Document on NVRAM

To store data persistently so that it remains intact even after flashing or updating the firmware, typically need to store it in non-volatile memory (NVM).

Verified the process of storing the serial number of a device in accordance to the product id storage where the ro.serialno within the AOSP source code repository. It is typically defined in one of the property files under the system/core/rootdir directory.

Here are some common ways to achieve this:

Flash Memory
EEPROM (Electrically Erasable Programmable Read-Only Memory):
External NVM Devices:
Battery-Backed SRAM (BBRAM)
File Systems on External Storage:

NVRAM (Non-Volatile Random Access Memory)

- It's a type of memory that retains data even when power is turned off.
- Unlike traditional RAM (Random Access Memory), which loses its data when power is removed, NVRAM preserves its contents.
- NVRAM is commonly usedin devices devices where it's necessary to retain certain settings or configuration data even after power cycling.
- It's often used to store system configuration settings, such as BIOS settings, network parameters, or calibration data.
- NVRAM comes in various forms, including battery-backed SRAM (BBRAM), EEPROM (Electrically Erasable Programmable Read-Only Memory), and flash memory. Each type has its characteristics in terms of speed, endurance, and cost.

Implementation:

- NVRAM is typically accessed using specialized read and write operations specific to the type of memory used.
- Embedded systems often allocate a portion of the available NVRAM for storing critical data, with mechanisms in place to ensure data integrity and prevent corruption.
- In some cases, NVRAM may be integrated directly into the microcontroller or system-on-chip (SoC), while in others, it may be implemented as external memory connected via a dedicated interface.

- When using NVRAM, it's essential to consider factors such as access times, write endurance, power consumption, and cost.

Product ID :

- Product IDs are unique identifiers assigned to individual products. They are used for tracking, inventory management, warranty validation, and other purposes. Storing product IDs in NVRAM ensures that they remain accessible even after device reboots or firmware updates.
- Product IDs can be stored in NVRAM using various methods, depending on the specific requirements of the system. This may involve allocating a portion of the NVRAM space for storing product IDs and implementing read and write operations to access this data.

Benefits:

- Storing product IDs in NVRAM offers several advantages, including:
- Persistence: Product IDs remain intact even during power loss or system reboots.
- Efficiency: NVRAM provides fast access times, making it suitable for retrieving product IDs quickly when needed.
- Reliability: NVRAM devices are designed for robustness and long-term reliability, ensuring that product IDs are safely preserved.

Feasability of NVME storage for Product ID

Using NVMe storage for storing product IDs is technically feasible, but it might not always be the most practical or cost-effective solution, depending on specific requirements. Here are some factors to consider when evaluating the feasibility:

1. Performance: NVMe SSDs offer exceptional performance in terms of read/write speeds and low latency, making them suitable for high-performance applications. If the application requires fast access to product IDs or involves frequent read/write operations, NVMe storage could be a good fit.
2. Capacity: NVMe SSDs typically offer larger storage capacities compared to traditional storage solutions like SATA SSDs or HDDs. If the product ID

database is expected to grow significantly over time or if needed to store a large number of product IDs, NVMe storage can provide ample space.

3. Cost: NVMe SSDs tend to be more expensive than other storage options. If cost is a significant consideration and the application doesn't require the high performance of NVMe storage, might find more cost-effective solutions with traditional SATA SSDs or even HDDs.
4. Endurance: NVMe SSDs have limited write endurance compared to other storage technologies. If application involves frequent updates or writes to the product ID database, then need to consider the endurance rating of the NVMe SSD and potentially implement wear-leveling algorithms to distribute write operations evenly across the storage cells.
5. Integration: NVMe SSDs require compatible hardware interfaces (PCIe) for integration into system. System architecture should supports NVMe storage and that have sufficient PCIe lanes and bandwidth for optimal performance.
6. Future Expansion: NVMe storage provides scalability in terms of capacity and performance, which can be advantageous if anticipate significant growth in theproduct ID database or if planning to add additional features that require high-speed storage access.