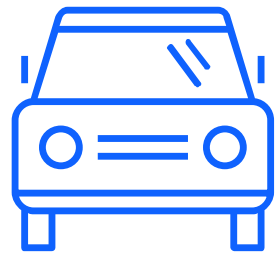


# IBM Engineering Roadmap Update: What You Need to Know

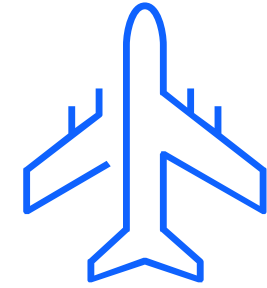
Fariz Saracevic  
Senior Product Manager



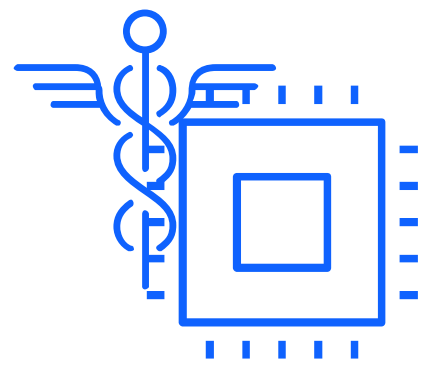
# IBM Engineering enables customers with complex engineering needs



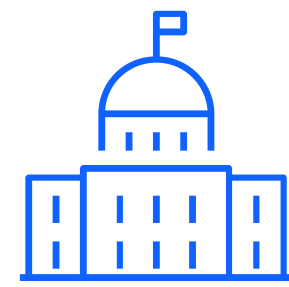
Automotive



Aerospace &  
Defense



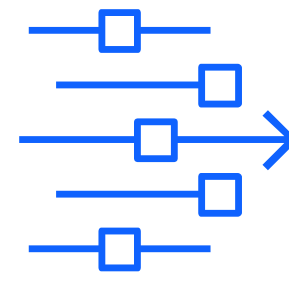
Electronics &  
Medical Devices



Public &  
Government



Regulated Finance &  
Insurance



Infrastructure

## Our strategic focus addresses

### Complexity

deliverable interacts with multiple other systems

### Compliance

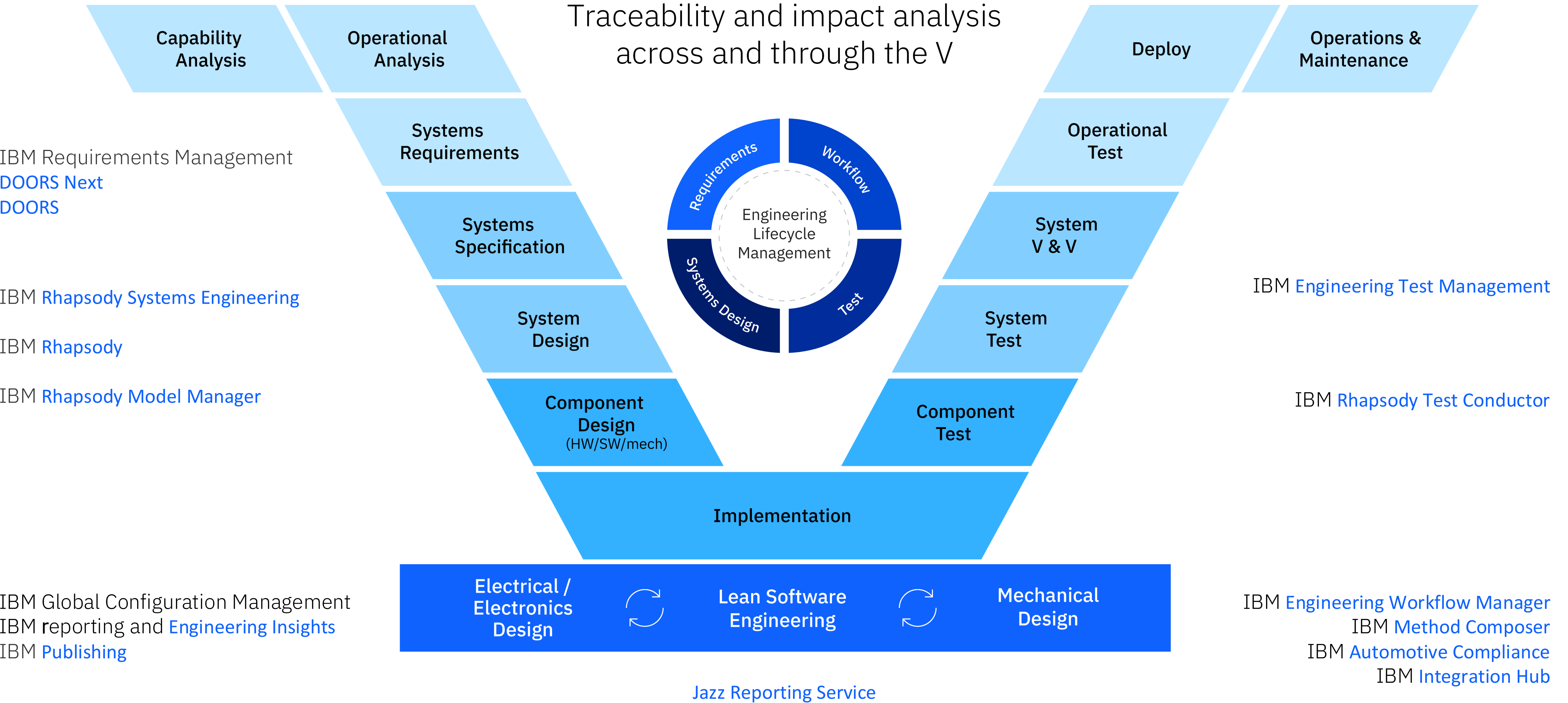
safety- and mission-critical systems, including those subjected to regulatory standards

### Distributed Work

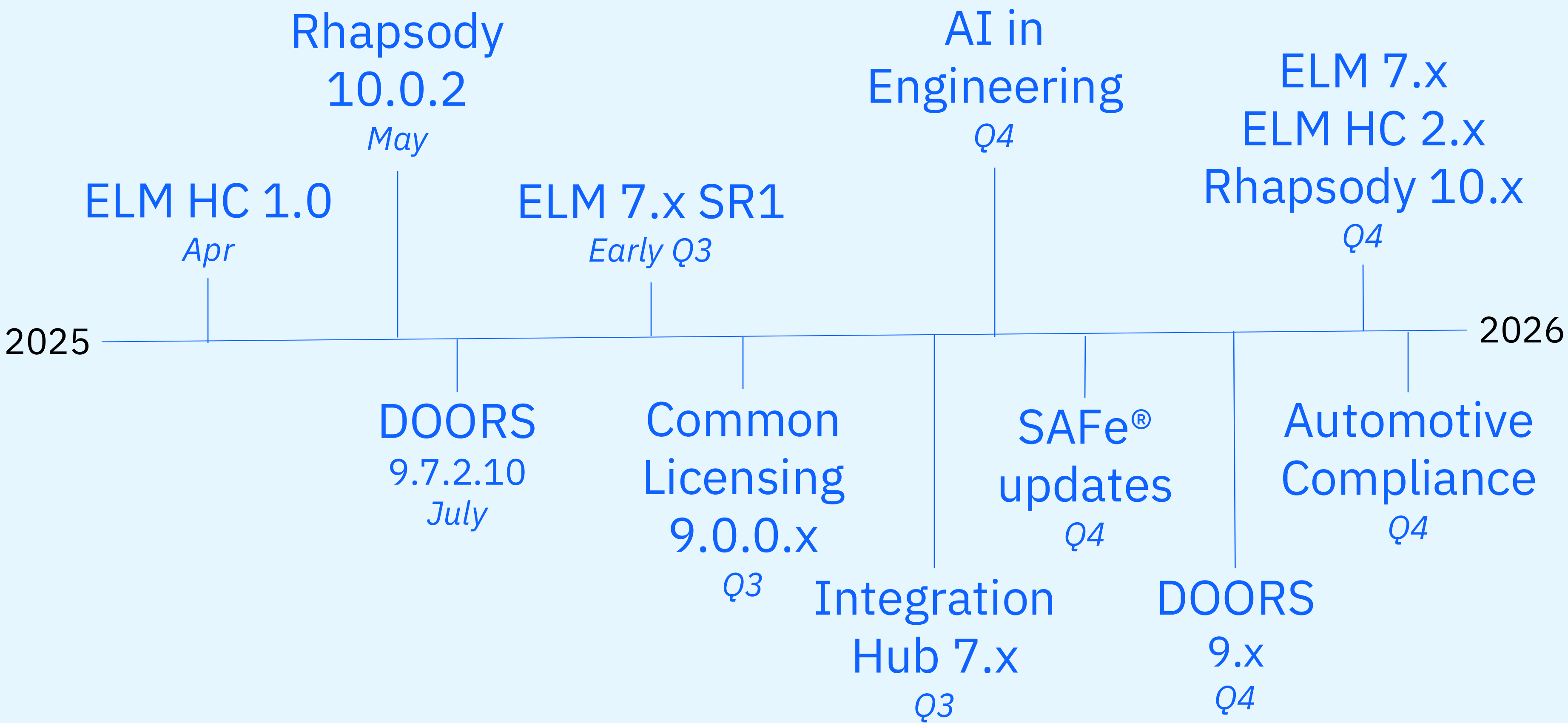
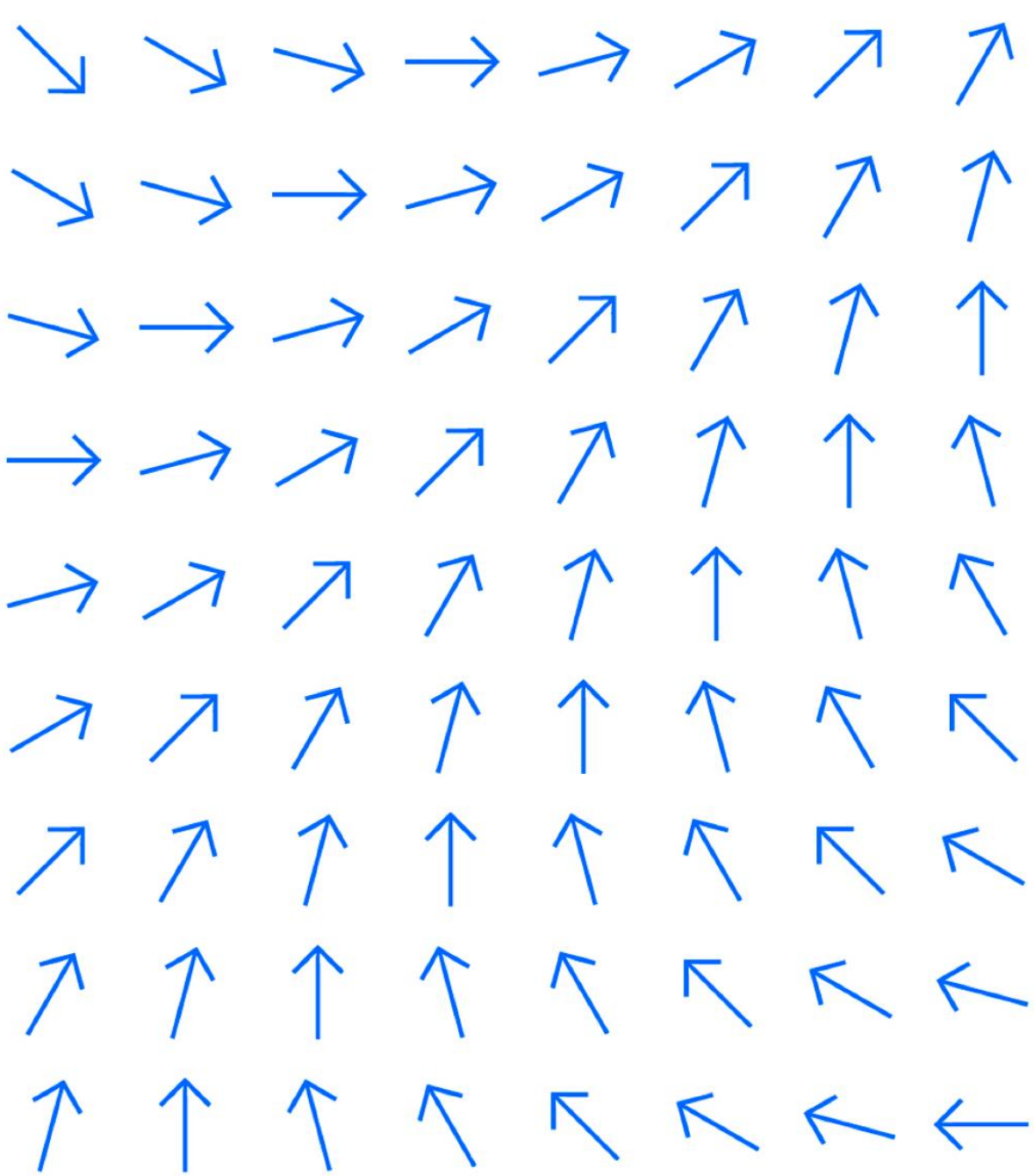
large, multi-faceted development organizations or partner/supplier chains

