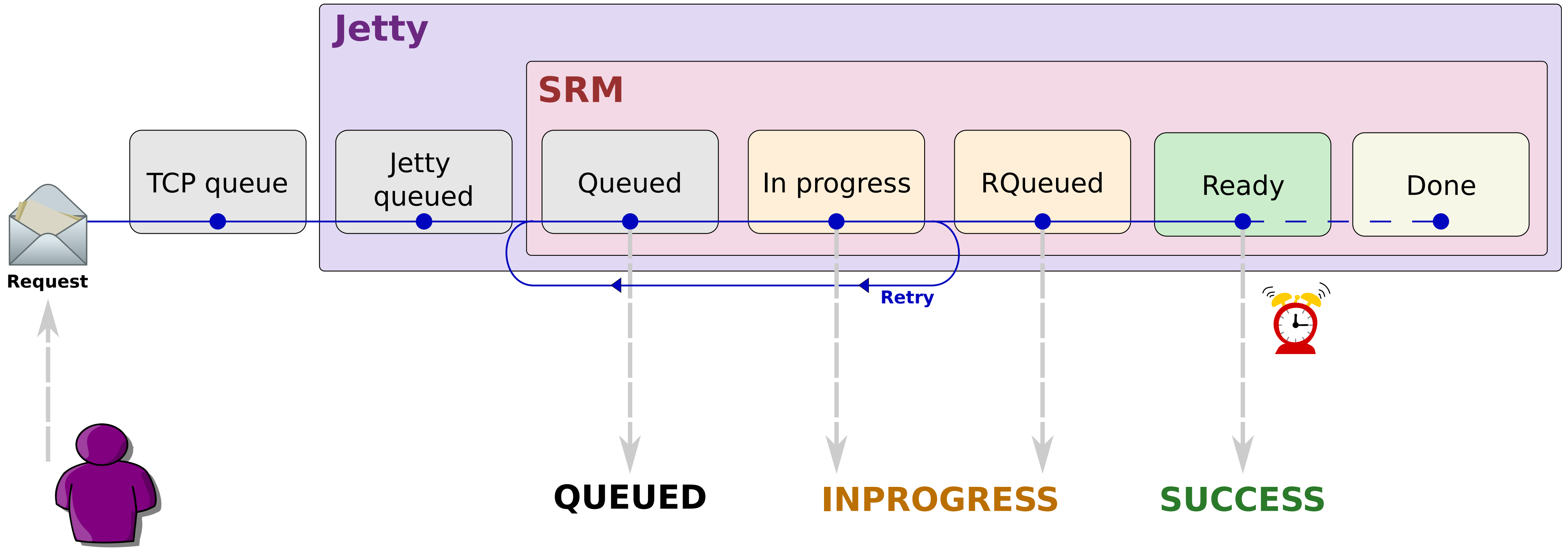
A request's journey: asynchronous



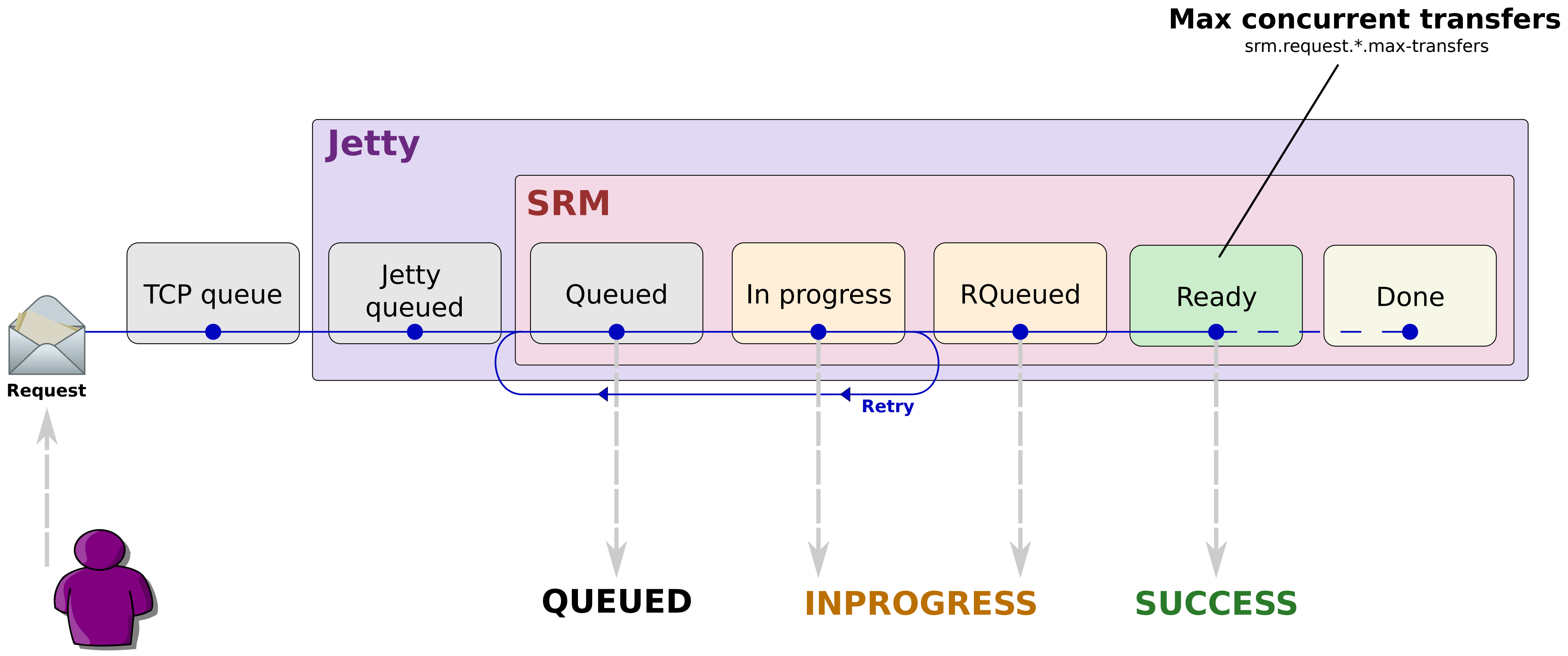
A request's journey: retries



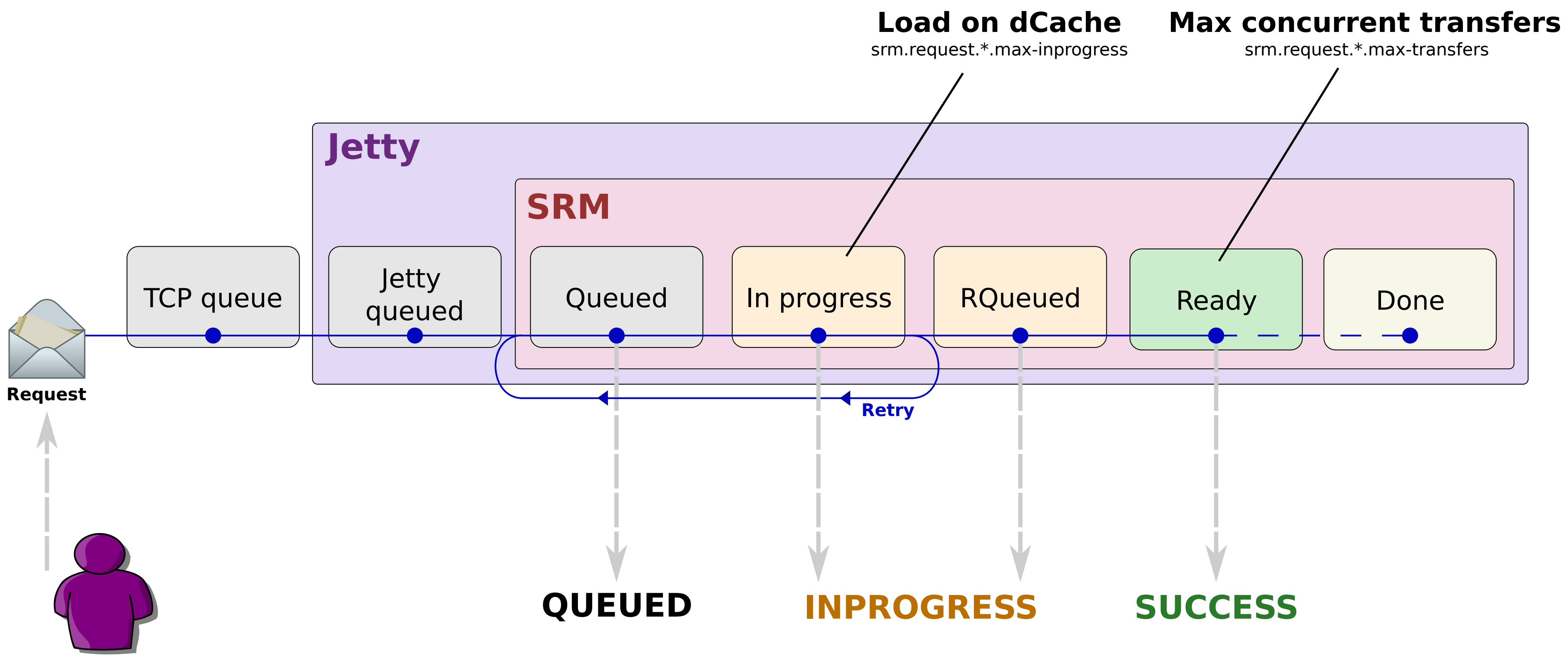
A request's journey: transfers



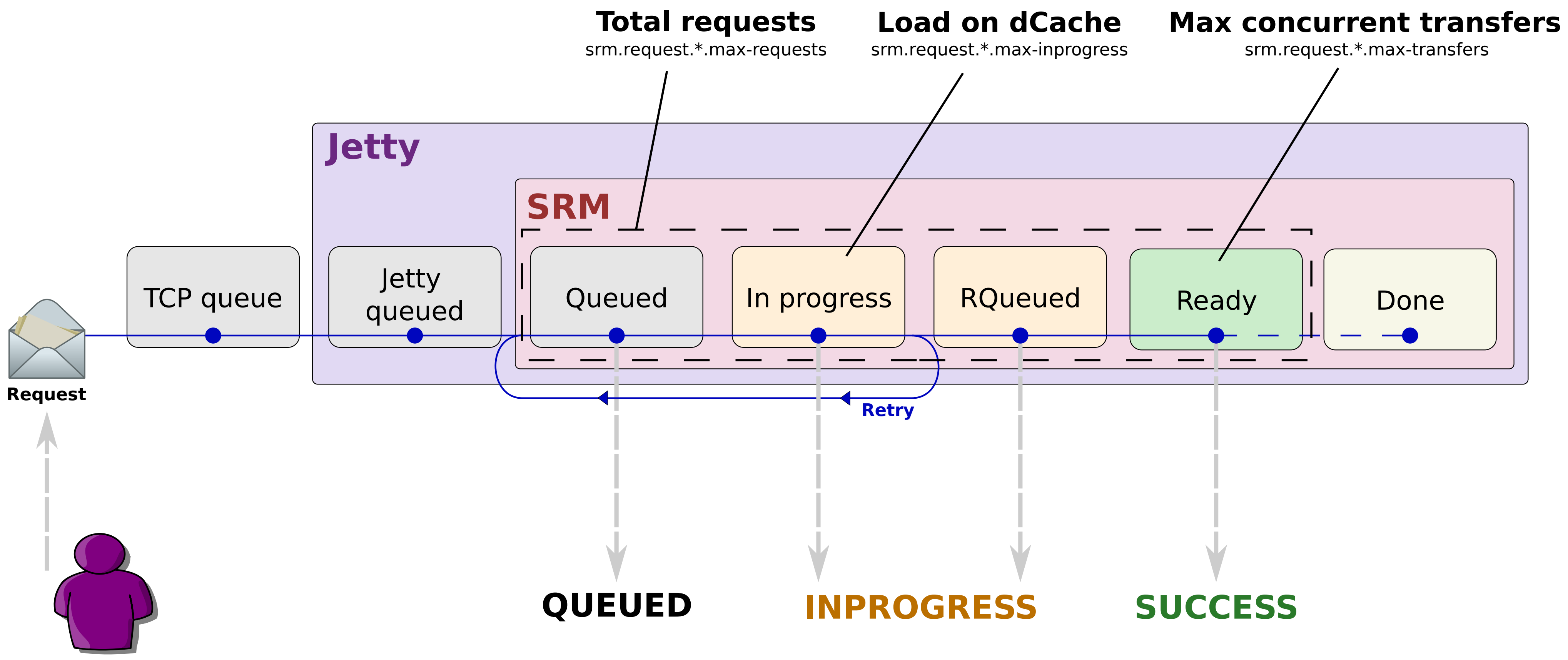
Throttling number of transfers



Protecting the rest of dCache

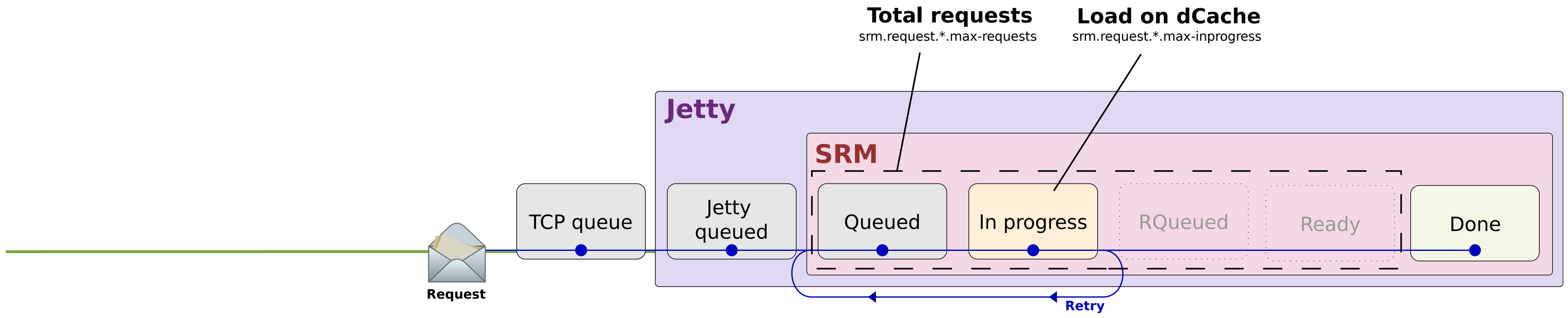


Don't run out of memory!



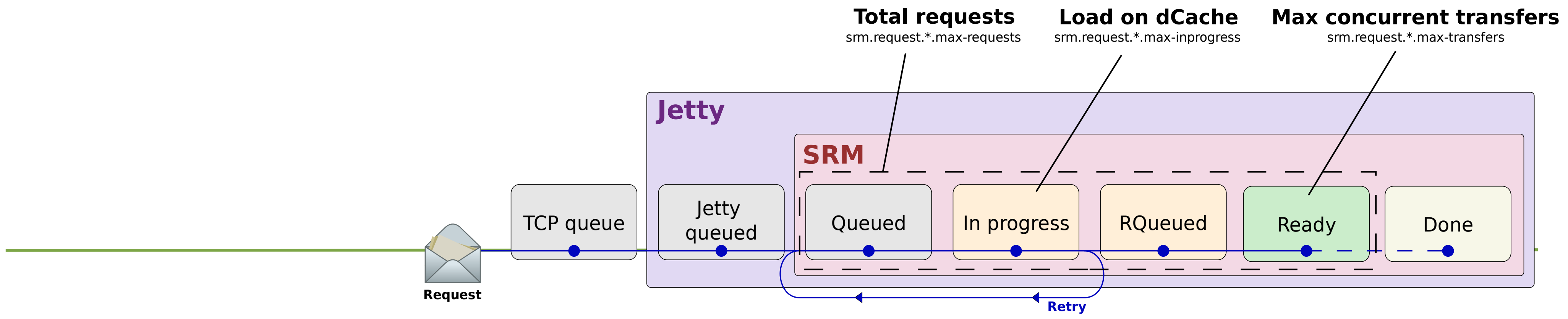
Info of non-transfer requests

```
--- scheduler-ls (Scheduler for LS operations) ---
