

# **On-Demand Forensic Accounting**

## **Universal Program Auditing Language**

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### ***Abstract***

*Forensic accounting, or financial forensics, currently lacks the ability to proactively record, access, examine, and analyze in real time all of the financial activity used in financial transactions and financial reporting.*

*The “black box” of opaque and inaccessible computing financial detail information has allowed and enabled numerous recent huge “Ponzi schemes,” including the Bernard Madoff and Allen Stanford cases, which cost investors billions of dollars while humiliating the responsible government regulators and causing the investing public to lose confidence in stock-market investing.*

*This paper describes a revolutionary and transformational patented forensic accounting and analytic capability that captures and records critical never before recorded information, including all executing program source statements and data, and puts a time stamp inside corporate computer programs as they produce financial reports. This makes ultimate drill-down to the source of financial information available—on-demand, instantly, and remotely—to authorized government regulators, auditors and investors.*

*Additionally, the Universal Program Auditing Language described in this paper provides the ability to see the financial document created by the program and the actual program source statements and data creating the information, including ultimate drill-down to the computation of the data in real-time, which is instantly available via mobile device to the Forensic Accountant, CPA, auditor, CFO, government regulator, Judge, or other authorized requestor.*

*A Rosetta Stone like transformational capability translates the arcane gobbledygook language of multiple programming languages used to produce financial reports, including Customer Stock Summary Statements, Balance Sheet and Income Statement documents, into the language (such as English, French, or German) desired by the requesting Forensic Accountant or other requestor, virtually instantly into useful information in a format desired by the requestor, and protected from fraud.*

### **1. Introduction**

Forensic accounting, or financial forensics [1], currently lacks the ability to proactively record, access, examine, and analyze in real time all of the financial activity used in financial transactions and financial reporting.

The “black box” of opaque and inaccessible computing financial detail information has allowed and enabled numerous recent huge “Ponzi schemes,” including the Bernard Madoff and Allen Stanford [2, 3] cases, which cost investors billions of dollars while humiliating the responsible government regulators [4,5] and causing the investing public to lose confidence in stock market investing [6].

This paper describes a revolutionary and transformational patented forensic accounting and analytic computer software capability [7] that captures and records all executing program source statements and data, and puts a time stamp inside corporate computer programs as they produce financial reports. This makes ultimate drill-down to the source of financial information available—on-demand, instantly, and remotely—to authorized government regulators, auditors and investors.

Additionally, the Universal Program Auditing Language described in this paper provides the ability to see the financial document created by the program and the actual program source statements and data creating the information, including ultimate drill-down to the computation of the data in real-time, which is instantly available via mobile device to the Forensic Accountant, CPA, auditor, CFO, government regulator, Judge, or other authorized requestor.

A Rosetta Stone [8] like transformational capability translates the arcane gobbledygook [9] language of multiple programming languages used to produce financial reports, including Customer Stock Summary Statements, Balance Sheet and Income Statement documents, into the language (such as English, French, or German) desired by the requesting Forensic Accountant or other requestor, virtually instantly into useful information in a format desired by the requestor, and protected from fraud.

The huge potential of forensic accounting was addressed by Dr. James Gordon Brown when he was Britain’s Chancellor of the Exchequer: “What the use of fingerprints was to the 19<sup>th</sup> century and DNA analysis was to the 20<sup>th</sup>, forensic accounting will be to the 21<sup>st</sup> century [10].

The fundamental key to unlocking and fully utilizing the huge potential of fingerprints, DNA, and now forensic accounting is to make them all essentially universally available on demand and in a standard easily and immediately understandable format to ultimate consumers worldwide.

The above-described patented on-demand Forensic Accounting computer software, “Real-Time Program Audit”, or RTPA, enables the pervasive worldwide implementation of Dr. Brown’s vision and dramatically empowers forensic accountants. In short, RTPA creates a read-only permanent audit record of exactly what is happening in the computer program, in real-time, including executing source statements, data (the contents of variables) and a timestamp.

On-Demand Forensic Accounting and Analytics provides a video camera–like computer program recording and auditing capability of RTPA [11, 12] software **on-demand via the Internet** to virtually any authorized computer worldwide. This on-demand computer forensic accounting capability enables and empowers government regulators, for the first time, to remotely forensically investigate the recorded actual computer program source statements and data produced in financial reporting, *in timestamp sequence as the computer executed them*, no matter how the multiple programs producing the financial statements were structured or the computer language used in individual program modules.

