

Flight Simulator for ATF2

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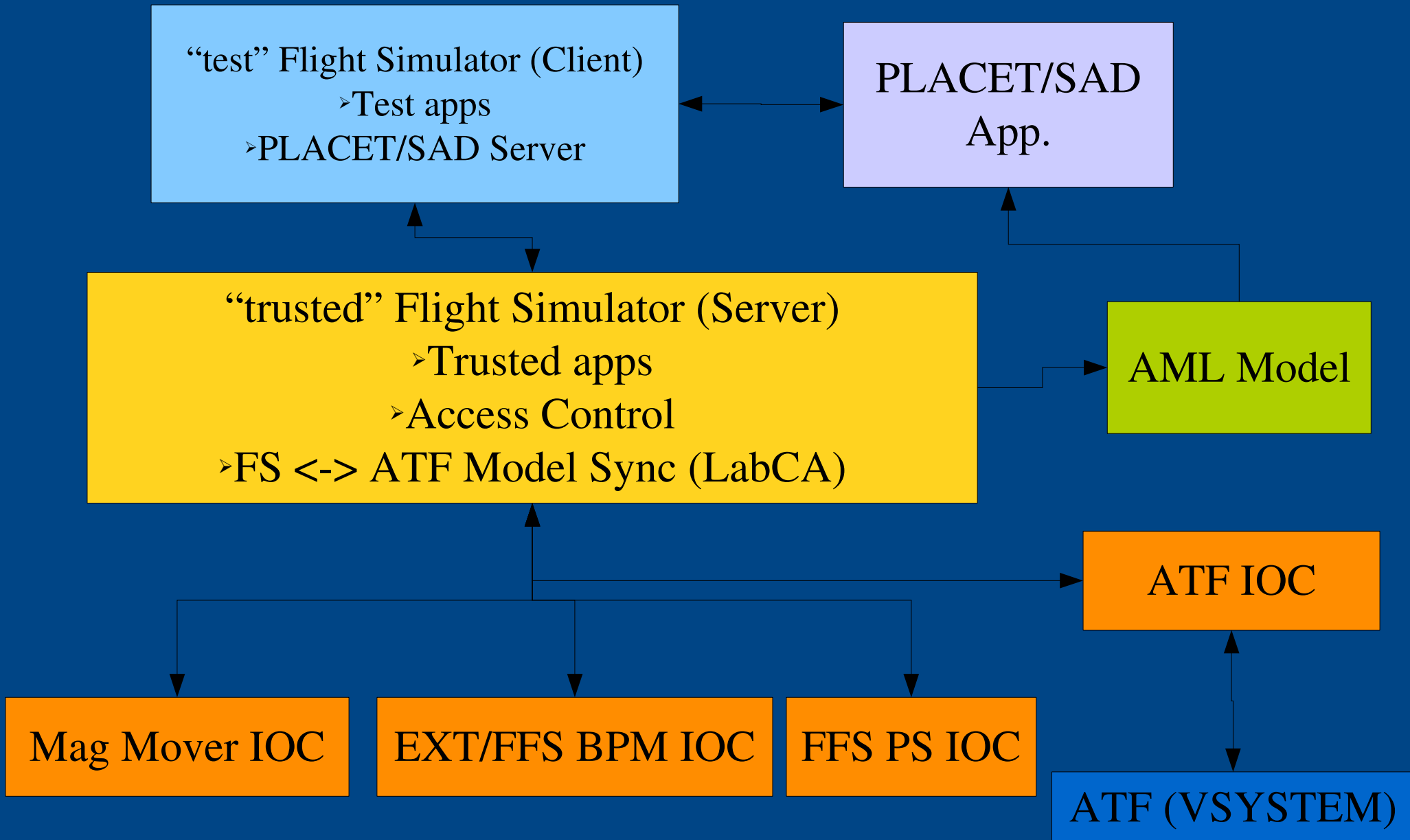
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- Motivation.
- Project goals.
- Software details.

