Danh **Nguyen**

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Education

Drexel University   *Philadelphia, PA*

B.S. / M.S. / Ph.D. in Computer Engineering   *2006–2009 / 2009–2014 / 2014–2017*

Thesis: "Agile Spectrum-Sharing Wireless Systems using Software Defined Radios and Reconfigurable Antennas"

Experience

Amazon Inc.   *Boston, MA*

Software Development Engineer (SDE II) / Senior SDE   *01/2022–Present*

- Developed embedded software, core OS platform, networking, and security features for Amazon Dash Cart - a smart shopping solution that combines computer vision, sensor fusion, and mobile edge computing to enable seamless grocery shopping experience
- Designed and implemented cloud infrastructure, internal tooling, and on-cart SW features for *(i)* embedded SW build, packaging, and OTA deployment, *(ii)* manufacturing automation, asset tracking, and in-store provisioning of devices, *(iii)* security hardening, identity management, and cloud credential sourcing in 3P environments, *(iii)* CI/CD-driven automated integration testing on real hardware device farms, and *(iv)* network-resilient, fault-tolerant, and power-aware SW architectures
- Collaborated with multi-disciplinary and cross-functional teams to root-cause and resolve large-scale systems issues both internal within the carts (inter-service resource sharing), within store premises (interactions with store fiducials and network infrastructure), and in the cloud (service partitioning, cellular store architecture, identity and access management, and observability)
- Delivered highly optimized and scalable SW solutions for edge compute, service offloads, and data sharing across a mobile fleet of battery-operated smart shopping carts

Qualcomm Inc.   *Boxborough, MA*

Staff Modem Systems Engineer (5G NR and WiFi 802.11ax)   *10/2017–01/2022*

- Drove **high-level functional modem designs** according to 3GPP (Release 16) and IEEE 802.11ax standards. Evaluated architectural trade-offs. Delivered reference models and test vectors for hardware/software development. Supported pre-/post-silicon lab bring-ups, inter-operability testing, and field commercialization of wireless chipset products
- Defined, implemented, and unit-tested the multi-tier, fixed-point **C++/SystemC software functional models** of the wireless modem's data paths and firmware microcode, specifically for WiFi 802.11ax (Hawkeye) and 5G NR (Snapdragon X65) modem chipsets
- Specialized in *(i)* receiver time-domain processing (AGC, packet detection, time and frequency synchronization, etc.) for WiFi 802.11ax, as well as *(ii)* PHY uplink data, control, and random-access channels, and associated Layer-1 control procedures for 5G modems. Resolved **5G NR systems issues** related to uplink BLER, random access procedure, and performance/peak throughput degradation. Debugged WiFi performance issues related to receiver sensitivity, spur mitigation, gain setting, and radar detection
- Developed large-scale **automation tools and testing infrastructure** for code-quality assurance and performance characterization of end-to-end wireless PHY hardware models using Matlab, Python, and Unix shell scripting
- Consolidated multiple fragmented, local log parsing tools into a **cloud-based data analytic and visualization platform** for modem log and IQ signal analyses. Deployed CI/CD pipeline for automated regression and deployment using GitHub webhooks and Jenkins. Applied containerization technology (Docker and Kubernetes) to enable horizontal scaling on Qualcomm's internal cloud
- Clarified and contributed to **3GPP 5G NR RAN1 standards** in uplink control procedures for Ultra-Reliable, Low Latency Communications (URLLC). See patent [P1]

Drexel Wireless Systems Laboratory   *Philadelphia, PA*

Graduate Research Fellow   *9/2009–9/2017*

- Designed and implemented a **synchronous directional wireless architecture** that uses reinforcement learning, time synchronization, and pattern-reconfigurable antennas to perform autonomous beamsteering for optimizing network throughput. Built a real-time 802.11 system prototype on the WARP software-defined radios. Authored 5 publications and a patent [P3]
- Handled backend development (cloud-controlled radios, gateway, and server software) of a **mobile augmented reality** framework to visualize and interact with wireless RF transmissions in real time. Authored 3 publications and a patent [P4]
- Developed **wideband spectrum sensing algorithms** in Matlab and FPGA hardware for cognitive radio operations in wireless small cells, leveraging a frequency-agile transceiver frontend for flexible spectrum access
- Implemented a **real-time, protocol-aware reactive jammer** using GNU Radio and the low-cost Ettus USRP N210 software-defined radio. Devised a hardware/software co-processing scheme to meet real-time deadlines while maintaining platform programmability. Authored 3 publications and 2 patents [P2, P5]

InterDigital Communications, Inc. *King of Prussia, PA*
RESEARCH ENGINEER - VIDEO OVER WIRELESS *6/2013–6/2014*

- Prototyped an experimental WiFi video delivery system using OpenWRT with modified Linux 802.11 drivers (`mac80211` and `nl80211` modules), and DASH (Dynamic Adaptive Streaming over HTTP) video clients
- Optimized H.264 video streaming over WiFi networks leveraging IEEE 802.11e QoS support for traffic access categories
- Implemented control algorithms for network-assisted rebuffering prevention through QoS elevation of distressed video streams

