US Army Distributed Simulation Capabilities

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Abstract — *Budget reduction, debt ceiling, Government costs have become a big problem to the United States government and politicians. This issue has arisen because of the possible debt ceiling reaching its limit and the economy not moving forward. This problem has an effect on many areas and departments and one that was not left behind is the Military Forces. Because of their high expenditures, alternatives of training were studied for an effort on reducing training costs. By integrating simulated training to the military training, it was found that cost could be reduced significantly without compromising the quality of the training.*

***Key Terms** — Cost effective training, Simulation, Indirect and Direct costs of training, War Training*

INTRODUCTION

The 75th Training Command (TC) serves as the Army's Staff Training Division that conducts Mission Command and staff training in an Integrated Training Environment (ITE) for Army elements as directed by United States Army Reserve Command. The training allows the Commanders and staffs to exercise authority and direction over all enablers and capabilities, resulting in commanders and staff elements fully capable in a mission command environment. The 75th Training Commands has five divisions across the United States with an approximate of 5,000 soldiers. Its main mission is to train all military forces across the United State prior to departing to the War. The 75th Training Command trains an average of 50 to 75 missions every year with an annual budget of $18 million.

Due to the U.S. government cutbacks and shortage of funds, the Department of Defense has taken the initiative to relook into different alternatives of training that are more cost effective and that would be as efficient as today's model of training. The Distributed Simulation Capabilities is a simulation based training system that removes the tyranny of geography and time from training. By removing these impediments to training, the US ARMY is better positioned to provide continuous, worldwide training: wherever, whenever and to whoever requires it and at the same time reduces the cost of training. With such objectives as leverage economies of scale for training unit personnel, state of the art simulated training while reducing direct and indirect cost and ensuring soldiers safety, and providing all possible war scenarios in a same location without requiring troops, equipment and personnel movements, makes DSC a very competent system to implement in the ARMY to address the needs of training having in consideration the constraints in funds.

DISTRIBUTED SIMULATION CAPABILITIES HISTORY

United States Economy and Wars

For the past decade, the United States of America has experience a change to its economy and a contribution to this is due to the two wars in the Middle East: Iraq and Afghanistan; and the Global War against terrorism. With a national debt increasing daily and politicians not able to come with an agreement on reducing this debt, the Department of Defense, along with many other departments, has taken the initiative to cut down in budgets per the request of President Barrack Obama.

To cut down in budget or expenses, the United State Army took a close look to all their expenditures on training, equipment, logistics, travel, strategic

operations and many other factors that can be re-organized to cut budget without jeopardizing the Army's operation and mission. One that brought caught the attention is the current method of performing training and the cost of it. By training units and soldiers in environments as real as the battlefield can possibly be, the Armed Forces have being incurring in costs of billions of dollars that cannot be afforded to spend.

IMPLEMENTING DISTRIBUTED SIMULATION CAPABILITIES

The 1998 Army Science and Technology Master Plan [1] addressed the budget cut downs and how the Army was going to be looking forward to implement new methods of training and cutting down budgets. Technology and Science provides the focus and direction that the Army is looking forward to train their troops to maintain global military advantage and ensuring soldiers they are well trained and ready for victory.

Implementing Distributed Simulation Capabilities (DSC) on Army's way of training can train soldiers to the standards for victory while costs of training can reduce in considerate amounts. The simulation system is carefully measure for its performance and accuracy in training [2]. Simulation systems are increasing do to the fact that these systems are used as a cheaper alternative to conduct field condition training. The two authors went to Ft. Hood, Texas to observe a collective simulated training that was conducted between two units to document their accuracy and ability to get soldiers train for the war. DSC has raised many good expectations, but not all of them are impressed with this capabilities and new proposed method of training. In a 2012 news article it was exposed how

high ranking officers of the Army feel or think towards simulated training; "We are telling commanders that this is not necessarily a better way to train, but it is more affordable," said Col. Tony Krogh, head of the National Simulations Center (NSC) at Fort Leavenworth, Kansas, Budget Cuts Force U.S. Army To Use 'Low Overhead' Alternatives [3].

Distributed Simulation Capabilities is the most accurate alternative that accommodates the Armed Forces needs for training in accordance with the budget requirements. In 2013 NATO article [4]: Members Must Develop Distributed Capabilities the importance and future growth of DSC and how NATO forces face big challenges on its implementation. "Simulation training between countries will be the future of training,"

METHODOLOGY

Systematic Approach

The ability to recognize and effectively solve problems is an essential skill. Army problem solving is a systematic approach to define a problem, develop possible solutions to solve the problem, arriving at the best solution and implementing it. It incorporates risk management techniques appropriate to the situation.

