Kiwamu Okabe - Research and Development Engineer

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Interests

I launched my career on developing embedded devices at Ricoh Company, Ltd, and also learned application design using functional language such like Haskell. I found Metasepi project[1] what is trying to apply strong type to embedded programming. For my first challenging, I developed an embedded Haskell compiler named Ajhc[2], and published some research papers[3].

Today, I choose ATS language[4] as embedded functional language, and found "Japan ATS User Group[5]" what holds Japanese translations about the language. And I'm implementing[6] these technology on tiny MCU such like ARM Cortex-M series and 8bit AVR for practical use.

Metasepi is very experimental and ambitious project, however I believe that it also introduces an by-product "the technology to design real software with predictable manpower and safety" regardless of embedded domain.

Work Experience

November 2016 - Present: Expert Engineer (permanent employee) at SELTECH CORPORATION

- Maintain a Hypervisor for embedded market
- Design and develop own secure OS for ARM platform

August 2014 - Present: Part-time Researcher at RIKEN Advanced Institute for Computational Science

- Research embedded functional programming running on ARM Cortex-M and AVR
- Verification for RTOS application such like ChibiOS/RT[7] running on ARM Cortex-M

July 2013 - Present: Self-employed Software Engineer at METASEPI DESIGN

- Research and develop Ajhc Haskell Compiler
- Host meetups[8] for hands-on to verify embedded application on ARM Cortex-M using STM32[9] board and ST-LINK[10] debugger

[1] http://www.metasepi.org/
[2] http://ajhc.metasepi.org/
[3] http://www.metasepi.org/papers.html
[4] http://www.ats-lang.org/
[5] http://jats-ug.metasepi.org/
[6] http://fpiot.metasepi.org/
[7] http://www.chibios.org/
[8] https://metasepi.connpass.com/
[9] http://www.st.com/en/microcontrollers/stm32-32-bit-arm-cortex-mcus.html
[10] http://www.st.com/en/development-tools/st-link.html

- ATS language evangelist
- Verification evangelist using VeriFast[11], which is a verifier C language programs annotated with pre-conditions and postconditions
- Translated VeriFast Tutorial into Japanese[12]
- Support to develop any embedded software
- Manage Metasepi Project and develop the core technology

February 2016 - November 2016: Software Enginner (contract employee) at Life Robotics Inc.

- Design GUI application running on Linux OS, using C++ and Qt[13]
- Design network protocol for Robotics application
- Reason for Quitting: to challenge verification of secure application using C language and VeriFast

March 2015 - February 2016: System Enginner (contract employee) at Centillion Japan Co., Ltd.

- Technical support for stock chart application using JavaScript
- Maintain MySQL database servers
- Launch new IoT business for farming
- Design a platform[14] to accelerate R programs
- Reason for Quitting: to change my job into embedded one, again

September 2014 - December 2014: Software engineer (trustee agreement) at Axsh co., LTD.

- Develop an OpenFlow application named "OpenVNet"[15]
- Design automation scripts for AWS using Ruby and GNU make
- Reason for Quitting: to have better salary

March 2012 - July 2013: Software Engineer (permanent employee) at MIRACLE LINUX CORPORATION

- Maintain own Digital Signage platform running on Intel architecture using Linux OS, C++, OpenGL, GTK+[16] and GStreamer[17]
- Verify and tune up performance of Digital Signage on new Intel platform and Intel video driver
- Verify PowerPC Linux kernel and debug/fix a race condition in the SMP kernel

[11] `https://github.com/verifast/verifast`
[12] `https://github.com/jverifast-ug/translate/blob/master/Manual/Tutorial/Tutorial.md`
[13] `https://www.qt.io/`
[14] `https://github.com/centillion-tech/kick-r`
[15] `https://github.com/axsh/openvnet`
[16] `https://www.gtk.org/`
[17] `https://gstreamer.freedesktop.org/`

- Debug and fix bug of crash[18] command's PowerPC virtual memory paging
- Design new Windows installer using NSIS[19]
- Introduce and maintain new Git server for internal use
- Reason for Quitting: to focus researching and developing Ajhc Haskell compiler on full-time work

April 2001 - February 2012: Software Development Engineer (permanent employee) at Ricoh Company, Ltd.

- Reason for Quitting: to join more small and quick team

April 2010: Port OS to new Intel hardware

I ported NetBSD-2.0[20] to new Intel hardware, and calculated boot time before porting the OS.

April 2008: Develop and technical support NetBSD OS

I became technical leader to maintain and support Ricoh's multifunction printer. Also I debuged and fixed many kernel level bugs. I designed power down process by software trigger.

April 2006: Develop POSIX thread library

I replaced old user level POSIX thread library with new NetBSD-2.0 m:n thread. My efforts are following.

