

# Kiwamu Okabe - Fullstack Engineer

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## Brief

I launched my career on developing embedded devices using Unix-like kernel at Ricoh Company, Ltd. The experience was not only for designing device drivers but also including debug of virtual memory. And I have experience in IoT platform such as ARM Cortex-M MCU and RTOS. Also I learned application design using functional language such as Haskell<sup>1</sup>, and published some research papers<sup>2</sup> about such languages.

I would like to continue to pursue quality improvement technologies (including security) regardless of the software layer.

## Skill Sets

### *Deep knowledge for Unix-like Kernel and User Space*

I am an expert for Unix-like kernel such as Linux, because I provided technical support for NetBSD<sup>3</sup>, which is a Unix-like OS similar to Linux, at Ricoh. My skill is not only for NetBSD but also Linux. In fact, a race condition bug in PowerPC Linux kernel was fixed by me in only five days at MIRACLE LINUX.

### *Wide experience in IoT platform*

I have a wide experience in IoT platform such as FreeRTOS, ChibiOS/RT<sup>4</sup>, ARM Cortex-M, ESP8266, AVR and MSP430. Also I launched a new IoT business using TWELITE wireless platform<sup>5</sup> at Centillion Japan.

### *Research Security and Quality*

A prototype of own Secure-OS similar to OP-TEE<sup>6</sup> was designed by me at SELTECH. It runs with the other RTOS on ARM Cortex-M MCU. Also I have a wealth of experience in strong static typing language such as Haskell and verification of C language such as VeriFast<sup>7</sup>, which are useful to keep the quality of products.

## Computer Skills

- Languages: C (12 years), Haskell (5 years), Intel/ARM assembler (5 years), Ruby (5 years), C++ (3 years), PHP (2 years), OCaml (2 years), SQL (1.5 years), Python (1 year), Erlang (1 year), JavaScript (1 year), R (1 year), Go (0.5 years)
- Platforms: Linux (15 years), NetBSD (12 years), Cygwin (2 years), FreeRTOS (1.5 years), ChibiOS/RT (1.5 years), Android NDK (1 year), MinGW (1 year), Yocto (1 year)
- Database: MySQL (2 years)

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<sup>1</sup><https://www.haskell.org/>

<sup>2</sup><http://www.metasepi.org/papers.html>

<sup>3</sup><http://netbsd.org/>

<sup>4</sup><http://www.chibios.org/>

<sup>5</sup><https://mono-wireless.com/>

<sup>6</sup>[https://github.com/OP-TEE/optee\\_os](https://github.com/OP-TEE/optee_os)

<sup>7</sup><https://github.com/verifast/verifast>

## Work Experience

*May 2021 - Present: Freelance Researcher*

Responsibilities:

- Improving the quality of open source OS

Key Achievements:

- Found the root causes of FreeBSD OS bugs and vulnerabilities with SRE postmortem style, and avoided them with ATS and VeriFast<sup>8</sup>

*February 2023 - September 2023: Cloud Infrastructure Expert (permanent employee) at VA Linux Systems Japan K.K.*

Responsibilities:

- Technical support for Linux distribution and open-source software

Key Achievements:

- Verified Linux kernel with Infer static analyzer<sup>9</sup>

Reason for changing job:

- To focus developing own software products

*August 2022 - January 2023: Systems Engineer (permanent employee) at Systemi.co.ltd*

Responsibilities:

- Entrusted development of web applications

Key Achievements:

- Published a payment application running on Android tablet designed with Kotlin language

Reason for changing job:

- Because I wanted to contribute to projects with a long-term perspective rather than short-term work such as contracted development
- Because I realized that embedded development is what I am suited for, not web server-side or Android application development

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<sup>8</sup><https://github.com/metasepi/postmortem>

<sup>9</sup><https://valinux.hatenablog.com/entry/20230803>

*August 2021 - February 2022: Systems & Applications Engineer (permanent employee) at NXP Japan Ltd.*

Responsibilities:

- Technical support for NXP Microprocessors

Key Achievements:

- Supported audio application using Yocto Linux and Android platform

Reason for changing job:

- Because I was engaged primarily in customer support and did not have the authority to commit to source code, I did not realize the progress and contribution I was working daily

*December 2020 - April 2021: Software Engineer (permanent employee) at Donuts Co. Ltd.*

Responsibilities:

- Maintained an ERP web application using PHP, Zend Framework, JavaScript, MySQL, and AWS

Key Achievements:

- Created a black-box testing tool running Docker to get better performance and keep quality
- Created a summarizer of MySQL query log using Go language

Reason for changing job:

- The sheer complexity of the business logic and the absence of design documentation made the code extremely difficult to be maintained

*July 2013 - November 2020: Freelance Researcher*

Responsibilities:

- Researched and developed Ajhc Haskell Compiler<sup>10</sup>
- ATS language<sup>11</sup> evangelist for embedded devices
- Verification evangelist using VeriFast<sup>12</sup>, which is a verifier C language programs annotated with preconditions and postconditions

Key Achievements:

- Published some research papers<sup>13</sup>
- Translated ATS documents into Japanese<sup>14</sup>
- Translated VeriFast documents into Japanese<sup>15</sup>

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<sup>10</sup><http://ajhc.metasepi.org/>

<sup>11</sup><http://www.ats-lang.org/>

<sup>12</sup><https://github.com/verifast/verifast>

<sup>13</sup><http://www.metasepi.org/papers.html>

<sup>14</sup><http://jats-ug.metasepi.org/>

<sup>15</sup><https://github.com/jverifast-ug/translate>

*October 2019 - March 2020: Software Engineer (trustee agreement) at QuantumCore CORPORATION*

Responsibilities:

