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Virtual Recruit Tracker (VRT) and Delayed Entry Program (DEP) Management and Training Tool

Phase 1.0 – Interim Report

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Naval Air Warfare Center Training Systems Division (NAWCTSD)
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Executive Summary

While waiting to begin recruit training, the preparation and training of Future Sailors are critical for: (1) maintenance of continued motivation, (2) mental and physical preparation to reduce attrition in the Delayed Entry Program (DEP) and at the Recruit Training Command (RTC), and (3) continuous screening of appropriate enlistment criteria in order to maintain eligibility. There is potential for Future Sailors to strengthen their commitment to the Navy as they prepare, through a learning process, for recruit training.

A Virtual Recruiting effort was piloted within select Navy Recruiting Districts (NRDs) in January of 2015. The goal of Virtual Recruiting is to gain efficiencies in production while at the same time reducing the physical recruiting footprint – fewer recruiting stations, less recruiter physical presence in some areas, and less physical contact with Future Sailors while in DEP. Since the pilot began, the recruiting footprint has been reduced in both large cities and remote locations. The results of an independent study performed by NAWCTSD’s Manpower and Studies branch are published in the *Virtual Recruiting Analysis and Process Development Study: Final Report*, available at <http://www.dtic.mil/dtic/tr/fulltext/u2/1047005.pdf>.

A challenge within a Virtual Recruiting paradigm is DEP training. For all the reasons listed above, this is one of the most critical times to maintain contact with Future Sailors as they wait to begin their transition to becoming a Navy Sailor. Consistent contact and tracking of their learning progression are crucial, and with limited physical interaction, it is believed that the likelihood of attrition from DEP increases. New methods (primarily virtual) of interaction and engagement must be explored and tested for effectiveness.

In an initial phase (Phase 1) of prototype development (Fiscal Year 2018), NAWCTSD has:

- 1) Further developed an existing Navy-owned mobile application (eHelm) to function on multiple mobile platforms (i.e., Android, iOS, and Windows).
- 2) Uploaded eHelm to Apple’s test environment (Test Flight) for downloading the mobile app to mobile devices.
- 3) Developed a Content Packaging Application (CPA) for building training content packages that are remotely pushed to the mobile app.
- 4) Provided inclusion of initial DEP Personnel Qualification Standards (PQS) as well as various training evaluations in a DEP content package for eHelm.
- 5) Developed a Management Component (MC) for recruiting professionals to verify and manage DEP training activities for Future Sailors.
- 6) Developed a tokenization method to anonymize and de-anonymize Future Sailor data collected by eHelm.
- 7) Implemented a user-friendly process for Future Sailors to link the mobile application running on their personal device (phone, tablet, or computer) to their Navy recruiting record within Navy recruiting databases using a Quick Response (QR) code generated by the MC.
- 8) Acquired smart devices (e.g., tablets, phone, and wearable fitness trackers) for functional, qualitative, and usability testing.
- 9) Begun exploring the concept of utilizing wearable fitness trackers and associated software.
- 10) Gained commitment from the Navy Talent Acquisition Force (NTAF) and NRC’s Warrior Challenge Community to utilize Future Sailors for pilot testing the Virtual Recruit Tracker (VRT) system.

The initial deliverables include system requirements documentation, a software prototype of the VRT (containing the MC, mobile application [eHelm], CPA, an anonymized communications layer between the mobile application and the MC, and a cloud-based storage), a notional and experimental dataset of Future Sailors, and this explanatory interim report.

In the follow-on phase (Phase 2), NAWCTSD proposes (1) further development of the mobile application to include advanced training content, (2) additional knowledge assessments, (3) enhanced evaluation content, along with all associated documentation (results and recommendations), and (4) testing the system with recruiters and Future Sailors from a local recruiting station. Most important is the transition of the VRT prototype to NRC’s information technology staff (NRC N6) for production, maintenance, and use by recruiters and Future Sailors to manage DEP training.

Figure 1 depicts a graphical overview of the VRT system to include the MC (recruiter interface), Mobile App (Future Sailor interface), and the interaction between the two.

Figure 1: Graphical Overview of VRT System



Study Overview

After completing an initial study of Virtual Recruiting, NAWCTSD proposed the development of a prototypical virtual recruit tracking and training tool (the VRT system) that will (1) provide Future Sailors with the necessary PQS training content (including fitness reporting) available to them in the DEP, (2) track their receipt and engagement with training information, and (3) validate continuous high-velocity learning while in the DEP.

The performers are NAWCTSD analysts, software developers, Instructional Systems Designers (ISDs), managers, and an industry partner (University of Central Florida [UCF], Institute for Simulation and Training – Mixed Emerging Technology Integration Lab [METIL]) who are proficient in the development of advanced training technologies, content, and evaluations. The stakeholder organizations are NRC (Training and Quality Assurance (N7), Strategy, Assessments and Innovation (N5), Information Technology (N6), NTAF, Warrior Challenge Community) and Manpower, Personnel, Training, and Education (MPT&E) Research, Modeling, Analysis, and Assessments Branch (OPNAV N1T).

The approach involves interactions with recruiting Subject Matter Experts (SMEs) and Future Sailors in the DEP, and continuing analysis of Navy recruiting policies and procedures. Additionally, applied design and development of the NAWCTSD-developed mobile application (eHelm), which allows Future Sailors to view, navigate, and interact with training content on mobile devices. The goal is to develop and deploy a government-owned cross-platform (iOS, Android, Windows) mobile application to provide DEP training content via a mobile-specific delivery method.

NAWCTSD has constructed the VRT as a prototype for an interactive DEP training environment. The objective is to increase Future Sailors' likelihood of success throughout the DEP prior to entering recruit training. The environment aims to achieve this by improving virtual recruiting efforts, enhancing applicable active recruiting, and striving to ensure that all Future Sailors remain engaged and are better informed and trained while in DEP. Specifically, it will introduce Future Sailors to entry-level training milestones such as the "CO's Top 6," "The Sailor's Creed," recruit training rules and offenses, necessary physical fitness preparation through self-reporting (and possibly remote monitoring capabilities), and various Ready Relevant Learning (RRL) materials, such as Bystander Intervention.

The second phase of prototype development (begun in October 2018) will focus on enhancing training content and evaluations, and ultimately transitioning to NRC's Information Technology department for production hosting and maintenance. This system is expected to allow Future Sailors to receive entry-level training on non-Navy issued equipment (i.e., Bring Your Own Device [BYOD]). Additionally, this will give recruiters a means to remain connected to Future Sailors by tracking their progress through the training materials, providing additional training as needed, and verifying Future Sailors' learning progression.

Requirements Documentation

Requirements for the VRT are being collected via several methods. This started by analyzing pertinent documents related to training Future Sailors. These documents included the Standards Transition Acknowledgement Requirement Training (START) Guide, portions of the Recruiting Manual (CRUITMAN), NRC's Fitness and Nutrition Guide, and several other training documents, policies, and instructions provided by Navy recruiting personnel. The next step was to meet with SMEs and other recruiting professionals to discover their needs and requirements for a tool to help with training Future Sailors. This was accomplished through requirements gathering workshops, both one-on-one and group settings.

Upon analysis of the initial requirements, NAWCTSD decided there would be three major components to the VRT tool: the mobile application (eHelm), the training content (assembled using the CPA), and the training MC. The mobile application (eHelm) is the vehicle that will deliver the training to the Future Sailors. The training content will be downloaded using eHelm by Future Sailors on their mobile devices. At a high level, the training requirements are to include the 11 DEP PQS, the *Faces of Boot Camp* video, the *Sexual Assault Prevention and Response – Department of Defense* (SAPR-D) video, and physical fitness training and self-reporting. Detailed requirements for the training content will be documented in the Lesson Design Strategy (LDS).

The MC (as part of the VRT system) will be used by recruiters and other recruiting professionals to track and document the training progress of Future Sailors. Major components of the MC will be the district dashboard, Future Sailors' list, add Future Sailors, and user management. Some high-level requirements of each aspect are as follows:

District Dashboard – Displays Future Sailors' training progress at a glance. The district dashboard displays the number of Future Sailors based on user's selection (All Districts, NRD/Navy Talent Acquisition Group [NTAG], or Navy Recruiting Station [NRS]/Talent Acquisition Onboarding Center [TAOC]) and shows their training completed based on what was selected. This is broken down into further detail based on shipping windows and by displaying information using charts and graphs.

Future Sailor's List – Displays details on Future Sailors' training based on user selections as described in the district dashboard section. Recruiters can verify Future Sailors' training progress here. Their progress will be automatically updated as they complete training topics on the mobile application; however, the training will not be counted as complete until it is verified through this section by an authorized user. Other than verification of training and viewing training progress, users will also be able to enter and track physical fitness, edit applicant data, and generate QR codes (QR codes are used by the Future Sailor to initialize the eHelm app).

Add Future Sailors – Enables authorized users to add Future Sailors' information to the training MC.

User Management – Enables authorized users to add new users. This area will also be where the user's access and security levels will be managed.

Requirements will continue to be refined based on prototype demonstrations to SMEs, stakeholders, and future pilots with designated recruiting districts and stations. More detailed requirements will be included in the eHelm documentation, the LDS, and the Functional Requirements Document (FRD).

Training Content

NAWCTSD proposed the development of the VRT to provide Future Sailors with the necessary PQS training content (including fitness) available to them in the DEP. The training content has its genesis with the START Guide, which is a pamphlet given to Future Sailors upon entering DEP. All training content presented in the VRT mobile application has been reviewed and approved by NRC's Public Affairs Officer (PAO) for unlimited release. The Future Sailor's first order is to read, understand, and acknowledge the information provided in the START Guide before shipping to RTC. The VRT development team has resolved to deliver the PQS training content within a mobile application that is interactive, engaging, and convenient for the ultimate objective of preparing, motivating, assessing, and tracking Future Sailors' progress to increase their likelihood of success throughout DEP and recruit training. To achieve our primary purpose, ISDs analyzed the training content, employed Merrill's principals, and applied Mayer's multimedia guidelines to develop a strategy for the mobile app's specific delivery method. In addition to the 11 PQS topics, there are entry-level training milestones such as indoctrination videos, physical fitness readiness and self-reporting, and assessments to measure proficiency. NAWCTSD partnered with UCF, Institute for Simulation and Training – METIL, to further enhance the training content. In phase 2, UCF will apply learning and behavioral science to specifically target motivation, engagement, and resiliency to improve learning outcomes and minimize forgetting. Various enhancements to make the training content interactive, such as structured messaging, interval spacing, gaming theory, card application, and compassionate language for feedback, will be discussed in a follow-on report at the end of phase 2 development. Table 1 lists the training content topics currently included in the phase 1 VRT application.

Table 1: Training Content Topics

DEP Responsibilities	
	Mission of the Navy
	11 General Orders
	The Sailor's Creed
	RTC Maxim
	Contacting Your Recruiter
	DEP Conduct
Navy Core Values	
	Honor
	Courage
	Commitment
Code of Ethics	
	Alcohol Policy
	Drug Policy
	Sexual Harassment Policy
	Fraternization Policy
	Prohibited Practices
RTC Chain of Command	
	RTC Chain of Command
	RTC Responsibilities
Physical Readiness Program	
	Fitness Tests
	Maximum Body Fat Percentage
Advancement	
	Advanced Pay Grade
	Referral Recognition Program
	Time in Grade (TIG) Policy
Military Drill/Etiquette	
	7 Drill Positions
	Crossing Quarterdeck (explained)
	Crossing Quarterdeck (demonstrated)
Navy Terminology/Phonetics	
	Alphabet/Military Time
Rank and Recognition	
	Enlisted Ranks
	Officer Ranks
	Warrant Officer Ranks
Aircraft and Ships	
	Descriptions
	Identifications
Personal Financial Management	
	Goal Setting
	MyPay
	Leave and Earnings Statement (LES)
	Direct Deposit System (DDS)
	Good Credit

Instructional Design Strategy

To ensure consistency, the training content was analyzed using Merrill's learning outcomes in the categories of Present, Recall, Demonstrate, and Apply. The original state of the training content was presented at a low-level, memorization-based experience with no interactive content. This is the current state of the DEP apps produced by other branches of the military. All of the training content was upgraded by improving its aesthetic quality, applying Mayer's multimedia principles and increasing it from low-level media to interactive content. Richard Mayer's multimedia principle states that words and graphics are more conducive to learning, rather than just text or graphics alone. He further explained that graphics can be anything from static pictures to animation or video, but they should always be relevant to the words on the page.

Our analysis showed some training content did not lend itself to advanced, interactive, instructional approaches. PQS content areas 1, 4, 6, and 11 qualify for these categories. The Sailor's Creed, a subtopic under DEP Responsibilities, has been upgraded to improve learning and interactivity. We have included a webpage allowing the Future Sailor to orally recite The Sailor's Creed and have what was spoken compared and scored against words from the Creed as an accuracy Knowledge Check. Additionally, there is a video (see Figure 2) demonstrating the pace and emphasis of a recruit reciting The Sailor's Creed. Complementing visually-improved PowerPoint slides with these two improvements for retention and engagement are examples of increasing the interactive content. Other content, with guidance from SMEs from NRC N7, could be extended and were candidates for Demonstrate and Apply. PQS content areas 2 and 3 qualify for these categories. Still, other training content, such as PQS areas 7, 8, 9, and 10, lends itself to very interactive, new media-type presentations. The design approach also included the media recommended.

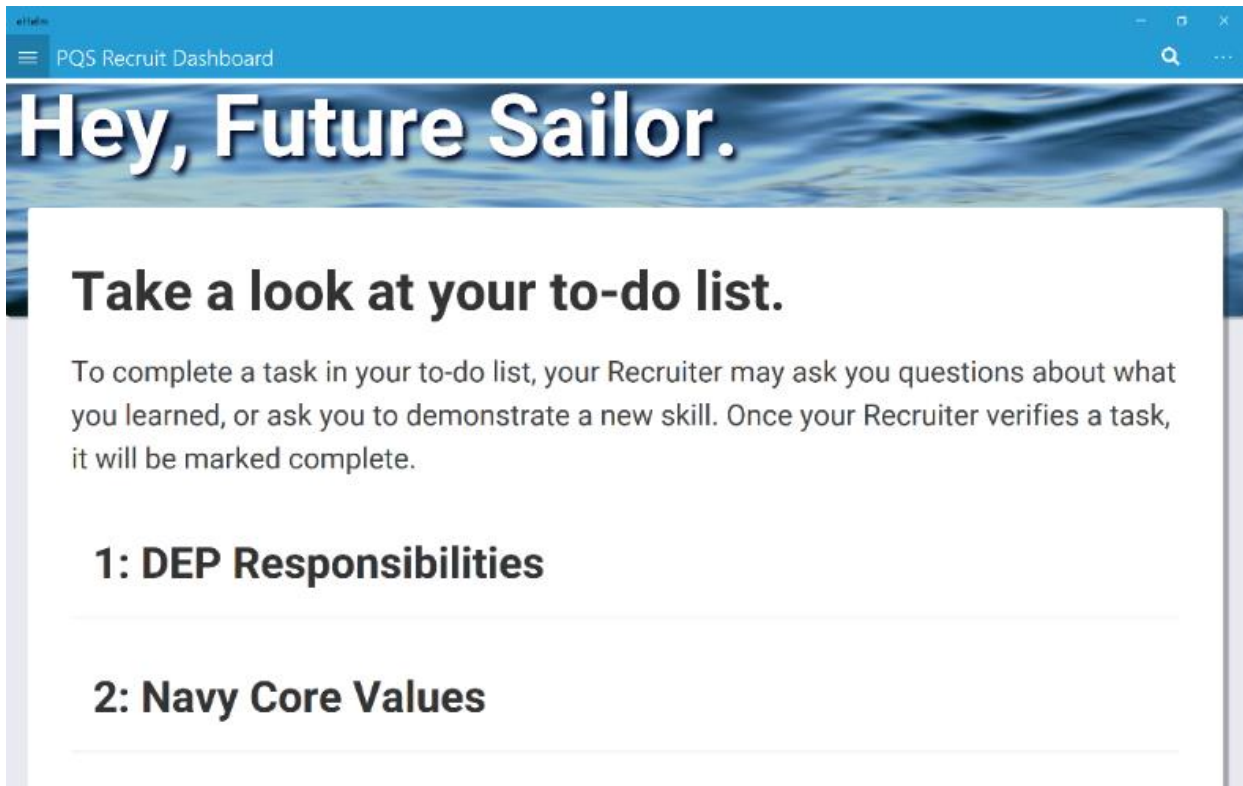
Figure 2: The Sailor's Creed Video Screenshot



Personnel Qualification Standards (PQS)

PQS topics convey the responsibilities and benefits of being a U.S. Navy Sailor. These standards begin a Future Sailor's journey of becoming "Sailorized." Currently, within the mobile app, this training content is delivered via PowerPoints, PDFs, external and internal websites, videos, and HTML5 content. They are listed below as they appear in the Future Sailor's "to-do list" within the PQS Recruit Dashboard shown in Figure 3. There are 11 Personnel Qualification Standards categorized with its subtopics (see Table 1). These standards are typically covered at DEP meetings, which occur once a month for most Future Sailors. As part of the VRT development, these standards are captured in the mobile app environment, so they are conveniently accessible for training. As recruiters interact with Future Sailors, they will confirm what the Future Sailor has learned by asking questions and/or asking him/her to demonstrate a new skill before verifying a task accomplishment via the MC (see the Management Component section of this report where this is explained).

