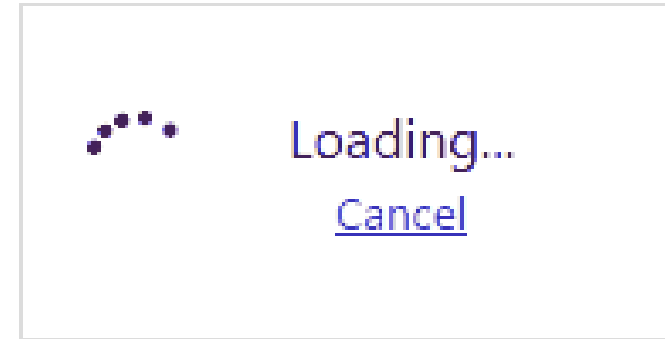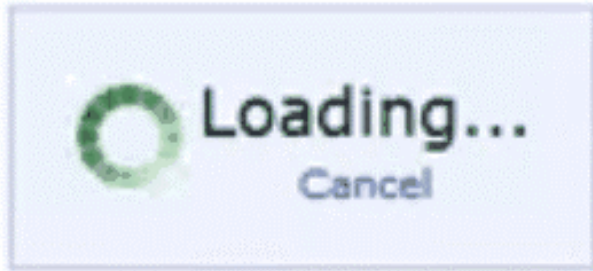# High Performance SSRS: Techniques for Fast Reporting

Objective

- Eliminate these (or at least reduce their time on screen)
- i.e. make your reports *fast*

Bert Wagner

Slides and code available here!

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SSRS Performance Tuning

There are 3 main things you can do:

- SQL solutions

- Reporting solutions

- Hybrid special case solutions

Part 1: SQL Solutions

Audience Participation:
Which interval is longer?

Photo by Abigail Lynn on Unsplash

The audience during my last SSRS presentation

SQL Solutions: **SSRS Usage Data**

	ItemPath	Format	TimeDataRetrieval	TimeProcessing	TimeRendering
1	/High Performance SSRS - Demos/01-TrafficAndSpecialization-QueryFiltering	RPL	623	122	198
2	/High Performance SSRS - Demos/01-TrafficAndSpecialization-DatasetFiltering	RPL	123	22530	3880

- You need a baseline for performance testing!
- SSRS database has built in logging for analysis
  - https://msdn.microsoft.com/en-us/library/ms159110.aspx
  - Use the "ExecutionLog3" view
- Most useful metrics to look at when measuring performance:
  - Time Data Retrieval - time getting the data for report
  - Time Processing - time manipulating the data in report (sort, filter, etc…)
  - Time Rendering - time to build the report in the chose render format (HTML, Excel, PDF, etc…)

Audience Participation:
Which is the right tool?

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Audience Participation:
Which is the right tool?

"Sand Castles" by Dave Gunn is licensed under CC BY-NC 2.0

"A Hole In The Ground" by Jitze Couperus is licensed under CC BY 2.0

SQL Solutions: **Tool Specialization**

SQL Database → **SSRS Server** → **User's Computer**

Scenario #1: No work in the query, lots of work in the report. Work includes filtering, sorting, etc…

Demo

SQL Solutions: **Tool Specialization**

SQL Database → **SSRS Server** → **User's Computer**

```
1  □SELECT
2      Id,
3      Title,
4      AcceptedAnswerId,
5      AnswerCount,
6      CreationDate,
7      Tags
8  FROM
9      StackOverflow.dbo.Posts
10 WHERE
11     AcceptedAnswerId = 0
12     AND AnswerCount < 3
13     AND Tags like '%<mssql>%'
14 ORDER BY
15     CreationDate DESC
```

- No filtering in the dataset
- No sorting in the tablix

Title	Creation Date	Tags
Why is my stored procedure returning 0?	3/6/2016 3:49:07 AM	<sql-server> <tsql> <stored-procedures>
SSIS Package Optimization for thousands of excel files and archival on the basis of business logic	3/6/2016 3:39:41 AM	<sql-server> <ssis> <ssis-2012>
Using CTE to find recursive records failed	3/6/2016 2:38:35 AM	<sql> <sql-server> <database> <data-warehouse>
ETL From Sql Server bak file to Postgres or other open source solution	3/6/2016 1:58:00 AM	<sql> <sql-server> <database> <postgresql> <data-warehouse>
The 'msolap' provider is not registered on the local machine	3/6/2016 12:58:55 AM	<asp.net> <sql-server-2012> <iis-7> <ssas> <olap>
SQL dynamic weekend/3 day date	3/5/2016 11:25:34 PM	<mysql> <sql-server>
SQL stored procedure output params OK on local server, return NULLs when called remotely, help please	3/5/2016 10:37:38 PM	<sql-server> <stored-procedures> <parameters> <rpc> <linked-server>
SQL Server Express installation never starts	3/5/2016 10:25:54 PM	<sql-server> <installation> <sql-server-express>

