

Student Team Senior Design Project
Confidentiality and Intellectual Property Agreement

This Senior Design Project Agreement (“**Agreement**”) is made as of the 1st of September, 2020, by and between; CTM Insights, LLC, a Delaware Limited Liability Corporation, with its principal address at 1988 Beekman Ct, Yorktown Hts, NY 10598 (herein after referred to as the “**Sponsor**”), and each student of Stevens Institute of Technology (the “**University**”) listed on Exhibit A hereto (herein after referred to collectively as the “**Team**” and, individually as a “**Team Member**”). Each Team Member and the Sponsor are parties to this Agreement and are collectively called the “parties.” For good and valuable consideration, as set forth in this Agreement, the parties agree as follows:

Background

The Team has agreed to undertake a student senior design project entitled: Database Integrity (the “**Project**”). A more detailed description of the Project (“**Project Plan**”) is attached to this Agreement as Exhibit B. The Team will work under the supervision of a faculty advisor and other faculty and staff who have been identified to the Sponsor (the “**Faculty Team**”).

The Sponsor will provide technical assistance throughout the Project to the Team. In addition, the Sponsor will pay to the University the amount of \$5,000.00 as sponsorship for the Project. Sponsor shall have no obligation to make any additional payment in support of the Project, unless Sponsor, in its sole discretion, determines that such payment is appropriate; all payments shall be made to the University.

Project Intellectual Property

“Project Intellectual Property” shall mean all intellectual property created by one or more members of the Team in the performance of the Project. Project Intellectual Property shall include: (a) rights associated with works for authorship, including copyrights; (b) know how identified by the Team; (c) patent rights; and (d) rights in or relating to patent applications related to any of the rights referred to in this sentence.

IP Rights Options [if Sponsor requests; if no request, delete this paragraph]

In consideration of the Sponsor’s technical assistance and sponsorship of the Project, and in consideration of the educational benefit the Team will receive through participation in the Project, each Team Member, hereby [check one option below]:

Option 1. Assignment of Rights ☒ [check if applicable]

Assigns to the Sponsor all rights in and to any Project Intellectual Property.

Option 2. Exclusive License to Rights ☐ [check if applicable]

Grants to the Sponsor a worldwide exclusive royalty free sublicensable license to make, sell,

reproduce, distribute, display and otherwise use the Project Intellectual Property.

Option 3. Non-exclusive License to Rights __ [check if applicable]

Grants to the Sponsor a worldwide nonexclusive royalty free sublicensable license to make, sell, reproduce, distribute, display and otherwise use the Project Intellectual Property.

Confidential Information

The parties acknowledge that in the course of participation in the Project they may have access to certain non-public information, including without limitation, trade secrets, copyrighted material or other proprietary information of the other party(ies), including processes, techniques, specifications, data, know-how or any other information (“**Confidential Information**”). Any Confidential Information must be marked as “confidential” at the time disclosed by the disclosing party or, if disclosed verbally, confirmed in writing as confidential within 5 days thereafter.

Confidential Information shall not, however, include any information:

- (i) Which is or becomes generally available to the public other than as a result of disclosure thereof by the receiving party in violation of this Section;
- (ii) Which is lawfully received by the receiving party on a non-confidential basis from a third party that is not itself under any obligation of confidentiality or nondisclosure to the disclosing party with respect to such information;
- (iii) Which by written evidence can be shown by the receiving party to have been independently developed by the receiving party without utilizing the disclosing party’s Confidential Information;
- (iv) Which was rightfully in the receiving party’s possession at the time of disclosure by the disclosing party (provided that such Confidential Information is not already in the receiving party’s possession because it was provided to the receiving party by another person, including without limitation a student, who is under an obligation of confidentiality or nondisclosure to the disclosing party); or
- (v) Is required to be disclosed by applicable law or judicial process or the rules of any national stock exchange on which the receiving party’s shares are listed, in which case the receiving party shall use reasonable efforts to notify the disclosing party thereof and, at the expense of the disclosing party, shall seek to limit the scope of Confidential Information so disclosed.

