"The Play's the Thing" Teaching High Level Skills through Dramatic Simulations

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ABSTRACT

Teaching a complex skill set, such as leadership, requires interaction with realistic environments. LEED (Leadership Education through Evolutionary Design) is a training simulation in which platoon leaders learn and practice leadership skills through interactive dramas related to crowd management. LEED uses Interactive Pedagogical Drama and autonomous agents to create interactive instruction. The learner interacts with simulated characters in a story-based setting where the plot changes as the learner's actions affect the story. LEED builds on previous research using an intelligent agent-based simulation infrastructure to model role-playing characters simulating crowd behavior and military responses during MOUT (Military Operations on Urban Terrain) operations. This paper will describe the use of agent-based crowd simulation architecture as an instructional medium, as well as provide a detailed description of the instructional design.

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SIMULATIONS AS A COST EFFECTIVE METHOD FOR LEADER TRAINING

The importance of leadership and leader development permeates Army culture. Given the current operating environment, leader development at lower echelons of leadership is particularly important. Moreover, the increased spectrum of operations requires that leaders must be able to transition rapidly from kinetic to non-kinetic operations. As General Scales noted, “While wars have become more complex, responsibility for those who fight them has increasingly slipped down the chain of command to junior personnel. Yet these young, inexperienced leaders have little time to prepare themselves to make strategic decisions” (2006, pg. 38). To address the need to develop junior leaders to deal with a wider scope of mission activities in a shorter period of time, new training and assessment approaches are required.

Higher order skills such as leadership are not acquired though straightforward didactic instruction. While basic leadership concepts can be taught through conventional instruction, the development of skills often requires practice in varied situations under skilled guidance. Alternatively, the skill can be developed in the field, but failure to receive guidance and feedback can produce inconsistent results. Consequently the development of skills requires the commitment of considerable human resources.

Prior research (Deshler, Lancaster and Schumaker, 2002; Martin, Jones, and Hearn, 1994) indicates that many complex interactive skills can be learned in role-playing environments. Such instructional environments enable targeting of critical skills that force students to practice necessary and challenging skills in realistic situations. Given that leadership, by definition, occurs within the context of interpersonal interactions, role playing and simulation may be a suitable approach for developing higher-order leadership skills.

Simulations for military training have been steadily increasing over the past decade, including the Modular SemiAutomatic Forces (ModSAF; Ceranowicz, 1994), the Joint Semi-Automated Forces (JSAF), and One Semi-Automated Forces (OneSAF; Wittman and Harrison, 2001) programs. While these simulations emphasized tactical skills, simulation also might be extended to the development of military leadership skills. This paper details research on how to develop an adaptive role playing simulation for leadership training. The simulation, called Leadership Education through Evolutionary Development (LEED), will consist of a variety of components, all compliant with DoD’s Shareable Content Object Reference Model (SCORM).

Several higher-order leadership competencies are defined in Army Field Manual 6-22 (FM 6-22), and LEED uses Interactive Pedagogical Drama (IPD) (Marsella, Johnson and LaBore, 2000) within a simulation-based training framework to provide platoon leaders with a context for developing two of those competencies, *Getting Results* and *Leading/Influencing Others*. In addition to doctrinal focus, the simulation approach is beneficial to the military because agent-based simulation cost effectively supports substantive variation in the practice environment. Moreover, the system can be readily employed for instruction, practice and assessment in many domains.

INSTRUCTIONAL METHODS

LEED uses autonomous agents in an IPD–based instructional design to create interactive stories. The learning process is both interactive and scaffolded, with interactions and instruction based on the learner’s prior actions. In this training environment, the learner interacts with the characters (modeled by intelligent agents) in a realistic, narrative-driven, story-based setting. The story's plot and hence the narrative changes as the learner's actions affect the current state of the story. The inherent flexibility in this instructional environment provides both ***believability*** and ***adaptability*** of the training environment through the use of an intelligent agent-based infrastructure to model characters. LEED builds on previous research using an intelligent agent-based simulation infrastructure to model role-playing characters simulating crowd behavior and military responses during MOUT (Military Operations on Urban Terrain) operations. The pedagogical process has strong constructivist characteristics and provides a situated learning experience. The trainee explores the experience, which responds to his or her actions that are realized through an avatar. Each time the learner runs the experience it is unique, supporting skills such as leadership that require practice for acquisition and mastery. Feedback to the learner is provided in four ways: the consequences of actions, embedded mentoring, on-screen feedback during the exercise and after action review (AAR).