Scenario #2: Filtering, sorting in the query, reporting server just displays the page to the user

Demo

SQL Solutions: **Disk IO, Network IO**
*a.k.a. Don't use SELECT **

Using SELECT *:
- Returns more data than is needed
  - Affects read time off disk
  - Fills buffer pool
  - Affects time spent on the network
- Prevents smaller, data dense indexes from being used
- Could impact SARGABILITY – indexes might not be used to filter data, table scan instead
- Could break queries/reports
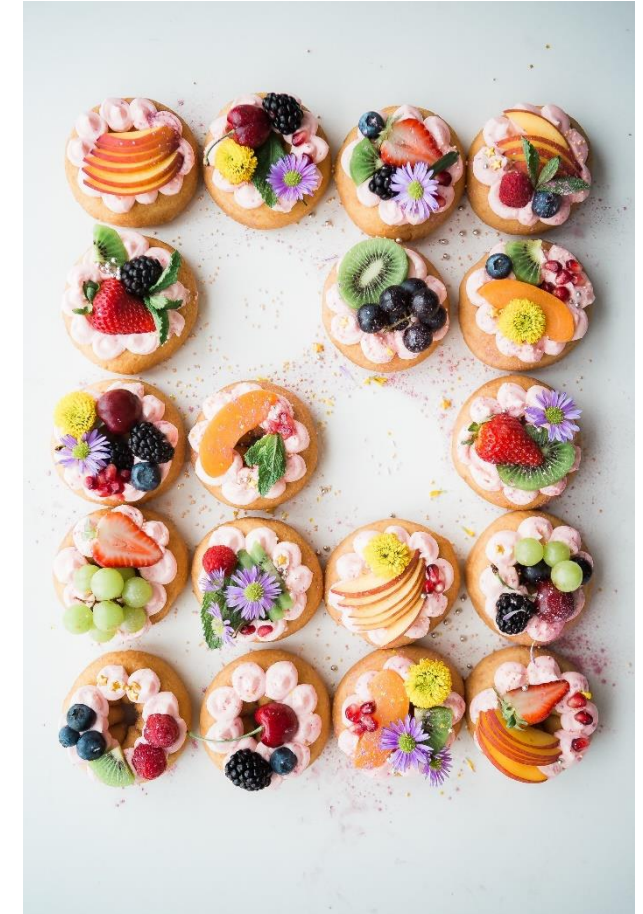- Gives no hints to future developers about intentions

Photo by Brooke Lark on Unsplash

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SQL Solutions: **Parameter Sniffing**
"Sometimes my report runs fast, other times slow"

- It's a feature!
  - Allows SQL Server to cache and reuse plans
  - Doesn't work well if your data is skewed
- Problematic if different parameter values should produce drastically different execution plans

Solutions:
- Better query plans (indexing, refactoring, no table variables, functions, etc...)
- RECOMPILE
- OPTIMIZE FOR
- IF/THEN
- Additional information: https://bertwagner.com/2017/08/08/why-parameter-sniffing-isnt-always-a-bad-thing-but-usually-is/

Demo

SQL Solutions: **Stage Your Data**

- If you have complex reporting queries that do lots of joining or transformations…
    - Use an ETL to stage that data instead.

Part 2: SSRS Solutions

Audience Participation:
Spot the difference?

Photo by Gabriel Sanchez on Unsplash

Photo by Gabriel Sanchez on Unsplash

SSRS Solutions: **Compress Images**

Photo by Gabriel Sanchez on Unsplash

Photo by Gabriel Sanchez on Unsplash

GIF 74 KB

JPG 5.44 MB

SSRS will not compress your images. Reduce network IO and compress them yourself!

