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## Reduce Single Point of Failures for a Ship's System

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Monterey, California. Naval Postgraduate School

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NAVAL RESEARCH PROGRAM  
NAVAL POSTGRADUATE SCHOOL

**MONTEREY, CALIFORNIA**

Reduce Single Point of Failures for a Ship's System

Report Type: Final Report

Period of Performance: 10/01/2016-01/31/2017

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Prepared for:

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Research Sponsor Organization (if different): N/A

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## **NPS NRP Executive Summary**

Title: [Reduce Single Point of Failures for a Ship's System]

Report Date: [15/03/2017] Project Number (IREF ID): [NPS-N16-N572-A]

Naval Postgraduate School / School: [GSOIS/Computer Science]

### **EXECUTIVE SUMMARY (3-5 PAGES, 600-800 WORDS)**

#### **Project Summary**

The project aimed to look at various ways to alleviate the failure points in a ship's network. The sponsor gave several options and the NPS team focused on 2 challenges, namely Database (DB) failover, and the use of virtualization for mobile device use.

Keywords: Database Failover, virtual pc, mobile devices.

#### **Background**

A ship has a full-fledged IT (information technology) infrastructure that needs to be updated and maintained. While land based systems are well connected to high speed networks, while the ship has to rely on slower speed satellite networks. So when a ship is out in the sea for months land based systems get constant software updates and security patches, thus managing to stay current. Replacing hardware on a ship is far more challenging given its deployment away from land. In spite of these limitations a ship has to be fully functional (always) and needs to meet the challenges of its designated role.

The student theses focused on the use of technology to keep the ship's IT infrastructure up and running, while requiring minimal human intervention.

#### **Findings and Conclusions (to include Process)**

Navy has a software license for the Oracle Database and uses it extensively to conduct its IT business. Every ships network and IT infrastructure includes a DB at the very least. If the DB fails then key functions are disrupted. The first thesis topic focus was on Oracle Data Guard (vendor solution) to ensure uptime even when there is a failure, and the ability to recover seamlessly. The fundamental aspect of the technology uses 2 or more DBs that are always mirror of each other. The thesis showed that it is possible for an IT professional to setup this technology, and maintain it for support of IT systems. A few tests were implemented to mimic real world scenarios.

The DB Thesis showed that the vendor technology does work and is not out of the realm of a Navy tech professional to support and maintain. This gives the Navy some confidence to try it on a ship on a test basis.

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The next thesis focus was the use of mobile devices for online training requirements. Normally training is done using dedicated desktops, this puts a limit on the efficient usage of resource and time, while most sailors have their own mobile devices, using it for training poses a security challenge. The thesis looked at technology from VMWare known as Horizon View that lets one create a secure virtualized PC that resides on the ship's network, which can be accessed via a thin client from a CAC card enabled mobile device. The ideas from this thesis were also applied to a Marine Net eLearning study.

The thesis looked at various mobile devices using cost as a factor and tested the effectiveness of using a mobile device for training. Network speeds were measured using tools to provide a basis of comparison. The results did show the efficacy of using CAC enabled devices with the virtual PC technology, thus meeting the security and lower costs goal.

### **Recommendations for Further Research**

There were many questions at the outset and only 2 were researched, so as a next step researchers can consider the other questions also. The suggested solutions from the 2 theses would gain validity if tested in a real ships network. Technology is in a constant state of flux and these very same questions could be researched with newer hardware and software.