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Subject: Re: [RFC][PATCH][cryo] Save/restore state of unnamed pipes  
Posted by [Matt Helsley](#) on Thu, 19 Jun 2008 23:46:00 GMT  
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On Thu, 2008-06-19 at 00:59 -0700, sukadev@us.ibm.com wrote:

> Matt Helsley [matthltc@us.ibm.com] wrote:

>

> <snip>

> |

> | > | I don't see anything in the pipe man page, at least, that suggests we

> | > | can safely assume pipefds[0] < pipefds[1].

> | > |

> | > | The solution could be to use "trampoline" fds. Suppose last\_fd is the

> | > | largest fd that exists in the final checkpointed/restarting application.

> | > | We could do (Skipping the PT\_FUNC "notation" for clarity):

> | > |

> | > |

> | > |

> | > | pipe(pipefds); /\* returns 5 and 4 in elements 0 and 1 \*/

> | > | /\* use fds after last\_fd as trampolines for fds we want to create \*/

> | > | dup2(pipefds[0], last\_fd + 1);

> | > | dup2(pipefds[1], last\_fd + 2);

> | > | close(pipefds[0]);

> | > | close(pipefds[1]);

> | > | dup2(last\_fd + 1, <orig pipefd[0]>);

> | > | dup2(last\_fd + 2, <orig pipefd[1]>);

> | > | close(last\_fd + 1);

> | > | close(last\_fd + 2);

> | > |

> | > |

> | > | Which is alot more code but should work no matter which fds we get back

> | > | from pipe(). Of course this assumes the checkpointed application hasn't

> | > | used all of its fds. :(

> | > |

>

> It appears that this last\_fd approach will fit in easier with current

> design of cryo (where we process one or two fds at a time and don't have

> the src\_fds and dest\_fds handy).

>

> BTW, we should be able to accomplish the above with a single-unused fd

> right (i.e no need for last\_fd+2) ?

Yes, I think that's sufficient:

```
int pipefds[2];
```

```
...
```

```
restarted_read_fd = 11;
restarted_write_fd = 12;
```

```
...
```

```
    pipe(pipefds);
```

```
/*
 * pipe() may have returned one (or both) of the restarted fds
 * at the wrong end of the pipe. This could cause dup2() to
 * accidentally close the pipe. Avoid that with an extra dup().
 */
    if (pipefds[1] == restarted_read_fd) {
        dup2(pipefds[1], last_fd + 1);
        pipefds[1] = last_fd + 1;
    }

    if (pipefds[0] != restarted_read_fd) {
        dup2(pipefds[0], restarted_read_fd);
        close(pipefds[0]);
    }

    if (pipefds[0] != restarted_read_fd) {
        dup2(pipefds[1], restarted_write_fd);
        close(pipefds[1]);
    }
}
```

I think this code does the minimal number of operations needed in the restarted application too -- it counts on the second dup2() closing one of the fds if pipefds[1] == restarted\_read\_fd.

Cheers,  
-Matt

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