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## Force capability analytics Achieving mission success

in contested environments with FutureScape<sup>™</sup>

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We are entering a new era of global contested dominance characterized by burgeoning conflicts on multiple fronts and intensifying geopolitical tensions between the world's superpowers on a complex and unstable international stage. The future strategic landscape is, and will continue to be, shaped by a redefined world order—Great Power Competition (GPC), shifting geopolitical alliances, the proliferation of cheap and accessible weaponry, technology, and logistics. Due to the dynamic nature and vulnerability to disruption in contested environments, the defense community needs effective and trustworthy tools to quickly simulate different capabilities, logistics support plans, future force designs, and Courses of Action (COA) to understand how to best meet mission readiness needs.

Enter FutureScape, Deloitte's AI-powered simulation platform that offers a repeatable, data-driven approach to simulate theater-level campaigns to assess effectiveness (e.g., logistics sustainability, troop movement, capability gaps, strategic placement of forces) with new concepts and capabilities at scale. Rapidly maturing concepts, capabilities, and innovative solutions at speed and scale is critical to maintain a dominating posture in GPC scenarios. By uncovering and resolving challenges early, analytically informed decisions will materially improve planning operations and the overall success of military campaigns.



## The Case for Action: Rise in nation- state adversaries and evolving landscape of war

While the U.S. has been focused on fighting terrorism and insurgency for the past 20 years, we are returning to Great Powers Competition (GPC) scenarios where nearpeer competitors are rising to counter U.S. power. Consequently, these competitors now demonstrate the means and intentions to shift the global landscape, threatening global supply chains and disrupting military operations.

On top of the increasing tension between the U.S. and the People's Republic of China (PRC) over Taiwan and disputes in the South China Sea, the U.S. is impacted by other conflicts such as those between Russia and Ukraine, Israel and Palestine, and recently, Iran. These are just the major ones; according to the Geneva Academy of International Humanitarian Law and Human Rights, there are over 110 active armed conflicts across the globe at the time of this writing<sup>1</sup>. Moreover, as technology continues to advance, the speed, lethality, and reach of conflict escalation in the 21st century cannot be anticipated by traditional methods of the past. As a result, our ability to support allied nations in future fights will be limited by the tools we use to assess strategic capabilities and operations.

In the dynamic operating landscape of the 21st century, Courses of Action (COA) that were viable yesterday may no longer be viable today. COAs that look viable on paper may actually have unintended consequences that are only illuminated through simulation. History of warfare demonstrates how catastrophic small assumptions or miscalculations can be on the strategic objectives of a nation. Traditional wargaming efforts often overlook infrastructure of host-nations such as deep-water ports, waterways, airports, bridges, and railways, which can have significant impact on mission outcomes. Supply chain bottlenecks and limited throughput of deployable service members and assets can arise from poorly planned operations in contested or unknown logistics environments. For

example, the German invasion of Russia during WWII was crippled by an oversight measured in inches as the German railcars, carrying much needed supplies, would not operate on Russian rails<sup>2</sup>.

Unfortunately, deploying the full force of our nation's combat power in a contested logistics environment against a near-peer threat is a perishable skill that has not been tested by our current combat forces. Today, deployments are supported by contracted logistics providers to move troops and equipment from home station to combat zone without threat from enemy combatants. In fact, very few military leaders have experience conducting theater-level operations in countries where their entrance to and ability to sustain was not a given, as was the case in wars of the 20th Century. During the Global War on Terrorism, vast networks of robust combat outposts and supply chains remain in place and relatively uncontested, something we can't count on in the future<sup>3</sup>.

