

Aircraft Service Application Case Study

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April 2021

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This material is based upon work funded and supported by the Department of Defense under Contract No. FA8702-15-D-0002 with Carnegie Mellon University for the operation of the Software Engineering Institute, a federally funded research and development center.

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This report was prepared for the SEI Administrative Agent AFLCMC/AZS 5 Eglin Street
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Aircraft Service Application Case Study

Background

The maintenance records for aircraft are much more involved than those for consumer products familiar to most people. First, every aircraft is different: even airplanes that have the same model number may have been built with parts from different suppliers. For example, if two airplanes with the same model number were built at different times, the manufacturer might have changed suppliers for some parts. Also, every aircraft has highly regulated intervals for service: when only one of the propellers on a two-propeller airplane is replaced, the amount of time each propeller has spent in flight must be tracked so that inspections and replacements can be done at the proper times.

Therefore, the records for a plane include model and serial numbers of the airframe, each engine, each propeller, each rotor, and so forth. The records include the date when each part was installed, inspected, or serviced, and the name of the person who certified that the work was done properly.

When servicing an aircraft, the people doing the work are given checklists of the tasks that must be done. The person overseeing the work must have the proper certification for doing that particular task and must sign off at the end stating that the work was done correctly. Also, many organizations consider their aircraft records to be confidential. These records are available to regulatory agencies, but companies do not want their competitors or the general public to know the details of their maintenance policies and procedures or details about their individual aircraft.

Periodically, updates to checklists or maintenance policies are made. This usually happens in response to an accident—to help determine an appropriate way to prevent a similar accident from happening again.

Case Study Overview

Maintenance of aircraft is extremely important. If something goes wrong in an aircraft during flight—an engine catches fire, for example—the results are often catastrophic. As a result, there are many procedures and regulations concerning how aircraft must be maintained. In this scenario, our organization intends to develop an application for Apple iPads¹ to help create and maintain aircraft maintenance records. Our “Service Application” will replace older systems that were both expensive and error prone.

Student Instructions

Typical Use Case

A typical use case for our application is as follows:

A maintenance crew checks out one or more iPads at the beginning of its shift.

¹ iPad is a trademark of Apple, Incorporated.

The crew consults the Service Application, which displays a list of tasks that must be completed. Crew members are not expected to complete all of the work tasks during their shift—the time taken to do maintenance can vary, and so they do as much as they can during their shift, after which the crew on the next

During a service task, the Service Application shows the crew the maintenance records for that plane, the instruction manuals for doing that particular task, and the correct checklists.

Upon completing an item on the checklist, a crew member must take some action (such as pressing the correct button on the screen) to confirm completion of that item. Sometimes checklist items require information such as the serial number of a part that replaces an old part.

Crew members can take photos of their work using the iPad camera and attach them to the service records.

When a task is complete, the Service Application requires the person responsible for the task (who must be properly certified) to sign off to verify that the task was done correctly.

Sometimes completing a task results in the creation of a new task. For example, an inspection may determine that a part must be replaced. The Service Application supports this scenario.

When their shift is over, the maintenance crew members return the iPads that they used.

The organization's main database of aircraft records is updated as service is completed.

System Description

Some key architecture decisions have already been made, as described below.

Our organization's data center will host:

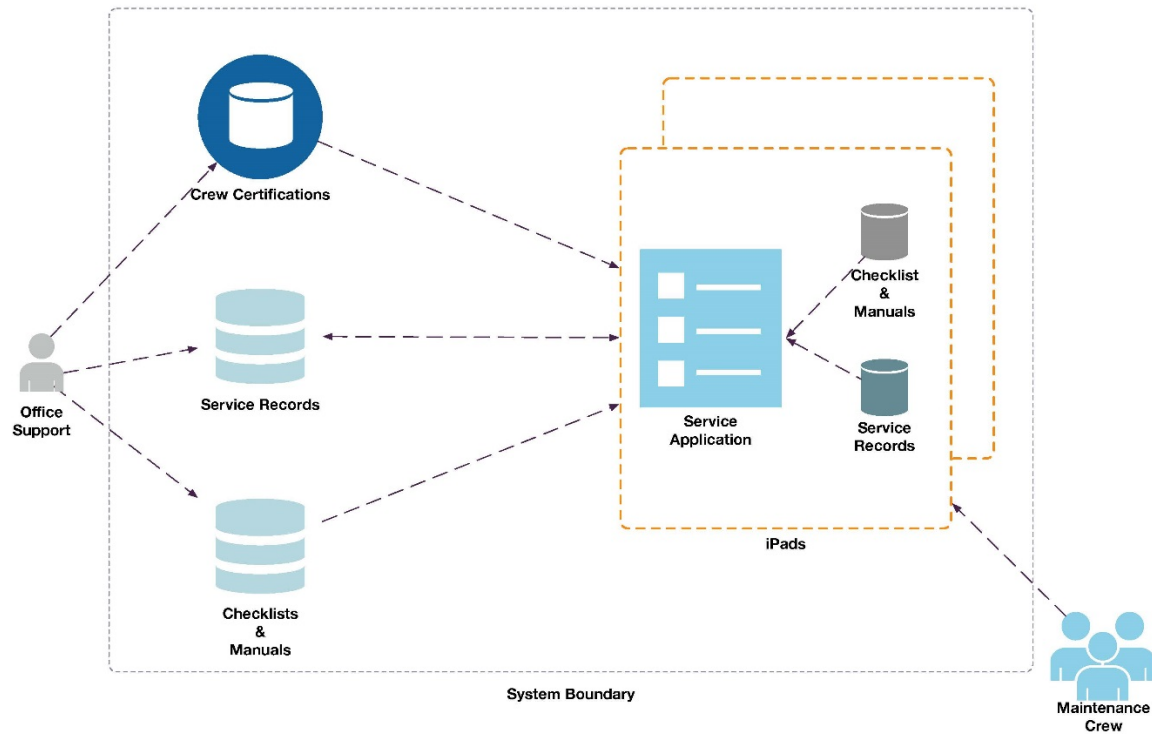
- the database containing all the service records for our aircraft (This database already exists: the Service Application will have to accommodate records that are created by legacy systems. Also, we won't be able to simultaneously replace our existing maintenance system, so even when the Service Application is being used, some people will still be using the older systems.)
- the master database of all the service manuals and checklists for all the equipment used by the organization
- the database of the certifications held by our service people

The iPads themselves will be Wi-Fi enabled, and Wi-Fi will be available in the organization's offices. However, Wi-Fi availability is not guaranteed out on an airport field or inside an aircraft's engine. Our Service Application will be installed on the iPads.

Because the iPad does not have enough storage capacity to hold all of the service manuals and checklists in the organization, the Service Application will provide only the manuals and

checklists that are needed. Similarly, an iPad cannot hold all the service records for all the organization's aircraft, so the Service Application will provide only the pertinent records.

Figure 1: Overview of Service Application



Instructor notes

None at this time.

Example solution

None at this time.

References

Mead, N. R., Shull, F., Vemuru, K., and Villadsen, O. 2018. A Hybrid Threat Modeling Method. Carnegie Mellon University Software Engineering Institute.
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