Resume of Robert Krten

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Background and Objectives

I am a multidisciplinary problem solver who brings both width and depth to solving interesting problems. I design elegant solutions that are highly performant.

The key is finding the simplicity in even the most complex problems.

I'm a combination **software developer**, **technical writer**, **business owner**, **systems architect**, **entrepreneur**. I've been been involved with **medical devices**, **military / avionics**, **hardware development**, **realtime control systems**, **simulation**, **telecoms**, **consumer electronics**, and **security**. I have often been recognized as the key contributor to the success of the projects I've been involved in (LinkedIn profile). I have 8 granted patents (US 9,407,442, US 9,454,666, US 9,798,867, US 9,934,374, US 10,459,851, US 10,798,128, US 10,459,851, and US 11,222,096). One of them is even for sale :-)

Challenge me with an interesting, open-ended problem to solve.

I am effective in positions where I can make real, significant contributions. I feel that the best way for me to accomplish this is as a consultant – someone who can be productive immediately, doesn't get involved in the politics or minutia of the "process," and can focus on accomplishing the task at hand. I thrive on vague, high-level goals: "can this go faster?" or "is it be possible to do X?" and other R&D problems.

I invite you to visit me at **www.ironkrten.com** for more details about services, or visit **my blog** to see examples of coding that I've done. To be perfectly honest, and to save us both time, here's a list of what I do and do not find interesting:

Interesting	Not Interesting
Research, prototyping, investigation	doing something that's been done to death, but just subtly different this time
relatively short duration	never ending
non time critical	high pressure, critical
solution requires my unique skill set	requires tons of process that's irrelevant to the task at hand
being a hero / mentor / inspiration / role model	low profile, low recognition commodity work
open work	highly secretive work (unless it's super interesting!)

That said, I'll even consider working for free (the "good of humanity"), equity, recognition, rights, future consideration, or other negotiable compensation, if circumstances warrant. I'll even do open source (but not GPL, though – I have *some* scruples, you know!). Normal rates are between US $100 and $150 per hour, depending on the skill set required, time commitment, and excitement level.

Experience History
(overlaps indicate multiple concurrent contracts)

NOV 23 – Present <confidential> *(contract)*
TBD

SEP 23 – NOV 23 Sabbatical
I had so much fun on my previous sabbatical, I took another one. This time I did the following:
- created a JSON-based UDP "bus" for IoT applications
- wrote an in-place JSON parser library
- created a "Borg Cube" LED display using WS2812 LEDs and Raspberry PICO
- interfaced an IBM PC/AT Type F keyboard to a PICO (h/w and protocol)
- created a novel DIY LED-based clock

NOV 22 – AUG 23 <confidential> *(contract)*
Doing **system** level **research and development**. Work involves parsers, importers, serializers, exporters, formatters, data converters, filters, and streamers for in-memory databases.

MAY 21 – NOV 22 Sabbatical
Took a sabbatical in order to complete "bucket list" technical projects. These include:
- **calculator** using powers of prime numbers to represent values;
- small **IoT** printed circuit board design and implementation;
- CAD-driven music **synthesizer**;
- financial **asset management** package;
- 6809 **reverse engineering** project / macro assembler;
- miscellaneous command line utilities that are missing from Unix

This period represented a commitment-free research phase -- no due dates, no pressure, no requirements.

SEP 19 – MAY 21 <confidential> *(contract)*
Company (Kanata/ON/CA): Created documentation for yet another new embedded **microkernel operating system**; duties included getting input from subject matter experts (*SME*) and creating new content (markdown, drawings, and Doxygen). My approach was to ask about corner cases, what-if scenarios, and (my favourite question), "**why?**" This had the side effect of facilitating design and development by forcing developers to think through their designs and articulate the (sometimes subconscious) design choices made. I then capture these, producing documents for both end users (the "how to" type of guide) and internal developers (the "how does it work" type of guide). Once a topic is explained such that I can understand it, I write about it and share the design, best-practices, and sometimes even the "wow!" factor straight from the architect / designer.

