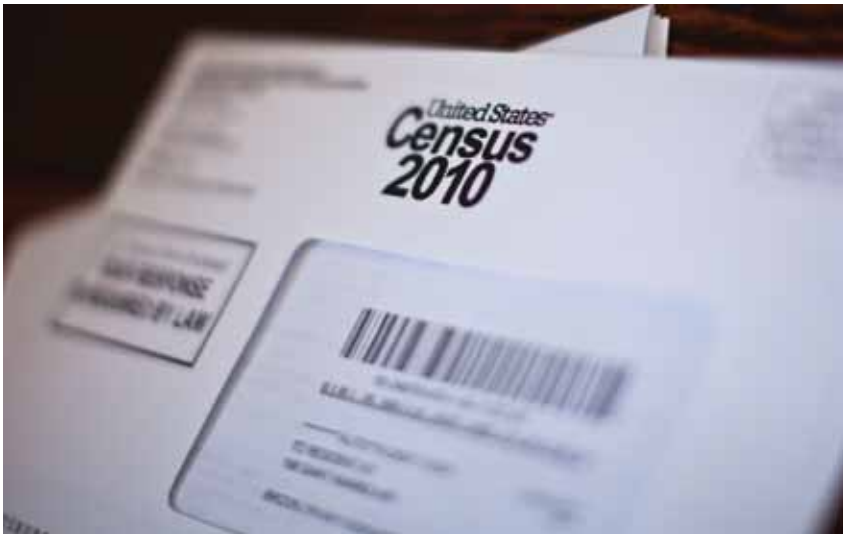
Counting on the Cloud: Early Reflections on the Adoption of Cloud Computing by the U.S. Census Bureau

By Costas Panagopoulos, Ph.D.

For the 23rd time since 1790, the U.S. Census Bureau has conducted the constitutionally-required, decennial national headcount in 2010. This enterprise includes mailing out 600 million forms and marshaling a network of 1.3 million temporary employees to count over 300 million people living in 130 million households. It is expected the cost of the current census will ultimately exceed $13 billion—or about $50 per person given population estimates. Against the backdrop of the economic downturn and escalated pressure on Congress and government agencies to curtail excessive spending, the Census Bureau has worked to capitalize on technological developments to meet its mission—and save money doing it. Among the many ways in which the 2010 Census features the use of cutting-edge technology, experimentation with the use of cloud computing has attracted considerable attention.



The cloud was almost tailor-made for the Census Bureau. Cloud computing enables providers to deliver computing services—applications, storage, processing, memory, and network bandwidth, for example—via the Internet, on demand, and from remote locations, thereby rendering computing location- and device-independent (Wyld 2009).

Computing tasks and information become available to users anytime, anywhere from any device, provided there is access to the Internet. Cloud computing is massively scalable with improved resource utlilization, economies of scale, and collaboration capabilities. Moreover, its capacity for on-demand infrastructure and computational power, and the decreased need for maintenance and upgrades provide further efficiencies. The cost-savings prospects are especially compelling; according to a report issued recently by the Brookings Institution, government agencies can expect to save between 25%–50% by using cloud-based computing services rather than internal IT resources. For an organization like the Census Bureau, which needs to retain and manage relationships with over 170,000 partners across the country, the cloud has offered unparalleled opportunities to significantly reduce IT costs and complexities while improving workload optimization and service delivery.

Government leaders had been heralding the potential advantages of cloud computing as agency leaders were making decisions about designing and conducting the 2010 Census.