Freedom Rings Partnership *Philadelphia, PA*
WEB DEVELOPER *8/2012–8/2013*

- Developed in Drupal CMS key features for the Freedom Rings Partnership's KEYSPOT website (https://www.phillykeyspots.org)
- Handled static pages, news and blog posting workflow, materials repository, search functionality, and E-Learning portal

Motorola Inc. - Home & Network Mobility (now ARRIS Group, Inc.) *Horsham, PA*
SOFTWARE ENGINEER COOP *3/2008–6/2009*

- Developed C++ features for the thin client software layer of set-top boxes to enhance digital video recording (DVR). Debugged and improved device drivers for external mass storage devices (eMSD) to handle DVR's external hard drive configuration process
- Implemented the System Test Program (STP) framework for automation of all design validation tests (DVTs) in the group

Skills

Programming	C / C++ / Python / Matlab (*proficient*), Java (*intermediate*), HTML / CSS, Javascript
Libraries	NumPy / Pandas (Python), GNU Radio / Intel IPP (C++), lwIP / liquid-dsp (C), Unity engine (C#)
Web Framework	Python Django / Flask / Nikola, PHP, Bootstrap, Drupal CMS, Node.JS Express
Infrastructure	Jenkins, GitHub, Gitlab CI/CD, Docker, Kubernetes, shell scripting
Hardware	Xilinx & Altera FPGA platforms, VHDL, Verilog, Xilinx ISE, Modelsim, JTAG debugging
CPU Architectures	x86-64, ARM Cortex-M4/7, Xilinx Microblaze, Atmel AVR
Operating Systems	Unix / Linux, OpenWRT / FreeRTOS (embedded), TinyOS / Contiki (wireless sensors)
Wireless Standards	IEEE 802.11ac/ad/ax (WiFi), 802.15.4 (ZigBee), Bluetooth, UMTS/W-CDMA, 4G LTE Advanced, 5G NR

Publications

CONFERENCE PROCEEDINGS (SELECTED 4 OF 15)

[1] Sub-Microsecond Network Synchronization for Distributed Wireless PHY Protocols
D. H. Nguyen, A. Paatelma, H. Saarnisaari, N. Kandasamy, and K. R. Dandekar
Proc. ACM Wireless of the Students, by the Students, and for the Students Workshop (S3), 2017

[2] Reinforcement Learning System to Mitigate Small-Cell Interference Through Directionality
A. Paatelma*, D. H. Nguyen*, H. Saarnisaari, N. Kandasamy, and K. R. Dandekar (*Co-primary authors)
Proc. IEEE Intl. Symp. on Personal, Indoor, and Mobile Radio Communications (PIMRC), 2017

[3] Demo: WiART - Visualize and Interact with Wireless Networks using Augmented Reality
D. H. Nguyen, J. Chacko, L. Henderson, A. Paatelma, H. Saarnisaari, N. Kandasamy, and K. R. Dandekar
Proc. ACM Intl. Conf. on Mobile Computing and Networking (ACM MobiCom), 2016

[4] Demo: Enhancing Indoor Spatial Reuse through Adaptive Antenna Beamsteering **(WinCool Best Demo Award)**
D. H. Nguyen, A. Paatelma, H. Saarnisaari, N. Kandasamy, and K. R. Dandekar
Proc. ACM Intl. Workshop on Wireless Network Testbeds, Experimental Eval., and Characterization (WiNTECH), 2016

PATENTS

[P1] Physical Uplink Control Channel Transmission for Low-Latency Communication Deployments
US Patent Application No. 17/303,217. Filed May 24, 2021

[P2] Energy-Efficient Reactive Jamming of Frequency-Hopping Spread Spectrum (FHSS) Signals using Software-Defined Radios
US Patent No. 10,985,861. Granted Apr. 20, 2021

[P3] An Adaptive Pursuit Learning Method to Mitigate Small-Cell Interference through Directionality
US Patent No. 10,694,526. Granted Jun. 23, 2020

[P4] Beam Visualization and Using Augmented Reality for Control and Interaction
US Patent No. 10,515,483. Granted Dec. 24, 2019

[P5]   Real-Time and Protocol-Aware Reactive Jamming in Wireless Networks
US Patent No. 9,531,497. Granted Dec. 27, 2016

Honors & Awards

2017	**IEEE Philadelphia Section Student Project Award**, (for BeamViewer Augmented Reality framework)
2017	**Frank and Agnes Seaman Endowed Fellowship**, Drexel ECE Department
2016	**WinCool Best Demo**, ACM WiNTECH '16 (judged by a panel from industry and academia)
2009–Present	**Graduate Research Fellow**, Drexel University
2008–2009	**Milton Rosenberg Scholar**, Drexel University (recognizing outstanding engineering students)
2009	**Senior Design Competition Winner**, Drexel ECE (for a real-time RFID-based product locating system)