To help fill the experience gap and avoid the mistakes of past campaigns, our military leaders need better tools to plan operations in contented environments. Previous generations have relied on table exercise and rehearsals of concepts to develop combat operations; however, these approaches do not offer the ability to test, revise, and validate against adversarial actions. The first time our nation's service members deploy to a new combat zone should not be the first time our military leaders have tested and validated Operational Plans (OPLAN). Legacy tools focus on optimizing a static or uncontested environment; this is no longer an appropriate assumption due to the Joint Logistics Enterprise's dynamic nature and vulnerability to disruption by near-peer competitors. New tools are needed that can simulate system-of- systems and the cascading effects of disruptions to these systems.

The rapid advancement of technology and the velocity of information dissemination is fundamentally reshaping the geopolitical landscape. Traditional boundaries of power are being redrawn in the Age of Al, as nations race to leverage new tools and tactics, techniques, and procedures (TTPs) to gain a competitive edge. This dynamic environment presents both opportunities and challenges for the U.S. to remain the world's dominant superpower. Our nation can no longer assume uncontested military operations, and the days of planning missions using whiteboards and excel sheets are now obsolete. In an era where information is key, this outdated approach cannot handle the volume, velocity, and variety of data we now have at our disposal. Our military leaders need better tools to identify capability gaps, test new capabilities, and uncover new force design strategies to meet the challenges faced in contested environments and the evolving landscape of war. This is where simulation comes into play.

## The Case for Simulation: Force design strategy and capability analytics

Modeling and simulation is a cornerstone in strategic planning and decision-making across various sectors that enables organizations to save time and money when developing technologies or strategic initiatives. In the world of simulation, there are three primary types: event-driven, agent-based, and dynamical. Event-based simulations model systems where changes occur at discrete points in time, such as a manufacturing process. Here, we are concerned with understanding things like resource utilization, performance, and process optimization. Agent-based simulations model systems defined by individual agents interacting with the environment and with each other, such as the spread of a disease or military wargaming. The primary focus is studying emergent behavior, which is unknown and can't be programmed ahead of time, more accurately modeling real world risks and uncertainties. Dynamical simulations model systems where understanding the physical and chemical effects are of utmost importance using differential equations. Modeling how a lithium-ion battery drains or how a new wing shape performs are examples of this type of simulation.

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Deputy Director Contested Logistics, AFC

We often face situations where we lack the necessary data to make informed decisions given the vast uncertainties that stem from complex interconnections and dependencies in our world today. Now, in the Age of AI, our military leaders can leverage advanced tools to explore contested environments at the speed and scale needed to meet the challenges of the future, which cannot be done with traditional planning methods. Simulation technology can dramatically improve our understanding of how systems behave and the effects of various feedback loops and the interdependencies that comprise them. Global conflicts, deployments and support operations can be tested, redesigned and improved in fast-paced agile iterations, generating relevant data from thousands of simulations, across multiple combat zones, without a single boot on the ground.

We must re-optimize our planning operations for GPC scenarios and contested environments, which requires evaluating new TTPs, Program Objective Memorandum (POM) investments, force designs, and capabilities. New warfighting concepts such as Multidomain Task Force, Army 2030, Force Design 2030, or Agile Combat Employment (ACE) cannot be tested at scale in a realworld environment. To better understand tradeoffs before long-run investments are made or when designing outside-of-the- box mission profiles, defense agencies must turn to data-driven methods to in high-fidelity simulation environments.

We call this Force Capability Analytics, which is the use of modeling & simulation tools and data analytics to assess different COAs, capabilities, force designs, and alternatives to uncover optimal force

structuring, investments, capability gaps, and sustainment activities for the best possible outcome. It involves the collection, generation, processing, and interpretation of data related to a particular campaign to inform strategic decisions. This can include things like troop movements, supply chain efficiency, equipment staging, or enemy activities. Logistics Planners can alter variables in a simulated environment to highlight vulnerabilities in supply chain resilience or perform "what-if" scenarios to determine overreliance on assets or infrastructure. Program Offices can simulate different assets in a force to assess mission outcomes and drive strategic investment decisions. New capabilities can be tested thousands of times at different locations within different combat units to better understand where the newly acquired asset may have the greatest impact. Mission planners can simulate different COAs to identify operational readiness and mission capability. In all of these cases, the point is to provide a data-driven basis for making decisions, at all levels of the operational planning lifecycle.

