AUDIO STREAMING SYSTEM USING REAL-TIME TRANSPORT PROTOCOL
BASED ON JAVA MEDIA FRAMEWORK

By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia in
Partial Fulfilment of the Requirements for the Degree of Master of Science

March 2004
To my Parents, Wife, Daughter, Brothers and Sister
Abstract of thesis presented to the Senate of Universiti Putra Malaysia in partial fulfilment of the requirements for the degree of Master of Science.

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March 2004

Chairman : Associate Professor Abdul Rahman Ramli, Ph.D.

Faculty : Engineering

Audio streaming is an important component of multimedia networking applications. Today’s Internet, however, offers only poor support for such streams due to the lack of the bandwidth and network traffic problems. The work presented in this thesis discusses the problems of real-time audio streaming and investigates solutions for improving the audio data transmitting over the network.

To achieve audio media data transmitting over the network in an efficient manner (real-time), the following issues: Initial delay of playing time (downloading time); current streaming protocols which can not cope well with network congestion; compression algorithms efficiency; network bandwidth utilization (network infrastructure); and security concerns of content owners, need to be considered.
In this thesis, the implementation method of a real-time audio streaming service system is discussed. The performance of the system implementation both in terms of resulting packet loss, initial delay and delay jitter is presented. This thesis describes audio streaming transmission protocols that are used to implement the system, the system architecture and how the system investigates and addresses the previous issues. A design proposal was outlined to provide an adaptive client/server approach to stream audio contents using Real-Time Transport Protocol (RTP) involving architecture based on the Java Media Framework (JMF) Application Programmable Interfaces (API). RTP protocol is the Internet-standard protocol for the transport of real-time data, including audio and video and can be implemented by using Java Media Framework (JMF). Java Media Framework library and the RTP protocol for audio transmission were used as development tools.

The developed system designed in this thesis together with experimental results proved that the system could be implemented successfully. A prototype of the developed system has been implemented and experiments over the Laboratory Local Area Network (LAN) and UPM campus LAN to investigate the issues mentioned before.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

SISTEM AUDIO STREAMING DENGAN MENGGUNAKAN REAL-TIME TRANSPORT PROTOCOL BERDASARKAN JAVA MEDIA FRAMEWORK

Oleh

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Aliran audio adalah komponen penting dalam aplikasi jaringan multimedia. Internet hari ini tidak memberikan kemudahan yang terbaik utk tujuan aliran berkenaan disebabkan oleh kekurangan di segi lebarjalur dan masalah laluan jaringan. Berkaitan dengan itu, tesis ini cuba membincangkan masalah-masalah berkenaan masa-nyata aliran audio, dan mengenalpasti penyelesaian untuk memperbaiki kaedah penghantaran data melalui jaringan berkenaan.

Untuk penghantaran masa-nyata data secara berkesan melalui jaringan, pertimbangan terhadap beberapa fakto berkaitan adalah perlu, seperti kelewatan masa memainkan (masa muatturun), protocol yang sedia ada tidak mengambil kira kesesakan laluan jaringan, keberkesanan algoritma-algoritma pemadatan, penggunaan lebarjalur jaringan (infrastruktur jaringan), dan keselamatan maklumat yang dihantar.

Sistem yang telah dibangun dan direka di dalam tesis ini, bersama keputusan ujikaji membuktikan bahawa system tersebut boleh dilaksanakan dengan jayanya. Model percubaan system ini telah dilaksanakan dan diuji di dalam Makmal LAN dan LAN UPM untuk menganalisa isu-isu yang telah di nyatakan sebelum ini.
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I certify that an Examination Committee met on 23rd March 2004 to conduct the final examination of Ibrahim Asaad Aref on his Master of Science thesis entitled “Audio Streaming System Using Real-Time Transport Protocol (RTP) Based On Java Media Framework (JMF) Application Programming Interface (API)” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for equations and citations, which have been duly acknowledged. I also declare that it has not been previously or currently submitted for any other degree at UPM or other institutions.

