



# **A Practical Guide for High Performance Reporting**

Five Report Design Best Practices

# Overview

In today's data-driven business environment, reporting and analytics are the lifeline of your business. Your decision makers need **reliable, relevant and accessible insights** to achieve results, whether that be growing revenue, controlling costs, reducing turnover or improving worker productivity. Reporting and analytics are critical to understanding what has happened, why it happened, and what may happen next, so that you can identify the best course for action. Arming your organization with this context allows it to make **better business decisions**.

In solving this challenge for our customers, Workday built reporting seamlessly into our applications. This allowed us to deliver **personalized reports** with **flexible security**. We allow customers to govern reports to the individual using organizational hierarchies, role-based permissions and row-level security.

We also make it easy for customers to get immediate value out of our reporting from Day 1 with an immense amount of delivered content. We offer a huge catalog of pre-built reports, dashboards and scorecards, addressing a wide range of common analytical questions. But we also know that your business is unique, and that there are a limitless number of ways you want to augment the content that we provide you with, or to make your own from scratch. We let you build reports to fit this limitless range of needs including features like **custom fields, custom data sources**, and more.

As you increase the complexity and magnitude of your reports, we want to make sure your reports are always running like our delivered reports, and as we have intended: **instantaneously**. With the power of live data, personalized security, massive distribution and report customization, there is also some responsibility that comes with keeping your reports running with the same **high performance**.

Here are key factors that contribute to report performance for you to consider.

## Key Factors to Report Performance



## Reporting Framework & Infrastructure

Workday continues to make significant investments in our reporting framework and infrastructure to support high report performance, with a focus on necessitating minimal uptake from you.

- Extending our indexing capabilities
- Making indexing more user friendly
- New parallelization methods

Workday helps you improve report performance by continually delivering **more indexed artifacts** (Fields and data sources) and exposing this information in an easy-to-use manner in the Report Writer tool. Several calculated Field types are enhanced for optimized indexing. Also, the Workday reporting framework uses **Hybrid Indexing** to automatically run your custom reports with a mix of indexed and standard fields faster.

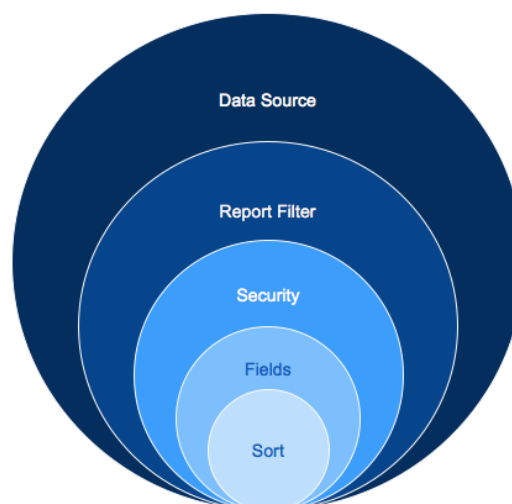
Workday has also introduced **parallelization methods** for processing filters, data source reads, sorting, and security evaluations in custom reports.

To increase the efficiency of reporting use cases that call for non-indexed reports needing calculated fields, Workday also provides the ability to define and index a **custom, logical data model** via the custom data source feature.

Beyond the investments we are making, this paper outlines **Report design best practices that YOU can follow to take greater control over your report performance.**

## Report Design: 5 Best Practices

### Performance-Influencing Design Choices



# 1: Choose the right data source

Data source selection is by far the most important design choice you can make while building custom reports.

