

Enabling Strategy Creation and Modification Through an Intuitive User Interface



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RIVERWARE USER
GROUP MEETING

FEBRUARY 2025



COLORADO RIVER BASIN POST-2026 OPERATIONS EXPLORATION TOOL



— BUREAU OF —
RECLAMATION



Center for Advanced Decision Support for
Water and Environmental Systems (CADSWES)
UNIVERSITY OF COLORADO **BOULDER**



VIRGA
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FEBRUARY 2025

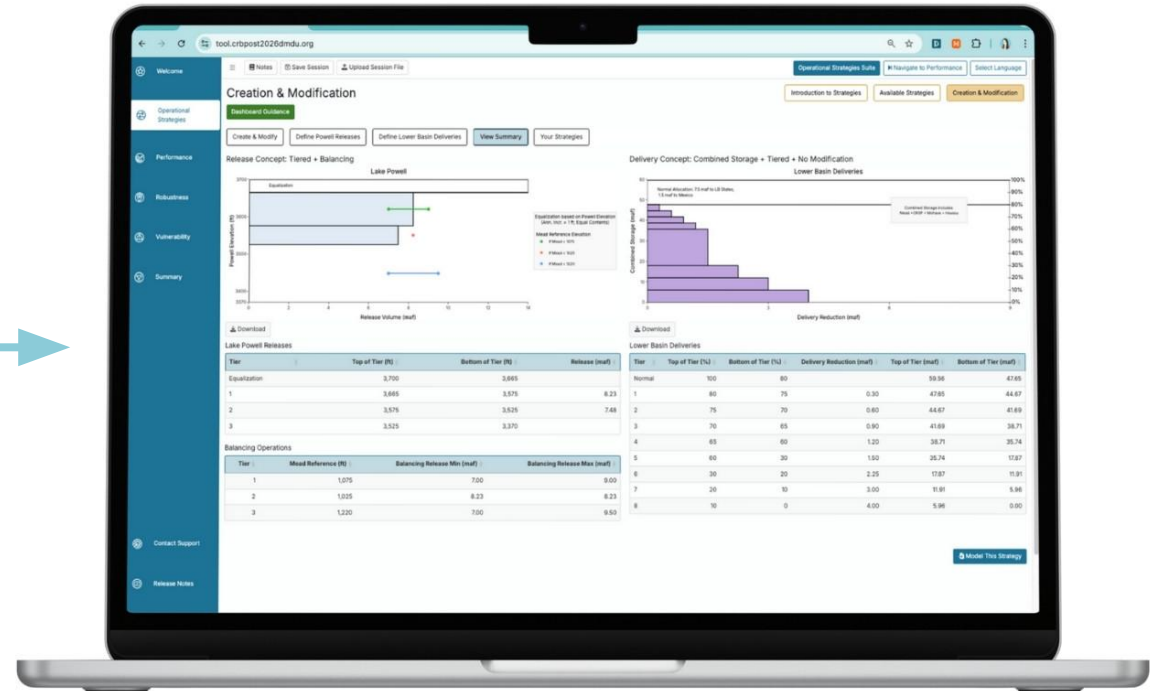
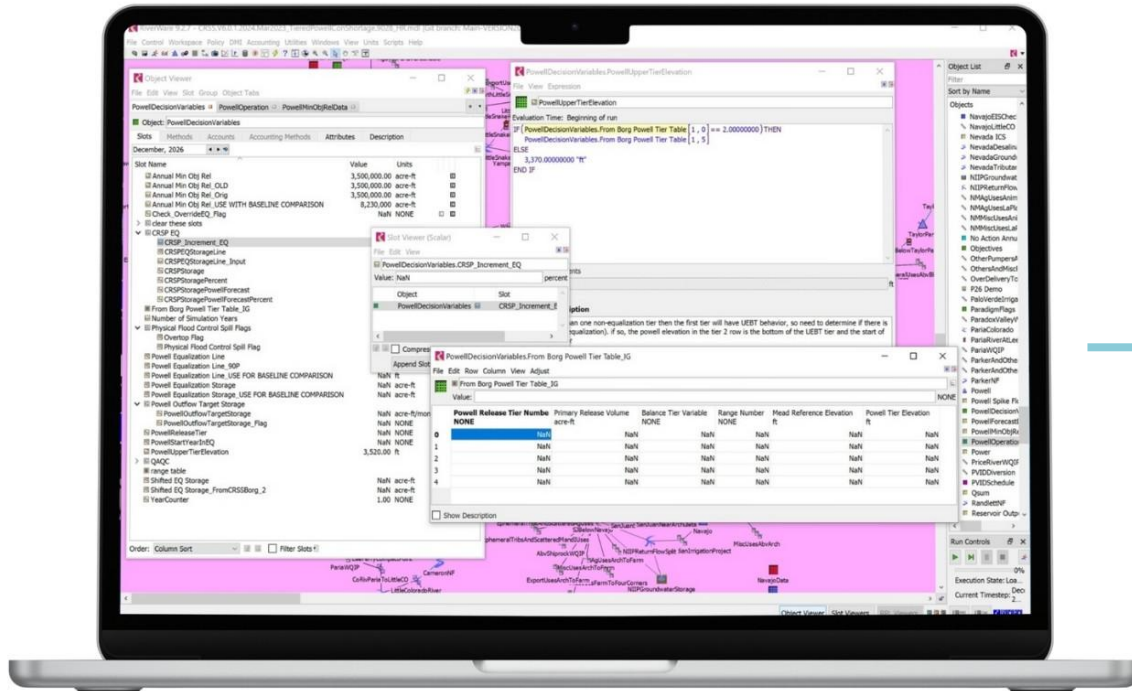
OVERVIEW

