

Sum Product

NEWSLETTER #128 - July 2023

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Bigger than ever this month!

Given we have no less than Power BI Updates detailed this month, the newsletter has become even larger. Perhaps we should just forego everything else this month..?

Nah.

This month we consider a classic clanger in Excel we all make, plus we include all the usual newsletter goodies such as the Beat the Boredom Challenge, Charts & Dashboards, Visual Basics, Power Pivot Principles, Power Query Pointers, Excel Updates, literally the A-B-C of Keyboard Shortcuts and LET the A to Z of Excel functions have pride of place here too.

As always, happy reading and remember: stay safe, stay happy, stay healthy.

Liam Bastick, Managing Director, SumProduct



2023 End of Financial Year Sale



10% off sail...

FY2023 has been a good year for SumProduct. We've helped more clients than ever before, trained more people than ever before and told more bad jokes than ever before. We hope FY2024 will treat us and our clients just as well, if not better. It's at this time of the year that we would typically review our price card and reset our stall in line with all those usual indices that are presently on the up. Boo hiss.

So we've decided we want to pay it back a little this year.

We are going to delay our price revisions until August 2023. But it's better than that – any new business* initiated between now and 31 July we will give you 10% off our current rates. So if you have been considering that modelling, auditing or consulting piece of work, maybe

it's better not to delay. Drop us a line now at contact@sumproduct.com and let's get the ball rolling. Get our new financial year off to the best possible start with an automatic discount.

Don't delay; feel free to drop us a line for a no-obligation quote today! Take advantage of our 10% off sail [*groan – Ed.*].

* Well done those that spotted the asterisk: unfortunately, due to existing agreements, we are presently unable to extend this offer to our training courses (sorry).



Congratulations to Bill Jelen



We're genuinely pleased to announce our friend and fellow Excel MVP Bill Jelen's Global Excel Award. Step forward Mr. Excel for the honour of the inaugural Lifetime Achievement Award. Brilliant job. Heartiest congratulations and a deserved winner.

Now in his fourth decade of his Excel journey, he's written 20 trillion books and has the entire population of the Milky Way on his Mr. Excel forum. As a popular speaker and YouTuber, he happens to know a "little bit" about Excel. If you have just returned from Alpha Centauri, do check out his output!

Also, congratulations to all the other award winners including Leila Gharani (we've never heard of her - we can't even seem to find a picture of her on the internet...). Congratulations one and all.

Our very own Liam Bastick was fortunate to be nominated for the Lifetime Achievement Award, but up against Bill and fellow Excel great Bob Umlas, he's said that he is happy just to be considered.

The point is, Excel remains the star of the show!

Formulae Referencing the Current Worksheet

Here's an issue most of us notice everyday but don't really *notice*. Imagine you are working in the worksheet 'Sheet1' of a particular workbook and you write a formula such as:

	A	B	C	D	E	F	G
1	Example						
2							
3							
4		Y-Intercept	3				
5							
6		Gradient	4				
7							
8		X-Value	5				
9							
10							
11		Result	23				=C8*Sheet2!C6+Sheet1!C4
12							

That's right. Instead of using cell references on this worksheet, part-way through the calculation you have linked to another sheet ('Sheet2') and then linked back to this sheet again afterwards. The result is

=C8*Sheet2!C6+Sheet1!C4

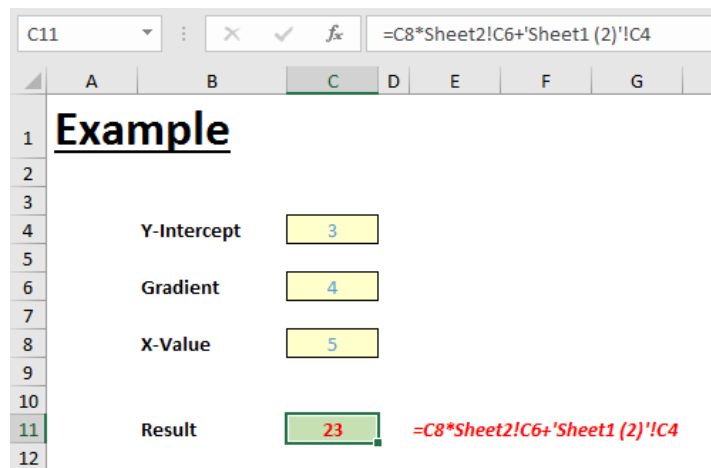
We have all produced formulae similar to this over the years.

As model auditors though, we have a problem with this calculation – in particular the 'Sheet1' reference. The formula

=C8*Sheet2!C6+C4

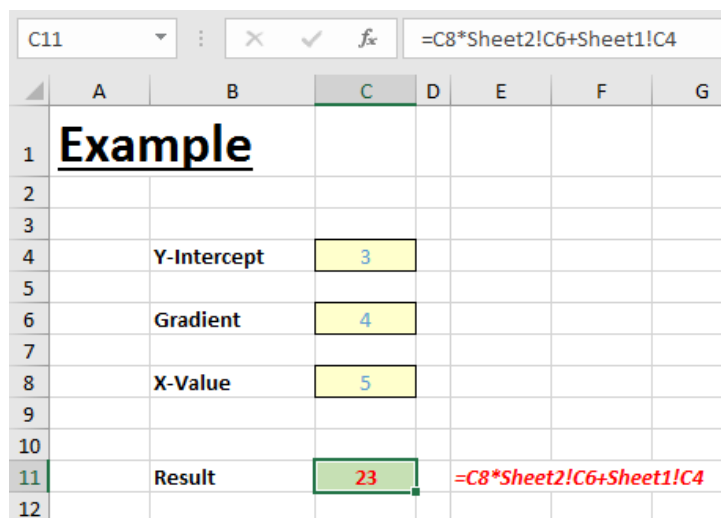
is not only shorter but it's easier to understand too. We know it is a reference to a cell on this worksheet and that makes it easier to check and follow. But there's more to it than that.

Let's make a copy of 'Sheet1' as the formula is presently written. Copying the worksheet creates a new worksheet 'Sheet1 (2)' viz.



Amazing, yes. We can rename the sheet, the formula will update and other than the fact the formula is longer than it needs to be necessarily (a bit like this sentence), it doesn't appear to be a big deal. However, let's now copy the worksheet a different way...

In this instance, we're going to insert a new blank worksheet (say, 'Sheet4') and then simply copy and paste the entire 'Sheet1' worksheet in using **CTRL + C** and then **CTRL + V**:



The first thing you will notice is that the gridlines returned, but more importantly, take a look at the formula:

=C8*Sheet2!C6+Sheet1!C4

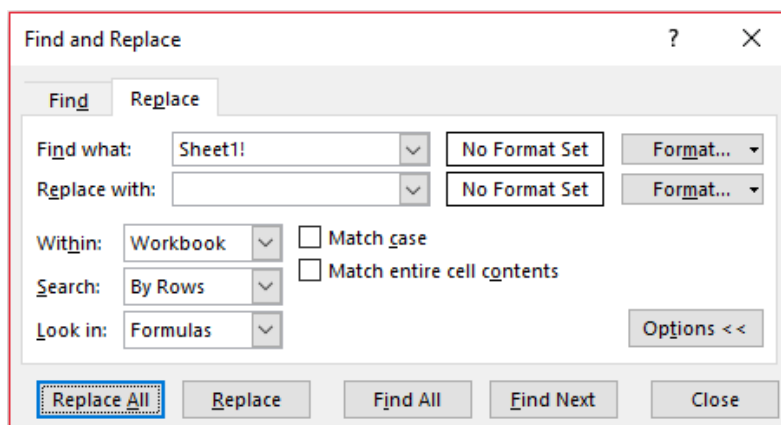
This is not referring to 'Sheet4' as expected. An end user may think it is correct too given the (correct) cell reference to 'Sheet2'. You might argue that the formula is "ok" – just ensure the worksheet is copied correctly – but exactly how do you enforce the former method of sheet copying in a workbook when others may use it?

We find this Excel behaviour quite dangerous as it catches out accomplished modellers too. For example, we have seen highly

experienced analysts build a template forecast sheet for a given business unit and then have it reviewed by model auditors – seemingly a very prudent course of action. Once checks have been completed, the sheet has been copied over and over again for a multitude of business units only to have certain calculations all reference the template sheet – something not picked up at the review stage.

Get into the practice of always removing sheet references to the current worksheet – then this cannot happen.

Excel's built-in functionality 'Find and Relace' (**CTRL + H**) may be used (ensure 'Workbook' is selected as the 'Within:' category and that 'Formulas' is selected from the 'Look in:' drop down:



If you cannot see all of these options, click on the 'Options' button in the bottom right-hand corner of the dialog box.

Alternatively, you may use a macro instead. This is particularly useful if a worksheet is hidden and / or protected. A simple example of a macro is detailed below:

```
Sub RemoveCurrentWorksheetReferencesFromFormulae()  
  
Dim ws As Worksheet  
Dim VisibleStatus As Variant  
Dim ProtectStatus As Boolean  
Dim ws_NameReplace As String  
Dim ws_NameReplace2 As String  
Dim dummyvariable As Variant  
  
Dim NameSwap As String  
NameSwap = ""  
  
'Speed up calculations by switching calculation and screen updating off  
Dim InitialCalc As Variant  
InitialCalc = Application.Calculation  
Application.Calculation = xlCalculationManual  
Application.ScreenUpdating = False  
  
'Reset Find/Replace behaviour to look at sheet only (not workbook)  
Set dummyvariable = Worksheets(1).Range("A1:A1").Find("Dummy", LookIn:=xlValues)  
  
'Error handling - if there's a problem, skip to the next worksheet  
On Error GoTo NextWorksheet  
  
'Repeat the following code for each worksheet in the workbook  
For Each ws In ActiveWorkbook.Sheets  
  
    'Store whether worksheet is hidden or not, and unhide if necessary  
    VisibleStatus = ws.Visible  
    ws.Visible = xlSheetVisible  
    ws.Activate  
  
    'Store whether worksheet is protected or not, and unprotect if necessary  
    ProtectStatus = ws.ProtectContents  
    ws.Unprotect ""  
  
    'Create variables to store the name of the worksheet in two different formulae forms - with/  
    without space  
    ws_NameReplace = "'" & ws.Name & "'"!  
    ws_NameReplace2 = ws.Name & "!"  
  
    'Replace if sheet name has a space  
    ws.Cells.Replace What:=ws_NameReplace, Replacement:=NameSwap, _
```

```

    LookAt:=xlPart, SearchOrder:=xlByRows, MatchCase:=False, _
    SearchFormat:=False, ReplaceFormat:=False
'Replace if sheet name does not have a space
ws.Cells.Replace What:=ws_NameReplace2, Replacement:=NameSwap, _
    LookAt:=xlPart, SearchOrder:=xlByRows, MatchCase:=False, _
    SearchFormat:=False, ReplaceFormat:=False

'Rehide the worksheet if it's hidden
ws.Visible = VisibleStatus

'Reprotect the worksheet if it was protected previously
If ProtectStatus = True Then
    ws.Protect
End If

NextWorksheet:

Next ws

'Reset calculation status
Application.Calculation = InitialCalc
Application.ScreenUpdating = True

End Sub

```

Word to the Wise

The macro may need to be amended if one or more worksheets is protected with a password or if a sheet is “very hidden”. No doubt someone will email us with some such instances!

Beat the Boredom Challenge

*With many of us currently “working from home” / quarantined, there are only so Zoom / Teams calls and virtual parties you can make before you reach your (data) limit. Perhaps they should measure data allowance in blood pressure millimetres of mercury (mmHg). To try and keep our readers engaged, we will continue to reproduce some of our popular **Final Friday Fix** challenges from yesteryear in this and upcoming newsletters. One suggested solution may be found later in this newsletter. Here’s this month’s...*

If you work with data across multiple categories, you’ll know some of the issues that arise when trying to group PivotTable data in different ways. Not all data is sorted in numerical or date order, and sometimes, there are specific codes that apply to different digits in an account code or business unit name.

For this newsletter, we have a fairly standard looking PivotTable: we have years going across the top of the table, and a list of product numbers going down the page, totalling up the sales by product in each year.

Row Labels	2001	2002	2003	2004	Grand Total
214			31,421.02	46,606.68	78,027.70
217			31,176.09	41,778.06	72,954.15
222			29,986.43	44,367.32	74,353.75
225			7,956.15	11,731.95	19,688.10
228			7,448.51	13,997.20	21,445.71
231			8,348.33	13,747.25	22,095.58
234			9,498.10	13,097.38	22,595.48
237			8,848.23	11,797.64	20,645.87
310	593,992.82	608,305.90			1,202,298.72
311	500,957.80	504,536.07			1,005,493.87
312	547,475.31	658,401.68			1,205,876.99
313	472,331.64	608,305.90			1,080,637.54
314	486,644.72	568,944.93			1,055,589.65

This month's challenge is to filter the data, without changing the raw dataset, so that it will only display product numbers that have a '1' as the middle digit. You can assume that there will only ever be three digits in the product number.

Note that filtering manually and selecting only the items with a '1' as the middle digit won't be scalable as new product numbers are incorporated into the list.

Sounds easy? Try it. One solution *just might* be found later in this newsletter – but no reading ahead!

Charts and Dashboards

It's time to chart our progress with an introductory series into the world of creating charts and dashboards in Excel. This month, we start a short series on dashboard layout.

To start, let's define what a Dashboard is and what a Reporting Dashboard is:

- a **Dashboard** is a collection of all the relevant charts from the source data, that is up-to-date and well maintained throughout all reporting periods
- a **Reporting Dashboard** is a collection of charts that highlight potential issues, or issues that may occur in the future, that have to be highlighted to senior management. Therefore, this is highlighted to allow senior management to address these issues, rather than being bogged down with all of the charts contained in the Dashboard.

The first thing to consider when designing a dashboard is how many charts or tables should you bring in and how to organise them. Each dashboard should contain no more than five to nine visualisations to avoid visual clutter. Cognitive psychology tells us that the human brain

can only comprehend around 7 +/- 2 images at one time (i.e. between five [5] and nine [9] images), and this should be the number of items you wish to show / highlight in your dashboard.

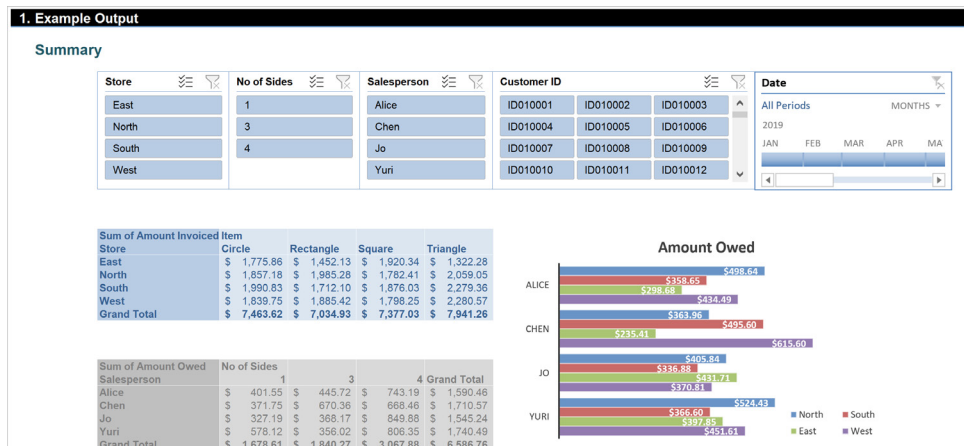
When designing a dashboard, it's important to follow some kind of organising principles:

- display the most significant insights on the top part of the dashboard
- trends in the middle
- granular details at the bottom.

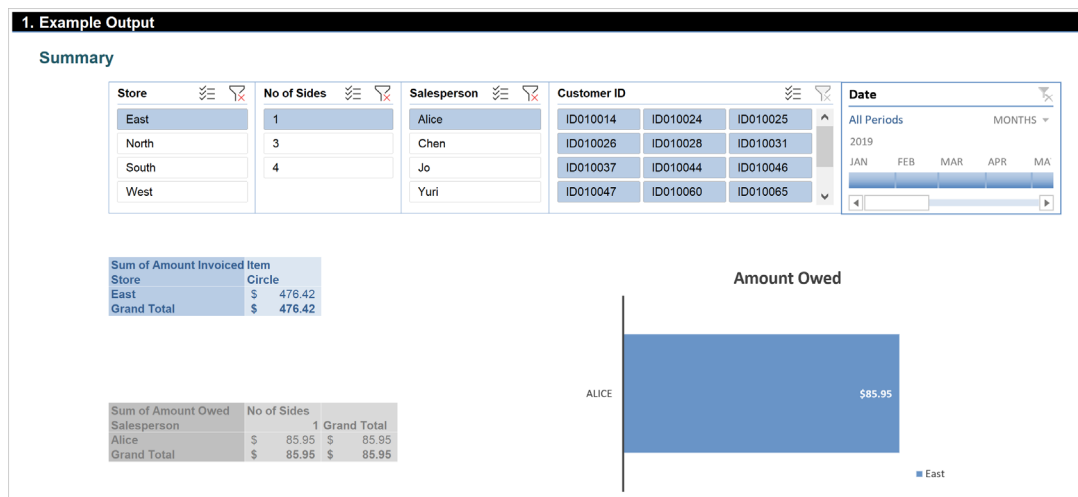
You can also avoid visual clutter by using filters and hierarchies, or simply by separating the dashboard into two or more clearer dashboards.



If PivotTables and Slicers are used in a dashboard, it is “Best Practice” to have the dashboard laid out as below, where all the slicers should be arranged at the top and their linked charts or tables underneath:



The reason why Slicers should be on the top is that the size and presentation of their linked charts change accordingly with the filters applied, hence the dashboard may look messy or have too much white space if the rescaled charts are placed at the top:



Although we might be tempted to display complex charts in this manner, it is recommended that we start simply and use only as much filtering, grouping and other summarising options as we need. The more options we add, the more unpredictable the results can be, and sometimes,

we'll end up with a result we didn't anticipate. If we need more, we can consider more charts. Each chart, table or slicer should have a specific purpose, not several. That's the essence of a clear dashboard.

More next month...

Visual Basics

We thought we'd run an elementary series going through the rudiments of Visual Basic for Applications (VBA) as a springboard for newer users. This month we stop the screen flickering.



You might be "Calibrating Fame Indicant" which may require a lot of movements between sheets whether in one workbook or many.

Each time Excel copies data from another worksheet in VBA, it snaps to the worksheet to copy the selection on the screen and snaps to the destination worksheet to paste it. A macro with a lot of copying around despite no scroll movement on the screen appear to "flicker" a lot as it jumps around. It flashes as it moves to different parts as the macro runs and can be very distracting.

However, even updating the screen to show this movement requires memory! Not only is Excel using memory to calculate the procedure, it's also reserving part of it to update the changes on the screen as it progresses through. We can turn this off in order for Excel to concentrate purely on the calculations. This is done with the **Application.ScreenUpdating** property.

It's pretty simple - at the start of the routine, just set this to **False** and at the end set it back to **True** and we're golden!

```
Sub StopReticulatingSplines()  
    Application.ScreenUpdating = False  
    Call DoStuff  
    Application.ScreenUpdating = True  
End Sub
```

More next month.

Power Pivot Principles

We continue our series on the Excel COM add-in, Power Pivot. This month, we take it to the **MAXX**.

The **MAXX** function evaluates an expression for each row in a table and returns the largest numeric value as a decimal number. The syntax of this function is:

MAXX(table, expression)

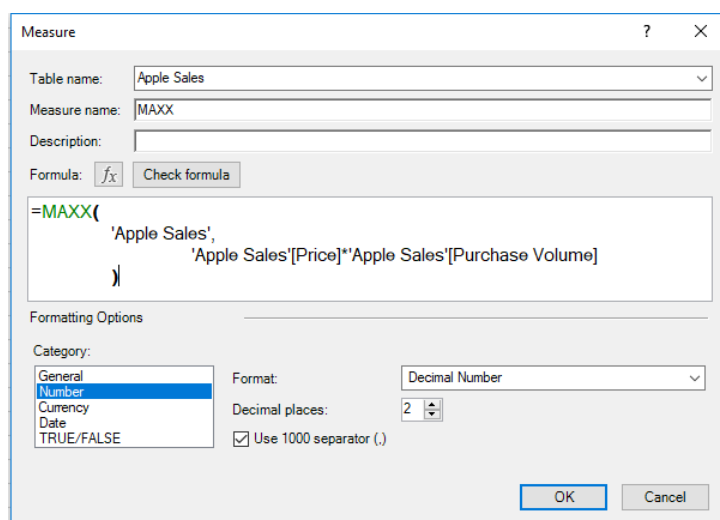
It is useful when you are trying to avoid creating an additional column in a Table to construct interim calculations. For our example, let's look at the following Table:

	A	B	C	D
3				
4		Customer	Price	Purchase Volume
5		Abiel	\$ 31.00	4
6		Beverly	\$ 10.00	10
7		Craig	\$ 9.00	6
8		David	\$ 96.00	5
9		Frank	\$ 69.00	10
10		Ellie	\$ 85.00	4
11		Niel	\$ 77.00	3
12		Maddie	\$ 18.00	10
13		Henry	\$ 91.00	7
14		Lester	\$ 5.00	5
15				

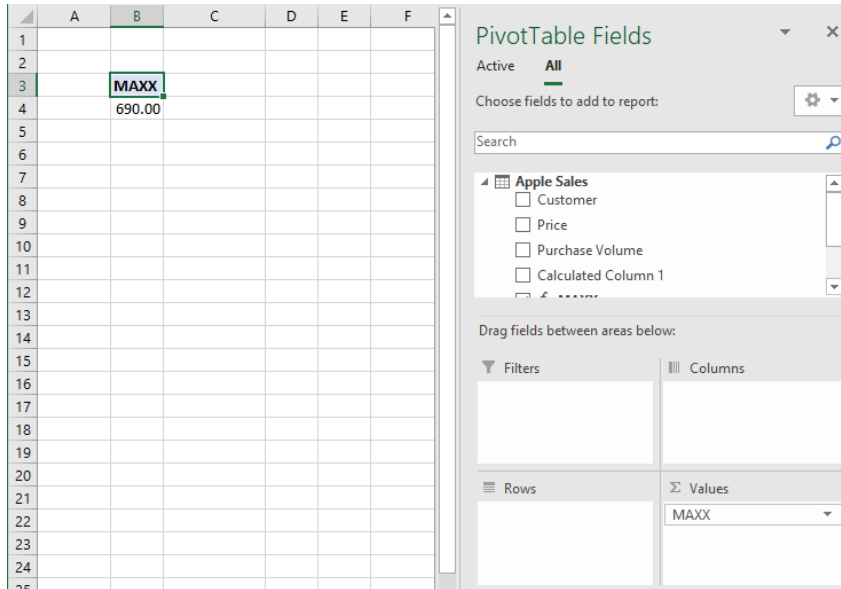
To demonstrate, let's create a measure using the **MAXX** function to the greatest amount spent on apples, the expression here is a simple multiplication of **'Apple Sales'[Price]** and **'Apple Sales'[Purchase Volume]**:

```
=MAXX(  
    'Apple Sales',  
    'Apple Sales'[Price]*'Apple Sales'[Purchase Volume]  
)
```

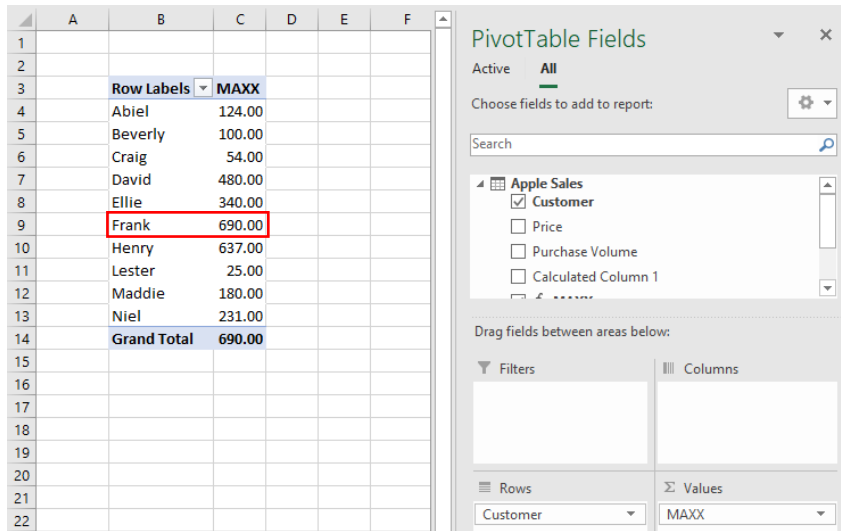
In other words, for each row, it is calculating the product of the **Price** and the **Purchase Volume**, and then deducing which row creates the highest multiplicative total – *all without having to create an extra column for the interim calculation.*



Exporting this to a PivotTable we shall see:



The greatest amount spent on apples is \$690.00. If we drag in the **Customer** field into the 'Rows' area of the PivotTable,



we can see that Frank spent the most on apples.

That's it for this month; more next time.

Power Query Pointers

Each month we'll reproduce one of our articles on Power Query (Excel 2010 and 2013) / Get & Transform (Office 365, Excel 2016 and 2019) from www.sumproduct.com/blog. If you wish to read more in the meantime, simply check out our Blog section each Wednesday. This month, we look at some useful, logical **M** functions to determine whether a date is in a particular period.

This month, we shall take a look at some Boolean **Date()** functions in **M** that are true if a date is in a particular period, for example, in the current month. There are a lot of Boolean date functions available, so we will give an example for those involving months, and a couple of year

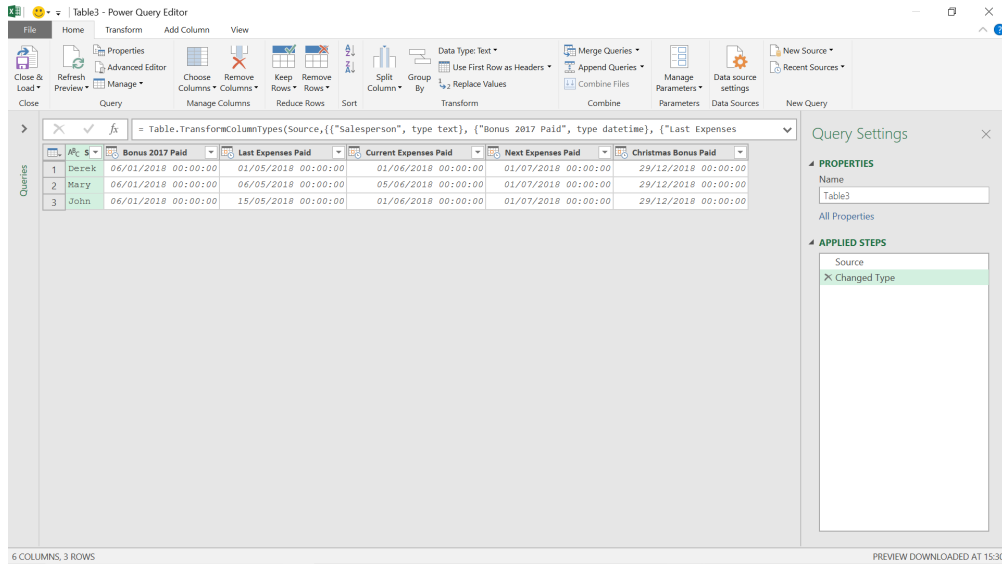
functions. We will then summarise the remaining functions as they are similar to the wmonth functions, but for different periods of time. These functions are usually used within other calculations, but it is helpful to understand what is available.

Date.IsInCurrentMonth

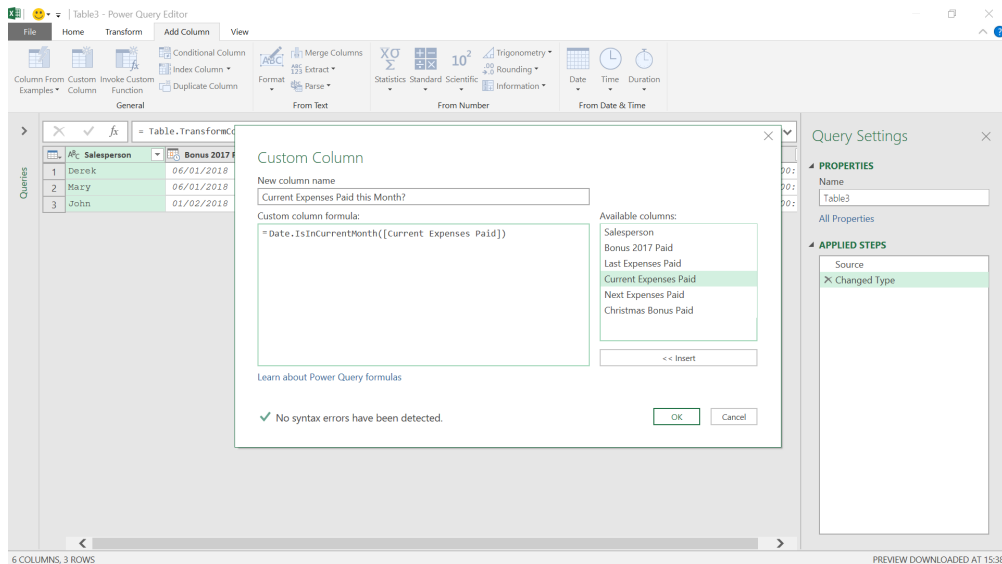
Date.IsInCurrentMonth(datetime) as logical

This returns a logical value indicating whether the given **datetime** occurred during the current month, as determined by the current date and time on the system.

Let's consider **Current Expenses Paid** (below):

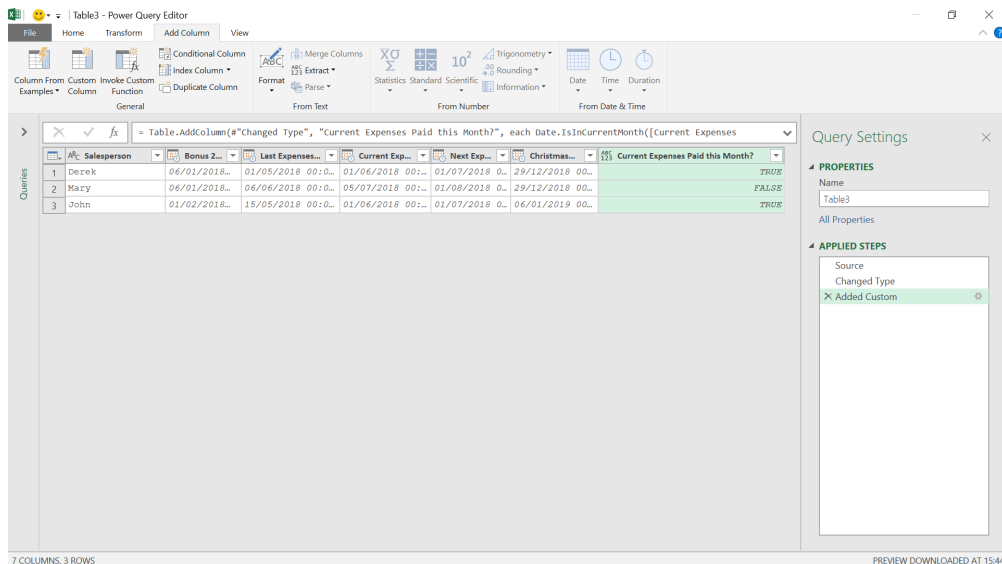


We may add a custom column to the table to show if the current expenses are paid this month.



We used the following **M** formula:

= Date.IsInCurrentMonth([Current Expenses Paid])



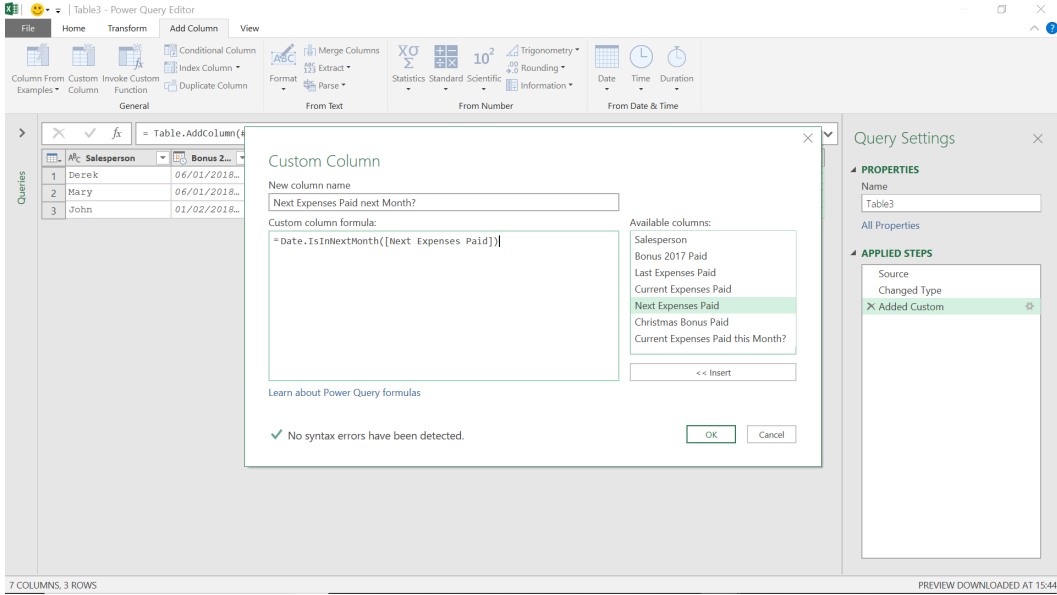
We can see that Mary does not receive her current expenses this month.

Date.IsInNextMonth

Date.IsInNextMonth(datetime) as logical

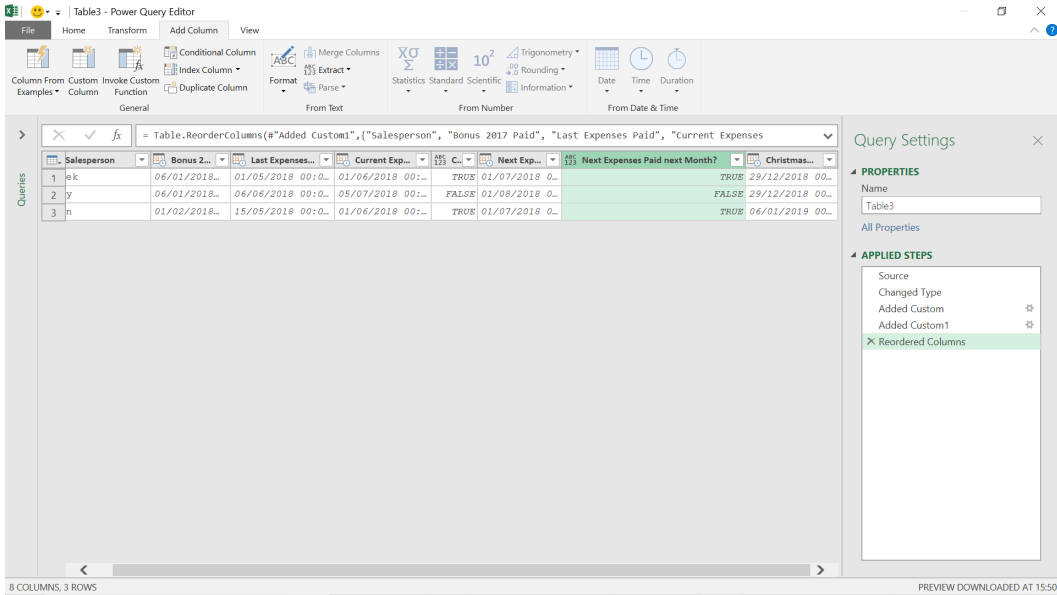
This returns a logical value indicating whether the given **datetime** occurred during the next month, as determined by the date and time on the system.

We will look if **Next Expenses Paid** occurs in the next month:



The M formula used here is:

= Date.IsInNextMonth([Next Expenses Paid])



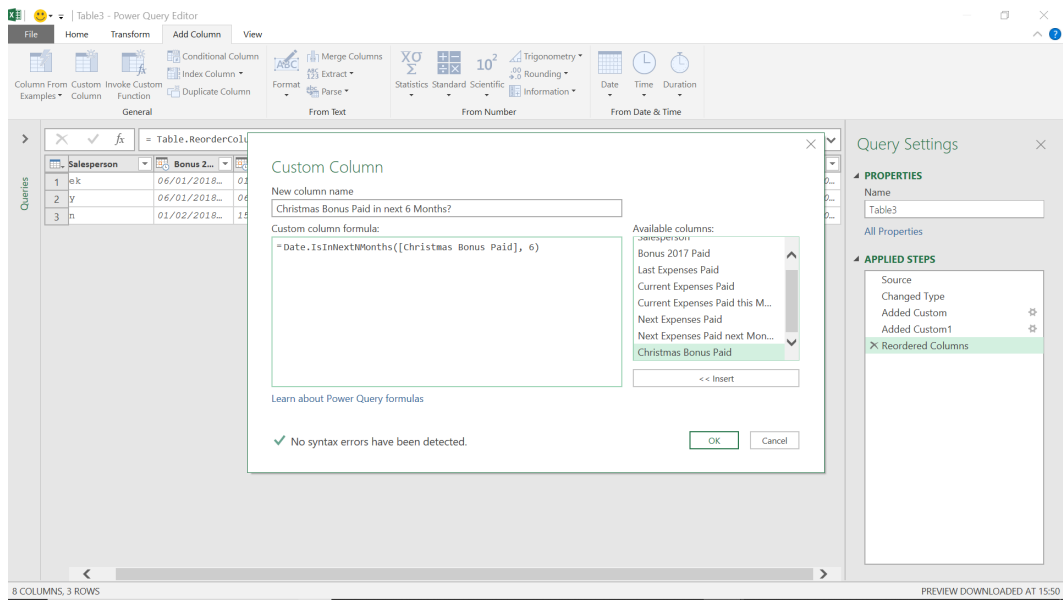
We can see that Mary doesn't get her next expenses next month.

