

Database Paradigms for Recordings Management

Master Thesis

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1 Involved parties

1.1 Students

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2 Background

Axis Communications is a world leading company in the market of surveillance and security solutions. Their products include network cameras, video encoders etc.

Axis cameras are embedded systems which store their data either locally on SD cards or remotely on network shares. Currently the recordings data collected by Axis cameras are stored in relational databases. Relational databases are a mature technology which have been used extensively throughout the years. Relational databases are not fit for all storage solutions, and in recent years there has been a lot of research into the development of alternative ways of managing data. This includes NoSQL databases, graph databases, etc.

3 Project scope

In this thesis, requested by Axis Communications, we will investigate alternative database-solutions to storing recordings data collected by Axis cameras.

Axis has used relational databases for all of their storage solutions, but has not made any investigations into alternative ways for managing their recording data in recent years. With the growth of alternative solutions they are now interested in looking at alternative solutions for any potential performance gains. This includes researching the following primary areas:

- How moving recording data from a relational database to a new database paradigm can affect performance,
- How re-evaluation of the recordings paradigm (how the data is stored) to suit the new solution can increase performance.

As well as the secondary areas

- How moving the recordings management logic between the embedded system and a remote host PC can affect performance,
- If, and how, a new database paradigm can support the use of metadata for indexing and searching.

4 Scientific contributions

The results of this thesis will mostly gain Axis Communications in their goal of finding alternative storage solutions to increase performance. We hope that the results will also provide a good basis for the research into alternative solutions for storing complex data (video and sound) on embedded systems.

5 Previous work

An initial set of resources which can be used as a basis for this thesis can be found below, along with short descriptions of each:

- <http://www.crcnetbase.com/doi/book/10.1201/9780203489864>
A book which handles the design of databases which store multimedia. Chapter 1 is of interest as it covers important aspects when working with databases and video data.
- [http://www.bth.se/fou/cuppsats.nsf/all/32737dee280f07ddc12578b200454a24/\\$file/BTH2011Henricsson.pdf](http://www.bth.se/fou/cuppsats.nsf/all/32737dee280f07ddc12578b200454a24/$file/BTH2011Henricsson.pdf)
A bachelor thesis which examines the use of NoSQL databases for storing documents. The result is not of great importance, but the methodology is applicable to our own work.
- http://www.jot.fm/issues/issue_2003_07/column2.pdf
An introduction and examination of object-oriented databases. It includes a comparison with relational databases which can be applicable in our work.
- <http://dspace.library.uu.nl/handle/1874/253635>
A master thesis comparing the use of the graph database Neo4j and the relational database PostgreSQL.

6 Methodology

The main goal of the thesis will be the investigation of the primary areas described in section 3. This will be accomplished mainly through experiments and collection of quantitative data in the form of time-measurements.

The work will (preliminary) be done using the following steps:

1. Understand how recording data are currently stored in the database and collect a set of baseline measurements.
2. Research alternative database technologies such as NoSQL databases. How is the data stored in the alternative database? What kind of data is suited for the technology? How does this structure differ from the current structure used for storing recording data in a relational database?
3. Create prototype for a selected technology and compare with the baseline solution.

In step 2 of the above process literature will be combined with small experiments, using samples of real recording data, in order to analyse storage solutions and scalability. In step 3 a prototype of a selected technology will be created, by Axis request, and will present the end result of the thesis work.

7 Resources

For this thesis Axis Communications will provide access to their camera hardware, software related to their current storage solution, as well as testing equipment (including current testing suites) for testing the measurable performance of different solutions.¹

¹We will provide a more detailed list of resources as we gain information about, and access to, them.