Systematic Approach application

The seven step of problem solving is a very simple and successful tool that helps to identify the problem and it will guide the users through the seven steps to reach a final decision to fix or address the problem. Figure 1 illustrates and explain the seven steps for this process.
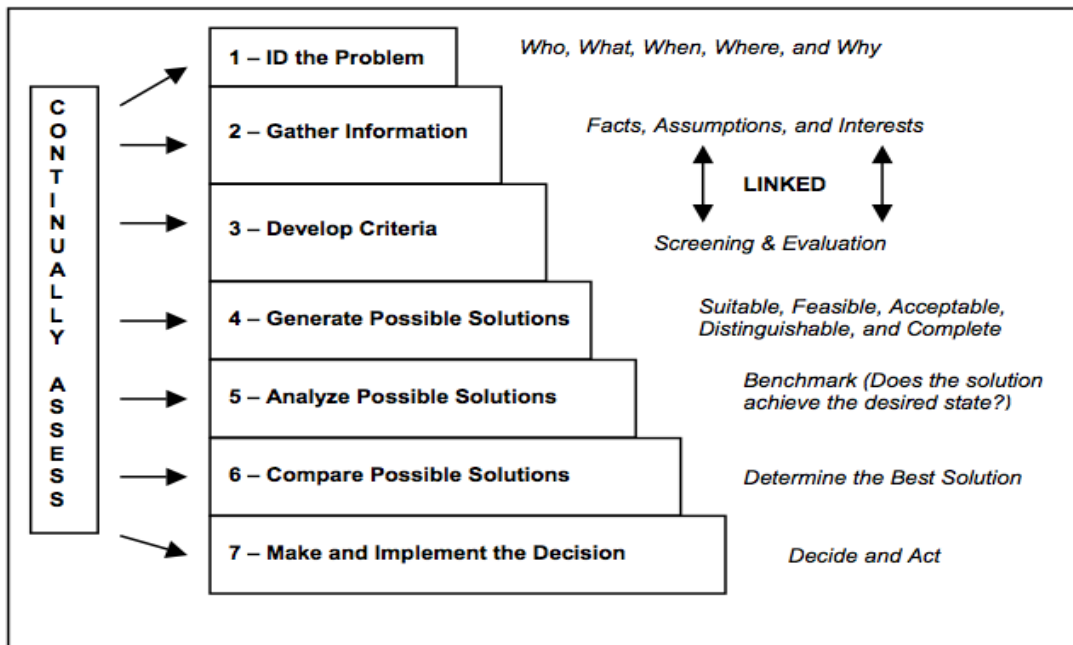
Figure 1
Seven step of Problem Solving Mode

Distributed Simulation Capabilities Implementation Process

The first step in the implementation of DSC is designing and acquiring the DSC technology. Authority to operate on the network needs to be granted and it is required to have the Department of Defense (DoD) Information Assurance Certification and Accreditation Process (DIACAP) to ensure that risk management is applied on information systems (IS). DIACAP defines a DoD-wide formal and standard set of activities, general tasks and a management structure process for the certification and accreditation (C&A) of a DoD-IS that will maintain the information assurance (IA) posture throughout the system's life cycle. Implementations of Standard Operation Procedures to ensure proper and accurate training are in accordance with all the regulations stipulated by the ARMY in all of its locations throughout the United States. SOP's goals are to guide and ensure the quality and standards of training are the same within the Training Command and its subordinate Divisions.

The concept of the Proof of Principle step is to confirm and prove that all the design stage and equipment acquired is able to perform under the given conditions and expectations requested by the ARMY. In this step, the DSC system will be tested at is initial or minimum conditions within the local organization.

Fielding stage consist of having the Mission Training Center (MTC) fully operable. At this point all systems are connected to the network loaded with the entire possible war scenarios available ready to operate under any conditions at the MTC level. No other location will be connected to the MTC at this point. DSC will be tested for performance and capabilities of training within the Headquarters location or MTC location.

Initial Operating Capability (IOC) stage units across the United States requiring training will be able to connect to the main training center (MTC) and will be able to interact with other units at different locations without requiring movement of equipment or movement of soldiers. At this stage, DSC will be validated as Fully Operational Capable.

System or software that to conform what is known as DSC is as follow:

- ABCS, Army Battle Command System, Overarching term for a family of Army systems

- JDLM, Joint Distributive Logistics Management, the premier enterprise logistics management tool.
- JCATS, Joint Conflict and Tactical Simulation are an entity level constructive training simulation system that provides command level training. It's a digital interface that has the capability to simulate joint battle-space and also Military Assistance to Civilian Authority (MACA) missions.
- VBS2 offers realistic battlefield simulations and the ability to operate land, sea, and air vehicles. Instructors may create new scenarios and then engage the simulation from multiple viewpoints. The squad-management system enables participants to issue orders to squad members. VBS2 was designed for federal, state, and local government agencies and can be specifically tailored to meet the individual needs of military, law enforcement, homeland defense, loadmaster, and first responder training environments. VBS2 may be used to teach doctrine, tactics, techniques, and procedures during squad and platoon offensive, defensive, and patrolling operations. VBS2 delivers a synthetic environment for the practical exercise of the leadership and organizational behavior skills required to successfully execute unit missions.
- CPOF, GD C4, in partnership with Battle Command, General Dynamics C4 Systems is fielding state of the art visualization and collaboration system to today's war fighters.

