MARCORSYSCOM

Chief Technology Officer (CTO)

Luis E. Velazquez

Artificial Intelligence (AI) Technology Impact Forum

AI and the Workforce*: *Augmenting existing capabilities and applying AI without having the workforce to learn AI.

REVISION 2

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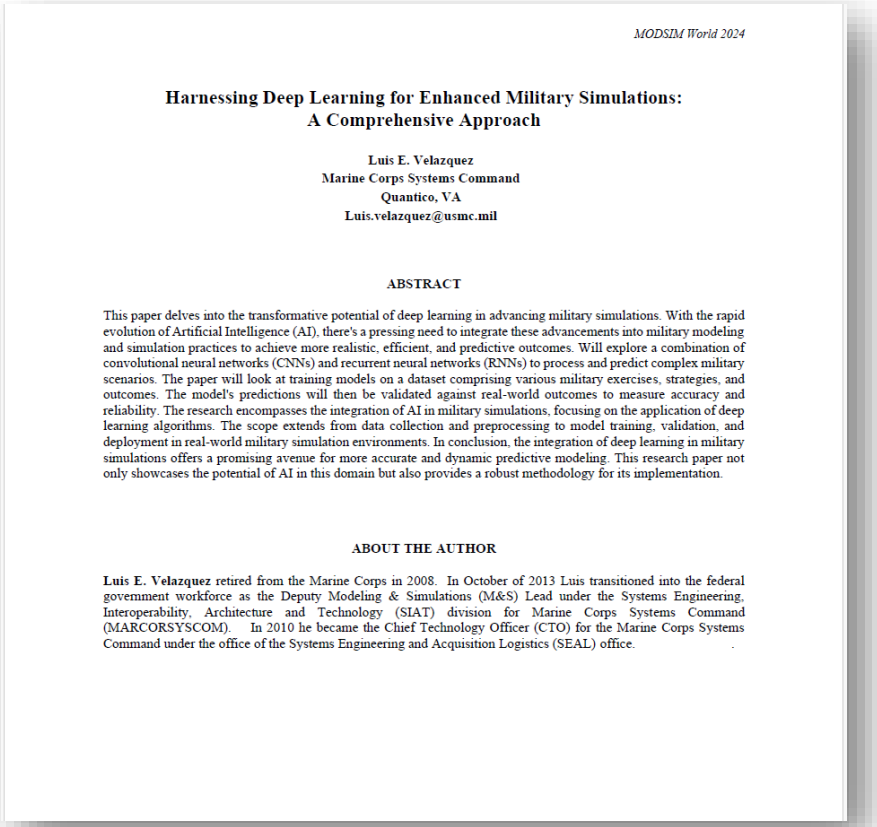
Author of the "*Harnessing Deep Learning for Enhanced Military Simulations*: *A Comprehensive Approach*" published April of 2024 – ***MODSIM WORLD***



MODSIM World 2024

Harnessing Deep Learning for Enhanced Military Simulations: A Comprehensive Approach

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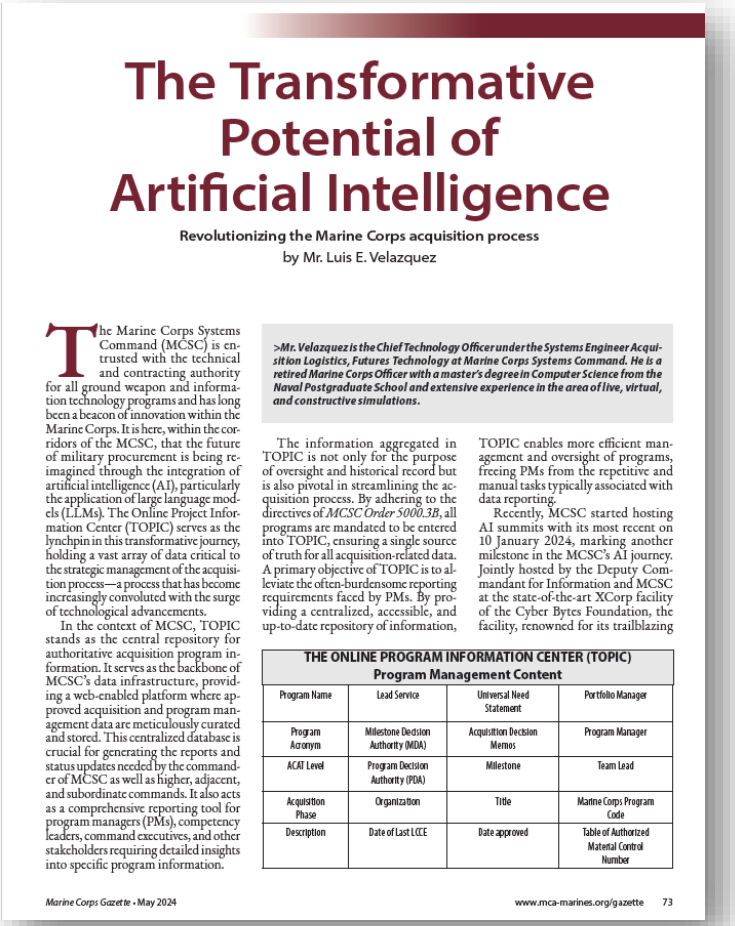
ABSTRACT

