PINTU KUMAR

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Overall Summary:	**More than 16+ years of experience in Embedded Linux product development**
Roles Played:	Individual contributor, Technical Leader, Troubleshooter, Mentor, Researcher
Major Work Background:	**Automotive/Telematics Linux Kernel development and support**, Tizen/Android smart phones/devices board bring up, feature enhancement/porting, investigation, prototyping, tools, **open source contributions**, **memory management** subsystem, robotics design.
Onsite visit and Visa:	South Korea, Taiwan, Japan, US (B1/B2 multiple entry visa: valid till 2023)

Experience (2004 – 2020)

Staff Engineer (Automotive Kernel/BSP), Qualcomm India, Bangalore	**Dec/2019 – Till Date**
System Software Architect (Linux Kernel Team), **Sony** India, Bangalore	2+ Years) Nov/2017 – Dec/2019
Principal Engineer (Tizen Kernel/BSP), **Samsung** R&D India – Bangalore	(8+ years) Sept/2008 – July/2017
Senior Engineer, **Sasken** Technologies Ltd – Bangalore	(4+ years) Feb/2004 – Sept/2008

Qualification (B.E. + MTech)

M.Tech (Embedded System), Manipal University – Bangalore	(July/2012 – Feb/2015), **CGPA: 9.09**
B.E (Computer Sc. & Engg) – KIIT, Bhubaneswar, India	(1997 – 2001) SCORE: 73.6 %
IELTS Results (Oct/2019)	Overall Band: **6.5** [L:7,W:7,R:6.5,S:6]

Skills Highlights

C, C++, **Linux kernel, device driver**, u-boot, smart phone bring-up, **Tizen**, Android, Ubuntu, **Telematics, Robotics**

Experience in **Linux Board bring-up** across various chipsets (SPRD, MEDIATEK, MSM, EXYNOS, OMAP)

Proven ability in **Linux Kernel development**, enhancement, issues investigation, feature porting and upgrades.

Majorly worked in **Linux Kernel Memory Management subsystem**: (prototype design and feature integration) ION/DMABUF buffer sharing, Tizen DRM-GEM design, CMA, ZRAM, LMK, low-memory system design, etc.

Experience in Kernel code size reduction, boot time reduction, memory optimization, performance tuning, sluggish improvement, **Linux Robotics** and **Linux real-time** (preempt-rt, Xenomai) model design and demos.

Linux kernel mainline contributions, back-porting patches, reviews, bug reporting, proposals, discussions, participation and speaker in various **Embedded Linux Conference** (ELC) world-wide.

New Technology Evaluation: XENOMAI, RISC-V, PSI, OPEN-AMP, etc.

Good **kernel debugging skills** with ability to investigate and find the exact root cause of the issue.

Others: Agile/Scrum, git/gerrit, yocto, kselftests, perf, systemd, qemu, gdb, trace-32, ramdump, memps, rt-tools

Major Interests: Linux board bring-up, Kernel memory management, Kernel upstream contribution, Linux based IOT/Robotics/Drones/Automotive bring up, research topics or value additional with in kernel, etc.

Achievements & Awards

OPEN SOURCE CONTRIBUTIONS:
a) Linux Kernel Mainline: [purely my own ideas]
https://lore.kernel.org/lkml/?q=pintu
https://git.kernel.org/cgit/linux/kernel/git/next/linux-next.git/log/?qt=grep&q=pintu ;
b) Xenomai – Real time Linux Kernel:
https://gitlab.denx.de/Xenomai/xenomai/-/commit/c984901a833848ac29e6df1862cb9871b26b400b
c) Tizen open source: https://git.tizen.org/cgit/contrib/robotics/