## Data Source Categories



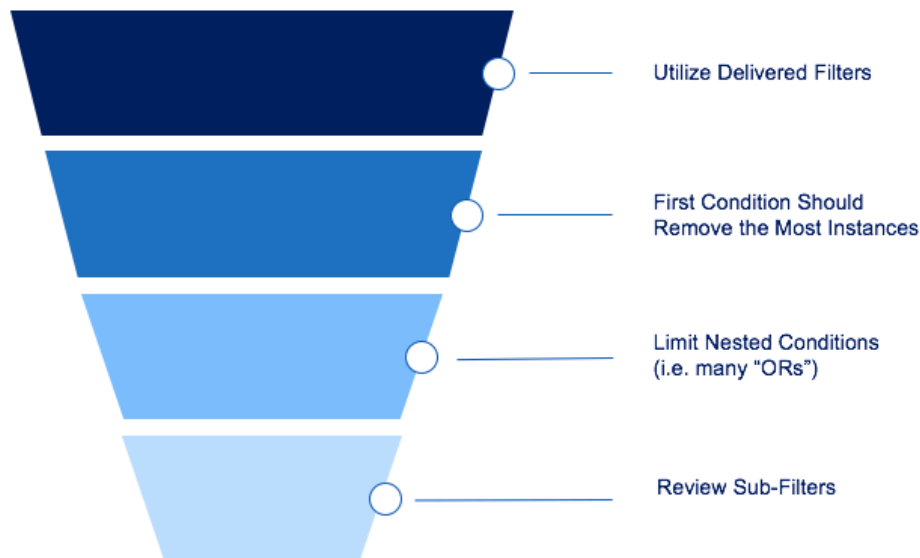
- Understand the use case of your report and review options for Business Object and Data Source using tools such as *Business Object Details* and *Data sources* before making a final selection of data source.
- Use Indexed data sources as the first choice for performance-critical reports, especially for dashboard reports. These are specially designed by Workday to be most efficient in returning large volumes of data.  
*Example: Choose **Workers for HCM Reporting** or **Trended Workers** rather than a non-indexed data source like **All Workers** or **All Active and Terminated Workers**.*
- If Indexed data source is not an option, select Filtered data sources that improve performance by filtering and fetching limited data sets of interest.  
*Example: Choose **Workers by Organization** or **Workers Supported by Role** rather than **All Workers**.*
- Where possible, select focused data sources that return limited instances based on the user running the reports.  
*Example: Choose **My Team's Goals** rather than **Goals by Organization** to include only data specific to the audience of the report.*
- Irrespective of type of data source used, always also ensure that you use the data source filters rather than adding your own filters into the report definition, to fully utilize the technical efficiencies Workday has built into them.
- Always use the **Trended Workers** data source for reporting on trended data.
- If you still experience performance issues, consider creating custom data sources.

- Data sources marked “Do Not Use” are marked so for a reason. Please redesign your reports using Workday-provided alternative data sources.
- Be aware of data sources whose primary design intent is to house massive volumes of data, to level set expectations around performance. These data sources are not the most performant data sources delivered by Workday; use them only if you *have* to. A couple of examples include:
  - **All Business Process Transactions** (*Use All Business Process Transactions of Type Completed in Date Range as an alternative*)
  - **All Active and Terminated Workers**

## 2: Use the right filters and sorts

Report Fields used as filters and the order in which they appear in a report definition directly impact report execution times.

### Best Practices for Field Filtering



- When creating reports using indexed data sources, use indexed filter fields. Reports built on indexed data sources are only as performant as the filter fields included in them.
- You can improve report performance when you use built-in prompts of the data source rather than creating your own filters and prompts.  
*Example: In **Workers by Organization** data source, prompts on **Organization, Subordinate Organization, Is manager** already exist. Using these in your report will improve performance over recreating these manually.*
- Review **filter order** in your report to ensure that the topmost one eliminates the most instances first before Workday processes subsequent filters.  
*Example: A simple move of **Line is Canceled** from being the first to the third amongst filters **Purchase Order Status, Spend Category Hierarchy as Worktag, Line is canceled**, on a custom*

*report built using Purchase Order Lines data source showed a 40% performance improvement in a performance lab run for a certain customer.*

- Consider making prompts “required” and moving them toward the top of the filter criteria, as applicable.
- Limit nested conditions in filters. Excessive “OR” conditions in a report definition can lead to a slow running report, in spite of all other elements of the report design being performant.
- Review your report for excessive use of sub-filters. Often, this indicates a wrong choice of business object/data source. If there are 8 or more sub-filters, refer to the **Business Object Details** report and select a more efficient business object.
- Optimize your filters and prompts.