This paper delves into the transformative potential of deep learning in advancing military simulations. With the rapid evolution of Artificial Intelligence (AI), there's a pressing need to integrate these advancements into military modeling and simulation practices to achieve more realistic, efficient, and predictive outcomes. Will explore a combination of convolutional neural networks (CNNs) and recurrent neural networks (RNNs) to process and predict complex military scenarios. The paper will look at training models on a dataset comprising various military exercises, strategies, and outcomes. The model's predictions will then be validated against real-world outcomes to measure accuracy and reliability. The research encompasses the integration of AI in military simulations, focusing on the application of deep learning algorithms. The scope extends from data collection and preprocessing to model training, validation, and deployment in real-world military simulation environments. In conclusion, the integration of deep learning in military simulations offers a promising avenue for more accurate and dynamic predictive modeling. This research paper not only showcases the potential of AI in this domain but also provides a robust methodology for its implementation.

ABOUT THE AUTHOR

Luis E. Velazquez retired from the Marine Corps in 2008. In October of 2013 Luis transitioned into the federal government workforce as the Deputy Modeling & Simulations (M&S) Lead under the Systems Engineering, Interoperability, Architecture and Technology (SIAT) division for Marine Corps Systems Command (MARCORSYSCOM). In 2010 he became the Chief Technology Officer (CTO) for the Marine Corps Systems Command under the office of the Systems Engineering and Acquisition Logistics (SEAL) office.

Author of the "Transformative potential of Artificial Intelligence" published May of 2024 – ***Marine Corps Gazette***



The Transformative Potential of Artificial Intelligence

Revolutionizing the Marine Corps acquisition process
by Mr. Luis E. Velazquez

>Mr. Velazquez is the Chief Technology Officer under the Systems Engineer Acquisition Logistics, Futures Technology at Marine Corps Systems Command. He is a retired Marine Corps Officer with a master's degree in Computer Science from the Naval Postgraduate School and extensive experience in the area of live, virtual, and constructive simulations.

The Marine Corps Systems Command (MCSC) is entrusted with the technical and contracting authority for all ground weapon and information technology programs and has long been a beacon of innovation within the Marine Corps. It is here, within the corridors of the MCSC, that the future of military procurement is being reimagined through the integration of artificial intelligence (AI), particularly the application of large language models (LLMs). The Online Project Information Center (TOPIC) serves as the lynchpin in this transformative journey, holding a vast array of data critical to the strategic management of the acquisition process—a process that has become increasingly convoluted with the surge of technological advancements.

In the context of MCSC, TOPIC stands as the central repository for authoritative acquisition program information. It serves as the backbone of MCSC's data infrastructure, providing a web-enabled platform where approved acquisition and program management data are meticulously curated and stored. This centralized database is crucial for generating the reports and status updates needed by the commander of MCSC as well as higher, adjacent, and subordinate commands. It also acts as a comprehensive reporting tool for program managers (PMs), competency leaders, command executives, and other stakeholders requiring detailed insights into specific program information.

The information aggregated in TOPIC is not only for the purpose of oversight and historical record but is also pivotal in streamlining the acquisition process. By adhering to the directives of *MCSC Order 5000.3B*, all programs are mandated to be entered into TOPIC, ensuring a single source of truth for all acquisition-related data. A primary objective of TOPIC is to alleviate the often-burdensome reporting requirements faced by PMs. By providing a centralized, accessible, and up-to-date repository of information, TOPIC enables more efficient management and oversight of programs, freeing PMs from the repetitive and manual tasks typically associated with data reporting.