Date.IsInNextNMonths

Date.IsInNextNMonths(datetime as any, months as number) as nullable logical

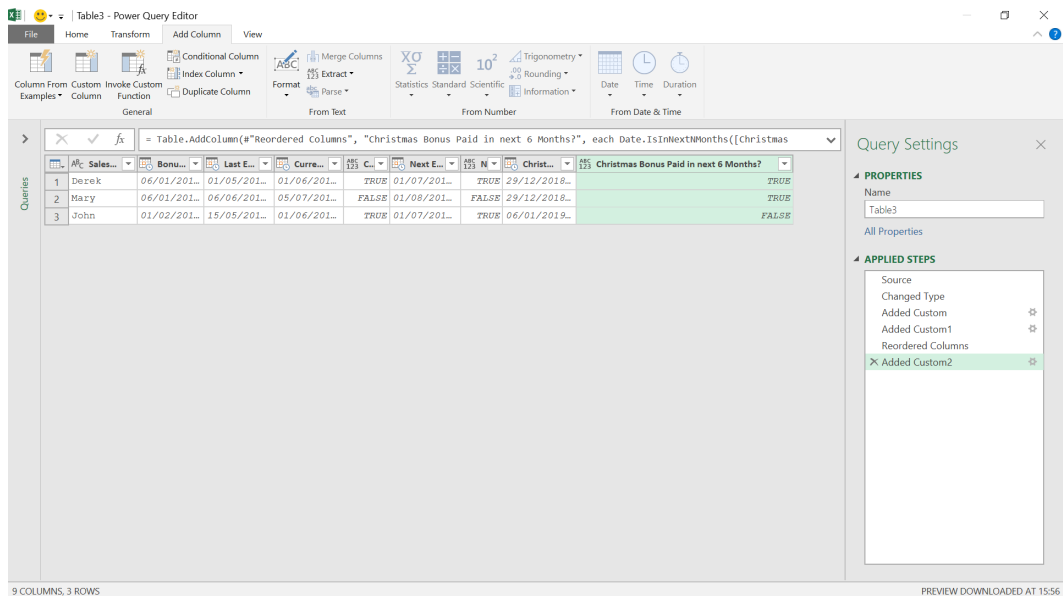
This indicates whether the given **datetime** occurs during the next number (**months**) of months, as determined by the current date and time on the system.

We will look at whether **Christmas Bonus Paid** takes place in the next six [6] months.



The M formula we have used is:

= Date.IsInNextNMonths([Christmas Bonus Paid], 6)



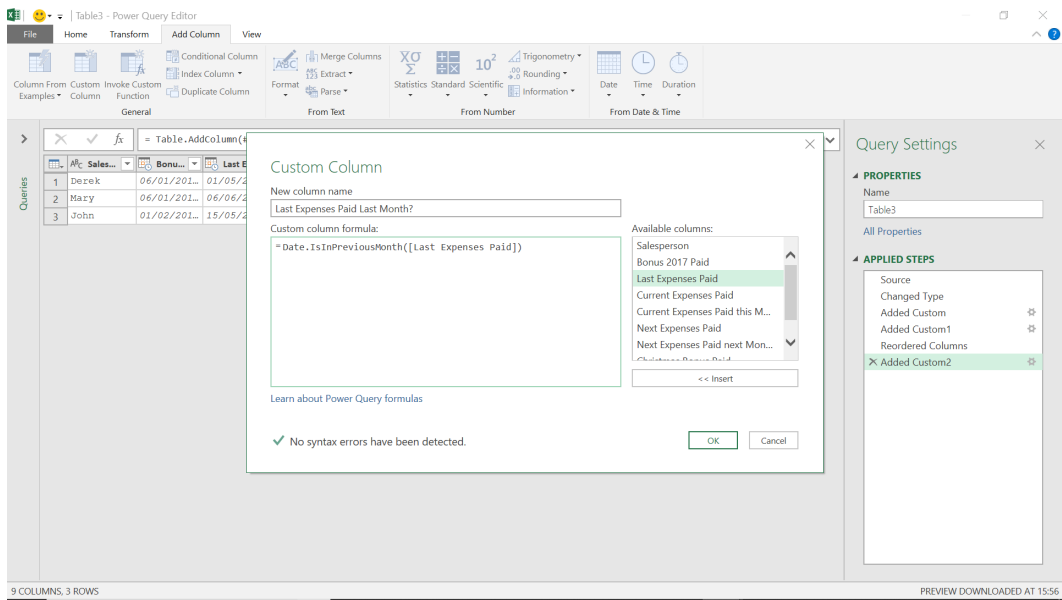
We can see that everyone gets their Christmas bonus in the next six months apart from John.

Date.IsInPreviousMonth

Date.IsInPreviousMonth (datetime) as logical

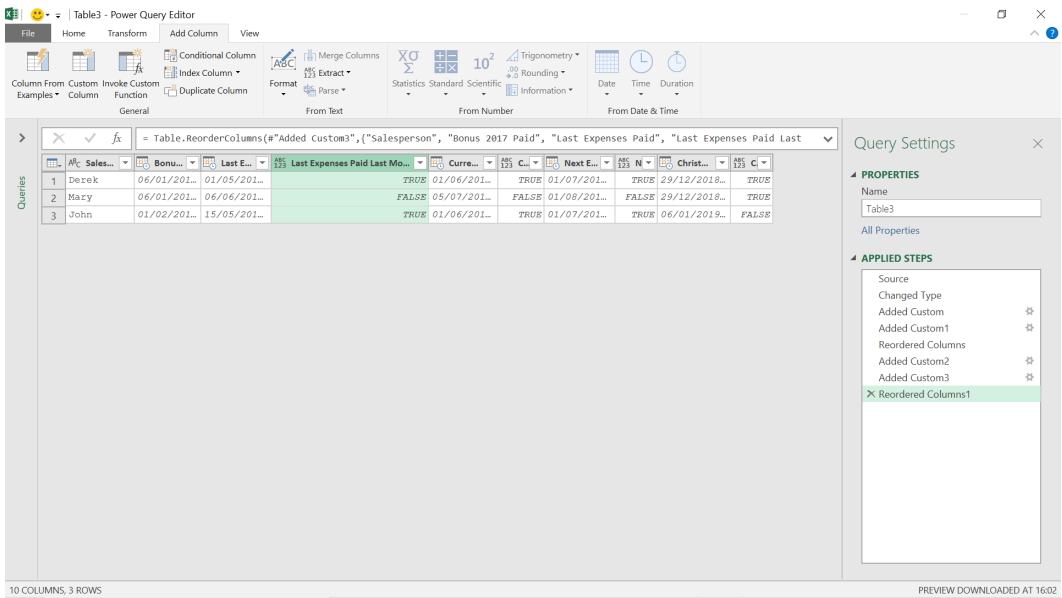
This returns a logical value indicating whether the given **datetime** occurred during the previous month, as determined by the current date and time on the system.

We will look if the **Last Expenses Paid** took place last month:



The M formula I have used is

= Date.IsInPreviousMonth([Last Expenses Paid])



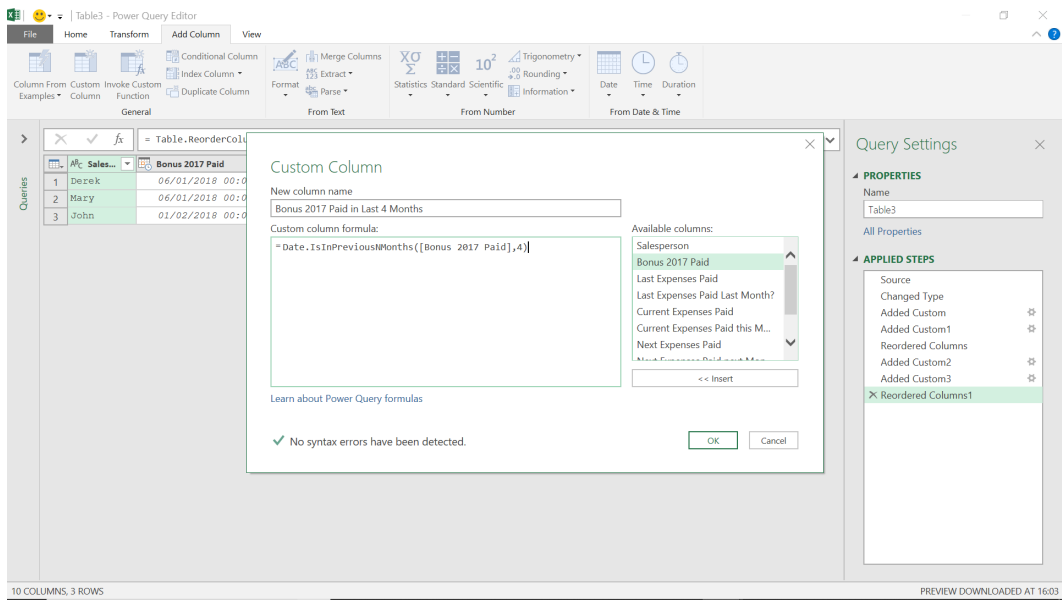
We can see that everyone got their expenses last month apart from Mary (who is either unlucky or bad at filling forms out!).

Date.IsInPreviousNMonths

Date.IsInPreviousNMonths (datetime as any, months as number) as nullable logical

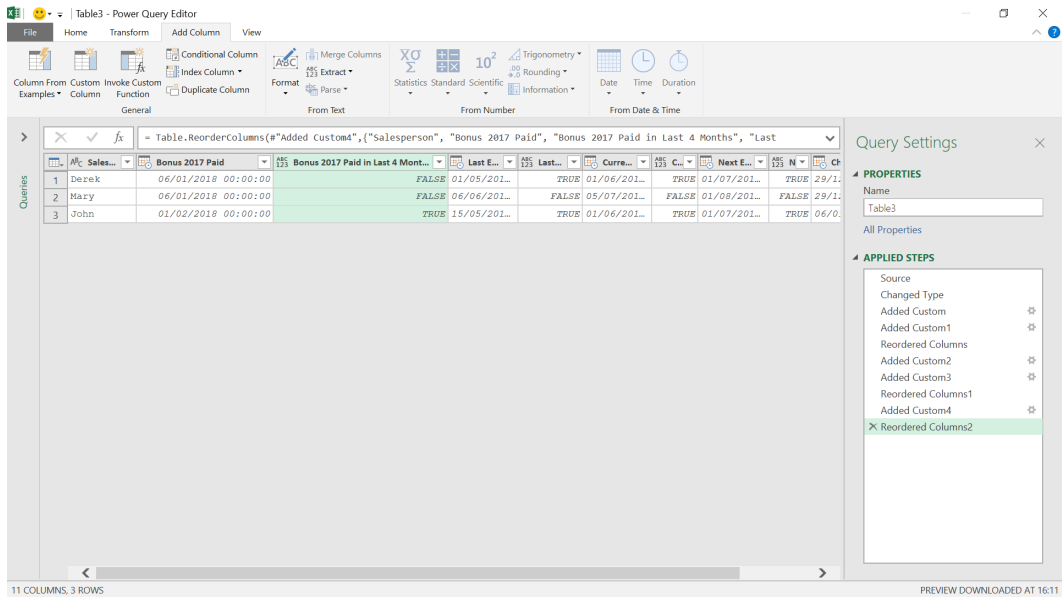
This indicates whether the given **datetime** occurs during the previous number (**months**) of months, as determined by the current date and time on the system.

This time we will look at whether **Bonus 2017 Paid** occurred in the last four [4] months.



The M formula used for this is:

= Date.IsInPreviousNMonths([Bonus 2017 Paid], 4)



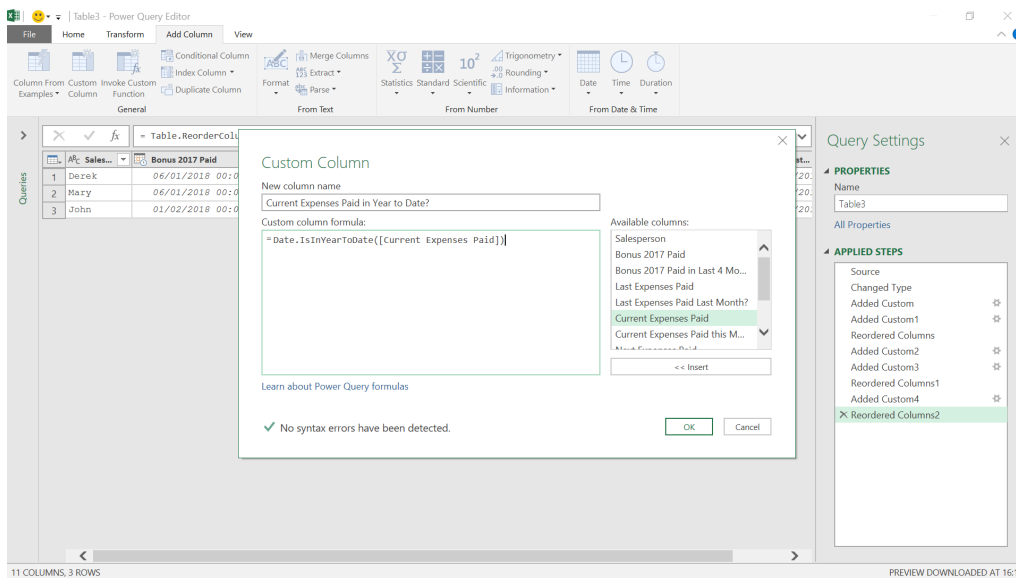
We can see that John received the 2017 bonus in the last four [4] months, but the others received theirs before this period.

Date.IsInYearToDate

Date.IsInYearToDate(datetime) as logical

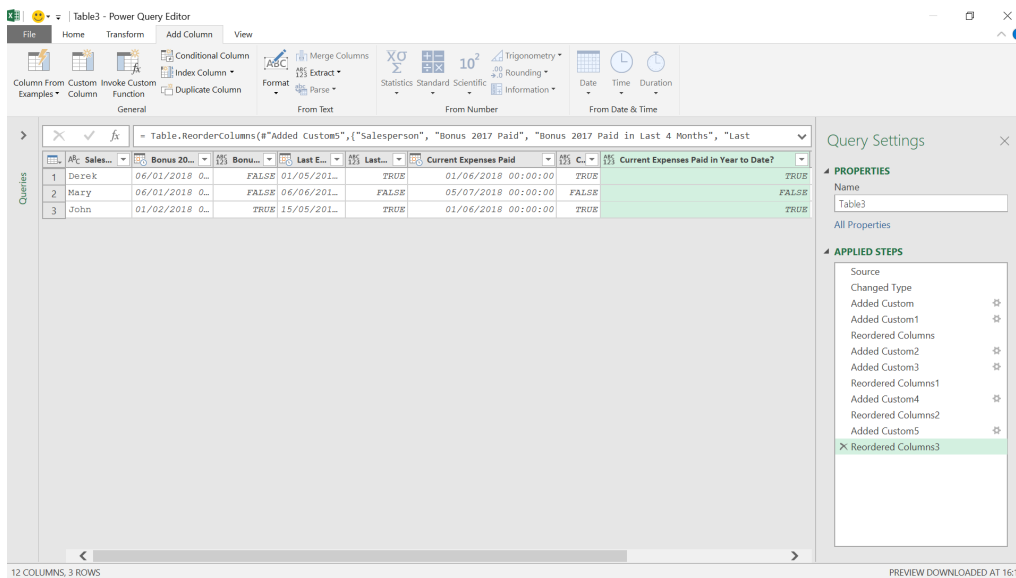
This returns a logical value indicating whether the given **datetime** occurred in the period starting January 1st of the current year and ending on the current day, as determined by the current date and time on the system.

This is useful for calculating totals to date. In this example, we will check if the **Current Expenses Paid** is in the year to date.



The M formula I have used is:

= Date.IsInYearToDate([Current Expenses Paid])



Therefore, we can see everyone has their expenses paid in the year to date apart from Mary!

Date.IsLeapYear

Date.IsLeapYear (datetime as nullable datetime) as nullable logical

This returns a logical value indicating whether the year portion of a datetime value is a leap year.

The remaining functions will be summarised as they are more on the same theme, just with different periods of time.

Date.IsInCurrentDay (datetime as any) as nullable logical

Indicates whether the given datetime occurs during the current day, as determined by the current date and time on the system.

Date.IsInCurrentQuarter (datetime) as logical

Returns a logical value indicating whether the given datetime occurred during the current quarter, as determined by the current date and time on the system.

Date.IsInCurrentWeek (datetime) as logical

Returns a logical value indicating whether the given **datetime** occurred during the current week, as determined by the current date and time on the system.

Date.IsInCurrentYear (datetime) as logical

Returns a logical value indicating whether the given **datetime** occurred during the current year, as determined by the current date and time on the system.

Date.IsInNextDay (datetime as any) as nullable logical

Indicates whether the given **datetime** occurs during the next day, as determined by the current date and time on the system.

Date.IsInNextNDays (datetime as any, days as number) as nullable logical

Indicates whether the given **datetime** occurs during the next number (**days**) of days, as determined by the current date and time on the system.

Date.IsInNextNQuarters (datetime as any, quarters as number) as nullable logical

Indicates whether the given **datetime** occurs during the next number (**quarters**) of quarters, as determined by the current date and time on the system.

Date.IsInNextNWeeks (datetime as any, weeks as number) as nullable logical

Indicates whether the given **datetime** occurs during the next number of weeks (**weeks**), as determined by the current date and time on the system.

Date.IsInNextNYears (datetime as any, years as number) as nullable logical

Indicates whether the given **datetime** occurs during the next number (**years**) of years, as determined by the current date and time on the system.

Date.IsInNextQuarter (datetime) as logical

Returns a logical value indicating whether the given **datetime** occurred during the next quarter, as determined by the next date and time on the system.

Date.IsInNextWeek (datetime) as logical

Returns a logical value indicating whether the given **datetime** occurred during the next week, as determined by the next date and time on the system.

Date.IsInNextYear (datetime) as logical

Returns a logical value indicating whether the given **datetime** occurred during the next year, as determined by the next date and time on the system.

Date.IsInPreviousDay (datetime as any) as nullable logical

Indicates whether the given **datetime** occurs during the previous day, as determined by the current date and time on the system.

Date.IsInPreviousNDays (datetime as any, days as number) as nullable logical

Indicates whether the given **datetime** occurs during the previous number (**days**) of days, as determined by the current date and time on the system.

Date.IsInPreviousNQuarters (datetime as any, quarters as number) as nullable logical

Indicates whether the given **datetime** occurs during the previous number (**quarters**) of quarters, as determined by the current date and time on the system.

Date.IsInPreviousNWeeks (datetime as any, weeks as number) as nullable logical

Indicates whether the given **datetime** occurs during the previous number (**weeks**) of weeks, as determined by the current date and time on the system.

Date.IsInPreviousNYears (datetime as any, years as number) as nullable logical

Indicates whether the given **datetime** occurs during the previous number (**years**) of years, as determined by the current date and time on the system.

Date.IsInPreviousQuarter (datetime) as logical

Returns a logical value indicating whether the given **datetime** occurred during the previous quarter, as determined by the current date and time on the system.

Date.IsInPreviousWeek (datetime) as logical

Returns a logical value indicating whether the given **datetime** occurred during the previous week, as determined by the current date and time on the system.

Date.IsInPreviousYear (datetime) as logical

Returns a logical value indicating whether the given **datetime** occurred during the previous year, as determined by the current date and time on the system.

More next time.

Power BI Updates

Last month's updates came too late to publish in the June newsletter. Therefore, we have a bumper selection for you this month! We did mention the announcement of Microsoft Fabric, but you'll also find the Preview announcement of new Open, Save and Share options when working with files in OneDrive and SharePoint document libraries,

updates to the On-Object Interaction feature released to Preview in March, a new feature that gives authors the ability to define query limits in Desktop, data model editing in the Power BI Service, a new demo experience to the Power BI Embedded playground which simplifies embedding and updates to the Power BI tabs in Microsoft Teams.

There is more to explore in Reporting, Modelling, Data Connectivity, Service, Paginated Reports, Developers, visualisations and other announcements too.

The full list is as follows:

Microsoft Fabric

- Announcing Microsoft Fabric
- Power BI Direct Lake mode is in public Preview
- The Azure Analysis Services to Fabric and Power BI Premium Migration Experience is now Generally Available
- Optimize Ribbon in Power BI Desktop is now Generally Available
- Hybrid tables are now Generally Available
- Azure Log Analytics for Power BI Datasets is now Generally Available
- Power BI data hub reimagined and rebranded as OneLake data hub
- Power BI Lineage and impact analysis support all Fabric items in Preview
- Announcing the renaming of the Power BI Free user licence
- New Fabric connectors:
 - New 'Get Data' category: Fabric
 - Lakehouse in Microsoft Fabric (new connector)
 - Warehouse in Microsoft Fabric (new connector)
 - KQL database in Microsoft Fabric (new connector)

- Matrix accessibility improvements
- On-Object Interaction (Preview) updates
- Set Query Limits in Power BI Desktop
- New card visual in Preview
- OneLake Data Hub in Power BI Desktop
- On-Object Interaction updates in Preview

Modelling

- New DAX function: **MATCHBY**

Data connectivity

- On-premises data gateway latest release
- New connectors:
 - MongoDB Atlas (new connector)
 - Celonis EMS (new connector)
 - CloudBlue PSA (new connector)
 - SolarWinds Service Desk (new connector)
 - Wrike (new connector)
- Introducing Visual Cue for New Tenant settings
- Introducing the Tenant Admin Settings API

Reporting

- Azure Maps is now Generally Available
- Measure driven data labels
- Work seamlessly in Power BI Desktop with files in OneDrive and SharePoint in Preview

Connector updates

- Anaplan (connector update)
- AssembleViews (connector update)
- Autodesk Construction Cloud (connector update)
- Azure Databricks, Databricks (connector update)

- BitSight Security Ratings (connector update)
- BQE Core (connector update)
- Eduframe Reporting (connector update)
- Funnel (connector update)

Service

- Data Loss Prevention (DLP) policies are now Generally Available
 - Classify and protect your Power BI data
 - Detect sensitive information using custom keywords
 - Complex conditions in DLP for Power BI
 - DLP policies in national clouds
- Edit your data model in the Power BI Service (opt-in) in Preview
- New Power BI tab configuration experiences in Microsoft Teams
- Storytelling in PowerPoint: Embed visuals from Power BI organisational apps
- Edit your Data Model in the Power BI Service updates in Preview
- Introducing a new administrator setting to control email subscriptions for B2B guest users
- Admin Monitoring in Preview
- Power BI Guidance documentation

Embedded

- Get started with Power BI Embedded in minutes
- Create Power BI reports instantly in Jupyter Notebooks

Paginated Reports

- Drill through in Paginated Reports
- Changes to Power BI Paginated Reports consumption of Power BI Premium capacity

Developers

- Enhance your custom visuals with keyboard navigation
- Detect filtered report state with custom visuals
- Power BI Desktop Developer Mode in Preview

Visualisations

- New visuals in AppSource
- Zebra BI Cards 1.6
- Create Pie Charts with Drill Down Pie PRO
- Acterys Gantt
- Strip Plot by Nova Silva
- TMap 2.0
- Calendar by MAQ Software updated
- Interactive waterfall charts using Drill Down Waterfall PRO
- PowerGantt Chart by Nova Silva
- Advanced Linear Gauge by MAQ Software (new).

Let's look at each in turn.

Announcing Microsoft Fabric

As we mentioned last month, Fabric, now in Preview, is an end-to-end, human-centred analytics product that brings together all of an organisation's data and analytics in one place. It combines Power BI, Azure Synapse and Azure Data Factory into one unified software as a service (SaaS) platform. Data engineers, data warehousing professionals, data scientists, data analysts and business users can seamlessly collaborate within Fabric to foster a well-functioning data culture across the organisation.

Generative AI and language model services, such as Azure OpenAI Service, are enabling customers to use and create everyday AI experiences that are reinventing how analysts spend their time. Powering organisation-specific AI experiences requires a constant supply of clean data from a

well-managed and highly integrated analytics system. However, most organisations' analytics systems struggle to integrate their specialised yet often disconnected services.

Microsoft Fabric is an end-to-end, unified analytics platform that brings together all the data and analytics tools that organizations need. Fabric integrates technologies like Azure Data Factory, Azure Synapse Analytics and Power BI into a single unified product, empowering data and business professionals alike to unlock the potential of their data and lay the foundation for the era of AI.

Fabric is an end-to-end analytics product that addresses every aspect of an organisation's analytics needs. There are five [5] areas that really Microsoft wants to emphasise:

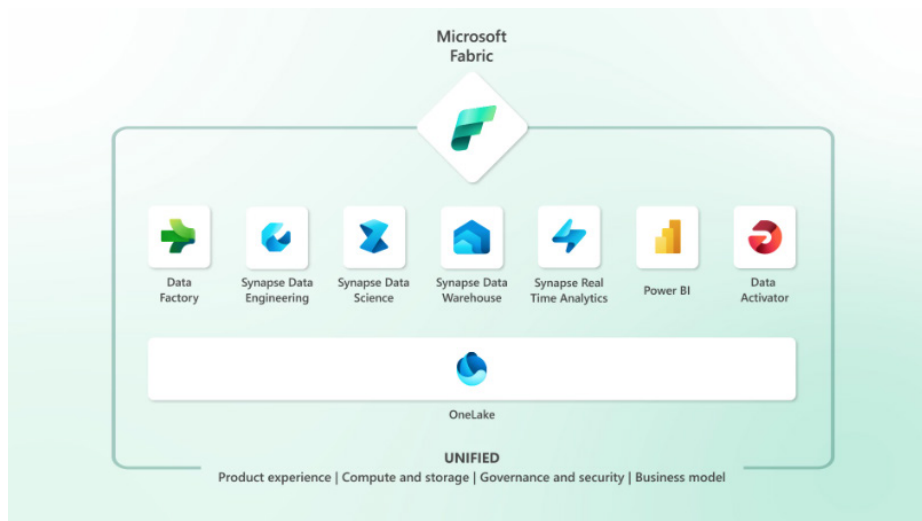
1. FABRIC IS A COMPLETE ANALYTICS PLATFORM

Every analytics project has multiple subsystems. Every subsystem needs a different array of capabilities, often requiring products from multiple vendors. Integrating these products can be a complex, fragile and expensive endeavour.

With Fabric, users may implement a single product with a unified experience and architecture that provides all the capabilities required for a developer to extract insights from data and present it to the

business user. By delivering the experience as software as a service (SaaS), everything is automatically integrated and optimized, and users can sign up within seconds and get real business value within minutes.

Fabric empowers every team in the analytics process with the role-specific experiences they need, so data engineers, data warehousing professionals, data scientists, data analysts and business users can get on with what they are paid to do.



Fabric comes with seven core workloads:

1. **Data Factory (Preview)** provides more than 150 connectors to cloud and on-premises data sources, drag-and-drop experiences for data transformation and the ability to orchestrate data pipelines
2. **Synapse Data Engineering (Preview)** enables better authoring experiences for Spark, instant start with live pools and the ability to collaborate
3. **Synapse Data Science (Preview)** provides an end-to-end workflow for data scientists to build sophisticated AI models, collaborate easily, and train, deploy and manage machine learning models
4. **Synapse Data Warehousing (Preview)** provides a converged lake house and data warehouse experience with industry-leading SQL performance on open data formats
5. **Synapse Real-Time Analytics (Preview)** enables developers to work with data streaming in from the Internet of Things (IoT) devices, telemetry, logs and more, and analyse large volumes of semi-structured data with high performance and low latency
6. **Power BI** in Fabric provides visualisation and AI-driven analytics that enable business analysts and business users to gain insights from data. The Power BI experience is also deeply integrated into Microsoft 365, providing relevant insights where business users already work
7. **Data Activator (coming soon)** provides real-time detection and monitoring of data and can trigger notifications and actions when it finds specified patterns in data all in a no-code experience.

You can try these experiences today by signing up for a Microsoft Fabric free trial.

2. FABRIC IS LAKE-CENTRIC AND OPEN

You don't need us to tell you that today's data lakes can be messy and complicated, making it hard for customers to create, integrate, manage and operate them. Once they are operational, multiple data products using different proprietary data formats on the same data lake can cause significant data duplication and concerns about vendor lock-in.

Fabric comes with a SaaS, multi-cloud data lake called OneLake that is built-in and automatically available to every Fabric tenant. All Fabric workloads are automatically wired into OneLake, just like all Microsoft 365 applications are wired into OneDrive. Data is organised in an intuitive data hub, and automatically indexed for discovery, sharing, governance, and compliance.

OneLake serves developers, business analysts and business users alike, helping eliminate pervasive and chaotic data silos created by different developers provisioning and configuring their own isolated storage accounts. Instead, OneLake provides a single, unified storage system for all developers, where discovery and sharing of data are easy with policy and security settings enforced centrally. At the API layer, OneLake is built on and fully compatible with Azure Data Lake Storage Gen2 (ADLSg2), instantly tapping into ADLSg2's vast ecosystem of applications, tools and developers.

A key capability of OneLake is "Shortcuts". OneLake allows easy sharing of data between users and applications without having to move and duplicate information unnecessarily. Shortcuts allow OneLake to

virtualise data lake storage in ADLSg2, Amazon Simple Storage Service (Amazon S3), and Google Storage (coming soon), enabling developers to compose and analyse data across clouds.

Fabric is deeply committed to open data formats across all its workloads and tiers. It treats Delta on top of Parquet files as a native data format that is the default for all workloads. This deep commitment to a common open data format means that customers need to load the data into the lake only once and all the workloads can operate on the same data, without having to separately ingest it. It also means that OneLake supports structured data of any format and unstructured data, giving customers total flexibility.

By adopting OneLake as a store and Delta and Parquet as the common format for all workloads, Microsoft offers its customers a data stack that's unified at the most fundamental level. Customers do not need to maintain different copies of data for databases, data lakes, data warehousing, business intelligence or real-time analytics. Instead, a single copy of the data in OneLake can directly power all the workloads.

Managing data security (table, column and row levels) across different data engines can be a persistent nightmare for customers. Fabric will provide a universal security model that is managed in OneLake, and all engines enforce it uniformly as they process queries and jobs. This model is coming soon.

3. FABRIC IS POWERED BY AI

Microsoft has announced they are infusing Fabric with Azure OpenAI Service at every layer to help customers unlock the full potential of their data, enabling developers to leverage the power of generative AI against their data and assisting business users to find insights in their data. With Copilot in Microsoft Fabric in every data experience, users may use conversational language to create dataflows and data pipelines, generate code and entire functions, build machine learning models, or visualise results. Customers can even create their own conversational language experiences that combine Azure OpenAI Service models and their data and publish them as plug-ins.

4. FABRIC EMPOWERS EVERY BUSINESS USER

Customers aspire to drive a data culture where everyone in their organisation is making better decisions based on data. To help users foster this culture, Fabric integrates with the Microsoft 365 applications people use every day.

Power BI is a core part of Fabric and is already infused across Microsoft 365. Through Power BI's deep integrations with popular applications such as Excel, Microsoft Teams, PowerPoint and SharePoint, relevant data from OneLake is easily discoverable and accessible to users right from Microsoft 365 helping users drive more value from their data

With Fabric, you can turn your Microsoft 365 apps into hubs for uncovering and applying insights. For example, users in Microsoft

5. FABRIC REDUCES COSTS THROUGH UNIFIED CAPACITIES

Today's analytics systems typically combine products from multiple vendors in a single project. This results in computing capacity provisioned in multiple systems like data integration, data engineering, data warehousing and business intelligence. When one of the systems is idle, its capacity cannot be used by another system causing significant wastage.

Purchasing and managing resources is massively simplified with Fabric.

CURRENT MICROSOFT ANALYTICS SOLUTIONS

Existing Microsoft products such as Azure Synapse Analytics, Azure Data Factory and Azure Data Explorer will continue to provide a robust, enterprise-grade platform as a service (PaaS) solution for data analytics. Fabric represents an evolution of those offerings in the form of a simplified SaaS solution that can connect to existing PaaS offerings. Users will be able to upgrade from their current products into Fabric at their own pace.

Power BI Direct Lake mode is in public Preview

Further to the above, Microsoft has just launched the public Preview of Direct Lake mode for Power BI datasets on Fabric Lakehouses. Moreover, Microsoft has also announced that they plan to launch the public Preview for Direct Lake mode datasets on Fabric Warehouses soon. For now, Direct Lake mode datasets for Warehouse is in private Preview, but it does take effect if you use the SQL Endpoint for Lakehouse.

In addition to avoiding vendor lock-in, One Copy of data shared across the Fabric analytical engines means customers will dramatically reduce data silos and data integration costs. Power BI is adopting Delta Lake and Parquet as its native storage format. By querying data directly from the lake, Power BI datasets enjoy quick query performance on a par

Copilot (*see below*) in Microsoft Fabric builds on existing commitments to data security and privacy in the enterprise. Copilot inherits an organisation's security, compliance and privacy policies. Microsoft does not use organisations' tenant data to train the base language models that power Copilot.

Copilot in Microsoft Fabric will be coming soon. Stay tuned for the latest updates and public release date for Copilot in Microsoft Fabric.

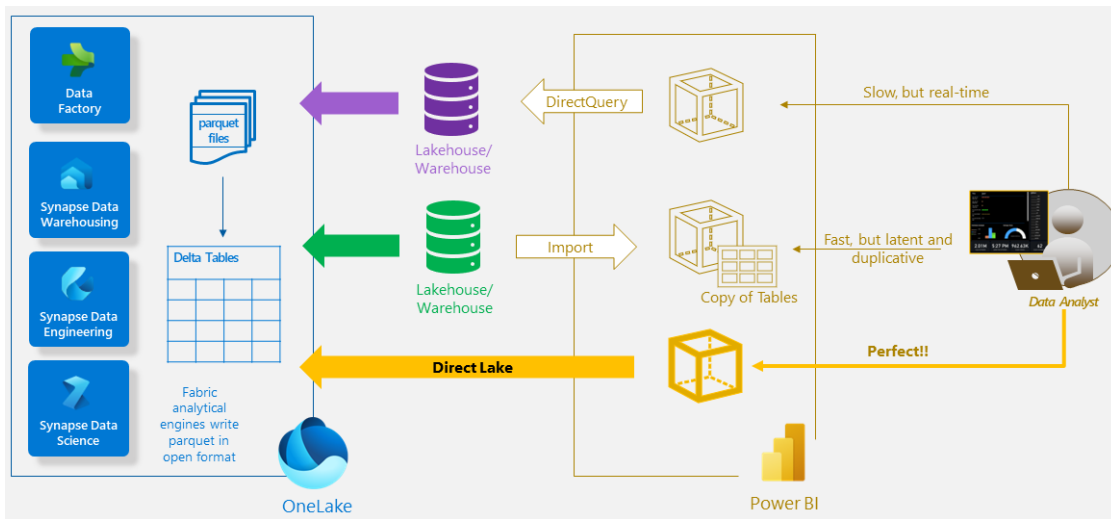
Excel can directly discover and analyse data in OneLake and generate a Power BI report with a click of a button. In Teams, users may infuse data into their everyday work with embedded channels, chat and meeting experiences. Business users can bring data into their presentations by embedding live Power BI reports directly in Microsoft PowerPoint. Power BI is also natively integrated with SharePoint, enabling sharing and dissemination of insights. With Microsoft Graph Data Connect (Preview), Microsoft 365 data is natively integrated into OneLake so analysts may unlock insights on their customer relationships, business processes, security and compliance, and people productivity.

Users may purchase a single pool of computing that powers all Fabric workloads. With this all-inclusive approach, analysts can create solutions that leverage all workloads freely without any friction in their experience or commerce. The universal compute capacities significantly reduce costs, as any unused compute capacity in one workload can be utilised by any of the workloads.

Microsoft Fabric is currently in Preview. You may sign up for the free trial. Everyone who signs up gets a fixed Fabric trial capacity, which may be used for any feature or capability from integrating data to creating machine learning models. Existing Power BI Premium users can simply turn on Fabric through the Power BI administrator portal. After 1 July 2023, Fabric will be enabled for all Power BI tenants.

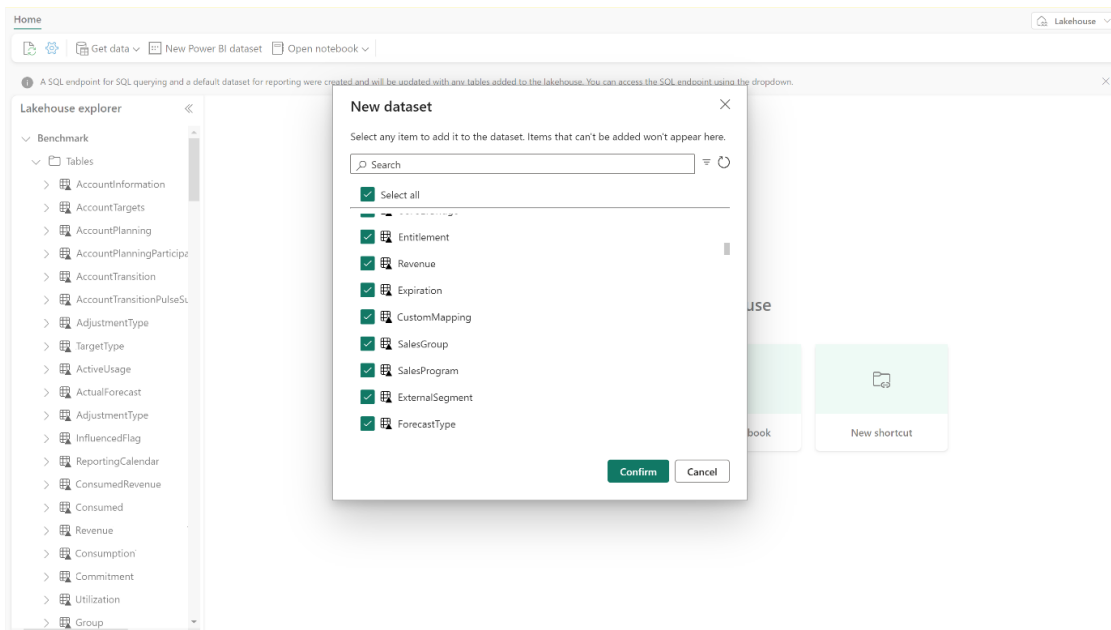
with Import storage mode without having to duplicate data or manage refreshes.

Until now, dataset creators had to choose between Import and DirectQuery mode for data access. Import mode delivers fast performance but Power BI must first copy the data during refresh. Any changes at the source are only picked up with the next data refresh. DirectQuery mode avoids having to copy data, but typically suffers performance degradation by having to submit federated queries to other database systems that are not as efficient for BI-style queries. Direct Lake mode combines the advantages of Import mode and DirectQuery: query performance on a par with Import without having to copy data or manage refreshes.



