FAA Cloud Computing Strategy

By Eric Carlson, TASC System Engineer

Alex Reyes, TASC Senior System Engineer

Ahmad Usmani, FAA Manager of Enterprise Programs

The Need

Cloud computing provides a new way of acquiring and delivering computing resources (infrastructure, platform, and software). Organizations around the world are under intense pressure to accelerate innovation and optimize Information Technology (IT) costs. Senior leaders are being asked to find ways to do more with less. Government agencies, the aviation industry, and the Federal Aviation Administration (FAA) are no exception. In the IT arena, critical pain points include escalating operations and maintenance costs, underutilized infrastructure, and inability to satisfy business agility demands. To address these issues in the Federal Government, the Office of Management and Budget (OMB) developed the “25 Point Plan to Reform Federal Information Technology Management” and as part of the plan, established the “Cloud First” policy that requires Federal agencies to evaluate and consider a safe, secure and reliable cloud computing option before making new investments. It is in this context that OMB asked the FAA to develop an FAA-wide cloud computing strategy.

Approach and Challenges

In response to the OMB directive, the FAA assembled a small team to develop an appropriate Cloud Computing strategy relevant to its two major domains: the National Airspace System (NAS) and the non-NAS. The team adopted an approach that consists of the following activities:

- Identify stakeholders, direction, and purpose of strategy
- Identify benefits to the FAA
- Identify risks to the FAA
- Articulate a vision, assuming all risks could be overcome and funding made available when required
- Define goals to support and enable the vision

These steps are not sequential and were performed iteratively in collaboration with the stakeholders.

The initial challenge was to define the intent, scope, level of technical detail for the strategy document, and align these with OMB’s goals and expectations. The team identified as a priority the need to communicate cloud computing possibilities and potential impacts of this technology to the mission and goals of the Agency. Their approach was to meet with key stakeholders to help each organization understand how cloud computing could be utilized within the agency, and get feedback from the stakeholders on their views of possibilities and any concerns that would hold them back from utilizing this technology. The team identified stakeholders across FAA organizations including finance, procurement, and multiple IT groups and organizations. These are shown in Figure 1. Interactions with various stakeholders helped to identify the key questions to be answered by the FAA Cloud Computing Strategy, which included: benefits, risks and

www.atca.org
challenges, goals/vision/intent, and ideas for enabling cloud computing. The team, in collaboration with business and IT stakeholders, decided the FAA Cloud Computing Strategy should define and communicate a unified FAA’s direction and strategy on cloud computing, and serve as a communication vehicle within the Agency and with external organizations, but not define, prescribe or constrain any particular technical design approach, plan, or solution.

With a clear idea on direction, purpose and scope, the strategy team collected information and developed specific concepts to define the FAA’s strategy. The team confirmed that any cloud computing capability identified to support the NAS environment – which today meets extremely high safety, security, and reliability requirements – must not introduce unnecessary levels of risk to the NAS environment.

Based on potential risks from cloud computing, the team determined that the cloud computing technology adoption by the FAA would be a risk-based approach supported by solid engineering that balances requirements, schedule, and cost. The team also determined that the strategy requires a comprehensive approach and should follow the process identified in Figure 2.
The circled arrows in the middle of the figure represent the cloud computing service lifecycle, from strategy and service conception, to the activation, migration, and operation of the cloud services. The small clouds around the circle identify the technical and management practices and disciplines to be revised including Governance, IT Planning, Acquisition Management System (AMS), Organizational, Enterprise Architecture (EA), and Security to enable the cloud service lifecycle. The team analyzed each one of these practices and disciplines to identify necessary changes to enable cloud services. For instance, acquisition practices need to support cloud services, EA needs to incorporate cloud elements into the target architecture, and security approaches need to incorporate protection specific to cloud computing security risks. The AMS Lifecycle is the FAA’s Acquisition Management Process; it also must be adapted to support cloud computing. It needs to both support the FAA’s acquisition of cloud computing capability as well as support offering that capability as Government Furnished Capability (GFC) to future FAA development contractors.

Another challenge for the team was to capture and incorporate NAS and non-NAS requirements for cloud computing. The FAA’s NAS and non-NAS systems have different imperatives, objectives, and characteristics and are represented by two different enterprise architectures. The NAS is characterized primarily by real-time, safety-critical operations, and it is supported by a restricted Federal Telecommunications Infrastructure (FTI) network. The non-NAS supports regulatory and administrative functions; it is characterized by non-safety critical support functions and operates on the FTI Mission Support Network. Given these differences, the team determined that, at a tactical level, the FAA would likely need two different implementation and execution approaches aligned with one unified FAA Cloud Computing Strategy that would properly address different criticality and sensitivity levels of NAS and non-NAS systems.

The FAA Cloud Computing Strategy

Using the approach described, the team developed the FAA Cloud Computing Strategy. The next paragraphs describe benefits, risks, vision, goals, and implementation approach captured by the team in the FAA Cloud Computing Strategy document.

It’s Never Too Early to Start

Get involved today!