The Command Post of the Future (CPOF) is an executive level decision support system providing situational awareness and collaborative tools to support decision-making. This tool suite is built using General Dynamics C4 Systems Co-Motion® technology.

CoMotion supports visualization, information analysis, and collaboration, in a single, integrated environment that ultimately helps commanders and decision makers analyze information, share thoughts, and evaluate courses of action. Team members share workspace and collaborate to create a rich multi-perspective shared operational picture. Supports parallel, synchronous and asynchronous cross-functional planning and execution.

- BCS3, Battle Command Sustainment Support System manages logistics and personnel operations.

System Flow Chart

In order to have coverage among the entire country, the 75th Training Command has strategically placed training sites in five different locations: Alabama, New Jersey, Illinois, Texas and California. Having a main Mission Training Center as the command control location will allow the other four locations to connect to the network and conduct their simulated training. Figures 2 and 3 illustrate the set up and coverage of the system within the United States.
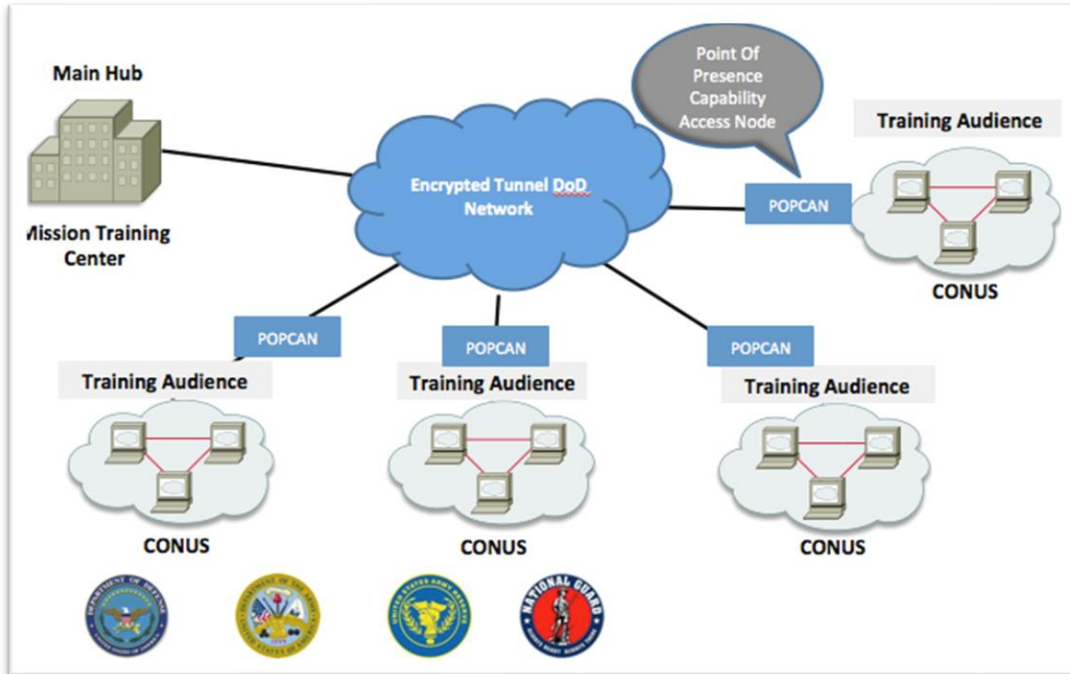
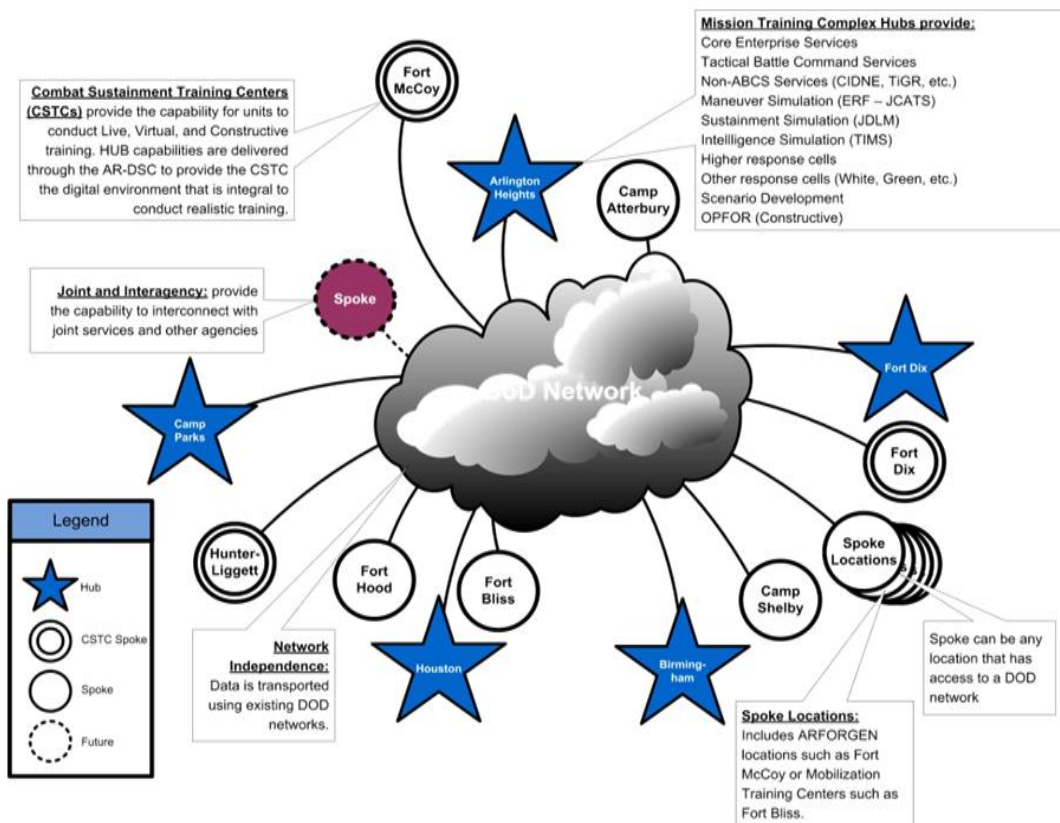**Figure 2**
Distributed Simulation Capabilities Flow Chart

