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Using Splunk for Program Integrity in Health and Human Services

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Agenda

- Healthcare program integrity
  - High-risk behaviors and activities
  - Internal and external monitoring
- Splunk for healthcare program integrity
  - Onboarding the data
  - Processing & analyzing the data
  - Presenting the data
- Q&A

Introduction

Bharane Balasubramanian

Manager
Deloitte & Touche LLP

- Over 10 years of cybersecurity experience
- Industry: Public Sector
- Certifications: CISSP, CIPP, CEH and SSCP

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Senior Consultant
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- Over 2 years of cybersecurity experience
- Over 3 years of Splunk experience
- Certifications: Splunk Certified Architect

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Introduction to Program Integrity

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An Overview of the Medicaid Program

- Every year, Medicaid covers medical expenses for more than ***57 million*** beneficiaries enrolled ***in 56 States and territory-administered programs***
- According to the US Government Accountability Office (GAO), the cost of this coverage in 2011 was ***$427 billion***
- Medicaid payments during 2011, including fraud, waste, and abuse, amounted to ***$21.9 billion***
- GAO Has designated Medicaid as a program that is at ***high risk*** for improper payments

Source: CMS Program Integrity
https://www.cms.gov/Medicare-Medicaid-Coordination/Fraud-Prevention/Medicaid-Integrity-Education/fwa.html

Medicaid Fraud, Waste, and Abuse

- Wasteful, fraudulent and abusive behaviors occur across HHS programs. These actions can be committed by providers, recipients and department staff alike
- Fraud Waste and Abuse Hinder departments from administering and delivering program services that are integrated, fiscally responsible, person-centered, accountable and sustainable
- Key highlights on the Fraud, Waste and Abuse trend:
  - $21.9 billion of improper payments in the year 2011
  - In FY2012, over $4 billion was recovered through the government's health care fraud enforcement efforts
  - State governments recovered over $2.9 billion in FY2012 and over $1.7 billion in FY2011

Source: CMS Program Integrity
https://www.cms.gov/Medicare-Medicaid-Coordination/Fraud-Prevention/Medicaid-Integrity-Education/fwa.html

To Prevent, Predict, Detect & Monitor is Key

Pre-payment

Improving pre-payment through better rules and models is essential to reducing overall program costs

Post-payment

Exploring post-payment data still has enormous value

Managed care

Identifying Fraud, Waste and Abuse (FWA) in managed care is essential for states to better negotiate capitated rates with Managed Care Organizations (MCO) and identify fraud not visible to individual MCOs

Fee-for-service

Identifying FWA in Fee-For-Service (FFS) claims through exploratory analytics is essential to develop new indicators and associated new rules and models.

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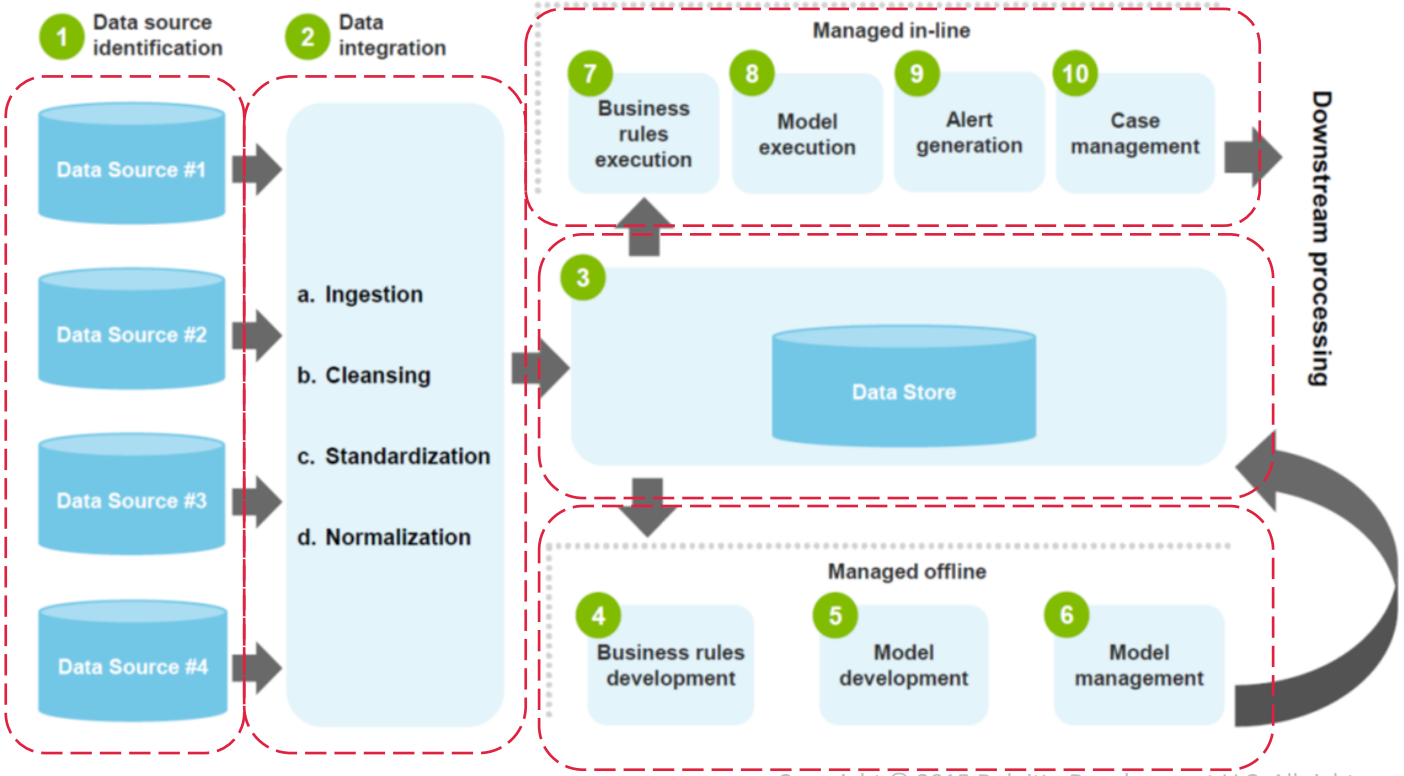
Building Blocks to Prevent, Predict, Detect & Monitor



