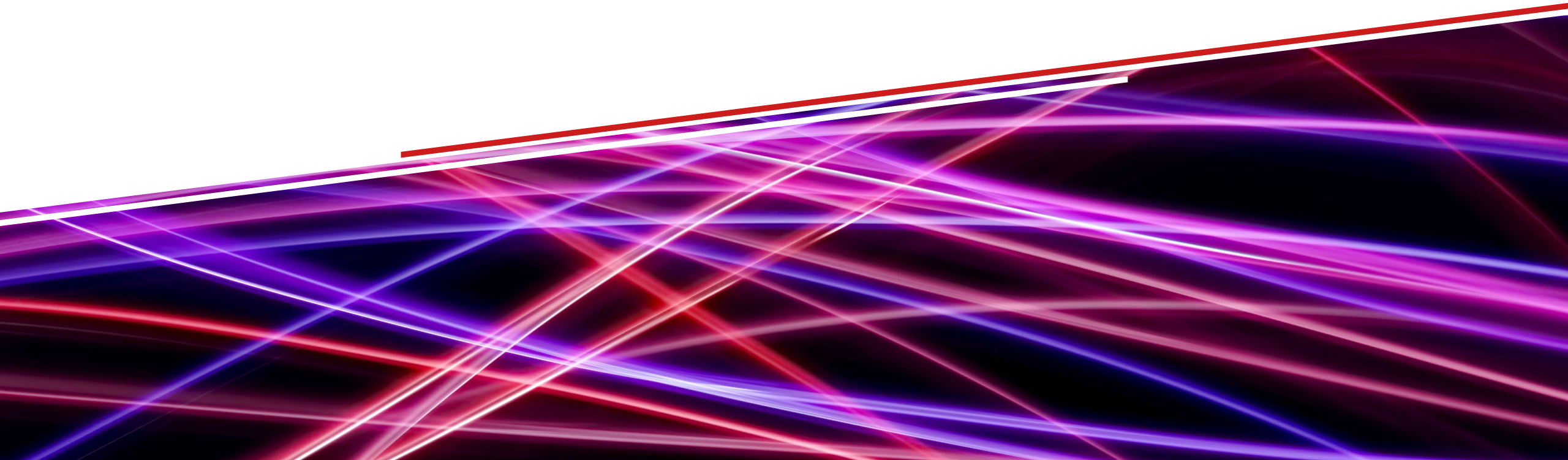
ACE2024

20 Years of Innovator at SRC Inc

Kevin Murray

March 6, 2024



Agenda

20 Years of Innovator at SRC

- About SRC
- Innovator at SRC
  - Innovator as a Controlled Item
  - Extending Workflow
  - SRC Goes Global
  - The Twins at 20
  - Assembly & Test
  - Foreign Influences

Unclassified

About SRC

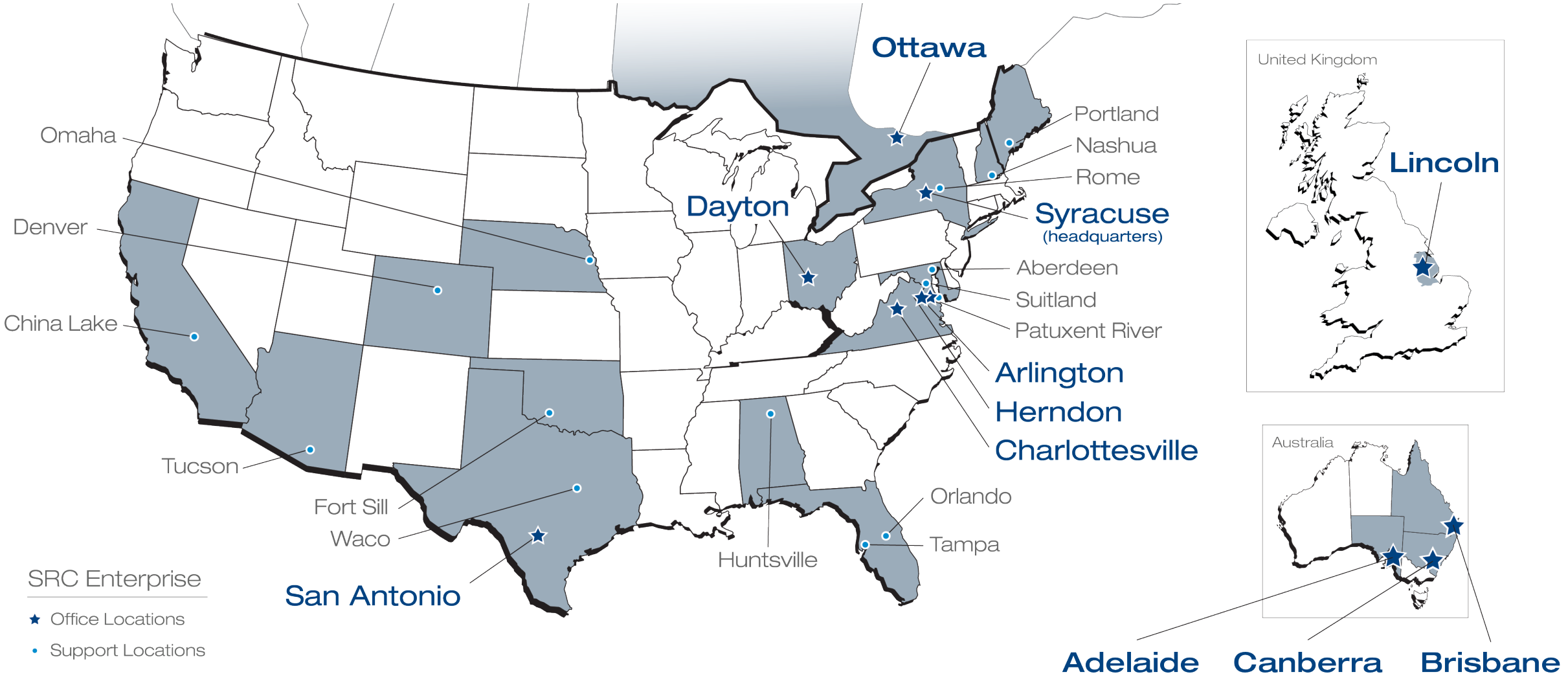
SRC at a Glance

- Defense, environment, intelligence

$379M	~1,400	1957	501(c)(3)
FY24 Projected Revenue	Employees	Founded	Not-for-Profit

Locations to Support Customers

Across the United States & Around the World



Redefining possible

Experts in Radar
Battle-proven, award winning radar & sensor programs

Leaders in EW
World-class EW tools, services & life-saving solutions

Authorities in Environmental Science
Internationally recognized scientific experts

Design, Manufacture & Support
Full life cycle management for complex defense systems

Trusted Advisor
Not-for-profit; unbiased R&D & services

20 Years of Innovator at SRC

Today's Talk

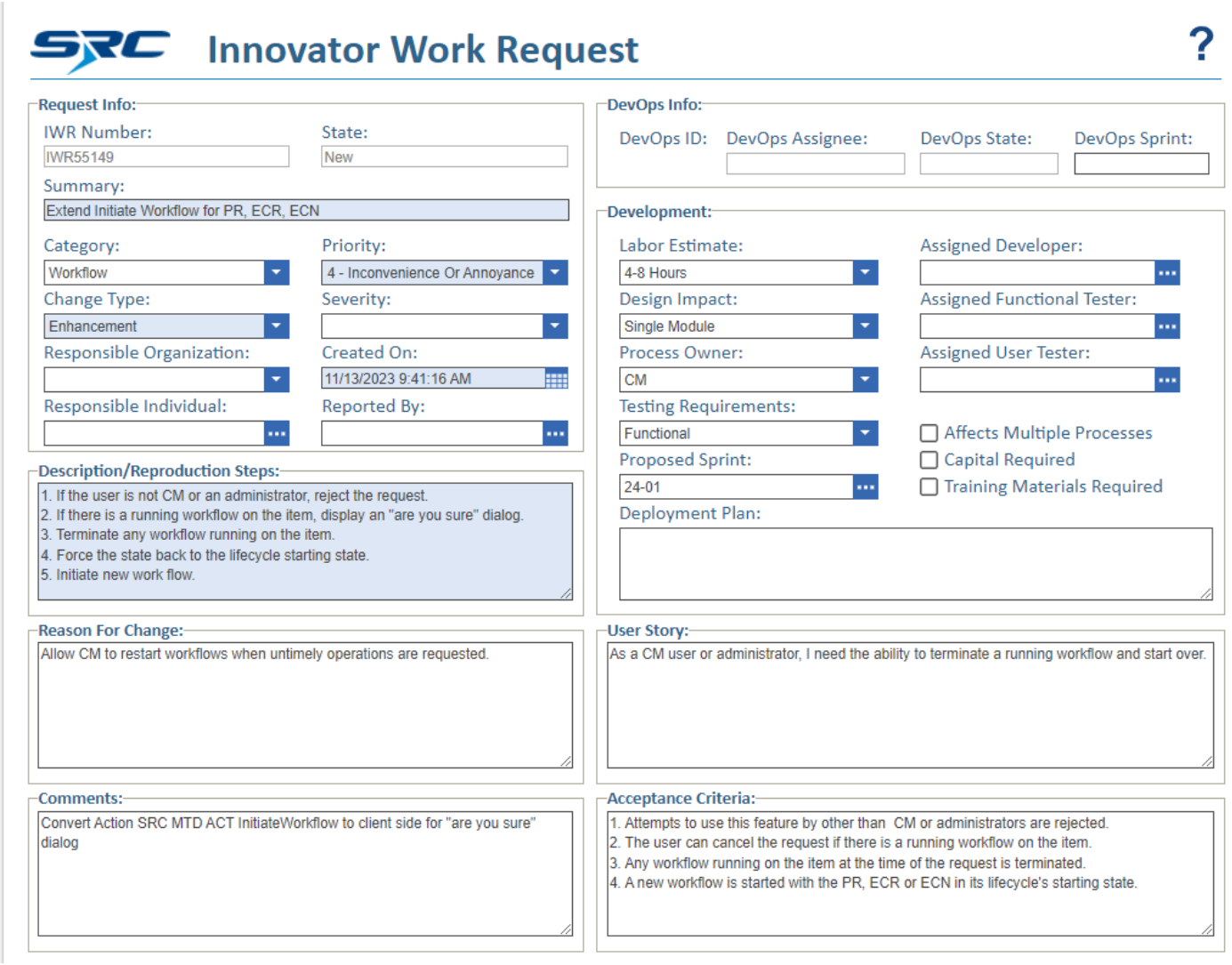
- SRC's motto is "Redefining Possible™"
- "Redefining Possible" in the PLM Space
  - Today's is a rapid-fire retrospective of 20 "Possibilities".
    - Some easy, some difficult
    - Some mundane, some novel
    - Some you may want to try
  - This is a retrospective with no deep feature discussion
    - For more detail
      - Download this slide deck
      - See past ACE presentations
      - Talk to me off-line
- Hopefully, you walk out with one good idea to apply.

