

BUILDING PERFORMANT POWER APPS



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Building Performant Power Apps

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Agenda - Power Apps Performance Optimization Techniques

- Delegation
- Controls Optimization
- Formula Level Optimization
- Reduce network calls
- Caching
- File Optimization
- Key Takeaways
- Learning Resources

Why WORRY about Power Apps performance?

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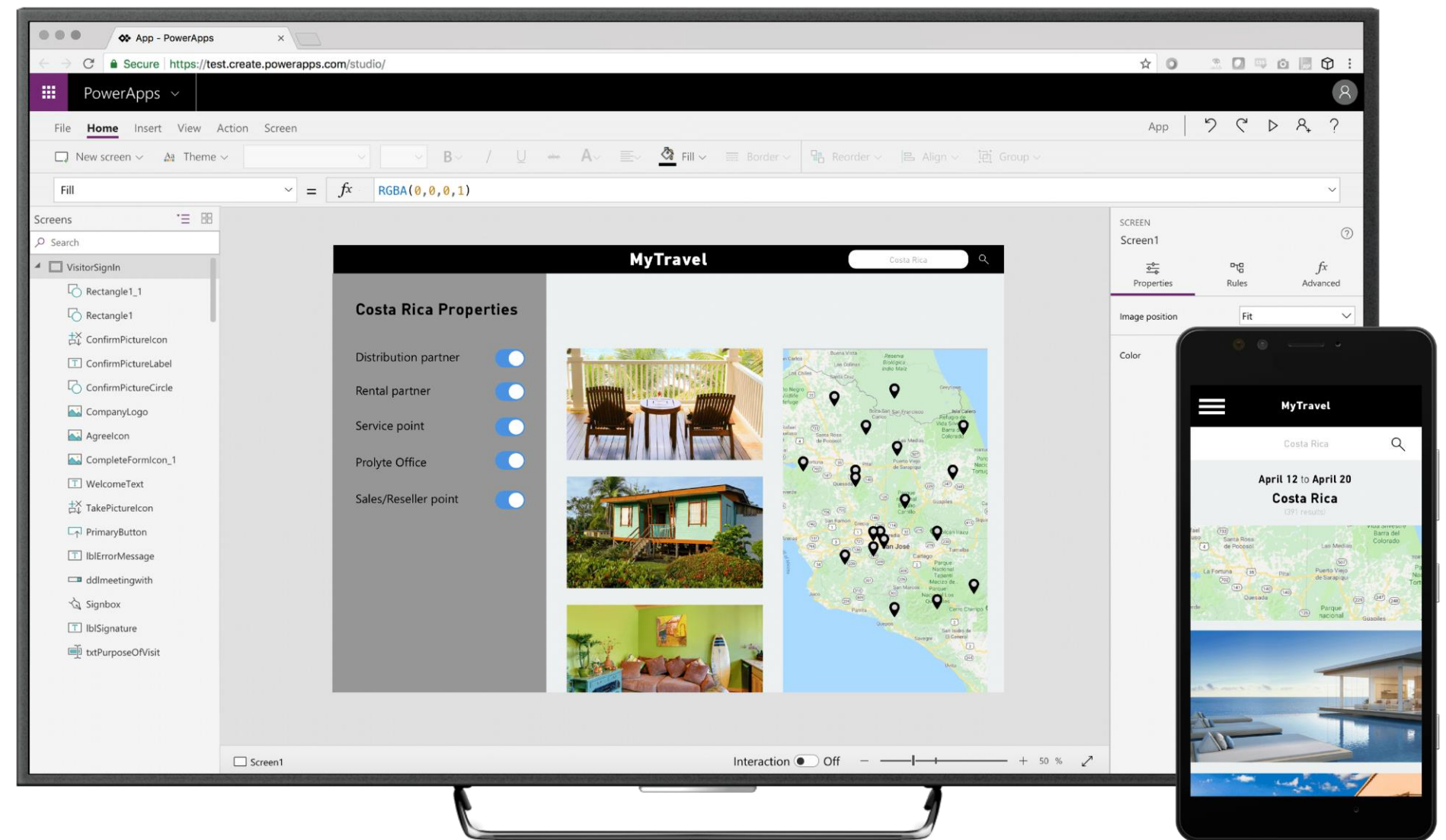


What is Power Apps?

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Power Apps is a suite of apps, services, **connectors** and data platform that provides a rapid application development environment to build custom apps for your business needs.

Easily build web & **mobile** apps with a full featured **low-code/no-code** development experience.



Key Points

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Connectors

- Data is at the core of most apps, including those you build in Power Apps. Data is stored in a data source, and you bring that data into your app by creating a connection. The connection uses a specific connector to talk to the data source. The connector in turn performs an OData query to the data source. Optimizing the queries is key !!!

Mobile

- Install the Power Apps mobile App and run Apps on your mobile/tablet devices.
- Calling data sources from a Mobile device – What if network connection is poor?
- Storing data locally in the App – How much storage space does the device have?
- Power Apps performing OData queries to data sources – How much processing power does your device have?

