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## EXPERTISE

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*Project Management, Project Leadership, Mentoring*

*C/C++ Programming*

*SCADA, Realtime and Embedded Development*

## PROFESSIONAL EXPERIENCE

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### Telvent Canada, October 2007 to Present

- As Project Manager and later Senior Project Manager my responsibilities included managing the Boardwalk Pipeline Partners Vector to OASyS DNA 7.5 upgrade project (Factory Acceptance Testing, Commissioning) and managing aspects of the El Paso OASyS DNA 7.5 upgrade project and the Williams Midstream OASyS DNA 7.4 upgrade project.
  - We Energies Upgrade Project (2007)

Assisted the (non-technical) project manager in addressing various technical issues to close out the project – our main focus was addressing deficiencies in the BSAP driver. I spent most of my time in a development lead role.
  - Keyspan Energy Delivery OASyS DNA 7.5 Project (2007 - 2008).

I initiated the development work on the project for the (non-technical) project manager.
- As Project Manager and later Senior Project Manager working with various teams ranging from 2 to 10 people I was the Project Manager responsible for the delivery of various projects including:
  - Equitable Resources Upgrade Project (2008)

The project's purpose was to upgrade an existing OASyS 6.2NT to OASyS DNA 7.5. It was one of the first OASyS 7.5 (Bragg Creek) systems to be delivered and featured some of the first deployments of system features into a production and corporate environment. Value: \$1.3 M (US).
  - ATCO Pipelines Co-Eng (2008)

The project was to gather requirements for the upgrade of OASyS 6.3UX to OASyS DNA 7.5. I was personally responsible for the analysis, design documents, statement of work, project plan, system architecture and quote.
  - Enbridge Polaris Co-Engineering Project (2009)

The project was to gather requirements for a Polaris Liquids Accounts system. I was responsible for the statement of work, project plans and quote.
  - TCPL (Great Lakes Gas) Relocation Project (2009)

The project was to add a backup Decision Support server to allow TCPL to migrate their GLG 6.3UX System from Michigan to Texas.



- ATCO Pipelines (2009)

The project was to upgrade of an OASyS 6.3UX to OASyS DNA 7.5. The system included pass through Gas Measurement. The project was the first OASyS 7.5 (Fraser) system to be delivered. The system is currently in warranty. Value: \$3.5 M (Cdn).
- Spectra (US) and Spectra (Duke Union) 7.4 Server Upgrade Project (2008/2009)

The project was to upgrade of Spectra's server hardware for their GMAS 7.4 Systems. This involved reinstallation, testing, data migration from old server hardware to new and then cutover from the old servers to the new.
- CenterPoint Energy Gas Transmission Co-Eng (2009)

The project was to gather requirements for the upgrade of an iFix based system to an OASyS DNA 7.5. I was personally responsible for the analysis and design documents.
- TCPL (Great Lakes Gas) Northern Border Project (2010)

The Northern Border project was to merge existing 6.2UX functionality from TCPL (Canada)'s systems with the existing GLG 6.3UX System thus allowing TCPL to move control of the Northern Border Pipeline from Calgary to Houston. The project included an analysis phase, the creation of a Test and Development System and a phased introduction of the functionality and configuration into the GLG system. I was personally responsible for the analysis.
- Spectra GMAS Upgrade Project (In progress).

The project is to upgrade Spectra's Sybase based GMAS 7.4 systems with the SQL Server 2008 based 64Bit GMAS 7.5. The project was started in 2009 and is expected to be completed in 2011.
- CenterPoint Energy Gas Transmission SCADA Upgrade Project (In progress).

Replacement of an iFix based system with an OASyS 7.5 system. (Pass through Gas Measurement) (In progress) Value: \$2 M (US).
- Boardwalk Pipeline Partners Gas Measurement Project (In progress)

