

PROFESSIONAL EXPERIENCE	<p>Embedded and Storage Professional with 10+ years of progressive experience in embedded systems, parallel programming using OpenCL, storage products involving embedded fibre channel switch virtualization and Linux kernel development projects.</p> <p>Area of expertise</p> <ul style="list-style-type: none"><li>• Experienced in Linux Kernel Programming, Porting and Board bring-up. Development of devices drivers for proprietary hardware.</li><li>• Storage Virtualization, Fibre Channel switch virtualization and Storage applications.</li><li>• Software development and performance based optimization for GPGPU/modern CPUs platforms using OpenCL. Worked on Nvidia/AMD GPUs.</li><li>• FC, SAM/SCSI 2 architecture &amp; Programming. Exposure to LSI Logic MPT architecture.</li></ul> <p>Professional summary</p> <ul style="list-style-type: none"><li>• Engineer - Canon India private limited (Mar '10 - till date)</li><li>• Engineer - Brocade Communications Pvt. Ltd. (Jan '08 - Mar '10)</li><li>• Specialist - Tata Elxsi Pvt. Ltd. (Sep '03 - Dec '07)</li></ul>
EDUCATION	<p>BITS Pilani M.S Software systems (Distance learning course) 2006-2009, cgpa 5.8.</p> <p>Govt Engg College, Trichur B.Tech, Computer Engineering 1999-2003 Batch. Aggregate marks 71%.</p> <p>Kendriya Vidyalaya, Trichur 12th (CBSE). Aggregate mark 88.8%</p>
SKILL SET	<p><i>Languages and Scripting</i> C, OpenCL, Exposure to C++, Python.</p> <p><i>IDE &amp; Tools</i> GNU development tools, KGDB/GNU Debugger, Cscope/Ctags, GNU Make, Rational Clear case, svn, CPP-Unit testing framework, Coware (now part of Synopsys) Virtualization Platform for SOC design, Microsoft, Install shield X.</p> <p><i>Protocol and Protocol Stack</i> Expertise in Fiber Channel and working knowledge of FCP. SCSI-2/SAM, Understanding of SCSI protocol and the SCSI protocol stack in Linux. Exposure to USB</p> <p><i>Storage Devices</i> - Brocade switch series. Primarily Brocade's 48K switch &amp; Pizza boxes - Flexline Array Controller, Sony AIT SCSI, IDE tape drives SDX series, L180 Tape Library</p>
CAREER PROFILE	<p>Most relevant Technical Projects executed till date.</p> <p><i>1. Canon proprietary SoC bring up with Linux.</i> Canon Inc, Japan 1 year and 1 month Canon proprietary SoC based on arm-v6 was targeted towards network application devices. This project involved initially bringing up of Linux 2.6.36 on Coware Virtual platform as SoC was not available at the time and later on the board itself.</p> <p>This project also involved in developing UART UIO drivers on beagle board to study and compare the benefits user mode drivers.</p>

#### Involvement

All the responsibilities were shared with another engineer.

- Responsible for porting and bringing up of Linux kernel 2.6.36 on Coware Virtual Platform. It involved device driver development for basic devices like interrupt controller, UART etc.
  - Associated in the porting on U-boot.
  - Responsible for development of a minimal user-land for the porting using busybox and for porting and testing the Linux kernel with LTP.
  - Responsible for developing UART-UIO driver and testing of the same on beagle board. Fine grained profiling of the read/write procedures and interrupt latency was carried out for modeling generic drivers as UIO drivers.
  - As an initial study of Virtual Platform hardware peripherals models were created and integrated to Virtual Platform in System C. I was responsible for the integration of reset-gen to Virtual Platform.
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### *2. Linux based Parallelized Image processing library (PARIMP)*

Canon Inc, Japan and Canon India

2 year and 5 months

This project involves in preparing a advanced parallel library on Linux for medical image processing algorithms with support for NVIDIA, AMD and X86 based platforms. The whole library is developed in OpenCL and highly optimized to perform faster than some of open and free solutions in this domain like OpenCV and ITK and Canon internal solutions.

Initial phase of this project involved in porting of Canon proprietary Digital radiography motion imaging software to OpenCL from HLSL (High level shader language).

#### Involvement

- Responsible for parallelizing image processing algorithms like Gaussian Blur, DFT, norm, determining Image statistics, performing Image normalization, Image Interpolation, Computation of 2D histogram and Image registration algorithms like Normalized mutual information using Powell optimizer through various phases of the project.
  - Responsible for performance analysis and comparison of OpenCV CUDA and OpenCL OCL implementation of various image processing algorithms.
  - Responsible for development of CPP-Unit based test framework for use of Canon India in early phase of development. It could automate CSV based testing, variation of performance parameters, test results and performance charts generations, template generations etc.
  - Responsible for porting DR motion software's image noise reduction (NR) module and image enhancement(EN) module to OpenCL. This task also required to reduce errors due to porting by finely adjusting floating point computation on OpenCL to match with HLSL and optimizing OpenCL implementation.
  - Responsible for porting a portion of DR software to CELL broadband engines using proprietary compilers for performance analysis and study.
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### *3. SAS (Storage area services)*

Bangalore and US

2 years and 3 months

SAS provides generic high available virtualization platform by moving storage application intelligence to the fabric. SAS today is successfully deployed in market with Brocade and OEM partners storage solutions like DMM, EMC Recover-point and Invista.

