

# Executive Summary

## Architecture for Digital Ecosystems: Beyond Service-Oriented Architecture

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A business ecosystem refers to the dynamic interaction of organizations in a community; over time, these groups co-evolve their capabilities and roles and tend to align themselves with the directions set by one or more companies that drive the evolution of the environment. The accompanying *Executive Report* focuses on the digital ecosystem, by which we mean any IT system that supports and enables this paradigm; it might more informally be called an “e-business ecosystem.” The report describes the current state-of-the-art in the digital ecosystem world and investigates whether service-oriented architecture (SOA) adequately addresses the implementation challenges that are unique in the context of a digital ecosystem. The report proposes an alternative architectural style to SOA, called an ecosystem-oriented architecture (EOA), and details the differences between the two architectures as well as the specific features of the EOA.

The report explores the fact that an ecosystem-oriented architecture is not a “sort of SOA,” nor is it just a “bigger SOA.” Instead, EOA addresses a whole set of new problems, namely supporting dynamic networking, evolution, lack of a central administration, sharing of knowledge, self-organization, and self-healing as in real-world ecosystems.

The report begins by addressing a misconception about Business-to-Business (B2B) solutions, emphasizing the difference

between uppercase B2B and lowercase b2B. B2B solutions as conceived today are not a type of digital ecosystem, essentially because the parties involved are divided into two roles: a consumer and a producer. B2B solutions are still limited, essentially because SOA, the enabling architecture used to implement the solutions, was conceived to support a single value chain in a single business domain and usually between a structured and fixed hierarchy of participants. These “B2B” implementations are often those of a single-organization supply chain. The meaning of B2B when applied with these assumptions is underestimated, or perhaps we should say that the term is not correctly used. Therefore, instead we shall name the current implemented scenarios “business-to-Business” (b2B) to emphasize the fact that the relationship between parties is not that of peers; in these cases, there is a single “master” in the supply chain, which is often the company that owns the chain. This company (usually a large organization) can impose its standard on its suppliers and customers, and the “small” players have to accept the specifications. It’s not a peer-based model, as the name B2B implicitly suggests. The two ways to interconnect organizations are very different, each with different capabilities. In the b2B case, only two fixed roles are involved: this is key. The B2B relationship is inherently competitive and democratic, while the b2B one is governed as a dictatorship.

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The aim of the report is to illustrate how the specific features and issues involved in a digital ecosystem cannot properly be addressed by SOA. Therefore, there is a need for a new perspective in the software architecture — a different style that specifically tackles digital ecosystem requirements from both a structural and functional viewpoint. Applying SOA when dealing with digital ecosystem implementations overlooks the problem. We need to understand at which point a problem, that's becoming more and more complex over time, becomes a whole new sort of problem; at this point, the approach and tools used to solve it need to be completely replaced. The report proposes the EOA as the architectural style to be used to implement a digital ecosystem and examines the components that make up an EOA.

## EOA COMPONENTS

The report details a number of EOA components; here we touch on just a few of these. For example, in a digital ecosystem it is essential to have a repository of models separated from the registry of services. The model repository needs a set of discovery features and supports XMI in order to implement model-driven capabilities like dependency, versioning, merge, and inheritance. Static taxonomy of models has to be replaced by a folksonomy approached (user-generated taxonomy using tagging).

Services need to be described from the business point of view as well; the computational specification is not sufficient in a digital ecosystem because services are not known in advance and the discovery process needs to be smarter and based on business specifications.

The service registry needs to overcome the static limitation of UDDI and dynamically bind to actual published services. In the near future, many mobile services are expected, and these devices are going to make use of DHCP. I believe that IP will not scale, and SOA does not support those principles. A lease-based binding

mechanism shall link the service end point with the actual entry in the service registry so that the two viewpoints of a service can coexist.

EOA has to consider a set of basic business services to support the ecosystem and ease the fast interaction between business services. A digital ecosystem without a proper set of basic services will hardly self-sustain: the goal is to improve the level of adoption by easing the participants' effort in publishing and integrating services.

It is fundamental, for example, to go through a negotiation process before actually consuming the service, which is not required in an SOA implementation. A service invocation in a digital ecosystem is about consuming a business service, rather than implementing it. For the same reasons, it is fundamental that services such as reputation and trust are provided.

The following services are needed to facilitate the bootstrap phase in a digital ecosystem:

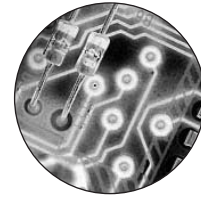
- Payment
- Business contract and negotiations
- Information carriers
- Billing
- Certification and trust
- Reputation
- Trust agencies
- Legal framework and compatibility

While SOA essentially supports only the service execution phase, a digital ecosystem has to support the entire business service lifecycle including service modeling, service selection (as opposed to plain service search), negotiation, agreement, contract specification, consumption, delivery, and settlement.

## CONCLUSION

Only when we have been freed from the inductances created

artificially by the supporting computational b2B platforms, via a proper EOA, can we expect some improvement in the networked organizations. Once the information, the services, and the knowledge are easily accessible and consumable in the digital ecosystem, then we can expect to have improvement in the way we conduct business with electronic mediums.



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