# **CO527**

Computer Networks and Distributed Systems

Assessed Coursework

RMI and UDP

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# **RMI vs UDP**

After testing our RMI code with two computers located in different parts of London, we concluded that RMI communication mechanism is very reliable. From our observations, we found that not a single message had been lost during transmission despite the computers being in different parts of London. This is because RMI uses Transmission Control Protocol (TCP). This ensures that a connection between the server and client is established before messages are sent over from client to server.

UDP is unreliable as it does not utilize TCP. Packets are sent over the network without first establishing a connection between the client and the server. This results in some loss of packets and the order of receipt being jumbled up.

# **Causes of lost messages**

## RMI

Messages can be lost when the network is congested, causing the buffer to become full. Subsequent packets are denied entry into the buffer and are not received properly. However, RMI implements TCP congestion control to deal with this situation. This explains why messages were hardly lost even when sending a large number of messages. However, this also took a toll on the performance as the messages were sent much more slowly due to client-server communication for each packet.

## UDP

Messages also can be lost when the network becomes congested. However, there is no in-built congestion control system, so messages are more easily lost. Furthermore, the lack of client-server communication results in faster sending rate of packets, causing the network to become congested more quickly when the number of messages is sufficiently large.

# **Patterns of lost messages**

## RMI

There were no patterns found as all messages were received via RMI.

## UDP

When testing on the lab computers, two patterns were discovered. The first was that around 70% of the time, all messages above 303 were lost. This could indicate a maximum buffer size or congestion control implemented by the DoC admins. In the other 30% of the time, the message loss rate varied but generally increased as the activity in the lab increased. This could be due to increased traffic over the network which caused the buffer to become full more quickly.

# **Comparison**

We believe that UDP was easier to program. RMI was more difficult because we had to implement protocols like the security manager and the server-client binding to ensure a connection was properly established. On the other hand, UDP only required a common port over which messages are sent and received.

Nevertheless, the simplicity of UDP meant that it was not as reliable in sending information from the client and receiving information from the server as compared to RMI. As the server and the client are not bound, there is a much higher chance of messages being lost from client to server.

# **APPENDIX**

Figure 1: Graph showing the effect of the number of messages on the percentage of lost messages

Figure 2: Graph showing the effect of the number of messages on the time taken

**Screen Dump**

Note: Only the last three lost messages were captured for brevity.

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# **RMI Client**

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# **RMI Server**

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**UDP Server**A screenshot of a cell phone

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**UDP Client**A screenshot of a video game

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