#### Involvement

- Responsible for SAS enhancements and related development features.
- Responsible for handling SAS related customer issues and maintenance.
- Enrolled ownership of virtual initiator module.

- Multiple deputations in Brocade-US for facilitation of SAS co-ordination activities between on-site team and India team.
- Involved in every phase of porting, development and enhancement of SAS to next generation platforms as and when required from Brocade.

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#### 4. *DVR-SMM (Digital Video Recording)*

Client - Seagate, US

Bangalore

6 months

This project involved in conceptualization of a DVR (Digital Video Recording) product based on client proprietary Hard drives. This solution involves component development like stream file system, stream I/O scheduler and enhanced disk driver for the hard-drives.

##### Involvement

- Module lead for Stream Scheduler module. SS Requirements elicitation and SRS preparation.
- Involved in Design and preliminary coding phase.
- zero copy implementation in Linux-2.6.12-3. Back porting of blktrace utility.
- Deputed on-site for demonstration purposes for POC phase.

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#### 5. *FCTMD (Fibre channel Target mode driver)*

Client - CMS, Japan

Bangalore

9 months

The project involves in development of Target Mode driver for LSI logic FC HBAs which are based on LSI-Logic Fusion Message passing technology.

##### Involvement

- Requirement analysis and design elaboration
- Understanding the LSI Logic Fusion -Message Passing Technology.
- Development of LSI Logic Fibre channel driver to work in standalone mode with real world devices and with Software RAID Controller system when required.

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#### 6. *Virtual Storage Management*

Client - SUN, USA

Bangalore

8 months

The VSM product line involves complete development of virtual storage management solutions for MVS (Mainframe) clients. The fibre channel tapes(3x90 series) are virtualized for infinite storage and high availability with SUN proprietary tape drives and libraries.

##### Involvement

- Implementation of 3490, 3590 Tape drive emulation (TDE) in the VSM product for MVS clients. This involved building up of basic framework structure for TDE.
- Individual contribution in implementation of 3490 commands (READFWD, WRITE, BSF, FSF, REWIND, WTM, and NOP).
- Implementation of Linux character driver IOCTL interface for dynamic testing by injecting tape commands to TDE.

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#### 7. *Swift*

Client - Sony, USA

Bangalore

5 months

This project involved firmware verification testing, compliance testing (towards Independent software vendors like Veritas, Arcserve, Netbackup) and WHQL testing of recent technology third generation AIT tape drives. Also involved in design and development of automated GUI tool in Windows for testing AIT-3 drives with SCSI-2 protocol tester card Itech-6160d.

#### Involvement

- As Personal interest created a Test suite development and compliant testing towards different ISVs.
- Active participation in the development of the framework (both GUI and structural framework) and test case development for the tape commands INQUIRY, TEST UNIT READY, RESERVE, RELEASE, LOAD, UNLOAD, MOD SENSE, LOG SENSE.

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#### TECHNICAL INTERESTS

Technical Projects executed due personnel interests. These projects were executed with no professional requirement and share no professional lifeline till now.

UMSDE (USB Mass storage device Emulation): - The project emulates the BULK Only USB mass storage devices to high speed memory like RAM and can do regular backups to actual disks. The final solution provides a bulk level interface to the USB mass storage device class. Completed in Linux kernel 2.6.15.

Kmemleak (Linux kernel Memory leak detector): - This project intended to develop a proficient kernel memory leak detector which will trace various kernel memory allocation interfaces like kmalloc, vmalloc, alloc\_pages etc. for a kernel module and will generate a report when required or when the module exits. This was developed as an augmentation for the FCTMD project.

IMPERCEPTIBLE MODULES: - The Linux kernel being monolithic in nature provides unrestricted access to kernel data structures and routines. The solution of imperceptible modules hides user specific data and data functions in extended memory areas unknown to kernel. This enhances the security features to the data associated, achieving complete code level security.

#### TECHNICAL WRITING

Writing a Network Device driver. Published in Linux Gazette online magazine - 2003

The Linux CFQ IO-Scheduler Part - 1. It describes the Linux block layer architecture and the discussed a Elevator and CFQ I/O scheduler as a part of Block I/O subsystem. (Available on request).

EXTRA ACTIVITIES I have interests in games like Table Tennis, Badminton, reading novels.

DECLARATION The information I have provided is true to the best of my knowledge and belief.