- Research the presence of thread-safe and cancel-safe in kernel, libc and libpthread.
- Write test code to get thread-safe and cancel-safe.
- Add API into the m:n thread library. Because printer application depend on the missing API.
- Debug and fix signal bugs in the m:n thread library.

June 2004: Tune multifunction printer boot time as 10 seconds

Before my tune, the printer boot time is 30 seconds. I developed a tool analyze log dumped by bootloader, kernel, init process and application, analyze IPC network, and advice how to get speed to application developer, and split application as groups for pre-boot and post-boot. Ricoh's multifunction printer "imagio"[21] uses my method and tool, ever now.

October 2003: Develop new BIOS for multifunction printer

Develop new custom BIOS with a company at the United States.

November 2002: Design secure boot for multifunction printer on Intel architecture

I re-designed bootloader to support public key algorithm authentication, and designed the format include secure key in SD card

[18] `http://people.redhat.com/~anderson/`
[19] `http://nsis.sourceforge.net/`
[20] `http://netbsd.org/`
[21] `http://www.ricoh.co.jp/imagio/`

July 2001: Develop BIOS and bootloader for multifunction printer on Intel architecture

My first work at Ricoh. Ricoh's multifunction printer "imagio"[22] use my bootloader design, ever now. Also I designed hardware dependent data structure to configure bootloader and kernel, and Option BIOS to boot on SD card

Education

- March 2001: Master of Engineering from Department of Electrical and Electronic Engineering, Tokyo Metropolitan University.
  The thesis: "Multimode Quartz Crystal Microbalance"[23]

Publications and Reports

- Kiwamu Okabe and Hongwei Xi. "Arduino programing of ML-style in ATS"[24]. ML workshop, 2015.
- Kiwamu Okabe and Takayuki Muranushi. "Systems Demonstration: Writing NetBSD Sound Drivers in Haskell"[25]. Haskell Symposium, 2014.
- Kiwamu Okabe. "ATS 言語を使って不変条件を API に強制する".[26] 夏のプログラミング・シンポジウム 2014, 2014.
- Kiwamu Okabe, Hiroki MIZUNO and Hidekazu SEGAWA. "強い型による OS の開発手法の提案"[27]. 第 55 回プログラミング・シンポジウム, 2014.

Activities

Open-source projects

Metasepi Project[28]

- Challenge to create an open-source Unix-like operating system designed with strong type such as ML or Haskell.
- Rewriting NetBSD kernel using Ajhc Haskell compiler. `https://github.com/metasepi/netbsd-arafura-s1`

Ajhc Haskell compiler[29]

- Extend and add embedded features to Jhc Haskell Compiler `http://repetae.net/computer/jhc/`.
- Ajhc has thread-safe and reentrant runtime. Also has Erlang style GC. It means Ajhc's Haskell context has own GC heap. GC can run on tiny CPU such as Cortex-M3 with 32kB RAM.

Japan ATS User Group[30]

- An user group for ATS language promotion of utilization. Translating ATS documents into Japanese.

[22] `http://www.ricoh.co.jp/imagio/`
[23] `http://ci.nii.ac.jp/naid/110004076869`
[24] `http://www.metasepi.org/doc/metasepi-icfp2015-arduino-ats.pdf`
[25] `http://metasepi.org/doc/metasepi-icfp2014-demo.pdf`
[26] `http://www.metasepi.org/doc/20141101_prosym_summer2014.pdf`
[27] `http://metasepi.org/doc/20140110_prosym55.pdf`
[28] `http://metasepi.org/`
[29] `http://ajhc.metasepi.org/`
[30] `http://jats-ug.metasepi.org/`

Debian Maintainer[31]

- Maintained uim package at Debian squeeze, and packages using Haskell at sid.

Carettah[32]

- A presentation tool written with Haskell. All of my slides[33] are created by the tool.

Computer Skills

- Languages: C, C++, Haskell, ATS, Intel/ARM assembler, Ruby, JavaScript, Python
- Platforms: Linux, NetBSD, FreeRTOS, ChibiOS/RT, Android NDK, Cygwin, MinGW, Bare metal

Reference available upon request

- Hiroyasu Fukuyama CTO - SELTECH CORPORATION
- Woo-Keun Yoon CEO - Life Robotics Inc.
- Kentaro Kuroiwa Research Chief - Centillion Japan Co., Ltd.
- Yasuhiro Yamazaki CEO - Axsh Co., Ltd.
- Takayuki Muranushi - RIKEN Advanced Institute for Computational Science
- Takashi KODAMA CEO - MIRACLE LINUX CORPORATION
- Shigeya SENDA - Ricoh Company, Ltd.
- Hitoshi Sekimoto Professor - Tokyo Metropolitan University, Department of Electrical and Electronic Engineering

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[31] `http://qa.debian.org/developer.php?login=kiwamu@debian.or.jp`
[32] `https://github.com/master-q/carettah`
[33] `http://www.slideshare.net/master_q/`