The project is to provide Boardwalk Pipeline Partners with a GMAS 7.5 system to replace the various Gas Measurement systems in place on the partners' systems. The project is in the design phase. Value: \$3 M (US).
- My responsibilities include: establishing and meeting project schedules, monitoring cash flow results, preventing liquidated damages, producing project progress reports, maintaining scope control, understanding and meeting customer requirements, ensuring conformance to ISO 9001, planning, communicating with other internal departments, managing the customer relationship, documenting all project activities, and ensuring customer satisfaction, assigning the technical project leader and other resources to the project, approving all project plans, monitoring project process, reviewing and updating project schedule, identifying major exceptions, ensuring adherence to quality-related tasks and objectives and being responsible for all aspects of subcontractors. In addition, I assist technical staff with any issues they encounter, initiate purchasing, oversee shipping, and facilitate product enhancements and product fixes.
- Tools and technologies used include: Windows (Server 2003, Server 2008, Windows XP), SQL Server (2005, 2008, 2008 R2), Sybase, Perl, C, C++, C#, .Net, OASyS DNA 7.5, OASyS 6.3UX, GMAS 7.5, GMAS 6.3UX, Real Time, SCADA, Gas Measurement, Oil & Gas, Protocols - BSAP, Modbus, Eagle, Optomux, DDSI, Mercury.



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### **TransAlta Utilities, December 2000 – Present**

- As system architect and principal developer I designed and developed a suite of B2B tools for Energy Trading between TransAlta and counter parties. This has been a continuing project with some hiatuses. (Current contract for incidental work up to December 2011)
- My responsibilities include designing and developing multi-threaded tools to access web sites using HTTP methods (GET, POST) and developing multi-threaded tools to identify time differences between sites using HTTP. I have also developed tools which support both basic authorization and secure sockets (via an open source SSL library), developed CGI scripts to present results and configure the tools, and performed first line maintenance for six different servers distributed throughout Canada and the United States.
- Tools and technologies used for this project are: Solaris (Sparc) 8, 9 & 10, Linux (RedHat 7.1, Fedora), Windows/NT 4.0, Windows 2000, GNU C/C++, Visual C++ 6.0, CGI, Apache WebServer 1.3.14 & 2.0, HTTP, HTML, SSL, threads, Sockets. JavaScript, SSL, sendmail, openSSL

### **Tela-Link Communications - Alarm Routing Management System, December 2005 – Present**

- As system architect/network developer I designed and developed enhancements for Tela-Link's long range radio network (Repeater and Master software upgrades). As system architect and principal developer I subsequently designed and developed the major communications component of a system consisting of a communications server which sends and receives alarm messages via TCP/IP, serial, DTMF tones, and modem connections. I also created a web-based application used to manage connections and monitor server status. The system supports various protocols including ContactID, SIA, SurGard, and custom protocols and was put into operation in a number of major US and Canadian cities. After the initial rollout I managed the development of additional features and protocols by another developer who used the framework that was designed, developed and documented during the initial development. I currently provide maintenance services for the Alberta, Canada systems.
- My responsibilities include: requirements gathering, design, development and testing.
- Tools and technologies used for these projects includes: Windows for Work Groups, serial communications, Visual C++ 1.52, Linux (RedHat 9, SuSe), PHP, Apache WebServer 2.0, HTTP, HTML, threads, sockets. JavaScript, ContactID, SIA, SurGard, modems, VoiceTronics cards, FSK, MaxDB, GNU C++.

### **Telvent Canada (Consulting), April 2006 to September 2007**

- As a contractor I was involved in a number of projects:
  - Great Lakes Gas Upgrade Project (2006/2007)

I helped close out the project which was to upgrade an OASyS 5.2.2 UX to OASyS 6.3UX system by fixing bugs in various subsystems. I did extensive work on the BSAP driver, created a software communications broker for the system interface with TCPL, helped complete the Site Acceptance Testing, and mentored a number of younger developers on bug fixing and working on a production system.
  - Piedmont Natural Gas (2006/2007)

I made comprehensive modifications to the OASyS 7.4 system's Mercury driver to accommodate AMR requirements and created various reports for Gas Measurement.
  - Williams Transco and Williams Gas Pipeline (2006/2007)

I produced various reports for Gas Measurement, fixed various customer written scripts in Perl and created Excel VBA reports. I designed BLT (Business Logic Tier) objects enabling data extraction from historical



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and realtime databases in order to generate Linepack deltas, made other customer requested changes to the Linepack functionality, and provided onsite support to the customer during the commissioning phase, addressing various issues as required.

- My responsibilities included bug fixing and development.
- Tools and technologies used for these projects were: Windows (Server 2003, Windows XP), SQL Server (2005), Sybase, Perl, C, C++, C#, .Net, OASyS DNA 7.4, 7.5, OASyS 6.3UX, GMAS 7.5, GMAS 6.3UX, Real Time, SCADA, Gas Measurement, Oil & Gas. Protocols – BSAP, Mercury, Sockets.

