

Cubeia Poker – Bandwidth Analysis

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Scope

The aim of this document is to evaluate the internal and external bandwidth requirements of running Cubeia Poker on top of Cubeia Firebase.

Setup

The tests were performed on Cubeia Ltd's load test environment in Hammarby, Stockholm. All servers participating in the test were configured as follows:

- Dual Core, Intel Xeon 2.4 GHz
- Linux (CentOS), Kernel 2.6.9 (EPOLL enabled)
- Sun Java HotSpot™ Server VM (build 1.5.0_12-b04, mixed mode)
- Poker 1.0-SNAPSHOT
- Firebase (FB) 1.6.1

The system was profiled using the following topology:

- 4 Nodes (2 Master & Client + 2 Game)

The sampling values were:

- CPU available (percentage)
- Hands per Minute (poker hands per minute as per Poker JMX values)
- External bandwidth (read & writes in Bytes/s).
- Internal bandwidth (read & writes in Bytes/s).

It can be noted that all values are approximate (i.e. average over all similar nodes).

Game Setup

The poker game has multiple tables configured. Sizes of the tables vary between 2, 6 and 10 seats with the majority being 10 seats.

Different tables will run with different timings as well. The tables are configured to normal, express and super express. Normal runs like a normal table, express is noticeably faster and super express is much faster than any real life table. About 50% are normal, 25% express and 25% super express.

Using faster than real life tables ensures that we are not running lenient load tests. The bots will respond to the table timing and answer within time unless they decide to timeout.

The profiling data is collected through the JMX attributes exposed by Firebase and the poker implementation.

Since we are load testing Firebase as a game server and not external systems we have minimized all external dependencies, e.g. we do not interface to external accounting services etc.

Lobby - Disclaimers & Notes

- The bots do not change tables between hands.
- Only a limited set of attributes are changed on a table between hands
- At least one attribute is always updates in the lobby between hands (hands played)
- Load and bandwidth was measured when game play is sustained
- Tables will play faster than real life

From this it can be noted that the lobby is potentially not changing as much as a finalized real money poker lobby might. The counter weight to this is that the tables are executing substantially faster than real life tables.

All measured values are observed when the system is in a steady state of execution (i.e. all logins are made and all bots are seated & playing).

The lobby is running at a period of 2 seconds, meaning that the longest time a lobby attribute can take to be updated for the client is 2 seconds + network latency.

Bandwidth

External bandwidth without Lobby

Below are the measured values for performance test running without lobby subscriptions.

Bots	Hands/Minute	Client Communication (Bytes/s)		CPU Used (total %)	
		Read (in)	Write (out)	Client	Game
2 000	550	6 000	170 000	7	6
8 000	2 200	24 000	720 000	35	30
12 000	3 400	34 000	1 040 000	45	44

Below are the measured values calculated per user in the system.

Bots	Hands/minute/bot	Read/Bot	Write/bot
2 000	0,275	3	85
8 000	0,275	3	90
12 000	0,283333333	2,833333333	86,66666667

External bandwidth with lobby

Below are the measured values for performance test running with lobby subscriptions (i.e. every Bot subscribes to the whole lobby).

Bots	Hands/Minute	Client Communication (Bytes/s)		CPU Used (total %)	
		Read (in)	Write (out)	Client	Game
2 000	570	6 400	1 300 000		
8 000	2 300	24 000	10 000 000	38	30

Note: 8000 bots - Bytes written is pending between 360k and 12m

Below are the measured values calculated per user in the system.

Bots	Hands/minute/bot	Read/Bot	Write/bot
2000	0,285	3,2	650
8000	0,2875	3	1 250

Analysis

Hands played per minute and client is not affected by turning the lobby on/off. This means that the increase in load and traffic does not affect game play. It can also be noted that the incoming traffic is unaffected by turning the lobby on/off, as expected.

The lobby traffic per user in the system is increased as we add more players. This is expected as more user also create more changes to the lobby (i.e. each user must receive more tables in each lobby update). The increase is only 2x when the number of players (and hands/minute) are 4x, this can most likely be explained by batching optimizations.

Internal Bandwidth

The internal bandwidth is not depending on the lobby turned on or off. The bandwidth used will however be very different between client nodes and game nodes since game nodes will send state objects between each other for fail over reasons.

Below is a sample of hard data collected from running 8 000 Bots in the system with 2 200 hands/minute.

Client + Master Node

rxpck/s	txpck/s	rxbyt/s	txbyt/s
2321.65	10464.95	2073234.02	1404087.63
2181.00	9410.00	1989161.00	1231347.00
2328.12	10606.25	2085531.25	1399484.38
2183.84	9746.46	1998971.72	1273429.29
2085.86	9896.97	1970096.97	1309831.31
2232.65	10838.78	2228808.16	1447907.14
2231.63	10734.69	2227148.98	1422758.16
2052.04	9376.53	2042033.67	1263592.86
1991.92	9572.73	2001620.20	1270301.01

The average traffic for a client and master nodes is about:

Incoming: 2 MB/s

Outgoing: 1.3 MB/s

Game + Tournament Node

rxpck/s	txpck/s	rxbyt/s	txbyt/s
6102	6867	4533514	6355293
5400	5741,84	4390342,86	4929039,8
5407,14	6207,14	3938707,14	5844016,33
5105,1	5628,57	3863114,29	5139080,61
5706	6607	4112157	6151933
5233,67	5935,71	3817669,39	5238819,39
5629,29	6324,24	4160555,56	5580092,93
5688,78	6485,71	4111261,22	5902776,53
5642,86	6423,47	4054501,02	5724247,96
5757	6539	4190997	5886200
5676,29	6395,88	4188689,69	5605411,34
5854,55	6662,63	4279124,24	6021378,79
5373,74	6209,09	3815046,46	5608920,2

The average traffic for a client and master nodes is about:

Incoming: 4.1 MB/s

Outgoing: 5.7 MB/s

Summary

Running a 4 server cluster with the current Poker implementation and 8 000 users, all subscribing to the entire lobby tree of tables will use approximately the following in terms of bandwidth:

External incoming traffic	1.3 MB/s
External outgoing traffic	10 MB/s
Internal traffic (most)	10 MB/s

NB: These values are probably lower than a real life installation where you would serve the clients with additional data such as account balances, player information etc.