*Example: Choose a Comparison Type of "Prompt the user for the value and ignore the filter condition if the value is blank" instead of having two filter conditions to check if the value matches the prompt AND is not blank.*

- Understand that even when you don't define a sorting configuration, Workday still sorts the report based on the very first column. More often than not, sorting text-type fields is more performant over the other report field types(Text, Numeric, Boolean, Currency and Date). As a best practice, ensure that the first column of your report is a Text type report field.
- Keep in mind that sorting is an expensive operation and can severely affect your report performance if you have too many/inefficient sorts in play.

### 3: Report fields

The runtime processing techniques applied to different types of fields (standard, calculated, group by, filters, aggregations, etc.) in a report contribute to its performance.

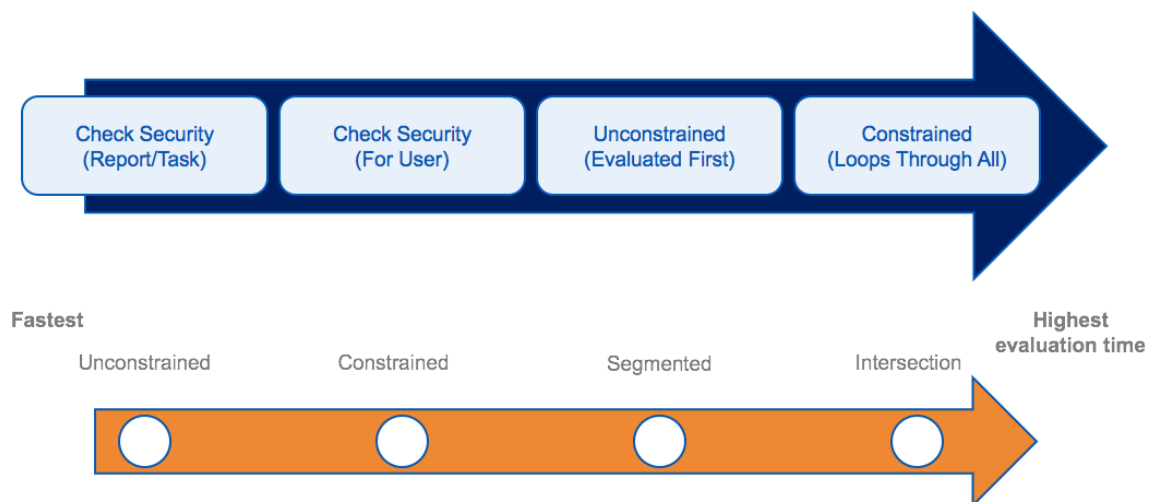
- The more fields that you include in your report, the more data that needs to be processed and security tests to be done. Only include the fields that you really need on the report.
- The more complex the fields that you include ( multi-level calculated fields), the slower the report execution. Try using sub-filters and related objects before using calculated fields.
- Review the group-by fields on the *Matrix* or *Column* tabs of your report definition.
- For matrix or trending reports built using indexed data sources, ensure that the group-by fields are *Indexed for Group-by* and *Indexed for Aggregation*. If this is not the case, you may still have slow running reports, in spite of using indexed data sources.
- Using calculated fields as filters can lead to significant slowdown. If your use case requires you to use many calculated field-based filters, create your own custom data source with these calculated fields.

- If using a calculated field, ensure that it has been optimized for performance by Workday. – Example

Indexed for Group By: Lookup Date Rollup, Lookup Hierarchy, Lookup Hierarchy Rollup, Lookup Range Band (also Indexed for filtering), and Lookup Related Value

If using Evaluate Expression calculated field, the lookup band order matters. At runtime, the Evaluate Expression calculated field evaluates a series of conditions and returns the value associated with the first true condition. Ensure that the most likely condition is first in the sequence of conditions in the report design.

