4G TECHNOLOGY WARRIOR'S NEW WEAPON

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Abstract: Information is power, nowhere is this truer than on the battlefield, where the ability to communicate clearly and rapidly pass on information spells the difference between survival and death? 4G (4th Generation) is the technology that is going to drive a soldier in the field in future. The key to empowering the military with tactical broadband voice, video and data is 4G communications technology. This technology adopts Wireless technology on the platform of fixed networks, advanced antennae technologies and more advanced wireless security technologies. Next thing is about the gear for the future warrior. Our system provides a enhanced power of vision, which provides Ground Guidance, Unit Detection, Soldier Status, Target Hand-Off and provides the Soldier Rescue during the battle. The uniform along with the armor, onboard computer which will monitor soldiers' overall physiological and psychological picture of how they are performing in the battle zone and enhanced human performance which weighs 50 pounds from head to tail against 120 pounds of the current day system present.

I. INTRODUCTION

The new systems include a weapon, head-to-toe individual protection, onboard computer network, soldier-worn power sources, and enhanced human performance. "The Future Warrior will be a responsive and formidable member of an invincible battle space team". The Future Warrior system will meet the more immediate, short-term demands of our fighting warriors in the battle space, and will remind you of an ominous creature out of a science fiction movie.

II. TECHNOLOGY & THE BASIC DESIGN

The approach will support military operations across a spectrum of environments from backpacks to ships. The key technology supporting these initiatives is ad hoc peer-to-peer wireless networking (ad hoc p2p), also known as a mobile mesh network. Ad hoc p2p operates by taking a collection of mobile terminals (such as handheld devices and vehicular systems) that communicate directly with each other without the aid of established infrastructure. Ad hoc networking provides a self-organizing and self-healing network structure. Multi-hop routing terminals act as routers and relays for each other, and extend the range and coverage of communications links between individual soldiers, troop transports and command centers.

The military and DARPA have outlined specific capabilities for these devices. At a minimum, they will need the following setup processes that are essential for a good and effective communication between the soldier and his troops. Illustrated in figure 2

Figure 2

Figure3

III. WORKING

DEPLOY-ABILITY WITH LITTLE OR NO FIXED- INFRASTRUCTURE:

Military engagements are often spontaneous, and a communications solution needs to be, as well. 4G Warriors bring their networks with them, and take them away when they leave. Network setup automatically begins the minute troops exit a transport, helicopter or ship.

GEO-LOCATION WELL BEYOND THE LIMITATIONS OF GPS:

Soldiers cannot afford to expose themselves on a battlefield to acquire GPS coordinates. GPS is also limited in that satellite signals cannot penetrate caves, underground bunkers or inside shielded buildings. Ad hoc p2p wireless has built-in geo-location using an extremely accurate form of triangulation. The 4G Warrior can triangulate his or her position, or that of another soldier, based on mesh-enabled vehicles or other devices, even when hiding in caves or otherwise out of harm's way. Readings are faster than GPS (under a second) because soldiers don't have to wait for multiple satellites to acquire a fix.

SECURITY:

The device security must address both communications security (COMSEC) and a way to protect the network from unauthorized use if the device is captured. Communications are more secure when mesh networks allow for route diversity. Meshed architectures also allow devices to transmit at lower output power to neighbors rather than Shouting at a cell tower. Figure3

ROUTING OF TRAFFIC AROUND DOWNED LINKS:

This lowers the probability of detection and increases battery life. Should a device be captured, the 4G Warrior can blacklist that device to maintain the integrity of the network.

ANTI-JAMMING ROBUSTNESS:

The 4G Warrior is neither dependent on a single frequency nor constrained to a military band. These self-forming, self-healing networks will have the ability to instinctively and proactively reduce the probability of jamming. Communications devices must operate while vehicles or soldiers are mobile, even at speeds in excess of 100 mph. 4G Warriors can receive real-time streaming video from aircraft, such as the Predator Drone flying over a battlefield. Multi-tap rake receivers minimize the effects of Doppler radar to maximize the impact of it.