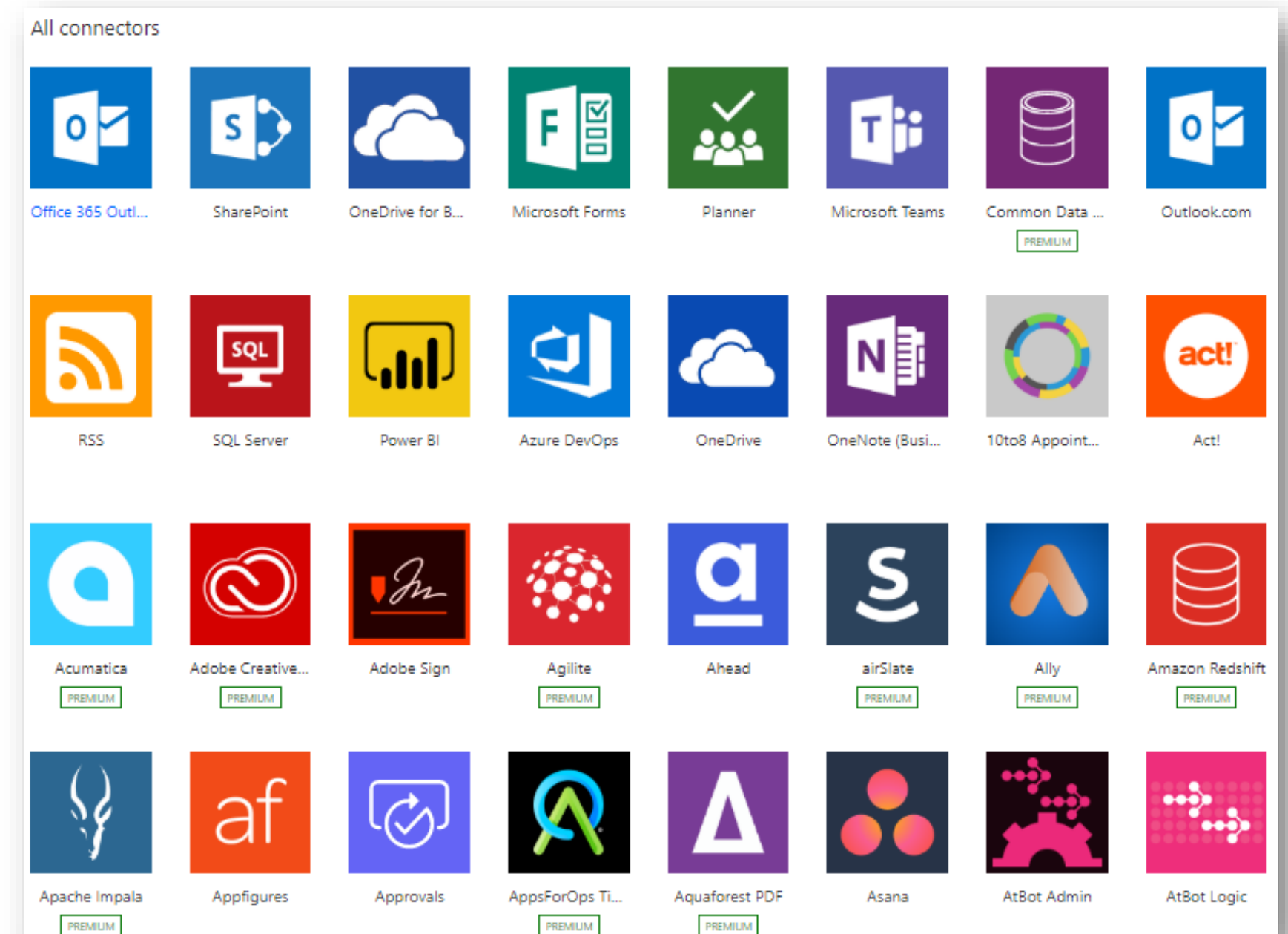
Low-Code

- Yes, but App maker now must consider performance & optimization of code/queries etc.

Connectors

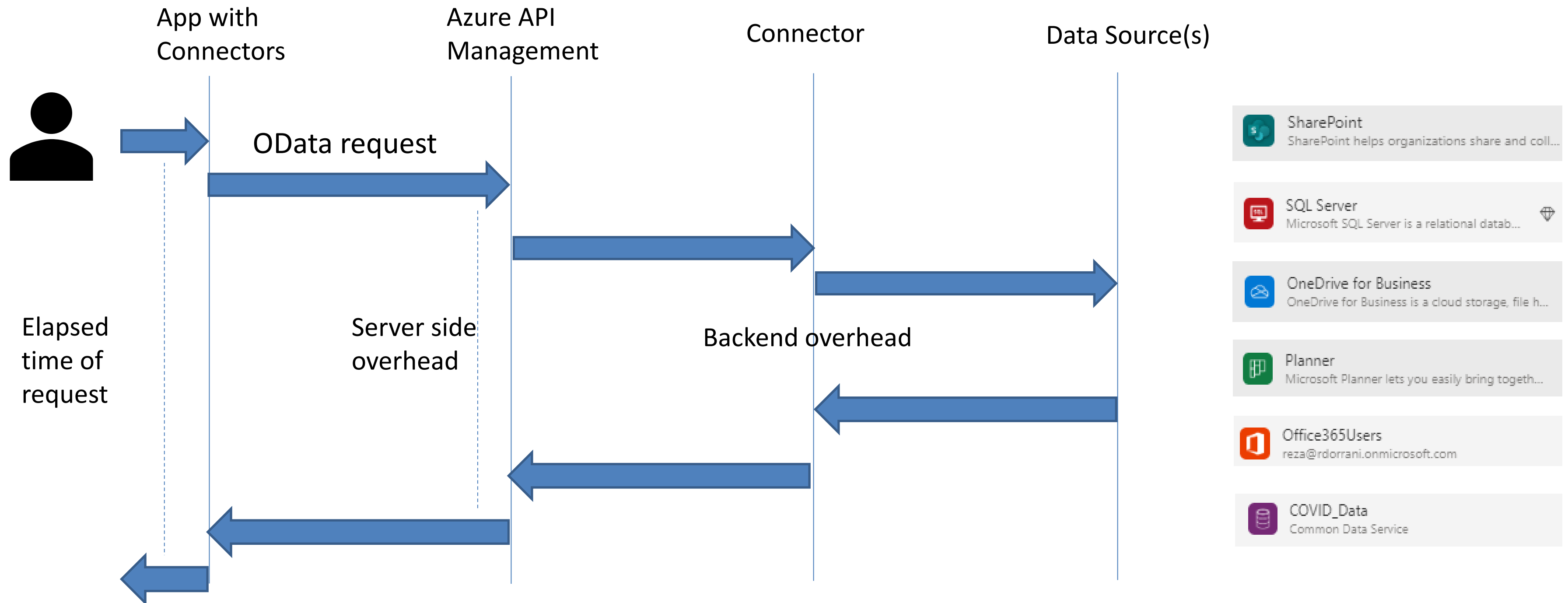
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- Defines how you connect to data sources and services in Office 365 & beyond.
- It is a proxy or a wrapper around an API that allows the underlying service to talk to Power Apps.
- Over 375+ connectors available.
- Connectors are classified as Standard, Premium & Preview.
- Connect to on-premises systems via the Data Gateway.
- Create your own - Custom Connectors.



