The Internet of Underwater Things

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The Internet of Things spans an estimated 31 billion connected devices, but most of them exist on land. Currently, much of the world's international data is supplied through underwater internet cables that span the ocean floor. However, these cables are costly and vulnerable. Adapting a wireless IoT network for our oceans, lakes and rivers – the Internet of Underwater Things (IoUT) – offers special challenges and opportunities.

IoUT Goals & Challenges

Connected devices underwater aid in monitoring water quality, pollution and oil and gas pipelines. They detect early signs of tsunamis, hurricanes and other disasters. IoUT opens research opportunities in aquatic education and data collection, shipwreck surveys and archeological expeditions and animal health and ecological monitoring.

Unfortunately, IoUT is more difficult to implement compared to its land counterpart. Radio and Wi-Fi signals don't travel far underwater and ocean waves, passing ships and marine life can cause signal interference. IoUT needs to withstand shifting salinity, extreme ocean temperatures and higher chemical and IV radiation exposure than traditional IoT. Because of these challenges, much of the world's current marine IoT floats or skims across the water rather than operating under it.

Underwater Vehicles & Light and Sound Communication

Light Fidelity or Li-Fi is a form of optical communication powered by LEDs. It can travel faster and further than radio waves but is still limited and slow underwater compared to land-based internet speeds. To combat this, researchers are developing underwater lasers to improve communications. More powerful than Li-Fi but still limited in reach, researchers use underwater vehicles that lock onto each other to transmit laser-enabled data. The technology has potential use in the U.S. Navy.

The Sunrise research project experimented with autonomous underwater robots from 2013 to 2015. These robots communicated by mimicking marine life – emitting acoustic waves. The robots used sensors to measure environmental factors such as water temperature and salinity and used sound waves to identify their surroundings. The robots were tested (in some cases successfully) to search for missing cargo and shipwrecks.

If autonomous underwater vehicles (AUVs) are to be part of the IoUT network, then PowerBuoy – an AUV charging station – may be integral as well. The buoy floats atop

the ocean's surface and collects energy from wave motion that can charge AUVs on the ocean floor. The buoy is used in the oil and gas industry to aid AUVs monitoring pipelines. Though the buoy transfers power and data via cable, advances in IoUT may eventually make it wireless.

The Future of IoUT

Li-Fi, lasers and acoustics – researchers disagree on the best methods for underwater communication. A new method may even one day be discovered. Though the projects discussed above are limited, they show the exciting possible architecture and uses of an IoUT network. As technology continues to advance, a wirelessly connected ocean may one day be within reach.

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