CURRICULUM VITAE

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SKILL SET SUMMARY

The skill set below represents a well-focussed primary collection of capabilities directed towards embedded and PC software, combined with extensive secondary expertise encompassing a wider range of engineering disciplines and management.

Primary skills

- Linux kernel and embedded platform
- Embedded software in C on microcontrollers (C167, 8051, H8, etc.) and other processors (ARM, SH4, MIPS, etc), using a variety of different real-time operating system environments (including VxWorks and Linux)
- Web technologies, including REST and web GUIs
- Graphical user interface and PC software using Visual C++, Visual Basic and C# on Windows
- Communications handling and protocols
- Security and encryption, including secure boot
- Control of electro-mechanical systems
- Operating system and driver software (Linux, etc. and State-Event Executive*)
- Unix / Linux – configuration and use (PC and embedded)
- Cross-platform GUI software development (Windows/Unix/Macintosh)
- System design and team leadership
- Structured documentation
- Software testing using test harnesses

Secondary skills

- Digital electronic hardware design and development (processor clocks up to 20MHz)
- Conceptual design of mechanical systems
- Database manipulation using SQL and other database tools
- Configuration of PC's and networks
- Scripting using Python, Perl, JavaScript, Bash (shell scripting)
- Java, including Swing, RMI and JNI
- Digital signal processing
- Software under OS/2
- German language (spoken and written)
- Web site design, including server side scripting
- Server configuration and maintenance – Windows and Linux
- General business management including accountancy and marketing

** The State-Event Executive, written by myself and improved over a number of projects, is made available free-of-charge to any project on which I am engaged. It is a very small real-time kernel which excels in the power of its simplicity, and the way in which it encourages rigorous design.*

PROFESSIONAL EXPERIENCE

1989-2022 Freelance, as BPRJ Product Devolpment (formerly Barnabas Projects) Limited, Bristol.

Barnabas Projects (BPRJ) has been running its own Linux system (originally Redhat, then SuSE, now Ubuntu) since 1998. Significant experience has been gained in all areas of server and desktop administration (including integration with Cygwin under Windows). This experience has been used in all projects below where administration of a Linux has been needed.

Femtocell Linux platform and other software for Node-H, Munich – Oct. 2011 ongoing
Node-H supply software for 3G, LTE and 5G femtocells. These are short range 3G/LTE/5G basestations, which connect to the mobile telcoms provider via broadband Internet.

- Secure bootloader design/development (from scratch), bare metal and EFI.
- Secure signing equipment design/development, using perl/catalyst web GUI.
- SHA1 / SHA2 / RSA digital signature processing software.
- NTP/PTP timing synchronisation using robust statistical analysis
- IPSEC: kernel drivers and StrongSwan
- Internal database system using Redis
- REST API via Lighttpd uisng the SGCI protocol
- 3GPP protocol stack implementation
- Porting the system to different platforms (Broadcom, Qualcomm)
- Build and software delivery system, including Yocto
- Configuration management using Subversion.

Femtocell Linux platform software for Ubiquisys, Swindon – Jun. 2007 – Sep. 2011
Ubiquisys make 3G and LTE femtocells. These are short range 3G/LTE basestations for domestic use, which connect to the mobile telcoms provider via broadband Internet.

- Linux device driver development on ARM 926 and MIPS 24KC processors.
- Enhancements to U-Boot boot loader.
- Development of custom high-security bootloader from scratch.
- Enhancements to Busybox utility suite.
- SHA1 / SHA2 / RSA digital signature processing software.
- Openssl 'C' API and writing of back-ends ('engines')
- Embedded software licensing system using network-based USB smartcard tokens
- IPSec encryption acceleration using AES and 3DES
- TPM and security for Intel platforms
- Bash/ash shell and Perl scripting (including web server CGI scripting in Perl)
- Interprocessor communications using XML-RPC (C, C++ and C#)
- Development of hierarchical makefile system.
- Xen virtualisation server configuration.
- Linux server configuration using Webmin.
- Apache web server configuration.
- Tiny portable Linux server system running as a virtual machine under Windows

Set-Top Box Driver Development for ST Microelectronics, Bristol – Feb. 2005 – Jun. 2007
There were several projects involved here, including: a Sky+ digital video recorder with quad tuner and dual-TV outputs; an NDS Common Device Interface (CDI)-compliant driver subsystem on Linux; an MPEG2/ATSC/H264 HD digital video recorder for Echostar; a WMDRM vaiant of this.