OData Request flow in Canvas Apps

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Concept of Delegation

- Working with large data sources

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What is Delegation?

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Delegation as the name suggests is the ability of Power Apps to delegate the processing of queries to the underlying data source, rather than processing the query locally in memory

A delegable Power App can handle queries (performance) on large data sets since the work of performing the queries will be delegated to the data source

*Working with large data sets requires using data sources and formulas that support delegation





What is the delegation limit?

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Default limit for non-delegable queries is **500** (Can be increased to **2000** by the App Maker)

Scenario: A data source exceeds 500 records, and a Power App query (function) does not support delegation

Outcome: Power Apps will only load the first 500 records in memory and then perform the query operation

Advanced settings

Data row limit for non-delegable queries

Set how many rows are retrieved from server-based connections where delegation is not supported.

Value:

Which data sources support delegation?

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Delegation is supported for the following data sources :

- Common Data Service (CDS)
- SharePoint
- SQL Server

If any data source supports delegation, then the connector documentation would specify it

Imported Excel files (static), collections, and tables stored in variables don't require delegation since the data is already in memory





What about functions?

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Every data source is different, and its associated delegable functions vary based on the data source (read connector documentation)

Filter, Search and Lookup are delegable functions

*Certain functions like If, Mod, Left etc. are not delegable when used with above functions.

<https://docs.microsoft.com/en-us/powerapps/maker/canvas-apps/delegation-overview>

Item	Number	Text	Boolean	DateTime	Complex [1]
Filter	Yes	Yes	Yes	No [4]	Yes
Sort	Yes	Yes	Yes	Yes	No
SortByColumns	Yes	Yes	Yes	Yes	No
Lookup	Yes	Yes	Yes	No	Yes
=	Yes	Yes	Yes	No [4]	Yes
<, <=, <>, >, >=	Yes [2]	No	No	No	Yes
StartsWith	-	Yes	-	-	Yes
IsBlank	-	No [3]	-	-	No
<div><div>ⓘ Note</div><div>Expressions that are joined with And or Or are delegable to SharePoint. Not isn't delegable.</div></div>					

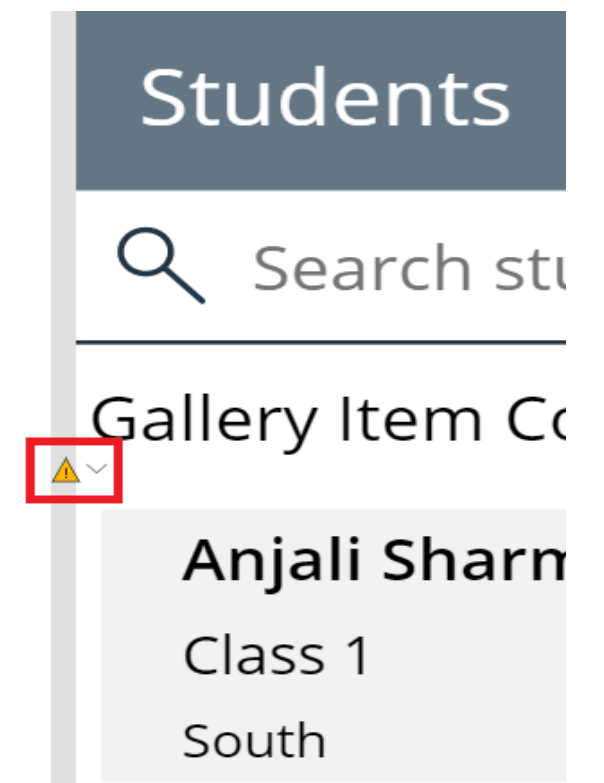
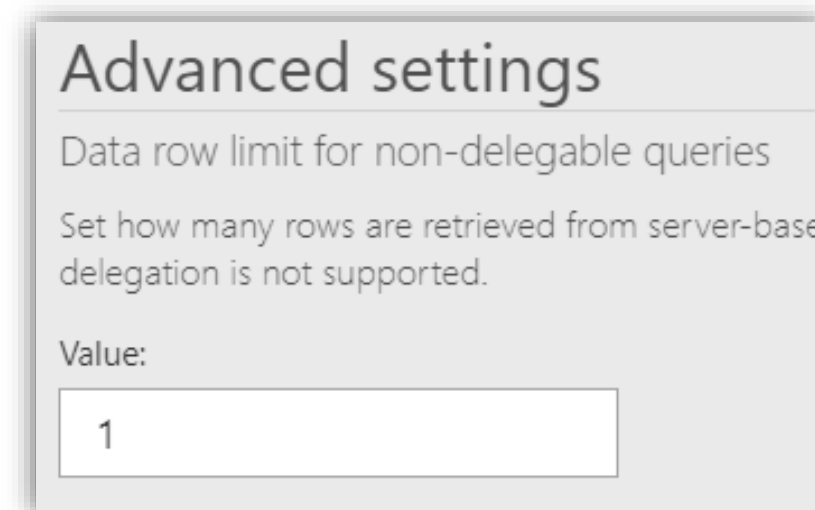
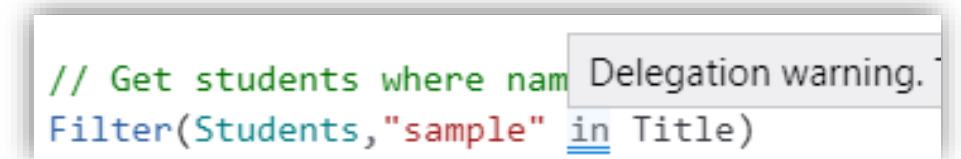
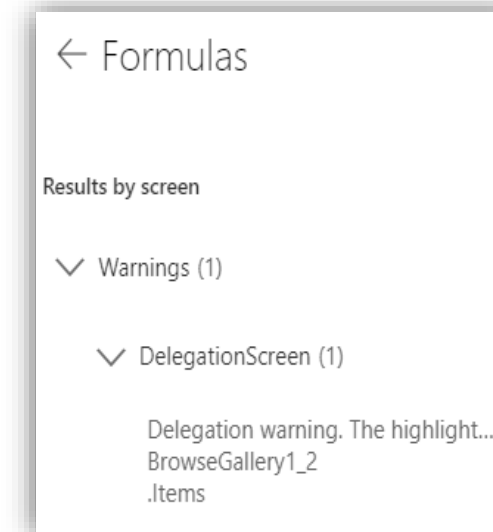
SharePoint delegable functions

How to identify a delegation warning?

