Developing the next evolution in underwater communication

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Dal researcher Christian Schlegel. Credit: Nick Pearce photo

Think about how far telecommunications have come in the past century, from the telegraph, to the wireless telephone, to being able to access the Internet from nearly anywhere on the planet. Along that path are a series of small evolutions that, when viewed from a distance, are revolutionary.

Christian Schlegel is trying to spark the next communications evolution — but not through air, as with most telecommunications, but underwater.

Dr. Schlegel, the NSERC/Ultra Electronics Maritime Systems Industrial Research Chair in Wireless Information Transmission and Networking at Dalhousie, is the lead researcher on one of four Nova Scotia projects to receive funding earlier this month through the Atlantic Canadian Opportunities Agency's (ACOA) Atlantic Innovation Fund.

Dr. Schlegel's research into new algorithms to support high-speed underwater communications networks received more than $2.3 million in funding.

"Part of the opportunity with this particular grant is to move towards prototyping, making this research more ready for industry to pick up and integrate into their products and development," explains Dr. Schlegel, part of Dal's Department of Electrical and Chemical Engineering and head of the Ultra Maritime Digital Communications Centre (www.umdcc.ca).

Halifax is, of course, a hotbed for work and research in the oceans, and when it comes to communicating underwater, the primary method of high-speed communications uses acoustics—the propagation of pressure waves.

"That presents its own challenges, including that the subsea channel is a very noisy channel; you're not the only one making noise down there" says Dr. Schlegel. "We're looking at bringing in a new generation of computational algorithms, modifying and adapting them to this particular problem. And if we can bring them to a prototype level—show their superiority over traditional methods, prove they can carry more data — then we'll have accomplished what we set out to do."

The research could have applications in everything from environmental research, to basic science, to military and commercial uses — really, anyone who has an interest in knowing what's going on under the ocean's surface. Dr. Schlegel adds that students will be a key part of the five-year research project.

"We have students do a lot of research, understanding the problem in analytical mathematical approaches. Then we model things in the computer, studying certain ways of signaling, see how they work, what issues crop up. And when we have an algorithm that seems to be a good candidate, and we have our bases covered, we move into what this grant is really for: the transition of the algorithm onto a hardware platform using programmable integrated circuits."

Dr. Schlegel sees this as a great research and development opportunity, given the amount of oceans-related work happening on Canada's East Coast, but is conscious that it's going to take a lot of hard work and partnerships to bring technology like this to market.

"It's a great opportunity, but a fragile one," he says. "We have to make sure people pull in the same direction and make the best use of the resources we've been given."

Provided by Dalhousie University

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