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Education

B.S.c Electrical Engineering, NYU-Polytechnic Institute of New York, 2000
M.S.c Computer Science NYU-Polytechnic Institute of New York, 2001
Ph.D. Computer Science and Mathematics – Hebrew University 2005
MBA Marketing and Management – Hebrew University 2008

Awards & Patents

AT&T Bell Laboratories - Distinguish Member of Technical Staff, **Fellowship award**, 2008
DARPA Grant, Ph.D. Thesis award - Optoelectronic Semiconductor Design & Fabrication, 2009
U.S Patent Application No. 16/176,580 "System and Method for Content Integrity", 2020
U.S Patent Application No. 98/987.776 "SDN Load Balancing NF & Scalable L7 Visibility 2017
U.S Patent No.: 6,301,267 B1: "Optical Smart Switch in Elastic Networks", 2009

Appointments

SD-WAN, Comcast 2019 - Present. **Philadelphia USA:** PoC design of Automated SD-WAN service offering, intent-based cloud-centric control and management policy driven, abstracted edge end-points & orchestration across routing, security, & application optimization domains. **Versa & Palo-Alto,** Architecture framework. Derive system design documentation, call-flows**,** provisioning & automation: NaaS & SASE Convergence, VNFs instantiation, advanced security functions: CASB & ZTNA. ZTP, applications dynamic micro-segmentation, service chaining and compliance, abstract edge physical end-points that facilitate management, security, flexibility, portability & automated service management.

Lead Mobile Network Solutions, **Huawei Technologies**, **2015-2018**. **Kista, Sweeden**: **Cloud Native SA SBA 5G network services design and PoC:** 5GC vIMS, vSBC, TAS, using SBI to deliver UC to leverage VoLTE, VoNR, ViLTE and IoT for machine to person communications. VNF decomposition to CNF, call flows, network slicing templates and KPIs, microservices CNF packaged in containerized images and orchestrated by Kubernetes and Openstack**:** EN-DC interworking based on network slice instance that forms a set of network function on sub-network instance.

Design and Integration of NF in cloud baed platform for wide array of Tier 1&2 Carriers: British Telecom, EE, 3UK, VF UK (London, UK), Telenor, TeliaSonera, Tele2 (Kista, Sweeden), T-Mobile (Vienna Austrian) Etisalat Group (Abuja, Nigeria), BSNL, Idea (Mumbai, India), Globes, Smart (Manila, Philippine) , STC (Riyadh Saudi Arabia), Mobily, Avea, Turkcell (Istanbul Turkey) , SingTel (Quora Singapore), INWI (Casablanca Morocco), MTC (Ulaanbaatar Mongolia).

Founder/CEO/CTO, Developing and implementing Network Optimization Tools, SeRIQA Networks, **2012-2014.** Network performance and traffic engineering. Customers: AT&T, Verizon (NJ, NY USA), SingTel, BT (**London UK)**, FT (Paris France), Belgacom (Bristle Belgium**)**, Bezeq, Pelephone, Cellcom, HOT, IEC and IDF (Tel-Aviv Israel**)**

Director, Business development and Strategic Planning, Amdocs, 2010 – 2012. Zero-Touch Automated Telecom Operations Solutions - Customers: BSNL & Vodafone Essar, ICE VertICE. Mumbai India & Raanana Israel

CTO & Lead Research, Network Solutions & Professional Services, telecom engineering, **Nokia-ALU**, **2005-2010.** FTTH ODN Optical Distribution System, IP networks transformation,- Customers: BT (Ipswich UK), DT (Munich Germany), FT (Paris France), KPN (Maastricht NL), Vodafone (VF-NL, VF- India, VF-Spain, VF-Ghana)

DMTS, Optical and Packet Network Research, **AT&T Bell Laboratories 2000-2005** Algorithms Design, Planning, Simulations and development for global packet network NJ **USA.**

Area of Expertise

SD-WAN Services and Operations Architecture redesign and PoC to provide automated service offerings: The SD-WAN is based on Versa using edge as policy enforcement and integration point and Amdocs available & active inventory. The proposed PoC is based on Palo-Alto, SASE: NGFW and UTM, provisioning and activation, automated service management from the enterprise portal, service assurance, policy management and zero-touch real-time operations, WAN optimization, service aware routing and traffi c steering, KPI assessment, monitoring and analytics.

