

Senior Capstone Project Proposal

The project is designed for a team of students working toward completion of a project, within two semesters¹.

Title	Redhawk Waveform Component Deployment on Distributed Processing Node
Sponsor	Contact person: Adam Mielke Company name: Pacific Defense
	Contact info: Adam.Mielke@Pacific-Defense.com
Description	<p>Redhawk is a software framework that manages distributed applications. Distributed applications are made up of multiple software components that are deployed on different processing nodes that are assigned specific responsibilities. These software components work together to accomplish one or more overall capabilities. An example is a software defined radio.</p> <p>Software Defined Radios (SDRs) may consist of many processing nodes including General Purpose Processors (GPPs), Digital Signal Processors (DSPs), Fully Programmable Gate Arrays (FPGAs), and Graphics Processing Units (GPUs). Each node may be responsible for one or more aspects of the overall radio capability. For example, a GPP may be responsible for the control and status of the radio. A DSP may be responsible for modulation, demodulation, filtering, error correction, and other signal processing tasks. Some of these same functions may also be handled by an FPGA. FPGAs also perform hardware tasks like digital down conversion, digital up conversion, analog to digital conversion, digital to analog conversion, discrete signal interfacing, and much more. GPUs can be used to increase performance through parallel processing. The Redhawk software framework is a solution that provides the capability to manage and deploy software to the different nodes of an SDR.</p> <p>SDRs are not the only example of a distributed capability that can be managed by Redhawk. Home monitoring systems, distributed manufacturing systems, battle management and control systems, cryptocurrency miners, IoT systems, etc. can all be deployed and managed by Redhawk.</p> <p>Redhawk primarily runs on a GPP like an ARM core or an x86_64 based processor and provides some of the control and status functionality previously mentioned. Redhawk can deploy a GPP-based software component to another GPP on the network that is running a Redhawk Device Manager. For nodes that are not capable of running a Redhawk Device Manager, like an FPGA, GPU, or DSP, Redhawk provides the Persona Pattern to define a standard way of interfacing with these devices.</p> <p>A successful project will demonstrate the deployment of a distributed application (any application will suffice, at the discretion of the team) using Redhawk that contains at least one node that requires the Persona Pattern.</p> <p>https://redhawksdr.org/3.0.0/html/index.html https://redhawksdr.org/3.0.0/html/Devices/persona-device-pattern.html</p>
Disciplines (ME, EE, CS, etc.)	Wieging, Alex M. (EE); Ullom, Brandon T. (EE); Miller, Christian L. (EE)

¹In general, one semester has 15 weeks. For a 3 credit hours course, a student is expected to work minimum of 8 hours per week for the project which is equivalent to minimum of 120 hours.

Estimated budget	TBD
Technology Disclosed? If so, what?	None
Additional requirements	Requires U.S. Citizenship
NDA or IP Assignment agreement requested?	Pacific Defense would retain IP.
Faculty Advisor	Dr. Todor Cooklev

Technology and ECCN:

“If your project involves ‘technology’ that is either (a) not publicly available or (b) includes proprietary source code (not executable files), then it requires an ECCN.” ‘Technology,’ for this purpose, is defined as “information necessary for the development, production, use, operation, installation, maintenance, repair, overhaul or refurbishing of an item. Technology may be in any tangible form, such as written or oral communications, blueprints, drawings, photographs, plans, diagrams, models, formulae, tables, engineering designs and specifications, computer-aided design files, manuals or documentation, electronic media or information revealed through visual inspection.”

Interactive tool to determine ECCN:

<https://www.bis.doc.gov/index.php/export-control-classification-interactive-tool>

NDAs and IP Assignments:

The sponsoring company typically has NDAs and IP assignment forms that it wishes to use. Neither the NDA nor the IP assignment is an agreement with Purdue directly; these agreements are between the students and the sponsoring company. Of course, our office can review the company-provided documents to be certain it aligns with Purdue’s standards. Alternatively, our office has draft agreements which we could provide for the sponsor’s use. Again, as NDAs are between the student and the sponsor, Purdue cannot be a party to or advise the sponsor or the student on the NDAs, other than to outline some basic expectations as to fairness and suitability of the NDA to a student project.

Sponsor Acknowledgements:

By way of background, Purdue University professors who have senior capstone class projects involving outside sponsor companies notify our office so that we can prepare an acknowledgement form for the sponsoring company’s completion. This is not a contract but an acknowledgement form signed by sponsoring companies which lays out Purdue’s guidelines regarding class projects and outside company inputs, potential export control issues, and student intellectual property. Some sponsoring companies offer a monetary donation to the project, but that is not a requirement.

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