# Max Filippov

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Objective: software engineering position;

## Experience:

HW platforms:
- IBM/PC-compatible (since 1995); direct ISA, PCI, ATA, COM, LPT device programming;
- Atmel AVR (2001 - 2004), AT90S2313, AT90S8515, ATMega103, ATMega128 controllers; embedded software development, direct SPI, GPIO peripheral programming;
- Freescale PPC (2009 - 2010), MPC8548, MPC8572, P4080 controllers; Linux/VxWorks application development, Linux cryptoaccelerator driver, VxWorks END-driver;
- Tensilica Xtensa (since 2011) FSF, DC212, DC233, custom cores on ISS, LX200/KC705, Cortina Golden Gate, Renesas R-CAR boards, Espressif esp8266, esp32.

Operating systems:
- MS-DOS (1995 - 2003), application and system programmer;
- Windows NT/2000/XP (1998 - 2006), administrator, application and system programmer;
- Linux (since 2004), administrator, application and system programmer; official maintainer of the xtensa architecture since 2012;
- VxWorks (2009 - 2010), application and system programmer;
- ThreadX (2010);
- Tensilica XTOS, XOS (2013 - 2022);
- FreeRTOS (since 2017);

Programming languages:
- Assembler
  - i8080, Z80 (1992 - 1997) used to be native;
  - i80x86 (since 1995) native;
  - AVR (2001 - 2004) can read with dictionary, used to develop small inline fragments;
  - PPC (2009 - 2010) can read with dictionary;
  - ARM (since 2009) functional, used to develop small inline fragments;
  - Xtensa (since 2011) native;
  - MIPS (2014) can read with dictionary;
- C/C++ (since 1995); C89/99/11; C++98/03/11; STL, ATL, MFC, Qt;
- JavaScript (2000 - 2004), server- and client-side scripting;
- SQL (2004 - 2009);
- bash (since 2004).

Development tools/IDEs:
- MS Visual Studio (1998 - 2006);
- Windows NT/2000 DDK (2002 - 2006);
- AVR Image Craft C (2001 - 2004);
- Atmel AVR Studio (2001 - 2004);
- GCC/binutils (since 2003); official maintainer of the xtensa ports since 2020;
- autotools (since 2008);
- vim (since 2006);
- QEMU (since 2009); developer and official maintainer of the xtensa target since 2011;

Protocols and technologies:
- Ethernet (since 2001), TCP/IP (since 1999) application software development, NT kernel driver development, full-blown TCP/IP for embedded system;
- IEEE 802.11 (2008 - 2009) Linux p54 driver contribution;
- LTE (2010 - 2011);
- PCIe (2011 - 2012);
- COM/DCOM/COM+ (2002 - 2004).

## Education:

- 2000, engineer, specialization: «Software for computing machinery and automated systems»; KnASTU, Komsomolsk-na-Amure;

Languages: English, Russian.

## Work experience:

September 2016 – March 2022;
Positions: Sr. Principal Design Engineer, Software Architect;
Employer: Cadence Design Systems Inc., San Jose, CA, USA;

Projects:

January 2020 – December 2020;
Project: refactoring Xtensa Audio Framework for preemptibility;
Personal responsibilities/contribution: define internal interfaces that would allow adding preemptibility and concurrent execution to a synchronous framework. Allow choice of underlying OS between XOS and FreeRTOS.
Results: XAF team adopted the interfaces and initial implementation and was able to deliver preemptible version of the framework to its customers.

November 2017 – March 2022;
Project: Tensilica binutils;
Personal responsibilities/contribution: maintain internal version of Xtensa binutils, fix reported issues, improve existing functionality, implement new features and workarounds for hardware defects.
Results: Improved jump trampoline placement code in assembler; resolved sign ambiguity in XTENSA_DIFF relocations; documented Xtensa-specific relocations; synchronized internal version with binutils mainline (10 years of separate development); developed support for the new RNX pipeline in the BFD library, assembler and linker.