During a recent interview<sup>4</sup>, The Deputy Director of Contested Logistics at Army Futures Command—remarked, "We want a tool to tell us that you need to start moving some ammo to island X today because it's going to take 10 days to get there, based on the threat information from the intel community." Analytics and simulation tools are needed to make sense of data and understand risks<sup>5</sup>. When planning for uncertain events in constantly changing environments, we must turn to simulations; however, not all simulations are created equally.

## The Case for FutureScape: Insights at the speed of change

Deloitte's FutureScape platform is a key enabler to empower our military leaders to address complex planning problems and explore disruptive operating concepts and capabilities that lie firmly beyond what is presently characterized by available data and existing intuition. FutureScape is our flexible, configurable, agent-based digitaltwin simulation platform that can simulate millions of agents and their interactions in complex, multi-system environments. When we say at the speed of change and scale of modern needs, we mean being able to simulate thousands of missions, people, vehicles, and bases over a single day, as opposed to weeks or months (Figure 1).

#### Figure 1: In just one day, FutureScape can simulate thousands of missions, people, vehicles, and bases



#### Figure 2. FutureScape can stress-test logistics with thousands of geospatial datapoints at scale



**11 -** Ship-to-shore refueling events

Modeling sustainment and logistics represents a large part of the value-add FutureScape brings to our military leaders. For example, if our troops can't get food, water, ammunition, or fuel, they can't win the fight. We model these networks using up-to-date geospatial information to accurately model what it takes to move supplies from procurement sources to their destinations across multiple transportation modalities (Figure 2).

Moreover, digital-twins go one step beyond traditional simulations to incorporate realtime data, allowing for new simulations to be executed as new information is received. Additionally, the agent-based approach is well suited for military campaign analysis because it better reflect units with unique objectives and responsibilities interacting over time. As mentioned above, this allows us to study emergent behavior, exactly what we seek to understand with the kind of problems our military leaders face. Traditional simulation tools such as AFSIM or STORM can't replicate this behavior and fall short of meeting the needs of military planners in the 21st century.

The platform takes a layered approach to create the building blocks necessary to represent complex, real world systems. Different layers provide functionality for different types of agents (i.e. blue/red forces, vehicles, personnel, equipment, communication) or world state information (i.e. geography, road networks, infrastructure, airports, seaports), and the layers are composed with well-defined interfaces that support multiple levels of customization and fidelity. Agents and domains are also modular, and can be adapted to include new behaviors or extended to include new domains. The ability to easily add domains or modify behaviors and effects is particularly important for evaluating the efficacy of strategic acquisitions, force designs, COAs, logistics and sustainment plans, or identifying capability gaps and quantifying risk.

The agent-based simulation framework helps teams proactively model concepts, capabilities, and resourcing decisions in dynamic and contested environments. By turning to simulation with FutureScape, agencies are better equipped to maximize mission readiness across different logistics strategies, sustainment support plans, or COAs – all without the need for heavy manual coding to emulate a conflict. Agencies can leverage FutureScape's platform to conduct virtual exercises where new concepts and OPLANS can be evaluated in a high-fidelity simulation environment. Real-world effects of disruptions on logistics support can be analyzed to make more risk-informed decisions (i.e., how much fuel is needed and where it is needed and where to best place logistic support bases in a forward environment).

These simulations are built from the groundup, so data is captured at the smallest unit, generating rich datasets. Tightly coupled with the simulation environment is an evaluation framework that defines success for COAs, parameters (e.g., impact of data latency), or capability (e.g., improving mission capable rate). By establishing a baseline and then conducting experiments with the new COA or capability, agencies can rapidly iterate on potential plans and understand the impacts and outcomes that each plan offers. Agencies can rapidly explore ideas through hypothesis testing and dramatically improve the feasibility of its OPLAN in a representative conflict environment with various modalities of troop/supply movement and combatant behaviors.