Direct Lake is a fast path to query data directly from the lake for your Lakehouse / Warehouse. The data volumes for Direct Lake mode exceed the per-dataset memory limits for Import models in Power BI Premium Gen2. Building near real-time BI solutions to unlock massive data is now simpler. Simply go to your Lakehouse or Warehouse in Fabric, click on the New Power BI Dataset button, select the tables you want to

include, and click Confirm. Open the data model to create measures and relationships as you would for any other Power BI dataset. Lastly, click the new report button and create your Power BI reports. You should note that the integrated experience from data in the lake through to report creation without leaving the browser or performing a refresh.



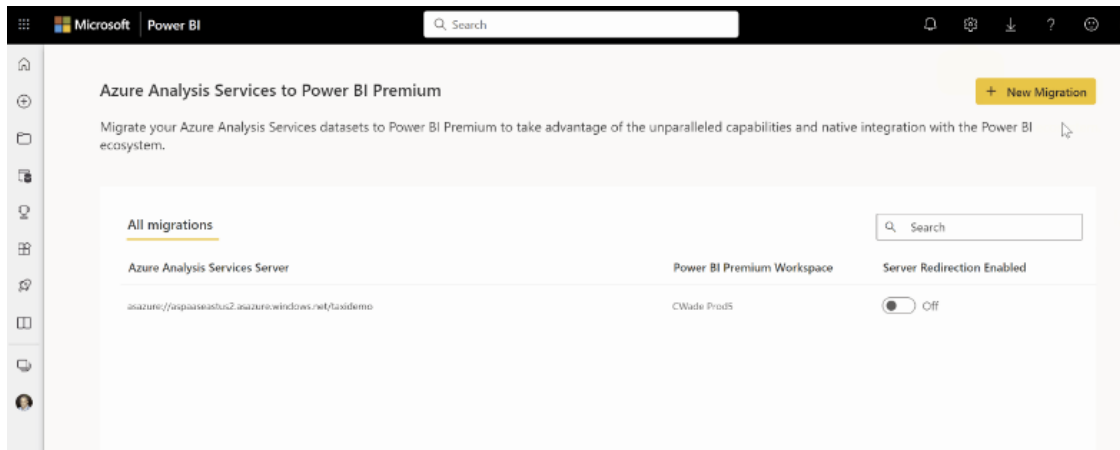
The Azure Analysis Services to Fabric and Power BI Premium Migration Experience is now Generally Available

Also known as the Azure Analysis Services to Premium Migration Experience, Microsoft also announced that it is now Generally Available. You can migrate semantic models from Azure Analysis Services (AAS) all the way to Fabric, Power BI Premium or Power BI Embedded in just a few clicks. Additionally, you may redirect existing reports to the migrated dataset.

This not only delivers a seamless migration experience that minimizes impact to downstream users, reports and automation processes, it also enables you to take advantage of the many benefits of Fabric and Power BI as a superset of AAS, such as greater capabilities and higher scalability. Power BI offers a modern, cloud BI platform that goes beyond comparable functionality available in AAS or SSAS. In Power BI, your enterprise BI solutions can scale dynamically, are straightforward to manage, and

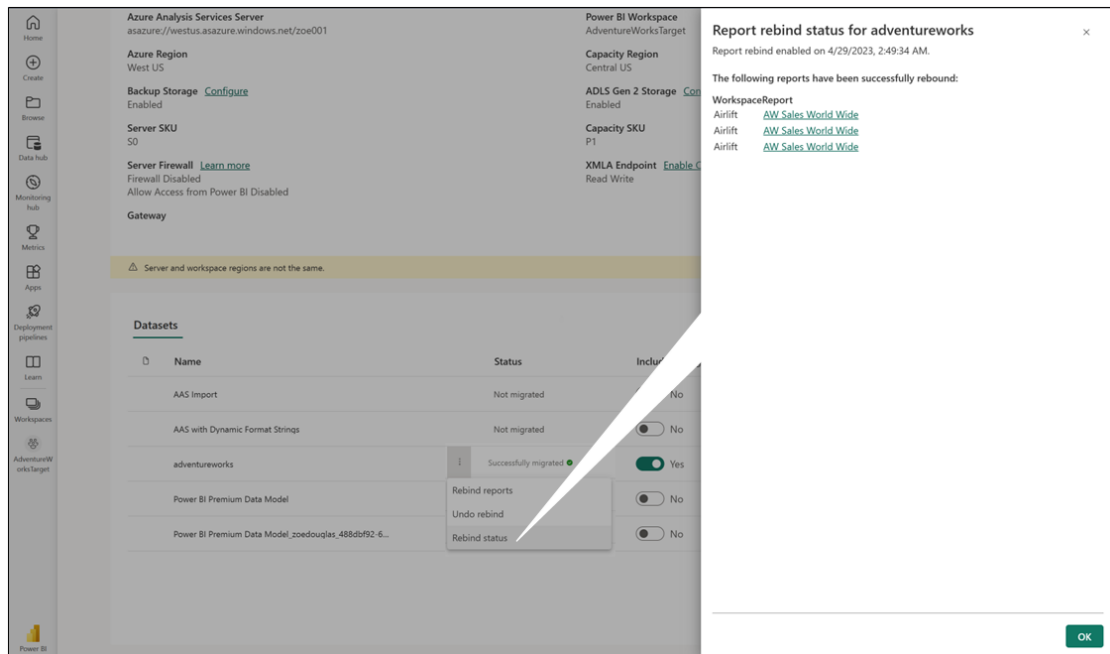
perhaps most importantly, are secure and easily sharable and discoverable within and across organisations. Migrating from AAS to Power BI is aligned with the Microsoft product roadmap and is a future-proof investment.

Whilst the migration of production solutions requires careful preparation, the actual steps to migrate from AAS to Power BI should be reasonably convenient. Just launch the Azure AS Migration Experience as in the following animated illustration, create a new migration, connect to your Azure subscription, select the AAS server and database that you want to migrate, connect to your workspace on Power BI Premium or create a new one, select the desired ADLS Gen 2 storage account, and you are up and running. You can monitor the migration progress and status while the migration experience performs the actual work for you.



The ability to redirect XMLA-based clients and rebind Power BI reports to the migrated dataset is perhaps one of the strongest reasons to use the Migration Experience for your Azure AS migrations. Equally convenient,

you can redirect all the Power BI reports that use a migrated dataset from within the migration experience. As the following screenshot illustrates,



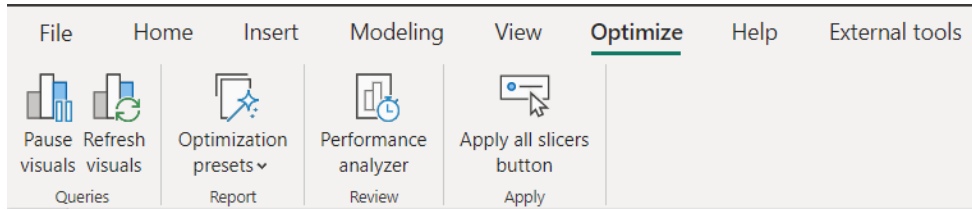
you can also verify the rebind status of your reports and revert the rebinding if you wanted to redirect your reports back to the original dataset on Azure AS. You might wish to evaluate the migration experience using a temporary target workspace first before launching the actual migration effort in your production environment.

After the actual migration is complete, users may continue to use their existing reports without disruption. You can also access your migrated dataset by using any tool or application that supports XMLA protocol. You can also create reports and dashboards using Power BI Desktop or Service and take your datasets to the next level by leveraging the numerous features and capabilities that Power BI has to offer, including:

- **Large dataset storage format:** this feature enables datasets up to 400 GB in size with improved performance and reliability
- **Incremental refresh:** this feature allows you to refresh only the data that has changed since the last refresh, reducing processing time and resource consumption
- **Aggregations:** this feature allows you to combine data from different sources and granularity levels, such as direct query and import modes, to optimise query performance and reduce costs
- **Composite models:** this feature allows you to combine multiple datasets into a single logical model, enabling cross-report drill-through and flexible data modelling scenarios
- **XMLA endpoints:** this feature allows you to connect to Power BI datasets using any tool or application that supports XMLA protocol, such as Excel, SSMS, SSIS or third-party tools.

Optimize Ribbon in Power BI Desktop is now Generally Available

The Optimize tab on the Ribbon in Power BI Desktop is now Generally Available. The Optimize ribbon can help you improve your report authoring experience with three main features: 'Pause visuals', 'Optimization presets' and the 'Apply all slicers' button:



- 1. Pause visuals** can stop visuals from sending queries when you are making changes. This can speed up your report design process, especially if you are using DirectQuery table storage mode. You can refresh individual visuals or all the visuals on a report page when you are ready
- 2. Optimization presets** lets you apply different report setting combinations to favour either Query Reduction or Interactivity between your visuals with one click. You can even use the 'Customize' option to pick and choose which settings best suits your reporting needs. 'Optimization presets' are particularly useful for large models and DirectQuery reports that require fine-tuning of performance and user experience
- 3. Apply all slicers** button stops slicers from instantly applying their selections when this button is added to a report page. This will reduce the number of times the other visuals refresh while report consumers are making selections across multiple slicers.

Hybrid tables are now Generally Available

For those building advanced Power BI datasets, you might welcome Hybrid Tables. This is an advanced partitioning feature that lets you combine import mode and DirectQuery mode in a single table, and it's now Generally Available. This means that your production solutions can now have fast performance for historical data stored in import-mode

partitions, and real-time data freshness for your latest data queried in DirectQuery mode.

This also means that you can define an incremental refresh policy with real-time data to generate a hybrid partitioning scheme automatically in your production datasets.

Granularity	Name	Row Count	
Year	2011	295,489,717	} Archived: Import
Year	2012	297,678,498	
Year	2013	295,575,442	
Year	2014	292,477,875	
Year	2015	297,780,469	
Year	2016	294,060,081	
Year	2017	300,419,682	
Year	2018	296,541,108	
Year	2019	292,787,420	
Year	2020	299,273,979	
Quarter	2021Q1	74,135,277	} Incremental refresh: Import
Month	2021Q104	24,939,498	
Day	2021Q10501	820,805	
Day	2021Q10502	826,885	} Real time: DirectQuery
Day	2021Q10503	821,043	
Day-DirectQuery	2021Q10504-DQ	271,110	
Total		3,063,898,887	

With Hybrid Tables now in Power BI Premium, you can analyse massive datasets with billions of rows interactively, while keeping up with the latest changes in your data source seamlessly. Of course, you can also

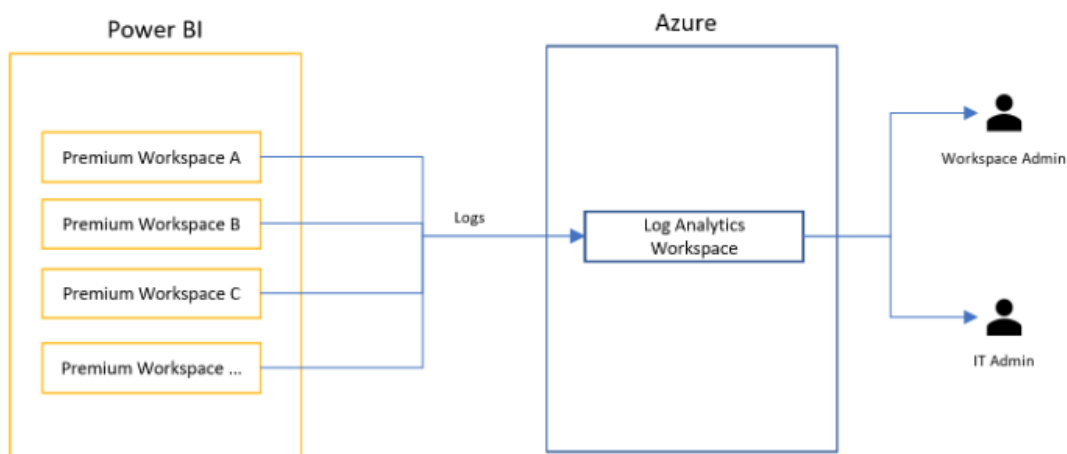
create a reverse partitioning scheme with less frequently analysed historic data in DirectQuery mode while providing the more frequently analysed recent data in import mode for blazing fast analysis.

Azure Log Analytics for Power BI Datasets is now Generally Available

Microsoft also announced the General Availability of Power BI integration with Azure Log Analytics. During public Preview, this feature proved to be very useful for administrators to analyse their detailed historical activity and independently perform diagnostics on their dataset activities.

However, until now this feature was limited to a single workspace per log analytics workspace. In other words, you could not connect multiple

Power BI workspaces to a single log analytics workspace. This meant you had to create a new log analytics workspace for each Power BI workspace or selectively decide which workspace you wanted to analyse. With this announcement, we have lifted the limitation and customers can now connect multiple workspaces to a single log analytics workspace:



With this added capability, administrators now can have full and detailed visibility into any Power BI Premium dataset usage, performance and metrics running in their premium capacities in near real time.

QUERY LOG ANALYTICS WITH KQL

Using the Log Analytics query interface administrators have the possibility to write queries using the powerful Kusto Query Language (KQL) and get instant results from massive amounts of data. Here's an example that counts the number of queries, users, CPU Average and Duration Average per workspace:

```
PowerBIDatasetsWorkspace
| where TimeGenerated > ago(30d)
| where OperationName == "QueryEnd"
| summarize QueryCount=count()
, Users = dcount(ExecutingUser)
, AvgCPU = avg(CpuTimeMs)
, AvgDuration = avg(DurationMs)
by PowerBIWorkspaceId
```

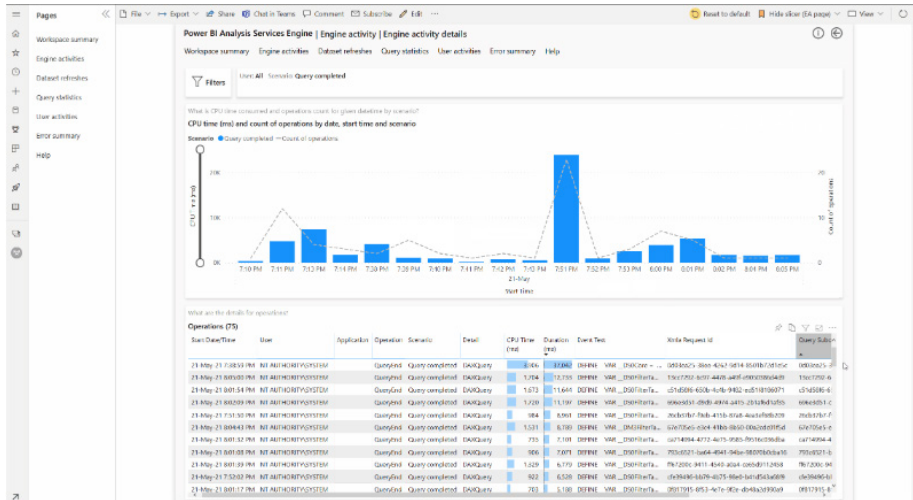
```
▶ Run Time range: Set in query Save Share + New alert rule Export Pin to
```

```
1 PowerBIDatasetsWorkspace
2 | where TimeGenerated > ago(1d)
3 | where OperationName == "QueryEnd"
4 | summarize QueryCount=count()
5   , Users = dcount(ExecutingUser)
6   , AvgCPU = avg(CpuTimeMs)
7   , AvgDuration = avg(DurationMs)
8 by PowerBIWorkspaceId
9
```

PowerBIWorkspaceId	QueryCount	Users	AvgCPU	AvgDuration
> 07C101A3-8FB5-42C2-98E9-304B4D59B567	5	1	9.6	6.4
> 0CF9E73B-DCB9-4CAB-B0FC-DB9E8DE28AF8	40	1	22.025	18.925
> 013659FD-F8FD-4B4C-A0D3-64E25D02E880	42	1	19.571428571428573	18.452380952380953

INSIGHTS WITH POWER BI TEMPLATE

Administrators may also use the previous released Power BI report template to connect to Log Analytics and get historical insights for dataset usage and performance data:



In summary, Log Analytics provides administrators with a unique way to:

- visualize historical data over long periods to observe usage trends, spot periods of unusual load, and identify performance degradation
- isolate activities by time range, capacity, dataset, user, report and more
- troubleshoot query and dataset refresh performance, by investigating internal operations and identifying where time is being spent
- correlate DAX Queries with the origin Power BI reports and visuals
- deep dive on Power BI Premium dataset overloads.

AUTOMATION WITH REST APIs

With General Availability, Power BI will also allow administrators to automate the connection of Power BI Workspaces to Log Analytics Workspace using the UpdateGroup Admin REST API, allowing admins to automate creation of the connection to Log Analytics. This is an important capability for large enterprise customers and independent software vendors (ISVs) who may have to frequently create new workspaces.

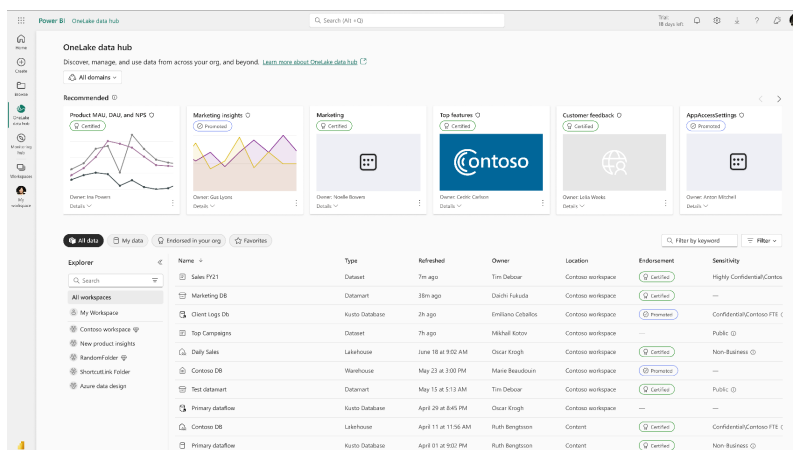
Power BI data hub reimaged and rebranded as OneLake data hub

The data hub is already the central location for discovering, managing and reusing data. With the introduction of Fabric, there are more data types available, and the OneLake data hub is expanding to support all Fabric data items, including Data warehouses, Lakehouses, their related SQL endpoints, KQL databases, Datamarts and Datasets. As part of the Fabric release, the data hub is rebranded as the 'OneLake data hub'. OneLake data hub serves as the interface to all data in OneLake, enabling users to effortlessly discover and manage their OneLake data.

There is another major enhancement that addresses customer requests related to the data hub experience. The new OneLake data hub Explorer enables users to quickly and easily locate the right data items while

browsing through the list of workspaces where they have data items inside. The OneLake data hub Explorer is particularly powerful for users who have access to data across multiple workspaces, including those with tens or more workspaces. By providing an intuitive and efficient way to browse through and locate data items, the Explorer makes it easier for users to work with large volumes of data and derive valuable insights. In the Explorer pane, users can see all of the workspaces in which they have access to data, and clicking on a workspace name scopes the data to that workspace only.

The OneLake data hub is accessible on Power BI Service, Power BI Desktop and in all Fabric workloads.



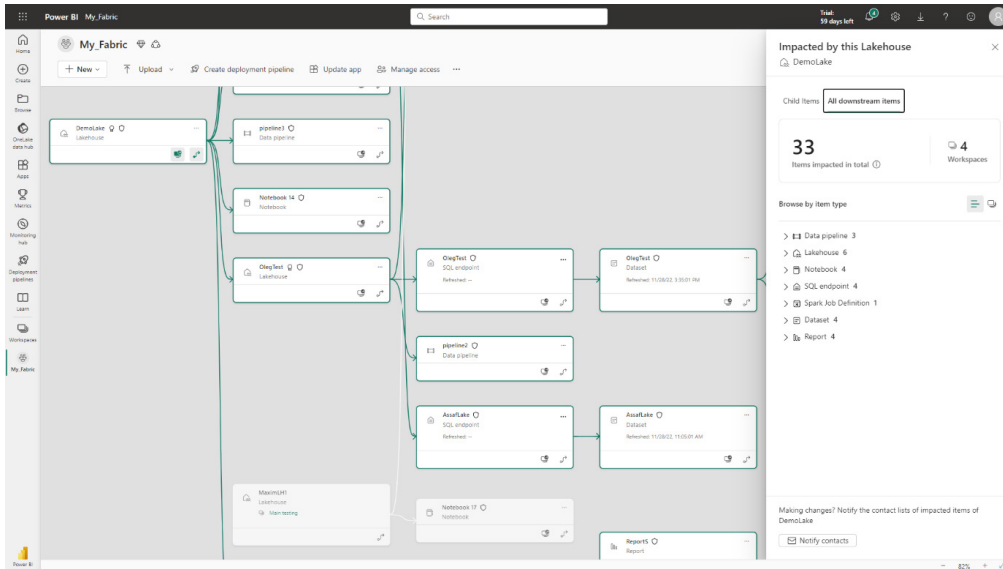
Power BI Lineage and impact analysis support all Fabric items in Preview

With the release of Fabric, Power BI workspaces now include many new items and BI projects often span across multiple items with many dependencies. The Lineage view feature is expanding (now in public Preview) to support all Fabric items. This will enable users to see how data flows from source to destination across all items, e.g. how a pipeline injects data into a lakehouse and then into its related warehouses, datasets and reports.

To help users better understand the long chain of dependencies across

workspaces, Power BI is also improving the impact analysis experience. This will allow users to see all downstream items through the chain, in addition to the direct child items.

Overall, these enhancements to the Power BI workspace Lineage view will improve data visibility and management, making it easier for users to work with complex BI projects and ensure that data is flowing smoothly across all items.



Announcing the renaming of the Power BI Free user licence

With respect to the introduction of Microsoft Fabric, the Power BI Free user licence is now the **Microsoft Fabric Free user license** (*sic*). This minor change requires no preparation as all functionalities that the

Power BI Free user licence previously offered, still remain. The renaming of the licence serves only to reflect inclusion within Microsoft Fabric.

New Fabric connectors

With the advent of Fabric, Power BI now has a new 'Get Data' category, combined with the release of three [3] new connectors which will appear within the Fabric category.

NEW 'GET DATA' CATEGORY: FABRIC

There is now a new category in the 'Get Data' experiences which will contain data sources from Microsoft Fabric. The following connectors will appear in the Fabric category, in addition to the 'Power Platform' category:

1. Dataflows
2. Power BI Datasets
3. Datamarts.

LAKEHOUSE IN MICROSOFT FABRIC (NEW CONNECTOR)

The 'Lakehouse in Microsoft Fabric' connector allows teams to connect to their Delta tables created in the Fabric Lakehouse. It also gives teams the ability to directly discover and connect to all their files in OneLake. With this new connector, teams can easily visualise their Lakehouse data to gain more business insights.

WAREHOUSE IN MICROSOFT FABRIC (NEW CONNECTOR)

The 'Warehouse in Microsoft Fabric' connector allows teams to connect to their warehouse data living in Microsoft Fabric. With the connector, teams can use the SQL endpoint to get data, write native queries and get more understanding of their data trends.

KQL DATABASE IN MICROSOFT FABRIC (NEW CONNECTOR)

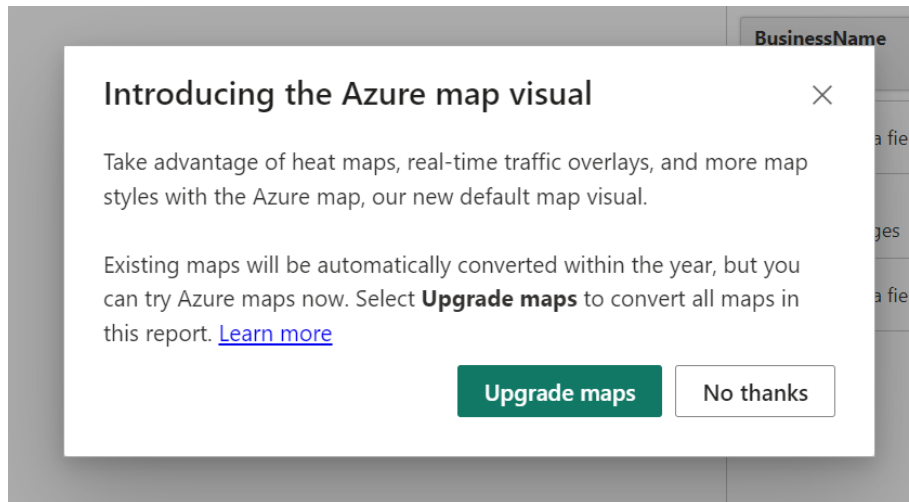
The 'KQL database in Microsoft Fabric' connector allows teams to connect to their KQL databases data living in Microsoft Fabric. With the connector, teams can use Query URI to connect to their KQL database and get valuable insights into their data.

Azure Maps is now Generally Available

The Azure Maps visual is now Generally Available. Since releasing the visual for private Preview over a year ago, Microsoft has added a variety of customisation options to help bring it up to par with their current Map visual. These additions include support for location name fields (geocoding), Pie chart layers, Filled Map layers and more.

With this release, you'll find a couple more changes:

1. When you open a report with an existing Map visual and Azure Maps is enabled for your organisation, you'll see a window pop up encouraging you to upgrade your Map to an Azure Map

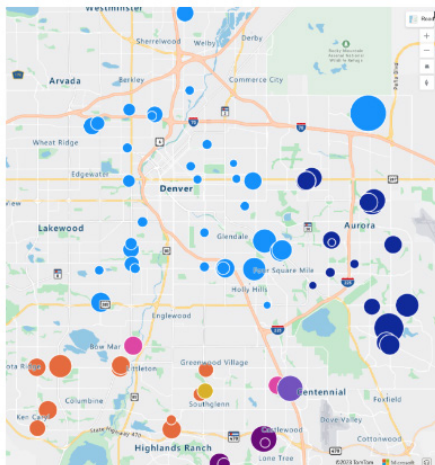


As you might have been able to infer since the release of the visual's public Preview, Power BI is focusing its development efforts on Azure Maps as the single first-party map visual. In fact, in a future release, Microsoft will fully deprecate older map visuals and migrate

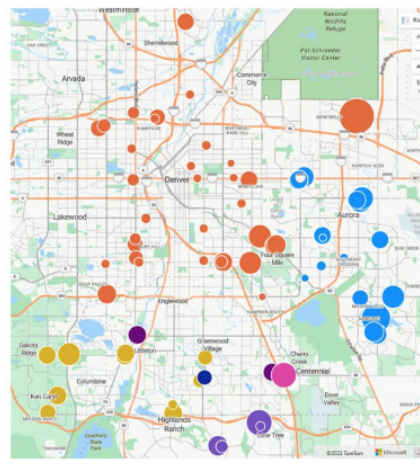
even existing reports over to Azure Maps in order to truly unify all of our map visuals into one. However, Microsoft encourage you to convert your Maps to Azure Maps now. This will make sure that you get all the new features as they ship in the future and that your

2. The style of all of Power BI's map tiles, including in the Azure Maps visual, will be updated.

Current Style



New Style



Since this will affect all reports, including existing reports, Microsoft is rolling this change out to users over time, so keep an eye out for the new style in your own reports and send them feedback early if you encounter any issues.

Whilst Azure Maps has now reached General Availability, Microsoft's investment in Azure Maps won't slow down apparently. They mention they "... still have even more features and improvements planned for the visual in the coming releases".

Measure driven data labels

This release will introduce an exciting new label capability that allows you to easily swap out your default data labels with more meaningful values based upon your chosen field or measure.



Work seamlessly in Power BI Desktop with files in OneDrive and SharePoint in Preview

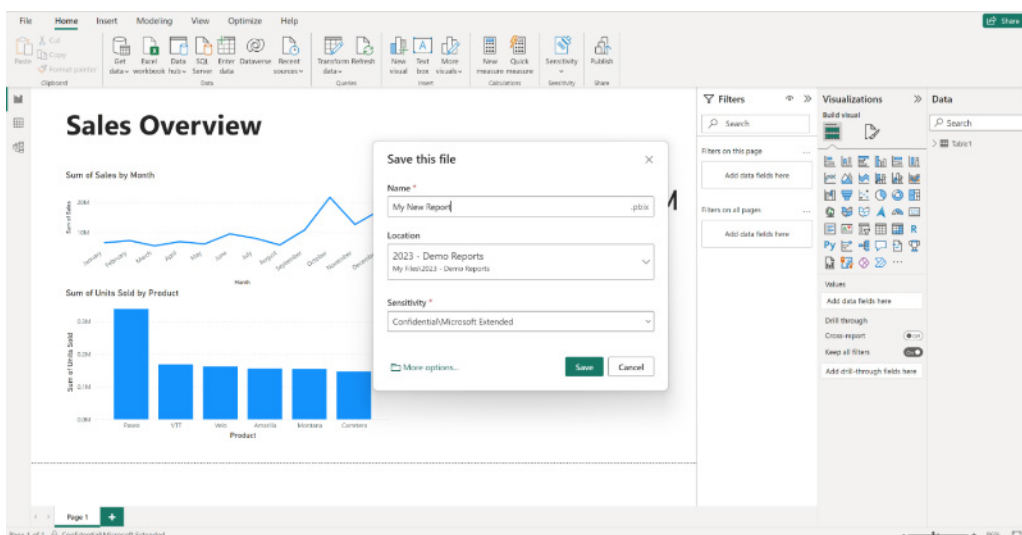
This month sees the Preview of new Open, Save and Share options when working with files in OneDrive and SharePoint document libraries.

Many report authors save their Power BI files to OneDrive and SharePoint during report creation. These new capabilities help authors with file versioning, collaborating with other authors and ensuring they always have a backup of their files in the cloud.

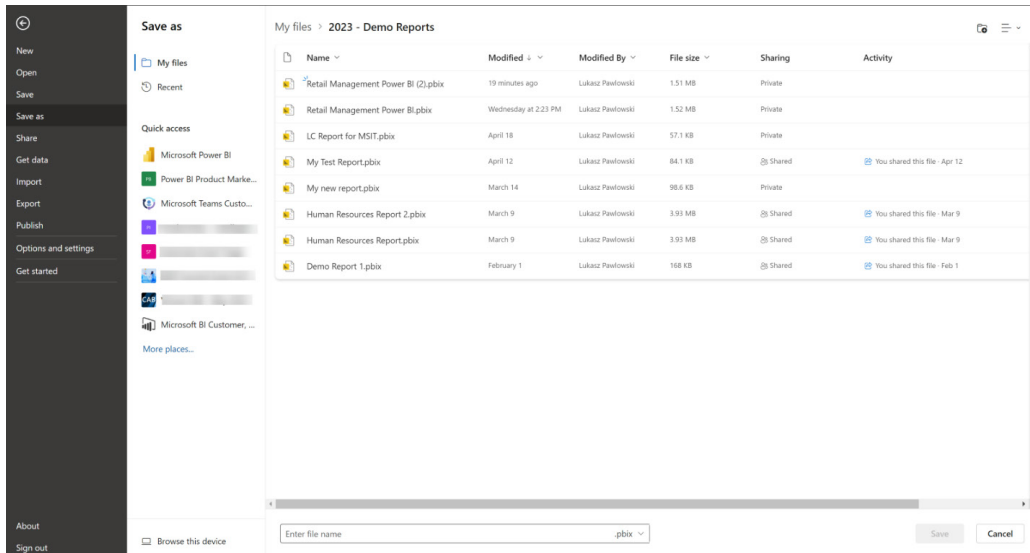
You may start by enabling the Preview by checking the 'Save to OneDrive and SharePoint' and 'Share to OneDrive and SharePoint options' in the

Options -> Preview Features. Note, if you have many recent files, there is a known bug affecting the performance. Microsoft is aware and has stated that this will be fixed next month and thus recommend you wait to turn this feature on.

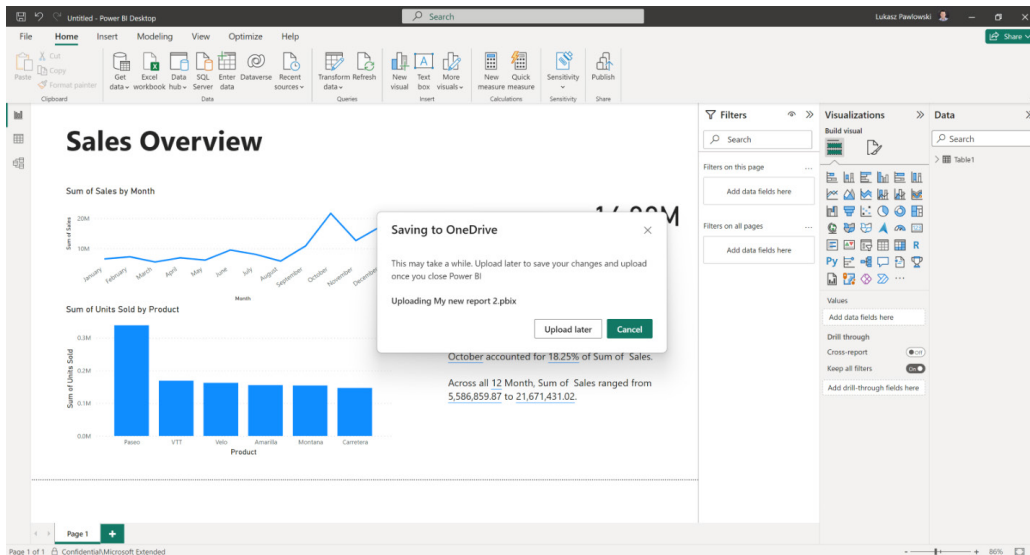
When enabled, the next time you save a new file in Power BI Desktop, you'll see OneDrive and SharePoint folders you've recently used, in addition to the local folders you've used recently.



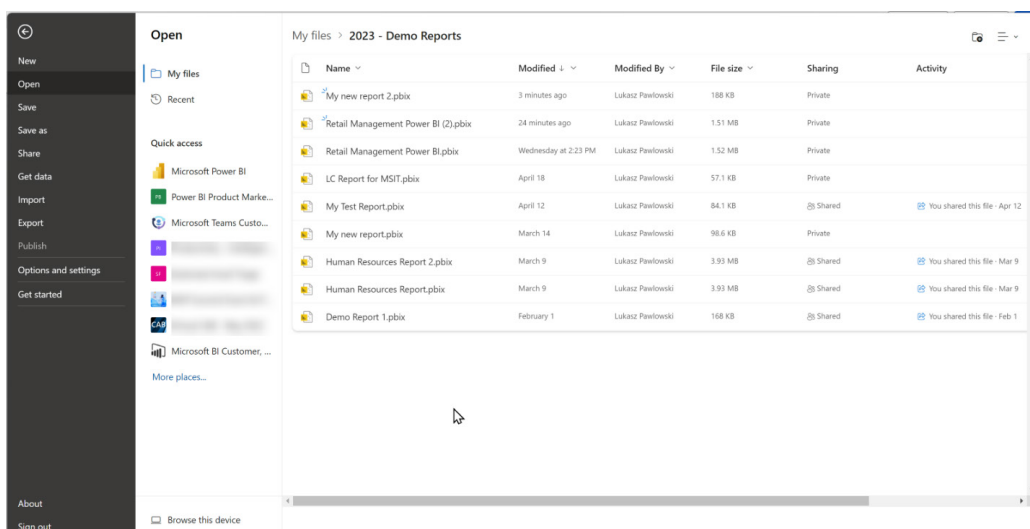
If you don't see the folder you need, select the 'More options...' button which opens the new 'Save As experience' that lists the OneDrive and SharePoint locations you have access to, and lets you navigate and create new folders. You may also 'Browse this device' to save to a local folder.



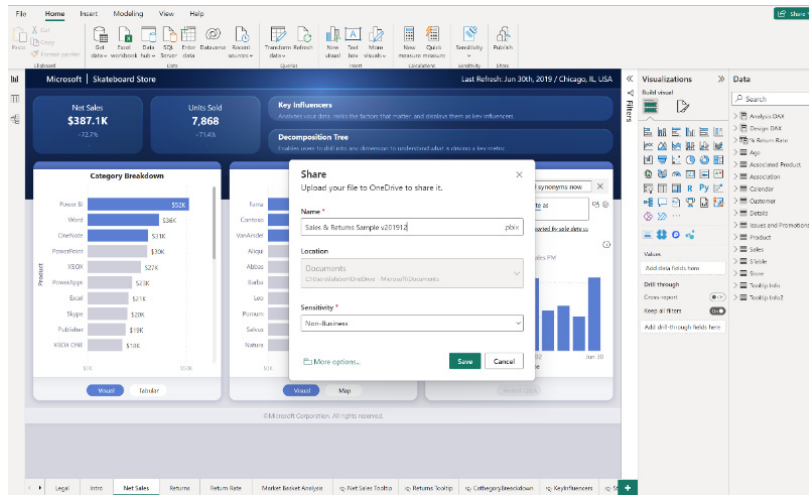
When you press Save, the file will be uploaded to the location you chose. You can press 'Upload later' to keep working and the file will be uploaded when you close Power BI Desktop.



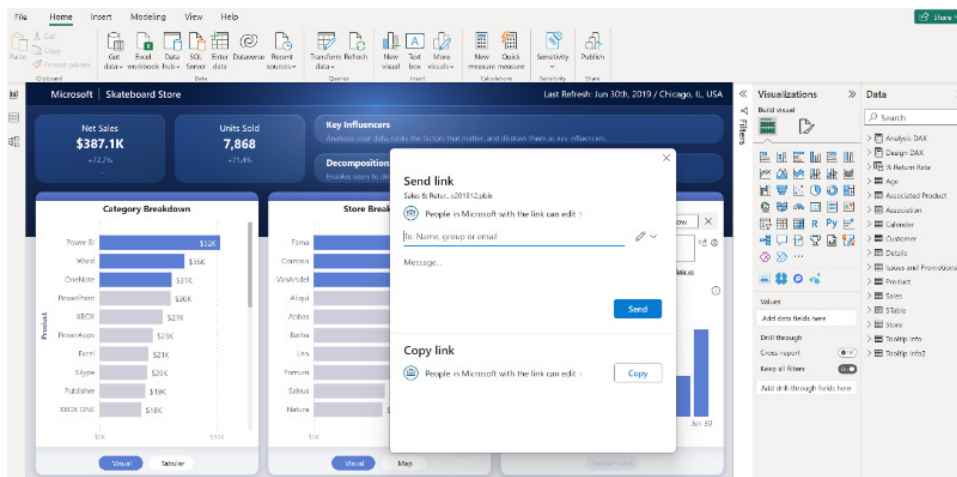
Next time you open Power BI Desktop, you'll be able to open the file directly from OneDrive and SharePoint document libraries. This downloads the file locally. This update does not add any collaborative editing of Power BI files.



