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### **Career Path**

Systems Architect: network engineering, software development, server management, automation.

### **Availability**

Immediate

### **Summary of Qualifications**

- Over 25 years of experience in the technology field
- Broad background in networks, security, software development, virtualization
- Work well with peers, vendors, consultants, and customers.
- Proven experience in technology integration
- Well developed communication skills
- Excellent troubleshooting and integration skills
- Able to handle multiple projects simultaneously
- Diversified cross platform skill sets: Linux, Windows, SQL, C++, Python, SDN
- Equivalent Skill Sets: Architect, Site Reliability Engineering (SRE), NetDevOps
- In-depth knowledge of LAN/WAN/DC engineering design and management
- Manage Personal BGP AS10388

### **Links**

Blog: <http://blog.raymond.burkholder.net>  
GitHub: <https://github.com/rburkholder>

### **Professional Experience**

#### **June 2018 – Present, One Unified Net Limited**

Owner, Consultant

- Consulting to TBI/Bluewave in Bermuda for networking, virtualization
- Consulting to QuadLii, building an SDN solution incorporating:
  - a custom C++ controller for OpenFlow/eBPF/XDP on Linux to handle switching/network-access- control/packet inspection, and related flow control
  - DNS intercepted and vetted via API to third party service
  - ZeroMQ/Boost ASIO for communications within a microservices architecture
  - PostgreSQL & Cassandra, database management
  - running Linux networking (iproute2, Free Range Routing, Open vSwitch) on Lanner network appliances
- Building scalable web site with backend composed of a) clustered Cassandra database server, b) middleware messaging service, and Wt/C++ server side web rendering toolkit.

#### **March 2017 – April 2018, Kwaret, Bermuda**

Android Tinnitus Masking Prototype

- Java based visual interface for selecting and mixing: pink/white noise, frequency, and mp3 music
- C++ based service for handling sound generation, mixing, timing, delay
  - used DSP techniques for low pass, high pass, band-pass adjustable filters
  - implemented adjustable white/pink noise generator

## **April 2014 – May 2018, QuoVadis Services Limited, Bermuda**

Cloud Services/Infrastructure Architect/SRE, Development and Operations, Reporting to CEO

- Designing scalable, highly resilient hosted infrastructure solutions for datacenter and wan customers
- Evaluating and integrating new technology, products, and services
- Leading design and technology education/selection sessions with management and team members
- Configuration building, scripting, troubleshooting, service provisioning, performance tuning
- Building orchestration/automation tools with SaltStack, dnsmasq, Python, shell, PXEBoot, Debian PreSeed for building/provisioning Linux based routers, switches, distributed firewalls, hypervisors, and guests
- Using automation toolsets to migrate IaaS infrastructure from a traditional L2/VLAN architecture to a L3/Routed/Encapsulated/SDN based architecture with eBGP/EVPN/Open vSwitch/OpenFlow
- Maintaining perimeter BGP (AS19626) connections to upstream providers with full tables, load balancing, route-maps, and route-reflectors
- Network infrastructure management – Arista Switches, Cisco Switches, Vyatta Routers
- Installing, maintaining and populating NetBox for infrastructure IP Address Management
- Virtualization infrastructure – managing and supporting VMware, Linux KVM, Linux LXC
- Linux Security: ssh, nftables, basic Squid, StrongSwan IPSEC
- Monitoring/Operations Infrastructure – Bind9, NTP, Nagios/Check\_MK, Rancid, Redmine, Nfsen/Netflow
- Security infrastructure – Stonegate/PaloAlto/CheckPoint Firewalls, Intrusion Prevention
- Storage infrastructure: SolidFire SSD based SAN, Nexenta dual head SAS/SATA iSCSI/NFS SAN
- Designed and implemented 100% open source based Hyper-Converged Platform built upon three Lanner NCA-5510A Network Appliance for providing robust traffic, virtualization, security, and storage management. (VxLAN, MP-BGP, eBGP, EVPN, LXC, nftables, TC/QoS, ZFS, BTRFS). BGP based anycast load balancing and resiliency.
- Implementing a style of Software Defined Networking (SDN) / Network Function Virtualization (NFV) solution.
- Mentoring/training team engineers with test environments based upon Vagrant/Ruby (see github)
- Initial trial of Sheepdog on ZFS volumes for distributed storage.
- Working with YubiKey two factor authentication
- Updated C# code as a sub-contract to national government department for reporting to IRS

