Many emerging Distributed Collaborative Adaptive Sensing (DCAS) systems rely on sensing, processing, and storage nodes interconnected via the Internet. Such systems require timely exchange of large volumes of sensor data among geographically distributed end-users under resource-constrained network conditions. We have developed and implemented an architecture, Application-Aware Overlay Networks (AWON), for deploying application-aware services in an overlay network to best meet the QoS requirements of DCAS systems.

Here we focus on a data fusion framework for such Application Aware overlay networks. We first present an architectural framework for real-time implementation of CASA multi-rad data fusion. We then extend it to a distributed, peer-to-peer based collaboration framework that aggregates and utilizes unused processing, storage, and communication resources in other peers. The fusion framework combines data in such a manner that a real-time requirement of the sensor application is met. An analytical model is presented that predicts data fusion latency. The fusion framework further utilizes an application specific mechanism to select subsets of data, from multiple radars, to increase the desired accuracy of the results. A dynamic peer-selection algorithm, Best Peer Selection (BPS), is used to choose a set of peers based on their computation and communication capabilities to minimize data fusion time. Simulation results show the ability of the proposed framework to satisfy CASA data fusion requirements.

**Research Objectives**

- Develop a multi-sensor radar data fusion framework that utilizes our Application Aware Overlay Network (AWON) architecture [6]
- Develop an analytical model to predict data fusion latency in DCAS systems

### D6: Application Aware Overlay Network Based Data Fusion Framework for Distributed Collaborative Adaptive Sensing

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**Abstract**

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**Overlay Network Based Multi-Radar Data Fusion**

**Future Work**

- Design and develop enhanced mechanisms for Application Aware overlay network based data fusion
- Efficient data and resource discovery through structured P2P
- On-demand ray-by-ray data transfer to reduce fusion latency
- In-network caching to enable reuse of preprocessed fused data
- Evaluate the performance and scalability of AWON based data fusion for small and large scale CASA systems

**Publications**


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