

Cloud Computing

The U.S. government announced a “Cloud-First” policy in 2010, igniting a massive migration from on-premise data centers to the cloud. More than 10% of central government systems had been migrated as of 2017, and more than 5,000 federal data centers are scheduled to close by 2019.^{1,2} This shift represents a transformation in the perceived capabilities of cloud systems as agencies achieve cost savings without sacrificing data security; as a result, agencies choose not to build more data center space. RTI has responded quickly to this race to the cloud, helping our clients migrate existing systems and launch new projects in a secure, cost-effective manner.

Putting the cloud to work for you means more than moving data to a remotely hosted computer. A project team might set out to make vast amounts of data available to dispersed teams of researchers, or to make sure school teachers in another country get paid on time. When a cloud-based solution best meets a client’s needs, RTI International applies advanced technology offerings from the world’s top cloud providers to help them achieve their goals.

Effectively implementing a customized cloud-based strategy to meet a client’s needs provides cost savings, a reliable infrastructure, and the flexibility to scale a system appropriately with minimal investment. We evaluate each client’s needs and propose secure, scalable, and cost-sensitive approaches—including the following:

- Infrastructure as a service (IaaS)
- Platform as a service (PaaS)
- Software as a service (SaaS)

For U.S. government clients, we offer significant experience migrating systems into GovCloud environments and meeting accompanying federal security requirements.



High-Performance Computing

Many RTI projects require high-performance computing clusters for data processing and analysis. To satisfy these projects' various needs, we employ cloud computing resources to set up scalable custom clusters that differ in several attributes, including

- Memory
- Processing power
- Storage
- Number of compute nodes

For some of these applications, we use the Amazon Web Services (AWS) framework to establish clusters in the AWS Elastic Compute Cloud (EC2). Once we have configured the systems, users can start and stop their custom computing clusters as needed with minimal assistance from information technology specialists. RTI also uses Microsoft Azure to host computing clusters in a similar manner.

Prioritized Data Security

We provide our clients with many critical services, including data security. RTI's corporate network is virtually attached to the top cloud providers, making AWS and Azure offerings available for computing needs at the start of a project. Controlled access, encryption, and other industry-standard security practices are already standard features in most cloud-hosted systems. RTI extends these features with our own Federal Information Processing Standard (FIPS) Moderate-compliant data systems to keep sensitive data protected.

Cloud Migration

RTI has deep experience migrating on-premise data systems into the cloud for federal and international clients. The benefits of cloud computing have become increasingly apparent since the early 2000s; as providers demonstrate their capabilities, RTI quickly responds by adopting the latest cloud technologies into our development stacks. RTI has worked with the Department of Health and Human Services and other federal clients to take advantage of the technological and financial benefits of migrating systems to the cloud.

Project Highlights

Hosting projects in the cloud can provide many benefits. The following examples highlight how RTI is able to take advantage of cloud computing to help our clients save money on IT costs, scale up projects quickly, facilitate collaboration, and manage information efficiently and securely.

LungMAP (National Heart, Lung, and Blood Institute, 2014–present).

RTI, in collaboration with researchers at the Duke Clinical Research Institute, serves as the data coordinating center (DCC) for the Molecular Atlas of Lung Development (LungMAP) consortium. We collect data generated by four research centers and a human tissue core—including various types of 'omics data and 2D and 3D imaging data—and then process, store, and present the data to the public via the LungMAP website. For this project, RTI built an entirely new cloud-based system using AWS. All servers (including development, testing, and production databases and web servers), as well as a server running a sophisticated tool for 3D image exploration, are hosted on AWS EC2 instances. Close to five terabytes of 2D and

3D images are stored and served to the website using the AWS Simple Storage Service (S3). We use AWS Lambda to run scripts for routine tasks, such as server back-ups and recovery. The scalability and flexibility of AWS have allowed us to respond nimbly to the project's evolving needs.

SPARS (SAMHSA, 2016–present).

The Substance Abuse and Mental Health Services Administration (SAMHSA) provides funding to grantees to offer substance abuse and mental health services to clients within their communities. Congress requires SAMHSA to report on grantee performance and the value the funding provides. RTI designed, developed, and maintains SAMHSA's Performance Accountability and Reporting System (SPARS)—the mechanism by which SAMHSA aggregates and reports on performance data from grantees. This project replaces three separate projects that provided performance data aggregation and reporting services, and it provides SAMHSA with a single system to receive and store Government Performance and Results Act data from discretionary funds grants across SAMHSA's three operational centers.