- Development/debug on GNU toolset (for ST20 and ST40/SH4 processors): C and debug at assembler and hardware register level.
- OS20 and OS21 real-time operating systems.
- Analysis of DVB transport and elementary streams (TS and PES), plus MPEG2 and H.264 (MPEG4) decoding of video and audio.
- Writing device drivers for Linux
- Stream processing and encryption for Windows Media DRM.
- Evaluation of Coverity as a tool for improving quality.
- Configuration management using Clearcase, CVS and Subversion.

JTAG Emulator Software Enhancements for ARM, Blackburn – Nov. 2003 – Feb. 2005
ARM's emulator supports ARM devices, and as a special enhancement, this project involved adding support for the Motorola Starcore DSP and Nexus trace. An additional project involved adding GDB protocol support for the emulator, along with virtual Ethernet over the ARM Debug Communications Channel plus corresponding Linux driver support.

- Development environment: Linux using KDE and KDevelop, etc. (Mandrake and Redhat Linux), Eclipse, and also Microsoft Visual C++ on Windows
- Target environment (on the emulator): embedded Linux (using an ARM processor)
- Languages used: mostly C++ (using STL), some C, some python for utilities
- Special cross-platform libraries: ZThread and STLPort
- Test environment/tool: CxxTest (a C++ derivation/extension of JUnit)
- GDB stub and protocol handler for ARM7, ARM9 and ARM11
- ARM assembler (for context switching in GDB stub)
- Starcore assembler
- Linux and U-boot: TTY, Ethernet, console and KGDB device drivers
- Linux Kernel configuration, debugging, etc.
- IP packet handling and routing
- Eclipse as a front end for GDB
- Version control: CVS

Cross-Platform PostScript Integrated Development Environment (Open Source) – May 2003 – Nov. 2003
The project is hosted on SourceForge.net under wxGhostscript, which incorporates IdePS (the IDE). The IDE allows development and debugging of PostScript programs on Windows, Unix/Linux and Macintosh. It uses the wxWindows cross-platform C++ library, and integrates with Ghostscript as its processing engine.

- Conceptual design and full implementation
- GUI design using wxDesigner for wxWindows
- Implemented to allow full internationalisation/localisation
- Windows implementation using Visual C++
- Unix implementation on Linux/Gtk using gcc
- Macintosh implementation using CodeWarrior on Classic/Carbon
- IDE uses the Scintilla editing component
- Debugger implemented in PostScript

Production Test System for Motion Media, Bristol – Sep. 2001 – May 2003
The test system was designed to functionally test printed circuit boards, sub-assemblies and full products as rapidly as possible with the minimum of operator intervention. Motion Media make videophones, and the product under test was a sophisticated TCP/IP-based unit.

- Specification and system design of the test equipment hardware.
- Interfaces for test included video (PAL/NTSC S-VHS and composite), audio, RS232, IrDA, USB, Ethernet, CCIR-656 digital camera, LVDS PanelLink, I²C, Dallas 1-wire, JTAG, SmartMedia, RS422.
- Test equipment used National Instruments and other specialist interface boards connecting to bed-of-nails and other fixtures.
- A target diagnostic command interpreter in C implemented a telnet-like socket server.
- Target system used a PowerPC microcontroller running VxWorks, with Tornado on Windows 2000 as its development system, and MS-SourceSafe for version control
- Test software was written in Visual Basic using a Microsoft SQL database
- Test software included digital signal processing using the Intel DSP library
- Bar code equipment was used to identify the units under test into the database.

UMTS Test Mobile System for Motorola, Swindon – Dec. 2000 – Sep. 2001
This project involved adding a scripting system to an existing protocol stack to enable system test engineers to fully test the base stations and network by controlling the behaviour of the mobile equipment.

- Integration of a JavaScript interpreter into the target system using C.
- Evaluation and implementation of PersonalJava as an alternative to JavaScript.
- Design and coding of Java programs using Swing, sockets, JNI and other major Java technologies.
- Target system used PowerPC603 running VxWorks, with Tornado as its development system
- The Java tests scripting system was ported to embedded (Bluecat) Linux on the PowerPC. This included the configuration of a SuSE Linux development server and the porting of Linux to a Motorola SBC (and some tests on USB).
- Development systems were Unix (Solaris) and PC-based with CVS for version control.

