Notai and MarsBux: Code-Writing Software and Its Cryptocurrencies

Solotron[0]
solotron@marbux.com
www.marsbux.com

Abstract. Significant effort and expense are allocated globally for software development. Those organizations which minimize development time, software bugs, and IT expenditures have a crucial advantage over their competition. To gain an additional competitive edge, we suggest the creation of software that can write and execute optimal code autonomously. This proposed system requires several essential features, namely, it must: write and test code using a scripting language; trap all errors; utilize a graph database; scrape code and data from the internet; implement problem-solving algorithms and machine learning routines; save and access distributed files using a decentralized file system; and interface with users or external servers.

Our software development system, Notai, is being built using these features. Supporting it are the cryptocurrencies, MarsBux (MARS) and MarsBux2 (MARS2). When Notai is deployed as a software service, they will be accepted in lieu of payment. Going forward, the use of these coins is not limited to our system. As human beings settle the planet Mars, the use of digital tokens will likely provide a convenient means of exchanging value. Both MARS and MARS2, currently being mined on planet Earth, are well-suited for that role.

Introduction

The development of computer software heretofore has depended upon human analysts defining algorithms for solving problems. Once defined, programmers would then translate those algorithms into computer programs by writing them in some computer language. When compiled, the instructions in these programs would be converted into actual machine-executable code. The recent use of scripting languages, however, has made the compiling phase of this process transparent to the programmer.

But the question arises whether or not human beings can be eliminated from this operation altogether. Couldn't a user simply request a solution to a problem and let the system determine the best algorithm, write the appropriate code, and execute it on demand? After processing requests, the system should also organize and save successful code for reuse and modification, and determine solutions to other related problems. Like the immune system that manufactures a specific antibody in response to a new antigen, this system creates novel software when presented with new requests.

Our system, Notai, is so named because we think it is “Not AI,” but rather a new kind of information technology. Here, discrete data values are represented as nodes on a weighted directed graph, and the edges contain the instructions for transforming one data value to another. While there are several ways for converting, say 2 to 4, of particular interest is the most efficient or optimal method. Efficiency can be measured as the inverse of execution time, meaning the quickest operation is the preferred one. In determining the shortest path for converting one data value to a more distant one in this digraph, we use a shortest path algorithm to trace the nodes having the lowest total “weight” of execution time. The sequence of instructions in any shortest path is the solution for that transformation.

A graph database, like a directed graph, can also determine relationships between nodes, including their shortest paths. Unlike the row-and-column structure of tables in a relational database, all columns in a graph database don't need to be populated. In fact, a graph database is not Cartesian at all—it only has nodes, edges and related properties. Interestingly, the performance of a graph database is independent of the number of nodes or edges it contains. By contrast, a typical relational database experiences degraded performance when nested “SELECT” statements query the same table, or when the number of rows in a table becomes enormous. Modifying fields in a table means bringing its database offline. A graph database, however, is dynamic, never needing to exclude users as changes are made to it.

Notai must not only be able to write and test code, but must trap any errors that result. If an error occurs during code execution, it will return a “non-result,” represented in some languages as “None,” “nil,” “null,” or an empty string. Under no circumstance should the system halt due to some error, like an attempted division by zero, or a disallowed operation on a wrong data type. Instead, it should return the designated non-result. If an unexpected result occurs, but not an execution error, then the user must realize that the request may be ambiguous. When converting 2 to 4, did the user want 2 plus 2, 2 times 2, or 2 squared? Or, perhaps the user wanted the bits of some unsigned integer shifted one position to the left. The array, [2, 3], if entered as input and converted to [4, 5], would reduce the ambiguity of the request. The system would recognize it as adding 2 to each number in the array and would write the appropriate code. If a request is ambiguous, the system might select the simplest solution or seek clarification from the user.

As the number of nodes, n, increases in any network, the number of possible unique edges, e, equals n(n-1)/2. For a directed graph, e equals n(n-1), as two edges connecting two nodes are unique if they point in opposite directions. If a function is found that can transform a 2 to a 4, the system will inherently attempt to determine a function to convert 4 to 2. As another example, consider the array, [1, 2, 3, 4], which uses a summation function to transform it to the integer, 10. Does a function exist such that 10 can be converted to a set of consecutive integers? Mathematically, any integer that is not a power of 2 can be considered as the sum of two or more consecutive integers [1], so yes.