Possibility 1

Self Managing Innovator

Innovator Work Request (2023)

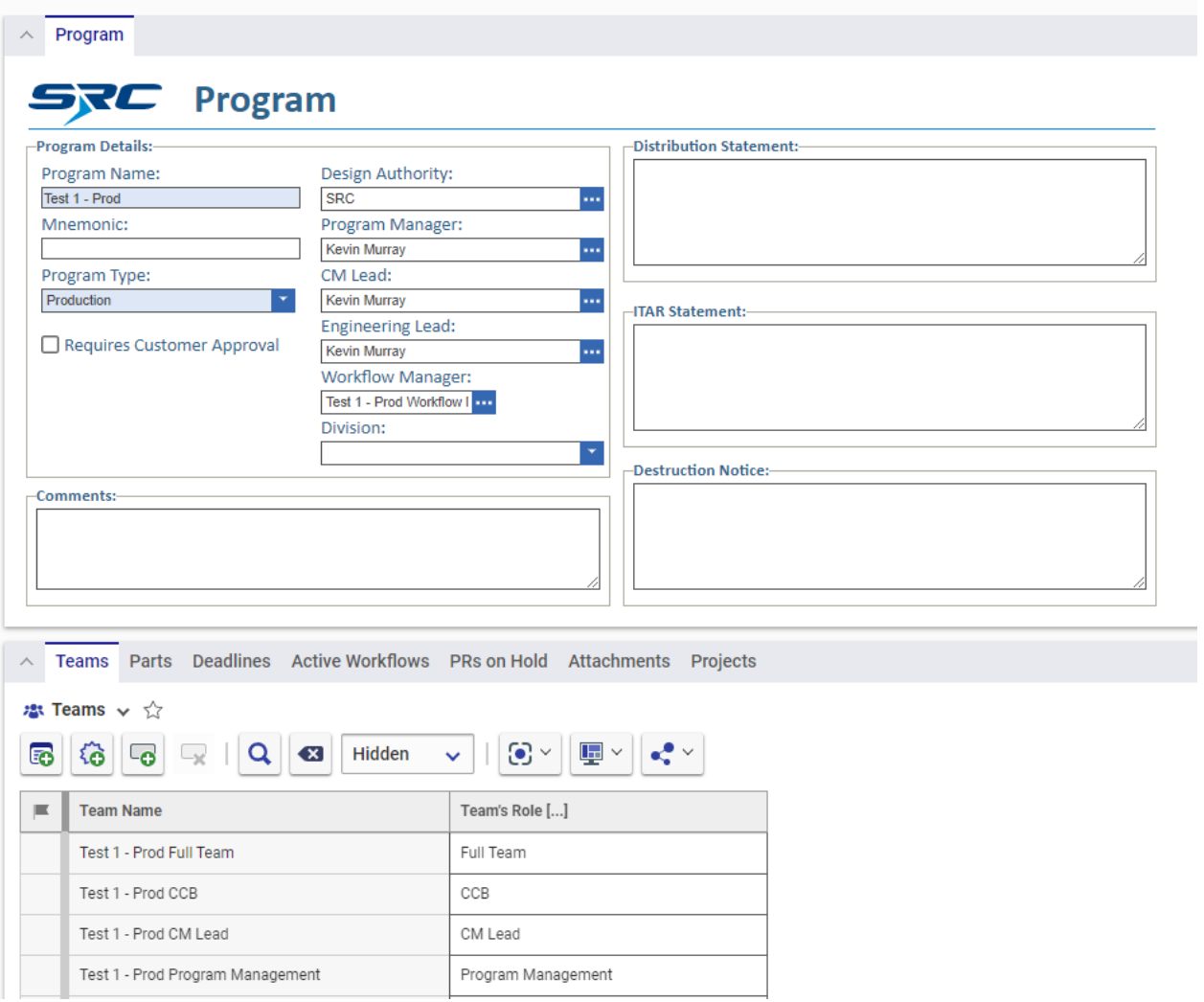
- Any user can initiate an IWR for
  - Enhancements
  - Report Issues
- Formerly PRs were used
  - Processes diverged



Workflow Possibilities (2023)

A Quick Business Orientation

- SRC is a Program driven business.
  - Programs closely tied to a product and funding
  - Many active programs
- Starter: PM's Program
- Customer's Mandate: "One workflow to rule them all."
  - No program specific workflows

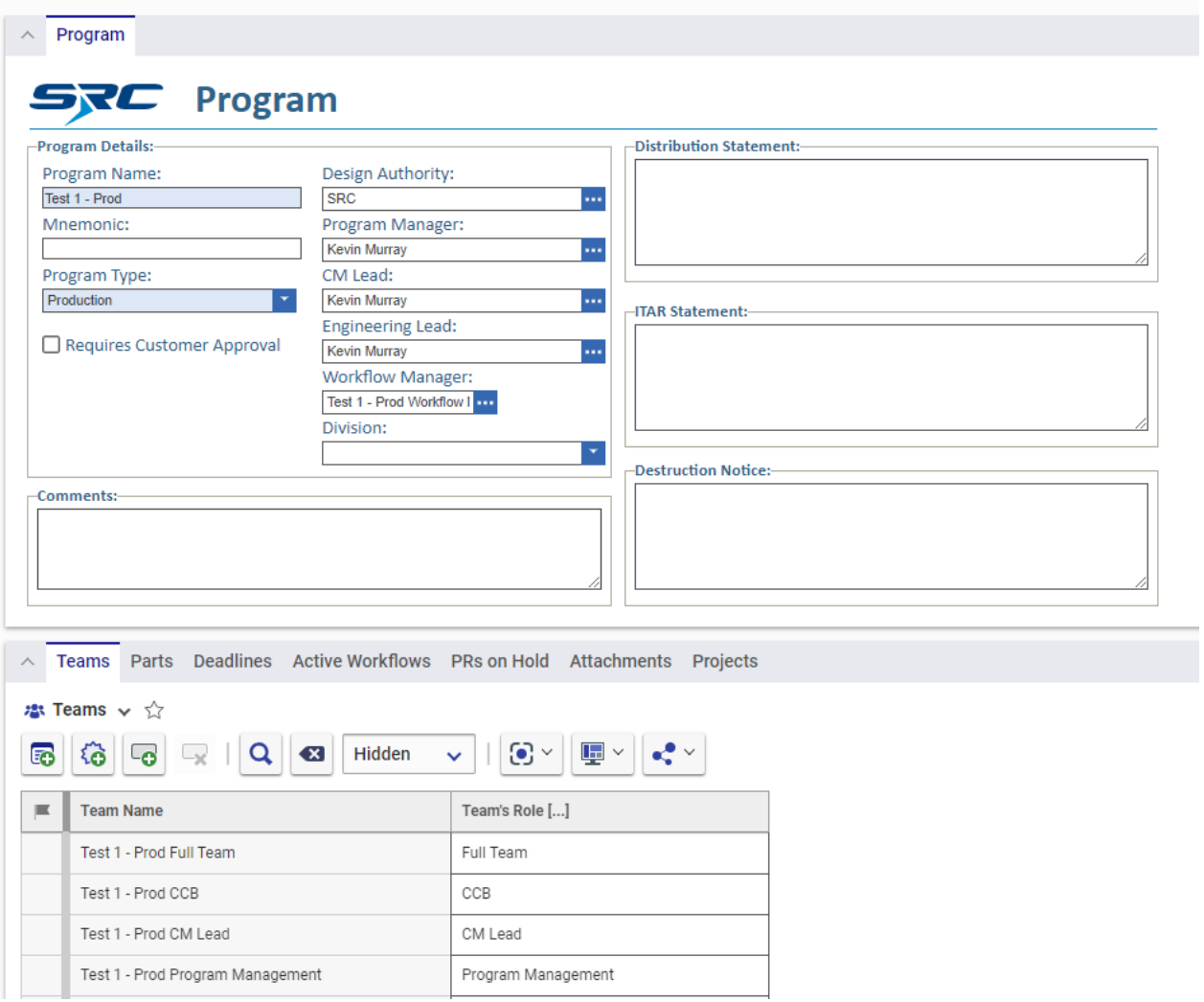


Possibility 2

Dynamic Activity Assignment

Use Case: Program Driven Assignments

- Workforce Roles
- Link Roles to Activities.
- Programs provide labor.
  - Teams: program-role-team determine activity assignments.
    - » program-role-Identity is easier to do
- Assignments are made on activity activation. (code)



Possibility 3

Leverage PM’s Business Calendar

Use Case: Durations and Deadlines

- Program Management's business calendar defines weekends and holidays
- On activity activation (code), durations and deadlines are extended.
  - Durations and deadlines in workdays, not calendar days.

Possibility 4

Dynamic Routing

Use Case: Program Driven Routing

- Development programs have simpler flows than Production programs, but ...
  - Changes affecting production items must follow production routing.
  - That's tricky, we don't want users to vote for trouble!
- We use an automatic activity with several exit paths.
  - » No default path designated in the Workflow Map
  - » The user votes
  - » Code sets the default path before the automatic activity before it activates.
  - » Flow then passes down the selected path.

Possibility 5

Hold a Workflow Pending until Others complete

Use Case: ECR Review Findings

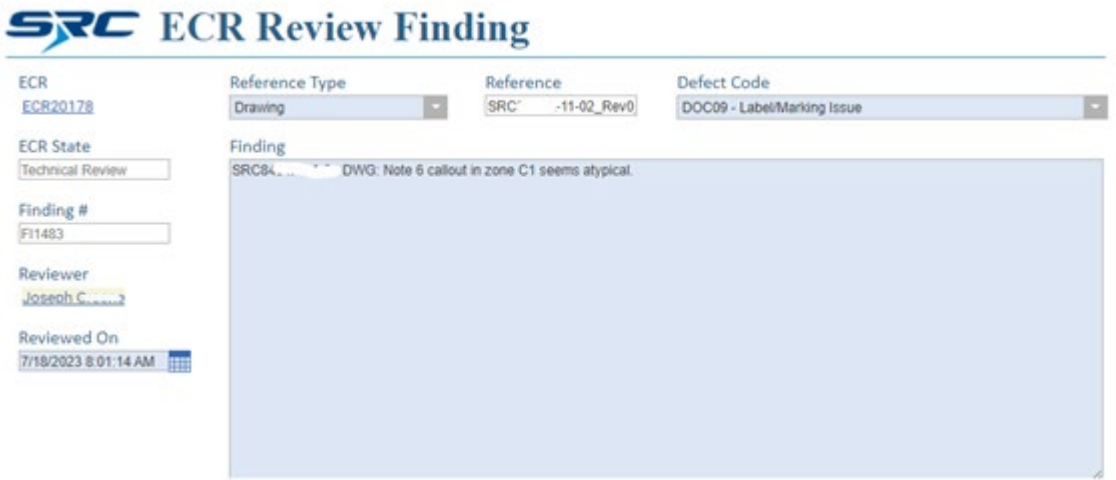
PRs | Add'l Programs Affected | Affected Items | Part Effectivity | Tech Reviewers | **Review Findings** | Attachments | Working Files | Comments | History

ECR Review Finding

Hidden

Finding No	Finding State	*Reference T...	*Reference	*Defect Code	*Finding [...]	ECR State Fo...	Reviewer [...]	Reviewed On ...
FI1483	Closed	Drawing	SRC[redacted]-11...	DOC09 - Label/Marking Issue	SRC[redacted] DWG: Note 6 callout in zone C1 seems atypical.	Technical Rev...	Joseph[redacted]	7/18/2023 8:...
FI1484	Closed	ECR	ECR20178	ECR01 - Change desc Missi...	Should the parenthetical statements in the ECR change description be removed now?	Technical Rev...	Joseph[redacted]	7/18/2023 8:...
FI1485	Closed	Drawing	SRC8[redacted]0...	DOC11 - Note Callout Missi...	SRC[redacted].0 DWG: ECR20178 should be listed in rev history table.	Technical Rev...	Joseph[redacted]	7/18/2023 8:...