## **2. Critical Need for a new Corporate Computing and Reporting Environment**

Students of history who have read Harold Evan’s landmark book “They Made America” [13] can recognize and understand both the importance of many key inventions to society, such as the steam boat, and the electric light bulb among scores of others, and also the entrenched resistance and inertia and difficulties against their acceptance and general usage.

Today, the computing industry and specifically the corporate computing software industry as a whole are operating with technology largely designed and developed at the dawn of corporate computing in the late 1950s when computer hardware was extremely slow and primitive and extremely expensive, and when people were extremely inexpensive. IBM used to “give away free” it’s System Engineers (programmers), including me [14], to work at customer locations until 1968 to customers who were implementing new IBM systems.

Since the early 1960s, computer hardware has gotten literally thousands of times more powerful and become inexpensive [15, 16], and computer programmers have become more than ten times [17] more expensive than in the early 1960s while largely still writing programs and applications in the arcane gobbledygook and opaque and deficient programming languages developed decades or scores of years ago. [18]

The paradigm change of Cloud computing [19], which essentially provides on-demand remote computing in a virtualized environment without end-user knowledge of the underlying computer hardware or software technology, provides the foundation and capability for a totally new corporate computing and reporting environment.

Medical advances over the past fifty years including the EKG, CAT scan, MRI, mammogram, ultrasound, Echocardiogram [20] (not to mention the previously discovered X-Ray and Stethoscope) have enabled doctors to literally see inside a patient and record what is happening and to save arguably millions of lives, while significant advances in important capability, such as recording and auditing computer program processing and the ability to reproduce the computer processing output with drill-down to the ultimate source of the data processed, in software computing languages are minimal and insufficient, at best.

Conversely the programming languages used today in the computing industry have essentially have the same primitive design as in the 1960s when optimizing the performance of a single available and expensive computer processor (CPU) was key and computers took minutes or

hours to process typical applications rather than perhaps a few seconds now needed to execute the same application, and there are multiple processors (CPUs) available for processing at a minimal cost.

Software languages and compilers have never gotten significantly beyond the 1950s and 1960s focus of transcribing a needed action into gobbledygook code to attempt to efficiently utilize a then scarce and expensive computer, by a then inexpensive programmer, while causing an opaque and unrecorded and not audited record of what the computer is doing or actually did inside the program. Thus, virtually none of the super-smart exquisitely trained and superbly qualified forensic accounts, CPAs, attorneys, CFOs, accounting firm auditors, government regulators and certainly not investors have a real clue as to what is happening inside the computer as it produces critical financial documents and reports, because they cannot see or understand what the computer actually did to record its entire execution statement-by-statement including variable data and a processing timestamp, and thus what is really is the ultimate source of the data in the financial documents [3, 4, 5, 6]. This lack of transparency or visibility or knowledge of exactly what is happening in real-time inside the computer and in recording it as in a video camera, allows and enables the types of “Ponzi schemes”[2] and other fraud caused by the “Black Box” of computers by shielding these frauds from real-time and mobile access in an understandable way by government regulators, auditors, and investors, and enables a host of fraud generated by computers in financial reporting and other reporting to remain undetected and not prosecuted at cost billions of dollars annually. [3, 4, 5, 6, 16, 21]

While there are hundreds or actually thousands of spoken languages worldwide, all aircraft Air Traffic Control [22] of airplanes worldwide is required to be spoken in the English language, due to the critical real-time need to understand and react and communicate to situations in a single language. Similarly, virtually anyone (including some 10 year olds) can drive any make or model car from any manufacturer by just stepping on the accelerator and steering and braking in an intuitive manner, worldwide, because of strict regulated standards to make the hundreds of millions of autos easily usable by the hundreds of millions of end-users without an expensive technician driving the sophisticated auto for them.

Additionally, the aircraft industry (FAA), auto industry (DOT), drug industry (FDA), securities industry (SEC and SIPC), among many other industries directly relating to the consumer, have strict safety and consumer protection standards and regulations [23]. However, the Information Technology (computing) industry has never had and today has essentially NO effective consumer standards or effective government regulation, and this lack of consumer (including investor) protection and transparency has directly enabled the opaque and gobbledygook computing systems of today and enabled the multiple massive frauds against the investor and the public.