## **October 2013 - March 2014, IBM / Bermuda Computer Systems / Igility, Bermuda**

Network Consultant

- Managing / troubleshooting / architecting customer networks.
- Working with Bermuda Hospital Board network staff to assist with migration and integration of existing dual 6509E Cisco core network with new dual Nexus 7000 core network.

## **August 2013 – February 2014, NeuralFutures LLC [contracted hours]**

C++ Developer / Linux Admin

- Working in conjunction with a UK developer to develop an application for simulating and trading equities, options, and futures. Making use of C++ libraries Boost, HDF5, ChartDir, SQLite, Curl, and wxWidgets. This is based upon code I've developed over the last four years.
- Managing two physical servers, each running Linux, in a NY colocation facility. These servers host personal DNS, Email, web sites and Software as a Service capabilities via LXC containers and KVM virtual machines. Traffic is routed between the servers via Quagga OSPF and to the upstream carrier via redundant connections with Quagga BGP.

## **October 2011 – July 2013, Digicel Bermuda (Digicel Acquired Transact)**

Manager, Network Operations, ISP

- Managing Transact ISP network operations of Digicel
- Architecting and coordinating the migration of a traditional ISP network into fully enabled private/public IP/MPLS/VPLS infrastructure for handling a variety of public and private MPLS VPN

based data and voice services. Integrating various Cisco products: 7600, 7206, ME3750, ME3400E, ISR3800. AS32020 BGP operations.

- For the operations side of Digicel Bermuda: evaluating and making recommendations for performance tuning, fault-tolerance, and enhancing a two site network comprised of four Cisco 4500 switches, two clusters of Enterprise licensed VMWare servers, HP Lefthand Networks iSCSI SAN, HP EVA 4000 Fibre Channel SAN, NexentaStor, and Symantec NetBackup with TB Enterprise licensing.
- Working with Solarwinds to monitor Digicel back office network.
- Site to Site VPN creation via mixed CheckPoint / Cisco ASA end-points
- Supporting the Business Development Group with pre-sales design along with post-sales implementation and support.
- Mentoring and training engineers on the operation of the network.

### **2008 – September 2011, Transact Limited, Bermuda**

Manager, Network Operations, ISP

(SBI and Transact were owned by same person, this was a transfer from one subsidiary to another)

- Provided dedicated 24x7 on-call client support
- Level 3 support including shift work weekdays, weekends, and graveyard shift
- Training and ongoing support to level 1 and level 2 technicians
- Diagnosed and repaired network and service faults
- Performed capacity & reliability analysis & planning
- Built redundancy into new and existing services for superior availability.
- Configured and operated Cisco switches, routers, and firewalls
- Implementing appropriate forms QoS on traffic circuits. Implementing IP SLA monitoring.
- Migrated EIGRP based network to BGP/OSPF/MPLS
- Using Cricket for SNMP monitoring, NFSen/NFDump for Netflow analysis, Rancid for versioning
- Managed physical servers including a VMWare based host environment
- Managed local services, including Bind for DNS; CommuniGate for SMTP, IMAP, POP3; Apache for HTTP; FreeRadius for RADIUS; PostgreSQL and MySQL for SQL
- Customized Perl and Shell scripts to integrate BillMax (ISP Billing System) with FreeRadius (network Authentication/Authorization/Accounting server), used for authenticating/authorizing PPPoE/PPTP clients connecting via Cisco 7206 Access Servers.
- Administered and maintained a mixture of Linux and FreeBSD based servers, operating systems, and services
- Provided Sales Engineering Support for recommending and designing appropriate solutions
- Liaised with local and international carriers for service improvements and upgrades
- Maintained network documentation
- Acquired IPv6 and additional IPv4 address space from ARIN
- Started implementation of IPv6 throughout Transact's Network