July 2017;
Project: Cosimulation of Xtensa DSPs with Android host;
Personal responsibilities/contribution: integrate android emulator with XTSC.
Results: Cosimulation environment provided for Android NN development team; Android kernel with XRP kernel driver is used to communicate with Xtensa DSPs running XTOS/XOS-based application with XRP library.

February 2017;
Project: Xtensa support in Zephyr OS;
Personal responsibilities/contribution: integrate open source Xtensa toolchain building into Zephyr SDK; fix Xtensa Zephyr OS port to be buildable with the open source Xtensa toolchain; integrate QEMU changes required to run Xtensa Zephyr OS port into Zephyr SDK.
Results: Xtensa Zephyr.OS port may be built and tested with 100% open source toolchain and emulator.

September 2016 – March 2022;
Project: Xtensa Remote Processing library;
Personal responsibilities/contribution: design library interface and implement it for bare-metal, Linux/Android and native hosts; support library users; plan for, design and implement new feature requests.
Results: OpenCL and OpenVX implementations for Xtensa and Android NN implementation with ARM hosts/Xtensa DSPs are using XRP library for host/DSP comminication. Source code of the library is available at https://github.com/foss-xtensa/xrp under MIT license (linux kernel driver is dual-licensed under MIT/GPL).

September 2016 – March 2022;
Project: Xtensa linux;
Personal responsibilities/contribution: maintain Linux for Xtensa, investigate and fix bugs, implement improvements and requested features;
Results: over 60 of bugfix/improvement patches are merged into Linux; list of implemented features: http://wiki.linux-xtensa.org/index.php/Linux_Kernel#Features_by_release. Most notable improvements:
XIP kernel support;
call0 ABI support in userspace and inside the kernel;
KASAN support;
support for DMA to high memory/ioremap of high memory;
CMA/memory reservation support.

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January 2014 – August 2016;
Position: Design Engineer;
Employer: Cadence Design Systems Inc., Moscow;

Projects:

January 2014 – August 2016;

Project: Xtensa linux;
Personal responsibilities/contribution: maintain Linux for Xtensa, investigate and fix bugs, implement improvements and requested features;
Results: over 200 of bugfix/improvement patches are merged into Linux; list of implemented features: http://wiki.linux-xtensa.org/index.php/Linux_Kernel#Features_by_release. Most notable improvements:
highmem support, on cores with aliasing cache as well;
ALSA playback driver for XTFPGA;
hardware perf counters and perf support;
noMMU (uClinux) support;
hardware breakpoints/watchpoints support.

February 2014 – August 2016;
Project: Xtensa opensource toolchain;
Personal responsibilities/contribution: maintain binutils/gcc/gdb/libc/crosstool-NG for Xtensa, investigate and fix bugs, implement improvements and requested features;
Results: over 50 of bugfix/improvement patches are merged into binutils-gdb, gcc and uclibc trees. Xtensa architecture support is merged into the crosstool-NG tree. Most notable improvements:
call0 ABI support;
uClinux support;
significant link-time relaxation speed improvement;
port of jump trampolines and auto literal pools.

February 2014 – August 2016;
Project: Xtensa Buildroot;
Personal responsibilities/contribution: maintain Buildroot for Xtensa, investigate and fix bugs;
Results: over 70 of bugfix/upstream backport patches are merged into the Buildroot tree.

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October 2012 – December 2013;
Position: Software Engineer;
Employer: Cogent Embedded, St. Petersburg;

Projects:

October 2013;
Project: small memory footprint gdbstub for Cortina Golden Gate Xtensa cores;
Personal responsibilities/contribution: gdbstub development.
Results: small memory footprint (5 KB code, 3KB data) gdbstub delivery, supporting registers/memory inspection/modification, single stepping, hardware-assisted breakpoints.

June 2013 – August 2013;
Project: driver for Renesas R-CAR HPB DMA engine;
Personal responsibilities/contribution: driver development for upstreaming.
Results: 7 patches are merged into Linux v3.13, HPB DMA is functional and used for SDHI on Marzen and Bock-W boards.

