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ALGORITHM FOR THE FORMATION OF AN ARRAY OF BILLING INFORMATION BASED ON THE STATISTICAL- EVENT MODEL OF THE BEHAVIOR OF CELLULAR SUBSCRIBERS

Abstract: As part of ensuring information security on cellular communication channels, search and analysis systems, such as I2, January, and others, are being used and actively developed, using sophisticated algorithms for searching for interrelationships of elements of modern telecommunication systems. To test the correctness of the implementation of analytical algorithms in systems of various types, arrays of billing information are required. Similar arrays should be used to ensure the educational process in the study of information and analytical security systems.

In order to form students' practical skills in searching and analyzing the interrelationships of elements of modern telecommunication systems, software has been developed for generating billing information arrays consisting of background billing and situational tasks (tests). The report provides statistical characteristics of the generated arrays of background billing.

The article reviewed a software package for the synthesis of billing information based on the developed spatial-temporal statistical-event model of user interaction in the networks of Telecom operators in order to obtain arrays suitable for testing the correctness of the implementation of search-analytical algorithms of information-analytical security.

Keywords: synthesis of arrays of billing information, Petri nets, information-analytical security systems.

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АЛГОРИТМ СИНТЕЗА МАССИВОВ БИЛЛИНГОВОЙ ИНФОРМАЦИИ С ИСПОЛЬЗОВАНИЕМ СТАТИСТИЧЕСКО- СОБЫТИЙНОЙ МОДЕЛИ ВЗАИМОДЕЙСТВИЯ АБОНЕНТОВ СЕТЕЙ СОТОВОЙ СВЯЗИ

Аннотация: В рамках обеспечения информационной безопасности на каналах сотовой связи применяются и активно разрабатываются поисково-аналитические системы, такие как I2, «Январь» и др., использующие сложные алгоритмы поиска взаимосвязей элементов современных телекоммуникационных систем. Для тестирования корректности реализации аналитических алгоритмов в системах различного типа требуются массивы биллинговой информации. Аналогичные массивы должны использоваться для обеспечения образовательного процесса в рамках изучения информационно-аналитических систем безопасности.

С целью формирования у студентов практических навыков по поиску и анализу взаимосвязей элементов современных телекоммуникационных систем разработано программное обеспечение для генерации массивов биллинговой информации, состоящих из фонового биллинга и ситуационных задач (тестов).

Рассмотрен программный комплекс для синтеза биллинговой информации на основе разработанной пространственно-временной статистико-событийной модели взаимодействия пользователей в сетях операторов связи, в целях получения массивов, пригодных для тестирования корректности реализации поисково-аналитических алгоритмов информационно-аналитических систем безопасности.

Ключевые слова: синтез массивов биллинговой информации, сети Петри, информационно-аналитические системы безопасности.

Within the framework of information security on cellular communication channels, search and analytical systems, such as I2, «January», etc., are used and actively developed, using complex algorithms for search of interconnections of elements of modern telecommunication systems. To test the correctness of the implementation of analytical algorithms in systems of various types, arrays of billing information are required. Similar arrays should be used to ensure the educational process in the study of information and analytical security systems on the flows of master's degree in the direction of «Information security» and on the flows of the specialty «Information security of telecommunication systems».

In order to develop students' practical skills in search and analysis of interconnections of elements of modern telecommunication systems, the software for generation of billing information arrays consisting of background billing and situational tasks (tests) has been developed. The report presents the statistical characteristics of the generated background billing arrays.

An array of billing information is a set of records ordered by a time stamp. Each record (row) is a data structure that includes 12 fields, which can be either filled or empty. The main significant fields for generation are: AbonentIMSI (subscriber's SIM card number), AbonentIMEI (subscriber's device type and serial number), AbonentPhone (MSISDN phone number), LAC and CellID (fields indicating binding to the base station), BillTime (event time), CallDuration (connection duration) and BillingType (event type).

The software package allowing generating an array of billing information on the basis of available statistical distributions is developed. As a basis for the generation of the array selected population of subscribers in the amount of 100 thousand people living in a fictional area, moving according to the rules during the generated period of time and interact by making calls and sending SMS-messages.

Modeling of subscribers' behavior is based on two strategies – the model of subscribers' movements within a given period of time and the model of connections.

The displacement model simulates a human settlement, which is modeled by a square consisting of 16 cells. For each cell of the square, symbolizing a part of the map of the settlement, unique parameters of Lac and CellID of the base stations serving it are set, which can be modified by means of application of lists of base stations.

Movement of the subscribers can be modeled in two superposed regimes: on the basis of frequency distributions of the popularity of specific areas or based on patterns in displacements. In the first case, the movement of subscribers are more random, the ability to quickly edit the nature of the movement of subscribers by changing the priorities of specific zones (map cells), in the second movement is predictable and directed (the user can change the routes of subscribers and specify specific points of the route at its discretion).

When generating a billing array, records are generated alternately for each subscriber, taking into account the connection model assigned to it.

Connection model is a statistical model that takes into account the distribution of events by time of day and duration, as well as the number of subscribers committed their actions for the period.

When forming a connection model, both sociological characteristics and statistical data were used.

The developed software package allows you to create arrays of background billing by statistical characteristics identical to the billing arrays of real networks of Telecom operators, which makes it possible to use these arrays for testing search and analytical systems and providing practical training on the study of information and analytical security systems.

An example of the IASB in the analysis of the created array is shown in Fig. 1.

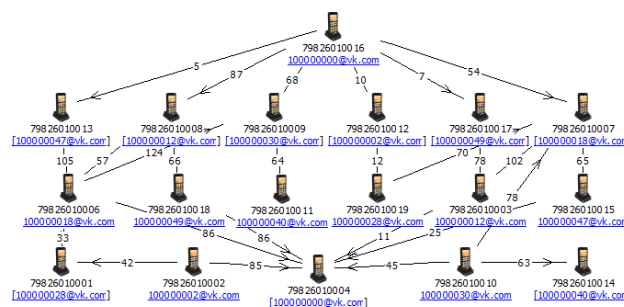


Figure 1 – Example of a search task to find the most related items

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