Each party agrees to use reasonable efforts to safeguard and not to disclose all Confidential Information of the other party in its possession, custody, and control; provided that the University, each member of the Faculty Team and each member of the Student Team may exchange and use Confidential Information received from the Sponsor for purposes of the Senior Design Project under this Agreement (with respect to the Student Team) and under the separate agreement entered into by the Sponsor with the University (with respect to the University and the Faculty Team).

Presentation/Publication

The Team and each Team Member shall be permitted to present the results of any research performed under this Agreement for all purposes of Stevens' academic programs including without limitation grading, evaluation and presentations to faculty.

The Team and each Team Member shall also be permitted to publish the results of any research performed under this Agreement or present such results at the University's Innovation Expo (or similar public event), provided that (i) any such publications or presentation shall be subject to the confidentiality terms of this Agreement and (ii) the Team or Team Member(s) who wish to publish or present shall provide Sponsor with a copy of any proposed publication or presentation at least thirty (30) days in advance of such proposed publication or presentation. Sponsor shall have thirty (30) days, after receipt of any proposed publication or presentation to object to such proposed publication or presentation, either because there is patentable subject matter that needs protection and/or there is proprietary or confidential information of Sponsor contained in the proposed publication or presentation, in which case the parties shall negotiate in good faith to remove such proprietary or confidential information and/or make arrangements at the expense of the Sponsor to protect such patentable subject matter.

The Sponsor shall have the right to receive credit in any publication by the Team or any Team Member in a form reasonably satisfactory to the Sponsor.

Entire Agreement

This Agreement constitutes the final and complete agreement between the parties with respect to the subject matter hereof, and supersedes any prior or contemporaneous agreement, either written or oral.

Governing Law, Jurisdiction, and Venue

This Agreement shall be governed by the laws of the State of New Jersey, without regard to its conflicts of law provisions. Each party hereto consents to the exclusive jurisdiction of the courts of the State of New Jersey and of the United States of America for Hudson County.

Notices

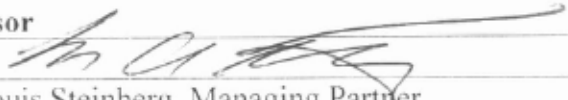
Any notice given under this Agreement shall be addressed to the parties at the addresses set forth opposite their signature line below with a copy to Stevens Institute of Technology, One Castle Point Terrace, [add address/title].

Miscellaneous

No party to this Agreement may assign its rights or obligations hereunder to any third party, nor subcontract or delegate any rights or obligations to any third party. All prior discussions or negotiations are integrated into this Agreement. This Agreement may not be amended except by a written instrument executed by each party. This Agreement may be executed in one or more counterparts, all of which together shall constitute one instrument.

In Witness Whereof, the parties hereto have executed this Agreement.

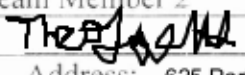
Sponsor


Louis Steinberg, Managing Partner
Address: 1988 Beekman Ct, Yorktown Hts. NY 10598

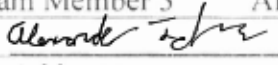
Team Member 1 Kurt von Autenried

Address:

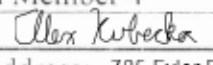
Team Member 2 Theodore Jagodits


Address: 625 Park Ave Hoboken NJ 07030

Team Member 3 Alexander R Johnson


Address: 530 Hardenberg Ave Pt Pleasant, NJ 08742

Team Member 4 Alex J Kubecka


Address: 785 Fyler Road Lot 117 Kirkville, NY 13082

Team Member 5 Hunter T Devlin

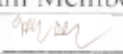

Address: 21 Ronald Court Ramsey, NJ 07446

Exhibit A

List of All Team Members

Kurt von Autenried <kvonaute@stevens.edu>,
Theodore Jagodits <tjagodit@stevens.edu>,
Alexander R Johnson <ajohnso5@stevens.edu>,
Alex J Kubecka <akubecka@stevens.edu>,
Hunter T Devlin <hdevlin@stevens.edu>

Exhibit B Project Plan

Database Integrity

Detect and isolated unauthorized manipulation of a database.