October 2012 – December 2013;
Project: platform software upgrade for Cortina Golden Gate router;
Personal responsibilities/contribution: forward-porting of private linux kernel modifications and platform-specific drivers from Linux v2.6.36 to v3.4.
Results: over 120 patches delivered, including ported ARM machine, drivers for serial, PCIe, DMA, ethernet, ATA, I2C, SPI, HWRNG, WDT, USB host controllers, crypto- and network accelerators, bugfixes and cleanups.

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August 2012 – August 2013;
Position: Contractor (remote);
Employer: Tensilica Inc., San Jose, CA, USA;

Projects:

August 2012 – August 2013;
Project: mainlining latest Xtensa Linux code;
Personal responsibilities/contribution: cleaning up, fixing and porting CPU (boot code, IRQs, atomic operations, string operations, SMP, device trees, ...) and boards (ISS, XT2000 and XTFPGA) support and sending them for inclusion to Linux mainline (over 70 patches are already accepted).

Technical details: source kernel: 2.6.29, target: 3.7+; HW platforms: QEMU and KC-705 FPGA.

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April 2012 – October 2012;
Position: Software Engineer;
Employer: Luxoft, St. Petersburg;

Projects:

April 2012 – October 2012;
Project: AMD Heterogeneous Software Architecture implementation for Linux;
Personal responsibilities/contribution: building/supporting SimNow-based debugging environment; initial analysis of HSA on SimNow issues.
Technical details: AMD IOMMUv2, PCIe, ATS, Radeon NI and SI series.

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June 2011 – April 2012;
Position: Software Engineer;
Employer: Oktet Labs, St. Petersburg

Projects:

June 2011 – April 2012;
Project: Test harness for 10G/40G Ethernet adaptor;
Personal responsibilities/contribution: test development, regression analysis and debugging for TX/RX DMA, PCIe TLP attributes; development of QEMU side support for tests.
Technical details: test harness: C, firmware: C + MIPS assembler, hardware: System Verilog; co-simulation platform: modified QEMU + Chronologic VCS.

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January 2009 – May 2011;
Position: Senior Software Engineer;
Employer: CJSC «Motorola ZAO», St. Petersburg

Projects:

August 2010 – May 2011;
Project: Alternative Wireless Topology, picocell eNodeB;
Personal responsibilities/contribution: macro eNodeB port for the Xtensa platform; BSD sockets API implementation for Xtensa ISS; porting and architectural support for the platform components; platform performance optimization by application architect requests.
Technical details: platforms - DAN2400 (multicore ARM), Xtensa; ThreadX OS; C, C++; hard real time; distributed development team (coordination with AWT team from Arlington Heights).

January 2010 - August 2010;
Project: CADDI (Common Administration Deployment and Diagnostic Interface) for the WiMAX BTS;
Personal responsibilities/contribution: Platform and Flow Manager diagnostic subcomponents porting to the new framework.
Technical details: platform: PPC, Linux OS; languages - C, UML2 (Telelogic TAU), XSLT; distributed development team (coordination with CADDI team in Arlington Heights).

August 2009 - January 2010;
Project: Enhanced MultiCarrier for the WiMAX BTS;
Personal responsibilities/contribution: design and implementation of the new Node State Management Task interfaces for the new configuration protocol (C, 7000 LOC changed); High Availability Platform information model augmentation for the additional information elements (Rational Rose), Network Management subsystem maintenance during system test phase, presentation of the changed Network Management subsystem for the Advanced Wireless Technologies teams from Bangalore and Arlington Heights.
Technical details: design by the Functional Requirements and Specifications document; platform: PPC, OS - VxWorks, Linux; compilers: diab, gcc; distributed development team (coordination with Bangalore and Arlington Heights Network Management teams).

January 2009 - August 2009;
Project: Network Management subsystem defect backlog reduction (WiMAX BTS);
Personal responsibilities/contribution: submission record analysis, root-causing, fixing, testing.

Technical details: verbal descriptions/stack traces of PPC Linux/VxWorks applications.

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April 2008 – Present;
Position: software engineer;
Employer: Open Source and Linux Lab, non-profit organization; St. Petersburg.