ELM is the foundation for complex software and systems development

# IBM Engineering solution



# IBM ELM deliveries projected in 2025

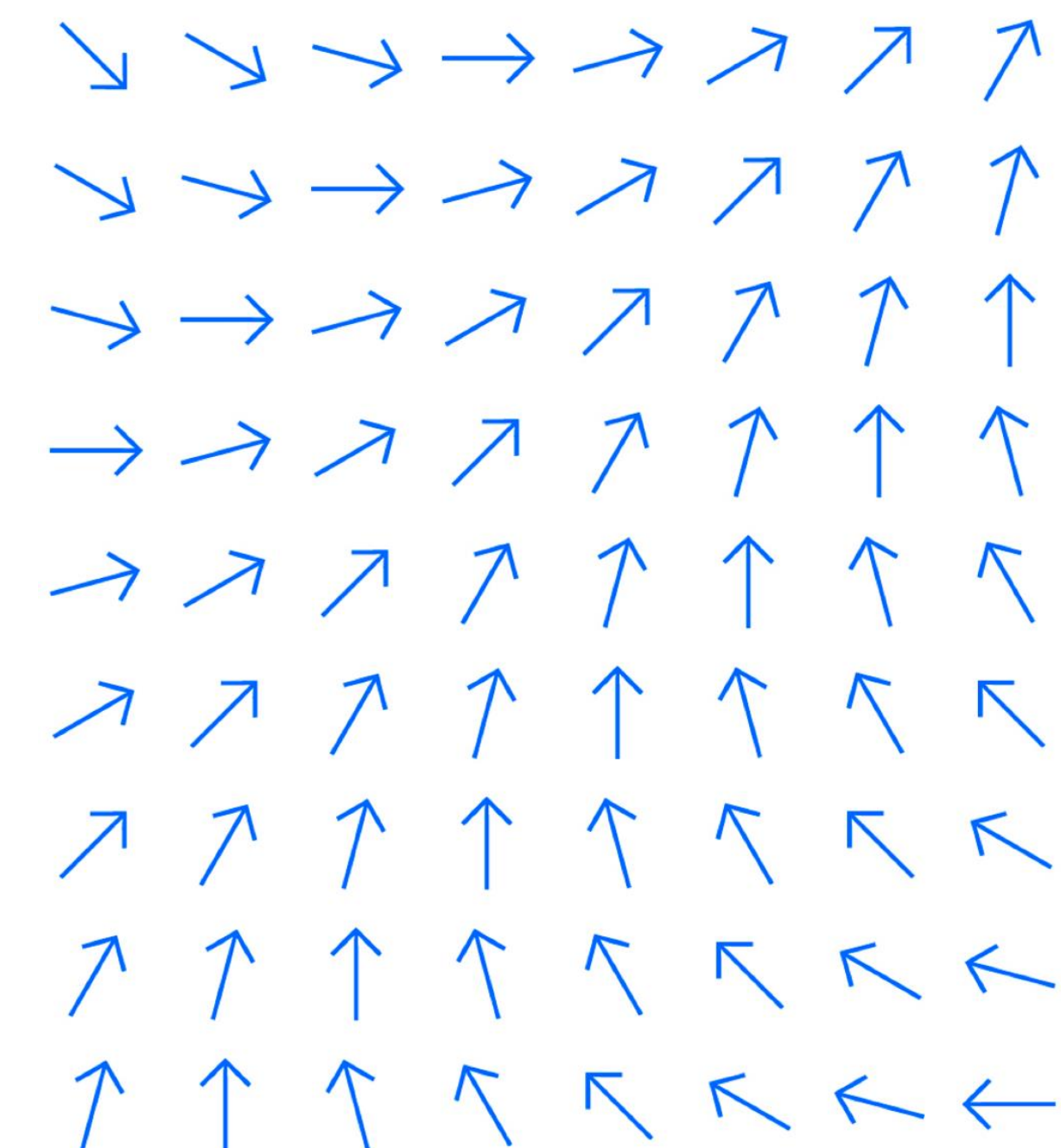


Quarterly: Rhapsody Systems Engineering releases  
Regularly: ELM iFixes



# ELM 7.1

builds on IBM  
leadership in...



## 1

### Digital Thread

Defines and helps teams manage dependencies among engineering data from their tools

Link between models with OSLC-AM (RMM), including with the new Rhapsody Systems Engineering (employing SysML v2)

Simplified linking: drag-n-drop across RMM browser windows

Larger/more convenient drop zone for work item drag-n-drop linking and adding attachments

Engineering Insights knowledge / traceability graph using LQE rs

## 2

### Reporting

Automates the gathering and presentation of project and program-wide status information and program deliverables

Report on additional dimensions in historical metrics when using LQE

Built-in Report Builder type explorer documents data source schemas, simplifying advanced report authoring

Reporting performance, scale reliability, availability:

- New relational database store for LQE is the default
- DOORS Next log-based TRS required
- Removed many cases for needing to reindex

## 3

### Configuration and Change Management

Improves the process of defining, reviewing, and changing artifacts in the context of the larger product under design or development

Create DOORS Next baseline at a time in the past

Export requirements in a baseline using an existing ReqIF definition

Enforce unique config names in ETM

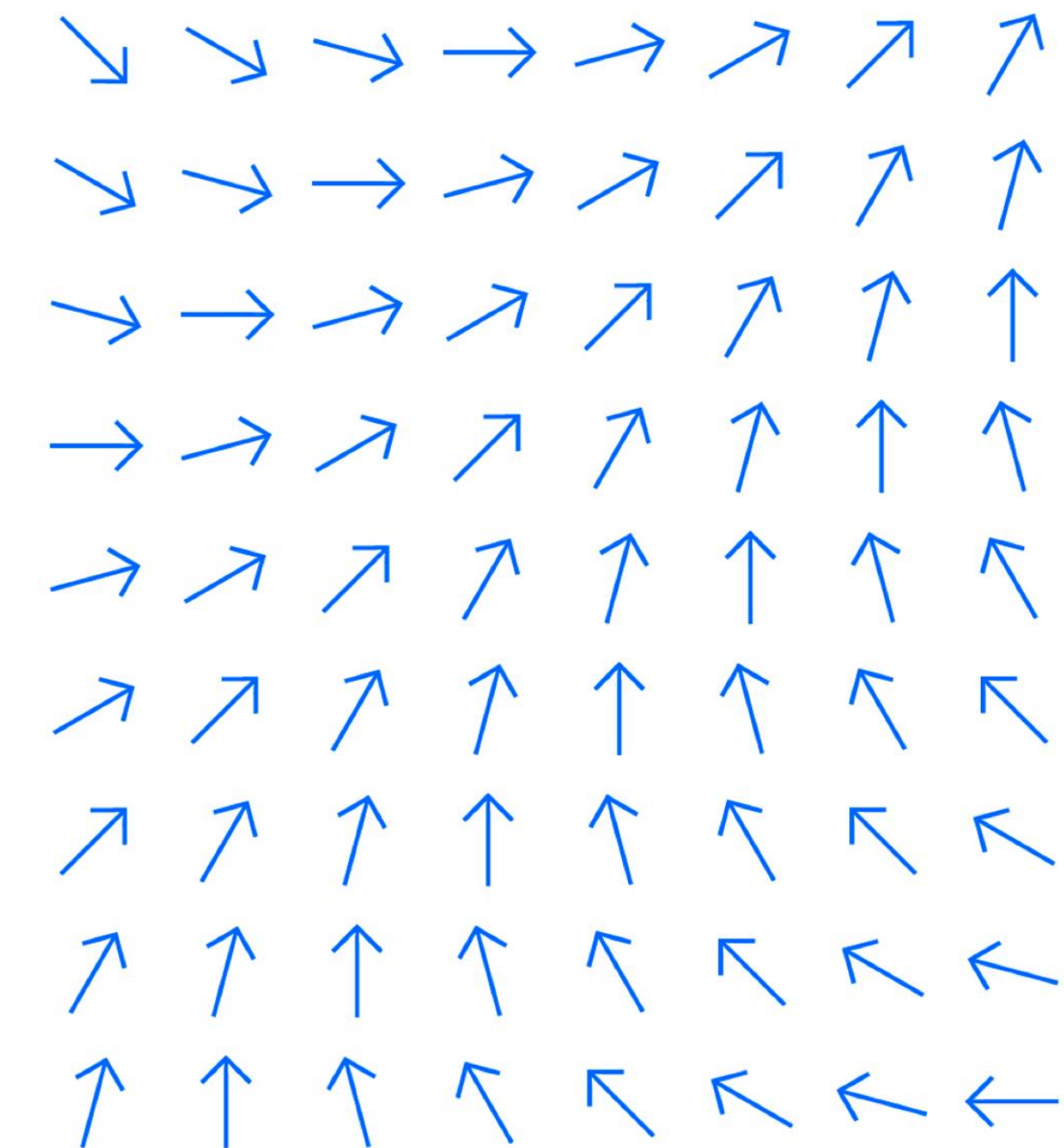
Use a more flexible and consistent grammar for more predictable EWM-Git workflow

Code review improvements

LDX rs: link index moved to relational store and combined with LQE rs (one less server!)