Vision

System administrators insert synthetic data tripwires into records of a database and monitor for unauthorized changes, while legitimate users remain unaware that the tripwires exist. This allows rapid detection and isolation of records that were manipulated by an attacker.

Deliverable(s)

A linux based database (ODBC) driver for Oracle and postgres that links to application code called a "shim". The shim connects to both the original driver and an externally hosted service called a "transformer", which manages and masks the tripwire data.

Description

The frequency and impact of cyber-attacks have continued to increase as online data and accounts have grown in value. Against this backdrop, the industry has adopted a commonly used model to classify the impact type of an attack called the C-I-A model. The model states that attacks against a system or data contained therein are generally classified in one of three buckets describing the type of impact; Confidentiality, Integrity, or Availability.

While attacks against Confidentiality and Availability are now commonplace, companies are just beginning to see attacks against data Integrity. These are likely to evolve rapidly in scope and sophistication.

What happens when:

- Malware intentionally changes data in databases so that books can't close, account balances and positions are incorrect, trade reconciliation fails. These attacks affect trust, and fundamentally undermine customer and regulator belief in our ability to execute.
- Attackers bias data so that machine learning and analytics generate incorrect results. Attackers might cause a drug trial to appear to fail (shorting the stock), or teach a trading system to make bad trades in a given sector (and take the other side)

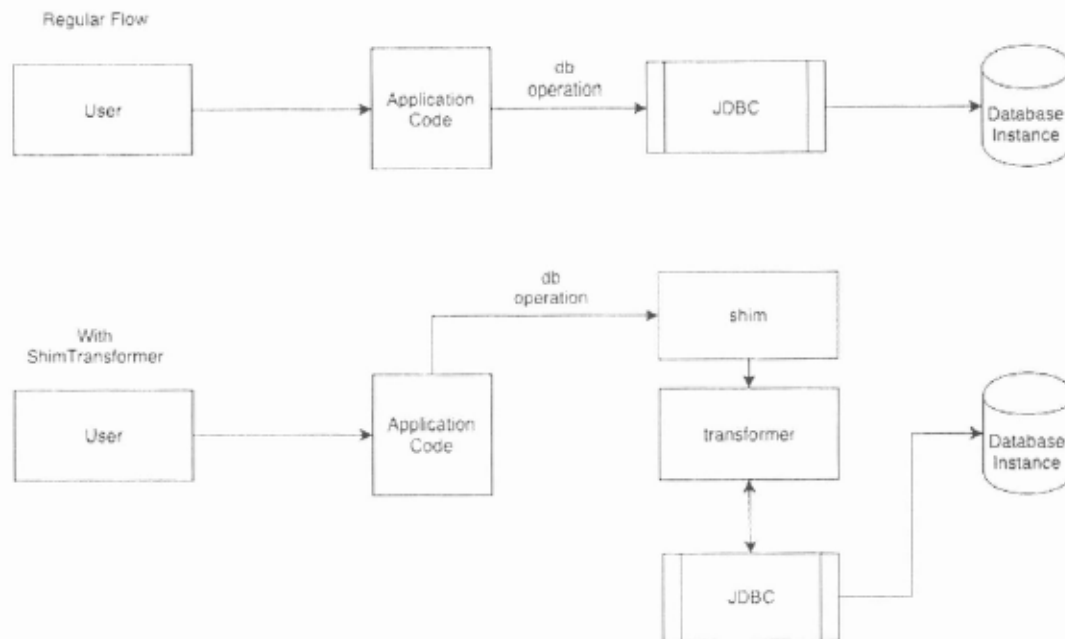
What is needed is a way to *efficiently isolate not just if, but where* data is suspect. For dynamic data (e.g. in a database), static tripwire characters can be inserted that are unchanging, and hashes taken across collections of these tripwires (regions).