d) Git Hub Contributions: https://github.com/pintuk
Demonstrated ideas and technical papers in Qualcomm **Hackathon-2020** and **QBuzz-2020** events.
Received **Performance Excellence Award** in SONY-2019 for the outstanding contributions done previous year.
Technical showcase and **demo presentation in SONY Open House** – 2019
Technical paper presentation in **Embedded Linux Conference** World-wide: Tokyo [July/2019]: Xenomai based **real-time automotive model** – Link: XENOMAI-RT-MODEL.pdf   San Diego [April/2016]: Tizen-based-Remote-Control-Robot – PDF - ELC2016-TIZEN-RC-CAR.pdf   San Jose [March/2015]: System-wide-Memory-Defragmenter.pdf [*Samsung Best Paper Award, 2015*]   Japan [June/2012]: Linux Memory Fragmentation : Observation and Analysis on Smart Phones [PDF here]
Submitted many potential patents, ideas, proposal, and demos during my tenure in Samsung.
Complete architecture, design and coding of Tizen based **robotic model bring up** (both hardware and software):   Check Video demo here: https://www.youtube.com/watch?v=n885XMAh7kI&feature=youtu.be
Samsung **Employee of the month** award – Nov/2014 (for first time Tizen bring-up on Mediatek)
Presented Technical papers and demos in **Samsung Technical Challenge** (NIPUN) – 2010/2011/2012
Presented a Technical Paper in **Sasken Technology Conference** – 2007
Received **Spot Awards** during Sasken tenure – 2004/2006/2007

Major Projects Highlights

Telematics/C-V2X Products (Linux Kernel/BSP Work)	Dec/2019 – Till Date (QUALCOMM)

- Working on Automotive-**Telematics Linux Kernel/BSP areas:** issues analysis, investigation, OEM specific customization, new feature development and proposals.
- Resolved long pending Winbond DDR boot-up issue with QC SA2150P chipset.
- Memory foot-print optimization/reduction for kexec/crash kernel feature on ARM64 and Linux Kernel 5.4. Reduced crash-kernel reserved memory size from 512MB to 96MB and successfully boot to login shell.
- Linux Kernel open source contributions in progress.
- Handling Kernel/BSP team (3) for supporting Qualcomm Telematics customer issues world-wide.

Value Addition:
- Presented an internal talk on Qualcomm C-V2X technology.
- Demonstrated ideas (Linux Kernel-Memory optimization) in Qualcomm **Hackathon-2020**.
- Presented technical E-Poster/paper in Qualcomm **QBuzz-2020**.
- Linux Kernel open source contributions.

Used – C, Linux Kernel: 3.18/4.9/4.14, MDM chipset (9x50, SA415/SA515M, SA2150P), C-V2X, others

SONY Contributions (Linux Kernel Team)	Nov/2017 – Dec/2019 (SONY)

- Several contributions in **Base Linux Kernel Development for Sony's** future products.
- Resolved many issues in **Sony Kernel feature** such as: page fault issue, cpu lock up issue, semaphore locking issue, smap issues, sync issue, rebooting issue, irqsoff latency issues, kernel oops, backtraces, etc.
- Investigation about DRM/HDMI display bring-up after **snapshot boot resume** on i.MX6 with Kernel-3.10+.
- Porting and improvement of **unique-page, zswap feature** from Kernel 3.0 to 4.9 to reduce snapshot-image size.
- **Complete design and implementation of GPIO IRQ affinity feature** (including snapshot boot suspend/resume support) for i.MX7 board with Linux Kernel 4.1. Using this, now GPIO devices can use the dedicated CPU.
- Detailed investigation of **Kernel vDSO** support for ARM-32 boards (i.mx7, pi2).

Value Addition:
- **Mentorship:** for M.Tech college intern to explore new technologies in Kernel areas.