- Ported a machine learning called “reservoir computing” onto ARM Cortex-M MCU
- Ported the machine learning onto Android platform

Key Achievements:

- Developed a library for linear algebra running on ARM Cortex-M MCU

Reason for changing job:

- Due to commissioned embedded AI project frozen

*February 2018 - July 2018: Software Architect at (contract employee) SHINKAWA LTD.*

Responsibilities:

- Researched and developed new software platform for wire bonding during semiconductor device fabrication

Key Achievements:

- Created a parser to understand SHINKAWA own embedded script language
- Evaluated EtherCAT<sup>16</sup> protocol for the realtime application

Reason for changing job:

- Initially, I joined SHINKAWA as a “Linux expert,” but as the team was organized, the person they needed was a hardware engineer

*August 2014 - October 2017: Part-time Researcher at RIKEN Advanced Institute for Computational Science*

Responsibilities:

- Researched functional programming for embedded platform

Key Achievements:

- Published some research papers<sup>17</sup>

Reason for changing job:

- Because RIKEN AICS was going to outsource compilers for supercomputers instead of making them, and my research theme was no longer in line with theirs

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<sup>16</sup><https://www.ethercat.org/>

<sup>17</sup><http://www.metasepi.org/papers.html>

*November 2016 - October 2017: Expert Engineer (permanent employee) at SELTECH CORPORATION*

Responsibilities:

- Researched and developed new Secure-OS for ARM Cortex-M platform

Reason for changing job:

- Due to the dissolution of the Secure OS project for Cortex-M microcontrollers that I was working on

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

Responsibilities:

- Developed GUI application running on Ubuntu OS, using C++ and Qt<sup>18</sup> for single arm robot

Key Achievements:

- Designed a network protocol for the robotics application

Reason for changing job:

- Commuting time was taking 4 hours round trip, and I was reaching my physical limit

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

Responsibilities:

- Technical support for stock chart application using JavaScript
- Maintained MySQL database servers
- Manager for offshore development in China

Key Achievements:

- Launched new IoT business for farming
- Design a platform<sup>19</sup> to accelerate R<sup>20</sup> programs

Reason for changing job:

- For the opportunity to return to embedded development after a career that had once moved to the web server side

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<sup>18</sup><https://www.qt.io/>

<sup>19</sup><https://github.com/centillion-tech/kick-r>

<sup>20</sup><https://www.r-project.org/>

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

Responsibilities:

- Developed an OpenFlow application named “OpenVNet”<sup>21</sup>

Key Achievements:

- Provisioned and automated deploying the OpenVNet on AWS platform using Ruby and GNU make

Reason for changing job:

- Because they did not receive commensurate compensation for the hours worked

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

Responsibilities:

- Developed own Digital Signage platform running on Intel architecture using Linux OS, C++, OpenGL, GTK+<sup>22</sup>, GStreamer<sup>23</sup>
- Supported and debugged own Linux distribution

Key Achievements:

- Debugged and fixed a race condition in the SMP kernel on PowerPC platform
- Debugged and fixed bug of crash<sup>24</sup> command’s PowerPC virtual memory
- Designed new Windows installer using NSIS<sup>25</sup>

Reason for changing job:

- I wanted to do business with a Haskell compiler that I had been developing privately

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

Responsibilities:

- Developed own platform for multi-function printer based on NetBSD OS

Key Achievements:

- Developed OptionBIOS and bootloader for the platform on Intel architecture
- Designed secure boot for the platform on Intel architecture
- Compressed boot time of the printer onto 10 seconds
- Verified m:n POSIX thread library

Reason for changing job:

- Because we wanted to develop a smaller organization with faster decision making

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<sup>21</sup><https://github.com/axsh/openvnet>

<sup>22</sup><https://www.gtk.org/>

<sup>23</sup><https://gstreamer.freedesktop.org/>

<sup>24</sup><http://people.redhat.com/~anderson/>

<sup>25</sup><http://nsis.sourceforge.net/>

## Education

- March 2001: Master of Engineering from Department of Electrical and Electronic Engineering, Tokyo Metropolitan University.  
The thesis: “Multimode Quartz Crystal Microbalance”<sup>26</sup>

## Publications and Reports

- Kiwamu Okabe and Hongwei Xi. “Arduino programing of ML-style in ATS”<sup>27</sup>. ML workshop, 2015.
- Kiwamu Okabe and Takayuki Muranushi. “Systems Demonstration: Writing NetBSD Sound Drivers in Haskell”<sup>28</sup>. Haskell Symposium, 2014.
- Kiwamu Okabe. “ATS 言語を使って不変条件を API に強制する”<sup>29</sup>. 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”<sup>30</sup>. 第 55 回プログラミング・シンポジウム, 2014.

## Activities

### *Open-source projects*

#### Metasepi Project<sup>31</sup>

- 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<sup>32</sup>

- 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<sup>33</sup>

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

#### Debian Maintainer<sup>34</sup>

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

Last updated: October 28, 2023

<sup>26</sup><http://ci.nii.ac.jp/naid/110004076869>

<sup>27</sup><http://www.metasepi.org/doc/metasepi-icfp2015-arduino-ats.pdf>

<sup>28</sup><http://metasepi.org/doc/metasepi-icfp2014-demo.pdf>

<sup>29</sup><http://www.metasepi.org/doc/20141101-prosym-summer2014.pdf>

<sup>30</sup><http://metasepi.org/doc/20140110-prosym55.pdf>

<sup>31</sup><http://metasepi.org/>

<sup>32</sup><http://ajhc.metasepi.org/>

<sup>33</sup><http://jats-ug.metasepi.org/>

<sup>34</sup><http://qa.debian.org/developer.php?login=kiwamu@debian.or.jp>