

Panel: Promising Research Areas

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SMART Event
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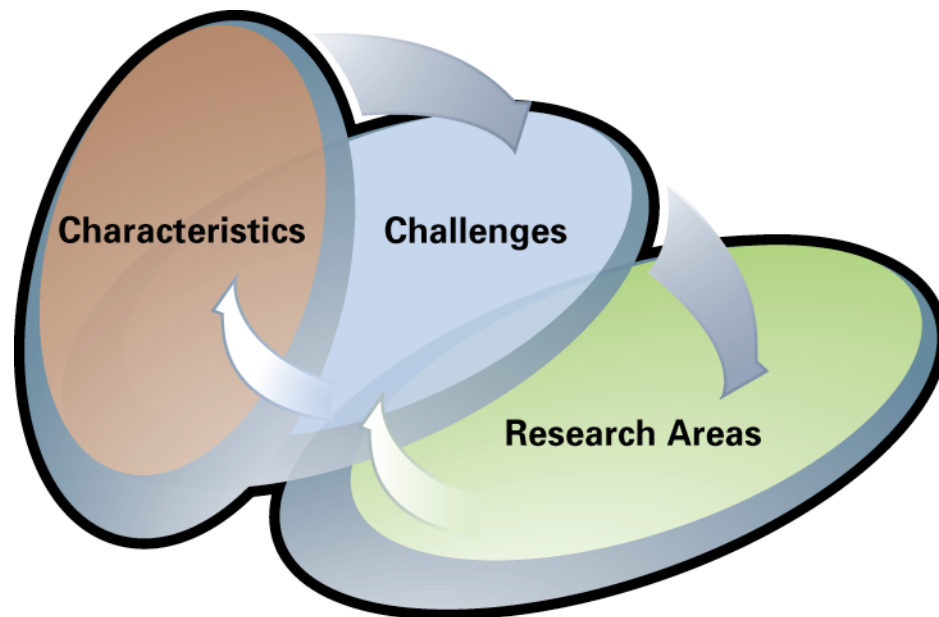


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ULS Systems Research Agenda

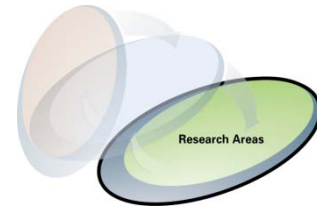


Describes

- the characteristics of ULS systems
- the associated challenges
- promising research areas and topics

Is based on a new perspective needed to address the problems associated with ultra-large-scale systems.

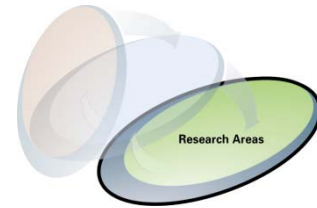




Research Areas - 1

- **6.1* Human Interaction:** involves anthropologists, sociologists, and social scientists conducting detailed socio-technical analyses of user interactions in the field, with the goal of understanding how to construct and evolve such socio-technical systems effectively.
- **6.2 Computational Emergence:** explores the use of methods and tools based on economics and *game theory* (e.g., *mechanism design*) to ensure globally optimal ULS system behavior by exploiting the strategic self interests of the system's constituencies; explores *metaheuristics* and *digital evolution* to augment the cognitive limits of human designers.
- **6.3 Design:** broadens the traditional technology-centric definition of design to include people and organizations; social, cognitive, and economic considerations; and design structures such as *design rules* and government policies.
- **6.4 Computational Engineering:** focuses on evolving the expressiveness of representations to accommodate the semantic diversity of many languages and focuses on providing automated support for computing the evolving behavior of components and their compositions.
- * Section in report where research area is described





Research Areas - 2

- **6.5 Adaptive System Infrastructure:** investigates integrated development environments and runtime platforms that will support the decentralized, “always-on,” nature of ULS systems as well as technologies, methods, and theories that will enable ULS systems to be developed in their deployment environments.
- **6.6 Adaptable and Predictable System Quality:** focuses on how to maintain quality in a ULS system in the face of continuous change, ongoing failures, and attacks and how to identify, predict, and control new indicators of *system health* (akin to the U.S. gross domestic product) that are needed because of the scale of ULS systems.
- **6.7 Policy, Acquisition, and Management:** focuses on transforming acquisition policies and processes to accommodate the rapid and continuous evolution of ULS systems by treating suppliers and supply chains as intrinsic and essential components of a ULS system.



Panel Objectives

- To provide more detail about the research areas proposed by the ULS System report.
- To describe progress where that has occurred
- To engage all attendees in a discussion about ongoing or needed research to meet ULS system challenges.



Panelists

John Goodenough, SEI

Doug Schmidt, Vanderbilt University

Kevin Sullivan, University of Virginia

Mark Klein, SEI

Dick Gabriel, IBM Research

Kurt Wallnau, SEI



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