MAY 18 – JUN 19 <confidential x 2> *(contract)*
Two concurrent remote contracts with confidential companies, both based in the Bay Area:
Company 1 (Mountainview/CA/USA):
> Created documentation for another new embedded **microkernel operating system**; duties included getting input from SMEs and creating new content (markdown and drawings). I **worked remotely** and with little supervision; generally I was pointed at a bunch of code and told to "write something." The audience level was mostly intermediate to expert, **C/C++ device driver** types. I also **wrote sample drivers** to illustrate concepts being discussed. This contract was 40h/week.

Company 2 (Fremont/CA/USA):
> This concurrent contract was on the order of 10h/week, and was a remote consulting role for a **QNX 6.6** based **semiconductor manufacturing product**. I reviewed designs, helped with the system architecture, and coded small parts of the system (e.g., **Simulink QNX driver framework** so that MathWorks models could be run in QNX).

FEB 17 – MAR 18 Best Theratronics Limited *(contract)*
Lead software architect and developer for the Mark I Single Tube Irradiator. This is a **medical device** featuring a Spellman high voltage (160kV / 30mA) power supply and Comet X-Ray tube. I was responsible for generating the **software architecture**, detailed design documents, and producing the code. The architecture involved a **QNX 6.6** kernel (with four custom **drivers**) communicating with an ARM M3 I/O board. I designed the **protocol** between the two CPUs using COBS, and wrote the drivers as well as the control software. Initially, since the hardware wasn't ready yet, I wrote simulators for the Spellman power supply and the ARM control board. Wrote a WebSocket ⟷ PPS server to speed up the GUI operations. Total of around 27kLOC and 200 pages of documentation.

JUL 16 – JAN 17 Cisco Systems Limited *(contract)*
Worked in the field of model-driven telemetry, I researched integrating Google RPC (**gRPC**), Google Protocol Buffers (**gPB**), **openconfig**, (specifically Google's Network Management Interface (**gNMI**). Major work included over 3,500 lines of C++ **code generator** / **recursive descent parser** that parsed protobuf files and automatically generated gRPC/GPB protobuf C++⟶C and C⟶C++ marshalling code. The code automatically generated the server class wrappers, provided two special hierarchical input dump mode handlers (one for text, and one for **JSON**), and consisted of a JSON input digester. Wrote a **universal test client** that accepted JSON and converted it to protobuf gRPC messages, sent them to the server, and converted the reply from the server to JSON.

JUN 16 – NOV 16 Merizzi Ramsbottom & Forster *(contract)*
Technical drafting for **patent application** preparation and prosecution, technical consulting therefor, and for **licensing and litigation** activities and other technical consulting tasks.

NOV 14 – JUN 16 QNX Software Systems (*contract*)
Wrote marketing and technical documentation relating to QNX's latest products. Provided domain expertise in medical, security, automotive and realtime micro-kernel.

AUG 13 – JUL 15 Irdeto Canada (*contract*)
Formulated the **requirements**, and generated the **architecture** of the next-generation **security framework**. Major requirements included **automatic security injection** into arbitrary customer code, support infrastructure, a **modular-yet-entangled security primitives** model, next-generation integrity verification, instrumentation and tracing, **multi-threaded defence architecture**. The framework provided **security as an emergent property** of the supplied code. Filed **4 solo patent** applications. Supplied code for efficient interprocess communications, and implemented novel object storage database. I interfaced to product management, transcoder and binary teams, and internal end-users.

DEC 13 – AUG 14 Broadcom Corporation (*contract*)
Wrote WICED Development System Reference Manual / Cookbook and related **documentation**.

APR 12 – JUL 13 Cisco Systems Limited *(regular, full-time employee)*
Technical lead in **IOS XR** team, worked on the **QNX kernel** and virtualization. Major projects included a Virtio block **paravirtualized driver** for QNX (hosted on **Linux/QEMU/KVM**). Responsible for maintenance of the **QNX kernel** used on the largest **core routers** (e.g., CRS family). Managed QNX consultants to work on bug fixes, diagnostics, and enhancements. I worked on really difficult, hard-to-debug "big system" **scalability** and interaction problems with geographically diverse teams (e.g., India, China, Japan, California, Europe), exercising effective **time-zone management** during my 16-hour EST/EDT interface window. 1 solo patent (US 9,798,867).