FS Components

- EPICS IOC's for all HW interaction.
 - Have used EPICS for all externally supported HW
 - Provide support for local VSYSTEM-based HW through “soft” EPICS IOC's mirroring VSYSTEM functionality.
- Middle-layer software to support HW access within an accelerator tracking simulation package.
 - Extension to Lucretia (Matlab-based) toolkit.
 - LabCA Matlab-based EPICS CA client used for HW access (well used and tested- e.g. MML)
 - Server for non-Matlab apps
- Graphical high-level interfaces for end-user implementation at ATF2.

Implementation at ATF2



Software Overview

- Core Flight Simulator software written in Matlab, based on Lucretia accelerator toolbox.
- Floodland module provides flight simulator functionality:
 - Server-client communications.
 - Access control to client installations.
 - Server-based data services (bpm averaging etc).
 - Sync epics ioc db entries with Lucretia model.
 - Maintain updated AML and Lucretia models.
 - Provide PS setting, magnet move functionality through native Lucretia functions (PSTrim, MoverTrim).

Software Overview

- Lucretia2AML
 - Synchronises Lucretia model with AML
 - Entry-point for non-Lucretia tracking code support
- Client-side runs server for non-Lucretia based support through socket communications
 - Currently tested with PLACET (running with tcl/tk & octave)
- EPICS (hardware IOC's + simulation)
 - Movers, bpms, power supplies
 - ATF interface (Vsystem –ring mags + bpms, ATF controls)
- Documentation:
 - *<https://confluence.slac.stanford.edu/display/ATF/ATF2>*

Security

- The computer which hosts the trusted server on control system sub-net has read/write privs on all EPICS databases.
- Users test their code on client which must request access privs from trusted server.
 - When tested, code can be migrated easily from client to server which then sits on main control console.
- Security provided by ATF network infrastructure and by EPICS access control which only allows write access through trusted server.

Sim. Implementation

“test” Flight Simulator (Client)
‣Runs as in production mode

“trusted” Flight Simulator (Server)
‣Runs simulation of ATF2
‣Added panel to control error application etc

Sim Mode

ATF IOC

Mag Mover IOC

EXT/FFS BPM IOC

FFS PS

Simulated Functionality

- Make as similar to production system at ATF as possible.
- Runs all on single pc (or more if desired).
- Enables simulation of real machine, enabling realistic testing of accelerator-ready beam dynamics code without need of access to KEK systems.
- EPICS IOCs are also running in the simulated environment providing the ability to build and test custom hardware interface with a simulated version of the complete set of in-production IOC's, control software and tuning routines etc.

