Andre Renard

Summary of Qualifications

- Over 11 years of work experience in software development and Linux administration
- Bachelor of Computer Science from the University of Waterloo
- Proven ability to design, develop and deploy high performance real-time software on large heterogeneous (CPU/GPU) computing clusters with >6.4 Tb/s networks
- Highly self-motivated, with the ability to rapidly learn, analyze and adapt to new technologies and challenges
- Co-leads teams developing software systems for several successful radio telescopes
- Able to design and manage large computer infrastructure projects

Technical Skills

- Very strong C/C++ programming, testing, debugging, and optimization skills
- Experience with Python, OpenCL, CUDA, bash, JavaScript, and more
- Experience in Linux and GPU development tools
    - Including: clang, gcc, nvcc, git, cmake, gdb, valgrind, VS Code, perf, PCM, uProf, Nsight systems/compute, etc.
- Extensive experience with Linux operating systems and common services:
    - Docker, Ansible, systemd, DNS, DHCP, LDAP, NFS, Grafana, KVM, ZFS, etc.
- Current knowledge of the HPC industry and the latest heterogeneous computing platforms and networking equipment
- Deep understanding of computer networks including both networking theory, and the latest advances in modern hardware and software

Work Experience

Radio Signal Computing Specialist   Nov 2019 – Present
Dunlap Institute, University of Toronto, Toronto, Ontario

- Co-leader of software development teams for the CHORD and HIRAX correlators
- Regularly presents at the CASPER workshop on the development of real-time radio processing software
    - Chaired the data transport (networking hardware and software) working group in 2023
- Designed the HIRAX and CHIME/Outriggers correlator clusters (server hardware selection, network design, and system evaluation) with international collaborators
- Developed high-speed C++ code for raw data packet capture from radio instruments at rates of >102 Gb/s/CPU
- Developed correlator software for the DRAO Synthesis telescope

CHIME Computing Specialist
Dunlap Institute, University of Toronto, Toronto, Ontario   Sep 2015 – Nov 2019

- Assisted with the design and deployment of the CHIME telescope supercomputer - the most powerful GPU based radio correlator at the time, with 256 computers and 1024 GPUs in the core array
- Co-led a team from multiple Canadian universities to build a high-performance software framework for real-time radio signal processing in CHIME
    o Due to its success this framework has now been implemented in several other radio telescopes
    o Technologies used included: C++, OpenCL, Python, git, etc.
- Configured and managed numerous Linux network services and dozens of switches on the CHIME supercomputer
- Helped design continuous integration (CI) automatic testing systems, end-to-end system validation software, coding standards and development best practices
- Trained and provided ongoing support to team members
- Regularly presented to non-technical members of the team
- Acted as liaison between software teams, researchers, and project management

Computing Consultant   July 2013 – Aug. 2015
Self-employed, Toronto, Ontario

Relevant contracts:

Pathfinder Correlator Development (CHIME Pathfinder Collaboration)
- Designed, programmed, tested and deployed a custom distributed software pipeline for processing radio telescope data
- Utilized efficient network libraries and wrote optimized C functions to achieve a record-breaking GPU correlator network throughput of over 52 Gb/s/node
- Collaborated with both internal and external teams to interface the software with GPU kernels, FPGAs, and data collection systems

Data Capture Systems (Algonquin Radio Observatory VLBI project)
- Wrote software to perform real-time data capture and storage at 6.4 Gb/s
- Reduced costs by recommending efficient low-cost hardware options

Network/System Software Developer, co-op   Jan. 2011 – Apr. 2011
Pravala Inc., Kitchener, Ontario   Sep. 2011 – Dec. 2011

- Created a distributed testing framework capable of dynamically reconfiguring over 30 real and virtual networked devices
- Developed statistical algorithms assessing network quality on WiFi, DSL, 3G/4G/LTE, and Satellite networks

Web Services Developer/Systems Administrator, co-op   Apr. 2010 – Aug. 2010
Virtual Properties.ca, Waterloo, Ontario   May 2012 – Aug. 2012

- Designed a new content management system for virtual real estate tours
- Worked closely with company photographers and clients to build a system that reduced the time for common procedures from 1 hour to 5 minutes
- Designed relational database layouts and improved company analytics
- Upgraded web services from Flash to HTML5

Assistant System Manager, co-op   May 2009– Dec. 2009
Canadian Institute for Theoretical Astrophysics,
University of Toronto, Toronto, Ontario

- Setup and configured a distributed file system with a 100TB capacity
- Assisted in the maintenance and upgrade of a 200-node Linux supercomputer
- Effectively managed multiple simultaneous projects
- Updated documentation on the network design
- Improved system uptime by rebuilding and upgrading core Linux/OS X network services: mail, web servers, print, DNS, SNMP network monitoring, and file systems onto multiple virtual servers

Education

University of Waterloo, Waterloo, Ontario   2008-2013

- Bachelor of Computer Science (Honours), Co-operative Program, With Distinction
- Elective courses in Physics, Astronomy, Cosmology, Statistics, Computer Graphics, and Data Visualization
- Completed professional development courses in project management, conflict resolution, report writing, and problem solving

Contests and Awards

- Honorable Mention for Best Use of Data (team award),   2013
        NASA International Space Apps Challenge
- Best Project Award (team award), Space Apps Challenge Toronto   2013
- National Gold Medal in "IT – Network Systems Administration",   2008
        Skills Canada National 2-day Competition, Calgary, Alberta

Significant Publications

- The CHIME Collaboration. "An Overview of CHIME, the Canadian Hydrogen Intensity Mapping Experiment" The Astrophysical Journal Supplement Series, Volume 261, No 2, 2022.
- Denman et al., "A GPU Spatial Processing System for CHIME", Journal of Astronomical Instrumentation, Volume 9, No 3, p.2050014, 2020.
- CHIME/FRB Collaboration. "A bright millisecond-duration radio burst from a Galactic magnetar", Nature, Volume 587, Issue 7832, p.54-58, 2020.
- CHIME/FRB Collaboration. "Periodic activity from a fast radio burst source", Nature, Volume 582, Issue 7812, p.351-355, 2020.
- Marcotte et al., "A repeating fast radio burst source localized to a nearby spiral galaxy", Nature, Volume 577, Issue 7789, p.190-194, 2020.
- CHIME/FRB Collaboration. "Observations of fast radio bursts at frequencies down to 400 megahertz", Nature, Volume 566, Issue 7743, p.235-238, 2019.
- CHIME/FRB Collaboration. "A Second Source of Repeating Fast Radio Bursts", Nature, Volume 566, Issue 7743, p.230-234, 2019.
- CHIME/FRB Collaboration. "The CHIME Fast Radio Burst Project: System Overview", ApJ. 863 48, 2018.
- Taylor et al., "Spectral Kurtosis Based RFI Mitigation for CHIME", JAI, Special Issue on RFI Mitigation, 2018.
- Denman et al., "A GPU-based Correlator X-engine Implemented on the CHIME Pathfinder", Proc IEEE ASAP, 35-40. 2015.
- Recnik et al., "An Efficient Real-time Data Pipeline for the CHIME Pathfinder Radio Telescope X-Engine", Proc IEEE ASAP, 57-61. 2015.
- Klages et al., "GPU Kernels for High-Speed 4-Bit Astrophysical Data Processing" Proc IEEE ASAP, 164-265. 2015.

Note: some publications are under my former surname "Recnik".

Other Interests

- IOT systems; programming ESP32 and Raspberry PI devices.
- Running a home lab network with pfSense, Proxmox, TrueNAS, WireGuard, NextCloud, HomeAssistant, and more
- Cryptography and digital security
- Photography