The generated data is stored and accessible to answer analytic questions, provide data-driven insights to military leaders, can integrate with existing data platforms, and support offline training of machine and deep learning models.Based on projectspecific needs, simulations can run either on-premises or in a cloud environment. Previously, the platform received Authority to Operate (ATO) for a Top Secret/Sensitive Compartmented Information (TS/SCI) cloud environment with an U.S. Intelligence agency.

#### **Why Deloitte**

In today's rapidly evolving digital era, agencies require a partner who not only brings experience in data and advanced analytics but also one with a deep understanding of the mission and compliance requirements. With a rich history of working with government clients and maintaining a strict adherence to compliance requirements, we have consistently demonstrated our ability to leverage advanced technology to achieve tangible outcomes.

Deloitte, a worldwide leader in data and analytics services, offers a team with experience and leadership in advanced analytics, modeling, simulation, data visualization, human centered design, and data science. Our team is supported by analytics, software, and simulation specialists who have successfully delivered FutureScape™ to other defense and intelligence agencies. Our experienced team members have reach-back support to Deloitte's global workforce and can leverage a wide variety of industry partnerships to break through challenges.

Deloitte Consulting, LLP provides services to a wide range of government clients across several sectors to include Defense, Security, and Justice (DS&J) and Strategy and Analytics (S&A). We emphasize our commitment to providing high-quality, flexible, and comprehensive modeling and simulation support for multi-domain operations and can quickly identify and

quantify capability gaps and risks, develop new capabilities, and meet changing requirements. Our team works with leaders to address complex planning problems and explore disruptive operating concepts and capabilities with fit-for-purpose analytic approaches using simulation to better understand gaps, risks, and requirements at scale and in contested environments.

To learn more about FutureScape and how we help solve complex planning problems for our nation's military leaders, reach out today.

#### Is FutureScape right for your needs?

#### You need to know the best course of action in a contested environment.

By modeling interconnected networks,FutureScape's agent-based approach will use logic to simulate and investigate unforeseen consequences in dynamic environments.

#### You need to use data to rapidly explore ideas or identify gaps & risks with automated analyses.

Rapidly evaluate the effectiveness of new strategies, investments, or force designs with FutureScape's cloud agnostic engine and run largescale simulations quickly and simultaneously.

#### You need to determine logistics feasibility in a dynamic conflict environment.

Leverage artificial intelligence in an agile testing environment to identify unforeseen disruptions, gaps, risks, and consequences while feasibility testing in contested environments.

### Endnotes

- 1 https://geneva-academy.ch/galleries/today-s-armed-conflicts
- 2 https://www.pilotguides.com/articles/the-russian-railways-world-war-2/
- 3 https://www.army.mil/article/258366/22\_657\_sustainment\_in\_support\_of\_large\_scale\_combat\_operations
- 4 https://www.armytimes.com/news/your-army/2024/02/07/future-soldier-resupply-could-rely-on-ai-powered-logistics-robo-boats/
- 5 https://www2.deloitte.com/us/en/insights/industry/public-sector/future-of-warfighting-in-a-digital-age/the-future-of-warfare.html

### Get In Touch



Steve Hardy, PhD Managing Director Defense, Security, & Justice Strategy & Analytics Deloitte Consulting, LLP Mobile: +1.571.858.0591 Email: sthardy@deloitte.com



Liv Weller Product Manager FutureScape Strategy & Analytics Deloitte Consulting, LLP Mobile: +1.703.253.2390 Email: oweller@deloitte.com



Timothy Darrah, PhD, PMP Technical Point of Contact FutureScape Strategy & Analytics Deloitte Consulting, LLP Mobile: +1.615.313.4323 Email: tdarrah@deloitte.com

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