Chapter 13
Extending Service–Driven Architectural Approaches to the Cloud

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ABSTRACT

Today, most enterprises own their IT infrastructures. In the future, it may well be more cost effective to use infrastructure and software provided by entities that are specialized in provisioning infrastructure and services on a need and usage basis. This is the Cloud Computing model. The Cloud enables ubiquitous, elastic, and on-demand network access, which can be rapidly self-provisioned. Information Technology is beginning to migrate to the Cloud, where dynamically scalable, virtualized resources, are provided as a service over the network. Currently, IT leaders focus on managing on-premises, centralized, and service-driven methodology, to deliver services and integration solutions for their businesses. In the future, they will be expected to deliver and manage a network of flexible services that are federated across on-premises and outsourced infrastructures. This chapter explores the capabilities and service models offered by the Cloud and the challenges of extending the Service-driven architectural approaches to that paradigm. It presents design principles and implementation guidelines to architect application services in the Cloud ecosystem. Finally, the chapter takes a look ahead at the future of Cloud Computing.

INTRODUCTION

Enterprises are constantly interested in improving business agility, growth, and profitability, while at the same time, reducing expenses, and implementing better management of risk and compliance. By adopting a service-driven approach to architecture, IT leaders are positioning their enterprise information technology to closely align with the dynamic needs of their businesses, thereby serving their business in an efficient and cost effective manner. Currently, those IT leaders focus on managing on-premises, centralized, and service-driven methodology, to deliver services and integration solutions. In the future, they will be expected to deliver and manage a network of
flexible services that are federated across on-premises and outsourced infrastructures.

Today, most enterprises own their IT infrastructures. But in the future, that certainly does not have to be the case. It may well be more cost effective to use infrastructure and software provided by entities that are specialized in provisioning infrastructure and services on a need and usage basis. By leveraging economies of scale, such providers will be able to supply the required processing power, software applications, and platforms at a lower cost, than could be achieved by enterprises internally. This is especially the case when business needs change constantly, resulting in drastic fluctuations in the required processing power, storage, and complexity of software to address the changing needs of the business. This model of renting and paying for computing power and software on an as-needed basis from a third party is called Utility Computing.

The idea of Cloud Computing is not new; it dates back to the 1950’s in the form of Utility Computing. The concept of Utility Computing was pioneered by Professor John McCarthy, a well-known computer scientist who initiated time-sharing in late 1957 on modified IBM 704 and IBM 7090 computers (McCarthy, 1983). McCarthy expected that corporations would be able to sell computing resources through the Utility Computing model. As expected, different organizations paid service bureaus such as IBM and other mainframe providers who offered computing power and database storage to large organizations from their world wide data centers. To facilitate this business model, mainframe operating systems evolved to include process control facilities, security, and user metering.

Since then, several other implementations have tried to leverage that Utility model including:

- **Utility Data Center**: HP introduced the Utility Data Center in 2001 by incorporating multiple software utilities to form a software stack. Services such as “IP billing-on-tap” were marketed.
- **Grid Computing**: The Grid concept involved combining computers from multiple administrative domains to form a distributed computing environment (Foster & Kesselman, 1998). This environment was composed of many networked and loosely coupled computers acting together to perform very large tasks. The Grid technology has been applied to solve computationally intensive scientific, mathematical, and academic problems based on a pay-per-use model.
- **Volunteer Computing**: Many research experiments that depend on compute intensive tasks, met their needs by exploiting idle computing resources available through volunteers (Sarmenta, 2001). This model provided researchers with access to supercomputer-like performance in a cost-effective manner. This is based on the grid computing model.
- **Web Hosting**: This service allows individuals and organizations to host their websites on Web servers provisioned by datacenters of other companies for a fee.
- **Application Service Provider (ASP)**: A model where software companies offer applications for remote access by clients through networks for monthly fees (Smith & Kumar, 2004). The ASP model exempts clients from the capital and operational expenditure of procuring, installing, and maintaining commercial off-the-shelf (COTS) software and the underlying hardware infrastructures.
- **Online File Sharing**: A model where websites enable Internet users to share their files online. For example, Flickr users
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