#### **BenTek Systems Inc, February 2006**

- As a network developer (contractor), I developed a program to capture ticket information from various devices into a CSV format.
- My responsibilities included: gathering requirements, producing a specification, and developing and documenting the application.
- Tools and technologies used for this project were: Windows 2000/XP, Visual C++ 6.0, serial communications, sockets, threads, windows services.

#### **CygNet Software Inc, February 2006**

- As SCADA consultant I assisted the CygNet team with the development of a gas measurement protocol driver for the Micro 1/C RTU for the CygNet SCADA package.
- My responsibilities included: gathering requirements, writing the Protocol Definition Document for the protocol, taking traces of existing operations and ensuring accuracy of documentation.
- Tools and technologies used for this project were: SCADA, Oil & Gas (Gas), CygNet, Micro 1/C, Modbus

#### **Everything IP, April 2005 – February 2006**

- As project manager I managed the installation of VoIP based telephone systems. As project manager/system architect (with 3 other developers) I designed and developed a series of VoIP Tools.
- My responsibilities included: requirements gathering, vendor negotiation, management of installer and client negotiation. I also investigated different protocols for suitability for use, tested various PBX systems and softphones, architected a platform neutral product in the VoIP space, completed detail design of the product for the Asterisk PBX, developed concept demonstration systems, and designed and developed a PHP interface to allow configuration of the PBX software.
- Tools and technologies used for these projects included: Linux (RedHat 9), Windows 2000, Perl, PHP, Asterisk, SIP, IAX2, Polycom phones, Sangoma T1 Cards, Rhino Channelbanks. X-Tel Softphone, Firefly Softphone, SIP Express Router (SER), rtpproxy, stun.

#### **Sunstone Projects Ltd, October 2005 – January 2006**

- As SCADA mentor I assisted the Sunstone Projects Ltd team with the selection and project management of a SCADA system for the Access Pipeline Project.



- My responsibilities included: gathering requirements, writing the Functional Requirements Specification for the SCADA system, creating a system specification for the SCADA Trainer, and writing the project execution plan for the SCADA system. I also evaluated various SCADA and Leak Detection systems as well as applications such as Pig/Batch Tracking and Simulation Models.
- Tools and technologies used for this project were: SCADA, Oil & Gas (Liquids), SCADA Systems: Adroit, ClearSCADA, Wonderware, SCADA Vision, Cygnet, Citect. Leak Detection and Pipeline Operational and Management Applications: ttc, Critical Control, Atmos, Energy Solutions.

#### **Stylus Metrics/Social Sector Metrics. May 2001 – March 2005**

- As project manager/developer/business analyst/system architect (with a 4 to 6 person team at Zebra Projects) I developed various products for Social Sector Metrics Inc and Stylus Metrics. This included development of various SCADA and Medical products targeting the Pocket PC and Palm PDA's and the development of various host and web applications to utilize information from the PDA on the Desktop using Visual C++ and Visual Basic.
- The products developed included the "Gas Measurement Data Collector" – a tool for collecting gas measurement on a PDA and syncing to a central RDBMS via wireless, the "Mini Modbus Master" – a PalmOS and Pocket PC based application for accessing SCADA data via Modbus from RTU's (For Electrical SCADA, Oil & Gas SCADA and Gas Measurement Applications), "Time Study System" – a tool to collect time sheet type information on PDA's and upload to a central database, the "Clinical Research Tool" – a tool to collect information for clinical trial on PDA's and upload to a central database and "Stylus Net Suite – SeNSe – a collection of productivity tools presented as a web application – which includes time tracking, project tracking, bug tracking, sales tracking etc. A utility to allow Desktop access to Alberta Health mainframe reports was also developed.
- Tools and technologies used for these projects were: CodeWarrior 7.1 and PalmOS SDK 4.0 and 5.0; Visual Basic, Visual C++, Palm Software Development Suite 1.1, GNU C/C++, MySQL, SQLServer, MaxDB, Apache WebServer 2.0, HTML, JavaScript, PHP, SCADA, Modbus

#### **Bow Networks, November/December 2004**

- As a consultant developer on a 3 person team I assisted with the development of Bow Networks' eLAN IED Anywhere V2 software used in SCADA Applications.
- My responsibilities included designing and developing a multi-threaded remote connector which connected to devices and allowed access to the device from a geographically transparent client.
- Tools and technologies used for this project were: Windows 2000, Visual C++ 6.0, Threads, Serial Comms, TCP/IP, IP\*Works, MFC, IEDs, Schweitzer Electronic Labs Relays, SEL-2020, Terminal Servers, Switches, Modems, Control DeviceMaster 8. SCADA.

