

# German Contributions to the CMS Computing Infrastructure

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The CMS computing model anticipates various hierarchically linked tier centres to counter the challenges provided by the enormous amounts of data which will be collected by the CMS detector at the Large Hadron Collider, LHC, at CERN. During the past years, various computing exercises were performed to test the readiness of the computing infrastructure, the Grid middleware and the experiment's software for the startup of the LHC which took place in September 2008. In Germany, several tier sites are set up to allow for an efficient and reliable way to simulate possible physics processes as well as to reprocess, analyse and interpret the numerous stored collision events of the experiment. It will be shown that the German computing sites played an important role during the experiment's preparation phase and during data-taking of CMS and, therefore, scientific groups in Germany will be ready to compete for discoveries in this new era of particle physics. This presentation focuses on the German Tier1 centre GridKa, located at Forschungszentrum Karlsruhe, the German CMS Tier2 federation DESY/RWTH with installations at the University of Aachen and the research centre DESY. In addition, various local computing resources in Aachen, Hamburg and Karlsruhe are briefly introduced as well. It will be shown that an excellent cooperation between the different German institutions and physicists led to well established computing sites which cover all parts of the CMS computing model. Therefore, the following topics are discussed and the achieved goals and the gained knowledge are depicted: data management and distribution among the different tier sites, Grid-based Monte Carlo production at the Tier2 as well as Grid-based and locally submitted inhomogeneous user analyses at the Tier3s. Another important task is to ensure a proper and reliable operation 24 hours a day, especially during the time of data-taking. For this purpose, the meta-monitoring tool "Happyface", which was developed at the University of Karlsruhe, is used in order to allow even non-expert shift crews to monitor and operate a centre continuously and to contact on-call experts, if needed.

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