Bryan C. Turner

Principal Software Engineer

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SHORT BIO

Bryan has a rare expertise in **consensus protocols** for fault-tolerant distributed systems, the core skill needed to implement **enterprise-grade cloud services** with five-nines availability and strong consistency. He authored a survey article on this topic which became Wikipedia's entry on the Paxos Consensus Protocol *[see publications]*. His tireless pursuit of software innovation has generated **40 patents**, and more than 30 in process.

- **Technical skills** – Broad range of professional projects including embedded systems, OS internals, AI models, cloud architecture, native + web GUI programming, full-stack development, database design + query optimization, protocol optimization, US patents, as well as subject matter expert in M&A diligence

- **Leadership skills** – Project lead for small teams, intern mentorship, org-wide educational presentations, executive demos, technical sales support for on-site pitches

- **Computer Science** – At home reading academic literature, technical liaison with academia, translating math into code, research/analysis/design of algorithms or protocols, functional programming

With close to 20 years' experience in **functional languages**, Bryan is leading the next generation of software development. He envisions a future of **compositional microservices**, on-demand scalability, deeply integrated security, and continuous fault-tolerance to meet the demanding, high-volume service infrastructure of tomorrow.

Bryan has also tackled the complete chain of **consumer product development** for his entrepreneurial businesses. From graphic design in **Adobe Illustrator**, modeling of new parts in 3D **CAD** (Computer Aided Design), programming metal-cutting strategies with **CAM** (Computer Aided Manufacturing), as well as machining the exotic metal parts on his **CNC** (Computer Numeric Control) mill, including integration with a **6-axis robotic arm** for part feed.

PROFESSIONAL WORK

Senior Software Engineer 2023-Present
Lucem Health

- Apply AI models in a healthcare setting. Worked to integrate new AI models into the Lucem architecture.
- Participated in the design of Lucem's next major product category, including ideation, mockups, and prototyping.
- Advanced the nascent pulmonary model product to include 3D rendering and verifiable repeatability.

Principal Software Engineer 2018-2023
Bandwidth Inc. R&D

- Principal developer and team lead for R&D department for enterprise grade CPaaS services
- Participated in the design of innovative cloud-native SMS delivery infrastructure, leading to a new primary company revenue stream within two years
- Implemented a deep learning AI model for voice quality improvement
- Executive presentations of R&D prototypes and implementation strategies
- Domain-Specific Language (DSL) design, including parser, compiler, optimizer, and interpreter
- Scalable, distributed, fault-tolerant transaction processing engine for hosting multi-tenant services

Software Engineer 2011-2018

Cisco Systems, SPNS : Service Provider Network Systems / IOS-XR

- Next-Gen Core Router OS Development
- Fault-Tolerant Server Architectures;
  - FT-TCP, FT-SSH, DDoS-mitigation
- US Patents; 40 issued, 37 pre-grant
- Cisco Media Solutions Group, Technical Reviewer
- MIT Media Lab, Technical Liaison
- Cisco Research Center, Technical Reviewer

Software Engineer 2008-2011

Cisco Systems, GGSG : Global Gov. Services Group

- Multi-Master Paxos Protocol
- Designed Language and Compiler for Fault-Tolerant Software
- Multi-Master Database with Parallel/Concurrent Updates
- Mesh-Network Robotics Control System
- Advanced Services Support (GGSG/AS)

Software Engineer 2001-2008

Cisco Systems, Technology Center

- Distributed OLTP Applications Platform
- Semantic Search Engine
- Bayesian Recommendation Engine
- P2P Video Streaming
- P2P Services Platform
- P2P File System
- VoIP (Voice over IP) Embedded Phone GUI

Associate Systems Developer 1998-2000

SAS Institute

- Designed a flexible element layout system for Multi-Dimensional DB display and exploration
- Implemented user interaction GUI for document editing similar to PowerPoint
- Achieved near-perfect report reproduction in HTML and RTF formats
- Implemented core technologies for new MFC-based reporting application
- Developed unique DLL for Windows 95/98 providing Unicode support for any application
- Re-implemented product architecture to eliminate race conditions

Part-Time Cooperative Education Programmer 1997

Peracom Corp.

