Any software needs recurring updates, and the control software for accelerator equipment at CERN does not differ. One year before the start of LS2, our team started the renovations of the software controlling the LHC 400 MHz RF system (ACS), which is based on FESA, and as a result we were able to validate the new software during one year of LHC operation.

SUMMARY

- Major update of the FESA (Front-End Software Architecture) framework (FESA 3.7x)
- Migration of PLC communication to SILECS (Software Infrastructure for Low-level Equipment Controllers)
- Important changes planned on the control interface of power converters
- Variety of the control software
- High-level control interfaces developed with standard tools by the CERN’s Controls group (Beams dep.)
- Expert interfaces implemented with LabVIEW

Software Upgrade

An ad-hoc laboratory installation composed of one module PLC, one line PLC and one services PLC was used to validate the system. The controllers were updated with the SILECS generated sources and three FESA classes were run on a test front-end to verify the functionality of the control software.

Following this phase, the new FESA classes for both modules and lines were deployed in LHC during the first months of 2018, before the restart of the machine after the winter break. The commissioning phase before the restart allowed to further fine-tune the sequencing and to restart the LHC with no delay. The Inspector applications were successfully integrated into CERN’s control system and they are currently the main interfaces used to condition, monitor and control the ACS system.

A considerable effort was invested in the migration of high level LabVIEW control applications to the Inspector rapid application development environment. The migration of the twenty-five expert control applications was completed in less than six months. The Inspector applications were successfully integrated into CERN’s control system and they are currently the main interfaces used to condition, monitor and control the ACS system.

CONCLUSIONS

The LHC 400 MHz RF control software was renovated to follow the evolution of the CERN front-end software frameworks. Three FESA classes were developed to substitute the existing six, using the latest control libraries. Communication with PLCs was achieved via the implementation of SILECS interfaces, and operator and expert applications were created using Inspector. The software was successfully deployed and fully integrated into CERN’s control system, allowing LHC nominal operation until the end of Run 2. The full software stack has been validated and stands ready to restart LHC in 2021.

The authors would like to thank Marc Magnan De Abril and the TE-EPC-CCS section for their support during the FGC class migration. Katarzyna Lung and Mathieu Therasse for their help and patience during the commissioning of the software and the BE-CO group for their assistance during the migration.