Recently, MCSC started hosting AI summits with its most recent on 10 January 2024, marking another milestone in the MCSC's AI journey. Jointly hosted by the Deputy Commandant for Information and MCSC at the state-of-the-art XCorp facility of the Cyber Bytes Foundation, the facility, renowned for its trailblazing

THE ONLINE PROGRAM INFORMATION CENTER (TOPIC)
Program Management Content

Program Name	Lead Service	Universal Need Statement	Portfolio Manager
Program Acronym	Milestone Decision Authority (MDA)	Acquisition Decision Memos	Program Manager
ACAT Level	Program Decision Authority (PDA)	Milestone	Team Lead
Acquisition Phase	Organization	Title	Marine Corps Program Code
Description	Date of Last LCCE	Date approved	Table of Authorized Material Control Number

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Background

The Marine Corps relies on the **Total Force Structure Management System (TFSMS)** to organize and manage information related to force structure. TFSMS provides critical data about personnel, units, and equipment. However, extracting actionable insights from this vast dataset can be challenging.

Problem Statement

The Marine Corps wants to:

1. **Efficiently mine TFSMS data**: Extract relevant information from TFSMS records.
2. **Train an LLM (Language and Learning Model)**: Develop an AI model that understands TFSMS data.
3. **Enable engineers to interact with the data**: Provide an intuitive interface for analysis and decision-making.

The **Total Force Structure Management System (TFSMS)** is an essential tool used by the United States Marine Corps to manage its force structure data. It is a web-enabled, workflow application that serves as the single authoritative source for all Marine Corps force structure information. This system facilitates the planning and coordination of manpower and equipment requirements across the entire Marine Corps enterprise.

TFSMS is used to receive, process, store, and disseminate data regarding the organization of units, including the number and types of personnel and associated equipment necessary for performing assigned missions. This data helps leaders at all levels to determine both current and future strategic needs. The system can project requirements up to 20 years into the future, making it a critical tool for strategic planning and decision-making.

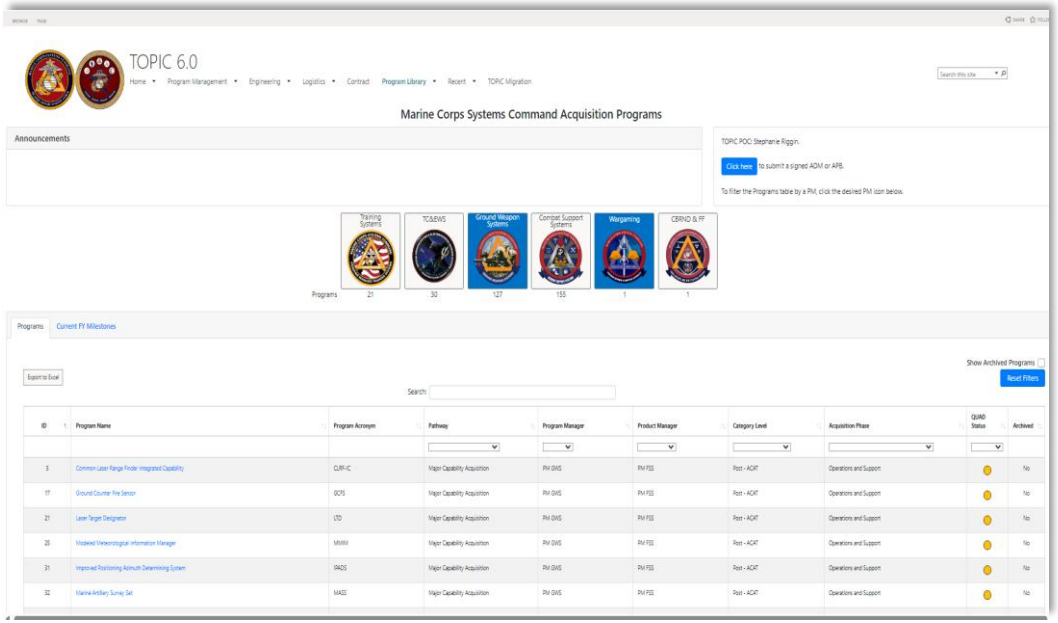
The system integrates various functions that were previously managed by multiple legacy systems, providing a comprehensive platform for manpower and equipment planning as well as readiness evaluations. TFSMS supports a wide range of tasks including the assessment of force structure requirements, the development of manpower and equipment plans, and the facilitation of readiness reporting through systems like the ***Defense Readiness Reporting System-Marine Corps (DRRS-MC***).

