eUtopia: A Framework for Managing Web Utility Services

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Extended Abstract

Introduction
Today, the web services model defines roles (service provider, service broker, and service requestor) and their interactions (publish, discovery, and usage). The various interfaces are specified in a simple way that is based on ubiquitous protocols, language-independence, and standardized messaging. Such technical advantages, as well as a growing industrial support, have given rise to a proliferation of web services. However, most web services that are provided today are free and unmanaged. Nevertheless, it is envisioned that web services will play a key role in (dynamic) e-business. In this new business environment, services are expected to be dependable, secure, reliable, guaranteed, and profitable. We refer to a web service that satisfies such requirements as a web utility service (or utility, for short). Thus, the current web services model needs to be augmented with management functions such as usage metering, accounting, controlled access, dynamic resource allocation as well as service security, reliability and availability. The resulting utility model is realized in a web utility services platform (or utility platform, for short). This platform provides the necessary management functions to offer web services as utilities—that is, as web services that can be subscribed to for usage according to predefined service level agreements (SLA), that can be delivered reliably and on demand, and can be billed on the basis of the usage. Such a platform will manage the various phases in the life cycle of a utility such as development, provisioning, and invocation.

In this paper, we present eUtopia, a web utility services platform, where we focus on management aspects. Our platform uses and extends the existing web services technologies (SOAP, WSDL and UDDI) to transparently provide subscription, metering, authentication and SLA management functions. We define as web utility service a web service that runs on our platform and that can be subscribed to and can be transparently metered, monitored, and managed.
**eUtopia Architecture**

Conceptually, a web utility service platform provides, in addition to the web services system, management functions as illustrated in Figure 1. A new role, the utility subscriber is introduced. Further, a host of management functions are implemented and provided transparently while the requester is using the utility. The utility interface is an augmented web service interface and is depicted as a layer around the web service interface. We call the implementation of such a layer the utility manager.

![Figure 1. A utility platform.](image)

eUtopia is a utility platform that provides tools and middleware for creating, provisioning, subscribing and operating utilities. The platform also provides automated mechanisms for subscribing and sharing a set of resources and services in a controlled manner through monitoring and metering; SLA-driven resource management; accounting and subscription management; event notification and interaction management; and registration and discovery. Using these mechanisms, eUtopia provides a framework for sharing infrastructure and maintenance costs among a multitude of users of a complex environment.

eUtopia implements a resource management system that is based on the SLAs negotiated between the utility provider and the subscribers. The architecture specifies monitors at various levels (utility instance, utility manager, utility requests, and utility sessions) as well as corresponding controllers. Furthermore, eUtopia provides a mechanism for controlled sharing of utilities, among multiple users, that is subscription-based, user-secure, and scalable. These and other services provided by the eUtopia platform are also shared among all utilities. In other words, common services are provided by the platform for simplicity, performance, scalability, and flexibility reasons.

An overview of the eUtopia system architecture is provided in Figure 2. We separate the administrative functions from the operations management functions. Both types of functions manipulate and share a common information base. Utility managers, implementing the utility interface, run in an environment called utility node. During their operation, utilities are managed through a network which provides control functions.
The system consists of five major components. Utility Nodes provide the environment where utilities are run and managed. A utility manager provides the utility interface. The Utility Administrative Services provide administration and operational services for the provisioning of utilities. Examples of such services are: security, subscription, accounting and billing, SLA management, and cataloging. The Utility Operations Management component provides management services during the operation of utilities. Examples of such services are: provisioning, monitoring and metering, and load management. The Utility Control Network is a networking facility for the interconnection of users and utilities that provides services such as access, load balancing, and scaling. The Utility Base is the information base containing data about utilities, subscribers, service contracts, accounts, and usage. Each utility provides a descriptor in this registry. Utility descriptor information is available to subscribers and various platform services.

The utility manager interfaces with the platform-provided services (transparently to the users and the service providers) and manages client requests so that SLAs are satisfied in an optimal manner while the available resource capacity is managed to minimize costs. The utility manager interacts with the rest of the platform through the utility control network. Also, the utility manager interacts with Agents that manage utility instances.

The utility control network is a messaging network that handles traffic between the client and entities such as platform operations management services and utility managers, as well as traffic among utility managers and other platform services. It is envisaged that the requirements on this messaging system depend the nature of interaction between senders and receivers. In general, the network provides loose coupling, asynchronous message delivery, and reliable messaging. Further, the network is able to handle point-to-point as well as publish-subscribe domains.
Conclusion
We extended the current web services model to transparently provide subscription, metering, authentication and SLA management functions. We presented eUtopia, a utility platform with focus on the management aspects. eUtopia provides standardized means for accessing and delivering utilities, so businesses can be built using the web utility service model. Further, we described a prototype that implements the eUtopia architecture. We have built a prototype implementation of the eUtopia architecture. In our presentation we will cover the details of the platform, the prototype as well as the resource and request management functions.

References to Related Work
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