# ELM 7.1

## builds on IBM leadership in...



### 4

#### Agile Engineering

Facilitates planning and managing work to reduce time to market, minimize bottlenecks, and accelerate the flow of work across the value stream for continuous value delivery

Express yourself: images and tables in work items descriptions

Enhance agility using latest guidance for SAFe®

- Updated flow metrics reports and templates

Extend Automotive Compliance

- ASPICE 4.0 updates
- ASPICE for Cybersecurity
- Improved TARA and guidance on vulnerability management

### 5

#### User Productivity

Practitioners and administrators can work faster with less overhead and fewer opportunities for error

Get the requirements data you need in front of you:

- Ancestors and descendants
- Advanced filtering

Easier navigation through Rhapsody models in web browser with RMM sidebar model explorer

### 6

#### Operating at Scale

With hardened deployments, increased data and user scale, and keeping current with the specific operation environment and integrations

Easier auditing of user access and permissions

- APIs and logging

Performance optimizations

- Significant improvements in report queries with LQE rs
- Significant improvements in versioned link lookups for UIs with LDX rs
- Other improvements

Secure deployments

- updates to components, specified operating environment, and integrations

# DOORS Next



# Complex Expressions with AND/OR Boolean Operators

IBM Engineering Requirements Management DOORS Next (/rm)

Z-CM-001-RM

AMR

Change set NOT required

Pam Turner

Search Artifacts

Project Dashboard

Artifacts

Reviews

Reports

1523439 AMR System Requirements Specification

Create

Apply

All match (AND)

No filters. Add filters to only list matching artifacts

Add filter

Add group

Edit in new window

Close filters

Views

Search Views

Gold Plating

Trace to Stakeholder Requirements

Upstream and Downstream Traceability (Satisfaction)

All Status

Approved Requirements

	ID	Contents
<input type="checkbox"/>	1523516	1 Introduction
<input type="checkbox"/>	1523681	1.1 Purpose of the Document
<input type="checkbox"/>	1523702	This document describes the specific functionality of the Automated Meter Reader system. The system is currently available with a handheld collection device. The mobile and fixed network methods of data collection are outside the scope of this system.
<input type="checkbox"/>	1523466	2 General Description
<input type="checkbox"/>	1523587	2.1 Functions and Purpose
<input type="checkbox"/>	1523630	The AMR system is used to determine water service / consumption for the more than 79,000 meter connections to residential, commercial and industrial customers inside a 72 square mile area.
<input type="checkbox"/>	1523699	In handheld AMR, a meter reader carries a handheld computer with a built-in or attached receiver/transceiver (radio frequency or touch) to collect meter readings from an AMR capable meter. This is sometimes referred to as "walk-by" meter reading since the meter reader walks by the locations where meters are installed as they go through their meter reading route. Handheld computers may also be used to manually enter readings without the use of AMR technology as an alternate but this will not support comprehensive data which can be accurately read using the meter reading electronically.
<input type="checkbox"/>	1523650	<AMR Artist Rendition>

Showing 72 of 72 (100%)

IBM

jazz



# Complex Expressions with AND/OR Boolean Operators

IBM Engineering Requirements Management DOORS Next (/rm)

Z-CM-001-RM

AMR

Change set NOT required

Pam Turner

Project Dashboard

Artifacts

Reviews

Reports

Search Artifacts

... / 01 Requirements /

1523439 AMR System Requirements Specification

Create

Apply

All match (AND)

All match (AND)

All match (AND)

Some match (OR)

Not all match (AND NOT)

None match (OR NOT)

Add group

Views

Search Views

Gold Plating

Trace to Stakeholder Requirements

Upstream and Downstream Traceability (Satisfaction)

All Status

Approved Requirements

Show

Ancestors

Descendants

Highlight filter matches

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Showing 72 of 72 (100%)

IBM.

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# Complex Expressions with AND/OR Boolean Operators

IBM Engineering Requirements Management DOORS Next (/rm)

Z-CM-001-RM

AMR

Change set NOT required

Pam Turner

Search Artifacts

Project Dashboard

Artifacts

Reviews

Reports

1523439 AMR System Requirements Specification

Create

Apply

All match (AND)

Some match (OR)

Name contains unit

Name contains device

Add filter

Add group

Views

Search Views

Gold Plating

Trace to Stakeholder Requirements

Upstream and Downstream Traceability (Satisfaction)

All Status

Approved Requirements

Show

Ancestors

Descendants

Highlight filter matches

	ID	Contents
<input type="checkbox"/>	1523653	The handheld device shall provide a means to automatically (electronically) read the meter.
<input type="checkbox"/>	1523664	Individual meter usage data and leak diagnostic data, when successfully uploaded to the handheld device, shall be immediately available for display on the handheld device.
<input type="checkbox"/>	1523544	The handheld device shall display the following data for leakage: timestamp, meter ID
<input type="checkbox"/>	1523535	3.1.2 Meter Interface Unit
<input type="checkbox"/>	1523632	The meter interface unit shall operate using walk-by, mobile (vehicle-based), and mesh network collection platforms.
<input type="checkbox"/>	1523703	The meter interface unit shall support all data collection functions (data reading, time-triggered operation, and management) of the AMR system.

Showing 34 of 34 (100%)

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# Complex Expressions with AND/OR Boolean Operators

IBM Engineering Requirements Management DOORS Next (/rm)

Z-CM-001-RM

AMR

Change set NOT required

Pam Turner

Search Artifacts

Project Dashboard

Artifacts

Reviews

Reports

1523439 AMR System Requirements Specification

Create

Apply

All match (AND)

Name

contains

handheld

None match (OR NOT)

Name

contains

unit

Name

contains

device

Add filter

Add group

Edit in new window

Close filters

Views

Search Views

Gold Plating

Trace to Stakeholder Requirements

Upstream and Downstream Traceability (Satisfaction)

All Status

Show

Ancestors

Descendants

Highlight filter matches

	ID	Contents
<input type="checkbox"/>	1523699	In handheld AMR, a meter reader carries a handheld computer with a built-in or attached receiver/transceiver (radio frequency or touch) to collect meter readings from an AMR capable meter. This is sometimes referred to as "walk-by" meter reading since the meter reader walks by the locations where meters are installed as they go through their meter reading route. Handheld computers may also be used to manually enter readings without the use of AMR technology as an alternate but this will not support comprehensive data which can be accurately read using the meter reading electronically.
<input type="checkbox"/>	1523762	Meter usage data and leak diagnostic data shall be retrievable on demand from any meter interface via the network or a handheld.

Showing 2 of 38 (5%)

IBM.

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# Complex Expressions with AND/OR Boolean Operators

IBM Engineering Requirements Management DOORS Next (/rm)

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Z-CM-001-RM

AMR ▾

Project Dashboard

Artifacts

Reviews

Reports

Change set NOT required ▾

Pam Turner

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Search Artifacts

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... / 01 Requirements /

1523439 AMR System Requirements Specification

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⬅

Create ▾

Filters are open in a separate window

Edit here

Bring to front

⬅

Views

Search Views 🔍

Gold Plating

Trace to Stakeholder Requirements

Upstream and Downstream Traceability (Satisfaction)

All Status

Approved Requirements

Show

☐ Ancestors

☐ Descendants

	ID	Contents
<input type="checkbox"/>	1523699	In handheld AMR, a meter readings from an AMR are installed as they go technology as an alternative
<input type="checkbox"/>	1523762	Meter usage data and

Showing 2 of 38 (5%)

Filter - Requirements Management (RM) - Google Chrome

Not secure https://svtperfihs.dev.fyre.ibm.com:9443/rm/edit-filters#artifactURI=https%3A%2F%2Fsvtperfihs.dev.fyre.ibm...

Filter - AMR System Requirements Specification

Close

Apply

All match (AND)

Name

contains

handheld

✎

⊖

None match (OR NOT) ▾

⊖

Name

contains

unit

✎

⊖

Name

contains

device

✎

⊖

+ Add filter

📁 Add group

+ Add filter

📁 Add group

IBM.



# Show Ancestors/Descendants

IBM Engineering Requirements Management DOORS Next (/rm)

Z-CM-001-RM

AMR

Change set NOT required

Pam Turner

Search Artifacts

Project Dashboard

Artifacts

Reviews

Reports

1523439 AMR System Requirements Specification

Create

View: Approved Requirements

Type to filter artifacts by text or by ID

Views

Search Views

Gold Plating

Trace to Stakeholder Requirements

Upstream and Downstream Traceability (Satisfaction)

All Status

Approved Requirements

Show

Ancestors

Descendants

Highlight filter matches

ID	Contents	Status
1523531	The handheld device shall provide for the means for the meter reader to manually enter a meter reading.	Approved
1523775	The handheld device shall include a leak indicator.	Approved
1523653	The handheld device shall provide a means to automatically (electronically) read the meter.	Approved
1523502	The meter interface unit shall employ two-way communications down to the endpoint making it possible for operators to 'push' interval data requests, firmware updates, new capabilities and updated monitoring schedules via the network.	Approved
1523719	The meter interface unit shall be powered by a replaceable long lasting battery (lithium or other).	Approved
1523625	The systems shall forward a reading from a more remote area back to a main collector without actually storing it.	Approved
1523772	The system shall consist of a series of antennas, towers, collectors, repeaters, or other permanently installed infrastructure to collect transmissions of meter readings from AMR capable meters and get the data to a central computer without a person in the field to collect it.	Approved
1523761	The control computer shall be capable of operating in a normal office environment.	Approved
1523781	The handheld unit shall function in environments from -5 degree C through +50 degree C.	Approved
1523611	The handheld unit shall function in environments with 99% ambient humidity.	Approved
1523499	The meter interface unit shall be able to store data into nonvolatile RAM which does not need power supply to maintain memory.	Approved

Showing 11 of 72 (15%)

IBM

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# Show Ancestors/Descendants

IBM Engineering Requirements Management DOORS Next (/rm)

Z-CM-001-RM

AMR

Change set NOT required

Pam Turner

Project Dashboard

Artifacts

Reviews

Reports

Search Artifacts

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1523439 AMR System Requirements Specification

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Create

View: Approved Requirements

Type to filter artifacts by text or by ID

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Views

Search Views

Gold Plating

Trace to Stakeholder Requirements

Upstream and Downstream Traceability (Satisfaction)

All Status

Approved Requirements

Show

☒ Ancestors

☐ Descendants

☐ Highlight filter matches

ID	Contents	Status
1523574	3 System Requirements	
1523552	3.1 Functional Requirements	
1523482	3.1.1 Handheld device	
1523531	The handheld device shall provide for the means for the meter reader to manually enter a meter reading.	Approved
1523775	The handheld device shall include a leak indicator.	Approved
1523653	The handheld device shall provide a means to automatically (electronically) read the meter.	Approved
1523535	3.1.2 Meter Interface Unit	
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1523719	The meter interface unit shall be powered by a replaceable long lasting battery (lithium or other).	Approved
1523663	3.1.3 Fixed Network Automated Meter Reading System	
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1523517	3.2 Non-Functional Requirements	

Showing 21 of 72 (29%)

IBM.

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# Show Ancestors/Descendants

IBM Engineering Requirements Management DOORS Next (/rm)

Z-CM-001-RM

AMR

Change set NOT required

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Project Dashboard

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1523439 AMR System Requirements Specification

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Create

View: Approved Requirements

Type to filter artifacts by text or by ID

⏭

Views

Search Views

Gold Plating

Trace to Stakeholder Requirements

Upstream and Downstream Traceability (Satisfaction)

All Status

Approved Requirements

Show

☒ Ancestors

☒ Descendants

☐ Highlight filter matches

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1523502	The meter interface unit shall employ two-way communications down to the endpoint making it possible for operators to 'push' interval data requests, firmware updates, new capabilities and updated monitoring schedules via the network.	Approved
1523782	The meter interface unit shall be compatible with the existing meter models in use for the area covered by this project.	In Process
1523719	The meter interface unit shall be powered by a replaceable long lasting battery (lithium or other).	Approved
1523558	The meter interface unit shall capture usage data hourly and store this consumption data for up to 365 days. This hourly consumption data is considered usage profile data.	In Process
1523762	Meter usage data and leak diagnostic data shall be retrievable on demand from any meter interface via the network or a handheld.	Obsolete
1523663	3.1.3 Fixed Network Automated Meter Reading System	

Showing 24 of 72 (33%)

https://svtperfihs.dev.fyre.ibm.com:9443/rm/web#action=com.ibm.rdm.web.pages.showReport...