Figure 3: PQS Recruit Dashboard



Other Content

Training topics not specifically included in the PQS are the *Faces of Boot Camp* and SAPR-D videos, the Physical Readiness Assessment, and Knowledge Checks. The two videos are 25 minutes and 10 minutes in length, respectively, and are intended to be watched within the first three to five days after signing a Navy contract (i.e., beginning DEP) during a Future Sailor's indoctrination period. Watching these videos is critical to knowing what to expect when a Future Sailor arrives at boot camp in order to obtain an explicit understanding about behaviors that are unacceptable in the Navy (i.e., drug policy, sexual harassment, and fraternization). Not knowing the information on these videos may cause a Future Sailor to fail or be set back (i.e., delayed completion of boot camp) at RTC.

The mobile application reports when each video has been watched by issuing an Experience Application Programming Interface (xAPI) statement, which is stored in the cloud by a Learning Record Store (LRS) and later retrieved by the MC to be seen by the recruiter. (For additional information about xAPI and other details of the network communications between components, refer to the Information Technology section of this report.) Upon seeing the completion status, the recruiter knows to reach out to the Future Sailor (via phone call, Skype, FaceTime, in-person meeting, etc.) to verbally quiz that individual on his/her knowledge of the video. Once the Future Sailor demonstrates his/her knowledge, the recruiter can mark the task as verified using the MC, and the Future Sailor will see the verification status in the Recruit Dashboard on his/her mobile app.

Physical Readiness Assessment

In response to approximately 60% of the recruits failing the initial Physical Fitness Assessment (PFA) at RTC, fitness tracking is included. The Physical Readiness Assessment is a fitness self-reporting form that can be completed by the Future Sailor, using the mobile app, after he/she has completed physical training on pushups, curl ups, and a 1.5-mile run or 500-yard swim. The primary function of the form is to allow the Future Sailor to communicate to the recruiter(s) his/her fitness training activities. The recruiter tracks this information via the MC's dashboard. The Future Sailor can also submit his/her current height and weight to have Body Mass Index (BMI) and Body Fat Percentage (BFP) calculated, as shown in the Physical Readiness Assessment Self-Reporting Form, see Figure 4. The formulas for BMI and BFP are located in the Information Technology section of this report. Once inputs are submitted, they are sent to a LRS in the cloud in the form of an xAPI statement, and the MC displays the information to the recruiter. The Future Sailors' fitness progress is critically important to a recruiter because it is the single point of failure positively correlating to success at RTC. Progression of physical readiness during the DEP) increases a Future Sailor's likelihood of success in DEP, at RTC, and throughout his/her Navy career. Figure 4 provides a view of the tracked fitness measures. The Management Component section of this report discusses the recruiters use of the MC to track the Future Sailor's fitness activities.

Figure 4: Physical Readiness Assessment Self-Reporting Form

The image shows a web browser window with a blue header bar containing the text "Physical Readiness Assessment" and a search icon. The main content area has a yellow background with the title "Fitness Tracking" in bold black text on the left and the date and time "9/9/2018, 17:16" on the right. The form includes several input fields for physical metrics: HEIGHT (in), WEIGHT (lbs), BMI, BODY FAT %, PUSH UPS (2 minutes), CURL UPS (2 minutes), 1.5-MILE RUN (min:sec), and 500-YARD SWIM (min:sec). A "SUBMIT" button is located at the bottom of the form. The background features a dark blue anchor icon on the left and a yellow silhouette of a ship on the right.

Physical Readiness Assessment

Fitness Tracking

9/9/2018, 17:16

HEIGHT in

WEIGHT lbs

BMI

BODY FAT %

PUSH UPS 2 minutes

CURL UPS 2 minutes

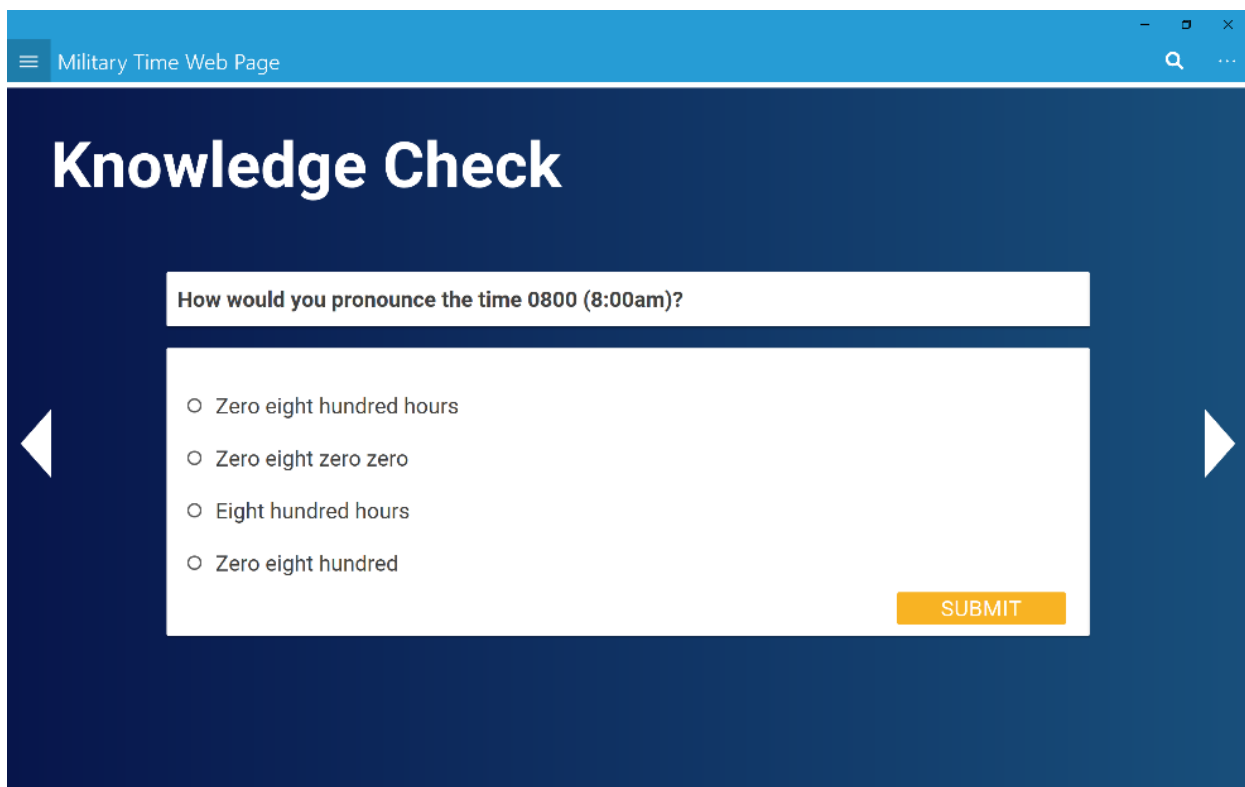
1.5-MILE RUN min:sec

500-YARD SWIM min:sec

Knowledge Checks

Knowledge Checks are assessments embedded within the mobile app that provide an opportunity for the Future Sailors to demonstrate proficiency in various areas of training. The assessments are developed in HTML5 to make the experience interactive with immediate feedback of correct or incorrect answers submitted. Knowledge Checks are located within the topic area and aid Future Sailors in learning the topics through repeated exposure to the content. Knowledge Checks will also be included as pretests and posttests to measure the amount of learning a Future Sailor has acquired in a specific subject before using the mobile app and after using the mobile app, respectively. Figure 5, Figure 6, and Figure 7 are examples of the Knowledge Checks currently implemented in the mobile application.

Figure 5: Knowledge Check – Sample Question



The screenshot displays a mobile application interface for a "Knowledge Check". At the top, a blue header bar contains the text "Military Time Web Page" on the left and search and menu icons on the right. Below the header, the main content area has a dark blue background with the title "Knowledge Check" in large white font. A white question box asks, "How would you pronounce the time 0800 (8:00am)?". Below the question, a white list of four radio button options is shown: "Zero eight hundred hours", "Zero eight zero zero", "Eight hundred hours", and "Zero eight hundred". A yellow "SUBMIT" button is located at the bottom right of the options list. White left and right arrow icons are positioned on either side of the options list.

Figure 6: Knowledge Check – Example of Correct Feedback

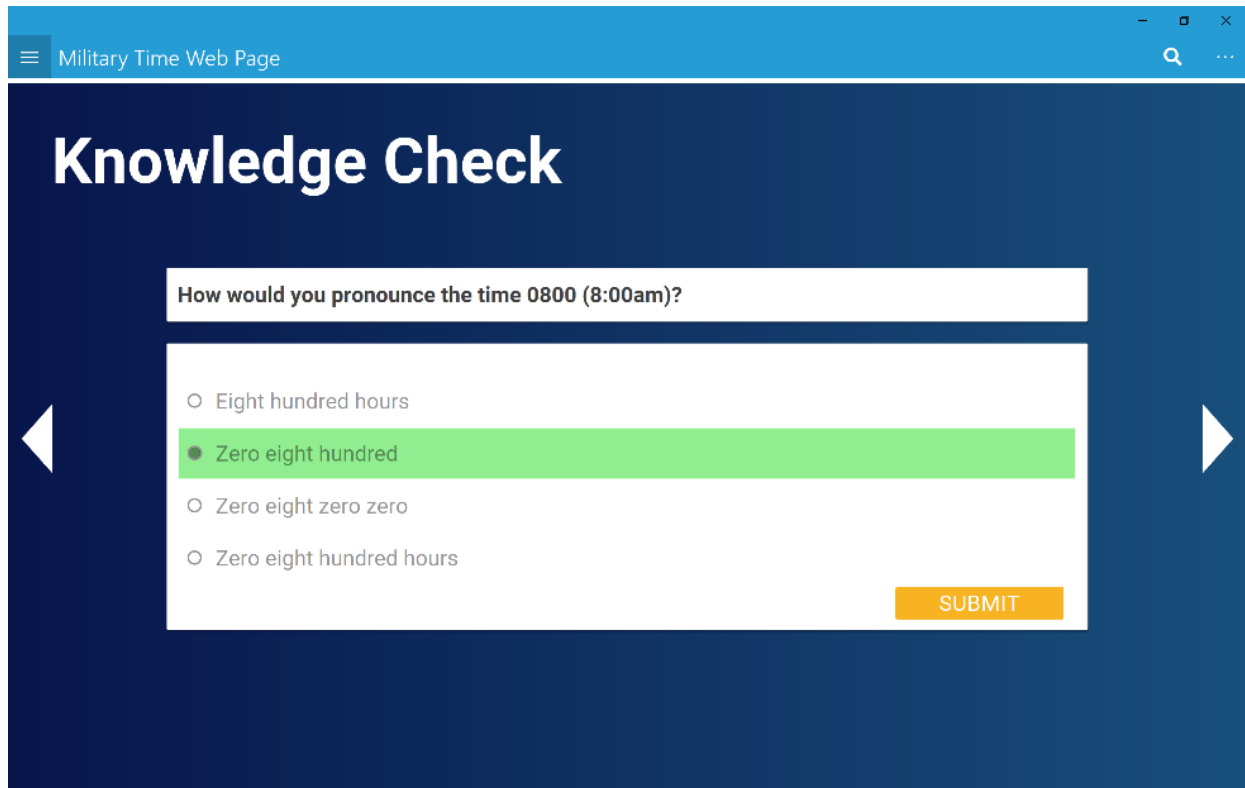
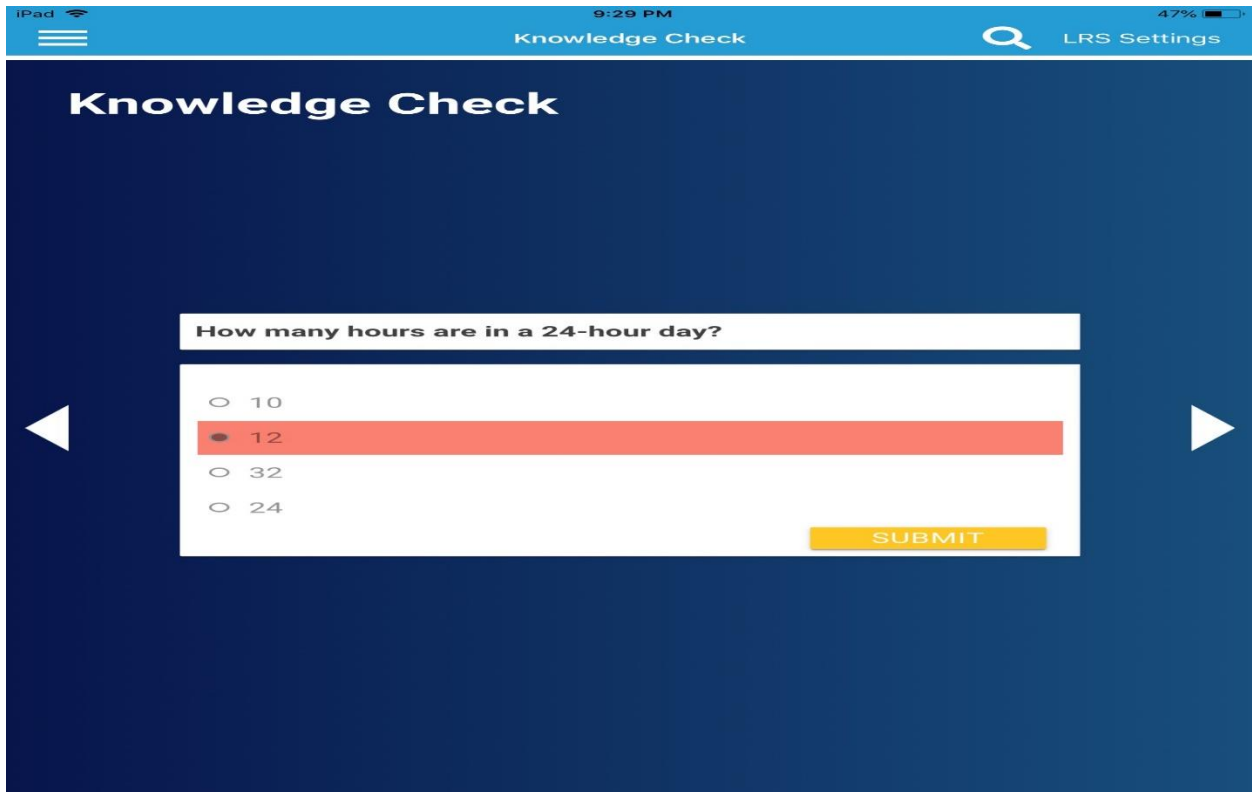


Figure 7: Knowledge Check – Example of Incorrect Feedback



Metrics and Analysis

Analysis is vital for developing variables and metrics, optimizing use of the system, analyzing data for performance monitoring, and determining ultimate return on investment. The analysis conducted in the Virtual Recruiting Analysis Study identified the need to construct a VRT prototype to aid in the training development of Future Sailors. The variables and metrics tracked via the MC, discussed in detail in the MC section of this report, are meant to provide recruiting and talent acquisition professionals with Future Sailor DEP training progression. These variables (see Table 2), combined with existing system-maintained data and variables tracked via the MC, will make up the data source for ongoing analysis by analytical professionals seeking to monitor and improve Navy recruiting and talent acquisition. Usability testing with existing Future Sailors will occur as part of Phase 2. See Appendix A: Performance Monitoring Analysis Data for the current draft of the analysis variables for performance monitoring.

