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1. Background

Throughout the Air Force, Airmen encounter problems every day that require physical documentation which must often be pulled from an official digital repository, printed, taken to site, filled out, and inputted back into the digital repository, wasting morale and man-hours on duplicated data entry. Even worse than this are systems that are only physical, meaning only a single Airman can utilize the knowledge of a document and no backup exists for worse case scenarios. There are other times where Airmen TDY away from their units, and lose access to much of the knowledge and documentation that correspond to their unique pieces of equipment. In many cases, the workflow would benefit from a digital repository for this information, as well as accompanying applications for ease-of-use. This alone would not completely solve the problem, as many of the locations that our Airmen work out of are devoid of internet or NIPRNet access. The solution to this is a portable "datacenter in a box," which hosts mirrors of relevant systems, provides compute and storage to Airmen, and hosts mechanisms to automatically sync information when returned to its home location.

2. Design

The system should be designed in such a way that it is:

- Scalable
    - Units should be able to increase or decrease compute, storage, networking, and deployed applications as needed.
- Portable
    - It should be relatively compact and lightweight so that Airmen are not burdened by bringing it.
- Intuitive
    - The system and interface should be developed so that it "plug and play" for the end users.
- Secure
    - IA and Comms should be included in the development process from the start, so that best practices are followed and approval for the system is ensured.

3. Prototype

A Scalable Airman Bootstrap Resource (SABR) proof-of-concept was developed using a toolbox, four small form factor PCs, a switch, and a router, weights 20 lbs, only requires a single 120 volt plug into a wall or generator to run, and cost approximately $1,500.

This prototype was built using off-the-shelf commercial equipment, with the following features:

- Hardware
    - 32GB of RAM
    - 32 compute cores
        - 24 x86 cores
        - 8 arm7 cores
    - 3TB of storage
        - 2TB are shared among all computers as network attached storage
    - 1 WiFi Router
        - 1 ready to use ethernet cord
        - 2 open ports for expansion
    - HDMI & USB connectivity control a single machine via screen, keyboard, and mouse.
    - GPIO Breadboard for the control and reading of different ad-hoc sensors and devices.
- Software
    - All devices are SSH enabled
    - All applications are containerized via docker, making deployment of new applications simple and painless.
    - Application dashboard so end-users don't need to remember addresses.
    - Web GUI based file sharing service
    - Wiki for knowledge management
    - Gitlab for DevSecOps uses
    - Jupyter Labs for data science uses
    - Home Assistant to communicate with various IoT devices
    - etc.

4. Potential Applications

LRS Kit Management. When an LRS unit deploys in support of an exercise or operation, they bring several kits with them. These kits are inventoried and managed entirely on paper and entered by hand back into ILSS when the unit returns. With the SABR, the LRS unit would be able to utilize an offline version of ILSS or similar application, which would then automatically sync with ILSS on connection to NIPRNet.

Portable Knowledge Management. Many pieces of equipment have nuances to them and a long repair history. Experienced maintainers often know the exact history of their equipment, what to check first, and what the most common solution is for a given problem. Access to this information is often lost when a member PCSs or when newer maintainers go TDY and can no

longer contact the experienced maintainer. Using SABR, a unit can utilize an internal wikipedia, or similar system, to maintain a record of common errors, fixes, and even step-by-step guides that can be taken along on TDYs. Members can document problems faced and solutions used while away and it will automatically sync with the larger system on return to the home unit.

Hackathon In A Box. With SABR, a unit can pre-load data and applications like Jupyter Notebooks, Gitlab, and other systems, and take it with them to an operating location, and require that all participants utilize the ecosystem that SABR provides. This would ensure custody of the data, as well as guarantee that the hackathon host has the ability to bring back and analyze all the solutions that the participants provided.

FOB Security In A Box. Units could set up a perimeter of cameras, and push the feed into the SABR box. By replacing two of the small form factor PCs with a server that has a GPU, object detection and classification could be applied to the surveillance feeds and pushed to a dashboard or similar application hosted in the box for situational awareness and monitoring.

5. Next Steps

Having proved the value of this system, and having used it several times in the field, the next step is to work towards producing a prototype that is authorized to store CUI data and integrate with NIPRNet when at its home station.

To this end, Information Assurance and Communications Squadrons must be integrated in the development process from the beginning, to ensure that any issues and concerns are addressed immediately and that the proper equipment is acquired to build the system. The end goal is that the final system has approval, in writing, to operate in the Air Force communications ecosystem.