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- Power Apps App Checker
- Look for **blue dot** errors in the formula bar
- Look for Hazard Symbol warnings on screen
- Set non-delegable query limit to 1

* Responsibility is on the App Maker to handle delegation



Delegation Demo

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Controls Optimization

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Reduce Number of controls

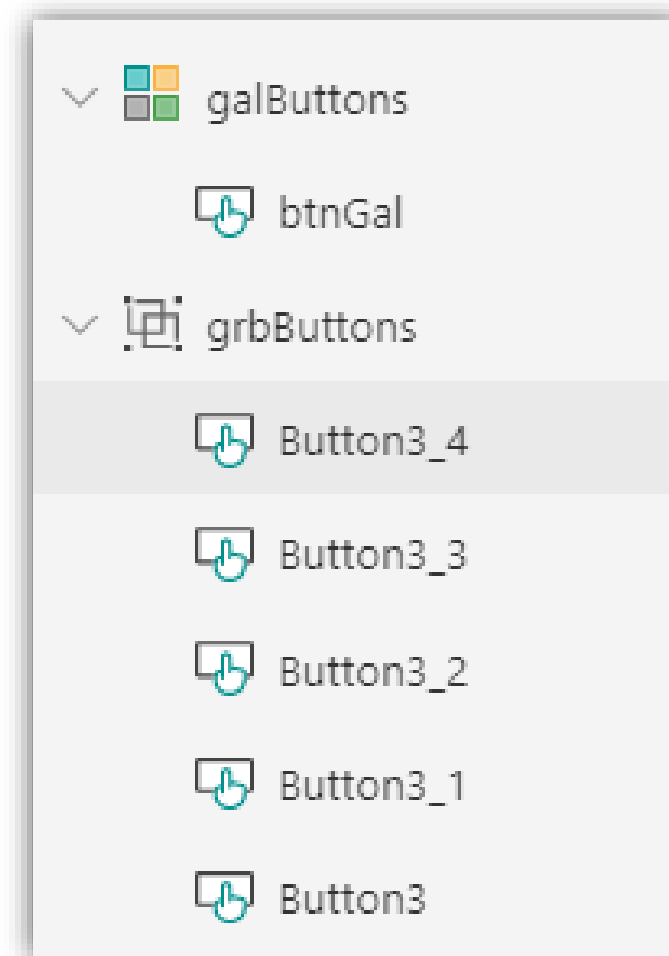
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Power Apps generates an Html DOM for rendering each control. The more controls you add the more time the App needs to generate these controls.

Some controls (such as PDF viewer, data table, and combo box) pull in large execution scripts and take longer to render.

Reduce number of control by leveraging galleries & components.

Recommendation: Don't add more than 500 controls to the same app. (This includes controls across all screens of the App)



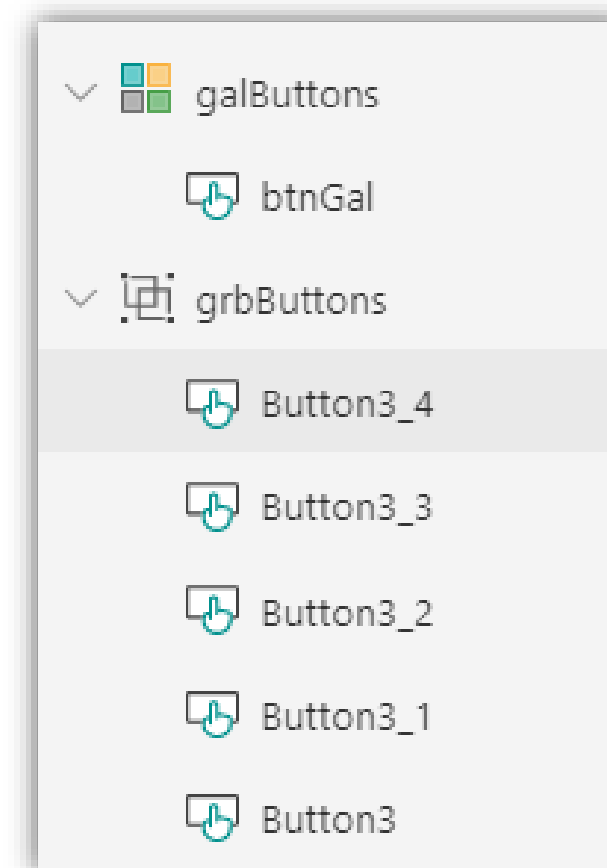
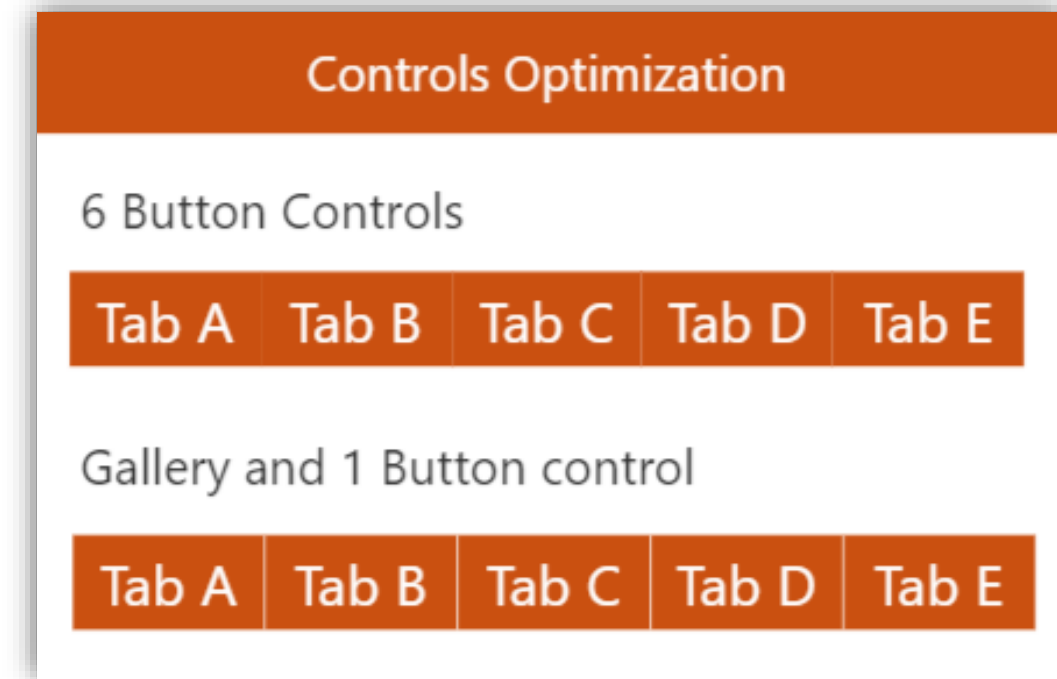
Use Galleries

