

Foundations of the Internet of Things

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Eight core *primitives* belonging to most distributed computing systems, and in particular, systems with large amounts of data, scalability concerns, heterogeneity concerns, temporal concerns, actors of unknown pedigree and possible nefarious intent, is presented. Primitives allow formalisms, reasoning, simulations, and reliability and security risk-tradeoffs to be formulated and argued. These eight primitives are basic building blocks for a Network of ‘Things’ (NoT), including the Internet of Things (IoT), an emerging ‘new’ distributed computing paradigm. They are: sensor, snapshot (time), cluster, aggregator, weight, communication channel, eUtility, and decision

A composability model and vocabulary that defines principles common to most, if not all NoTs, is needed. For example, “what is the science, if any, underlying the IoT”? Primitives offer answers by allowing comparisons between one NoT architecture to another. They offer a unifying vocabulary that allows for composition and information exchange among differently purposed networks. And they prove useful towards more subtle concerns, including interoperability, composability, and late-binding of assets that come and go on-the-fly, all of which are large concerns for IoT.

Bio

Jeffrey Voas is a computer scientist. His current research interests include vetting mobile app software, how apps depend on clouds, software certification ethics, and Internet of Things (IOT). Voas has worked for small private companies, defense contractors, and government agencies. Dr. Voas has served as the IEEE Reliability Society President (2003-2005, 2009-2010), Vice-President of the IEEE Technology Management Council for Operations (2013-2014), and as IEEE Director (2011-2012). He co-authored two John Wiley books, *Software Assessment: Reliability, Safety, and Testability* (1995) and *Software Fault Injection: Inoculating Software Against Errors* (1998). He is currently an Associate Editor-In-Chief of IEEE’s IT Professional Magazine, and is on the editorial board of IEEE Computer Magazine as well as the Editorial Advisory Board of IEEE Spectrum Magazine. Voas also serves on IEEE’s Industry Advisory Board for the Future Directions Committee, and on IEEE’s Fellow Committee. Dr. Voas received his undergraduate degree in Computer Engineering from Tulane University (1985), and his M.S. and Ph.D. in Computer Science from the College of William and Mary (1986 and 1990, respectively). He is a Fellow of the IEEE and Fellow of the American Association for the Advancement of Science (AAAS).