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## Synchronizing data stream processing

Mohammad Siddique Fawad Qureshi  
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Qureshi, Mohammad Siddique Fawad, Synchronizing data stream processing, M.Comp.Sc.-Res. thesis, Information Technology and Computer Science, University of Wollongong, 2007. <http://ro.uow.edu.au/theses/649>

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# **Synchronizing Data Stream Processing**

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A thesis submitted in fulfillment of the requirements for the award of the degree

**Master of Computer Science (Research)**

from

**UNIVERSITY OF WOLLONGONG**

by

**M. S. Fawad Qureshi**

B.Sc Computer Science – University of Sindh  
M.Sc Computer Science – University of Sindh

**SITACS**

**School of Information Technology and Computer Science**

**2007**

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# Certification

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I, M. S. Fawad Qureshi, declare that this thesis, submitted in fulfillment of the requirements for the award of Master of Computer Science, in the School of Information Technology and Computer Science, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

**M. S. Fawad Qureshi**

Date: 30 March 2007

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# List of Publications

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Publications arising from this thesis:

Qureshi, M. S. F. and Getta, J. R. (2007): Synchronizing Data Stream Processing. *Proc. IASTED International Conference on Parallel and Distributed Computing and Networks*, Innsbruck, Austria, 233 – 238.

Peer-reviewed proceedings of an international conference.

# Abbreviations

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<b>AQP</b> .....	Adaptive Query Processing
<b>ART</b> .....	Average Response Time
<b>CQL</b> .....	Continuous Query Language
<b>CQP</b> .....	Continuous Query Processing
<b>DBMS</b> .....	Data Base Management System
<b>DSMS</b> .....	Data Stream Management System
<b>DSP</b> .....	Data Stream Processing
<b>DSPN</b> .....	Data Stream Processing Network
<b>MDR</b> .....	Maximum Data Rate
<b>PQP</b> .....	Pipelined Query Processing
<b>QoS</b> .....	Quality of Service
<b>QP</b> .....	Query Processor
<b>SPE</b> .....	Stream Processing Engine
<b>STREAM</b> .....	Stanford Stream Data Manager
<b>SQL</b> .....	Structured Query Language
<b>TQL</b> .....	Tapestry Query Language
<b>XML</b> .....	Extended Markup Language

*to my beloved father*  
***Haji Muhammad Saleem Qureshi***

# Abstract

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Synchronization of data stream processing has a significant impact on performance of systems where processing of long sequences of data items needs to be done simultaneously. In earlier works on stream processing, synchronization has been discussed to a limited extent or has been completely overlooked. This work describes a formal model of synchronization in a data stream processing network. We use a notation of data stream processing networks to identify circumstances that necessitate synchronization. We also express processing of groups of data items in terms of database transactions within a data stream processing network. A technique similar to timestamp ordering of database transactions is used to solve the problems. A solution is presented as a set of rules that govern processing of groups of data items. A proof of correctness has been provided for the strategy used to solve the problems.

# Acknowledgments

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I would like to thank my supervisor Dr. Janusz R. Getta for his invaluable guidance, support, and patience. He helped me in defining a suitable problem for my thesis, and always provided productive suggestions in the course of the writing process.

My special thanks to Professor John Fulcher and Dr. Heather Jamieson for their encouragement during the revision process.

I would like to thank my family and friends for their continuous support and help in the best way possible.