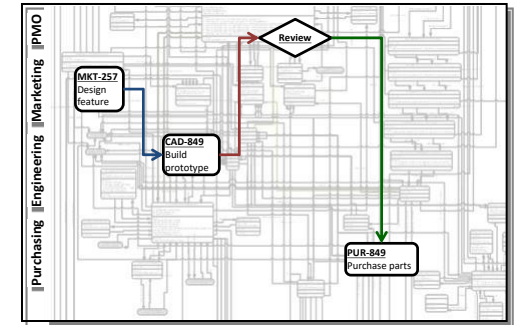


# MetaTech

Business Transformation

Process Improvement, Software Engineering



## From Complexity to Insight

Querying Large Business Process Models to Improve Quality

PQ 2018

3rd International Workshop on Process Querying

*10 September 2018, Sydney, Australia*

**Kurt Madsen**

Process Architect

[www.MetaTech.us](http://www.MetaTech.us)

# About the Author – Kurt Madsen

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## Professional Experience

- Software Engineer specializing in process analysis and BPM implementation.
- Verticals: banking, manufacturing, health care, aviation, radio, and government.
- Board of directors for [WMNF.org](http://WMNF.org), non-profit community conscious radio station in Florida, USA committed to social justice, equality, & creativity.

## Education

- Master of science, computer science, New York University, [engineering.nyu.edu](http://engineering.nyu.edu)
- Bachelor of arts in economics, Rutgers University, [rutgers.edu](http://rutgers.edu)
- Taught 20 courses as adjunct instructor at [engineering.usf.edu](http://engineering.usf.edu) and [phoenix.edu](http://phoenix.edu)

## Research Interests

- Extending PQL beyond processes to [TOGAF] enterprise architecture models
- PQL portability across modeling tools (other than ProVision)
- PQL applied to process model drift detection and compliance

## Queries → Layers

# Models Before Querying and Filtering: Complex and Confusing

## Large Process Models

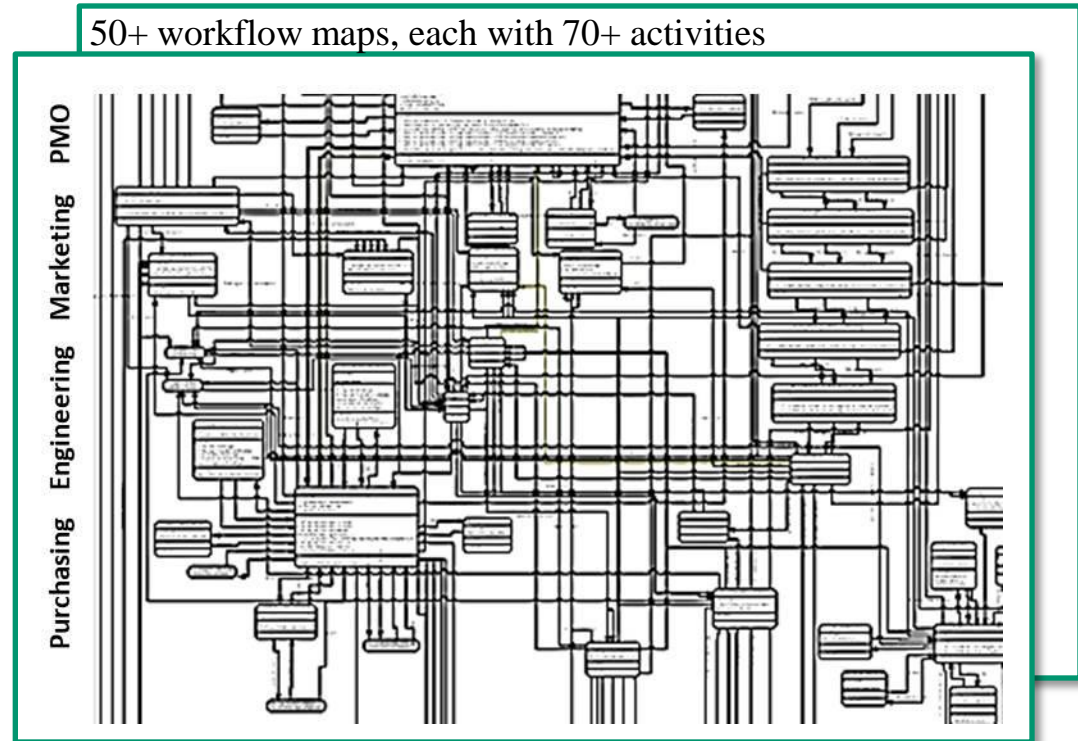
- Multi-year cycle times
- Thousands of workers
- Hundreds of task types
- Dozens of roles
- Complex supply chains