- User Interface Design
- RiverWare Cloud Configuration
- Automated Data Post-Processing

DESIGN

- **User Interface Design**
- RiverWare Cloud Configuration
- Automated Data Post-Processing

Transforming the User Experience



Interactivity Demo

The screenshot displays the 'CRB Post-2026 Tool' web application. The browser address bar shows the URL 'tool.crbpost2026dmdmdu.org'. The interface features a teal sidebar on the left with navigation options: Welcome, Operational Strategies (selected), Performance, Robustness, Vulnerability, Summary, Contact Support, and Release Notes. The main content area is titled 'Creation & Modification' and includes a 'Dashboard Guidance' section with buttons for 'Create & Modify', 'Define Powell Releases', 'Define Lower Basin Deliveries', 'View Summary', and 'Your Strategies'. Below this is a 'Strategy Creation & Modification' section with two columns: 'Strategy Creation' (with a '+ Create' button) and 'Strategy Modification' (with a 'Please Select' dropdown and a 'Modify' button). The footer contains logos for the Bureau of Reclamation and Virga Labs, along with version information (v 1.41.0) and copyright details (© 2025 Martin & McCoy LLC dba Virga Labs). A disclaimer states that a portion of the software and data was provided through a project award sponsored by the Bureau of Reclamation under Contract #140R8122P0009.

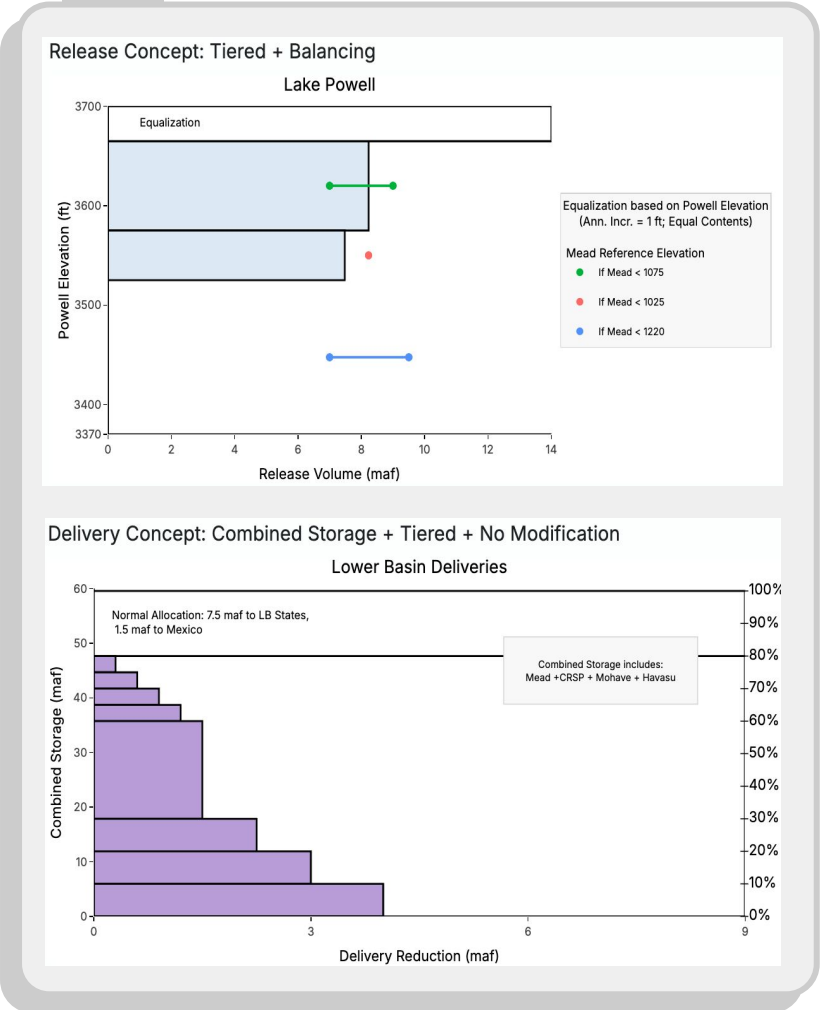


CONFIGURATION

- User Interface Design
- **RiverWare Cloud Configuration**
- Automated Data Post-Processing