Table 2: Proposed Analysis Variable List – Sample

Variable	Description
Device_Type	Device with application downloaded
Operating_System	Device operating system
App_Download_Date	Initial download date
Commitment_Level_%	Calculated based on self-reported commitment level survey question responses
DEP_Start_Download_Date	This represents the difference in days between the DEP Start date and the date the mobile app was downloaded.
Number_of_Users	This represents the cumulative number of mobile app downloads.
Time_Remaining_In_DEP_Attrite	This represents the days remaining in DEP, prior to ship, when an individual attrites.
Early_Ship	This represents ≥ 1 day when an individual ships that is prior to the original ship date.
Late_Ship	This represents ≥ 1 day when an individual ships that is after the original ship date.
DEP_Length_Exceeds_6_months_Flag	This flag is set for Future Sailors when the current date is six months past their first reservation date and there is no confirmation date or cancelation date.
Ship_Date_Change_Flag	This flag is set for Future Sailors when their Confirm Date changes (1 for earlier date, 2 for later date).

Information Technology

Introduction/Purpose

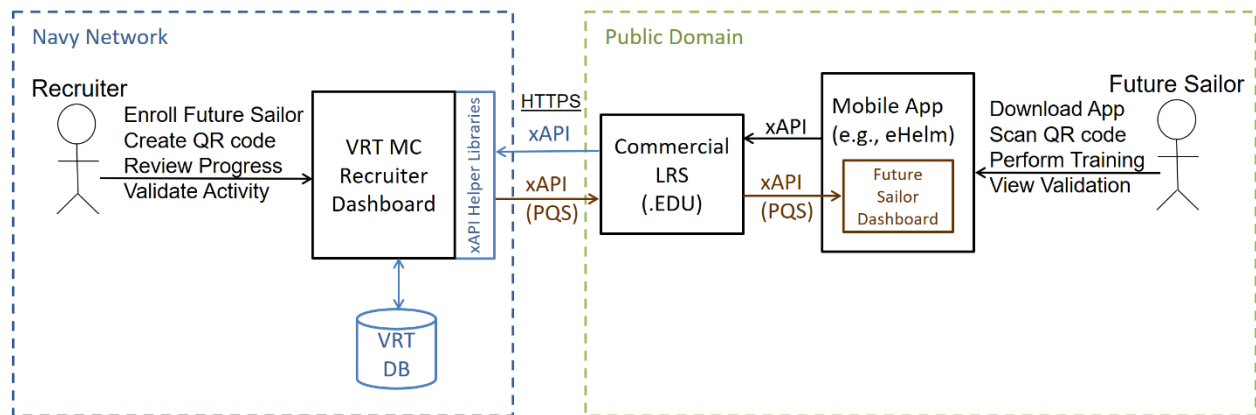
In this section, we describe the overall VRT system, underlying interactions and the technologies implemented. Accomplishing the goals of delivering and tracking Future Sailor training and development, while protecting sensitive data, requires the use of various strategies. Allowing the use of personal devices (a strategy called BYOD), storing interactions with a Navy approved mobile application, and providing a means for recruiter oversight, generate technical, security, and administrative challenges. While this effort is a research project that requires the creation of a prototype, the ultimate goal is to transition the VRT system into NRC's managed production environment for full use in the training of Future Sailors.

Development/Prototype

The creation of a prototype system requires ensuring that the planned technologies to be implemented are feasible and flexible. The envisioned or ideal end-state of the VRT system will be described in detail as the main focus of this report. Figure 8 depicts the prototype functionality as it currently exists.

Once the Future Sailor downloads the eHelm app from the public app store, he/she will start the app and scan the QR code provided by the recruiter (which the recruiter generated from the MC). Scanning the QR code will cause eHelm to automatically download the DEP content package (which is stored on the device for offline viewing) and will associate the Future Sailor's device with the anonymized ID that links his/her progress in the app with his/her profile on the MC. The implementation of this functionality was begun in Phase 1 and will be completed in Phase 2.

Figure 8: Current Prototype Functionality



Current System

Figure 9 outlines the current system as it operates in development and potentially in its primary use case in the production test environment. Each major portion of the figure is numerically labeled and correlates with the detailed description in Table 3. The numbered explanations in the table include a brief functional description of its purpose, details on the technologies used, and any implementation, development, or communication details needed.

Figure 9: Current System Architecture

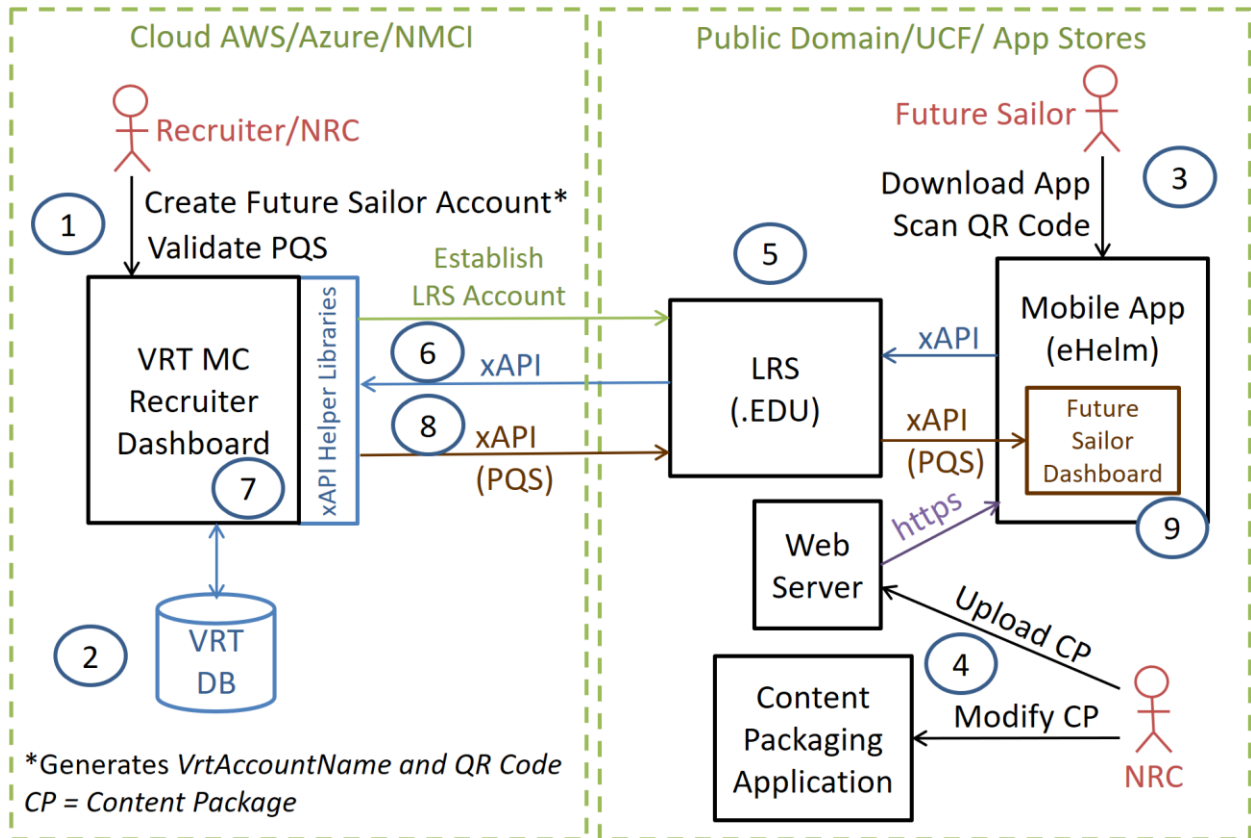


Table 3: Current System Architecture Descriptions

Reference	Description
Account Creation (1)	The creation of a Future Sailor record is where the VRT system comes into play. In the envisioned and ideal future state of the overall process, a new PRIDEMOD record will generate a new Future Sailor record in the VRT MC database. In theory, any updates made to a Future Sailor record in PRIDEMOD would then be reflected in VRT. PRIDEMOD would expose its Future Sailor records using a RESTful Web Service. Note: In the current VRT prototype, Future Sailor account generation is accomplished by NRC personnel through an interface in the VRT MC. Optimally, the VRT MC and its database would reside in the cloud, sharing a functional space with the PRIDEMOD system. The proposed future location of all NRC systems, including the VRT MC and its database, is the Amazon Web Services (AWS) cloud.
GUID Creation (2)	The creation of a Future Sailor record in the VRT MC generates a Globally Unique Identifier, commonly referred to as a GUID, which serves as a token for anonymizing the data sent and received by the mobile application. This identifier is associated with the Future Sailor at the MC, linking information that is anonymous in the public domain to the Personal Identifiable Information (PII) database that is protected in the VRT MC. The VRT MC generates a QR code, and the recruiter will provide it to the Future Sailor via printout or email.
eHelm Download (3)	The Future Sailor will be provided a link by recruiting personnel to download eHelm (mobile application) from the respective public app store for his/her device type.
Training Content (4)	When the Future Sailor launches eHelm for the first time, he/she will be prompted to scan the QR code provided by the recruiter. Scanning the code will provide the GUID assigned to the Future Sailor. The scanning process also provides eHelm with a location (Uniform Resource Locator [URL]) to download the necessary Content Packages (CPs) needed for DEP training. Upon completion of the CP download, the Future Sailor is now able to view and interact with the mobile training content. The downloaded content is stored on the mobile device for offline viewing.
LRS and xAPI (5)	While using the mobile application, JavaScript Object Notation (JSON) objects are sent to the LRS using the xAPI protocol. The user of the mobile application may watch a video, read content, or take an assessment. Each time an activity is performed, that information is sent to the LRS.
Querying the LRS (6)	The VRT MC will query the LRS in order to update its database with information on Future Sailor interactions with his/her mobile app. A query to the LRS from the VRT MC is made over Hypertext Transfer Protocol Secure (HTTPS) (SSL 443) in adherence with the necessary security posture. Since the data transferred between the LRS and the MC has been anonymized using tokenization, PII is neither stored on the LRS nor transferred between the LRS and the MC. The GUID of the Future Sailor is how the VRT MC matches LRS statements to a particular Future Sailor, and the mapping between GUIDs and Future Sailors is protected within the MC, which is only accessible by authorized recruiters.

Reference	Description
Recruiter Verification (7)	Recruiters may access the VRT MC from Navy Marine Corps Intranet (NMCI) at any time, as it will always be available to them. VRT MC user accounts are associated to Electronic Data Interchange Personal Identifiers (EDIPs) allowing login via Common Access Card (CAC) Public Key Infrastructure (PKI). Recruiters will use the VRT MC to validate Future Sailor completion of PQS items or additional training. While interactions with the mobile training will be visible to the recruiters, their process of verifying its mastery is dependent upon recruiting personnel. The VRT MC is simply a vehicle for them to check off completion and view reports based upon those validations.
Writing to the LRS (8)	As the recruiter validates Future Sailor PQS and additional training completions, the VRT MC writes a specially formatted JSON object using the xAPI protocol to the LRS. Like the information sent from eHelm, these statements are anonymized by using tokenization. These statements will be queried by eHelm by referencing the GUID.
Recruit Dashboard (9)	eHelm reads statements written by the VRT MC and updates its Recruit Dashboard. On the Recruit Dashboard screen in the mobile application, a Future Sailor can see that a recruiter verified his/her completion of a PQS item.

Note: Numerical references in this table refer to the numbers in Figure 9.

Management Component

Implementation

The VRT MC is a web application for use by recruiting professionals, onboarding team members, and Recruiting Command headquarters personnel. The MC is accessible via NMCI and a CAC – PKI login capabilities. The proposed production state of the MC has it hosted with other Recruiting Command applications used by recruiters and other NRC staff. The MC database will contain Future Sailor PII. These hosting, data, and usage requirements drove the prototype development technology decisions (listed below) made by NAWCTSD, as the environment and tools implemented needed to be in line with other Navy systems, especially those used and maintained by NRC. Note: recruiters are referred to as the user of the MC in this section.

Functionally, the MC provides Navy recruiting and acquisition professionals with the capability to view regional, district, and recruiting station Future Sailor DEP data. These data include numbers and percentages of Future Sailors, how much time they have remaining in DEP, shipping window information, name, gender, and birthdate. Recruiting professionals have access to utilize the MC for daily insights into the DEP. Personnel may glean aggregate and individual Future Sailor PQS and required training status. The MC can also be used to generate information for preparing and sharing DEP status reports to the Navy's recruiting headquarters.

The main purpose of the MC is to allow recruiters to manage the DEP training progression of Future Sailors. Other training items and videos generally used in DEP are also tracked; see other training content (Table 4) and PQS items tracked in Table 5. See the Training Content section of this report for more details.

Table 4: Other Training Content

<i>Faces of Boot Camp</i> video*
SAPR-D video*
Accommodation of Religious Practices
CO's Top 6
Education Information, Leaving for RTC
Recruit Leadership
Resiliency
Responsibilities regarding Family Members
What to Bring to RTC
When Recruiters Transfer

* Currently implemented in the VRT phase 1 prototype

Table 5: PQS Items Tracked

DEP Responsibilities
Navy Core Values
Code of Ethics
RTC Chain of Command
Physical Readiness Program
Advancement
Military Drill/Etiquette
Navy Terminology/Phonetic Alphabet/Military Time
Rank and Recognition
Aircraft and Ships
Personal Financial Management

All of the PQS items shown in Table 5 can be verified in the system by the recruiter or acquisition personnel. The recruiter’s verification process is required for any PQS or training percentages to change, altering reports and any data presented.

User Actions

The MC allows five different user types (see Table 6), and, within those user types, various district- and station-level accesses may be granted. This section describes the user levels and what actions users can perform within the MC.

Table 6: Management Component User Access

User Type	Access
User Type #1 – Onboarding	The onboarding user type is granted the ability to access multiple stations within a district. This user type may also create and edit recruiter user-type accounts within those stations.
User Type #2 – Commanding Officer (CO)	The commanding officer user type is granted the ability to access all the stations within a district. This user type may also create and edit onboarding and recruiter user-type accounts within the district/station for which the CO has access.
User Type #3 – Administrator	The administrator user type is granted the ability to access all districts and stations. This user type may also create and edit all other user types.
User Type #4 – HQ Recruiting Command	The HQ recruiting command user type is granted the ability to access all districts and stations. This user type may also create and edit onboarding, commanding officer, and recruiter accounts.
User Type #5 – Recruiter	The recruiter user type will generally have access to only one station. This user type will have no access to add or alter MC user records.

Table 7: Management Component Technologies

Technology	Description
Development IDE (Integrated Development Environment)	Microsoft Visual Studio — Visual Studio is a suite of component-based software development tools and other technologies for building powerful, high-performance applications.
Development Languages and Controls	C#, HTML, Razor, JavaScript, Telerik UI for ASP.NET
Development Pattern/Methodology	ASP.NET MVC — The ASP.NET MVC is a web application framework developed by Microsoft, which implements the model-view-controller pattern.
Web Server	IIS/IIS Express — Internet Information Services; Microsoft’s Web Server: In production, the MC would run on IIS, but, for development and debugging, IIS Express is used.
Database Management System (DBMS)	Microsoft SQL Server — Microsoft Structured Query Language (SQL) Server is a relational DBMS. As a database server, it is a software product with the primary function of storing and retrieving data as requested by other software applications, which may run either on the same computer or on another computer across a network (including the Internet).
Stored Procedures	In a DBMS, a stored procedure is a set of SQL statements with an assigned name that is stored in the database in compiled form so that it can be shared by a number of programs. Stored procedures are used in the VRT MC database to greatly increase the speed and efficiency of frequently used queries and executions that are data intensive.
Relational Data	A relational database is a set of formally described tables from which data can be accessed or reassembled in many different ways without having to reorganize the database tables. This methodology was utilized for the VRT MC database for its usability with a transactional web application like the VRT MC.