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Use of Splunk for Near Real-Time Detection (Pre-Payment)

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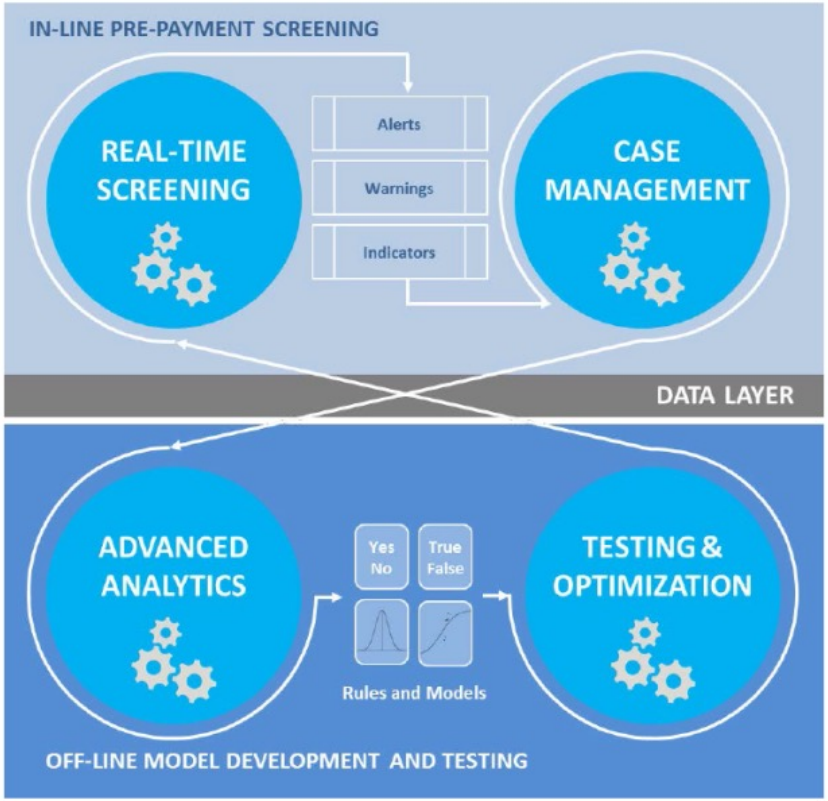
Implementation of Pre-payment Analysis



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- Locate and analyze high-risk transactions
- Enable cross-checking federal and state benefits paid to clients
- Reduce time for fraud detection

Business Analytics/ Intelligence

- Benefit correlation
- Worker overrides
- Duplication of cases

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Use Cases

1. Monitor multiple instances of the same case for the same individual
2. Multiple overrides performed by a worker
3. Monitor One Time Issuance (OTI) cases amount exceeding the threshold value
4. Identify Special Program Request by case
5. Detect members of the same household receiving the same benefit
6. Skipping over SSN verification needs for a case

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Use Case - Definition

Use case	Business Requirement	Outcome
1. Individual applies frequently for benefits or is requesting retroactive benefits.	• Non-Continuous Eligibility (NCE) should only be issued in increments and non-continuous by design. • There should not be recurring instances of NCEs on the same case for the same individuals.	Identified a list of cases or users with recurring NCE segments within a given timeframe across several benefit programs.
2. Perform case overrides, nullifying the system results.	• Overrides should not be performed excessively as there may be limited oversight. • Overrides bypasses the eligibility rules that were designed in the system. • Lack of oversight on overrides may lead to benefits provided to not valid cases.	Detected cases where repetitive overrides are performed by a case worker within a given timeframe across several benefit programs.
3. Skip Social Security Number (SSN) Verification requirements.	• SSN Verification is required for open-cases • During certain scenarios, SSN verification is not required. If this condition is inappropriately used, benefits can be provided to incorrect individuals.	Identified a list of cases where a worker has used verification code of “Not Required” for an individual’s SSN verification within a given timeframe.

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Use Case - Definition

Use Case	Business Requirement	Outcome
4. One Time Issuances (OTI) by Case or by Supervisor	• OTIs can be issued for any value • Agency specifies threshold for review • To avoid potential fraudulent transactions, it is essential to review all OTI issuances though it's below agency threshold.	Documented a list of cases or case workers where the One Time Issuance (OTI) amount exceeds a program office selected amount within a given timeframe. This can be cumulative across cases or for a single case.
5. Special program requests by Case	• Special program requests should not be performed excessively due to limited oversight • Special program requests bypasses the traditional eligibility rules.	Provided a list of cases where a Special Program Request was made by a worker within a given timeframe.
6. Assign Supplemental Nutrition Assistance Program (SNAP) benefits to individuals who may reside in same household where they are receiving Heating Benefits.	• Members of the same household receiving heating benefits can exist as active members on multiple SNAP cases – Individuals live in same household, but they purchase and prepare food separately	This report will provide a list of cases where the household members receiving heating benefits exists as active members on multiple (more than two additional) SNAP cases.