AUG 10 – APR 12 Irdeto Canada (formerly Cloakware) *(regular, full-time employee)*
Team lead on the binary technologies tools. Architected and implemented low-level **security tools**, as well as interfaced with product management, test, and documentation. Gained deep experience with **ELF**,

Windows **PE**, and **COFF** file formats. Designed an **integrity verification** system that was substantially smaller and *2 orders of magnitude faster (!)* than the previous version, and featured many innovations to address customer concerns. 2 joint patents (US 9,454,666 and US 9,934,374).

APR 08 – AUG 10 Semiconductor Insights *(regular, full-time employee)*
Worked on **software reverse engineering**. Took systems apart, extracted the software, and created a high-level representation of the **assembly language** instructions. Created some of the R&D tools, most interestingly, the research into a **decompiler** that takes arbitrary assembly language and converts it to C. Additional responsibilities included **patent analysis** in support of matching claims against high level code constructs, and providing claims documentation for end clients. Experience with **ARM**, PIC, PPC, **x86 processors** and WinCE, REX, and proprietary OSs.

MAR 07 - AUG 07 SynCardia Systems Inc. **(***contract***)**
Worked on software components of the SynCardia CardioWest temporary Total Artificial Heart, a class III **medical device** based on **QNX**/Neutrino. I participated in the **architecture** of the software components, and implemented the Data Manager, Alarm Manager, Watchdog Manager, as well as a system logger.

NOV 06 - JAN 07 QNX Software Systems **(***contract***)**
Worked in two main project areas, Board Support Packages (**BSPs**) and the QNX **Graphics** Framework **training course**. The BSP work involved verifying functionality, writing support code, building images, and even **fixing hardware**. Worked on BSPs for the KaRO Triton PXA270 (ARM-based eval board with LCD), AMPRO Littleboard (x86), and an e300-based PowerPC custom board. Authored just over 300 slides for the QNX Graphics Framework, a separate TDK (Technology Development Kit) that featured 2D and 3D graphics for embedded systems featuring an embedded version of **openGL**.

APR 04 – JUN 06 MDS Nordion Limited *(contract)*
Intense design and development contract involving three **medical devices**. I was the **project lead** on the **design** and **implementation** of the software for the Gammacell 40/1000/3000 (a blood irradiator). Responsible for the **software architecture**, **functional specification, traceability matrices, detailed design docs, coding, simulator, embedded web server, and subcontractor management.** I also helped with the software verification **test plan** of the Avanza Table project, and worked on the Avanza Table interface software, performed code reviews, and helped to diagnose and debug the code for the Equinox Radiation Therapy machine. The Gammacell and Equinox were based in **C** on the **QNX RTOS**. Software development lifecycle process was roughly equivalent to what would today be called IEC 62304.

FEB 04 Insight Control Systems *(contract)*
Helped to **port** over 350k lines of code from QNX 4 to QNX Neutrino 2 on a **process control** system which performs bottle inspection, consisting of several dozen closely cooperating processes. The main challenges were moving from Watcom C to GCC, **rearchitecting** proxy concepts to use Neutrino's pulses, and moving the individual drivers to be resource managers. Provided general "how to" **consulting.**

SEP 03 – DEC 03 PARSE Software Devices *(owner)*
Wrote "*The QNX Cookbook – Recipes for Programmers*" **book**, with 6 major projects explained in detail, including a RAM-disk **filesystem**, **data acquisition** driver, **high-availability** component, and others. Performed **publishing, marketing and sales** for the book, finally selling the complete rights to QNX (the company) – it's available for free on their website. Also **wrote, published, marketed, and sold** "*Getting Started with QNX Neutrino 2*", 500 pages, with Japanese and Russian translations. Rights sold to Cisco and QNX; book also available on QNX website.

JUN 03 – SEP 03 Century Aluminum of Kentucky *(contract)*
Worked on **data acquisition** drivers for PCL-711, ISO-813, and DIO-144 cards under QNX 6.2. Created a higher level **database server** (ADIOS, for Analog Digital I/O Server) that read the values from all installed drivers and put them into a **shared memory interface**, organized as a **ring buffer**. Created **API** and **utilities** for managing tag names and ring buffer contents.