Figure 3
Distributed Simulation Capabilities coverage

DISTRIBUTED SIMULATION CAPABILITIES PROGRESS

DSC Milestones

DSC Milestone for the implementation process are to be accomplished in a four year time from 01 OCT 12 to 30 SEP 15. Figure 4 illustrates the tasks to be accomplished and in what year is to be accomplished. After FY15, the 75th Training Command DSC system will be fully capable and the implementation process will be completed and it would be manner of maintenance to the system and the equipment to maintain high standards of training and performance.
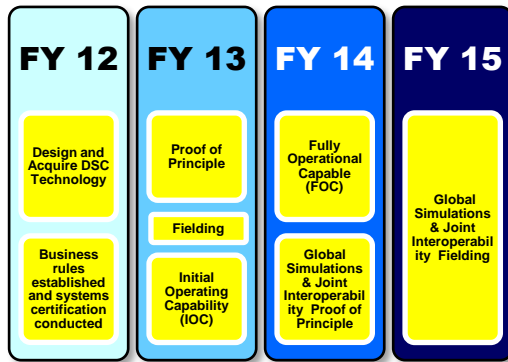
FY 12	FY 13	FY 14	FY 15
Design and Acquire DSC Technology	Proof of Principle	Fully Operational Capable (FOC)	Global Simulations & Joint Interoperability Fielding
Business rules established and systems certification conducted	Fielding	Global Simulations & Joint Interoperability Proof of Principle	
	Initial Operating Capability (IOC)		

Figure 4
Distributed Simulation Capabilities Milestone

Future Capabilities

The 75th Training Command does not only train unit in the United States for the past 5 years, it also has been collaborating with the Korean Army and has been conducting training in the Korean Peninsula. Many dollars are spent in these exercises every year. An average of $6 million is spent during 4 events in Korea. Because of the magnitude of the event, the high dollar value and importance of this event, the 75th Training Command has requested the implementation of DSC to these events. By implementing DSC to the Korean events, DSC will be performing not only within the United States; it will also operate in globally.

The US ARMY expectations of DSC is to be a training tool with lots of diversity and one diversity that is being very attractive not only to the ARMY, but to any military force in the United States which is the capability of performing joint forces training among all the military branches. Having this ability, DSC can simulate a war scenario in which military forces can rehearse how other military forces perform their missions and their operations.