Finally, when you're ready to share your work with a colleague, you can click the Share button at the top right-hand corner. If the file is a local file or a new file, you'll be prompted to save it to OneDrive or SharePoint.



Then, you'll be able to use standard SharePoint and OneDrive UI to get a shareable link or send it to the people who need it.



Sharing through OneDrive and SharePoint is convenient for report authors and small teams. For larger organisations, it's best to use the Publish option to share through the Power BI Service, where it's easier to distribute, find and manage trusted reports.

Power BI administrators may turn off the ability to 'share through OneDrive and SharePoint' for users in their organisation in Power BI Desktop. Use the Power BI 'admin portal' to disable the 'Users can share links to Power BI files stored in OneDrive and SharePoint through Power BI Desktop' setting (catchy title).

- Users can share links to Power BI files stored in OneDrive and SharePoint through Power BI Desktop *Enabled for the entire organization*

Users who have saved Power BI files (.pbix) to OneDrive and SharePoint can share links to those files using Power BI Desktop. [Learn More](#)



When the setting is disabled, the Share button will be disabled for signed-in users. If the user has not signed in, they'll need to sign in after pressing Share. If the Admin setting is disabled, the share option gets disabled. Users will still have the option to save to their OneDrive for Business or a SharePoint Document Library, which many already do today by synchronising their local file system with OneDrive or manually uploading files.

As we have advocated for years, organisations need to build a single source of truth where everyone can find the most authoritative and up-to-date insights. Publishing to the Power BI Service and distributing through the Power BI app will assist with this process.

These new open, save and share experiences work together with the recently announced view in OneDrive and SharePoint experience. Your Power BI Admin can enable the 'Users can view Power BI items saved in OneDrive and SharePoint (Preview) tenant' setting if necessary too.

These new OneDrive and SharePoint capabilities complement existing processes by meeting the needs of authors, who often collaborate as a team before publishing official versions of reports through the Power BI Service.

It also helps organisations that are just starting out. They may have just a few people using Power BI who are already familiar with sharing content in OneDrive.

Matrix accessibility improvements



Microsoft has also announced several enhancements to the Matrix visual for existing and new reports to improve usability and accessibility for all users. These updates include:

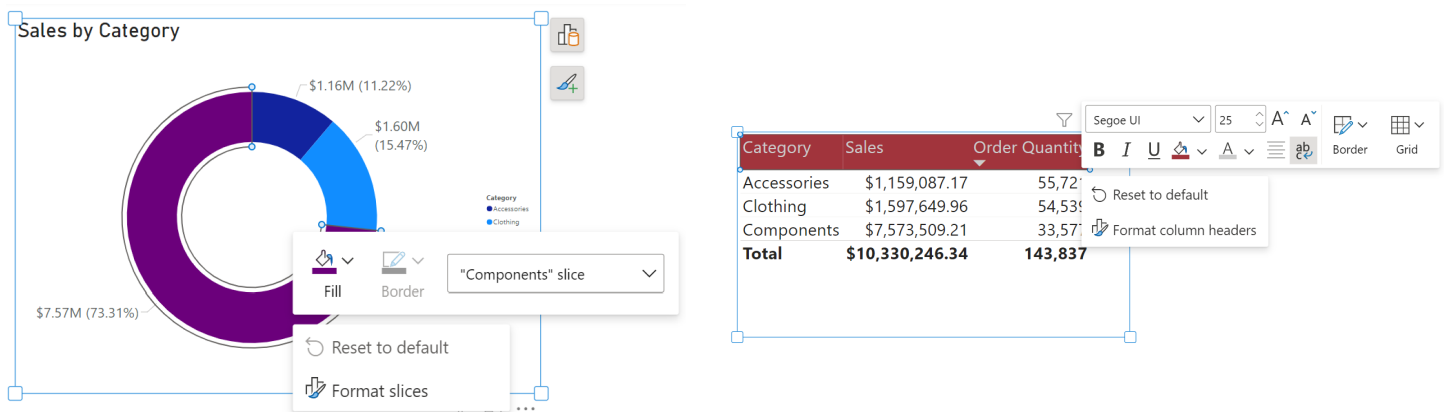
- improved keyboard navigation and new keyboard shortcuts, including Page Up, Page Down, Home and End to quickly traverse data in large matrices
- a two-toned focus outline that will always be visible even in darker backgrounds, meeting colour contrast requirements
- new support for screen reader announcements to convey Matrix structure and interactions
- added screen reader support for conditional formatting icons and data bars
- removed browser (default) ToolTips for values that aren't truncated
- overall performance improvements for scrolling and rendering, with an updated scrollbar style.

Item Type Region	Cereal		Clothes		Cosmetics		Fruits	
	Units Sold	Total Revenue	Units Sold	Total Revenue	Units Sold	Total Revenue	Units Sold	Total Revenue
Sub-Saharan Africa	299787	61,666,185.90	322873	35,283,561.44	269093	117,647,459.60	330404	3,082,669.32
North America	18144	3,732,220.80	54853	5,994,335.84	27917	12,205,312.40	69347	647,007.51
United States of America			18179	1,986,601.12	9326	4,077,327.20	15628	145,809.24
Mexico	↓ 8613	1,771,694.10	↓ 9380	1,025,046.40	↓ 3028	1,323,841.60	↓ 9805	91,480.65
Greenland			↓ 8880	970,406.40	↓ 1739	760,290.80	↑ 27238	254,130.54
Canada	↓ 9531	1,960,526.70	↑ 18414	2,012,281.92	↑ 13824	6,043,852.80	↑ 16676	155,587.08
Middle East and North Africa	150206	30,897,374.20	85739	9,369,557.92	131201	57,361,077.20	128465	1,198,578.45
Europe	372704	76,665,212.80	242165	26,463,791.20	238081	104,089,013.20	227626	2,123,750.58
Central America and the Caribbean	107332	22,078,192.40	156160	17,065,164.80	93119	40,711,626.80	140595	1,311,751.35
Trinidad and Tobago	↓ 9571	1,968,754.70			↓ 4116	1,799,515.20	↓ 9711	90,603.63
The Bahamas			↓ 8813	963,084.64	↓ 2284	998,564.80	↑ 14533	135,592.89
Total	1073725	220,865,232.50	1045949	114,301,306.72	1016806	444,547,583.20	1098330	10,247,418.90

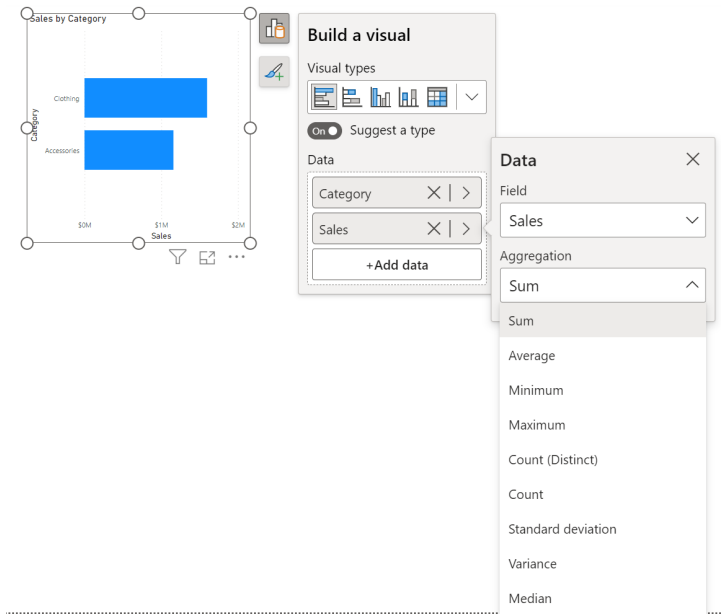
On-Object Interaction (Preview) updates

You may recall the new On-object interaction feature was released to Preview in March. There have been improvements / bug fixes made in this update:

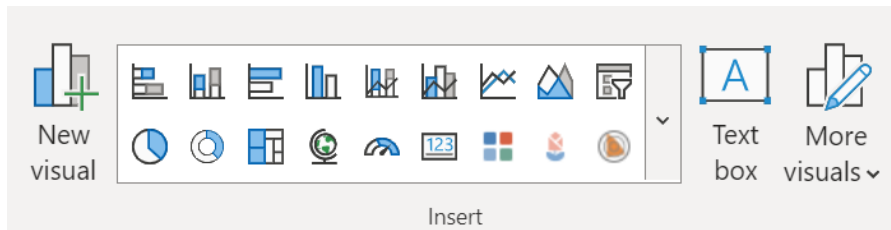
- Pie, Donut and Table visuals are now supported



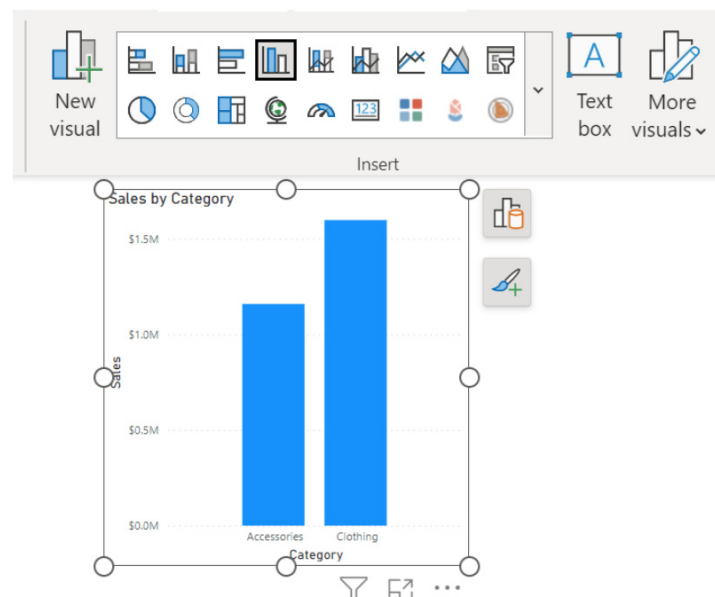
- new aggregations menu: Microsoft has noted that switching aggregations is difficult to find on right-click alone in the new On-object design. Therefore, Power BI has now added a new discoverable dropdown to the flyout menu to be able to switch aggregations more easily. When first adding data, the data dropdown should open by default to avoid adding another initial click to the experience



- if using drag / drop instead of the 'add data' button to add data to your visual, Power BI has improved the drag / drop experience. When dragging a field to the On-object build menu for a selected visual, the build menu will open automatically to make dropping in the correct field well even easier
- custom visuals are now shown in the Ribbon Visualizations gallery:



- behaviour update: the Ribbon Visualizations gallery is now dual-purpose. When no visual is selected, the Ribbon will insert a new visual of that type. When a visual is selected, you can use the Ribbon to change the visual type of the current selection

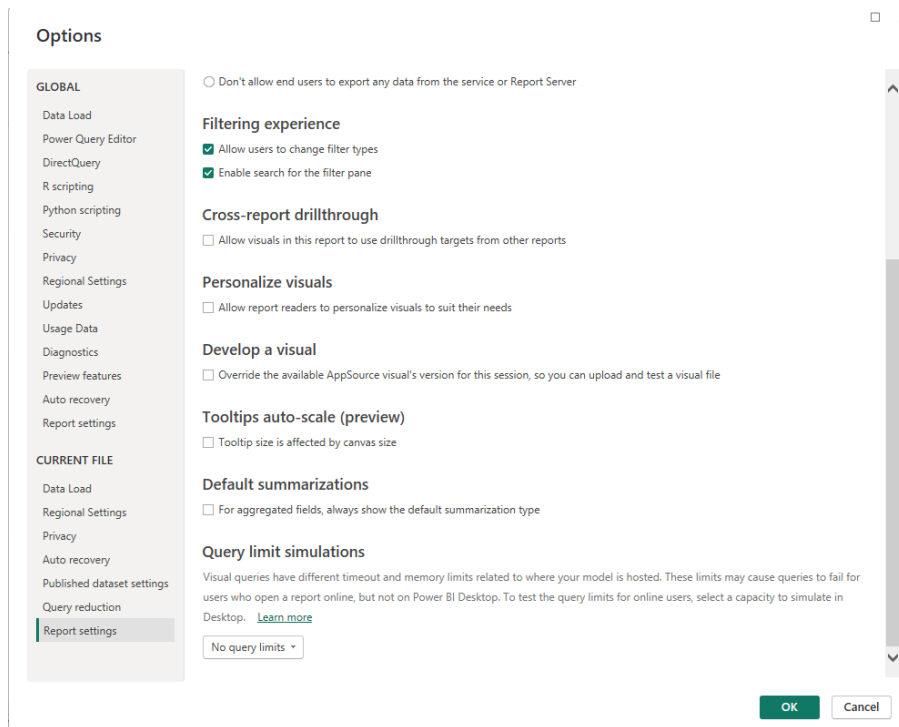


- bug fix: dragging to scroll within the Build menu is now fixed when dragging upward
- bug fix: scrolled position is now maintained within the Build menu when adding, swapping or renaming a field.

Set Query Limits in Power BI Desktop

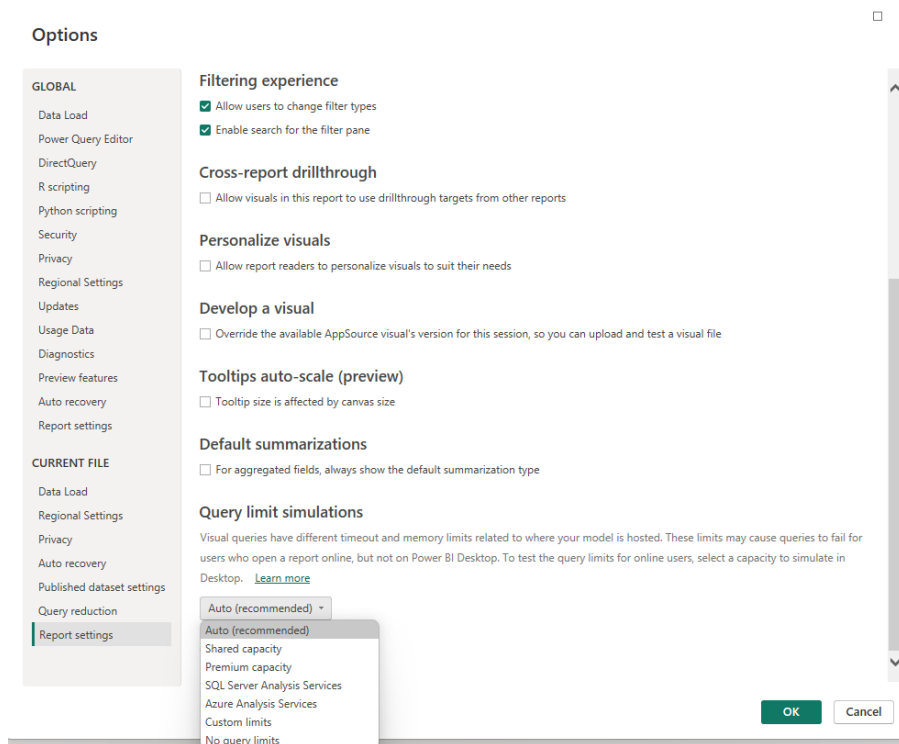
In the Service, depending on where a Power BI report's data is hosted, there are different limits to the time a query is allowed to run and the amount of memory that query is allowed to use. However, in Power BI Desktop, these limits do not exist. This occasionally causes confusion when a visual that works on Power BI Desktop unexpectedly errors when it is viewed in the Service.

To reduce this confusion, Microsoft is giving authors the ability to define query limits in Desktop as well. This way, you can match the limits that will be found wherever your data will be hosted in the Service. You can find these new options in the **Options -> Report settings** tab:

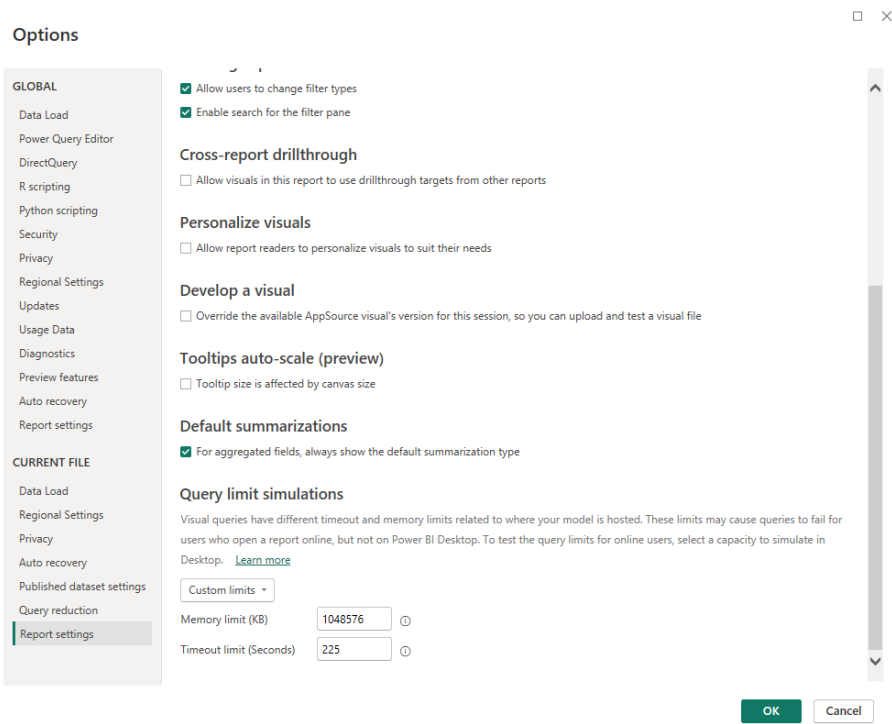


Existing reports will be defaulted to 'No query limits' to match previous behaviour, but new reports will now have 'Auto' limits set by default. With 'Auto limits', Power BI will do its best to identify where the model

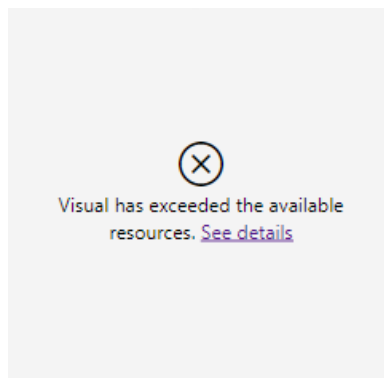
is hosted, and otherwise default to the Shared Capacity (which tends to be the strictest) for safety.



You can see the limits being set for each capacity you choose, and you can also set custom limits with the 'Custom limits' option. When you set your own limits, you can use '0' [zero] to indicate "no limits".

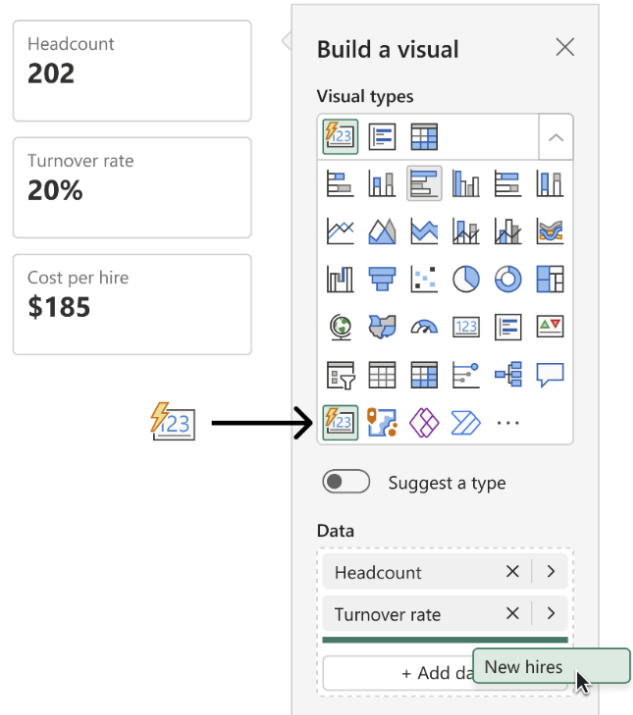


When a query limit is reached, you will see a similar error to what you would see in the Service:



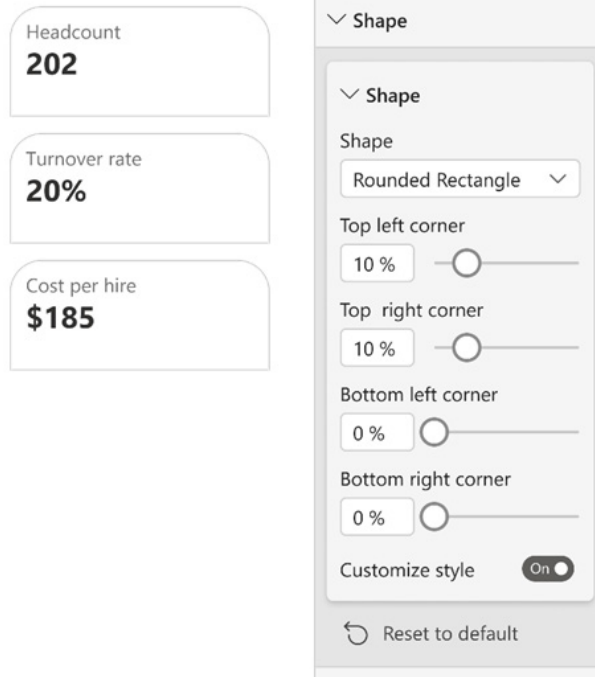
New card visual in Preview

With this latest update, a new card visual feature has been introduced, which you can find in the core visual gallery. If you prefer, you can also access it as a Preview feature under **Options -> Preview features -> New card visual**. You can display multiple cards by dragging and dropping all fields or measures into the 'Data' field well.

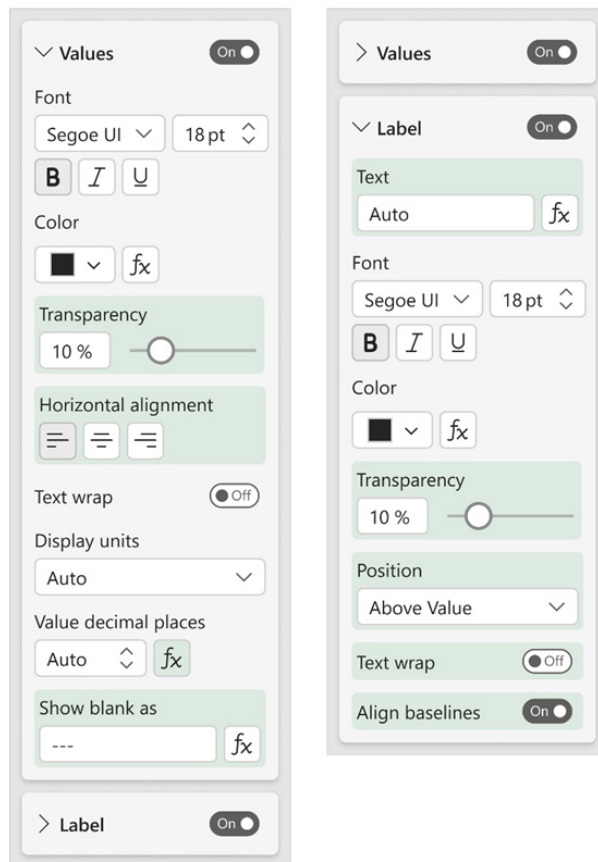


The new card visual comes with features that include:

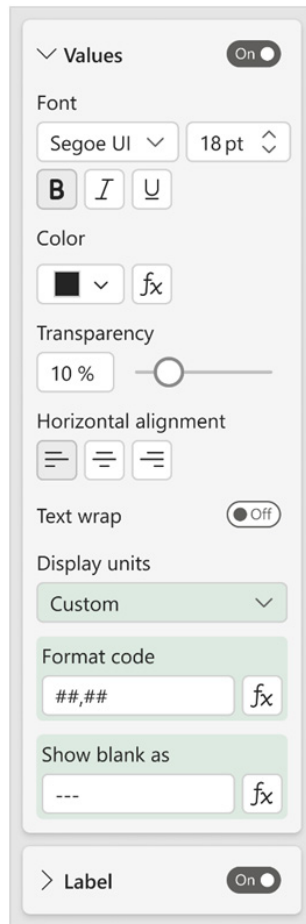
- customise the **shape** corners to achieve your desired style



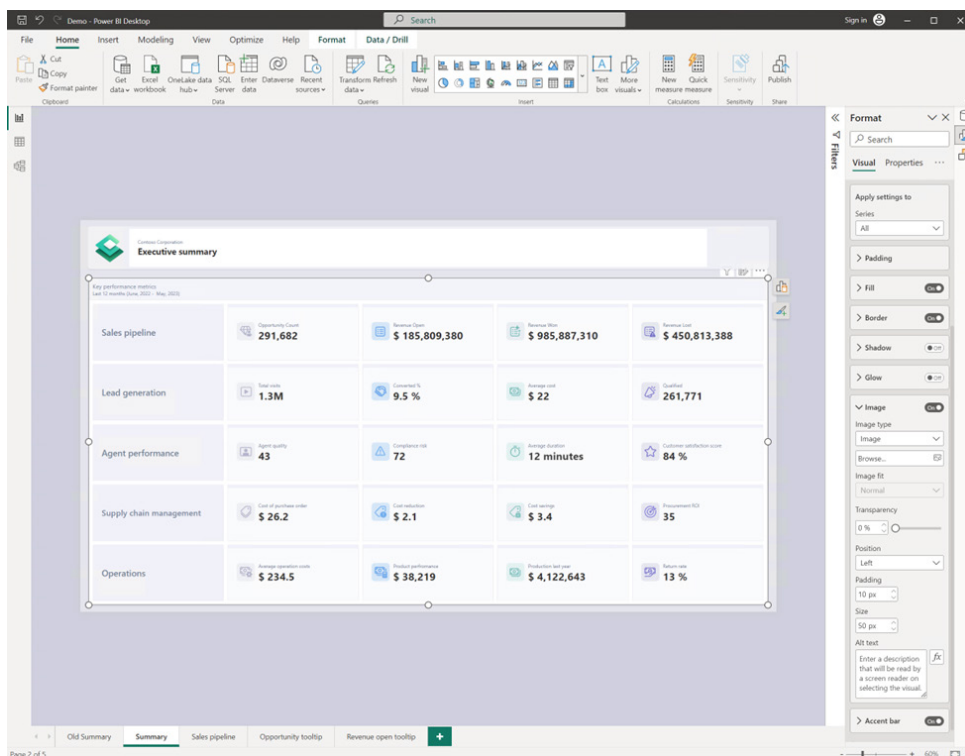
- refined Formatting settings for **values** and **labels**, with expanded support for conditional formatting and the introduction of font transparency



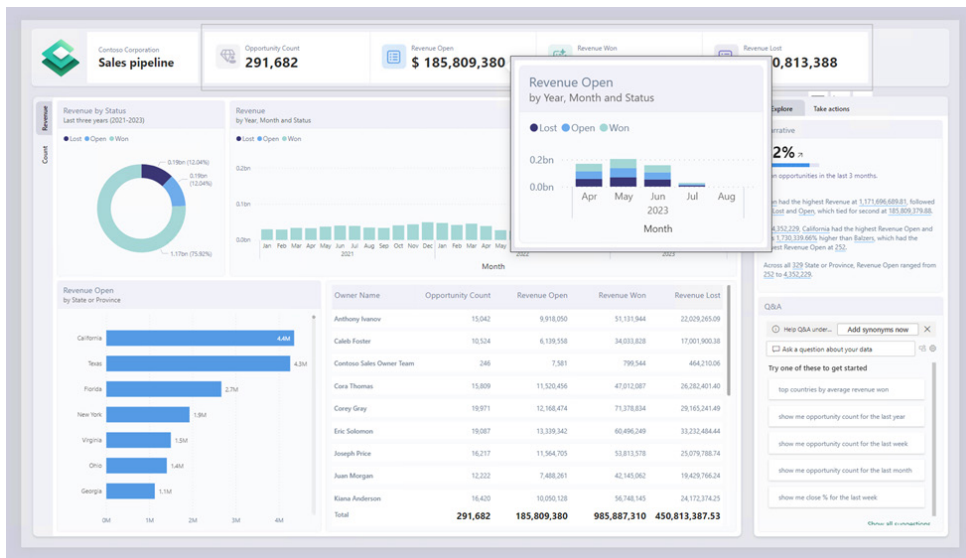
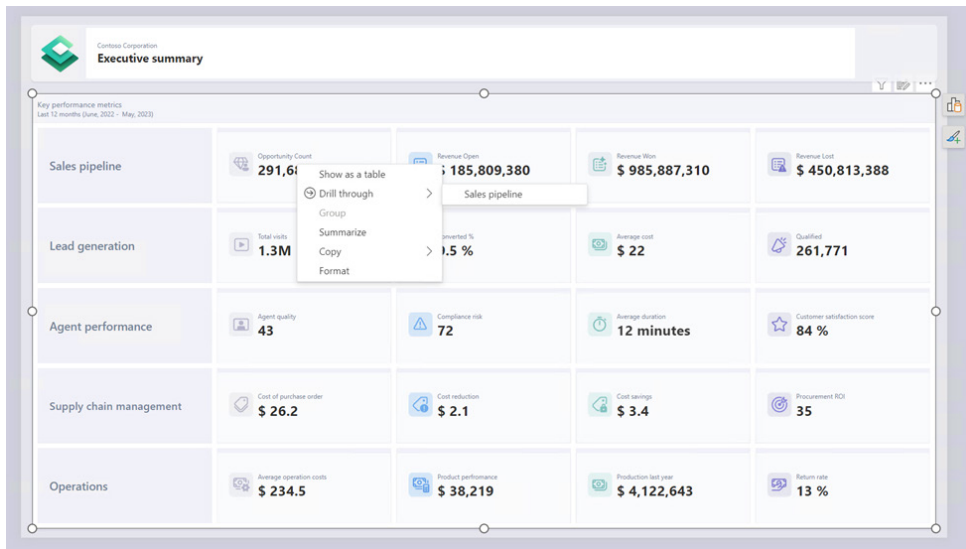
- customise your **display units** with precision control, thanks to the new **Custom** option and ensure your cards display the proper content, even when no data is found, with the new 'Show blank as' feature



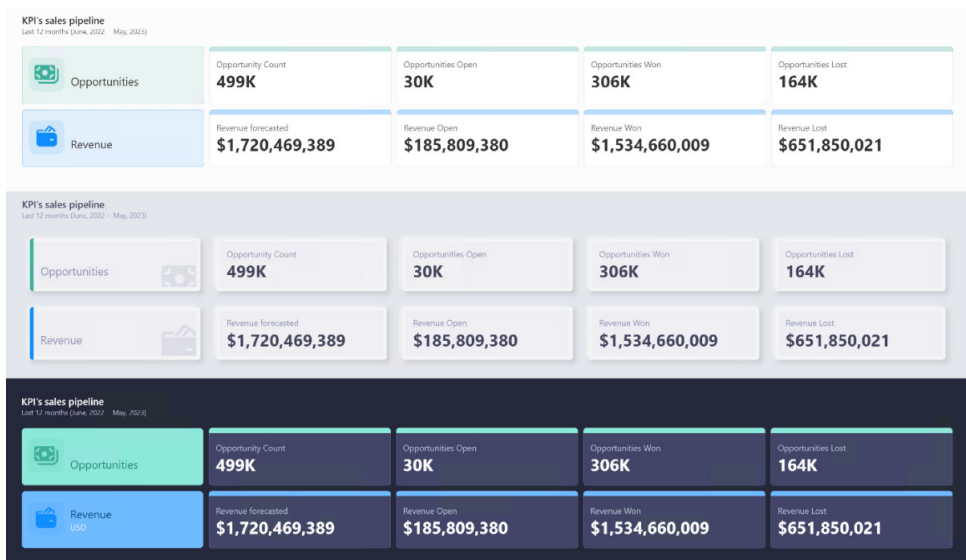
- choose from three layouts (horizontal, vertical and grid) and fine-tune your cards by adjusting the padding, spacing and text alignment
- take your design further with the addition of 'Image' and 'Accent bar'



- bring your data to life with interactivity features like **ToolTips** and **drill through**



- Themes' allows you to control all formatting settings to personalise your default styles.



Apparently, the new card visual is just the beginning; in the coming months, Microsoft plans to add more capabilities and features.

OneLake Data Hub in Power BI Desktop

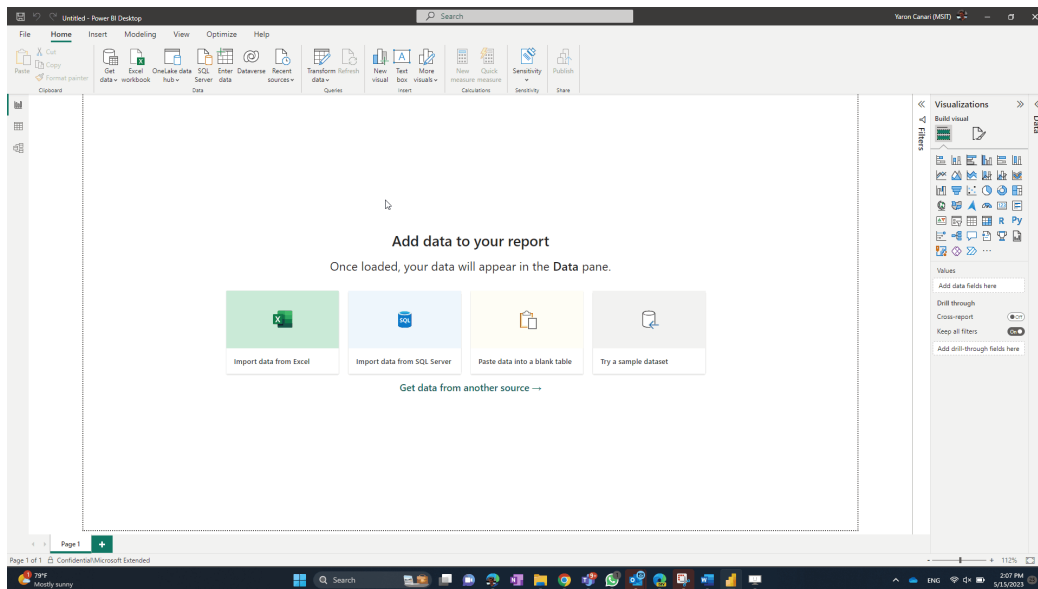
The data hub in Power BI Desktop serves as a central location for discovering and reusing data. With the Fabric release, the data hub is to be rebranded as the 'OneLake Data Hub'.

OneLake Data Hub in Power BI Desktop allows you to reuse existing Fabric items and create your own datasets and reports on top of them. It supports the following items: data warehouses, lakehouses, their related SQL endpoints, datamarts and datasets (later in the year, you should also see the advent of KQL databases).

For lakehouses and their SQL endpoints, as well as datamarts and warehouses, you have two options to get-data:

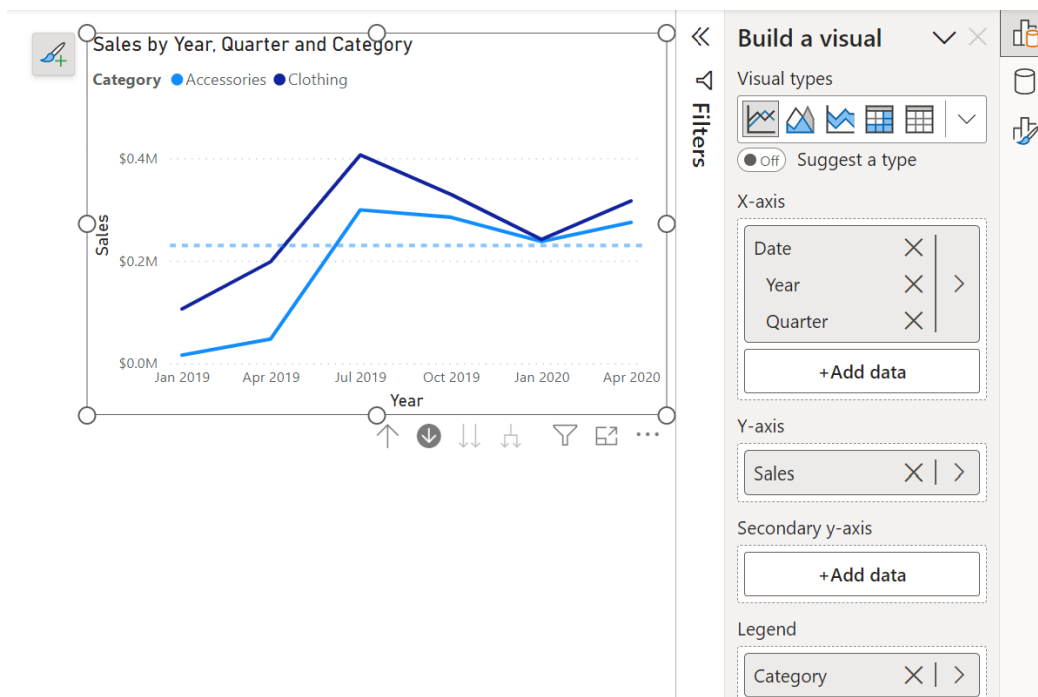
1. connect to the underlying auto-generated dataset
2. connect directly to the SQL endpoint to create your own dataset.

The OneLake data hub in Power BI Desktop is to be the gateway to your Fabric data ecosystem.