While this approach works to detect and isolate changes, it fails the efficiency test in that large numbers of hashes are required for granular isolation. CTM has been exploring ways to improve efficiency (as measured by the ratio of the detection granularity vs the number of hashes needed) and has created IP in this space. Our approach intentionally has hashed regions overlap, creating a venn diagram like model. When a known “good” hash of a region intersects with a known “bad” hash of a region, the area of overlap is “good”. Similarly, when two overlapping hashed regions are both “bad”, the area of intersection is the likely “bad” area.

This project will take these concepts and create a working Proof of Concept for Oracle and Postgres databases by building JDBC driver shims, a secure transformer service, and private/temporary tables in the database (for performance). The shim acts as a dumb switch, either calling the real JDBC driver or the transformer. The transformer inserts (on CREATE), preserves (on UPDATE), and masks (on SELECT) the tripwire characters. It also alerts an external service when a row is added or deleted, so that hashes can be recomputed, and responds to requests to supply the locations of the inserted data in each column.

To improve performance of SELECT statements, the transformer may need to create temporary tables in the database. These tables must be hidden from access by anything except the transformer.

Details: All database operations are delegated to a database driver, which executes database queries on the database instance and returns results to the application code.

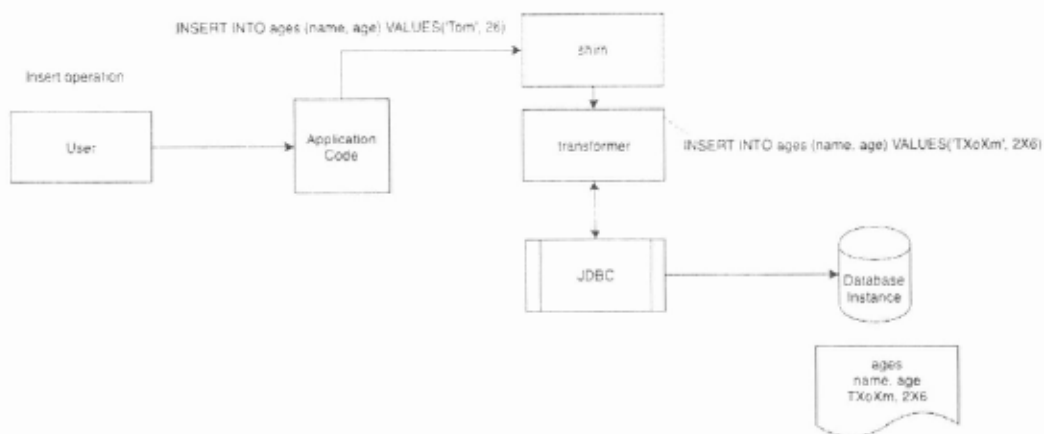


With the ShimTransformer, a shim is loaded in place of the JDBC driver so that the database operations go to the shim instead of the JDBC driver. The shim delegates the operations to the transformer -

- a. if the query is a write query, the transformer modifies the query by inserting values in the data being inserted and then executes the query on the database through the JDBC driver that was originally used in the application code
- b. if the query is a read query, the transformer retrieves data from the database through the JDBC driver, undoes the modifications that were done during insertion and returns data to the application

The transformer contains transformation logic that it fetches from an external server and applies to each db operation.

Here's an example of an Insert operation being modified by the transformer.



The application code executes the query

```
INSERT INTO ages (name, age) VALUES('Tom', 26)
```

Without the ShimTransformer, this query would create the values 'Tom', 26 in the database table. However the query is modified by the transformer into

```
INSERT INTO ages (name, age) VALUES('TXoXm', 2X6)
```

By using the logic: insert X between every two characters

And the actual values written into database is 'TXoXm', 2X6.