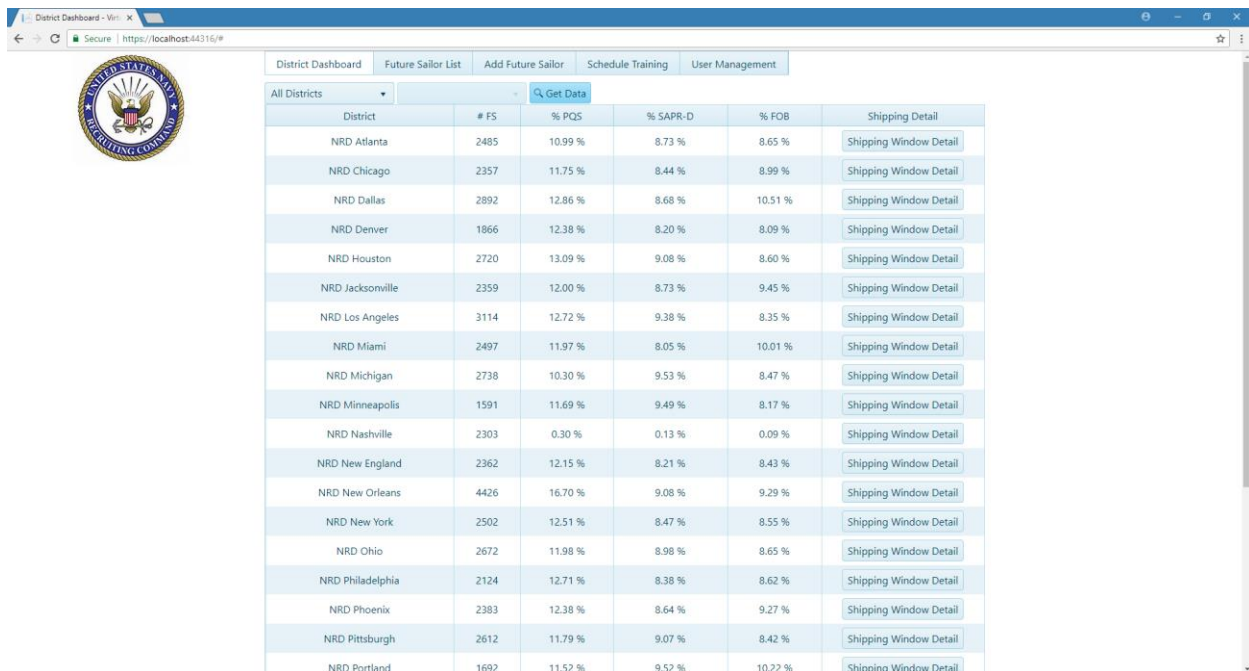
Management Component Usability, User Interface, and Functionality

The MC has slightly different uses and data access depending on the logged-in user's level of access (detailed in the Viewing Aggregate Data section of this report). This section outlines all the system's functions, assuming the greatest level of access in order to detail the entire interface and capabilities.

Logging In

The first step to accessing the system is having access to a connected NMCI desktop or laptop computer. If a recruiter is on the road, he/she can use an NMCI laptop over a Wi-Fi connection, assuming the recruiter has a CAC reader. To access the MC, the user will browse to its production URL (this is notional and not currently implemented). Upon doing so, the user will be prompted to present his/her DoD PKI certificate. A user's DoD EDIPI is associated in the VRT database with his/her account, so the user should choose his/her ID certificate from the list presented. Upon entering a Personal Identification Number (PIN), the user will be logged into the system with the appropriate permissions level.

Figure 10: Recruiting Districts



District	# FS	% PQS	% SAPR-D	% FOB	Shipping Detail
NRD Atlanta	2485	10.99 %	8.73 %	8.65 %	Shipping Window Detail
NRD Chicago	2357	11.75 %	8.44 %	8.99 %	Shipping Window Detail
NRD Dallas	2892	12.86 %	8.68 %	10.51 %	Shipping Window Detail
NRD Denver	1866	12.38 %	8.20 %	8.09 %	Shipping Window Detail
NRD Houston	2720	13.09 %	9.08 %	8.60 %	Shipping Window Detail
NRD Jacksonville	2359	12.00 %	8.73 %	9.45 %	Shipping Window Detail
NRD Los Angeles	3114	12.72 %	9.38 %	8.35 %	Shipping Window Detail
NRD Miami	2497	11.97 %	8.05 %	10.01 %	Shipping Window Detail
NRD Michigan	2738	10.30 %	9.53 %	8.47 %	Shipping Window Detail
NRD Minneapolis	1591	11.69 %	9.49 %	8.17 %	Shipping Window Detail
NRD Nashville	2303	0.30 %	0.13 %	0.09 %	Shipping Window Detail
NRD New England	2362	12.15 %	8.21 %	8.43 %	Shipping Window Detail
NRD New Orleans	4426	16.70 %	9.08 %	9.29 %	Shipping Window Detail
NRD New York	2502	12.51 %	8.47 %	8.55 %	Shipping Window Detail
NRD Ohio	2672	11.98 %	8.98 %	8.65 %	Shipping Window Detail
NRD Philadelphia	2124	12.71 %	8.38 %	8.62 %	Shipping Window Detail
NRD Phoenix	2383	12.38 %	8.64 %	9.27 %	Shipping Window Detail
NRD Pittsburgh	2612	11.79 %	9.07 %	8.42 %	Shipping Window Detail
NRD Portland	1692	11.52 %	9.52 %	10.22 %	Shipping Window Detail

Viewing Aggregate Data

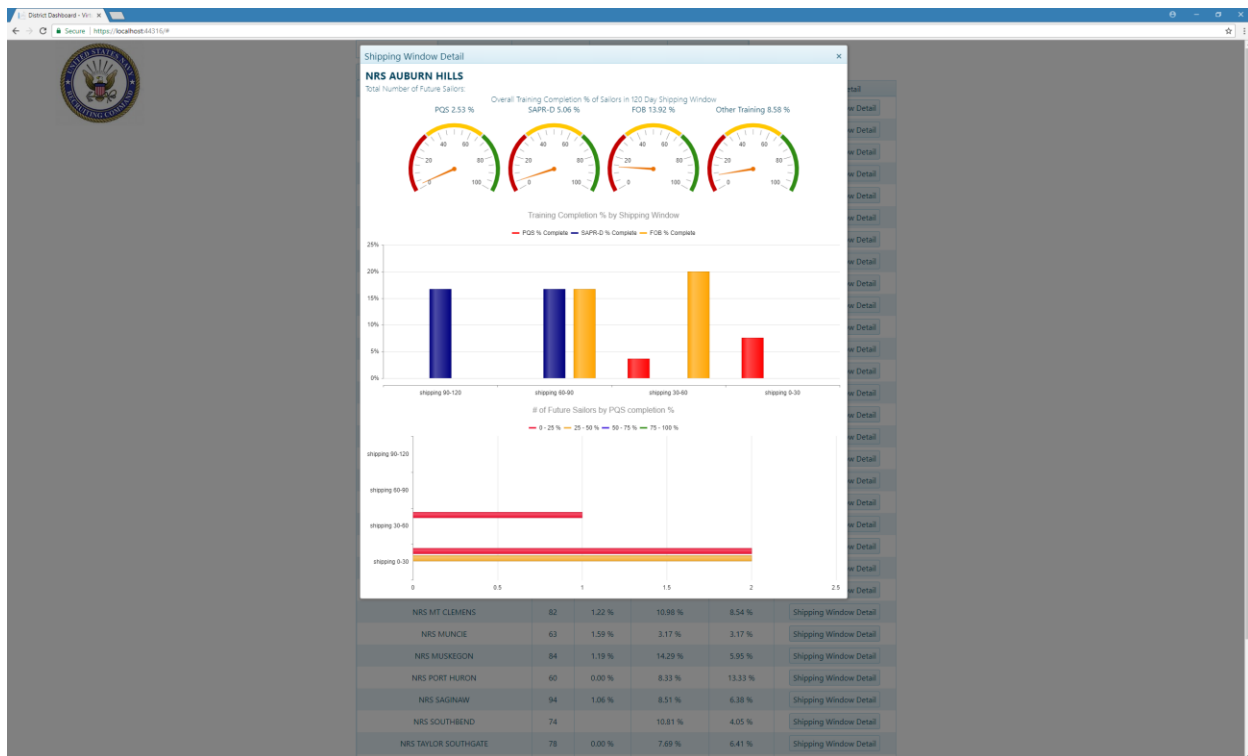
One of the major functionalities of the MC is to be able to view PQS data at an aggregate level. Depending upon the user's role, different levels of data can be viewed. If a user is an administrator or has headquarters-level access, he/she may view data from a district-level view. Once logged in, the user is taken directly to the District Dashboard area. From there (access-level dependent), the user can view all districts (see Figure 10), all the stations in a district (see Figure 11: Recruiting Stations), or simply one specific station. While viewing these screens, the user can determine the number of Future Sailors currently assigned to a district or station. At a glance, the user can also glean the percentage of Future Sailors who have completed PQS training, and the percentages of those who have watched the SAPR-D and *Faces of Boot Camp* videos. From the District Dashboard list, the user may click the "Shipping Window Detail" button in order to see more details on the district or station selected.

Figure 11: Recruiting Stations

TAOC	# FS	% PQS	% SAPR-D	% FOB	Shipping Detail
NRS AUBURN HILLS	79	2.53 %	5.06 %	13.92 %	Shipping Window Detail
NRS BATTLE CREEK	67	0.00 %	5.97 %	2.99 %	Shipping Window Detail
NRS BIG RAPIDS	77	0.00 %	14.29 %	16.88 %	Shipping Window Detail
NRS BLOOMINGTON	65	0.00 %	12.31 %	1.54 %	Shipping Window Detail
NRS CLARKSVILLE	89	5.62 %	13.48 %	10.11 %	Shipping Window Detail
NRS COLUMBUS	78	0.00 %	6.41 %	10.26 %	Shipping Window Detail
NRS DETROIT WEST	82	1.22 %	7.32 %	9.76 %	Shipping Window Detail
NRS EVANSVILLE	63	0.00 %	7.94 %	6.35 %	Shipping Window Detail
NRS FLINT	88	1.14 %	10.23 %	5.68 %	Shipping Window Detail
NRS FORT WAYNE NORTH	68	1.47 %	14.71 %	11.76 %	Shipping Window Detail
NRS GAYLORD	67	1.49 %	4.48 %	10.45 %	Shipping Window Detail
NRS GRAND RAPIDS	91	1.10 %	10.99 %	8.79 %	Shipping Window Detail
NRS GREENWOOD	76	0.00 %	6.58 %	11.84 %	Shipping Window Detail
NRS INDY EAST	89	1.12 %	8.99 %	7.87 %	Shipping Window Detail
NRS INDY NORTH	88	2.27 %	4.55 %	14.77 %	Shipping Window Detail
NRS INDY WEST	90	2.22 %	6.67 %	12.22 %	Shipping Window Detail
NRS JACKSON	70	0.00 %	11.43 %	8.57 %	Shipping Window Detail
NRS KALAMAZOO	71	0.00 %	11.27 %	4.23 %	Shipping Window Detail
	79	1.27 %	10.13 %	12.66 %	Shipping Window Detail

The Shipping Window Detail screen displays three main graphs (see Figure 12). The topmost graph shows the percentages completed for PQS, SAPR-D, *Faces of Boot Camp*, and other required training. These numbers may differ from those viewed on the District Dashboard district/station listing because they are calculated using only those Future Sailors who are shipping within 120 days of the current date. The middle graph displays percentages of PQS, SAPR-D, and *Faces of Boot Camp* completed, divided into shipping windows of 90-120, 60-90, 30-60, and 0-30 days, respectively. The bottom graph focuses on PQS color-coded completion percentages, while also being separated by shipping windows. Note: the colors represent percentage ranges within their respective shipping windows. Red is 0-25%, yellow is 25-50%, blue is 50-75%, and green is 75-100%.

Figure 12: Shipping Window Detail



Viewing a Station’s Future Sailors

The next section of the application is the Future Sailor List. Most of the MC’s functionality is employed from this area, which is reached by clicking on “Future Sailor List” on the top main menu (see Figure 13). From this area, depending upon access level, the user can select a district/station combination to view that station’s list of Future Sailors. If the user is looking for a particular Future Sailor, the recruiter can also apply a filter by adding a part of, or all of, the last name prior to clicking the “Get Data” button. There are also options that will only return Future Sailors who have completed the PQS items that are unverified by the recruiter and also only those who are currently in the DEP program (this is selected by default; however, once the system is in the production environment, it is likely that Future Sailors who have attrited from DEP or shipped to RTC will have their records archived).

Once the user completes a query, the Future Sailor List is displayed (see Figure 13). Information available from the list includes the Last Name, Birth Date, Ship Date, DEP Date, Gender, TAOC, Days to Ship, Days in DEP, PQS Percentage, SAPR-D completion, and *Faces of Boot Camp* (FOB) completion. The list also contains color cues that can alert the user to particular Future Sailors who need attention. If a Future Sailor’s record is highlighted yellow, then he/she has been in the DEP for greater than 90 days, but are less than 50 percent complete with his/her PQS requirements. If a Future Sailor’s listing is highlighted red, then he/she has less than 30 days until being shipped and is less than 50 percent complete with his/her PQS requirements. The recruiter may also sort on any of the columns displayed in the list by simply selecting that column’s header, similar to an Excel spreadsheet.