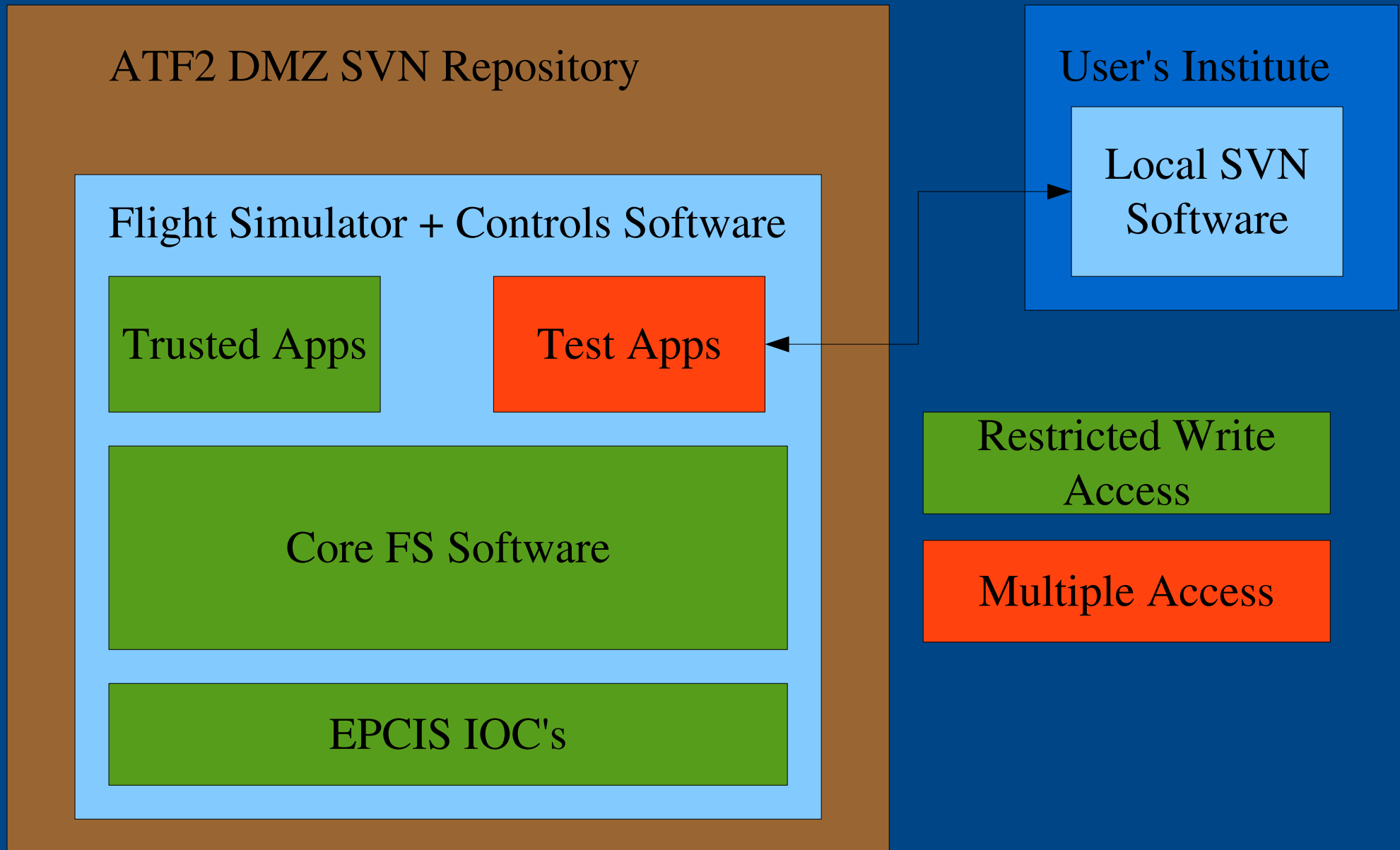
External Interface

- Client Flight Simulator installation runs a socket server to provide Lucretia and Floodland commands to external beam dynamics software
 - PLACET, SAD etc...
- Only requirement is that the external software package implements read/write access to a tcp socket.
- Can read in current live lattice at any time using AML file. (then update via this or through the FS client server).
- Example generic c++ implementation included in flight simulator software package
(*Lucretia/src/Floodland/testClient/test_connect.cpp*).
- Read/write interface done using AML-like commands.