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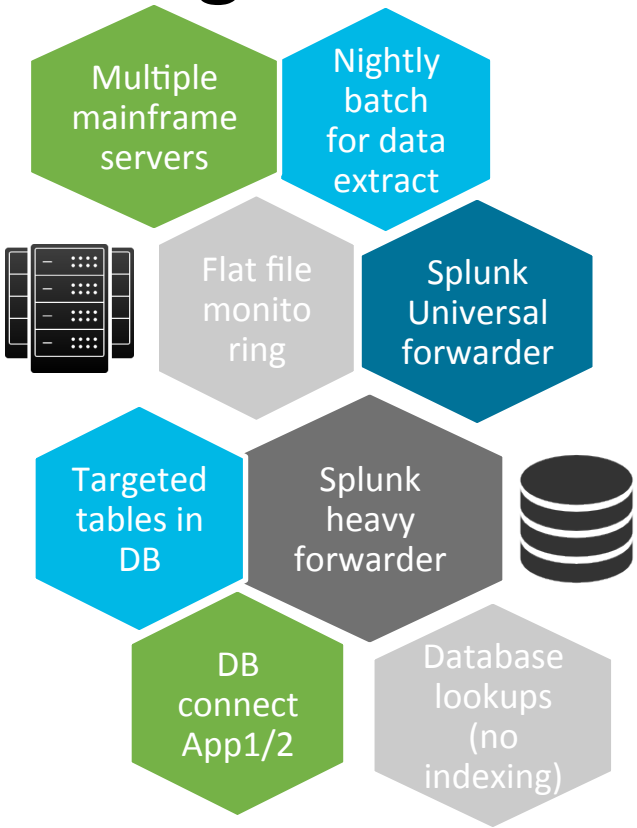
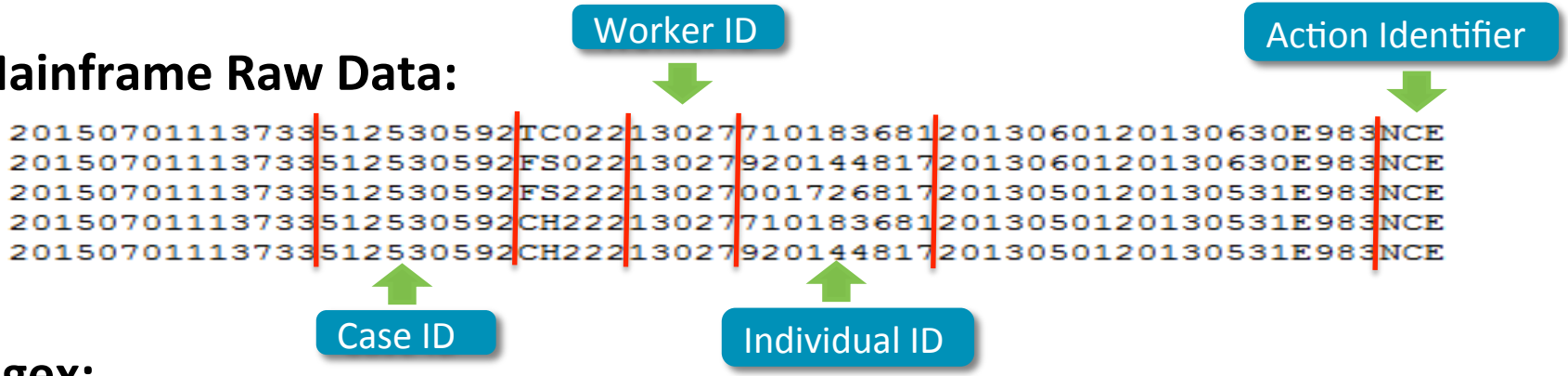
Challenges



- 18 Months of history data
- Application access logs
- Mainframe data collection
- Direct connection to database
- Access rights to reports and ad-hoc filters
- Previous days case action monitoring
- Integration with web application

Raw Data Configuration

Mainframe Raw Data:



Regex:

```
^(?P<Authorization_Date>.{14})\s(?P<Case_ID>.{9})(?P<Category_Code>.{3})(?
P<Grant_Group>.{1})(?P<Program_Status_Code>.{2})(?P<Worker_ID>.{5})(?
P<Individual_ID>.{9})(?P<Benefit_Begin_Date>.{8})(?P<Benefit_End_Date>.{8})
(?P<Override_Date>.{8})(?P<Override_Reason>.{3})(?P<Notice_Option>.{1})(?
P<NCE_Notice_Reason_Code>.{3})(?P<Action_Identifier>.{4})
```

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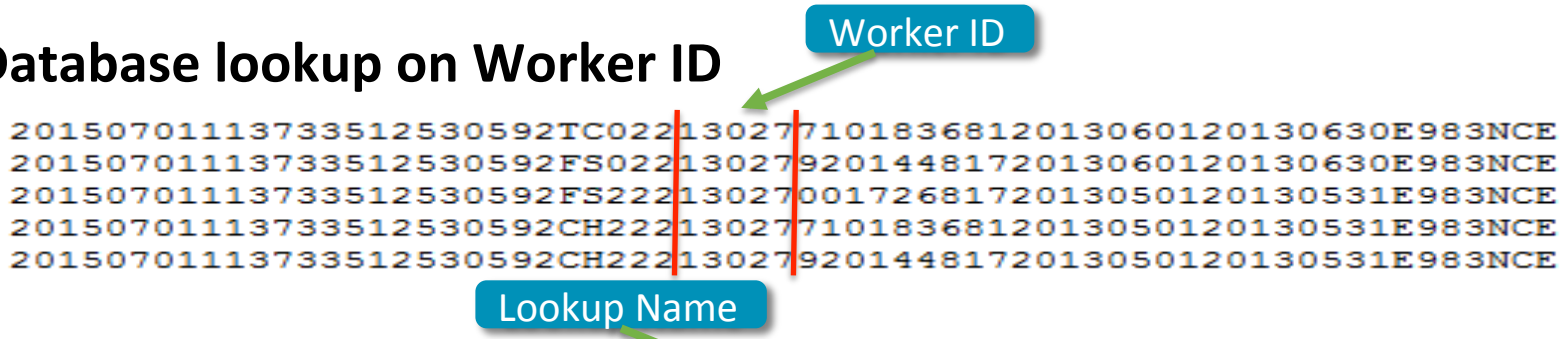
Database Lookup