- **OpenAMP:** Investigation about OpenAMP and rpmsg/remoteproc interface in Kernel.
- **PSI:** Investigation and experimentation about PSI feature in mainline Linux Kernel 4.20 → 4.9.
- **REAL-TIME:** Xenomai 3.0 bring up, evaluation, prototype, demos with Kernel 4.9 on various x86/arm boards.
  - ♦ First time Xenomai Kernel 4.9 bring up on Qualcomm chipset sdm845, Resolved many boot up issues.
  - ♦ Complete architecture, design and implementation of **Xenomai based real time robotic model** using Raspberry Pi-3 and Linux Kernel 4.9. Demonstrated the working ideas in various forums.
- **RISC-V:** RISC-V Linux Kernel 4.18 bring up and evaluation on QEMU environment.

Used – C, Linux Kernel, i.MX{6/7}, Raspberry Pi, Beagle Bone, Hikey620, QualComm Snapdragon-845

TIZEN Smart Phone Development [SPRD chipset]	April/2014 – June/2017 (Samsung)

[Complete ownership for India/Asia model release]

Samsung Z4 & Z2 Model (SC9830, 1GB, 4GLTE), Z3 (SC7730, 1GB, 3G), Z1 (SC7727, 768MB, 2G):

- **Technical Leader** for Tizen Kernel/BSP team including **individual contributions below**:
- **First time Tizen smart phone bring up** on Spreadtrum (SPRD) chipset with Linux Kernel 3.10.
- Initial Zinitix touch screen driver bring up and customization for Tizen Z4 model.
- Improving SPRD-DRM-GEM (drivers/gpu/drm/sprd) and **ION buffer sharing** mechanism.
- Enhancing and tuning **memory management areas** [ION, CMA, ZRAM, OOM, LMK, vmpressure, etc.].
- Finding issues in vendor kernel, back porting patches from mainline to improve system stability.
- Proposed and implemented **several new features in kernel**: reduced daemon swapping, dynamic low memory killer, automatic system-wide memory shrinker and compaction, slow path monitoring, oom kill count monitoring, cma tracking, sgt-list allocation fallback, exact mem-available feature, gem buffer tracking, etc.
- Developed **sluggish-test utility** to quickly reproduce sluggish behavior and find root cause.
- Others: mainline patches porting, gerrit code review, vendors follow-up, ramdump analysis, log analysis, issues investigation, boot time analysis, sluggish analysis, memory leak analysis, memory failure analysis, etc.
- **Proposal to enhance Tizen ecosystem** for OEMs and thereby promoting chipset vendors to adapt Tizen.

Platforms/Software Used - C, Linux Kernel 3.10.xx, Tizen 2.3/2.4/3.0, Spreadtrum (SPRD) chipset

TIZEN - MTK Bring up (MT6571 chipset, RAM: 512MB)	Nov. 2014 – March 2015 (Samsung)
[1 month onsite in Taiwan MTK HQ]	

- **First time Tizen smart phone bring up on Mediatek chipset** (MT6571) with 512 MB RAM, Kernel 3.4.
- Kernel customization, console shell bring up, Kernel patches porting, Tizen sdb shell bring up.
- **First time, complete architecture and design of MTK-DRM-GEM** (drivers/gpu/drm/mtk) for Tizen Graphics/Display bring up on Mediatek smart phones.
- **Kernel memory optimization (~12 MB),** kernel boot time reduction, issues analysis and investigation.
- Received "**Employee of the Month Award**" and appreciation from MTK folks. Finished bring up in 3 weeks.

Platforms/Software Used - C, Linux Kernel 3.4, Mediatek chipset, Tizen 2.3

ULC Feature Phone Bring up (SC6821 chipset, RAM: 128MB)	Aug 2013 – Jan 2014 (Samsung)

- **First time Tizen bring up on Spreadtrum (sprd) chipset** with 128MB RAM, and NAND flash (UBIFS).
- **First time, complete architecture and design of SPRD-DRM-GEM** (drivers/gpu/drm/sprd) interface for Tizen display/graphics bring up on smart phones and make it light weight and portable.
- Kernel **code size reduction below 5MB**, reserved memory reduction below 40MB, boot time below 40s.
- ZRAM driver integration, **CMA/ION backporting** (3.8 to 3.0) to save ~8MB reserved, performance tuning, etc.
- Implemented SWAP field in Tizen memps utility to show used swap space by each process.

