Performance optimisation of webmail

Katerina Mparmpopoulou    Periklis Stefopoulos

Supervised by: Michiel Leenaars

University of Amsterdam
System & Network Engineering

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Approach

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Webmail System Components

E-mail Components

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<tr>
<th>E-mail Components</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mail User Agent (MUA)</td>
<td>Afterlogic</td>
</tr>
<tr>
<td>Mail Submission Agent (MSA)</td>
<td>Afterlogic</td>
</tr>
<tr>
<td>Mail Transfer Agent (MTA)</td>
<td>Postfix</td>
</tr>
<tr>
<td>Mail Delivery Agent (MDA)</td>
<td>Postdrop</td>
</tr>
<tr>
<td>Mail Access Agent (MAA)</td>
<td>Cyrus</td>
</tr>
</tbody>
</table>
Research purpose

- Hundreds of millions of end users depend on Webmail technologies
- Open source web frontends to mail servers are an often neglected area of development
- Better understanding the performance of web mail applications is a prerequisite to better tuning these applications
Research Question

What are the bottlenecks, in terms of performance, of current Webmail implementations and which could be the most optimal solution?
Experimental Environment

Webmail Frontends

- Squirrelmail
- Roundcube
- Horde IMP
- Afterlogic Webmail Lite

Webmail Backends

- **Courier** - Postfix - Amavis - ClamAv - SpamAssassin
- **Dovecot** - Postfix - Amavis - ClamAv - SpamAssassin
- **Cyrus** - Postfix - Amavis - ClamAv - SpamAssassin
Experiments

5 users with different mailbox size

- 1500 messages with only text
- 1500 messages with attachments plus text
- 3000 messages with only text
- 4500 messages with only text
- 6000 messages with only text

3 different user actions

- Log in to Webmail
- Searching a keyword from the "Subject" field
- Searching a keyword from the entire message content
### Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Extraction method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latency</td>
<td>tcpdump/Wireshark</td>
</tr>
<tr>
<td><strong>CPU time</strong> (^1)</td>
<td>systat/sar</td>
</tr>
<tr>
<td><strong>Unique Set Size (USS)</strong></td>
<td>smem</td>
</tr>
<tr>
<td><strong>Proportional Set Size (PSS)</strong></td>
<td>smem</td>
</tr>
</tbody>
</table>

\[ \text{CPU time} = \text{CPU utilization} \times \text{elapsed time} \times \text{number of CPUs} \]

\(^1\) *CPU time* = *CPU utilization* \(* \) *elapsed time* \(* \) *number of CPUs*
Figure: average fetching time during login
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Figure: Comparison of the most effective Solutions regarding searching from "Subject"
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Searching from the Entire Message

**Courier IMAP backend**

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<tr>
<td>1500 text</td>
<td>0.5</td>
<td>1.2</td>
<td>2.3</td>
<td>0.8</td>
</tr>
<tr>
<td>1500 - attach</td>
<td>1.5</td>
<td>2.5</td>
<td>3.2</td>
<td>1.0</td>
</tr>
<tr>
<td>3000 text</td>
<td>2.5</td>
<td>3.5</td>
<td>4.2</td>
<td>2.0</td>
</tr>
<tr>
<td>4500 text</td>
<td>3.5</td>
<td>4.5</td>
<td>5.2</td>
<td>3.0</td>
</tr>
<tr>
<td>6000 text</td>
<td>4.5</td>
<td>5.5</td>
<td>6.2</td>
<td>4.0</td>
</tr>
</tbody>
</table>

**Dovecot IMAP backend**

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Figure: Comparison of the most effective Solutions regarding searching from Entire Message content
Resources consumption when user searches from the "Subject"

**Dovecot and Cyrus IMAP backends**

![Graph showing resource consumption for Dovecot and Cyrus IMAP backends.]

**Resources consumption when user searches from the "Subject"**

**Courier IMAP backend**

![Graph showing resource consumption for the Courier IMAP backend.]

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**Figure**: users search a keyword from the Entire Message Content: CPU time consumption for Dovecot and Courier IMAP backends
Figure: average memory consumption
Conclusions

- **Afterlogic** achieves shortest latencies in searching
- **Horde IMP** has the longest response times
- **Dovecot and Cyrus** carry out the search from "Subject" request efficiently and with relatively the same latency
- **Cyrus** is the IMAP backend that performs the best during search from the entire message
- **Cyrus** has the lowest CPU utilization and the highest average memory consumption for all IMAP functions, followed by Dovecot
Answering the Research Question

What are the bottlenecks, in terms of performance, of current Webmail implementations?

- The major bottleneck in an integrated webmail system is the IMAP backend

which could be the most optimal solution?

- the solution of using Cyrus IMAP combined with Afterlogic Webmail Lite performs better in terms of both user experience and system overall performance
Questions