The role-playing agents are an adaptation of research conducted as part of a project sponsored by the Air Force, using an intelligent agent-based infrastructure (Lyell and Decker, 2005) to model role-playing characters with motivations, attitudes, emotions and actions. The Ortony, Clore, and Collins (OCC; 1988) model is utilized as a framework for agent emotions, and is described in greater detail later in this paper. The agent has rules of action based on Blue and Adler's (2000) work on self-organized patterns in human activities. We have used this infrastructure to simulate crowd behavior set during and after an Improvised Explosive Device (IED) explosion in an Iraqi marketplace.

LEED demonstrates a seamless interface between simulation federates and SCORM-compliant instructional Sharable Content Objects (SCOs). Previously (Haynes, Marshall, Manikonda and Maloor, 2004) we presented SITA (Simulation-based Intelligent Training and Assessment), an architecture that integrates HLA-compliant simulation with SCORM-compliant online instruction and assessment. The LEED project extends that work to support a more dynamic, interactive training environment.

Pedagogically, the challenge is to integrate the simulation into a rich instructional environment combining adaptive and interactive instruction with simulation to enhance development of higher level skills. A "crawl–walk–run" plan of instruction is used to structure the simulation experience. In the crawl phase the simulation segments can be paused for instruction (specific on-screen coaching) to illustrate potential consequences. In the walk phase, short segments are linked into scenarios that require decision-making during pauses providing the learner the opportunity to carefully consider options. Feedback on selected courses of action may elicit feedback during the crawl and walk phases. In the run phase, the learner makes decisions during the flow of the simulation. The instructional design entails:

1. **Pre-assessment** of trainees' relevant knowledge and skills *prior to* LEED training.
2. **Didactic instruction**, giving trainees information about the content they are expected to learn and are about to practice.
3. **Interactive instruction**, giving trainees an opportunity to practice pieces of the content with immediate feedback on their performance.
4. **Practice combined with coaching** of the skills, individually and in combination with increasing levels of complexity in the practice environment.
5. **Post-assessment** of relevant knowledge and skills following training.
6. **Feedback** to the trainees in the form of a military after-action review (AAR).

These design features support a crawl-walk-run approach to instruction. The interactive instruction and coached practice are mutually supportive. As the experiences become more complex, the feedback evolves from immediate feedback to mentoring. In LEED, a Platoon Sergeant (a simulated character) provides guidance to the learner similar to what would be provided by a Platoon Sergeant in the field. LEED provides a different experience for the learner each time the simulation is used—while teaching the same leadership skills. The learner's actions affect the scenario directly. Additional variability is provided through randomized changes in the characters, their numbers, their placement, their circumstances, events and the mission. This project investigates whether leadership skills can be taught effectively through the use of simulations, and this hypothesis will be tested more extensively through our ongoing research.

In the exercise, the trainee plays the role of platoon leader. During the simulation portion the other platoon members are enacted by agents, as are the crowd members when encountered. A prototypical mission has been developed with subject matter experts (SMEs).

The prototypical scenario has no crowd control portion, but represents a mission during which everything proceeds according to plan. The instructional scenario is subdivided into *segments*. This prototypical mission, without the crowd control segment, is a sequence of five segments (Figure 1).

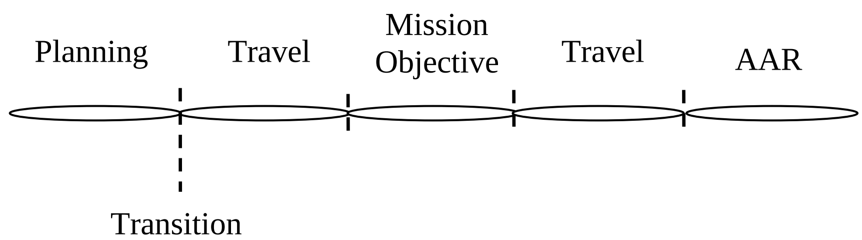

Figure 1. Prototypical mission.