_____________________________
IBRAHIM ASAAD AREF

Date:
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDICATION</td>
<td>ii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>v</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>vii</td>
</tr>
<tr>
<td>APPROVAL</td>
<td>viii</td>
</tr>
<tr>
<td>DECLARATION</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xiv</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xv</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xviii</td>
</tr>
</tbody>
</table>

## CHAPTER

### I. INTRODUCTION

1. Media Data Transmission 1
1.1 Objectives 5
1.2 Scope of The Thesis 6
1.3 Thesis Contribution 7
1.4 Thesis Organization 7

### II. LITERATURE REVIEW

2. Streaming Media Concept 8
2.1 History of Streaming Media 14
2.2 The Principle of Streaming 16
2.3 Streaming Features 16
2.4 Streaming Types 17
2.5 Unicast Streams 18
2.5.1 Media-On-Demand 18
2.5.2 Broadcast Transmissions 19
2.5.2 Multicast Streams 19
2.6 Streaming Architecture 19
2.6.1 Capture and Encoding 20
2.6.2 Serving 21
2.6.3 Distribution and Delivery 21
2.6.4 Media Player 21
2.7 Working with Time-Based Media 22
2.7.1 Streaming Media 22
2.7.2 Content Type 23
2.7.3 Media Streams 23
2.8 Media Presentation 24
2.8.1 Presentation Controls 24
2.8.2 Latency 24
2.8.3 Presentation Quality 25
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.9</td>
<td>Media Processing</td>
<td>26</td>
</tr>
<tr>
<td>2.10</td>
<td>Java Media Framework</td>
<td>26</td>
</tr>
<tr>
<td>2.10.1</td>
<td>JMF History</td>
<td>27</td>
</tr>
<tr>
<td>2.10.2</td>
<td>JMF Architecture</td>
<td>29</td>
</tr>
<tr>
<td>2.10.3</td>
<td>JMF Data Processing Model</td>
<td>29</td>
</tr>
<tr>
<td>2.10.3.1</td>
<td>JMF Input</td>
<td>30</td>
</tr>
<tr>
<td>2.10.3.2</td>
<td>JMF Process</td>
<td>30</td>
</tr>
<tr>
<td>2.10.3.3</td>
<td>JMF Output</td>
<td>30</td>
</tr>
<tr>
<td>2.10.4</td>
<td>JMF Main Functionality</td>
<td>31</td>
</tr>
<tr>
<td>2.10.5</td>
<td>Presentation</td>
<td>32</td>
</tr>
<tr>
<td>2.10.5.1</td>
<td>JMF Player</td>
<td>33</td>
</tr>
<tr>
<td>2.10.5.2</td>
<td>JMF Player Architecture</td>
<td>34</td>
</tr>
<tr>
<td>2.10.5.3</td>
<td>JMF Player States</td>
<td>35</td>
</tr>
<tr>
<td>2.10.5.4</td>
<td>Creating and Displaying a Player</td>
<td>37</td>
</tr>
<tr>
<td>2.10.5.5</td>
<td>Controlling Media Players</td>
<td>39</td>
</tr>
<tr>
<td>2.10.6</td>
<td>Processing</td>
<td>40</td>
</tr>
<tr>
<td>2.10.6.1</td>
<td>Processor</td>
<td>41</td>
</tr>
<tr>
<td>2.10.6.2</td>
<td>Processor States</td>
<td>44</td>
</tr>
<tr>
<td>2.10.6.3</td>
<td>Configuring a Processor</td>
<td>45</td>
</tr>
<tr>
<td>2.10.6.4</td>
<td>Processing Controls</td>
<td>46</td>
</tr>
<tr>
<td>2.10.6.5</td>
<td>Data Output</td>
<td>46</td>
</tr>
<tr>
<td>2.10.7</td>
<td>Media Capture</td>
<td>46</td>
</tr>
<tr>
<td>2.10.7.1</td>
<td>Capture Devices</td>
<td>47</td>
</tr>
<tr>
<td>2.10.7.2</td>
<td>Capture Controls</td>
<td>48</td>
</tr>
<tr>
<td>2.10.8</td>
<td>Media Data Storage and Transmission</td>
<td>48</td>
</tr>
<tr>
<td>2.11</td>
<td>Real-Time Media Streams</td>
<td>48</td>
</tr>
<tr>
<td>2.11.1</td>
<td>Streaming Media in Real-time</td>
<td>48</td>
</tr>
<tr>
<td>2.11.2</td>
<td>Protocols for Streaming Media</td>
<td>49</td>
</tr>
<tr>
<td>2.12</td>
<td>The Internet Protocol</td>
<td>50</td>
</tr>
<tr>
<td>2.13</td>
<td>Connection-Oriented Versus Connectionless</td>
<td>51</td>
</tr>
<tr>
<td>2.14</td>
<td>Sockets and Client / Server Communication</td>
<td>52</td>
</tr>
<tr>
<td>2.14.1</td>
<td>Transport Control Protocol (TCP)</td>
<td>53</td>
</tr>
<tr>
<td>2.14.2</td>
<td>User Datagram Protocol (UDP)</td>
<td>54</td>
</tr>
<tr>
<td>2.15</td>
<td>Real-Time Transport Protocol (RTP)</td>
<td>56</td>
</tr>
<tr>
<td>2.15.1</td>
<td>Transmitting RTP Media Streams</td>
<td>57</td>
</tr>
<tr>
<td>2.15.1.1</td>
<td>DataSink</td>
<td>59</td>
</tr>
<tr>
<td>2.15.1.2</td>
<td>Session Manager</td>
<td>60</td>
</tr>
<tr>
<td>2.15.2</td>
<td>Receiving RTP Media Streams</td>
<td>60</td>
</tr>
<tr>
<td>2.15.2.1</td>
<td>Receiver Buffering</td>
<td>62</td>
</tr>
<tr>
<td>3.1</td>
<td>Introduction</td>
<td>64</td>
</tr>
<tr>
<td>3.2</td>
<td>Development Tools</td>
<td>64</td>
</tr>
<tr>
<td>3.2.1</td>
<td>The Platform</td>
<td>64</td>
</tr>
<tr>
<td>3.2.2</td>
<td>Real-time Transport Protocol (RTP)</td>
<td>66</td>
</tr>
<tr>
<td>3.3</td>
<td>System Architecture</td>
<td>67</td>
</tr>
</tbody>
</table>