- **Database lookup on Worker ID**



mainframe: LOOKUP-Worker_ID = lookup_workerid mainframe_WORKER_ID AS Worker_ID
OUTPUTNEW Database_WORKER AS DB_WORKER

Input

Output

- **Results**
  - ✓ 13027= username1

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Use Case 1: Searches

- **Non-Continuous Eligibility (NCE) Segments by Case**

```
index="mainframe" sourcetype="mainframe" `NCE_Action_Identifier` | search $Program_Type$
| stats count as nce_duplicate_program_count by Case_ID | sort -nce_duplicate_program_count |
where nce_duplicate_program_count >= $nce_duplicate_program_count$ | rename Case_ID as
"Case Record No", nce_duplicate_program_count as "Number of NCEs"
```

1, 2, 3, 2

- **Non-Continuous Eligibility (NCE) Segments by Worker**

```
index="mainframe" sourcetype="mainframe" `NCE_Action_Identifier` | search $Program_Type$
| eval Worker_ID = upper(DB_WORKER) | stats count as nce_duplicate_program_count by
Worker_ID | sort -nce_duplicate_program_count | where nce_duplicate_program_count >=
$nce_duplicate_program_count$ | rename Worker_ID as "Worker ID",
nce_duplicate_program_count as "Number of NCEs"
```

1, 2, 3, 2

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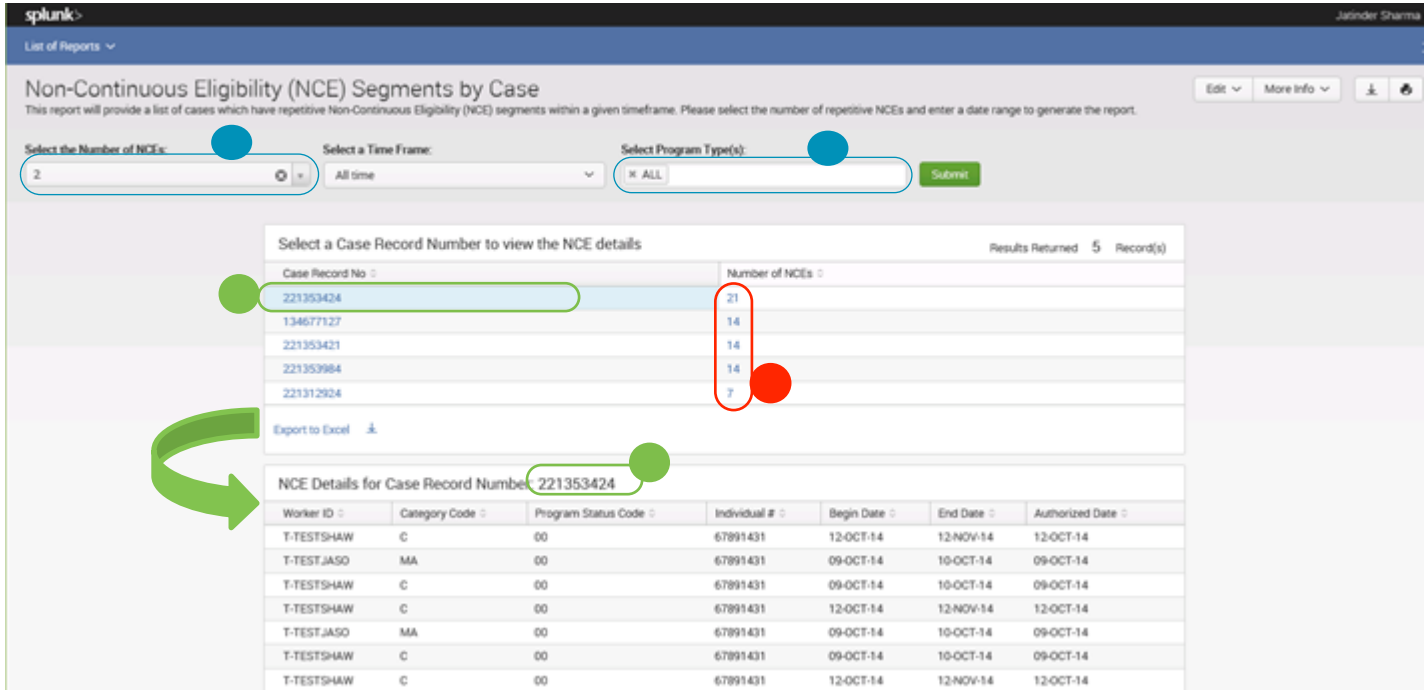
Use Case 1: Display Results



1. Filtered case record number for action identifier

2. User input values

3. Results based on threshold value

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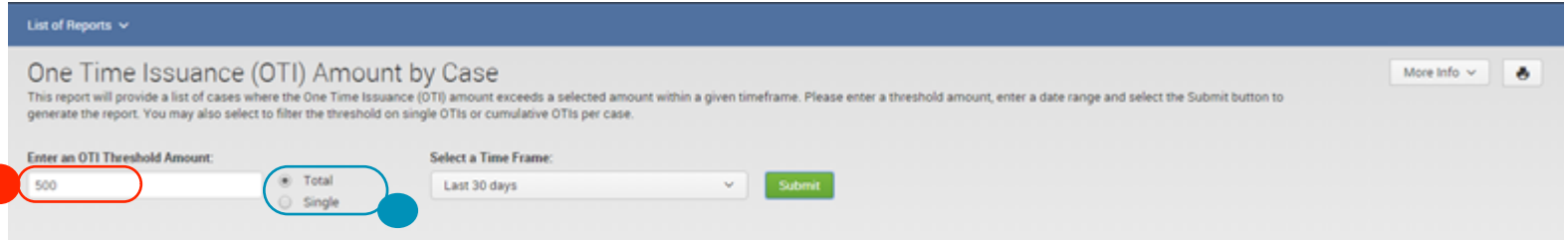
Use Case 2: Inputs



