

## A custom toolchain for WEST legacy LynxOS subsystems

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Despite continued efforts to engineer a standardized infrastructure, through regular hardware and software upgrades and refactoring, the WEST CODAC still includes several subsystems based on Motorola PowerPC VME boards running LynxOS V3.1. There lies a major challenge for the years to come in maintaining and operating more than 10 such entities some of which, such as the poloidal field control and monitoring system (DGENE) are critical for Tokamak operation and plasma control.

Regarding software developments and deployments to these targets, a 30-year-old VME native compiler running on LynxOS was used until very recently. The latter was never upgraded to avoid instabilities and system incompatibilities on critical equipment. To suppress the looming risk of hardware malfunction, a complete replacement toolchain was designed. The proposed cross-compiler is based on QEMU to provide a virtualized emulated PowerPC environment. It also uses Debian 7 « Wheezy » which is a 32-bit Linux distribution providing PowerPC support. The gcc 2.94 compiler, last version to support LynxOS V3.1, was customized within this virtual PowerPC environment in order to cross-compile functional binaries targeting Motorola PowerPC VME boards.

The custom toolchain was qualified during the WEST C4 experimental campaign following a request to modify the code of DGENE. Subsequently, the toolchain was included within the WEST framework allowing for automatic deployments using the WEST continuous integration workflow and automatic software quality control for all legacy VME subsystems, with a clear impact on reliability and maintainability of some of the oldest systems on WEST.

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