DEVELOPMENT AND IMPLEMENTATION OF LEADERBOARD SERVICES FOR GAME APPLICATIONS

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ABSTRACT: In today's competitive world leader-boards play a crucial role in letting individuals to know there status with respect to the members who are in competition with them in contest to gaming platform. The leader-board adds a whole new dimension to games. Leader-boards are mean to show the users current position in an effective manner. These leader-board can also connect to social network. Building a leader-board is technical challenged. Generally, there are two types of leader-boards: absolute leader-board and relative leader-boards. Absolute leader-boards display the top X number of players. The relative leader-board shows, all the nearby users relative to the user position. The solution that best fits is using a Redis database. Redis is essential for speed.

Keywords- Leaderboard, absolute, relative, redis

INTRODUCTION

Leader-boards are mean to show the users current position in an effective manner. These leader-board can also connect to social network. Generally, there are two types of leader-boards: absolute leader-board and relative leader-boards.

Absolute leader-boards gives the top X numbers list of players in game. These absolute leader-boards gives great feeling to people who are visible on the leader-board and they feel like a achievement and status. However, this is not fair for the people who are in the bottom of the leader-board. Some users will take this as challenge but others will start disengage with the game. This may lead to loss of interest on the game. For this reason relative Leader-board are developed. Relative leader-boards show the user position in the leader-board list and also provides relative ranks to that user. The relative leader-board similar ranks list to the users position. For example, if there are 1000 players in the game and user present in some way around 400th place than these relative leader-boards shows the list from 390 to 410. This can give some hope to the users on the game.

When a game having several million users, the leader-board must be implemented in effective, scalable and optimal way. This leads to a big challenge to the developers to achieve all these factors. There is scope to be more challenges in that implementation while handling these many records. There is another factors that are involved in the development of the leader-boards are providing weekly, daily and monthly reports to the users and timely modifications to that leaderboard list . This is also a challenge. Here is the solution for this challenge, that is Redis database fits better.

In other databases it is quite difficult to handle this large amount of data. Redis has two different approaches that differ with others: it is inmemory database. And it has unique data structures that can allow users to do some operations on data. Redis gives an outstanding performance by using these techniques. Depending on the use case, data can be preserved by dumping the dataset to disk every once in a while, or by appending each command to a log. Redis is an master-slave replication and supports easy-to-set, with very fast non-blocking first synchronization, auto-reconnection on net split and so fort.

The possibility of using Redis, an advanced key-value storage engine, Redis commands using their sorted set data type to perform operations on leader-boards such as:

LEABERBOARD OPERATIONS:

Retrieving general information about a leader-board such as total members or total pages.

Adding or removing members from a leader-board.

Retrieving information about a member in the leader-board such as their rank or score.

Updating score information for a member in the leader-board.

Retrieving an arbitrary page of leaders from the leader-board.

Retrieving the leaders around a given member in a leader-board, also known as an "Around Me" leader-board.

Retrieving information for an arbitrary set of members in a leader-board, e.g. How do my friends compare against me?

CONTRIBUTIONS:

Leader-boards are an mostly effective to the social feature, with the help of optimized 3rd party providers, and it can be easily added to a game. From a game design point of view, the underlying technology can be complex. Mainly it encounters problems when it deals with larger Users, to provide faster and accurate results among them.

RELATED WORK

Scoreloop supports a huge variety of platforms like Windows, Android and Blackberry and offers free services to the developers. This is the reason why game developers had gained interest in Scoreloop. Scoreloop emphaisizes on the social arena and hence extends its area of mobile technology to a large extent. Scoreloop doesn't compete in the market space as it is neither a game developer nor a publisher. Instead of that, Scoreloop cooperates with all players to maximize their gamers' experience, improve their community's cohesiveness, and provide them with additional revenue streams of the mobile gaming value chain - from game developers and aggregators, to publishers and portals.

LEADER-BOARDS AS SERVICE:

Now a day's leader-boards occupy most predominant place in Gamification. Gaming application added a new dimension through social networking sites leads to more users. Leader-boards can be a fun way to drive competition among players, both for hardcode fans and for casual players. These Leader-boards automatically creates daily, weekly and all-time versions and there is no need to create separate leader-boards for each time frame.

Developing a leader-board with million's users is not a simple thing because leader-board always needs to more accurate and faster with results. The main issue in development of leader-board is handling the large amount of user details. Another issue is, developing efficient leader-board for every game. To overcome these issues, here is an alternative 'Leader-boards As a Service'.

Leader-boards are also served as 3rd party services to the game developers. These Leader-boards have all users' details with their scores and finally gives leader-board positions of all users; this is more accurate and faster than the inbuilt leader-boards. With this single step the gaming application got a new magnified diminution.

DEVELOPING AN LEADER-BOARD

Leader-boards works on simple concept called sorting, by taking input as user scores and user details. The output should be a sorted list of the users with respective to their scores.