XML Input:

```
<input type="radio" searchWhenChanged="false"
token="input_report_type">

 <label></label>

 <default>Single</default>

2 <choice value="| stats sum(AMOUNT) as Total_Amount by
IDN_CASE | where Total_Amount >=">Total</choice>

2 <choice value="| table USER_CHANGE_LAST, AMOUNT | rename
AMOUNT as Total_Amount | where Total_Amount >=">Single</
choice>

</input>
```

```
<input type="radio" searchWhenChanged="false"
token="input_report_type">

 <label></label>

 <default>Single</default>

<choice value="| stats sum(AMOUNT) as Total_Amount by
IDN_USER_CHANGE_LAST | where Total_Amount
>=">Total</choice>

<choice value="| table USER_CHANGE_LAST, AMOUNT |
rename AMOUNT as Total_Amount | where Total_Amount
>=">Single</choice>

</input>
```

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Use Case 2: Searches

One Time Issuance (OTI) Amount by Case

```
index=database_1 sourcetype=database_1 source="dbmon-tail://database_1/table_OTI"
| eval IDN_CASE=if(len(IDN_CASE) = 8,"0"+IDN_CASE,IDN_CASE)
$input_report_type$ $Total_Amount$
| eval Total_Amount=round(Total_Amount,2) | sort -Total_Amount | rename IDN_CASE as "Case Record No", Total_Amount as "OTI Amount"
```

1

2

3

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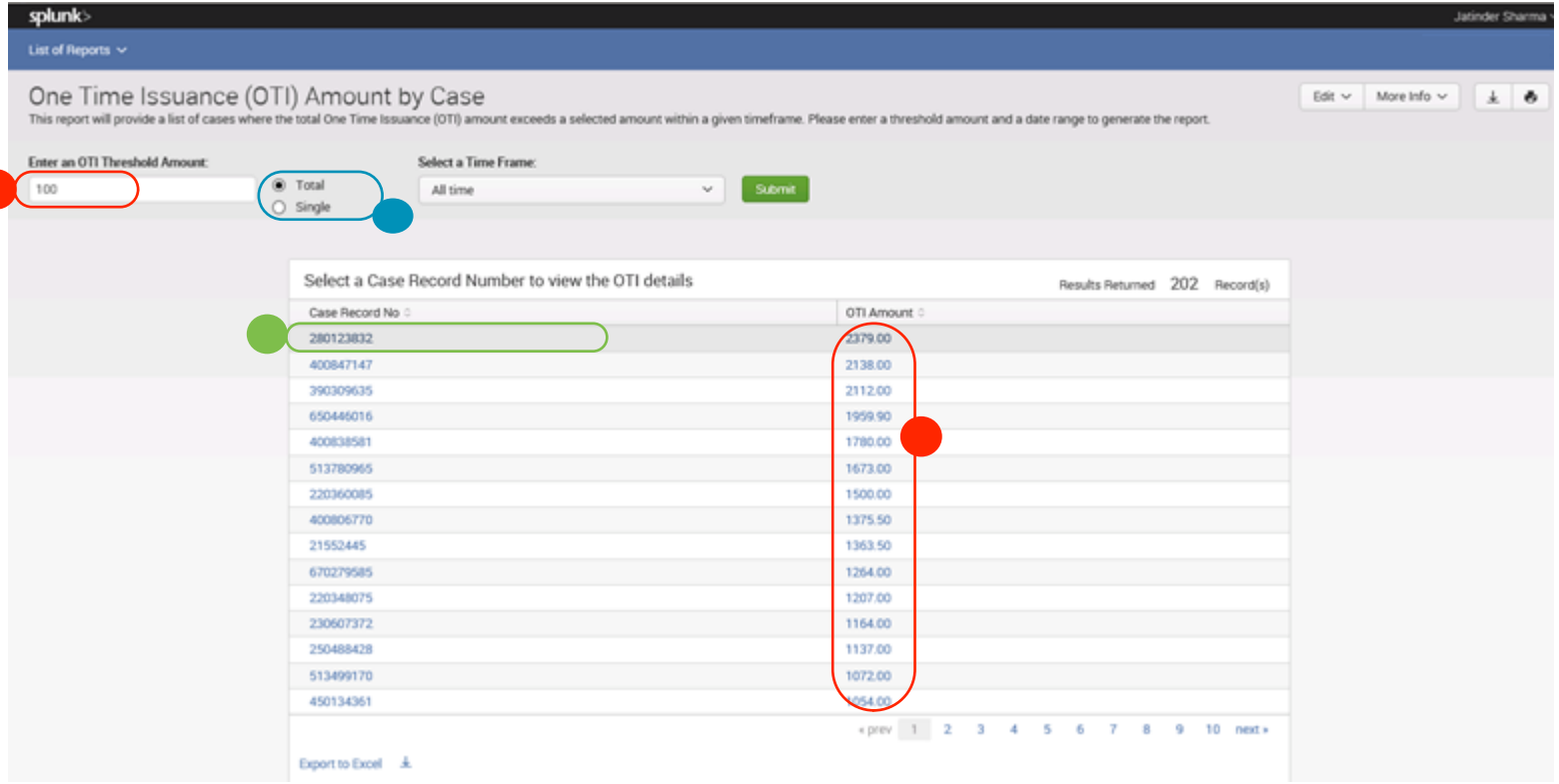
Use Case 2: Display Results