The instructional power of this segmented structure lies in the ability to vary it (Figure 2). Variations of this prototypical mission will be created for pedagogical purposes. Three mechanisms can be exercised to provide variations: 1) scenario structure though segment rearrangement, 2) agent characteristics; modifying personality, emotion and other behavioral characteristics of individual characters (modeled by agents), and 3) method of presentation; each of the prototypical segments can be presented as programmed instruction (i.e., computer based instruction, CBT). For example, in the first segment, planning and rehearsal may provide instruction and practice in determining objectives, allocating resources and providing a clear vision to the troops. The travel segment may be presented as a video clip with minimum or no interaction. Mission execution may have various levels of complexity. The AAR is generated automatically and in real-time, reflecting the trainee's performance during the exercise.

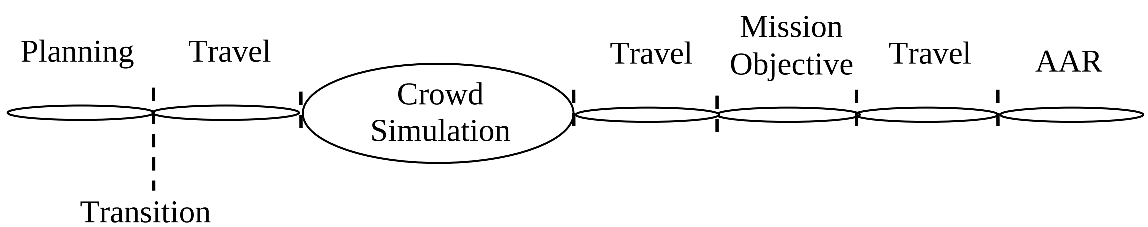

Figure 2. Prototypical mission with an isolated crowd simulation.

Leadership moments (decision points that reflect leadership competencies) will be integrated into the prototypical mission and its variants. Instruction may be varied along three dimensions: *complexity*, *difficulty* and *numerosity*. **Complexity** is the number of variables and their interrelationships. For example, a crowd in a village center with buildings and vendors close by is more complex than a crowd out in the open. **Difficulty** is the number of Standard Operating Procedures (SOPs) that must be considered in exercising leadership. **Numerosity** is the number of autonomous agents active in the simulation. Although these dimensions are not completely independent, it provides a framework for managing variability. Because leadership is partially reflected in the ability to contend with deviations from the expected, crowd control serves as a useful context for providing leadership skill training and practice by offering significant opportunities for variability without being a part of planned operations. A crowd control segment may be isolated, for example in a break between two travel segments on the way to the mission execution site (Figure 2). A crowd situation may be conflated with a travel segment, e.g., a mission execution segment, or it may be adjacent to any of them. More than one crowd segment may be encountered on a given mission. The makeup and context of the crowd may vary. Manipulations of factors in the simulation segments provide a wide range of variability for leadership training, practice and assessment. As these variations are created *stochastically* through the use of autonomous agents rather than programmatically, the incremental cost of each variation is very low.

Instruction, assessment and practice can be accomplished within both the CBT and simulation portions of the scenario. A segment may be a simulation or a CBT (programmatic) experience. For this stage of development the crowd experience is simulated. The other components are CBT unless conflated with the crowd. The segmentation of the scenarios allows reuse of segments in different scenarios, with or without modifications. The performance of a competency within a scenario may vary according to the context. For example, the methods of crowd control for a low value mission may differ from those of a high value mission where it may be time critical to arrive at the mission site. The segmentation of the scenario also serves to *bound* the simulation to instructionally manageable components. If the entire scenario were a single simulation, then a wide range of variations would be possible but would be far more complex to construct, both instructionally and technically. A CBT segment may converge to a single final state as the trainee is corrected before proceeding. With early didactic instruction the learner will select a narrower range of options. The limited number of end states may dictate a particular simulation to be used in the next segment. Thus, there is a low incremental cost of variations.

INSTRUCTIONAL OBJECTIVES

The objective of the IPD method of instruction is to engage the learner in a compelling experience that operates as an unfolding narrative in response to the learner's actions (Marsella, et al., 2000). An effective simulation must vary parameters of the environment and skill level required to support practice so that the learner acquires a skill that will transfer to both expected and novel real world situations.