    Queued ...........................     0     [TQueued]
    Waiting for CPU .........     0              [PriorityTQueued]
    Running (max 50) ........     0              [Running]
    Running without thread ...    0              [RunningWithoutThread]
    Waiting for callback .....    0              [AsyncWait]
    In progress (max 50) .....   SUM >>    0
    Queued for retry .................     0     [RetryWait]
    ------------------------------------------
    Total requests (max 50000) .......     0

    In progress per user soft limit : 100 requests
    Maximum number of retries       : 10
    Retry timeout                   : 60000 ms
    Retry limit                     : 10 retries
```



Info of non-transfer requests

```
--- scheduler-put (Scheduler for PUT operations) ---
    Queued ...........................    0     [TQueued]
    Waiting for CPU .........     0              [PriorityTQueued]
    Running (max 12) ........     0              [Running]
    Running without thread ...    0              [RunningWithoutThread]
    Waiting for callback .....    0              [AsyncWait]
     In progress (max 50) .....   SUM >>    0
    Queued for retry .................    0      [RetryWait]
    Queued for transfer ...............   0      [RQueued]
    Waiting for transfer (max 50000) ..   0      [Ready]
    ------------------------------------------
    Total requests (max 50000) .......    0

    In progress per user soft limit : 100 requests
    Maximum number of retries       : 10
    Retry timeout                   : 60000 ms
    Retry limit                     : 10 retries
```



Tuning points not covered...