Product Fulfilment Consultant for MouseGreetings.com, Bath – Jun. 2000 – Nov. 2000
The project required taking order and customisation data downloaded from the company web server, loading into a management control system, and generating print run data.
- Evaluation of available systems and recommendation of technical solutions
- Design and coding of special page formatting routines in PostScript
- Outline design of a fulfilment and financial control system using Great Plains Dynamics
- Set up and maintenance of NT and Linux servers, including Samba, DHCP, WINS, DNS, CVS, etc.

Set-top box with Internet access for Sony at IPL, Bath – Apr. 2000 – Jun. 2000
The set-top box was customised for the Canal+ satellite TV network.
- Software testing using IPL's own 'Cantata' test and metrics tool
- Software development performed on Sun Unix and Redhat Linux host environments
- Target system used the pSOS real-time operating system on Motorola and Sparc 32-bit processors
- Software graphics manipulation (GIF, PNG, JPEG, etc.)
- Version control using CVS

Radio-based Traffic Information Systems for Trafficmaster, Milton Keynes – Dec. 98 – Apr. 2000
Two projects were performed here: a software upgrade for the 'YQ' real time traffic display product to cover UK trunk roads, plus new software for data broadcast over Vodafone Paging; and a system consisting of a network of radio beacons which transmit traffic information to passing vehicles, controlled and monitored from a central location. These receive their information via GSM cell broadcast, and are controlled remotely using GSM SMS messaging.
- Embedded software in C on an H8/3000 and Atmel AT103.
- Development of embedded control and user-interface software under Visual C++ with graphically simulated user-interface.
- Used an upgraded version of the State-Event Executive (from other projects below)
- Data transmission software (multithreaded) and graphical user interface on Windows NT, using Visual C++, MFC and OLE DB templates.
- Communications using RS232, DCOM and straight TCP/IP. Also data communication over GSM.
- Mapping utilities in Visual Basic.
- Simulation and test harness facility using the Python scripting language
- Back-end SQL Server 7.0 database, using queries written in SQL and Access 2000.
- Server and network configuration, also ISDN dial-up router configuration (Cisco).
- Technical team leader for the software part of the radio beacon project
- Version control using Microsoft SourceSafe

Consultant and Project Leader for Westinghouse Brakes, Chippenham. Aug. 97 – Nov. 98.
Electric Door Actuator Mark II: a re-development of the previous product with additional monitoring and communications facilities.
- Software-based closed loop motor control (a form of digital signal processing)
- Software in C on the Siemens C167
- Communications using CAN bus and RS485

- Re-development of the State-Event Executive (mentioned below)
- Diagnostics software on Windows NT/95 using C++ Builder and Visual C++
- Fault tracking database on Microsoft Access
- Project management and team leadership

Automatic Fare Collection Systems for Thorn Transit Systems, Wells. – Dec 93 – Jul 97.
Here there was involvement in a number of different projects, including a note-accepting ticket vending machine and a host computer system for the Kowloon-Canton Railway in Hong Kong, a ticketing system for Hong Kong Airport Express, the system for the Turkish underground railway in Ankara consisting of ticket machines, turnstiles, supervisory PC's and a central database computer.

- Real-time control of complex high-speed mechanisms, including a coin-handling system.
- Electronic design and development of 8051-based control boards, and embedded PC-based systems.
- Embedded software in PL/M, C and assembler on 8051's with a state-event executive, and in C on embedded PC's with DOS. Also assembler on a PIC16C54.
- Desktop software in C, C++ and Visual Basic under DOS, OS/2 with Presentation Manager, Windows 3.1 (using Visual C++ and MFC) and SCO Unix with Ingres.
- Automatic test system software in C and Visual Basic (for the user interface).
- RS485 communications protocols.
- Design of proportional fonts and associated display software, with Roman and Chinese characters, based on rectangular pixels.
- A small terminate-and-stray-resident (TSR) program for DOS
- Human-machine interface design including graphical layout and control logic.
- Structured design documentation (a variation on Yourdon) and the writing of user/maintenance manuals
- On-site work, liaising and working with the end client in Hong Kong and Turkey.

