SEng 468 Documentation
Daytrading Inc.

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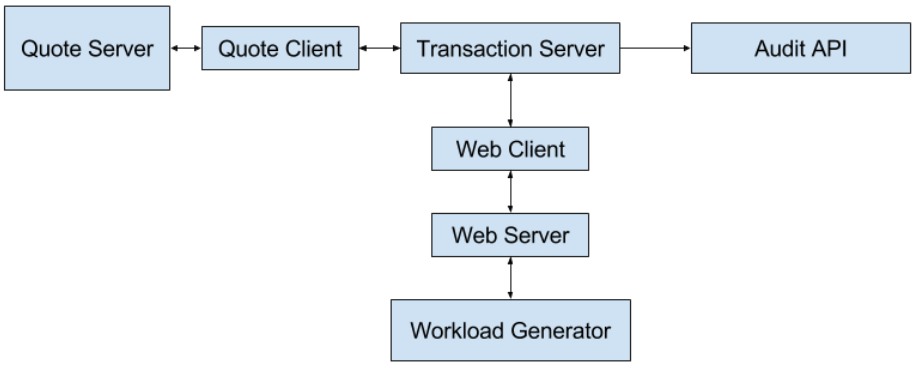
Contents

1 Architecture

1.1 Current System Architecture

For quickly achieving a one user workload in the day trading application, a minimal system architecture was used. The graph below demonstrates the architecture that was used to support a one user workload.



The workload generator simulates a users interaction with the system by taking a list of commands, and then sending HTTP requests to the appropriate web server endpoints. The web server matches the HTTP request to the particular endpoint, and then the Web client forwards the request to the respective transaction server endpoint.

The transaction server is where the bulk of the processing is currently done. All user actions are executed within the transaction server. The transaction server currently tracks the current user's id, account funds, and stocks. Additionally, the transaction server sends a message to the quote client which will query the quote server with the specified action. The quote client then returns the result of the query back to the transaction server for any further processing.

Upon receiving a command, the transaction server makes a call to the Audit API to log the requested command. Further calls to the audit API may be made depending on if the user's command was executed successfully, or if an error occurred.

Once a command has been completed, the transaction server will return a message to the Web Client to indicate whether the command was a success or a failure. The web client then processes the response from the transaction server, and creates a corresponding HTTP status code message. The web client then passes the HTTP status code back to the web server which then sends the HTTP response back to the Workload generator.

Finally, the workload generator parses the response and determines if the command was successful or not. After all commands have been executed, the workload generator gives a report of the total number of successful and unsuccessful commands.

1.2 Project Plan

1.2.1 Weekly Deadlines

- First log book entries are due Jan 19th by 23:59:59
- Log book entries (must be completed individually by each group member and signed by the entire group - 1% deducted for each missing/late log book entry to a maximum of 5% of the project mark)
- Jan 26th: Verified execution of 1 user workload file
- Jan 29th: Documentation

  - Project Plan
  - Initial Requirements
  - Architecture

- Feb 9th Verified execution of 10 user workload file
- Feb 16th Verified execution of 45 user workload file
  Requires:
  - prep multiple instances of components (either auto scale or deploy enough in advance)
- Feb 23d Verified execution of 100 user workload file
  Requires: - deal with scaling issues as they persist
- Mar 9th Verified execution of 1000 user workload file
  Requires: - deal with scaling issues as they persist - optimise performance

  Note: just under a month here, then final deadlines hit This means we have lots of time to do these optimisations, along with report writing and presentations.

  - polish web interface - report writing - presentation prep
- April 4th Group project presentations during regular class time Presentation schedule will be announced in class, end of March Students must attend all presentation days
- April 4th Demonstration of web interface (must be booked with your TA by March 24th)
- April 8th Verified execution of final 2018 workload file by 16:59:59.
- April 11th - Submission of final project reports, printed and in PDF format, by 16:59:59 - Submission of all project source code via email to TA

1.2.2 Grading

- 5% Transaction and cost performance relative to the other groups
- 5% Overall Architecture and Documentation, including Project Plan
- 5% Security Design, Analysis and Documentation
- 5% Test Plan Design, Analysis, and Documentation
- 5% Fault Tolerance Design, Analysis, and Documentation
- 5% Performance Analysis, Testing, and Documentation
- 5% Capacity Planning Analysis, Measurement, and Documentation
- 5% Project Presentation
- -1% Each missing (or late) log book entry (assessed individually)
- -1% Each missing (or late) milestone deliverable (assessed on a group basis)

1.3 Requirements

1.3.1 Ports

Quoteserver: 4450
Inter-Lab comms: 44455 - 44459

1.3.2 User Commands

Document describing all available commands is available at the course website. All of the above commands must be supported from the client console. The ability to dump a log of all transactions must be supported from a supervisory client (implement as part of the group project web site)

1.3.3 Software rules

- DayTrading Inc. requires that the project be build using Docker Container technologies. All other software choices are open to each group to make, along with the responsibility to install, maintain, come up to speed on, etc. the full technology stack used. All groups must use a full proper code repository for their project.
- Caching strategies may be applied to reduce the quote server access time, but all business rules and specification must still be met.
- Inputs and outputs of the Stock Quote Server are ASCII strings of the following format:
  Server Command Format: "StockSymbol, USERNAME"
  Server Quote Return Format: "Quote, StockSymbol, USERNAME, CryptoKey"

1.3.4 Business rules

Note: All business rules are peculiarities derived from the specs document.