Leader-boards architecture has three primary stakeholders they are game application, users and third party leader-board provider. Mainly game application was connected to the users and leaderboared providers. Below figure shows detailed view of the Leader-board architecture.
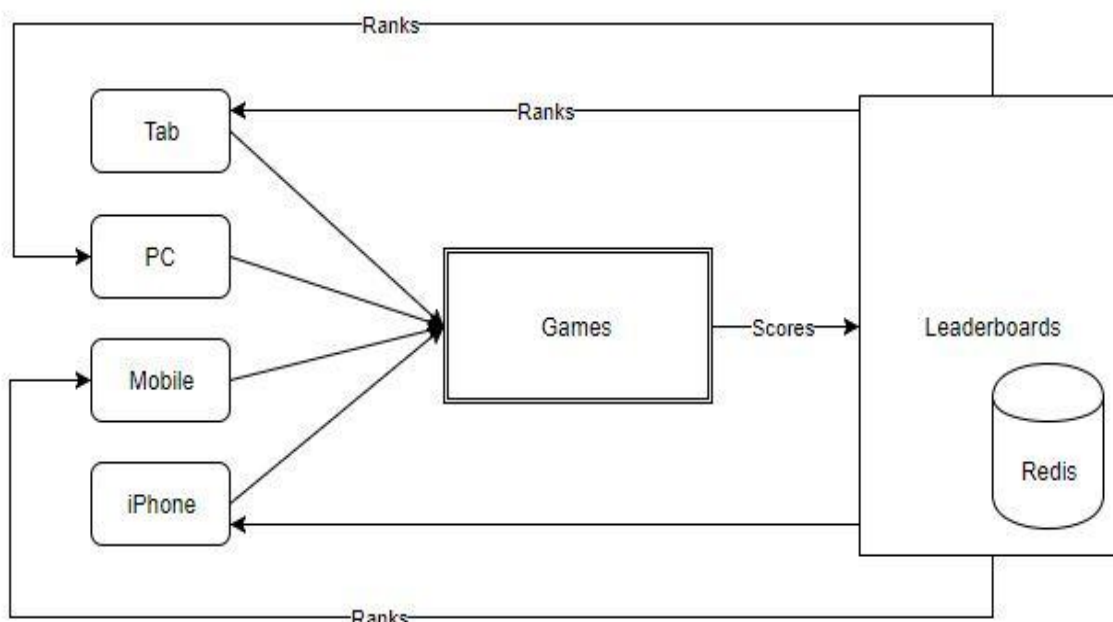

Fig: Leader-board Architecture

Users directly connected with game application and generate user scores. This user scores will send to leaderboarders. Leader-board handles large amount of data with the help of Redis database. Application and leader-boards are connected with the REST Api, that sends output to their users.

Redis is an in-memory data structure and stores keys. Redis has built-in replication and single treaded which leads to faster than other databases. Redis also supports trivial-to-setup master-slave asynchronous replication, with very fast non-blocking first synchronization, auto-reconnection with partial resynchronization on net split.

LEADER-BOARDS IMPLEMENTATION

Django is a web development framework that assists in building and maintaining quality web applications. Django helps eliminate repetitive tasks making the development process an easy and time saving experience. This tutorial gives a complete understanding of Django.Django REST framework is a powerful and flexible toolkit for building Web APIs. The main features are, it supports web browsable API, Authenticatin policies and Serialization.REST API follow below steps.

ALGORITHM STEPS:

create_leaderboard
- – Input: leaderboard_type, updation_type
- – Output: leaderboard_id

get_leaderboard_details
- – Input: leaderboard_id
- – Output: leaderboard_type, updation_type,

save_user_score
- – Input: leaderboard_id, user, score
- – Output: leaderboard_score, user_rank

get_user_last_score
- – Input: leaderboard_id
- – Output: user_last_leaderboard_scor

get_user_latest_score
- – Input: leaderboard_id
- – Output: user_latest_leaderboard_score

get_user_score_over_time_period
- – Input: leaderboard_id, time_range
- – Output: list_of_scores

get_top_members_in_leaderboard
- – Input: leaderboard_id, top-k
- – Output: member_id, score, rank

get_members_around_user
- – Input: leaderboard_id, around-k
- – Output: member_id, score, rank

CONCLUSION AND FUTURE WORK:

Leader-boards which are of plug-and-play style, hence went with Django as it has various 3rd party library support. Any client can access this service, hence went with REST protocol. Should retrieve millions of records in real time, hence went with REDIS.

REFERENCES:

[1] Bassily, Raef, Smith, Adam, Steinke, Thomas, and Ullman, Jonathan. More general queries and less generalization error in adaptive data analysis. CoRR, abs/1503.04843, 2015.

[2] Dwork, Cynthia, Feldman, Vitaly, Hardt, Moritz, Pitassi, Toniann, Reingold, Omer, and Roth, Aaron. Preserving statistical validity in adaptive data analysis. In Proc. 47th Symposium on Theory of Computing (STOC). ACM, 2015.

[3] Gelman, Andrew and Loken, Eric. The statistical crisis in science. American Scientist, 102(6):460, 2014.

[4] Hardt, Moritz and Ullman, Jonathan. Preventing false discovery in interactive data analysis is hard. In Proc. 55th Foundations of Computer Science (FOCS), pp. 454–463. IEEE, 2014.

[5] Hastie, Trevor, Tibshirani, Robert, and Friedman, Jerome. The Elements of Statistical Learning. Springer, 2001.

[6] Ioannidis, John P. A. Why Most Published Research Findings Are False. PLoS Medicine, 2(8):124, 2005. doi: 10.1371/journal.pmed.0020124.

[7] Nissim, Kobbi and Stemmer, Uri. On the generalization properties of differential privacy. CoRR, abs/1504.05800, 2015.

[8] Steinke, Thomas and Ullman, Jonathan. Interactive fingerprinting codes and the hardness of preventing false discovery. CoRR, abs/1410.1228, 2014.