Various Small Freelance Projects for Different Customers. – May 91 – Dec 97.
A wide variety of different projects were done during this time, some sequentially and some concurrently with other projects. These projects include:

- A feasibility study for a nitrate blending system using SCAN1000 (a standard SCADA system) and Basic.
- Prototype hardware design of various motion mechanisms and writing of patent specifications.
- Stepper motor control software in C on the 80186.
- Hardware design of an interface to a whiteboard scanner using a PAL and a FIFO buffer.
- Training on various software systems including Borland C/C++, ObjectWindows, Zapp (portable GUI library), ObjectVision, Crystal Reports, Multimedia Toolbook and Animation Works Interactive.
- Computer animation and directing of professionally-made promotional video.
- Prototype pen-based communicator using MS-Windows for Pen, Visual Basic and a CT2 mobile phone with fax/modem.
- Formal verification of modifications to control software for an irradiated fuel cell and fuelling machine at Nuclear Electric's Heysham II power station.
- Prototype dodgem using patented mechanism that comprised an energy transfer system to move kinetic energy from a flywheel to the vehicle and back again, thus delivering a high dynamic performance while only needing a small motor to keep the system topped up with energy.
- A user interface to a telex system written in Visual Basic, using an Access database and Crystal Reports.
- Microsoft FrontPage 98, Interdev, Active Server Pages (Visual Basic Scripting), SQL.

Consultant and Project Leader for Westinghouse Brakes, Chippenham. Oct. 89-May 91
My company at the time, Barnabas Projects Limited, was taken on to do the 'Electric Door Actuator' for controlling entry onto trains train, using a brushless DC motor, deriving position feedback from

the motor's commutation Hall effect devices. At the time the company employed myself, plus an analogue hardware engineer and a software engineer on the project.

- Feasibility study leading to requirements and design specifications
- Project planning and management
- Digital circuit design and implementation using the H8/532 microcontroller
- Design of a dynamometer plus an intelligent test harness/simulation facility
- Embedded software in C and assembler, using structured hierarchical methods and documentation, as required by railway authorities
- Configuration software written in Microsoft C (v6.0) using a DOS windowing library and embedded LISP.
- Initial work involved investigations on the Intel 8051, Siemens 80C537, Intel 80C196 and the Siemens 80C166. A certain amount of software was initially written in PL/M-51 and 8051 assembler.

Hardware design troubleshooting for Sharetree Systems, Stroud. Jul.-Oct. 89.
Sharetree made integrated circuit burn-in oven equipment

- Troubleshooting and hardware design modifications to analogue and digital signal multiplexing equipment

1985-1989 **Project Engineer for Strachan Henshaw Machinery, Bristol.**
Strachan Henshaw Machinery made printing, packaging and paper converting equipment. Projects included a length-setting device for a paper/board roll-to-sheet cutter, a system for feeding pre-printed web into a high-speed newspaper press (in-register) and performing splicing on-the-fly from an expiring reel onto a new reel (also in-register) , and the control system for a variable-sized flexible web-fed book press.

- Complete conceptual design of a machine control system.
- Hardware design of 14 different circuit boards ranging from small 4-IC boards to extended double eurocard microprocessor boards.
- Management of sub-contracts.
- Specification and design of custom machine SCADA (supervisory) system
- Main machine microcomputer system used the 68000 microprocessor on STE bus, running OS/9 as its operating system, with software written in C.
- Project rescue on customer's premises, involving system/hardware re-design to overcome a design flaw.
- Software written in Z80 assembler and C, developed under CP/M-80.
- Z80 microcomputer hardware design, using STD bus with software in Z80 assembler.

INDUSTRIAL TRAINING

1981 - 1985 Industrial Training as part of sponsored university course at GEC Turbine Generators, Manchester and Rugby.

1980 - 1981 Training/mini apprenticeship at Westfalia Separator AG, Oelde, Germany, including basic metalwork training, maintenance of machine tools and software systems associated with the maintenance and archiving of CNC programs. Day-to-day fluency in German together with experience in written and technical German was additionally achieved.

EDUCATION AND QUALIFICATIONS

1981-1985: University of Bath, School of Electrical Engineering.
B.Sc (Hons) in Electrical and Electronic Engineering
Chartered Engineer
European Engineer
Member (lapsed) of the Institute of Electrical Engineers (now the IET).