Intelligent Automation, Inc. (IAI), in conjunction with the United States Army Research Institute for the Behavioral and Social Sciences (ARI), tested the feasibility of developing IPDs for training leadership skills using agent-based simulations. This method builds on previous research using agent-based simulations for instruction (Haynes, Maloor, Lyell and Zbylut, 2004). The initial application is leadership training of new platoon leaders, typically First Lieutenants (1LTs). A first phase of this research examined the execution of the IPD method for leadership training using a short simulation of crowd control in Iraq. The ability to incorporate a limited set of higher order leadership competencies, drawn from FM 6-22, into a training simulation was examined. The results of this preliminary research indicated that the development of agent-based simulations implementing IPD methods is feasible, warranting further research.

Leadership involves people as individuals and in groups. The agent system in LEED provides a group of agents that model different character types in both the platoon and in the crowd. The agents model individuals and their interactions through models of individuals' internal states and their subsequent behaviors. The specific character types for each experience are drawn from a pool according to defined rules. For example, if there is a village elder, there is only one. He may be friendly, neutral or hostile. Each agent will have influences on the agents around it, producing crowd behaviors. Thus the experience is always unique (unless intentionally captured for replay). Rules relating to behaviors of crowds and individuals can be programmatically recognized as leadership moments. For example, if a man in the crowd runs off, the Platoon Leader may choose to respond depending on the circumstances. The appropriate response may be moderated by the mood of the crowd and the previous influence on the crowd by the trainee's actions. Not every crowd will have a man that runs off, his location and timing will vary if present.

Targeted Leadership Competencies

Leadership is a complex phenomenon, and the variety of leadership theories present in the behavioral sciences and management literature illustrates this point. To determine which aspects of leadership to target in the simulation, we examined the literature on leadership performance requirements and leader competencies, with particular attention to Army doctrine. Despite the vast body of leadership literature, some common leadership themes emerged. In his review of military and nonmilitary research, Zaccaro (2001) described two basic leadership performance dimensions: *setting direction* and *managing unit operations*. The latter included utilizing and coordinating personnel in executing collective action. The taxonomy of leader performance dimensions developed by Fleishman, Mumford, Zaccaro, Levin, Korotkin and Hein (1991) also specified leadership functions related to planning and execution. Yukl, Gordan, and Tabor (2002) summarized 16 behavioral taxonomies of leadership, and grouped leadership activities into three broad categories reflecting task-oriented, people-oriented, and change-oriented behaviors. The classifications from these sources were used as a basis for comparison with more Army-focused studies and doctrinal materials. The *Combat Leader's Field Guide* (12^{th} edition, Stoneberger, 2000) described troop-leading procedures and the steps in the Military Decision-Making Process that support each of these procedures. These procedures and corresponding processes summarize the core behavioral and cognitive activities that comprise the actions of military leaders in setting directions and executing actions.

Although the leadership review revealed a large number of leadership performance requirements and corresponding competencies, the decision was made to focus on two competencies specified in Army FM 6-22: *Getting Results* and *Leading/Influencing Others*. These competencies best represented the core leadership functions of setting unit direction and managing the unit's operations in executing actions. They also represented the minimum number and types of competencies likely to be displayed in most performance episodes required of platoon leaders, (Jacobs and Jaques, 1987, 1990; Zaccaro, 2001; Zaccaro, Wood, Chiara, Salas, and Burke, 2004), the expected target audience for the training. In addition, we determined that these were the optimal number and type of competencies to cover without losing necessary breadth and depth of coverage within the specified training time. These particular competency sets are described in the next sections.

Getting Results

According to Army FM 6-22 (p. A-9), "Getting Results" is defined as follows:

A leader's ultimate purpose is to accomplish organizational results. A leader gets results by providing guidance and managing resources, as well as performing other leadership competencies. This competency is focused on consistent and ethical task accomplishment through supervising, managing, monitoring, and controlling of the work.

This leadership competency has several facets (Army, FM 6-22, p. A-9), each of which is incorporated into LEED. In the LEED program, trainees are presented with a series of performance episodes that require using more than one of these facets, within three phases:

1. *Anticipatory phase*: The leader is planning or preparing the team to execute specific actions required within a particular context of a larger mission. This includes coordinating and sequencing tasking, acquiring resources, assigning roles, and conducting action rehearsals.