Data State: User Interface

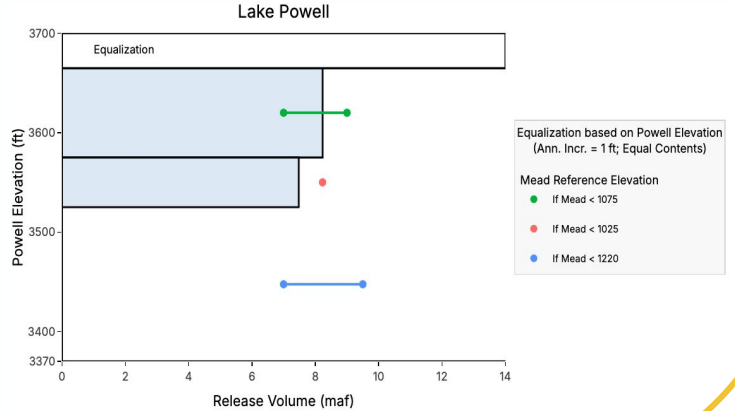
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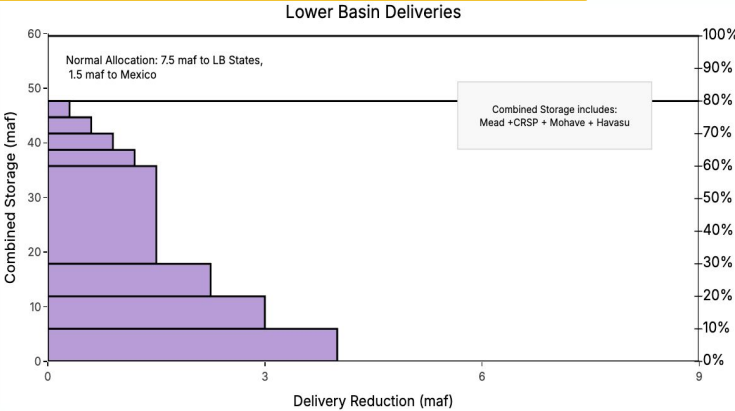
Data State: Data Table

1

Release Concept: Tiered + Balancing



Delivery Concept: Combined Storage + Tiered + No Modification



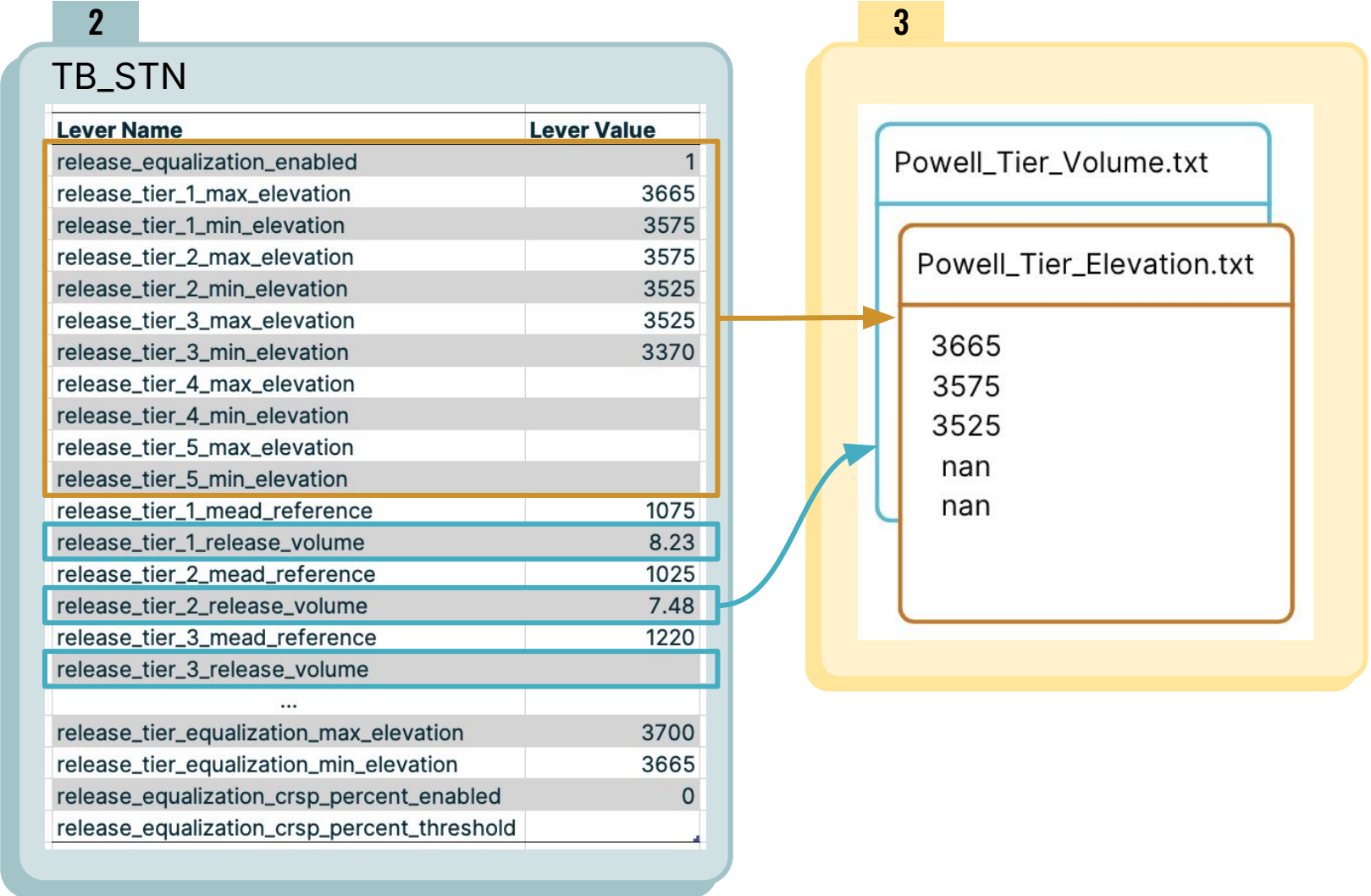
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TB_STN