Figure 13: Future Sailor List

Last Name	Birth Date	Ship Date	DEP Date	Gender	TAOC	Days to Ship	Days in DEP	PQS	SAPR-D	FOB
ALBRIGHT	1/1/2001	9/17/2018	8/27/2017	Male	NRS BARTLETT	54	332	100.00%	X	X
ASCHWALD	1/27/1995	12/18/2018	12/4/2017	Male	NRS BARTLETT	146	233	100.00%		
BELLCOLFER	1/15/2000	11/28/2018	4/27/2018	Female	NRS BARTLETT	126	89	%		
BELL	8/3/1997	8/1/2018	8/1/2018	Female	NRS BARTLETT	7	54	0.00%		
BURNS	9/8/1999	9/4/2018	2/10/2018	Male	NRS BARTLETT	41	165	36.36%	X	
CANARIS	9/29/1996	7/24/2019	3/9/2018	Female	NRS BARTLETT	364	138	%		
CARLETON	7/1/2000	10/7/2018	2/14/2018	Female	NRS BARTLETT	74	161	%		
CHABOT	10/17/1995	1/26/2019	9/15/2017	Male	NRS BARTLETT	185	313	90.91%		
CHES	2/17/1997	10/25/2018	9/24/2017	Male	NRS BARTLETT	92	304	%		
CROTTS	4/28/1996	12/14/2018	2/11/2018	Male	NRS BARTLETT	142	164	%		
DICKINSON	1/13/1998	11/16/2018	8/21/2017	Male	NRS BARTLETT	114	338	%		
DOBIE	4/4/1999	11/1/2018	2/8/2018	Male	NRS BARTLETT	99	167	%		
FANTANO	5/28/1996	10/22/2018	12/31/2017	Female	NRS BARTLETT	89	206	%		
FERMO	5/27/1995	8/17/2019	3/12/2018	Female	NRS BARTLETT	388	135	%		
FLIPPIN	5/14/1998	12/13/2018	4/27/2018	Male	NRS BARTLETT	141	89	%		
FUSSWINKEL	3/13/1999	7/2/2019	3/20/2018	Female	NRS BARTLETT	342	127	18.18%		
GARVEY	2/2/2000	12/20/2018	11/20/2017	Male	NRS BARTLETT	148	247	%		
GARZA	4/29/1999	8/19/2018	11/4/2017	Male	NRS BARTLETT	25	263	%		
GRANATINO	5/8/1998	4/5/2019	12/2/2017	Female	NRS BARTLETT	254	235	%		
GUERRANT	2/13/1999	8/8/2019	2/19/2018	Male	NRS BARTLETT	379	156	%		

Editing Future Sailor Data

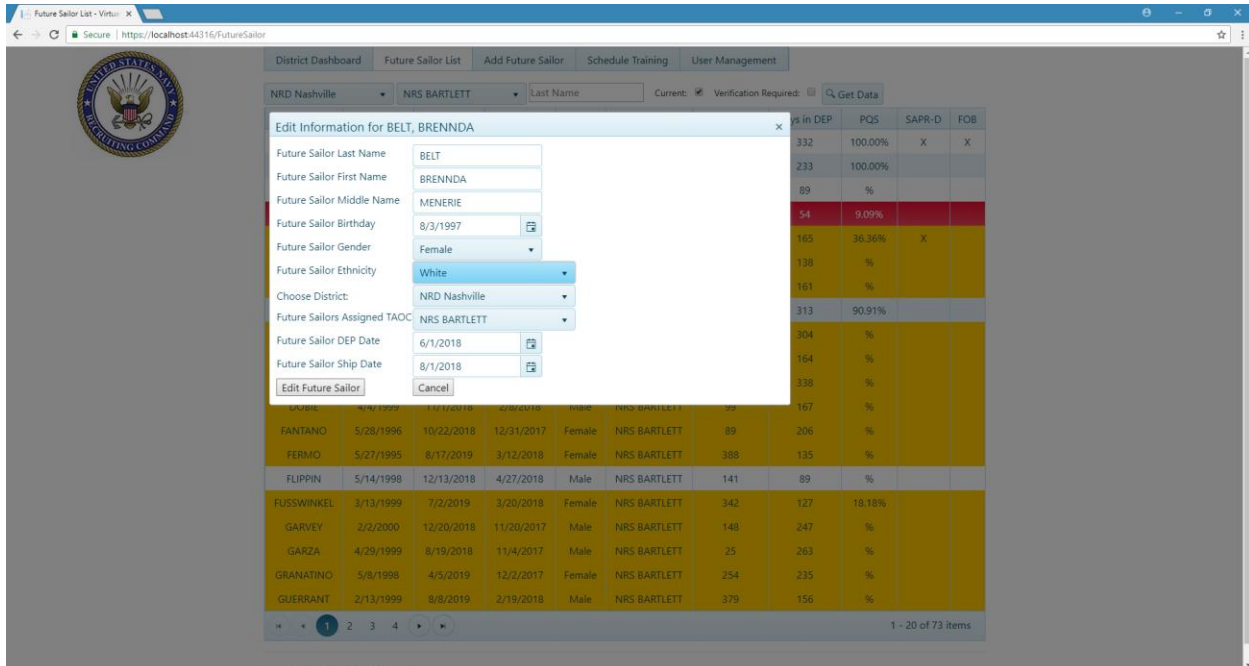
There may be instances in which a Future Sailor has a name change, or any of his/her information is incorrect and requires updating. If the recruiter right-clicks on a Future Sailor, a menu will display providing the recruiter with several options, one of which is Edit Applicant Data (see Figure 14). Note: “Applicant” and “Future Sailor” are used interchangeably.

Figure 14: Edit Applicant Data

Last Name	Birth Date	Ship Date	DEP Date	Gender	TAOC	Days to Ship	Days in DEP	PQS	SAPR-D	FOB
ALBRIGHT	1/1/2001	9/17/2018	8/27/2017	Male	NRS BARTLETT	54	332	100.00%	X	X
ASCHWALD	1/27/1995	12/18/2018	12/4/2017	Male	NRS BARTLETT	146	233	100.00%		
BELLCOLFER	1/15/2000	11/28/2018	4/27/2018	Female	NRS BARTLETT	126	89	%		
BELT	8/3/1997	8/1/2018	6/1/2018	Female	NRS BARTLETT	7	54	9.09%		
BURNS	9/8/1999	9/4/18			NRS BARTLETT	41	165	36.36%	X	
CANARIS	9/29/1996	7/24/18			NRS BARTLETT	364	138	%		
CARLETON	7/1/2000	10/7/18			NRS BARTLETT	74	161	%		
CHABOT	10/17/1995	1/26/19			NRS BARTLETT	185	313	90.91%		
CHES	2/17/1997	10/25/2018	9/24/2017	Male	NRS BARTLETT	92	304	%		
CROTTS	4/28/1996	12/14/2018	2/11/2018	Male	NRS BARTLETT	142	164	%		
DICKINSON	1/13/1998	11/16/2018	8/21/2017	Male	NRS BARTLETT	114	338	%		
DOBIE	4/4/1999	11/1/2018	2/8/2018	Male	NRS BARTLETT	99	167	%		
FANTANO	5/28/1996	10/22/2018	12/31/2017	Female	NRS BARTLETT	89	206	%		
FERMO	5/27/1995	8/17/2019	3/12/2018	Female	NRS BARTLETT	388	135	%		
FLIPPIN	5/14/1998	12/13/2018	4/27/2018	Male	NRS BARTLETT	141	89	%		
FUSSWINKEL	3/13/1999	7/2/2019	3/20/2018	Female	NRS BARTLETT	342	127	18.18%		
GARVEY	2/2/2000	12/20/2018	11/20/2017	Male	NRS BARTLETT	148	247	%		
GARZA	4/29/1999	8/19/2018	11/4/2017	Male	NRS BARTLETT	25	263	%		
GRANATINO	5/8/1998	4/5/2019	12/2/2017	Female	NRS BARTLETT	254	235	%		
GUERRANT	2/13/1999	8/8/2019	2/19/2018	Male	NRS BARTLETT	379	156	%		

Clicking “Edit Applicant Data” presents the recruiter with a pop-up window that allows the recruiter to update the Future Sailor’s record (see Figure 15). From the “Edit Information for Last name, First name window,” the recruiter can update the Future Sailor’s last, first, and middle names, as well as the Sailor’s birthdate, gender, ethnicity, district, TAOC, DEP Date, and Ship Date. District and TAOC fields are especially important as they are where the recruiter would update information if the Future Sailor needed to be moved to a different TAOC.

Figure 15: Future Sailor Record



Verifying Future Sailor PQS

On the Future Sailor List, if the recruiter right-clicks on a Future Sailor and then selects “PQS Verification,” that Future Sailor’s PQS Verification screen appears. There are two screens: one to verify main sections and one to view and verify sub-items (Figure 16). On the main screen, if a recruiter chooses to verify an entire heading, clicking the “Verify” button updates the information displayed in the “Verified By” and “Verified On” columns with the recruiter’s name and the current date, respectively. Then, clicking “Verify” on the main screen updates all of the sub-items in that PQS section. If the recruiter desires to view individual PQS sub-items, he/she can click the “Sub-Items” button on the same line as the main PQS section. Clicking “Sub-Items” displays the PQS Sub-Items window enabling the recruiter to view each sub-item and whether or not the Future Sailor interacted with the mobile application regarding the Pass/Fail, Test Date, and Opened # columns. If the Future Sailor opened a particular section in the mobile application, that will update the Opened # column. If the Future Sailor completes an item on the mobile application, that will update the Pass/Fail and Test Date columns. The recruiter can verify an individual sub-item by clicking on the “Verify” button on that row.

The following are the current PQS and Sub-Items that can be verified by the recruiter. Note: These PQS and Sub-Items exist in the mobile application and are explained in the Training Content section of this report.

- DEP Responsibilities
 - Define the mission of the Navy.
 - Recite the eleven general orders of a sentry.
 - Recite The Sailor's Creed.
 - Recite the RTC Maxim.
 - How many times are you required to contact your recruiter?
 - Explain your conduct while in the DEP.
- Navy Core Values
 - Define Honor.
 - Define Courage.
 - Define Commitment.
- Code of Ethics
 - Explain the Navy's Policy on Alcohol use.
 - Explain the Navy's Drug Policy.
 - Explain the Navy's Sexual Harassment Policy.
 - Explain Fraternalization (while in DEP and Boot Camp).
 - Explain your recruiter's prohibited practices.
- RTC Chain of Command
 - Discuss the RTC Chain of Command.
 - Discuss the RTC's responsibilities.
- Physical Readiness Program
 - How many fitness tests will you receive at RTC?
 - What is the maximum body fat percentage allowed at RTC?
- Advancement
 - Explain the different ways to get advanced pay grade prior to attending RTC.
 - Explain the Referral Recognition Program.
 - Explain the minimum time in pay grade for normal advancement from E-1 to E-4.
- Military Drill/Etiquette
 - Attention
 - Hand Salute
 - Left Face
 - Right Face
 - About Face
 - Regular/Close Interval Dress
 - Parade Rest/At Ease
 - Explain/Demonstrate the proper way to cross a Quarterdeck.
- Navy Terminology/Phonetic Alphabet/Military Time
 - Discuss Navy terminology.
 - Recite the Phonetic alphabet.
 - Recite Military Time.
- Rank and Recognition
 - Name and identify enlisted ranks, E-1 through E-9.
 - Name and identify officer ranks, O-1 through O-10.
 - Name and identify warrant officer ranks, W-2 through W-5.

Verifying Future Sailor Additional Training

Similar to verifying the PQS items on the Future Sailor List, if the recruiter right-clicks on a Future Sailor and then selects “Additional Training Verification,” that Future Sailor’s Additional Training Verification screen appears (see Figure 18). On this screen, there are only main topics with no sub-items, so the recruiter may simply click the “Verify” button on each item as required. The recruiter will also be able to determine if the Future Sailor has interacted with or watched the training material by the information in the Completed On and Watched # columns. If the recruiter chooses to verify, updates to the “Verified On” and “Verified By” columns will display showing the current date and the recruiter’s name, respectively.

In some cases, a recruiter may want to know in which main section a Future Sailor has performed an action without clicking through all of them. When a Future Sailor completes a PQS item within the mobile application, those items that have not yet been verified by the recruiter will flag the major section he/she is in by turning that line item yellow (see Figure 17).

Figure 17: Flagged PQS Header

The screenshot shows a web application interface for managing Future Sailors. A modal window titled "PQS Verification for BELT, BRENNDA" is open, displaying a table of PQS items. The table has columns for "PQS Item", "Verified By", "Verified On", "Verify", and "Sub-Items". The "Navy Core Values" row is highlighted in yellow, indicating it is flagged. Below the modal is a table of Future Sailors with columns for "Name", "DOB", "Gender", "Last Name", and other details.

PQS Item	Verified By	Verified On	Verify	Sub-Items
DEP Responsibilities	LAWSON, TIMOTHY	9/10/2018	Verify	Sub-Items
Navy Core Values			Verify	Sub-Items
Code of Ethics			Verify	Sub-Items
OTC Chain of Command			Verify	Sub-Items
Physical Readiness Program			Verify	Sub-Items
Advancement			Verify	Sub-Items
Military Drill/Etiquette			Verify	Sub-Items
Navy Terminology/Phonetic Alphabet/Military Time			Verify	Sub-Items
Rank and Recognition			Verify	Sub-Items
Aircraft and Ships			Verify	Sub-Items
Personal Financial Management			Verify	Sub-Items

Name	DOB	Gender	Last Name	Completed On	Watched #	Completed %	FOB
CANARS	9/29/1996	Female	NRS BARTLETT	7/24/2019	231	36	%
CARD	10/18/2000	Female	NRS BARTLETT	11/28/2018	44	206	%
CHAROT	10/17/1995	Male	NRS BARTLETT	1/26/2019	152	36	100.00% X
CHENEVERT	2/20/2000	Male	NRS BARTLETT	6/28/2019	255	53	%
CHES	2/17/1997	Male	NRS BARTLETT	8/25/2019	311	36	%
CHRISTOPH	12/3/1997	Female	NRS BARTLETT	7/6/2019	283	36	%

The following are the required training items that the recruiter can verify:

- Faces of Bootcamp*
- SAPR-D*
- Accommodation of Religious Practices
- CO Top Six
- Education Information
- Leaving for RTC
- Recruit Leadership
- Resiliency
- Responsibilities regarding Family Members
- What to bring to RTC
- When Recruiters Transfer

* Currently implemented in the VRT phase 1 prototype

Figure 18: Training Verification Screen



Entering, Editing, and Tracking Future Sailor Fitness Information

While on the Future Sailor List, if the recruiter right-clicks on a Future Sailor and then selects “Physical Fitness,” a submenu appears that displays “Add New PFA Record” and “PFA Progression.” Selecting “Add New PFA Record” displays the PFA entry screen, allowing the user to enter any PFA data for a particular date/time (Figure 19). From this screen, the user may select the date/time the action was completed and at least one of the following items of data:

- Run Time (Minutes, Seconds)
- Pushups (Whole Number)
- Situps (Whole Number, also referred to as Curlups)
- Height (Whole Number in Inches)
- Weight (Whole Number in Pounds)

If the user selects “PFA Progression,” the PFA Progression screen appears (

Figure 20), displaying four graphs with the information entered by the user on the Add New PFA Record screen for the Future Sailor selected (Figure 19).

- The top left graph displays the Future Sailor’s progression in curlups and pushups.
- The bottom left graph shows the Future Sailor’s progression in BMI and BFP. The BMI and BFP numbers are not official Navy measurements and are only meant as an approximation to show progress to the recruiter or user of the MC. Current formulas used in the application are as follows:

$$\text{BMI} = (\text{weight} \times .45) / \text{SQUARE}(\text{height} \times .025)$$

$$\text{BFP} = (((\text{bmi} \times 1.20) + (.23 \times \text{age})) - (10.8 \times \text{genderval})) - 5.4$$

Note: genderval = 1 for males, 0 for females

- The top right graph represents the Future Sailor’s progression with his/her 1.5 mile run time.
- The bottom right graph displays any changes to the Future Sailor’s height or weight as entered by the user.

If a recruiter wishes to edit a PFA record that he/she entered, he/she selects “Edit PFA Records” (see Figure 21), and a listing of that Future Sailor’s PFA records will appear. The recruiter may then click the edit button and can alter any entries previously made to that record. Currently, user entered PFA records (from the mobile app) cannot be edited by the recruiter (to ensure consistency with the LRS). The recruiter can determine at a glance which records have been entered by the Future Sailor because those records will appear yellow highlighted on the Edit PFA screen.

Figure 19: Add New PFA Record Screen

New PFA Record for BURNS, TAISHAN

Action Date: 7/25/2018 9:31 AM

PRT

Enter 1.5 mile run time: Minutes: Seconds:

Enter number of pushups: Pushups:

Enter number of situps: Situps:

BCA

Enter Height in inches: Height:

Enter Weight in pounds: Weight:

Save PRT/BCA Data

POS	SAPR-D	FOB
332	100.00%	X X
233	100.00%	
89	%	
54	0.00%	
110	36.36%	X
138	%	
161	%	
313	90.91%	
304	%	
164	%	
338	%	
167	%	
89	206	%
388	135	%
141	89	%
342	127	18.18%
148	247	%
25	263	%
254	235	%
379	156	%

Figure 20: PFA Progression

PFA Progression for BELT, BRENNDA

Future Sailor Pushup/Curlup Progression

Future Sailor Run Progression

Future Sailor BCA Progression

Future Sailor HT/WT Progression

POS	SAPR-D	FOB
00.00%	X	X
00.00%		
%		
9.09%		
36.36%	X	
%		
%		
90.91%		
%		
%		
%		
%		
%		
18.18%		
%		
%		
%		
%		

Figure 21: Edit PFA Records

The screenshot displays a web application interface for managing sailor records. At the top, there are navigation tabs: 'District Dashboard', 'Future Sailor List', 'Add Future Sailor', and 'User Management'. The user is logged in as 'LAWSON'. The main content area shows a table of sailor records with columns: Last Name, Birth Date, Ship Date, DEP Date, Gender, TACC, Days to Ship, Days in DEP, PGS, SAPR-D, and FOB. Two records are visible: ALLENJONES and ANDERTON. A modal window is open, titled 'Edit PFA Record(s) for CHENEVERT, RASHEEN'. This modal contains a table with columns: Height, Weight, Action Date, Pushups, Curlups, Run Time, Swim Time, BMI, and BFP. The modal table lists 9 records for Rasheen Chenevert. Below the modal, the main table shows records for CHENEVERT, CHES, and CHRISTOPH. The footer indicates '© 2018 - DEP Training Manager'.

