Zachary Tod Welch
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BUZZWORDS

Over 30 years of software engineering experience at all stages of numerous products' life cycles: specification, architecture, design, implementation, maintenance, and support; over 10 years of project and product management

30 years UNIX software development: various platforms (Linux, Unixware, SCO, HP-UX, Solaris), C/C++ development tools (gcc/g++, ccache, distcc), debugging tools (gdb, valgrind, oprofile), cross-platform development (ARM, MingW32), databases (MySQL, sqlite), threading, networking (IPC, sockets), GNU autotools, scripting (Makefile, Bash), Perl, Python, visualization (Qt, OpenGL, GraphViz, gnuplot)

26 years developing embedded systems: ARM/Thumb, low power devices, Microchip PICs, MCS-51 (8051) family, digital I/O (A/D, D/A, PWM, infrared, serial, wireless, ethernet, MIDI, I2C, CSI2/MIPI), embedded Linux, device drivers, real-time software, networking stacks, Yocto, OpenEmbedded, LinuxLink Factory, buildroot, Nvidia Jetson (TX2/Xavier/Orin), STM32

24 years of Linux system and network administration: heterogeneous distributions (Ubuntu, Yocto, Gentoo, RedHat, custom), Linux kernel, DNS (bind), e-mail (Sendmail, courier-imap, Postfix, Dovecot), web (Apache, custom), SSH (OpenSSH, sshfs), version control systems (CVS, BitKeeper, Subversion, git), filesharing (Samba, NFS), network boot services (DHCP, TFTP), bug tracking (Bugzilla, Mantis), mailing lists (Mailman), Firewall/NAT (iptables), system clock synchronization (NTP)

10 years experience targeting MacOS and Windows via cross-compilers and portable programming

SKILLS

Strong with C/C++, assembly, bash, Python, LaTeX, board bring-up and debugging
Capable with Go, Perl, TCL/Tk, XML/HTML, Schemes/Lisps, Lua
Decent with hardware design and repair, mechanical design
Licensed as Amateur Extra HAM radio operator (W7MCF)
Dislike and avoid C#/.NET, Java, JavaScript, PHP, Ruby, The Cloud

RESOURCES

- R&D Facilities: electronics laboratory, makerspace, shop, and garage
- 100 acres of farm and forest, with ample resident livestock and wildlife
- A guest lodge for hosting meetings, sprints, working vacations, and other events

EXPERIENCE

02/2022–07/2025

Aquabyte Inc; San Francisco, California
Position: Lead Embedded Engineer (remote)
E-mail: zach@aquabyte.ai (inactive)

Responsibilities:

- Developed firmware-to-OS software for fish tracking cameras and related systems
  - Implemented custom OS images using Yocto/OE for assorted Nvidia Jetson TX2/NX, iMX6, and RPi systems
  - Developed bootloader, kernel, and user space BSP packages
  - Implemented CI systems to build, test, and release images
  - Supported custom application development and testing
- Performed bring-up of custom Xavier/Orin NX carrier board through five revisions
  - Wrote custom kernel device drivers and microcontroller firmware
  - Managed several minor carrier board revision and release processes
- Integrated and deployed Mender OTA update support
  - Contributed implementations upstream to `meta-mender-community`.
  - Developed custom CLI/GUI interface for automating fleet upgrades
  - Automated delta update generation and release processes

04/2010–*present*

Mandolin Creek Farm, Blodgett, Oregon
Position: Owner and Operator
E-mail: zach@mandolincreekfarm.com, zach@mandolincreek.net
Websites: `https://mandolincreekfarm.com`,
`https://mandolincreek.net`, `https://mandolincreek.org`

Responsibilities:

- Actively producing beef, lamb, pork, poultry, and more
- Wired and configured the farm network, spanning several buildings
- Hosting all DNS, SMTP/IMAP, HTTP, NTP, and more at servers here at the farm
- Administering personal internet-facing systems on local networks since 1999

10/2019–02/2022

Timesys Corporation; Pittsburgh, Pennsylvania
Position: Sr. Software Engineer (remote)
E-mail: zach.welch@timesys.com (inactive)

Responsibilities:

- Develop Board Support Packages (BSPs) for customers' embedded hardware platforms using Yocto, LinuxLink Factory, and other build systems
- Provide BSP maintenance and support for customers' rolling or periodic releases
- Designed and implemented new Continuous Integration system for verifying Yocto BSPs using Docker and GitLab
- Designed and implemented generic non-volatile storage layer for Yocto systems with read-only root file systems
- Leading in-house efforts to improve reproducibility of BSP builds in Factory and Yocto BSPs, including development of tools to define and automate standard BSP setup, build, test, release, CI/CD, documentation, and other processes.