## Difficult to Query

- Many stakeholders
- Process maps clouded by irrelevant details
- Poor model searching



Complexity + Confusion



## Queries → Layers

# Models After Querying and Filtering: Clear and Insightful

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## Query Tools

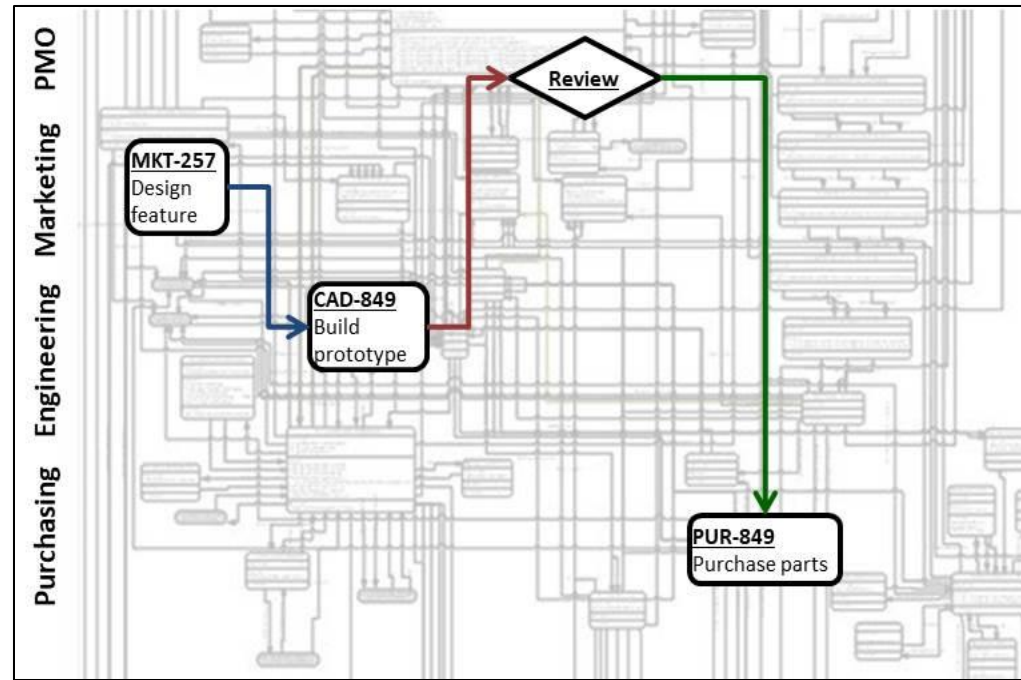
- Search by task owner
- Search by data flows
- Navigation via composite searches

## Filtered Views

- Many stakeholders
- Understanding clouded by irrelevant details
- Poor model searching



Clarity + Insight



## Queries → Layers

# Initial Approach to Optimizing Process Time-to-Market



## (A) BPM Workflow Inventory

Author/SME (From Activity)	Author/SME (To Activity)	From Activity (Title)	To Activity (Title)	Weeks Before SLA Deadline (e.g., Ready-to-Manufacture)				Opportunities Milestone			
				Start (From Activity)	Finish (From Activity)	Start (To Activity)	Finish (To Activity)	LAG (F-S)	LEAD (F-F)	From	To
Smithers	Constance	Design concept part	Build prototype part	191	180	185	170	*	5	Design	Design
Horan	Constance	Safety Tolerances	Build prototype part	185	185	185	170	0	*	Design	Design
Constance	Jones	Build prototype part	QC part review	185	170	168	167	2	*	Design	Design
Jones	MacDonald	QC part review	Order 1st batch	168	167	166	160	1	*	Design	Design

- (A) supports searching and prioritizing workflows

## (B) Gantt Task Inventory

- (B) does not. It requires programmatic iteration

ID	Task	Start	Finish	Predecessors	Opportunities (manual calc)
1	Design concept part	191	180		?
2	Safety Tolerances	185	185		?
3	QC part review	168	167	5	?
4	Order 1st batch	166	160	3	?
5	Build prototype part	185	170	1,2	?