Jazz

# Show Ancestors/Descendants

IBM Engineering Requirements Management DOORS Next (/rm)

Z-CM-001-RM

AMR

Project Dashboard | Artifacts | Reviews | Reports

Change set NOT required

Pam Turner

Search Artifacts

1523439 AMR System Requirements Specification

Create

View: Approved Requirements

Type to filter artifacts by text or by ID

Views

Search Views

Gold Plating

Trace to Stakeholder Requirements

Upstream and Downstream Traceability (Satisfaction)

All Status

Approved Requirements

Show

☒ Ancestors

☒ Descendants

☒ Highlight filter matches

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Showing 24 of 72 (33%)

https://svtperfihs.dev.fyre.ibm.com:9443/rm/web#action=com.ibm.rdm.web.pages.showProjectDashboard&componentURI=https%3A%2F%2Fsvtperfihs.d...

jazz



# Show Ancestors/Descendants

IBM Engineering Requirements Management DOORS Next (/rm)

Z-CM-001-RM

AMR

Project Dashboard

Artifacts

Reviews

Reports

Change set NOT required

Pam Turner

Search Artifacts

←

... / 01 Requirements /

1523439 AMR System Requirements Specification

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Create

View: Approved Requirements

Type to filter artifacts by text or by ID

⏭

Views

Search Views

Gold Plating

Trace to Stakeholder Requirements

Upstream and Downstream Traceability (Satisfaction)

All Status

Approved Requirements

Show

☒ Ancestors

☒ Descendants

☒ Highlight filter matches

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Showing 24 of 72 (33%)

https://svtperfihs.dev.fyre.ibm.com:9443/rm/web#action=com.ibm.rdm.web.pages.showProjectDashboard&componentURI=https%3A%2F%2Fsvtperfihs.d...

jazz

# Create a historical baseline

IBM Engineering Requirements Management DOORS Next (/rm)

Z-CM-001-RM

AMR

AMR Initial Stream

Pam Turner

Project Dashboard

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Modules

Collections

Create

Type to filter artifacts by text or by ID

Folders

Views

AMR

00 Admin

01 Requirements

02 Reference

Module Template

Terms

Use Case Content

Actors

1523449

1523448

1523447

1523446

1523445

1523444

1523443

1523442

1523441

AMR Hazards and Risks

Software Requirements Specification

Showing 11 of 11 Artifacts

Create Baseline

Create a baseline of the "AMR Initial Stream" stream.

Name: \*

Before Review Started

Description:

Create Time:

Now

8/15/2024

08:00:00

Cancel

Create

# Improved DOORS Next TRS

The DOORS Next Tracked Resource Set (TRS) service is now **more resilient** to unplanned server outages and heavy server load.

It provides data to (1) LQE for reporting (Report Builder, Engineering Insights) and (2) LDX for versioned link information when using global configurations.

The improved **log-based TRS** replaces the previous **event-based TRS**.

**New installations:** New DOORS Next v7.1 server deployments use the new, improved log-based TRS

**Upgrading to 7.1:** Switching to log-based TRS required\* as part of the upgrade process. This includes a DOORS Next TRS rebase operation and LQE reindex of the DOORS Next TRS data

For additional details, see the interactive upgrade guide.

# Workflow Management



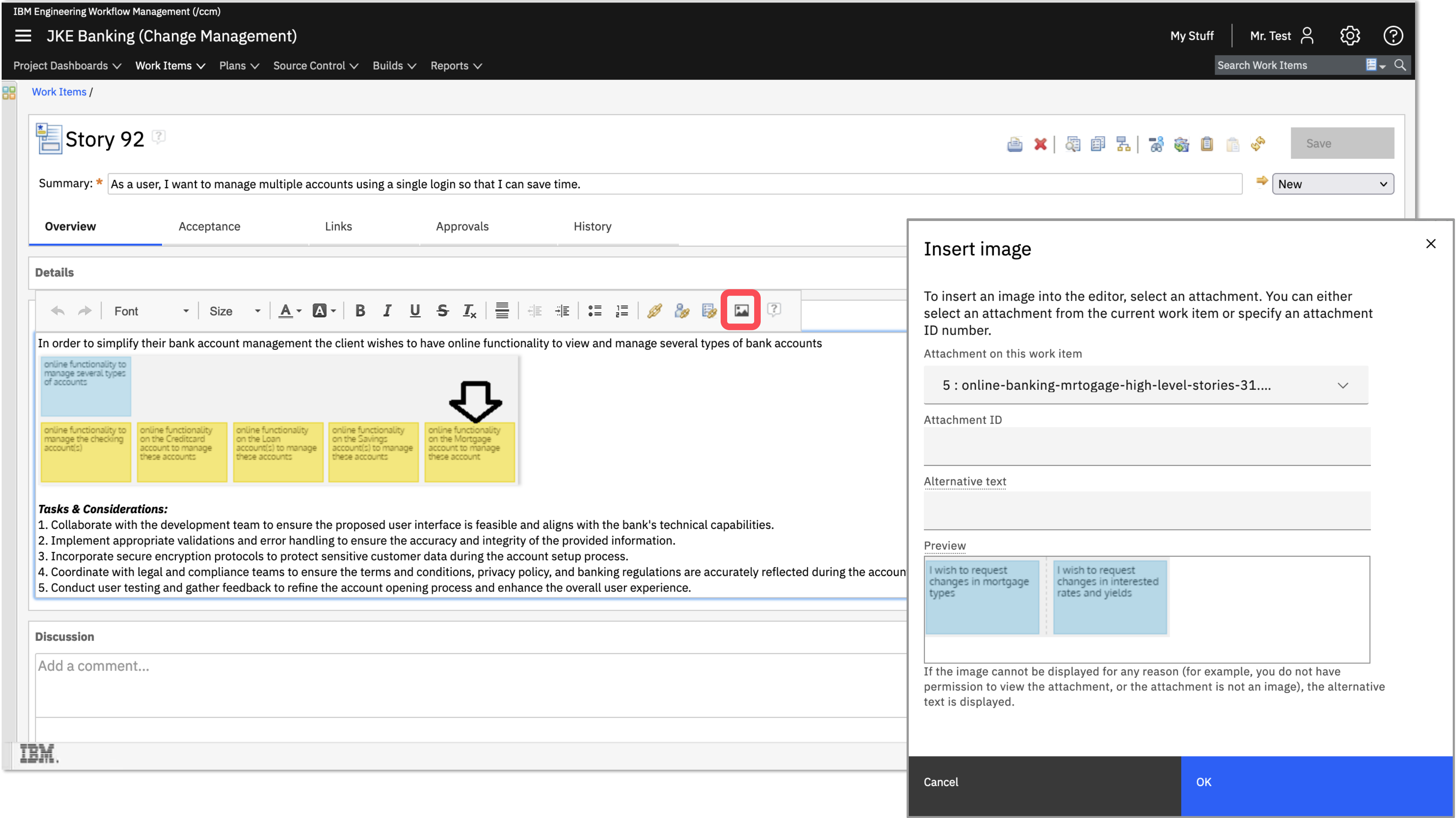
# Add images inline to work item description and large html attributes

## Image types

jpeg, gif, png, and bmp

Copy-paste image from the clipboard or file explorer

Or use existing image attachments from current or different work item



# Add tables inline to work item description and large html attributes

- Use common html table features
- Copy-paste table from MS Word and MS Excel

Project Dashboards ▾ Work Items ▾ Plans ▾ Source Control ▾ Builds ▾ Reports ▾

Task 121: Conduct Attack Analysis for Item: Smart Car Sharing Lock\*

Details

Description

Collapse Section

Attack surface analysis involves mapping all attack vectors within the organization. It helps find risk areas and vulnerable systems for organizations to minimize as many attack vectors as possible.

Table 1: Threat Analysis

Asset	Security Property	Damage Scenario	Threat Scenario	Impact Analysis					Justification	
				Stakeholder: Road User						
				S	F	O	P			
Access to key details	Authenticity	An unknown third party can access the car using an intercepted access token	Spoofed messages	0	2	1	3		Key details leaked, but the car is still operatable and safe	
	Integrity	An unknown third party able to access a car with a fraudulent access token	Tampered messages	0	2	1	3		Key details leake, but the car is still operatable and safe	
	Non-repudiation	The user unlocked the car but is not identifiable	Replay of intercepted messages by attacker	1	2	2	1		Either guest user or attacker	
	Confidentiality	Access to key details shared beyond the trusted group	Unauthorized disclosure of messages via social engineering	0	3	1	3		High privacy impact as key detail shared with the attacker who knows the user	
	Availability	Access to key information is impossible, and road users are not able to unlock the car	Denial of service attack on key-sharing platform	0	1	3	1		No Safety implication as the car cannot be moved	
	Authorization	Guest users are unexpectedly able to access key detail	Elevation of privilege in the guest user database	2	1	2	1		Can have safety implications for assisted driving models	

Discussion

IBM

Table Properties

Rows\*  
9

Columns\*  
9

Headers  
First Row ▾

Caption  
Table 1: Threat Analysis

Cancel OK

Cell Properties

Width  
21  
Height  
30

Rows Span  
Columns Span

Cell Type  
Data ▾

Background Color  
#FF7E79

Cancel OK

# Jazz Reporting Service + Link Index Provider

# For practitioners



# Report on additional LQE historical metrics

You can report on these additional dimensions using Lifecycle Query Engine **historical metrics**

Work Item **Closure**

- Filed Against
- Resolved
- Resolution
- Team Area

Work Item **Creation**

- Found In
- Resolved
- Resolution

Work Item **Totals**

- Found in
- Priority
- Resolved
- Resolution
- Severity
- Team Area

## Add condition

Attributes of: Closure trend for Work Item [Type: Closure trend for Work Item] ▼

Choose an attribute: ?

×

☐ Filed Against ?

☐ Found In ?

☐ Iteration ?

☐ Priority ?

☐ Project Area ?

☐ Resolution ?

☐ Resolved ?

☐ Severity ?

☐ Status ?

Select valid filter values to continue.

# Creating simpler reports across subtypes in reports with LQE data source

When reporting across multiple child types that shared a common parent type such as Work Item or Requirement using an LQE data source, you would previously create a report using the merge or append of multiple report branches, that could lead to repeating traceability paths in each branch making the report more complex to maintain and slower to perform.

Now you can use external URIs to promote them into the parent type and create single branch reports with LQE data source that can return and filter on those promoted properties including common filtering across sub-types from the same parent type.

To distinguish subtype attributes, after attribute in the brackets, the word **Promoted** is added. The end result should be simplified report creation and most likely improved report performance when there is a large number of subtypes.

**Add condition**

Attributes of: Requirement [Type: Requirement] ▾

Choose an attribute: ?

Search

☒ Include attributes from subtypes

☐ Category Type (Promoted)

☐ Component ?

☐ Contributor

☐ Creation

☐ Creation

☐ Description

☐ Foreign

☐ Foreign

☐ Foreign

☐ Foreign

☐ Foreign

Select v

**Add attributes to the report**

Attributes of: Requirement [Type: Requirement] ▾

Search

☒ Include attributes from subtypes

☐ Select all

☐ Category Type (Promoted)

☐ Component ?

☐ Contributor

☐ Count artifact versions ?

# A help when writing advanced queries: RB Type explorer documents data schemas

- You can view data source schema details for all data sources (LQE rs, LQE Jena and DW) and use it to develop reports in Report Builder (RB). From the **Help** menu in RB, click **Type explorer** to view data source schema details. Filter the details based on data source, data type, categories, and artifacts.
- Use this information to understand the structure and dependencies of the data source schema. By using the detailed insights about the data source schema, you can create custom SQL queries and develop reports in RB.

IBM Engineering Report Builder

Take a tour

Reports

Schedules and results

Type explorer

Data source

Lifecycle query engine sc...

Data type

Current data

Historical trends

Categories

Change and Configuration management

Quality management

Requirements management

Architecture management

Artifacts

Approval

Approval Task

Change Request

Change Set

Deliverable

Dimension for http://jazz.net/ns/lqe/metrics/shapes/cm/WorkItemClosure

Dimension for http://jazz.net/ns/lqe/metrics/shapes/cm/WorkItemCreation

Approval

Work Item Approval is a EWM defined CM resource recording a specific approval of a work item.

ID

rtc\_cm:Approval

Hidden

true

Item table

RITRS.WORK\_ITEM\_APPROVAL

URI

http://jazz.net/xmlns/prod/jazz/rtc/cm/1....

