

Fault Tolerant DMTCP Coordinator

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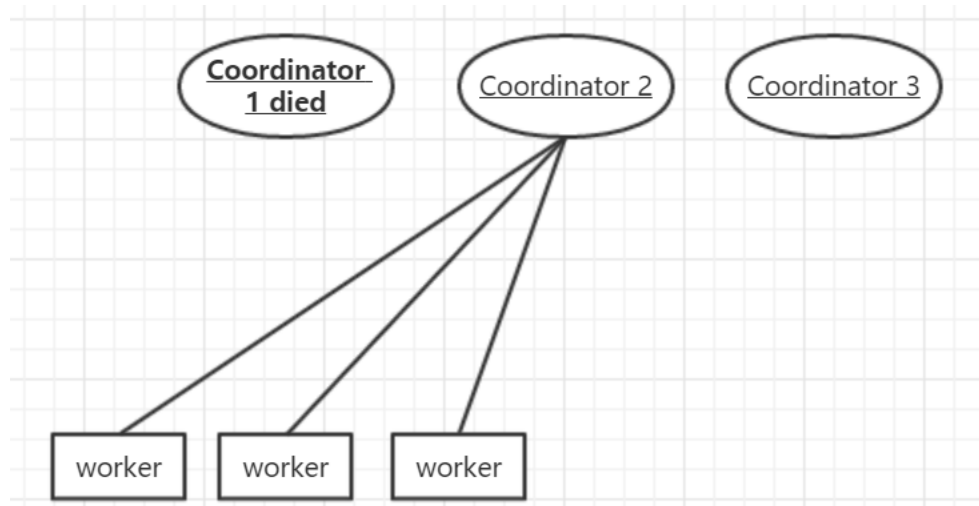
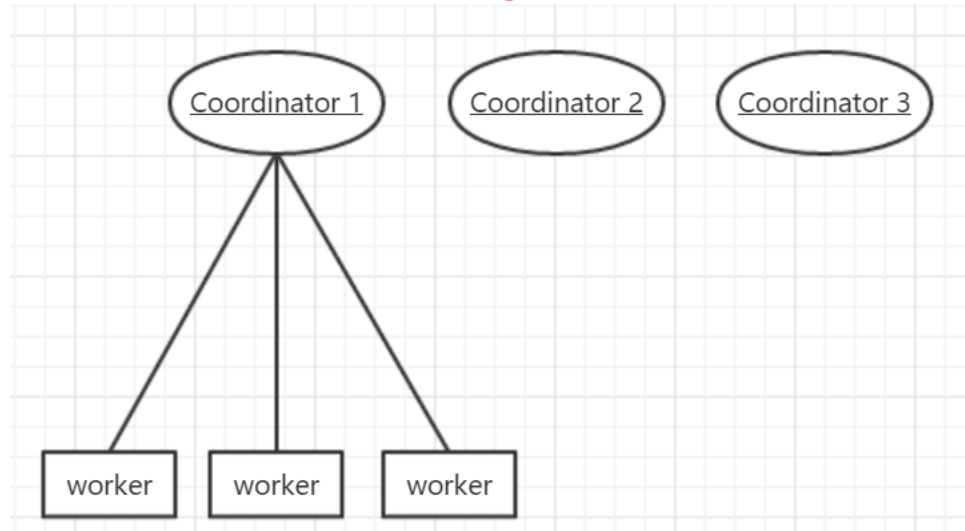
Computer System 5600

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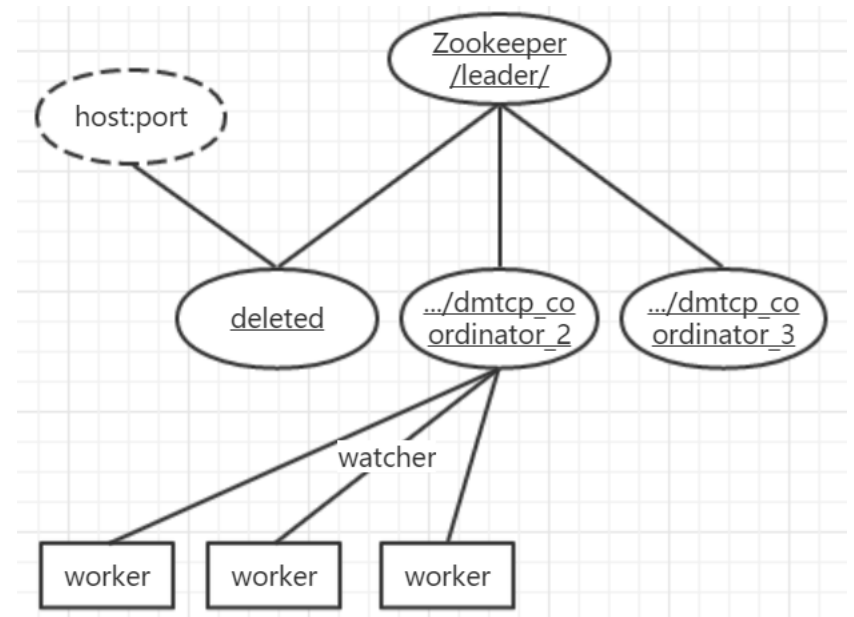
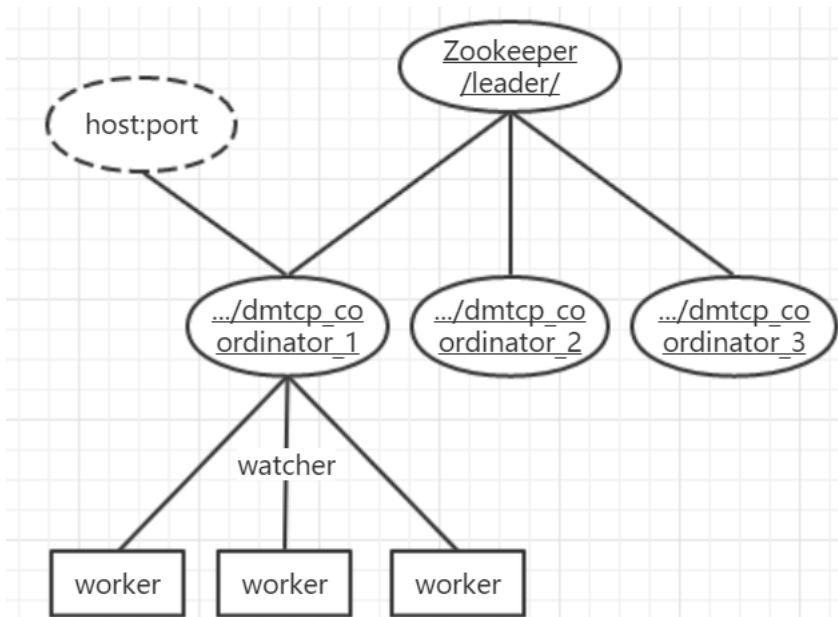
Abstract

