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Unraveling the Supernova - Gamma-Ray Burst Mystery

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Gamma-Ray Bursts are, simply put, the brightest explosions in the universe. Core-collapse Supernovae are the most energetic events in the modern universe. Observations show that both originate from massive stars, but the details of their central engines are essentially unknown. This remains one of the central challenges for astrophysics and cosmology today. Numerical calculations to address this challenge have been performed for decades, but have so far been unable to solve this problem. Comparison of current results indicates that large scale computing will be required to make further progress: Large scale (world-wide) collaborations to pool expertise from different fields of physics into a single, comprehensive code infrastructure, and large scale (at least petascale) calculations to allow accuracy and fidelity that are presently not yet reachable. I will first give brief overview over the (believed) necessary ingredients for a successful simulation of Gamma-Ray Bursts, and will then describe our approach towards addressing this challenge. I will outline the software infrastructure on which be base our research, and comment on the relation between the code infrastructure and the style of collaboration both within and outside of our group.