By creating inverse functions, the system would not only grow the graph database based upon requests, but by discovering and constructing additional edges between existing nodes. If an edge can be created between two clusters of unconnected nodes and edges, a cascade effect will occur, where suddenly many nodes become connected by edges. Additionally, nodes can be created by applying existing functions to other nodes to create new values, or through scraping data from other sources like the internet. All of these processes grow the graph database, making it more useful and responsive to future requests. Thus, if the system already has determined shortest paths between nodes, responses to queries will be expedited.

Scripting Languages

Python

Scripting computer languages have the advantage that their scripts can originate from anywhere and are evaluated at run-time. Python[2] is a popular, fairly concise scripting language that is considered loosely typed. The structure of this language is self-documenting in the sense that code indentations indicate the start of a new block of statements. It features “try:” - “except:” blocks for trapping errors. If code within the “try:” block fails during execution, it will run code within the following “except:” block, rather than terminate the entire program.

The following defined function in Python will double the parameter (omega) passed to it, or if it fails, it will return the designated non-result, None. Notice that the first “except:” block contains a nested “try:” - “except:” block for dealing with a list (i.e., array) of integers instead of a single integer value. Python supports the use of lambda functions, which are unnamed segments of code. In this example, the “map” operator is used with the embedded lambda function to iterate through the list and double each element.

```
def Doubler(omega):
        try:
                return 2*omega
        except:
                try:
                        return list(map(lambda x: 2*x, omega))
                except:
                        return None
```

GNU APL

GNU APL is a scripting language that uses some non-ASCII characters as operators, making the language quite terse. A sequence of but a few APL characters can invoke a great deal of processing. A Programming Language[3], first defined by Kenneth E. Iverson, has built-in operators that act upon arrays or matrices, eliminating the need for looping used in other languages. GNU APL[4] is being maintained by Jürgen Sauermann and adheres mostly to the ISO standard 13751·. This free, modern APL implementation supports unicode characters, JSON, SQL, Windows and Linux files, lambda functions, and much more. Error trapping is accomplished by using the ⎕EA (Execute Alternate) dyadic function, where code in the right argument is executed first. If it fails for any reason, the left argument is executed.

The highlighted top line of the following interactive example is functionally equivalent to the previous Python code. It shows the integer array, 1 2 3, being passed to an APL lambda function containing the Execute Alternate error trapping function. (Lambda functions in APL are enclosed in curly braces.) Since the array, 1 2 3, (the omega) is numeric and can be multiplied by 2, the second line displays the resulting array, 2 4 6, a doubling of the passed parameter. The highlighted line below that fails to multiply the string 'abc' by 2, as alphabetic characters have no numeric value. Consequently, it returns an empty string as the fourth line.

```
      {'θ' ⎕EA '2×ω'⍎ω} 1 2 3        ⍝ Doubles the argument
2 4 6
      {'θ' ⎕EA '2×ω'⍎ω} 'abc'        ⍝ Returns the empty set as a non-result
```

The Graph Database

A graph database, like Neo4j[5], allows users to query, update, add or delete nodes and edges from within it. Querying information can be done interactively by using Cypher Query Language (CQL)[6], or via the Python module, py2neo. The following sample Python snippet will return the shortest path from one node to another by invoking the function, shortestPath. It will show the optimal code for converting 3 to [2, 3].

```
from_item = "3"
to_item = "[2, 3]"

query = """MATCH (a:DataNode { name: '"""+from_item+"""' }),
                 (b:DataNode { name: '"""+to_item+"""' }),
                 p = shortestPath((a)-[:Function*]->(b))
                 WHERE ALL (r IN relationships(p)
                 WHERE exists(r.duration))
                 RETURN p"""

results = graph.run(query)
```

A Distributed, Decentralized File System

In the S03E02 of *The X-Files*[7], called "Paper Clip," Assistant Director Walter Skinner tells the Smoking Man that he is prepared to hand over or destroy a secret tape in exchange for the safety and reinstatement of FBI agents Mulder and Scully. The Smoking Man thinks Skinner is bluffing, but then Skinner introduces Albert Hosteen, a Navajo, who "in an ancient oral tradition of his people, he's told twenty other men the information on those files." Skinner quips, "Welcome to the wonderful world of high technology." Although communicated verbally and not electronically, such is the usefulness of a secure, anonymous, distributed, and decentralized file system: inviolate information can always be retrieved from multiple sources.