The Online Project Information Center (TOPIC)

The United States Marine Corps (USMC) "***The Online Project Information Center***" (**TOPIC**) is a digital platform designed to enhance project management and information sharing within the Marine Corps. This platform is part of the broader effort by the Marine Corps Systems Command (MCSC) to streamline operations and improve efficiency in handling projects, especially those related to acquisition, logistics, and information technology.

Key Features and Components of TOPIC:

- Project Management Tools
- Task Tracking
- Resource Management
- Document Management:
- Centralized Repository
- Version Control
- Data Integration and Analysis
- Data Aggregation
- Analytics and Reporting
- Collaboration and Communication
- User Access and Permissions
- Collaboration Tools
- Security and Compliance
- Data Security
- Compliance Management
- User Interface
- Dashboard Views
- Customization Options

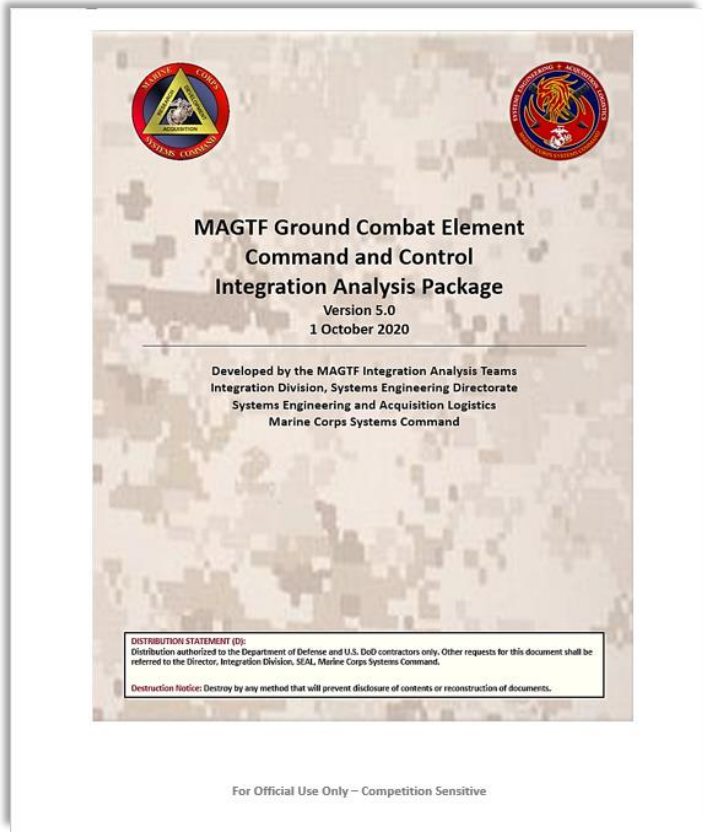


MAGTF Ground Combat Element Command and Control - Integration Analysis Package (IAP)

The Marine Corps Systems Command Integration Analysis Package (IAP) document is a comprehensive report / collection of documents that provide detailed analysis and insights into the integration of systems, technologies, or capabilities within the Marine Corps. These documents are critical in ensuring that new systems or upgrades are effectively integrated into existing Marine Corps operations without causing disruptions or inefficiencies.

The IAPS document serves several key purposes:

- **System Integration Requirements**
- **Analysis of Alternatives**
- **Technical Assessments**
- **Testing and Validation Plans**
- **Implementation Guidelines**
- **Risk Management**
- **Operational Impact Assessment**
- **Feedback and Recommendations**