- Designed and implemented a Universal Serial Bus test suite and monitor application
- Contributed to the design of value-add software for new USB products in development
- Intel assembly for new USB product device driver

Cooperative Education Programmer 1995-1996
Alphatronix

- Succeeded in customer site-repair of software in Leeds, England and Charlotte, NC
- Reverse-engineered proprietary protocols over Ethernet
- Improved an image conversion system and archival database
- Designed new GUI for improved customer productivity and satisfaction
- Optimized image processing algorithms
- Automatic database analysis/repair utility

ENTREPRENEURSHIP

CAD / CAM / CNC Programmer + Machinist 2016-Present
Grave Raven

- Product design, development, manufacturing, and packaging
- Quality control and process control
- Materials sourcing, cost modeling
- Marketing: organic social media engagement & paid media advertising
- Website design, sales funnel optimization, SEO
- Machinist, 4-axis CNC milling, 6-axis robotic arm integration, and EOAT design for part gripping

EDUCATION

North Carolina State University, College of Engineering (Raleigh, NC) - *Cum Laude* 1998
Bachelor of Science in Computer Science, minor in Business Management

US PATENTS, 40 Issued

Selected Examples:

8,819,653 - Automated improvement of executable applications
8,437,281 - Distributed real-time data mixing for conferencing
8,301,897 - Challenge-based authentication protocol
8,271,687 - Streaming network coding
8,051,170 - Distributed computing with determined capacity requirements
7,752,311 - Gracefully changing a node in a distributed computing network
7,739,390 - Achieving optimal transfer times in a peer-to-peer network
7,694,335 - Preventing server attacks with computational challenge in handshake
7,562,125 - Placement of distributed objects based on physical communication costs
7,552,464 - Techniques for presenting network identities at a human interface
7,457,835 - Optimizing distributed database latency by moving data
7,440,971 - Pre-caching content at remote client
7,023,989 - Application delivery to VoIP telephony device

PUBLICATIONS

Publications, Professional

· *Bandwidth R&D DeepRacer 2021 Season Recap*
https://www.bandwidth.com/blog/bandwidth-rd-aws-deepracer-2021-season-recap/

· *How to Become a Software Engineer*
https://www.howtobecome.com/how-to-become-a-software-engineer-2

· *Real-Time 3D Terrain Rendering — GameInstitute.com course, textbook, and live online classes*
https://web.archive.org/web/20011127130703/http://www.gameinstitute.com:80/gi/courses/coursedescription.asp?courseID=7

· *Real-Time 3D Landscape Rendering*
https://web.archive.org/web/20160626154527/http://www.gamasutra.com/view/feature/3188/realtime_dynamic_level_of_detail_.php

Publications, Non-Professional

· *Paxos Family of Consensus Algorithms*
Current Revision:
Paxos (computer science) in *Wikipedia, The Free Encyclopedia*
http://en.wikipedia.org/wiki/Paxos_(computer_science)
Turner, Bryan. Primary contributor: 18:11, 19 October 2007.
Original Work:
http://www.fractalscape.org/2007/10/01/paxos-family.html

· *State Machine Approach '08*
Current Revision:
State Machine Replication in *Wikipedia, The Free Encyclopedia*
http://en.wikipedia.org/wiki/State_machine_replication
Turner, Bryan. Primary contributor: 20:06, 13 March 2008.
Original Work:
http://www.fractalscape.org/2008/02/01/state-machine-approach.html

· *Efficient Byzantine k-Anonymous Broadcast*
http://www.fractalscape.org/2006/08/01/efficient-byzantine-k-anonymous-broadcast.html

· *Byzantine k-Anonymous Broadcast in $O(Nf^2)$ Messages*
http://www.fractalscape.org/2006/08/15/byzantine-k-anonymous-onf2.html