Submission by

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For the FY15 Hearing on

"Driving Innovation through Federal investments"

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Amazon is pleased to provide written comments for today's hearing on driving innovation through federal investments. As federal agencies continue to face budget constraints, it is imperative to drive more efficiency and cost savings in federal IT investments, particularly through the greater use of cloud computing throughout the federal government. But the benefits in doing this go well beyond just reducing IT costs – the cloud unleashes innovation and greatly improves agility as organizations seek to get more "mission" for the money. For example, as more recipients of federally funded research utilize cloud computing, these organizations can spend less on capital expenditures to buy equipment and can invest more on the actual research.

Amazon Web Services

As you may know, Amazon.com opened for business on the World Wide Web in July 1995 and today offers Earth's Biggest Selection. Amazon seeks to be Earth's most customer-centric company, where customers can find and discover anything they might want to buy online, and endeavors to offer our customers the lowest possible prices and the best possible services. *Technology innovation has always driven Amazon's growth*. As we expanded our offerings for retail customers, we also expanded customer segments.

After over a decade of building and running the highly scalable set of web applications and databases known as Amazon.com, the company realized that we had developed a core competency in operating massive scale technology infrastructure and datacenters. So, we embarked on a much broader mission of serving a new customer segment – including government agencies – with a platform of web services through our cloud computing business called Amazon Web Services (AWS).

In 2006, AWS began offering developer customers access to in-the-cloud infrastructure services based on Amazon's own back-end technology platform. Previously, businesses, government agencies, research institutions and other organizations only had an option of either making massive capital investments to build their own infrastructure or of contracting with a vendor for a fixed amount of

datacenter capacity that they might or might not use. This choice meant either paying for wasted capacity or worrying about shortages, *i.e.*, that the capacity they forecasted was insufficient to keep pace with their growth. Businesses and government agencies spent a lot of time and money managing their own datacenters and co-location facilities, which meant time not spent on their core organizational missions of providing products and services for their customers and citizens.

With AWS, government no longer needs to make massive, risky infrastructure investments in order to develop, launch, and run flexible, reliable, and scalable IT systems. AWS provides a highly reliable, scalable, secure, and low-cost infrastructure platform in the cloud that powers hundreds of thousands of enterprise, government, education, and startup organizations. AWS just passed its eighth birthday and we have built a business that has hundreds of thousands of customers in over 190 countries all over the world, including over 3,000 academic institutions.

Companies that leverage AWS in the commercial sector range from large enterprises such as Bristol-Myers Squibb, GE, Intuit, Samsung, and Shell to innovative start-ups like Airbnb, Dropbox, Flipboard, Instagram, and Pinterest. Throughout the U.S. federal government, agencies and departments are adopting AWS for a wide range of technology infrastructure services and applications including at the U.S. National Institutes of Health, the U.S. Department of Interior, NASA's Jet Propulsion Laboratory, the U.S. Department of the Navy, and the U.S. Securities and Exchange Commission. AWS also offers its dedicated *GovCloud* to U.S. government agencies and system integrator partners, allowing them to move more sensitive workloads into the cloud by addressing their specific compliance requirements, such as the International Traffic in Arms Regulations (ITAR). In fact, over 800 government agencies worldwide are using AWS today.

Cloud Computing

One way to think about cloud computing is that instead of buying, owning, and maintaining their own datacenters or servers, federal agencies can acquire technology resources such as compute power and storage on an as-needed basis, and dispose of it when it no longer is needed. Many industry experts refer to this as a "utility" model of obtaining and using IT capability, analogous how the government obtains access to water, gas, or electrical power. Users only pay for what they use – by the compute-hour or storage-gigabyte – and they are not locked into long-term contracts.

If a program is funded one year and then unfunded the next, or a pilot project or test program does not achieve its expected results, agencies no longer need to be tied to large, capital IT expenditures that cost tens of millions or even hundreds of millions of dollars. As a result, agencies have more agility, which enables greater innovation, but when a project does fail, agencies also have more flexibility to adjust quickly and contain costs. The result is achieving more on your investment and avoiding costly overruns and high profile failures. That's how businesses operate and that is what we also need to empower federal agencies and federally funded organizations to do.

Not coincidentally, the Obama Administration recognized the importance of the utility-based model of cloud computing on Page 41 of the President's FY2015 Budget Request:

> *Expanding Federal Cloud Computing.*
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> *The Budget includes investments to transform the Government IT portfolio through cloud*

computing, giving agencies the ability to purchase IT services in a utility-based model, paying for only the services consumed. As a result of the Administration's Cloud First policy, Federal agencies adopting cloud-based IT systems are increasing operational efficiencies, resource utilization, and innovation across the Government. To accelerate the pace of cloud adoption, the Administration established the Federal Risk Authorization Management Program, a Government-wide program standardizing how we secure cloud solutions. To further grow the use of cloud-based services, the Government is working to establish a credential exchange system that allows citizens and businesses to securely access online services at different agencies without the need for multiple digital identities and passwords.