- Where possible, employ unconstrained (user-based) security groups rather than constrained security groups to improve processing.  
*Example: Integrations sourced from custom reports should use Integration System User (unconstrained) security groups. This is because the Workday determines field by field what should be accessible, and this complex security determination takes longer to process.*
- When using constrained (role-based) security groups, consider setting access rights to *Current Organization* and *All Subordinates* rather than *Current Organization* and *Unassigned Subordinates*. This reduces security processing time and improves report performance, especially if roles have been assigned at very high levels in the organization.
- If the report log shows considerable time evaluating security, review alternative (pre-filtered/contextual) data sources to see if a more concise one can be used.

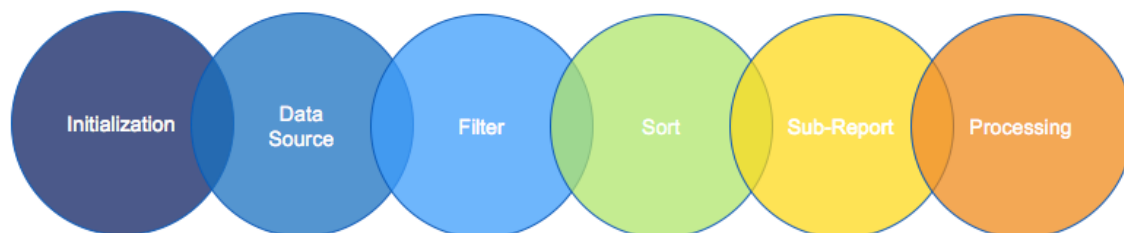


## 4: Leverage report logs

The Report Log tool helps gather performance timings by creating a breakdown of time spent processing the report.

The total execution time of any standard or custom report in Workday is a sum of six buckets.

### Constituent Elements of Report Execution Time



- Parse Report Log information to identify which elements of the report need to be redesigned.
  - *Initialization*: If this time is high, consider fine-tuning your prompt settings.

- *Data Source*: If this time is too high, try a different data source or check if the data source can be improved by Workday development

## Report Performance Comparison of Different Data Source Selections

<b>Report Data Source: All Workers</b>  <b>Report Filter:</b> Supervisory Organization = Global Modern Services	<b>Report Data Source: Workers by Organization</b>  <b>Report Data Source Filter:</b> Supervisory Organization = Global Modern Service
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### Example from Tenant with 5,000 Workers

#### ---Report Timings (ms) and Instance Counts---

Total Execution Time: 960  
 Total CPU Execution Time: 3011  
 Initialization Time: 3  
 Data Source Time: 249  
 Top Level Filter Time: 2736  
 Contextual Security Filter Time: 0  
 Top Level Sort Time: 6  
 Processing Time: 17

CommonDataSource Instance Count: 5225  
 Post Filter Instance Count: 2

#### ---Report Timings (ms) and Instance Counts---

Total Execution Time: 46  
 Total CPU Execution Time: 46  
 Initialization Time: 24  
 Data Source Time: 2  
 Top Level Filter Time: 0  
 Contextual Security Filter Time: 0  
 Top Level Sort Time: 5  
 Processing Time: 15

CommonDataSource Instance Count: 2  
 Post Filter Instance Count: 2

- *Filter*: A high *Top Level Filter* timing indicates
  - A slow running calculation field in the filter
  - A slow running field in the filter
  - Less than optimal filter order
- *Sort*: If this time is too high, replace with text fields when possible and ensure the first column in the report does not include an instance field type.
- *Sub-Report*: Identify which sub-reports of the composite report take too long to process and redesign the sub-report as needed.
- *Processing*: If the instance count is too high, re-evaluate your choice of data source or choose better filter settings.
- DO NOT release reports to production without evaluating performance via repeated report log analysis.



#### Continuous Evaluation Report Performance Logs



- Be aware that data in your tenant is ever-growing. Even a well-designed report from 3 years ago may need to be fine-tuned to execute today, since data has increased multifold in this timeframe. Establish recurring report log reviews to account for continuous tuning and uptake of more performant alternatives.

## 5: Invest in a “Thought-guide” for report design

Understanding the report’s business case and embedding it into each aspect of report design is crucial to developing a fast running report.