Platforms/Software Used - C, Linux Kernel 3.0, SPRD (sc6821)

TIZEN Smart Phone Bring up on QUALCOMM (QC) chipsets	Sept 2012 – July 2013 (Samsung)
3 months onsite leader for base camp @ San Diego & Hyderabad]	

- Co-worked with QC team for **first time Tizen menu-screen bring up** on QC chipset – 7x25, 8x10.

- Reserved memory analysis and optimization. **CMA, COMPACTION, ION, ZRAM** porting and stabilization.
- System stability issues analysis, OOM analysis, memory/fd leak analysis, **DRM-GEM/ION buffer sharing**.

Platforms/Software Used - C, Linux Kernel 3.4, MSM8974, MSM7x25, MSM8x10, MSM8x26

TIZEN – ION/DMABUF Investigation and Integration	**Mar 2012 – Aug 2012 (Samsung)**

- **First time study and demonstration of ION and DMABUF** buffer sharing mechanism in Kernel.
- Developed sample drivers to verify **zero-copy in Kernel/User space** using DMABUF and ION mechanism.
- Co-work with HQ counterpart and Tizen Graphics/Multimedia team in integrating the whole solution for Tizen smart phones.

Platforms/Software Used - C, Linux, Kernel 3.0, Exynos 4420, MSM 8974

SLP - Linux Memory Fragmentation (Analysis & Research)	**April 2011 – Dec 2011 (Samsung)**

- Detailed study, **experimentation and research about Memory Fragmentation problem** in Linux Kernel.
- Developed sample modules and utility to measure fragmentation level across each zones and orders.
- Conducted several experiments and implemented techniques in Kernel to **improve page allocation success rate by about ~90%.** Check ELC Paper [here]
- Suggestion to backport memory compaction from mainline Kernel 2.6.36 to track memory fragmentation.

Platforms/Software Used - C, Linux, Kernel 2.6.32/36

Samsung Boot loader Development (Loke3/s-boot)	**Aug 2010 – Mar 2011 (Samsung)**

- Complete development and **bring-up of Samsung Loke3 boot loader** (aka s-boot) for OMAP4 board.
- S-boot customization, UART bring-up, i2c interface, USB and charging support, LCD bring up, partition management, ODIN protocol porting, binary flashing and downloading mechanism, kernel booting etc.

Platforms/Software Used - C, Linux, u-boot, X-loader, OMAP4430, omapflash, Odin

CDR – SD Card Data Recovery Solution for Mobile Phones	**May 2010 – July 2010 (Samsung)**

- Complete architecture, design, porting and implementation of Samsung patented **data recovery solution for Linux** based mobile phone.
- Implemented multi-threaded sector scanning capability to **speed up formatted card recovery by 1/4th times.**
- **Implemented new features** such as: date/filename based recovery, listing deleted files, automatic detection of mount point, recovery progress status, automatic detection of memory leaks etc.

Platforms/Software Used - C, C++, Linux, FAT32 file system

SASKEN - PROJECTS	**Feb 2004 – Sept 2008 (Sasken)**

TUX4.0 - Linux Based VoIP Phone Development (Nortel Networks)
VCOM driver porting, reduced licensing cost by **porting open source gcomm library to core upload module**, implemented ideas for **automatic core upload to MSC card during boot up**, resolved many critical issues such as initial clipping of voice.
SHARP – GPS Driver Porting (Texas Instruments)
Complete porting and integration of TI GPS Linux driver for sharp mobile including SUPL interface.

Platforms/Software Used - C, C++, Linux Kernel 2.4, 2.6, Shell scripting, PPC, OMAP3430