SUMMARY OF RESULTS

DSC Accomplishments

The implementation of the Army's Distributed Simulation Capabilities system was set in a timeline to be able to trace the accomplishment of the goals and also to trace the status of the project. The project timeline and accomplishment is represented on Figure 5.
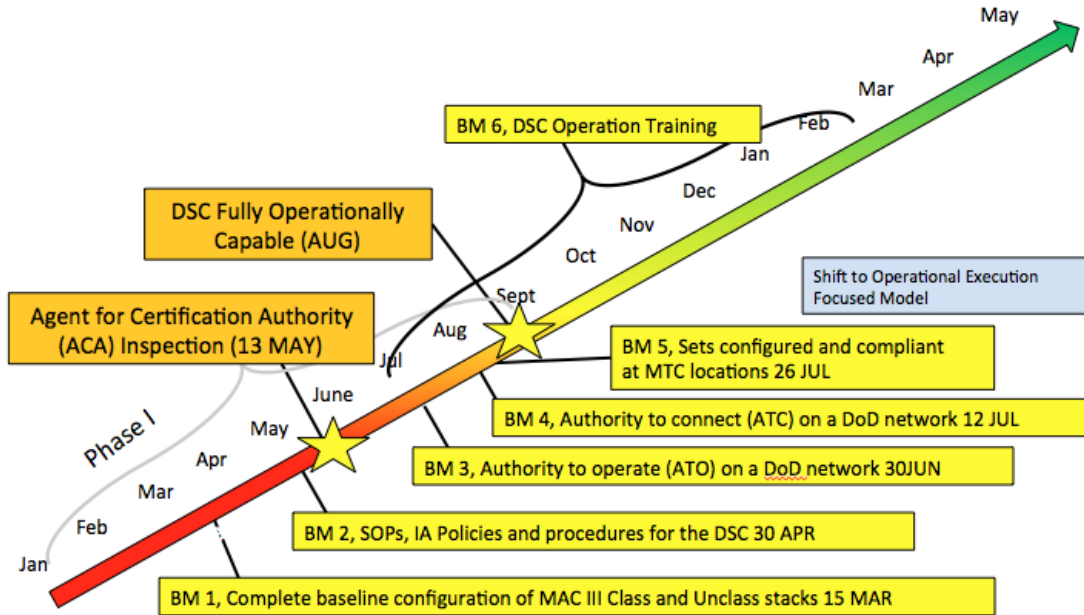
Figure 5
Distributed Simulation Capabilities Timeline

Implementation accomplishments

On 15 MAR 13 baseline configuration of DSC system and software was conducted successfully at the Mission Training Center located in Houston Texas. On 30 APR 13 the Standard Operation Procedures in accordance with the ARMY's training regulations and policies were created and turned in to the five Divisions. On 30 JUN 13 Authority to Operate on DoD network was granted then Authority to connect to the DoD network was granted on 12 JUL 13 with this two accomplishment mentioned before DSC was able to go live through all our locations around United States to proof that DSC worked. Two weeks later on 26 JUL 13 proof of principle took place at Houston Mission Training Center with a complete success. Once DSC was working properly at the Mission Training Command Center it was time to bring the technical support team to have them trained on the DSC system. From 01 JUL – 28 FEB 14 Distributed Simulation Capabilities operation training for technical support teams and personnel was conducted.

Training Accomplishments

Two phases of training were schedule, Proof of Concept and Point of Presence Capability Access Node to smooth the process of testing the system and to engage any failures of the system more efficiently. The two phase's process is described below:

- Proof of Concept 19-30 August 2013 at Joint Base Lewis McCord at Mississippi. The concept was to integrate connectivity between three locations; Joint Base Lewis McCord at Mississippi, Korean Battle Simulation Center (KBSC) and the MTC located in Alabama. A link with War fighter Simulation (WARSIM) was successful. A HUB spoke concept transfer of data was pushed from the parent HUB to the HUB in Alabama and Point of Presence Capability Access Node (POPCAN) located in Mississippi.   The POPCAN was used as a connector to establish the network required to secure the traffic.   The simulation was successful for three uninterrupted hours.
- POPCAN Testing 29 Aug - 5 Sep 2013 at Ft. Hunter Liggett, California. Overall the testing was a success. Supervisor's opinion was that the design phase needed at least 3 days in order to enter the execution phase. The reason being is

the connectivity of routers throughout the network is complex and needs more training.

Savings

Return of Investment Analysis

The 75th Training Command every year has recurrent training to perform mandated by the US ARMY Reserve Headquarters. For each training travel and per-diem cost are calculated based on the location of the training site. STAFFEX, CTE and CPX cost are the same because they are conducted on the same location on the other end the WAREX is more expensive because of the magnitude if the event and the amount of soldiers attending these trainings is much more than the other three exercises

mentioned previously. The breakdown of the exercises and their cost are shown in Table 1.

