

# On-Demand Forensic Accounting and Analytics

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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 at application level.*

*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, highlighted the need for an overhaul to the responsible government regulatory practices, and shook the investing public to lose confidence in stock-market investing.*

*This paper describes a transformative patented forensic accounting and analytic capability 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.*

## **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 at application level.

The “black box” of opaque and inaccessible computing financial detail information has allowed and enabled numerous recent huge ‘Ponzi schemes’ [2], including the Bernard Madoff and Allen Stanford cases, which cost investors billions of dollars, highlighted the need for an overhaul to the responsible government regulatory practices [3, 4], and shook public confidence in stock market investing.

This paper describes a transformative patented forensic accounting and analytic computer software capability [5] 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.

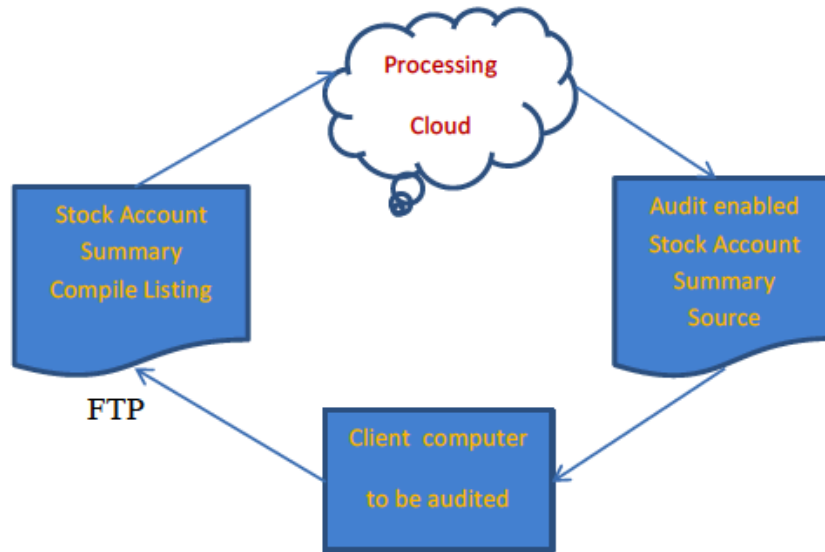
The huge potential of forensic accounting was addressed in 2006 by Dr. James Gordon Brown, former UK Prime Minister and Chancellor of the Exchequer. In a speech about terrorism he commented [6]:

*What the use of fingerprints was to the 19th century, and DNA analysis was to the 20th century, so financial information and forensic accounting has come to be one of today's most powerful investigative and intelligence tools available in the fight against crime and terrorism.*

The above-described patented On-Demand Forensic Accounting computer software, 'Real-Time Program Audit', or RTPA, would facilitate forensic accountants by providing new previously-unavailable data at application level. 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 [7, 8] software on-demand via the Internet to virtually any authorized computer worldwide. This on-demand computer forensic accounting capability would enable 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.

## 2. 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 (eg, Stock Account Summary Statements) of a 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 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 on premises, or if the client has the enhanced auditing capability in-house [7].
- (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.
- (9) The Forensic Accountant or Government regulator can examine, inspect, analyze, document, and record the audit output in real-time and remotely, including using mobile devices.

```

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

Key Field Information
  4  CUSTMAST
      CUSTREC1 is the RPG name of the external format CUSTREC.
          CUCUST          PACK      7,0 SIGNED
          CUSTOR          PACK      7,0 SIGNED

  2  ORDERDE
      ODETREC
          ODORD#          PACK      7,0 SIGNED
          ODLIN           PACK      5,0 SIGNED

Global Field References:
  IORDER      S(8,3)
  TORDER      S(7,0)
  XORDER      S(9,2)

(partial source program compile listing FTPed to Cloud for audit enablement)

```

**Figure 2: Client Stock Account Summary program compile listing for forensic accounting**

```

0323.00     torder = 1500;
0324.00             Z$SRC# = 16 ;
0325.00             EXSR      Z$GENS;
0326.00             EXCEPT  Z$00016;
0327.00     iorder = 78.543;
0328.00             Z$SRC# = 17 ;
0329.00             EXSR      Z$GENS;
0330.00             EXCEPT  Z$00017;
0331.00     // value of iorder has now been computed
0332.00             Z$SRC# = 18 ;
0333.00             EXSR      Z$GENS;
0334.00     xorder = torder + 13.45 +
0335.00     // this is a continuation free form statement preceded with +
0336.00         26.2 + iorder;
0337.00             EXSR      Z$GETI;
0338.00             EXCEPT  ZF00001;
0339.00     sorder = torder + xorder + iorder + rorder + morder + norder;
0340.00             Z$SRC# = 19 ;
0341.00             EXSR      Z$GENS;
0342.00             EXCEPT  Z$00019;

(partial source program FTPed from Cloud audit enabled for forensic accounting)

```

**Figure 3: Client Stock Account Summary source program audit enabled**

## 2.1 Method

The FTPed Client Stock Account Statements Summary program compile listing (Figure 2) 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 3) 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 4).