The auto industry in particular has embraced and responded to the needs for the end-user driver to successfully operate and maintain an ever more sophisticated vehicle and technology by literally just stepping on the accelerator in any auto worldwide, and further has even made the auto virtually scheduled maintenance free for scores of thousands of miles and mandated critical safety equipment such as air bags and catalytic converters even over the protests of some manufacturers. And beyond that, the auto industry regulators have mandated an industry standard of vehicle diagnostics [24], which enables the end-user consumer (driver) to see in real-

time inside the vehicle with a PC and a diagnostic tool. This real-time and available auto auditing technology allows literally any auto shop or interested driver to actually see and understand what is really happening or is wrong and directly avoids potential massive fraud previously rampant in the auto industry, while simplifying the maintenance of an increasingly complex and sophisticated and expensive auto.

Nothing like the auto industry mandated diagnostic capability, or safety capability is available to the financial industry investor or to the general public or to the government regulators, or CPAs, or attorneys or forensic accounts or corporations utilizing information technology. They are all literally in the dark with the opaque and gobbledygook software used in Information Technology, and in truth they are all at best guessing at what might be behind that stonewall of Information Technology ancient and deficient technology used as the source of financial information. [2, 3, 4, 5, 6]

Why cannot all forensic accountants, CPAs, auditors, government regulators, CFOs, investors worldwide see in real-time and understand what is happening inside the computer executing program and **recreate the financial documents with ultimate drill-down to the creation of the data updated in an Excel spreadsheet and in a single understandable language such as English (or optionally French or German) on-demand from a remote mobile device such as a computer tablet or smart-phone?**

The incredible answer is forensic accountants and others could essentially accomplish the above paradigm change today with huge productivity gains and major fraud reduction and huge cost savings with available technology such as On-Demand Forensic Accounting and Analytics [7, 10, 11, 12].

## **2.1 Reasons preventing the needed new Corporate Computing and Reporting Environment**

Perhaps the primary reason preventing the corporate computing and reporting environment from moving from the antiquated and deficient and un-productive and expensive computing languages and techniques (old technology) used in the past and today is the fact that the primary revenue source of the existing information technology providers is now the hugely profitable software and services businesses rather than the ever diminishing and now less profitable hardware business. [25, 26]

The huge profits generated by having a corporation needing to utilize the services and software of an effectively monopolistic information technology vendor to implement applications or to decode a gobbledygook program problem or application problem at perhaps eight times the average programmer compensation [17] or forty times the federal minimum wage [27] is a powerful incentive to perpetuate the status quo and resist innovation which would eliminate that need. The technical staff of these services providers is not necessarily as well trained or capable as I was when I performed such services for IBM in the 1970s [14]. The huge and profitable services revenue is also a powerful incentive to develop additional software which will require similar services to implement and support it, and to resist simplification and standards which will enable end-users to quickly and effectively utilize these products independent of the vendor.

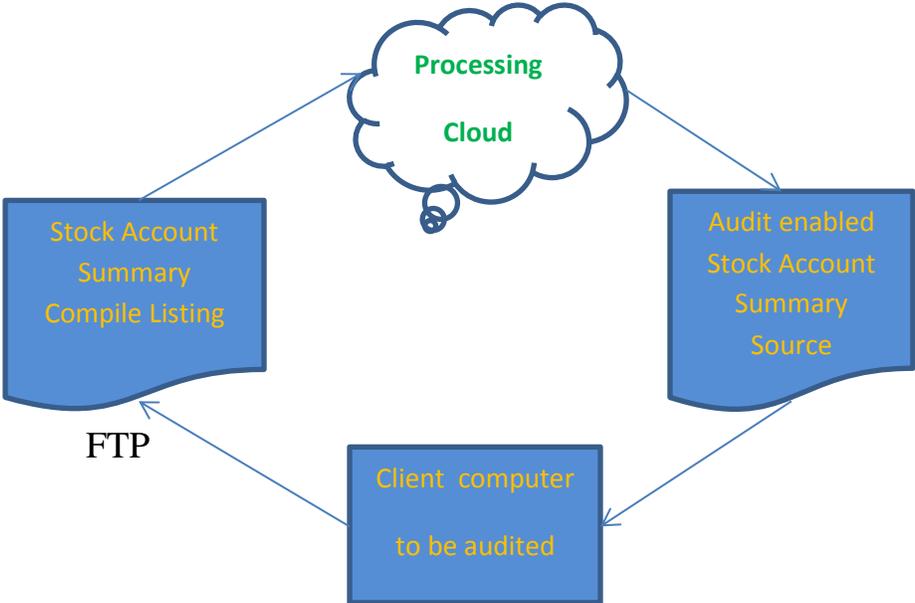
Perhaps the second biggest reason preventing the corporate computing and reporting environment from moving from the antiquated and deficient and un-productive and expensive computing languages and techniques used in the past and today is existence of often bloated corporate information technology programming and management staffs, who have essentially career high-paying jobs trying to decode the gobbledygook programs and applications used by their companies. The executive senior management of those companies is effectively held hostage by the same unknown and incomprehensive gobbledygook knowledge locked up within the information technology staff and the feared risks of replacing it.

