

## Senior Capstone Project Proposal

The project is designed for a team of students working toward completion of a project, within two semesters<sup>1</sup>.

<b>Title</b>	Network-based, time-synchronous, audio interface board
<b>Sponsor</b>	Contact person: Andrew Foster Company name: Q-SYS (QSC LLC)
	Contact info: <a href="mailto:andrew.foster@qsc.com">andrew.foster@qsc.com</a>
<b>Description</b>	<p>QSC acquired Attero Tech for their design resources and product line (including Wall-mount Network Audio Interfaces - <a href="https://www.qsc.com/products-solutions/q-sys/integration/attero-tech-by-qsc-non-q-sys-native/">https://www.qsc.com/products-solutions/q-sys/integration/attero-tech-by-qsc-non-q-sys-native/</a>). These products were based on licensed technology from Audinate, known as Dante, to distribute audio. QSC has a technology platform (Q-SYS) for network-based audio, video, and control, distribution. With the global IC shortage, Audinate is unable to provide their solution to meet QSC demand. QSC would like to redesign the network audio interface board, replacing the Dante solution with a QLAN processor, to better control the technology and supply chain of these wall-mount endpoints.</p> <p><b>Students will be given:</b></p> <ul style="list-style-type: none"> <li>• Electrical, mechanical, and software requirements to ensure compatibility with existing electrical assemblies, mechanical enclosures, and software technologies.</li> <li>• Circuit design for existing Audinate solution and electrical interfaces.</li> <li>• Circuit example of a QLAN processor</li> <li>• Reference software <ul style="list-style-type: none"> <li>○ Previous embedded software design (STM32 Cortex-M3)</li> <li>○ QLAN platform</li> </ul> </li> <li>• Guidance to establish criteria for design validation</li> </ul> <p><b>Students would be expected to:</b></p> <ul style="list-style-type: none"> <li>• Document a comprehensive list of engineering requirements and design criteria.</li> <li>• Provide design documentation demonstrating adequate understanding of the program goals.</li> <li>• Create a validation plan to ensure the requirements have been met.</li> <li>• Design a QLAN interface board with supporting software <ul style="list-style-type: none"> <li>○ Learn the Altium PCB Designer software</li> <li>○ Perform schematic capture of new design</li> <li>○ Perform PCB design and layout</li> <li>○ Take part in design reviews (hardware/software)</li> </ul> </li> </ul>

<sup>1</sup>In 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.

	<ul style="list-style-type: none"> <li>○ Learn GIT SCM, GCC, CMAKE, Segger J-link, Ozone debugger</li> <li>○ Port application firmware to new architecture</li> <li>○ Develop firmware to initialize hardware</li> <li>○ Develop application software/firmware to support product needs</li> </ul> <ul style="list-style-type: none"> <li>● Execute design validation tasks (hardware and software)</li> </ul> <p><b>Student may be asked to:</b></p> <ul style="list-style-type: none"> <li>● Consider/provide alternate parts based on availability/cost</li> <li>● Redesign portions of the reference circuits based on availability</li> <li>● Use Jira and Confluence for issue tracking and documentation</li> </ul>
<b>Disciplines (ME, EE, CS, etc.)</b>	Winters, Jonathan M. (EE); Ali, Muhammad (CPE); Dalton, Cameron R. (EE); Miller, Christian L. (EE)
<b>Estimated budget</b>	\$TBD – QSC will provide or pay for a workstation, software licenses for development tools, prototypes, and test equipment.
<b>Technology Disclosed? If so, what?</b>	Electronic designs for current product and proprietary software/firmware. ECCN – EAR99
<b>Additional requirements</b>	This proposal is subject to QSC and the Purdue University entering into a mutually agreeable written agreement regarding the terms and conditions of the program, and any subject student entering into a mutually agreeable written agreement with QSC, covering, among other things, invention assignment/transfer and confidentiality terms.
<b>NDA or IP Assignment agreement requested?</b>	NDA – Yes. Students and advisor IP Assignment – Yes. Students to QSC
<b>Faculty Advisor</b>	Dr. Elizabeth Thompson

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**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>

**NDA 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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