### **2005 – 2009, Self Directed, Bermuda**

Developing Trading Application using SmartQuant C# Framework

- C# based platform for high frequency trading
- Some code results:
  - <https://github.com/rburkholder/QuantDeveloper>
  - <https://github.com/rburkholder/GeneticProgramming>

### **2004 – 2008, Systems Business Integration Ltd / Igility Ltd, Bermuda**

Senior Systems Technologist

- Went on sales calls with the sales team to understand customer requirements and needs
- Provided designs and support (BoM, SoW) to the sales team, and assisted in developing proposals and presentations for deployment of products and solutions.
- While working on 'current' solutions, staying in touch with the customer base to see what is coming down the pipe
- Presenting demonstrations and solution proofs-of-concept

- Bermuda Fire & Marine (On Bermuda Stock Exchange)
  - Assumed management of an existing Callmanager / Unity / AVVID solution
  - Improved VLAN arrangement, switch QOS of a thirteen 3550/3750 switch network
  - Reconfigured Callmanager to improve Calling Search Space and Partition arrangements in a multi-site calling solution
  - Upgraded Publisher/Subscriber to Callmanager 4.1.3
  - Implemented site-to-site VPN between three sites with QOS via IPSEC Tunnels
  - Running OSPF in-site and inter-site over VPN
  - Making use of VRF's across four sites to segregate and independently route voice traffic, data traffic, guest traffic, and BGP load balanced traffic
  - Implemented NBAR basic traffic classification
  - Using SAA/SLA for inter-site quality monitoring
  - Designing and implementing TACACS+ network authentication and authorization
  - Implemented Open Source monitoring tools including: Cricket, RANCID, NetDisco, & FlowTools, NTOP, and custom Perl code
  - Assisted with re-iping the network to facilitate summary-routes and standardized VLAN assignments for each site
  - Converting Unity Exchange to Redundant Unity Notes (work in progress)
  - Testing IPCC in IT Help desk scenario (work in progress)
  - Implementing redundant 3750 layer 2/3 core (work in progress)
  - Designing & implementing wireless IP Telephony solution with LWAP (work in progress)
  - Providing network documentation
  - Wireless site survey and installing Cisco Wireless Access points on multi-floor campus
  - Working with four Internet Service Providers for carrier diversity
  - Designing eBGP and iBGP multi-homing infrastructure
- Axis Specialty (NYSE:AXS)
  - Installed 80 seat Cisco Callmanager 3.3 / Unity 4.0 IP Telephony solution with SRST integrated into Active Directory
  - Configured ten 3550 series switches in a Layer 2 QoS'd network through three buildings
  - Upgrading to Unity 4.0.5
  - Troubleshooting Active Directory and Exchange 2000/2003 issues in multi-national network
  - Integrating New York Callmanager cluster with Bermuda Callmanager cluster through intra cluster links
- Arch Re Insurance, a member of Arch Capital Group Ltd (Nasdaq:ACGL)
  - Implemented IDS solution based upon Snort/Base/PostgreSQL/BleedingSnort/oinkmaster
  - Integrating IDS into nAble Network Monitoring Software
  - Making recommendations on Active Directory integration
  - Implementing Open Source monitoring solution based upon Debian/NetFlow/FlowTools/Cricket/Mason/NetDisco/PostgreSQL/Perl
- Max Re Capital Ltd. (Nasdaq:MXRE)
  - Converted network of daisy-chained 2950 switches to a star topology with a redundant core of Layer 3 3750's.
  - Implemented Snort server and Network Monitoring server with Cricket, Nagios, Rancid & NetDisco
  - Implement 802.1x network port security
  - Redesigned and re-rop'd network implementation with a VLAN structure
  - Implement policy-based routing to route Citrix realtime traffic over dedicated link and Citrix printer traffic across higher bandwidth VPN tunnel
  - Installing Open Source Master Shaper
- Bank of Butterfield (On Bermuda Stock Exchange)
  - Troubleshooting Microsoft SQL Server applications
  - Developing SQL Server applications with Microsoft Visual Studio/C#
  - Migrating data from Ingres database to MS SQL and writing Microsoft SQL Reporting Services reports.
  - Optimizing Butterfield Direct web server