Perhaps the third biggest reason preventing the corporate computing and reporting environment from moving from the antiquated and deficient and un-productive and expensive computing languages and techniques used in the past and today is the inertia and resistance to innovation of educational institutions, like my Drexel University [14]. Apparently the tenured and secure appointments of these PhDs. in teaching essentially the same technology they learned as students overrides the need and opportunity for true innovation and providing their students and alumni with a significant competitive advantage in the changing world of business.

Other significant reasons preventing the corporate computing and reporting environment from moving from the antiquated and deficient and un-productive and expensive computing languages and techniques used in the past and today include the inexplicable lack of mandated government standards and regulations requiring transparency and simplicity of the information technology industry.

And, the apparent total lack of ability by super-smart and capable and apparently dedicated government regulators such as the SEC [23] and the Congress to understand how to solve their huge problems quickly and effectively with fraud and implement those solutions. [3, 4, 5, 6, 11] And, the forensic accountants, CPAs, auditors, attorneys, government regulators, CFOs, investors worldwide who are in fact are literally in the dark when confronted with this opaque information technology, and who are apparently unwilling to admit it and get transparent and real-time simplified and verifiable information in English remotely on their mobile devices.

### 3. On-Demand Forensic Accounting and Analytics Scenario



### **Figure 1: Stock Account Summary program compile listing for forensic accounting.**

The government regulator or authorized forensic accountant requires financial reporting (for example, **Stock Account Summary Statements**) (Figure 1) for a corporate client to be audited, including source program statement execution and data and timestamp showing exactly how all program information is created (1)

- The client being audited transmits the financial source program listing to the secure government- authorized server or the Cloud for audit enablement via the Internet (2)
- The secure government server enhances the financial source program to enable source statement execution and data recording (3)
- The enabled, smarter and auditable source program source is transmitted back to the client via the Internet, and is compiled with the standard language compiler into a forensic accounting audit environment (4)
- The government regulator supervises processing of the audit enabled financial program at the client site in a secure separate auditing environment, and queries and analyzes the audit output files (5)

#### Scenario Notes:

- (1) The ultimate drill-down to the original program statement execution and data as it is actually created include reconstruction of the financial document and Excel spreadsheet detail of all levels of summarization and eliminates the often used altering and corruption of summarized information at all levels of reporting.
- (2) The Internet or cloud normally uses secure FTP or File-Transfer-Protocol, and is nominally free.
- (3) The central secure government server or authorized Cloud server and FTP transmission is required only to enhance or make auditable the client source program, and is NOT required if the language vendor provides this enhanced auditing capability at the client SITE, or if the client has the enhanced auditing capability in-house [10].
- (4) The elapsed time to enable a typical client source program for forensic accountant auditing and analytics is less than 10 seconds.
- (5) Forensic accounting auditing is performed in a separate and secure environment at the client site.
- (6) No client data or client files are needed to audit-enable the client program remotely at the Government secure server or by the processing Cloud.
- (7) The audit-enabling process is completely automated and without human operator involvement.

- (8) The client production program and productions operating environment is unchanged, as a separate auditing environment is established.

### 3.1 Method

The FTPed Client Stock Account Statements Summary program compile listing is received and processed by the **Processing Cloud** server and the program source statements, and variable (data) information is stripped from the compile listing and is used as the input program source, files, and variables.

The inserted audit statements (Figure 2) in the audit enabled source program allow the enabled program to record all of the executing source statements, data (variables) and the timestamp as the compiled object program is later executed at the client site.