### III. METHODOLOGY

3.1 Introduction 64
3.2 Development Tools 64
3.2.1 The Platform 64
3.2.2 Real-time Transport Protocol (RTP) 66
3.3 System Architecture 67
3.3.1 Audio-On-Demand Algorithm 69
3.3.2 Broadcast Stored Media Algorithm 70
3.3.3 Broadcast Captured Live Event Algorithm 70
3.4 Implementation Stages 70
3.4.1 M-O-D and Broadcast Stored Media Application 71
3.4.2 Broadcast Captured Live Media Application 72
3.5 Implement JMF Player Application Program 73
3.5.1 Implementation Description 73
3.5.1.1 Functionality 74
3.5.1.2 Program Description 74
3.6 Implement Client/Server interaction using TCP socket 76
3.6.1 Establishing a Server Program Using Stream Sockets 78
3.6.2 Establishing a Client program Using Stream Sockets 79
3.7 Implement RTP Media Streaming Programs 81
3.7.1 Transmitting RTP Audio Streams 81
3.7.1.1 Program Description 85
3.7.2 Receiving RTP Audio Streams 90
3.7.2.1 Program Description 92
3.8 Implementation of Graphics User Interface (GUI) 92
3.9 Playing the Local Captured Live Audio 96
3.9.1 Program Description 99
3.10 Transmit the Captured Live Audio Over the Network 98
3.11 Receiving the Captured Live Audio 99

IV RESULTS AND DISCUSSION 101
4.1 GUI Client/Server Application Description 101
4.1.1 Server Side Application 102
4.1.2 Client Side Application 104
4.2 Developed JMF Player for Playing Local Media Data 106
4.2.1 Experimental JMF Player 107
4.2.1.1 JMF Player with MP3 Format 108
4.2.1.2   JMF Player with WAV Format

4.3   Downloading Approach

4.4   Streaming Audio Media using Developed Application
   4.4.1   Streaming Stored Audio over Laboratory LAN
   4.4.1.1  Broadcast Live Event
   4.4.1.2  Packet Status
   4.4.2   Streaming Stored Audio over UPM Campus

V
CONCLUSION AND FUTURE DEVELOPMENT

5.1   Conclusions

5.2   Future Development

REFERENCES

APPENDICES

BIODATA OF THE AUTHOR