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Research Directions in Multiagent Systems

Today's service-oriented systems realize many ideas from the research conducted a decade or so ago in multiagent systems. Because these two fields are so deeply connected, further advances in multiagent systems could feed into tomorrow's successful service-oriented computing approaches. This article describes a 15-year roadmap for service-oriented multiagent system research.

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We've already seen service-oriented computing (SOC) take hold in cross-enterprise business settings, such as the use of FedEx and UPS shipping services in e-commerce transactions; the aggregation of hotel, car rental, and airline services by Expedia and Orbitz; or book-rating services for libraries, consumers, and bookstores. Given the widespread interest in and deployment of Web services and service-oriented architectures that are currently under way in industry, the scope of SOC in business settings will expand substantially. However, the emphasis has been on the execution of individual services and not on the more important problems of how services are selected and how they can collaborate to provide higher levels of functionality. Fortunately, four major trends in computing are addressing the same problems:

- Online ontologies are enabling meaning and understanding, arguably the last frontier for computing, to be captured and shared in
- more refined ways – via the Semantic Web initiative, for example, with the development of languages and representations for marking up heterogeneous content. In an alternative approach, shared representations are emerging from the works of (millions of) independent content developers. These ontologies will form models for numerous real-world entities and systems, as well as the meanings for documents and content.
- Ubiquitous computing, consisting of widespread embedded processing with local awareness, is making huge strides in global deployment. It's expected that most of the world's objects with a distinct identity and exhibiting state or behavior will have a processor or RFID tag. The processors themselves consider only narrow domains of intelligence – a door, for example, could have a processor that knows whether it's currently locked and under what conditions it should be unlocked.
- Entities, from corporations to individ-