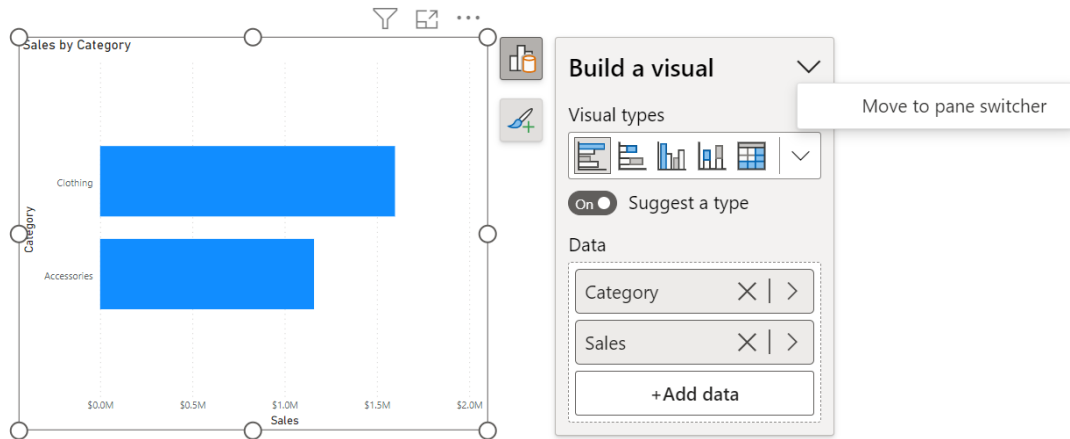
On-Object Interaction updates in Preview

The new On-object interaction feature was released in Preview back in March. Update introduces the ability to re-attach the Build menu as a pane.

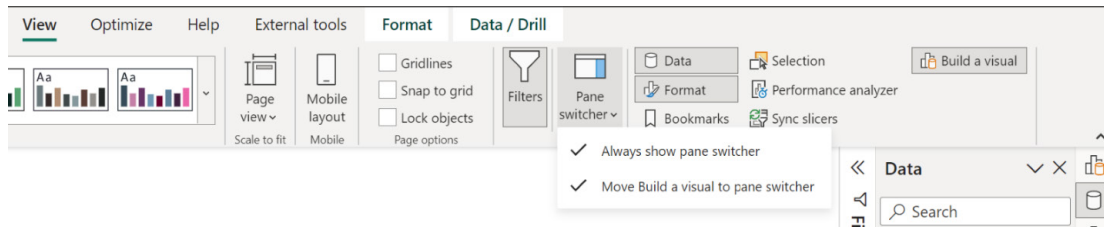


Now you may attach the Build menu to the Pane Switcher in one of three [3] ways:

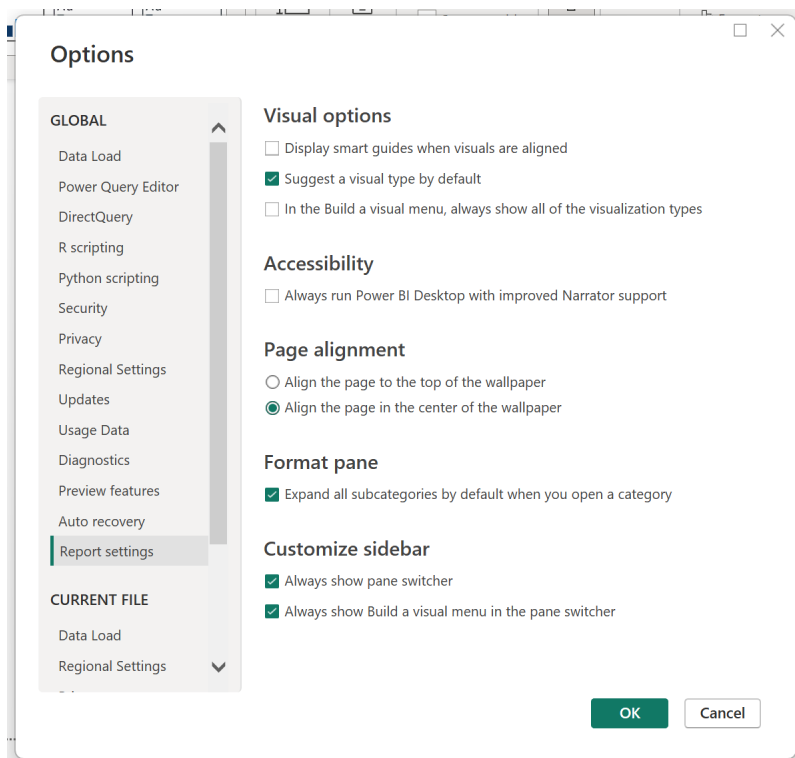
1. Directly from the On-object button



2. From the View tab on the Ribbon



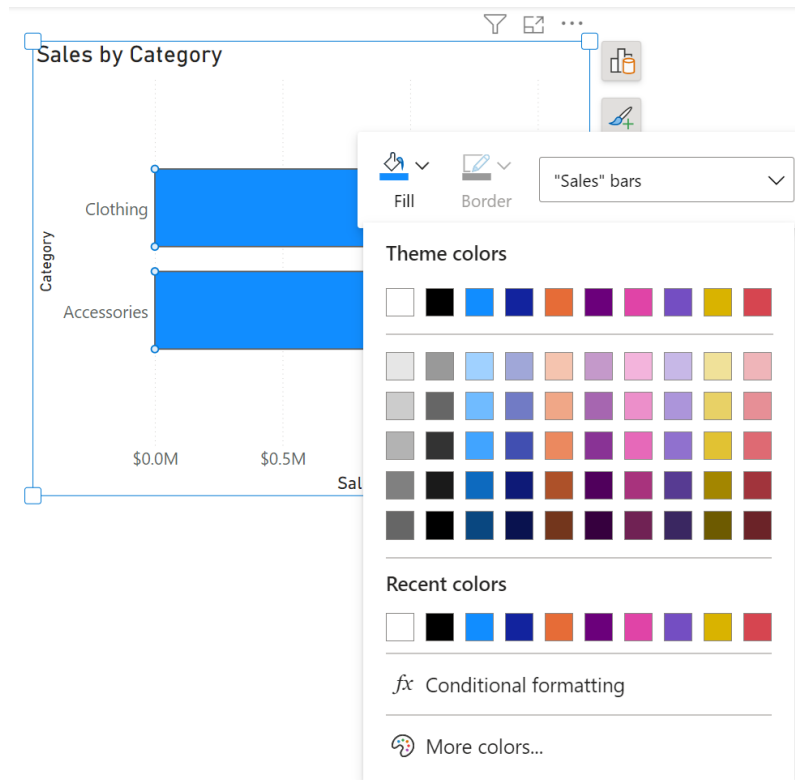
3. From the Options menu



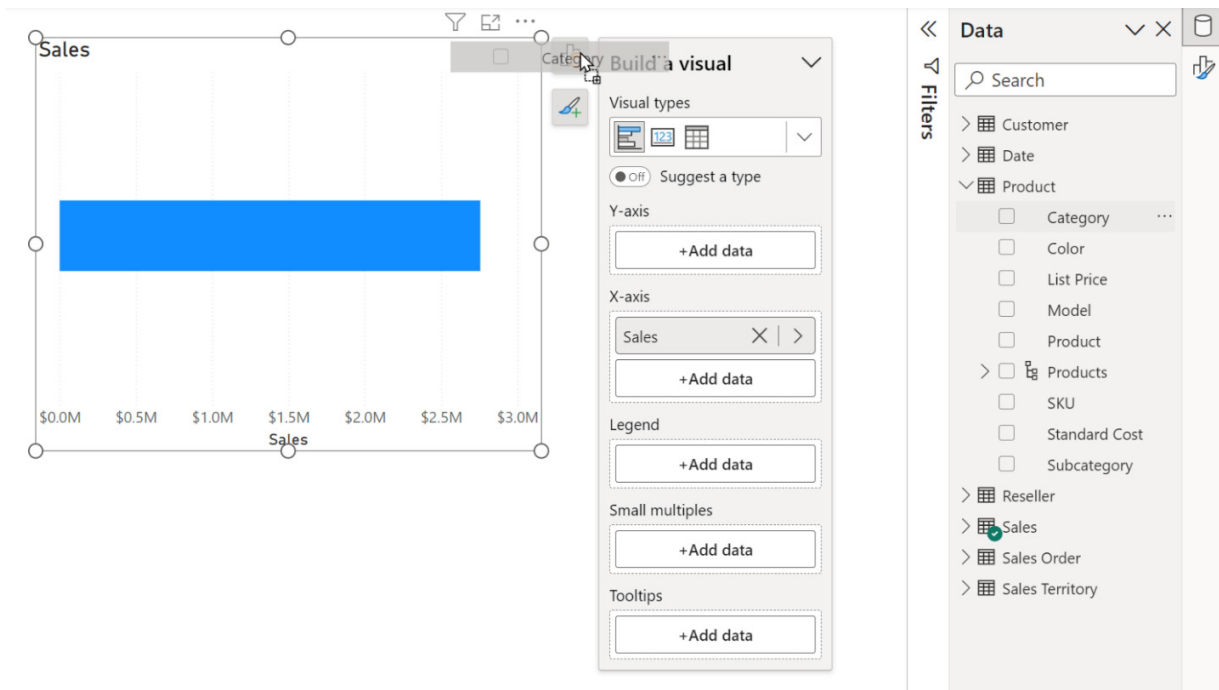
Along with the ability to re-attach the Build menu, this update has also added a setting to allow users to choose to have the Pane Switcher always shown. Both of these two new settings will persist across reports. There will even more customisation to the Pane Switcher shortly. Apparently, we should be on the lookout for two new features:

1. a new 'Add' button on the Pane Switcher to quickly add new panes without having to go to the Ribbon
2. saving those newly added panes on the Pane Switcher across reports.

Another addition this month is setting and editing conditional formatting from the On-object mini toolbars:



As well as drag / drop precision improvements within the On-object Build menu's field wells, auto-opening the Build menu when dragging a field has been included:





This month sees the introduction of a new DAX function: **MATCHBY**. When used within any window function, this function defines the columns that are used to determine how to match data and identify the current row.

For example, below is a query that returns **FactInternetSales** with an added column, which indicates, for each sale, the previous sales amount

```
EVALUATE
ADDCOLUMNS (
FactInternetSales,
"Previous Sales Amount",
SELECTCOLUMNS (
OFFSET (
-1,
FactInternetSales,
ORDERBY ( FactInternetSales[SalesAmount], DESC ),
PARTITIONBY ( FactInternetSales[ProductKey] ),
MATCHBY( FactInternetSales[SalesOrderNumber], FactInternetSales[SalesOrderLineNumber] )
),
FactInternetSales[SalesAmount]
)
)
```

This function can only be used within windows functions. (A window function performs a calculation across a set of table rows that are somehow related to the current row. This is comparable to the type of calculation that can be done with an aggregate function.)

On-premises data gateway latest release

This revision realises the advent of the latest update for the on-premises data gateway (version 3000.174.TBD). It brings the on-premises data gateway up to date with the May 2023 release of Power BI Desktop.

[Download On-Premises Data Gateway \(Standard Mode\)](#)

[Download On-Premises Data Gateway \(Personal Mode\)](#)

This version of the gateway will ensure that the reports that you publish to the Power BI Service and refresh via the gateway will go through the same query execution logic / run-time as in the May version of Power BI Desktop.

Any Power BI dataflow using an on-premises data gateway version older than April 2021 might fail. To ensure your refreshes continue to work correctly, be sure to update your gateway to the latest version.

MongoDB Atlas (new connector)

The MongoDB Atlas Power BI Connector allows you to access and analyse application data stored in MongoDB Atlas. You may easily connect Power BI Desktop to Atlas and begin querying using SQL without the need for schema definition. You can use native Power Query functionality for data

transformation, advanced querying or self-service data modelling. You may also perform sophisticated analysis across multiple data sources, without disrupting in-production application workloads, by leveraging the built-in federated query engine and workload isolation of Atlas.

Celonis EMS (new connector)

The new Celonis EMS connector for Power BI allows you to link Power BI with your Celonis EMS Instance. As a result, you can embed process intelligence produced by the Celonis EMS into Power BI to enhance reporting with insightful process knowledge. All published Knowledge Models are automatically listed by the Celonis EMS connector for Power

BI and it is easy to import Records that are defined in the Knowledge Models. To enable the full PQL experience inside Power BI, you will be able to define Records in PQL inside the Knowledge Models and load them into Power BI.

In summary, the Celonis EMS connector for Power BI will allow you to:

- connect to a Celonis EMS Team via the Team URL from Power BI
- list all published Knowledge Models and Records defined in those Knowledge Models
- export data from a Record defined in a Knowledge Model.

CloudBlue PSA (new connector)

CloudBlue PSA is purpose-built with functionality to simplify the needs of professional services organisations. The platform empowers services organisations to scale recurring channel revenue and diminish operational complexity via its advanced product suite, which includes automated

billing and reconciliation, an industry-leading customer support centre and network operations centre (NOC), real-time profitability analysis and more. CloudBlue PSA is available globally.

SolarWinds Service Desk (new connector)

The SolarWinds Power BI connector allows you to integrate with Power BI to pull data on incidents in the SolarWinds Service desk system and create reporting, analytics and insights in order to improve your reporting.

Wrike (new connector)

The Wrike Connector for Microsoft Power BI lets you pull data efficiently from your Wrike account directly into Power BI, making the Wrike data objects available for your reporting purposes. Available data objects include Projects, Tasks, Custom Fields, Finance Fields, Job Role, Bookings, Approvals, Attachments, Contacts, Groups, Timelogs, Workflows etc.

Account Level datasets, Space Level datasets and Project / Folder Level datasets. You can drill down through your Wrike Space / Project / Folder hierarchy in the Wrike Connector and select your required datasets for your preferred Space, Project or Folder. This will let you create focused analytical reports for your target Space / Project / Folder, without the need of manually filtering the data of your entire Wrike account.

You can pull the data, that you have access to in Wrike, in the form of

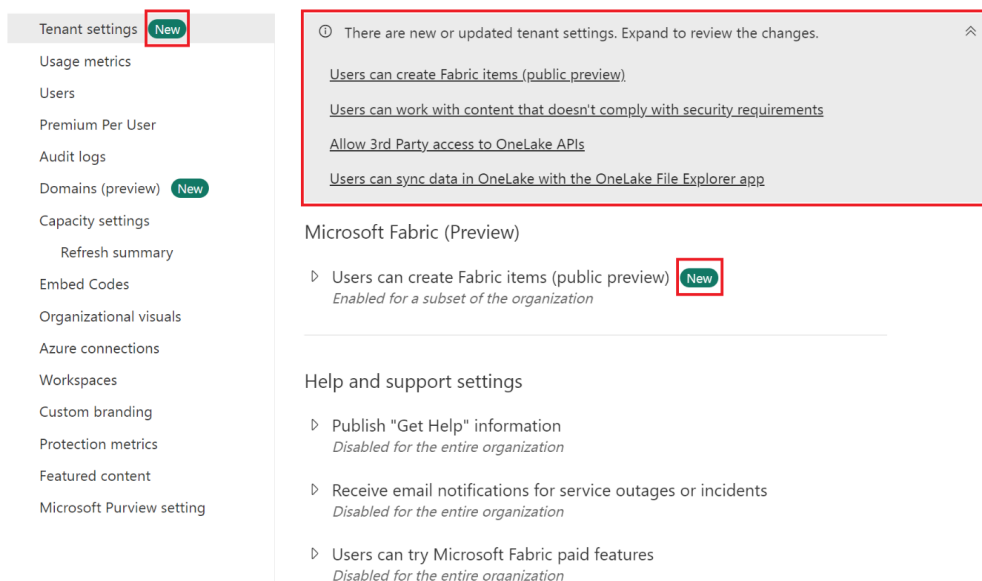
Introducing Visual Cue for New Tenant settings

This update sees the addition of a new feature for tenant administrators. With visual cue in the Admin portal, administrators can now easily identify and manage new settings within their Power BI environment.

with the new icon to help administrators discover new settings. Further, a summary of all new settings is available at the top of the page that links directly to the corresponding settings, aiding quick navigation and management of tenant-level controls.

Changes within the Tenant settings page in the Admin portal are tagged

Admin portal



Introducing the Tenant Admin Settings API

There is also the introduction of a new API that empowers developers to read tenant administrator settings within Power BI. With the Tenant Admin Settings API, you can retrieve and access a wide range of administrative settings programmatically. With just one API endpoint,

you may access all the required tenant-level administrative settings such as on / off status, security group configuration, etc. You can unlock new possibilities such as automating tenant setting audit by leveraging the Tenant Admin Settings API.

Anaplan (connector update)

This version of the Power BI connector for Anaplan includes backend changes for compatibility with ongoing Anaplan infrastructure updates. There is no change to user-facing connector features.

AssembleViews (connector update)

This update to the Assemble Views Connector adds the ability to select individual models as well as views for maximum flexibility when pulling data from your Assemble project.

Autodesk Construction Cloud (connector update)

The updates this month include:

- enhanced navigation experience to allow users to specifically select the tables from either the account extract or a specific project extraction
- users may now pull extractions from multiple projects on the same account
- backwards compatibility with existing dashboards using the previous navigation method removed Beta flag.

Azure Databricks, Databricks (connector update)

The updates this month include:

- add escape support in sqlCapabilities
- remove the Beta label from the connector
- enable SQL_API_SQLBINDCOL by default.

BitSight Security Ratings (connector update)

The updates this month include:

- new feature: there is now a column called **Details** that offers additional information about security vulnerabilities and findings
- bug fix: fixed a bug where "attributed.guid" and "attributed.name" did not refer to the right entity in a company's tree
- bug fix: fixed a bug where character encoding did not work for French characters.

BQE Core (connector update)

The API endpoint was updated to retrieve Contact, using **/Contact** instead of **/Crm/Contact**.

Eduframe Reporting (connector update)

The updates this month include:

- added teachers as a resource
- renamed blocks to personal program elements
- added a function to fetch Eduframe-specific user authentications.

Funnel (connector update)

The updates this month include:

- updated labels and help texts to be more in line with the Funnel app
- renamed 'Account' to 'Workspace'
- renamed 'View' to 'Data Share'.

Data Loss Prevention (DLP) policies are now Generally Available

Following the Preview announcement of Data Loss Prevention (DLP) policies for Power BI last year, this update has now made these DLP policies Generally Available.

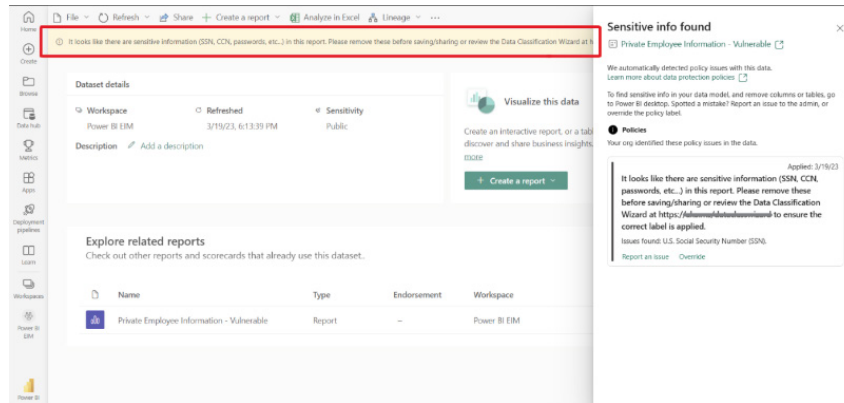
CLASSIFY AND PROTECT YOUR POWER BI DATA

Whilst organisations are taking more measures to properly classify sensitive information and install processes on how to interact with sensitive information, much of their business-critical data is still in the dark. This is precisely where the power of DLP policies comes into play: with DLP you can automatically detect sensitive information as it is uploaded to Power BI, and by thus uncover data that may have been accidentally uploaded into the wrong workspace, for instance.

Security administrators may 'set alerts' to be automatically generated when sensitive information is found in datasets. They can provide 'customized messages to users' and help guide them on how to interact

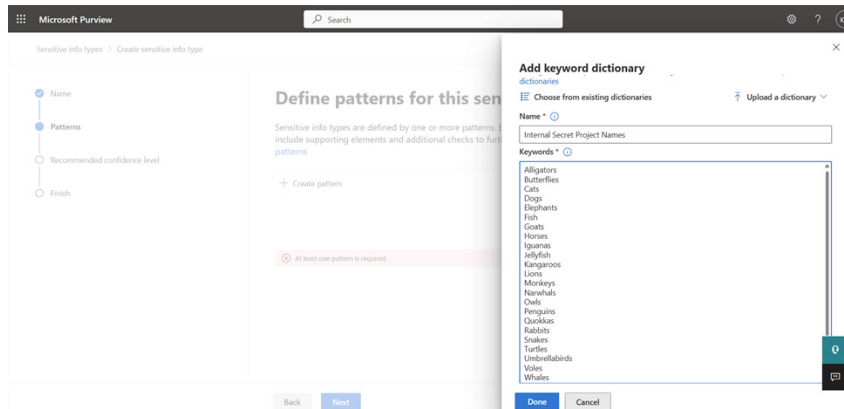
with sensitive data, such as what steps they should take. For example, whenever proprietary information is detected, show Power BI users a message explaining that this information is internal and should not be shared externally. DLP is 'audited' in the Microsoft Purview Compliance Portal, where security admins can also monitor their policies and refine them based on feedback from users, such as reported false positives.

By using DLP policies in Power BI, you strengthen your security posture and reduce the risk of sensitive information being uploaded to the cloud without your knowledge.



DETECT SENSITIVE INFORMATION USING CUSTOM KEYWORDS

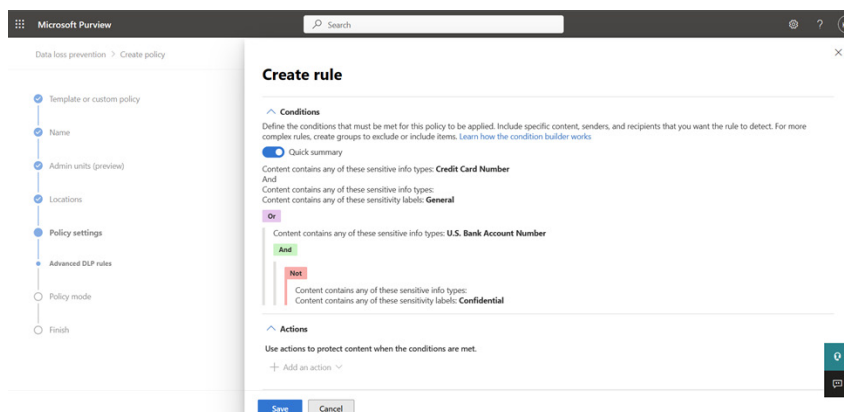
Some organisations consider certain terms, such as internal project names, as sensitive information that they want to ensure is not exposed outside of the organisation. With this update, you will be able to define those unique internal terms as a custom keyword sensitive info type and use it as a trigger for DLP in Power BI.



COMPLEX CONDITIONS IN DLP FOR POWER BI

Complex conditions enable security administrators to create advanced rules using a combination of **AND / OR / NOT** operators. With a new and improved flow, you can configure granular and flexible rules that utilise a combination of conditions. A common scenario is locating sensitive

data where it is not properly labelled according to the organisation's guidelines. In this case, you could also use the custom policy tip text to encourage users to set the correct label.



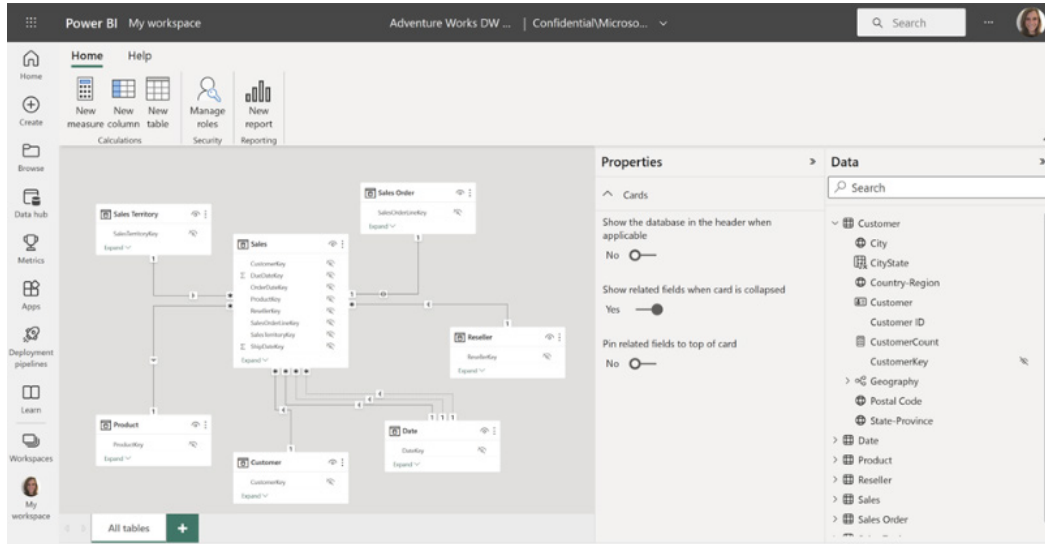
DLP POLICIES IN NATIONAL CLOUDS

All of the capabilities above have been extended to include national clouds: US Government: GCC, GCC High, DoD; China: China East.

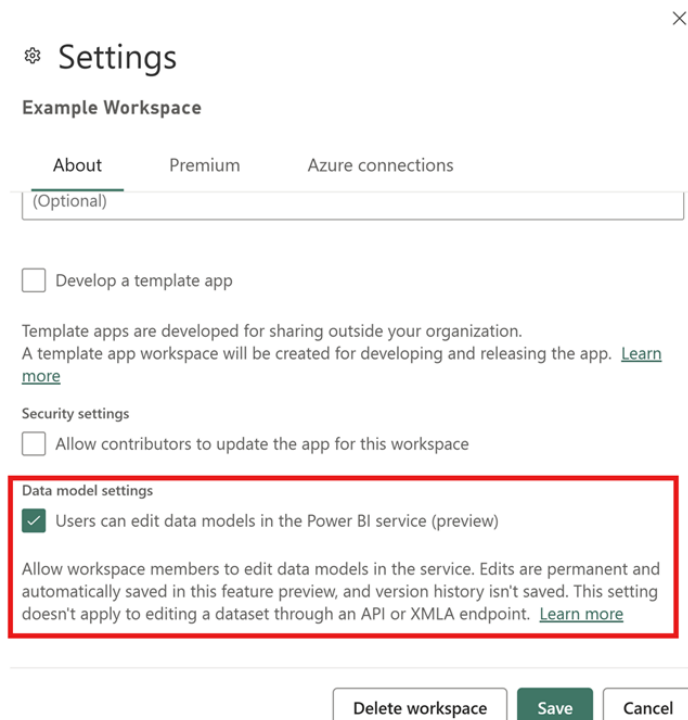
Edit your data model in the Power BI Service (opt-in) in Preview

For many years, Power BI Desktop users have been able to configure and modify aspects of their data models in the Model view. However, these Model view capabilities have been specific to Desktop with no additional data model support in Service. Now, Microsoft is introducing data model editing in the Service, allowing Service users a first step towards modifying their existing data models on the web. In this Preview, you

can modify your existing data models on the web through actions such as editing relationships, creating DAX measures and managing row level security (RLS). Microsoft has announced that they will continue to regularly release updates to this experience with the eventual goal of parity in modelling capabilities offered in the Service.



This feature is automatically turned on for datasets stored in 'My Workspace'. To try this experience in a collaborative workspace, turn on the workspace level Preview switch under workspace settings:



Storytelling in PowerPoint: Embed visuals from Power BI organisational apps

You can now embed visuals from organisational apps into your PowerPoint presentation. You just need the link to the visual you want to embed. To get the link, open your organisational app and find the visual you want to embed. Open the visual's More options (...) menu,

select the 'Share' option and then choose either 'Link to this visual' or 'Open in PowerPoint'. Then, copy the generated link and paste it into the add-in in your presentation.

Edit your Data Model in the Power BI Service updates in Preview

The new Data Model editing in the Service feature was released to Preview recently. There has been one improvement added this month: improve layouts limitations.

Changes you make to layouts in Power BI Service will now be saved for future sessions, including:

- any additional custom layouts you create or delete in Power BI Service. The corresponding name and tables added / removed to these layouts will also be saved

- all visual alterations you make to a layout such as the size and location of cards, expand all / collapse all fields in a card, and pinning fields to the top of a card.

You should note that any layout changes made within Power BI Service will only be saved within the Service itself. Currently, there is a limitation where uploading a .PBIX file to the Service will not include any existing layout changes, including custom layouts created in Desktop. Similarly, when downloading the .PBIX file, any layout changes made in the Service, including custom layouts, will not appear in Power BI Desktop. However, Microsoft is actively working to remove these limitations: stay tuned!

Introducing a new administrator setting to control email subscriptions for B2B guest users

As a tenant administrator, you now have improved control over email subscriptions specifically for B2B guest users. Turning on the new B2B guest users can set up and be subscribed to email subscriptions setting allows B2B guest users to create their own email subscriptions as well as users in your organisation to include B2B users as recipients of email subscriptions. With this setting turned off, only users in your organisation may set up and be subscribed to email subscriptions.

There may be cases where you would like B2B guest users to be able to access content in the Power BI Service but would like to prevent them from distributing content using email subscriptions. This new setting empowers you to achieve that.

The default state of this new setting upon release will match the state of the general setting for email subscriptions, 'Users can set up email subscriptions'.

▾ B2B guest users can set up and be subscribed to email subscriptions
Enabled for the entire organization

Authorized B2B guest users can set up and be subscribed to email subscriptions. Authorized B2B guest users are external users you've added to your Azure Active Directory. Turn off this setting to prevent B2B users from setting up or being subscribed to email subscriptions.

Enabled

⚠ Turning off this setting will also turn off the following setting: Users can send email subscriptions to external users

Apply to:

The entire organization

Specific security groups

Except specific security groups

Apply Cancel

Admin Monitoring in Preview

With the increased focus on governance, compliance and policy, customers need greater visibility into workflows related to these areas. The new Admin Monitoring workspace delivers curated insights that should help you better manage, administer and govern your tenant.

The public Preview release includes the 'Feature Usage and Adoption' dataset and report, which provide tenant administrators with insights based upon inventory metadata and audit logs, enabling them to:

- understand who is doing what
- track tenant usage and adoption growth
- support audits and ensure compliance.

By default, the Admin Monitoring workspace will be available only to Tenant administrators, who can choose to share the workspace or specific reports within it with others in their organisation.



The Out-of-Box report / dataset can assist you as follows:

- the 'Feature Usage and Adoption' report provides analytical views built on the Audit Logs to help you understand who is doing what, enabling you to better govern Power BI by identifying specific trends, patterns and activities. For example, you may discourage direct report sharing from personal workspaces and may want to have visibility if this happens
- the 'Feature Usage and Adoption' dataset will contain tenant metadata dimensions of most Power BI items as well as Audit Log fact data about asset lifecycle activities such as create, access, modify and delete. Power BI will provide access to a subset of Audit Log data directly through the dataset, so you won't need Microsoft 365 administrator rights to view this audit data
- to take advantage of Power BI native support for composite data modelling, the out-of-box dataset can be reused and enhanced with additional data such as user licensing information, data lineage data, regional or department-specific metadata. This facilitates customised reporting based upon individual organisational scenarios.

Power BI Guidance documentation

A new series of auditing and monitoring articles has been added to the Power BI implementation planning guidance. The implementation planning guidance is a series of articles that includes key actions, decision-making criteria, considerations and recommendations for various subject areas.

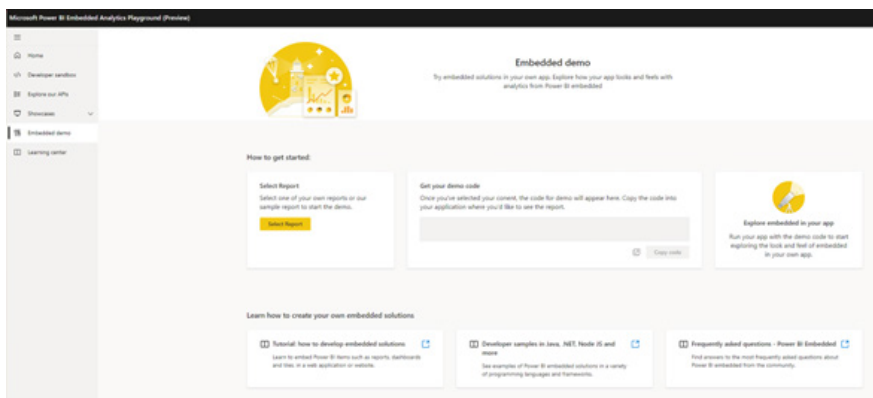
for tenant setup, workspaces, security and information protection, with additional articles on the way. This guidance also includes a series of usage scenarios to help you understand and implement common patterns for using Power BI. The implementation planning guidance augments the Power BI adoption roadmap, which includes relevant strategic / tactical considerations and action items.

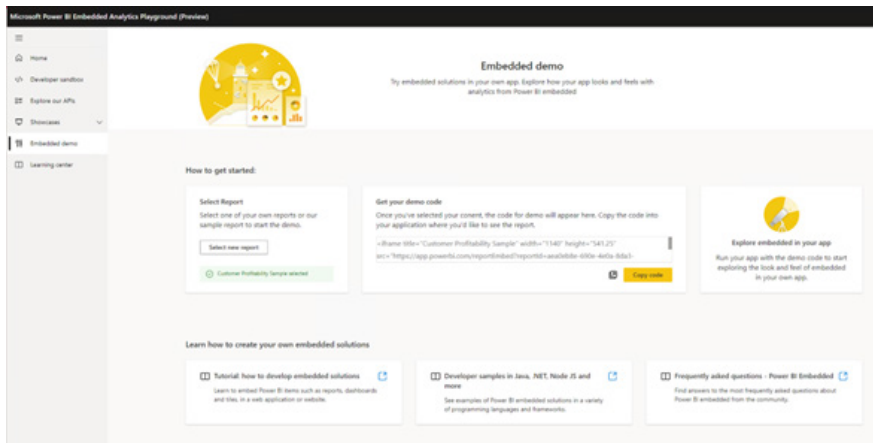
This implementation planning documentation also includes guidance

Get started with Power BI Embedded in minutes

A new demo experience to the Power BI Embedded playground has been added recently which simplifies the process of exploring embedding Power BI in your application. With this demonstration, you can easily generate code that you can copy and paste to preview how the report

will fit in your app. Even if you haven't created your own reports, you can generate demo code for the sample report to see how it would look in your application.





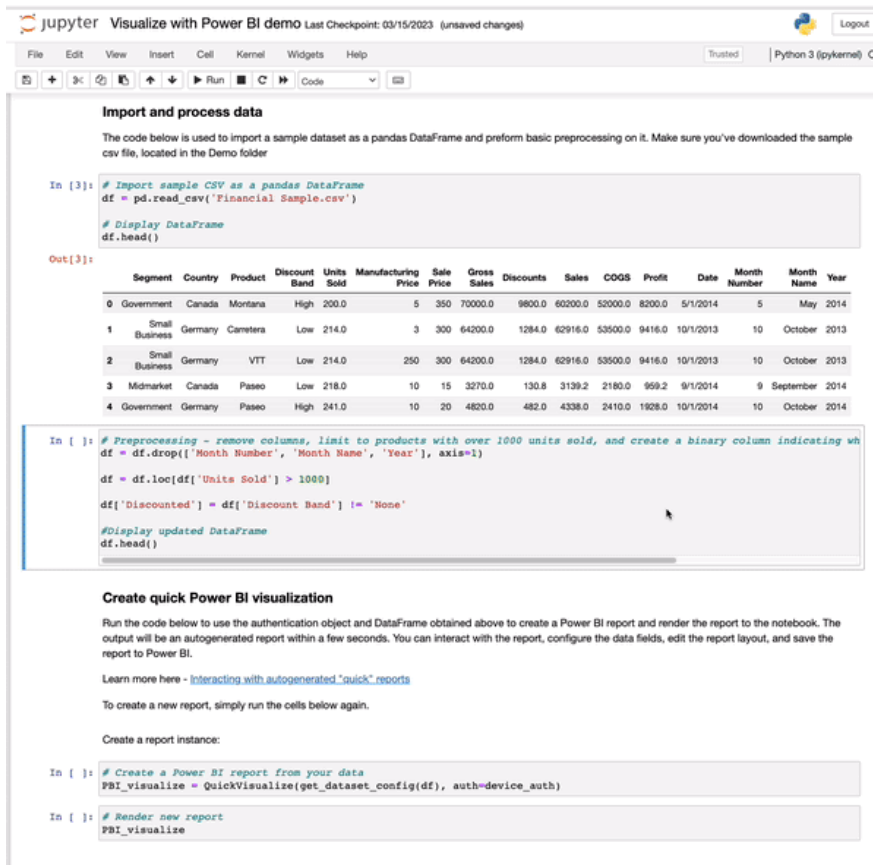
Once you're satisfied with the embedded content, you can select the solution that best fits your needs and follow the relevant tutorial to create the necessary code. After that, you can also use the Client APIs to enhance the interactions between the report and your app, and

custom fit the look and feel of the report to your app. These APIs can be tested and interacted within Microsoft's 'Explore our APIs' or 'Developer Sandbox' pages.

Create Power BI reports instantly in Jupyter Notebooks

The latest version of the powerbi-jupyter Python library enables the creation of new Power BI reports directly from data within the notebook, providing instant insight without the need for switching between different tools or performing any exports from the notebook. This new

update supplements the existing ability to embed Power BI reports in Jupyter notebooks, enabling you to enhance your notebook with any of your existing Power BI content to tell a "compelling data story".



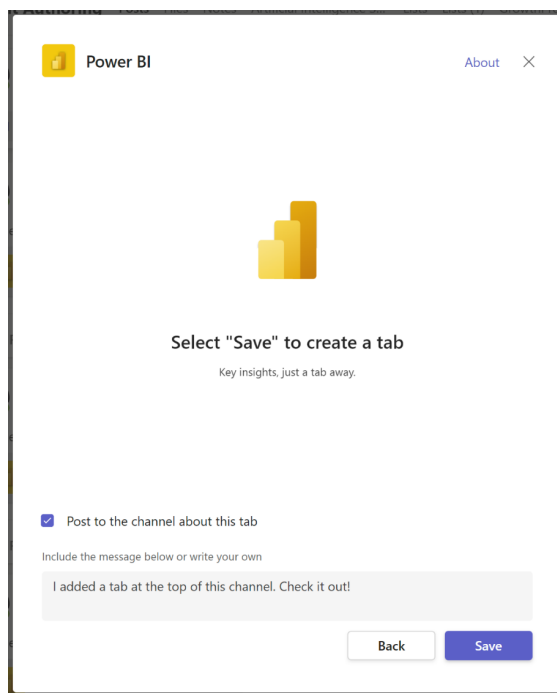
The newly created report will be an auto-generated report, based upon the data from the DataFrame passed as input. The report may be customised and modified, and it can be saved to Power BI to keep the report and share it with others in your organisation. You can use this report to explore your data or as starting place for creating your own custom report.