END-TO-END IP:

Modern soldiers grew up with computers and will demand the same applications and user interfaces available to civilians. The 4G Warrior, using instant messaging, can send photos of enemy positions back to the camp for analysis, and use voice over IP to communicate with nonmilitary phones in an occupied city.

IV. 4G ON THE BATTLEFIELD

All of the battlefield network devices including those embedded in tanks or other vehicles will instantly form, heal, and update the network as users come and go. That is, they will associate in an ad-hoc manner. Moreover, the devices will automatically and continuously optimize network connections as users merge in and out of the network at will. As intelligent elements, all of the devices will constantly reconfigure routing tables to determine the best network routes and, unlike cell-based solutions, network coverage and service levels will improve when soldier density increases. The network resources are better utilized because networks are self-balancing, as well. The soldier's subscriber devices can hop to distant network access points, away from points of congestion, shifting network capacity to meet demand. Network deployment will be fast and easy because it is tower less. Communication systems providing the backhaul and the network will disappear as fast as it was formed once soldiers leave the area. The 4G battlefield will be entirely mobile, with satellites or other. This technology could function as a personal are network (PAN), local area network (LAN), or wide area network (WAN), simultaneously. This means that the same network can connect a soldier to the squad or platoon, to the battalion, and to a fully mobile division. It is the equivalent of a Bluetooth, 802.11, and 3G convergences, but in a single network, with a single device.

POWER OF VISION:

This has been seen in science-fiction movies, a dropdown piece of eyewear from the helmet allows the soldier to see a 17-inch computer screen displaying anything relayed to the soldier. "This eyewear device is see-through, so it hangs out in space. This allows soldiers to take in all supporting data while keeping both hands on their weapons. Illustrated in Figure 4 Soldiers wearing the new system will have no need for an external microphone to communicate. "The helmet has sensors that register vibrations of the cranial cavity so they don't have to have a microphone in my mouth. That allows the soldier to control the entire computer via voice. Soldiers will be able to cycle through onboard menus via their eyewear device.

Figure 4: eye wear with helmet

figure5: unit detection

UNIT DETECTION:

Overlays beyond-line-of-sight combat identification, this allows to differentiate Friend from Foe. Combat-ID is limited to line-of-sight identification, requires initiation, and encumbers soldiers with additional equipment. It can exposes enemies that are camouflaged, obscured, or outside of a soldier's visual range. Enables rapid firing decisions and reduces the risk of friendly fire. Since, in Desert Storm (Jun 91) 35 out of 148 US casualties resulted from friendly fire. Illustrated in Figure 5

GROUND GUIDANCE:

Directs soldiers are the targets while avoiding obstacles. Ground Guidance fuses road maps and aerial imagery to discover obstructions and generate routes. This enables commanders to cordoned off dangerous areas and demarcate secure zones. These Frees commanders from an issuing turn-by-turn directions, This is a relief for the commanders of olden days in which they use paper maps, issue turn-by-turn directions, and suggest obstructed routes.

Figure 6: ground guidance

Figure 7: target handoff

TARGET HAND-OFF:

Enables rapid selection of fire support targets and also enables a soldier to select targets using his weapons scope and range finder. It determines the coordinates of the target. It also warns the commander if soldiers are near the target. It alerts friendly soldiers to the presence of targets via their scope and map. Illustrated in Figure 7

SOLDIER RESCUE:

The Coordinates Missions to Aid Injured Soldiers. Identifies soldiers with failing vital signs and prompts commanders to call in nearby soldiers to provide assistance directs the rescue team to the injured soldier, while avoiding enemy obstacles. This provides lowers casualty rates, reduces the severity of injuries, and prevents enemy ambush.

Figure8: soldier rescue

Figure 9

SOLDIER STATUS:

Presents battery indicator, vital signs, and round count are soldiers wearing the new system will have no need for an external microphone to communicate. "The helmet has sensors that register vibrations of the cranial cavity so I don't have to have a microphone in my mouth. That allows the soldier to control the entire computer via voice-activation".

