(U) Visualizing the RF Environment

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Dr. Rich Thissell
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(U) Objectives

• (U) Modeling and simulation of RF sources, propagation, attenuation, interference, and multi-path effects for use by the tactical war-fighter.

• (U) More intuitive man-machine interfaces for data visualization of RF sources, propagation, attenuation, interference, and multi-path effects.

(U) Make the complex physics of RF propagation, etc. accessible and comprehensible to the non-technically educated to increase coalition spectrum dominance in the battlespace.
(U) Technical Challenges

- (U) RF propagation in a tactical environment is many dimensional, whilst our visual cortex has evolved to comprehend six data dimensions at most (e.g., space, wavelength, intensity, and time). What are the best visualization methods for rapidly understanding the multi dimensions of RF propagation, such as space, time, phase, frequency bandwidth, and intensity?

- (U) Existing open source RF propagation software are designed for engineers to use and are not intuitive for non-technical users. An analysis of alternatives is required to determine the best framework to build upon to meet the requirements.

- (U) Service Labs and FFRDCs in house developed capabilities and DARPA RadioMap and PIXNET visualization projects need to be analyzed for potential capability merger.

- (U) Key visualization enabling capability may be Cesium V 1.35+ with 3-D tiles, released July 2017.
(U) Implicit Requirements

- (U) SWAP limited processing power at the tactical edge requires processing reach back using software as a service (e.g., cloud computing converged with high performance computing) with data visualization over dis-advantaged networks.

- (U) Highly complex problem where engineering best practice dictate risk reduction through decomposition into multiple phases:
  - A. Phase 1: Modeling and simulation of tactical emitter and propagation environment with a plug-in architecture and multiple human factors assessments of novel data visualization techniques of modeling results. Deliverable is information and knowledge to inform requirements for subsequent phases.
(U) Summary

• (U) Objective is modeling and simulation of RF sources, propagation, attenuation, interference, and multi-path effects for use by the tactical war-fighter in a dis-advantaged communication environment.

• (U) Objective has a special focus on more intuitive man-machine interfaces for data visualization of RF sources, propagation, attenuation, interference, and multi-path effects.

• (U) Implicit requirement for open source (OS) and GOTS RF propagation modeling frameworks with a plug-in architecture for RF emitters and standard objects.

• (U) Implicit requirement for HTML 5 browser and augmented reality device multi-dimensional data visualization frameworks based on OS and GOTS capabilities.

• (U) Multiple human factors engineering (HFE) assessments are anticipated, led by government HFE teams.

• (U) Development will follow the dev-test-ops maturation methodology.

• (U) Development will utilize the DI2E collaboration portal.