

# Curriculum Vitae

## Robert W. Horst, Ph.D.

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### Expertise

- Computer design and architecture
  - Fault tolerant computing
  - CPU, cache and memory design
  - I/O and storage subsystems
  - High speed networks
  - Performance evaluation
  - Hardware testing
  - Patents and intellectual property
  - Robotics and motor control
  - Power electronics
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### Professional Summary

From: 2018 University of Illinois at Urbana-Champaign

To: Present

Position: Adjunct Research Professor

- Department of Electrical and Computer Engineering
- Participate in research projects

From: 2001 HT Consulting

To: Present San Jose, CA

Position: Independent consultant

- Worked with startups, VC firms, established companies and law firms on architectural definition of new products, design reviews, technical due diligence on potential investments, identification and protection of intellectual property and litigation support.
- Testified as an expert witness in patent and technology litigation.

From: 2013 AlterG

To: 2015 Fremont, CA

Position: Chief Technology Officer, Robotics

- Continued the development of the AlterG Bionic Leg after Tibion was acquired by AlterG in April, 2013.
- Designed power systems, control electronics, and embedded firmware of AlterG Anti-Gravity treadmills.

From: 2001 Tibion Corporation

To: 2013 Sunnyvale, CA

Position: Founder / VP of R&D / CTO

- Inventor of the Tibion Bionic Leg, the first wearable robotic device for assistance and rehabilitation of those with impaired mobility.

## Curriculum Vitae

- Developed electronics, control algorithms, software and mechanics from conception through production of 100+ units.
- Formulated and executed IP strategy.

From: 2002 Network Appliance, Inc.  
To: 2003 Sunnyvale, CA  
Position: Technical Director

- Investigated processor and interconnect options for future generations of network-attached storage subsystems.
- Represented Network Appliance in the PCI Express Advanced Switching working group.

From: 1999 3ware, Inc.  
To: 2001 Mountain View, CA  
Position: Vice President, Research & Technology

- Initiated and lead a project that resulted in industry's first Ethernet Storage Area Network storage subsystem. Enhanced the company's patent position with 10 new patent applications.
- Developed a novel disk mirroring architecture and helped the company to grow from 15 to over 100 people. Participated in fund raising activities and prototype development.

From: 1980 Tandem Computers / Compaq Computers  
To: 1999 Cupertino, CA  
Position: Technical Director

- Created new fault-tolerant system architectures and designed several generations of fault-tolerant mainframes used in banking, stock exchanges, and commerce.
- Co-founded Tandem Labs. Initiated internal projects and started several joint research projects with universities.
- Lead the architecture of the ServerNet System Area Network. Wrote technical papers and made numerous presentations to technical audiences and customers.
- Conceived of the architecture and lead the design of the NonStop Cyclone superscalar processor. Filed applications resulting in the industry's first superscalar patents.
- Lead the development of the NonStop TXP fault-tolerant CPU.

From: 1976 Hewlett-Packard Co.  
To: 1980 Cupertino, CA  
Position: Development Engineer

- Designed the micro-sequencer and cache of the HP3000 Series 64 processor.
- Designed a test system using scan and signature analysis.

# Curriculum Vitae

## Litigation Support Experience

Served as a testifying and consulting expert witness on patent cases related to systems, processors and storage. Served as a consulting expert on class-action and defective product cases. Further details furnished on request.

## Patents

#	PAT. NO.	TITLE
82	9,893,604	Circuit with low DC bias storage capacitors for high density power conversion
81	9,889,058	Orthotic device drive system and method
80	9,474,673	Methods and devices for deep vein thrombosis prevention
79	9,131,873	Foot pad device and method of obtaining weight data
78	8,679,040	Intention-based therapy device and method
77	8,639,455	Foot pad device and method of obtaining weight data
76	8,353,854	Methods and devices for moving a body joint
75	8,274,244	Actuator system and method for extending a joint
74	8,058,823	Actuator system with a multi-motor assembly for extending and flexing a joint
73	7,811,189	Deflector Assembly
72	7,648,436	Rotary Actuator
71	7,537,573	Active muscle assistance device and method
70	7,521,836	Electrostatic actuator with fault tolerant electrode structure
69	7,484,038	Method and apparatus to manage storage devices
68	7,468,982	Method and apparatus for cluster interconnection using multi-port nodes and multiple routing fabrics
67	7,365,463	High torque motor
66	7,239,065	Electrostatic actuator with fault tolerant electrode structure
65	6,966,882	Active muscle assistance device and method
64	6,950,428	System and method for configuring adaptive sets of links between routers in a system area network (SAN)
63	6,924,780	Spatial display of disk drive activity data
62	6,775,794	Use of activity bins to increase the performance of disk arrays
61	6,753,878	Parallel pipelined merge engines
60	6,751,757	Disk drive data protection using clusters containing error detection sectors
59	6,650,533	Pluggable drive carrier assembly
58	6,646,984	Network topology with asymmetric fabrics
57	6,631,131	Transpose table biased arbitration scheme
56	6,591,339	Methods and systems for selecting block sizes for use with disk arrays
55	6,591,338	Methods and systems for mirrored disk arrays
54	6,567,892	Use of activity bins to increase the performance of disk arrays