JUN 02 – MAY 03 Cisco Systems *(contract)*
Updated Cisco IOS 12 device driver **documentation**. This involved finding my way through literally millions of lines of code, coordinating with various subject-matter experts, and writing and **organizing** the documentation base.

JUL 01 – DEC 01 Photuris Inc. *(contract)*
General consulting to their QNX 6 development team, as well as the production of miscellaneous tools, such as "big brother", a **system monitoring tool** that detects memory overruns, stack usage, CPU usage, etc., and then acted based on a script file. Another tool gave **symbolic names** to threads to aid in debugging multi-threaded programs (especially useful when some threads were loaded from DLLs).

FEB 01 - MAY 01 Olin Chemical Corporation *(contract)*
Analyzed proprietary OMNX **industrial control** system for **scalability** and **architecture**, design, and implementation. Analyzed sourcebase for correct design principles, wrote **regression testcases** and **universal testing client** (allowing arbitrary messages to be sent from command line). Created a reflective shared memory driver for ARCNet to allow two QNX 4 nodes to **share memory over a network**.

JUN 00 - JAN 01 Cisco Systems *(contract)*
Developed **courseware** for world's largest router (**CRS** aka **HFR**). Scoped training materials, rounded up SMEs, parsed design documents, **courseware preparation and presentation**.

OCT 99 - JUN 00 QNX Software Systems Limited *(contract)*
Designed a **high-availability** **infrastructure** for the QNX Neutrino (QNX 6) operating system (everything from cold/warm/hot standby to **in-service upgrade** strategies to **load-sharing** and **load-balancing**). Wrote three chapters of a **device-drivers** "developers" book (USB, io-net, and the graphics infrastructure).

JUL 98 - AUG 98, JAN 99 - SEP 99 Cisco Systems *(contract)*
Worked on **Cisco GSR 12000 drivers**, including a driver for a high-speed (**gigabit** range) **switching fabric**. Also worked on Primary/Standby **arbitration module** for redundant RPs.

NOV 97 - APR 98 MATROX Electronics Systems *(contract)*
Ported MATROX's "Genesis" **frame grabber** software written for Windows/NT to QNX 4.

NOV 95 - DEC 98 QNX Software Systems Limited *(contract)*
Developed and presented "Realtime Programming under Neutrino" (4 day **OS internals** course) and "Writing a Resource Manager" (3 day course on **device drivers**, with X10 and ".tar" **filesystem** projects). Developed initial prototype of "**qnet**" (native **network manager** for QNX 6, with **transport layer** and **kernel interface**). Wrote large part of the highly technical "Building Embedded Systems" manual.

NOV 96 - JAN 97 DIPIX Technologies *(contract)*
Ported the DIPIX XPG **frame grabber** device driver from Windows/NT to QNX 4.

JAN 95 - DEC 96 Bell Northern Research (8I44) *(contract)*
SEP 94 – JUN 95 Bell Northern Research (7P24/7P31) *(contract)*
JUN 94 - SEP 94 Canadian Marconi Company *(contract)*
APR 94 - JUN 94 Rohde & Schwarz Canada *(contract)*
FEB 93 - MAR 94 Canadian Marconi Company *(contract)*
SEP 92 – JAN 93 Excalibur *(contract)*
SEP 91 – SEP 92 Ottawa Technology Group *(contract)*
JUN 91 – JUN 91 BioRad *(contract)*

**MAY 87 – MAY 91 DATEM** *(regular, full time employee)*
JUL 84 – DEC 86 Omzig *(regular, full time employee)*
JUN 84 – JUL 84 Gandalf *(student, part time)*

Personal Projects

I've been involved in many personal projects over the years (hyperlinks to project articles):

