Smart Filtering in C MOVE SCP

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Contact info of Presenter

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Outline

This paper focuses on the usage of particular medical imaging workflow C MOVE DICOM protocol in an optimal manner in a medical imaging application.

Smart Filtering in C MOVE SCP

Introduction

Our aim is to address the current problems of C MOVE DICOM protocol. The Emphasis is on the possible ways to improve the handling of the protocol and inducing smart solution to optimize the workflow

Current Workflow of C MOVE Service

Current Behaviour of C MOVE
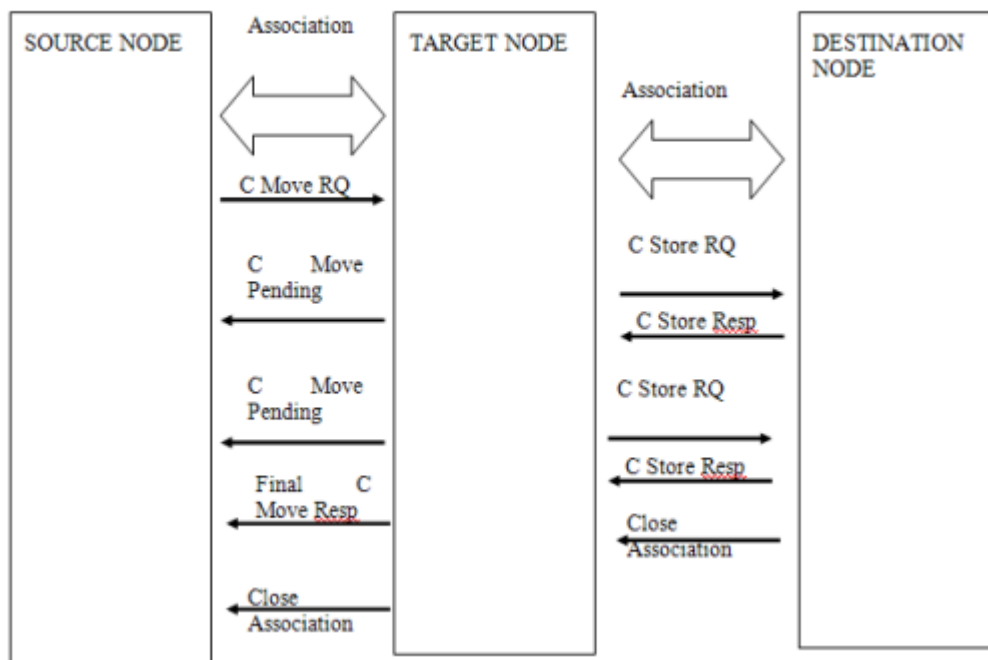
The data are moved from TARGET NODE to DESTINATION NODE. The request of data movement is initiated by SOURCE NODE.

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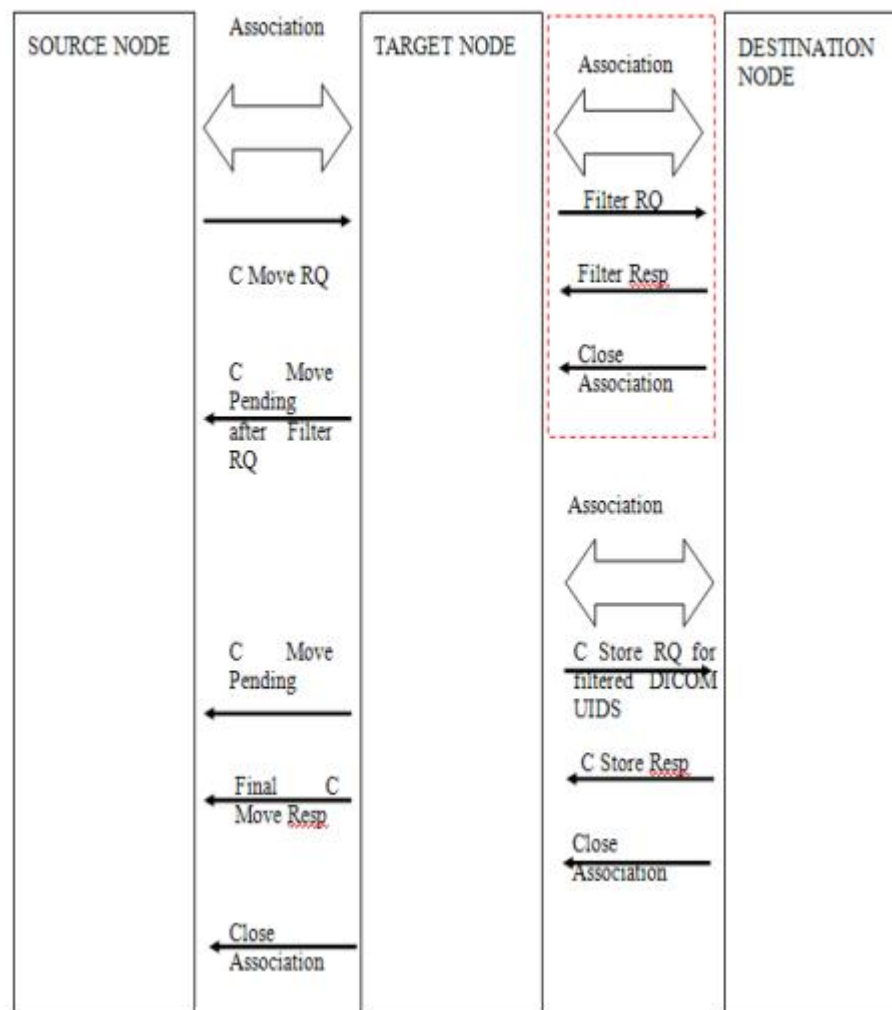
Current Workflow of C MOVE Service