- Recommending best practices regarding application development, business continuity, security management, data base management, & network design
- Designing dual SQL cluster with log-shipping for fail-over and load balancing
- Montpelier Re (NYSE:MRH)
  - Installing & Maintaining 75 seat Cisco Callmanager 3.3 / Unity 4.0 / Personal Assistant 2.0 IP Telephony solution with SRST
  - Installing & Configuring Microsoft Systems Management Server
  - Maintaining iSCSI SAN environment
  - Implementing IDS on DMZ using SNORT/BASE/BleedingSnort
  - Maintaining switched network with two 4506 switches, one 4006 switch, and a number of 3550's
- ACE (NYSE:ACE)
  - Configured ten 3550 switches in collocation facility for redundancy
  - Implemented MRTG for monitoring
- PXRE
  - Maintained a Cisco Callmanager 3.3 / Unity 4.0 / Domino IP Telephony solution
- Hamilton Princess Hotel
  - Wireless Site Survey for Cisco Wireless Access Points
- Saltus Grammar School
  - Upgrading network Layer 2 and Layer 3 infrastructure in preparation for IP Telephony solution
  - Proposing replacement of existing 25 node wireless implementation with a Cisco LWAP wireless implantation
  - Performing wireless network survey with AirMagnet software
  - Monitoring network with Debian/Cricket/Rancid
  - Troubleshooting network issues with Ethereal
  - Implementing Multicast on network to facilitate Symantec Ghosting of student workstations
- Tucker's Point Club (Bermuda's Premier Golf Resort)
  - Designed and implemented campus wide switch network
  - Designed and implemented dual Callmanager 3.3 installation with Forced Authorization Codes
  - Integrated Nevotek's Hospitality Management solution in with Callmanager
- TeleBermuda
  - Implementing SNORT for monitoring border servers
- Quovadis
  - Tuning an Asterisk Open Source Telephone solution

## **2002 – 2003, 2005 Choice Communications, US Virgin Islands**

Network Architect

- Managed the Internet Operations Department of a full service Internet and Television ISP
- Worked to reduce daily network incident rates
- Planned and budgeted for service improvements, new products, and network expansion
- Mentored a technical team of people with skills in Cisco router/switch/security technology, software development, Linux servers, and Microsoft products.
- Reduced dial-up issues
- Improved ISO Layer 1, Layer 2, and Layer 3 connectivity and reliability.
- Improved eBGP multihoming arrangements and internal OSPF routing configurations
- Implemented SNMP network management and monitoring with Cricket/NMIS/NAGIOS/RANCID
- Worked to improve wireline/wireless integration with BreezeCom, Alvarion, Hybrid, and AB Access radios.
- Troubleshooting DS3 and NTP network issues on a 7206VXR based network.

## **1995 - 2002, One Unified, Kitchener, Ontario**

Project Manager, Technology Integration

- Providing full life-cycle pre-sales, sales, design, implementation and support
- Cisco CallManager 3.2 multi-partition implementation over WAN, and integration into Unified Messaging/Communications system

