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Preparing for the future….
Never forgetting the past!

Office of Naval Research Code 30
Thrust Area Willful Intents
FY12 - FY13

Persistent Intelligence Surveillance and Reconnaissance TIA – Willful Intent

Current Capability:

- Current sensors are generally weakly responsive to the information requirements associated with early phases of warfare and with irregular warfare. Sensors are not easily discoverable, are generally un collaborative and have limited ability to produce semantic information. Sensor planning and management are manual processes.

FY	Desired Capability	S&T Challenge	S&T Solution
Near Term FY12-FY14	• Integration of the ACP tool with ISR aperture to enable visibility of SIGINT sensor health and status • Sensor planning informed by predictive analysis • The value of sensors to information needs is expressible. • Smarter long life sensors and smarter wide area sensors. • Reliable entity recognition at 100 meters	• Resolving differences between existing registry services and open sensor web standards. • Resolving lexical differences between information requirements and predictive tools. • Resolving lexical differences between information requirements and sensor capabilities • Develop long life smart sensors. • Automating the detection of conditions of interest at the sensor. • The quality of sensed information is dependent on collection conditions.	• Develop the requisite sensor models and interfaces to enable full SIGINT sensor visibility • Develop the requisite interface between predictive tools and ACP. • Mature a sensor capability ontology. • Integrate enhanced signal processing into unattended ground and tower based sensors. • Develop condition invariant entity recognition.
Mid Term FY15-FY17	• Integration of all available sensors with an open standard based Sensor Aperture • Sensor planning is automated and based on information needs. • A service can be used to discover sensors applicable to an information need. • A wide area hyperspectral sensing capability is available as a tactical UAS payload. • Recognition/fingerprinting of specific entities at 1000 meters.	• Imagery sensors are generally COTS based and do not automatically produce health and status information. • Understanding how to utilize semantic sensor health and status information and information needs as the basis for developing an automated sensor planner. • Development of semantic sensor capability descriptors. • Increasing the amount of information a power constrained sensor system can process. • Fingerprint extraction form low resolution data is challenging.	• Automate the generation of DDMS compliant metadata at all sensors. • Develop a sensor planning service that tasks sensors in accordance with priority and specific information needs. • Develop a semantic service discovery application. • Develop smarter hierarchical software and workflow architectures. • Enabled by a common coordinate system, enable higher zoom and/or increased directionality to be used by sensors.

Persistent Intelligence Surveillance and Reconnaissance TIA – Willful Intent Continued

Far Term **FY18-FY20**	• Sensors base measures of performance, a subset of health and status, on IR/PIR, SIR and AOIs. • Clusters of sensors can be tasked to answer an information need as one. • Sensor fields can infer patterns of life and intent. • Recognition/fingerprinting of specific entities at 2000 meters	• Integrate the required intelligence at the sensors so sensors can understand what they are supposed to be collecting. • Understanding how to utilize semantic sensor health and status information and information needs as the basis for developing an automated sensor manager. • Understanding how the contributions of individual sensors can be combined. • Enabling sensors to move from signal to object to behavior recognition. • Fingerprint extraction form low resolution data is challenging.	• Automate the production of semantic information at the sensor. • Develop a sensor management service that tasks sensors in accordance with priority and specific information needs. • Develop a workflow authoring and supporting knowledge display technology. • Develop distributed processing algorithms that can run across a sensor field to enable behavior, intent and patterns of life inferencing. • Increase the use of context by specific entity recognition algorithms.

Endstate:

- Enhanced planning, directing, and collection steps of the USMC intelligence process enable the synchronization of available ISR assets and available intelligence products. Available ISR assets are responsive to the intelligence requirements of tactical commanders for all mission types and during all phases of warfare.

Knowledge Generation TIA – Willful Intent

Current Capability:

- Most raw data and many information products remain hard to find by enterprise application services. Visualizations are largely manually created in COTS office software or link analysis programs. Network definition and tracking is largely manual. Cultural intelligence is generally only useful as background knowledge.