- Gather key pieces of information such as
  - Who is running the report?
  - How often are users running it? Is scheduling an option?
  - What types of information are users trying to get out of this report?
  - Data as of today?
  - Aggregations?
  - Different sources of data together?
  - Are your users doing any further manipulation with this data after running the report in Workday?

- Research all options available from the **Business Object Details** report BEFORE selecting the most efficient data source.
- Where possible, build custom reports by customizing Workday-delivered standard reports.
- Review all report types available in Workday and choose the one that makes most sense for your particular use case/audience.

*Example: Choose Matrix reports with calculations if aggregating data in calculated fields.*

*Creating an advanced report to achieve the same will result in a significantly slower report.*

*Example: When designing dashboard reports for workers that support or manage more than 10-12k workers, only use Indexed data sources.*

- Choose composite reports if comparing data and looking for changes/variances like data audit reports, year-over-year reports, etc.

- For infrequently-run reports (per quarter, per month, per fiscal period, etc.) or executive reporting, choose scorecards.
- For recurring runs of reports (for example, every Monday morning or every last Friday of the month), consider pushing the reports to the background as a scheduled process.
- For reporting on trends, choose trended data sources and scorecards.
- For “point-in-time” reporting, use standard data sources. DO NOT use indexed data sources.
- For reporting across multiple sources of data, consider composite reports and ensure that underlying sub-reports are built using indexed data sources ONLY.
- For advanced reports that need downstream heavy lifting (pivots), consider creating matrix reports instead.
- ‘What-not-to-do’ when designing your report

*Example: When trying to add a particular report on a dashboard, know how much data that Workday is likely to return. For example, a payroll report that returns a large number of instances will likely trigger any timeout controls.*

*Example: Do not create dashboard reports using indexed data sources whose filters are NOT indexed.*

*Example: In the case of non-performant reports with calculated fields, include a ‘LINK’ to the report on the dashboard instead.*

*Example: Do not design executive dashboard reports, that calculate turnover for >100k workers using data sources other than the **Trended Workers** data source.*

- Pay attention to ALL warnings in Report Writer.  
Example: Matrix and composite reports display alerts when you include a slow-running field in the definition. Do NOT ignore warning; try to re-design proactively.

## Continuous Feature Adoption & Report Sharpening

This paper should have given you some actionable steps you can take today to take more control and ownership of your report performance. Workday continues to deliver new features that make it easier to manage report performance. We also invest in infrastructure and automation to do it for you without any setup.

A proactive step you can take is to set up and analyze report performance logs to assess optimization opportunities. As Workday delivers new features, take time to purge, redesign, and rebuild your existing custom reports.

Some recommended processes include:

- Report Data Source Review  
Set up a routine task to check for Reports with Retired Data Sources and Fields and rebuild reports using alternative data sources/fields provided.  
Consider creating custom Audit reports to track outdated analytics content in your reporting repository.
- Report Design Review

- Report Run Optimization  
Use the *system health dashboard* to identify time periods when your tenant's processing resource usage is at its lowest and set up your scheduled report runs in those windows.
- Security Review

However, to get the most out of Workday reporting, we always recommend staying current on new feature deliveries related to report performance. Make sure to leverage the **What's New** reports in Workday and the **Adoption Planning Dashboard**. These tools help you to prioritize reporting feature adoption. We also recommend following the [Reporting User Groups](#) for reporting specific commentary and ideas, and also leveraging your local Workday community in the [Regional User Groups](#).

Finally, be sure to take advantage of Workday's [services offerings](#) for guidance and support on new features, establishing best practices, and assessing your existing reports.

## Fast Reports in Reach

In organizations everywhere, big and small, data is rapidly expanding. Naturally, so are reports and analytics. Like keeping a machine well-oiled and running smoothly, **Report hygiene requires intention and attention**. Between Workday's infrastructure investments, applying these best practice design principles, adopting new performance features as they come out, and continuous sharpening of your existing reports, you should have all of the tools you need to make every report a high performing one!

## Related Resources

- [NextLevel Series on Report Performance](#)
- [Framework Factors affecting Performance Q&A](#)
- [Optimizing report performance](#)
- [Custom schema](#)