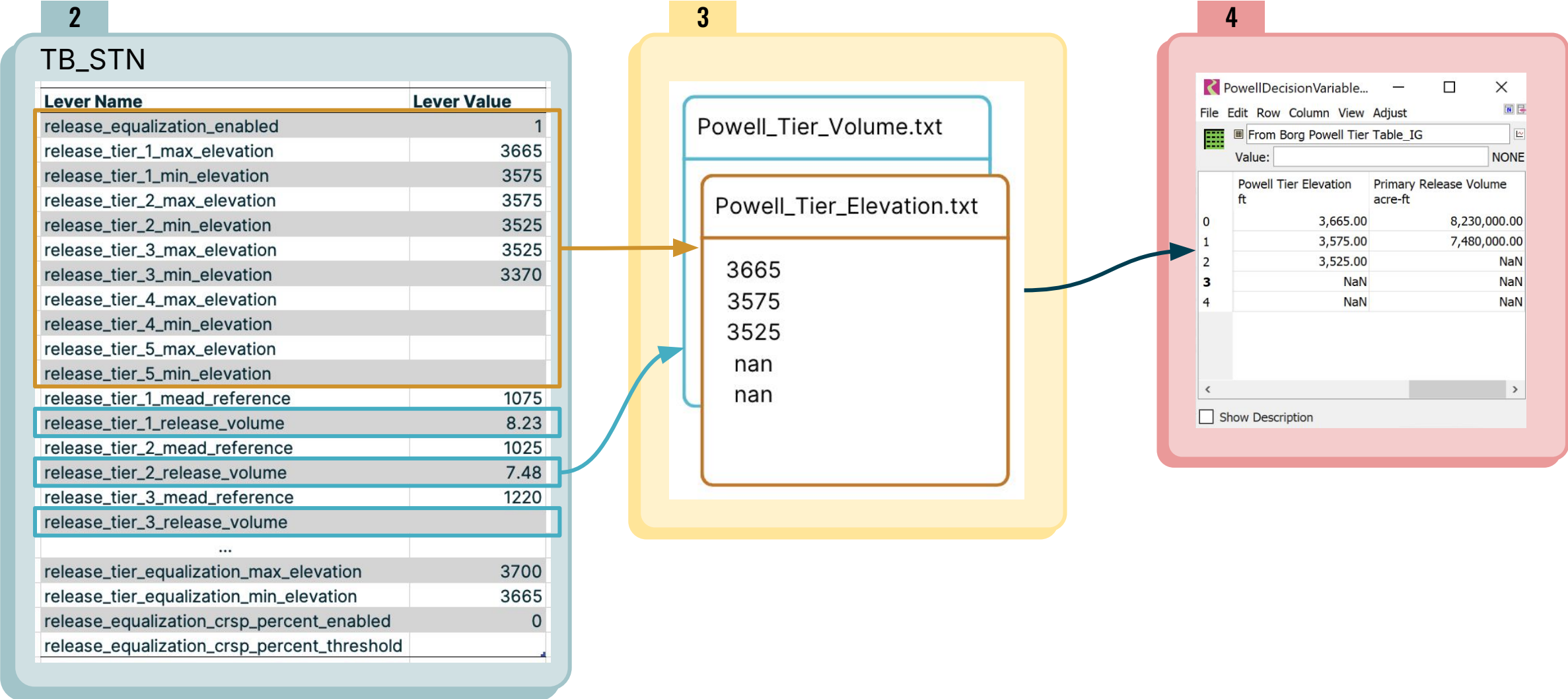
Lever Name	Lever Value
release_equalization_enabled	1
release_tier_1_max_elevation	3665
release_tier_1_min_elevation	3575
release_tier_2_max_elevation	3575
release_tier_2_min_elevation	3525
release_tier_3_max_elevation	3525
release_tier_3_min_elevation	3370
release_tier_4_max_elevation	
release_tier_4_min_elevation	
release_tier_5_max_elevation	
release_tier_5_min_elevation	
release_tier_1_mead_reference	1075
release_tier_1_release_volume	8.23
release_tier_2_mead_reference	1025
release_tier_2_release_volume	7.48
release_tier_3_mead_reference	1220
release_tier_3_release_volume	
...	
release_tier_equalization_max_elevation	3700
release_tier_equalization_min_elevation	3665
release_equalization_crsp_percent_enabled	0
release_equalization_crsp_percent_threshold	



