Setting Cloud Standards in a New World

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This area will serve as a forum for describing not only cloud-specific standards seeing use, but also the process through which they're developed.

A defect in a cryptographic standard might expose you, me, and everyone working with us to financial ruin, catastrophic security vulnerabilities, or weaknesses. An inconsistent Web browsing experience between products is no longer the most unpleasant thing we might expect from inconsistent HTTP frameworks. Such inconsistencies led to server-side developers spending a great deal of time and effort to deal with them. Although this problem still occurs, an even more important consideration now stems from the manner in which hypermedia and Web APIs are being designed and integrated deeply into business processes for essentially all new software. The corresponding need for consistency and reproducibility in the associated frameworks and standards is very high.

The ongoing process of defining, developing, and recognizing standards in general is intrinsically a community activity. It might be possible to define what constitutes a standard, at its most basic level, as "anything agreed to by more than one party," and in such a definition, we could sweep up a broad range of human intellectual effort. In the IT field, there is and has always been a wide variety of community time and effort expended to define and codify the framework and details of our work.

This great range of activity continues to this day. In the first article in the "StandardsNow" series, which appears elsewhere in this issue, I describe some of the practical aspects and nuances of the current cloud standards landscape. For reasons detailed here and in that column, the area of standards for cloud computing is now mature enough to merit coverage in *IEEE Cloud Computing* on an ongoing basis.

Articles in the "Standards and Compliance" area of the magazine will therefore be selected to provide this needed coverage. Like all the other editorial sections of the magazine, we want to recruit well-written, clear, succinct articles from leading projects and experts that illuminate our readers about the topic at hand. Although other areas might touch on standards from time to time, and many of the introductory editorials already mention such topics, articles in this part of the magazine will focus in detail on the development process used to create cloud computing stan-

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dards, on their analysis and description, and on their practical use to solve real-world problems.

Topics of Interest

Are there really established and emerging standards in the new world of cloud computing? Yes, definitely. You might not know about such efforts yet, so for this purpose I intend in this section of the magazine to collect the most coherent explanations available and expand on them wherever possible. This effort will aim to study, explain, document, and give a forum for describing not only the standards that are seeing use, but also the process through which they're developed to the point that they can see the light of day. As we'll see, standards in the cloud computing world aren't new at all; many of these protocols and specifications have been under continuous development for several years, leading to an increasing state of maturity that makes it possible and practical to take on such an effort.

What about standards adoption? We shouldn't miss the opportunity to engage in this topic directly. Articles that document adoption efforts for both established and emerging standards sets are welcome here. Of course, standards that are experiencing substantial uptake are the best ones to document, and possibly the ones that least need documentation, but there's room also to put promising new efforts into the spotlight to provide exposure and possibly improve their uptake.

Because standards are in fact a communal activity, I'll be relying on the community, meaning you, to identify what's of interest. Contributions can be historical or modern in approach, as long as they're focused on creating a successful standards-based framework for cloud computing innovation. I'll also make space available for short tutorials or relevant and revealing use-case examples, if these examples are general in nature and illustrate the solution provided by the standard being described.

Specific topics to be targeted in the "Standards and Compliance" area include

- architectural efforts;
- ontology, taxonomy, and definitions;
- standards structured for particular branches of service-oriented architectures (SOAs), such as infrastructure as a service (IaaS), software as a service (SaaS), and platform as a service (PaaS);
- standards intended to cut across or bridge SOA levels;
- proofs of principle;
- use cases and requirements;
- test infrastructures; and
- benchmarking for performance and functionality.

I'm also interested in articles that describe cooperative work across multiple standards-developing organizations, especially work that combines efforts to reduce duplication, promote cooperation, or refine cooperative standards and specification sets into new levels.

Improving Interoperability and Promoting Innovation

It must be acknowledged at the outset that not all parts of the cloud computing world are or will be amenable to treatment by standards. This is true of any field. I explore this topic in more detail in the "StandardsNow" column, but for the moment let me just say that there are already successful cloud standards, and it's even possible to understand where they'll work best; in brief, "standardize at the interfaces to enable innovation between the boundaries" of a process or workflow. This approach not only works best, but it can simultaneously improve interoperability and promote innovation in a given cloud project or product.