FY	Desired Capability	S&T Challenge	S&T Solution
Near Term FY12-FY14	• Services are able to condition data entering a geospatial data repository to expose information • Data is organized into case (interest) or COI folders automatically • Applications that can discover networks using all-source intelligence (HUMINT, SIGINT, IMINT, MASINT, OSINT, TECHINT) • An automated tool that can mine and semantically store relevant cultural information. • User friendly fixed but multi-INT visualizations afforded the analyst and warfighter.	• Metadata tagging of unstructured documents currently requires human interpretation • Moving from organizing data by provided metadata to semantic organization requires advances in NLP. • Text and audio processing capabilities do not support accurate network visualizations from complex data, entity disambiguation algorithms will not prevent redundant entities. • Connection between cultural data fields and collected data is poorly understood • Placing all data in a common space, time, meaning space remains challenging.	• Base document tags on the output of various natural language processing applications • Develop NLP tools that can accurately find meaning in groups of words. • Develop audio processing and text processing algorithms that can support network visualizations. • Mature entity disambiguation algorithms. • Mature an ontology that translates detailed cultural intelligence schema to collectable information. • Mature NLP to support automated discovery of cultural intelligence requirements • Maturation of data meta data extraction/schema that enables data to be registered within a space/time/meaning portal.
Mid Term FY15-FY17	• Ability to store and run map reduce jobs against any terrabyte per hour data streams. • Automated tool for intelligence analysts that enable the analysis of entities and aggregates in discovered networks and that can produce daily reports on personas and groups of interest. • Predictive capability that uses both cultural and conventional intelligence data to infer intent and actions. • Customized and collaborative visualization of complex data.	• Maintaining enterprise awareness of the information content of large distributed data stores is challenging. • Translation of network and NLP derived data cannot currently accurately be translate into a behavior space. • Scarcity of cultural data layers does not support classic causality algorithms. • Visualizations cannot currently be constructed on a situation dependent basis.	• Mature frameworks such as Hadoop to store and process large distributed data stores . • Mature the understanding between network metrics, themes and word frames and behavior. • Mature causality measures that can handle data with widely varying space/time resolution and data gaps. • Mature semantic visualizations that are automatically populated based on what the applicable information requirements

Knowledge Generation TIA – Willful Intent Continued

Far Term **FY18-FY20**	• Ability to automatically apply semantic tags to data written to a portal • Tool that can provide live updates direct to the warfighter and/or analysts when changes to networks are detected. • Decision tool that optimizes warfighter decision recommendations using all available information. • Development of visualizations that support ad hoc information requirements and human-machine interaction.	• Automated understanding of the information content of new data sources is not currently possible • The significance of measurable changes to networks detected in structured and unstructured data cannot accurately be assessed. • Decision support tools that optimize first and second order effects cannot currently be developed is human reaction is involved. • Visualizations leveraging data and human insights cannot currently be automated.	• Continue to develop NLP technologies that can be applied to structured data as well. • Continue to study how to establish causal relationships between network changes and detected outcomes. • Mature agent based modeling of multi-player interactions. • Develop automated visualizations that maximize the human-machine interaction.

Endstate:

- A semantic web enabled data/application enterprise with automated workflows capable of automatically addressing analyst and warfighter information needs. Structured and unstructured data of widely varying pedigrees are seamlessly fused to generate accurate assessments and predictions.

ISR-C2 Actionable Intelligence TIA– Willful Intent

Current Capability:

- Intelligence primarily supports intelligence preparation of the battle space activities. When data is forwarded to the commander it is generally unstructured.

FY	Desired Capability	S&T Challenge	S&T Solution
Near Term FY12-FY14	• Sensors automatically produce metadata that characterize discovered information. • Filters utilize rich meta data to properly route information • PDA based apps translate conditions of interest and entities of interest into data subscriptions.	• Analysis at the node needs to support the recognition of activities vice just presence • Current DDMS standards do not support semantic tags. • Mappings of conditions of interest and target folders to data require human intuition.	• Continue to evolve algorithms that can run at the sensor and identify both entities by prints and activities/behaviors • Utilize comment fields and maturing NLP tools to enhance the value of DDMS compliant metadata cards. • Develop mappings of conditions of interest and target folders to data.
Mid Term FY15-FY17	• A capability to aggregate the output of multiple sensors to generate situational understanding. • A capability to semantically fill the information needs of the warfighter. • Wiki based visualization (show me) of all information relevant to a case file, condition of interest or target. • Enterprise assessment of how much a unit will need to know in the future is known.	• Currently fusion algorithms run best under hub and spoke architectures. • A common lexicon between information requirements and data/information has not been developed. • Semantic web enablement is a work in progress. • Quantize the value of information and the quantity of information along mission threads	• Develop distributed fusion algorithms enabled by richer metadata generation. • Develop a common lexicon between information requirements and data/information • Mature a semantic web relevant to information requirements and analytic questions. • Develop models of what is known and he value of additional collections/analytic activity as a function of space/time
Far Term FY18-FY20	• Cloud enabled environment that surgically discovers and delivers the information a warfighter needs. • Information delivery supports simple show me/tell me statements • ISR enterprise anticipates the information needs of the warfighter and acts	• Applicable application jobs have not been demonstrated. • Develop translations between plain language subscriptions and data/information • The translation of unit reporting to optimum ISR enterprise suggestion of action is currently not possible.	• Mature a cloud computing environment that contains sensors, analysis nodes and the warfigher. • Apply NLP to information requests to translate such requests to a common lexicon hat can be filled by sensors/analytic services using a mapped vocabulary. • Develop an agent based architecture that tracks current operations in information need space automatically

Endstate:

- Intelligence supports current and future ops, inside the decision cycle of own force. All data and information products are screened and routed through the proper workflows. Mission models and data/information models are linked by a high level ontology.