End-User Web Availability

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Measuring Availability

• Measuring “nines” of uptime is insufficient
  – Reflects unrealistic operating conditions
• Need to capture end-user’s experience
  – Server + Network + Client
    • Client Machine and Client Software
Experiment

• “Hourly” small web transactions from two sites (Mills CS, Berkeley CS)
• To a variety of sites, including
  – Internet Retailer (including international sites)
  – Search Engine
  – Directory Service (also including int’l sites)
• Ran for 6+ months
## Results

- **Success, completeness, and speed**

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Retailer</th>
<th>Search</th>
<th>Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Raw</strong></td>
<td>.93049</td>
<td>.93108</td>
<td>.93456</td>
<td>.92668</td>
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<tr>
<td>Ignoring client</td>
<td>.98877</td>
<td>.98870</td>
<td>.99349</td>
<td>.98569</td>
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<td>problems</td>
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<td>Ignoring client and</td>
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<td>.99756</td>
<td>1.0000</td>
<td>.99972</td>
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<tr>
<td>network problems</td>
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<td>.99945</td>
<td>.99845</td>
<td>1.0000</td>
<td>.99991</td>
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<tr>
<td>network, and one-time errors</td>
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</tr>
</tbody>
</table>
Put Another Way

- Client Errors
- Medium Network Traffic
- Severe Network Traffic
- Server Errors
- Corporate Errors
Client Hardware Problems
Dominated User Experience

• System-wide crashes
• Administration errors
• Power outages
• And many many more…
What About Speed?

![Graph showing time (sec) versus availability with different lines for retailer, search, and directory categories.]

- retailer
- search
- directory
## Does Retry Help?

<table>
<thead>
<tr>
<th>Error Type</th>
<th>Total</th>
<th>Retailer</th>
<th>Search</th>
<th>Directory</th>
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</thead>
<tbody>
<tr>
<td>Client</td>
<td>0.26667</td>
<td>0.27059</td>
<td>0.26471</td>
<td>0.26471</td>
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<td>Medium Network</td>
<td>0.86207</td>
<td>0.87037</td>
<td>0.92857</td>
<td>0.83178</td>
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<td>Severe Network</td>
<td>0.78947</td>
<td>0.92308</td>
<td>1.00</td>
<td>0.68889</td>
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<td>Server</td>
<td>0.91111</td>
<td>0.78571</td>
<td>1.00</td>
<td>0.96</td>
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<tr>
<td>Corporate</td>
<td>0.42105</td>
<td>0.31250</td>
<td>1.00</td>
<td>n/a</td>
</tr>
</tbody>
</table>
What Guides Retry?

- Uniqueness of data
- Importance to user
- Loyalty of user
- Transience of information
- And more…