Announcements

• **Open up S3 location of hand ins:**
  – Give access to your S3 bucket to:
    • public
    • [onlinecloudcomputingcourse@gmail.com](mailto:onlinecloudcomputingcourse@gmail.com)
  – You could lose credit or be penalized otherwise
  – See Piazza Post on how to open up your handin directory

• **Encounter a general bug:**
  – Post on Piazza

• **Encounter a grading bug:**
  – Post Privately on Piazza

• Post feedback on OLI
Project 3 Student Progress

• Part 1: File vs. Database
  – 43/44 Students Completed (98%)

• Part 2: Vertical Scaling
  – 42/44 Students Completed (95%)
Vertical Scaling

Instances and Clients
- m1.large
- m1.xlarge

Storage Options
- Ephemeral
  - 2X Ephemeral RAID0
  - 4X Ephemeral RAID0
- RAM Disk
- EBS
- Enhanced EBS

External Client on m1.small
Client Running on Server
Vertical Scaling Results

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Server Instance Type</th>
<th>Server Storage Type</th>
<th>Run test from</th>
<th>Average TPS for the Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>m1.large</td>
<td>ramdisk</td>
<td>the server</td>
<td>499.72</td>
</tr>
<tr>
<td>2</td>
<td>m1.large</td>
<td>ramdisk</td>
<td>m1.small client</td>
<td>396.46</td>
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<tr>
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<td>m1.small client</td>
<td>119.83</td>
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<td>4</td>
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<td>stripe</td>
<td>m1.small client</td>
<td>188.80</td>
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<td>EBS</td>
<td>m1.small client</td>
<td>375.43</td>
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<tr>
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<td>EBS Optimized</td>
<td>m1.small client</td>
<td>377.12</td>
</tr>
<tr>
<td>7</td>
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<td>ramdisk</td>
<td>the server</td>
<td>1060.19</td>
</tr>
<tr>
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<td>ramdisk</td>
<td>m1.small client</td>
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</tr>
<tr>
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<td>stripe</td>
<td>m1.small client</td>
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<td>m1.small client</td>
<td>401.33</td>
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<td>11</td>
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<td>EBS Optimized</td>
<td>m1.small client</td>
<td>411.36</td>
</tr>
</tbody>
</table>

- Local Tests (from the server) always faster than Remote Tests (from an m1.small client)
- EBS faster than Ephemeral (Instance Store) and RAID0 Ephemeral
- EBS is almost as fast as ramdisk
- Optimized EBS does not necessarily provide better performance for this application.
Note on Our Database Experiments

• Synthetic Benchmark
  – No Memory Caching
  – No Index of Tables
  – Stress the disk to see differences between the storage back-ends

• Not an indicator of real world performance!
  – Typically in-memory cache and indexing will give you speeds similar to ramdisk, for any storage backend.
  – Database performance is not purely based on storage performance
    • CPU, Memory, Network and the type of Queries all affect TPS.
New Modules

• Unit 4 – Cloud Storage:
  – Cloud Storage
    • The Big Picture of Cloud Storage
    • Data and its Abstractions
    • Abstractions in Storage: File Systems
    • Abstractions in Storage: Databases
    • Abstractions in Storage: Objects
    • Block Devices
  – Case Study: Distributed File Systems
    • The Hadoop Distributed File System (HDFS)
    • The Parallel Virtual File System (PVFS)
    • HDFS vs. PVFS
Project 3 Part 3

- Project 3
  - Part 1
    - Files vs. Databases
  - Part 2
    - Vertical Scaling in Databases
  - Part 3
    - Horizontal Scaling in Databases
Discussions

- Your questions...
Upcoming Deadlines

• Unit 4:
  - **UNIT 4: Cloud Storage**
    - Module 14: Case Studies: Distributed File Systems

• Project 3
  - **UNIT 7: Project 3**
    - Module 23: Horizontal Scaling in Databases
      - Horizontal Scaling
        - **Checkpoint**
        - **Available Now**
          - Due 3/31/13 11:59 PM