XRootD 5.0.0
Encryption and Beyond

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http://xrootd.org

XRootD 5.0.0 The Next Big One

- Introduces many new features
  - Breaks plug-in ABI in some cases
    - Some external plug-ins will need to recompile
      - No source changes are needed
- It's very ambitious & planned for 4Q19
  - Realistically, for all practical purposes, 1Q20
- This talk presents the highlights
  - And introduces what's ahead

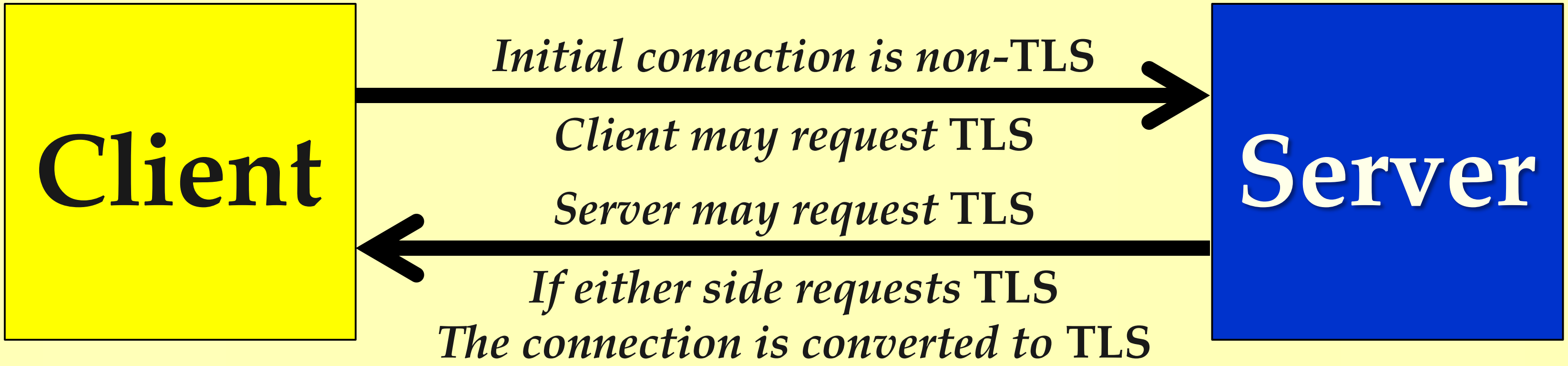
Transport Layer Security (TLS)

- Why do it?
  - Allow for authorization token handling
    - E.g. SciToken
  - Improves security and data integrity
- What are the obstacles?
  - Backward compatibility
  - Forward migration path

The XRootD approach?

- Flexible TLS
  - Not every client has TLS
    - We need to supply backward compatibility
  - Not everything needs TLS
    - We need to account for operational context
  - So, a connection may or may not require TLS
    - At the discretion of the client, or
    - The insistence of the server

Flexible TLS



Client

*Initial connection is non-*TLS

Client may request TLS

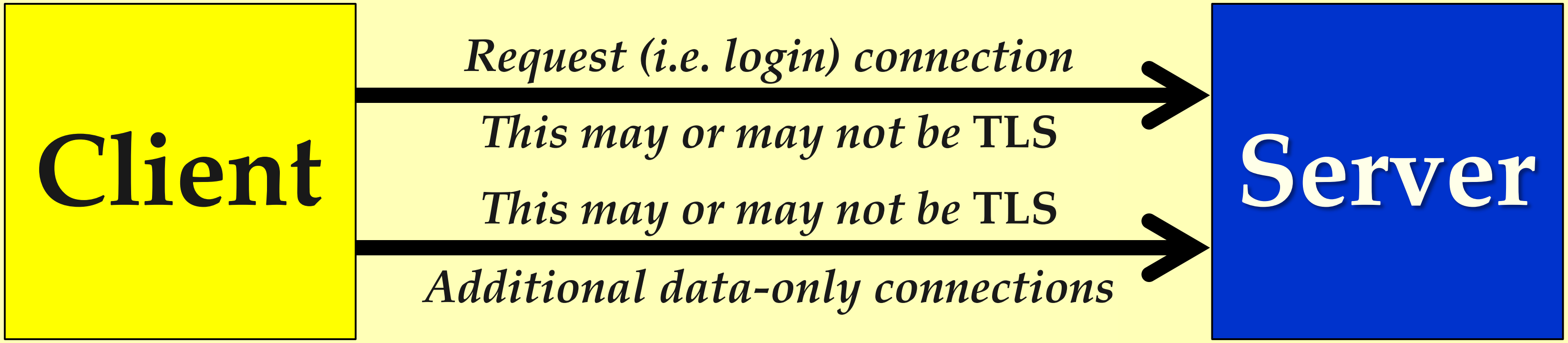
Server may request TLS

Server

If either side requests TLS
The connection is converted to TLS

- The heart of flexible TLS is negotiation
  - Ability to go from non-TLS to TLS at any time
  - Provides backward compatibly & migration
    - Plus, no special ports are needed (but you can have one)

Flexible TLS Is Super-flexible


Client
Request (i.e. login) connection
This may or may not be TLS
This may or may not be TLS
Additional data-only connections
Server

- Client’s connections may be mixed
  - Requests may use TLS but not data responses
    - Similar to what gridFTP does for data transfer
  - TLS only when and where it’s needed

What triggers TLS?

- Client URL that uses **roots** or **xroots**
  - xrdcp xroots://server//mydata /tmp
  - Implicit for authorization token usage
- Server configuration
  - TLS may be required for certain contexts
    - Third Party Copy
    - All TLS-capable clients
    - For all data

XRootD TLS Implementation

- Based on OpenSSL
  - All typically deployed versions are supported
    - Version 1.0.0 and above
      - Though should work with the old 0.9 series
    - Hostname verification added to cover all versions
- All TLS actions are logged
  - When a connection switches to TLS
  - What version of TLS the client is using

XRootD 5.0.0 has more than TLS

- Internal improvements & geeky features
  - Plug-in stacking
  - New general monitoring stream
  - Better containerization coexistence
  - **Xcache** improvements
  - See IN2P3 **XRootD** Workshop presentations
    - https://indico.cern.ch/event/727208
- And…

User settable file extended attrs

- Allows adding metadata to a file
  - Client can only play in the user namespace
    - System name space is fully hidden
- Done via binary API or xrdfs command
  - xrdcp extended to copy attributes as well (soon)
- Requires underlying file system support
  - Most file systems have it but not all
    - Some require special mount options

Beyond XRootD 5.0.0

Some of these will appear in 5.1.0!

- 5.0.0 lays the groundwork for…
  - End-to-end data verification
    - On-the-fly disk *and* network verification
  - Server-side appends to a zip archive
  - uid/gid tracking for files/directories
  - Apply/Map operation for data pipelining
  - RDMA support for better HPC integration
  - Multi-protocol third party copy

In The End

- 5.0.0 significantly extends usability
  - Important because **XRootD** is now embedded in many HEP data delivery system
    - EOS, DPM, CTA, dCache (Java version), QSERV, etc
  - New experiments are also relying on **XRootD**
    - E.g. Dune, LCLS II , LSST
- 5.0.0 addresses new and evolving needs
  - Not only for HEP but other fields as well
  - Via it’s **Xcache** component