- Open Source Asterisk IP Telephone consulting
- Unified Messaging/Unified Communication solution installations.
- ASP based Fax-To-Email services
- IVR (Interactive Voice Response) systems, Voice Recognition systems.
- Vovida/SIP/Linux Implementation
- Distributed IP Telephone System Design & Installation
- Network management & monitoring with Cisco Works 2000, Cisco Works for Windows 6, and WhatsUp Gold v7
- eCommerce development using 3-Tier techniques: ADO/SQL 2000 database, VB COM+ Components, ASP pages, Perl CGI scripting, C++ Coding
- Microsoft Exchange Server 2000 Installation, Configuration & Maintenance
- Windows 2000 Active Directory Installation, Configuration, & Maintenance.
- Cisco IOS router configuration packet filtering, EIGRP, RIP, OSPF, BGP4
- Familiar with routing technologies: RIP, IGRP, EIGRP, OSPF, BGP4
- Worked with Microsoft SMS Network Analysis/Sniffer Tool
- Cisco Switch/Router based VLAN and multi-layer switch configurations
- Cisco IPSEC based Router to Router virtual LAN over DSL, ISDN
- Cisco Dial Up solutions with W2K & CiscoSecure RADIUS authentication
- Wireless voice & data networks
- T1/PRI/DSL/BRI services selection and provisioning
- Firewall design & implementations with Cisco IOS/ IP/FW, MS Proxy.
- Certified installer for 3M Fibre, Hubbell Copper & Fibre
- TCP/IP, DHCP (Cisco & W2K), WINS, DNS (BIND & NT) integrated configurations
- Network Monitoring and alerting with CastleRock SNMPc, CiscoWorks, HP OpenView
- Linux, Unix, Windows 95, 98, 2000, XP

### **Example Projects with One Unified**

#### **2006 – 2009**

- Developing trading strategies using SmartQuant's QuantDeveloper C# framework

#### **2010 – 2014**

- Developing trading solution from the ground up using C++. Utilizes Oracle's Berkeley DB for symbol management; SQLite for position and portfolio management; HDF5 for quote, trade, depth, greek data streams; Boost libraries: datetime, phoenix, spirit, statecharts; and ChartDir for charting.
- Handles live streams from IQFeed and Interactive Brokers, automated executions through Interactive Brokers.

#### **2004            Vertex Works**

- Implemented a 15 seat Asterisk based IP Telephone solution

#### **2000 – 2002        One Unified**

- Design multi-site network architecture for providing VoIP and Unified Communications services in an ASP (Application Service Provider) environment.
- Utilized Cisco Call Manager / AVIID architecture components (routers, switches, firewalls, gateways)
- Integrated with Microsoft Exchange Server 2000
- Custom 3-tier web site development with integrated credit card processing

#### **1999 – 2002        ESG International**

- Troubleshoot IP/IPX network connectivity issues
- Implement wide area VPN network with Cisco routers and switches
- Architect Windows NT multi-domain, multi-site network

- Design plan for migrating from Windows NT environment to Windows 2000
- Migrate Exchange 5.5 to Exchange 2000
- Installation & configuration of Coldfusion web server

**2002                    Compublox**

- Install IP Centrex solution using Cisco Callmanager, Unity, Personal Assistant
- Troubleshoot Wide Area Connectivity issues

**2001                    Stack A Shelf**

- Implement PIX firewall connectivity with parent company
- Audit Microsoft Exchange Server connectivity and backup scenarios
- Custom software development for accounting system conversion

**2001                    Outokumpu Mintec**

- Designed and installed Cat 5e network/telephone cabling at new office location
- Assisted with moving, migrating, and connecting IP/IPX network to sister company's network
- Integrated wiring for use with PBX telephone network wiring

**2001                    Coldwell Banker**

- Designed, documented, and presented a greenfield network infrastructure design utilizing Cisco AVVID networking technologies incorporating Call Manager products, Alexis Unified Communications services, and Microsoft Exchange Server capabilities.