- Provide acceptable performance, reliability, fault tolerance
- Minimum transaction processing times.
- Full support for required features.
- Reliability and maintainability of the system.
- High availability and fault recoverability (i.e. proper use of fault tolerance)
- Full persistence for all transaction and accounting operations.
- Minimal costs (development, hardware, maintenance, etc.)
- Clean design that is easily understandable and maintainable.
- Appropriate security
- A clean web-client interface.

- Fully supported and complete audit trail
- Full documentation of architecture including complete analysis of design choices.
- Full documentation of test plans, testing results, and test analyses.
- Full documentation of work effort required to build prototype, including weekly individual log book entries signed by each member of the design team.
- Complete capacity planning and transaction time documentation, including experimental results and extrapolations.
- Full security analysis.
- Full project planning and execution documentation for prototype development effort.
- Full analysis of system capacity and capacity planning documentation
- All claims within the project documentation must be supported through appropriate experimental testing and analysis
- All documents must be clear, concise, and correct with respect to English usage and grammar.
- Documentation that is not comprehensible, overly verbose, rambling, etc. willbe viewed by DayTrading Inc. as indicative of the design team's general level of care and attention,and therefore will reflect negatively on the team's overall evaluation.
- Each client logs in through a web browser and then performs a number of stock trading and account management activities.
- In addition to the client activities, DayTrading requires full auditing capabilities; hence, complete transaction logs must be able to be produced on demand that detail of all client activities in thesystem (including timestamps of all transactions), a record of each individual transaction, each transaction's processing time information, and all account state changes within the system.
- This log must be dumped from the system as an ASCII text file when it receives the "DUMPLOG"command.

2 Component Documentation

2.1 Web Server

2.2 Audit Server

Description The audit server is an HTTP web server. For each endpoint, pass the information as URI queries. For example, to post a new userCommand event, the request URI would be as follows:

`localhost:8080/userCommand?server=TRANS&funds=22.33&transactionNum=11&command=BUY`

TODO:

- Input validiation and error checking
- Multithreading requests to write to the log object
- Set up and document proper return values

Endpoints For all supported params, being surrounded with brackets indicates optional.

- **/userCommand**
  Supported Params: server transactionNum command (username) (stockSymbol) (filename) (funds)
- **/quoteServer**
  Supported Params: server transactionNum price stockSymbol username quoteServerTime cryptoKey
- **/accountTransaction**
  Supported Params: transactionNum action (username) (funds)
- **/systemEvent**
  Supported Params: transactionNum command (username) (stockSymbol) (filename) (funds)
- **/errorEvent**
  Supported Params: server transactionNum command (username) (stockSymbol) (filename) (funds) (errormessage)
- **/dumpLog**
  Supported Params: filename (username)

Return Values:
Right now the commands just echo the parsed xml.

2.3 Transaction Server

The transaction server still handles the core of the logic.

2.4 Database

For a database, we chose to use Redis for its scalaiblity, fault tolerance and low overhead. In addition, in an iterative course such as this, we value being able to change the schema on the fly. Since Redis is a key/value store we kept the schema light. The documentation has key in the header, with a description of the params in the body. Our redis instance is fully Docker containerized and runs well with the default settings.

Endpoints Redis uses TCP by default. There are also many clients provided.

- **USERID:Balance**
  Contains the balance of the user ID. Stored as a floating point number for now, however Redis does offer some accuracy guarantees.
  Functions: AddFunds GetFunds RemoveFunds
- **USERID:Stocks**
  Redis hash of the stocks a user owns. Stocks are stored as integers.
  Functions: AddStock GetStock RemoveFunds
- **USERID:SellOrders**
  Keeps tracks of user's uncomitted sell orders.
  Functions: PushSell PopSell
- **USERID:BuyOrders**
  Keeps tracks of user's uncomitted buy orders.
  Functions: PushBuy PopBuy
- **USERID:SellTriggers**
  Keeps tracks of user's running triggers.
  Functions: AddSellTrigger RemoveSellTrigger GetSellTrigger
- **USERID:BuyTriggers**
  Keeps tracks of user's running triggers.
  Functions: AddBuyTrigger RemoveBuyTrigger GetBuyTrigger
- **USERID:BalanceReserve** Keeps tracks of user's reserve account balance. This holds funds offset for triggers *Not implemented yet*
- **USERID:StocksReserve** Keeps tracks of user's waiting sell triggers balance. *Not implemented yet*
- **USERID:History** Keeps tracks of all user's account transactions.
  Not implemented yet
- **Other functions** GetUserInfo: Returns as user's account information

Running Build the docker container. Expose the proper ports when running (-p exposed:6397). Good to go!