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Enterprise Service Oriented Architecture

Cloud-based Integration and SOA Architecture

The benefits of a peer-to-peer approach

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CLOUD-BASED INTEGRATION AND SOA ARCHITECTURE

The benefits of a Peer-to-Peer approach

Executive Summary

Today's enterprise environment is rapidly changing. The disparate mix of operating systems, applications and databases for businesses and organizations is part of a rapidly evolving technological dynamic – made even more complicated by the emergence of cloud computing. As Enterprise Software applications grow in complexity, the need for organizations to leverage cloud computing as part of their integration strategies is growing exponentially. Putting a cloud integration and Enterprise Service Bus (ESB) strategy in play prepares enterprises for the next generation of flexible, distributed and scalable cloud-enabled business applications while facilitating greater operational efficiency, generating more revenue, and helping businesses enter new markets.

The key to success in the networked economy is the ability to create and deploy distributed cloud-based ESB and SOA processes to integrate value chains in concert with changing requirements. Faster change management will help enterprises integrate their processes over the cloud so they can achieve greater efficiency, generate more revenue, and enter new markets.

This paper addresses the software infrastructure requirements for SOA-enabled systems to leverage Cloud Computing for the deployment of the next generation of flexible, distributed and scalable cloud-enabled business applications.

Cloud-Ready SOA Applications

In its most general form, an SOA application is composed of multiple services that communicate with each other via messages over a distributed ESB infrastructure platform. Cloud-enabled SOA applications have a number of characteristics that impose particular requirements on the underlying ESB infrastructure over which SOA applications are deployed.

For instance, each Service in a cloud-enabled SOA application may be written in a different programming language or script and may run on a different platform, either on-premise or across the private/public cloud. Services need to have the ability to communicate across the cloud either synchronously (request/response) or asynchronously (via data-flow or events). Since the Services in a general SOA application may be distributed across multiple enterprises and private/public clouds, distributed Security and Governance are core requirements for the underlying ESB.

The next section of this paper discusses various architectures for cloud-based integration in use today, together with the pros and cons of each architecture. This is followed by a discussion of the architecture requirements for a general purpose, cloud-enabled ESB platform which enables the seamless integration of on-premise, public and private cloud applications.

Cloud-Based Integration: On-Premise to Cloud Integration

A popular pattern for integration today is one where ESB/integration middleware hosted within an enterprise integrates on-premise applications with cloud-based applications such as Salesforce.com, Netsuite and others. This model is illustrated in Figure 1 below.

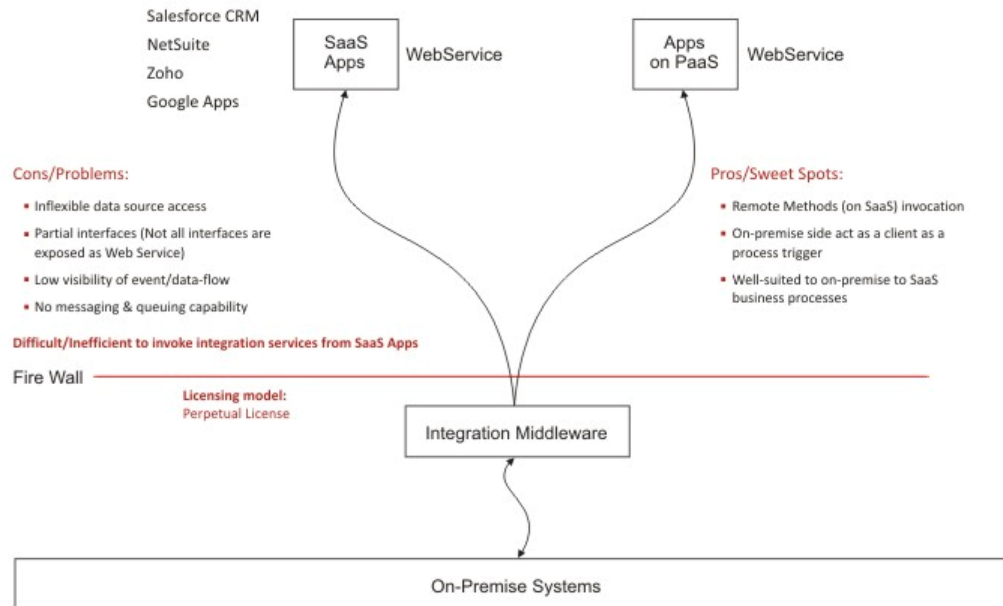


Figure 1: Integrating on-premise and Cloud-based applications

This model has the benefits of easy invocation of remote SaaS APIs using web-services. The on-premise client acts as a process-trigger. This architecture is particularly suited to the integration of on-premise applications with SaaS applications hosted in a public or private cloud. The licensing model is typically perpetual, based on server CPU/Core utilization.

