Joseph P. G. Mack, Ph.D.

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Summary of Qualifications

- **Programming and Visualisation:** C, C++, parallel programming: mpi/omp/pvm3, SIMD, threads, Fortran. Perl (and cgi), Python, xml, html, php, asp, shell, awk, sed, tcl/tk (and tklet), Javascript, Pascal, LaTeX, RPC sockets, Mathematica/Maple/MatLab, APL, Ada, GPUs. MSDOS assembler (TSR device driver, interrupt routines and real time dsp programming). OpenDX (IBM Data Explorer), Postscript, X-windows (Xt, Athena widgets), Motif, Java. Unit tests, regressions, path testing, valgrind, agile and waterfall environment, documentation.

- **SysAdmin - 20yrs**: Unix/Mac/Windows; HPC, Linux (RedHat, SuSE, Slackware, Debian, Ubuntu), Solaris (and SunOS), IRIX, AIX, HPUX, E&S, VMS, Windows (NT-XP, Win7), Mac, NFS, Samba, SAN, DNS/DHCP, BGP/RIP, IPv6, sendmail, Apache, wifi, tcpdump/wireshark, Tomcat. Performance monitoring/reporting, automatic backup and integrity testing, firewalls/security/DMZ, capacity planning. Cluster design. CMVC, Perforce, CVS, RCS, make, imake.

- **Virtualization:** Linux Virtual Server (LVS) a kernel level highly available (HA) layer 4 load balancer. I maintain the HOWTO and wrote the early configure and failover code. Was the main respondent on mailing list for 8 yrs. Xen, VMWare, Grid/Condor, VirtualBox, VNC.

- **Relational Databases**: MySQL (DBI/DBD), PostgresSQL, Access.

- **Scientific/Bioinformatics**: Discovered the conserved DD(35)E motif in Retroviral Integrase (HIV), by sequence alignment, allowing crystallisation of the catalytic domain and testing of lead drugs. GGC, BLAST, clustalw, phylip, logo. Numerical methods, DSP (IIR, FIR, signal averaging).

- **Consulting:** Installed wifi in a hospital to allow Doctors and staff to access patient records through hand-held PDAs. System had to HIPAA compliant, remain up for 2 hours after a power failure, be resistant to lightning in the summer, and have an uptime in the order of years. Modified WAPs to report number of associations, bandwidth, cpu usage, load average and memory use. On-call sysadmin to local small businesses (15yrs).

- **Teaching:** College through to Grade school level. A 30 min video of my class on the Platonic Solids **http://www.austintek.com/icosahedron_class/** with 3rd graders assembling the NOAA Icosahedral Globe of the earth. Computing and Physics to advanced middle/high school students after school in the student's homes **http://www.austintek.com/#computer_class**. A class field trip to the Duke University DIVE **http://www.austintek.com/DIVE/**. College: Enzyme kinetics UMBC MD, xray crystallography Hood College MD. Instructor UNSW (Sydney). Tutor in biochemistry, St Andrews College, Sydney University. Private tutoring in chemistry to undergraduates. Sport: Professional Soccer Referee, USSF grade 8, 2007-9, youth soccer (CASL). Amateur soccer referee and coach, 2000-7 (Rainbow Soccer). Novice Crew (rowing) coach Sydney University (was in the Sydney University Lightweight Crew at Australian University Championships for two years).

- **Supervision:** of medical student while at NIH, mentor of students at UMBC.

- **Hardware**: Design and service high performance computer clusters (Beowulfs). Amateur radio license since high school. Two-way communication Earth-Moon-Earth, using Moon as a passive reflector, on 144MHz and 432MHz. Designed and built electronics since grade school; transmitters, receivers, yagi antennas, TTL logic, VHF and UHF construction (stripline), Gunn diode oscillators, DSP for weak S/N. Use standard machine shop tools; end-mill, lathe, drill press, sheet metal bender, tap and dies, rebuilt two car engines.

- **Public Service:** Treasurer: North Carolina Systems Administrators (2000-2003); Converted 10yrs of financial records to double entry format, organised paper records using standard accounting methods, to facilitate record keeping, auditing and conversion to a 501(c)(3) Corporation. AZ_PROJ azimuthal equidistant map server (since 1994) **http://www.wm7d.net/azproj.shtml** 10,000 maps/yr, co-author and maintainer. **Military**: Pilot Officer, Royal Australia Air Force (RAAF), Efficiency Award. **Queen Scout** (Australian Eagle Scout).

- **Presentations:** Linux Virtual Server: UNC 2007, Outsourcing in the Information Technology Industry: NCSA 2004, Gnucash and double entry accounting: NCSA 2001, Aurora of 15-16 Jul 2000: NEWS 2000, The Spring Sprints: NEWS 1999, Linux Virtual Server: NCSA 1999 and Linux Expo 1999, AZ_PROJ: CSVHF Conf. 1994.

- **Ph.D. in Biochemistry** and B.Sc.(Hons) Organic Chemistry, Sydney University, Sydney, Australia. Research at Yale University; National Institutes of Health, Bethesda, MD; National Cancer Institute, Frederick, MD; U.S. Department of Agriculture, Beltsville, MD; U.C. Davis, CA. Enzymology, enzyme inhibitor (drug) design and synthesis, molecular biology, bioinformatics, xray crystallography.

- **US Citizen**,

Lockheed-Martin, contractor to EPA 1999-present

Senior Systems Engineer, High Performance Computing (HPC): maintain the HPC systems, write technical papers, make unsolicited proposals.

- In collaboration with a colleague, designed a low cost, low latency, Clos infiniband network for a 2016 core Nehalem HPC cluster in Marietta, GA. The Clos design reduced the number of crossbars in the switching fabric by a factor of 5.4 and reduced the latency from 8 to 6 hops.

- Improved system performance in a 256 CPU HPC system, by a factor of upto 20, by analysing disk access patterns. This work was cited by the EPA in accomplishments for the year for our section.

- Proposed and implemented python support on the HPC systems. The HPC systems are C and Fortran (and not Python), while the users (scientists) program in Python. Users had to ship their 30GByte files to their desktops (and back) for processing and visualization. By understanding user's requirements and the EPA's constraints, was able to liase between the two groups, to build a credible case to change EPA policy to allow python support on the HPC clusters. Proposed single sign-on.

- User tools: Proposed, developed and installed a web based tool to graphically monitor 40 parameters of a 256 CPU HPC cluster; web based database query tool to search for information on chemical entities of interest to the EPA (now in use to enable public access to the EPA's databases of hazardous and toxic chemicals); realtime 3-D stereo visualisation of data collected by a towed scientific platform monitoring the Great Lakes (a sample graphic was used in a Lockheed-Martin publicity poster); tool to automatically quantitate damage in lung tissue caused by environmental hazards (*e.g.* smoking).

Alphatronix (a division of Auspex) 1998

Build Engineer, SysAdmin for 66 developers and 160 computers. Solaris, HPUX, AIX

- Completed conversion to full automation of the nightly backup and build, from repository to installable packages.

Duke University, Xray Crystallography Laboratory 1995-7

Lab Manager: maintained Xray crystallography equipment, 40 computers. IRIX, AIX, VMS.

- Proposed, designed, procured and installed the first Beowulf (64bit DEC Alpha) at Duke University. Much of the project's effort was in educating the end user who was then able to start a research program of *in silico* protein folding.

  A detailed resume and publication list is available at http://www.austintek.com/#about_joe