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A Gallery control can show multiple records from a data source, and each record can contain multiple types of data.

Galleries reduce the number of controls needed as they act like a repeating control to display records based on the tabular data provided.

Galleries have the advantage of customizing only the template item(first item) and all other items will follow the same pattern.



Use Components

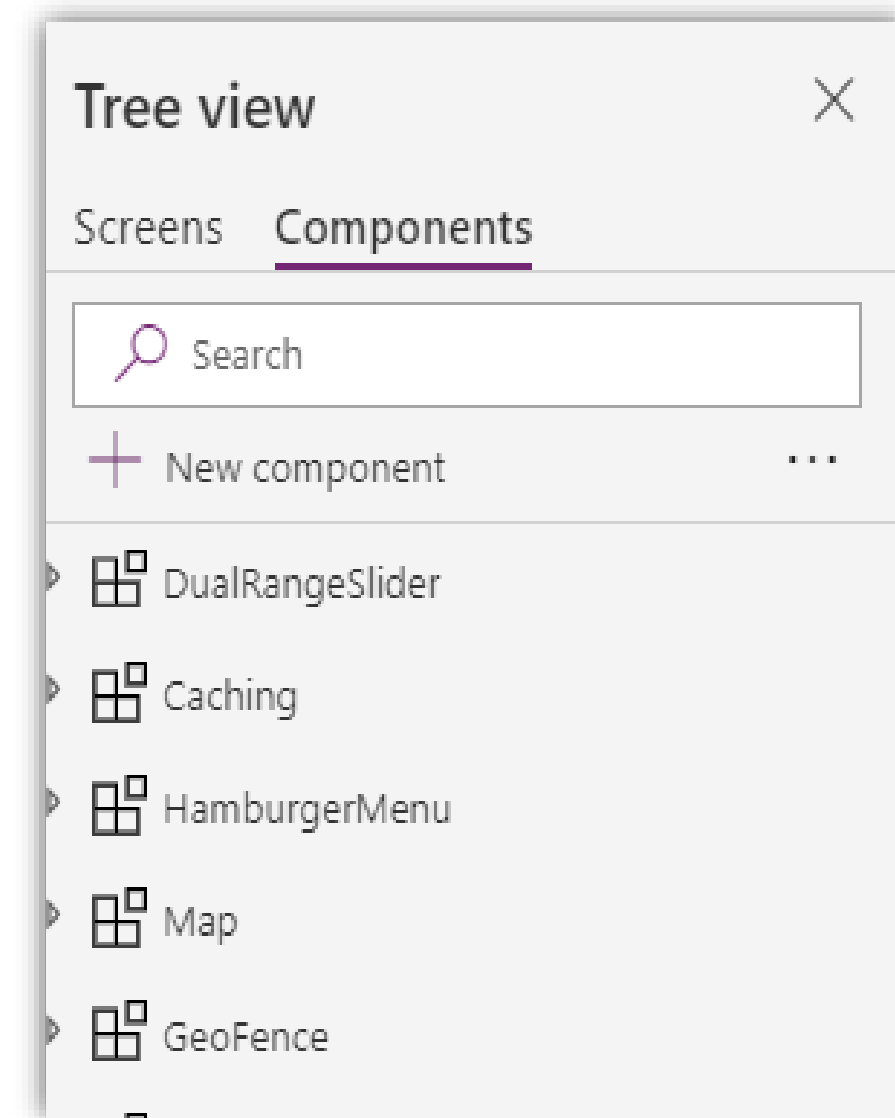
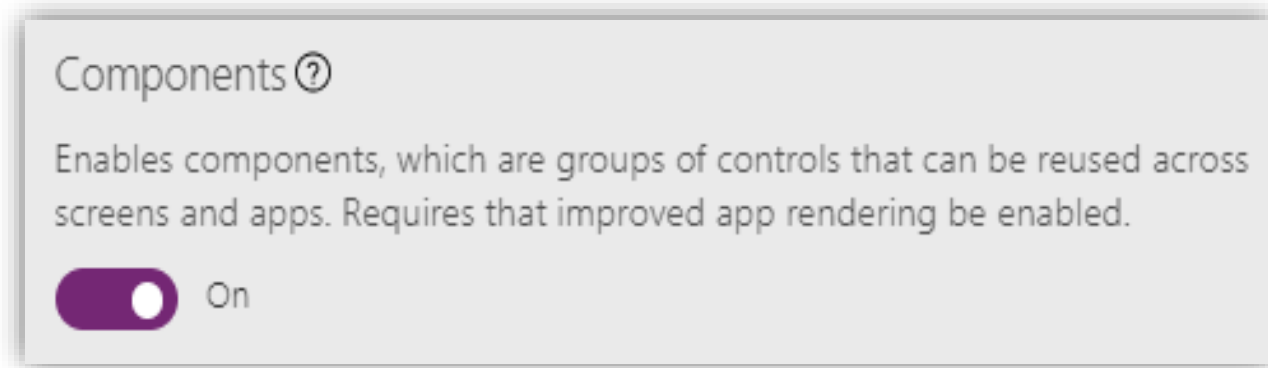
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Components are reusable building blocks.

