Maximizing Operational Potential

In an Era of Complex Systems and Changing Environment

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Security forces are trusted with turning directives and required operational objectives into operational missions. To handle this, large missions are broken down into sub-missions, which are translated into operational orders for different groups and arenas.

Every mission or sub-mission requires planning and real-time decisions regarding changing variables, including:

1. The operational goal (measure of success)
2. A map of the enemy's threat (what are we up against)
3. Location of potential strategic assets (operational systems) available for our forces use for completing the mission
4. Constraints and limitations of operating the systems due to the terrain.

Aside from the operational goal that is generally clearly defined - both to the decision makers and the operational units - mission planning and mission order can be changed during the battle, depending on how the battle evolves. The operational order can be defined with various numbers and parameters such as the number of available systems, locations, operation mode, communication requirements and so on. These so-called numbers and parameters, which are part of the basic operational order, in many cases, are difficult to set for achieving optimum results - particularly when the battle is ongoing and there are severe time constraints.

The operational missions of the 21st century include relentless challenges from both sides of the border, including a focus on protecting the home front and national infrastructure, which have been turned into a front by the enemy's tactics of asymmetrical warfare. These operational missions are both strategic and tactical; a fact that affects (and will continue to affect) the way in which missions are planned and units are assembled - with an aspiration of providing quick solutions on one hand, and making intelligent and effective use of existing assets on the other.

To illustrate the problem, we will review a number of examples and examine the sensitivity of the operational solution to the changing parameters.

Evolved Threat Map

The geo political realities surrounding Israel are constantly changing, and as a result, the security forces are receiving new tasks, which are influenced by the evolved threat map. Among the group of threats including Hamas, Hizbullah in the North, and the nuclearization of Iran, there is in the past few years a new group of radicals with access to advanced weapons and the ability to actualize its vision of threatening the State of Israel. The availability and smuggling of COTS technologies, and the substantial financial support, is leading to a quickening rate of threats at all levels.

Combat Systems and Assets Available for Use

Standing against the developing threats are existing combat systems and the dire need to develop more advanced combat systems capable of providing practical and flexible solutions fit for the battlefield in order to quickly subdue the enemy.

There are a number of challenges associated with this:

The first challenge is the development time frame of new technologies, including testing, fixes, stages of evaluation and improvements until the technology is battle ready is very long, and occasionally does not fully answer the requirements of standing up to the threat, as the threat has evolved since the project began.

A further challenge is that these existing systems are generally providing inconsistent performance. The degradation of the system hardware affects its operational performance, and, in addition, the performance of any detection system is highly dependent on the arena in which it operates.

One method in which to overcome these challenges and to enable a partial solution to the development of defense challenges is the development of a combat system based on software that includes the ability to use and control COTS hardware with parameters given to adaption, without the need for developing new hardware and software for each new requirement.

Together with this, a change in parameters generally requires the involvement of the system engineers to produce a revised set of parameters, specifically during the integration phase - a long and oftentimes irrelevant process. In this case, the time to market of system validation for the current operational requirements needs to be as short as possible.

The third challenge is the answer to the question: Are we taking full advantage of the system capabilities in the optimal fashion? Are we able to keep optimal performance all the time? The answer to this challenge is becoming more complicated as combat systems themselves become more complicated at a cost of operational flexibility, and as the time required for system adaptation becomes shorter, the conventional solution (involvement of the developer's system engineers) is no longer valid.

The Environment's Impact

As opposed to the ability to control system performance and the assets in our possession through intervention (mainly in system SW and a change in required parameters), when it comes to the environment - we are not in control.

The definition of the environment is every parameter that is not in the control of the mission commander, and represents an interference or limitation to the performance of the systems, and for all purposes, falls on the operational force trying to achieve the operational goal.

Examples of the environment's impact includes weather that effects optical systems, electromagnetic interference from one system that is picked up by another, and even use of systems that can effect detection systems. The surprises that come from the environment can have a potentially substantial effect on the performance of the combat system and against the operational goal.

Where do we go from here?

By using technology which allows operational flexibility as well as control of parameters "on the fly", and without the requirement for new development, we achieve flexibility in the operational capabilities of the system.

With this, the question still remains. How do we know to position the correct parameters in the system to make them fit the environment and mission requirements?

In order to attempt to provide an answer to this gap, we will try to answer the following questions.

1. If the mission planner knows the expected odds of mission success relative to the operational goal?
2. Is it possible to improve the way the system operates (layout and parameters) such that the chances of success will be higher?
3. Given the evolving threats, the environment, and our forces - are we able to recommend changes in a short time, including system deployment and locations, improving the chances of operational success, maximizing the system potential and assets available to use?

The solution to these questions is found in a tool that allows optimal planning by using the assets available to us, and in ongoing awareness of the mission success. A tool that will take into account the current threat map, the status of the systems, and the effects of the environment.

Extracting technical and operational capabilities of the core defense systems is achieved via integrated real-time decision support systems which include the following capabilities: real time simulation, analysis and performance monitoring of the systems and advanced optimization engines.

Simulation capabilities of entire systems taking part in mission planning, effective modeling of the environment and an optimization engine allow operational mission planning that will bring the greatest chances of success. Maximizing performance is made possible thanks to an optimization engine that tests overall possibilities "likely ones" and recommends the best solution for reaching the mission goals.

Connecting the system in real time to different sensors and systems enables consideration of actual system performance, the threat map and environmental parameters. Every change in the above data and in relation to the original plan causes an optimization process whose purpose is to recommend on a new operational plan and mission order in order to reach optimal mission performance.

These systems support both LIC and HIC operations. Operational success is achieved with a lot of effort from combat systems, and in particular, detection and gathering systems with the intention of creating a hermetic umbrella that represents for all purposes the safety belt of the State of Israel. Proper management of the incoming data, and its translation into real activities via battle decision support systems recommending optional methods of action improves mission success and eases the amount of data presented to the commander. As the number of missions increase, and the time required for reaching decisions gets shorter, the challenge is bigger; making a system that actualizes operational potential a necessary tool.

To illustrate the complexities of the technical challenge, let us assume that we have three systems, and for every system, there are three parameters that can be controlled, and for every parameter, there are ten different values which can be chosen. The number of possibilities is now 9^10. If every calculation is done in one second, the predicted end time for the calculation is over 30 years!

Omnisys's solution enables shortening the computation time to a more relevant time frame. The challenges are only getting bigger when evaluating the optimization problems of systems that can support the number of missions and mission prioritization. Via optimization planning, layout and placement of the system, it is possible to maximize the complex system performance and to make best use of the assets, which have already had so many resources invested into them.

Omnisys provides its clients real time decision support systems. Omnisys systems, battle proven by defense forces, are used to maximize the operational achievements in a range of operational missions while dealing with challenges of the modern battlefield.

Over the past 15 years, Omnisys has provided solutions to maximize strategic and tactical mission success by combining operational know how with advanced technology and algorithmic development. The Company's generic architecture, Sandbox®, improves the technical and operational performance of any defense unit, and is part of the core assets in securing Israel's defense.

Omnisys is an important partner with Israel's defense industry, Ministry of Defense and IDF.