Last Name	Birth Date	Ship Date	DEP Date	Gender	TACC	Days to Ship	Days in DEP	PGS	SAPR-D	FOB
ALLENJONES	10/19/1998	6/25/2019	7/6/2018	Male	NRS BARTLETT	232	102	100.00%	X	X
ANDERTON	2/26/1998	11/10/2018	7/5/2018	Male	NRS BARTLETT	25	103	%		

Height	Weight	Action Date	Pushups	Curlups	Run Time	Swim Time	BMI	BFP
72	185	10/1/2018	70	70	10:10	12:10	25.69	18.77
72	185	8/27/2018	62	65	10:45	14:15	25.69	18.77
72	189	8/15/2018	57	60	10:55	00:00	26	19
72	193	6/6/2018	60	58	11:01	00:00	27	20
72	195	5/10/2018	58	57	11:54	00:00	27	20
72	197	4/11/2018	55	53	12:02	00:00	27	21
72	201	3/5/2018	51	46	12:55	00:00	28	21
72	205	2/5/2018	50	30	13:10	00:00	28	22
72	210	1/2/2018	41	29	13:55	00:00	29	23

Last Name	Birth Date	Ship Date	DEP Date	Gender	TACC	Days to Ship	Days in DEP	PGS	SAPR-D	FOB
CHENEVERT	5/20/2000	8/28/2019	8/24/2019	Male	NRS BARTLETT	255	53	%		
CHES	2/17/1997	8/25/2019	8/10/2018	Male	NRS BARTLETT	313	36	%		
CHRISTOPH	12/3/1997	7/6/2019	9/10/2018	Female	NRS BARTLETT	263	36	%		

Generate QR Code for Future Sailor Login to eHelm

In order for the Future Sailor to link his/her record in the MC with eHelm on a mobile device, there are several complex items of information required by eHelm (the information required is covered in detail in the Information Technology section of this document). For convenience, in order to avoid the need to manually type information into the mobile device, the information is encoded into a QR code by the MC. Once a Future Sailor's record is created in the MC, the recruiter is able to generate the QR code. From the Future Sailor List, the recruiter can right-click on the desired Future Sailor and select "Display QR Code." The QR code for the selected Future Sailor will display on screen (Figure 22) allowing the recruiter to print it and give it to the Future Sailor (or paste it into an email for the Future Sailor to print). The Future Sailor can use eHelm on his/her personal device to scan the QR code from the printout or directly off the MC screen with assistance from the recruiter.

Figure 22: QR Code

The screenshot shows a web application interface for the 'Future Sailor List'. The browser address bar indicates the URL is <https://localhost:44316/FutureSailor>. The interface includes a navigation menu with options like 'District Dashboard', 'Future Sailor List', 'Add Future Sailor', 'Schedule Training', and 'User Management'. A table lists sailor records with columns for Last Name, Birth Date, Ship Date, DEP Date, Gender, TAOCC, Days to Ship, Days in DEP, PQS, SAPR-D, and FOB. A modal window titled 'QR Code for BELT, BRENNDA' is open, displaying a QR code and a unique alphanumeric code: 0e5cfa6-15e1-e711-8b4e-480cf535ebd. A 'Print' button is visible below the code. The table shows that BRENNDA BELT has a 9.09% PQS and is currently highlighted in red.

Last Name	Birth Date	Ship Date	DEP Date	Gender	TAOCC	Days to Ship	Days in DEP	PQS	SAPR-D	FOB
ALBRIGHT	1/1/2001	9/17/2018	8/27/2017	Male	NRS BARTLETT	54	332	100.00%	X	X
ASCHWALD	1/27/1995	12/18/2018	12/4/2017	Male	NRS BARTLETT	146	233	100.00%		
BELLCOLFER	1/15/2000	11/28/2018	4/27/2018	Female	NRS BARTLETT	126	89	%		
BELT	8/3/1997	8/1/2018	6/1/2018	Female	NRS BARTLETT	7	54	9.09%		
BURNS								96.36%	X	
CANARIS								%		
CARLETON								%		
CHABOT								90.91%		
CHES								%		
CROTTIS								%		
DICKINSON								%		
DOBIE								%		
FANTANO								%		
FERMO	5/27/1995	8/17/2019	3/12/2018	Female	NRS BARTLETT	388	135	%		
FLIPPIN	5/14/1998	12/13/2018	4/27/2018	Male	NRS BARTLETT	141	89	%		
FUSSWINKEL	3/13/1999	7/2/2019	3/20/2018	Female	NRS BARTLETT	342	127	18.18%		
GARVEY	2/2/2000	12/20/2018	11/20/2017	Male	NRS BARTLETT	148	247	%		
GARZA	4/29/1999	8/19/2018	11/4/2017	Male	NRS BARTLETT	25	263	%		
GRANATINO	5/8/1998	4/5/2019	12/2/2017	Female	NRS BARTLETT	254	235	%		
GUERRANT	2/13/1999	8/8/2019	2/19/2018	Male	NRS BARTLETT	379	156	%		

Add New Future Sailor to System

In the absence of any connection to other NRC information systems, Future Sailor records must be manually created by recruiting personnel. Adding a new Future Sailor is a quick process in the MC and is accessible from the top main menu. If a recruiter needs to add a Future Sailor record, he/she can click “Add Future Sailor,” at which time the MC will display the necessary inputs to create a record (Figure 23: Future Sailor Input Screen). The information displayed is the same as listed in the Editing Future Sailor Data section of this document. The selection of District and TAOC for the new record is dependent on the access rights of the user. If the user only has rights to one TAOC, that is the only TAOC to which he/she can create new Future Sailor records.

Figure 23: Future Sailor Input Screen

Virtual Recruit Training

Secure | https://localhost:44316/FutureSailor/NewFutureSailor

District Dashboard Future Sailor List Add Future Sailor Schedule Training User Management

Future Sailor Last Name: Guy

Future Sailor First Name: New

Future Sailor Middle Name: Sailor

Future Sailor Birthday: 7/25/2018

Future Sailor Gender: Female

Future Sailor Ethnicity: Do not use Asian/P. Isindr

Choose District: NRD Michigan

Future Sailors Assigned TAOC: NRS CLARKVILLE

Future Sailor DEP Date: 7/25/2018

Future Sailor Ship Date: 7/25/2018

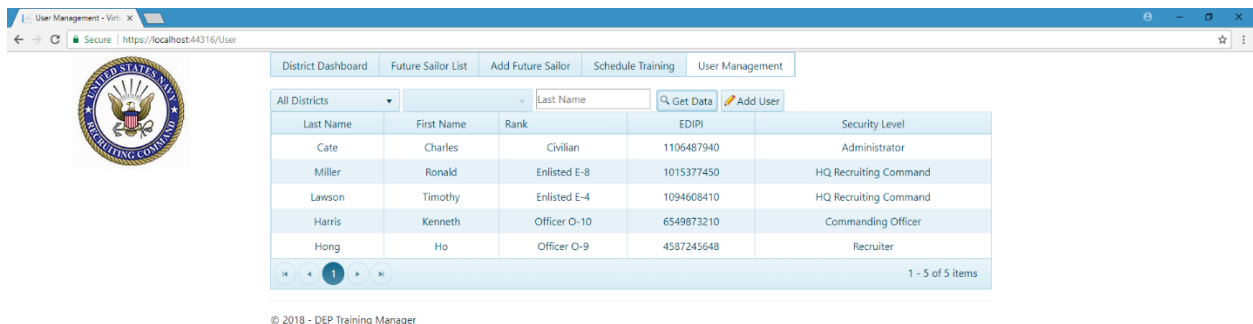
Save New Future Sailor

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User Management

The User Management portion of the MC is where the new recruiter, on-boarder, or headquarters user accounts are created and managed. This area of the application is accessed through the top main menu by clicking the “User Management” link, which takes the current user to the User Data Screen (Figure 24). The User Data screen functions similarly to the Future Sailor List screen. Depending on the current user’s rights, he/she can select a district or station and filter by last name while searching for current users. If the user wishes to edit information on an existing account, he/she needs only to right-click on that row and select “Edit User Data” to display the Insert or Update User Data Screen (Figure 25). The entries on the Insert or Update User Data screen will be prepopulated with the selected accounts information, allowing the user to make any updates necessary. If the current user wishes to add a new account, he/she should click the “Add User” button from the User Data screen. The user can then grant rights to the newly created user (or alter rights for a user already in the system) by clicking “Access Rights.” From the Access Rights screen, the user may then grant or remove any rights that he/she has the authority to grant and that the user has the authority to receive.

Figure 24: User Data Screen



The screenshot displays the User Management interface within a web browser. The browser's address bar shows the URL <https://localhost:44316/User>. The interface includes a navigation menu with options: District Dashboard, Future Sailor List, Add Future Sailor, Schedule Training, and User Management. On the left, there is a circular logo for the United States Navy Recruiting Command. The main content area features a search bar with a dropdown menu for "All Districts" and a text input for "Last Name". To the right of the search bar are buttons for "Get Data" and "Add User". Below the search bar is a table with the following columns: Last Name, First Name, Rank, EDIPI, and Security Level. The table contains five rows of user data. At the bottom of the table, there is a pagination control showing "1" and "1 - 5 of 5 items".

Last Name	First Name	Rank	EDIPI	Security Level
Cate	Charles	Civilian	1106487940	Administrator
Miller	Ronald	Enlisted E-8	1015377450	HQ Recruiting Command
Lawson	Timothy	Enlisted E-4	1094608410	HQ Recruiting Command
Harris	Kenneth	Officer O-10	6549873210	Commanding Officer
Hong	Ho	Officer O-9	4587245648	Recruiter

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Figure 25: Insert or Update User Data Screen

The screenshot shows a web browser window with the title 'Insert or Update User Data'. The address bar displays 'https://localhost:44316/User/insertUpdateUser/3'. The browser's navigation bar includes a back button, a 'Secure' indicator, and a star icon. Below the address bar is a menu with five items: 'District Dashboard', 'Future Sailor List', 'Add Future Sailor', 'Schedule Training', and 'User Management'. On the left side of the page is the official seal of the United States Coast Guard. The main content area is titled 'Insert or Update User Data' and contains a form with the following fields: 'LastName' (Lawson), 'FirstName' (Timothy), 'MiddleName' (Wayne), and 'EDIPI' (1094608410). At the bottom of the form are two buttons: 'Insert/Update User' and 'Cancel'. A copyright notice '© 2018 - DEP Training Manager' is located at the bottom of the page.

LastName	Lawson
FirstName	Timothy
MiddleName	Wayne
EDIPI	1094608410

Insert/Update User Cancel

© 2018 - DEP Training Manager

Future Sailor Experimental Data

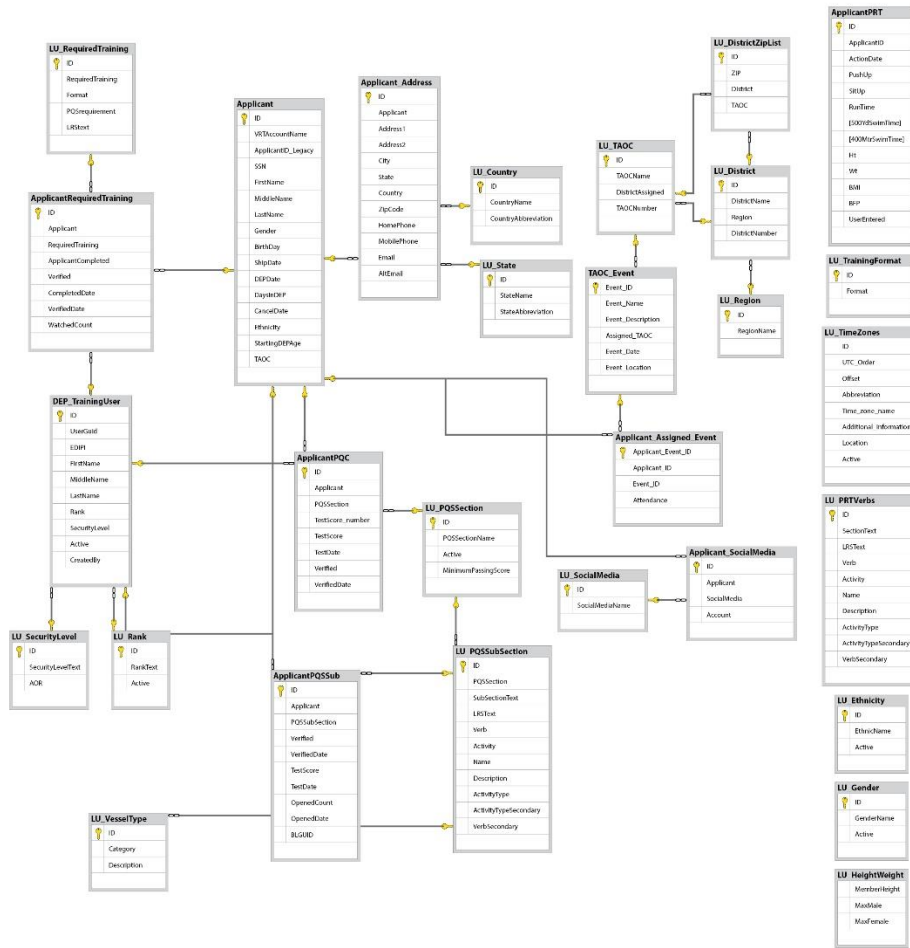
An experimental dataset has been created for testing the VRT system based on realistic Future Sailor attributes. This dataset represents the “VRT DB” listed on the Current VRT Architecture diagram (Figure 9), explained in the Information Technology section of this report. The experimental dataset was created by the project’s technology staff. The number of records depends on the demonstration or experiment being conducted. For example, 60,000 (not representative of reality) Future Sailor records were created for demonstration of the VRT system for the 2017 Interservice/Industry Training, Simulation and Education Conference (I/ITSEC). A total of 1,000 records constitutes a representation of Future Sailors assigned to a recruiting district for one recruiting year. Future demonstrations and experiments may require representing the full complement of Future Sailors (approximately 26,000) in the DEP for all districts and stations.

The experimental dataset was constructed as a “relational database.” The structure and design of a database allow one to identify and access data in relation to another piece of data in the database. Often, data in a relational database is organized into tables. Tables can have hundreds, thousands, sometimes even millions of rows of data. These rows are often called records. Tables can also have many columns of data. Columns are labeled with a descriptive name (for example, age) and have a specific data type. Tables can become large and have a multitude of columns and records. Relational Database Management Systems (RDBMSs) manage the data in these large tables (see Figure 26: Relational Database for Experimental Future Sailors). The complexity of the data and the functionality of the VRT application required by the end users make this the most appropriate solution. SQL statements are used both for interactive queries for information from a relational database and for gathering data for reports.

The database and all the data were created utilizing a sample based on Navy Recruiting District Ohio demographics. The personnel records were based on a sample of “popular” first and last names, common street names, and city names. State and zip code data were randomly generated based on information from the United States Postal Service.

All of the personnel demographics (date of birth, gender, height, weight, and Physical Readiness Test (PRT) scores), test scores, DEP dates, and ship dates were randomly generated based on the parameters from the requirements document.

Figure 26: Relational Database for Experimental Future Sailors



Mobile Application (App)

The Modern Learning Strategies (MLS) team at the NAWCTSD Orlando is focused on helping military agencies implement modern technologies for learning. While modern technologies have much value to add, understanding and addressing the significant hurdles and providing practical approaches to address them is often elusive. The MLS team approaches these hurdles from the Science of Learning, Technology Development, and Systems/Acquisition engineering disciplines in an effort to enable and promulgate these technologies.