### Step 1: Export BPM model into a Searchable Format for Query

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- This research involved querying process exports in CIF.xml and \*.XPDL formats. *Future work should move towards real-time queries (inquiry, manipulation, and update) in dynamic, modeling environments.*
- An excerpt of a process model follows. It shows one activity instance of many.

```
01 <activity id="157896" name="CAD-849">
02   <descr>Build prototype car parts</descr>
03   <parent refID="435524"/>
04   <workTime></workTime>
05   <performer refID="467908"/>
06   <customProperties>
07     <property name="Author">
08       <value>John Doe</value>
09     </property>
10   </customProperties>
11 </activity>
```

## Queries → Layers

### Step 2: Manipulate Model Using PQL-like Query Results

---

- Applying the jQuery below to the previous process model file yields a filtered list of activities which are members of the desired process layer (that satisfies the query in question.).

```
01 declare variable $author:="John Doe";
02 for $activity in /process/activities/activity
03 let $activity-id := $activity/@id
04 where $activity/customProperties/property
05     [@name="Author"]/value[matches(., $author)]
06 return <member refID="{ $activity-id}" />
```

```
01 <modelScenario name="Process layer, author filter">
02   <members>
03     <member refID="157896"/>
04     <member refID="...etc..." />
05     ...etc...
06   </members>
07 </modelScenario>
```

### Step 3: Update Model in Rendering Engine to Show Results

---

- Applying the jQuery below to the previous process model file yields a filtered list of activities which are members of the desired process layer (that satisfies the query in question.).

```
function highlightWorkflowsByStereotype(model) {  
    var bpmParts = model.getComponents();  
    for (i = 0; i < bpmParts.length; i++) {  
        if (bpmParts[i].getType() == "Workflow") {  
            var nextStereotype = bpmParts[i].getStereotype();  
            if (nextStereotype == "WfOverlap")  
                bpmParts[i].Line.setColor(BLUE);  
            if (nextStereotype == "WfGap")  
                bpmParts[i].Line.setColor(GREEN);  
            if (nextStereotype == "WfError" )  
                bpmParts[i].Line.setColor(RED);  
        }  
    }  
}
```



## Queries → Layers

# Models After Querying and Filtering: Clear and Insightful

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## Query Tools

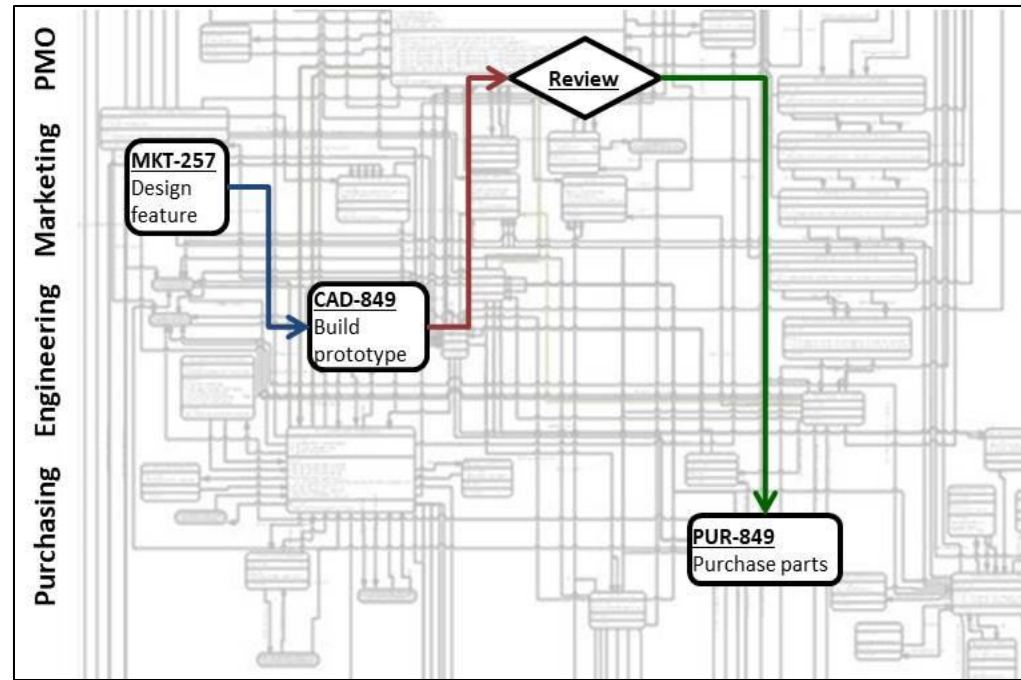
- Search by task owner
- Search by data flows
- Navigation via composite searches

