Seastar underwater acoustic local-area network

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Objective

Asymmetric links: high-BW links from peripheral nodes to central node; low-BW links from central node to peripherals and peer-to-peer

Short range point-to-point communications (50 to 500 m) employ the 30-100 kHz band

Data are fused/beamformed at the central node

Central node reports compressed information through the Seaweb wide-area network

Seastar LAN increases the information carrying capacity of the undersea environment by an order of magnitude

Applications include sensor arrays, sensor clusters, unmanned undersea vehicle formations, and dive teams

Seastar LAN prototype at AUVfest/Unet 2007 sea trials

Set-up

• Teledyne Benthos ATM-885 modems, 9-14 kHz
• 5 peripheral nodes
• Poll at 140 bit/s, data at 800 bit/s
• 1850 byte test message
• Seaweb link layer: SRQ enabled

Results

• 26 hrs of operation
• 2031 successful transmissions
• 53 subpkt. corrupted, 3 pkt. abort, 12 range abort, 3 pkt. out of sequence
• 3 network self-recoveries
• Average Latency ~ 3 minutes/cycle

Candidate protocols

Polling

• No SRQ
• SRQ

Token ring

• No SRQ
• SRQ, through hub

Physical layer

Identifying operating frequencies and spectral bandwidth with link margin modeling

Link layer

Comparing protocol performance with network simulations

Design optimization metrics

Comparing protocol performance with network simulations

Information throughput

Bit-rate (bits/s)

Packet size (bytes)

SRQ retransmissions

Number of peripheral nodes

Number of peripheral nodes