Jonas Markussen
Systems Software Engineer

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EXPERIENCE

Software Architect — 2019 —
Senior Software Engineer — 2018 — 2019
Dolphin Interconnect Solutions

Working with Dolphin's PCIe-based shared-memory solutions. Gained experience with PCIe non-transparent bridging, cluster interconnects, RDMA, distributed shared-memory architectures, NVMe, GPU programming, Linux driver development and Linux kernel hacking.

- Contributed to the integration of the SmartIO framework from my PhD into Dolphin's standard product line.
- Created a distributed block device driver for simultaneous sharing of a non-SR-IOV NVMe among multiple hosts in a cluster.

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 my PhD on my own time. Worked on a research project in collaboration with Dolphin, with the goal of creating a framework called SmartIO for efficiently sharing I/O resources in a PCIe shared memory cluster.

- Contributed significantly to the design and implementation of SmartIO.
- Evaluated SmartIO and identified performance bottlenecks, and implemented several optimizations that reduced the overall system performance overheads to near-zero (less than 100 nanoseconds).
- Implemented Linux KVM hypervisor support for SmartIO using VFIO mediated device drivers for assigning remote physical devices to VMs.
- Developed a storage framework based on SmartIO using NVMe and GPUDirect, providing zero-copy data transfers and allowing GPUs to initiate reads and writes directly without involving CPUs.
- Published 5 academic papers based on SmartIO, including a publication in a flagship journal on distributed computer systems (ACM TOCS).

Software Developer — 2014 — 2015
Bridgetech

Worked with real-time analysis of digital video over network. Got experience with working with C++ in an embedded environment, network traffic analysis, video encoding, MPEG streams, and PIM-SM multicasting.

- Contributed to an MPEG transport stream parser for the VB288 content extractor using libpcap for live capturing IPTV (MPEG-DASH).
- Implemented a parser for MPEG-2 and MPEG-4/AVC video streams in order to extract and validate CEA608/708 closed captioning data and provide real-time event notifications.

Software Development Engineer — 2013 — 2014
Fotoware

Worked as a back-end web developer on Fotoweb, an web-based image and video archiving system with full-text metadata search and workflows based on metadata tags. Designed REST services from the ground up, and worked with C++ (FastCGI) and Python (Flask).

- Implemented a hierarchical metadata taxonomy tree that supported CRUD operations and assignment to assets of tens of thousands of metadata tags within milliseconds.
- Created a configurable workflow engine allowing users to create custom pipelines and workloads for processing assets based on metadata tags.
- Made a background job scheduler with support for webhooks and asynchronous message-passing as well as bulk file operations.
- Implemented both back-end and front-end for exporting assets to an external CMS and an access management UI for these exports.

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.

PART-TIME JOBS & INTERNSHIPS

Front-end Web Developer 2011 — 2013
Fotoware

Java Programmer — 2010 — 2011
Redimi

Teaching Assistant — 2009 — 2011
University of Oslo

SELECTED PUBLICATIONS

- J. Markussen. "SmartIO: Device sharing and memory disaggregation in PCIe cluster 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

- J. Markussen, L.B. Kristiansen, R.J. Borgli, H.K. Stensland, F. Seifert, M. Riegler, C. Griwodz, P. Halvorsen. "Flexible device compositions and dynamic resource sharing in PCIe interconnected clusters using Device Lending". *Cluster Computing*, vol. 23, no. 2. 2020.DOI: 10.1007/s10586-019-02988-0

- J. Markussen, L.B. Kristiansen, H.K. Stensland, F. Seifert, C. Griwodz, P. Halvorsen. "Flexible Device Sharing in PCIe Clusters using Device Lending". *International Conference on Parallel Processing Companion* (ICPP Comp.). 2018.DOI: 10.1145/3229710.3229759

- B.R. Opstad, J. Markussen, I. Ahmed, A. Petlund, C. Griwodz, P. Halvorsen. "Latency and fairness trade-off for thin streams using Redundant Data Bundling in TCP". *IEEE Local Computer Networks* (LCN). 2015.DOI: 10.1109/LCN.2015.7366322