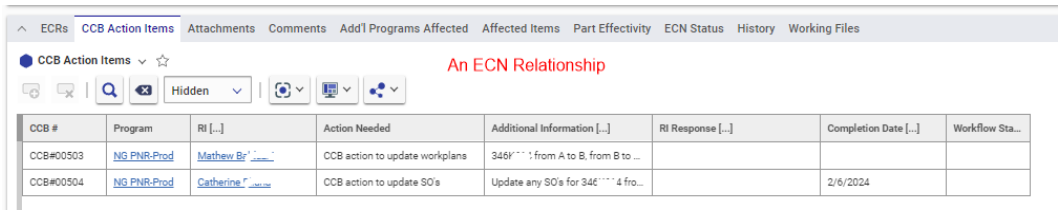
- ECR discrepancies must be fixed before progressing to the next activity.
  - Query for open review workflows in the ECR Activity Vote.
  - Block voting until all finding workflows close.

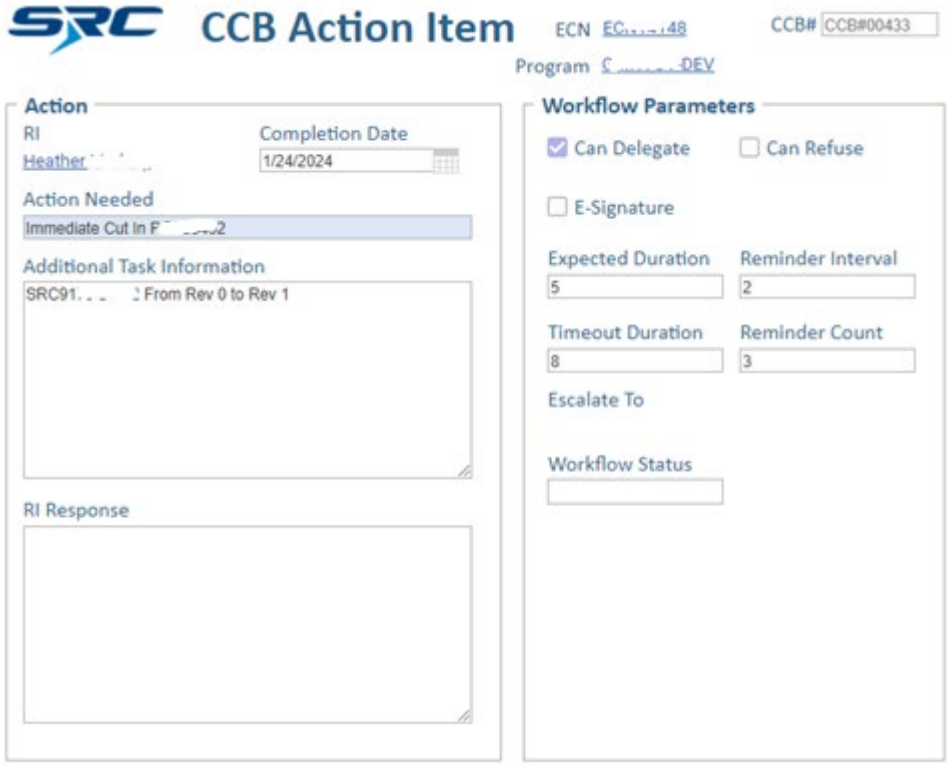


Possibility 6

Add Activities Ad-hoc to Running Workflows

Use Case: CCB Action Items for ECN



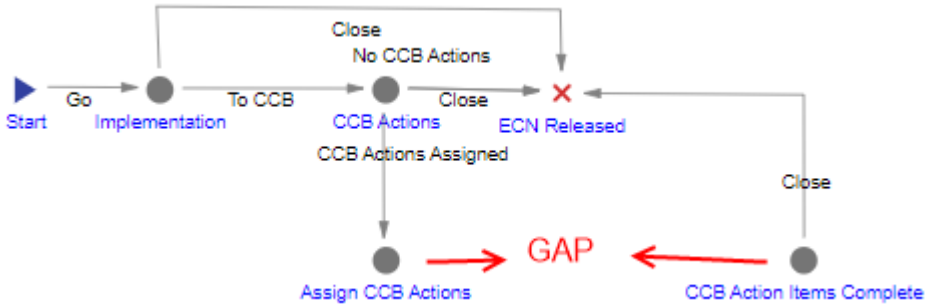


- CCB Action Items are post release activities performed by various actors.
- Hold the ECN workflow open until the last action completes.
  - Closeout may be protracted.
  - Don't want to revisit ECN weeks later.

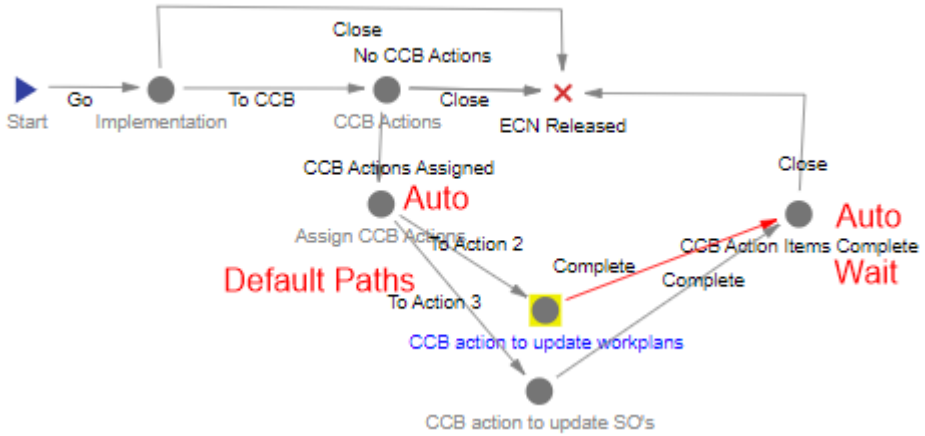
CCB Action Items

- Leave a gap for activity insertion.
  - » Go around it if there are no activities!
- Insert an activity into the gap for each CCB Action Item
  - » Remember paths, assignments, parameter defaults and server events, too.
  - » Activities performed in parallel – default paths lead to each
  - » Converging on an automated gate keeper activity that waits for all inputs.

Workflow Map



Workflow Process



SRC Goes Global (2016)

Commodity Classification

When SRC decided to pursue international opportunities, we extended Innovator with trade control features, enabling us to enter the international market.

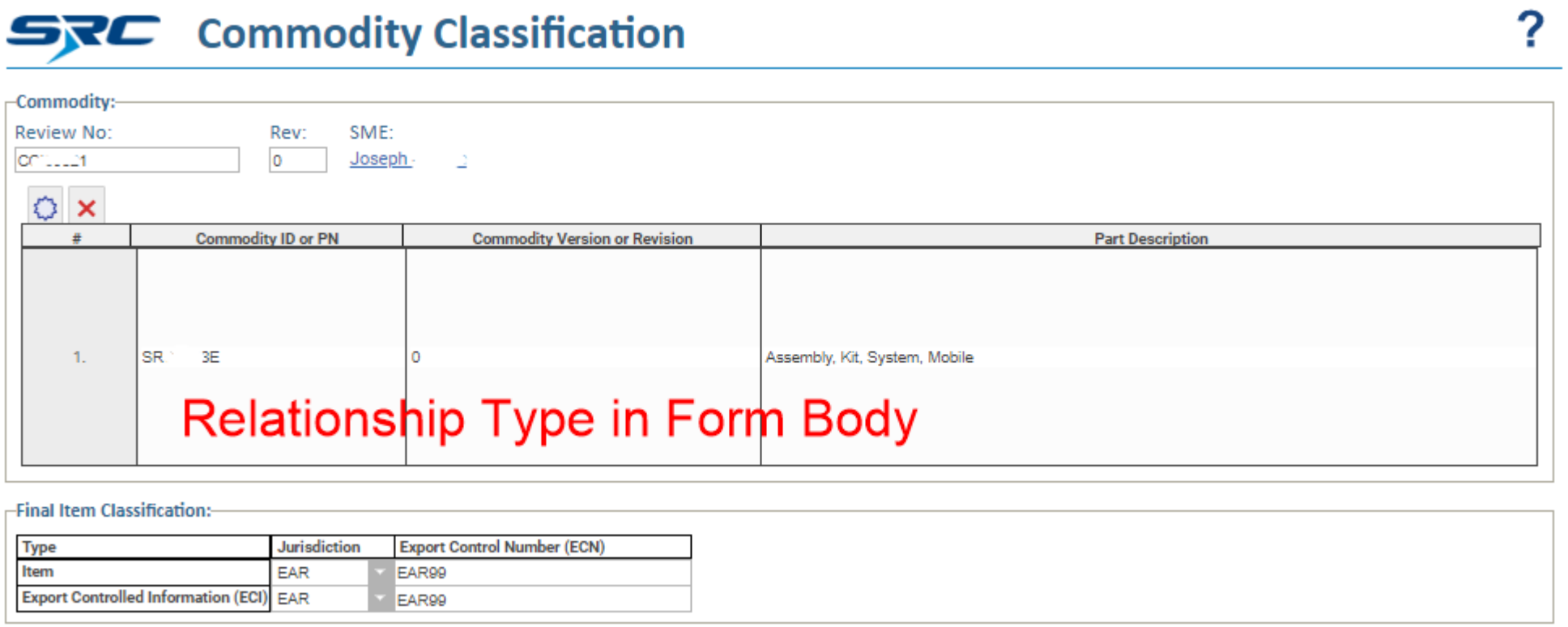
To stay true to the old paper form we needed…

Possibility 7

Relationships in Form Body

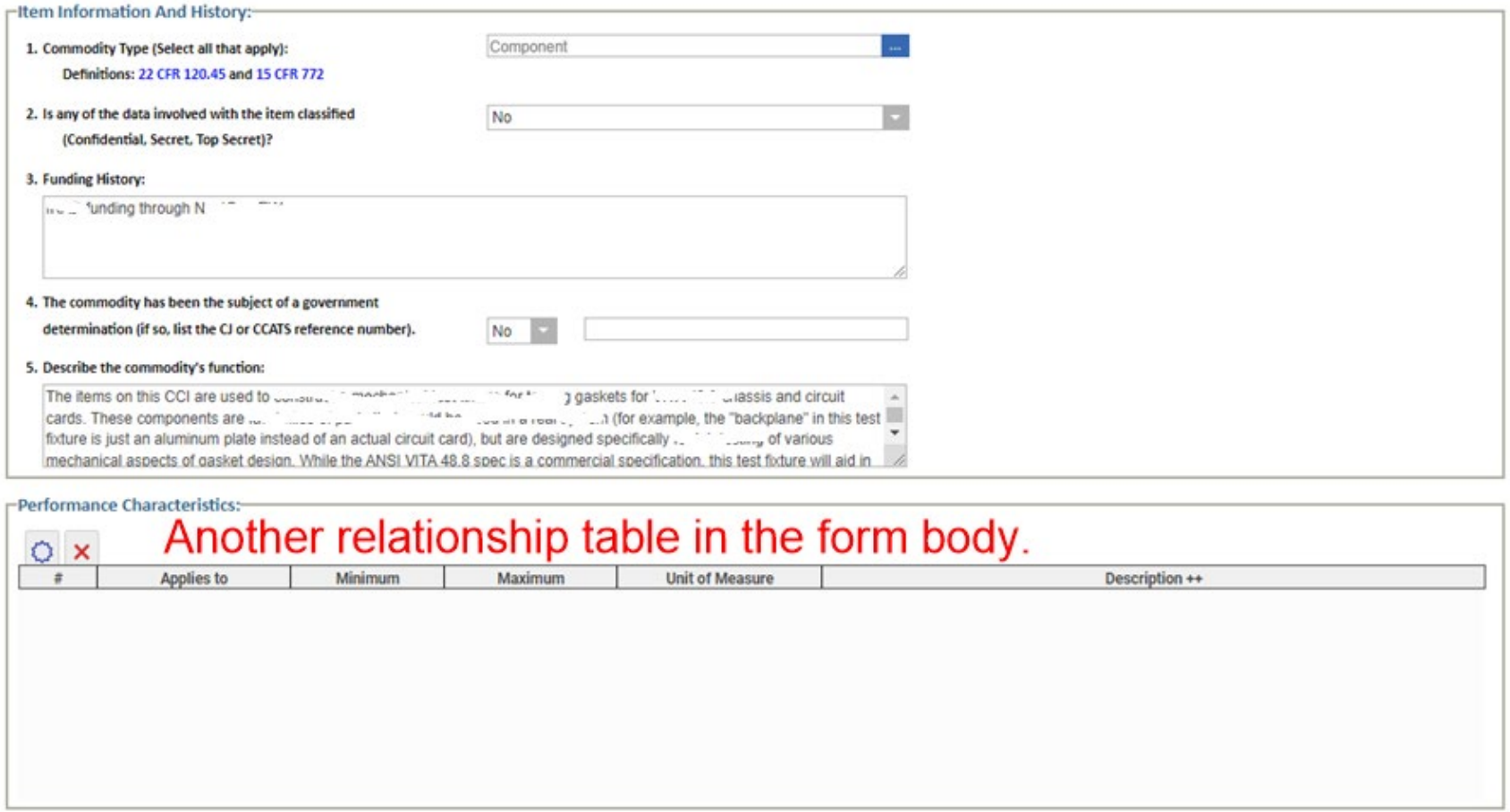
Commodity Classification

- The CCI Determines trade restrictions for a group of parts.
  - » Performed by specially trained engineers.
  - » The applicable parts are a relationship type displayed in a table.