## Filtered Views

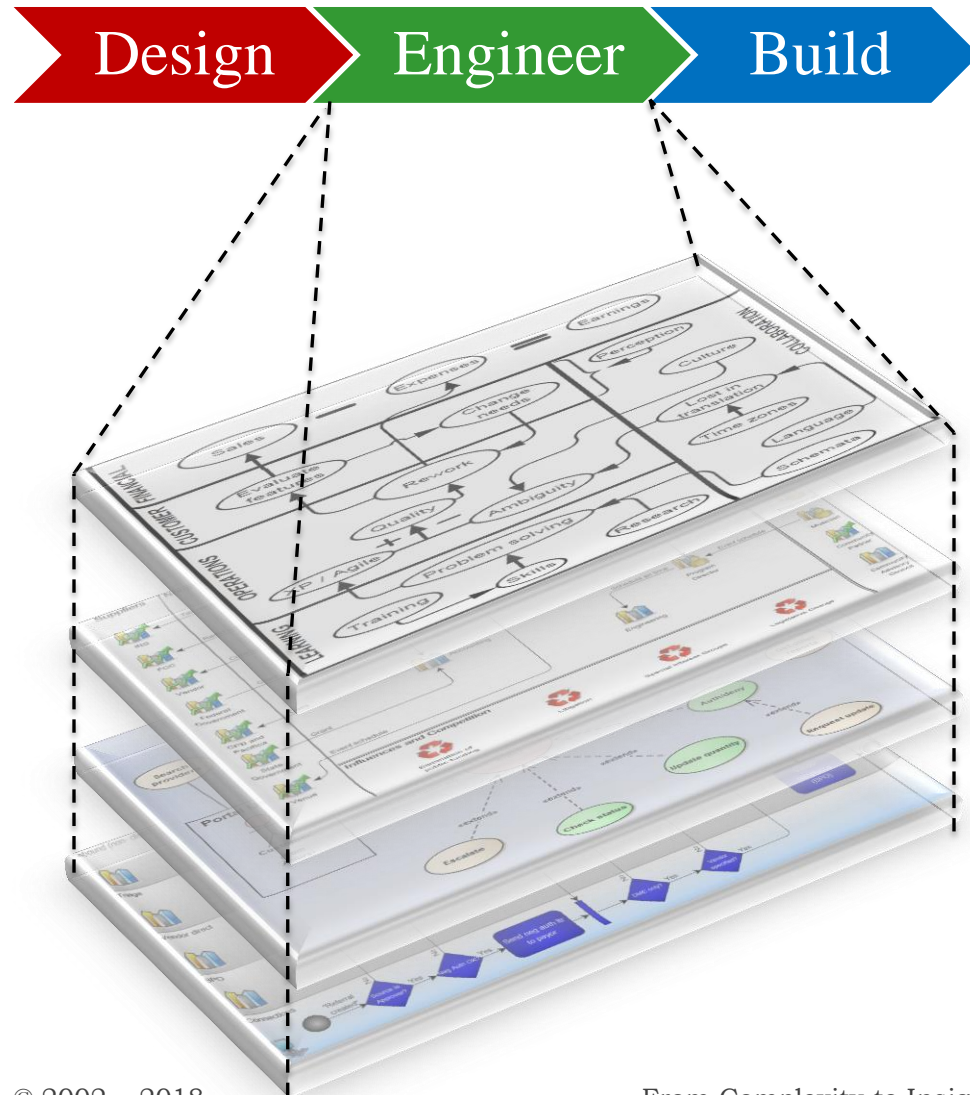
- Many stakeholders
- Understanding clouded by irrelevant details
- Poor model searching



Clarity + Insight



## Exploration and Discovery in Enterprise Architecture Models



### Interconnected Models

Iterative queries into interconnected models enable exploration and discovery within the enterprise.

### TOGAF Model Layers

- Strategic
- Organization
- Capabilities
- Processes
- Information
- Applications and Services

### Different perspectives

- COO: world-class manufacturing
- CFO: tracing financial data flows
- CTO: legacy migration to cloud
- Arch: integrated knowledge base
- Counsel: regulatory compliance