Data State: Programmatically Written Text Files

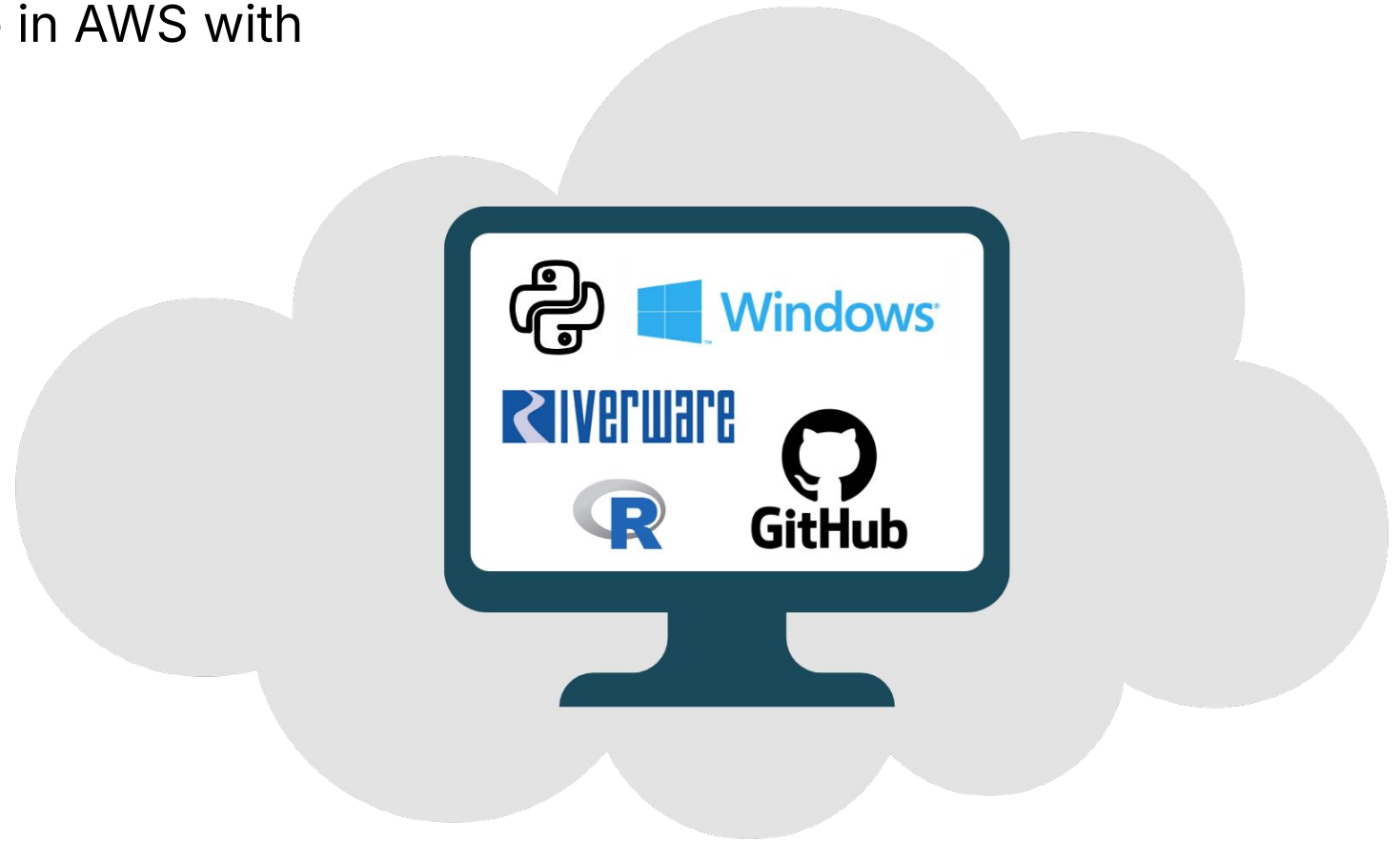


Data State: Generated DMI



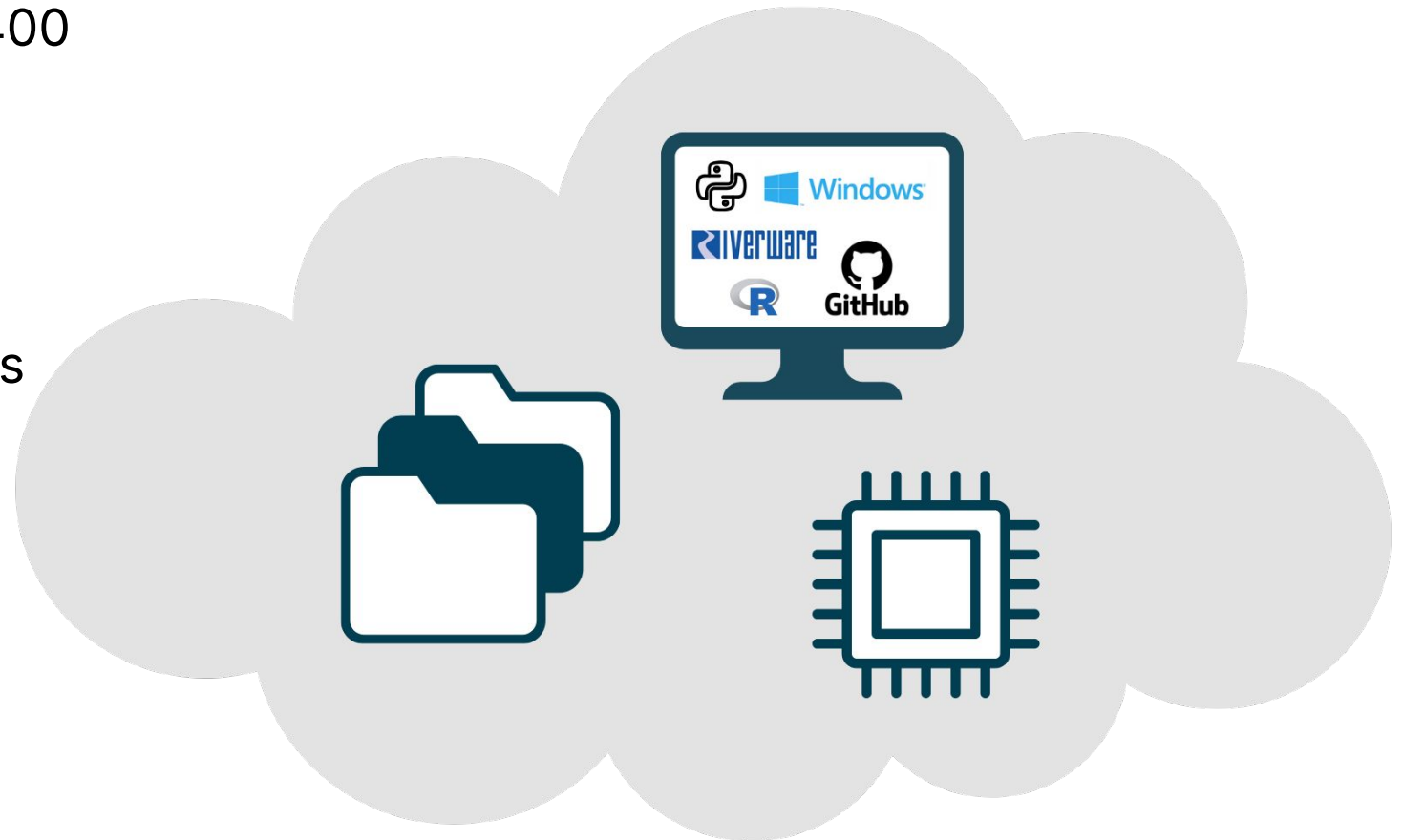
Configuring Virtual Machines with RiverWare