Commodity Classification

- Let's Scroll the form
  - » Performance characteristics are another relationship type displayed in a table.



Commodity Classification

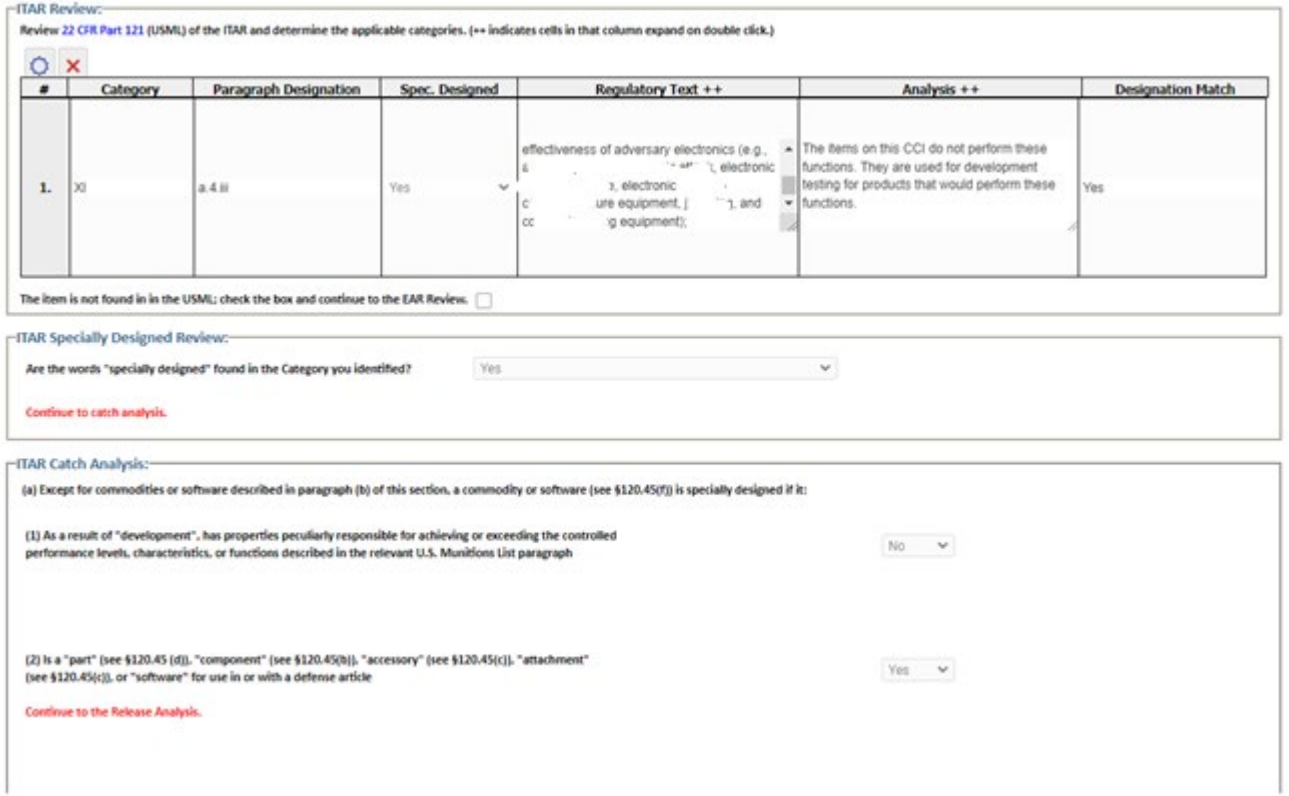
- The CCI form is complex.
- The proper path through the form varies depending how the responses to certain items.
- To guide the user through the form and improve first pass quality we…

Possibility 8

Draw Forms Conditionally

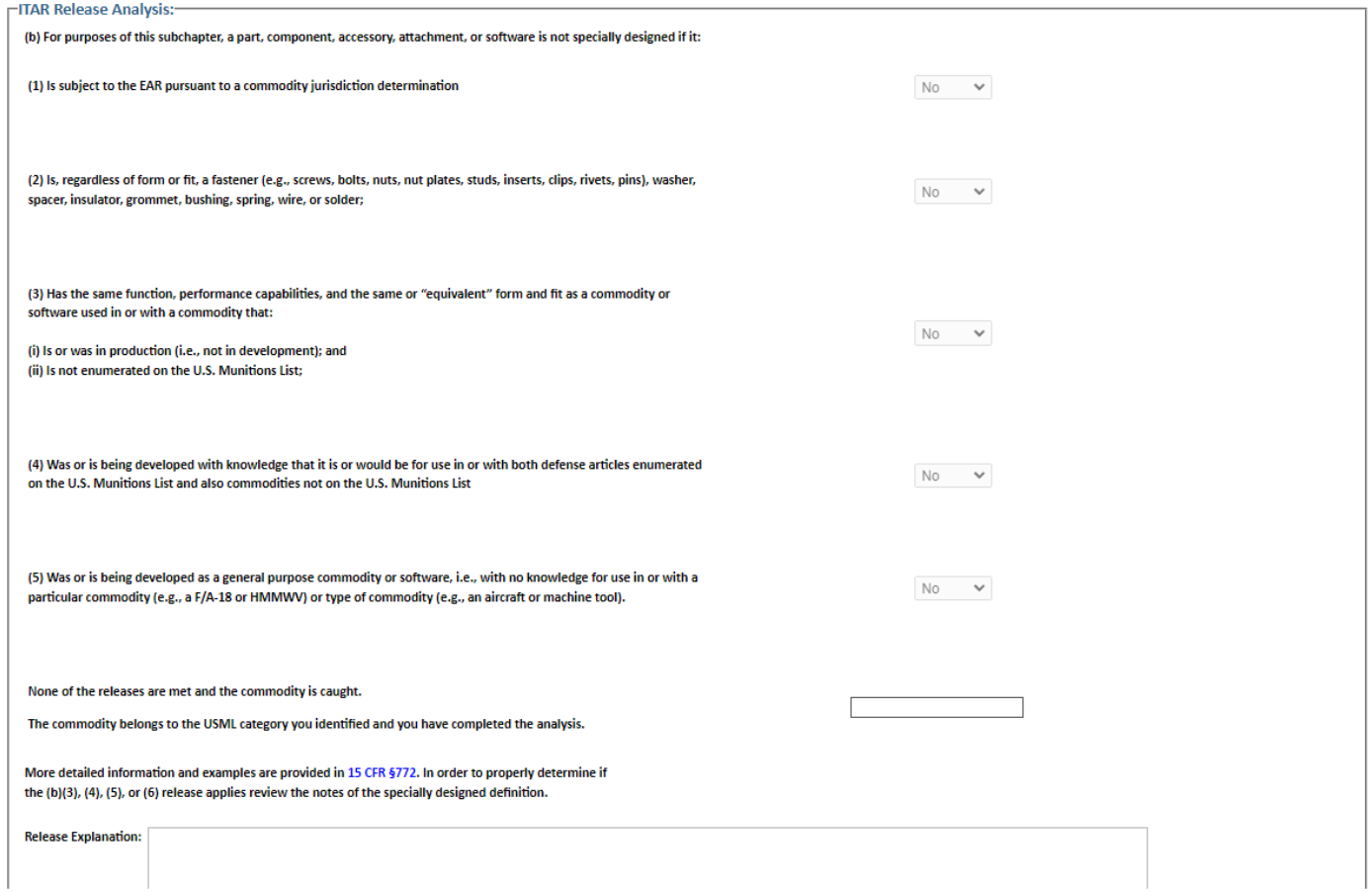
Commodity Classification

- The CCI form is drawn as the process unfolds.
  - A “Specially Designed” determination injects the ITAR catch analysis section into the form.
  - A positive answer to any catch analysis question injects the ITAR release section.



Commodity Classification

- If any release question is affirmative, ITAR doesn't apply but other laws may.
  - We inject additional catch and release blocks for other jurisdictions.
  - The outcome for each drives what's next on the form until we determine none apply.


ITAR Release Analysis:

(b) For purposes of this subchapter, a part, component, accessory, attachment, or software is not specially designed if it:

(1) Is subject to the EAR pursuant to a commodity jurisdiction determination — No

(2) Is, regardless of form or fit, a fastener (e.g., screws, bolts, nuts, nut plates, studs, inserts, clips, rivets, pins), washer, spacer, insulator, grommet, bushing, spring, wire, or solder; — No

(3) Has the same function, performance capabilities, and the same or "equivalent" form and fit as a commodity or software used in or with a commodity that:

(i) Is or was in production (i.e., not in development); and
(ii) Is not enumerated on the U.S. Munitions List; — No

(4) Was or is being developed with knowledge that it is or would be for use in or with both defense articles enumerated on the U.S. Munitions List and also commodities not on the U.S. Munitions List — No

(5) Was or is being developed as a general purpose commodity or software, i.e., with no knowledge for use in or with a particular commodity (e.g., a F/A-18 or HMMWV) or type of commodity (e.g., an aircraft or machine tool). — No

None of the releases are met and the commodity is caught.

The commodity belongs to the USML category you identified and you have completed the analysis.