# Model Navigation Portal

## Enterprise Architecture Portal with Filters and Search Keys

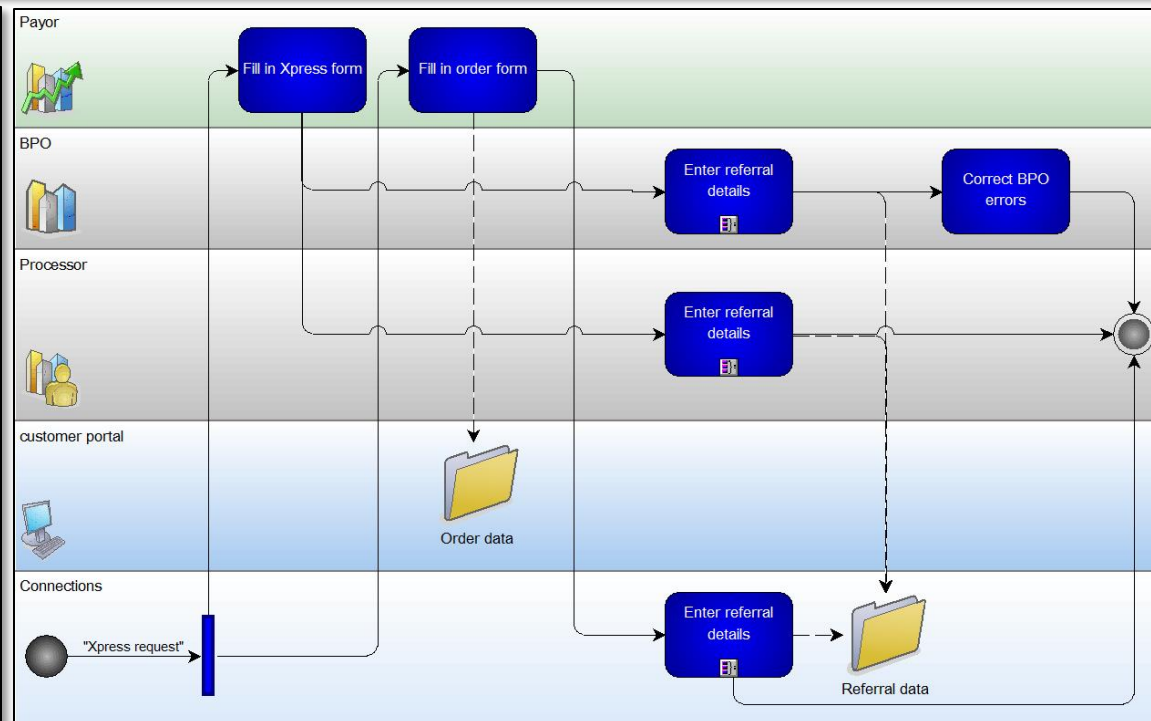
<input type="text" value="Portfolio"/>		<b>Technical Perspective:</b> <input type="text" value="TOGAF Layer"/>
<b>Key</b>	<b>Value</b>	<b>Business Perspective:</b> <input type="text" value="Product Milestone"/>
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	
		<a href="#">Clear</a> <a href="#">Open Model</a>
		Model Publishing Timeline: <input type="text" value="10/09/18"/>

Filtered list of  
hyperlinks to models:

- Item 01
- Item 02
- Item 03
- ...etc...

With link syntax as:

```
<a  
href="https://metatech.us/  
portfolio.01/viewpoint.02/  
view.03/item.04.html"  
target="model_panel">  
Item.01  
</a>
```



# Enterprise Architecture Portal with Filters and Search Keys

Filtered list of hyperlinks to models:

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# Model Navigation Portal

## Enterprise Architecture Portal with Filters and Search Keys

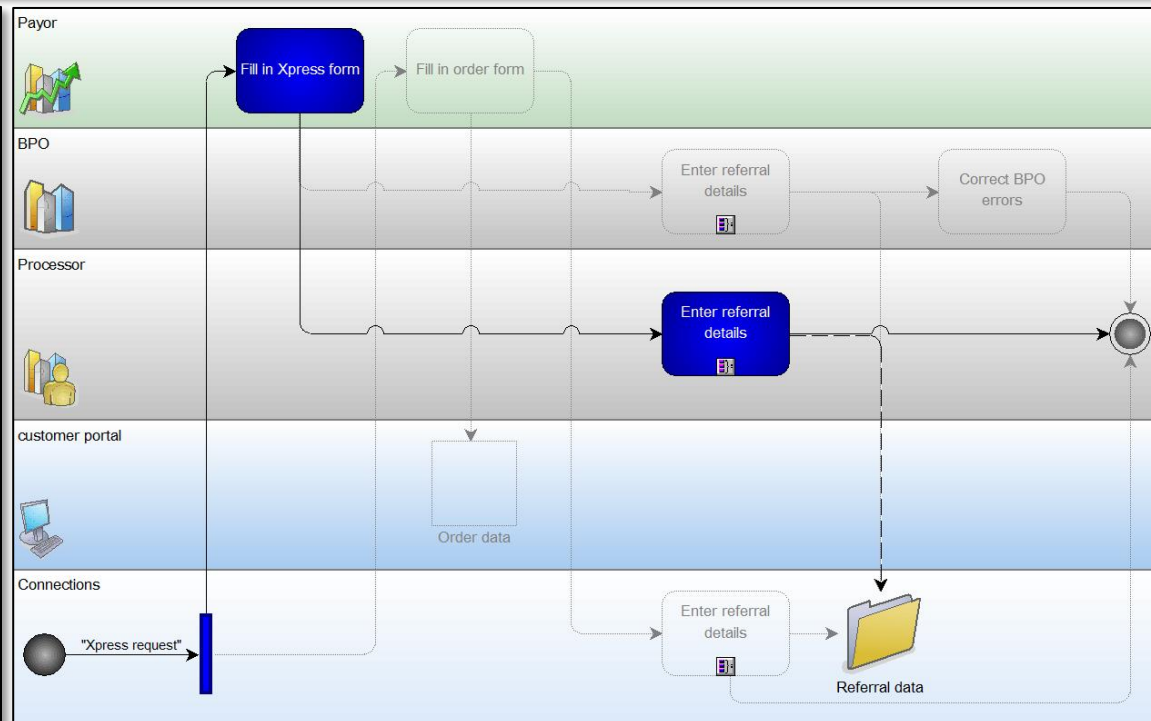
Referral Processing ▼		<b>Technical Perspective:</b> Process ▼
<b>Key</b>	<b>Value</b>	<b>Business Perspective:</b> Product Milestone ▼
Role	'Processor' IS NOT empty	
		<a href="#">Clear</a> <a href="#">Open Model</a>
		Model Publishing Timeline: 10/09/18