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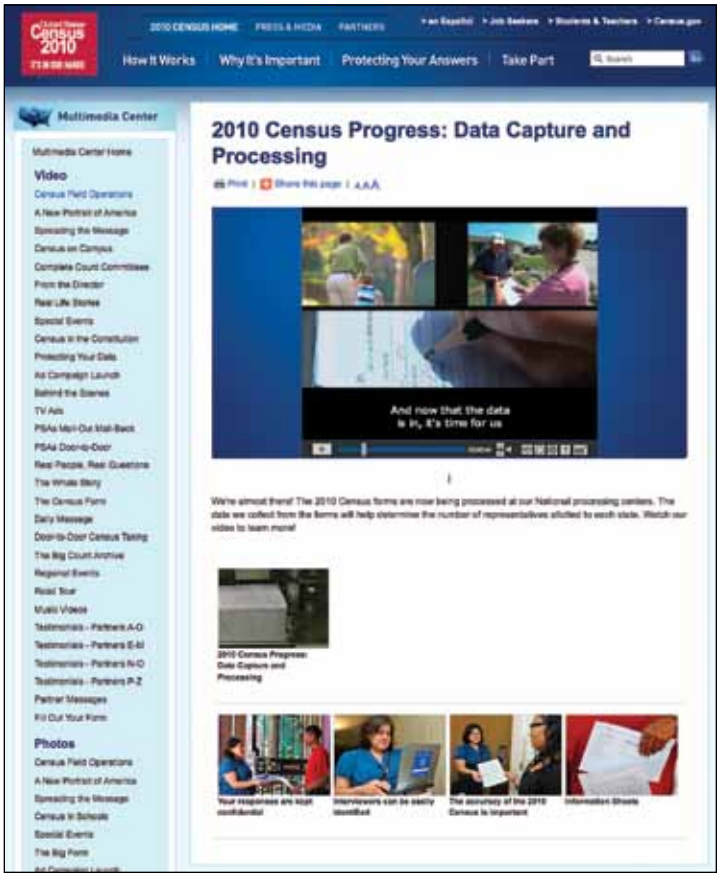
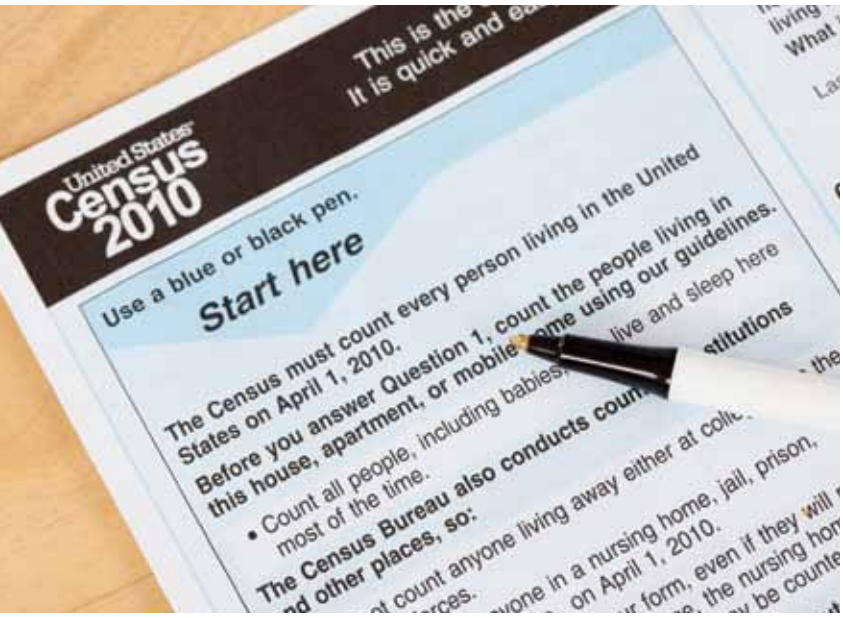
In May 2009, the nation's first chief technology officer (CTO), Aneesh Chopra, advocated "greater use of cloud computing where appropriate." Similarly, Vivek Kundra, appointed in March 2009 as America's first federal chief information officer (CIO), had indicated the deployment of cloud computing in federal IT would be a leading priority (Wyld 2009). These goals notwithstanding, a June 2009 Merlin Federal Cloud Initiative survey found that only 13 percent of federal IT managers reported using cloud technology. Anecdotally, Peter Mell, who leads NIST's cloud computing research team, had also observed there has not been widespread adoption of cloud technology in the public sphere. Against this backdrop, the Census Bureau's experience with cloud technology in 2010 is especially ripe for investigation.

So what has been the Census Bureau's experience to date in using cloud technology and what are the early lessons emerging from this experience? Initial indications suggest the Bureau's overall experience using the cloud has been quite positive (Duffy Marsan 2010). The Bureau has reportedly spent $11.8 million on cloud-related efforts to support the 2010 Census. Census CIO Brian McGrath notes the Bureau has used the cloud in eight specific instances that "provided a huge benefit for us." These include:

- The Census Bureau contracted with Akamai to enhance the performance of its redesigned website—www.census.gov. The website, which attracted 4-5 million hits per week at its peak, featured video clips, blogs, and other interactive elements aimed at citizens. McGrath has said that using the Akamai network provided a better-quality web experience to citizens for less money than building an internal network. He also noted Akamai provided an effective barrier against distributed denial-of-service (DDoS) attacks.
- The Census Bureau also used several software-as-a-service (SaaS) providers, including RightNow, which offers self-service customer support such as searchable FAQs, and GovDelivery, which provides outsourced e-mail delivery services to public sector clients.
- The Census Bureau built its Integrated Partner Contact Database upon Salesforce.com's platform, which it paid for on a subscription basis.