#### **BP Canada, May 2003 – November 2003**

- As project manager and business analyst I performed requirements analysis and did the design of a Compressor Fleet Management System for BP Canada. The system was web-based using an MS-Access database as backend database.
- Tools and technologies used for this project included: C++, CGI, HTML, JavaScript, MS-Access and ODBC.



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### **SchlumbergerSema, November 2002 – January 2003**

- As a device programmer I ported a product from the standard Pocket PC/Cell phone configuration to a “T-Mobile” Pocket PC Phone Edition (also known as the “xDA”) configuration.
- My responsibilities included: identifying device specific differences between the existing product on a Pocket PC/Cell phone configuration and the “T-Mobile” Pocket PC Phone Edition, developing a compatibility layer to hide differences between the Pocket PC/Cell phone combination and the Pocket PC Phone Edition, and prototyping a module to communicate with the BlueTooth stack for IPAQ’s.
- Tools and technologies used for this project were: Embedded Visual C++, Windows CE Phone Edition, T-Mobile, SMS, GPRS, MAPI, COM, Widcomm BlueTooth Stack

### **Smartcore Systems Inc, September 2001 – July 2002**

- As developer I developed an iVision protocol driver for the HP 48000 RTU. (End customer: BP)
- As developer/project manager (of 4 person team at Zebra Projects) I designed and developed enhancements to the iVision protocol drivers for the ABB Total Flow and Modbus drivers to enable uploading/downloading of AGA Parameters and Gas Analysis and uploading of Gas flow history. I also developed enhancements to upload Trends from Total Flow and Modbus RTU's. The Modbus driver was designed to handle various RTU's which utilize contiguous registers for AGA parameter, gas analysis and history blocks. Supported RTU's include the ProSoft AGA 2100 and the ScadaPack with a custom load. (End customer: EnCana)
- As developer, I developed a MicroSoft Cluster Service Monitor for iVision. The software reports the status of MicroSoft Cluster and Cluster Groups to iVision. (End customer: EnCana)
- As developer, I developed a “Dead Gateway Detection and Recovery” Service for MicroSoft Windows 2000/2000 Advanced server which detects gateway problems before the MicroSoft DGD software and forces changes in a timely fashion. (End customer: EnCana)
- Tools and technologies used for these projects were: MicroSoft SQL Server, Visual C++, Visual Basic, Oil & Gas, SCADA, iVision, MicroSoft Cluster Server, MicroSoft Services, TCP/IP.

### **Metso Automation, May 2001 – July 2001**

- As Technical Consultant on the Enterprise Project Team, I assisted the Project Manager with various aspects of project startup including requirements and documentation.
- Tools and technologies used for this project were: OASyS, SCADA, Oil & Gas

### **ACM Automation Inc/Sempra Atlantic Gas, March 2001 – April 2001**

- As a consultant on the ACM/SAG Project Team, I assisted the ACM Project Manager with various aspects of project startup including project planning, vendor negotiation and requirements gathering/business analysis.
- Tools and technologies used for this project were: OASyS, SCADA, Oil & Gas



### **Neles Automation SCADA Solutions, August 2000 to November 2000**

- As Project Manager with a three to seven person team, I upgraded TransCanada's Dragon SCADA System from OASyS V6.0 to OASyS V6.2UX.
- My responsibilities included: establishing and meeting project schedules, monitoring cash flow results, preventing liquidated damages, producing project progress reports, maintaining scope control, understanding and meeting customer requirements, ensuring conformance to ISO 9001, planning, communicating with other internal departments, managing the customer relationship, documenting all project activities, ensuring customer satisfaction, assigning the technical project leader and other resources to the project, approving all project plans, monitoring project process, reviewing and updating project schedule, identifying major exceptions, ensuring adherence to quality-related tasks and objectives, and being responsible for all aspects of subcontractors.
- Tools and technologies used for this project were: Alpha UNIX 4.0, C, PowerBuilder 5.0, Perl 5.0, Sybase 11.5, Stored Procedures, Windows/NT, Real Time, SCADA, Oil & Gas.

