P2 - Looking for Group Synchronization

By: Jaeme Patrice O. Rebano
STDISCM S14

Possible deadlock and starvation

Deadlock

Incomplete Party

Dungeon instances are held by incomplete parties. Players are waiting indefinitely because of lacking required roles. System will try to form parties but gets stuck because there is no party left to be formed. *No instance can start or be freed.*

Circular Waiting for Dungeons

A deadlock occurs if parties are waiting for each other to release dungeon instances but can't proceed.

Starvation

Some players will never get matched

For example, the queue has **10 tanks, 10 healers, 6 DPS**. The system forms 2 parties, using 6 DPS. The remaining 8 tanks and healers have no DPS left to form a party, meaning they get ignored. Other parties are still able to finish, but these players don't get the chance to enter any dungeon.

Some instances can take much longer than others

If all instances get unlucky with t2 dungeon clear time at the start, other parties will sit in the queue for too long since fast clearing parties might get stuck behind slow ones.

Synchronization mechanisms used to solve the problem

I made use of a ConcurrentLinkedQueue to handle the order of available dungeons and ensure that a party will only be assigned to a dungeon once one is available. Additionally, to avoid players deadlocking, the number of parties that can be made are calculated beforehand and only n parties will get queued into a dungeon instance. To ensure that only n threads are able to get n dungeons at at time, **semaphores** are used. A thread will try to acquire a semaphore when getting an available dungeon in **getAvailableDungeon()**, if none available, it will wait until one was released in **releaseDungeon()**. In regards to the clear times of parties, I added a priority based type of scheduling. Any parties with a clear time closer to the minimum are marked as “Priority 1” parties and those closer to the maximum are marked as “Priority 2” parties. To ensure the “Priority 2” parties do not end up waiting long, these two types alternate in being scheduled.

Thank you :3

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