Yuuta Liang

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Skills

- **Programming Language**: C# (2013), Java 8 (2016), POSIX Shell (2020), C11 (2021), Make (2021), Scheme (2022), RISC-V Assembly (2023), Haskell (2024), SystemVerilog (2024), Prolog (2024).
- **Development Environment**: .NET Framework (2013), Android app (2016), AOSP system and Binder IPC (2017), Vert.x (2017), POSIX (2021).
- **Electrical Engineering**: Basic analog circuit design (2012), Basic AllWinner V3s circuit and PCB design (2024).
- **Embedded Systems**: Cyclone V (2024), AllWinner V3s (2024).
- **System Programming**: Basic Linux and U-Boot porting, device tree and driver development (2024).
- **Unix**: Arch Linux (2019), FreeBSD (2022), Debian (2024), AOSC OS (2024), good at Unix command line and systemd.
- **System Administration**: Nginx (2017), Docker (2018), Unix and Linux (2019), MariaDB (2019), Windows Server (2019), Microsoft ADDS (2019), Kerberos (2021), OpenLDAP (2021), Dell iDRAC (2021), VMware vSphere (2022), PostgreSQL (2022), Microsoft ADCS (2023).
- **Network Engineering**: EdgeRouter (2020), BIRD2 Routing Daemon (2021), DN42 AS4242422980 (2021), AS142281 (2021), `2404:f4c0:f9c0::/44` (2021), AS212347 (2022), `2a0d:2580:8000::/35` (2024).
- **Software Engineering and Web**: UMeng analytics (2016), Java Servlet (2016), Fabric analytics (2017), Firebase (2017), Travis CI (2017), Vert.x (2018), Azure DevOps (2018), WordPress (2019), WooCommerce (2019), Azure FaaS (2020).
- **Version Control and Tooling**: Git (2016), Vim (2018), Tmux (2020), Quartus Prime (2024), KiCad (2024).

Work Experience

PLCT Lab, Institute of Software, Chinese Academy of Sciences 2023 / 06 – 2023 / 09
Intern in the AOSP group Beijing, China

- Worked on porting `libvpx` C routines into RISC-V Vector (SIMD) intrinsics.
- Optimized `libvpx` matrix memory copy routines by rewritting the C implementation into RISC-V Vector intrinsics.

Projects

UGDISK: Linux USB Gadget installation disk – Linux, embedded Nov 2024 – Present

- A USB disk that simulates a CD-ROM drive that allows users to dynamically mount arbitrary ISO for the ease of operating system installation.
- Chose AllWinner V3s due to its good mainline Linux and U-Boot support to easily get started.
- Designed embedded system hardware based on V3s development board schematics and its official reference schematics, using KiCad.
- Uses latest mainline Linux kernel and U-Boot for code cleanness and portability.
- Currently porting the userspace SPI E-ink display driver provided by the vendor to a Linux kernel DRM driver.

CurryCoin: Haskell BIP-like blockchain (GitHub) – Haskell, blockchain Oct 2024 – Dec 2024

- A tiny BitCoin-like blockchain implementation in Haskell.
- Learnt and implemented Merkle tree using Haskell data definition.
- Utilized IO Monad to display a user-friendly command line prompt.

PiSDR: Linux embedded WebSDR – Linux, systemd, SDR Apr 2024 – May 2024

- A powerful Web-based SDR based on Raspberry Pi 5, RTL-SDR, SDRPlay RSP1A, OpenWebRX+, and a custom-built embedded Linux image.
- Focused on the cleanness and portability of the OS image by using mainline Linux kernel, Debian bookworm, UEFI, and systemd. Not using any vendor kernels or U-boot because they are specific to a single platform.
- Maximized stability by installing the OS image into a NVMe SSD instead of SD card and also powering the whole system using 802.11af POE.
- Heavily used systemd to build an immutable OS image and to implement A / B updates; using mkosi, systemd-repart, systemd-sysupdate, and UKI (unified kernel image). These systemd toolchains are new and unstable, and several bugs were found and reported to the upstream during development of this project.
- Chose Raspberry Pi 5 due to its working mainline kernel and UEFI firmware support.

