RT in User namespaces

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User Namespaces

• Enables non root users to create namespaces

• Non root user mapped to root user(UID 0) inside.

• Gets root privileges/capabilities inside the namespace including CAP_SYS_NICE

• Capabilities not effective in changing/setting RT priority
User Namespaces

- Capabilities only applicable to resources inside namespace

- Restriction also on other capabilities like IPC_LOCK, SYS_TIME, MKNOD etc, affecting global resources.

- Mapping root user from init namespace (UID 0) into User namespace still has same restrictions.

- Deal with them on case by case basis?
RT priority in User Namespaces

- Use case: Multitenant Oracle DB – Uses User namespace

- Multitenant Oracle DB requires running some processes with RT priority inside namespace, but cannot.

- Same limitation with Linux(lxc) unprivileged containers.
Multitenant Oracle DB

- Architecture to enable Oracle Database to be multitenant Container Database (CDB)

- CDBs have zero or many customer pluggable databases (PDB)

- Benefit - Database Consolidation.
Multitenant Oracle DB

- Database environment before Database consolidation
  Multiple databases on each server
Multitenant Oracle DB

- Database consolidation CDB/PDB
- Easier management
- Cost reduction
Multitenant Oracle DB

- There can be multiple CDBs running on a system.
- For Security & Isolation, PDBs and CDBs are sandboxed using Usernamespace + other namespaces (PID, mount, Net).
- CDB runs in top level Usernamespace. PDBs are in nested User namespaces inside.
- Multiple CDBs on a system
Multitenant Oracle DB

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Multitenant Oracle DB

- CDBs have critical processes (Ex Logwriter) that need to run with highest priority (above all other user process priority).

- Critical processes are run with RT priority

- CDBs unable to set RT priority due to User namespace restrictions

- A solution – use help of a daemon/process in parent(init) namespace to change/set RT priority – not convenient
Possible Approaches

● Allow root(uid 0) from init namespace mapped into User namespace to set RT priority (/etc/subuid – Testuser:0:1)

● Permit CAP_SYS_NICE capability if an User namespace is tagged.

● With use of cgroup controls, allow RT priority privileges to UID 0 in User namespace.

● Alternative – Have a fixed high priority scheduler option, above all user priority – avoid RT.
Thank You!