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The Worldwide LHC Computing Grid input to the ESPP24-26

The Worldwide LHC Computing Grid (WLCG) is the global infrastructure, developed and operated over the last two decades, that provides the computing infrastructure for the processing and analysis of data from the LHC experiments. The WLCG Collaboration comprises the sites being part of the infrastructure and the LHC experiments, with a thin management layer. The notable achievement of WLCG has been to successfully meet the needs of the LHC experiments by the integration of globally distributed Exascale-level resources, with services and software within a trust framework that transcends site and national boundaries. The success of WLCG has relied on innovation, leadership, collaboration, agility, and the confidence of the community and funding agencies to commit to the endeavour as an essential step towards the success of the physics initiatives. Today, WLCG has evolved from the initial Grid of uniform systems to a much more diverse infrastructure, able to support the experiments via owned centers, public and private clouds, and HPC systems. WLCG is still a rather unique facility in science, but as the needs of other communities grow beyond what can be provided by individual facilities, they too have started to tackle similar issues. The future brings new challenges in terms of scale, technology, funding, sustainability, and the integration and coexistence with related communities. This note is the WLCG input to the ESPP 2024-2026 process and elaborates on the WLCG 2024-2027 Strategy Document approved by the WLCG Overview Board in June 2024. While the ESPP process looks at a much larger timespan, in the context of computing the most significant challenge of the next two decades is the HL-LHC, starting in 2030. The next few years will be vital for the commissioning of the software and the computing infrastructure for HL-LHC, which is why we focus on this shorter time span.

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