Based in the mission analysis for fiscal year 14, 22 events will cost the 75th Training Command $2,115,200.00 if live training is to be conducted. With the implementation of DSC, the equipment and training investment that would reflect in the first year would show a $875,660.00 negative investment. The second year forward, the only investment for DSC is an average of $156,886.00 yearly for the maintenance of the circuit that is required operating the DSC equipment. In table 2 and figure is illustrated the DSC authority to operate and the Return of Investment analysis for the five year period granted by US ARMY to implement the DSC model of training.

Table 1
Fiscal Year 14 mission cost analysis

Mission Matrix Data FY 2014	14		19		9		31	
			Number of Exercises Per Year - USARC Only					
STAFFEX	10	CPX	14	CSTX/WAREX	7	CTE	22	
Travel	$ 1,600	Travel	$ 1,600	Travel	$ 8,000	Travel	$ 1,600
Per Diem & Lodging	$ 17,600	Per Diem & Lodging	$ 17,600	Per Diem & Lodging	$ 168,000	Per Diem & Lodging	$ 17,600
SUB TOTAL	$ 19,200		$ 19,200		$ 176,000		$ 19,200
Favorability/YR	$ 192,000		$ 268,800		$ 1,232,000		$ 422,400
							$ 2,115,200

Table 2
Distributed Simulation Capabilities Cost Analysis

		Analysis Based on Authority to Operate				
Year	1	2	3	4	5	
Favorability	$ 2,115,200	$ 2,115,200	$ 2,115,200	$ 2,115,200	$ 2,115,200	
Eqpt Cost - 32 POPCANs	($2,890,860)	$0	$0	$0	$0	
Assembly & Config of Eqpt	($100,000)					
Circuit Cost	$0	($150,000)	($154,500)	($159,135)	($163,909)	
Difference	($875,660)	$ 1,965,200	$ 1,960,700	$ 1,956,065	$ 1,951,291	$ 6,957,596

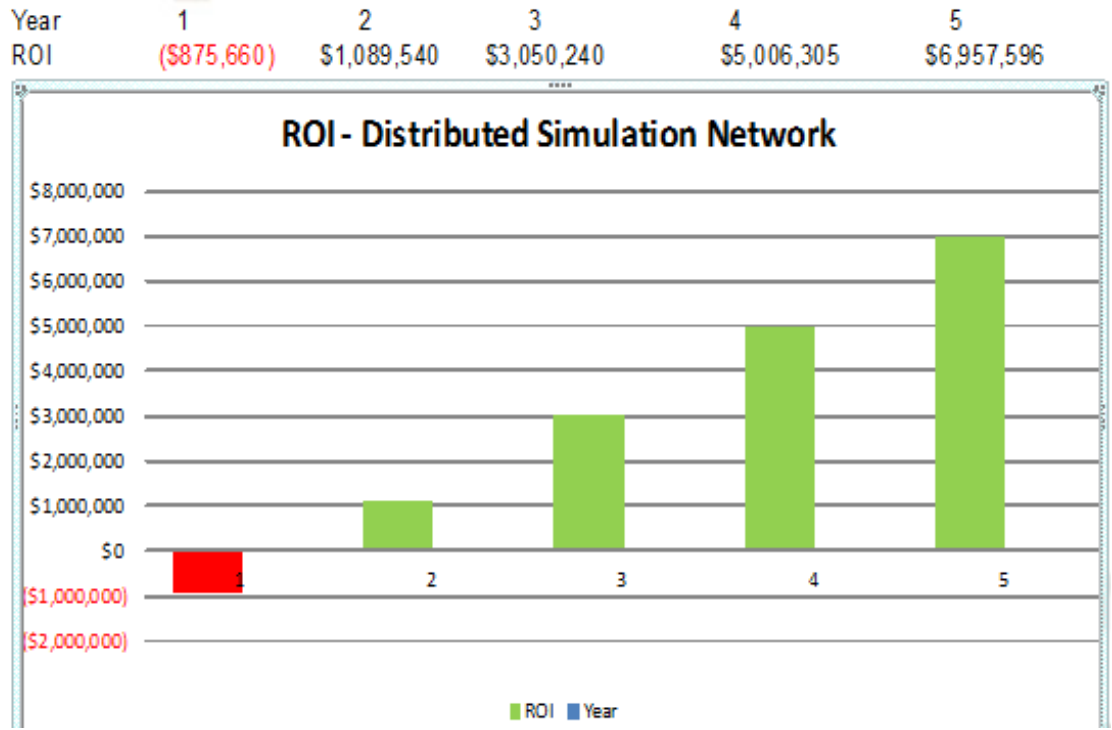| Year	1	2	3	4	5
ROI	($875,660)	$1,089,540	$3,050,240	$5,006,305	$6,957,596

ROI - Distributed Simulation Network

Figure 6
Return of Investments

The return of investments analysis demonstrate that DSC will save the US Government an approximate of $7 million in a four year plan on the 22 events required to the 75th Training Command by the US ARMY Reserve Headquarters.

