My project expired and my team left, so let's rewrite all the software from scratch

Dr. Tobias Weinzierl [1]

1 Durham University, UK

Software

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Category: talks
Published: November 3, 2020

Peano is a framework for large-scale simulations using dynamically adaptive Cartesian grids. It is used today for Earthquake and Black Hole simulations, for example. The fourth generation of the software is currently under development.

Peano's development as well as the push behind ExaHyPE, a solver engine built upon Peano, always has been shaped by the ambition to implement state-of-the-art numerics. In our field, this implies multiscale algorithms where others work with "flat" data structures, dynamically changing data structures where others rely on something static, writing multi-numerics/multi-physics codes where others focus on one thing, supporting hybrid architectures where others commit either to GPGPU- or CPU-only, and so forth.

In this talk I briefly categorise the software and present application areas. After that, I focus on the software's genesis. Peano has started off as a collection of codes for solving incompressible fluids, yet spread out into many application areas, it has been shaped (and misshaped) by dozens of core developers, and it has grown repeatedly into a state that made it hard to maintain and extend further. Therefore, each generation has become a complete rewrite—also as we tried to bring in new, fancy numerics every time.

I will explain which software design patterns we use today in our framework in an attempt to deliver software that is fast, maintainable and usable for all the different communities involved. With our complex agenda, it is basically impossible to find developers among PhDs, academics or RSEs that master all areas of relevance. So we need a strict separation of concerns (and flaws) which materialises in our code as the Hollywood Principle: Don't call us, we call you. In short, we take a lot of freedom away from developers how they can realise things. Instead, we force them to focus on what they want to do.