BODY GEAR

The uniform system of the Future Warrior is been designed with more advanced nanotechnology. Nano-technology deals with the creation of incredibly small materials, devices or systems with a scaled-down size of 100 nanometers or less. A nanometer is a metric measurement equivalent to one billionth of a meter. What we hope to gain from this program is body armor that wears like a traditional textile impregnated with nanomachines connected to an onboard computer, So when you shoot a round into the uniform system, it's normally pliable until it senses the strike of a round it becomes rigid, defeats the strike of the round and becomes soft again. A shortcoming of traditional body armor is that it can only absorb so many strikes from machine-gun rounds. When you have a uniform with this new nanotechnology, it can absorb unlimited numbers of machine-gun rounds. Another potential development is inserting. Fabric is impregnated with nanomachines that create the same weight, lift and feel as a muscle. So I coat the outside of the armor with a nanomuscle fiber that gives me 25 to 35 percent better lifting capability. The uniform from the waist down will have a robotic-powered system that is connected directly to the soldier. This system could use pistons to actually replicate the lower body, giving the soldier upwards of about 300 percent greater lifting and load-carriage capability. We are looking at potentially mounting a weapon directly to the uniform system and now the soldier becomes a walking gun platform. This also provides protection against chemical and biological agents is more realistic with a respirator tube that attaches to the back of the helmet and connects to a low-profile air purifier that forces cool air into the helmet for comfort and visor defogging. Another major change in the uniform is the addition of protruding, interconnecting black pieces of plastic on the legs that represent a lower body exoskeleton. It is shown in figure 9. It will connect through the boots up to the waist and enable the wearer the ability to carry up to 200 pounds. Above the waist, MIT_s research on Nano muscles for advanced arm and torso strength may be linked to the exoskeleton to give Future Warrior potentially superhuman ability to move or carry. A flexible display on the forearm of Future Warrior glows when switched on and draws attention to the simulated touch screen keypad for information input and output for tasks such as navigation. The display is connected into a compact computer worn on an armored belt around the waist. The onboard computer will monitor soldiers' overall physiological and picture of how they are performing in the battle zone. Warrior Physiological Status Monitoring System gives the soldier's body core temperature, skin temperature, heart rate, whether the soldier is standing or prone, and how much water the soldier has drunk. The psychological status monitors the brain waves such that when a friendly fire can change into an enemy. A medic, who can be miles away, will now be able to diagnose and treat a soldier who is about to have sunstroke, without even physically seeing the soldier. So a medic can see how the soldier's core body temperature is rising (and) heart rate is falling and the soldier then knows to go directly to the medic for treatment. The computer will drop down a map to direct the soldier where to find the medic for help. The new system commanders will be able to consider each soldier, aircraft and vehicle as part of a node of a tactical network that shares data with each other, sending and receiving data inside the battle space shown in figure 10 & 11.

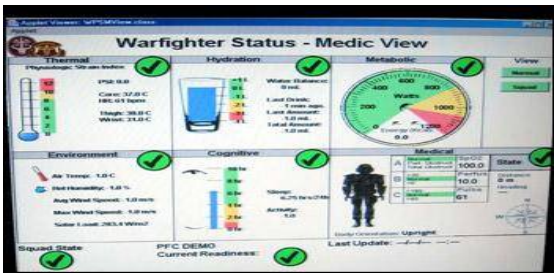

Figure10: monitoring system

Figure11: monitor held in hand

V. CONCLUSION

Here we have used the next technology of mobile technology- 4G for creating a fool proof system that can be used at any place by a military force in the future. This system can be used to provide intelligent communication cum detection system using which every soldier can be virtually connected to a network that will be monitored by a mobile unit. Since the 4Gtechnology is yet to become a reality the system may look very simple but as the technology will be implemented a more complex and cost effective system could be designed.

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