ATCA’s Young Aviation Professionals

knowledge. exposure. relationships.
www.atca.org/youngprofessionals
The FAA’s Cloud Computing vision is to:
*Identify and migrate suitable IT services to a cloud computing environment to reduce costs and increase IT provisioning speed, while ensuring that FAA Air Traffic Control and Management systems maintain their current high levels of safety, security, reliability, and performance.*

The FAA’s strategy on cloud computing establishes five foundational Agency goals to enable the vision and capture potential benefits:

- **Goal 1:** Adopt an FAA-wide approach to cloud computing. Define and adopt a comprehensive approach to identify, evaluate, select, migrate, and operate cloud services.
- **Goal 2:** Define and develop an FAA Cloud Computing Architecture and integrate it into the FAA’s Enterprise Architecture (EA). The FAA EA will be expanded to incorporate cloud computing architectural elements as required.
- **Goal 3:** Develop a cloud computing program implementation strategy. The FAA will ensure that all relevant processes and policies support cloud computing program adoption as required.
- **Goal 4:** Increase the efficiency of current and future IT investments. Ensure that potential benefits are captured and measured throughout the FAA lifecycle.
- **Goal 5:** Manage technical and management risks and support FAA transition to cloud services.

The FAA’s cloud computing vision and goals are illustrated in Figure 3.

The team also identified key success factors for the implementation of the strategy, shown in Table 1.

### Table 1. Key Success Factors

| FAA-wide scope, owned, driven and supported by senior FAA executives; an FAA-wide perspective to take advantage of economies of scale, avoid the creation of IT silos |
| Implementation that has measurable value, is practical, and demonstrates value and benefits including cost efficiency early in the cloud adoption and migration process |
| Incremental implementation to manage risk |
| Collaboration across FAA organizations and programs. The adoption of cloud services has the potential to impact all elements of the FAA organization including those with responsibility in systems engineering, the AMS life cycle, enterprise architecture, information security, software development, and program management |

**Figure 3.** Identify and migrate suitable IT services to a cloud computing environment while ensuring Air Traffic Communication (ATC) and Air Traffic Management (ATM) systems maintain their current high levels of safety, security, and performance.
Lessons Learned

Developing the FAA’s cloud computing strategy leads us to several recommendations for others who may face a similar challenge:

- Focus the strategy on the mission and goals of the organization. Measure the impact of benefits and risks to support and enable organization’s mission and goals. Any technology adoption is probably not worth it if it presents a disproportionate level of risk to the organization.
- Define the purpose, scope, and audience of the strategy early on. It will drive the content and requisite level of technical and management detail.
- Use a holistic and comprehensive approach that is open to all parts of the organization.
- Set realistic expectations. Despite the hype and compelling potential opportunities, cloud computing is still evolving and maturing – there are critical risks to evaluate and analyze.
- Look beyond the obvious cost benefits for impacts to the organization, as a whole. Initial benefits on cloud computing are focused on cost savings, rapid provisioning of IT services, flexibility, and scalability, but there are also additional potential benefits that can support and enable interconnected operations, information sharing, data analytics, mobile and wireless technologies, and more.

Cloud Computing Assessment Tool

To determine the suitability of a program, system or component for a cloud environment, the team developed a Cloud Computing Suitability Tool to produce a quantifiable deter-
mination of cloud computing readiness based on a number of weighted factors.

The tool is designed to be part of an interactive process with the stakeholders to identify the systems, components or environments that would benefit moving to a cloud computing environment. Interviews with senior leaders and managers will provide the strategic context to calibrate the tool's ratings and define scope based on potential risks and impacts to Agency mission and goals. For instance, a system may be excluded if senior leaders or managers determine that cloud adoption represents too much risk to the Agency or it does not comply with existing rules and regulations. Interviews with individual programs and organizations will perform a more granular level assessment including individual systems, components and environments as required. A cloud computing solution, for example, might not be suitable in its entirety for an organization unit or program but might be suitable for its sub-systems, components or smaller environments. In summary, the tool is not intended to provide a binary “yes or no” cloud determination. Instead, it supports the overarching risk-based process to determine cloud technology adoption.

Next Steps

With the recent approval of the FAA Cloud Computing Strategy by FAA senior leadership, the FAA is now in the process of executing the strategy. The team has started conducting a cloud computing assessment across the NAS to identify opportunities for the application of cloud computing.

The assessment of the NAS is taking place with both a horizontal (across programs and organizations) and vertical (across IT environments and components) comprehensive assessment of opportunities across the Agency including infrastructure, platform, and software services. Programs are being assessed for cloud computing application at each stage of the FAA acquisition life cycle. This approach is illustrated in Figure 5.

The team is developing a concept of operations document to describe the proposed target state and relevant requirement elements to enable the target state incorporating cloud technologies in the NAS. Additionally, the team recognizes the importance of education and they will facilitate communication and knowledge-sharing sessions to ensure cloud computing benefits and opportunities are understood by all NAS program managers and stakeholders. The FAA Cloud Computing Strategy can be found under “Cloud Computing” in the “Documents” section of the SWIM Website at http://www.faa.gov/nextgen/swim

Reference

1 Co-authorship by an FAA employee does not imply an endorsement direct or implicit by the FAA of the information contained in this article.