The 75th Training Command not only conducts the recurrent events analyzed in the return of investment analysis, but they also conduct around 50 to 75 other exercises around the United States that are not recurrent events and their cost vary on the type of training required and locations. For these events, costs are calculated with an exercise manning support document (ESMD) also known as the budget request form. Figures 9 and 10 illustrate the ESMD formats for an actual training cost and DSC based training cost, respectively.

	MISSION RECAP FOR:					Brigade:	3/75				
EVENT SUMMARY	EVENT DATE	PRE/POST MOB	TOTAL MDAYS	TOTAL MILITARY	TOTAL CONTRACT	1 QTR TOTAL	2 QTR TOTAL	3 QTR TOTAL	4 QTR TOTAL	MISSION TOTAL
MCS 1 926 EN BDE	16-Oct-13	PM	30	5		$ 10,010.00	$ -	$ -	$ -	$ 10,010.00
B		PM				$ -	$ -	$ -	$ -	$ -
MSEL DEVEOLPMENT	22-Sep-13	PM	8	4	1	$ -	$ -	$ -	$ 2,564.00	$ 2,564.00
MPWG	01-Nov-13	PM	33	11		$ 10,483.00	$ -	$ -	$ -	$ 10,483.00
MCS 1	14-Oct-13	PM	40	8	5	$ 16,146.00	$ -	$ -	$ -	$ 16,146.00
MCS 2	13-Nov-13	PM	60	12	7	$ 26,304.00	$ -	$ -	$ -	$ 26,304.00
MCS 3	11-Dec-13	PM	50	10	8	$ 21,920.00	$ -	$ -	$ -	$ 21,920.00
		PM				$ -	$ -	$ -	$ -	$ -
I		PM				$ -	$ -	$ -	$ -	$ -
FPWG	14-Jan-14	PM	110	22	4	$ -	$ 35,530.00	$ -	$ -	$ 35,530.00
FINAL MEL SYNC	10-Feb-14	PM				$ -	$ -	$ -	$ -	$ -
EXCON REHERSAL	07-Mar-14	PM				$ -	$ -	$ -	$ -	$
WAREX	18-Mar-14	PM	1614	68		$ -	$ 509,890.00	$ -	$ -	$ 509,890.00
WAREX CONT	18-Mar-14	PM	2335	98		$ -	$ 689,627.00	$ -	$ -	$ 689,627.00
1ST QTR PLANNING	01-Oct-13	PM	228	3		$ 62,700.00	$ -	$ -	$ -	$ 62,700.00
2ND QTR PLANNING	01-Jan-14	PM	282	3		$ -	$ 82,250.00	$ -	$ -	$ 82,250.00
3RD QTR PLANNING	01-Apr-14	PM	63	3		$ -	$ -	$ 18,375.00	$ -	$ 18,375.00
TOTALS			4853	247	25	$ 147,563.00	$ 1,317,297.00	$ 18,375.00	$ 2,564.00	$ 1,485,799.00

OTHER DETAILS

TOTAL O&M TRAVEL COST	$ 5,540.00	FUNDS PROVIDED VIA LOA (AMT/SOURCE)	
TOTAL O&M COST	$ 5,540.00	AMOUNT	$ -
TOTAL AT COST	$ 1,311,435.00	SOURCE	
TOTAL ADOS-RC COST	$ 168,824.00	FUNDS PROVIDED - MIPR (AMT/SOURCE)	
TOTAL RPA COST	$ 1,480,259.00	AMOUNT	$ -
TOTAL MIPR/GBL/CBL/OTHER COSTS	$ -	SOURCE	
PRE MOB ADOS DUTY	$ -	TOTAL ADOS DUTY	$ 161,425.00
PRE MOB ADOS TRAVEL	$ -	TOTAL ADOS TRAVEL	$ 7,399.00
PRE MOB AT DUTY	$ -	TOTAL AT DUTY	$ 1,142,900.00
PRE MOB AT TRAVEL	$ -	TOTAL AT TRAVEL	$ 168,535.00
PRE MOB O&M / IDT TRAVEL	$ -	TOTAL O&M / IDT TRAVEL	$ 5,540.00
FINAL MISSION COST			$ 1,485,799.00