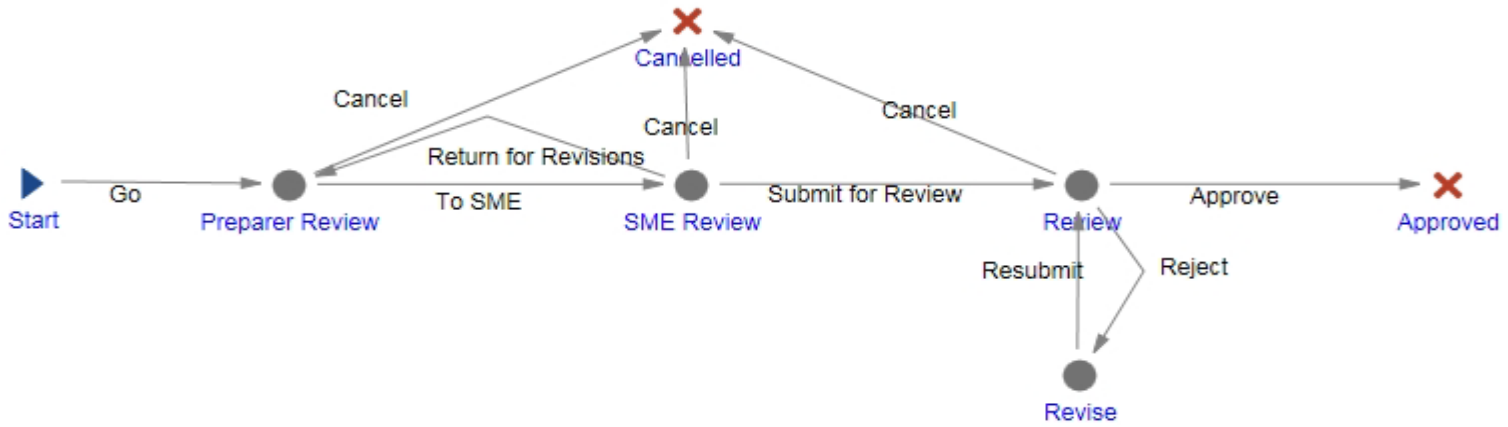
More detailed information and examples are provided in 15 CFR §772. In order to properly determine if the (b)(3), (4), (5), or (6) release applies review the notes of the specially designed definition.

Release Explanation:

Possibility 9

Update Items from a Workflow

Use Case: Update Parts with Trade Data



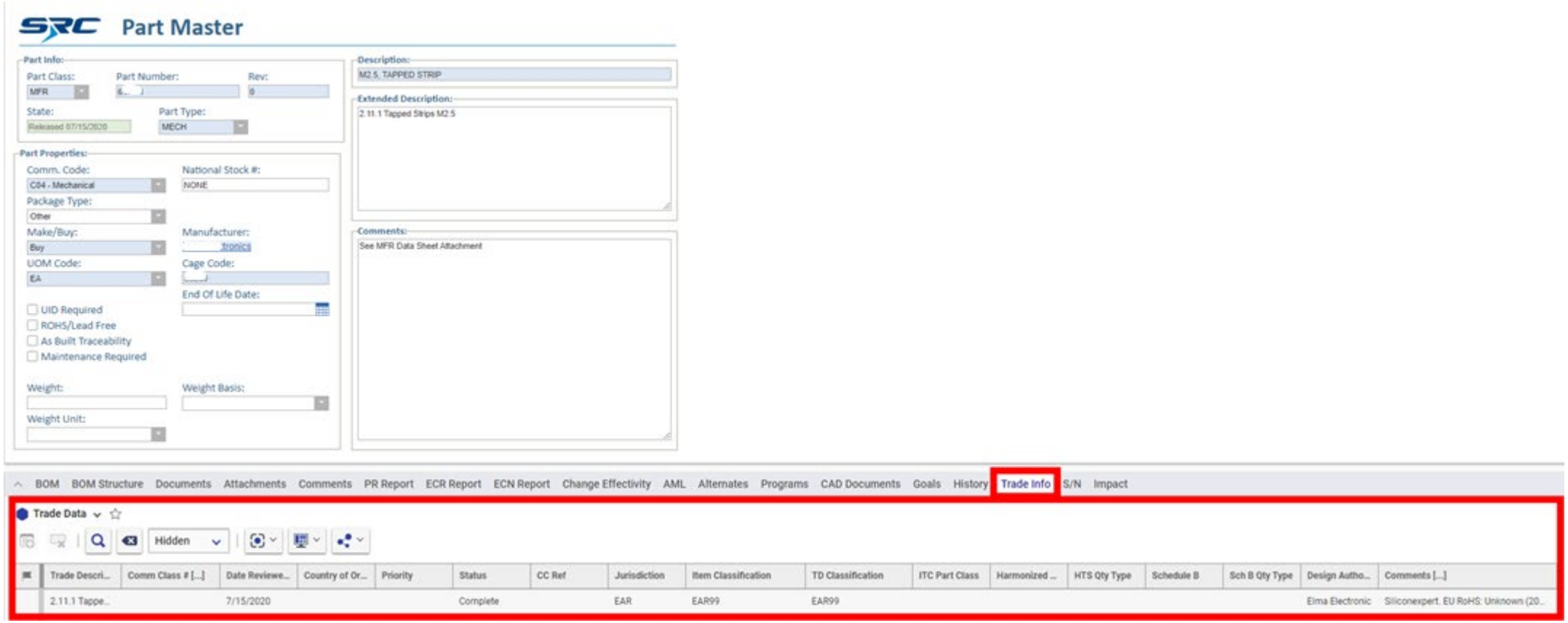
- A workflow drives Commodity Classifications through review.
  - At the end, every part on the CCI is updated with its trade determination.

Possibility 10

The Digital Thread as a Compliance Tool

Use Case: No Part Trade Info, No Part Release

- Prevent part release unless the Part's trade info tab is populated.



The Twins at 20 (2004)

The Twins at 20

Day Week Month **Longer**

In 2020 the Aras introduced the Digital Twin Core placing Innovator squarely in the manufacturing segment of the product life cycle.

In 2024, our digital twins turn 20.

Possibility 11

Manufacturing Records in Innovator

Part Serialization

- Customer Order
  - Line items
  - Make Items (Components)
- Work Order
  - One per make item w/ quantity
- Serialized Part

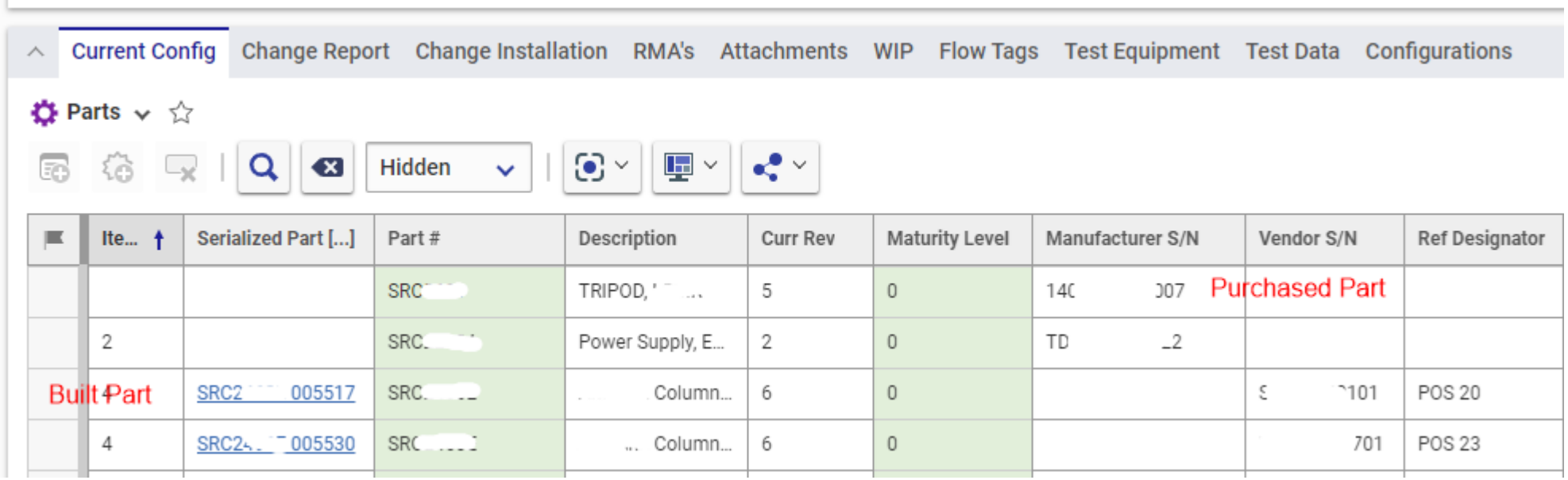
Our Twins – a Portrait

- Five Categories
  - Identification and tracking Information
  - Customer Order
  - Work Order
  - Status Information
  - Comments

Possibility 12

Capture the lifecycle with versioning

As Built Configuration



- The Current Config tab captures serial numbers for installed parts.
  - Lists traceable COTS, built and software/firmware components
  - Because we version, we not use from – to dates.

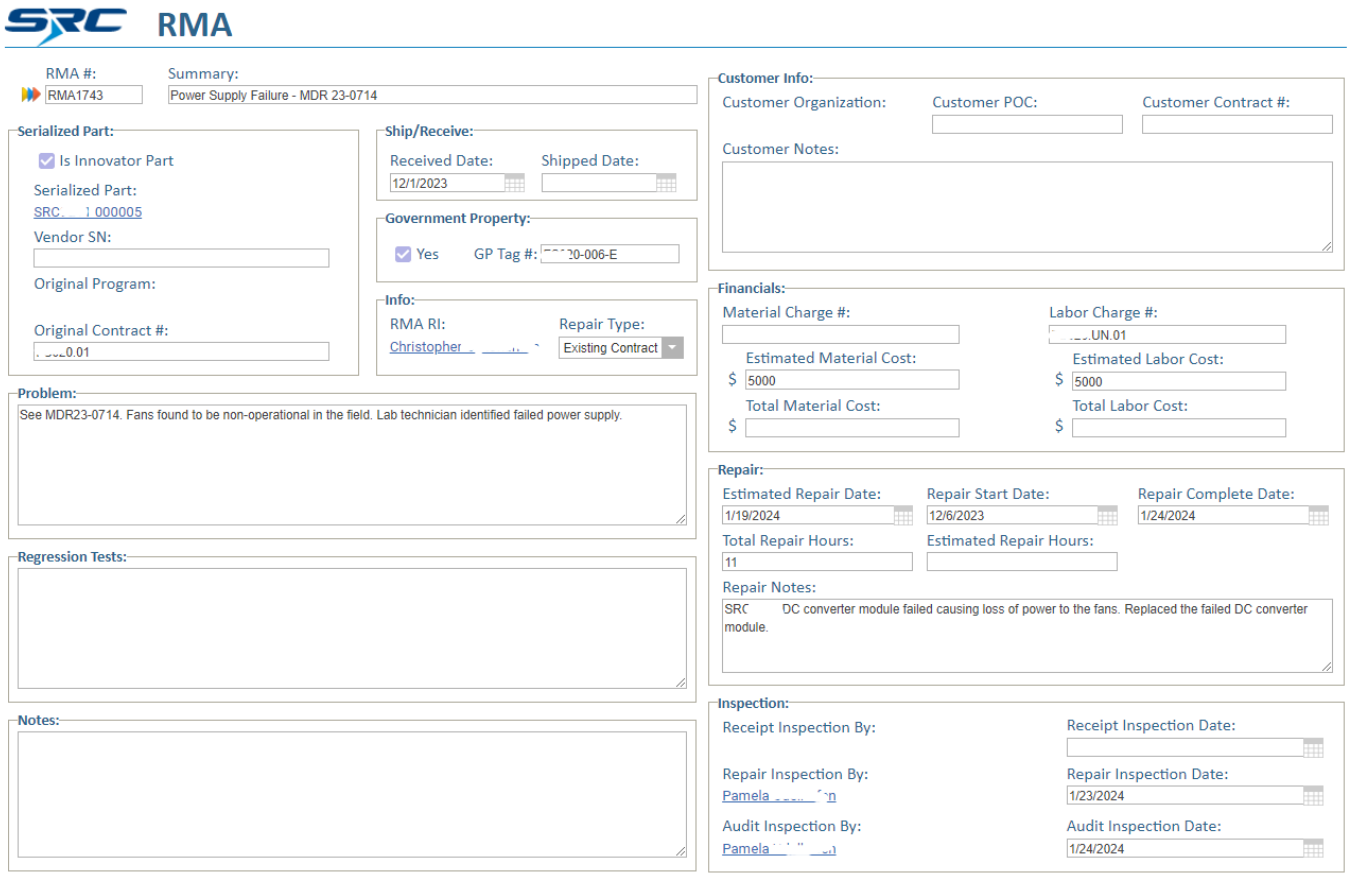
Possibility 13

Returned Material Requests (2013)

RMA

Day Week Month **Longer**

- Returned Material Authorizations
  - RMA – Serialized Part Relationship
    - » “Defective Components”
- Serialized Part- RMA Relationship
  - » RMAs listed with the serialized part



SRC RMA

RMA #: RMA1743
Summary: Power Supply Failure - MDR 23-0714

Serialized Part:
Is Innovator Part
Serialized Part: SRC. 1 000005
Vendor SN:
Original Program:
Original Contract #: .0.01

Ship/Receive:
Received Date: 12/1/2023
Shipped Date:

Government Property:
Yes GP Tag #: 0-006-E

Info:
RMA RI: Christopher
Repair Type: Existing Contract

Problem:
See MDR23-0714. Fans found to be non-operational in the field. Lab technician identified failed power supply.