- Tuning number of threads:

  acceptor-thread(s), jetty-threads, scheduler-threads
- Closing idle connections,
- Tuning synchronous–asynchronous delay,
- Tuning DB behaviour,

  connectors, persistence of requests
- Retry behaviour:

  delay before retrying, number of retries to attempt
- Same-user request balancing,
- Number of in-flight rm requests

See Dmitry's previous talk on these points one more thing...

Multiple SRM instances

Yes, you can do it...

even running multiple SRM instances on the same host*

… but for isolating multiple “customers”, not load-balancing.

* some limitations apply

Requirements

Each **SRM instance**...

- must use a different SRM databases (can be in same PostgreSQL instance)
- must be bound to different IP addresses (if on the same host)
- must be in different domains

Clients must...

- connect to same instance for duration of an asynchronous request.
- call srmPutDone / srmReleaseFiles on same SRM instance as srmPrepareToPut / srmPrepareToGet.

Probably easiest to have VO-specific SRM endpoint and clients that know to connect to that endpoint.

Thanks for listening!

What is SRM?

- Standard protocol for managing storage
- Features not available in other protocols:

    AL/RP, spaces, protocol negotiation, 2-stage commit for uploads, staging with pins, 3rd party copy, …

- **Bulk** operations:

    BringOnline, PrepareToGet, Ls, PrepareToPut, Copy, CheckPermission, GetPermission, Rm, ReleaseFiles, PutDone, AbortFiles, ExtendFileLifeTime, ChangeSpaceForFiles, ExtendFileLifeTimeInSpace, PurgeFromSpace.

- **Asynchronous** operations:

    BringOnline, PrepareToGet, Ls, PrepareToPut, Copy, ReserveSpace, ChangeSpaceForFiles, UpdateSpace.

SRM: asynchronous operations

- What: tell client to come back later
- Why: some requests require SRM to communicate with other dCache components. While clients wait, memory and a thread are “wasted”
- How does it work: SRM starts a timer; if this goes off before reply is complete, tell client to come back.
- How to tune?

  srm.request.switch-to-async-mode-delay & .unit
- How to know what is the correct value?

SRM: tuning threads

- What: adjust the thread behaviour to match server
- Why: idle threads make server more responsive, maximum threads prevent running out of memory.
- How to tune?
  - srm.limits.jetty.threads.max
  - srm.limits.jetty.threads.min
  - srm.limits.jetty.threads.idle-time.max & .unit
  - srm.limits.jetty.threads.queued.max
- How to know what is the correct value?
  - 512 kB per thread (1,000 threads → 500 MiB)
  - takes time to create a thread (~ 0.25 ms), much better to avoid this
  - Tune threads.max and thread.queued.max so you don't run out of memory
  - Tune threads.idle-time.max based on observed client behaviour
  - Tune threads.min on

SRM: client-view of requests

- General progression:

  SRM_REQUEST_{QUEUED → INPROGRESS → SUCCESS}

- What they mean:

  QUEUED: no work done yet,

  INPROGRESS: work started,

  SUCCESS: finished.

SRM: internal states (simple case)

- Simple flow:

  PENDING → TQUEUED → RUNNING → DONE

- What they mean:

  PENDING – just received

  TQUEUED – not working on request

  RUNNING – dCache (SRM or elsewhere) working

  DONE – successful outcome.

SRM: internal states (transfer requests)

- Simple flow:

  PENDING → TQUEUED → RUNNING → RQUEUED → READY → DONE

- What they mean:

  PENDING, TQUEUED, RUNNING as before

  RQUEUED the TURL is ready but not handed to the client

  READY the TURL is in client's hands

  DONE the TURL is no longer valid, transfer was successful.

SRM: when too much activity

- When too much client activity, requests are queued
  - Need to remember client activity – writing to database for restart
-

What is SRM?

- Parameters for throttling client activity
- Parameters for recording client activity:

  Knowing what happened, surviving restart
- Parameters for protecting against OOM
- Parameters for generating TURLs
- Parameters controlling interaction with rest of dCache.