A components comprises of a set of controls and properties that can be reused across screens within your App or across Apps in an environment.

The Component itself will act as the master template and one can create multiple instances of this template to be utilized across the app. Any update to the master template (controls or properties) will automatically push the changes to all the instances across the app.

Pros: Consistency, Reusable controls, Less Maintenance, etc.



Re-use the Form Control

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The form control can be used to Create, Edit and View records.

Many a times we build screens for Create, Edit and Viewing records.

The same form control can be leveraged for all the 3 purposes by just changing the FormMode using the following functions

- EditForm(FormControlReference)
- ViewForm(FormControlReference)
- NewForm(FormControlReference)

The image shows a web form titled "Form Control". It contains the following elements:

- Name:** A text input field.
- Age:** A text input field.
- Email:** A text input field.
- Enrolled Date:** A date input field with a calendar icon, showing the date 12/31/2001.
- Submit:** A blue button at the bottom right.

Demo - Controls Optimization

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Optimizing the OnStart function

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Optimizing App OnStart

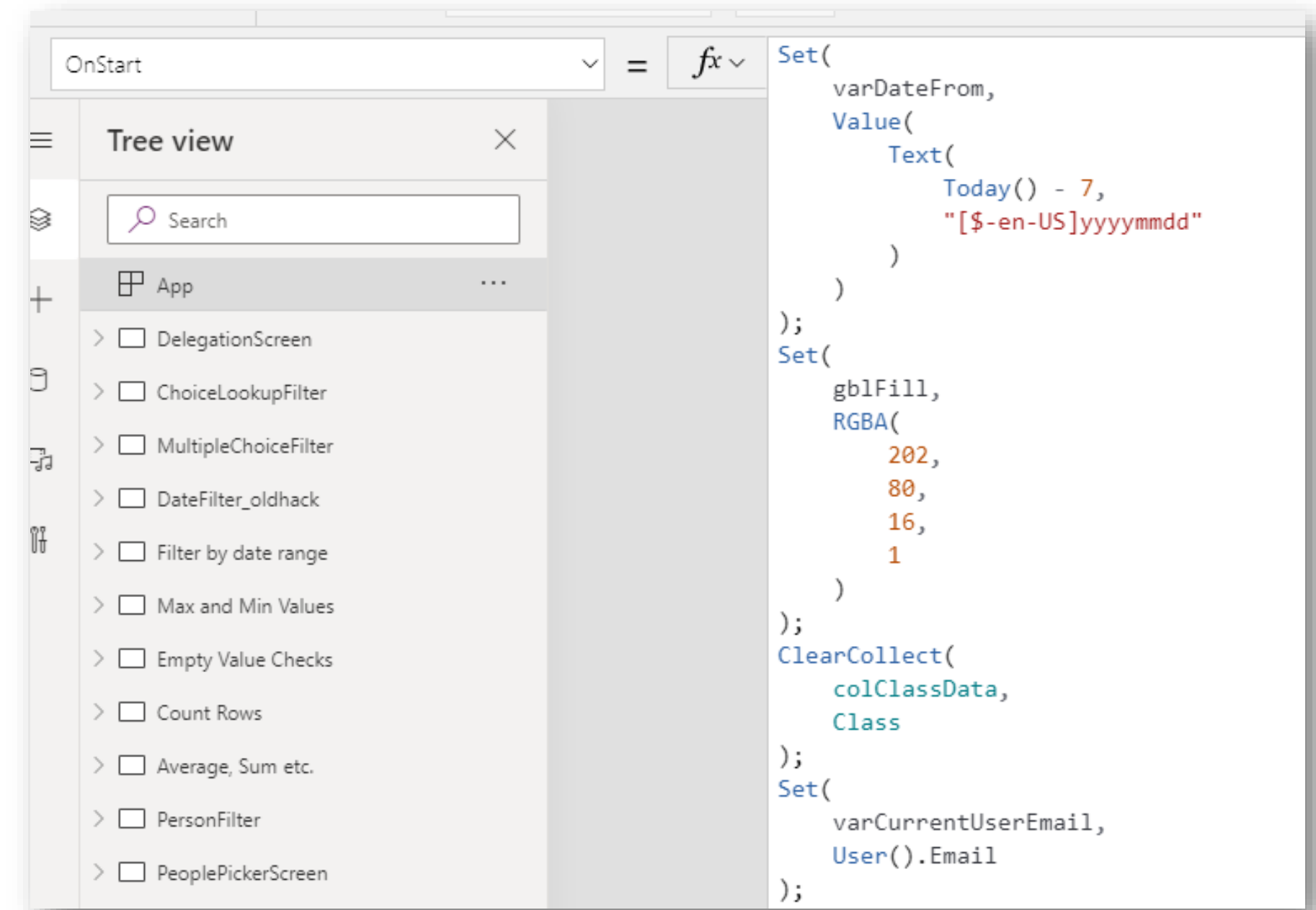
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When your App loads the OnStart function is the first to execute before the user navigates to the main screen

Use Collections to load data locally for scenarios where the data does not change during the user session.

Note: A Collect statement can hold up to 2000 records. You can chain multiple Collect statements however this will impact performance as all the data will be held locally and could cause App to crash when run on low memory devices or take time to load the data in case of poor network connections.

Cache lookup data locally in Variables. This avoids repeatedly querying for the same data set.



Concurrent Function

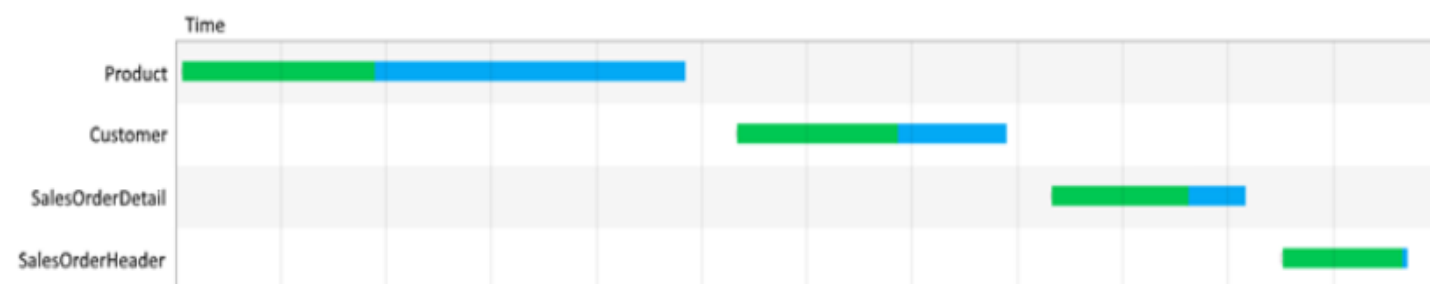
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Use Concurrent function to run multiple functions in parallel. This significantly improves the App start time.

