

Strongbridge Cloud Engineering Series

COBOL To Cloud Bridge™ - An Innovation in Cloud Migration

Executive Summary - Whitepaper

June 2019



Solutions for Application Modernization

Strongbridge Quick Facts:

- *Innovative small business, 14 years supporting government IT*
- *Cloud migration specialists*
- *AWS and Microsoft Partners, with certified staff*
- *CMMI Level 3 for development (DEV) and services (SVC)*
- *ISO 9001:2015 – Quality Management*
- *ISO 20000-1:2011 – IT Service Management*
- *ISO 27001:2013 – IT Security Management*

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COBOL's Use In Government Systems

*“Legacy IT investments across the federal government are becoming increasingly obsolete. Specifically, many use outdated languages and old parts. Numerous old investments are using obsolete programming languages. Several agencies reported using **Common Business Oriented Language (COBOL)**—a programming language developed in the late 1950s and early 1960s—to program their legacy systems. It is **widely known that agencies need to move to more modern, maintainable languages**, as appropriate and feasible.”* – Government Accountability Office (GAO)

As a whole, the government uses a large and diverse portfolio of IT applications to support its missions and, as GAO has reported, many of these applications including the systems and infrastructure that support them are as old as 50 years. They include millions of lines of code of COBOL and JCL. These older applications and their supporting infrastructure impose an enormous ongoing maintenance burden on these government organizations, and use up limited resources in O&M budgets, leaving too little for future development, modernization, and innovation. The government's ongoing use of COBOL for mission critical systems is problematic for several reasons:

- **Diminishing Staff Resources** -The staff available to do mainframe COBOL work are scarce, costly and a diminishing market resource that is only becoming more expensive over time. Hourly rates for this skill are unnecessarily high as compared to other, more modern languages.
- **Operational Expenses** – The operational expenses of legacy mainframe platforms continue to rise and their fundamental architecture, envisioned many decades ago, conflicts with modern approaches for frictionless horizontal resource scaling found in today's cloud ecosystems. Any attempt to leverage *pay-as-you-go* cloud services from the code operating in the mainframe is an awkward and brittle integration at best.
- **Tooling** - Modern Integrated Development Environments (IDEs) and Continuous Integration / Continuous Development (CI/CD) toolsets extend the reach of programming teams to do much more within the same set of development team working hours. Generally, tooling for legacy COBOL environments has not kept pace with platform-as-a-service (PaaS) offerings in contemporary clouds.
- **Policy Compliance** – Federal and State policies consistently direct application system stakeholders to modernize to today's runtime platforms, with enterprise services, pay on demand models, lower infrastructure unit costs, and cloud infrastructure resources.

For these reasons, modernization to newer languages, computing architectures, and contemporary labor-saving development tools will provide many benefits for the government. This whitepaper examines how to approach such a modernization, defining a technical and procurement solution to modernizing government COBOL capabilities in an incremental manner that lowers program risk and drives down costs.

Modernization Objectives and Characteristics

Strongbridge has developed our innovative *COBOL to Cloud Bridge™* solution for government organizations who recognize the need to modernize, and who want to lower program risks and costs during the modernization. Our COBOL modernization solution has the following characteristics:

- **Functional equivalence** - One of the primary objectives of the modernization effort is that the application produce the same functional results as the original program. The application often has decades of proven business rules and statutory compliance incapsulated in the old COBOL code and it is essential that those business rules are correctly transitioned.
- **Secure** - Our approach supports cloud runtime environments that are certified as FedRAMP Moderate or FedRAMP High. Studies have shown that cloud ecosystems with comprehensive security control coverage and continuous monitoring are more secure than legacy architectures. It has been suggested by legacy system proponents that the upside of COBOL obsolescence is that systems can be 'too old to attack', but this logic is not supported by the new research.
- **Incremental** - Our *COBOL to Cloud Bridge™* solution incrementally moves legacy COBOL jobs and logic

Strongbridge LLC – Modernization: Innovation with COBOL To Cloud

from the mainframe environment to market leading cloud infrastructure, using microservices frameworks, such as AWS Lambda or Microsoft Azure Functions. We are Partners with AWS and Microsoft and have certified staff in both clouds to lower migration risks. We work side-by-side with stakeholders and owners to develop an Agile backlog of capabilities and user stories to move to the cloud and execute that move with team-based Agile sprints, using a comprehensive toolset described below. With the Agile method the customer can see project progress throughout the process.

- **Migration – Function Decomposition** - Our solution decomposes parts of an overall process flow and re-works that portion of the process to operate in a secure cloud. We find that many projects are too large to move in one effort and there are benefits to working with stakeholders to decompose large efforts. Decomposition lowers project risks.
- **Public or Private Cloud** – We are cloud-native developers and we will target the desired runtime environment for the migration to be the cloud ecosystem selected by the customer.
- **Maintainable and Modern** - In the cloud we use object-oriented code, such as Java or .NET C# to replace logic to match capabilities that formerly were achieved on the mainframe. The resulting new code in the migrated system will follow object-oriented concepts and the resulting benefits that object-oriented language bring, such as inheritance and class-based objects. Since human coders are at the heart of our solution, strong software engineering principles such as encapsulation, loose coupling, and abstraction are present in our resulting designs. These are qualities that no automation-only solution has been able to achieve. One of the benefits of our approach is that we will eliminating dead code in the code base as we move through the migration process. Similarly, as we build up classes, we will consolidate duplicate code to shrink the code base and increase maintainability of the project.
- **Leveraging Pay As You Go Cloud Services** – The services we employ (e.g., cloud processing, storage, etc.) are used with published rates from the cloud service providers (CSPs), provisioned on demand, and are only charged when they are in use.
- **Staffing Skills** – Our solution uses IT skills that are contemporary (e.g., Java or .NET programming, cloud computing) and will ease the burden of staffing maintenance efforts in the future.
- **Serverless Deployments** – Many of our implementations are serverless, meaning there is significantly reduced server infrastructure for the customer to operate, administer, patch, or maintain. Serverless deployments help the government leap-frog into a modern cloud architecture with no server operating system to license or manage.
- **No Run Time Licensing Payments** – The resulting object-oriented code (e.g., Java or C#) in our conversion project is the property of the customer. There are no run-time fees or licensed components from Strongbridge associated with the new migrated application.