Though the Census Bureau has leveraged the benefits of cloud computing in 2010, many concerns about control and security remain paramount. For example, the storage of sensitive personal information could not be migrated to cloud computing without some risk. Still, the use of cloud technology in several areas during the 2010 Census process appears to have gone off relatively seamlessly, and McGrath has indicated the Bureau will expand its use of commercial, cloud-based computing services "where appropriate," and move forward with building an internal cloud.





Public managers can extract early lessons from the Census Bureau's experience. There are five initial lessons learned from the Bureau's adoption of cloud computing in ramping up for the 2010 Census:

1. **Start small.** The adoption of cloud computing need not be comprehensive, especially at first, and experimentation with the use of cloud computing for select needs can be instrumental in helping to manage expectations and assess performance. Such initiatives can also help to build internal and external support for subsequent adoption and expansion. Building an internal culture of support for cloud computing can be especially critical in public and governmental organizations. It is also crucial to evaluate performance and develop ways to measure effectiveness, efficiency, and cost-effectiveness.

2. **Partner with other agencies.** The Census Bureau was able to move quickly and speed up acquisition of cloud-based services by partnering with other federal agencies—including the National Institutes of Standards and Technology (NIST)—to choose SaaS vendors that had already been certified by another agency. "We didn't have to recertify and reaccredit the systems," noted McGrath, "and it really pushed the delivery of the services down from months to days or weeks."

3. **Tweak existing configurations.** Customized programming platforms can be costly and time-consuming. Instead, agencies can work within existing software platforms to execute goals. After the Census Bureau encountered difficulties with its previously-planned in-house database in 2010, it worked with Salesforce.com to modify its existing platform to store information on the Bureau's 170,000 partners at a fraction of the cost and time. The company was reportedly able to get the database up and running in six weeks, a task that often takes the government months or even years to accomplish.

4. **Use a public cloud while a private cloud is in development.** Private clouds offer federal agencies the promise of greater control or security as well as specialized application, but development is often complex and expensive and can take several years. The 2010 Census experience suggests public clouds can be used effectively to maximize efficiency while private cloud initiatives are underway. Moreover, the experiences and relationships cultivated with vendors in public cloud collaborations can subsequently be leveraged to build internal cloud computing resources.

5. **Lay the groundwork early.** Cloud computing initiatives can often be implemented with unprecedented speed, but preparation is still essential. One reason the Census Bureau was able to move so aggressively into cloud computing in 2010 is because it had been migrating to virtualization since early 2009. As of June 2010, the Bureau, which had spent $6.1 million on hardware and software for its Windows virtual farm, had 427 virtual machines operating on 57 server platforms. McGrath noted the Bureau's compressed hardware footprint was saving the agency $2 million per year, but it also simplified the move to cloud computing. The Census Bureau is virtualizing its Linux servers next and is also planning to homogenize and virtualize its storage platforms after that.

As the U.S. Census Bureau wraps up the 2010 survey in the coming months, as details become available, and as agency leaders and top administrators get down to the hard work of evaluating the impact of the range of initiatives adopted in this census cycle, further insight about the benefits and challenges of cloud computing in the public sector will become available. A more comprehensive overview of the 2010 Census experience will likely yield answers to key questions of practical interest to other public managers, including:

- How were decisions about cloud technology adoption made at the Census Bureau? Who was involved, what was the process, and what were the criteria used?
- Details about the costs of cloud deployment and evidence about any cost savings associated with adoption of the technology.
- How were key objections about cloud computing resolved to enable limited uses in 2010, and what specific reservations prevented further adoption of the technology?
- How was effectiveness monitored and evaluated?
- What were the experiences working with specific vendors?
- To what extent has/will the Census Bureau share its experiences with other federal agencies?

As public managers contemplate the adoption of emerging technologies in their own organizations, it is critical to inform their decision making with reliable evidence from other agencies' experiences. Given the Census Bureau's recent experience using cloud computing to more efficiently meet its mission, the Bureau is ideally positioned to offer invaluable insights to counterparts in the public sector. Stay tuned! ◘

Sources:

Duffy Marsan, Carolyn. 2010. "Census Bureau Counting Heads in the Cloud." *Network World*. July 6. Accessed online on September 12, 2010 at http://www.networkworld.com/news/2010/070610-census-bureau-cloud-computing.html.

Hendrichs, Renee. 2010. "Cloud Computing and the U.S. Census." *Digital Journal*. January 23. Accessed online on February 12, 2010 at http://www.digitaljournal.com/article/286285.

Wyld, David. 2009. *Moving to the Cloud: An Introduction to Cloud Computing in Government*. IBM Center for the Business of Government Report.