PoC Standalone 5GC IMS based service design and deployment: Initial services offerings include voice and video conferencing, eMBB & mMTC. The architecture is based on microservices NF packaged in containerized image and orchestrated by Kubernetes on network slice instance. The network slice instances are based on VNF decomposition, the CNF are monitored & integrated using automated data analytics: AI and ML. Enabling FWA, eMBB, URLLC & mMTC using SBA & MEC

Data analytics and quantitative modelings for devices and wireless networks to improve device performance, quality, user QoE, QoS. Device analytics and performance, RF performance, device quality, device antenna performance, device readiness. Statistical modeling of wireless network and device QoS/ KPI/KQI, user behaviors. Visualize the analytical results using data visualization tools. ML algorithms: forecasting, clustering, classification, reinforcement learning, deep learning. Data extraction/ transformation/loading, text mining and statistical analysis using Python, R, Matlab, VBA, Java Scripts. Spark, Hadoop, MySQL, MS Excel, VBA, TeraData SQL, MS SQL.

Services and Operations Architecture Design and Deployment: PoC for VF: vEPC, vCPE, vDNS, v/eMBB, eSIM, vIMS, vVoLTE, vVoWiFi, vVoMBB, vVoiceMail, vEmail, vMTAS, vHLR & vHSS using Telco cloud deployment. In M/R/E- CORD, ONOS and ONAP for wireless, terrestrial, and optical networks, IP-MPLS, SD-WAN, access and core transport networks

Integration: multi-vendor ecosystem, VIM/NFVI and PNFs, data models, on-boarding, resilience applications decompose into smaller functionalities that runs on cloud platform, PaaS APIs services

Manage research team: network security, embedding VNF descriptors & SDN reroute of malicious traffic. DLT for E2E content integrity, protecting communication channels from adversary attack

Plan services automation: provisioning and activation, 5G and LTE network slice instantiation of chained VNF in cloud core for FWA

Virtualized SGi-LAN: Chained VNFs, network slice and MEC transparent breakout to optimize mobile carrier's RAN, topology of connections & individual link requirements: throughput & QoS

Location Based Services: optimized video quality content delivery to mobile devices, radio analytics with information on estimated downlink radio throughput and adjusting TCP congestion control (social, analytics, video, surveillance, etc.)

Geospatial Data Network Visualization and Analytics: data collection and storage, clustering, dispersed analysis, network structures, consumer demand and availability, R and Python

MEC video streaming trans-multiplexing: splitting video content into small segment, distributed CDN cashes, MEC video distribution stream analysis & surveillance, WLAN and IP-PBX integration

Telco cloud services transformation: plan for vTelco M-CORD and MEC placement and interaction with a vGi-LAN, eNB, gNB, vEPC, eSIM, GCF, NBIoT, workload placement**,** mobile computing services (e.g., offloading video encoding), CaaS (UC embedded SDK), RCS and DaaS, cloud transformation project M-CORD, ToC (Telecom Operation Centre), ONOS for SDN, (ESX/KVM/ OpenNebula, etc.), and vIMS Multi Tenancy Cloud Solution based on Cross-BU solutions

Clouds interoperability: E2E user experience in Openstack in hybrid cloud, SDN and NFV automation Core Network initiatives, Open Cloud based VoLTE and VoWiFi services: vNAT, vFW, vSwitch, vSBC, vCSCF, vTAS, vLB, vCPE and vBRAS

TCP/IP splicing: ADC, DDoS, URL filtering and offload application suing SDN, clustering, routing, operations and performance optimization

Hosted services program: technical architecture governance and E2E operational model and remote help desk (NOC in India), APIs exposure program for 3ed party vendors, feasibility, design, analysis and E2E deployment, SDP/SOA/ESB