Solution Objectives

Solution Objectives

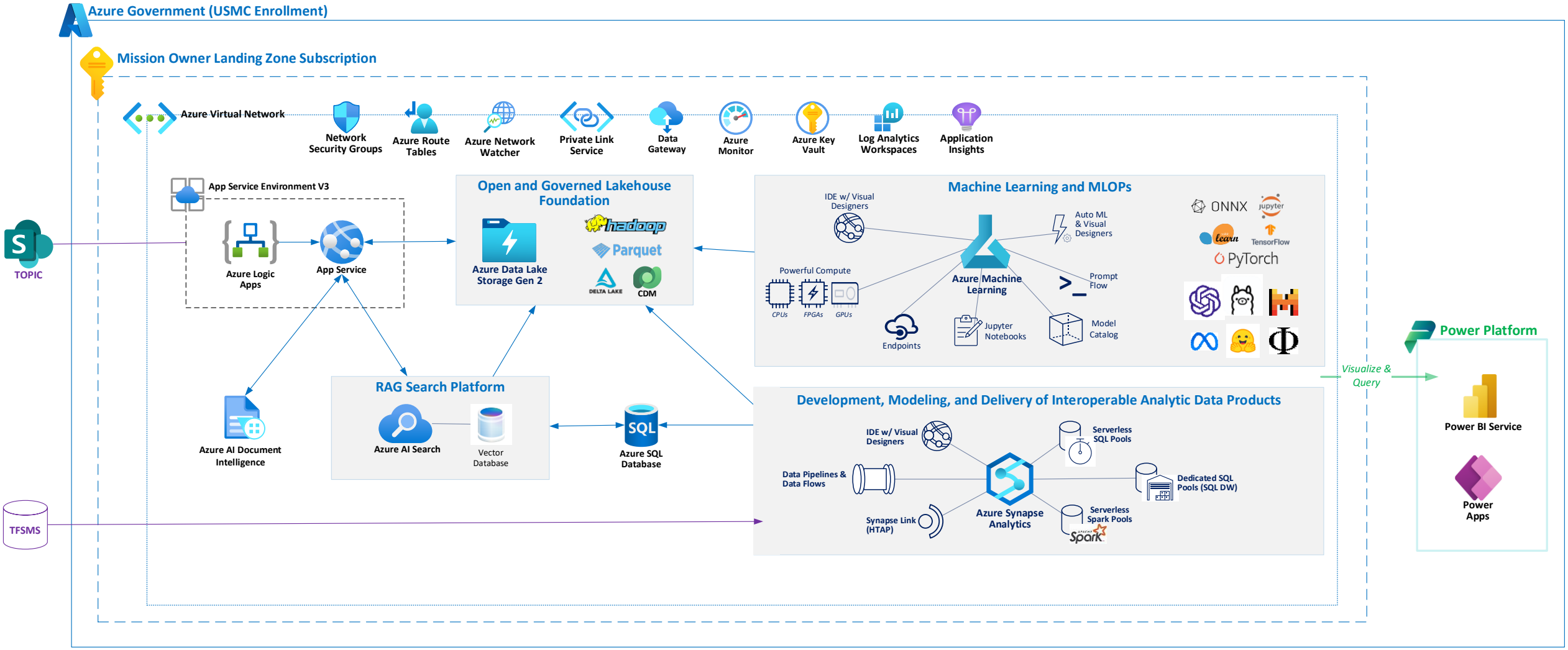
- The ***integration*** of the Total Force Structure Management System (**TFSMS**) and The Online Project Information Center (**TOPIC**) data into the Microsoft AI platform can significantly enhance the development and maintenance of the Integration Analysis Package (**IAP**) document.
- This integration facilitates comprehensive data analysis, ensures standardization, improves interoperability, and supports innovation within Command and Control (C2) systems in the USMC.

Objectives

1. Centralize and integrate data from TFSMS and TOPIC to provide a **single authoritative source for all data** needed to build, maintain and deliver the Integration Analysis Package (**IAP**) document; to **enable seamless access** to force structure data, project management information, and associated metadata; and to **enable realization of analytic / AI opportunities not possible with a siloed approach**.
2. Leverage Microsoft tools / capabilities to analyze and process data for the **efficient extraction and serving of mined / curated knowledge, business intelligence and analytic insights**. These insights include trends in manpower and equipment requirements, project health assessments, cost analysis, and readiness evaluations.
3. To the full extent possible, **automate today's manual business processes** responsible for the development, delivery, and maintenance of the IAP document – thereby, reducing costs and increasing the accuracy and timeliness of data insights.
4. **Enhance standardization and interoperability** in the production and delivery of IAPS data – thereby, increasing consistency, compatibility, and compliance across Marine Corps units and platforms.