The process through which standards are developed and studied is obscure to most people and even to a large fraction of experienced developers in this field, even if they're familiar with the resulting specifications. In my experience, the standardization process works best when there are multiple coordinated avenues for close, iterative communication between people working on the documents comprising the standards and those using them in the field.

Although this much almost goes without saying, it's nonetheless true that there are many ways for such communication to take place, and these methods differ substantially between various organizations developing standards. In fact, they vary so much that there's often little resemblance among them from one organization to the next.

For this reason, it will be interesting to the community to document and describe the procedures used by the various organizations, which range from completely open processes designed to develop working software for a given project, to much more elaborate specification-oriented document production methods that aren't tied to any one particular software product. (Disclosure: I work a lot with organizations that are in the latter category, and in the case of the Open Grid Forum, a specification can't even be promoted to the highest recommendation level without documented evidence of more than one successful implementation in the field as well as significant uptake.)

Road to Adoption

I understand that the topic of standards might not be everyone's cup of tea, and that often people need to encounter this topic multiple times before it even begins to make sense to them. This is true of many other aspects of IT development, especially in the new world of cloud computing (which, again, is actually not that new).

This characteristic makes it especially important to recruit good, clear articles that not only capture the technical details of a standard set or specification, but that go beyond such details to explain the motivation, usage scenarios, value, and expected interdependency of such standards for the benefit of the educated reader.

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Consider the Open Cloud Computing Interface as an example. (This explanation anticipates a longer discussion to be published in an upcoming issue, as mentioned in my "StandardsNow" column.) OCCI was one of the first standards to be deployed in the area of infrastructure services control, the IaaS level of SOA.[1–3] It was designed as a general boundary-layer protocol to allow RESTful control and communication across that boundary, and has an extensible design that allows discovery of service aspects at any level of the URI for accessing those services, as well as mix-ins to allow customization of service descriptions and interactions. Although OCCI was initially applied to IaaS control and communication, it's intended to be general in nature and, with its flexible format, can apply equally well to PaaS and SaaS applications.

Other standards have also been developed to tackle particular aspects of cloud computing interfaces for specific tasks, often with greater specialization to the task at hand. For example, the Open Virtualization Format (OVF) is a packaging standard designed to improve the portability and deployment of virtual appliances, including machine images and associated metadata needed to deploy, start, and manage them.[4] The implementation of such metadata to carry out detailed machine control once such images are running wouldn't be covered under OVF, but would require an IaaS control standard, either OCCI or a standard such as the Cloud Infrastructure Management Interface (CIMI), which is specifically designed to perform such tasks.[5]

We can use these standards to orchestrate workflows requiring coordination among multiple machine instances, using communication flows that are possible within the information that they're designed to convey. For this purpose, there are other standards either already existing or in process that are designed specifically to help with such coordination, such as the Topology and Orchestration Specification for Cloud Applications (TOSCA).[6] Although it might be possible to handle such workflow coordination on your own or through a general standard, specifications that are specifically written for particular cloud tasks will have features that are customized to make your life easier when handling the characteristic details of those tasks.

Not all of these standards fit together, and many of them have been designed independently. (This isn't unusual: often many successful software products are also designed independently, but any thought directed toward how they can be used to accomplish different parts of a given task can be fruitful.) Explaining the relationship between these standards, or even whether they can in fact be used together within a given piece of cloud software, is the ongoing goal of this area of the magazine.

It's also true, as should be obvious to even casual observers of the cloud computing scene, that not all aspects of the field have yet been covered by sufficiently mature standards. Leaving aside the question of uptake, which will be discussed in detail when we get to each standard, there's the question of whether the architecture and landscape of cloud computing applications is sufficiently settled to identify all areas in which the application of standards-based approaches is even sensible.

I need your help identifying areas in which a substantial discussion on cloud standards is now possible. To be successful, articles must go beyond normal levels of clarity and readability. Too often, jargon associated with the standards-development process can and does exhaust the patience of many participants in the cloud computing world, so I appeal to you to write topical, lively (but not too argumentative!) articles that will truly illuminate the subject under discussion.

If you can produce a coherent, readable account of recent work in this area, I'd like to hear from you. For purposes of this area of *IEEE Cloud Computing*, you can reach me at alan.sill@standards-now.org.

On behalf of all of the editors of the magazine, we look forward to your submissions.

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