A major focus area for the MLS team has been mobile devices and their use within the Naval training enterprise. After a thorough look at the hurdles facing mobile device use in the Navy, a need was identified that led to the development of the eHelm mobile application. The eHelm application is a cross-platform (Android, iOS, Windows) mobile app that provides schoolhouses with a streamlined "first step" to loading their existing course content on mobile devices.

The purpose of eHelm is to allow curriculum managers to reuse the large amounts of existing "as is" training content that they possess (e.g., PowerPoint presentations, videos, PDF documents, Hypertext Markup Language [HTML] pages, etc.) and easily convert it into mobile-friendly data formats that are presented in a single-user experience application. Additionally, content in eHelm is available in an "offline" environment, organized per a curriculum manager's needs, and eHelm captures metrics on how that content is being used. The app also provides features such as interactive note taking and bookmarking.

The CPA is a Windows desktop application designed to be used by curriculum managers (or in the case of the VRT, the NRC's recruiter training and quality assurance team) to create the content that is loaded by eHelm. It provides a simple user interface that does not require specialized software expertise. The CPA allows curriculum managers to interactively import, organize, and package their content for consumption by the eHelm mobile app. This is extremely valuable, as often there is no funding, time, or expertise available to spend on reengineering existing content. The CPA handles all of the work of "converting" the content so that it can be viewed on mobile devices; thus the "first step" in mobile.

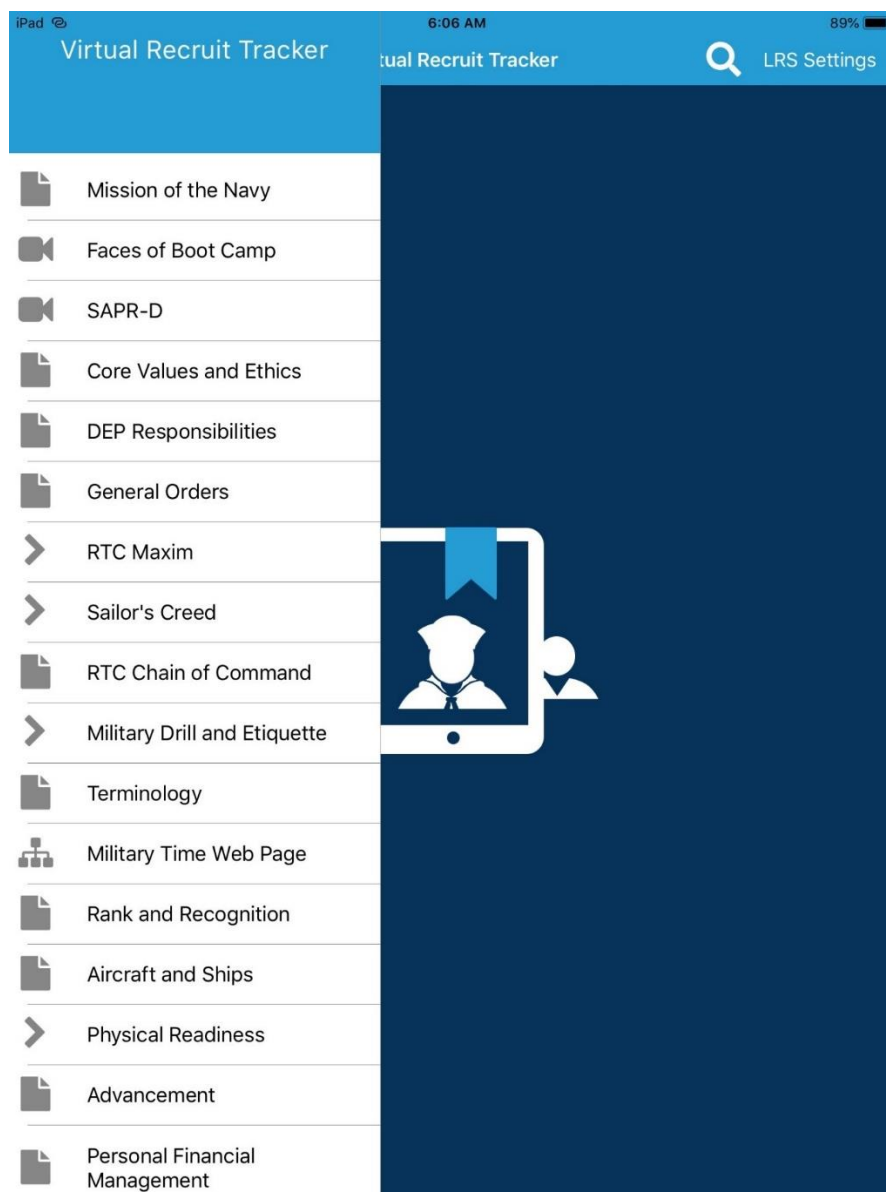
The eHelm application provides usage metrics back to curriculum managers, giving them insight into how the content is being interacted with. What content items, what parts of the content, how often it is opened, etc., are all data points that eHelm tracks and provides back to managers. This data layer gives not only an important insight to curriculum managers for content management, but also allows decision makers to see what is being viewed in eHelm and by which users (in the case of VRT, the MC collects and displays the usage statistics for each Future Sailor). This data layer is built on the xAPI protocol discussed later in this document.

A DEP content package for eHelm was created, based upon the information in the START Guide, for individuals interested in the Navy, applicants who are endeavoring to join the Navy, and Future Sailors who have begun the DEP and are beginning the phased DEP training program. The DEP content contains PQS training content for Future Sailors to become proficient in the CO's Top 6, The Sailor's Creed, Recruit Training Command's (RTC's) rules and offences, resilience, and physical fitness. Usage metrics are collected and reported using xAPI. Usage metrics collected while the device is offline are saved on the

device and subsequently transmitted when the mobile device is reconnected to a network. Figure 27 depicts a screenshot of the eHelm application with the DEP content package loaded.

The eHelm application with the DEP content package loaded provides an interface for Future Sailors to navigate training content, take notes, add bookmarks, and take assessments tied to training content. Future versions of eHelm (expected in VRT Phase 2 and beyond) may allow Future Sailors to receive event-driven feedback and updates as training content becomes due, is successfully completed, or is supplemented by additional training content. The future vision for VRT includes the ability for Future Sailors to engage in weekly check-ins with acquisition professionals, interactive audio and visual group training activities, and 24-hour chat and guidance from recruiting professionals and fellow Future Sailors.







Figure 27: eHelm User Interface for VRT







Implementation

The eHelm mobile application is developed using Visual Studio 2017 Enterprise, Xamarin Forms, and the C# programming language. The functions available to the user (see Table 8) through the interface are navigation of training content, interface overview, video viewing, bookmarking, note taking, and listing of bookmarks and notes.

Table 8: eHelm User Interface Descriptions

Interface Function	Description
Navigation	<p>The Navigation Pane contains the overall structure of the current CP. The Navigation Pane houses different item types, including:</p> <ul style="list-style-type: none"> • Files/Videos — Present content to the user to read, watch, and/or interact with.  • Containers — Contain other containers, files, and websites. Provide a way to structure courses.  • Websites — Display a website that is internal to the CP.  • URL — Displays a website that is external to the CP (e.g., www.navy.com).  • Video — Plays a video that is external to the CP (e.g., www.youtube.com). 
Content Interface Overview	<p>Name of the content being viewed, application settings, and scrollbar thumb/current page number.</p> <p>Notes/Bookmarks summary view — Add a note to content/a bookmark to current page.</p>
Videos	<p>Content may have videos embedded within it. A play icon will be shown if a video can be played. Press the icon to play the video.</p> 

Interface Function	Description
Bookmarks	<p data-bbox="553 226 1432 331">“Add a bookmark” — Scroll to the page you want to bookmark. Ensure the scrollbar thumb indicates the page you are on. You may have to zoom in to get the page you are trying to bookmark.</p>  <p data-bbox="553 478 1432 611">“Remove a bookmark” — Scroll to the page you want to remove a bookmark from. Ensure the scrollbar thumb indicates the page you are on. You may have to zoom in to get the page you are trying to remove the bookmark from.</p> 
Notes	<p data-bbox="553 722 1432 758">Add, edit, save, and delete.</p> 
Bookmark and Notes List View	<p data-bbox="553 867 1432 999">You can view bookmarks and notes by selecting the “Bookmark and Notes List View” button. You can switch between views by selecting the Bookmarks or Notes tab header. Selecting a bookmark or note from the list will take you to that page in the current document.</p> 

Special Topics

Over the course of the initial virtual recruiting study and the Phase 1 prototype development, we identified special topics that extend the development team's knowledge related to Navy recruiting. We expect to use this knowledge to increase our ability to develop an impactful DEP training tool. DEP management, Resilience, Fitness Tracking, and xAPI Working Group are four such topics discussed in this section.

DEP Management

The DEP, also called the Delayed Enlistment Program (or the Future Soldiers Program in the Army), is a program whereby individuals going into active duty in the United States Armed Forces enlist first in the DEP before they ship out to Basic Training or "boot camp." The Navy currently has one single RTC located in Great Lakes, IL. All Navy enlisted recruits conduct their recruiting training and boot camp at the RTC. The primary focus of DEP management is overall program oversight, administration, and improvement. Some degree of DEP attrition will occur; however, effective DEP management should reduce the quantity of surprise attrition and minimize the effects of the attrition that do occur. Properly used, the tools presented in this section from the Navy's enlisted recruiting instruction will enhance program effectiveness (COMNAVCRUITCOMINST 1130.8K, NAVY RECRUITING MANUAL-ENLISTED, VOLUMES I – V, 010103. GENERAL). The Virtual Recruiting Study identified DEP as the most crucial area where a training tool should be implemented that could positively benefit Future Sailor's preparedness for recruit training.

Fitness Tracking

As part of the Navy's DEP requirements, maintaining fitness and motivating Future Sailors to be as well prepared as possible are important components of readiness to report, as well as a predictive indicator of their success upon entry to the RTC. As an initial step to fitness tracking, we have implemented a self-reporting form within the VRT that allows Future Sailors to input and track aspects of their fitness during the DEP timeframe. In Phase 2, we are exploring automated fitness tracking using a wearable device that will allow the Navy to conduct experiments, to include both human performance as well as system integration dynamics and capabilities. Just as with the smartphone or tablet, this concept is based on BYOD. The VRT development team will leverage both existing know-how in running similar experiments as well as the findings from a requirements matrix developed to evaluate existing market solutions based on cost, convenience, accuracy, durability, battery life, security, and interoperability. Based on these factors from prior reviews, as well as a current review focused on the Future Sailor audience, experimental devices are being acquired by NAWCTSD for evaluation in Phase 2.

An app framework for input and review as well as additional motivational messaging and techniques exists and can be modified to conduct experimental tests for mobile access to data and tracking. Leveraging these existing toolsets and known, off-the-shelf capabilities, will provide assurance of a successful solution for the Navy, keep costs for this component of the Phase 2 effort low, and allow the development team to explore the potential of an open model (multiple wearables, mobile devices, and apps that promote fitness).

Figure 4 depicts the current self-reporting fitness form within VRT. The form allows the Future Sailor to input height, weight, pushups, curl ups, 1.5-mile run, and 500-yard swim activity. The BMI, and BFP are computed from the height and weight provided. This information is transmitted by the mobile application to a LRS where it is retrieved by the MC for verification and tracking by recruiting officials.

xAPI Working Group

The Experience API (Application Programming Interface) is an e-learning software specification developed by the government-organization Advanced Distributed Learning (ADL) Co-Lab that allows learning content and learning systems to speak to each other in a manner that records and tracks all types of learning experiences. Learning experiences are recorded in a LRS. An LRS is a data storage system that serves as a repository for learning records collected from connected systems where learning activities are conducted. It is an essential component in the process flow for using the xAPI standard. The LRS was developed specifically to work with xAPI. If you are using xAPI, you have an LRS somewhere: either Central, Regional, or Local. Learning occurs in a series of experiences, and an LRS captures those individual experiences. An LRS stores and retrieves learning records about Future Sailors' learning experiences and progress.

If a regional LRS is used with local LRSs, JSON statements can be shared between LRSs, improving data portability and in-depth reporting and analytics. Stored statements are immutable: they cannot be changed, but can be deleted by administrators with system permissions. The LRS does not contain training content, but does contain xAPI Statement Objects received from training content about the Sailor and how he/she experienced the training content while learning (in the case of the Future Sailor training tracked by VRT, the xAPI Statement Objects are anonymized before being transmitted to the LRS). Once a statement is received by the LRS, the statement is validated for proper format and then stored in the LRS.

Members on the VRT team are primary members of the xAPI Working Group. This working group, chartered under NETC N6, is focused on four functional areas regarding the use of the xAPI protocol for Navy training.

1. Defining the data to be collected
2. The rulesets around the data collection
3. How to implement the protocol while addressing cybersecurity and PII challenges
4. The IT infrastructure and architecture to support this data collection

The ultimate goal of the working group is to provide a means for developers to implement xAPI in a way that will allow the data to be useful in supporting a Future Sailor's learning continuum. The VRT team has contributed to the working group by providing a subsection of VRT-specific rulesets for data collection that are included in version 1.0 of the working group's documentation and guidance for implementing xAPI.

Conclusion

The success of this effort has been through combining expertise in Navy recruiting, mobile applications, web development, analysis, instructional systems design, and data management technologies. The VRT development team has successfully developed a functional prototype system that includes a mobile application containing DEP training content and a Management Component (MC) that allows Navy recruiters to track Future Sailor DEP training progression, along with the necessary metrics collection and data storage capability.

A phase 2 effort is necessary to further evaluate and implement enhancements to the mobile application and the MC, present the system to Future Sailors and Navy recruiters to test its usability in the field, and transition the system to NRC's information technology organization life cycle maintenance processes.

Usability testing will be a significant milestone; the development team has developed a usability test plan to be approved by N6, N7, TAOC, and NRS Bartlett. The goal is to have Future Sailors in DEP and recruiters utilize the VRT system and provide feedback to the development team (this information would be shared and reported to stakeholders).

The expectations for the successful transition of the VRT prototype to a production environment and its long-term use by Future Sailors are very high. A successful implementation of VRT will better prepare Future Sailors for success at RTC and provide them a great start to their Navy careers, as well as enhance recruiters' ability to track and assist Future Sailors during DEP. This report highlighted the building blocks that were used to develop the prototype, and communicates the goals for the follow-on efforts.

Appendix A: Performance Monitoring Analysis Data

Table 9: Draft Analysis Data for Performance Monitoring

Variable	Description
Device Type	Device with application downloaded.
Operating System	Device operating system.
App Download Date	Initial download date.
Other Navy Apps Used	Represents the number of additional Navy-sponsored mobile applications being used by this user, excluding VRT.
Other Service Apps Used	Represents the number of additional other military services-sponsored mobile applications being used by this user, excluding VRT.
RunTime Self Report	Self-reported entry, for each entry (these values are collected for a maximum number of entries; beyond maximum, the earliest entry gets replaced by the newest entry).
CurlUp Self Report	Self-reported entry, for each entry (these values are collected for a maximum number of entries; beyond maximum, the earliest entry gets replaced by the newest entry).
PullUp Self Report	Self-reported entry, for each entry (these values are collected for a maximum number of entries; beyond maximum, the earliest entry gets replaced by the newest entry).
SwimTime Self Report	Self-reported entry, for each entry (these values are collected for a maximum number of entries; beyond maximum, the earliest entry gets replaced by the newest entry).
BMI Self Report	Calculated based on self-reported input of height and weight (these values are collected for a maximum number of entries; beyond maximum, the earliest entry gets replaced by the newest entry).
BFP Self Report	Calculated based on self-reported input of height and weight (these values are collected for a maximum number of entries; beyond maximum, the earliest entry gets replaced by the newest entry).
Commitment Level %	Calculated based on self-reported commitment level survey question responses.
DEP Start Download Date	Represents the difference in days between the DEP Start date and the date the App was downloaded.
Faces of Boot Camp Viewed Prior Ship	Represents the difference in days between viewing the <i>Faces of Boot Camp</i> video and the ship date to RTC.
SAPR-D Viewed Prior Ship	Represents the difference in days between viewing the SAPR-D video and the ship date to RTC.
NCIS Video Viewed Prior Ship	Represents the difference in days between viewing the Naval Criminal Investigative Service (NCIS) video and the ship date to RTC.
Additional Training Topics Completed	Represents list of additional training topics completed.
Documents Uploaded	Represents documents (by selected title, e.g., motor vehicle violation) uploaded via App.
Number of Users	Represents the cumulative number of App downloads.
Time Remaining In DEP Attrite	Represents the days remaining in DEP, prior to ship, when an individual attrites.
Early Ship	Represents \geq one day when an individual ships that is prior to the original ship date.