The audit enabled source program is FTPed back to the client, compiled into an executable object program, and run by the forensic accountant in a separate secure environment with normal client data and procedures to produce the ultimate recorded drill-down to all program statements actually executed and the data processed by each and every executed source program statement (Figure 3).

**Note:** If the client already has the source program audit enabling software installed at the client site, then no FTPing or processing Cloud is needed. For instance, this might be the case if government regulators installed that auditing capability during an audit of the client, or if the client already utilized the audit enabling software to enhance productivity.

**Note:** The program language providers of client financial applications, including IBM, Microsoft, SAP, Oracle, Hewlett Packard, and open source languages could easily provide this program audit enabling capability in their standard compilers.

```

302     torder = 1500;
           1500
303     iorder = 78.543;
           78.543
304     // value of iorder has now been computed
305     xorder = torder + 13.45 +
           1618.19    1500
306     // this is a continuation free form statement preceded with +
307     26.2 + iorder;
           78.543
308     sorder = torder + xorder + iorder + rorder + morder + norder;
           93330.496    1500
                           1618.19    78.543
                               32109.876
                                   34567.098
                                       23456.789

```

(partial Client Stock Account Summary forensic accounting audit output)

**Figure 2: Client Stock Account Summary forensic accounting audit output.**

The right side of the audit output shows the source sequence number, change date and the timestamp of the **moment-in-time** when the statement was executed (Figure 3). These program statements were executed, recorded, and audited in the elapsed time of **one millisecond, and in a tiny fraction of a CPU second.**

```

00209 020623 23800           16.50.19.042 2012-09-19
                                16.50.19.042 2012-09-19
00210 020623 23900           16.50.19.043 2012-09-19
                                16.50.19.043 2012-09-19
00211 061201 24000           16.50.19.043 2012-09-19
00212 020623 24100           16.50.19.043 2012-09-19
                                16.50.19.043 2012-09-19
00213 061201 24200           16.50.19.043 2012-09-19
00214 020623 24300           16.50.19.043 2012-09-19
                                16.50.19.043 2012-09-19
00215 070214 24400           16.50.19.043 2012-09-19
                                16.50.19.043 2012-09-19
                                16.50.19.043 2012-09-19
                                16.50.19.043 2012-09-19
                                16.50.19.043 2012-09-19
                                16.50.19.043 2012-09-19

```

(partial Client Stock Account Summary forensic accounting audit timestamp)

**Figure 3: Client Stock Account Summary forensic accounting audit output timestamp.**

**3.2 Forensic Accounting and Analytics of the Audited Program Output**

The forensic accountant, with this On-Demand Forensics and Analytics capability, has the capability to remotely actually see from a mobile device the reconstructed financial document, for example

Stock Account Summary or Balance Sheet or Income Statement, including Excel spreadsheet detail data of exactly how the data was created and processed, and understand exactly is happening at the client’s computer inside the audit enabled program at the ultimate lowest level of information, which is the executing program code and data, and can utilize the full set of analytics tools including SQL to select and extract any desired information from the read-only audit output Relational Data Base (Figure 4).

The 64GB flash memory in mobile devices such as smartphones, tablets, laptops, and video camcorders enables the forensic accountant to **remotely access, inspect, analyze, and record** literally everything of interest processing inside the client’s computer program, in real time.