- Configure a single virtual machine in AWS with all required software:
 - Windows Operating System
 - RiverWare
 - Python
 - R
 - GitHub



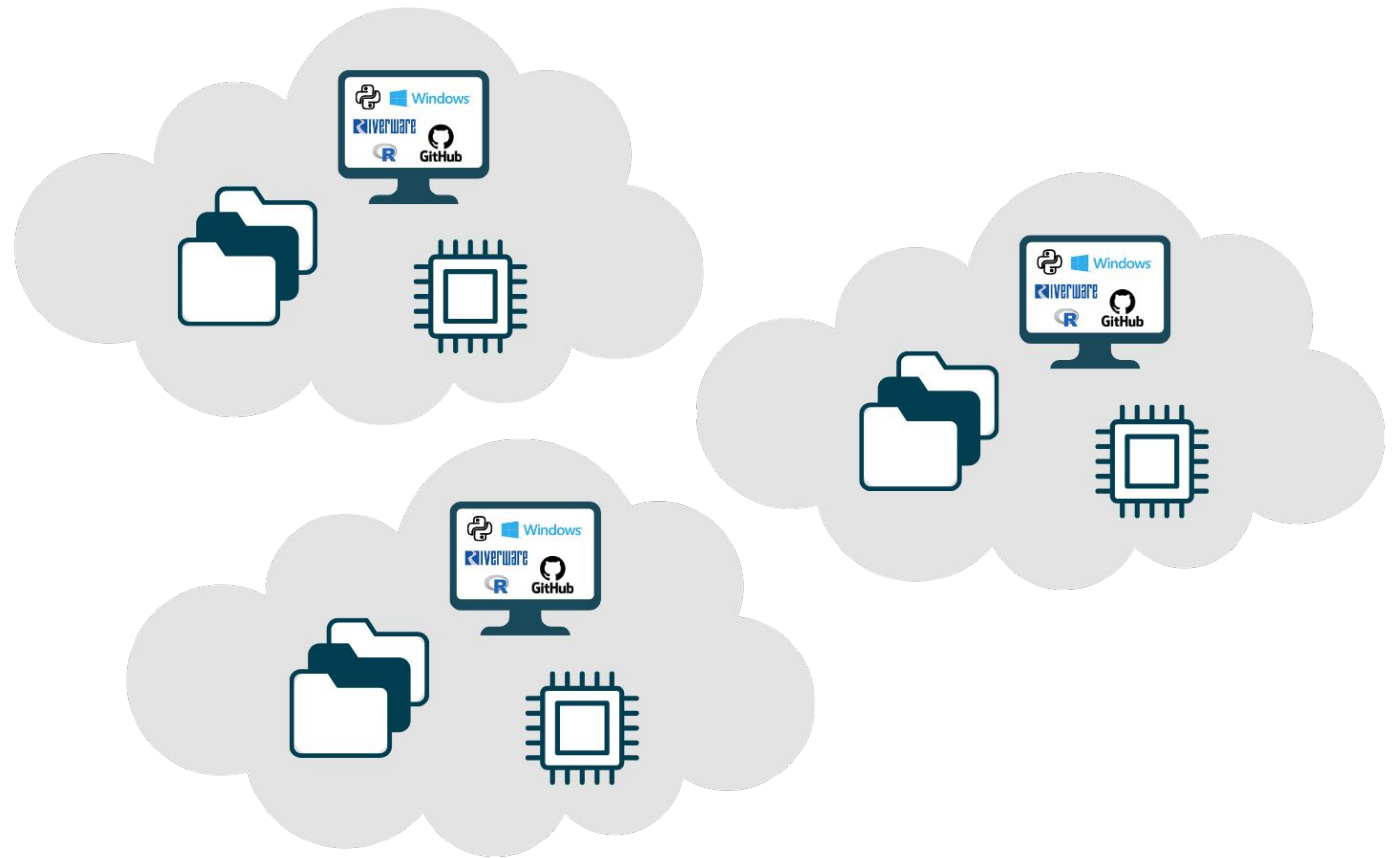
Configuring Virtual Machines with RiverWare

- For a single strategy, there are 8,400 individual 30-year simulations.
- This requires a machine with 96 virtual CPUs to run for 3 hours.
- The raw data produced from this is 18,900 rows per simulation, resulting in 157,000,000 raw data points per strategy.