Regression Tests:

Notes:

Customer Info:
Customer Organization:
Customer POC:
Customer Contract #:
Customer Notes:

Financials:
Material Charge #:
Labor Charge #: .UN.01
Estimated Material Cost: $ 5000
Estimated Labor Cost: $ 5000
Total Material Cost: $
Total Labor Cost: $

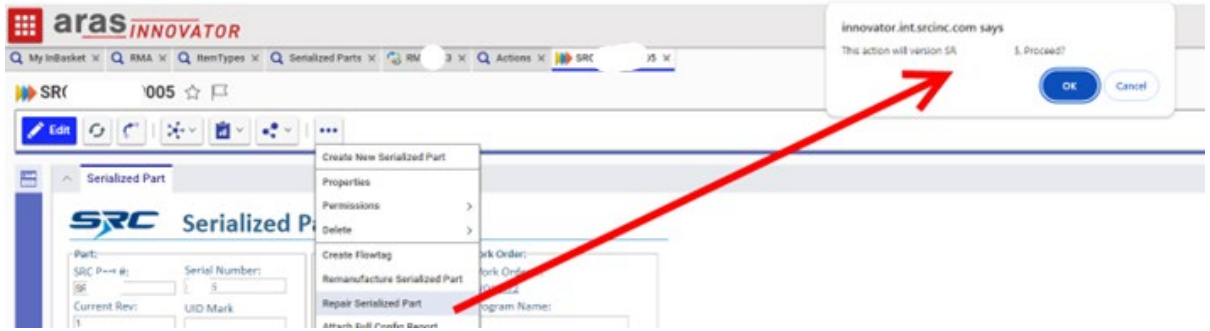
Repair:
Estimated Repair Date: 1/19/2024
Repair Start Date: 12/6/2023
Repair Complete Date: 1/24/2024
Total Repair Hours: 11
Estimated Repair Hours:
Repair Notes:
SRC DC converter module failed causing loss of power to the fans. Replaced the failed DC converter module.

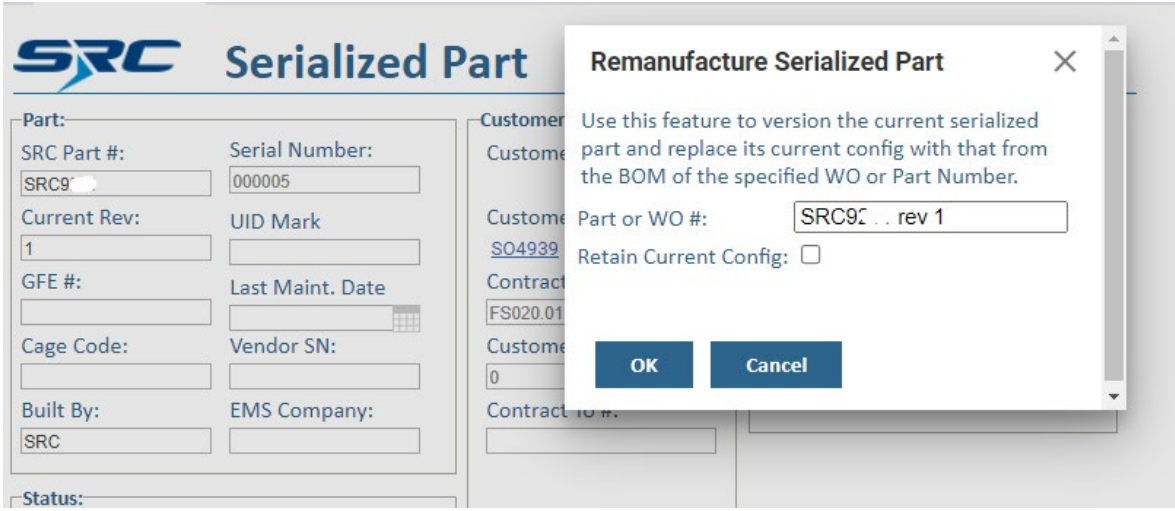
Inspection:
Receipt Inspection By:
Receipt Inspection Date:
Repair Inspection By: Pamela n
Repair Inspection Date: 1/23/2024
Audit Inspection By: Pamela
Audit Inspection Date: 1/24/2024

Repair and Remanufacture

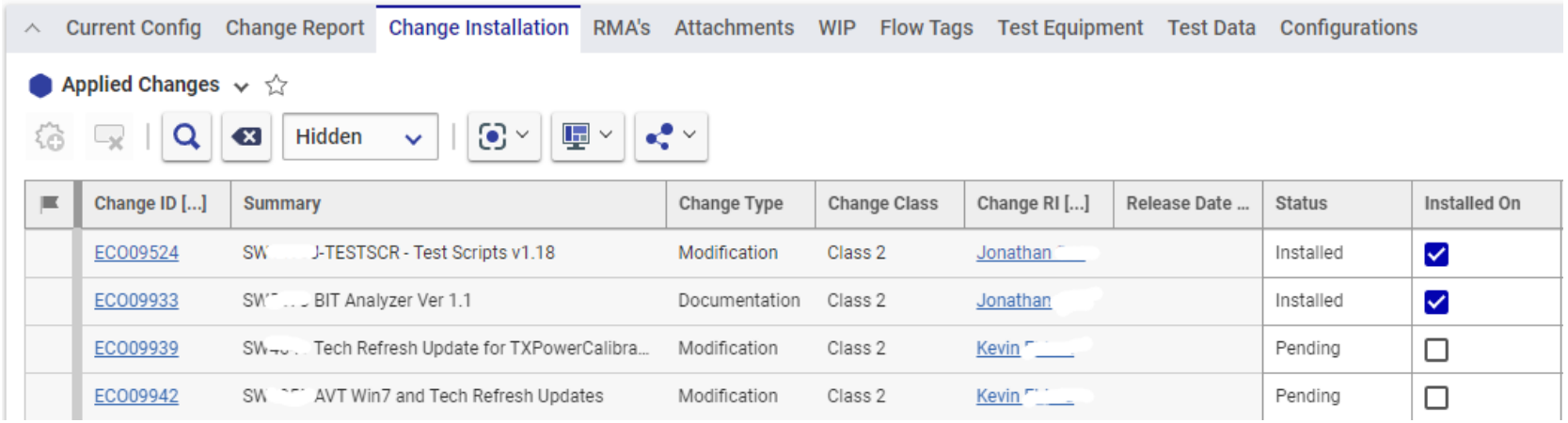
Day | Week | Month | Longer

- Repair
  - Versions the serialized part
  - Promotes it to a workable state
- Remanufacture
  - Additionally (and Optionally) updates the as built to the specified revision level.





Change Tracking



Change ID [...]	Summary	Change Type	Change Class	Change RI [...]	Release Date ...	Status	Installed On
ECO09524	SW J-TESTSCR - Test Scripts v1.18	Modification	Class 2	Jonathan		Installed	☑
ECO09933	SW BIT Analyzer Ver 1.1	Documentation	Class 2	Jonathan		Installed	☑
ECO09939	SW Tech Refresh Update for TXPowerCalibra...	Modification	Class 2	Kevin		Pending	☐
ECO09942	SW AVT Win7 and Tech Refresh Updates	Modification	Class 2	Kevin		Pending	☐

- Change Installation status.
  - » The returned configuration often differs from as delivered.
  - » Customers may perform field repairs or modifications.
  - » Customers may not want to pay for installing all changes
- Capturing changes installed later in life.

Possibility 14

Assembly & Test Records (2020)

Assembly and Test for R&D

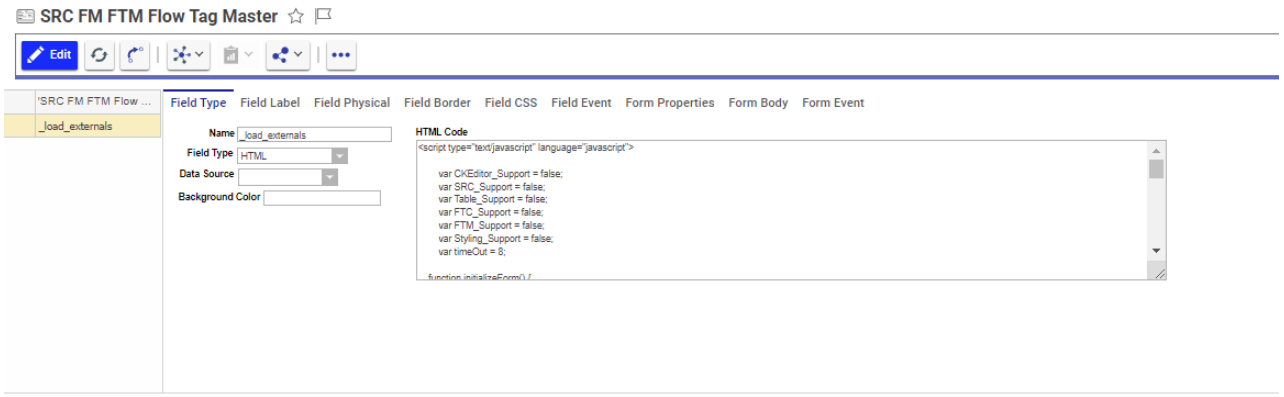
- Flow Tags capture assembly and test data
  - Development builds & RMA work
  - More flexible than an MES system.
  - Flow Tags are one-to-one with serialized parts.
- The steps and requirements differ for every part.
  - Flow Tag Masters define Flow Tag content on a per part basis.
  - Each time we build a part we create a Flow Tag from the master.