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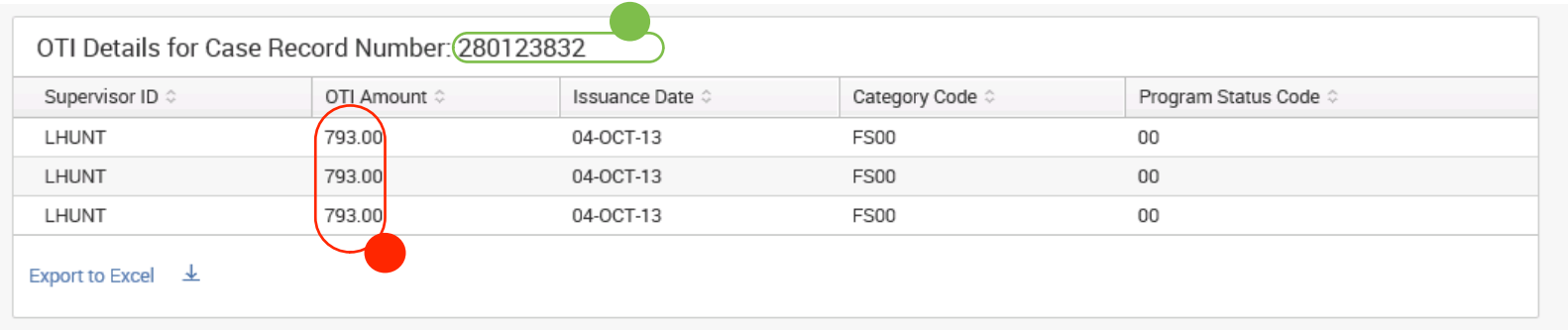
Use Case 2: Drill-Down Details

One Time Issuance (OTI) Amount by Case – Drill Down Details



OTI Details for Case Record Number: 280123832

Supervisor ID	OTI Amount	Issuance Date	Category Code	Program Status Code
LHUNT	793.00	04-OCT-13	FS00	00
LHUNT	793.00	04-OCT-13	FS00	00
LHUNT	793.00	04-OCT-13	FS00	00

Export to Excel

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Use Case 3: Searches

Heat Cases with Multiple SNAP Cases

1 index=database sourcetype=database source="dbmon-tail://database_heat" | rename IDN_INDIV as Individual_ID | join type=inner Individual_ID [search index=mainframe 1 sourcetype=mainframe Category_Code="*FS*"] | stats dc(Case_ID) as count by IDN_CASE |

2 where count > 2 | rename IDN_CASE as “Heat Case Record No", count as "Number of Associated 3 SNAP Cases“

Cases associated to Heat Case Record Number

2

1 index=database sourcetype=database IDN_ACTION=LMS $Heat Case Record No$ | rename IDN_INDIV as Individual_ID | join type=inner Individual_ID [search index=mainframe 1 sourcetype=mainframe Category_Code="*FS*"] | table case_id, worker_id, Individual_ID | rename case_id as "SNAP Case Record No", worker_id as "Worker ID", Individual_ID as "Individual #"

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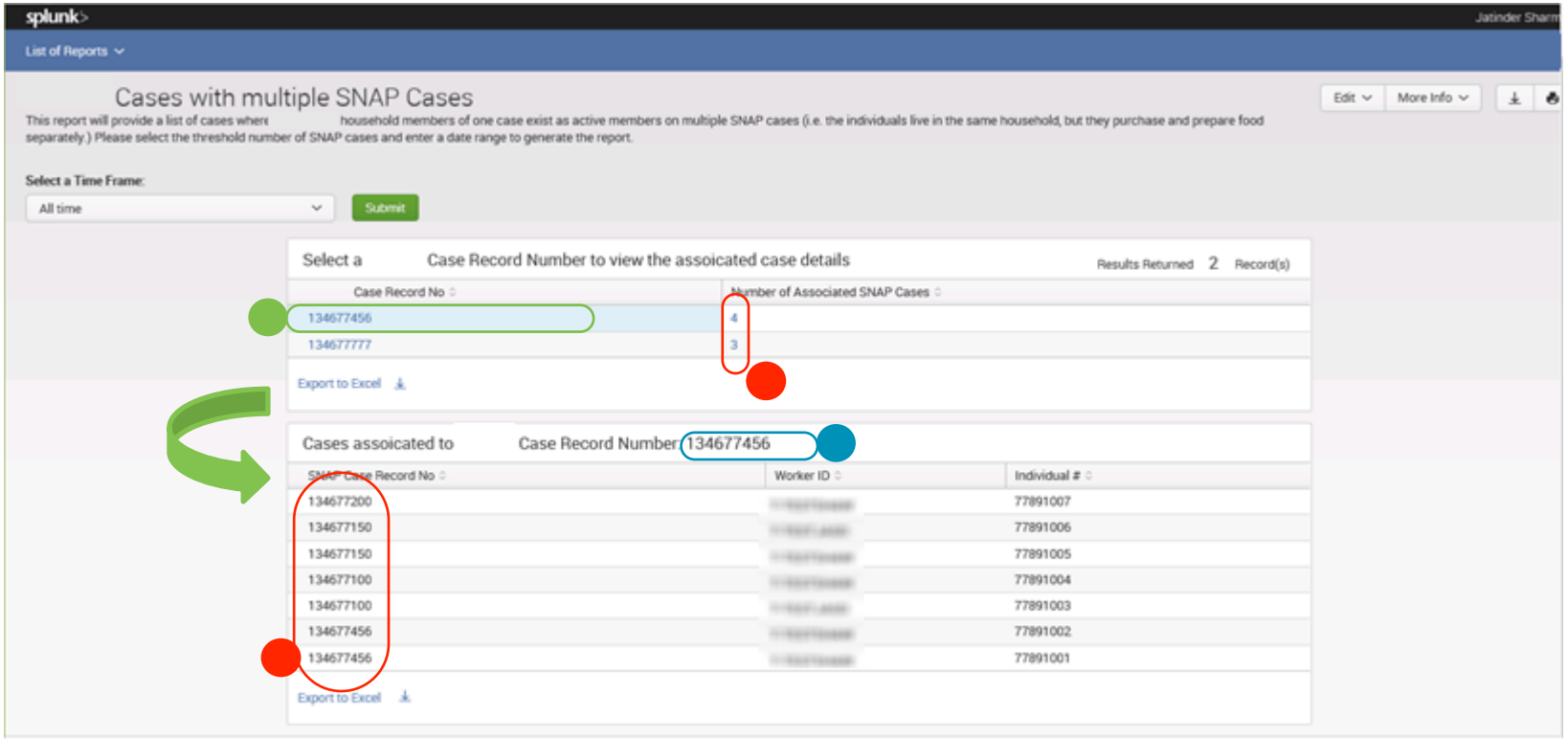
Use Case 3: Display Results