[Legacy Operations](#)

Some mainframe processing is job-based, with each job working with a data store or a file to produce the next logic step in a complex business process. The job can represent a task such as a query of a data store or a master file, or the creation of an extract or a subset of the larger data store to get a working set of data to address a particular business use case at hand. Often a series of these operations is developed over time to address evolving reporting requirements, statutes, or leadership queries.

Our approach focuses on migration of jobs-based mainframe capabilities to cloud operations. We do this by breaking apart the larger solution, which is often implemented in millions of lines of code and dozens of jobs, and using single jobs as beginning demarcations of definable business process functions. We work with the government staff to prioritize and select a mainframe jobs for migration. We have unique tools to analyze the COBOL source code that comprise the jobs and look for replacement library functions available in the target language (e.g., Java) and the target ecosystem (e.g., AWS GovCloud). While we leverage tools to the maximum, we do not use fully automatic code converters, so the new code produced has the structure, readability, and maintainability that human coders produce.

Modernization Tools – Extending Team Efficiency

On a modernization project, the right tools are a force multiplier, allowing our DevSecOps teams to do more, and at a greater speed. We have assembled an end-to-end tool suite of **commercial and custom-created tooling**, that we apply to automate build and testing steps to save team labor hours and make outcomes highly predictable. Some tools are language specific where we start to look at topics such as coding style and static code analysis. Our tools include an Integrated Development Environment (IDE), mocking frameworks, regression test suites, source code collection analyzers, microservice testers, CI/CD tools, coding style checkers, static code analyzers, and security deployment scanners.

Rapid Prototyping with BridgeUI™ – To accelerate migration, we create custom tools and augment commercial tools. As an example, for process steps with user facing browser interfaces, we have developed a unique custom tool which allows us to work interactively with government stakeholders and build out the UI/UX. This tool automatically generates AngularJS code as the screens are defined. BridgeUI™ allows our cloud engineers to quickly build UI/UX browser-based screen interfaces while working with project teams and turning those prototypes into code and runtime executables. BridgeUI™ uses AngularJS to create a client-like experience in a browser that is efficient to load across the network. The government can see the interrelationship of the visual components and the UX that users will see deployed.

Combined with the innovative, end-to-end CloudBridge™ series of tools, BridgeUI™ will accelerate your migration.

A Legacy COBOL Migration Example – Department of Housing and Urban Development (HUD)

We are successfully migrating COBOL-based applications to the cloud today. As a subcontractor to Salient CRGT, Strongbridge is migrating a large-scale, legacy COBOL system to the Microsoft Azure cloud. The Computerized Homes Underwriting Management System (CHUMS) supports the HUD Single Family organization and enables HUD/FHA to process applications for HUD mortgage insurance and respond to inquiries regarding applications and insured mortgages. Strongbridge is supporting the CHUMS modernization as an initial Technology Modernization Fund (TMF) project. The Modernizing Government Technology (MGT) Act established an initial \$100 million allocation for the TMF in fiscal year 2018. HUD received \$20 million from the TMF to migrate its UNISYS mainframe systems to the cloud and we are on the team to implement that goal.

Application of Simplified Acquisition

The iterative, DevSecOps work structure for the *COBOL to Cloud* migration activity, and the structure of our approach naturally lends itself to the use of simplified acquisition procedures or modular contracting techniques under FAR Part 39. Members of the Strongbridge staff have completed training on the use of rapid acquisition techniques, including our completion of training in the use of innovative contract procedures hosted by the DHS Procurement Innovation Lab (PIL). We are fully prepared to adopt and work within these procedures to swiftly complete project milestones and deliver migrated solutions.

Who is Strongbridge?

Strongbridge is an innovative small business with more than 130 employees and 14 years of government IT experience with market-leading cloud-native development experience. We are experts in developing, operating, and enhancing complex government software systems in secure cloud ecosystems for nationwide use. We specialize in applying innovative technology to mission essential environments that require high availability, precision, accuracy, and reliability. We invest in well recognized quality processes and certifications to ensure our clients' success, such as the **Capability Maturity Model Integrated (CMMI) Level III** for software development (DEV) and Services (SVC), our **ISO 9001:2015** corporate Quality Management System (QMS), our **ISO 20000-1:2011 IT Service Management** processes, and our **ISO/IEC 27001:2013 IT Security Management** processes. These independent certifications provide assurance that our management and technical processes are documented, reviewed, and audited, resulting in continuous improvement to all of our technical services.