- **virtual filesystem** for the efficient management of USENET news,
- **virtual 64-bit filesystem** layered on top of a 32-bit filesystem,
- 8086 instruction set **simulator / disassembler,**
- **disassembly and reverse engineering** of Mitel SX-20 PABX firmware,
- **disassembly and reverse engineering** of PDP-8 diagnostics routines,
- **hardware repair** of TTL minicomputers (PDP-8 family) and their peripherals,
- **synthesizer emulator** that simulates music synthesizers for rendering MIDI files,
- complete **design** of FIFO-based 16-bit stereo A/D & D/A **interface cards** and **drivers**,
- Caller ID **software modem**
- **design and implementation** RGB LED PWM UDP-based light controller H/W & S/W
- learned **C++** by writing a VI clone from scratch (part1, part2), leveraging multi-core in all aspects
- automatic **stock trading AI** with options analysis using adjacency matrix stock correlation
- XML/HTML/SGML **C++ parser** with higher-level analyzer plugins
- custom-designed **printed circuit boards** for data acquisition, display, and control
- video motion sensor software and streaming TCP based server
- custom-designed GUI environment using **SDL** with menus, scrolling **graphics**, for **home automation**.
- **music synthesizer** evolution allowing "patch panel" (created by hijacking the **KiCad** schematic package and exporting **netlist**), and using **C++ to parse the netlist** and create sound.
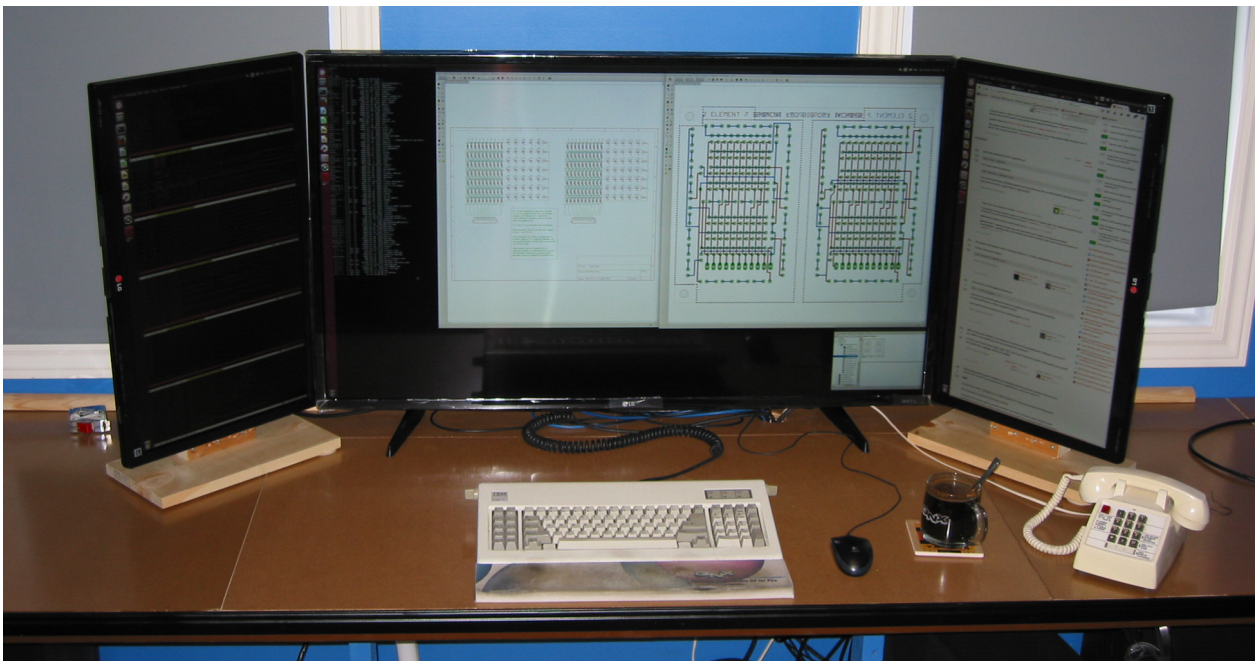
I'm a hardcore developer; this is my desktop :-) It features a 4k TV used as a monitor, and two 1080p monitors in portrait mode. I built the monitor stands (not terribly impressive), but I also completely refinished the office and built a U-shaped custom bench (more impressive) with LED lighting underneath it for easy tower computer maintenance (slightly impressive, but really useful). I have a real keyboard, and yes, the phone works – it connects to my SX-20 PABX. The monitor shows a PCB layout and schematic.