On the downside, this architecture does not work efficiently for inter or intra cloud integration because the core integration infrastructure is hosted within the enterprise. Inflexible data-source access, the low visibility of event/data flow and the inherent lack of messaging and queuing capability make this model inefficient to invoke integration services from SaaS applications.

Cloud-Based Integration: Integration as a Service (“IaaS”)

A second pattern that has seen some usage is the concept of “Integration as a Service”, illustrated in Figure 2 below. In this model, the integration infrastructure itself is hosted within the cloud. Applications that expose web-services interfaces can be easily integrated using this approach, which also provides the benefits of easy SaaS to SaaS integration. In this model, the licensing is typically via an annual subscription, with charges based on the number of integration paths and/or on transaction volume.

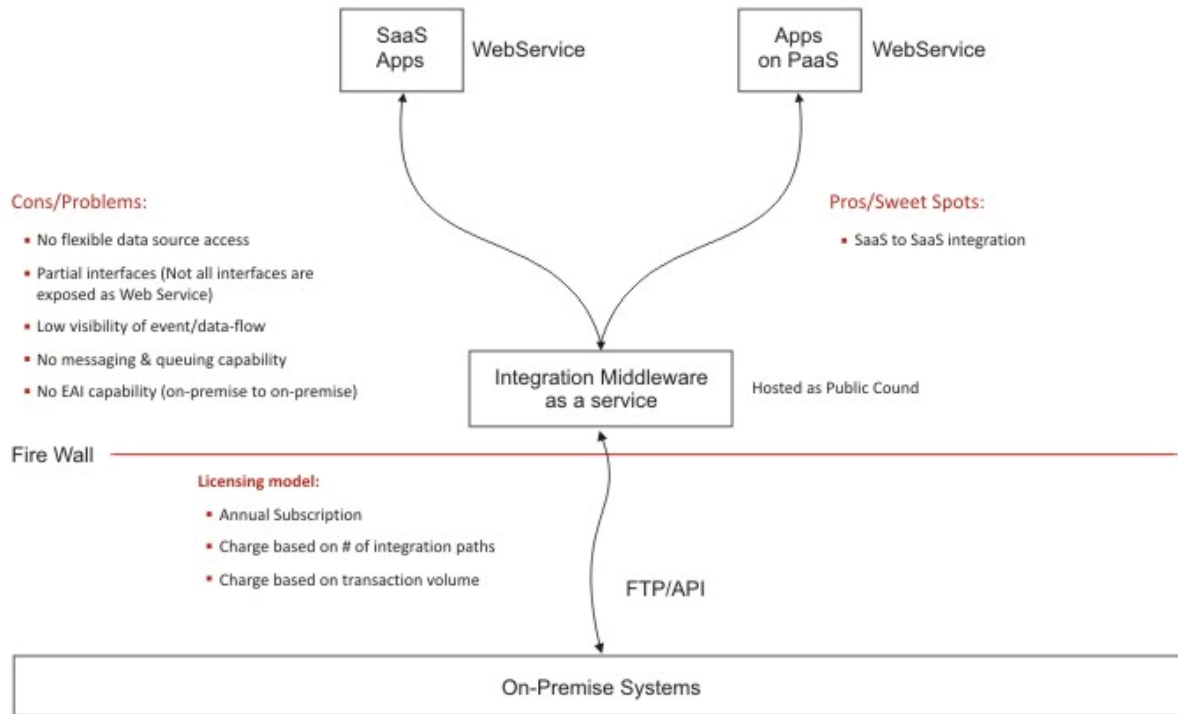


Figure 2: Integration as a Service

Hosting of the infrastructure within the cloud does impose some limitations, however. Access to data-sources is typically limited to web-services, often resulting in efficiency issues; not all interfaces to applications are exposed as web-services, so critical application functionality may not be available for integration; the messaging and queuing capability of this topology is inherently limited in most implementations because of the inherent request/reply nature of web-services protocols; finally, this model is inefficient for the integration of on-premise to on-premise applications.

Cloud-Based Integration: Hybrid, Integration Platform

The inherent limitations and problems of the traditional (on-premise) integration and the SaaS Integration (Integration as a service) approaches can be overcome via a hybrid of the two, based on a Peer-to-Peer ESB platform. Figure 3 illustrates the system architecture of the Hybrid platform.