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# Model Navigation Portal

## Enterprise Architecture Portal with Filters and Search Keys

Referral Processing ▼		<b>Technical Perspective:</b> Process ▼
<b>Key</b>	<b>Value</b>	<b>Business Perspective:</b> Phase THREE ▼
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	

[Clear](#) [Open Model](#)

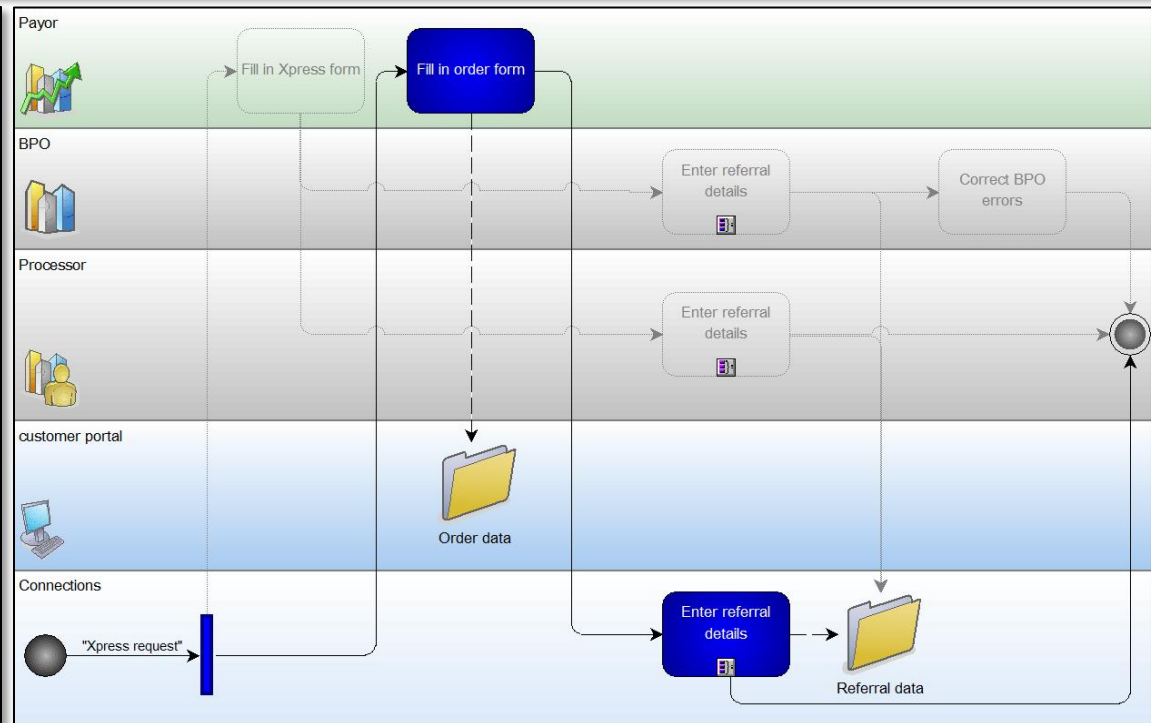
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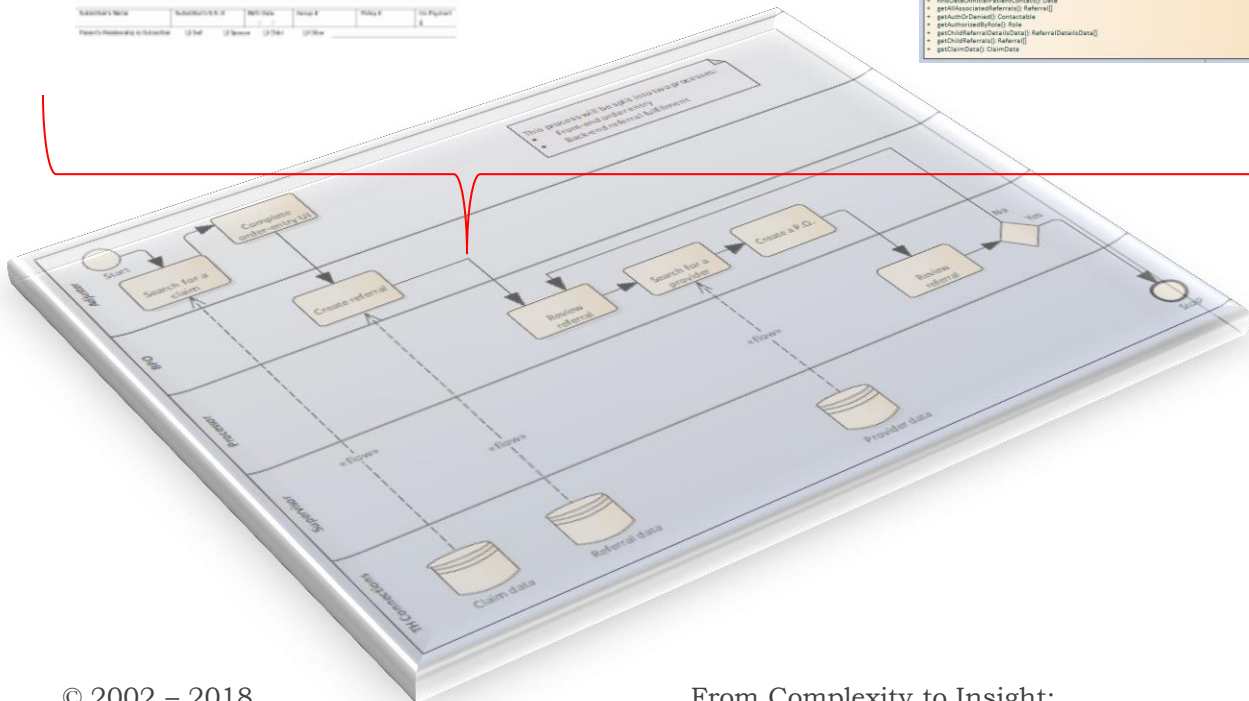