**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.

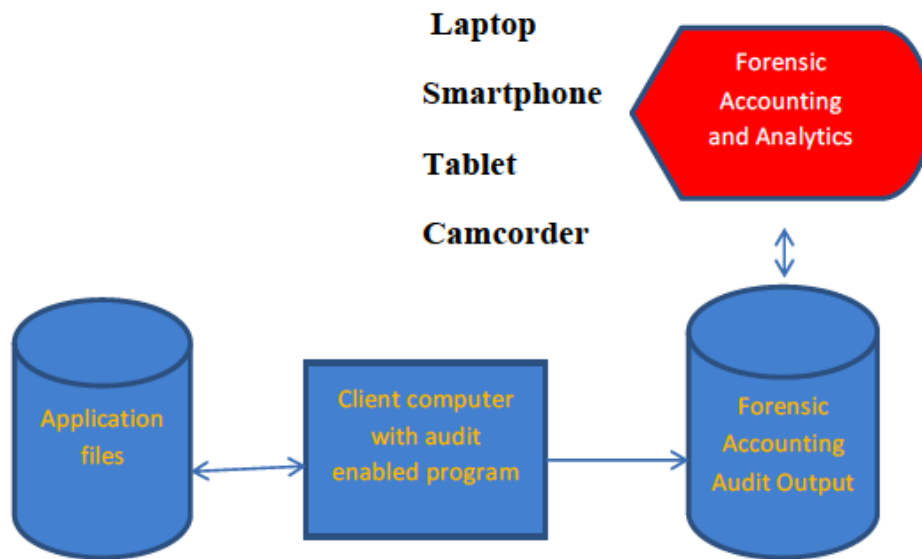
**Note:** The program language providers of client financial applications (eg, IBM, Microsoft, SAP, Oracle, Hewlett Packard, and open source languages) could provide this program audit enabling capability in their standard compilers.

```
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 4: Client Stock Account Summary forensic accounting audit output**





**Figure 6: Forensic Accounting and Analytics (can be remote and mobile and real-time)**

### 2.3 Additional Technical Details

Additional 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.realtimeprogramaudit.com](http://www.realtimeprogramaudit.com) website [7].

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 *The Power of Traceability* white paper [8].

Computer program source statement and data audit-enabling provides a new set of previously unavailable data for machine learning, autonomic computing, and (as technology progresses) artificial intelligence activities, as all of the source program executing statements and all of the data (variables) are real-time recorded and are now available for ML, AI, and autonomic computing purposes [9]; this contrast to existing scenarios where such activities are based on program output written external to the program (normally to disk), or available by program probes. **Thus new opportunities for critical ML and self-healing capabilities are now available real-time at the most atomic level of all of the executing program statements and data. This development is also in line with the recent trend in application ‘observability’** [10].

### 3. Related Work

Today’s computer hardware and mobile devices are incredibly powerful, and are becoming more powerful at an increasingly rapid pace [11], making computing power, speed, and data storage

considerations of minimal concern to implementing source program audit-enablement for forensic accounting.

#### **4. Possible Applications of the Real-Tie Program Audit and On-Demand Forensic Accounting**

Potential positive beneficiaries of real-time computer source program and data audit-enablement and recording include all corporate (client) computer program related functions, activities, and related personnel (eg, programmers, analysts, IT managers, operations, compliance officers, auditors, and CFOs).

Additional benefits include productivity gains, cost reductions, increased confidence, and large capability gains of each of the above listed jobs, even down to warehouse packers in manufacturing implementations.

The immediate economics of audit-enabling forensic accounting and auditing as discussed may be illustrated in the huge costs of belatedly discovering criminal fraud and in recovering and prosecuting potentially preventable fraud, which in the case of the Madoff investigation have topped \$1 billion for a single case [12].

The huge multi-billion dollar revenue generated annually by the **general accounting industry**, together with their relatively similar skills and capability in forensic accounting, would make a transformational capability commanded by one of them a powerful competitive and marketable revenue capability.

Additionally, a huge new opportunity to educate and train and support forensic accounts, public accountants, government regulators and corporate personnel in new proactive techniques of fraud detection and dispute resolution would be available to early adopters of this technology.

Similarity, the huge **Investment Advisory industry** is very competitive and most firms have relatively similar skills and capability in forensic accounting, which would make a transformational capability, commanded by one of them a powerful competitive and marketable revenue capability.

Probably the most important possible use of computer audit audit-enabled forensic accounting would be governmental **regulatory authorities**. In the USA, agencies such as the U.S. Securities & Exchange Commission (SEC), the IRS, the FBI, and the Securities Investment Protection Corporation (SIPC), would have access to additional real-time data with which to prevent and investigate fraudulent activities with this computer program audit-enabling technique.

#### **5. Conclusion**

Forensic accounting is in its infancy, and through its current techniques it has successfully uncovered and prosecuted major criminal fraudulent activity, and has proven its immense potential and value to society. The Madoff recovery effort alone has recovered over \$13 billion for its victims with the recovery effort still ongoing [13].



However, given the fast-paced and widespread developments in computing, forensic accountancy as a discipline must keep pace with technological developments. Using the computer itself to provide a real-time security camera-like recorded auditing capability at the most atomic level of the executing source program statement and data provides the basis for a revolutionary and transformational change in how auditing and information technology and forensic accounting are performed.

The importance of Dr. Gordon Brown's quote about financial information and forensic accounting becoming 'one of today's most powerful investigative and intelligence tools' is being proven true and on a scale unimaginable until now.

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