**2000                    Digitized Solutions**

- Migrate Windows NT network to Windows 2000 Active Directory
- Migrate Exchange 5.5 to Exchange 2000

**1999                    A Trinidad Consulting Company**

- Presented a one day Year 2000 seminar to IT Professionals

**1999                    Armid Marketing**

- Supervised the development and roll-out of an Envoy based IVR system
- Implemented user utilities for designing customized IVR scripts incorporating any combination of yes/no, numeric, and multiple choice entries
- Handled integration into accounting and reporting system
- Supervised two developers

**1998 – 2000        Merck Medco Rx Services of Nevada**

- Develop Microsoft Visual C++ application for interfacing packaging machine to VMS mainframe
- Utilized multithreaded, object oriented programming model
- Migrated ODBC database connectivity to OLE/DB/ADO architecture
- Handle communications between a VAX VMS system using DECNet & TCP/IP protocols and an Allen Bradley PLC5 using RS-Linx/OPC drivers.
- Worked with PLC programmers, mechanical designers, mainframe developers, and operations personnel

**1997                    Johnsonite Floor Coverings**

- Implemented C program in a manufacturing environment for data-logging values from: Allen Bradley SLC/03 PLC using DH-485 protocols, a string of Euratherm temperature controllers over RS-422, and a LaserMike measuring system over RS-232.
- Supervised software developer.

**1996                      Bell Northern Research (Nortel), Angstrom Engineering**

- Thin Film Vacuum Deposition Equipment Automation
- Designed and implemented a modularized, object-oriented, multi-threaded, Microsoft Visual C++ program to use process recipes for controlling thin film deposition under vacuum in a real time environment.
- Supervised software developer.

**1985 – 1996            Limnoterra Atlantic, Inc.**

- Embedded Systems Design, Software Development
- Provided full life-cycle design, development and support for Electronic Fish Measuring System, Electronic Ecobug Data Logger, Electronic Digital Calipers
- Designed, coded, and tested assembly language level embedded firmware which implemented a Forth-flavored token interpreter.
- Used Lex, YACC, and C to develop a tokenizer for translating Instrumentation Configuration Language source code into pseudo-code (p-code) instructions.
- Designed a general purpose hierarchical database engine. Engine field and record definitions were defined by a text based schema language read in by Lex/Yacc. The engine was used for controlling and validating Electronic Fish Measuring System collection sessions.
- Supervised test engineer and installation engineer.

**Employment History**

|             |  |
|-------------|--|
| 2014 – 2018 | Site Reliability Engineer, Quovadis Services Limited, Bermuda                      |
| 2013 - 2014 | Network Consultant, IBM / Bermuda Computer Systems                                 |
| 2009 - 2013 | Manager, Network Operations, <u>Digicel/Transact</u> , Bermuda                     |
| 2004 – 2008 | Senior Systems Technologist, <u>Systems Business Integration/Igility</u> , Bermuda |
| 2002 - 2003 | Network Architect, <u>Choice Communications</u> , St. Thomas, USVI                 |
| 1995 - 2002 | Project Manager, <u>One Unified</u> , Kitchener, ON                                |
| 1985 - 1995 | Systems Architect, <u>Limnoterra Limited.</u> , Kitchener, ON                      |
| 1984 - 1985 | Systems Analyst, <u>Wilfrid Laurier University</u> , Waterloo, ON                  |

**Professional Affiliations & Certifications**

Member of Association for Computing Machinery (ACM)  
 Member of The Institute of Electrical and Electronics Engineers (IEEE)

**Education**

BS Mathematics, 1986; Wilfrid Laurier University

**Public Code**

C++, C#, Python, Java, & Ruby on Linux & Android: <https://github.com/rburkholder>

**Seminars**

Cloud Monitors Cloud: <https://www.slideshare.net/stargrazer/cloud-monitors-cloud>

**Hobbies**

Sound Mixing, Photography, Video, Animation, Lighting:

<http://youtu.be/-DJoa7yHdHQ> – Blender based animation of local bar, meshes from photogrammetry

[http://youtu.be/k9kwGh\\_cZgo](http://youtu.be/k9kwGh_cZgo) – Band video: Mohawk Radio

<http://youtu.be/ltK4Gzjpafo> – Band video: HiVibes