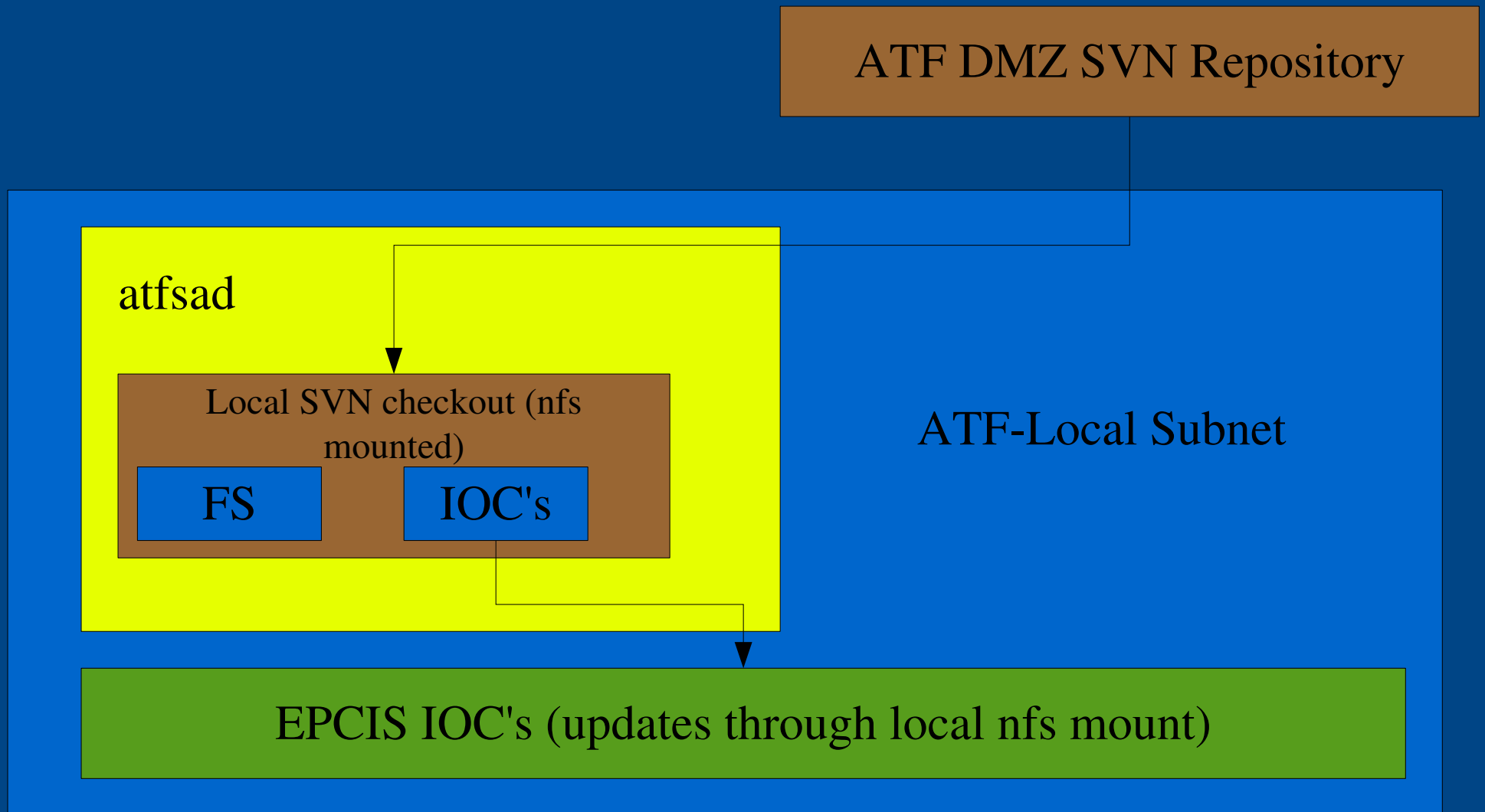
Non-Matlab Based Installation – now available

- For users who wish to use FS without Matlab license.
- Use “Matlab Compiler” toolbox to generate standalone executable, which when used with downloaded MCR runtime shared libs, is free of licensing restrictions.
- Can still develop apps in PLACET/SAD environment.
- Loose interactive shell for FS.

Remote SW Update Management



KEK SW Update Management



Summary

- Have updated FS software now from ATF test to include V.4 ATF2 optics, included ATF2 magnet B-I lookup tables etc.
- Non-Matlab version of FS now available,
- ATF2 apps being written- (e.g. S.Molloy beam tools...)
- Need to update Nanobpm socket server (vsystem interface)- if use same interface as used at ATF for non-EPICS controls (currently assumed).
- Need to set up Software management at KEK (repositories).
- Need to update FS software on atfsad and test.