12/2010–07/2016
Mentor Graphics Corporation; Wilsonville, Oregon
Position: Software Engineer (remote)
E-mail: zwelch@codesourcery.com (inactive)

Responsibilities:

- Produced first production 64-bit Windows cross-compiler toolchain for CodeBench IDE products
- Produced 64-bit versions of all commercial CodeBench toolchains for Linux and Windows hosts targeting ARM, PowerPC, x86/x86_64, mingw32/64, and other embedded architectures
- Improved testing visibility for CodeBench release process
- Implemented GDB remote debugging stub for Nios II and Altera ARM/FPGA targets
- Maintained and improved debug stubs for all targets
- Fixed bugs in GDB, binutils, and other toolchain components

10/2010–12/2010
CodeSourcery, LLC
Position: Sourcerer (Software Engineer, remote)
E-mail: zwelch@codesourcery.com (inactive)

- Assigned to Linaro to extended libunwind (stack unwinding library) for ARM architecture
- Improved and extended ltrace support for ARM architecture
- Merged with the company into Mentor Graphics Corporation

04/2009–12/2009
The OpenOCD Project
Position: Volunteer Project Leader (remote)
E-mail: zw@superlucidity.net

Responsibilities:

- Helped to lead community to its 0.2.0 and 0.3.0 releases, in both architectural and project management capacities.
- Performed tree-wide clean-up: removed warnings, improve parsing, etc.
- Created new developer manual, style guides, and release process documentation.
- Progressed from "Active Contributor" to "Project Leader" in just over two months.
- Committed over 500 patches, leading maintainers and contributors.

01/2009–03/2009
NaturalPoint, Corvallis, Oregon
Position: Firmware Developer

Responsibilities:

- Developed application and IAP loader images for STR912FA target.
- Implemented high-efficiency UDP/IP μstack and driver for ENET.

03/2008–09/2008
Energetic X, LLC; Spokane, Washington 99202
Position: R&D Engineer (remote)

Responsibilities:

- Designed and developed proprietary algorithms for improving traffic simulations.
- Developed C++ traffic microsimulation prototype on Ubuntu Linux.
- Developed middleware for interfacing with UI using MySQL and message queues.

08/2001–12/2006
Superlucidity Services, LLC; Corvallis, Oregon 97330
Position: Founder and Managing Member
E-mail: zw@superlucidity.net

Responsibilities:

- Founded to provide open source software consulting services.
- Specialized in embedded system development.
  - Helped launch the Gentoo Embedded project, develop its first ARM port.
  - Worked with original Gumstix hardware to debug their BSP.
- Attempted to fork the Gentoo distribution into The Zynot Foundation.
- Developed domain-specific software solutions for IR motion tracking, project management, web services, and VoIP.

06/1999–07/2001
Tripod Data Systems; Corvallis, Oregon 97333
Position: System Software Architect

Responsibilities:

- Adapted Linux to Ranger handheld (see ARM Linux Machine Registry, #28).
- Developed WinCE BSP for Ranger handheld from board bring-up to production.
- Produced operating system firmware upgrades from 2.12 through 4.0-beta.
- Provided e-mail, phone, and Bugzilla support for in-house and OEM developers.
- Managed technical support and testing staff for Ranger product.