The updated library is currently accessible on PyPI, whilst the open-source Python package, complete documentation and demos may be found on GitHub.

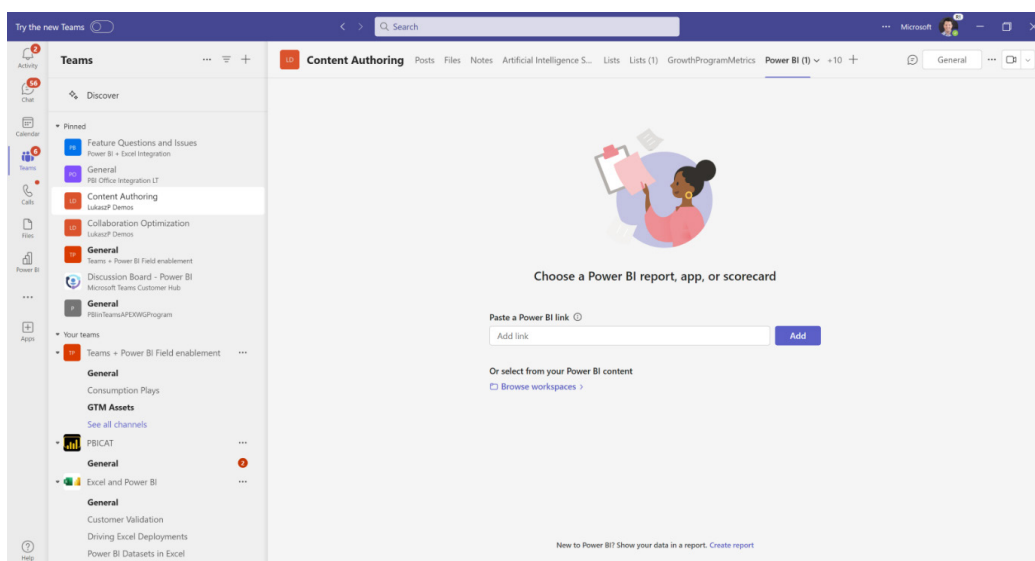
New Power BI tab configuration experiences in Microsoft Teams

There are also updates to the Power BI Tabs in Microsoft Teams. These updates help you create tabs faster, allow you to use links to configure tabs and help you save default filters in your tabs.

When you add a Power BI Tab in Teams, you'll see the new simplified tab user interface (UI). Just press Save to add the tab.



When the tab loads, you're greeted with a new landing page where you can 'paste a link'. You can also 'browse workspaces' to select content. If you're new to Power BI, you can even click through to 'create a report'.



You can paste links to interactive and paginated reports, scorecards and organisational apps. Many kinds of links are supported. These include:

- simple links like those from the browser address bar
- sharing links from the Share dialog
- sharing links with permission (like 'everyone in my organization')
- sharing links with include 'my change's (shared views)
- links to specific items in an Organizational App.

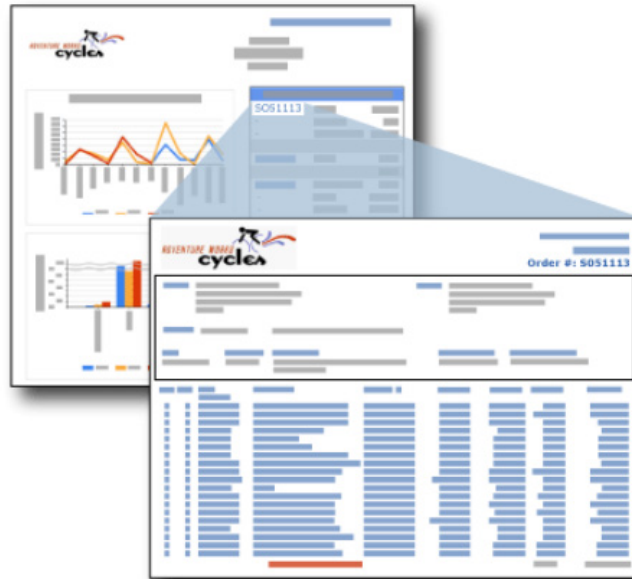
The same report is often used by multiple teams, channels and in many meetings. However, in each of these locations, the report needs to be filtered to meet the unique needs of each team working with the report. By using links that 'include my changes', you can customise the report, so it opens on the most relevant content for the collaboration context you use.

Drill through in Paginated Reports

Drillthrough reports have now been added to Paginated Reports in Power BI Service. This means Power BI Service now supports on-premises drillthrough capabilities.

A Drillthrough report is a report that a user opens by clicking a link within another Paginated Report. Drillthrough reports commonly contain

details about an item that is contained in an original summary report. For example, in this illustration, the sales summary report lists sales orders and totals. When a user clicks an order number in the summary list, another report opens that contains details about the order.



A drillthrough report can be used to validate summarised data. It may also be used to provide granularity within another report, allowing the consumer to digest the details in a separate report instead of crowding the main report with too many data details.

You can add a drillthrough link to any item that has an 'Action'

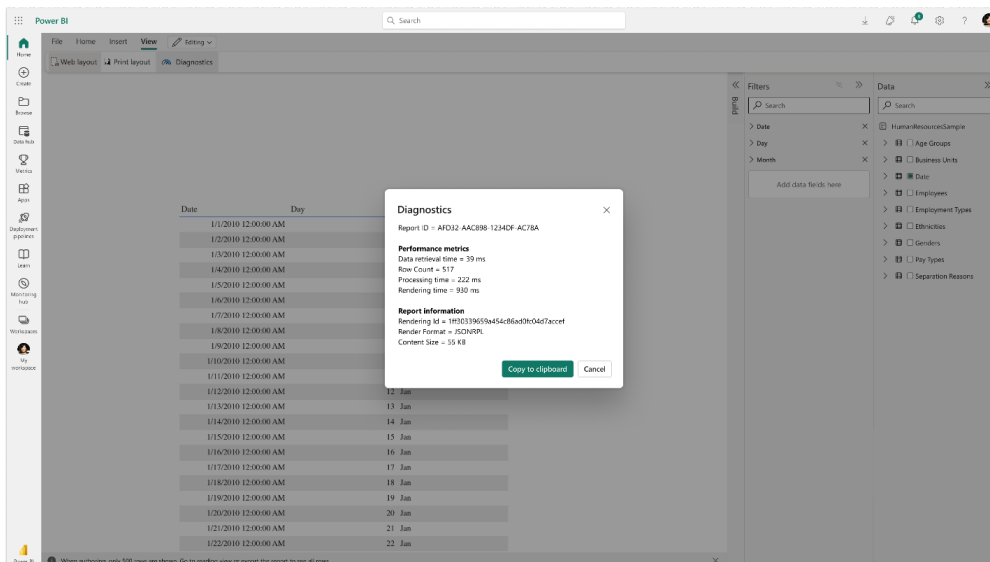
property, such as a text box, an image, or data points on a chart within the Power BI Report Builder authoring tool. By right-clicking on the desired data point, you will see the dialog box containing the 'Action' property. Drillthrough is the radio button option 'Go to report'. You will need to specify the target or drillthrough report name and the parameters associated with the detailed report.

Changes to Power BI Paginated Reports consumption of Power BI Premium capacity

Power BI has made changes to how the Paginated Report workload uses Power BI capacity and how it is reported. The goal with the adjustment was to move to a measurement unit that was simpler to understand, closely related to user actions, and easier to manage / address report execution time. As a result, most customers are seeing a net reduction in resource consumption for the same Paginated Report workload. It is noted though that a few users, particularly those with long-running queries on small capacities, may experience a net increase. In these

cases, Microsoft's recommendation is to consider a combination of optimising data retrieval to reduce total report execution time and increasing capacity as required.

A new Diagnostic view is also being introduced to all users with edit permissions for the report that provides diagnostic performance metrics to help you understand how the report execution relates to Premium capacity consumption.



Enhance your custom visuals with keyboard navigation

As a developer, you may wish to create custom visuals that are not only visually stunning but also accessible to everyone, regardless of their physical abilities. With this borne in mind, Microsoft has introduced keyboard navigation. With keyboard navigation, custom visuals will be easier to use for people with disabilities and will provide more options for interacting with reports.

The keyboard navigation feature in Power BI includes the following:

- pressing **ESC** will move the focus from inside the visual container, allowing users to easily exit the visual and move on to the next element of the report
- pressing **ENTER** on the visual will allow users to get inside the visual and interact with it using their keyboard
- pressing **TAB** within the custom visual will navigate between the visual elements in a loop, providing a seamless and intuitive way for users to explore your custom visuals.

By supporting keyboard navigation in your custom visuals, you can significantly improve the accessibility and usability of your visuals for all users. Therefore, you might wish to add keyboard navigation to your custom visuals to improve their quality and parity with other visuals in Power BI.

Detect filtered report state with custom visuals

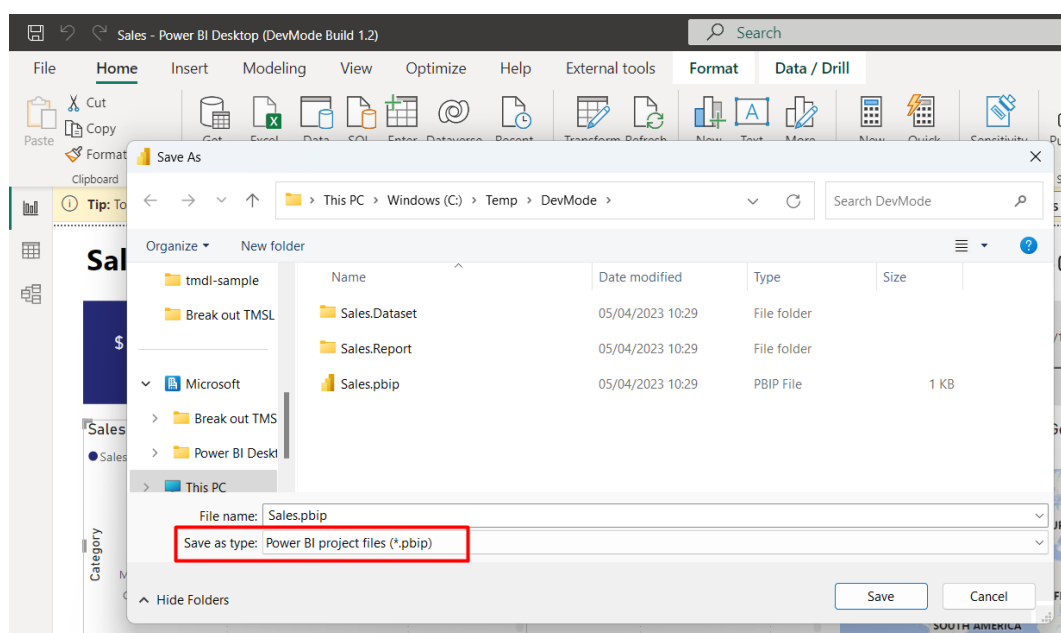
In certain scenarios, it's important for custom visuals to be able to detect whether a report has been filtered. Up until now, custom visuals were unable to determine this state. However, with the release of version 5.4 API, custom visuals can now find out if there are any filters applied to the report.

This new feature is made possible through the addition of a Boolean called **"isDataFilterApplied"** in the **DataViewMetadata** object. By accessing this property, custom visuals can now easily detect if a filter has been applied to the report and adjust their behaviour accordingly.

Power BI Desktop Developer Mode in Preview

Power BI customers want enterprise BI solutions that scale to all users across the largest organisations. This depends upon enabling team collaboration and automation of deployments across development, test and production environments to meet the needs of BI systems. To assist, Microsoft has announced the public Preview of Power BI Desktop Developer Mode.

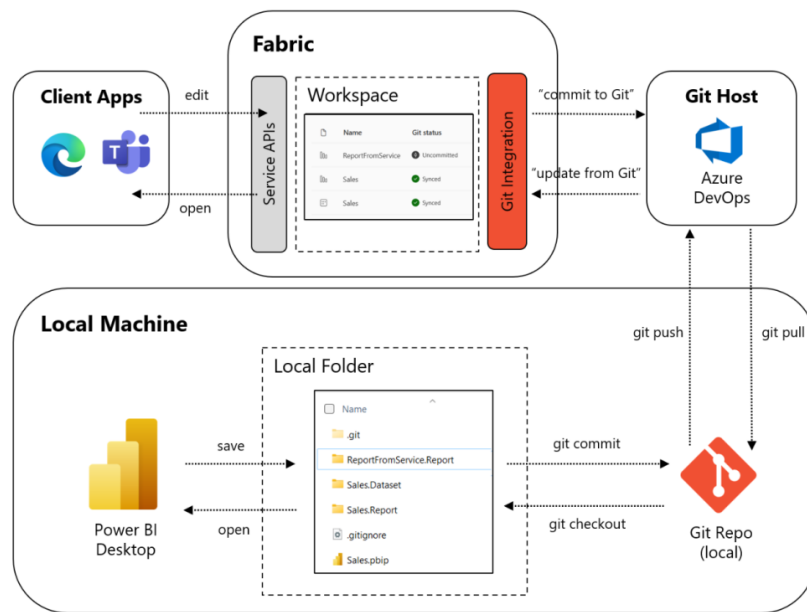
Power BI Desktop introduces a new way to author, collaborate and save your projects. You may now save your work as a Power BI Project (PBIP). When saving as project, report and dataset definitions are saved as individual plain text files in a simple, intuitive folder structure.



As a developer, you can use this integration to:

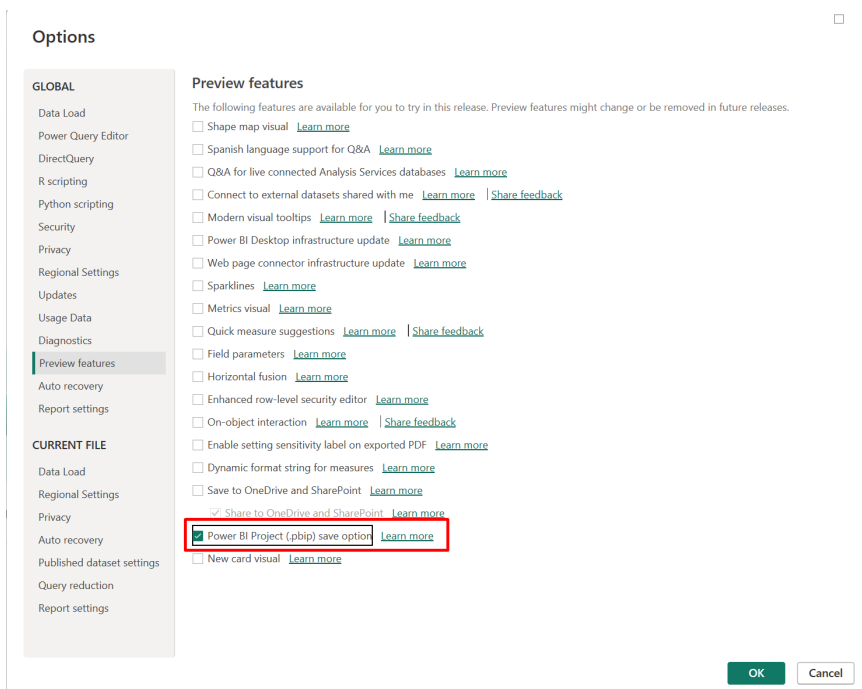
- use Power BI Desktop to author report and dataset metadata files in source-control friendly formats
- enable multiple developer collaboration, source control integration to track version history, compare different revisions (diff), and revert to previous versions
- build continuous integration and continuous delivery (CI / CD) workflows to enforce quality gates prior to reaching production environments
- enable code reviews, automated testing, and automated build to validate the integrity of a deployment.

With the combination of Power BI Desktop Developer Mode, Fabric Git Integration, Azure DevOps and Deployment Pipelines, developers gain the ability to seamlessly synchronise their Power BI workspaces with Git repositories, ensuring consistency and facilitating CI / CD workflows.



By utilizing Git as the centralised repository for your developments, you establish it as the “source of truth”. This integration allows you to commence your report development in Power BI Desktop, seamlessly transition to the Service, and return to Power BI Desktop, where every modification is securely backed up and versioned by Git.

Saving as a Power BI Project file is in public Preview. To use this feature first go to **File -> Options and settings -> Options -> Preview features** and check the box next to ‘Power BI Project (.pbip) save option’.



New visuals in AppSource

The following are new visuals for this update:

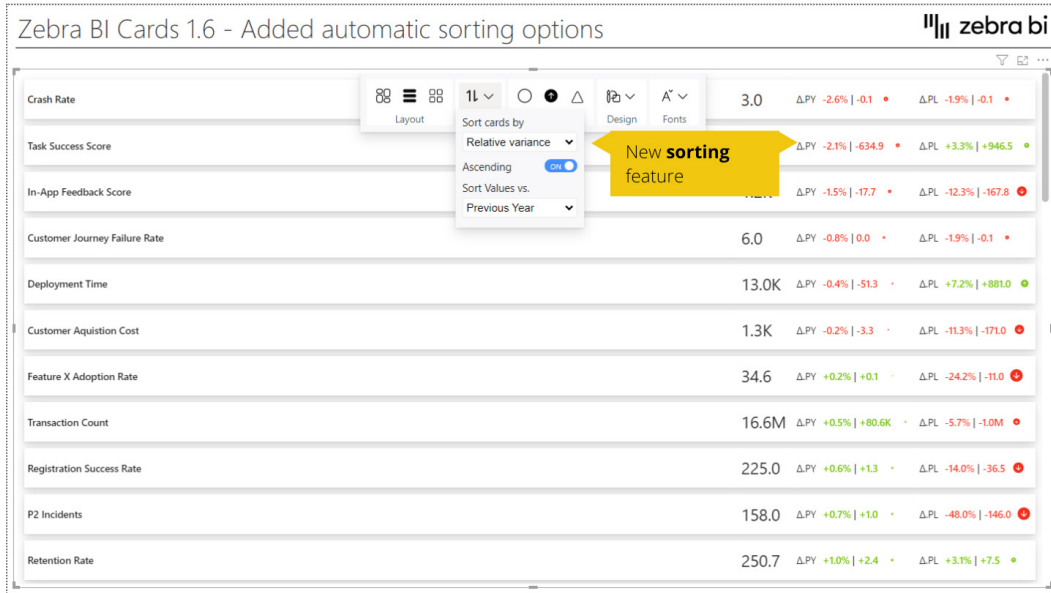
- Archilogic Floor Plan Visualization
- Datellers Bar of Pie
- Horizontal Bullet Chart with Label
- Innofalls
- Multi Line Chart with ToolTips
- Sunburst Chart by Powerviz
- swTable
- WeWrite Service
- Writeback Grid.

Zebra BI Cards 1.6

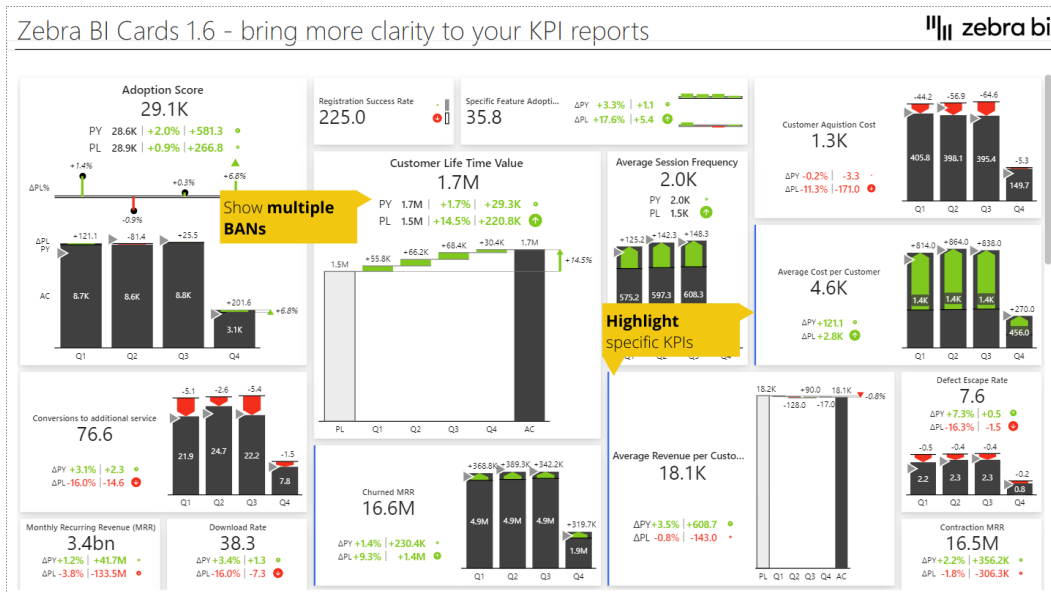
Zebra BI Cards 1.6 brings several new features that will make KPI reporting clearer. You may highlight specific cards to attract attention and show multiple Big Annoying Numbers (BANs) for clearer reports. It

can provide a detailed description of KPIs for faster understanding. You can also change to the basis points format to track your performance better, etc. Improvements include:

- Sort by different criteria:** to help you prioritise KPIs, you can now explore the new sorting option for the cards. To improve data visibility, you can organise the cards by variance (relative or absolute), title, or value and sort by plan, previous year or forecast. You may view KPIs from different angles, gain clarity on what needs your attention, and act accordingly

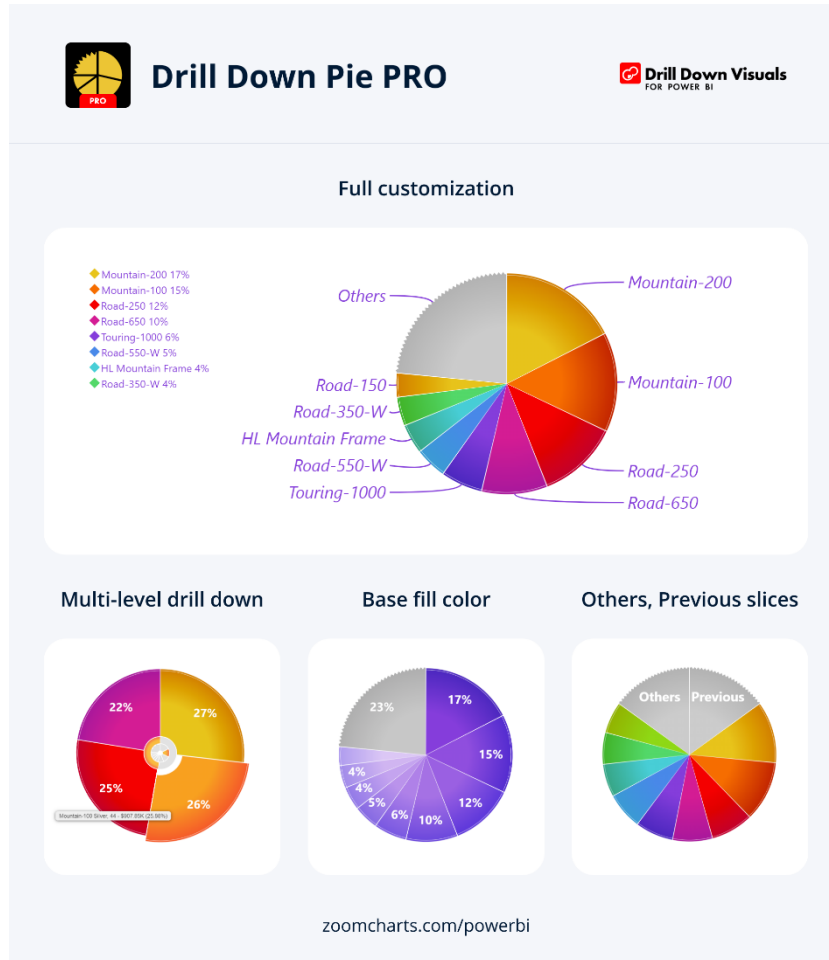


- Highlight specific KPIs:** you can now emphasise specific KPIs that need special attention from your report viewers by highlighting their respective cards. This way the visual message of your dashboard is even stronger and helps you get crucial insights faster
- Show multiple BANs:** you can now display multiple BANs on each card. This way, you can easily compare them on the spot and get additional insights into the most critical KPIs immediately.



Create Pie Charts with Drill Down Pie PRO

Drill Down Pie PRO lets users create visually appealing pie charts for easy data exploration. All interactions take place on the chart using just the mouse, letting users enjoy intuitive interactions that guide the eye. You can fully customise the look of your chart with advanced formatting options.



Main features include:

- adjustable “Others” slice: set the number of visible slices and group the rest
- cross-filtering: use the chart as a filter for the rest of the report
- multi-level drill-down: drill down up to nine [9] levels
- full customisation: customise slices, labels and the legend
- desktop and touchscreen navigation: explore charts the same way on any device.

Drill Down Pie PRO is useful for various use cases, such as:

- measuring campaign performance in sales and marketing
- staff composition, salary distribution and performance data in human resources
- income and expense analysis, billings and debtors in accounting and finance
- risk distribution and resource allocation in project management.

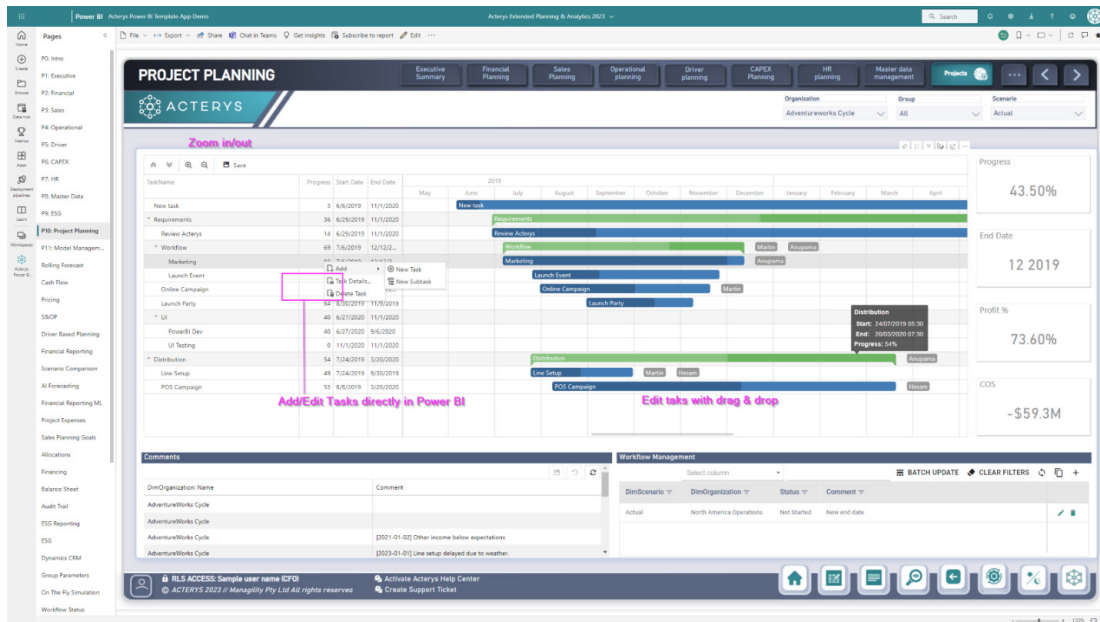
Acterys Gantt

Acterys Gantt enables comprehensive project management functionality in Power BI. In addition to extensive Gantt visualisation options, the visual also supports planning and write-back for example adding and editing tasks. Features include:

- Gantt Display of tasks on multiple hierarchy levels and task groupings
- adding and editing of tasks stored in a supported data source (e.g. SQL Server and any data source supported by Acterys)
- editing completion progress
- managing resources assigned to tasks.

Benefits include:

- manage and edit your projects directly in Power BI.

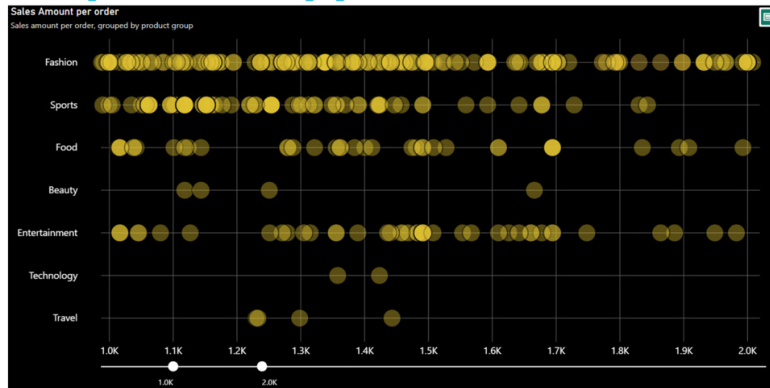


Strip Plot by Nova Silva

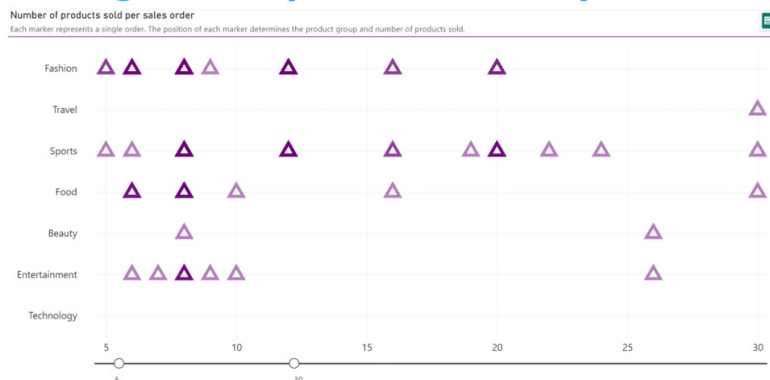
Most charts will force you to summarise or categorise data before it is displayed. This can hide important details and may be misleading. The Strip Plot shows all your data observations in one go without hiding important details. It shows each data point on a single continuous scale.

The colour formatting of all visible objects may be managed now. This allows you to use the Strip Plot in dark mode or any other preferred colour scheme.

Strip Plot: support for dark mode



and significant performance improvement

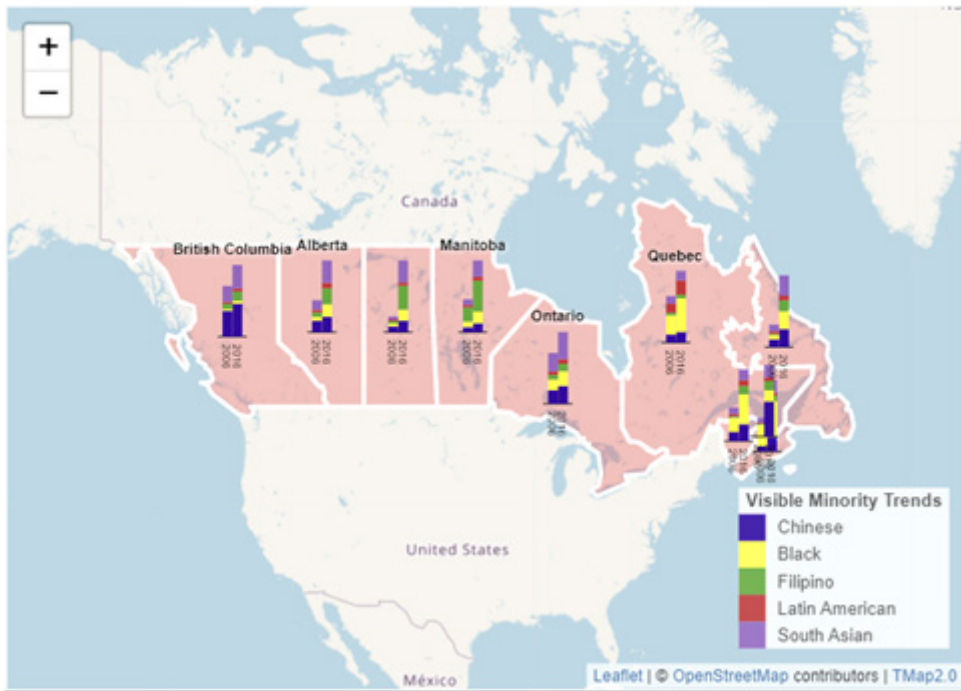


Several changes were also applied to significantly improve the loading performance of the Strip Plot. You can now show up to 30,000 markers in a single visual (!).

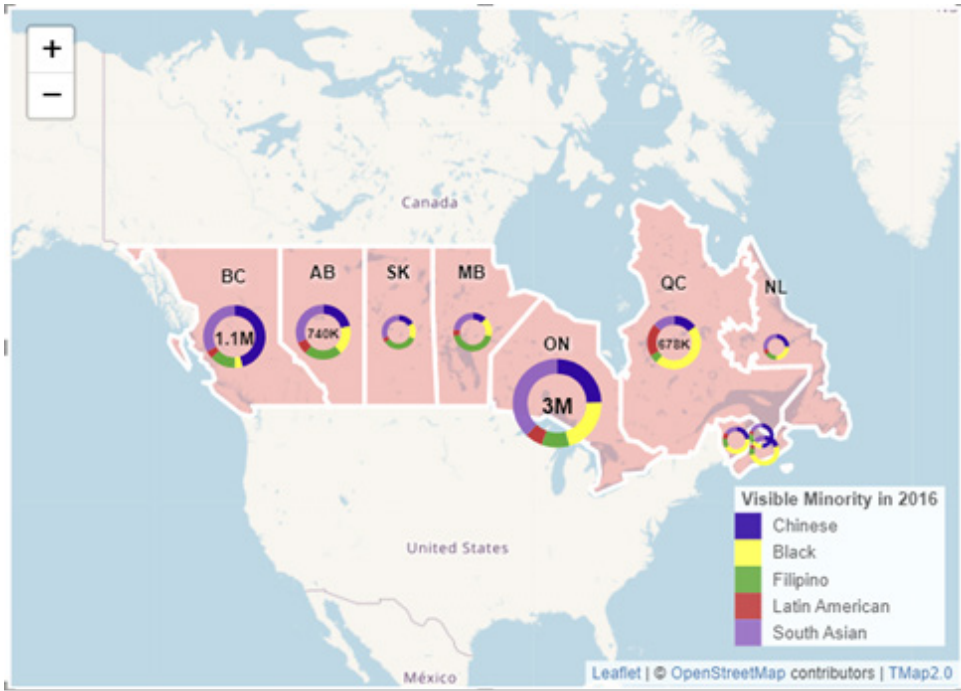
All of the visuals continue to support the standard Power BI interface. They incorporate the same user experience as Microsoft in the default visuals. You can use the Strip Plot (and all our other visuals) with the latest features: On-object interaction, Subtitle, Divider, etc.

TMap 2.0

The newly released TMap 2.0 has added two [2] types of maps: Stacked Bar chart map and Donut chart map, and smart labelling for the linked polygon layer. The Stacked Bar chart map can be used to show trends of a group of data across different geographical regions.

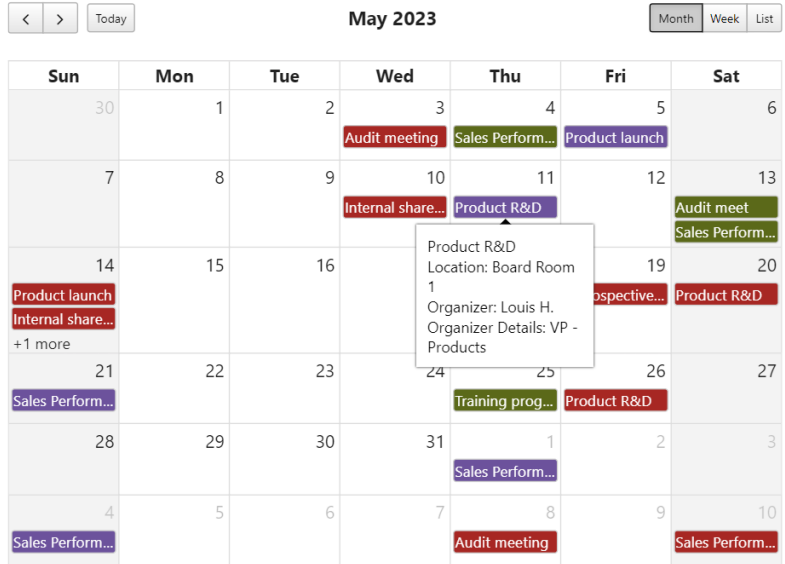


Labels for the polygon layer will be shown or hidden as zoom level changes and adjusted their positions to reduce overlapping with charts.



Calendar by MAQ Software updated

You can view key events on your Power BI report in a calendar view. One of the commonly used visuals, Calendar by MAQ Software, has just been updated with additional features to better serve end users. You may readily track events in Power BI and experience the most effective way to visualise and manage events with the enhanced Calendar visual.



Key business uses:

- **Project Managers:** monitor project schedules and key deadlines
- **Sales and Marketing:** keep track of key dates in sales and marketing campaigns
- **Human Resources:** manage the organisation’s events, vacation schedule and year-end reviews.

Key features include:

- ability to group events based upon category
- multiple views available: Month, Week, Day and List
- ability to navigate to event details with a click.

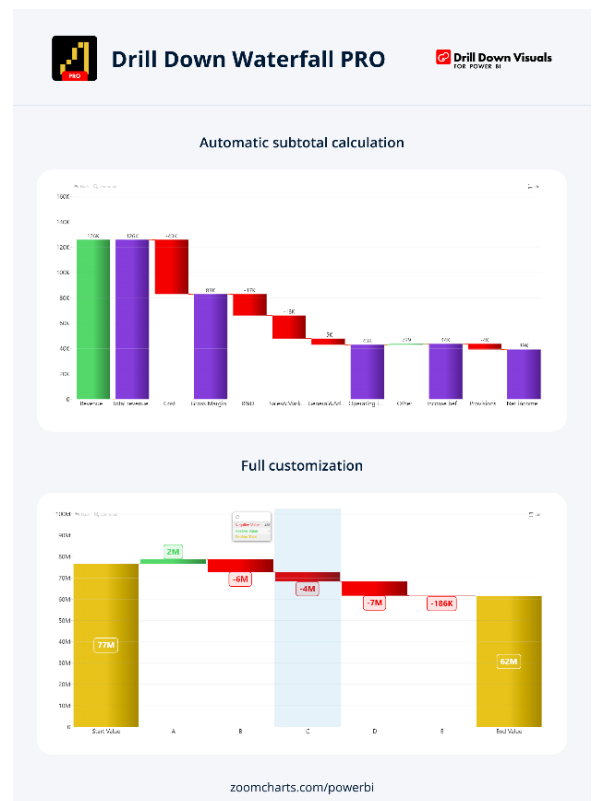
Updated features:

- added custom views (Year, Semester, Quarter)
- ability to hide time in Week and List view
- ability to select multiple events.