Note: Functions within Concurrent should not have any dependency on each other.

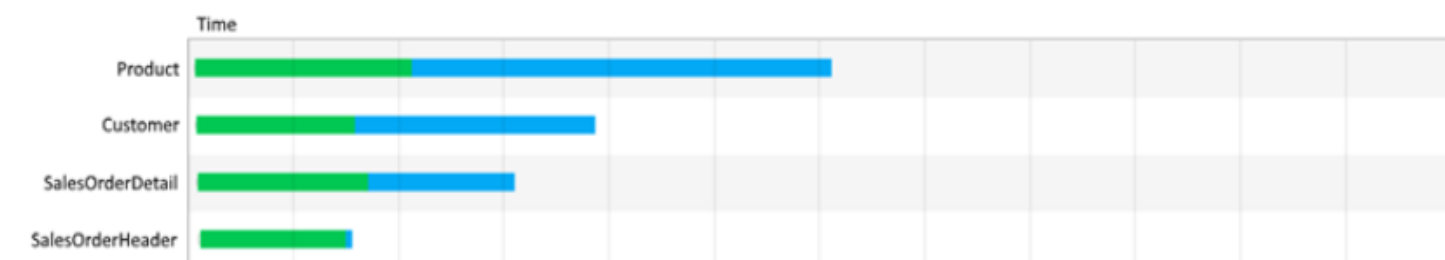
```
ClearCollect( Product, '[SalesLT].[Product]' );  
ClearCollect( Customer, '[SalesLT].[Customer]' );  
ClearCollect( SalesOrderDetail, '[SalesLT].[SalesOrderDetail]' );  
ClearCollect( SalesOrderHeader, '[SalesLT].[SalesOrderHeader]' )
```

If we watch this formula in action with a network monitor, we see this kind of pattern:



```
Concurrent(  
    ClearCollect( Product, '[SalesLT].[Product]' ),  
    ClearCollect( Customer, '[SalesLT].[Customer]' ),  
    ClearCollect( SalesOrderDetail, '[SalesLT].[SalesOrderDetail]' ),  
    ClearCollect( SalesOrderHeader, '[SalesLT].[SalesOrderHeader]' )  
)
```

And that's all it takes to parallelize the requests:



Formula Optimization

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First value of Filter vs Lookup

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Filter returns tabular data whereas lookup returns a Record.



```
First(Filter(Students, StartsWith(Title, "David"))).Bio
```



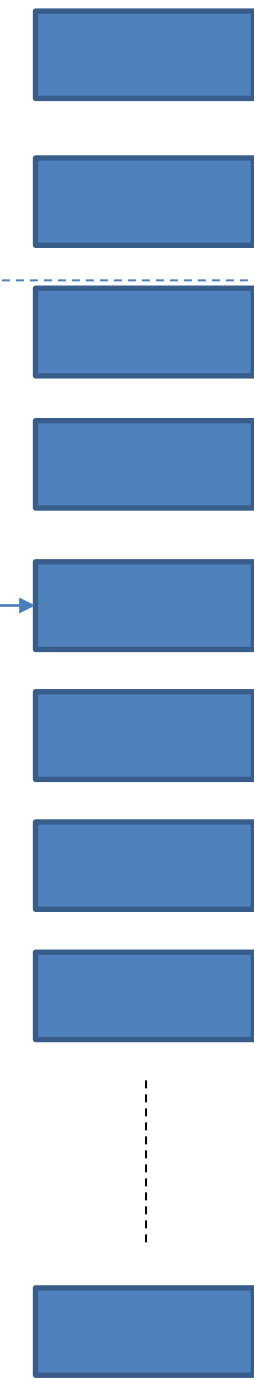
Scans entire data set for all records matching the criteria & returns a table.



```
Lookup(Students, StartsWith(Title, "David")).Bio
```



Scans the data set until it gets the first match.



Records
in data
source

*Results for both the below formulas is the same. But there is a difference in performance



Runtime formulas vs Variables

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Utilize variables to store results and leverage them across the App

✘ `Filter(Students, Manager.Email = User().Email)`

⚡ `Set(
 varCurrentUserEmail,
 User().Email
);`

| `Filter(Students, Manager.Email = varCurrentUserEmail)`

Delayed Load

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Delayed Load

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Delayed load ensures that only the controls bound to the Screen visible are loaded.

If delayed load is turned off, all the controls associated to all the screens bound to a data source will make network calls.

Note: Delayed load is a preview feature that is turned ON by default.

Preview features

These features will be turned on for all apps soon. Please test your apps with the

Delayed load

Speed up your app's start time by setting on-demand screen expression calls.



Control Dependency

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Control Dependency

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Power Apps loads screens of an App in memory as and when needed by the user.

However, if 1 control on a screen has a property that depends upon another screen then both the screens would be loaded in memory.

This could lead to a dependency chain causing multiple screens to be loaded at once thereby reducing performance. Example: Gallery.Selected is a very common scenario to show data related to a selected item.

Tip: Use Variables.

Screen Label has Color property dependent on a Label in another screen



lblHeader.Fill = 	Data type: Color
--	-------------------------

Screen Label Color property is set by referencing a variable which holds the color value.



```
Set(gblFill,RGBA(202, 80, 16, 1));
```

gblFill = 	Data type: Color
---	-------------------------

N+1 Query

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Avoid Lookup in Gallery

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Avoid using Lookups/data source queries within a Gallery.

This causes a network call for each item in the Gallery which significantly reduces performance.

Tip: Store the data in a Collection (local cache) if data does not change for user session & make calls against the local cache.