Attributes

Search

ID	Title	Description	Range	URI	Column	Table
jrs:versionSkew	Count artifact versions	Add this attribute to ...	http://www.w3.org/2...	http://jazz.net/ns/jrs...		RITRS.WORK_ITEM_...
rtc_cm:approvalDue	Due	The due date for an a...	http://www.w3.org/2...	http://jazz.net/xmlns/...		RITRS.WORK_ITEM_...
dcterms:title	Title		http://www.w3.org/2...	http://purl.org/dc/ter...	NAME	
rtc_cm:approvalType	Type	The type of the appro...	http://www.w3.org/2...	http://jazz.net/xmlns/...	APPROVAL_TYPE	
xsd:anyURI	URL		http://www.w3.org/2...	http://www.w3.org/2...		RITRS.WORK_ITEM_...

Items per page: 50

1-5 of 5 items

1

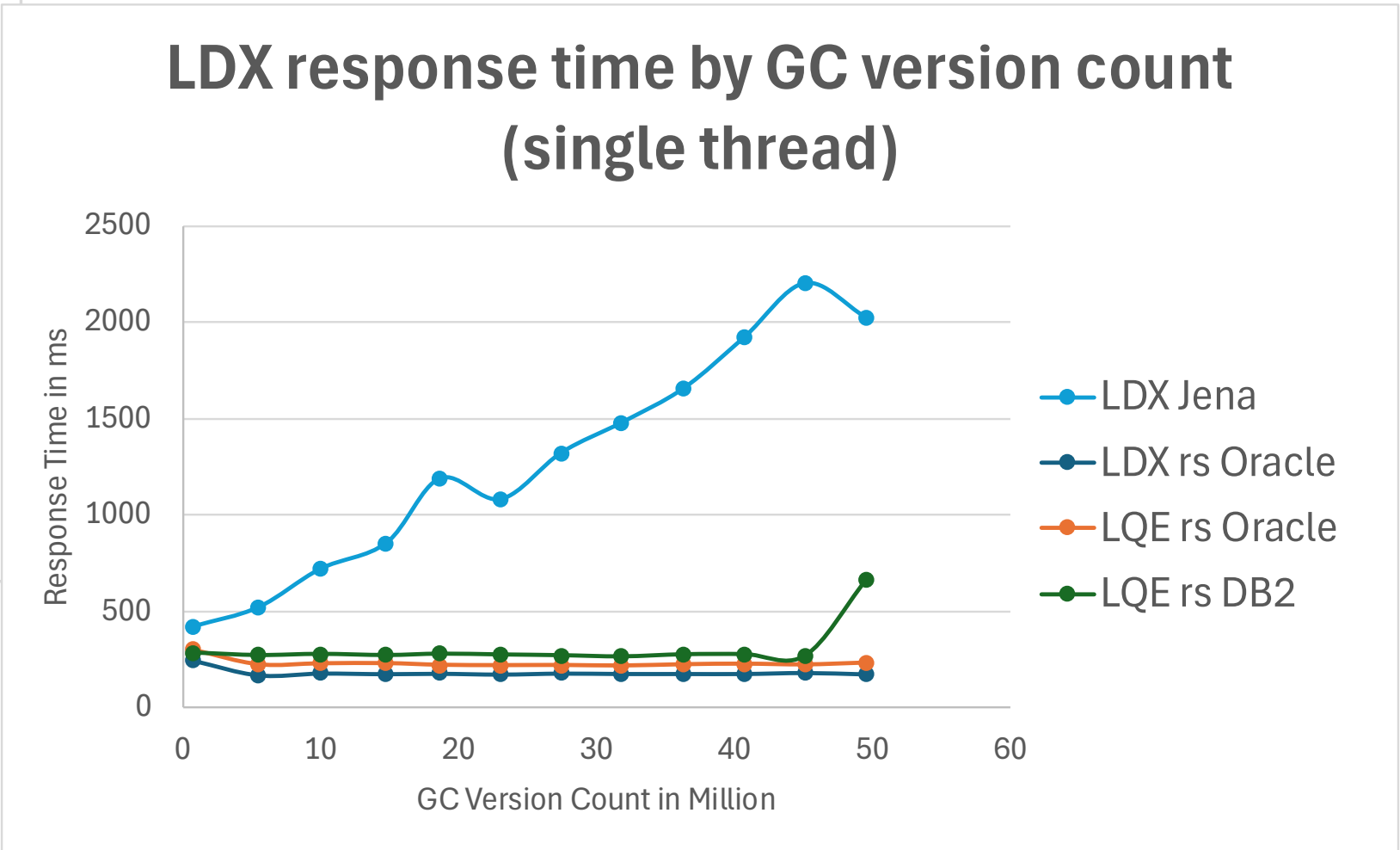
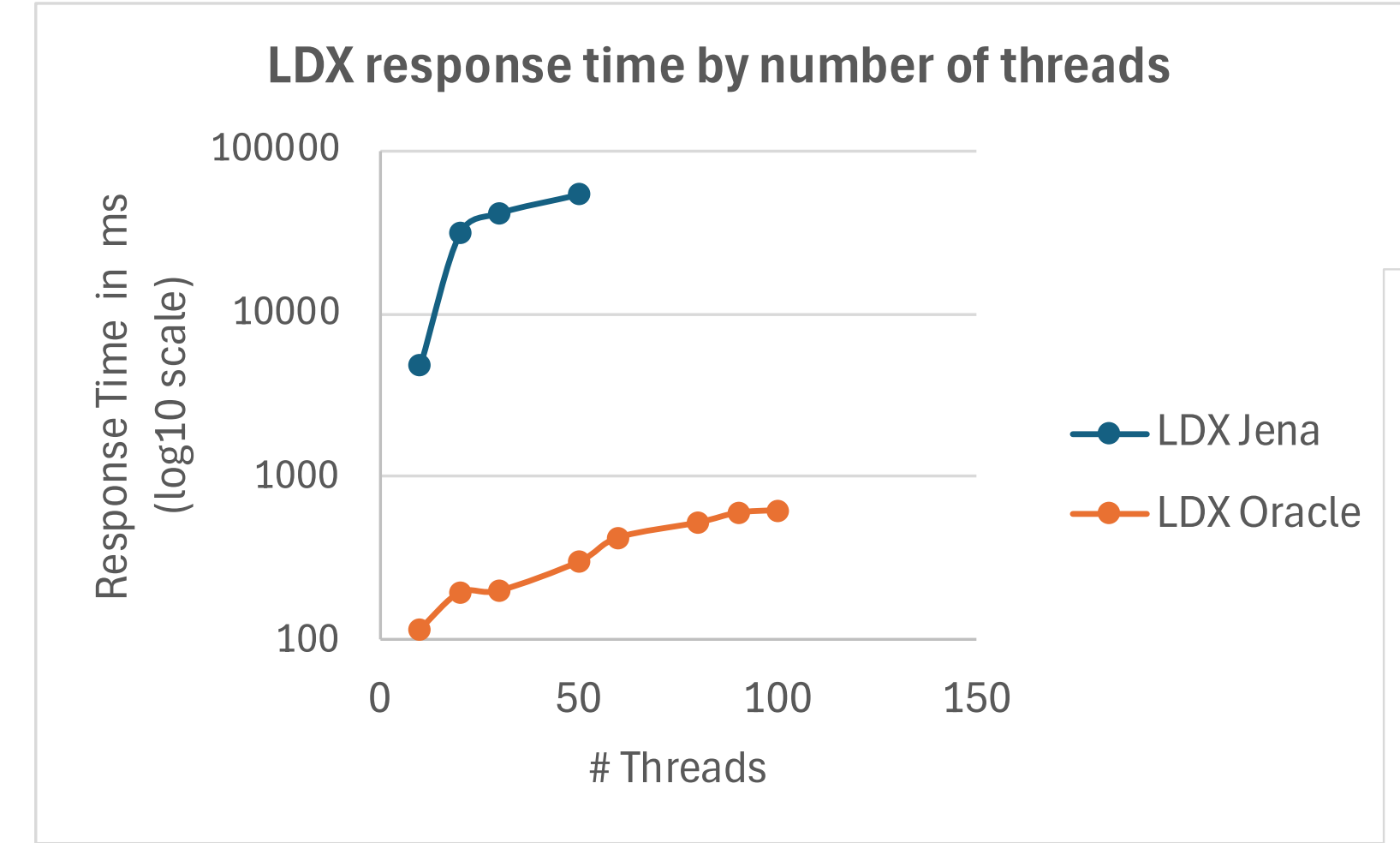
1 of 1 pages



# For administrators

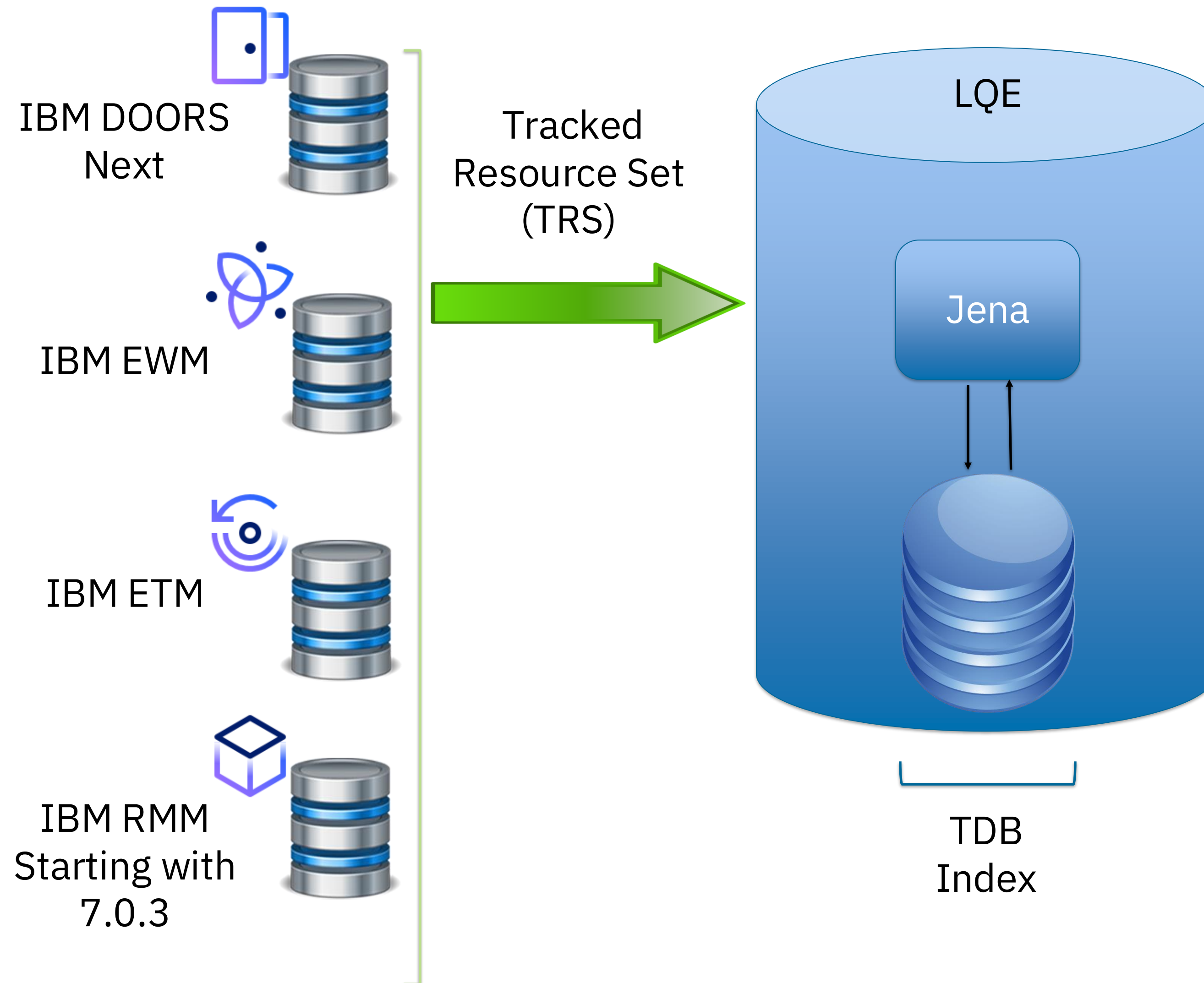
# Major improvements using Lifecycle Query Engine relational store (LQE rs and LDX)

- LQE rs is the default installation for new JRS deployments
- It offers significantly better performance and availability than LQE Jena: Generally faster queries, higher concurrency, less RAM required.
- Improvements are so good\* that we now recommend using LQE rs for Link Index Provider (LDX) as well. [LDX rs 7.1 performance report](#).
- Enable LQE rs during JTS setup. Report Builder detects whether LQE relational store is enabled. If so, then Report Builder enables LQE rs for reports.
- When LQE Jena is not installed or disabled, only SQL query language is supported, and query language options are not visible
- During the time that ELM 7.1 is deployed in your organization, plan to convert all remaining RB SPARQL reports to SQL. ELM 7.1 is the last version that will include LQE Jena.