Concurrent RiverWare Runs

- Next, we needed to be able to spin up multiple copies of those virtual machines to run individual strategies at the same time on their own machine.
- Most configurations between machines needed to be the same
- For each strategy being run, the specific lever data needed to be uploaded to the appropriate machine



Automation and Monitoring

- Finally, all of this had to be automated:
 - Launch a new Virtual Machine with preconfigured RiverWare installations and appropriate data
 - RiverWare runs headlessly for model completion and data validation
 - If no licenses are available, queue the model run until one becomes available.



POST-PROCESSING

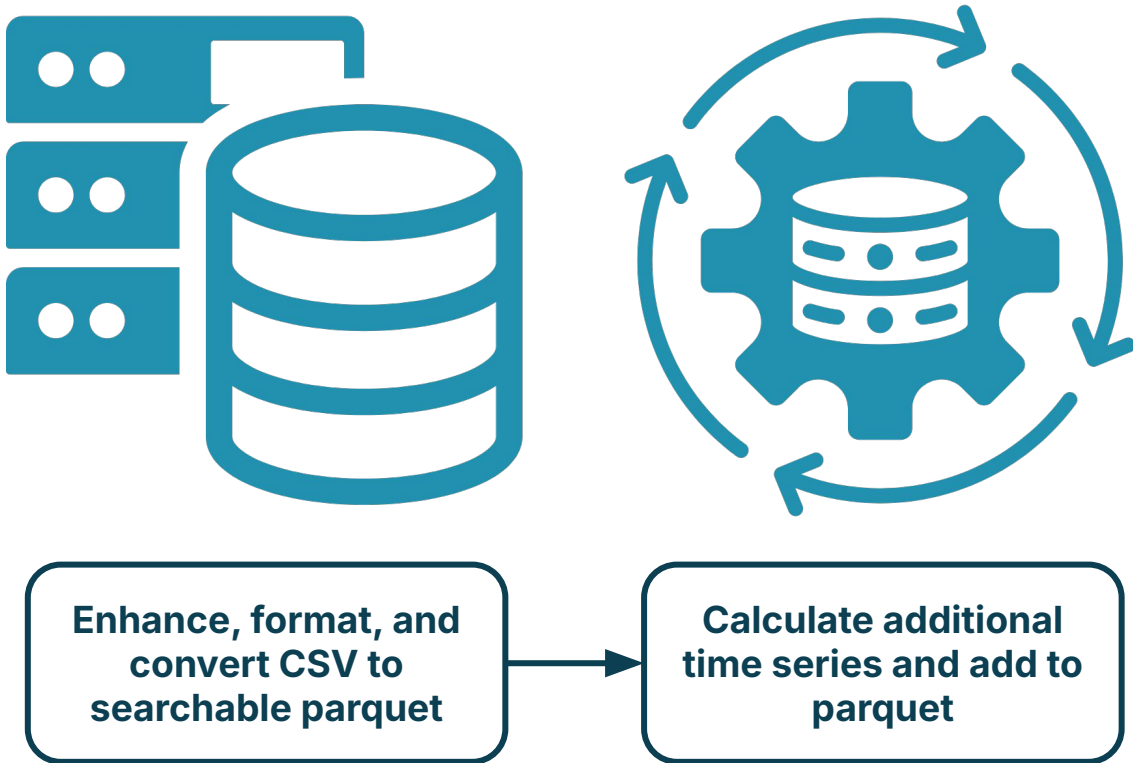
- User Interface Design
- RiverWare Cloud Configuration
- **Automated Data Post-Processing**