### **Neles Automation SCADA Solutions, January 2000 to November 2000**

- As Project Manager (acting until April) I allocated resources as required and I was responsible for the maintenance, support and ongoing development of TransCanada's Dragon and Tiger SCADA Systems.
- Responsibilities were as above.
- Tools and technologies used for this project were: Alpha UNIX 4.0, C, PowerBuilder 5.0, Perl 5.0, Sybase 11.5, Stored Procedures, Windows/NT, Real Time, SCADA, Oil & Gas, Measurement.

### **Neles Automation SCADA Solutions, April 1999 to November 2000**

- Initially as Project Leader and later as Project Manager with a staff between 10 and 3 as required, I developed, tested, installed, and commissioned a SCADA System for Coral Energy and managed the ongoing expansion of a SCADA System for Tejas Energy/Coral Energy.
- My responsibilities as Project Leader were initially for all technical aspects of the project. As the project was fast-tracked, the project schedule was collapsed, and I personally integrated a new protocol driver (BSAP) and spent five weeks on site commissioning (which included re-integrating a more stable protocol driver over a weekend). The system went live on schedule (four months from order to production) and Neles received a \$300,000 (US) bonus for early delivery. Subsequently I was responsible for Project Leadership and a Project Management role. During this period the system was a Beta project for the latest release of OASyS, the first Web connectivity to OASyS was installed and a new subsystem was added to handle Coral Energy's offshore operations. In total, approximately \$600,000 US work was added in follow on-sales.
- Tools and technologies used for this project were: Alpha UNIX 4.0, C, PowerBuilder 5.0, Perl 5.0, Sybase 11.5, Stored Procedures, Windows/NT, Real Time, SCADA, Oil & Gas, Web.

### **Neles Automation SCADA Solutions, November 1998 to March 1999**

- As a Senior System Analyst I worked in a team to resolve problems on a SCADA System for West Coast Energy.
- My responsibilities included addressing problems in the Compressor Monitoring application, the core product's alarming functionality and with the Gas Management Application. Most of this work was done in C on UNIX and Sybase stored procedures. I was also responsible for addressing functionality and performance issues with the Gas



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Management Applications. This work was done in C and C++ on UNIX. A highlight was identifying problems in the core product's transaction processing and implementing changes which provided a transaction retry mechanism as well as improving transaction throughput to approximately 20 times. In addition, I developed a client application which allowed users to switch between the live and development SCADA Systems. This work was done in Perl and PowerBuilder.

- Tools and technologies used for this project were: Alpha UNIX 4.0, C, PowerBuilder 5.0, Perl 5.0, Sybase 11.5, Stored Procedures, Windows/95/NT, Real Time, SCADA, Oil & Gas.

### **Neles Automation SCADA Solutions, November 1997 to October 1998**

- As a System Analyst and later Senior System Analyst I worked in a team to implement the Dragon SCADA System for Nova Gas Transmission.
- My responsibilities included designing and developing major changes to the Compressor Monitoring application in C on UNIX, making all the changes to the client application in PowerBuilder on Windows for the project, providing a Student Trainer Interface (C, Sybase Stored Procedures) and being a member of the bug fixing team for the project.
- Tools and technologies used for this project were: Alpha UNIX 4.0, C, PowerBuilder 5.0, Perl 5.0, Sybase 11.5, Stored Procedures, Windows/95/NT, Real Time, SCADA, Oil & Gas.

### **Perseus System Integration (South Africa), November 1995 to September 1997**

- As an external consultant I was originally asked to assist with the installation of RAID subsystems. I was later asked to take on tasks associated with the NaTIS (National Traffic Information System) project – my original two-day contract was eventually extended into 2 years of 3 month contracts. During this time I managed a five-person technical support team and a two-person IT team.
- My responsibilities included writing (and later on, managing the writing of) procedures for installation and commissioning of systems, installing DG/UX, setting up RAID disk subsystems, evaluating products and analyzing performance of UNIX systems, developing of tools for performance analysis for DG/UX systems, providing technical support to developers, trouble-shooting, and developing concepts (e.g. Web pages). In addition I was responsible for the planning and execution of all high profile system installations, including sizing, deployment, installation, data conversions and commissioning.
- Tools and technologies used for this project were: DG/UX R4.11, Ingres 6.4/06, OpenIngres 1.1, TCP/IP, x.25, SCO 3.2v4.2, OpenServer 5, HTML 3.0, Cameo Hubs, Ethernet Group Switches, C, HTML

### **Cornerstone Funeral Fund (South Africa), September 1995 to November 1995**

- As a contractor I designed, developed and documented a Policy Administration application for an insurance franchise. The system allowed the main office to import data from the franchises and export data to the various franchises based on the origin of the contracts. It included screens to capture policies, examine policies, track premiums, track payments against claims, manage claim information, manage agent information, calculate agent commission and track commission payments.
- Visual Dbase 5.5 was used for this project.