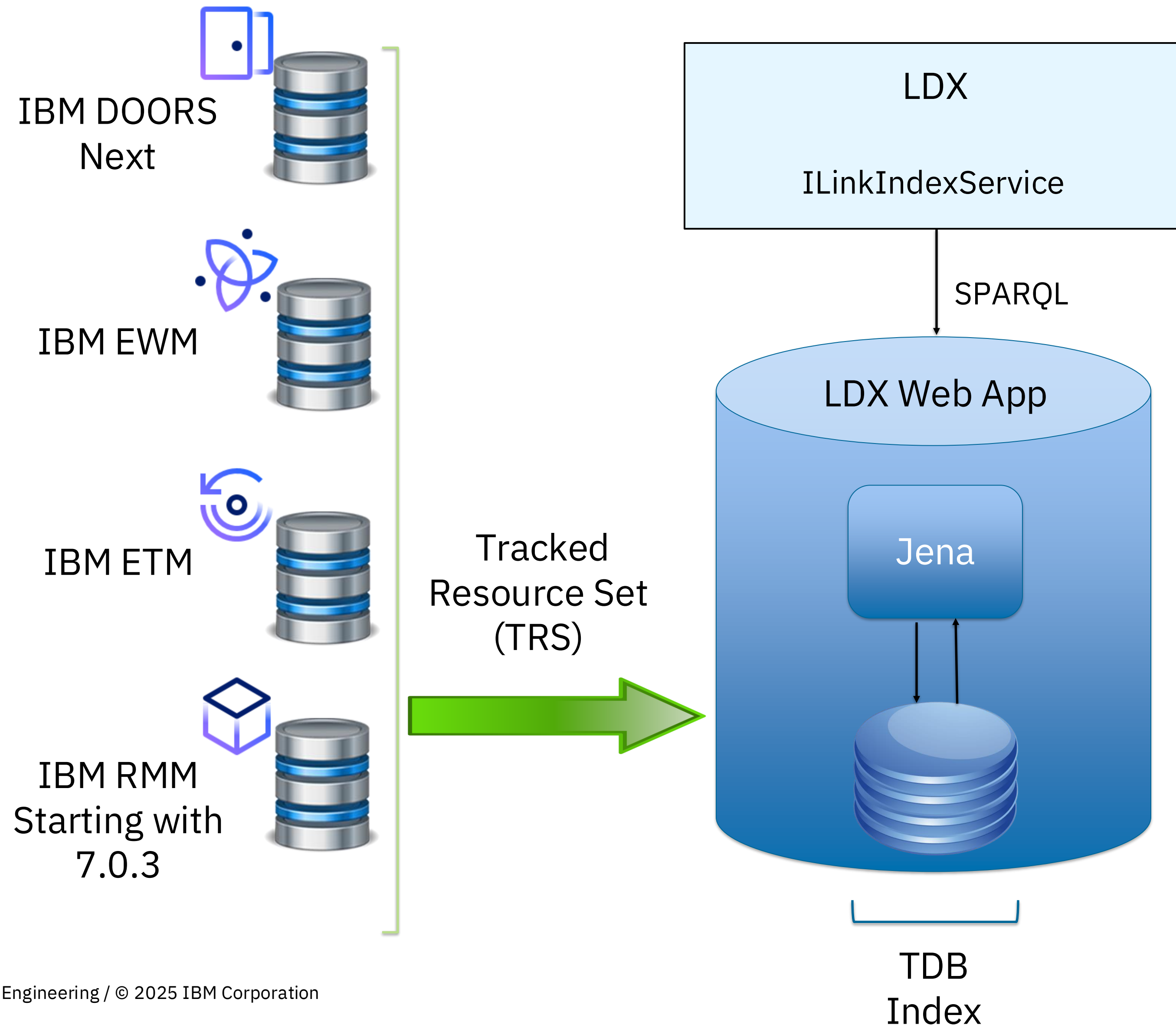
*\* Tested in IBM lab; your performance may vary*

# LQE Jena architecture prior to the ELM 7.0.3



- LQE is well structured as a TRS indexer and query endpoint provider
- Has a storage interface that currently writes to Jena
- Jena limited by scale that can be achieved on one machine (no clustering support)
  - Data needs to be local to Jena (local filesystem)
  - Jena creates multiple index files that handle various ?s ?p ?o patterns – performs best when memory mapped

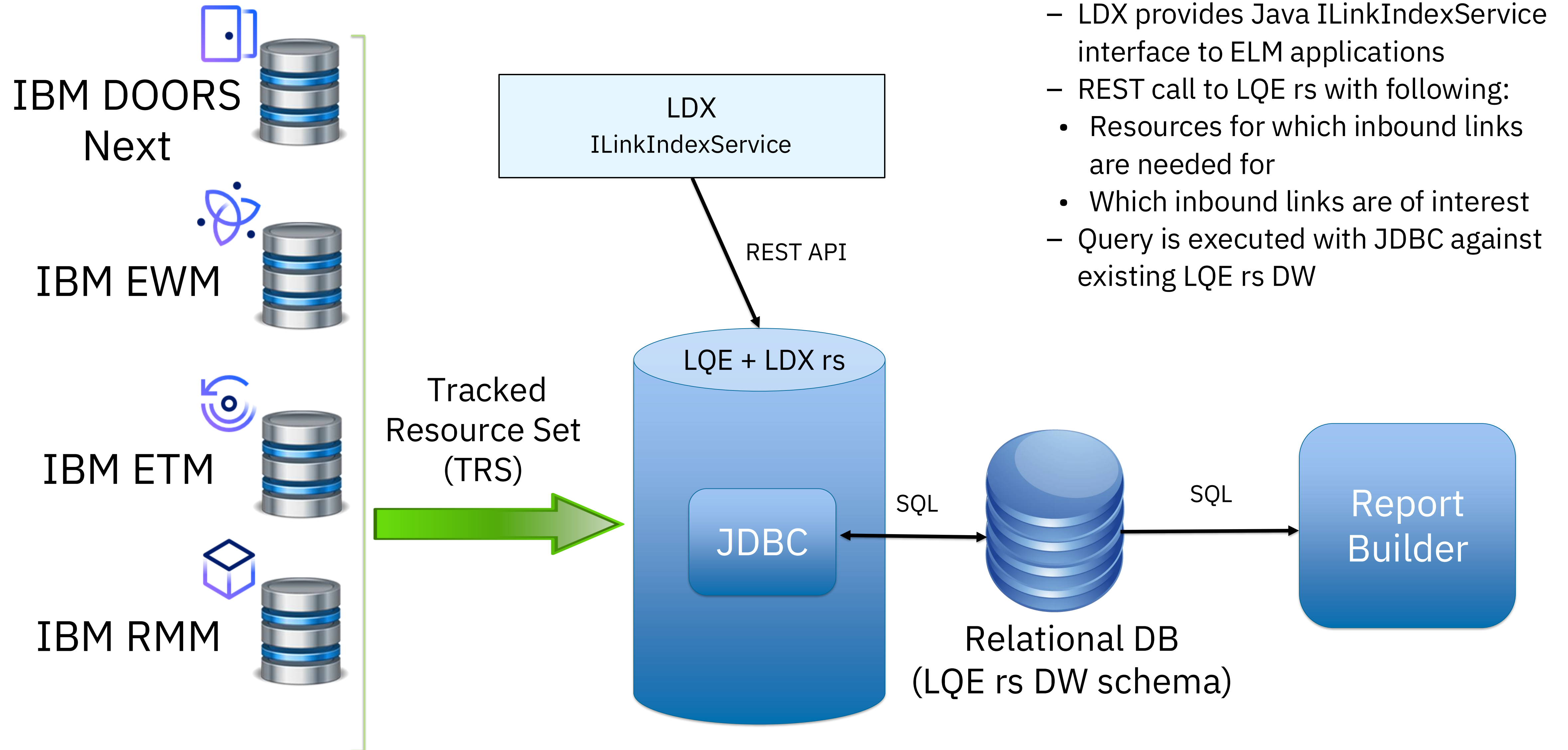
# LDX in 7.0.3 and earlier was a separate application (a special case of LQE)



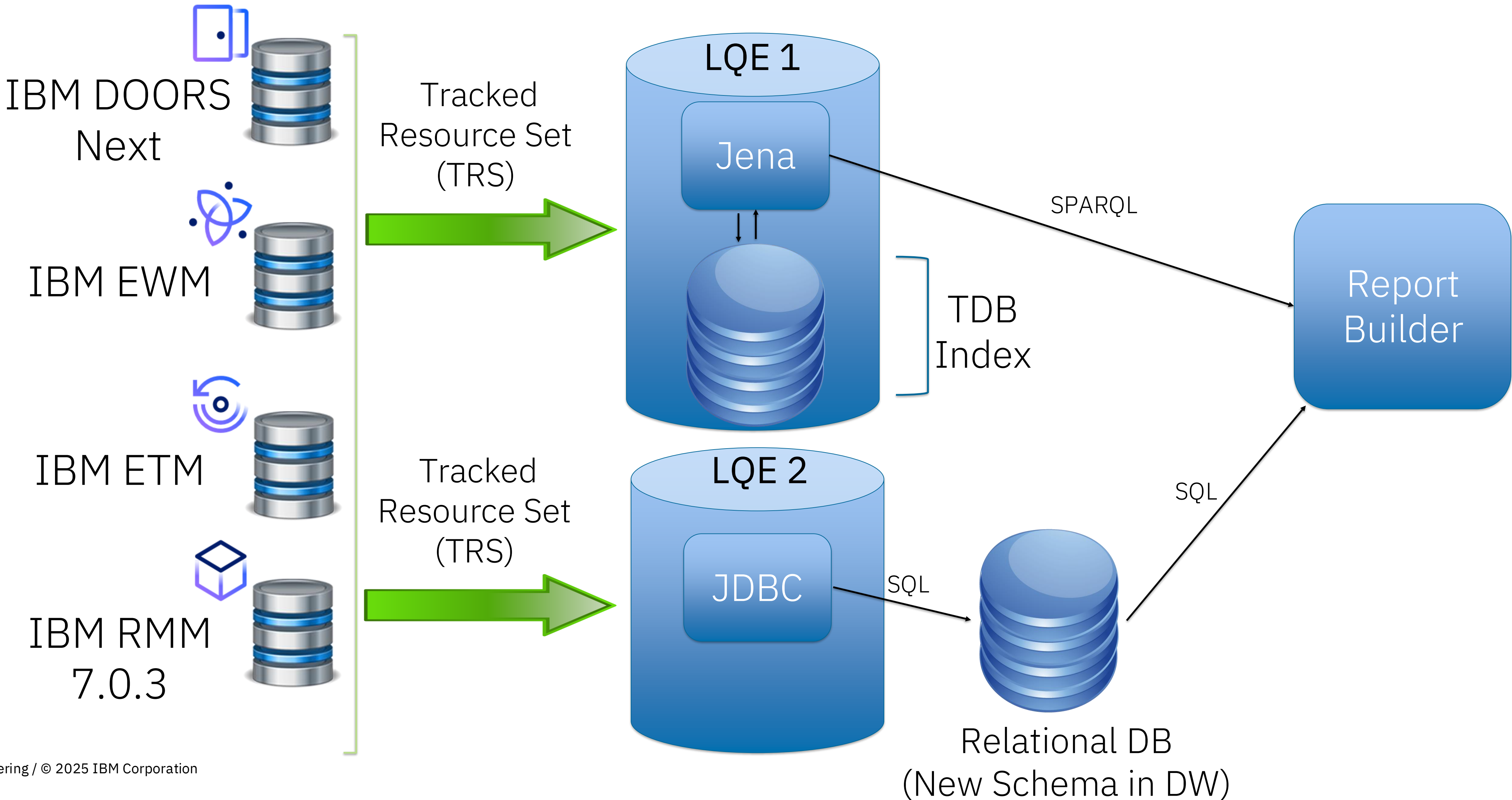
- Link Index Provider (LDX) provides Java ILinkIndexService interface to ELM applications
- The interface utilizes a parameterized SPARQL query
  - Resources for which inbound links are needed for
  - Which inbound links are of interest
- Query is executed against the custom LQE at /ldx
- Customized LQE as /ldx web app
- Adjusted to store only link info from resources, as well as Global Configuration (GC), Local Configuration (LC) for scoping details
- Setup to index a subset of ELM data providers
  - Only the ones that own the storage for links between 2 domains
  - If cross DN to DN server links are created, those DN TRS feeds added as data providers



