Brendan Hall

Engineer and Innovator

I am a multi-disciplinary system, software, and test engineer with over 25 years of experience within safety relevant embedded system development. I have a proven track record of innovation with 45 patents awarded date. Working within Advanced Technology, I am fortunate to be able to engage and contribute on a wide range of systems and technologies, from leading edge to time-tested. My projects have ranged from developing the integrated fly-by-wire networking architecture for the Orion Space Program, to the development of low-cost partitioned systems based on field bus technologies. Aside from building cool stuff, I am also really interested in how we build systems safely. Hence, I am keenly interested in model-based development, model-based safety analysis, applied formal methods and integrated design assurance methods and technologies. This diverse background and areas of interest have afforded me to realize in depth knowledge of fault-tolerance, system architecture, communications protocols and the practical application of aerospace development and certification standards. This high assurance experience is complemented with an earlier career spent developing video telephony and high-volume automotive engine control systems, where I worked within design validation and production test rolls.

I hold dual USA and UK citizenship.

Personal Information

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Employment

2001 - now

Engineer Fellow @ Honeywell

As an Engineert Fellow working with Honeywell within platform systems,I am responsible for executing internal and external technology research programs, and the maturation and transition of targeted technology to production systems.

Successful Record of Funded Research Wins and Execution

A primary goal of Advanced Technology is to attract research funding. To support this goal, I have established strong collaborative research partnerships and successfully led several funded research programs. Selected ongoing and past projects are highlighted below:

- **FAA - Complex Systems** (2015 - 2017). Working with MIT, NDU and Certification Services Inc., this project is exploring the issues related to modern complex systems, and technologies ad development strategies that can reduce system development risks.
- **NASA - AFFIRM** (2013 - 2017). Partnering with Galois Inc., this program explored the application of Domain Specific Language (DSL) and related syntheses technologies to analyze and implement provably correct distributed systems.
- **NASA - CERTWARE** (2013 - 2016). Partnering with Kestrel Technology, this program is developing an eclipse based certification workbench, integrating safety and assurance case notations, natural language with formal assurance case reasoning.
- **NASA - AFCS** (2013). Partnering with SRI and WWTechnology, this research program targeted the application of formal architectural modeling and formal methods to distributed fault-tolerant architectures.
- **FAA - Checksum and CRC Section Criteria** (2013). This research worked to identify aviation best practices for the Selection of Cyclic Redundancy Code and Checksum Algorithms to Ensure Critical Data Integrity This work was subsequently referenced in the .Advisory Circular 66
- **FAA - Data Bus Handbook** (2009). The research developed the FAA Handbook for Data Bus Evaluation. The Research team comprised Honeywell, Carnegie Mellon University and Certification Services Inc.

Proven Record of Technology Development Leadership

- **Integrated Model-Based System, Safety And Requirements**
  - For the past year, I have been pioneering the application of constrained natural language requirements specification to Honeywell system development. This work has adopted and extended the Easy Approach to Requirements Syntax (EARS), to support natural language based system specifications, whilst providing automation in the form of consistency checking and automatic test generation.
  - A second area of focus is the Integration of model-based system engineering activities across heterogeneous tooling and modeling technologies. In this area, we are exploring model integration technologies, such as ModelBus, OSLC, FMI to support the

integration and integrated analysis and behavioral evaluation of mixed technology workflows targeting AADL/SysML Simulink, Modelica and VHDL-AMS integration strategies.
    - In 2016 I Worked with our research partners to develop a formal methods training program, which is now available on the Honeywell learning Hub.
- **TTEthernet Development** (2005 - 2010). I led the Honeywell team in the joint Honeywell and TTTech development of TTEthernet (SAE-AS802). The project developed and matured the technology from conception through TRL-6. This was one of the first Honeywell projects to apply 'in-line formal methods' to an active development. Following the selection TT-GbE as the by-wire backbone for the NASA Orion program, I championed and led the development of the Network Integration Lab (NIL) facility. This facility utilized COTS hardware to emulate the full complement of Orion networked equipment. Incorporating provisions for extensive monitoring and fault injection hardware, the facility was used to formally retire the network technology risks on the Orion program. To date, no issues have been found within TTEhernet Switch nor End-System IP cores. Given that these designs were among the largest and most complex designs developed within Honeywell, this is testament to the mitigation approach and the design/verification teams.
- **Other Developments include**
    - A Minimalist TTP-HUB (DO254)
    - Low-cost FlexRay Dependability Augmentation and Gateway
    - A Low-complexity Partitioned Barrel Processor
    - The Braided Ring Availability Integrity Network (BRAIN).

2000 - 2001

Master Software Engineer @ Hamilton Sunstrand

Generic duties included the development of aircraft utility control software for the HS -SPDA secondary power distribution cabinet architecture. SW developed in accordance with DO178B, utilizing the Shlaer/Mellor development methodology. Target platform was a MPC750 processor using DiabData C and a proprietary time and space partitioned OS.

