

Quality of Information for Semantically-Adaptive Networks (QoI)



S&T Campaign: Information Sciences Networks and Communications

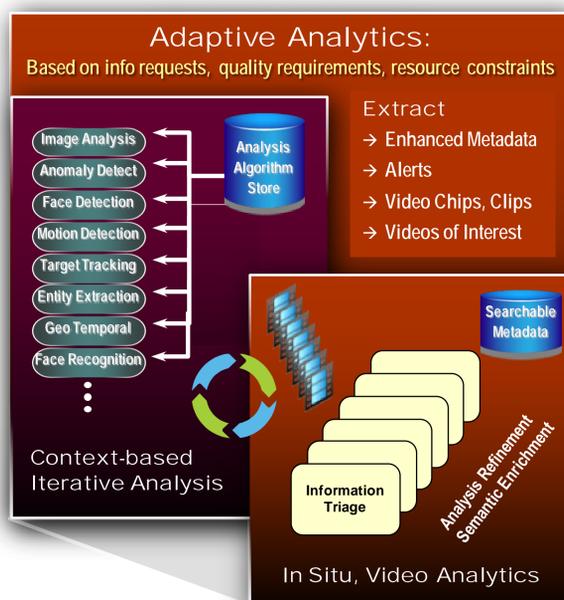
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Research Objective

- Foundational science to model, characterize, and control **information delivered through multi-genre networks** based on the network environment and semantics context of queries
- **Maximize overall information capacity of networks** by taking into account the context in which the requested information is used, and by exploiting the tradeoffs between data representation, the desired information quality, and communication capabilities for tactical networks



Quality of Information Analytics

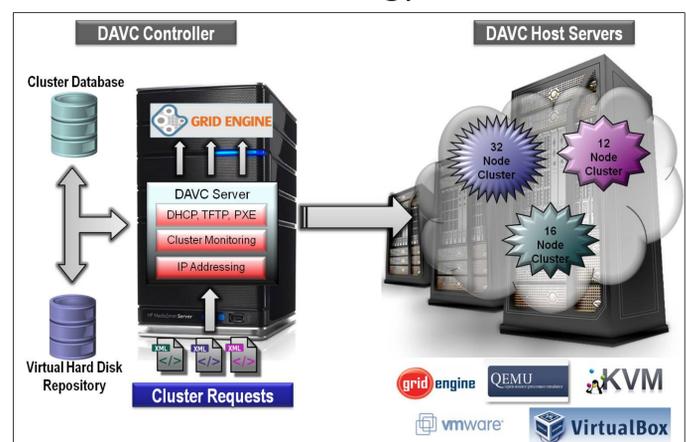
Challenges

- **Representing semantic analogues of classical information theoretic results:** Foundational science of representing and communicating semantic information. Fundamental limits of representation and communication significantly over classical semantics-agnostic results (source & channel coding)
- **Lack of understanding of relationships within multi-genre networks and their impact on information capacity:** Consider the quality and quantity of information as it propagates through different network structures and types. Model impact of communication modalities on information flow
- **Limited understanding of the tradeoffs between QoI metrics for semantic information delivery:** develop algorithms to improve quality of delivered information while considering network retrieval devices and information base of structured or unstructured items (e.g. video) involved in information queries



ARL Facilities and Capabilities Available to Support Collaborative Research

- **Research Insights**
 - Use of semantic information in image queries, improves completeness & timeliness over non-semantically-aware schemes
 - Processing on end-devices can drastically impact QoI & required capacity. Tradeoffs are not straightforward
- **Experiment Facilities:** Network Science Research Laboratory (NSRL): state-of-the-art experiment facility with a wide range of capabilities:
 - Integration of various multi-genre network experiment platforms applications (e.g., EMANE, ELICIT, Algolink, Apollo)
 - Concurrent emulation of wireless networks utilizing Dynamically Allocated Virtual Clusters (DAVC)
 - Close collaboration with research partners in the Network Science Collaborative Technology Alliance



Dynamically Allocated Virtual Clusters (DAVC)

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- **Integration of other military-relevant networked applications** into NSRL enhances the fidelity of environment and expands the potential for QoI research results
- **New approaches to improve QoI metrics** in various networked scenarios provides perspective into current research direction

Selected Publications

- J. Edwards, A. Bahjat, Y. Jiang, T. Cook, T.F. La Porta, "Quality of Information-aware Mobile Applications," Pervasive & Mobile Computing, Elsevier, June 2013.
- G. Cirincione, R. Govindan, S. Krishnamurthy, T. F. La Porta, P. Mohapatra, "Impact of Security Properties on the Quality of Information in Tactical Military Networks," IEEE MILCOM 2010.