TOMITRIBE CASE STUDY

National Aeronautical & Space Administration

APACHE TOMEE, A SUCCESSFUL OPEN SOURCE MIGRATION JOURNEY FOR NASA

The National Aeronautics and Space Administration (NASA) is the United States government agency that is responsible for civilian space program, aeronautics and aerospace research since October 1958.

> **" APACHE TOMEE MEETS THE REQUIREMENT AS A DATA MANAGEMENT SOLUTION."**
>
> **Armstrong Flight Research Center NASA Software Architect**

KEY CHALLENGES

- Scattered data sources: flight, aircraft, weather, engineering, and logistical data

- Forced product obsolescence by the vendor in lieu of newer product

- Upgrading solutions would necessitate a rewrite of the SOFIA Flight Portal

- Budget pressure on the Armstrong Flight Research Center

- Vendor proprietary solutions were no longer an option

PROJECT

NASA's SOFIA Program is an observatory mounted in a Boeing 747SP aircraft. The aircraft flies with a door open, behind which is housed a 2.5-meter reflecting telescope. SOFIA makes transatlantic and transpacific flights from California, Germany, and New Zealand, studying the universe with its unique infrared instruments.

CHALLENGES

NASA developed the SOFIA Flight Portal in-house against a closed source proprietary application platform. The solution needed to centralize flight, aircraft, weather, engineering, and logistical data which was scattered across various systems. Unifying these systems into a single data management system was critical and a major priority for the SOPHIA Flight Program.
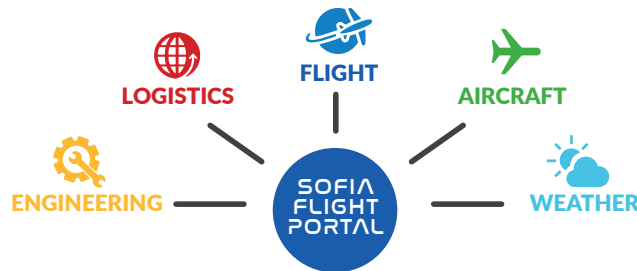

Figure 1: SOFIA Flight Portal - centralized data management system

The original application server was not performing optimally and was being forced into obsolescence by the vendor in lieu of their newest solution. This would necessitate a rewrite of the SOFIA Flight Portal. To further complicate the matter, the vendor was no longer offering support for the aging application platform. Transition to the latest solutions would mean increased costs for license and support.

The issue became complicated when the federal research budget for the SOFIA Flight Program was reduced in 2008; the NASA Armstrong Flight Research Center and the SOFIA Flight Program now had both a technical and a budget issue. This meant that proprietary vendor solutions were no longer an option.

SOLUTION

Caught between budget restrictions and forced obsolescence, the NASA software team searched for a cost-effective solution. The Apache Tomcat servlet container could provide basic container services, but it lacked support for other vital services. The NASA team discovered Apache TomEE. It is an open source product that offered similar APIs as the previous proprietary vendor product, but in a standards compliant manner.

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PLATFORM MIGRATION

The NASA team converted the SOFIA Flight Portal code base to standards compliant Java EE code using Apache TomEE. The conversion involved removing proprietary application program interfaces (APIs) from the code base. The process was smooth and took about three (3) months for a complete migration of services.

Figure 2: NASA SOFIA Flight Portal Migration timeline

OUTCOME

The Software Architect and team for the SOFIA Flight Portal, now powered by Apache TomEE, won an Exceptional Space Act Award in 2015. This award highlights outstanding achievements by NASA employees and contractors for creating projects of great value to the organization.

The SOFIA Flight Portal has been up and running smoothly on TomEE since September 2013. The use of Apache TomEE is spreading; other NASA teams and interns are able to use and develop on TomEE with ease.

BENEFITS

The Apache TomEE platform provided NASA with all the required services. In addition to fulfilling technical and budgetary requirements, TomEE yields faster development cycles, uses less memory, and provides faster startup times. It increased the mean time between system restarts from days to months.

TomEE has the advantage of being Apache Source Licensed, which is a very business friendly license. The Apache Source License does not have viral clauses that plague other open source licenses.

TomEE, with its standards-based and cross platform nature, allows the SOFIA team the ability to deploy code anywhere. While the previous vendor only supported their own operating system, TomEE is thoroughly tested and used on many operating systems by thousands of users worldwide.

LOOKING AHEAD

TomEE is an extremely effective application platform by technical and financial measures. Eventually, TomEE may run "in the clouds" onboard the aircraft so pilots and crew may use their tablets to view live mission data.

BENEFITS OF ADOPTION

• Improved performance, startup times, and average time between restarts after switching to TomEE in September 2013

• Migrating to TomEE meant application portability and release of proprietary vendor API dependencies

• Future proofed the SOFIA Flight Portal - NASA can now run on any platform and operating system of choice

• TomEE gives reliability and stability to the SOFIA Flight Portal, allowing NASA teams to focus on performing science