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SSRS Solutions: **Explicitly Define Property Values**

- Any report properties not explicitly defined during render have to determined by SSRS during the processing and render steps.
- Explicitly define properties like:
  - Text alignment (don't use General)
- Some properties have to do lots of calculating which hurts performance:
  - AutoGrow, AutoShrink
  - Image AutoSize

A full list of properties and considerations can be found here:
https://technet.microsoft.com/en-us/library/bb522806(v=sql.105).aspx?f=255&MSPPError=-2147217396#Render
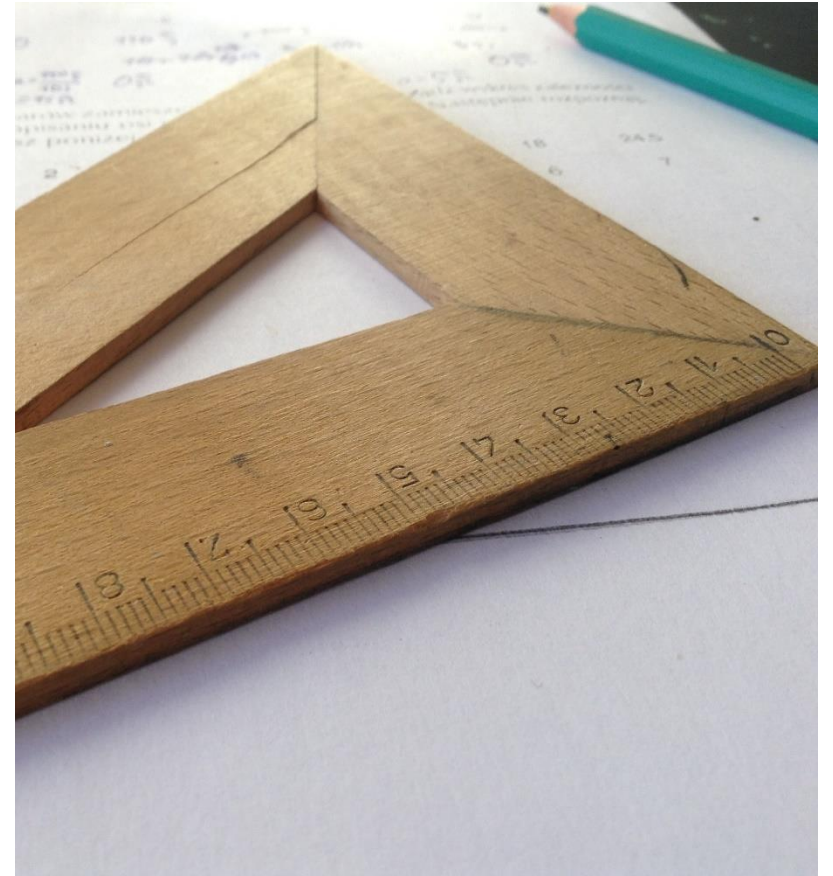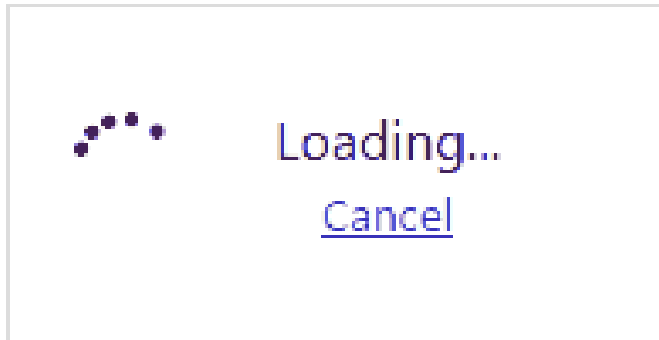

Photo by Dawid Małecki on Unsplash

SSRS Solutions: **Don't Render HTML**

Loading…
Cancel

- Rendering HTML reports is relatively expensive
- Other options, like Excel, perform significantly faster
  - E.g. add &rs:Format=EXCELOPENXML to end of URL
  - Available formats found in your config file
  - Use EXCELOPENXML instead of default EXCEL to force the newer (smaller) version of Excel (applies to older versions of SSRS)
- Paginate!
  - Why render HTML for pages that will never be shown on screen? Only render the ones that the user views.