At the core of SPARS is vast cloud-hosted architecture with layers of databases, application servers, and data warehouses tuned to deliver a highly available suite of integrated applications for reporting and analytics. Powerful and immersive SPARS data visualizations

benefit greatly from the cloud-hosted system's flexibility and expandability, providing users and clients with better insight into their study data. Additional SPARS features include an online learning system, multifactor authentication, and an ad-hoc reporting suite made possible by the AWS GovCloud service offerings. Because the cloud is not limited by physical server space, there is always room for expansion. As computing needs for systems like SPARS increase, scaling out requires minimal overhead and lower deployment times.

ECHO Data Analysis Center (Johns Hopkins University, 2017–present).

RTI serves as the data analysis center for the Environmental Influences on Child Health Outcomes (ECHO) study. We provide data harmonization, epidemiology, and biostatistics services to support longitudinal and multilevel analysis. To expand ECHO's analysis capabilities efficiently, we are developing a novel, flexible, and secure data infrastructure to serve as a resource for pediatric health. Partnering with Microsoft, RTI created a privately accessible Azure cloud network, making all of Azure's cloud capabilities directly available to RTI development teams. The private access runs through RTI's proprietary Federal Information Security Management Act (FISMA) Moderate network, and researchers work within this secure network to analyze data in ECHO's data lake and other large-scale databases.



What does it mean to be cloud capable? RTI has migrated several projects to cloud-based environments for clients, including SAMHSA's SPARS, improving reliability and reducing costs.



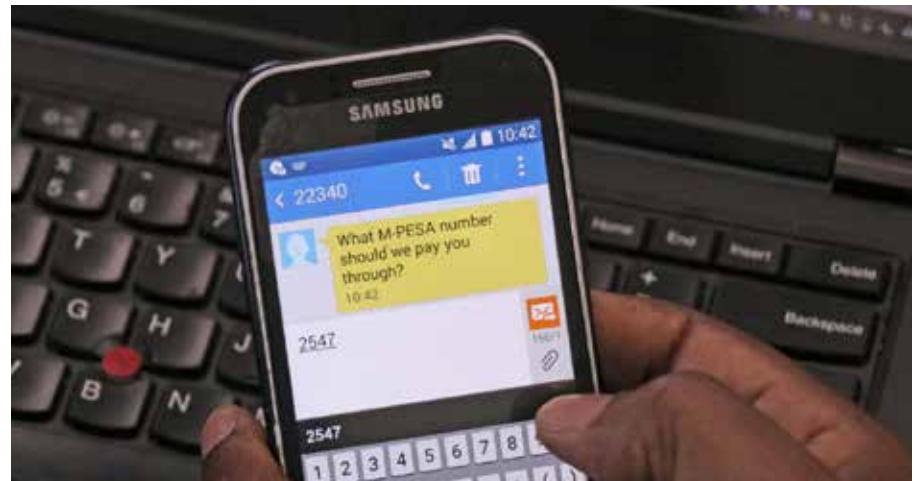
Tusome (United States Agency for International Development Africa Bureau, 2014–present).

Many people who live in countries with widespread rural populations now have mobile phones; therefore, highly available short message service (SMS) systems can provide critical services. Projects such as Tusome (meaning “Let’s Read” in Swahili), designed to improve primary literacy outcomes for 7 million Kenyan children, use the Gooseberry SMS application to accurately and efficiently pay teachers who participate in program trainings. The teachers register via Gooseberry and then receive payment via a mobile money transaction. Systems like this require high availability and uptime, a benefit easily gained with cloud-hosted platforms. Applications such as Gooseberry have nearly unlimited options for failover, redundancy, and availability; additionally, these applications can pay up to 100,000 teachers across Kenya every 3 months. The cloud lets us build sophisticated systems, such as the one RTI created for Tusome, on hardware made available on-demand. Combining rapid deployment capability with low overhead helps projects like Tusome succeed in developing countries that have serious resource constraints.



More Information

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RTI takes advantage of cloud hosting to build sophisticated systems to support projects in countries where mobile phones are the primary gateway to the internet.

¹ Mew, B. (2017, October 12). The digital government path ahead - migration, transformation and automation - diginomica government. Retrieved May 21, 2018, from <https://diginomica.com/2017/10/12/digital-government-path-ahead-migration-transformation-automation/>

² Babcock, C. (2016, April 14). ‘Cloud-first’ to close 5,000 federal data centers by 2019. Retrieved May 21, 2018, from <https://www.informationweek.com/data-centers/cloud-first-to-close-5000-federal-data-centers-by-2019/d-d-id/1325103>

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