As we mentioned earlier, there are many examples of federal agencies that have begun to embrace the utility-based model of cloud and we'll highlight three in our written submission.

First, NASA's Jet Propulsion Laboratory (JPL) decided several years ago to use the utility-based mode of cloud in support of the Mars Rover-related programs and had considerable success in doing so; AWS enabled the Rover program to run more efficiently. When the next major Mars mission, the Mars Space Lab (also known as Curiosity) achieved its successful landing in 2012, cloud computing infrastructure from AWS was utilized in support of various aspects of that effort, including the data and image management pipeline dealing with all the new data streaming down from Mars. As Tom Soderstrom, the CTO of NASA JPL, has described, JPL has leveraged cloud services to dramatically reduce IT costs and, in the process, increased their agility and decreased the "time to science," while enabling JPL to have complete flexibility when using those computing resources.

Second, the U.S. Food and Drug Administration (FDA) leverages cloud services to bring scale and cost effective innovation to protect and promote public health. The agency, which receives 100,000 handwritten reports of adverse drug affects each year, needed a way to make the data entry process more efficient and reduce costs. By using AWS, the FDA quickly turns manual reports into machine-readable information with 99.7 percent accuracy, reducing costs from $29 per page to $0.25 per page.

Third, the U.S. Department of the Navy's CIO office initiated a pilot project in 2013 to move unclassified data to the AWS cloud. The Navy is continuing to move workloads to AWS in 2014, a move that could save the Navy as much as 60 percent versus the cost of hosting or managing data in their own datacenters. Let's imagine, for a moment, if that level of cost savings could be applied to all federal IT spending in the next decade?

We would like to summarize briefly how utility-based cloud computing is driving innovation and can help the federal government maximize its investments:

- First, with cloud, IT users can trade capital expenditures for variable expenses. That is, users can pay only for what IT they actually consume, and only when they consume it.

- Second, with cloud, those variable expenses are lower than they would be if the user self-provided the IT service. With inherent economies of scale, the large-scale commercial cloud is simply more efficient than anything a particular user could build and operate for itself.

- Third, users don't need to guess their capacity needs. Before cloud, users risked the waste of buying

too much IT capacity if demand were lower than guessed, or they risked dissatisfaction of their customers or citizens with shortages, if the users bought insufficient IT capacity to meet demand.

- Fourth, the speed and agility of user innovation is dramatically increased with cloud. Instead of waiting many weeks to obtain IT infrastructure, virtually unlimited capacity is available to users within minutes.

- Fifth, cloud computing allows a user's scarce technical talent to focus on its core mission, not on maintaining basic compute and storage infrastructure to support it. With the budget challenges that agencies face today, that focus is valuable now more than ever to government users.

The reality is that cost savings is only part of the total picture. It's also about *innovating for less* and that is where cloud computing excels more than any other IT model. That's why some businesses are now shifting their entire IT infrastructure to the cloud. Even enterprises that invested a lot previously in their IT infrastructure and became really good at it, decided that they could not achieve the same efficiencies and benefits – including the ability to innovate faster at a substantially reduced cost – as they could if they shifted to the cloud. *That same approach needs to be applied to the federal government*.

The bottom line is that there are some IT missions that federal agencies should no longer pursue on-premise or by using the old model of capital expenditures to build out IT infrastructure and have lots of people manage it. This brings me back to the Navy Department example that we referenced earlier. What Mr. Halverson, the Navy CIO decided, was that instead of being satisfied with the old model, he was going to innovate and use a new model, one that was more efficient, more flexible, more scalable, and every bit as secure – if not more secure -- than the old one. In his words: "The decision to host the data on a public Web server resulted from an analysis of several factors, including the type of data stored in the portal, the ease of access due to significantly faster response times, security, and cost."

Consider also the mission and business needs that were factors in NASA JPL's decision to utilize public cloud infrastructure. It wasn't just about cost savings, it was also about flexibility, scalability, security – and landing a rover on Mars is a pretty obvious example of "mission critical." The cloud has also enabled a new level of secure data sharing and collaboration with other research centers in the U.S. and around the globe. The cloud actually enables much tighter control over data access than sending datasets on hard disks or allowing arbitrary data downloads from around the globe. Finally, leveraging cloud computing also provided NASA JPL the option to use the infrastructure when they actually needed it, and to turn it off when they did not.

With cloud computing, all federal agencies and organizations that receive federal funding can spin up thousands of services in minutes, and then, if an experiment or project doesn't work, can either give them back to AWS and stop paying for them, or can reuse them for other experiments. This approach works for businesses of all sizes and it can work for the federal government too. Also, by enabling the President's continued emphasis in his FY15 Budget on Cloud First, this Committee has an opportunity to drive even more innovation through Federal investments.

Amazon looks forward to working with the Committee to enable greater innovation, improved agility, and cost savings by expanding the adoption of cloud computing by federal agencies and organizations that receive federal funding.

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