By contrast, when all content is located on a single website, it can be shut down through distributed denial-of-service (DDoS) attacks. Likewise, a government, hosting organization or internet service provider can shut it down if it decides to do so. To circumvent such tactics, a distributed, decentralized file system like the InterPlanetary File System (IPFS)[8] can be used. The IPFS system stores secure files using anonymous public or private peers, called swarms. Files can be shared as long as there is a network connection between two or more participating peers. Every file name is an encrypted hash based on that file's contents. If the file's contents change, the old file name can no longer be used to store the updated contents; it assigns a different hashed file name. This convention prevents file modification, ensuring file integrity.

Due to redundancy, should any peer in a swarm be offline, the file is still available. When a peer publishes a new file, the rest of the swarm can acquire it by its file name. After a file is saved by many peers, a requesting peer can obtain it quickly, as several peers cooperate in sending parts of it to the requester simultaneously. An entire folder containing files can also be published using a single hash name, as was the case on April 29, 2017 when, due to a court order, Wikipedia went offline for everyone living in Turkey[9]. Within days, however, those maintaining IPFS published an uncensorable snapshot of tr.wikipedia.org. This action was prompted by IPFS' main goal of improving humanity's access to information, which is hampered by censorship, the erosion of civil liberties, and centralized control.

The Cryptocurrencies - MARS and MARS2

The cryptocurrency, MarsBux (MARS), was created on May 29, 2017, followed by MarsBux2 (MARS2) on July 27, 2017. Their source code is located on Github[10]. Considered utility tokens, no initial coin offering (ICO) was performed at their introduction. Instead, they were immediately listed on the cryptocurrency exchange, CoinExchange.io. By June, 2019, they had become the two most actively traded cryptocurrencies on their DOGE market. Unfortunately, that exchange ceased operations four months later, leaving MARS and MARS2 untradable.

The utility use of these two tokens will be in lieu of payment for software services involving Notai, as well as future cryptocurrency on the planet Mars. Today, interested parties can download wallets from the website, www.marsbux.com, and can accumulate these coins through mining or peer-to-peer trading. Anyone with access to a Scrypt-style ASIC mining rig can freely mine them from available mining pools like those listed on the website. Those lacking ASIC devices can rent them from online organizations, like www.miningrigrentals.com. Existing MARS or MARS2 explorers allow users to select wallet or transaction information for these tokens. Going forward, our roadmap includes having MarsBux and MarsBux2 relisted on one or more cryptocurrency exchanges. This will allow price discovery, exchange between other cryptocurrencies, and obviate the need for the downloading and synchronization of local wallets.

Conclusion

Notai is designed as a new kind of information technology, one in which the software itself writes new software to solve problems. Certain key features of Notai have been deliberately omitted from this document to protect its intellectual property and trade secrets. Since their creation, there has been little effort to promote the cryptocurrencies, MarsBux (MARS) and MarsBux2 (MARS2). The suitability of Notai, its applicability to any given business environment, or the current or future value of its cryptocurrencies, will be left for the marketplace to decide.

References

[0] “SOLOTRON” as a trademark belongs to General Nutrition Investment Company (GNC). “Solotron” and “solotron” are the pseudonyms of the author and are in no way associated with, nor endorsed by, GNC.

[1] Wai Yan Pong. *Sums of Consecutive Integers*. The College Mathematics Journal. Vol. 38, No.2, pages 119-123. 2007.

[2] Python computer language official website. www.python.org

[3] Kenneth E. Iverson. *A Programming Language*. John Wiley & Sons, Inc. Library of Congress Catalog Card Number: 62-15180. 1962.

[4] Jürgen Sauermann. APL Info manual. https://www.gnu.org/software/apl/apl.html

[5] Neo4j Graph Platform, a graph database. www.neo4j.com

[6] Cypher Query Language (CQL). The Neo4j Cypher Query Manual. © 2020 Neo4j, Inc. https://neo4j.com/docs/cypher-manual/current/

[7] *The X-Files*. An American science-fiction drama. Created by Chris Carter. Distributed by 20th Century Disney-ABC Domestic Television. 1993-2002. 2016. Cited here under fair use guidelines, to prove a point, and not intended as an endorsement.

[8] InterPlanetary File System (IPFS), “a protocol and peer-to-peer network for storing and sharing data in a distributed file system.” https://ipfs.io/

[9] Uncensored Wikipedia on IPFS. https://blog.ipfs.io/24-uncensorable-wikipedia/

[10] MARS and MARS2 source code on Github. https://github.com/solotron/marsbux