Abstract: From the extreme violence of a compact binary merger, bursts of escaping electromagnetic and/or neutrino radiation may be detected in coincidence with the gravitational wave burst. The binary neutron star merger GW170817/GRB 170817A dramatically exemplified this prospect, providing exciting new insights into the nature of extreme matter and the production of heavy elements. Looking ahead to telescopes and gravitational wave interferometers with far greater sensitivity to events like these, the future of multimessenger astrophysics appears bright. However, without corresponding improvements to theoretical models grounded in full, non-perturbative solutions of the general relativistic field equations (numerical relativity), insights gained from future compact binary merger observations may be curtailed. After a gentle introduction to multimessenger astrophysics and the challenges associated with multimessenger source modeling, I will outline a new approach aimed at greatly reducing the cost of compact binary simulations. With the reduced cost comes the potential to both perform binary black hole simulations on the consumer-grade desktop computer and add unprecedented levels of physical realism to binary neutron star supercomputer simulations.

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