NIST Service Model Clarification Subgroup

FINAL Recommendations for the Reference Architecture and Taxonomy working groups

Subgroup Goals

1) Suggest clarifying detail about the NIST service models
2) Assess the relationship of XaaS to the NIST service models
3) Provide examples for each of the NIST service models

Subgroup Participants

Cary Landis (Lead), Michele Drgon, Frederic de Vaulx, Ken Stavinoha, Alan Sill, Dr. Prabha Kumar, Babak Jahromi, Leslie Anderson, Steven Woodward, Hung Nguyen, Jan Levine, Liu, Fang, Jian Mao, Jin Tong

September 2, 2011
Summary of Recommendations

The NIST Service Model Clarification Subgroup was formed to perform a deeper analysis of the NIST Service Models, namely SaaS, PaaS and IaaS. The goals of the subgroup were to:
1) Suggest clarifying detail about the NIST service models
2) Assess the relationship of XaaS to the NIST service models
3) Provide examples for each of the NIST service models

The subgroup met regularly on Friday afternoons from May 23, 2011 through September 2, 2011 to discuss the NIST Service models in and formulate recommendations for the NIST Reference Architecture and Taxonomy Working Groups for Cloud Computing.

Final recommendations are as follows:

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Rationale</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Include definitions in the Taxonomy for Cloud Service, Service Model and Specialized Service (XaaS).</td>
<td>Specialized services are emerging, raising questions about relevance to NIST's Reference Architecture.</td>
<td>See slide #5</td>
</tr>
<tr>
<td>2. Include examples of the service models in the Reference Architecture Strawman.</td>
<td>Clarifying detail.</td>
<td>See slide #6</td>
</tr>
<tr>
<td>3. Include in the RA Strawman a clarification of the relationship between service model implementations (stack vs. ground up), as is depicted by the “inverted Ls”.</td>
<td>Clarifying detail.</td>
<td>See slide #7</td>
</tr>
</tbody>
</table>

Additional considerations

<table>
<thead>
<tr>
<th>Additional considerations</th>
<th>Rationale</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.  It was suggested that NIST should consider including a clarification of Enterprise vs. Consumer cloud services.</td>
<td>The terms are being used in DoD, and deemed relevant.</td>
<td>See slide #9</td>
</tr>
<tr>
<td>ii. It was suggested that NIST should consider adding a legend for interpreting the positioning of boxes in the Reference Architecture.</td>
<td>The subgroup feels that interpretation should be more explicit instead of implicit.</td>
<td>See slide #10</td>
</tr>
</tbody>
</table>
The Combined Conceptual Reference Diagram

Cloud Consumer
- Service Layer
  - SaaS
- PaaS
- IaaS
- Resource Abstraction and Control Layer
- Physical Resource Layer
  - Hardware
  - Facility
- Cloud Service Management
  - Business Support
  - Provisioning/Configuration
  - Portability/Interoperability

Cloud Auditor
- Security Audit
- Privacy Impact Audit
- Performance Audit

Cloud Provider

Cloud Broker
- Service Intermediation
- Service Aggregation
- Service Arbitrage

Cloud Carrier

Information Technology Laboratory Cloud Computing Program

Included for reference only. No changes.
Cloud Software as a Service (SaaS). The capability provided to the consumer is to use the provider’s applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface such as a web browser (e.g., web-based email). The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.

Cloud Platform as a Service (PaaS). The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations.

Cloud Infrastructure as a Service (IaaS). The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications, and possibly limited control of select networking components (e.g., host firewalls).
## Proposed Definitions

<table>
<thead>
<tr>
<th>TERM</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cloud Service</td>
<td>A mechanism to enable access to one or more capabilities, where the access is provided using a prescribed interface and is exercised consistent with constraints and policies as specified by the service Description[1] and any Service Level Agreement(s); and which is measured and delivered on demand to consumers over a broad network, taking advantage of resource pooling and rapid elasticity.[2]</td>
</tr>
</tbody>
</table>


| Service Model         | A classification of a cloud service that is based on the computing capabilities that the service provides. There are three established models: software as a service, platform as a service, and infrastructure as a service. |

| Specialized Services (XaaS) | Service models that are derived from the three primary service models, namely SaaS, PaaS and IaaS. |
NIST Service Model Examples

**SaaS**
Office productivity software; mission support systems; ERP software; collaboration software; other software services.

**PaaS**
Cloud OS (Application runtime with control panel and integrated web services); App runtime; Cloud IDE; or standalone web services for building, deploying and managing SaaS solutions.

**IaaS**
Control Panel and API for provisioning, configuring and monitoring VMs. Compute and Storage services.
**Stack vs. “ground up” services**

**Stack**
A cloud service that builds on other cloud service model layers.

**Ground up**
A cloud service that is built without relying on the other cloud service model layers.