

State Collection Timing

This paper describes timing analysis and results on State collection module. There are two parts depending on different phase_duration.

Part 1: Large phase_duration

A large phase_duration is being set in CBroker.hpp. And State_Timeout is also being set a large number in LoadBalance.hpp.

PHASE_DURATION: 30000ms

Load_Timeout: 40ms

State_Timeout: 100000ms

(Run r-facts4 first, then r-facts3, then r-facts5 with PSCAD simulation interface running)

Under this settings, GM, LB and SC will be issued in sequence with time period indicated by phase_duration. The goal is to obtain the time slot for the state collection when it is running in isolation. But the challenge is to run three machines simultaneously.

My observations:

1. Depends on how closely the three machines start, the time slot for state collection will be a little different. The following figures show leader's state collection logger for two cases. Each peer node returns one state back. In case 2, machines are run more simultaneously than case 1.

Case1:

```
2012-May-09 15:54:54.101170 : Status(4):      ++++++Initiate+++++
2012-May-09 15:54:55.433655 : Status(4):      Sending requested state back to lb module

2012-May-09 15:54:55.376429 : Status(4):      (Peer)The number of collected states is 1

2012-May-09 15:54:55.373998 : Status(4):      (Peer)The number of collected states
is 1
```

It costs (1s and 332ms) = 1332ms for leader to obtain all states. There is a pause observed during the state collection cycle in leader's log.

Case2:

```
2012-May-09 16:09:46.394388 : Status(4):      ++++++Initiate+++++
2012-May-09 16:09:47.521455 : Status(4):      Sending requested state back to lb module
```

```
2012-May-09 16:09:47.404124 : Status(4):      (Peer)The number of collected states is 1
```

```
2012-May-09 16:09:47.402500 : Status(4):      (Peer)The number of collected states  
is 1
```

It costs (1s and 127ms) = 1127ms to obtain states. There is a pause observed during the state collection cycle in leader's log.

2. Depends on how many states including in transit messages collected back, the time slot for state collection will be different.

In Case 2:

```
2012-May-09 16:12:46.435765 : Status(4):      ++++++Initiate+++++  
2012-May-09 16:12:47.596116 : Status(4):      Sending requested state back to lb module
```

```
2012-May-09 16:12:47.361967 : Status(4):      (Peer)The number of collected states is 1
```

```
2012-May-09 16:12:47.402354 : Status(4):      (Peer)The number of collected states  
is 18
```

The above figures show that the state collection costs (1s and 160ms)=1160ms with one peer return 1 state and the other return 18 states back.

```
2012-May-09 16:18:46.644001 : Status(4):      ++++++Initiate+++++  
2012-May-09 16:18:50.305168 : Status(4):      Sending requested state back to lb module
```

```
2012-May-09 16:18:48.618775 : Status(4):      (Peer)The number of collected states is 6
```

```
2012-May-09 16:18:48.950894 : Status(4):      (Peer)The number of collected states  
is 149
```

The above figures show that the state collection costs (3s and 661ms) = 3661ms with one peer return 6 states and the other return 149 states back.

Part 2: Small phase_duration (No PSCAD simulation running)

case	Phase_duration	Load_Timeout	State_Timeout	Calculated SC based on log	Result
1	50ms	40ms	300ms	Around 170ms	Almost all sc cycles could finish and send states back.
2	50ms	40ms	250ms	Around 170ms	A few SC cycles couldn't finish.
3	50ms	40ms	200ms	Less than 170ms	Most SC cycles couldn't complete.

Analysis:

There is a time difference between State_Timeout and calculated SC, because it costs 60ms-120ms for Load Balance to request a state collection (sending a message to SC) and SC actually start initiate.

My suggestion for State_Timeout setting is at least 300ms if using small phase_duration.