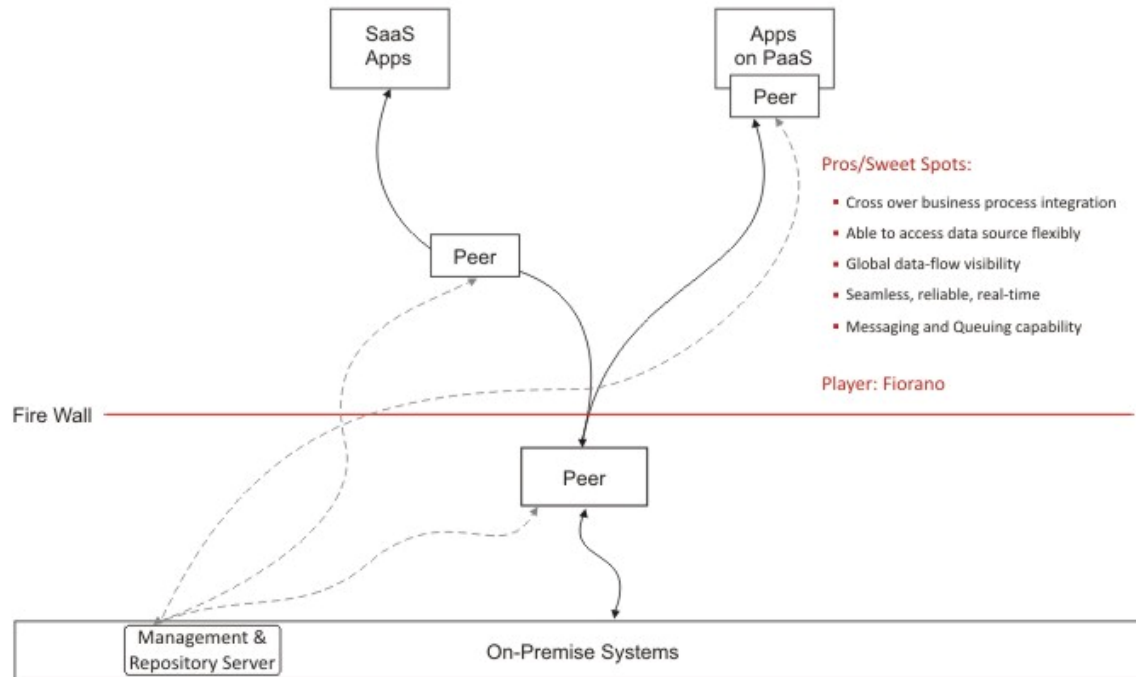


Figure 3: Hybrid, Peer-to-Peer Integration Platform

The Peer-to-Peer approach of the hybrid model provides the benefits of centralized control while maintaining the inherent efficiency of peer-to-peer architectures. Data-sources can now be accessed flexibly, via web-services or via messaging and other APIs; separate peer-servers for SaaS and PaaS clouds ensure that applications within a given cloud are efficiently integrated since there is no longer any need for integration data to leave the cloud. The in-built messaging and queuing capability of the platform ensures that there is global data-flow and event-flow visibility across the entire network – including all SaaS applications and applications hosted in PaaS frameworks such as Amazon EC2, Windows Azure, Google Application Engine and Force.com. Efficient peer-to-peer communications ensure seamless, real-time and flexible integration with no bottlenecks. The platform blends cloud-based integration with general business-process integration since cloud-based applications can now be integrated easily with on-premise applications.

