American humorist Mark Twain is credited with observing that “history does not repeat itself, but it does rhyme.” More than a century after his death, Twain’s aphorism might indeed hold true about the latest technological wave to hit computing — the cloud.

For the concept of the cloud to work, of course, the prevailing principle of any-to-any, end-to-end interoperability must be extended from the principles of the Internet’s architecture, and even communications networks that predated packet-based exchange, according to cloud veteran David Bernstein.

“What we saw with the development of the telegraph and phone companies, what we saw with the Internet, and what we’re seeing with cloud computing, these are themes — and interoperability always has a profound industry effect,” Bernstein says. “Sometimes the incumbents roll with that and prosper, and sometimes the incumbents’ value proposition was a walled garden and therefore they crumbled. But it will and does have a profound effect, and cloud will be no exception.”

Bernstein — who chairs the IEEE’s intercloud interoperability working group (P2302; http://standards.ieee.org/develop/project/2302.html) — and other industry observers and researchers are neck-deep in one of the most fascinating issues surrounding the future of the global communications network’s infrastructure. In some cases, the lessons of the past 20 years give these industry veterans reason to be optimistic. In others, resignation or pessimism reigns. Whatever transpires, it might serve technologists well to heed Twain’s observation.

Necessity for Interop Plain as Day

Dan Woods, CTO and editor at technology analyst firm CITO Research, says the cloud was the logical end point of the success of millions of network end points connected to, in theory, any other end point, but also funneling to a handful of behemoths, such as Amazon and Google.

“The artifacts of the cloud were created because Amazon needed to write its software differently to handle its business, because Google needed to write its software differently to handle its business,” Woods says. “The impact of the cloud is [that] you had this new use case of millions of people interacting with data in unimaginable volumes, having to do it on commodity hardware, and having the hardware be unreliable, so you had to write the applications differently. Eventually, that was all commoditized into components at various levels — platform as a service, infrastructure as a service, and applications [or] software as a service. That became what was known as the cloud. Now the question is, what’s going to make the biggest impact going forward?”

Woods believes the answer lies not in the numerous standard-setting efforts the IEEE, IETF, Oasis, and others are undertaking, but rather in a de facto landscape taking shape that’s dominated by Amazon Web Services (AWS) and the open source OpenStack community interfaces.

“It certainly isn’t irrelevant that people are trying to set standards, but the most important thing is what is being created and being used,” Woods says, “so Amazon is the biggest ‘standard setter’ out there. It has the most APIs that are implemented and working and that people are using.”

Woods says one factor that might make cloud interoperability easier to attain than that for previous architectures is the relatively simpler API landscape.

“These APIs aren’t like the old generation of APIs, where you have this huge computing surface and this complex model underneath,” Woods says. “They are relatively high level and implemented in REST. It’s not like it’s really hard to support multiple standards at this point, and you may find that OpenStack someday creates a translator that will translate anything you have from Amazon APIs to OpenStack APIs. It’s not

News & Trends

Detailed Questions Hit the Cloud

Greg Goth
News & Trends

News in Brief

The European Commission is seeking public consult on proposed legislation that could make risk management practices and security breach reporting mandatory for systems that are critical to Internet function or provide key social or economic services, such as those related to transportation, finance, energy, and health. Current EU law requires such practices only for ISPs and telecom operators. Lawmakers are seeking input through 12 October from industry, governments, and citizens on how to manage incidents that might disrupt the Internet and other essential network and information systems.


ICANN has announced Fadi Chehadé as its next president and CEO. Chehadé served most recently as CEO of Vocado, a US firm that provides cloud-based administrative software for educational institutions; he was previously general manager of IBM's Global Technology Services in the Middle East and North Africa. In addition to his extensive international experience, Chehadé has, according to ICANN Board Chair Stephen Crocker, “an amazing track record of success and the obvious leadership qualities to help carry ICANN into the next stage of its evolution.” Chehadé succeeds Rod Beckstrom, who led ICANN until 1 July; he will take over from acting CEO Akram Atallah on 1 October.


According to the Russian International News Agency (RIO Novosti), Russia’s State Duma approved legislation on 25 July that would let the state block blacklisted websites, claiming that such a move was necessary to combat child hard to imagine that happening and also having it work pretty well.”

Woods compares what he calls the likely path to interoperable cloud build-out with the battle between those who favored the SOAP-based, W3C-sponsored WS-* family of standards and the champions of REST in the early days of Web services construction.

