Cluster Specification

Database engine: Apache Ignite (version 2.5.0)
Three instances running on:

1- Amazon EC2 (t2.medium) - us-east (Ohio) - linux - 2 cores - 4GB memory
2- Amazon EC2 (t2.medium) - us-east (N. Virginia) - linux - 2 cores - 4GB memory
3- Amazon EC2 (t2.medium) - eu-west (Paris) - linux - 2 cores - 4GB memory

Sample Application Specification

Objects:
Bank_account(**int** id, **string** owner, **int** balance)

Transactions:
The sample application has 2 transactions. One which is read only and simply returns the status of the first two accounts and another that increases the balance of a given account:

```
check_status_txn(){
        v1 = cache.get(1);
        v2 = cache.get(2);
        return (v1,v2);
}

deposit_txn(int id) {
        v1 = cache.get(id);
        cache.put(id, v1+100);
}
```

* 25% of the clients deposit into account #1, 25% deposit into account #2, and the remaining 50% perform the read-only transaction. This is in accordance with the YCSB benchmark specification.
* Each client repeats its transaction 5 times and measures the total execution time.
* Note that these transactions when are executed concurrently, allow the *long fork* anomaly to occur under all weak isolation levels and in order to preserve serializability as the application correctness property, transactions must be executed with ACID (i.e. serializable txns). However, when the correctness target is ES, the transactions can be run under weaker isolation guarantees.
* In this case, we are able to achieve performance by running the read-only transaction under READ_COMMITTED guarantees which avoids the costly synchronization step present in SERIALIZABLE guarantee.

Results

(Note that in this experiment the cluster is under extremely high contentions and hence the high overall latency)

ES (Guaranteed by read committed transactions)

Number of Clients	Ohoio (1)	Virginia (1)	Paris (1)	Ohio (2)	Virginia (2)	Paris (2)	Average
4	114ms	114ms	115ms	116ms	116ms	114ms	115ms
8	228ms	182ms	181ms	227ms	184ms	181ms	197ms
16	1s 62ms	926ms	296ms	1s 63ms	929ms	296ms	0s 762ms
32	1s 995ms	1s 489ms	1s 359ms	1s 764ms	2s 126ms	585ms	1s 553ms
64	4s 665ms	4s 577ms	2s 266ms	5s 28ms	4s 356ms	2s 8ms	3s 817ms
128	4s 3ms	10s 39ms	8s 744ms	3s 996ms	10s 59ms	9s 679ms	7s 753ms

SER (Guaranteed by serializable transactions)

Number of Clients	**Ohoio (1)**	**Virginia (1)**	**Paris (1)**	**Ohio (2)**	**Virginia (2)**	**Paris (2)**	**Average**
4	918ms	474ms	919ms	853ms	1s 308ms	939ms	0s 902ms
8	1s 856ms	966ms	850ms	1s 26ms	2s 611ms	1s 762ms	1s 512ms
16	3s 446ms	5s 758ms	3s 725ms	3s 704ms	2s 247ms	3s 994ms	3s 812ms
32	11s 881ms	12s 18ms	3s 357ms	7s 646ms	12s 144ms	7s 821ms	9s 144ms
64	16s 263ms	25s 21ms	16s 106ms	16s 259ms	24s 652ms	16s 271ms	19s 95ms
128	48s 932ms	49s 480ms	32s 154ms	48s 869ms	49s 478ms	32s 95ms	43s 501ms