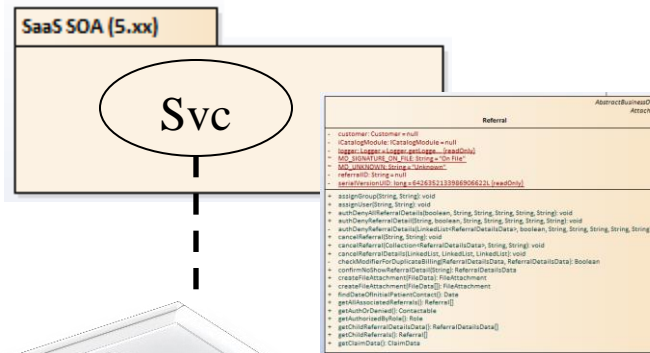


# Workflow Data Analysis

## Mapping Workflow Data to Cloud-Based Micro-Services

### Legacy Forms

### Migration to Cloud SaaS



### Legacy

- MS Office documents
- Scanned forms
- Archived PDFs
- Manual processes

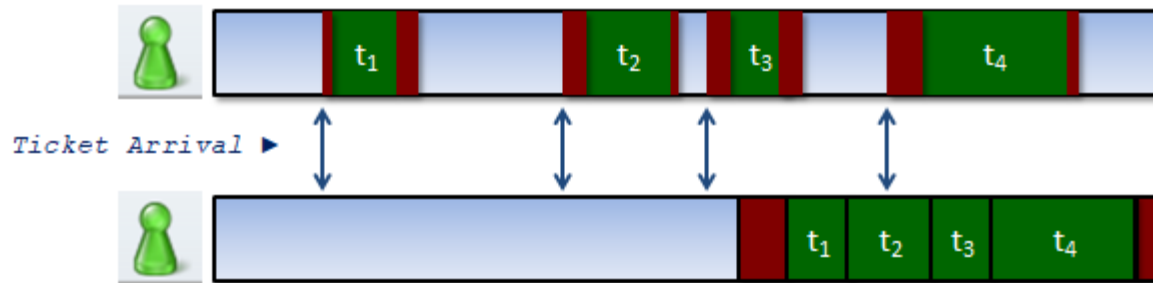
### Migration to cloud

- Retired legacy apps
- Integrated flows
- Service-ready tasks
- Measured progress