Projects:

Since March 2011:
Project: QEMU system emulation of xtensa architecture
Personal responsibilities/contribution: implementation of xtensa frontend for QEMU from scratch, implementation of opencores 10/100 Mbit/s ethernet model, implementation of sim and LX60 development board models, documentation. Over 60 patches are accepted into QEMU mainline.
Results: qemu-1.0 is released with xtensa architecture support. See http://wiki.qemu.org/Features/Xtensa and http://wiki.qemu.org/ChangeLog/1.0

Autumn 2008 - spring 2009;
Project: IEEE802.11s mesh network for Nokia 8x0;
Personal responsibilities/contribution: making linux p54spi driver work, code reviews/testing p54spi-related changes by requests in linux-wireless@vger.kernel.org.
Results: 12 patches are accepted by the linux-wireless, p54spi is fully functional since linux-2.6.31.

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July 2004 - January 2009;
Position: software engineer;
Employer: Research and Engineering center ETU, St. Petersburg.

Projects:

2004 - 2009;
Project: automatic build/testing system for multiplatform development;
Personal responsibilities/contribution: Makefile structure design, interproject dependency tracking design, project preparation/build/packaging/testing scripts development; target system repositories organization and maintenance; maintenance of the whole system on 3 platforms;
Technical details: OS – AltLinux 2.4, MCBC 3.0, Fedora Core 6, Fedora 7, 8; project types – C/C++, PostgreSQL database, Java, library; tools: make, bash, cvs, ssh, cron, rpm, yum, mock;

July 2004 - January 2009;
Project: ground-based measurement processing library;
Personal responsibilities/contribution: design, development, maintenance, performance optimization and refactoring for the following libraries: system utilities (11000 LOC), data source access (5000 LOC), math (30000 LOC);
Technical details: C++, OS – Linux, MCBC;

July 2004 - January 2009;
Project: application suite for the real-time ground-based measurement processing;
Personal responsibilities/contribution: design and development of the following subsystems: measurement acquisition subsystem, user interface (22000 LOC);
Technical details: C++, OS – Linux, MCBC; gcc4.1/gcc3.4/2.95; Qt3; separate threads for UI and math;

October 2005 - September 2008;
Project: launch site measurement collection application suite;
Personal responsibilities/contribution: transport software for data transmission over telephone/telegraph/LAN (UDP/TCP/IP) (9000 LOC); user interface design and development; database schema development and optimization; application interface to the database design and development;
Technical details: C++, OS – Linux, MCBC; gcc4.1/3.4/2.95; Qt3; PostgreSQL, unixODBC; UDP/TCP/IP;

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March 2002 – June 2004;
Position: software engineer;
Employer: JSC Amur Shipyard, Komsomolsk-na-Amure.

Projects:

March 2008 - May 2008 (additional contract);

Project: oxygen-gas cutting functionality implementation for the «Crystal» termal cutting station CNC;

Personal responsibilities/contribution: user interface unification for the «Crystal» and «Garnet» termal cutting stations CNC, oxygen-gas cutting user interface design and implementation;

September 2006 - December 2006 (additional contract);

Project: «Garnet» termal cutting station CNC upgrade (full replacement of CNC and electric drive subsystems);

Personal responsibilities/contribution: design and implementation of the CNC embedded software (MS Visual C++, 25000 LOC) – multithreaded Win32 application; 3d-positioning card/GPIO card driver development (hard realtime); robust trajectory interpolator development; 3d-positioning card/GPIO card/external device emulators development;

Technical details: IBM/PC-based embedded system; FLASH DiskOnModule, 128МБ; OS – Windows 2000; Advantech PCL-832 3d-positioning card; 10ms external device polling loop; ISO program interpreter; dynamic GPIO assignment; debug display/manual control mode for GPIO;

February 2004;

Project: factory power distribution display panel;

Personal responsibilities/contribution: display panel server development (MS Visual C++, 1000 LOC), individual display controller software development (ICC AVR, 400 LOC);

