# Sergey Shchekoldin

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Side projects: https://cgen.dev/
https://github.com/s-shchekoldin/

## Summary

Software and Hardware Developer with the following skills and experience:

- C/C++ (more than 18 years), standards: C++/11/14/17 (strong OOD & OOP skills)
- FPGA (Xilinx/Intel/Altera) – System Verilog (> 8 years)
- Microcontrollers: STM32, MSP430, AVR (> 10 years)
- Proficient in high-frequency PCB and schematic design using Altium Designer (>10 layers, 10 GHz), with hands-on experience in prototype assembly and soldering (> 5 years)
- Frameworks: STL, BOOST, DPDK, CUDA, REST, SQL, PCRE, OpenSSL, OpenCV, OpenCL
- Database (ODB): MySQL, Oracle, NoSQL, Redis
- Debugging & Profiler: gdb, valgrind, strace, operf/opcontrol

I developed solutions for:

- Digital Signal Processors (DSP) for Radio Frequency Systems (RFS)
- General-Purpose computing on Graphics Processing Units (GPGPU)
- High Performance Computing (HPC) for distributed systems spanning over 9000 servers
- Deep Packet Inspection (DPI) for Lawful Interception Systems
- Data Leak Prevention (DLP) for Threat Intelligence Systems
- BigData solutions for high-load databases and storage/recording network traffic payloads (> 1Tbit/s)
- Hardware devices for voice interception: E1 (copper), STM 1-64 (optical), SS7 (Ethernet frames)
- Protocol Parser Generators
- Anti-NAT - specific network cards and software to compare traffic before and after NAT
- Specialized hardware network devices for routing, aggregation, and balancing traffic
- Anti DoS/DDoS solutions

Extensive experience in developing high-load applications and optimizing code for various architectures: x86-64, AMD-Epyc, Arm, Loongson (LoongArch64 with 4 NUMA), Tilera (64 + Pro), Cavium (Octeon), NVIDIA CUDA (sm50-90 + Jetson), FPGA (Xilinx/Intel/Altera), Russian CPUs Elbrus (E8C) and Baykal T1000

Parsing and communication with network protocols:

- ethernet, rdma, ptp, ipv4/ipv6, mpls, vlan, pppoe, gre, arp, tcp/udp/sctp
- bgp, igrp, ospf, netFlow, radius, snmp
- http1-2.0, https/ssl/tls, dns, ftp, smtp, pop3, imap, mime
- sip, h323, ss7, sigtran, mtp, abis, ranap, megaco, mgcp, skinny, rtp
- icq, irc, msn, jabber, xmpp, mra, yahoo, BitTorrent
- xml, json/bson, asn1 (ber+per), zeroMQ, protoBuf

## Experience

### SENIOR SOFTWARE ENGINEER

Confidential company (UAE, Abu Dhabi), Feb 2023 – Present

- I designed and implemented a custom FFT (Fast Fourier Transform) algorithm that consumes 3.5 times fewer logic elements (LUTs) than the Xilinx FFT IP core, achieving a significant improvement in efficiency
- I implemented high-speed data reception processing for RFS, achieving a speed of 80 Gbit/s for x86/64+avx512
- Optimized legacy company algorithms by up to 40x, primarily by migrating from x86/x64 to Nvidia GPU using CUDA and TensorFlow (Mellanox Ethernet card to GPU, via Direct RDMA)
- Contributed to the development of a serverless mobile version of the system based on NVIDIA Jetson Orin
- I successfully reduced the prime cost of the system and significantly decreased the overall energy consumption of the system

Received a formal letter of appreciation for assisting the FPGA team during the transition period following the departure of two key developers. Joined the FPGA department at the end of 2024.
Granted a 10-year UAE Golden Visa

### TEAM LEAD (SOFTWARE/HARDWARE DEVELOPER)

Norsi-Trans (Russia), Sep 2011 - Feb 2023 (11.5 years)

Development for the Telecommunication industry:

- Developed Yakhont-SHD - proprietary Big-Data database, establishing relationships between statistics/indexed network flows (TCP/UDP) and corresponding raw-packet traffic (PCAP) or voice payload (RTP/E1/STM)
- Possess experience in building storage with a recording speed exceeding 1 Tbit/s, accommodating statistics/indexed data for 3 years and raw-packets for more than 6 months
- I implemented Shproto, a program that generates C++ code to parse protocols based on simple rules. It addressed parsing protocol challenges and served as the foundation for the company's DPI/DLP products.
- Implemented a distributed system for indexing images and objects (using OpenCV) and performing similarity search optimized with NVIDIA CUDA on GPU
- Developed a system for detecting the most important words and phrases (factorial analysis) in text or messages (similar to Yandex MyStem)
- SOPSA (https://sopsa.ru/) - Anti-DDoS solution (based on NetFlow+BGP+SNMP protocols), analogous to Arbor Networks
- KROZ - DPI/DLP solution
- NanoSwitch-64/128 ports - hardware network device (based on FPGA-Xilinx) for routing, aggregation, and balancing traffic (alternative to solutions from Gigamon)

These hardware devices were entirely developed by me, sold to Norsi-Trans, and subsequently some were mass-produced in series exceeding 1000 units (devices are based on FPGA, STM32 with FreeRTOS, and include PCIe/USB drivers):

- E1-48 - interception (identifying E1 period, parsing HDB3, transferring it to host for future analysis), similar to a Sangoma Technologies cards, but 20 times less expensive
- STM1-64 - interception (finding STM period, translating STM-4-16-64 to STM1, parsing STM1 to VC4, and transferring it to x86/64)
- Anti-NAT - a specific network card and software for comparing traffic before and after NAT (>120m flows/sec)
- TAP-1G - for SS7 interception (protected inline connection in the Ethernet channel to send a copy of traffic)
- NS-light (12 ports x 10 Gbit/s) – a lower-cost alternative to NanoSwitch with a configurable number of modules and ports

**SYSTEM ARCHITECT/PROGRAMMER**

MFI Soft (Russia) Aug 2007 - Sep 2011 (4 years)

I progressed from a developer to a system architect at one of the largest companies in Russia in the telecommunications industry. Participated in the following projects:

- Anti-DDoS solution: https://www.anti-malware.ru/reviews/DDoS_attack_prevention_Perimetr
- Presentation server (remote presentation from a mobile phone, iPad, notebook, etc., without software on it, from a web browser): www.nicemeeting.com (functionality was integrated into some projectors)
- Analysis of the executable Skype.exe file (reverse-engineered) to decrypt the transmitted traffic: https://xakep.ru/2007/06/08/38543/

I was awarded diplomas as the best employee of 2009 and 2010 in the MFI-SOFT company.

## Education

- 2011-2013 Master's degree in Information Technology, Faculty of Business Informatics, Higher School of Economics (national research university), top-3 in Russia, top-400 in the world
- 2006-2010 Bachelor of Economics, Business economics for managers, Faculty of Economics, State University of Nizhni Novgorod named after N.I. Lobachevsky (UNN)
- 2004-2009 Bachelor of Science in Information Technology, Faculty of Radiophysics, State University of Nizhni Novgorod named after N.I. Lobachevsky (UNN)