Gerald Jean South	Teacher A	←	Querying another data source for each gallery item
Keith Cheryl South	Teacher A	←	

Delay Output on Text Input controls

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Delay Output on Text Input controls

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Formulas that reference a text input control are executed for every keystroke on the text input control.

Setting the DelayedOutput property of the text input control to true will ensure the text value is updated only after keystrokes entered in quick succession have ceased.

This will result in the formulas to not run as many times thereby improving performance.

DelayOutput

true

Avoid repeating formulas

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Avoid repeating formulas

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Do not repeat the same set of formulas on multiple controls. This results in multiple functions with same result running on multiple controls.

```
Set(  
    varUser,  
    Office365Users.MyProfile()  
);
```

Use variables and store the result of the formula and leverage the result across the controls.

```
Filter(Students, Manager.Email = varCurrentUserEmail)
```

This improves performance significantly in scenarios where the formulas involve a query to a data source.

File Optimization

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File Optimization

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Your App assets like images, videos & audio files should be optimized to reduce its file size.

Smaller asset size = fast download time.

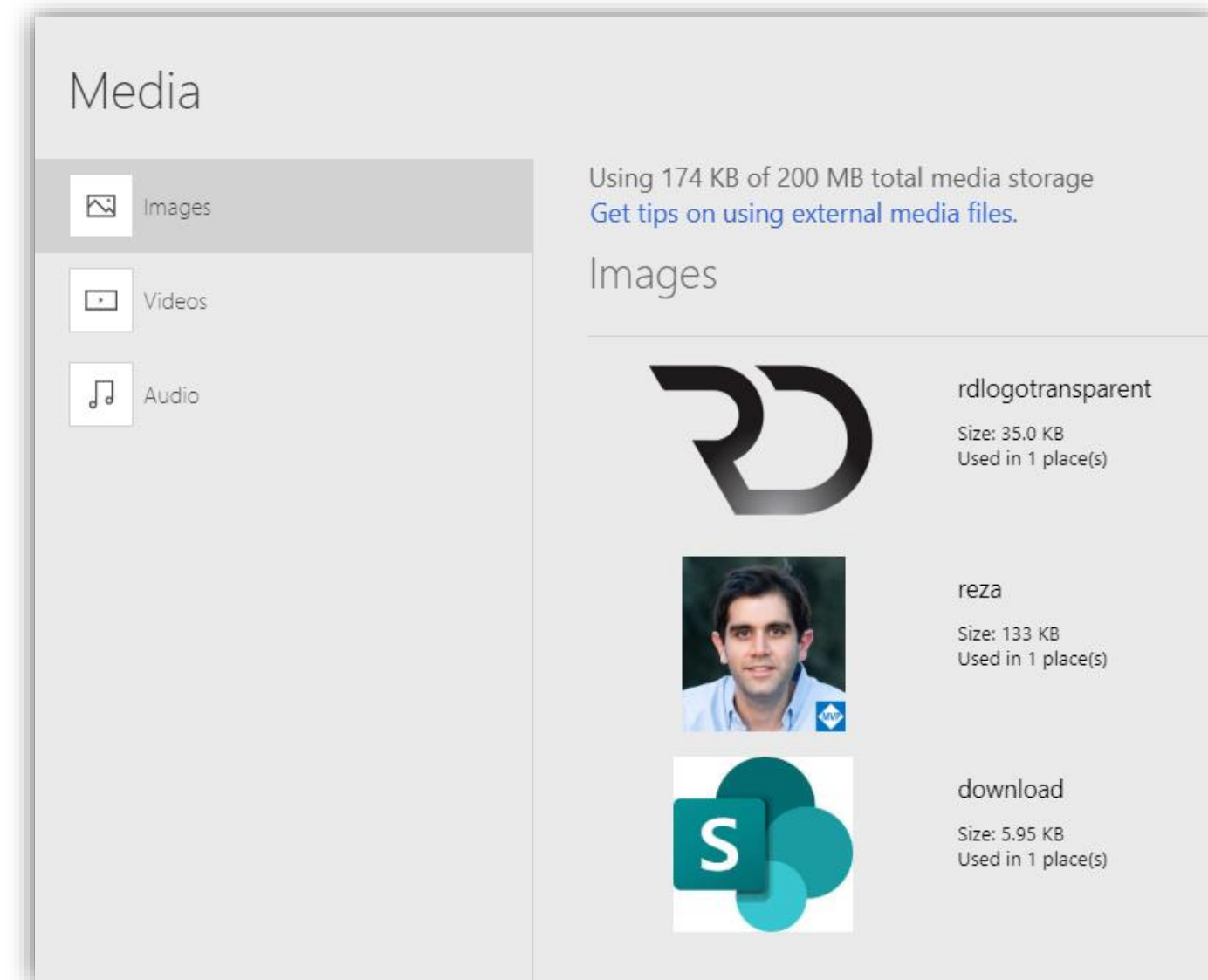
<https://compressor.io/>

<https://tinypng.com>

<http://compressjpeg.com/>

If loading images from a data source, ensure to show the low-resolution images first and load the high-resolution image only when required.

Tip: Dataflex Pro produces both thumbnails and image and thereby provides a mechanism for image optimization.



Key Takeaways

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Key Takeaways

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Understand delegation when working with large data sources.

Use Caching wherever possible.

Reduce number of network calls.

Avoid control dependencies.

Reduce number of controls on screens by using Galleries & Components.

Re-publish Apps regularly. Also keep looking for new experimental and preview features to enhance performance.

Learning Materials

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Learning Materials

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Delegation Playlist

<https://www.youtube.com/watch?v=gwiErbYtRdA&list=PLTyFh-qDKAiE6ia-D94Qk5-AzpN4dqOmD>

Performance Tips

<https://docs.microsoft.com/en-us/powerapps/maker/canvas-apps/performance-tips>

Performance Considerations

<https://powerapps.microsoft.com/en-us/blog/performance-considerations-with-powerapps/>

Master Class on building Performant Apps

<https://powerusers.microsoft.com/t5/Microsoft-Business-Applications/Microsoft-PowerApps-The-master-class-on-building-performant-apps/td-p/310618>

Thank You

Any questions now?

If not, you can always contact me later:



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