09/1993–12/1998
Educational Technology Resources, Inc.; Aztec, New Mexico 87410
Position: Software Engineer (remote)

Responsibilities:

- Participated in the overall design, implementation, and maintenance of a distributed media control solution.
- Specified, designed, implemented, and maintained Macintosh clients (C/C++, Metrowerks CodeWarrior, PowerPlant, TCP/IP)
- Designed, implemented, and maintained UNIX servers (IPC, TCP/IP, ...)
- Assisted in design, implementation, and maintenance of real-time embedded systems' firmware (8051, infrared control, TCP/IP, ...)
- Drafted and maintained internal documentation for the above projects
- Managed summer internship program (summer of 1998)
- Telecommuted full-time while attending school (Oct. 1995 – Dec. 1998)

EDUCATION

09/2007–10/2008

Oregon State University, Corvallis, Oregon, 97331
Status: Withdrew in Good Standing (10/2008)
Institution GPA: **3.51**

School: Mechanical, Industrial, and Manufacturing Engineering (MIME),
Department: Mechanical Engineering – Controls and Dynamics
Group: Adaptive Agents and Distributed Intelligence *Adviser*: Dr. Kagan Tumer
Focus: Reducing Traffic Congestion using Multi-Agent Systems

Special Courses:
Multi-Agent Systems, Artificial Intelligence I and II, Optimization in Design

Courses Taught:
Introduction to Engineering Computation Lab, Engineering Orientation Lab

09/1995–03/1999

Oregon State University; Corvallis, Oregon, 97331
Degree: B.S. in Computer Science, graduated March 1999
Major/Institution GPA: **3.93 / 3.85** (Summa Cum Laude)

Special Courses:
Data Structures, Analysis of Algorithms, Theory of Computation, Programming Languages, Translators, Fundamentals of Software Engineering, Digital Logic Design, Computer Structure and Assembly Language Programming, Computer Architectures, Microprocessor System Design, Operating Systems I + II, Database Management Systems, Computer Graphics, Introduction to Parallel Programming, Visual Programming Languages

09/1992–09/1993

New Mexico Institute of Mining and Technology; Socorro, New Mexico 87801
Major: Computer Science
Special Courses:
Computer Programming I, Data Structures, Practicum in C, Practicum in UNIX

PUBLICATIONS

Traffic Congestion Management as a Learning Agent Coordination Problem. K. Tumer, A. K. Agogino, and Z. Welch. In A. Bazzan and F. Kluegl, editors, Multiagent Architectures for Traffic and Transportation Engineering, Lecture notes in AI, Springer, 2008.

Aligning social welfare and agent preferences to alleviate traffic congestion. K. Tumer, Z. Welch, and A. Agogino. In Proceedings of the Seventh International Joint Conference on Autonomous Agents and Multiagent Systems, Estoril, Portugal, May 2008.

Burnett, Margaret M, John W. Atwood, Jr. and Zachary T. Welch, Implementing Level 4 Liveness in Declarative Visual Programming Languages. In 1998 IEEE Symposium on Visual Languages, Halifax, Nova Scotia, Canada, Sept. 1998.

HOBBIES

Homesteading:

My rural homestead enables me to pursue a multitude of interests:

- farm-to-fork (on 20 acres of pasture and paddocks):
  - livestock (cows, sheep, pigs, poultry)
  - vegetable gardens
  - personal milk production
- timber-to-truss (on 80 acres of diverse timber growth):
  - forest management and logging
  - portable lumber milling
  - timber-frame construction

Makerspace:

My personal makerspace provides facilities, equipment, and services for the village:

- 30x70 shop and 25x25 garage
- prototyping (digital electronics, CNC machining, 3-D printing, woodworking)
- metal casting and welding
- auto and machine repair
- new facility construction (carpentry, plumbing, electrical)

Music:

Music is an essential part of my farm experience, as I have been playing various acoustic instruments since the age of six:

- fairly fluent on stringed family instruments
- classically trained on violincello; studied jazz in college
- focused on Bluegrass and related acoustic genres, styles, and instruments
- created compositions and arrangements for various ensembles
- taught individuals and arranged ensembles
- produced weekly/monthly performances

Empire Building:

Eventually, I intended these interests to collectively manifest:

- an economically profitable village that offers...
- a comprehensive and structured rural business incubator program that manifested as...
- a formal apprenticeship learning environment for mastering a range of rural trades and skills.

Those dreams now have passed into legend, but they still accurately represent the scope and magnitude of my ambitions.