Jonas Markussen

Systems Software Engineer

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Software Engineering Experience

Software Architect 2019 —
Senior Software Engineer (R&D) 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, driver development and Linux kernel hacking.

- Contributed to the design, implementation and evaluation of SmartIO.
- 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.
- 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 various shared-memory cluster benchmarking tools.

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 real-time network traffic analysis.

- 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 (Web 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. Designed REST services from the ground up, and worked with C++ (FastCGI) and Python (Flask). Also gained some experience with MongoDB and front-end technologies (JavaScript, HTML/CSS, jQuery).

- 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.

Other Job Experience

Front-end Web Developer 2011 — 2013
Fotoware

Java Programmer 2010 — 2011
Redimi

Teaching Assistant 2009 — 2011
University of Oslo

Skills

Software engineering – C, Python, C++, CUDA, JavaScript, Bash, git, CI/CD, PHP, Java.

System architecture – Linux kernel hacking, PCIe device drivers, microcontrollers, embedded systems, virtual machines, memory and resource virtualization, Linux KVM/VFIO, memory architectures, NVMe, GPUDirect.

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

TCP/IP networking – transport protocols, TCP, routing protocols, multicasting, QoS & AQM, traffic engineering, libpcap, traffic analysis, HTTP, REST API design.

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 Transactions on Computer Systems*, 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