### **PCS Computer Projects (South Africa), October 1994 to August 1995**

- As an internal consultant I worked on the NaTIS system described above and managed a team of five that provided consulting services to the rest of the company.
- My responsibilities were as previously described with the addition of planning, setting up machines, executing large scale database conversions and prototyping (e.g. an investigation into using Tuxedo as middleware).
- Tools and technologies used for this project were: DG/UX 5.4R3.10, Ingres 6.4/04, OpenIngres 1.1, TCP/IP, x.25, SCO 3.2v4.2, C, Tuxedo

### **Perseus Computer Systems (South Africa), December 1992 to September 1994**

- As a System Engineer I worked on the NaTIS system described above and temporarily managed the NaTIS Control Room staff of five.
- I was responsible for integrating 486 machines, writing procedures for integration teams, installing SCO Unix, DG/UX, TCP/IP, x.25, Ingres and various drivers; making initial data conversions, installing and commissioning of sites, writing procedures for data conversions, trouble-shooting, and providing technical support to the Project Manager.
- Tools and technologies used for this project were: DG/UX 5.4R2.10, Ingres 6.4/03, TCP/IP, x.25, SCO 3.2v4.2, C

### **Grinaker Systems Technologies (South Africa), January 1991 to November 1992**

- As software development lead on a team of eight I worked on the development of a system to tracking vehicles in an Open Cast mine using GPS.
- My responsibilities included the conceptual and detailed design of all software for the project (including the SCADA engine, polygon analysis software and a data radio protocol), management of three internal developers who were developing the GUI and two subcontractors who were developing the communications server and some of the embedded software. I personally developed the base station software (Modula-2, OS/2), the embedded software for the outstation (Modula-2 and assembler) and the data radio (PL/M 196, ASM 196). After its installation in twenty vehicles, this system improved the productivity of the mine by 11%.
- Tools and technologies used for this project were: Intel x86, Intel 196, PL/M 196, ASM 196, OS/2, Modula-2, Real Time, Embedded, LAN Manager, GPS, Data Radio Communication, Telemetry, SCADA

### **Grinaker Systems Technologies (South Africa), January 1991 to November 1992**

- As a software/firmware developer working with a hardware developer, I created a number of small products for the underground mining industry, i.e. winch controller, conveyor belt controller and environmental monitoring outstation.
- My responsibilities included the conceptual and detailed design of all software for the products, development of the embedded software for the outstation (Modula-2 and assembler) and operator panels (PL/M 196, ASM 196). The products were designed to interface to the SCADA engine developed for the GPS project.
- Tools and technologies used for this project were: Intel x86, Intel 196, PL/M 196, ASM 196, Modula-2, Real Time, Embedded, Firmware, Communication, Telemetry, SCADA



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### **Grinaker Systems Technologies (South Africa), August 1989 to July 1991**

- As software development lead on a team of eight, I worked on two projects for Direction Finding.
- My responsibilities included the system and software design (Type A and Type B specifications), the software portion of the production (Type C) specification, management of software subcontractors (communications software - HDLC and equipment drivers), development of the equipment control, telemetry, real time GUI and data analysis software (Modula-2). The second project was to provide the same functionality for a different type of direction finder.
- Tools and technologies used for this project were: Intel x86, Modula-2, HDLC, Encryption, Defense Industry, Real Time, Embedded, Firmware.

### **EDUCATION**

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University of Stellenbosch (South Africa)

B.Sc. in Computer Science and Applied Mathematics 1984

Hons-B.Sc. in Computer Science (Cum Laude) 1985

University of Cape Town (South Africa)

M.Sc. in Computer Science (Cum Laude) 1988

### **SPECIAL ACCOMPLISHMENTS**

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- South African Institute of Computer Scientists Award for best M.Sc Thesis (1988).