Interactive waterfall charts using Drill Down Waterfall PRO

Drill Down Waterfall PRO by ZoomCharts lets you create waterfall charts with features such as:

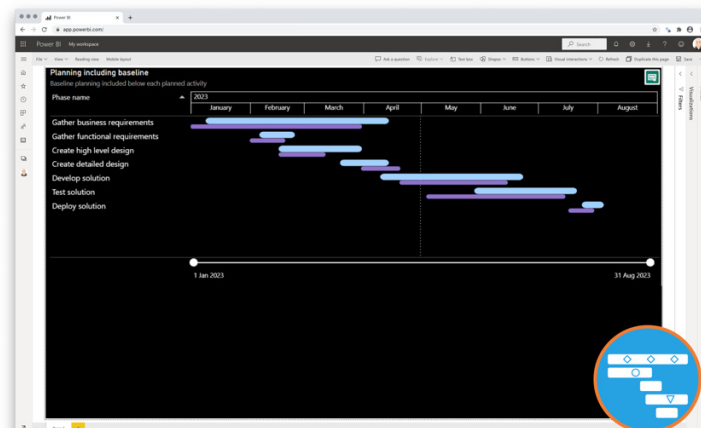
- sub-totals: set display values in your dataset or let the visual automatically calculate them for you
- various customisation options: customise increasing, decreasing and totals series separately, with options for colours, outlines, column widths, column connectors, value labels and more
- static and dynamic thresholds: demonstrate targets with up to four [4] thresholds for a visual representation of your data
- touch device friendly: explore data on both mouse and touch input devices.



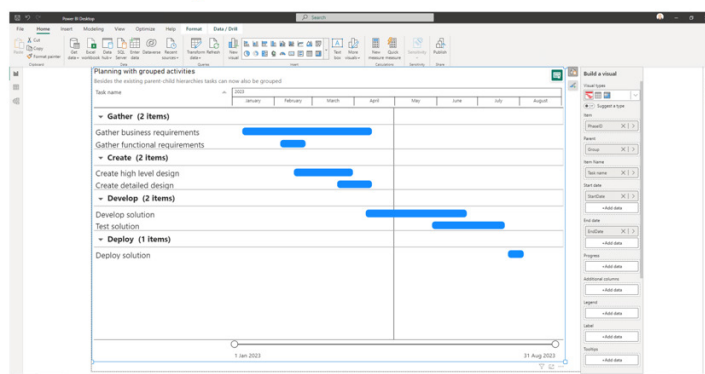
PowerGantt Chart by Nova Silva

In the last version of the PowerGantt Chart, a new feature has been added that allows you to include a baseline planning. You can view the baseline planning as a thinner bar located beneath the main task bar. In the image below, the purple bar represents the baseline planning:

PowerGantt Chart by Nova Silva



NEW: display baseline plan, task grouping and on-object interaction



Besides supporting parent-child hierarchies, the PowerGantt Chart now allows you to group tasks by any categorical variable.

There are also new Power BI features for all Nova Silva visuals: On-object interaction, subtitle and divider.

Advanced Linear Gauge by MAQ Software (new)

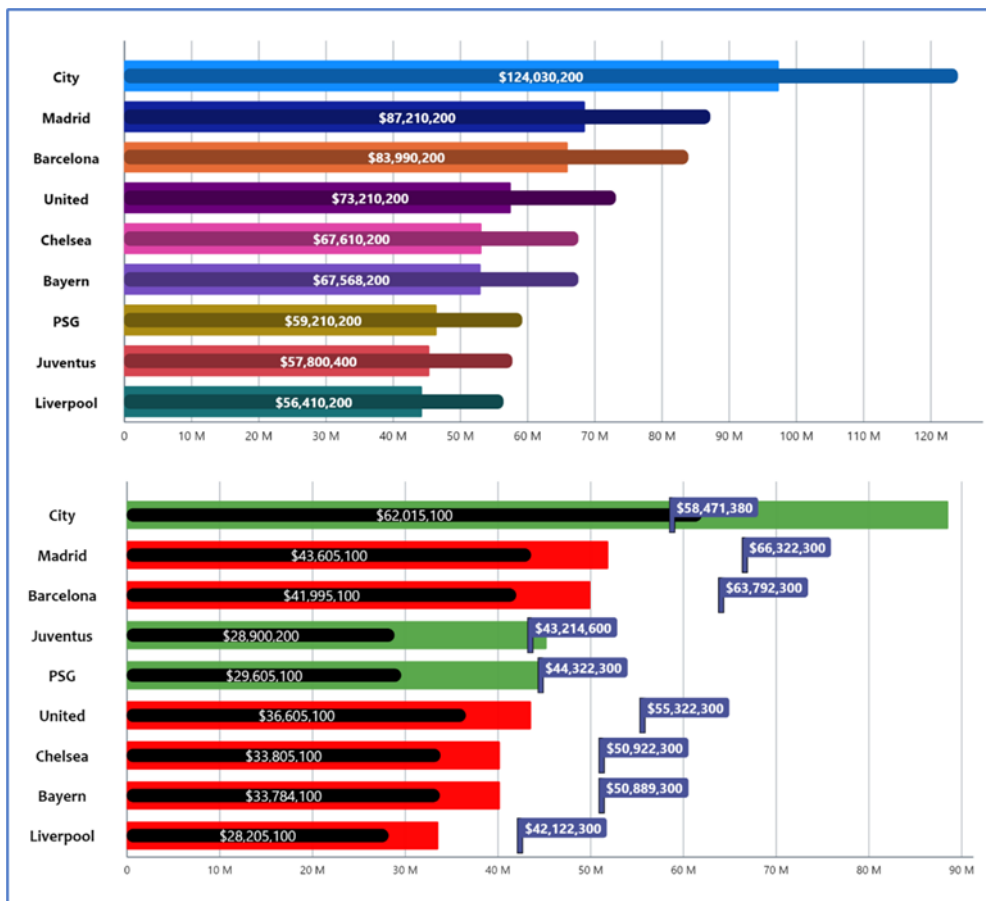
Frequently, you will try to establish goals before pursuing them. With this visual, you can monitor progress towards target values and conduct detailed analysis with the visual's suite of basic and premium functionalities.

Key business uses:

- Financial Services: track budget consumption against allocated budgets for the year or quarter
- Sales: track daily or weekly progress against sales goals for the year or quarter
- Marketing: track progress on impressions, views and clickthrough against the marketing campaign targets
- Operations: track daily output against daily or weekly goals.

Key features:

- customisable bars
- customisable axis labels, colours, fonts, etc.
- customisable labels for the data points
- ability to designate one set of values (five [5] in Premium) as the target for the categories
- ToolTips to display additional information
- ability to plot an inner Comparison bar (Premium)
- colour rules: automatically change the colour of bars based upon specified thresholds (Premium)
- connector lines: lines to align multiple targets within a single bar (Premium)
- customisable display ratio: change the display ratio of the bars and axis labels (Premium).



More next month!

New Features for Excel

This month sees several new features across Excel for the web, Windows and Mac. The option to directly share a link to a table context menu is now Generally Available for web users, as well as Immersive Reader which allows you to customise your reading experience. You can now

enable proper date support and implicit measure support for both web and Windows users. Narrator enhancements, available for Windows users, provide a better audio experience for Excel users, and the formula Value Preview ToolTip is now available for both Windows and Mac users.

You can check out the list here:

Excel for the web

- Add 'Option to Share' Table context menu
- Enable proper Date support for Power BI PivotTables
- Implicit Measures support for Power BI PivotTables
- Immersive Reader

Excel for Windows

- Narrator enhancements (Insider Preview)
- Enable proper Date support for Power BI PivotTables (Current Channel)
- Implicit Measures support for Power BI PivotTables (Current Channel)
- Check your formula with Value Preview ToolTip (Current Channel)

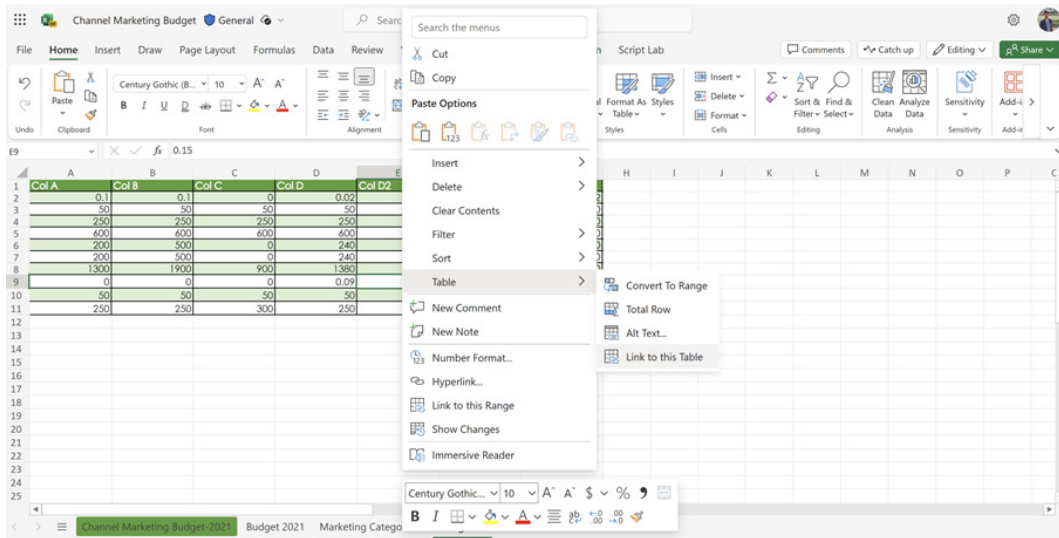
Excel for Mac

- Check your formula with Value Preview ToolTip.

Let's get started.

Add 'Option to Share' Table context menu

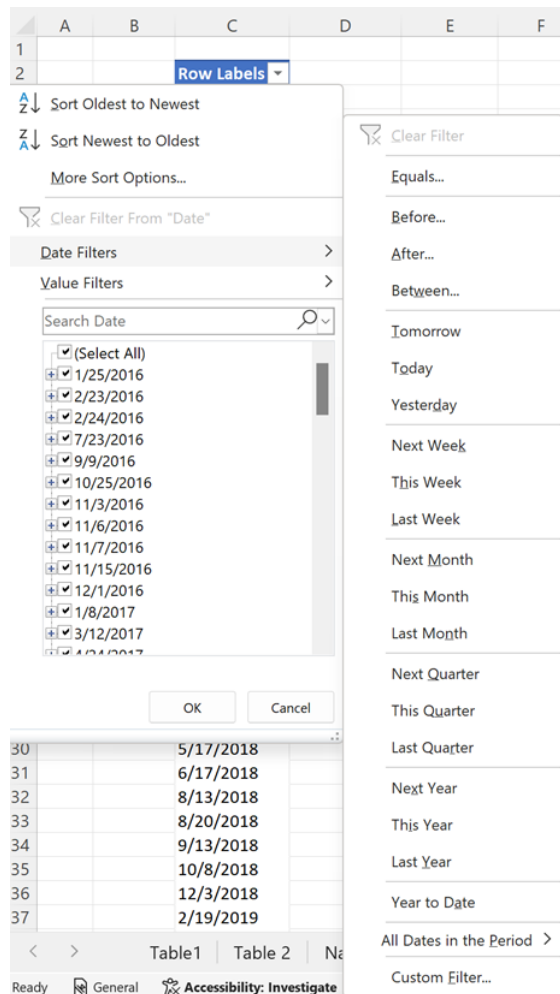
This new capability in Excel for the web helps users to bring attention to the Table present in their Excel workbook. You may do this by generating a link to the table from the Table option in the right-click menu and sharing it with others, viz.



Enable proper Date support for Power BI PivotTables

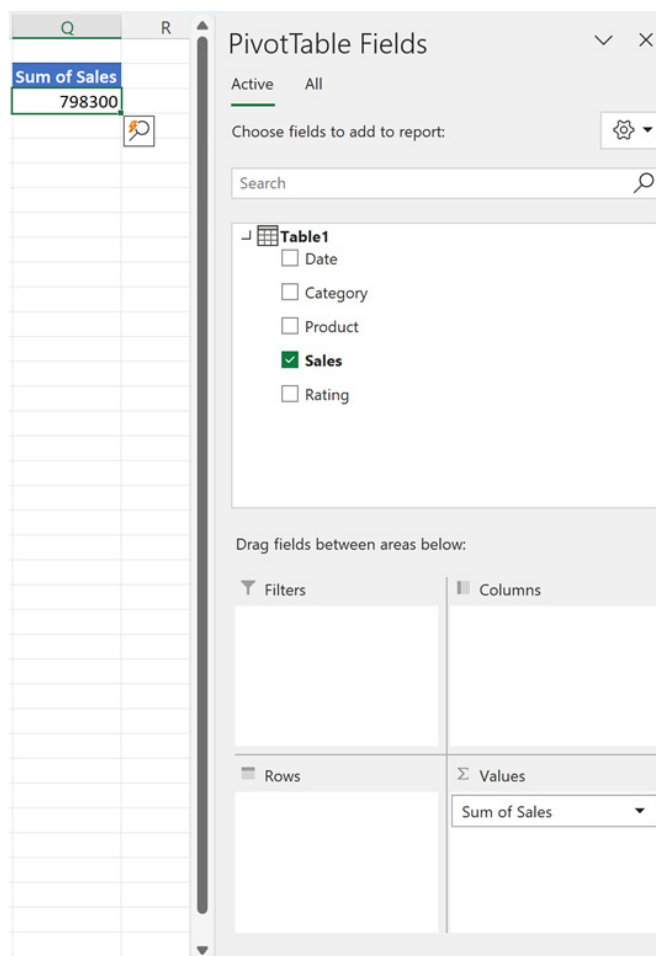
In both Excel for the web and the current channel of Excel for Windows, proper date support has now been enabled for PivotTables. Previously, dates were recognised as strings. Now, they are date-and-time objects,

allowing for accurate time-based filtering and sorting of data within the PivotTable. Be careful though: this improvement does not yet allow for proper date support outside of the PivotTable (e.g. in a formula).



Implicit Measures support for Power BI PivotTables

In both Excel for the web and the current channel of Excel for Windows, support for implicit measures in Power BI-connected PivotTables have now also been enabled. These now support drag-and-drop aggregations (e.g. sum, average, distinct count) of fields without needed pre-defined measures (i.e. explicit measures) in the underlying Power BI datasets.



Immersive Reader

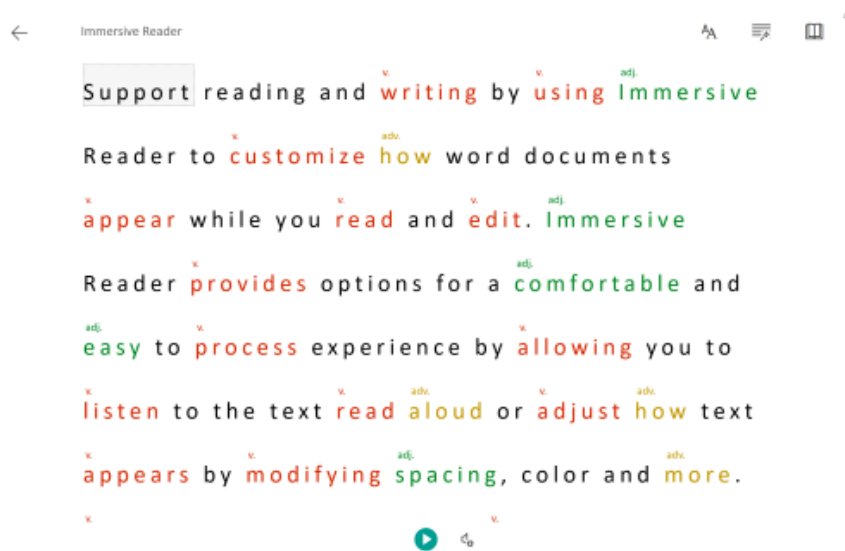
Immersive Reader is now available in Excel for the web. This feature allows you to customise your reading experience to be more comfortable to you, resulting in increased reading speed, simpler comprehension and fewer errors whilst reading. For example, Microsoft claim that people

with dyslexia read 10% faster and had 50% fewer reading errors when reading text with optimised layout, which is an option in Immersive Reader.

In Excel for the web, the following customisations are now available through Immersive Reader. All adjustments change only your view and will not affect the spreadsheet for others:

- increasing character spacing and line spacing
- breaking words into syllables
- focusing on one or only a few lines at once
- changing the background colour of the view
- highlighting certain parts of speech
- associating a picture with a word using the Picture Dictionary
- reading content aloud
- translating content on-the-fly.

You may try the Immersive Reader today in Excel for the web by selecting text and then right-clicking or opening the context menu on a cell that you want to read and selecting Immersive Reader from the list. You can also select text and find Immersive Reader on the View tab of the Ribbon or press the keyboard shortcut **ALT + W + R**.



Narrator enhancements (Insiders Preview)

Narrator now provides a more succinct and efficient reading experience while working in Microsoft Excel for Windows (available in Preview on the Insiders channel). Announcements are prioritised based upon the information you need to skim a workbook and are customisable using convenient keyboard shortcuts.

To enable the enhanced announcements, you need to be on the latest Windows Insider and Microsoft 365 Insiders builds and start Narrator using the keyboard shortcut **CTRL + Windows + ENTER**. The updated experience will be available through the Microsoft Store, so it may take a few minutes to be available on your PC.

Check your formula with Value Preview ToolTip

The Value Preview ToolTip is now available both in the current channel for Excel for Windows and Excel for Mac.

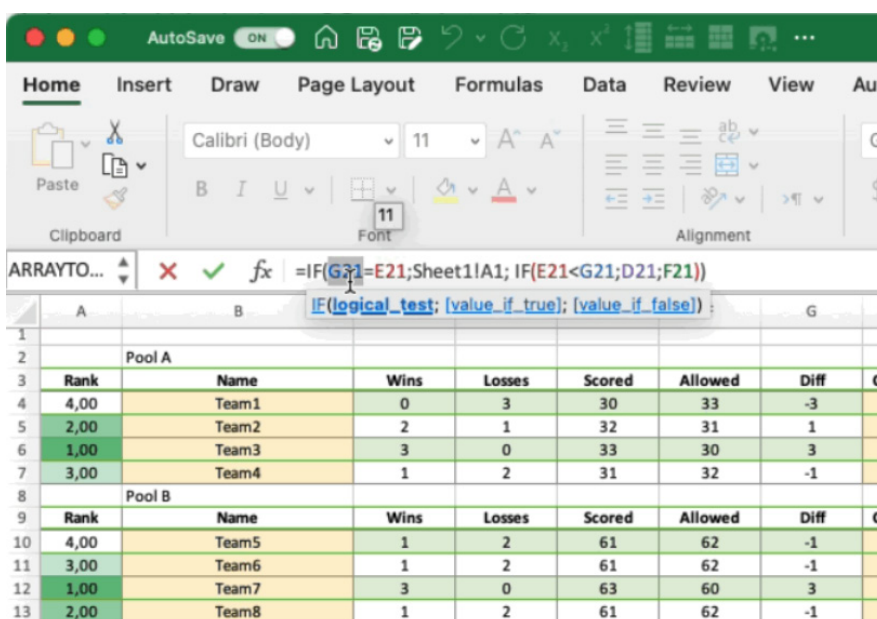
Microsoft has added ToolTips to help you check your formulae directly in the Formula bar or in the cell you're editing. All you need to do is select part of the formula, and Excel will display a ToolTip that contains the current value of the part you highlighted. They're called **Value Preview ToolTips**, a catchy title if ever there wasn't one. But don't let that put you off!

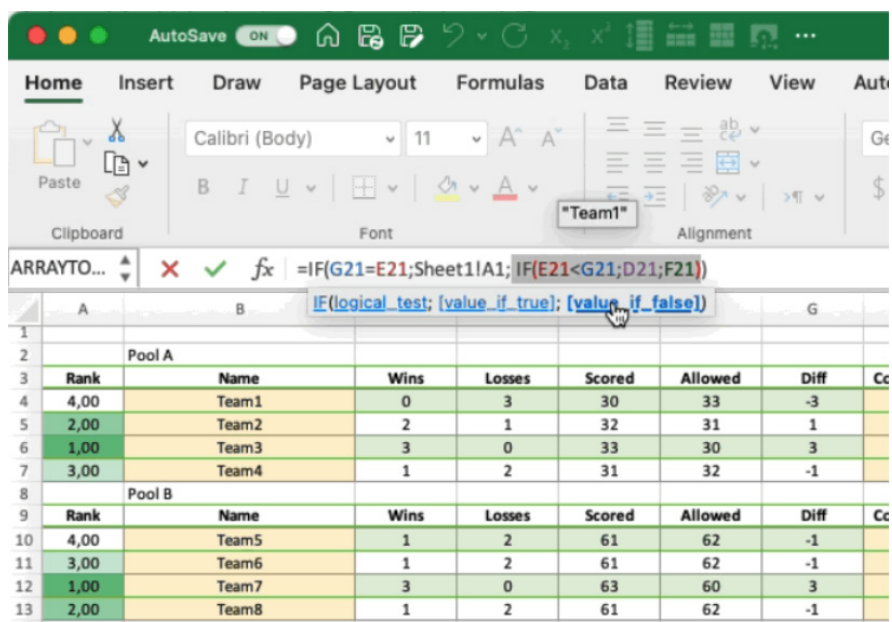
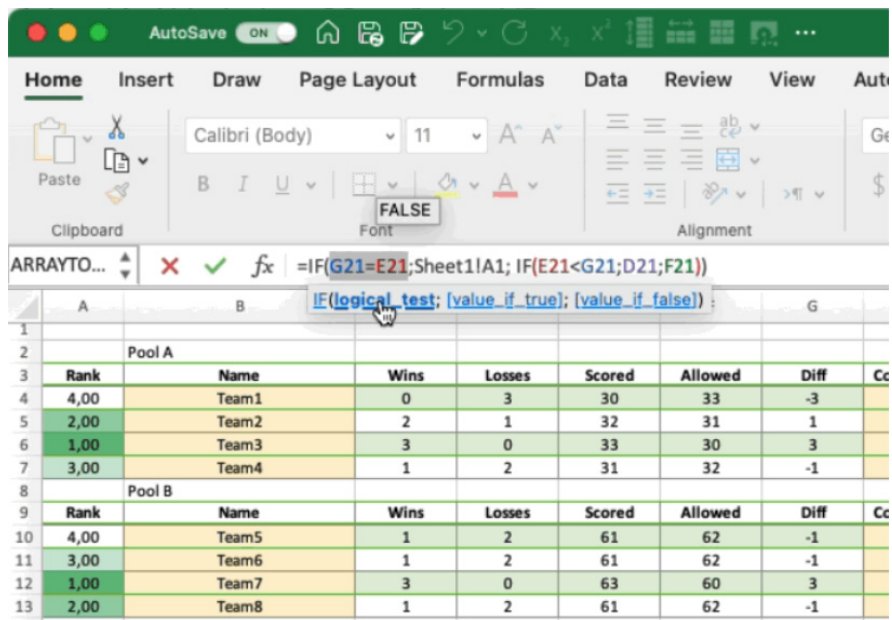
Up until now, a common technique modellers employed to obtain the current value of (part of) a formula was to select the formula (or part thereof) and press **F9**. Doing so would replace (the selected part of) the formula with its current value. You'd probably only do this to check a

value, and then you press **ESC** to avoid keeping it as a hard-coded value in your formula.

Alternatively, another approach was to use the 'Evaluate Formula' dialog (**ALT + M + V** or **Formulas -> Evaluate Formula**), which let you check the current value of (each part of) your formula. ToolTips are intended to be easier to use and less burdensome should you just want to focus on one part of the formula.

To get this new feature to work, in any formula, simply select the part you wish to evaluate. For example, in a ToolTip that shows the function syntax, click any of the function parameters to select it, and then take note of the ToolTip that appears which shows the current value of that parameter.





It should be noted that:

- You may select references, functions, parameters within a function or even the entire formula
- if you'd like to turn off the ToolTips, you can press **CTRL + ALT + P** toggle the feature on or off, but note:
 - on Excel for Mac, this only works when you are not editing a cell
 - on Excel for Windows, it may be toggled on / off anytime (if a Tooltip is visible, pressing the shortcut will not immediately hide the Tooltip, but it will switch the feature off so that subsequent selections won't show the Tooltip).

Thus, in any formula that contains range or table references, you may select a reference and see that the Tooltip shows the value or values in the referenced cells. Further, while editing a formula that has one or more functions, you may also place your cursor inside the brackets of the function so that the syntax Tooltip appears. Then, click one of the parameter names in the syntax to select that part of your formula.

If you select a part of the formula that can't be evaluated, you won't see a Tooltip. For example, if you select only part of a reference or part of a parameter, no Tooltip will be displayed.

It's possible to see a tooltip for part of the formula that doesn't get calculated as part of the cell value. For example, if your formula is =101+201, you could select 1+20 and see a tooltip that shows 21, even though that part isn't relevant when calculating the entire formula.

Dates presently show as serial numbers in Excel, rather than how they would be displaced under current locale settings. This *may* change in the future – watch this space!

Finally, you can move the Tooltip if it's covering something you need to see, or if you just want to locate it somewhere else.

The updated version of the grid with all the new features is fast becoming too complicated to show clearly here. Nonetheless, you can find the interactive links at aka.ms/ExcelFeaturesFlyer.

Excel Features Availability

Page 1 of 4

Feature	Insider		Production				Web
	Windows Find the latest Excel version for this platform	Mac Find the latest Excel version for this platform	Windows/CC Find the latest Excel version for this platform	Windows/MEC Find the latest Excel version for this platform	Windows/SA Find the latest Excel version for this platform	Mac Find the latest Excel version for this platform	
Block XLI Add-ins	Version 2302 (Build 16130.20128) or later						
PivotTables: Manual Sort of Rows & Columns			Already Supported	Already Supported	Already Supported	Already Supported	February 2023
Automatic Recalculation Optimization	Version 2208 (Build 15529.10000) or later	Version 16.64 (Build 22081401) or later					
Import Data from SQL Server Database		Version 16.68 (Build 22110801) or later					
Import Data from Additional Sources						Version 16.69 (Build 23010700) or later	
Power Query Editor						Version 16.69 (Build 23010700) or later	
IMAGE function			Version 2211 (Build 15831.20190) or later	Version 2211 (Build 15831.20252) or later		Version 16.67 (Build 22102900) or later	December 2022
Check Formulas with Value Preview Tooltips	Version 2302 (Build 16116.20000) or later	Version 16.70 (Build 230116) or later					
Office Scripts	Version 2212 (Build 15922.20000) or later	Version 16.68 (Build 22120101) or later					
Automate Tasks with Power Automate tab			Version 2301 (Build 15793.10000) or later			Version 16.66 (Build 22092500) or later	
PivotTable Show Details to XLO							January 2023
Excel Live in Teams							December 2022
Formula Suggestions							December 2022*
Formula by Example							December 2022*
Suggested Links							December 2022
Add search bar in queries pane							December 2022

*Starting to roll out

Features Flyer: aka.ms/ExcelFeaturesFlyer

CC: Current Channel, MEC: Monthly Enterprise Channel, SA: Semi Annual Enterprise Channel
All information is subject to change.

Excel Features Availability

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Add keyboard shortcut to open PQ editor			Version 2211 (Build 15793.31883) or later				
Create nested PQ data types	Version 2211 (Build 15928.10000) or later						
Add Get Data from Dynamic Arrays	Version 2105 (Build 14014.20002) or later						
Data from picture			Version 2210 (Build 15723) or later	Version 2210 (Build 15726.20262) or later		Version 16.38 or later	December 2022
Chart Data Folds							November 2022
Show Changes			Version 2209 (Build 15703.10000) or later			Version 16.66 (Build 22092500) or later	Already Supported
New Paste Options	Version 2210 (Build 15726.20000) or later						
Quickly Find the Command you need			Version 2206 (Build 15333.20010) or later				October 2022
New DAX Functions	Version 2208 (Build 15504.10000) or later						
Navigation Pane			Version 2209 (Build 15629.10000) or later				
Smooth Scrolling			Version 2205 (Build 15225.20092) or later	Version 2208 (Build 15601.20230) or later	Version 2208 (Build 15601.20456) or later	Already Supported	Already Supported
Check Performance							September 2022
Share Section of Excel Workbook							September 2022
Dynamic Array Support in Charts	Version 2209 (Build 15617.10000) or later			Version 2210 (Build 15726.20262) or later			September 2022
Modern Comments			Version 2209 (Build 15427.20000) or later				
Manage Your Storage Accounts from One		Version 16.64 (Build 22082100) or later					

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Excel Features Availability

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New Excel functions			Version 2208 (Build 15427.20194) or later	Version 2208 (Build 15601.20230) or later		Version 16.64 (Build 22081401) or later	August 2022
Power Query Group operations							August 2022
Improvements to the connected Power BI experience	Version 2208 (Build 15601.20028) or later						August 2022
Add and edit rich text formatting			Already Supported	Already Supported	Already Supported	Already Supported	August 2022
Sort by color or icon from auto filter menu			Already Supported	Already Supported	Already Supported	Already Supported	August 2022
Edit files with legacy data connections			Already Supported	Already Supported	Already Supported	Already Supported	August 2022
Edit files with legacy Shared Workbook feature			Already Supported	Already Supported	Already Supported	Already Supported	August 2022
Delete chart elements							August 2022
Multiline formula bar							August 2022
Search within PivotTable Field List			Already Supported	Already Supported	Already Supported	Already Supported	July 2022
Set automatic data conversions	Version 2207 (Build 15427.20000) or later						
Natural Language Query Improvements			Version 2206 (Build 15330.20230) or later	Version 2205 (Build 15225.20356) or later		Version 16.63 (Build 22070801) or later	
Resize Conditional Formatting dialog box		Version 16.64 (Build 22070600) or later					
Sheet protection			Already Supported	Already Supported	Already Supported	Already Supported	June 2022

Features Flyer: aka.ms/ExcelFeaturesFlyer

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All information is subject to change.

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	Windows Find the latest Excel version for this platform	Mac Find the latest Excel version for this platform	Windows/CC Find the latest Excel version for this platform	Windows/MEC Find the latest Excel version for this platform	Windows/SA Find the latest Excel version for this platform	Mac Find the latest Excel version for this platform	
Semi-select for links creation			Already Supported	Already Supported	Already Supported	Already Supported	June 2022
Add "PivotTable Connections to Slicer settings pane"			Already Supported	Already Supported	Already Supported	Already Supported	June 2022
Import from local text, CSV, and XLSX files						Version 16.57 (22011100) or later	
Provide automatic alt-text suggestions on charts and PivotCharts			Version 2205 (Build 15225.20288) or later	Version 2204 (Build 15128.20280) or later		Version 16.62 (22061100) or later	
Power Query refresh for selected data sources			Already Supported	Already Supported	Already Supported	Already Supported	May 2022
Changing source file for workbook links			Already Supported	Already Supported	Already Supported	Already Supported	May 2022
Improved Recommended PivotTable experience	Version 2204 (Build 15128.10000) or later						
Faster recalc on resource constrained devices		Version 16.62 (Build 22050004) or later	Version 2204 (Build 15128.20248) or later	Version 2204 (Build 15128.20280) or later			
Faster Autofilter				Version 2204 (Build 15128.20248) or later	Version 2208 (Build 15601.20456) or later	Version 16.61 (22050700) or later	
Dataflow connector				Version 2203 (Build 15028.20248) or later			
Dataverse connector			Version 2204 (Build 15128.20178) or later				
Improved Find dialog and Find All						Version 16.60 (220410) or later	
LAMBDA Helper Functions			Version 2202 (Build 14931.20120) or later	Version 2202 (Build 14931.20274) or later	Version 2208 (Build 15601.20456) or later	Version 16.56 (Build 211211) or later	Already Supported

Features Flyer: aka.ms/ExcelFeaturesFlyer

CC: Current Channel; MEC: Monthly Enterprise Channel; SA: Semi Annual Enterprise Channel. All information is subject to change.

More next month, we're sure.

The A to Z of Excel Functions: LET



It's been over three years since Microsoft announced the Excel function **LET** for Office 365. This allows you to stop writing the same expressions time and time again in a formula or allows portability of segments of a computation for different formulae. As Microsoft puts it, it's "...names on a formula level".

In essence, this function assigns values or expressions to defined names and then passes these to calculation results. It can store intermediate calculations, values or defining names inside a formula. The defined names only apply within the scope of the **LET** function in a similar way to variables in general programming scenarios.

If you reuse the same expression multiple times in a formula, Excel calculates that expression multiple times. That's *not* a good thing. **LET** allows you to name the expression and refer to it using that name, similar to **VAR** in a DAX expression, for those that know the language. Any named expression is calculated only once, even though it may be referred to many times in the formula. This can significantly improve performance considerably and speed up your spreadsheets.

To use the **LET** function, we must define pairs of names and associated values, and a calculation that uses them all, as the final argument. At least one name / value pair must be defined.

It has following syntax to operate:

LET(name1, value1, [name2...], [value2...], calculation)

where:

- **name1**: the name for the first value
- **value1**: the value to associate with the first name
- **name2** (optional): additional names for second and subsequent values
- **value2** (optional): additional values for the second and subsequent values
- **calculation**: this is the calculation to perform. This is always the final argument and it can refer to any of the defined names in the **LET**.

The main benefits of using **LET** function includes:

- **readability**: **LET** function tracks the changes in defined cells or expression in dynamic way, so there is no need to remember what a specific range / cell reference referred to. With the ability to define variables, it can provide more meaningful context to end users
- **performance**: **LET** allows named expression in the formula and calculated only once, even if it is referred to many times in the formula. This can significantly improve performance for complex expressions.

Let's look at an example. If we are considering **LET**, how about we use the property rental market! Suppose we run a company where salespeople make commission based upon 1% of the average of the square of the weekly rent, e.g. if Annie makes two sales of \$400 and \$300, then the average of the amounts squared would be $(300^2 + 400^2) / 2 = 125,000$

and 1% of that would be \$1,250. Not much incentive to make lots of sales, is there? It's not my fault she negotiated her contract badly...

Anyway, it's convoluted, but we are trying to construct an example which we cannot simply solve using a standard Excel formula like **AVERAGEIFS!**

	A	B	C	D	E	F
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						

Business Unit	Salesperson	Sales Amount
A	Annie	374
A	Brad	347
A	Charlie	159
A	Dee	393
B	Brad	478
B	Charlie	354
B	Charlie	159
C	Dee	203
C	Brad	371
C	Annie	300
C	Annie	400
D	Dee	187
D	Brad	140

Business Unit	C
Salesperson	Annie
Comm. Rate	1.00%
Commission	\$1,250.00

*=LET(BusinessUnit,B3:B15=C17, SalesPerson,C3:C15=C18, Selection,BusinessUnit*SalesPerson, Commission,C19, SalesAmt,D3:D15, SUMPRODUCT(Selection*SalesAmt^2)*Commission/SUMPRODUCT(Selection))*

The formula in cell **C21** is given by

=LET(BusinessUnit, B3:B15=C17, SalesPerson, C3:C15=C18, Selection, BusinessUnit*SalesPerson, Commission, C19, SalesAmt, D3:D15, SUMPRODUCT(Selection*SalesAmt^2)*Commission/SUMPRODUCT(Selection))

The final argument is the formula – but more on that shortly. Before that, there are pairs of expressions where the first element is the name and the second is an expression for a value. Let's go through all of these arguments (mainly in pairs):

- **BusinessUnit, B3:B15=C17** define the array **BusinessUnit**, which is an array of TRUE and FALSE values depending on whether the Business Unit is equal to the value in cell **C17** (which is "C" in the illustration). Therefore, we have {FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, TRUE, TRUE, TRUE, TRUE, FALSE, FALSE}
- **SalesPerson, C3:C15=C18** generate a similar array (named **SalesPerson**), which provides TRUE and FALSE values depending on whether the salesperson was Annie. Therefore, we have {TRUE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, TRUE, TRUE, FALSE, FALSE}

- **Selection, BusinessUnit*SalesPerson** now shows the value of **LET**. This names the value of the product of the first two parameters **Selection** without having to write out the formula again and, more importantly, *without having to calculate them a second time unnecessarily*. This results in TRUE/FALSE expressions multiplied by other TRUE/FALSE expressions, which results in a one if both are TRUE and zero (0) otherwise. Therefore, we have {0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0}
- **Commission, C19** is relatively simple, naming the value in cell **C19** (1%) **Commission**. Similarly, **SalesAmt, D3:D15** apply the name **SalesAmt** to the range **D3:D15** for the purposes of this formula. Therefore, we have {374, 347, 159, 393, 478, 354, 159, 203, 371, 300, 400, 187, 140}
- Finally, the formula **SUMPRODUCT(Selection*SalesAmt^2)*Commission/SUMPRODUCT(Selection)** calculates the commission similarly to the approach explained above. However, **Selection, SalesAmt** and **Commission** are merely referenced and neither need to be recalculated nor written out in full.

This may seem verbose, but it speeds up calculation time considerably, and makes formulae easier to read (once you get your head around this new approach). Further, **LET** only defines the range name *within* the formula. These are not general range names in the spreadsheet – Excel

will not recognise them outside of this **LET** formula.