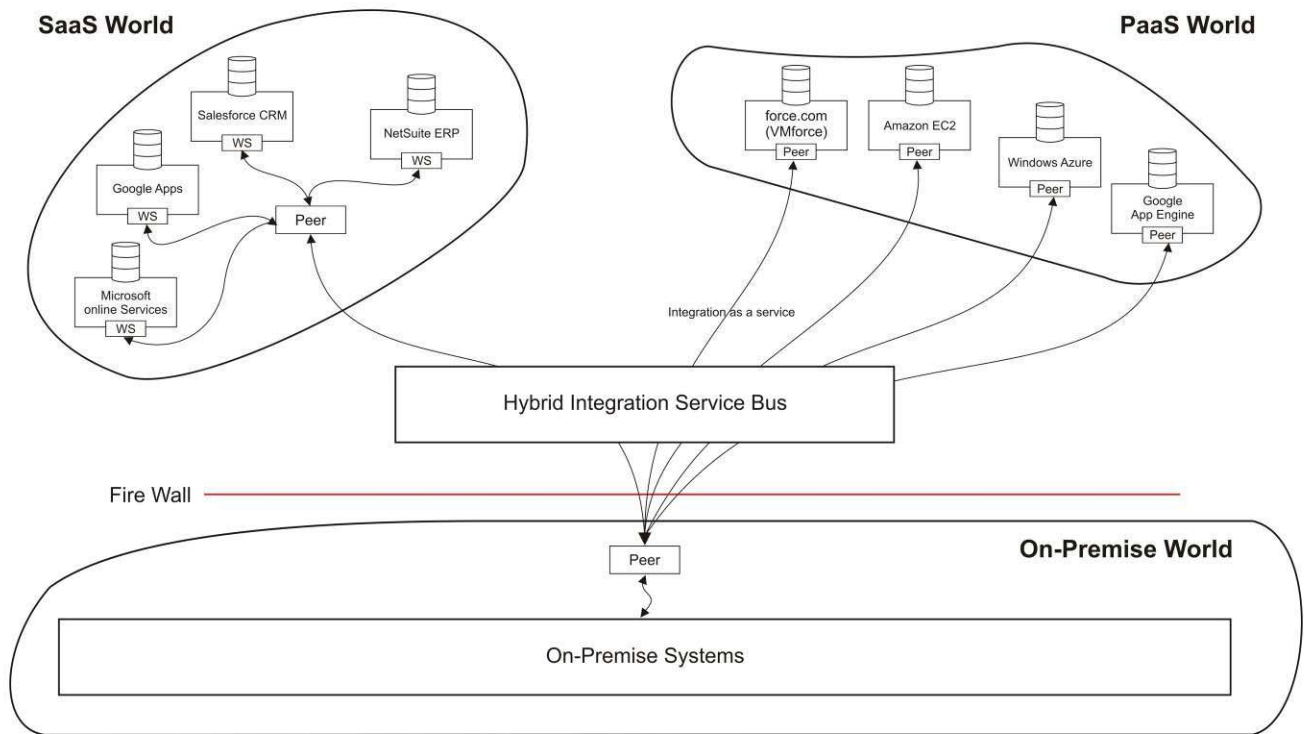


Figure 4: Involving Cloud Users via Peer-to-Peer Hybrid Integration

Figure 4 illustrates how the Hybrid, Peer-to-Peer Integration Service Bus involves cloud and enterprise users together. Note that the management of the distributed bus is centralized; control information flows to a central server, typically hosted within the enterprise (or in a data center controlled by the enterprise for security purposes), while data flows directly between peers. The platform thus incorporates all of the administrative benefits of a central-broker architecture while avoiding the inefficiencies of the hub becoming a data-bottleneck.

Benefits of Hybrid, Peer-to-Peer Cloud-based ESB Architecture

A cloud-based Enterprise Service Bus is a general-purpose infrastructure platform that lets developers and business analysts create, deploy, manage, and change processes across the private/public cloud, with the following benefits:

- Distributed, event-enabled architecture
- Flexibility via service-enabled processes
- Enterprise standards support
- Fault tolerance, reliability, and scalability
- Security in distributed environment
- Develop once, Deploy Anywhere Application Architecture
- On-the-fly process changes

With these benefits, a cloud-based ESB lets enterprises quickly respond to changes and integrate operations efficiently across the cloud, regardless of platform, language, database, or application.

Summary

The move toward cloud computing affects all software application deployment in the future. SOA provides a layer of abstraction over all existing architectures, allowing distributed solutions to be built by composing asynchronous services into composite applications over a network. Deploying an SOA across the cloud requires software that provides service-oriented management, integration, security, tools, and processes. While these segments are currently served by individual packages and solutions, they'll evolve into a single, cloud-enabled platform.

A cloud-enabled Peer-to-Peer ESB includes all the distributed computing functionality an organization needs to develop, deploy, manage, and extend distributed cloud-enabled applications; such platforms will come to dominate enterprise computing over the next few years.

About Fiorano Software

Founded in 1995, Silicon Valley based Fiorano is a California Corporation with proven leadership in enterprise middleware and peer-to-peer distributed systems. Fiorano's innovative [event-driven](#) SOA platform integrates applications and complex technologies into an enterprise nervous system, increases business process performance, yields higher message throughput and enhances availability through agent-based [visual composition](#) that bridges the capability gap between business models and their implementation – the model is the application, ready to run.

Global leaders including ABN AMRO, Boeing, British Telecom, Chicago Mercantile Exchange Group, McKesson, NASA, POSCO Steel, Qwest Communications, Rabobank, Schlumberger, Lockheed Martin, United States Coast Guard and Vodafone have deployed Fiorano to drive innovation through open, [standards-based](#), event-driven SOA applications built in just days, yielding unprecedented productivity.

[Fiorano Enterprise Service Bus](#) (ESB) and [Fiorano Message Queue](#) (MQ) deliver the industry fastest, lowest latency, highest throughput [real-time messaging](#) (asynchronous and synchronous) to power [high performance](#), highly available, and collaborative workflow applications whose application services are distributed throughout the IT landscape. Fiorano's distributed, peer-to-peer agents abstract complexity of developing and deploying services to unlock value in a customer's enterprise architecture framework.