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Use Case 4: Summary Index

```
index=sat_icis sourcetype=sat_ecis_risk_audit source="dbmon-tail://eCIS_Database_RISK_AUDIT_SAT/V_RISK_AUDIT_SSN_MCI" | rename IDN_CLIENT as IDN_INDIV, _time as Max_SSN_Verification_Date
| join type=inner IDN_INDIV, Max_SSN_Verification_Date
 [search index=sat_icis sourcetype=sat_ecis_risk_audit source="dbmon-tail://eCIS_Database_RISK_AUDIT_SAT/V_RISK_AUDIT_SSN_MCI" | fields source, IDN_CLIENT, CDE_VERIF_SSN, _time | rename IDN_CLIENT as IDN_INDIV, _time as SSN_Verification_Date
 | join type=inner IDN_INDIV
  [ search index=sat_icis sourcetype=sat_ecis_risk_audit source="dbmon-tail://eCIS_Database_RISK_AUDIT_SAT/V_RISK_AUDIT_SSN_CASE_INDIV" | fields IDN_CASE, IDN_INDIV
   | join type=inner IDN_CASE
    [ search index=sat_icis sourcetype=sat_ecis_risk_audit source="dbmon-tail://eCIS_Database_RISK_AUDIT_SAT/V_RISK_AUDIT_SSN_WKFLW_AUDIT" CDE_TRANS_AUDIT_WKFLW = "CC" | rename _time as Case_Commit_Date | fields IDN_CASE, IDN_USER_CRTD, CDE_TRANS_AUDIT_WKFLW, Case_Commit_Date]]
 | join type=inner IDN_CASE
  [search index=sat_icis sourcetype=sat_ecis_risk_audit source="dbmon-tail://eCIS_Database_RISK_AUDIT_SAT/V_RISK_AUDIT_SSN_Heat" ]
 | table _time, IDN_CASE, IDN_INDIV, IDN_USER_CRTD, CDE_VERIF_SSN, SSN_Verification_Date, Case_Commit_Date | eval IDN_WORKER = upper(IDN_USER_CRTD) | table IDN_CASE, IDN_INDIV, IDN_WORKER, SSN_Verification_Date, CDE_VERIF_SSN, Case_Commit_Date | stats max(SSN_Verification_Date) as Max_SSN_Verification_Date by IDN_CASE, IDN_INDIV, IDN_WORKER, Case_Commit_Date]
| dedup IDN_CASE IDN_INDIV
| rename Max_SSN_Verification_Date as _time
| table _time, IDN_CASE, IDN_INDIV, IDN_WORKER, CDE_VERIF_SSN
```

- Over 40 million records joins
- Reduce over 8 hours to 40 minutes
- Detects every update by a worker

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Permissions and User Access

```
.shared-splunkbar-systemmenu
{
        display:none !important;
}
.shared-splunkbar-messages
{
        display:none !important;
}
.shared-splunkbar-activitymenu
{
        display:none !important;
}
```

```
.shared-splunkbar-helpmenu
{
        display:none !important;
}
.shared-splunkbar-find
{
        display:none !important;
}
.shared-splunkbar-appmenu
{
        display:none !important;
}
```

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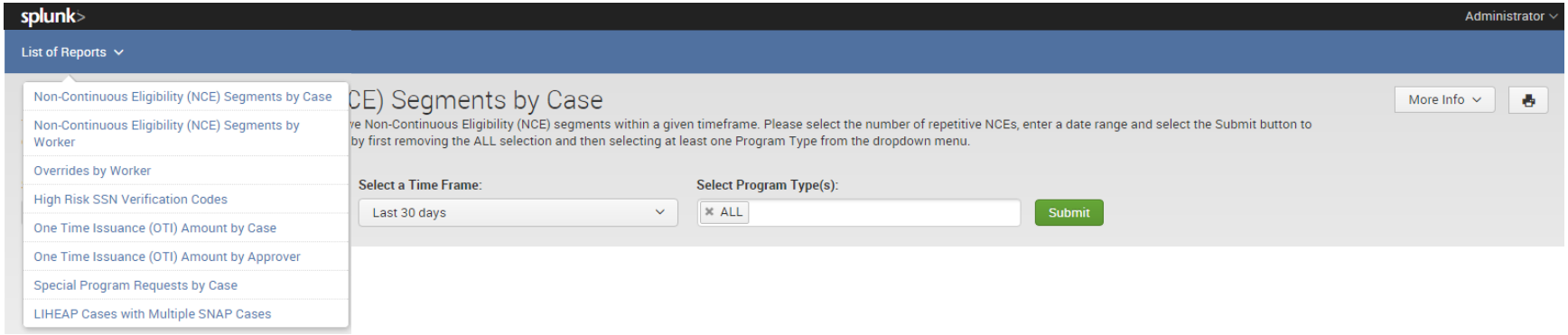
Custom App