JCA: Java X.509 secondary certification authority (git.yuuta.moe/jca.git) – Java, Swing, PKI Sept 2023 – Dec 2023

- A GUI X.509 certification authority based on Java and Swing.
- Support common CA tasks: reqest a CA certificate from the root CA, define certificate templates, issue and revoke certificates, sign CRLs, and audit logs. These functions define a basic offline certification authority.
- Implemented a complete ASN.1 DER and X.509 encoder and decoder due to the absence of modern X.509 libraries in 4,500LOC. Fully-tested in 4,800LOC, with 100% coverage.
- Leveraged OOP and have a clear abstraction structure when modelling the ASN.1 objects. All ASN.1 objects have their own model classes which extend a common parent class, and all ASN.1 model classes implement their own encoding and decoding methods, while the parent ASN.1 object class provide necessary facilities for encoding and decoding.
- Confromted to ITU standards ASN.1, X.501, X.509, X.680, X.690, and PKCS#10 since the CA has to interact with other softwares that involve certificates. Read multiple ITU standards and RFCs.
- Leveraged pure functional programming to design immutable data structures and use higher-order functions to manipulate lists.
- Designed a modern GUI using the IntelliJ theme and icons that makes JCA stand out from other Swing applications. Became familiar with Swing APIs and layout managers.
- Designed an automatic UML generator using Kotlin, Java AST libraries, Freemarker, and Graphviz that analyzes and shows inheritance and association relationships; just invoke a Gradle task and all UML diagrams will be generated in PDF format automatically.

YuutaHome: Microsoft Active Directory infrastructure – ADDS, ADCS, PKI, LDAP, Kerberos, SSSD, OpenVPN Mar 2022 – Present

- A complete AD domain that manages my personal workstations, laptops, and servers, with a full ADDS and ADCS deployment and globally-accessible VPN.
- Deployed two AD domain controller for two different sites, cloud and my home, which replicate from each other using WireGuard site-to-site VPN.
- Setup multiple group policy objects to secure workstation and server access.
- Included a Azure AD tenant and setup AAD Connect to enable AAD signle-sign-on and password writeback.
- Installed a completely functional two-tier PKI infrastructure using OpenSSL as root CA and Microsoft ADCS as secondary CA, with publically-accessible CRL and AIA endpoints.
- Joined Linux computers and servers to the domain using SSSD, so Linux computers can access domain resources using Kerberos single-sign-on.
- Deployed a WPA-Enterprise WiFi network at my home and setup Microsoft NPS RADIUS server with MSCHAPv2.
- Deployed a globally-accessible VPN infrastructure based on OpenVPN and WireGuard, and domain-joined Windows computers can reach the domain using their computer certificates in both Canada and China.

YuutaCloud: On-premises private cloud (yuuta.network) – BGP, OSPF, WireGuard, vSphere Jun 2020 – Present

- A private cloud built upon BGP (AS142281) and VMware vSphere, able to spin up cheap cloud servers at home to satisfy personal server requirements.
- Deployed six cloud BGP routers in Asia and North America, connected to three upstream ISPs including Hurricane Electric and Vultr for balanced routing. All routers are connected using OSPF and WireGuard via Arch Linux and BIRD2.

- Optimized continental intra-AS routing using OSPFv6, so continents are arranged into OSPF areas such that cross-continent traffic are forwarded to specific edge routers.
- Intensively used Linux iptables and the netfilter framework to realize policy routing and firewall.
- Deployed a VMware vSphere hypervisor and a VMware vCenter server for easy-to-use VM management.
- Employed refurbished enterprise-grade servers and network devices like Dell PowerEdge R520, HPE ProLiant DL360p Gen8, APC PDU, ProCurve J9028B for out-of-band management like Dell iDRAC.
- Installed a Microsoft Active Directory domain and CA for single-sign-on, management, and internal PKI services.