2. *Execution phase*: The leader executes action plans. This includes facilitating the ongoing progress of an action.

3. *Monitoring and Review Phase*: The leader monitors the consequences of unit actions, and determines whether adjustments need to be made in team actions. This phase includes providing feedback to soldiers and to the unit.

Implications for training development: LEED presents the trainee with a series of performance episodes designed to elicit some or all of the facets of a competency. Some of the scenarios may present only one of the three phases of an action episode, while others will present all three action phases. Likewise, these scenarios range from presenting some episodes requiring one subgroup of competencies, to presenting episodes requiring all of the subgroups.

Leading Others

According to Army FM 6-22 (p. A-2), "Leads Others" is defined as follows:

Leading is all about influencing others. Leaders and commanders set goals and establish a vision, and then must motivate or influence others to pursue the goals. Leaders interview others in one of two ways. Either the leader and followers communicate directly, or the leader provides an example through everyday actions.

This leadership competency has a number of facets (Army, FM 6-22, p. A-2), but can broadly be decomposed into two subgroups: (1) setting direction and purpose, and (2) motivating or energizing others in line with this purpose.

Implications for training development: The construction of performance episodes that relate to this competency also flow from those requiring one of these subgroups of skills to those requiring both subgroups.

The trainee will be shown the relationship between the arrangement of the competencies in FM 6-22 and the subsequent regrouping into closely related competency groups in the didactic portion of instruction. Each group will be presented followed by an assessment in simple question-and-answer format, providing a pre-training assessment. A "talking head" may be used in conjunction with text to provide a dual mode didactic instruction. This will provide the learner with the objectives of the instruction.

Performance Metrics and Assessment

The LEED program uses a number of metrics to assess learning gains and training progress. These metrics will include knowledge tests to access understanding of concepts presented in the program and situation judgment tests to assess gains in leadership competencies. Gains in leadership competencies will also be assessed using objective measures (e.g., response selection, reaction time, latency of responses) gathered at different key points in the simulation, especially as the performance episodes increase in complexity. Finally, the IAI team is considering two more comprehensive mixes of declarative knowledge tests, situation judgment tests, and simulated performance episodes to use as pre-tests and post-tests to evaluate the validity of the LEED program in growing the targeted skills. These decisions will be finalized as the LEED program evolves in the second quarter of this project.

INSTRUCTIONAL DESIGN

The instructional design uses the Army's familiar "crawl–walk–run" model. The instructional design progresses through the following phases following the pre-assessment:

7. Provide an advanced organizer. The trainee is presented with the objectives of the leadership competencies to be acquired and practiced in this training program. A simple *didactic* method of instruction is used. The trainee is presented with the competencies to be taught and shown the mapping into the competency groups. The trainee is presented with the competencies in the groups and assessed for knowledge of the competencies after each group is presented. A passing score is required before the trainee can proceed to the next level of instruction.
8. The trainee is taught and assessed on the basic competencies as exercised in the planning segment. *Interactive* CBT methods will be used, with typical knowledge assessment methods/items.
9. The learner progresses though the segments in the scenario, exercising each competency as appropriate to the segment. Assessment with feedback occurs within the segment. The trainee completes a planning phase. Thus, the entry into the next mission phase is ordered.
10. The trainee experiences a scenario comprised of segments that includes a simulation segment. In the early exercises the trainee encounters the crowd in an isolated segment. The trainee is coached by the Platoon Sergeant (PSG), who is enacted by an agent in the scenario. Each training pass provides assessments that can be stored for later review. The trainee is debriefed in the AAR. The trainee is allowed—and if appropriate, encouraged—to repeat the exercise at will. Each repetition will differ, using the methods of variation described earlier.
11. The trainee experiences the scenario with the crowd simulation conflated with one of the active segments. Again, the PSG will coach. Repeated trials will differ, becoming increasingly more complex and difficult. Agent selection, locations, placement in the overall scenario will be controlled statistically according to predefined probabilities. These probabilities can be manipulated to favor the development of certain types of leadership moments. The program will determine the occurrence of leadership moments and appropriate responses using predefined rule sets.

