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A quantum network of clocks PETER KOMAR, ERIC KESSLER, Harvard University, MICHAEL BISHOF, University of Colorado, Boulder, LIANG JIANG, Yale University, ANDERS SORENSEN, Niels Bohr Institute, JUN YE, University of Colorado, Boulder, MIKHAIL LUKIN, Harvard University — Shared timing information constitutes a key resource for positioning and navigation with a direct correspondence between timing accuracy and precision in applications such as the Global Positioning System (GPS). By combining precision metrology and quantum networks, we propose here a quantum, cooperative protocol for the operation of a network consisting of geographically remote optical atomic clocks. Using non-local entangled states, we demonstrate an optimal utilization of the global network resources, and show that such a network can be operated near the fundamental limit set by quantum theory yielding an ultra-precise clock signal. Furthermore, the internal structure of the network, combined with basic techniques from quantum communication, guarantees security both from internal and external threats. Realization of such a global quantum network of clocks may allow construction of a real-time single international time scale (world clock) with unprecedented stability and accuracy. See also: Komar et al. arXiv:1310.6045 (2013) and Kessler et al. arXiv:1310.6043 (2013)

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