Jonas Markussen

Distributed Systems and Networks Specialist

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💼 EXPERIENCE

Scientific R&D Manager	2023 —
Software Architect	2019 — 2023
Senior Software Engineer	2018 — 2019

Dolphin Interconnect Solutions

- Leading a newly established R&D team, continuing research and development of SmartIO as well as looking into CXL and next-gen. PCIe.
- Responsible for integrating the SmartIO device sharing solutions from my PhD into Dolphin's standard product line.
- Implemented an NVMe device driver and block device interface on top of SmartIO, allowing multiple hosts in a PCIe cluster to share and simultaneously access NVMe devices without requiring virtualization.
- Developed multiple shared-memory and RDMA-based tools for benchmarking the performance of data transfers in Dolphin PCIe clusters.
- Contributed to two research papers on PCIe P2P and offloading a DPDK network card driver onto an FPGA and a GPU, respectively.

External PhD Student	2018 — 2022
PhD Student	2015 — 2018

Simula Research Laboratory

- Was a full-time PhD student until my scholarship ran out, and then completed the PhD on my own time while I worked for Dolphin.
- Co-invented the SmartIO solution for enabling a composable & disaggregated infrastructure in Dolphin PCIe-based shared-memory clusters, allowing host machines in such clusters to disaggregate and share their internal host memory and PCIe devices (such as GPUs, NVMes, FPGAs, etc.). As hosts can use remote resources over native PCIe as if they were locally installed, SmartIO facilitates efficient and flexible resource sharing with extremely low overhead and without requiring changes to existing device drivers or application software.
- Extended SmartIO to support assigning physical devices to VMs running on remote hosts in a Dolphin cluster, by adding support for the Linux KVM hypervisor using the VFIO mediated device driver API.
- Developed a CUDA/C++ library with GPUDirect support for interfacing with the low-level functionality of SmartIO, and, as proof of concept, implemented a userspace NVMe driver using this API that enable GPUs to initiate reading and writing from storage independently of CPUs and moving data directly into GPU memory (driver offloaded onto GPU).
- Published 5 academic papers about SmartIO, including a paper in ACM TOCS, a flagship journal on distributed computer systems.

Software Developer (C++)	2014 — 2015

Bridgetech

- Contributed to a solution using libpcap for live capturing OTT/IPTV traffic and parsing out MPEG transport streams sent over RTP.
- Implemented a parser for MPEG video streams to extract and validate closed captioning data and provide real-time event notifications in case of missing or corrupted data.

Software Development Engineer (C++/Python)	2013 — 2014
Front-end Web Developer	2011 — 2013

Fotoware

Java Programmer (part-time)	2010 — 2011

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🎓 EDUCATION

PhD, Informatics	2015 — 2022

University of Oslo
& Simula Research Laboratory
Doctoral degree in computer science.

MSc, Informatics	2010 — 2014

University of Oslo
& Simula Research Laboratory
Master's degree in computer science.

BSc, Informatics	2006 — 2010

University of Oslo
Bachelor's degree in computer science.

🏷 SKILLS & EXPERTISE

</> Software Engineering
C, Python, C++, JavaScript, Bash, git, Docker, Gitlab CI/CD, PHP, Java.

🖳 Computer Architecture and Embedded Programming
Linux kernel hacking, device drivers, microcontroller programming, virtual machines, memory and resource virtualization, PCIe NTBs, Linux KVM/VFIO, memory architectures, NVMe, CUDA/GPUDirect.

🖧 Distributed and Parallel Computing
Distributed systems, distributed shared-memory applications, cluster computing, high-performance computing, RDMA, GPU programming, ultra low-latency networking.

🖧 TCP/IP and Network Programming
Transport layer protocols, routing protocols, AQMs & traffic engineering, traffic analysis, libpcap, QoS, WLAN & MANETs, PIM-SM multicasting, REST API design, web applications & development, HTTP.

📄 SELECTED PUBLICATIONS

- J. Markussen. "SmartIO: Device sharing and memory disaggregation in PCIe clusters using non-transparent bridging". *PhD thesis*. 2022. DOI: 10852/97351

- J. Markussen, L.B. Kristiansen, P. Halvorsen, H. Kielland-Gyrud, H.K. Stensland, C. Griwodz. "SmartIO: Zero-overhead Device Sharing through PCIe Networking". *ACM Transactions on Computer Systems (TOCS)*, vol. 38, no. 1–2. 2021. DOI: 10.1145/3462545

A list of publications can be found at
https://dblp.org/pid/169/0395.html