Possibility 15

Roll-Your-Own Forms Designer

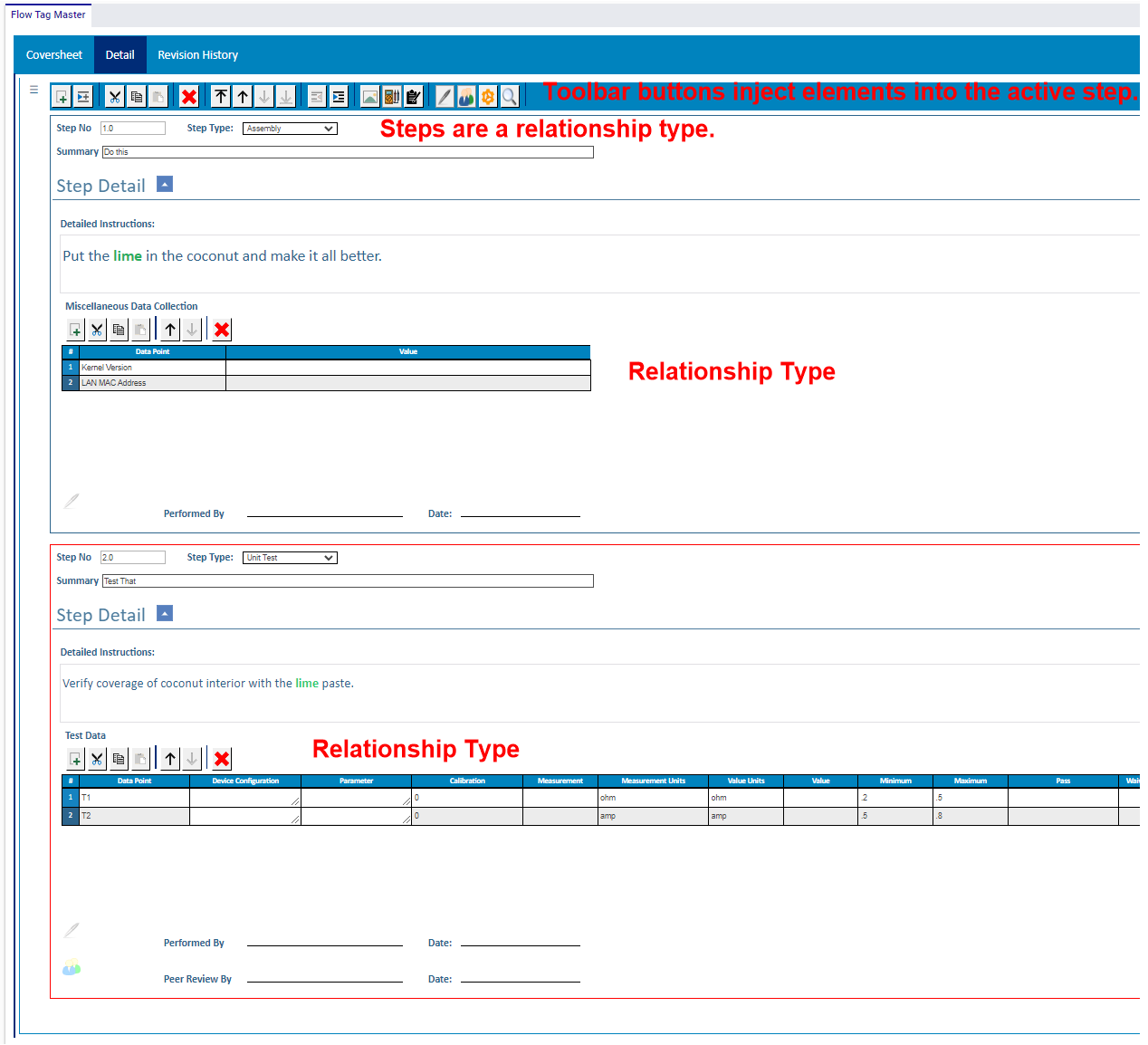
Assembly and Test for R&D

- This is NOT easy to do!
- Flow Tag and Flow Tag Master Forms are blank.
  - At right – that's all of it!
  - Bootstrapping code loads an external code module. (We used Visual Studio & TypeScript).
  - The external code draws the form's elements.



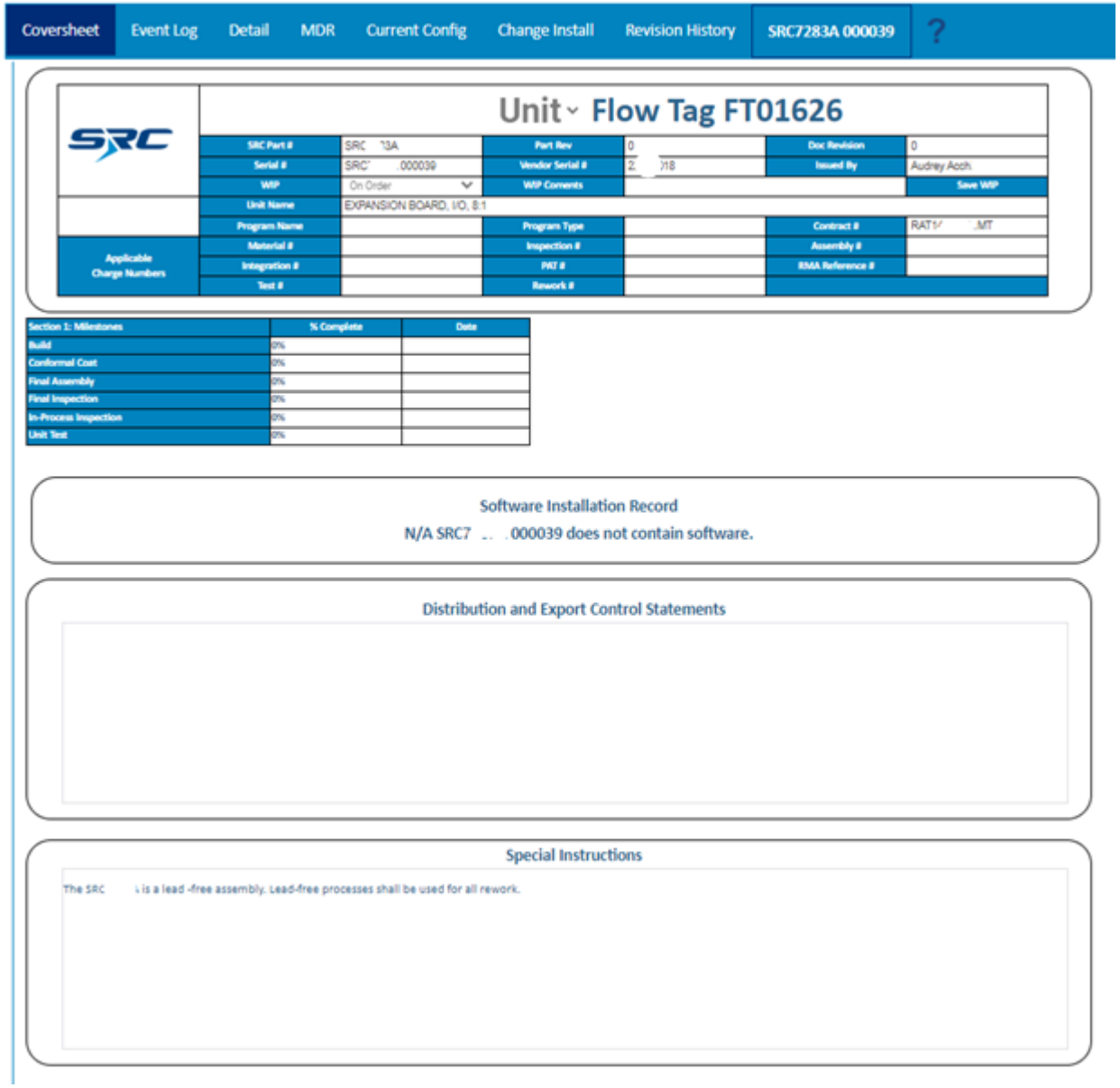
Flow Tag Masters

- At run time, the author draws flow tag steps selecting needed elements from the authoring tool bar.
  - » Data collects
  - » Test Measurements
  - » Instructions
  - » Signoffs
  - » Fixed Elements



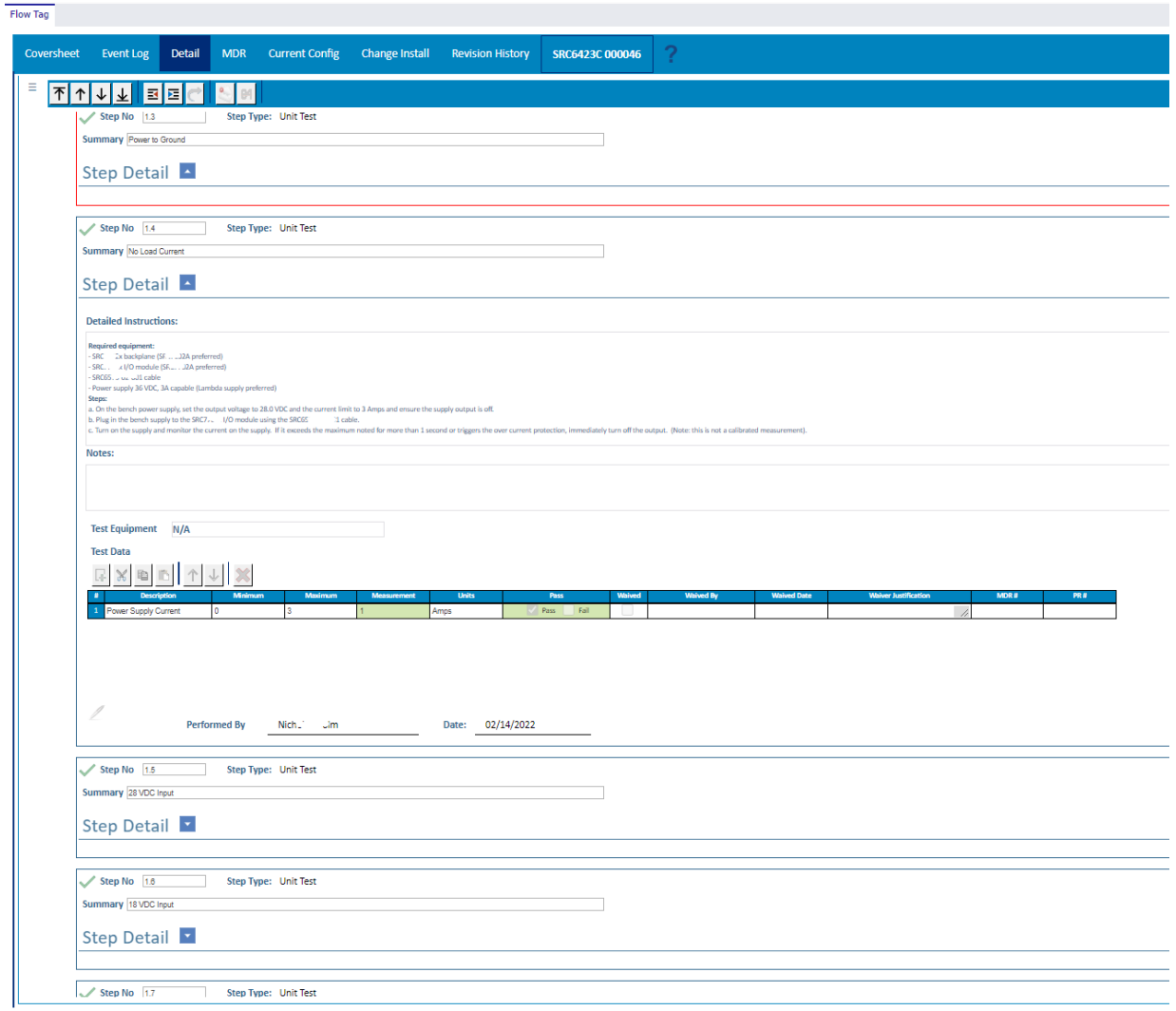
Flow Tag

- The Master is copied to the Flow Tag and extended with performance data.
- At runtime flow tag, it looks like this.
  - Tabbed interface
  - As with the trade form, flow tags display relationships in the form body.
    - » 17 Relationships



Assembly and Test: Flow Tag

- Integrates with
  - Serialized Part
    - » Read/Writes to As built
    - » Read/Writes ECN Change Installation
  - Material Deficiency Reports
    - » Quality System Federation