SSRS Solutions: **Caching and Snapshots**

- SSRS can cache reports if data (parameters!) don't change
  - Data warehouse refreshed overnight? Don't requery all day long
  - First person queries live, the rest get the cached copy

- Can also schedule Snapshots
  - The results of a query at a specific time
  - Can schedule for certain times allowing all users (including the first) to receive snapshotted data

- Setup subscriptions to email results
- Cache results on network storage and email links instead

More information: https://docs.microsoft.com/en-us/sql/reporting-services/report-server/preload-the-cache-report-manager

Part 3: Hybrid Solutions

Hybrid Solutions: **CRUD Operations**

- It is possible to INSERT/UPDATE/DELETE on the database from an SSRS report
  - Can actually do anything that a stored procedure will allow
- There are a few things we exploit to get this to work:
  - Datasets in a report always execute - even if they call a stored procedure that inserts/updates/deletes and returns no data
  - If the data source's "single transaction" property is enabled, datasets will execute in the order they appear

Photo by Mr Cup / Fabien Barral on Unsplash

Demo

Hybrid Solutions: **Dynamic SQL**

- Dynamic SQL is a query that is built programmatically
  - This gives us lots of flexibility in terms of how we can display our data and build reports so they are reusable
- Dynamic SQL can run very efficiently or have terrible performance; use caution and ALWAYS test
- Dynamic SQL also leaves lots of room open for SQL injection - be sure to parameterize any user input you are building into your query
  - Further info about SQL injection: https://bertwagner.com/2017/08/29/warning-are-your-queries-vulnerable-to-sql-injection/
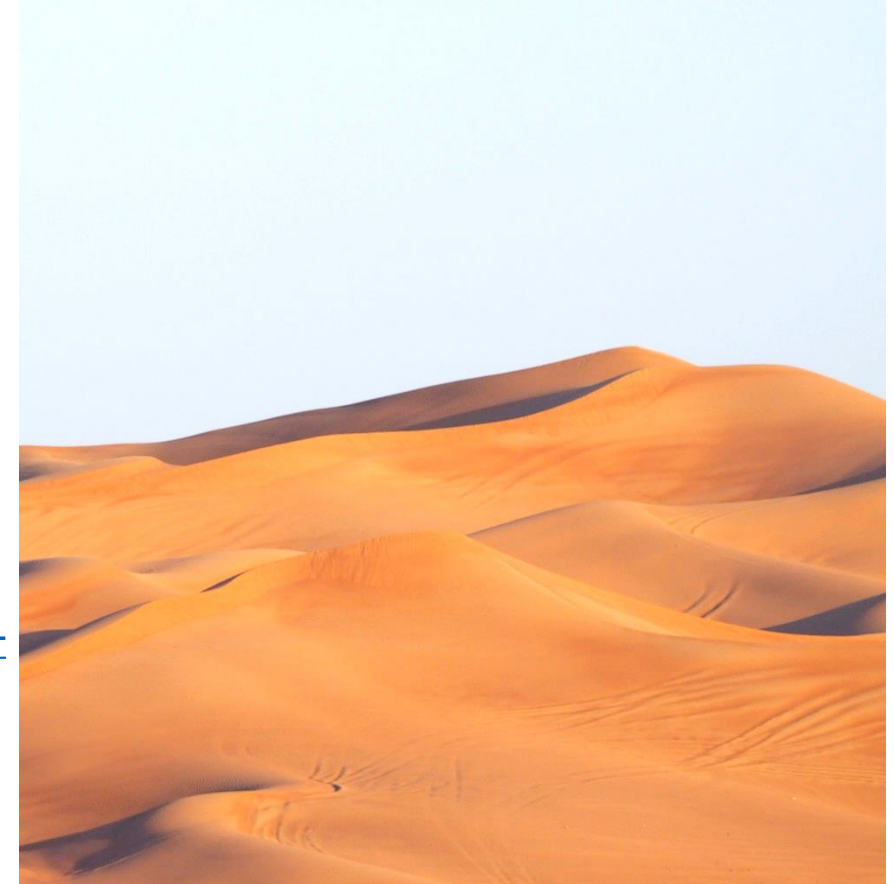

Photo by Timothy Simon on Unsplash

Demo

Hybrid Solutions: **Subreport Switching**

- Reports with lots of expressions generally take a long time to render
- If a report is using a lot of expressions, it's sometimes possible to break them up into multiple subreports
  - The parent report decides which subreport to run (based on efficiency)
  - This comes up a lot if you are displaying data using dynamic SQL

Photo by Natalia Y on Unsplash

Demo

Recap

1. SQL Solutions

- SSRS Usage Data
- Tool Specialization
- Disk IO, Network IO
- Parameter Sniffing

2. SSRS Solutions

- Compress Images
- Explicitly Define Property Values
- Don't Render HTML
- Caching and Snapshots

3. Hybrid Solutions

- CRUD Operations
- Dynamic SQL
- Subreport Switching

Thank you!

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New posts and videos every Tuesday!