TECHNICAL METHODS

Crowd Simulation

Leadership skills involve managing people. The simulation in LEED models the behavior of individuals in a crowd, as well as soldiers in a platoon convoy. The scenarios take place during various missions set in Iraq. The simulation infrastructure is based on a previous effort (Lyell and Becker, 2005) in which we modeled pedestrian behavior during the outbreak of a fire in a US metropolitan building. Although the nature and behavior of the crowd in both cases is different, the shared underlying infrastructure is in terms of the codebase and communication infrastructure.

We modeled crowds as a collection of agents. The crowd behavior results from the activity of multiple agents. The agent model of an individual incorporates the cognitive processes of the individual, the emotional elements that influence cognitive processes, and its relevant physical capabilities and characteristics. The scenario models pedestrian locomotion as agents walking in an environment, encountering an unexpected event. The model of a cognitive pedestrian agent is a hybrid, possessing (1) physical features, (2) cognitive skills, and (3) emotional and personality characteristics. Relevant physical characteristics include the pedestrian agent's stride rate and stride length. We derived agent model results from diverse areas of the literature for (1) personality and emotions framework development, and

(2) pedestrian walking representation. A number of models of non-cognitive pedestrian walking have been developed; those using a cellular automata representation are pertinent to this scenario. We selected the rule set defined by Blue and Adler (2000). The emotional aspects of the pedestrian agent model were defined within the framework of the OCC (Ortney, Clore and Collins, 1998) cognitive model of emotions. The OCC models emotions as arising from reactions (positive or negative) to events, objects, or actions. Personality traits are considered as longer-term constructs through which more transient emotions are filtered. We included the personality traits in the model of the cognitive pedestrian agent. Emotions and personality both influence cognition in the simulation. An emotional tag attached to an event (or object or action) will influence the cognitive activity regarding goals or plan state, and the nature of the influence will depend upon the personality type. For example, a character that is of a curious but fearful nature will approach a scene of an explosion out of curiosity but will scamper away from the vicinity of the scene if confronted by a soldier. On the other hand, a curious and agitated character would perhaps move away from the scene if firmly confronted but will mill around looking for opportunities to vent his/her anger at the soldiers. We used the Five Factor Model (Digman, 1990) of human personality. The five factors are: (1) Openness, (2) Conscientiousness, (3) Extraversion, (4) Agreeableness, and (5) Neuroticism. The cognitive agent is modeled as having a knowledge base, perception and calculation skills, and goal selection skills that support its cognition abilities. It also has an action set that supports progress toward its goals. There are different personality types that are considered for the cognitive agents. Each agent has an emotion set, and engages in the "observation - cognition – action" cycle, incorporating the emotions that are triggered by meaningful events in the scenario. We include several personality types for both crowd and soldier agents in the simulation. The agents' emotion sets are those relevant to a hostile scenario, and include varying levels of different emotions, such as fear, anger and distress. A cognitive agent's goal selection is mediated by both environmental factors and its emotional response to these factors, which befit its personality.

Simulation-based Intelligent Training and Assessment (SITA) Architecture

The overall architectural vision (Manikonda, Maloor, Haynes and Marshall, 2004; Haynes, Marshall, Manikonda and Maloor, 2004) in developing SITA was to create a framework that integrated SCORM-compliant instruction with an agent-based simulation in order to enable the development of a richer instruction and training development environment. The design of SITA was guided by several requirements: (a) Providing a channel for communication between a SCORM-compliant Learning Management System (LMS) and the simulation, (b) Transmitting and translating user input and other relevant data to and from the LMS (SCORM format) and the simulation, and (c) Providing a centralized capability (inside the SCO) to start and stop the simulation. Previously, we demonstrated the feasibility of the SITA architecture by interfacing an Air Traffic Management (ATM) course with an HLA-compliant Collaborative Regional Flow Control (CRFC) Decision Support Tool (DST) (Satapathy, Manikonda, Robinson and Farley, 2002). In the current effort, we use an extension of this architecture that supports non-HLA compliant simulations and a more interactive story-based instructional format. This modified architecture is explained in detail in Haynes et al. (2006).