Possibility 16

Assembly Data Extends the Digital Thread

Extending the thread

- Serialized Part Tab display
  - All flow tags ever used (build & repair)
  - All test measurements
  - All test equipment
- Test Equipment
  - Where used
  - Not showing the Equipment Management (2021) package today
    - » Maybe next year

Foreign Influences (2014 – 2023)

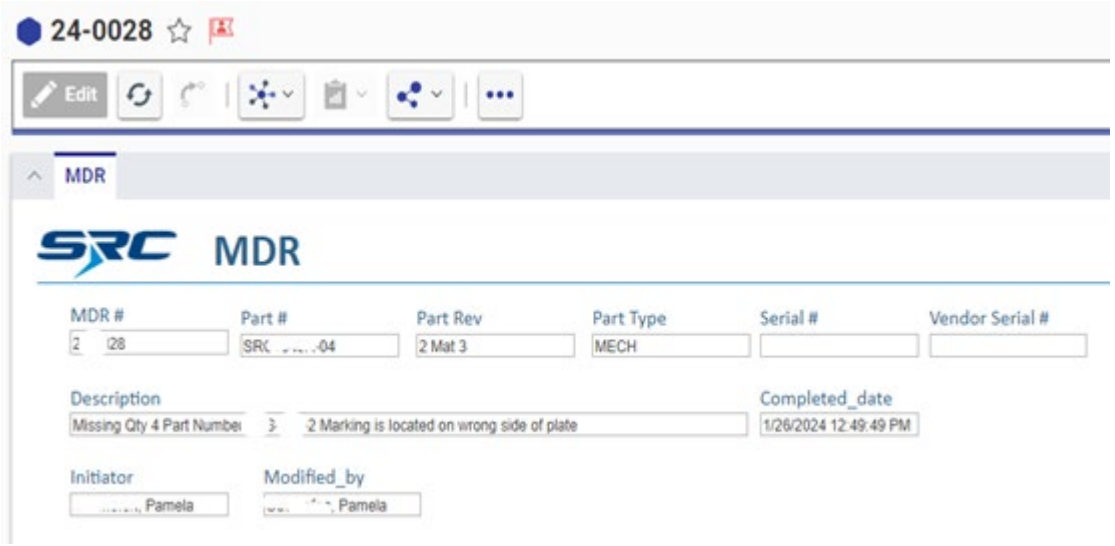
Possibility 17

Silo Demolition with Federation

Quality System (2020)

Day | **Week** | Month | Longer

- Material Deficiency Reports exist in the Quality System
  - MDRs are viewable, searchable and sortable in Innovator
  - Even have their own form
  - Flow Tag - MDR relationship

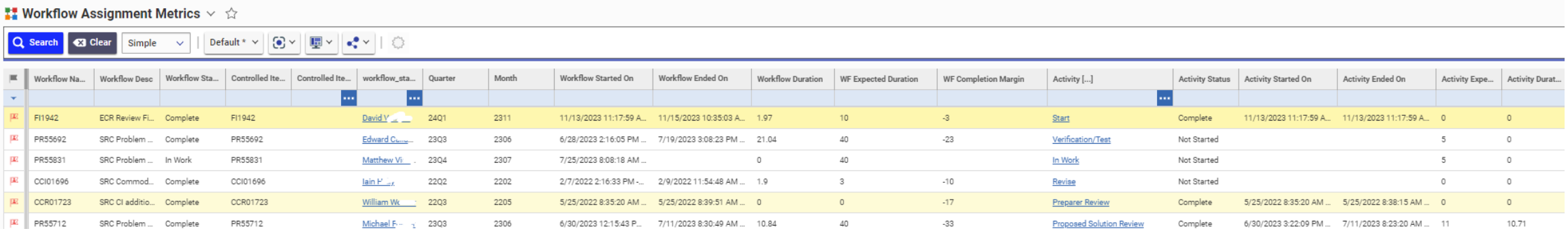


Possibility 18

Federation Can Display SQL Views as Items

Self Federation (2023)

- Federation is useful for more than integration.
  - Examples
    - » Workflow Status
    - » Various Process Metrics



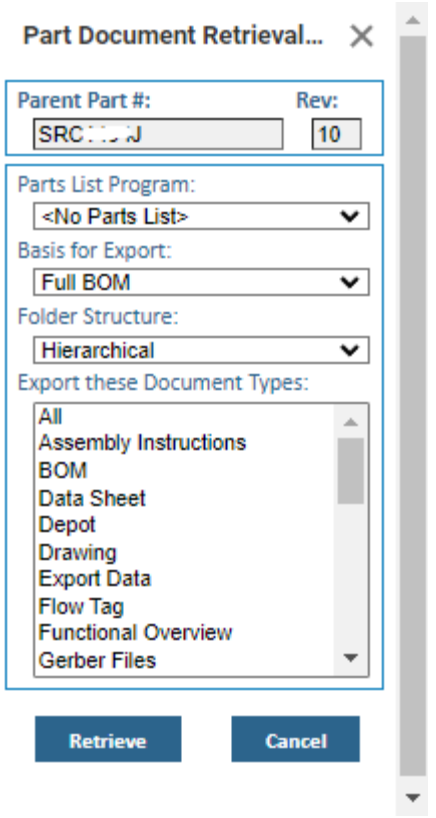
Workflow Na...	Workflow Desc	Workflow Sta...	Controlled Ite...	Controlled Ite...	workflow_sta...	Quarter	Month	Workflow Started On	Workflow Ended On	Workflow Duration	WF Expected Duration	WF Completion Margin	Activity [...]	Activity Status	Activity Started On	Activity Ended On	Activity Expe...	Activity Durat...
FI1942	ECR Review Fi...	Complete	FI1942		David V	24Q1	2311	11/13/2023 11:17:59 A...	11/15/2023 10:35:03 A...	1.97	10	-3	Start	Complete	11/13/2023 11:17:59 A...	11/13/2023 11:17:59 A...	0	0
PR55692	SRC Problem ...	Complete	PR55692		Edward C...	23Q3	2306	6/28/2023 2:16:05 PM ...	7/19/2023 3:08:23 PM ...	21.04	40	-23	Verification/Test	Not Started			5	0
PR55831	SRC Problem ...	In Work	PR55831		Matthew Vi	23Q4	2307	7/25/2023 8:08:18 AM ...		0	40		In Work	Not Started			5	0
CCI01696	SRC Commod...	Complete	CCI01696		Iain H	22Q2	2202	2/7/2022 2:16:33 PM -...	2/9/2022 11:54:48 AM ...	1.9	3	-10	Revise	Not Started			0	0
CCR01723	SRC CI additio...	Complete	CCR01723		William W	22Q3	2205	5/25/2022 8:35:20 AM ...	5/25/2022 8:39:51 AM ...	0	0	-17	Preparer Review	Complete	5/25/2022 8:35:20 AM ...	5/25/2022 8:38:15 AM ...	0	0
PR55712	SRC Problem ...	Complete	PR55712		Michael F	23Q3	2306	6/30/2023 12:15:43 P...	7/11/2023 8:30:49 AM ...	10.84	40	-33	Proposed Solution Review	Complete	6/30/2023 3:22:09 PM ...	7/11/2023 8:23:20 AM ...	11	10.71

Possibility 19

Generate Technical Data Packages

Technical Data Package Generator (2013)

- A Part Item Action
  - A TDP is a set of part named folders containing document arranged by BOM Hierarchy.
  - Multiselect document types
  - TDP is constructed server-side
  - Returned as a zip file.



Possibility 20

Boost Productivity with Federation

Purchasing (2023)

- Buyers were creating hundreds of TDPs serially for each part on their “Buy List”.
  - Using federation we expose the purchasing system “Buy List” in Innovator.
  - Multi-select from hundreds of parts on buyer’s list for one click TDPs Creation

User Accounts

- Automate User Account Maintenance (2015)
  - Nightly batch process
    - » Shut user accounts off automatically on termination.
    - » Update name, title changes and other information
- Smart Creation of User Accounts (2023)
  - We use login name to query the HR system.
  - Populates the user record during onBeforeAdd

Thank You

Kevin Murray
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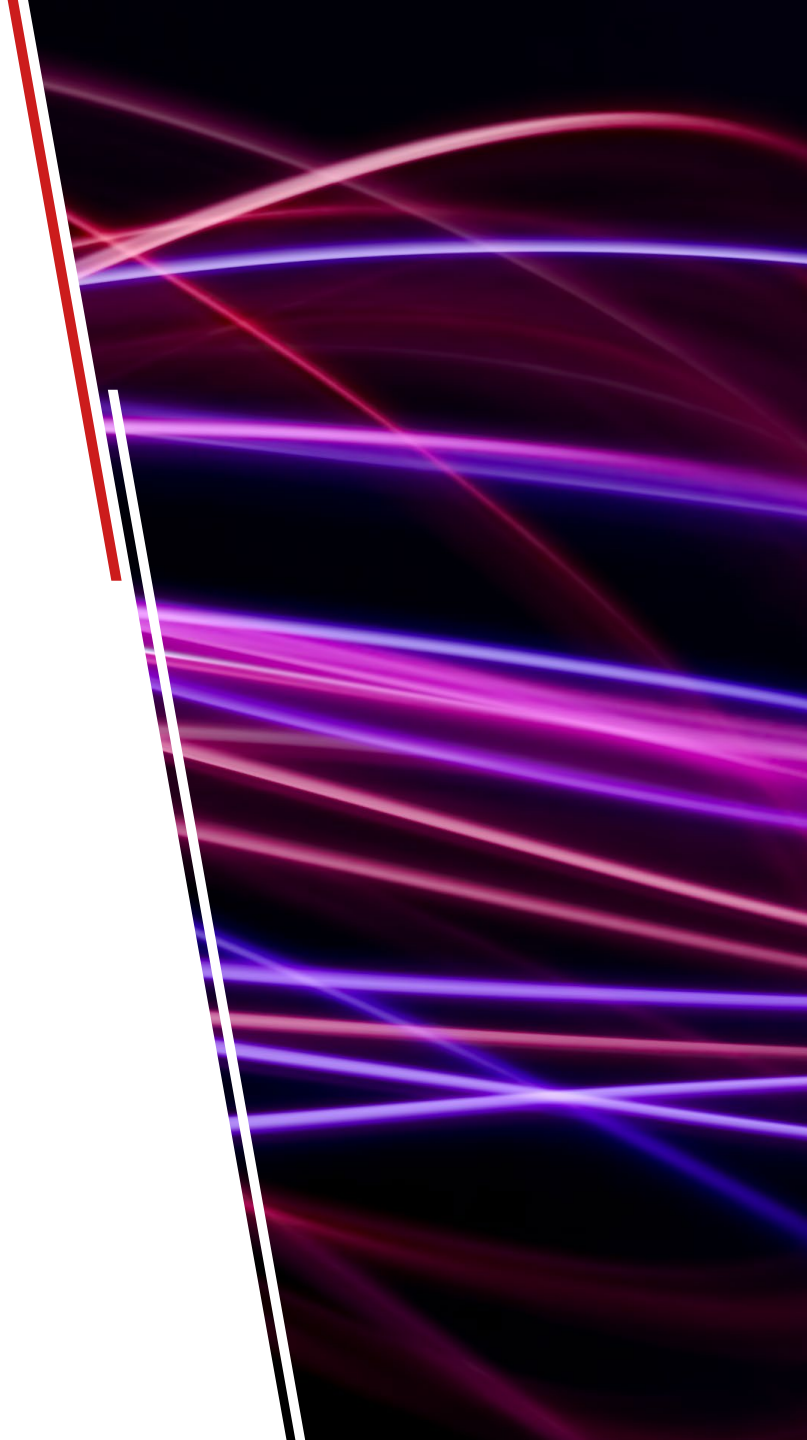

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