“If you look at what’s going on with Web services, there’s been a lot of work in the standards community on creating these ornate standards that really haven’t had a lot of impact,” he says, “compared to REST, which is lightweight and defies standardization because it makes everything really simple. That has superseded a lot of the other activities.”

Everybody’s on Board

Bernstein, however, says the effort around cloud interoperability standards could better be compared to the global success of standards such as the IEEE 802.11 wireless communications protocols. He contends that because the community universally recognizes that cloud platforms will become virtually ubiquitous, a technological minuet of sorts is under way.

“What we’re doing within the 2300 series of working groups is establishing a really modern approach,” he says. “2302 is just one of the efforts; there’s another effort people are starting around APIs; there’s an effort to try to take the de jure standard of the AWS APIs and create them as an IEEE number, and gain Amazon’s cooperation in this, which will effectively allow governments and companies like large telecommunications companies to procure against it.

“Amazon has been quite careful to allow this to occur without actually endorsing it. They’ve put no copyrights in the XML and interfaces, and they’ve been careful to allow a number of different implementations that contain AWS-compatible interface code that does not contain Amazon’s intellectual property. It’s good for Amazon; they haven’t said ‘This is great,’ they haven’t said ‘This is bad.’ They’ve just sort of watched it unfold. There’s another IEEE working group attempting to take the APIs from OpenStack, the native ones, and put those into an IEEE standard.”

Another exemplar Bernstein refers to is the fully recognized open source development model. The global OSS ethos has been so absorbed by the mainstream that the 2302 working group is pursuing a parallel test-bed to run while the interoperability standard is being developed.

“If you were trying to come up with a supercomputer interoperability standard, you’d be in the rarefied air of, first you have to find one,” Bernstein says. “But if you want to build a substantial cloud, a 500-server cloud, it’s really kind of obtainable. You can go onto the public Internet and create a movement and have things occur at global scale.”

As to possible overlap between standards efforts, Bernstein says good coordination exists between likely domain stakeholders.

“There are a handful of organizations that are actually working on different specific areas,” he says. “For example, everybody pretty much knows the interoperability guys are in the IEEE. And everybody knows the storage guys are in SNIA [the Storage Networking Industry Association]. And everybody pretty much knows the hypervisor format and management guys are in DMTF [the Distributed Management Taskforce], and so on. A lot of us are members of two or three of these, and there’s also a cloud-standards.org group, where we all have a weekly call and coordinate informally. Nobody wants to duplicate efforts.”

Icebergs Dead Ahead?

One researcher hopes the spirit of coordination between technologists of varying expertise will continue into production cloud deployments, but doesn’t express much optimism that...
would function analogously to the oversee intercloud elements such as also calls for a trusted authority to otherwise,’” Ford says. “So I think there is sure rules, then you will be able to get follow this particular set of disclo-
on which customers are required to computation on this particular cloud, risk purposes, saying ‘If you run your
nies whose business it is to underwrite
that is, some risk management role
information to a trusted third party —
you may also have concerns about the
tection, education, and develop-
grants of up to US$10,000 each for
The Internet Society has announced grants of up to US$10,000 each for
The IEEE interoperability draft also calls for a trusted authority to
intercloud elements such as an
function analogously to the Internet’s top-level domains and DNS. Bernstein says that, although existing organizations such as ICANN or ISOC
could assume such a role, neither has acknowledged the 2302 effort, and infrastructure providers in global regions that have shown dissatisfaction
with the political structure of Internet governance might insist on another method of oversight.

“There’s been a huge protest around who controls the DNS in the United Nations,” Bernstein says. “It’s nothing new at all, but it’s worth asking the question. That’s why the
question is called in the draft.”

Bernstein foresees a global effort coalescing around carriers and their customers with multinational architectures. One example is the Global Inter-Cloud Technology Forum (GICTF) formed in Japan to address
architectural requirements of multinational clients of Japanese carriers, which are geographically constrained
due to their government charter.

“If you’re a multinational entity in Japan, you want NTT to federate with Singtel and provide you a multconti-
nental cloud for a variety of reasons,” Bernstein says. “Not only because you’re a multinational, but because you may also have concerns about the quality of the robustness in the area.”

The urgency of interoperable clouds such as those envisioned by the GICTF became clear after the 2011 Japanese earthquake and tsunamis, Bernstein says. In its final report on maintaining
communications capabilities following large-scale disasters (www.soumu.go.jp/ main_content/000146938.pdf), the nation’s Ministry of Internal Affairs and Communications expressly mentioned “it is key that the MIC continues initiatives to boost the reliability and availability of cloud services while taking advantage of frameworks like the GICTF.”

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