LQE rs can service LDX and it is the default for 7.1 and recommended for all customers



# LQE rs architecture for existing ELM customers – Topology 1



# LQE rs architecture for existing ELM customers – Topology 1

## When to consider:

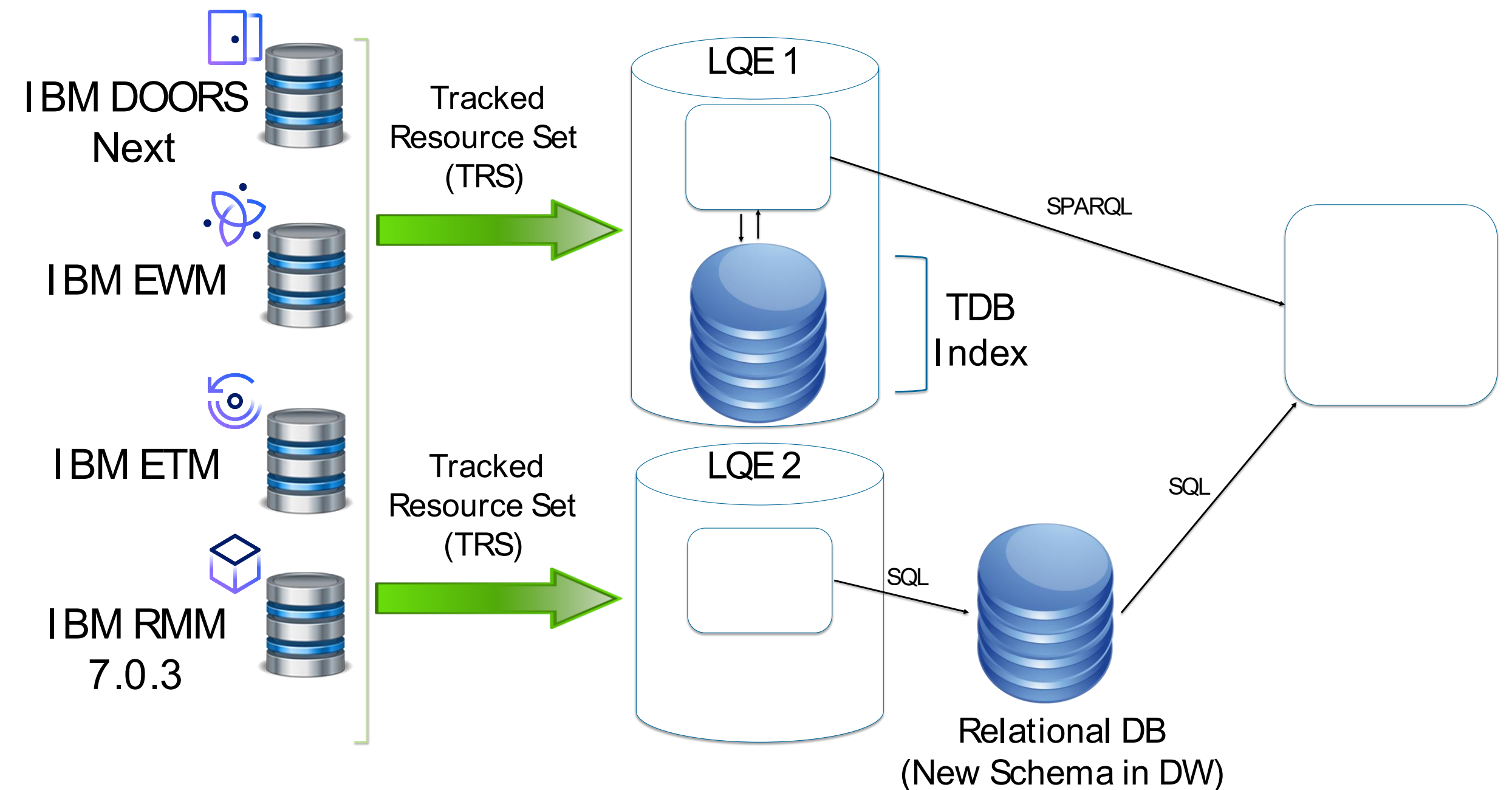
- The current LQE has a large index and is under heavy load

## Pros:

- ✓ LQE rs will not be impacted by the LQE Jena's performance

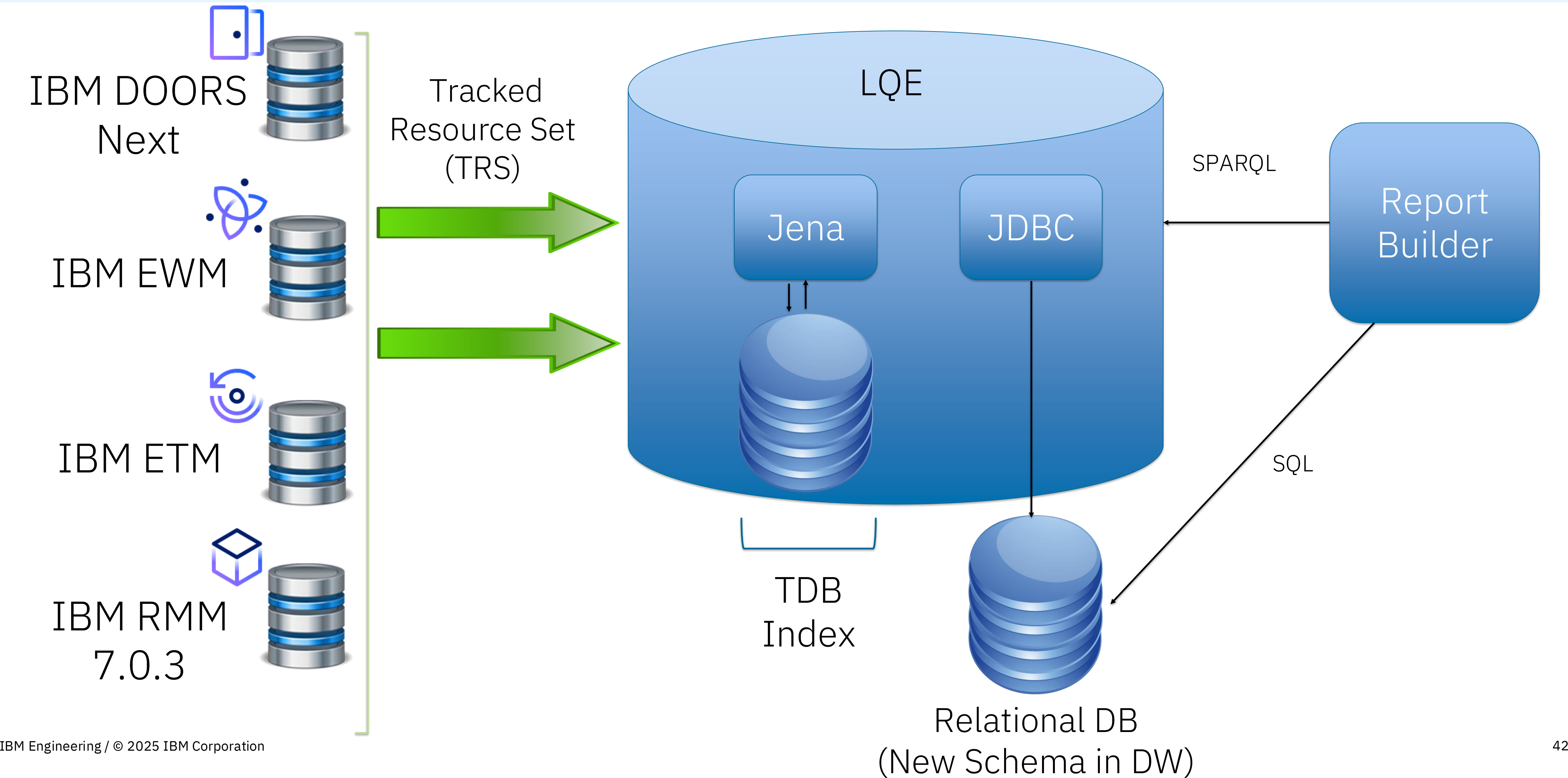
## Cons:

- ❖ Additional installation work
- ❖ More data sources to manage in Report Builder
- ❖ More physical server to maintain