Significant Projects and Innovations

- Championed and led a pilot study to use COTS tools (MATLAB, Beacon-for-Simulink, DOORS) with in-house scripts for the automatic code generation of avionics utility control software demonstrating significant productivity gain.
- Developed SPDA integration and network scheduling tooling in python
- Developed Windows based bench utilities to support early prototype system checkout
- Worked with United Technology Research Center (UTRC) to develop influential internal white paper detailing the application of TTP to secondary power distribution architectures. Subsequently, after I had left and returned to Honeywell, the Boeing 787 Power Distribution Architecture was based on TTP.

1998 - 2000

Principal Software Engineer @ Honeywell Engines

Generic responsibilities included the design and development of embedded

C++ APU Engine Control Software to DO178B. Development tools include Microtec/Diab C++ under UNIX/NT and Rational Rose UML. Platforms include single and dual6833x, MPC509, using in house simple schedulers and COTS RTOS (VRTX). CVS and Clear Case used for configuration management.

Significant Projects and Innovations

- **Modular Aerospace Control (MAC).** I Tucson's Modular Aerospace Control (MAC) a modular FADEC architecture based upon a TTP/C based fault-tolerant backbone. MAC was awarded research funding from NASA and has been successful in winning significant new business for the Tucson site
- **Honeywell Data Monitor (HDM).** I led the development of a Windows based tool for target based software monitoring and qualification testing. HDM comprised a win32 (Microsoft Visual C++, MFC, COM) based automation server hosting the script language Python. The tool was successfully deployed (100+ users) to support AS900 engine (D0-178B) certification. The tool is still in use 17 years later.

I left Tucson to mitigate VISA uncertainty related to a pending GE merger.

1995 -1998

Senior Engineer @ Motorola Design Center

Responsibilities included the strategic planning of test methods and the design of test platforms for new products (automotive power-train ECUs) under development in the department. The work included the design of ATP and environmental stress screening (ESS) systems, in C, C++ and Assembler (68xxxx). Test hardware included ISA, GPIB and VXI instrumentation; the software platforms in use were Microtec, Borland 4.5, Lab-Windows CVI, SourceSafe (for CM).

Significant Projects and Innovations

- I developed new modular test development SW architecture that reduced test set development time by 8X.
- I developed Environmental Stress Screening (ESS) software techniques that enabled largely autonomous ESS execution.
- I pioneered innovative Background Debug Mode (BDM) test strategies which enabled digital component test coverage to be gained on analog in-circuit test systems. Following the successful deployment at our local facility, I led the deployment of the technology partner production facilties in Europe (Italy, France).

1993 - 1995

Test Development Engineer @ Motorola AIEG

Responsibilities included the design and continuous improvement of test systems for an ISDN PC based video conferencing system. Test systems developed included PC GPIB, and VXI based functional and parametric quality audit systems. Tests implemented to meet BABT manufacturing approval. Activities also included the proving and validation of test equipment; specifying GR&R campaigns and the training of production line and analysis personnel.

1991 - 1993

Test Engineer @ British Aerospace Dynamics

This position incorporated both design and post design support roles. The main responsibilities comprised the design and development of automatic test system software working in C and Pascal on both DOS VxWorks, using GPIB and VXI instrumentation. Post design support of Z80/6502 assembler.

Education

1993 - 1997

University of Hertfordshire

Computer Science, PGDip

1988 - 1991

University of Reading

Electronic Engineering, Bachelor of Enginering, (2:1 Hons)

2013 -2014

Honeywell Leadership Development Program

I was very fortunate to be selected for the Honeywell Leadership Development Program. Attendance is merit-based and very limited.

2014

SCRUM Master Certification

Awards And Recognition

2002 - 2017

Patents & Publications

I have been awarded over 45 patents to date.

I have published over 30 papers and two book chapters. For details and citation counts, please visit my Google scholar page

2010

NASA Space Flight Award

I am very proud of this award from NASA. It was awarded to the development team, for the development and maturation of the TTEThernet (TTGbe) technology and its deployment on the Orion Manned Space Program.

2010

Technical Achievement Award (Aerospace Wide)

For work relating to the development and standardization of Time-Triggered Ethernet (SAE AS6802).

2008 & 2010

Honeywell Outstanding Engineer

This is a peer nominated award that is awarded to less than 1% of the Honeywell population. I was fortunate to be nominated twice; once in 2008

and again in 2010.

2003

Technical Achievement Award

For work relating to the MAC FACEC and TTP Guardian Implementation

1989 & 1991

Apprentice Award Winner

I was awarded Apprentice of the Year as a Technician and an Undergraduate.

Skills

Development

Programming Languages	C, C++, Python, Prolog, JavaScript, ADA, VHDL, VHDL-AMS
Cerification and Design Assurace Processes	ARP-4754A, ARP-4761, STPA, ARP-5107A, DO-178C, DO-331, DO-333, DO-254
Modeling Languages and Formal Methods	AADL, SysML, BPMN, OCRA, SAL
Tools & Integration Technologies	SCADE Suite, SCADE Architect, Enterprise Architect, Paypyrus, ModelBus, OSLC
Web Technologies	HTML5, CSS, Bootstrap

Service

Memberships	Member of INCOSE, IEEE and SAE
Committees	Actve memner of SAE AS-2C (AADL) and AS-2D (TTEhernet) committees
Community	I have been a First Lego League coach for a number of years

Hobbies

3D printing and robotics , Music , Bicycling , Swimming