Figure 7
Actual training cost

	MISSION RECAP FOR:	77th				igade:	3/75				
EVENT SUMMARY	EVENT DATE	PRE/POST MOB	TOTAL MDAYS	TOTAL MILITARY	TOTAL CONTRACT	1 QTR TOTAL	2 QTR TOTAL	3 QTR TOTAL	4 QTR TOTAL	MISSION TOTAL
MCS 1 926 EN BDE	16-Oct-13	PM	30	5		$ 10,010.00	$ -	$ -	$ -	$ 10,010.00
B		PM				$ -	$ -	$ -	$ -	$ -
MSEL DEVEOLPMENT	22-Sep-13	PM	8	4	1	$ -	$ -	$ -	$ 2,564.00	$ 2,564.00
MPWG	01-Nov-13	PM	33	11		$ 10,483.00	$ -	$ -	$ -	$ 10,483.00
MCS 1	14-Oct-13	PM	40	8	5	$ 16,146.00	$ -	$ -	$ -	$ 16,146.00
MCS 2	13-Nov-13	PM	60	12	7	$ 26,304.00	$ -	$ -	$ -	$ 26,304.00
MCS 3	11-Dec-13	PM	50	10	8	$ 21,920.00	$ -	$ -	$ -	$ 21,920.00
		PM				$ -	$ -	$ -	$ -	$ -
I		PM				$ -	$ -	$ -	$ -	$ -
FPWG	14-Jan-14	PM	110	22	4	$ -	$ 35,530.00	$ -	$ -	$ 35,530.00
FINAL MEL SYNC	10-Feb-14	PM				$ -	$ -	$ -	$ -	$ -
EXCON REHERSAL	07-Mar-14	PM				$ -	$ -	$ -	$ -	$
WAREX	18-Mar-14	PM	1614	68		$ -	$ 112,985.00	$ -	$ -	$ 112,985.00
WAREX CONT.	18-Mar-14	PM	2335	98		$ -	$ 204,877.00	$ -	$ -	$ 204,877.00
1ST QTR PLANNING	01-Oct-13	PM	228	3		$ 62,700.00	$ -	$ -	$ -	$ 62,700.00
2ND QTR PLANNING	01-Jan-14	PM	282	3		$ -	$ 82,250.00	$ -	$ -	$ 82,250.00
3RD QTR PLANNING	01-Apr-14	PM	63	3		$ -	$ -	$ 18,375.00	$ -	$ 18,375.00
TOTALS			4853	247	25	$ 147,563.00	$ 435,642.00	$ 18,375.00	$ 2,564.00	$ 604,144.00

OTHER DETAILS

TOTAL O&M TRAVEL COST	$ 3,440.00	FUNDS PROVIDED VIA LOA (AMT/SOURCE)	
TOTAL O&M COST	$ 101,584.00	AMOUNT	$ -
TOTAL AT COST	$ 333,736.00	SOURCE	
TOTAL ADOS-RC COST	$ 168,824.00	FUNDS PROVIDED - MIPR (AMT/SOURCE)	
TOTAL RPA COST	$ 502,560.00	AMOUNT	$ -
TOTAL MIPR/GBL/CBL/OTHER COSTS	$ -	SOURCE	
PRE MOB ADOS DUTY	$ -	TOTAL ADOS DUTY	$ 161,425.00
PRE MOB ADOS TRAVEL	$ -	TOTAL ADOS TRAVEL	$ 7,399.00
PRE MOB AT DUTY	$ -	TOTAL AT DUTY	$ 281,325.00
PRE MOB AT TRAVEL	$ -	TOTAL AT TRAVEL	$ 52,411.00
PRE MOB O&M / IDT TRAVEL	$ -	TOTAL O&M / IDT TRAVEL	$ 101,584.00
FINAL MISSION COST			$ 604,144.00

Figure 8
Distributed Simulation Capabilities training model cost

The Budget requests above shows the difference in savings between the actual training model and DSC training model. The same training at the same location with the same amount of soldier will cost $880,000 dollars less than the actual model of training.

Conclusion

Distributed Simulation Capabilities System has proven in design, analysis and implementation that it is the best training tool to acquire based on the accomplishments of the objectives for this project saving; government funds, versatility of training removing the geography tyranny and the safety of the Soldiers while performing their training.

Distributed Simulation Capabilities is capable of saving the government $1.5 million dollars annually in recurrent events that are mandated by the US ARMY Reserve Headquarters. For all other 50 - 75 missions that are a onetime event and their cost are based in their location and magnitude, DSC saved the Government at a minimum of $500,000. Their advantage of DSC is the safety; within its training not a single soldier got injured while conducting simulated training. War scenarios just take minutes to be changed instead of all the requirement and movement of equipment that takes in real life training model

Distributed South California, is on its initial year of implementation and while performing the initial testing faults where discovered and technical support skills came missing. For future simulated training, these faults need to be addressed and corrected. More skilled personnel are needed at the training sites. Also training to technical personnel is a must have in the near future because the more skill personnel, the more faultless the system will be.

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