PINTU KUMAR [Linux Kernel Enthusiast]

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Seeking for an opportunity in core Linux Kernel areas in an R&D company, which can provide me a platform to apply my innovative ideas to develop futuristic embedded product

Current Title:	**Software Architect** @ SONY, Bangalore
Experience Background:	**Around ~10 years in Embedded Linux Kernel development**
Roles and Responsibilities:	Individual contributor, Technical Leader, Mentor, Reviewer, Troubleshooter
Major Work History:	**Linux Kernel/BSP**, bring up, porting, customization, **memory management**, analysis, investigation, Tizen/Android smart phones, Xenomai Real-time
Onsite visit and Visa:	South Korea, Taiwan, Japan, USA (10 years Business visa available: till 2023)

Experience (Overall: ~15 Years)

Architect – Linux Kernel Team @ SONY India, Bangalore	**Nov/2017 – Till Date**
Principal Engineer, 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. + M.Tech)

M.Tech (Embedded System), Manipal University – Bangalore *[Equivalent to Canada Master's Degree – WES Report Available]*	(July/2012 – Feb/2015), **CGPA: 9.09**
B.E (Computer Sc. & Engg) – KIIT, Bhubaneswar, India	(1997 – 2001) SCORE: 73.6 %

Skills Highlights

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

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 Memory Management areas**.
Complete prototype design and integration of (ION, DMABUF, CMA, ZRAM, LMK, DRM-GEM driver) for Tizen.
Experience in Kernel code size reduction, boot time reduction, memory optimization, performance tuning, sluggish improvement, **Linux Robotics** 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 Real-time, RISC-V, PSI, OPEN-AMP, etc.

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

Others: kselftests, perf, systemd, Yocto, git/gerrit, QEMU, Agile/Scrum, Jira, system-tools, shell-scripting

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

Linux Kernel Mainline Contributions: [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 ;
Some of the contributions includes:
* ION buffer sharing utility ; split cma-reserved in dmesg ; introduce CMA total/free in meminfo ; introduce oom_kill counter in vmstat ; proposal for shrink_memory node in /proc/sys/vm/ ; others
Git Hub Contributions: https://github.com/pintuk

Received **Performance Excellence Award** in SONY-2019 for the outstanding contributions done last year.	
Technical showcase and **demo presentation in SONY Open House** – 2019	
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 Code contributed to **Tizen open source**: https://git.tizen.org/cgit/contrib/robotics/	
Technical paper presentation in **Embedded Linux Conference** World-wide: Tokyo [July/2019]: Xenomai based real-time 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.	
Samsung **Employee of the month** award – Nov/2014 (for Mediatek project)	
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

SONY Contributions	Nov/2017 – Till Date (SONY)

- 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.
- Porting and improvement of **unique-page, zswap feature** from Kernel 3.0 to 4.9 to reduce ss-image size.
- **Complete design and implementation of GPIO IRQ affinity feature** (including suspend/resume support) for IMX.7 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 (imx.7, 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 (**in progress**).
- **PSI:** Investigation and experimentation about PSI feature in mainline Linux Kernel 4.20 → 4.9 (**in progress**).
- **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, 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, QC SDM845	

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) [1 month onsite in Taiwan MTK HQ]	Nov. 2014 – March 2015 (Samsung)

- **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