Proposed Solution Architecture

Proposed Azure Solution Architecture



Solution Components (1 of 2)

1. **Azure Logic App(s)** may be configured to trigger upon a file being added to a TOPIC document library / directory and to copy the data into the **Azure Data Lake**, and to execute an API request to an **Azure App Service** endpoint responsible for subsequent the documents subsequent processing (e.g. text / knowledge extraction)
2. **Azure Document Intelligence Service** provides pre-built and customizable ML models capable of extracting / labeling document text (e.g., from the Quad Chart Program Briefs) and schematizing it for subsequent data integrations.
3. **Azure Synapse** provides automated data pipelines for ingesting data from TFSMS on a periodic basis and persisting it within the **Azure Data Lake** for subsequent integrations.
4. **Azure Data Lake** provides a centralized repository for persisting all force structure management data within interoperable formats and serving it through open/standard APIs and protocols.
5. **Azure Synapse** provides a unified platform for ingesting, exploring, preparing, transforming, managing, and serving data for immediate BI and machine learning needs. It may be used to integrate force structure management data and produce / serve transformed / monetized data to downstream analytic consumers.

Solution Components (2 of 2)

6. **Azure SQL Database** may store the fully-enriched and curated datasets that support IAPS and the delivery of analytic insights. Azure SQL DB also offers vectorization to support LLMs and AI-driven similarity searches alongside full-text, regex, and equality searches.
7. **Azure AI Search** provides vector, full-text, and hybrid search over structured or unstructured data synchronized from multiple data sources and enables grounding of LLMs over proprietary/private data (e.g., force structure management and IAPS data) within Retrieval-Augmented Generation (RAG) solutions.
8. **Azure Machine Learning** provides a unified platform for ML experimentation, prompt engineering, and the building, training, management and deployment of models and model endpoints. It also offers a catalog of pre-built and open-source models (including LLMs which may be employed to provide generative AI solutions over force structure management and IAPS data).
9. **Power BI Service** provides reporting, visualization, and AI capabilities to support the delivery and synthesis of analytic and AI insights (e.g., insights pertaining to force structure management and IAPS data)

Solution Next Steps

Solution Next Steps

1. Azure ***Landing Zone procurement***
2. Azure solution architecture ***deployment and configuration***
3. ***Data staging*** to enable Proof of Concept (POC) development and the validation of core use case feasibility
4. Identification of initial ***Points of Contact (POC)s*** required that the team will target – proposed options include:
    a. POC for ***ingesting TFSMS data*** and shaping it for analytic consumption
    b. POC for ***extracting / labeling data points*** of interest from the Quad Chart Program briefs
    c. POC for ***Retrieval-Augmented Generation (RAG)*** solution supporting ***LLM reasoning*** over force structure management and IAPS data
5. Identification of ***technical support required*** for progressing technical solution from conceptualization through operationalization and sustainment

Questions?

Report generation / modernization effort involving Microsoft Azure that will migrate legacy human in the loop and human intensive data analytics Total Force Structure Management System (TFSMS) / TOPIC) databases for the creation of the Integrated Architecture and Platform Specifications (IAPS) products (takes 7 months) and making this a point am click on demand solution. Will involve the Science and Technology Reinvention Laboratory (STRL) at MCTSSA along with other engineers.

Background

The Marine Corps Systems Command Integration Analysis Package (IAP) document is typically a comprehensive report or a collection of documents that provide detailed analysis and insights into the integration of systems, technologies, or capabilities within the Marine Corps. These documents are critical in ensuring that new systems or upgrades are effectively integrated into existing Marine Corps operations without causing disruptions or inefficiencies

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Integrated Architecture and Platform Specifications (IAPS)

Marine Corps Systems Command (MCSC) produces a document referred to as the ***Integrated Architecture and Platform Specifications (IAPS).***

The IAPS document serves several key purposes:

- **Standardization**: It provides standardized guidelines and specifications for C2 systems, ensuring consistency and compatibility across various platforms and units within the Marine Corps.
- **Interoperability**: It addresses the need for interoperability among different C2 systems, facilitating seamless communication and coordination between units and with other branches of the military.
- **Efficiency**: It aims to streamline the development, deployment, and maintenance of C2 systems, improving overall operational efficiency and effectiveness.
- **Innovation and Upgrades**: It sets the framework for integrating new technologies and upgrades into existing C2 systems, ensuring that the Marine Corps can leverage the latest advancements in technology.