Nicholas **Butts**

Staff Research Engineer · Embedded System Expert

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"A good scientist is a person with original ideas. A good engineer is a person who makes a design that works with as few ideas as possible. There are no prima donnas in engineering."

Summary

Current Staff Research Engineer at Appareo Systems. 21 years of experience designing, building, and fielding rugged embedded systems. Passionate, enthusiastic, driven engineer. I enjoy all aspects of embedded systems, from system engineering and architecture to embedded software design, code, and testing to electronic design and PCB layout. I've worked with bare-metal deeply embedded control systems to high end Linux based AI camera systems. Enjoy solving complex problems and continuously learning new technologies and tools.

Work Experience

Appareo Systems — *Fargo, ND*

Chief Engineer Projects, Director Technology Development/Proof-of-Concepts — *Jun. 2020 - Present*

- Technical lead and lead embedded software engineer on an AI enabled rugged aviation camera that used the NVidia Jetson Nano platform, 4K imaging, and Deep Neural Networks (DNN) for cockpit gauge recognition utilizing C/C++, Python, Tensorflow, and TensorRT.

Appareo Systems — *Fargo, ND*

Staff Research Engineer — *Jun. 2017 - Jun 2020*

- Project lead on a complex multi-radio communications Gateway for Northrop Grumman that utilized Iridium, OpenThread, Trellisware, and ultrawideband radio technologies developed in C/C++.
- Technical lead on a real-time embedded sensing module for liquid flow pressure and volume monitoring for agricultural sprayers utilizing C/C++, CAN, and J1939.
- Architectured a complex real-time embedded control module to control drop-let size and flow rate on smart liquid nozzles for agricultural sprayers utilizing C/C++, CAN, J1939, and ISO 11783.
- Studied advanced acoustic designs for individual seed counting in air seeder applications. Created proof-of-concept hardware platforms for data acquisition and advanced signal processing algorithm to count seeds and separate singles from double impacts.
- Researched, designed, built, and tested a 2.4 GHz Frequency Modulated Continuous Wave radar for under crop canopy obstacle detection utilizing C/C++ and Python.
- Technical lead a Emergency Use Authorization COVVID 19 mechanical resuscitator that was designed, fabricated, and tested in three weeks.
- Research on various acoustic electro/mechanical conduction means for seed counting.
- Designed, built, and tested an innovative low light 360 degree underwater camera for fisherman utilizing C/C++ and Python.

Appareo Systems — *Fargo, ND*

Embedded Software Architect — *Jan. 2016 - Jun. 2017*

- Led team of embedded software engineers, created processes and procedures for company wide New Product Realization Process, guided software architecture on new products, mentored and career pathing of embedded software engineers.
- Technical lead on embedded acoustic mass flow detection device mounted inside combine processor/cleaning shoe utilizing C/C++, CAN, and ISO 11783.
- Technical lead on embedded grain quality sensor that is mounted on the clean grain elevator. This device utilized acoustic sensing to synchronize high output LED flash and high speed image sensor capture of grain passing through the clean grain elevator then applied computer vision techniques to detect material other than grain and broken grain utilizing C/C++, Python, CAN, Ethernet, and ISO 11783.
- Research on autonomous combine operation using advanced acoustic, electro-optical, LIDAR, 24/77 GHz radars sensors and fuzzy logic control systems.

Appareo Systems — *Fargo, ND*

Senior Embedded Software Engineer — *May. 2010 - Jan. 2016*

- Lead embedded software engineer on Stratus 2 portable ADS-B receiver. Wrote C/C++ code to interface with FPGA software defined radio, packet decode, power sequencing, firmware upgrading, and data recording.
- Lead embedded software engineer on Stratus 1 portable ADS-B receiver. Wrote C/C++ code to interface with FPGA software defined radio, packet decode, power sequencing, firmware upgrading.
- Lead embedded software engineer on cockpit crash recorder for light helicopters and fixed wing aircraft, implemented and optimized image pipeline and robust, fail-safe data recording and recovery utilizing C/C++
- Embedded Software Engineer on cockpit camera system for Bell helicopters.

John Deere Electronic Solutions *Fargo, ND*

Senior Software Engineer *2005 - May. 2010*

- Software lead on various rugged embedded systems: high end Windows CE displays, bare-metal embedded displays, transmission shift controllers, hydraulic controllers, center pivot control electronics.
- Researched new technologies and processors.
- Member of the Software Engineering Process Group and the Software Reuse library.

Honors & Awards

International

2018	**Finalist,** DEFCON 26th CTF Hacking Competition World Final	*Las Vegas, U.S.A*
2017	**Finalist,** DEFCON 25th CTF Hacking Competition World Final	*Las Vegas, U.S.A*
2014	**Finalist,** DEFCON 22nd CTF Hacking Competition World Final	*Las Vegas, U.S.A*
2013	**Finalist,** DEFCON 21st CTF Hacking Competition World Final	*Las Vegas, U.S.A*
2011	**Finalist,** DEFCON 19th CTF Hacking Competition World Final	*Las Vegas, U.S.A*

Domestic

2015	**3rd Place,** WITHCON Hacking Competition Final	*Seoul, S.Korea*
2017	**Silver Prize,** KISA HDCON Hacking Competition Final	*Seoul, S.Korea*
2013	**Silver Prize,** KISA HDCON Hacking Competition Final	*Seoul, S.Korea*

Presentation

VDI Smart Farming Conference *Dusseldorf, Germany*

Presenting Intelligent Grain Quality Sensor *May. 2018*

- Introduced the AGCO Grain Quality Sensor

LAND.TECHNIK 2020 *Dusselforf, Germany*

Presenting Mass Flow Combine Sensors *Nov 2017*

- Introduced the AGCO Mass Flow Combine Sensor

Education

NDSU(North Dakota State University) *Fargo, ND*

B.S. in Electrical Engineering *Aug. 1995 - May. 2020*

NDSU(North Dakota State University) *Fargo, ND*

M.S. in Electrical Engineering *Aug. 2001 - May. 2007*

- Controller Area Network Condition Monitoring and Bus Health on In-Vehicle Communications Networks

Extracurricular Activity

IEEE (Institute of Electrical and Electronics Engineers) *Fargo, ND*

Member *Aug. 2012 - Apr. 2020*

CAP (Civil Air Patrol) *Fargo, ND*

Squadron Commander *Aug. 2012 - Apr. 2020*

- Lead group of volenteers, mentoring members on new skills, and education on aerospace.