# Model Drift and Compliance Deviation




## Lost Time due to Random Work Arrival

**As Is:** Worker workload is unpredictable because fraud cases arrive at random.



**To Be:** Worker utilization is optimized because workload is predictable and efficient.

### Legend

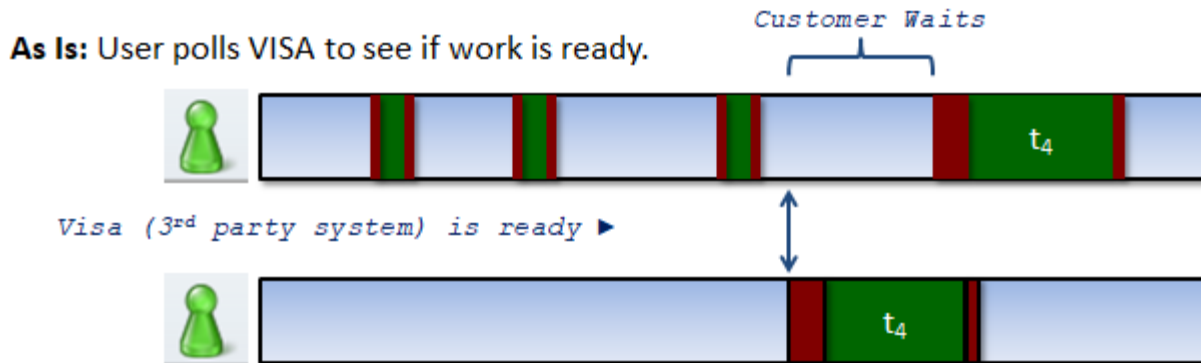
-  = Available for other work
-  = Lost Time (due to switching between tasks)
-  = Productive Time (working on the n<sup>th</sup> ticket)

*How it Works:* Queue new fraud cases as they arrive. Once enough cases have accumulated, release them in a batch to workers' To Do lists. (Cases may be released early to meet SLAs.)






# Model Drift and Compliance Deviation

## Lost Time due to External Dependencies



**To Be:** Fraud investigator is free to work on other tasks and is notified immediately when Visa is ready. Polling tasks are eliminated freeing time for other work.

### Legend

-  = Available for other work
-  = Lost Time (due to switching between tasks)
-  = Productive Time (working on the n<sup>th</sup> ticket)

**How it works:** Integrate systems with 3<sup>rd</sup> party (so users don't have to wait for random events). Then, send push notifications to users when 3<sup>rd</sup> Party is ready.

# Process Query Use Cases at MetaTech

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## Querying process logs

- Not-for-profit, community radio stations lend each other equipment encumbered by donor-imposed usage constraints. Regulations restrict certain usage models.
- Medical device manufacturers release faulty products, get sued, then fined for non-compliance with design specification retention requirements by the gov't.
- Credit card fraud prevention case workers deviate from process models by rearranging tasks to circumvent dependencies on external partners (e.g., Visa).

## Querying process models

- Automotive manufacturing process planners struggle to optimize time-to-market due to the scale and complexity of global vehicle development processes.
- Enterprise architects migrating legacy information systems to micro-services in clouds use process querying to extract metadata attached to workflows.
- Medical insurance claims processors use DeMorgan's laws to re-factor and simplify process steps prior to BPM peer review and quality assurance.

## Example PQL Query: Identify Opportunities for Cloud Migration

---

Goal: replace legacy information systems with cloud-based, micro-services.

1. Identify workflows where process participants used email to hand off information across swim lane boundaries, a practice that leads to rework.
2. Combining the resulting set of workflows with the list of end-of-life systems provided a short-list of migration-eligible systems.
3. Create micro-service interfaces and integrate into BPM modeling tool such that “ServiceReady” Activities are inventoried and available for next-gen modeling.

```
SELECT id FROM workflows AS w WHERE  
crossesSwimlaneBoundary(w.id) = true AND w.id IN  
(SELECT id FROM workflows AS w WHERE w.endLink.refId  
IN (SELECT id FROM activities AS a WHERE  
has_artifact(a.id) = true AND regexp(a.id,  
partsDataPattern) = true))
```

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## Questions ?

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Kurt Madsen

Telephone: +1 (813) 298-8180

Tampa, Florida, USA

Email: [kmadsen@metatech.us](mailto:kmadsen@metatech.us)

[www.MetaTech.us](http://www.MetaTech.us)

[www.Linkedin.com/in/KurtMadsen1](http://www.Linkedin.com/in/KurtMadsen1)