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**Nested Autonomy - Adaptive and collaborative sensing with  
hybrid sensing networks**

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Control of undersea sensing networks is restricted by the limited acoustic communication capacity and the need for surfacing 'data-mules' for communicating with the operators. Adaptive sampling of episodic events must therefore be performed fully autonomously. Similarly, collaboration between nodes is limited by the communication horizon. These constraints favor the use of a nested operational paradigm, with clusters of highly autonomous nodes capable of detecting, classifying and localizing episodic events, if possible collaborating with neighboring nodes without operator intervention. Such a Nested Autonomy operational paradigm is being developed for capturing episodic oceanographic events by AUVs and gliders in the NSF ORION ocean observatory. Based on the portable, open-source MOOS-IvP autonomous control framework, the same paradigm is being applied for distributed acoustic surveillance networks in the ONR PLUSNet program. In either case the nested autonomy enables the autonomous exploitation of the environmental and tactical situation, and collaborative tracking of targets or oceanographic events. The operator control is limited to very simple deploy and prosecute commands. The performance of the nested autonomy paradigm is demonstrated by examples using a high-fidelity simulation environment, and by results from recent field experiments. [Work supported by ONR]