

Describe the complete program of research and experimentation proposed including description of equipment and theory of operation. Describe the specific objective sought to be accomplished:

The Edge Communications architecture enables connectivity between families of heterogeneous systems with the goal of creating new communication paths between field locations and established communication and data network infrastructures. The creation of connectivity between heterogeneous networks allows the unattended sensor grid(s) possessing various levels of on board intelligence to accurately collect and in selected situations integrate, fuse and/or correlate data collected then, transmit said data to various users via dedicated reach back links. The architecture attributes include:

- 1) low power, low probability of detection/interception, self forming, ad hoc, self healing sensor networks employing heterogeneous RF waveform/modulation schemes and heterogeneous data transport protocols;
- 2) long range, increased throughput/data rate RF systems which provide reach back connectivity to in place, legacy communications and data networks;
- 3) fixed and mobile router/bridging nodes which create network overlays by providing communications protocol conversion algorithms or hardware designs to enable efficient collection, correlation and transport of data between these diverse heterogeneous networks;
- 4) reach back capability with increased range, throughput and data rates to accommodate data aggregation from the multiple networks and node spacing. Our solution encompasses multiple layers of communications and supporting architectures allowing diverse sensor data to be collected, routed, and/or directed by a controller (human or artificial intelligent [smart] devices) to provide ubiquitous access to users anywhere in the world via dedicated or on demand paths utilizing protocols in newly formed or existing stable communications networks.

This problem has never been resolved before in this fashion and no one has proposed an integrated, open, standards based solution to address this problem on a wide scale end to end basis. Through this experiment, we aim to provide robust, on-demand, end-to-end communications for tactical and first responders who currently have limited or no communications in the field.

Describe how the program of experimentation has a reasonable promise of contribution to the development extension, expansion or utilization of the radio art, or is along the lines not already investigated:

Edge communications environments scale widely – variations include data collection and establishing network communications down to the last tactical foot stretching the capabilities of today's military networks located in unpredictable surroundings; to first responders facing disaster scenarios; to densely populated third world cities where disadvantaged users may not have the knowledge or technology to support emergency or tactical situations. What these environments share in common is that data collection and timely dissemination of information to and from 'edge' environments and the user is unpredictable & often challenging if not impossible to predict. The Edge Communications architecture will provide users with the ability to transmit and receive data (consisting of voice, text, image, video, fused information) from the scene of an event or activity where existing communication infrastructures are unavailable or unreliable.

This invention shall provide accurate and timely collection and transmission of critical data collected via heterogeneous networks composed of sensors, data collectors (machine or human), routers, transmitters and controllers which may be located in urban, field and other disadvantaged communication environments to a mobile or stationary operations center and/or network management control center, which will advance the development and extension of radio-based technologies. Because this solution will be utilized in various demanding situations, the Edge Communications architecture is designed with flexibility and risk aversion in mind, thereby reliably fulfilling critical information needs (which are currently unmet) such as: situational awareness, technical, medical and tactical; providing status to geographically diverse resources and users.