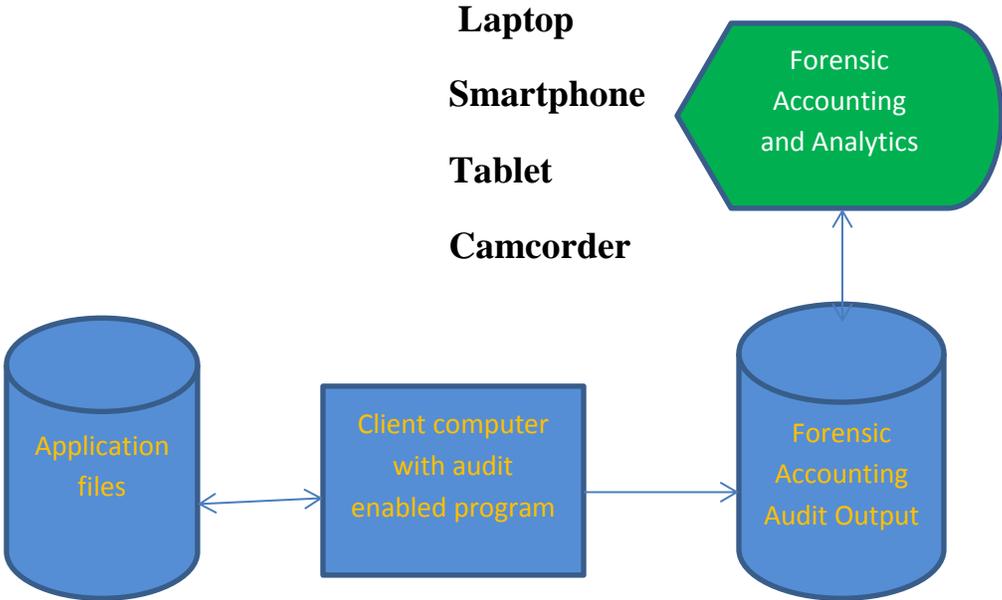
The forensic Accountant or Government regulator has the capability to Query the audit output for literally any variable data produced by the audit-enabled program. For instance, the auditor could query for 1618.19 and examine exactly where and how the variable xorder was computed. (Figure 4). The data contents of program variables, such as **xorder**, can be updated to an Excel spreadsheet (for example variable **xorder value 1618.19** and variable **torder value 1500**) so the ultimate drill-down and the total value of variables may be verified independently outside of the executing program.

```

305      xorder = torder + 13.45 +
          1618.19      1500
306      // this is a continuation free form statement preceded with +
307          26.2 + iorder;
          78.543

```

This real-time audit output of the executing program source statements and data (Figure 2) provides the input for the Universal Program Auditing Language remote mobile display in English to the forensic accountant and others.



**Figure 4: Forensic Accounting and Analytics (can be remote and mobile and real-time).**

Also, source program comments statements (statement 306) can be translated into another language of the auditor's choice as in the Google language translator [28].

Ultimately, the entire gobbledygook source program language audit output could be translated in real-time and in English and available remotely on a mobile device in an easily understandable format by a forensic accountant, auditor, CPA, attorney, government regulator, Judge, CFO, investor and the programmer developing the financial document program, starting with a reconstruction and display of the financial document created by the executing program and Excel spreadsheets with the detail computation of the variables (data) used in the program.

Additionally, the **Universal Program Auditing Language** output described above could include fraud detection and flagging capability such as when the detail variable (data) does not correctly match to the total document value for the variable (for example **xorder** or **torder** in Figure 4), which indicates manipulation of the data or errors such as "plugged totals" in the program, purposeful or not.

### **3.3 Additional Technical Details**

The technical details of exactly how computer programs are enabled to audit and record the executing source program statements and all data (variables) processed is fully described on the patented Real-Time Program Audit (RTPA) software web site [www.harkinsaudit.com](http://www.harkinsaudit.com) and related documentation, including videos.

Detailed information and techniques about exactly how virtually any corporate programming language may be audit-enabled with video camera-like recording of the executing source statements and data are available in the "paper "On-Demand Forensic Accounting and Analytics" [11] and in the "The Power of Traceability" paper. [12]

Detailed information about the emerging and transformative field of Forensic Accounting, and particularly Computer Forensics, is widely available on the Internet, including the book *Computer Forensics: An Essential Guide for Accountants, Lawyers, and Managers* [29]