MiPushFramework: OSS port of MIUI system push services (GitHub) – Android, Java, Hooks, DevOps Aug 2018 – Oct 2020

- An Android app that ports the Xiaomi MIUI system push services to generic Android devices via reverse-engineering.
- Dramatically reduced RAM usage for any app using the Xiaomi push service and saved battery life.
- Used many hooks and injection techniques to modify Xiaomi push SDK internal states or function behaviours, so they work on non-MIUI systems.
- Interacted a lot with the Android system IPC mechanism including Binder and AIDL to hook efficiently.
- Developed a web-based push testing service using Vert.x, Kotlin, RESTful API, and Docker, so users can test their installation quickly without relying on third-party apps.
- Setup a dev branch and a master branch, which the later is protectd, so me and other collaborators can work on the dev branch and finally merge the changes to the master branch to release a new version.
- Deployed Travis CI that automatically builds canary builds upon every push to the dev branch and builds release builds upon push to the master branch.
- Included analytics using Fabric to track monthly active users.
- Included analytics using UMeng to track monthly active users, collect users' Android versions, and collect crash reports to fix bugs; also setup a few basic events that tracks user behaviours.
- Highly popular in the Chinese Android hacking community and earned 2,100 stars on GitHub.

Dir: Community-based Android cleaning tool (dir.yuuta.moe) – Android, Java, Kotlin, Vert.x, PaaS DB, DevOps Jan 2017 – Apr 2020

- A community-based Android storage cleaning tool that deletes junk files and prevents them from being created again.
- Built a community-driven online ruleset database that defines paths to common junk files. Hired several community volunteers to review user contributions. The database was stored at LeanCloud, a PaaS DB service.
- Focused on removing tracking IDs and advertisements that protects user privacy.
- Specialized in preventing deleted files being created again by creating an empty placeholder file that replaces the original directory, exploting the Unix feature that files and directories cannot have the same name.
- Developed a backend to provide in-app purchase and rule sync services, using RESTful API, LeanCloud, Vert.x, Firebase, Azure FaaS, and Docker.
- Setup Travis CI and Azure DevOps to automatically build and release beta and major versions to Azure DevOps testing service and Google Play upon Git push and manual triggers.
- Included analytics using Fabric and Firebase to track monthly active users, collect users' Android versions, and collect crash reports to fix bugs; also setup a few basic events that tracks user behaviours.
- Implemented in-app purchase with server-side verification supporting both Google Play and Alipay, based on payment providers including Youzanyun, Ping++, and Stripe.
- Setup an online app store to sell in-app purchase, based on WordPress, WooCommerce, Stripe, WooCommerce Serial Number Plugin, and server-side serial number verification service using Java and Azure FaaS.
- Designed a beautiful Material Design GUI with pretty animations.
- Highly popular in the Chinese Android hacking community: 30,000 monthly active users (2019), C$ 600 monthly income for in-app purchase.

Rome Map: All-in-one map app that combines multiple map providers – Android, Java, PaaS DB 2016 – Dec 2016

- A map app that combines navigation routes from three different Chinese map providers (AutoNavi, Baidu, Tencent) into one, so users no longer need to switch between map apps to choose the best route.
- Integrated AutoNavi, Baidu, and Tencent map SDKs into one app and allows users to quickly switch between them while keeping a unified user experience.
- Supported voice search using iFlytek voice recognition SDK, so drivers can easily use the app.
- Developed a simple navigation mode that follows the user's current location and reports where to go next, based on iFlytek TTS SDK.
- Included analytics using UMeng to track monthly active users, collect users' Android versions, and collect crash reports to fix bugs.
- Designed a pretty Material Design GUI.

Smart Flower Pot: Automatically water the flower based on soil moisture 2013 – 2015

- An electrical project that automatically water the flower based on soil moisture.
- Designed completely in analog circuits, using moisture resistor and triodes to control relays which switches the pump on / off. The original circuit was extended from an elementary circuit demo that uses light sensor (also a resistor) to control LEDs based on triods.
- Built a seven-segment water counter (up to 99) driven by 74LS logical gates, allowing users to see how many times the flower had been watered or to reset the counter.
- Designed and simulated the circuit in Multisim.
- Award: First place in the Chinese National Youth Electronic Designing Championship, elementary students group (2014), 97 / 100.

Education

University of British Columbia 2022 / 09 – Expected 2028 / 05

Bachelor of Science, Major in Computer Science, with Co-op Vancouver, BC, CA

- GPA: Comulative 89.6 / 100.0
- Courses Taken: Computer Architecture, Haskell and Prolog, Programming Languages Implementation, Databases