Jonas Markussen

R&D Software Engineer and PhD

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Software Engineering Experience

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

Contributed to the SmartIO framework for high-performance, distributed I/O and resource sharing, in PCIe shared-memory clusters. Gained experience with PCIe, non-transparent bridging, cluster interconnects, RDMA, distributed shared-memory architectures, NVMe, GPU programming, Nvidia GPUDirect, driver development and Linux kernel hacking.

- Contributed to the design, implementation and evaluation of SmartIO.
- Created a distributed device driver for simultaneous sharing of a non-SR-IOV NVMe among multiple hosts in a cluster.
- Implemented Linux KVM hypervisor support using VFIO mediated device drivers for assigning remote physical devices to VMs (pass-through).
- Developed a storage framework based on SmartIO and GPUDirect, providing zero-copy raw block access to NVMes from multiple GPUs in the cluster without involving CPU in the data path.
- Developed various DMA and RDMA cluster benchmarking tools.

Embedded & Systems Software Developer 2014 — 2015
Bridgetech

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

- Contributed to an MPEG transport stream parser for the VB288 content extractor using libpcap for live capturing IPTV.
- 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 (Back-end) 2013 — 2014
Fotoware

Worked mainly with FotoWeb, a web-based image and video archiving system with full-text metadata search and workflows based on metadata tags. Gained experience working with Apache2, MongoDB, web caches, designing REST services from the ground up, and creating HTTP endpoints 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.

Selected Publications

- J. Markussen, L.B. Kristiansen, P. Halvorsen, H. Kielland-Gyrud, H.K. Stensland, C. Griwodz: *SmartIO: Zero-overhead Device Sharing through PCIe Networking.* ACM TOCS (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 (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.* 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 LCN (2015). DOI: 10.1109/LCN.2015.7366322

Education

PhD, Informatics 2015 —
University of Oslo
& Simula Research Laboratory
Doctorate 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.

Other Job Experience

Front-end Developer 2011 — 2013
Fotoware

Java Programmer 2010 — 2011
Redimi

Teaching Assistant 2009 — 2011
University of Oslo

Skills

System architecture – Linux kernel hacking, device drivers, ATmega & STM32 microcontrollers, embedded, PCIe, KVM, virtual machines, memory and resource virtualization, memory architectures, non-transparent bridges, NVMe, GPUDirect, x86, ARM.

Cluster computing & HPC – distributed shared-memory applications, ultra low-latency networking, MPI, RDMA, interconnection networks, GPU programming (CUDA).

IP networking – routing protocols, transport protocols, TCP, multicasting, 802.11 WLAN family, MANETs, QoS, traffic engineering, libpcap, TCP congestion control, traffic analysis, AQMs.

Web technologies – HTTP, REST, Ajax, FastCGI, jQuery, SQL, HTML/CSS, MongoDB, Flask, Apache2, nginx, CDNs, web caching.

Projects

libnvm (formerly ssd-gpu-dma) – A software library for developing user-space NVMe drivers and storage applications. Supports GPUDirect, enabling direct data transfer into GPU memory.
https://github.com/enfiskutensykkel/ssd-gpu-dma

analyseTCP – Contributed to a TCP traffic analyser that looks at the per-byte latency from sent to received, useful for measuring the performance of time-dependent traffic.
https://github.com/enfiskutensykkel/analyseTCP