Automating the Data Processing Pipeline

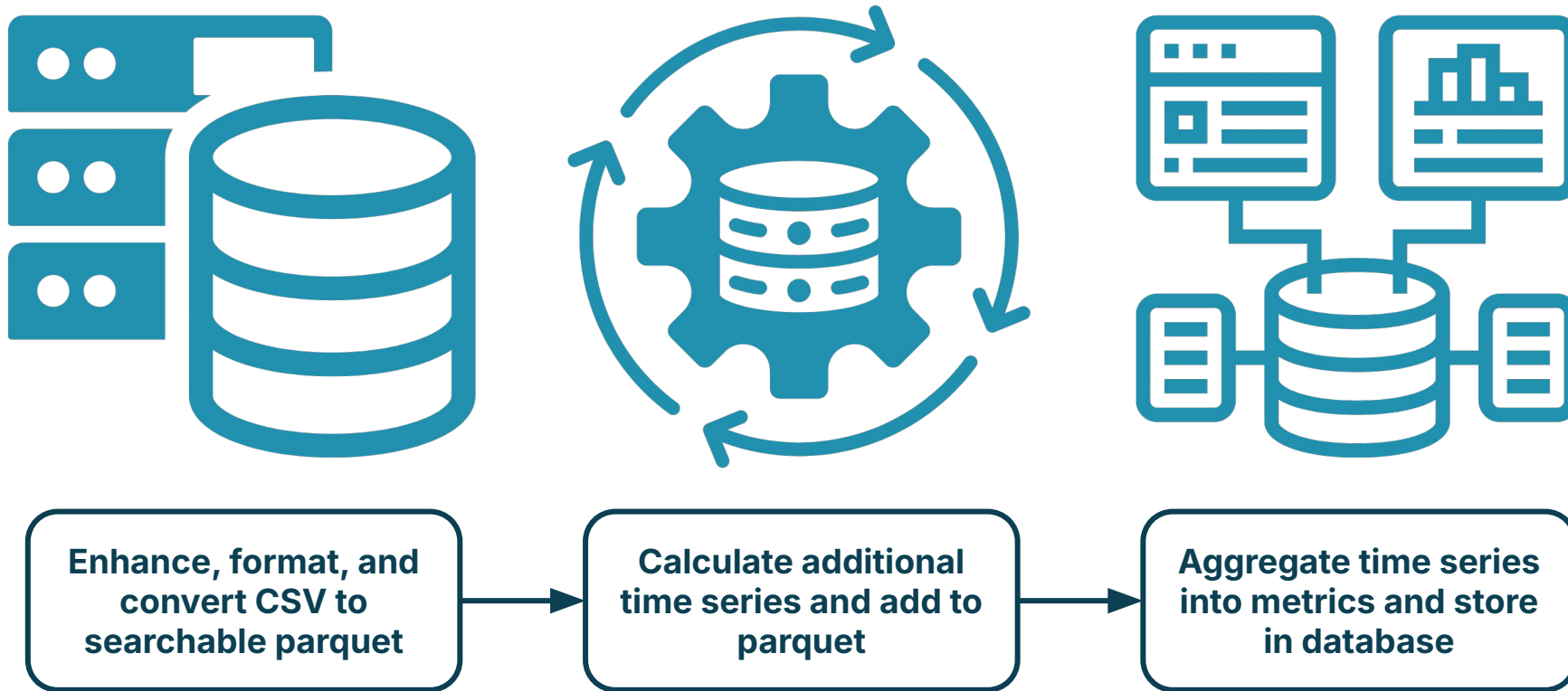


Enhance, format, and
convert CSV to
searchable parquet

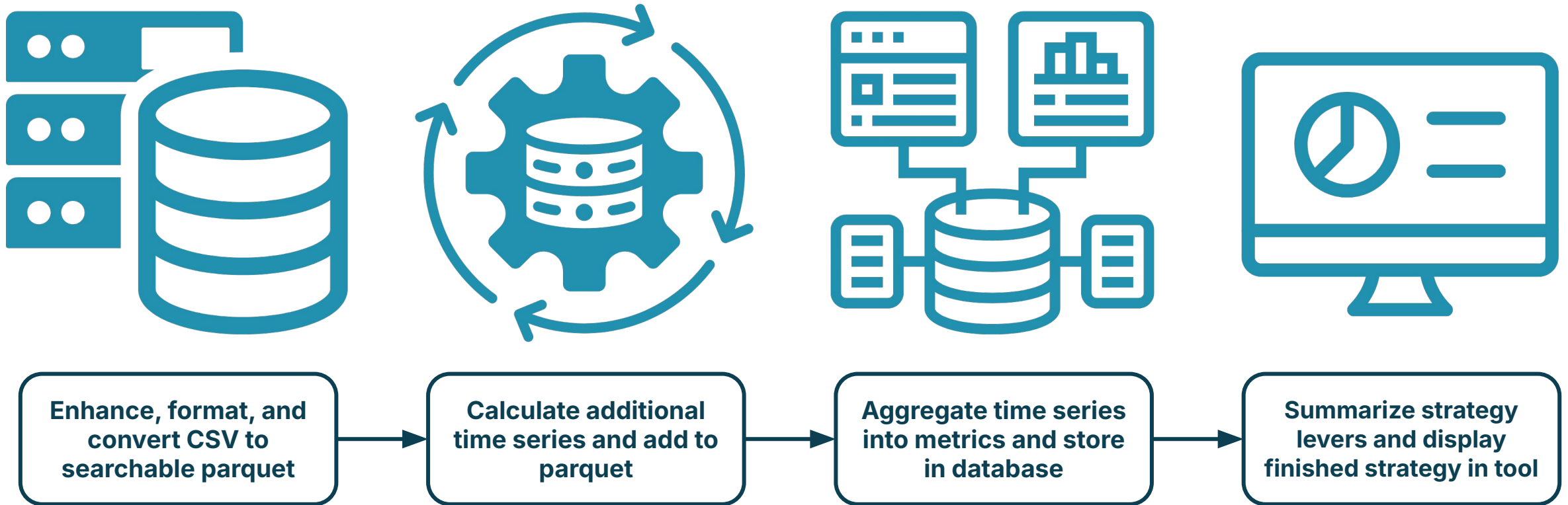
Automating the Data Processing Pipeline



Automating the Data Processing Pipeline



Automating the Data Processing Pipeline



QUESTIONS



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