Variable	Description
Late Ship	Represents \geq one day when an individual ships that is after the original ship date.
Actual Ship Date	Represents the actual ship date for a Future Sailor.
DEP Responsibilities Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
Mission of Navy Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
General Orders of a Sentry Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
Sailor's Creed Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
RTC Maxim Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
DEP Responsibilities Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
Core Values Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
RTC Chain of Command Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
Physical Readiness Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
Advancement Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
Drill and Etiquette Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
Nomenclature Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
Rank and Recognition Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
Ships and Aircraft Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
Personal Finance Management Not Viewed Flag	This flag is set if this PQS has not been viewed prior to actual ship date.
DEP Responsibilities Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
Mission of Navy Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
General Orders of a Sentry Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
Sailor's Creed Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
RTC Maxim Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
DEP Responsibilities Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
Core Values Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
RTC Chain of Command Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
Physical Readiness Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
Advancement Completion Date	Date the PQS was completed; noted by recruiter verification of completion.

Variable	Description
Drill and Etiquette Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
Nomenclature Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
Rank and Recognition Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
Ships and Aircraft Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
Personal Finance Management Completion Date	Date the PQS was completed; noted by recruiter verification of completion.
DEP Responsibilities Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
Mission of Navy Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
General Orders of a Sentry Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
Sailor's Creed Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
RTC Maxim Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
DEP Responsibilities Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
Core Values Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
RTC Chain of Command Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
Physical Readiness Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
Advancement Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
Drill and Etiquette Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
Nomenclature Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
Rank and Recognition Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
Ships and Aircraft Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
Personal Finance Management Time to Complete Days	This flag is set if this PQS has not been viewed prior to actual ship date.
DEP Length Exceeds 6 months Flag	This flag is set for Futures Sailors when the current date is six months past their first reservation date and there is no confirmation date or cancelation date.
Ship Date Change Flag	This flag is set for Future Sailors when their ConfirmDate changes (1 for earlier date, 2 for later date).

Note: Variables listed in this table will be collected on an ongoing basis, starting with initial testing with actual Future Sailors in DEP. These variables are separate from the variables and metrics listed in the MC interface.

Appendix B: Technologies (References)

Cloud Computing

Cloud computing is a type of computing that relies on shared computing resources rather than having local servers or personal devices to handle applications. In its most simple description, cloud computing is taking services and moving them outside an organization's firewall.

RESTful Web Services

RESTful web services are built to work best on the Web. Representational State Transfer (REST) is an architectural style that specifies constraints, such as the uniform interface, that if applied to a web service would induce desirable properties, such as performance, scalability, and modifiability, that enable services to work best on the Web. In the REST architectural style, data and functionality are considered resources and are accessed using Uniform Resource Identifiers (URIs), typically links on the Web. The resources are acted upon by using a set of simple, well-defined operations. The REST architectural style constrains an architecture to a client/server architecture and is designed to use a stateless communication protocol, typically HTTP. In the REST architecture style, clients and servers exchange representations of resources by using a standardized interface and protocol.

VRT Management Component (MC)

The VRT MC is a web application used by recruiting professionals, onboarding team members, and Recruiting Command headquarters personnel. It was developed using Microsoft Visual Studio, utilizing the following languages: C#, HTML, Razor, JavaScript, and Telerik UI for ASP.NET. The web application in its production environment would run on the Microsoft Internet Information Services (IIS) web server and have a SQL server backend database. The database is structured in a relational format to run optimally with a web front-end. These technologies were chosen due to their familiarity with the NAWCTSD development staff as well as sharing the same environmental requirements as the other NRC systems.

GUID

A Globally Unique Identifier (GUID) is a 128-bit number used to identify information in computer systems. When generated according to the standard methods, GUIDs are for practical purposes unique, without depending for their uniqueness on a central registration authority or coordination between the parties generating them, unlike most other numbering schemes. While the probability that a GUID will be duplicated is not zero, it is close enough to zero to be negligible.

Thus, anyone can create a GUID and use it to identify something with near certainty that the identifier does not duplicate one that has already been, or will be, created to identify something else. Information labeled with GUIDs by independent parties can therefore be later combined into a single database, or transmitted on the same channel, with a negligible probability of duplication.

Adoption of GUIDs is widespread, with many computing platforms providing support for generating them and for parsing their textual representation.

QR Code

The QR code is the trademark for a type of matrix barcode (or two-dimensional barcode). A QR code uses four standardized encoding modes to efficiently store data; extensions may also be used. A QR code consists of black squares arranged in a square grid on a white background, which can be read by an imaging device, such as a camera, and processed using Reed-Solomon error correction until the image can be appropriately interpreted. The required data is then extracted from patterns that are present in both horizontal and vertical components of the image.

eHelm

The eHelm application is the vehicle that delivers the training content for the VRT to Future Sailors. It was developed using the Microsoft Visual Studio 2017 Integrated Development Environment and Xamarin Forms as the project. The application was developed in C# and is available as a cross-platform app, working on Android, iOS, and Universal Windows Platform devices. The eHelm app (1) will allow the reuse of legacy course content in a user-friendly mobile application without the need for redevelopment of existing content, (2) allows xAPI metrics to track usage and to begin the exploration of content optimization, (3) has the capability to add bookmarks and notes to the content that is displayed on the app, and (4) provides a single app that integrates all content in one navigable experience with minimal work for curriculum managers. Specifically, for the VRT system, a Future Sailor would download eHelm, scan his/her QR code, which triggers the app to download the training package containing the DEP material.

QR Code Scan for eHelm

The QR code generated from the VRT MC contains specific information needed by eHelm to function within the greater VRT system. The VRT QR code contains the following:

- endpoint: URL of the LRS.
- identifier: Parameter used when connecting to the LRS that identifies the database to record statements.
- token: Parameter used when connecting to the LRS that validates access to the database indicated by the identifier.
- actorId: GUID (tokenized username) that identifies the Future Sailor using the application.
- contentPackageUrl: Public URL from which the eHelm application will download the DEP content package.

The VRT MC generated QR code is a JSON object; an example of which is below:

```
{
  "endpoint": "https://vrt.example.com/statements",
  "identifier": "lrsidentifier",
  "token": "lrstoken",
  "actorId": "futuresailorguid"
  "contentPackageUrl": "http://navy.com/vrtpackage"
}
```

JSON Objects

JSON is a lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate. It is based on a subset of the JavaScript Programming Language. JSON is a text format that is completely language independent but uses conventions that are familiar to programmers of the C-family of languages, including C, C++, C#, Java, JavaScript, Perl, Python, and many others. These properties make JSON an ideal data-interchange language.

JSON is built on two structures:

- A collection of name/value pairs. In various languages, this is realized as an *object*, record, structure, dictionary, hash table, keyed list, or associative array.
- An ordered list of values. In most languages, this is realized as an *array*, vector, list, or sequence.

These are universal data structures. Virtually all modern programming languages support them in one form or another. It makes sense that a data format that is interchangeable with programming languages also be based on these structures.

LRS

An LRS is a data storage system that serves as a repository for learning records collected from connected systems where learning activities are conducted. It is an essential component in the process flow for using the xAPI standard by Advanced Distributed Learning (ADL). The LRS was developed specifically to work with xAPI. If you are using xAPI, you have an LRS somewhere: either Central, Regional, or Local. Learning occurs in a series of experiences and an LRS captures those individual experiences. An LRS stores and retrieves learning records about Future Sailors' learning experiences and progress. If a regional LRS is used with local LRSs, JSON statements can be shared between LRSs, improving data portability and in-depth reporting and analytics. Stored statements are immutable: they cannot be changed, but can be deleted by administrators with system permissions. The LRS does not contain training content, but does contain xAPI Statement Objects received from training content about the student and how he/she experienced the training content while learning. Once a statement is received by the LRS, the statement is validated for proper format and then stored in the LRS.

xAPI

The xAPI captures large-scale data on human performance. To accomplish this, xAPI uses what are called “Statements.” Statements are comprised of four components:

Actor: The user or the system that interacts with the content.

Verb: The type of interaction the actor performs.

Object: The content that was acted upon by the actor.

Content, Results (optional): Extra details about the interaction such as timestamps, scores, or attachments.

Statement format is “I did this”. Where the actor is “I”, the verb is “did”, and the object is “this”.

The Sailor (actor) started (verb) the Electronic Fundamentals lesson (object) and stopped at 50% (results).

The Sailor completed the Electronic Fundamentals lesson.

The Sailor obtained a score of 90% in the Electronic Fundamentals lesson test: 2nd highest in the class.

In various granularity, once a statement is triggered by the learning software, the statement is transmitted over HTTP or HTTPS and saved in an LRS in JSON. If no Internet connection is available at the time, xAPI statements can be buffered until a connection is made.

xAPI verbs and activity types in use by the VRT system include:

Issued by eHelm:

- opened: document, web page
- read: document, web page
- watched: video

Issued by VRT MC

- defined: vocabulary-word
- recited: mantra, time
- explained: policy-practice
- described: vehicle
- discussed: policy-practice, vocabulary-word
- answered: question
- demonstrated: drill-command
- named: rank
- identified: rank

Secure Socket Layer (SSL 443)

Secure Socket Layer Encryption (SSL Encryption) is a process undergone by data under the SSL protocol in order to protect that data during transfer and transmission by creating a channel, uniquely encrypted, so that the client and the server have a private communication link channel over the public Internet. The VRT MC specifically uses SSL Encryption between the recruiter's browser and the web server, and, when making any reads or writes, to the LRS database.

NMCI

NMCI is the unclassified intranet in use by most Navy personnel, including Recruiting Command personnel. NMCI systems will be utilized by recruiters to access the VRT MC for Future Sailor training, validation, reporting, and QR code generation.

EDIPI

An EDIPI is a unique number assigned to a record in the U.S. Department of Defense's Defense Enrollment and Eligibility Reporting System (DEERS) database. Each account in the VRT MC will have the user's EDIPI saved in the database. Having EDIPI stored allows the VRT MC to authenticate a user to the system using his/her CAC.

CAC/PKI

Any personnel logging into the VRT MC will need to use their DoD-issued CAC. The Navy uses the CAC not only as an ID card, but also to carry a user's Public Key Infrastructure (PKI) certificate, which is simply an electronic document used to confirm his/her identity.

A PKI is a set of roles, policies, and procedures needed to create, manage, distribute, use, store, and revoke digital certificates and manage public-key encryption. The purpose of a PKI is to facilitate the secure electronic transfer of information for a range of network activities such as e-commerce, Internet banking, and confidential email. It is required for activities where simple passwords are an inadequate authentication method and more rigorous proof is required to confirm the identity of the parties involved in the communication and validate the information being transferred.

Appendix C: Definitions

Bring Your Own Device (BYOD) — Also called bring your own technology (BYOT), bring your own phone (BYOP), and bring your own personal computer (BYOPC). Refers to the policy of permitting employees to bring personally owned devices (laptops, tablets, and smartphones) to their workplace and to use those devices to access privileged company information and applications. The phenomenon is commonly referred to as Information Technology (IT) consumerization.

Globally Unique Identifier (GUID) — Is a term used by Microsoft for a number that its programming generates to create a unique identity for an entity such as a Word document. GUIDs are widely used in Microsoft products to identify interfaces, replica sets, records, and other objects.

Learning Record Store (LRS) — Is a place to store learning records. The LRS is the heart of any Experience Application Programming Interface (xAPI) ecosystem, receiving, storing, and returning data about learning experiences, achievements, and job performance.

Quick Response (QR) Code — Is the trademark for a type of matrix barcode (or two-dimensional barcode) first designed in 1994 for the automotive industry in Japan. A barcode is a machine-readable optical label that contains information about the item to which it is attached.

RESTful Web Service — Refers to a Representational State Transfer (REST) and is an architectural style that defines a set of constraints to be used for creating web services. Web services that conform to the REST architectural style, or RESTful web services, provide interoperability between computer systems on the Internet. REST-compliant web services allow the requesting systems to access and manipulate textual representations of web resources by using a uniform and predefined set of stateless operations. Other kinds of web services, such as Simple Object Access Protocol (SOAP) web services, expose their own arbitrary sets of operations.

Test Flight — Allows testers to install and beta test apps on iOS, tvOS, and watchOS devices. Testers must receive an invite directly from a developer first before they can begin testing with TestFlight.

Appendix D: Acronyms and Abbreviations

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Acronym	Definition
A return to top↑	
ADL	Advanced Distributed Learning
App	Application
AWS	Amazon Web Services
B return to top↑	
BFP	Body Fat Percentage
BMI	Body Mass Index
BYOD	Bring Your Own Device
C return to top↑	
CAC	Common Access Card
CO	Commanding Officer
CP	Content Package
CPA	Content Packaging Application
CRUITMAN	Recruiting Manual
D return to top↑	
DBMS	Database Management System
DDS	Direct Deposit System
DEERS	Department of Defense's Defense Enrollment and Eligibility Reporting System
DEP	Delayed Entry Program

Acronym	Definition
E return to top↑	
EDIPI	Electronic Data Interchange Personal Identifier
eHelm	Mobile application
F return to top↑	
FOB	Faces of Boot Camp
FRD	Functional Requirements Document
G return to top↑	
GUID	Globally Unique Identifier
H return to top↑	
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
I return to top↑	
IDE	Integrated Development Environment
IIS	Internet Information Services
I/ITSEC	Interservice/Industry Training, Simulation and Education Conference
ISD	Instructional Systems Designer
IT	Information Technology
J return to top↑	
JSON	JavaScript Object Notation
K return to top↑	
L return to top↑	

Acronym	Definition
LDS	Lesson Design Strategy
LES	Leave and Earnings Statement
LRS	Learning Record Store
M return to top↑	
MC	Management Component
METIL	Mixed Emerging Technology Integration Lab
MLS	Modern Learning Strategies
MPT&E	Manpower, Personnel, Training, and Education
N return to top↑	
NAWCTSD	Naval Air Warfare Center Training Systems Division
NCIS	Naval Criminal Investigative Service
NMCI	Navy Marine Corps Intranet
NRC	Navy Recruiting Command
NRD	Navy Recruiting District
NRS	Navy Recruiting Station
NTAG	Navy Talent Acquisition Group
NTAF	Navy Talent Acquisition Force
O return to top↑	
P return to top↑	
PAO	Public Affairs Officer
PDF	Portable Document Format
PFA	Physical Fitness Assessment
PII	Personal Identifiable Information

Acronym	Definition
PIN	Personal Identification Number
PKI	Public Key Infrastructure
PRT	Physical Readiness Test
PQS	Personnel Qualification Standards
Q return to top↑	
QR	Quick Response
R return to top↑	
RDBMS	Relational Database Management System
REST	Representational State Transfer
RRL	Ready Relevant Learning
RTC	Recruit Training Command
S return to top↑	
SAPR-D	Sexual Assault Prevention and Response – Department of Defense
SME	Subject Matter Expert
SOAP	Simple Object Access Protocol
SQL	Structured Query Language
SSL	Secure Socket Layer
START	Standards Transition Acknowledgement Requirement Training
T return to top↑	
TAOC	Talent Acquisition Onboarding Center
TIG	Time in Grade
U return to top↑	
UCF	University of Central Florida
URI	Uniform Resource Identifier

Acronym	Definition
URL	Uniform Resource Locator
V return to top↑	
VRT	Virtual Recruit Tracker
W return to top↑	
X return to top↑	
xAPI	Experience Application Programming Interface
Y return to top↑	
Z return to top↑	

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