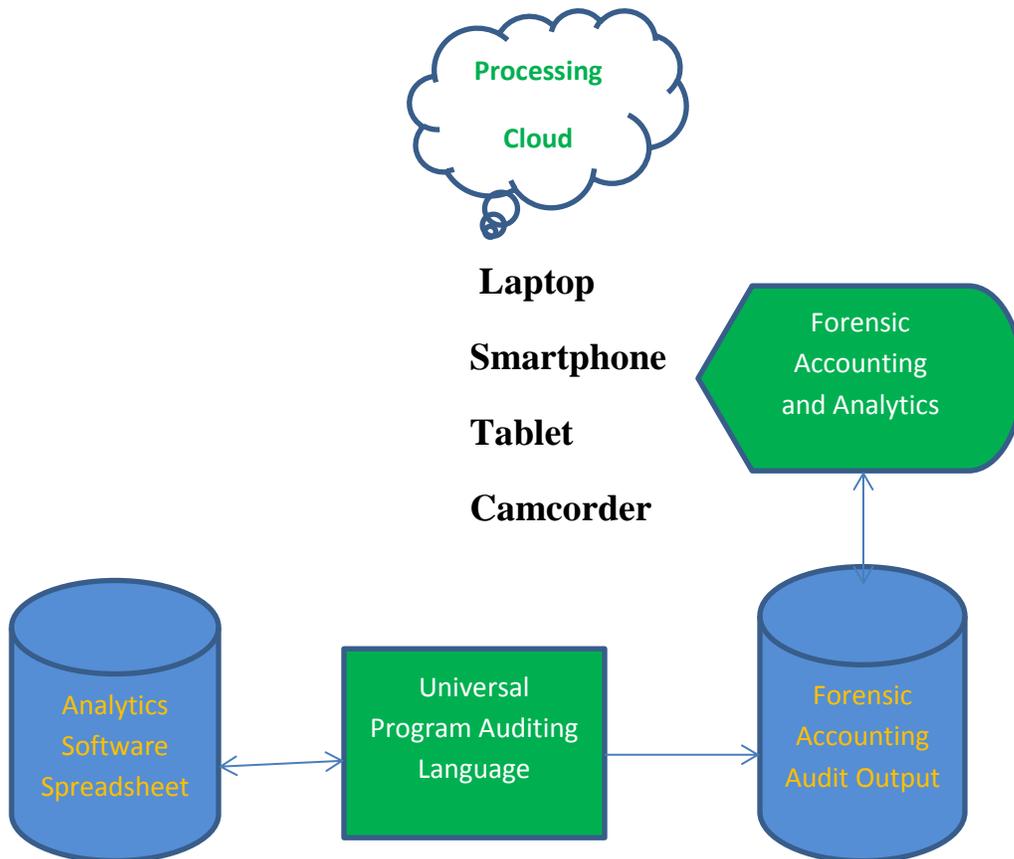
Computer program source statement and data audit-enabling provides, for the very first time, the capability for true **Autonomic Computing** [30], as all of the source program executing statements and all of the data (variables) are real-time recorded and available for autonomic computing, NOT just the program output written external to the program (normally to disk), or available by program probes. **Thus, a vast new world of critical self-healing capability is now available real-time at the most atomic level of all of the executing program statements and data.**

#### 4. The Universal Program Auditing Language

The forensic accountant, with this On-Demand Forensics and Analytics capability using the Universal Program Auditing Language (Figure 5), has the capability to remotely actually see in real-time via mobile devices [31, 32, 33] the final financial documents produced and *all* of the information and procedures actually used to create the document.

The initial display is the actual financial document or documents (for example; Stock Summary Report, Balance Sheet, Income statement) with data. Ultimate drill-down and spread sheet detail of variables, including the executing program source statements and timestamp and processing user information if desired, is available in the language of the requestor by clicking on the desired information as in a normal drill-down in a financial document or analytical report.

Business analytics software may be utilized, and never before possible **true** autonomic processing may be accomplished using computational program data never before written external to the program, such as error messages sent to warehouse packers that are not now recorded external to the program. The real-time auditing and recording of the executing program statements and data is a **quantum leap** in computing and analytics.



## Figure 5: The Universal Program Auditing Language

### 5. Conclusion

The importance of Dr. Gordon Brown's quote "What the use of fingerprints was to the 19<sup>th</sup> century and DNA analysis was to the 20<sup>th</sup>, forensic accounting will be to the 21<sup>st</sup> century" [10] is being proven true today in the detection, prosecution and prevention of multiple huge financial frauds.

Unfortunately, the gobbledygook antiquated and deficient information technology systems in place, together with the almost total lack of effective government financial document processing and auditing standards and enforcement makes this forensic accounting process cumbersome, slow, and incredibly expensive [34].

The huge productivity gains achievable in many industries, the huge achievable cost reductions, the quantum leap in analytics capability, and the restoration of confidence in the securities industry achievable with the Universal Program Auditing Language will require its recognition and adoption worldwide

The U.S. Securities Exchange Commission (SEC) [35] and the U.S. Securities Investor Protection Corporation (SIPC) [36] and the U.S. Congress should *mandate* the implementation of the Universal Program Auditing Language, and additional modern and effective methods, in all financial and securities reporting. This will enable its staffs and the auditing community led by forensic accountants to exercise effective proactive government regulation and fraud detection and prevention and restore consumer confidence in the opaque and fraud riddled financial industry [37, 38].

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