## Curriculum Vitae

- 53 6,549,977 Use of deferred write completion interrupts to increase the performance of disk operations
- 52 6,516,032 First-order difference compression for interleaved image data in a high-speed image compositor
- 51 6,496,940 Multiple processor system with standby sparing
- 50 6,487,633 Methods and systems for accessing disks using forward and reverse seeks
- 49 6,484,235 Methods and systems for dynamically distributing disk array data accesses
- 48 6,424,655 Transpose table-biased arbitration
- 47 6,424,523 Pluggable drive carrier assembly
- 46 6,266,765 Computer architecture capable of execution of general purpose multiple instructions
- 45 6,233,702 Self-checked, lock step processor pairs
- 44 6,157,967 Method of data communication flow control in a data processing system using busy/ready commands
- 43 6,092,177 Computer architecture capable of execution of general purpose multiple instructions
- 42 6,009,506 Computer architecture capable of concurrent issuance and execution of general purpose multiple instructions
- 41 5,964,835 Storage access validation to data messages using partial storage address data indexed entries containing permissible address range validation for message source
- 40 5,930,275 Clock error detection circuit
- 39 5,918,032 Computer architecture capable of concurrent issuance and execution of general purpose multiple instructions
- 38 5,914,953 Network message routing using routing table information and supplemental enable information for deadlock prevention
- 37 5,890,003 Interrupts between asynchronously operating CPUs in fault tolerant computer system
- 36 5,867,501 Encoding for communicating data and commands
- 35 5,838,894 Logical, fail-functional, dual central processor units formed from three processor units
- 34 5,765,007 Microinstruction sequencer having multiple control stores for loading different rank registers in parallel
- 33 5,758,113 Refresh control for dynamic memory in multiple processor system
- 32 5,752,064 Computer architecture capable of concurrent issuance and execution of general purpose multiple instructions
- 31 5,751,932 Fail-fast, fail-functional, fault-tolerant multiprocessor system
- 30 5,742,135 System for maintaining polarity synchronization during AMI data transfer
- 29 5,710,549 Routing arbitration for shared resources
- 28 5,694,121 Latency reduction and routing arbitration for network message routers
- 27 5,675,579 Method for verifying responses to messages using a barrier message

## Curriculum Vitae

26	5,628,024	Computer architecture capable of concurrent issuance and execution of general purpose multiple instructions
25	5,574,941	Computer architecture capable of concurrent issuance and execution of general purpose multiple instruction
24	5,574,933	Task flow computer architecture
23	5,404,550	Method and apparatus for executing tasks by following a linked list of memory packets
22	5,390,355	Computer architecture capable of concurrent issuance and execution of general purpose multiple instructions
21	5,384,906	Method and apparatus for synchronizing a plurality of processors
20	5,353,436	Method and apparatus for synchronizing a plurality of processors
19	5,329,629	Apparatus and method for reading, writing, and refreshing memory with direct virtual or physical access
18	5,317,726	Multiple-processor computer system with asynchronous execution of identical code streams
17	5,287,472	Memory system using linear array wafer scale integration architecture
16	5,239,641	Method and apparatus for synchronizing a plurality of processors
15	5,203,005	Cell structure for linear array wafer scale integration architecture with capability to open boundary I/O bus without neighbor acknowledgement
14	5,193,175	Fault-tolerant computer with three independently clocked processors asynchronously executing identical code that are synchronized upon each voted access to two memory modules
13	5,146,589	Refresh control for dynamic memory in multiple processor system
12	5,075,844	Paired instruction processor precise exception handling mechanism
11	5,072,364	Method and apparatus for recovering from an incorrect branch prediction in a processor that executes a family of instructions in parallel
10	5,034,964	N:1 time-voltage matrix encoded I/O transmission system
9	5,016,208	Deferred comparison multiplier checker
8	4,872,109	Enhanced CPU return address stack
7	4,823,252	Overlapped control store
6	4,800,486	Multiple data patch CPU architecture
5	4,754,396	Overlapped control store
4	4,636,943	Enhanced CPU microbranching architecture
3	4,618,956	Method of operating enhanced alu test hardware
2	4,574,344	Entry control store for enhanced CPU pipeline performance
1	4,571,673	Enhanced CPU microbranching architecture

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