21CN IP transport design architecture: Separation of control and user plane applications (DNS, DHCP, Radius, NTP, LRSI), routing protocols and architecture deployment of BGP, OSPF, FWs, IPSec, SSL/TLS, AES (CBC & GCM), 3DES, PKI, backhaul and front-haul aggregation

Wireless Office Design: FMC and Data services in Wireless-IMS environment for the enterprise, OSS/BSS, IP-Iub/Abis migration, SS7/STP, SCCP MAP, SIGTRAN, CAMEL, Diameter/DRx, SIP, GTP, Policy (PCRF/ OFCS),WebRTC, RCS, roaming services, IP-VPN (GRE, IPSec); VPLS, PWE3, L2VPN and IP/MPLS network

DWDM/CWDM Optical Network Design and Deployment: integrated optical and IP packet domain SDN controllers (L0, OTN-L1, Packet-L2), dark-fibre/SDH/ SONET, IP-over-ASON/DWDM, ODN, OTN, ROADM, FOADM, SDH, SONET, 40G/100G/200G/400G coherent optical transmission technologies, Ethernet, Wave, Switching, Routing, Data Networks, DCN, and synchronization of optical network, optical mesh redundant routes, DSL, MSAN/MSAG, OAM&P platform and EMS/NMS.

E2E Circuit Designs: MPLS, Ethernet, eLAN-eLine, TCP/IP, BGP, QoS, IP, WAN, LAN Topologies, Enterprises network planning, design and provisioning: EWL and IPVPN

Standards Engagement: CNCF, 3GPP, 5GPP ETSI, MEF, TMForum, Linux Foundation, ONAP, Open-O, Apache Foundation, OCP Oasis Foundation, ONF, IETF, IRTF, RCS, OMA-DM, ISG, ITU-T, ONF, IEEE 802.1a/b/g/n/ac, ITIL3.3/eTOM, HGI, OSGi, BBF, OMA-DM

Cloud Platform:, Openshift, AWS, Azure, Telco private clouds and Heroic, Docker, Kubernetes, Openstack, Chef and Puppet

Scripting and Programming: Linux, GitHub, TCL, Perl, Ruby, Go, RESTful, gRTP, Kafka, APIs,C/C++,JavaScript, Java/J2EE,Servlets, OpenvSwitch, PHP, R, SOA, Spring MVC, SQL and No-SQL. HTML5, JS, CSS, XML, Apache Spark

Open Source Software Components and Tools: Cloud Foundry, LF Networking, ONAP, OPNFV, tungsten fabric, panda, Open Switch, FD.io, SANS.io, CNCF, Akraino Edge Stack, LF Edge, LF Deep Learning, Acumos AI, Ansible, Helm, Terraform, Prometheus,...

Platforms Scripting and Modeling: Openstack, VMware, VirtualBox, Docker Engine, Kubernetes, Hypervisors (ESXi, KVM, OVM, Xen), Linux (RedHat/Ubuntu), Apache, YANG, (Python, Groovy, YAML, Perl), vSwitches/vNics, VMFS, SAN/NAS, MEF and LSO project, OPNFV, IO Visor, OpenContrail, ONOS and ONAP

Protocols: Openflow, Opendaylight, NETCONF, P4, TCP/IP, UDP, EIRGP, OSPF, BGP, RRC, NAS, GTP, VoIP/SIP, IN, NETCONF, TL1, HTTPS/SOAP, CMTS, SMSC/MMSC/CPM/EVVM/WAP, PDCP, RLC, MAC, SSL/TLS, MSF, NGN, LMDS, MMDS, SIP, ISIS, RIP, SMNP, CLI, XML, AMQP, SONET/SDH/ATM/PDH, CORBA, Diameter, SS7, ISUP, PRI, MGCP, TGCP, NCS, INAP/TCAP

Network Programming Tools: sFlow/NetFlow, Arieso/JDSU, Wireshark, ATPG, Scapy, NetSonar(trace route and ping), Libra, etc., Tools and Common Services: VNF SDK, Microservices Bus, Logs, Auth. RF tools: Atoll, Planet EV, MapInfo, Windcatcher and Alteryx.