- User permissions in Splunk
- Ad-hoc report list

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Hide Panels on Report Load

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Java Script to Hide/Unhide Panels

```
require(['jquery', 'splunkjs/mvc/simplexml/ready!'], function($)
{
        $("#search_btn").click( function()
        {
            $(".dashboard-row1").css('display', 'block');
            $(".dashboard-row2").css('display', 'none');

        });
        $("#panel1").click( function()
        {
            $(".dashboard-row2").css('display', 'block');
        });
});
```

```
<div class="form-submit" id="search_btn">
    <button class="btn btn-primary submit">Submit</button>
</div>

<div id="row1" class="dashboard-row dashboard-row1">
    <div id="panel1" class="dashboard-cell" style="width: 100%;">
        <div class="dashboard-panel clearfix">

<div id="row2" class="dashboard-row dashboard-row2">
    <div id="panel2" class="dashboard-cell" style="width: 100%;">
        <div class="dashboard-panel clearfix">

<div id="row2" class="dashboard-row dashboard-row2">
    <div id="panel2" class="dashboard-cell" style="width: 100%;">
        <div class="dashboard-panel clearfix">
```

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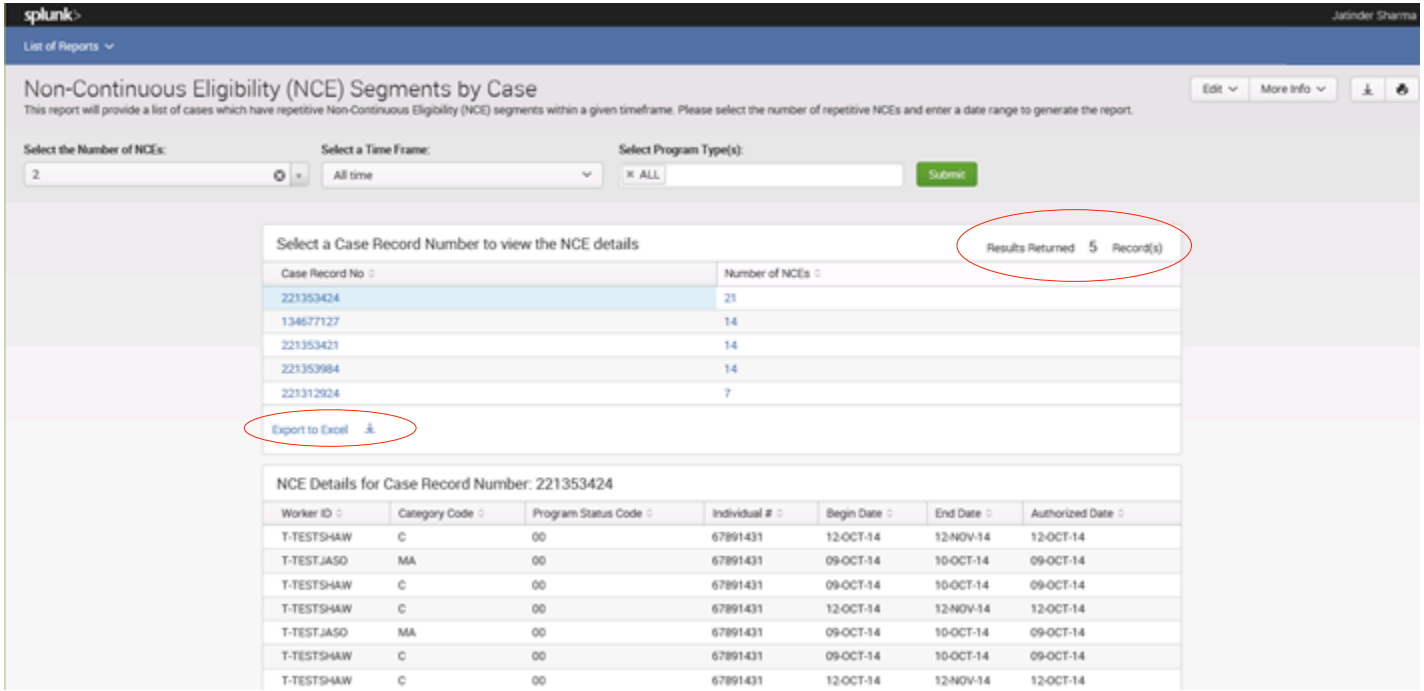
Display Result Count on Panel



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Java Script to Add Text and Result Count

```
$(function(){
        $("#icis_drilldown").on("DOMNodeInserted", function(){
                var object = $('#icis_drilldown .icon-export');
                if(object.length == 1)
                {
                    console.log(object);
                    $('#icis_drilldown').off("DOMNodeInserted");
                    object.before("Export to Excel: ");
                }

                });

 });
```

```
$(function(){
$("#element1").on("DOMNodeInserted", function(){
 var object = $('#element1 .panel-body .single-result');
        if(object.length == 1 && parseInt(object.text()) != NaN)
                        {
                            console.log(object);
                            console.log("'"+object.text()+"'");
                           $('#element1').off("DOMNodeInserted");

$("#icis_drilldown .panel-head h3").append(" - ").append($
("#element1 .panel-body .single-result").text());
                                }                                   });
                    });
```

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Takeaways – Be Prepared for Changes

1. **ONE SIZE DOES NOT FIT ALL**
   Multiple approaches needed to holistically evaluate Medicaid claims for FWA
2. **THINK BROADLY**
   Software solutions alone are not sufficient to enable advanced analytic models
3. **MODEL CONTINUOUSLY**
   Continuous modeling is essential to eliminate false positives and adapt to emerging trends and schemes
4. **YOU CAN DELEGATE RESPONSIBILITY, BUT NOT ACCOUNTABILITY**
   Managed care does not obviate the need to identify fraud or its cost may be passed along
5. **INTEGRATE DUE DILIGENCE**
   Strong models and rules can be developed by testing and validating hypotheses using due diligence techniques

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