# LQE rs architecture for existing ELM customers – Topology 2





# LQE rs architecture for existing ELM customers – Topology 2

## When to consider:

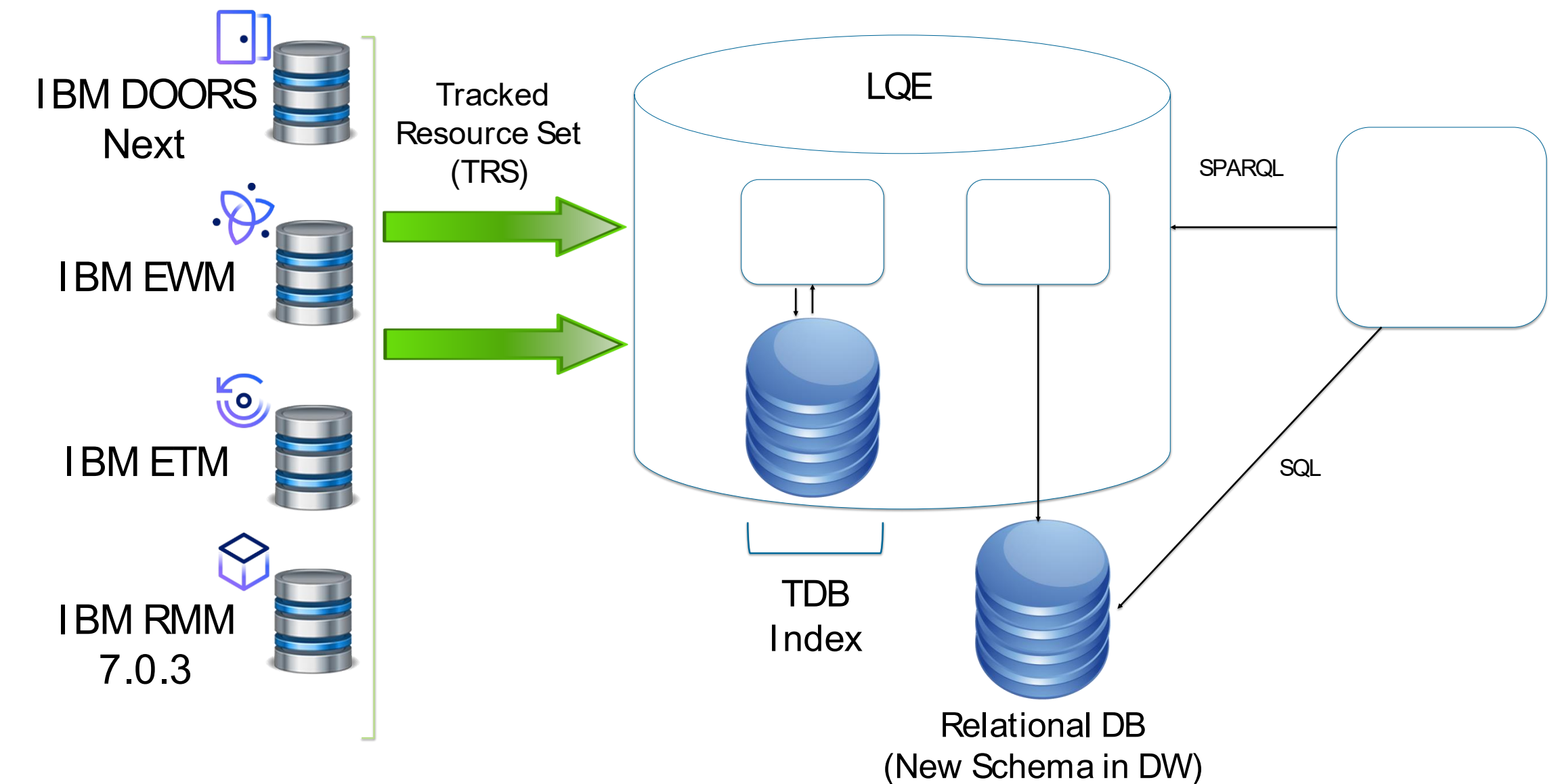
- The LQE Jena server does not have much data and is not under heavy load.

## Pros:

- ✓ Minimal additional installation work
- ✓ Less Report Builder data sources to manage
- ✓ Less maintenance work on additional physical server

## Con:

- ❖ Server rename is needed if decide to move LQE to a server with less resources



# What should you expect when adopting LQE rs?

Detailed LQE rs performance report can be found at [LQE rs performance report](#), as well as [LQE rs database sizing](#).

## Improved scalability and resilience

- LQE rs handles concurrent report execution more efficiently, and a single long report will no longer impact the entire LQE server
  - Tested up to 5000 simulated users (83 reports/sec)
  - LQE Jena could only handle 25 simulated users for the set of reports used in IBM testing

## Equivalent or better report performance

- A minority of reports may run longer. New user-selectable database hints will optimize report performance.

## Reduced resource requirements

- A database server with 128GB of RAM can handle a reporting workload that required 1.5TB of RAM on an LQE Jena server: [less than 1/10<sup>th</sup> the RAM](#)
- Disk size of LQE rs database is roughly [half](#) the Jena data store

## Incremental indexing times should be similar to LQE Jena

- Full reindexing should be equivalent but may take longer depending on the load on the database server hosting LQE rs

# Automated the LQE server rename for LQE with relational store removes the need to reindex

- LQE server rename for LQE rs is now automated in Report Builder: **no need to reindex!**
- To rename the LQE server, all you need to do is generate and replace the mapping.txt file into the JTS LQE location and restart the Jazz Team Server.
- Previously, whenever the LQE server renaming process was triggered, you had to first unregister LQE from JTS, manually rename the server, and register the LQE again, and then reindex all data sources.

# Removal of Lifecycle Query Engine Jena support

- Starting with IBM Engineering 7.2, the Lifecycle Query Engine (LQE) Jena is no longer supported. The LQE relational store will be the only supported storage mechanism. This change improves performance and simplifies maintenance by standardizing on a single storage mechanism.

Note: Before you upgrade to IBM Engineering 7.2, you must migrate your SPARQL reports from LQE Jena to the LQE relational store as upgrading will disable LQE Jena support entirely.



## The ELM release cadence continues...

In recent years we released ELM twice each year (in addition to normal maintenance):

- Minor release of features in 2Q / early 3Q (in iFix)
- Major release in 4Q

For ELM 7.0.1 and 7.0.2 we released SR1 in 2Q / early 3Q to replace outdated and vulnerable components (notably: log4j v1). [[post](#)]

For ELM 7.0.2 iFix18 we added low-risk features and serviceability items [[post](#)]

For ELM 7.0.3 iFix07 we added low-risk features and serviceability items [[post](#)]

A Service Release (SR) provides a way to remove old components from the deployed system

The ELM patch service is additive: a simple way to deploy that can update components; it has no way to remove old component versions.

A service release is installed using an updated installer and/or updated IBM Installation Manager repositories. It provides a way to remove old component versions.

- Upgrades and new installs will use an updated installer
- Where 7.1 is already installed, a side-by-side installation will be done with an updated installer

This is the same pattern as used in ELM 7.0.2 SR1 [[Technote 6588059](#)]

ELM 7.1 Service Release (SR)  
is planned for early Q3, 2025

Update Java runtime to Java 17  
(IBM Semeru Runtime Certified Edition V17)

Update various component versions, including Java  
and IBM Eclipse SDK (IES)

Include selected high-value, low-risk features

Include serviceability improvements

Include fixes to product issues identified by  
customers (normal iFix content)

ELM 7.1 SR1 interim fix 4 will be the  
prerequisite for future ELM 7.1 iFixes

The ELM 7.1 SR1 will serve the purpose of 7.1  
iFix04.

The ELM 7.1 SR1 interim fix 4 release will  
become the basis for future incremental  
maintenance (iFix05+, debug patches, etc.)

This is the same pattern as ELM 7.0.2 SR1  
[[Technote 6588059](#)]

# Planned content of ELM 7.1 SR1 interim fix 4 – more detail

Category	Rationale	Detail
Runtime environments	Keeping the specified operating environment current	<ul style="list-style-type: none"><li>• Java 17, Liberty 25.0.0.3</li></ul>
Security	Meet IT Security operational requirements	<ul style="list-style-type: none"><li>• JRS Excel reports with live data can use application passwords for authentication/authorization</li><li>• JRS, LQE, LDX can participate in single sign-out when using Jazz Authorization Server (JAS) using the new advanced property “Jazz logout”</li><li>• Updated components</li></ul>
Digital Thread	Ensure accurate information model when using multiple DOORS Next servers	<ul style="list-style-type: none"><li>• Custom link constraints between artifacts managed in multiple DOORS Next servers</li></ul>
Requirements type system management	Simplify effort to make type systems changes consistently	<ul style="list-style-type: none"><li>• Create your own automations for type system management across many project areas, components, and configurations using new DOORS Next public APIs to find, create, read, and delete artifact types</li></ul>
Scale, performance, reliability, monitoring, serviceability	System reliance / ease of admin	<ul style="list-style-type: none"><li>• Improve the speed and reliability of work item post-save operations during periods of high activity (including full text indexing, attachment visibility, TRS change log, MBean updates)</li><li>• DOORS Next change set delivery: additional integrity checks and improved logging</li><li>• JRS: provide more event data to LQE administrators; for data sources: provide separate retry interval settings for TRS document and individual items</li><li>• ETM avoid TRS validation false positives due to user activity while validation check is running</li><li>• Provide Engineering Insights sample views using LQE relational store, simplifying adoption of LQE rs</li></ul>

# DOORS Next: Link constraints across RM servers

- Ability to enforce linking rules when RM artifacts are spread over 2 or more RM servers
- Link constraint rules can now use artifact types defined on another RM server (remote server)
- URI can be used to create rules that apply both to linking to artifact on the same and on another server

Link Constraints ?

Create link rules to restrict which links are allowed. If no rules are specified, all links are allowed.

Cancel

Specify which links are allowed between requirement artifacts based on artifact types and link types. If no rules are specified, all links are allowed.

Link Rules

Generate Rules

Source Artifact Type ^	Link Type (Outgoing ▶, Incoming ◀ )	Target Artifact Type
Actor	Link (Link To, Link From)	Actor
Business Goal	Link (Link To, Link From)	System Specification [9443RM (9443RM2)]
Business Goal	Satisfaction (Satisfies, Satisfied By)	Business Rule [9443RMComp (9443RM2)]
Hardware Requirement [9443RM2Comp (9443RM2)]	Embeds (Embeds, Embedded In)	Actor

New Rule

Remote server

Artifact type (link start): \*

Actor

Link type: \*

Link To ▶

Artifact Container:

All project areas in current global configuration

Components:

9443RM (9443RM)

Artifact type (link end): \*

Select artifact type

Close

Add and Close

Add



# ENI predefined content when using LQE relational store (LQE rs)

LQE rs based sample views and Custom Artifact Elements are included in the following folders:

- Predefined custom artifact elements
- Predefined views

Custom artifact elements

	Name	Actions	Description	Query language
	Asset management			
	Configuration management			
	DOORS requirement management			
	Engineering workflow management			
	Defect		SQL based custom artifact element which contains SQL query to fetch all Defect. Multiple custom conditions and project scope support added. Also, custom link added to link to another Artifact.	SQL
	Story		SQL based custom artifact element which contains SQL query to fetch all Story. Multiple custom conditions and project scope support added. Also, custom link added to link to another Artifact.	SQL
	Task		SQL based custom artifact element which contains SQL query to fetch all Task. Multiple custom conditions and project scope support added. Also, custom link added to link to another Artifact.	SQL
	Workitem		SQL based custom artifact element which contains SQL query to fetch all Workitems. Custom conditions added for Workitem's Identifier and to apply Project scope. Also, custom link added to link to another Artifact.	SQL
	Quality management			
	Test Case		SQL based custom artifact element which contains SQL query to fetch all Test Cases. Custom conditions added for Test Case's Identifier and to apply Project scope. Also, custom link added to link to another Artifact.	SQL
	Test Execution Record		SQL based custom artifact element which contains SQL query to fetch all Test Execution Record. Multiple custom conditions and project scope support added.	SQL

Views /

Shared views

My viewsShared views

	Name	Actions	Description	Query language
	Predefined views			
	Change Request Activities in Time Intervals		SQL based view which includes change request activities from all lifecycle management applications categorized by specific time intervals.	SQL
	Change Request Explorer - Work Item Hierarchy		SQL based view which allows user to select a work Item, and show the related work items in a hierarchical structure.	SQL
	Change Requests Multilevel View		SQL based view which shows related work items in a hierarchical view that helps you analyze their dependencies.	SQL
	Requirement Collection Implementation Coverage		SQL based view which shows requirement collections, related requirements, and existing or missing implementation activities associated with specific requirements. The view shows links to versioned file artifacts that are linked to the implementation work.	SQL
	Requirement Collection Implementation Test Coverage		SQL based view which shows requirement collections, related requirements with implementation activities, and related test cases and test results.	SQL
	Requirement Explorer		SQL based view which allows user to select a requirement, and show the related artifacts from all lifecycle management applications.	SQL
	Requirement Implementation Test Coverage		SQL based view which shows requirements with existing or missing implementation activities. The view shows links to versioned file artifacts that are linked to the implementation work through change sets.	SQL
	Requirements Traceability - Links-to Relationship Starting from Collection		SQL based view which shows the requirement link-to relationship in a hierarchical view.	SQL
	Requirements Traceability - Links-to Relationship		SQL based view which shows the requirement link-to relationship in a hierarchical view.	SQL
	Requirements Traceability - Child Relationship		SQL based view which shows the requirement parent child relationship in a hierarchical view.	SQL
	Test Plan Explorer		SQL based view which allows user to select a test plan, and show the related	SQL

# Q/A