- **The SOURCE NODE opens a association to TARGET NODE to initiate the C MOVE RQ**

- **The SOURE NODE sends list of UIDs that has to moved from TARGET NODE to DESTINATION NODE**

- **The TARGET NODE opens a association to DESTINATION NODE to initiate C STORE RQ to store the UIDs in the DESINATION NODE**

- **All UIDs information are transferred from TARGET NODE TO DESTINATION NODE**

- **THE DESTINATION closes the association to TARGET NODE**

- **The TARGET NODE closes the association to the SOURCE NODE**

Problem found in Current Workflow

- **An unnecessary network transfer can happen if the instances moved are already present in the DESTINATION NODE**

- **The data presence can be detected only while committing the instances in the system**

- **The above transfer can reduce the performance due to redundant transfer**

- **The receiver in case of passive send has no other way to receive the redundant images and finds the presence of same instance only during database commitment**

- **There is no mechanism to prevent the duplicate instance UID conflicts issue**

Suggested Workflow

Suggested Improvement in C MOVE Handling

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Suggested Workflow

- **The SOURCE NODE opens a association to TARGET NODE to initiate the C MOVE RQ**

- **The SOURE NODE sends list of UIDs that has to moved from TARGET NODE to DESTINATION NODE**

- **The TARGET NODE opens a association to DESTINATION NODE to initiate Commitment request to check status the UIDs(i.e. Whether already present**

- **The TARGET NODE filters UIDs that are already present in the DESTINATION NODE and send the UID information that are not present DESTINATION NODE**

- **THE DESTINATION NODE closes the association to TARGET NODE**

- **The TARGET NODE closes the association to the SOURCE NODE**

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Advantages of Suggested Workflow

❑ **Performance improvement**

❑ **Effective bandwidth utilization**

❑ **Effective Data utilization for intelligence algorithm**

❑ **Avoiding Redundant data transfer**

Experimental Values - Current Workflow

For instance consider a set of 1000 images of Patient A for moving out of which 500 images are already present in the destination machine and only 500 images are newly generated

With the Current Workflow

- Time taken to send one image from target to destination =   68ms

- Approximate time taken to send 1000 images   =   68 secs

- Time taken for commitment for 1000 images   =   3 secs

- Total time taken for one workflow   =   71 secs

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Experimental Values - Suggested Workflow

By implementing the Suggested Workflow

- Time taken for initial commitment (filter request) = 3 secs

- Approximate time taken to send 500 images = 32 secs

- Time taken for final commitment for 500 images = 3 secs

- Total time taken for one workflow = 38 secs

The values are based on the transfer results on C++ based medical imaging systems with constant CPU performance, Networking Protocols Standards ,Constant Network Performance and Constant DICOM Series.

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Conclusions

With the experimental results there is saving of 33 secs which is almost equal to the percentage of images already present in the destination Node(ie 50%).

This clearly shows that there is a requirement to improve the handling of C MOVE RQ in C MOVE SCP. A filtering mechanism when implemented in C MOVE SCP can give a performance improvement and a better bandwidth utilization.

Smart Filtering in C MOVE SCP

References

http://dicom.nema.org/

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Thank you for your attention !