Technical details: OS – Windows NT/W2K+; RS-485, MODBUS; 25 parallel 4-digits displays, each controlled by Atmel AT90S2313; display panel server is NT/W2K service;

May 2002 – July 2003;

Project: «Crystal» termal cutting station CNC upgrade (full replacement of CNC and electric drive subsystems);

Personal responsibilities/contribution: design and implementation of the CNC embedded software (MS Visual C++, 15100 LOC) – multithreaded Win32 application; original 3d-positioning card driver modification; robust trajectory interpolator development; W2K kernel file system filter driver development; 3d-positioning card/GPIO card/external device emulators development;

Technical details: IBM/PC-based embedded system; FLASH DiskOnModule, 128МБ; OS – Windows 2000; ICP DAS Piso300 3d-positioning card; 8 hardware buttons, 20 Fn-keys control keyboard; 10ms external device polling loop; ISO program interpreter; dynamic GPIO assignment; debug display/manual control mode for GPIO;

July 2002 - October 2002;

Project: upgrade of a punched tape reader to a FLASH-based unit; conversion of the punched tape collection library into XML; CNC programming IDE development;

Personal responsibilities/contribution: CNC programming IDE development (MS Visual C++, 12000 LOC), parallel port driver for a FLASH card/punched tape reader interface development (MS Visual C++, 3600 LOC), embedded software for optical punched tape reader emulator development (ICC AVR, 3400 LOC);

Technical details: OS – Windows 9x/NT/W2K+; MFC MDI application; XML-based CNC program storage format; parallel port drivers in COM-objects, ATL; FLASH: Atmel AT45 series, direct LPT connection; software SPI over LPT implementation; Atmel AT90S8515 based embedded system, HD44780U LCD display, 5-button keyboard, screen menu, FLASH chip type autodetection, all AT45 subtypes up to 64Mbit;

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July 2001 – June 2004;
Position: software engineer;
Employer: Ascom, Ltd, Komsomolsk-na-Amure.

Projects:

January 2004 – March 2004;

Project: radio alarm network for the municipal electrical services;

Personal responsibilities/contribution: radio protocol design; server side software design and implementation (MS Visual C++, 5900 LOC), client side software design and implementation (MS Visual C++, 6900 LOC C++, 1500 LOC HTML/JavaScript);

Technical details: client-server approach; OS – Windows 2000+ (server), Windows 9x/NT/2000+ (client); COM+, ATL, STL, role-based access control; client side – MMC snap-in, ATL, STL, HTML-interface; client-server interaction – COM+/DCOM; simplex radio channel, unidirectional and bidirectional radio protocols;

January 2003 – April 2003;

Project: automated municipal street lighting system (street lighting remote control, electrical network parameters monitoring, intrusion detection subsystem);

Personal responsibilities/contribution: server side software design and implementation (MS Visual C++, 4700 LOC), client side software design and implementation (MS Visual C++, 7500 LOC C++, 1900 LOC HTML/JavaScript);

Technical details: OS – Windows 2000+; client-server approach; COM server, ATL; versioned radio protocol, simultaneous operation of multiple site controller versions; client side – MMC snap-in, ATL, HTML-interface; 33

controlled sites, radio network diameter – ~10 km, simplex radio channel, bidirectional radio protocol; site controller – Atmel AT90S8535;

July 2001 – october 2001;

Project: TCP/IP from scratch for the embedded system (TCP/IP stack, NIC driver, network API, HTTP, FTP servers);

Personal responsibilities/contribution: NIC driver develpment, TCP/IP stack implementation, HTTP, FTP servers implementation, FLASH file system design and implementation, network API (ICC AVR, 11700 LOC, portable C, works on Atmel ATMega103, i80x86 MS-DOS and Win32); network emulator development (MS Visual C++, 1400 LOC);

Technical details: Atmel ATMega103 SoC, RTL8019AS NIC, Atmel AT45D081A FLASH; 30% instruction memory used, 1.5KByte data memory per TCP connection; peak throughput – 80KBytes/s; current controller parameters accessible through HTTP as dynamically updated web-page.