The basic architecture (Figure 3) consists of the learning management system (LMS), the Crowd Simulation and three major interface modules that constitute SITA: SCO-Sim interface module, Simulation Manager and the Launcher/Collector Applet, which together enable communication between the LMS and the Simulation.

Upon initialization, the student's simulation settings are read from the LMS by a SCO. The SCO then launches the simulation by sending a *start simulation* command to the *Simulation launcher/collector* applet, which runs in the same client browser context as the instructional content (SCO). The applet connects to the *Simulation Manager*. The Simulation Manager starts the *crowd simulation* federates. The Simulation user interface can be displayed on the same or a different client machine from the SCO. Communication between simulation federates and the LMS is achieved via the *SCO-Sim Interface federate*, the *Simulation launcher/collector applet* and the *LMS Adapter*. All distributed communications are done using Java Remote Method Invocation (RMI). Intra-federate communication is supported by the Cybele (Cybele) distributed agent infrastructure (Cybele agent platform, open source version available at http://www.opencybele.org).

Every relevant action by the trainee and all characters in the simulation are transferred back to the SCO. Some of the information types that are communicated include: (a) Trainee-input parameters such as interventions, responses and remedial actions, (b) Actions, emotions of characters (soldiers and crowd elements) during

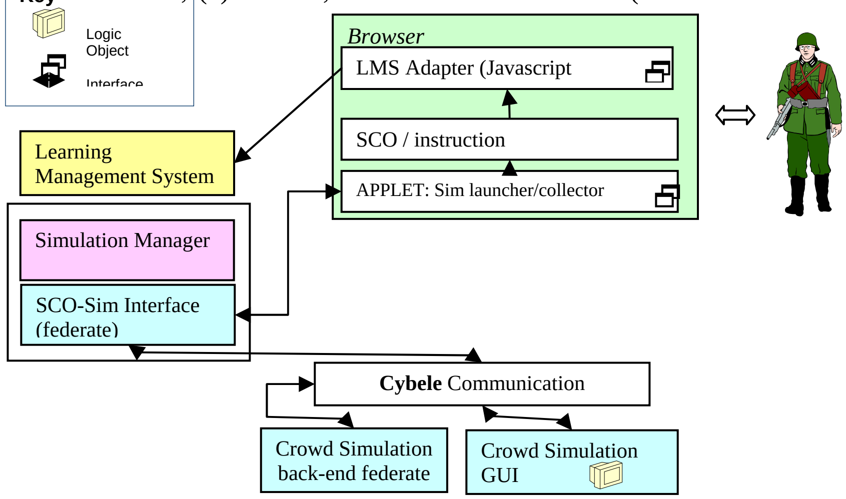

Figure 3. SITA Architecture

various states in the simulation, and (c) Messages (conversations) passed between various characters. Therefore, as compared to the previous implementation of SITA, the SCO-Sim Interface and Simulation launcher/collector Applet components must support a far greater amount of traffic. This information transfer is done over http sockets using Java RMI. The data transfer components and the collection components have been modified to handle this increased traffic.

CONCLUSIONS

Our work has been motivated by the need for developing a richer interactive learning environment where a student can demonstrate higher level competencies such as leadership by applying them in a realistic simulation environment. During the initial phase of the research, a proof-of-concept prototype system demonstrating the technical feasibility of an IPD-based approach for adaptable story-based leadership training; assessment was developed (a user evaluation of the instructional design and courseware was beyond the scope of the "proof-of-concept" nature of the presented work.) The working prototype demonstrated (a) technical feasibility of creating a simulation that can be used to train platoon leaders on a limited set of leadership competencies. (b) technical feasibility of embedding agent-based simulations into SCORM-complaint instruction. Additionally, the prototype demonstrates that the "plot" of the scenario can change as a trainee's decisions impact the storyline. The non-deterministic nature of the simulation affords a level of variability that enables training of simple-to-complex combinations of leadership skills within the same scenarios.

We are now in the process of building complex training scenarios that leverage the believability and flexibility that intelligent agent-based simulations provide combined with the interactivity that the sequencing and navigation features of SCORM 2004 allow. We will conduct user studies to evaluate both the quality of instruction and training and the usability aspects of our training system.

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