- The main purpose of our project is to make the DMTCP fault tolerant. The current DMTCP has a centralized coordinator that communicates with all worker nodes. The centralized nature makes it a single point of failure for the computation.
- Our final result can achieve two main functions:
 - 1. The coordinator can switch from dead one to alive one, while the workers are connecting to the coordinator.
 - 2. When coordinator dead during the check point, the worker process can still function.

Primary Goal

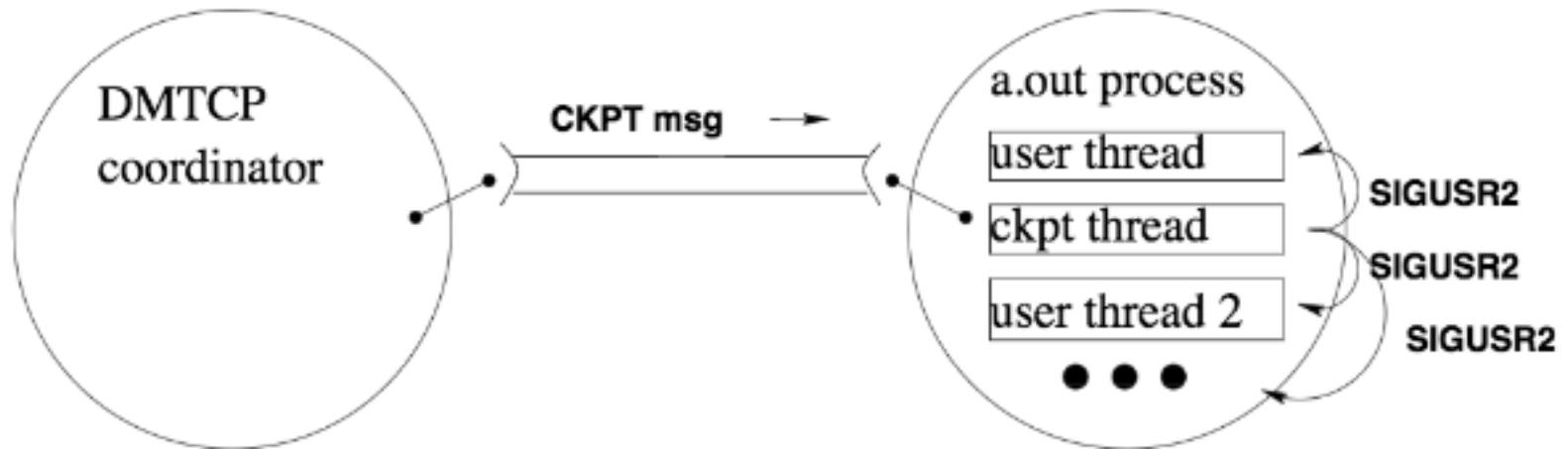


Approach



Challenge

- What if a coordinator dies in the middle of checkpointing?



Problems

- Zookeeper watcher doesn't work!
All processes and threads are suspended when checkpointing begins.
- Creating a new connection to zookeeper server? The following code in zookeeper will generate a segmentation fault error.

```
int32_t fetch_and_add(volatile int32_t* operand, int incr)
{
#ifdef WIN32
    int32_t result;
    asm __volatile__ (
        "lock xaddl %0,%1\n"
        : "=r"(result), "=m"(*(int *)operand)
        : "0"(incr)
        : "memory");
    return result;
}
```

Solution

- If a coordinator dies, the ckpt thread will skip all codes that are trying to talk to the coordinator. A new connection to a valid coordinator will be created when check pointing has been finished.

DEMO

- <https://www.youtube.com/watch?v=T00SI6CMLBc>

Thank You

- Reference:
 - DMTCP source code and docs
 - Zookeeper source code and API documents
- Authors:
 - Tianlu Hou and Yuanyang Li
- Source code:
 - <https://github.com/YuanyangLiNEU/dmtcp/tree/stable2.5>