ABSTRACT

In this talk we will demonstrate how a tight combination of visualization, analysis and domain expertise allows us to build tools that let engineers at Google manage and troubleshoot extremely large and complex systems. Typically, visualization, data analysis and complex systems are taught and practiced as separate disciplines. However, it is difficult to use any of these disciplines on their own to understand the runtime behavior of large systems, because of the sheer number of servers involved, the complexity of the interactions and the vast number of different events produced over time. Instead, we take a more integrated approach. As tool builders, we first embed ourselves with the experts of a particular domain to learn about the structure and behavior of their systems, their pain points and challenges. We investigate how we can extract the data that describes the behavior of these systems. In many cases we can tap into existing tracing and logging mechanisms. Sometimes we need to create new channels to report aspects of the system behavior. We then apply different analysis techniques to reduce the amount of data. In addition to simple aggregations, we extract patterns or find outliers, often using domain heuristics. This then drives the design of the interactive visualizations, which should reflect the mental model that the domain experts have of their systems. We will illustrate these concepts with a few examples: our storage clusters, traffic of data between servers and server load balancing for Bigtable and Spanner.

BIOGRAPHY

Dr. Wim De Pauw is a Staff Software Engineer and Tech Lead for the Visual Analytics team at Google in New York. His current responsibility is to invent and develop visual analytical tools for Google’s Storage infrastructure. These tools are currently used to manage, troubleshoot and optimize Google’s data centers and storage systems such as Colossus, Bigtable, Spanner and Cloud Storage. Before joining Google, he worked at the IBM T.J. Watson Research Center as a Research Staff Member where he led several software visualization projects covering Java, logs, streaming apps and service-oriented architectures. His scientific interests include disentangling large complex systems by using a combination of visualization, pattern extraction and statistical analysis. He has published articles in refereed journals, has chaired conferences, and holds several patents in software visualization, tracing and debugging. He received his PhD in Computer Science from the University of Ghent in Belgium.
ACM Activities and Prospects in the 21st Century (Keynote)

Alexander L. Wolf
Imperial College, London

ABSTRACT
ACM is the oldest and largest international membership society of computing professionals and students. It is acknowledged as the preeminent archivist and curator of scholarly technical content for computing’s practitioners, researchers, and educators. Its conferences and journals are consistently ranked among the top tier. ACM volunteers have leveraged ACM’s position to reach beyond publishing and conference sponsorship to further broader community and societal aims in areas such as diversity, inclusion, curriculum development, K12 education, public policy, and computing professionalism in developing regions. This talk reviews the on-going activities of ACM volunteers, but also looks at the deep and difficult question of whether the current model of professional societies is sustainable in the 21st century. What is the future value of a professional computing society in the age of computer-mediated social networks?

BIOGRAPHY
Alexander L. Wolf serves as President of the ACM. He is a Professor in the Department of Computing at Imperial College London. He also holds an appointment as Distinguished Professor in the Baskin School of Engineering at the University of California, Santa Cruz. Prior to this he spent more than a decade on the University of Colorado faculty, where he was the Charles Victor Schelke Chair in the College of Engineering and Applied Science and Professor of Computer Science. Previously, he was a Member of the Technical Staff at AT&T Bell Laboratories in Murray Hill, New Jersey. During a two-year leave from CU he helped found the Faculty of Informatics at the University of Lugano, Switzerland. Alex’s interests span the areas of distributed systems, networking, and software engineering. His achievements include seminal work in software architecture, business analytics, and information-centric networks. He is currently involved in projects having to do with cloud computing, edge computing, data-center networking, and connected autonomous vehicles. Alex is a Fellow of the ACM, IEEE, and BCS.