To be crystal clear, there are two key differences between defined range names and this new **LET** function:

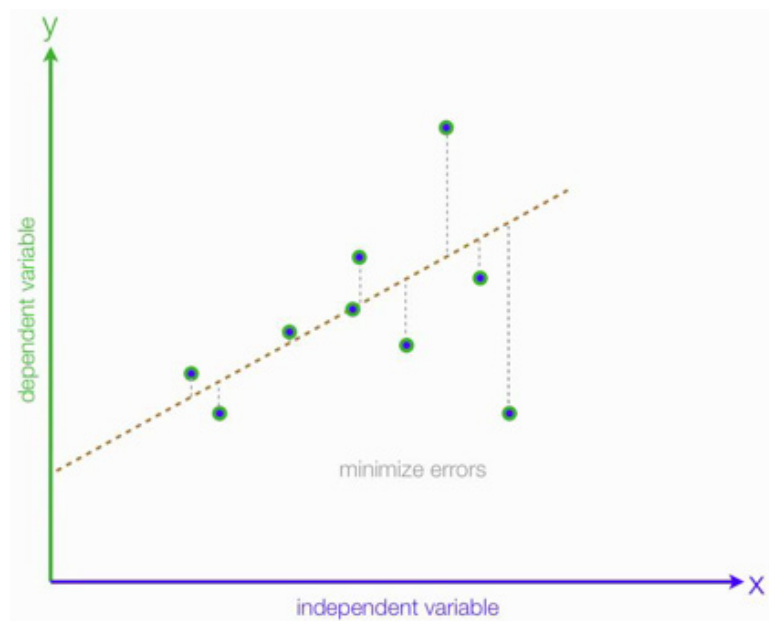
1. **LET** allows you to see the definition of the name there and then without jumping to the definition elsewhere. Yes, the formula may be longer in the cell, but the user can hopefully follow it without audit tools
2. When Excel sees a defined name in a formula, it pauses the current formula, evaluates the defined name's formula to get a result, and returns to the original formula. A variable defined using **LET** is only ever evaluated once.

An example that shows the difference is **=LET(x, RANDBETWEEN(1, 1000000), x - x)**. This formula will always return zero, since **RANDBETWEEN(1, 1000000)** gets evaluated and then assigned to **x**, which never changes, so **x - x = 0**.

If you instead use the name manager to define the name **x** as **=RANDBETWEEN(1, 1000000)**, then entering **=x - x** is almost never going to be zero, since each **x** in the formula causes **RANDBETWEEN** to be evaluated.

It should also be noted that you must be careful with your order of arguments and defining reference names. Name definitions can only make use of prior and not subsequent names. In the example above, **Selection** could only be defined once **BusinessUnit** and **SalesAmt** had both been defined.

The A to Z of Excel Functions: LINEST



Sometimes, you wish to forecast what comes next in a sequence, *i.e.* make a forecast. There are various approaches you could use:

- **Naïve method:** this really does live up to its billing – you simply use the last number in the sequence, *e.g.* the continuation of the series 8, 17, 13, 15, 19, 14, ... would be 14, 14, 14, 14, ... Hmm, great
- **Simple average:** only a slightly better idea: here, you use the average of the historical series, *e.g.* for the continuation of the series 8, 17, 13, 15, 19, 14, ... would be 14.3, 14.3, 14.3, 14.3, ...
- **Moving average:** now we start to look at smoothing out the trends by taking the average of the last **n** items. For example, if **n** were 3, then the sequence continuation of 8, 17, 13, 15, 19, 14, ... would be 16, 16.3, 15.4, 15.9, 15.9, ...

- **Weighted moving average:** the criticism of the moving average is that older periods carry as much weighting as more recent periods, which is often not the case. Therefore, a weighted moving average is a moving average where within the sliding window values are given different weights, typically so that more recent points matter more. For example, instead of selecting a window size, it requires a list of weights (which should add up to 1). As an illustration, if we picked four periods and [0.1, 0.2, 0.3, 0.4] as weights, we would be giving 10%, 20%, 30% and 40% to the last 4 points respectively which would add up to 1 (which is what it would need to do to compute the average).

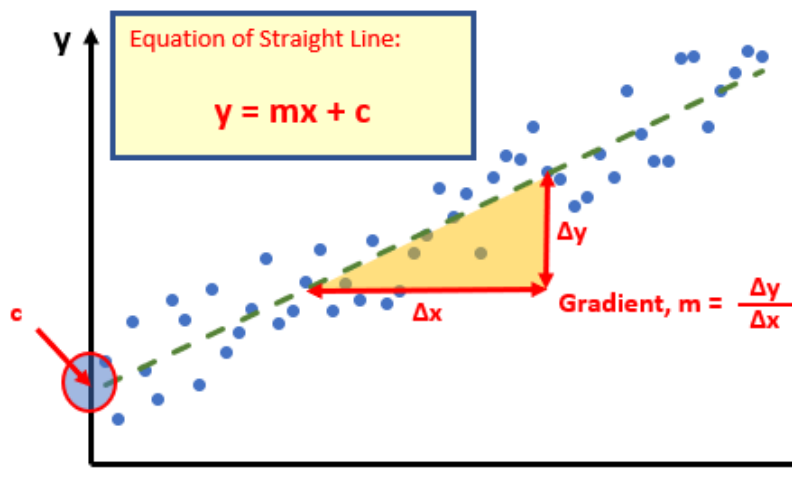
Therefore the continuation of the series 8, 17, 13, 15, 19, 14, ... would be 15.6, 15.7, 15.7, 15.5, 15.6, ...

All of these approaches are simplistic and have obvious flaws. We are using historical data to attempt to predict the next point. If we go beyond this, we are then using forecast data to predict further forecast data. That doesn't sound right. We should stick to the next point. Since we are looking at a single point and we can weight the historical data by adding exponents to the calculation, this is sometimes referred to as **Exponential Single Smoothing**.

A slightly more sophisticated method is called **regression analysis**: well,

that takes me back! This is a technique where you plot an independent variable on the **x** (horizontal axis) against a dependent variable on the **y** (vertical) axis. "Independent" means a variable you may select (e.g. "June", "Product A") and dependent means the result of that choice or selection.

For example, if you plotted your observable data on a chart, it might look something like this:



Do you see? You can draw a straight line through the data points. There is a statistical technique where you may actually draw the "best straight line" through the data using an approach such as Ordinary Least Squares, but rather than attempt to explain that, I thought I would try and keep

you awake. There are tools and functions that can work it out for you. This is predicting a trend, not a point, so is a representative technique for **Exponential Double Smoothing** (since you need just two points to define a linear trend).

Once you have worked it out, you can calculate the gradient (**m**) and where the line cuts the **y** axis (the **y** intercept, **c**). This gives you the equation of a straight line:

$$y = mx + c$$

Therefore, for any independent value **x**, the dependent value **y** may be calculated – and we can use this formula for forecasting.

Of course, this technique looks for a straight line and is known as **linear** regression. You may think you have a more complex relationship (and you may well be right), but consider the following:

- Always split your forecast variables to logical classifications. For example, sales may be difficult to predict as the mix of products may vary period to period, for each product, there may be readily recognizable trends
- If the relationship does not appear to be linear, try plotting **log x** against **log y**. If this has a gradient of two then **y** is correlated with **x²**; if the gradient is three, then **y** is correlated with **x³** etc.

This idea may be extended. The line may be defined by

$$y = mx_1 + mx_2 + \dots + mx_n + c$$

if there are multiple ranges of **x**-values, where the dependent **y**-values are a function of the independent **x**-values. The **m**-values are coefficients corresponding to each **x**-value, and **c** is a constant value. Note that **y**, **x**, and **m** may be vectors.

The **LINEST** function calculates the statistics for a line by using the "least squares" method to calculate a straight line that best fits your data, and then returns an array that describes the line. You may also combine **LINEST** with other functions to calculate the statistics for other types of models that are linear in the unknown parameters, including polynomial, logarithmic, exponential and power series. Since this function returns an

array of values, it must be entered as an array formula.

If an "extended" line definition is required, it should be noted that the array that the **LINEST** function returns is **{m_n, m_{n-1}, ..., m₁, c}**, i.e. the coefficients *reverse*. **LINEST** may also return additional regression statistics (please refer to the notes below).

The **LINEST** function employs the following syntax to operate:

LINEST(known_y's, [known_x's], [constant], [statistics]).

The **LINEST** function has the following arguments:

- **known_y's**: this is required and represents the set of **y**-values that you already know in the relationship **y = mx + c**
- **known_x's**: this is optional and denotes the set of **x**-values that you may already know in the relationship **y = mx + c**
- **constant**: this argument is optional and is a logical value specifying whether to force the constant **c** to equal zero (0)
- **statistics**: this final argument is also optional. This too is a logical value specifying whether to return additional regression statistics (*see below*).

It should be further noted that:

- if the range of **known_y's** is either in a single column or else a single row, each column of **known_x's** is interpreted as a separate variable
- the range of **known_x's** may include one or more sets of variables. If only one variable is used, **known_y's** and **known_x's** can be ranges of any shape, as long as they have equal dimensions. If more than one variable is used, **known_y's** must be a vector (*i.e.* a range with a height of one row or a width of one column)
- if **known_x's** is omitted, it is assumed to be the array {1,2,3,...} that is the same size as **known_y's**
- if **constant** is TRUE or omitted, **c** is calculated normally
- if **constant** is FALSE, **c** is set equal to zero (0) and the **m**-values are adjusted to fit **y = mx**
- if **statistics** is TRUE, **LINEST** returns the additional regression statistics; as a result, the returned array is {**m_n, m_{n-1}, ..., m₁, c; se_n, se_{n-1}, ..., se₁, se_c; r², se_y; F, df; ss_{reg}, ss_{resid}**}
- if **statistics** is FALSE or omitted, **LINEST** returns only the **m**-coefficients and the constant **c**

the underlying algorithm used in the **INTERCEPT** and **SLOPE** functions is different than the underlying algorithm used in the **LINEST** function. The difference between these algorithms can lead to different results when data is undetermined and collinear. For example, if the data points of the **known_y's** argument are zero (0) and the data points of the **known_x's** argument are one (1):

- **INTERCEPT** and **SLOPE** return an **#DIV/0!** error. The **INTERCEPT** and **SLOPE** algorithm is designed to look for one and only one answer, and in this case there can be more than one answer
- **LINEST** returns a value of zero (0). The **LINEST** algorithm is designed to return reasonable results for collinear data, and in this case at least one answer can be found.

With regard to the additional regression statistics, these are produced in a grid (an array) as follows:

	A	B	...	N-1	N	N+1
1	m_n	m_{n-1}	...	m₂	m₁	c
2	se_n	se_{n-1}	...	se₂	se₁	se_c
3	r²	se_y				
4	F	df				
5	ss_{reg}	ss_{resid}				

These statistics may be described as follows:

Statistic	Description
se ₁ , se ₂ , ..., se _n	Standard error values for the coefficients m₁, m₂, ..., m_n . The standard error is a measure of the statistical accuracy of an estimate, equal to the standard deviation of the theoretical distribution of a large population of such estimates. It is usually estimated in practice as the sample standard deviation divided by the square root of the sample size (assuming statistical independence of the values in the sample), $\frac{\sigma}{\sqrt{n}}$
se _b	Standard error value for the constant c (but this is equal to #N/A when constant is FALSE)

Statistic	Description
r^2	<p>This is the coefficient of determination, which compares estimated and actual y-values and ranges, with a value between zero(0) and one (1). If it is 1, there is a perfect correlation in the sample, <i>i.e.</i> there is no difference between the estimated y-value and the actual y-value. At the other extreme, if the coefficient of determination is zero, the regression equation is not helpful in predicting a y-value.</p> <p>The coefficient of determination, R^2, is the proportion of the variance in the dependent variable that is predictable from the independent variable(s). There are several definitions of R^2, but they are not always equivalent (indeed, they can be negative on occasion). One class of such cases includes that of simple linear regression where r^2 is used instead of R^2. When an intercept is included, then r^2 is simply the square of the sample correlation coefficient (<i>i.e.</i> r) between the observed outcomes and the observed predictor values. Here, the coefficient of determination will range between zero (0) and one (1)</p>
se_y	Standard error for the y estimate
F	<p>This is the F statistic or the F-observed value. You should use the F statistic to determine whether the observed relationship between the dependent and independent variables occurs by chance</p> <p>This may be calculated using the F.INV.RT function in Excel. An F statistic is a value you get when you run an analysis of variance (ANOVA) test or a regression analysis to find out if the means between two populations are significantly different. It's similar to a T statistic from a T-Test: a T-test will tell you if a single variable is statistically significant, whereas an F test will tell you if a group of variables are jointly significant</p>
df	<p>The degrees of freedom. You should use the degrees of freedom to help you find F-critical values in a statistical table. Compare the values you find in the table to the F statistic returned by LINEST to determine a confidence level for the model.</p> <p>The degree(s) of freedom is the number of independent values or quantities which may be assigned to a statistical distribution. It is calculated as follows.</p> <p>When no x columns are removed from the model due to collinearity:</p> <ul style="list-style-type: none"> if there are k columns of known_x's and constant = TRUE or is omitted, df = n - k - 1 if constant = FALSE, df = n - k. <p>In both cases, each x column that is removed due to collinearity increases the value of df by one (1)</p>
ss_{reg}	<p>This is the regression sum of squares</p> <p>In regression analysis, Excel calculates for each point the squared difference between the y-value estimated for that point and its actual y-value. The sum of these squared differences is called the residual sum of squares, ss_{resid}. Excel then calculates the total sum of squares, ss_{total}. When the constant argument = TRUE or is omitted, the total sum of squares is the sum of the squared differences between the actual y-values and the average of the y-values. When the constant argument = FALSE, the total sum of squares is the sum of the squares of the actual y-values (<i>without</i> subtracting the average y-value from each individual y-value). Then, the regression sum of squares, ss_{reg}, may be found from: $ss_{reg} = ss_{total} - ss_{resid}$. The smaller the residual sum of squares is, compared with the total sum of squares, the larger the value of the coefficient of determination, r^2, which is an indicator of how well the equation resulting from the regression analysis explains the relationship among the variables. The value of r^2 equals ss_{reg}/ss_{total}</p>
ss_{resid}	This is the residual sum of squares, as explained above.

To be clear:

- you can describe any straight line with the slope and the **y**-intercept:
 - slope (**m**): to find the slope of a line, often written as **m**, take two points on the line, (x_1, y_1) and (x_2, y_2) ; the slope is equal to $(y_2 - y_1)/(x_2 - x_1)$
 - y**-intercept (**c**): the **y**-intercept of a line, often written as **c**, is the value of **y** at the point where the line crosses the **y**-axis
 - the equation of a straight line is given by **$y = mx + c$** . Once you know the values of **m** and **c**, you can calculate any point on the line by plugging the **y**- or **x**-value into that equation. You may also use the **TREND** function

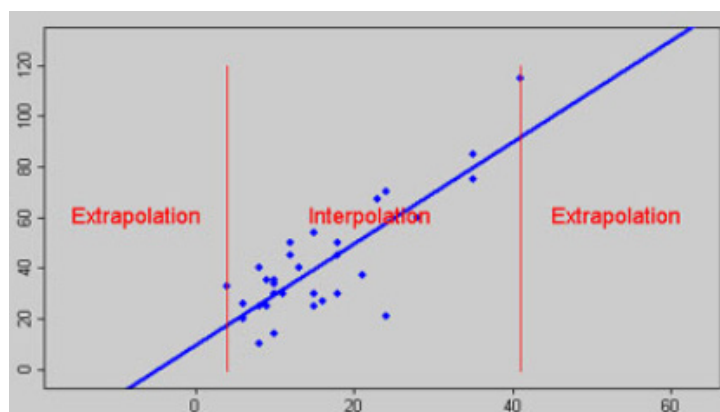
- when you have only one independent **x**-variable, you can obtain the slope and **y**-intercept values directly by using the following formulae:
 - slope: `=INDEX(LINEST(known_y's, known_x's), 1)`
 - y**-intercept: `=INDEX(LINEST(known_y's, known_x's), 2)`
- the accuracy of the line calculated by the **LINEST** function depends upon the degree of scatter in your data. The more linear the data, the more accurate the **LINEST** model will be. **LINEST** uses the method of least squares for determining the best fit for the data. When you have only one independent **x**-variable, the calculations for **m** and **c** are based on the following formulae:

$$m = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

$$c = \bar{y} - m\bar{x}$$

where **x** and **y** are sample means, *i.e.* **x** = `AVERAGE(known x's)` and **y** = `AVERAGE(known_y's)`

- the line- and curve-fitting functions **LINEST** and **LOGEST** can calculate the best straight line or exponential curve that fits your data. However, you have to decide which of the two results best fits your data. You can calculate **TREND(known_y's, known_x's)** for a straight line, or **GROWTH(known_y's, known_x's)** for an exponential curve. These functions, without the **new_x's** argument, return an array of **y**-values predicted along that line or curve at your actual data points. You can then compare the predicted values with the actual values. You may want to chart them both for a visual comparison
- in some cases, one or more of the **x** columns (assume that **y**'s and **x**'s are in columns) may have no additional predictive value in the presence of the other **X** columns. In other words, eliminating one or more **x** columns might lead to predicted **y** values that are equally accurate. In that case, these redundant **x** columns should be omitted from the regression model. This phenomenon is called **collinearity** because any redundant **x** column can be expressed as a sum of multiples of the non-redundant **x** columns. The **LINEST** function checks for collinearity and removes any redundant **x** columns from the regression model when it identifies them. Removed **X** columns can be recognised in **LINEST** output as having zero (0) coefficients in addition to zero (0) **se** values. If one or more columns are removed as redundant, **df** is affected because **df** depends upon the number of **x** columns actually used for predictive purposes
- if **df** is changed because redundant **x** columns are removed, values of **se_y** and **F** are also affected. Collinearity should be relatively rare in practice. However, one case where it is more likely to arise is when some **x** columns contain only zero (0) and one (1) value as indicators of whether a subject in an experiment is or is not a member of a particular group. If **constant** = `TRUE` or is omitted, the **LINEST** function effectively inserts an additional **x** column of all one values to model the intercept. If you have a column with a 1 for each subject if male, or 0 if not, and you also have a column with a 1 for each subject if female, or 0 if not, this latter column is redundant because entries in it can be obtained from subtracting the entry in the "male indicator" column from the entry in the additional column of all 1 values added by the **LINEST** function
- formulae that return arrays must be entered as array formulas; however, do note that in Excel for the web you cannot create array formulae
- when entering an array constant (such as **known_x's**) as an argument, use commas to separate values that are contained in the same row and semicolons to separate rows. Separator characters may be different depending on your regional settings
- note that the **y**-values predicted by the regression equation may not be valid if they are outside the range of the **y**-values you used to determine the equation (*i.e.* extrapolation versus interpolation)



- in addition to using **LOGEST** to calculate statistics for other regression types, you can use **LINEST** to calculate a range of other regression types by entering functions of the **x** and **y** variables as the **x** and **y** series for **LINEST**. For example, the following formula:

`=LINEST(yvalues, xvalues^COLUMN($A:$C))`

works when you have a single column of **y**-values and a single column of **x**-values to calculate the cubic (polynomial of order three [3]) approximation of the form:

$$y = m_1x + m_2x^2 + m_3x^3 + c$$

You can adjust this formula to calculate other types of regression, but in some cases it requires the adjustment of the output values and other statistics

- the F-test value that is returned by the **LINEST** function differs from the F-test value that is returned by the **FTEST** function. **LINEST**

Please see our comprehensive example below:

	A	B	C	D	E	F	G	H	I	
1	Floor Space	Offices	Entrances	Age	Assessed Value					
2	x_1	x_2	x_3	x_4	y					
3	2,310	2	2	20	\$142,000					
4	2,333	2	2	12	\$144,000					
5	2,356	3	1.5	33	\$151,000					
6	2,379	3	2	43	\$150,000					
7	2,402	2	3	53	\$139,000					
8	2,425	4	2	23	\$169,000					
9	2,448	2	1.5	99	\$126,000					
10	2,471	2	2	34	\$142,900					
11	2,494	3	3	23	\$163,000					
12	2,517	4	4	55	\$169,000					
13	2,540	2	3	22	\$149,000					
14										
15										
16	Results					=LINEST(E3:E13,A3:D13,TRUE,TRUE)				
17	-234.2372	2553.2107	12529.7682	27.6414	52317.8305					
18	13.2680	530.6692	400.0668	5.4294	12237.3616					
19	0.9967	970.5785	#N/A	#N/A	#N/A					
20	459.7537	6.0000	#N/A	#N/A	#N/A					
21	1,732,393,319	5,652,135	#N/A	#N/A	#N/A					
22										
23										
24	Statistics									
25	m_4	m_3	m_2	m_1	c					
26	se_4	se_3	se_2	se_1	se_c					
27	r^2	se_y								
28	F	df								
29	SS_{reg}	SS_{resid}								

The A to Z of Excel Functions: LN

So you get bored one afternoon and decide it's time to sum the reciprocals of all of the factorial numbers:

$$e = \sum_{n=0}^{\infty} \frac{1}{n!} = \frac{1}{1} + \frac{1}{1} + \frac{1}{1 \cdot 2} + \frac{1}{1 \cdot 2 \cdot 3} + \dots$$

This constant is known as **Euler's number (e)** and is equal to the limit of $(1 + \frac{1}{n})^n$ as n approaches infinity, an expression that arises frequently in the study of compound interest. It is equal to

e = 2.71828 18284 59045 23536 02874 71352 66249 77572 47093 69995 95749 66967 62772 40766 30353 54759 45713 82178 52516 64274 27466 39193 20030 59921 81741 35966 29043 57290 03342 95260 59563 07381 32328 62794 34907 63233 82988 07531 95251 01901 15738 34187 93070 21540 89149 93488 41675 09244 76146 06680 82264 80016 84774 11853 74234 54424 37107 53907 77449 92069 55170 27618 38606 26133 13845 83000 75204 49338 26560 29760 67371 13200 70932 87091 27443 74704 72306 96977 20931 01416 92836 81902 55151 08657 46377 21112 52389 78442 50569 53696 77078 54499 69967 94686 44549 05987 93163 68892 30098 79312 77361 78215 42499 92295 76351 48220 82698 95193 66803 31825 28869 39849 64651 05820 93923 98294 88793 32036 25094 43117 30123 81970 68416 14039 70198 37679 32068 32823 76464 80429 53118 02328 78250 98194 55815 30175 67173 61332 06981 12509 96181 88159 30416 90351 59888 85193 45807 27386 67385 89422 87922 84998 92086 80582 57492 79610 48419 84443 63463 24496 84875 60233 62482 70419 78623 20900 21609 90235 30436 99418 49146 31409 34317 38143 64054 62531 52096 18369 08887 07016 76839 64243 78140 59271 45635 49061 30310 72085 10383 75051 01157 47704 17189 86106 87396 96552 12671 54688 95703 50354 02123 40784 98193 34321 06817 01210 05627 88023 51930 33224 74501 58539 04730 41995 77770 93503 66041 69973 29725 08868 76966 40355 57071 62268 44716 25607 98826 51787 13419 51246 65201 03059 21236 67719 43252 78675 39855 89448 96970 96409 75459 18569 56380 23637 01621 12047 74272 28364 89613 42251 64450 78182 44235 29486 36372 14174 02388 93441 24796 35743 70263 75529 44483 37998 01612 54922 78509 25778 25620 92622 64832 62779 33386 56648 16277 25164 01910 59004 91644 99828 93150 56604 72580 27786 31864 15519 56532 44258 69829 46959 30801 91529 87211 72556 34754 63964 47910 14590 40905 86298 49679 12874 06870 50489 58586 71747 98546 67757 57320 56812 88459 20541 33405 39220 00113 78630 09455 60688 16674 00169 84205 58040 33637 95376 45203 04024 32256 61352 78369 51177 88386 38744 39662 53224 98506 54995 88623 42818 99707 73327 61717 83928 03494 65014 34558 89707 19425 86398 77275 47109 62953 74152 11151 36835 06275 26023 26484 72870 39207 64310 05958 41166 12054 52970 30236 47254 92966 69381 15137 32275 36450 98889 03136 02057 24817 65851 18063 03644 28123 14965 50704 75102 54465 01172 72115 55194 86685 08003 68532 28183 15219 60037 35625 27944 95158 28418 82947 87610 85263 98139 55990 06737 64829 22443 75287 18462 45780 36192 98197 13991 47564 48826 26039 03381 44182 32625 15097 48279 87779 96437 30899 70388 86778 22713 83605 77297 88241 25611 90717 66394 65070 63304 52795 46618 55096 66618 56647 09711 34447 40160 70462 62156 80717 48187 78443 71436 98821 85596 70959 10259 68620 02353 71858 87485 69652 20005 03117 34392 07321 13908 03293 63447 97273 55955 27734 90717 83793 42163 70120 50054 51326 38354 40001 86323 99149 07054 79778 05669 78533 58048 96690 62951 19432 47309 95876 55236 81285 90413 83241 16072 26029 98330 53537 08761 38939 63917 79574 54016 13722 36187 89365 26053 81558 41587 18692 55386 06164 77983 40254 35128 43961 29460 35291 33259 42794 90433 72990 85731 58029 09586 31382 68329 14771 16396 33709 24003 16894 58636 06064 58459 25126 99465 57248 39186 56420 97526 85082 30754 42545 99376 91704 19777 80085 36273 09417 10163 43490 76964 23722 29435 23661 25572 50881 47792 23151 97477 80605 69672 53801 71807 76360 34624 59278 77846 58506 56050 78084 42115 29697 52189 08740 19660 90665 18035 16501 79250 46195 01366 58543 66327 12549 63990 85491 44200 01457 47608 19302 21206 60243 30096 41270 48943 90397 17719 51806 99086 99860 66365 83232 27870 93765 02260 14929 10115 17177 63594 46020 23249 30028 04018 67723 91028 80978 66605 65118 32600 43688 50881 71572 38669 84224 22010 24950 55188 16948 03221 00251 54264 94639 81287 36776 58927 68816 35983 12477 88652 01411 74110 91360 11649 95076 62907 79436 46005 85194 19985 60162 64790 76153 21038 72755 71269 92518 27568 79893 02761 76114 61625 49356 49590 37980 45838 18232 33686 12016 24373 65698 46703 78585 33052 75833 33793 99075 21660 69238 05336 98879 56513 72855 93883 49989 47074 16181 55012 53970 64648 17194 67083 48197 21448 88987 90676 50379 59036 69672 49499 25452 79033 72963 61626 58976 03949 85767 41397 35944 10237 44329 70935 54779 82629 61459 14429 36451 42861 71585 87339 74679 18975 71211 95618 73857 83644 75844 84235 55581

05002 56114 92391 51889 30994 63428 41393 60803 83091 66281 88115 03715 28496 70597 41625 62823 60921 68075 15017 77253 87402 56425
34708 79089 13729 17228 28611 51591 56837 25241 63077 22544 06337 87593 10598 26760 94420 32619 24285 31701 87817 72960 23541 30606
72136 04600 03896 61093 64709 51414 17185 77701 41806 06443 63681 54644 40053 31608 77831 43174 44081 19494 22975 59931 40118 88683
31483 28027 06553 83300 46932 90115 74414 75631 39997 22170 38046 17092 89457 90962 71662 26074 07187 49975 35921 27560 84414 73782
33032 70330 16823 71936 48002 17328 57349 35947 56433 41299 43024 85023 57322 14597 84328 26414 21684 87872 16733 67010 61509 42434
56984 40187 33128 10107 94512 72237 37886 12605 81656 68053 71439 61278 88732 52737 38903 92890 50686 53241 38062 79602 59303 87727
69778 37928 68409 32536 58807 33988 45721 87460 21005 31148 33513 23850 04782 71693 76218 00490 47955 97959 29059 16554 70505 77751
43081 75112 69898 51884 08718 56402 60353 05583 73783 24229 24185 62564 42550 22672 15598 02740 12617 97192 80471 39600 68916 38286
65277 00975 27670 69777 03643 92602 24372 84184 08832 51848 77047 26384 40379 53016 69054 65937 46161 93238 40363 89313 13643 27137
68884 10268 11219 89127 52230 56256 75625 47017 25086 34976 53672 88605 96675 27408 68627 40791 28565 76996 31378 97530 34660 61666
98042 18267 72456 05306 60773 89962 42183 40859 88207 18646 82623 21508 02882 86359 74683 96543 58856 68550 37731 31296 58797 58105
01214 91620 76567 69950 65971 53447 63470 32085 32156 03674 82860 83786 56803 07306 26576 33469 77429 56346 43716 70939 71930 60876
96349 53288 46833 61303 88294 31040 80029 68738 69117 06666 61468 00015 12114 34422 56023 87447 43252 50769 38707 77751 93299 94213
72772 11258 84360 87158 34835 62696 16619 80572 52661 22067 97540 62106 20806 49882 91845 43953 01529 98209 25030 05498 25704 33905
53570 16865 31205 26495 61485 72492 57386 20691 74036 95213 53373 25316 66345 46658 85972 86659 45113 64413 70331 39367 21185 69553
95210 84584 07244 32383 55860 63106 80696 49248 51232 63269 95146 03596 03729 72531 98368 42336 39046 32136 71011 61928 21711 15028
28016 04488 05880 23820 31981 49309 63695 96735 83274 20249 88245 68494 12738 60566 49135 25267 06046 23445 05492 27581 15170 93149
21879 59271 80019 40968 86698 68370 37302 20047 53143 38181 09270 80300 17205 93553 05207 00706 07223 39994 63990 57131 15870 99635
77735 90271 96285 06114 65148 37526 20956 53467 13290 02599 43976 63114 54590 26858 98979 11583 70934 19370 44115 51219 20117 16488
05669 45938 13118 38437 65620 62784 63104 90346 29395 00294 58341 16482 41149 69758 32601 18007 31699 43739 35069 66295 71241 02732
39138 74175 49230 71862 45454 32220 39552 73529 52402 45903 80574 45028 92246 88628 53365 42213 81572 21311 63288 11205 21464 89805
18009 20247 19391 71055 53901 13943 31668 15158 28843 68760 69611 02505 17100 73927 62385 55338 62725 53538 83096 06716 44662 37092
26468 09671 25406 18695 02143 17621 16681 40097 59528 14939 07222 60111 26811 53108 38731 76173 23235 26360 58381 73151 03459 57365
38223 53499 29358 22836 85100 78108 84634 34998 35184 04451 70427 01893 81994 24341 00905 75376 25776 75711 18090 08816 41833 19201
96262 34162 88166 52137 47173 25477 72778 34887 74366 51882 87521 56685 71950 63719 36565 39038 94493 66421 76400 31215 27870 22236
64636 35755 50356 55769 48886 54950 02708 53923 61710 55021 31147 41374 41061 34445 54419 21013 36172 99628 56948 99193 36918 47294
78580 72915 60885 10396 78195 94298 33186 48075 60836 79551 49663 64489 65592 94818 78517 84038 77332 62470 51945 05041 98477 42014
18394 77312 02815 88684 57072 90544 05751 06012 85258 05659 47030 46836 34459 26255 52137 00806 87520 09593 45360 73162 26118 72817
39280 74623 09468 53678 23106 09792 15993 60019 94623 79934 34210 68781 34973 46959 24646 97525 06246 95861 69091 78573 97659 51993
92993 99556 75427 14654 91045 68607 02099 01260 68187 04984 17807 91739 24071 94599 63230 60254 70790 17745 27513 18680 99822 84730
86076 65368 66855 51646 77029 11336 82756 31072 23346 72611 37054 90795 36583 45386 37196 23585 63126 18387 15677 41187 38527 72292
25947 43373 78569 55384 56246 80101 39057 27871 01651 29666 36764 45187 24656 53730 40244 36841 40814 48873 29578 47348 49000 30194
77888 02046 03246 60842 87535 18483 64959 19508 28883 23206 52212 81041 90448 04724 79492 91342 28495 19700 22601 31043 00624 10717
97150 27934 33263 40799 59605 31446 05323 04885 28972 91765 98760 16667 81193 79323 72453 85720 96075 82277 17848 33616 13582 61289
62261 18129 45592 74627 67137 79448 75867 53657 54486 14076 11931 12595 85126 55759 73457 30153 33642 63076 79854 43385 76171 53334
62325 27057 20053 03988 28949 90342 59566 23297 57824 88735 02925 91668 25894 45689 46559 92658 45476 26945 28780 51650 17206 74785
41788 79822 76806 53665 06419 10973 43452 88783 38621 72615 62695 82654 47820 56729 87756 42632 53215 94294 41803 99432 17000 09054
26507 63095 58846 58951 71709 14760 74371 36893 31946 90909 81904 50129 03070 95956 22662 03031 82649 36573 36984 19555 77696 37876
24918 85286 56866 07600 56602 56054 45711 33728 68402 05574 41603 08370 52312 24258 72234 38854 12317 94813 88550 07568 93811 24935
38631 86352 87083 79984 56926 19981 79452 33640 87429 59118 07474 53419 55142 03517 26184 20084 55091 70845 68236 82008 97739 45584
26792 14273 47756 08796 44279 20270 83121 50156 40634 13416 17166 44806 98154 83764 49157 39001 21217 04154 78725 91998 94382 53649
50514 77137 93991 47205 21952 90793 96137 62110 72384 94290 61635 76045 96231 25350 60685 37651 42311 53496 65683 71511 66042 20796
39446 66211 63255 15772 90709 78473 15627 82775 98788 13649 19512 57483 32879 37715 71459 09106 48416 42678 30994 97236 74420 17586
22694 02159 40792 44805 41255 36043 13179 92696 73915 75424 19296 60731 23937 63542 13923 06178 76753 95871 14361 04089 40996 60894
71418 34069 83629 93675 36262 15452 47298 46421 37528 91079 88438 13060 95552 62272 08375 18629 83706 67872 24430 19579 37937 86072
10725 42772 89071 73285 48743 74355 78196 65117 16618 33088 11291 20245 20404 86822 00072 34403 50254 48202 83425 41878 84653 60259
15064 45271 65770 00445 21097 73558 58976 22655 48494 16217 14989 53238 34216 00114 06295 07184 90427 78925 85527 43035 22139 68356
79018 07640 60421 38307 30877 44601 70842 68827 22611 77180 84266 43336 51780 00217 19034 49234 26426 62922 61456 00433 73838 68335
55534 34530 04264 81847 39892 15627 08609 56506 29340 40526 49432 44261 44566 59212 91225 64889 35696 55009 15430 64261 34252 66847
25949 14314 23939 88454 32486 32746 18428 46655 98533 23122 10466 25989 01417 12103 44608 42716 16619 00125 71958 70793 21756 96985
44013 39762 20967 49454 18540 71184 46433 94699 01626 98351 60784 89245 14058 94094 63952 67807 35457 97003 07051 16368 25194 87701
18976 40028 27648 41416 05872 06184 18529 71891 54019 68825 32893 09149 66534 57535 71427 31848 20163 84644 83249 90378 86069 00807
27093 27673 12758 19665 63941 14896 17168 32980 45513 97295 06687 60474 09154 20428 42999 35410 25829 11350 22416 90769 43166 85742
42522 50902 69390 34814 85645 13030 69925 19959 04363 84028 42926 74125 73422 44776 55841 77886 17173 72654 62085 49829 44989 46787
35092 95816 52632 07225 89923 68768 45701 78230 38096 56788 31122 89305 80914 05726 10865 88484 58731 01658 15116 75333 27674 88701
48291 67419 70151 25597 82572 70740 64318 08601 42814 90241 46780 47232 75976 84269 63393 57735 42930 18673 94397 16388 61176 42090
04068 66339 88568 41681 00387 23892 14483 17607 01166 84503 88721 23643 67043 31409 11557 33280 18297 79887 36590 91665 96124 02021
77855 88548 76176 16198 93707 94380 05666 33648 84365 08914 48055 71039 76521 46960 27662 58359 90519 87042 30017 94655 3679 ...

courtesy of University of Utah

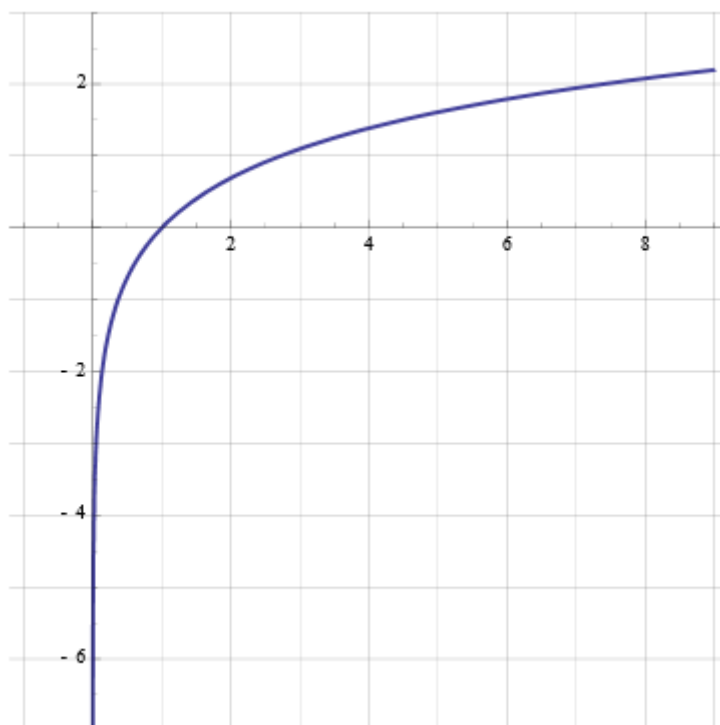
You should learn this. It will make you much more desirable at parties.

Like π , e is transcendental: it is not a root of any non-zero polynomial with rational coefficients, but it is a very powerful number in the world of mathematics. Bizarrely, this constant was not discovered by Swiss mathematician Leonhard Euler, but rather by his compatriot, Jacob Bernoulli, while studying compound interest. If it had been named after the latter, *blog* (rather than \log_e) might mean something entirely different...

The natural logarithm of a number is its logarithm to the base of said constant e . The **natural logarithm** of x is generally written as $\ln x$ (where n is after John Napier, the discoverer of logarithms and the “natural” base, e , is also referred to as Napier’s constant) or less frequently, $\log_e x$.

The natural logarithm of x is the power to which e would have to be raised to equal x . For example, $\ln 7.5$ is 2.0149..., because $e^{2.0149...} = 7.5$. The natural logarithm of e itself, $\ln e$, is 1, because $e^1 = e$, whilst the natural logarithm of 1 is 0, since $e^0 = 1$.

The function slowly grows to positive infinity as x increases and slowly goes to negative infinity as x approaches 0 ("slowly" as compared to any power law of x); the y -axis is an asymptote, viz.



The LN function employs the following syntax to operate:

LN(number)

The LN function has the following arguments:

- **number**: this is required and represents the positive real number for which you want the natural logarithm.

It should be further noted that:

- LN is the inverse of EXP, the natural exponential of **number**.

Please see our example below:

	A	B	C
1	Formula	Description	Result
2	=LN(67)	Natural logarithm of 67	4.204693
3	=LN(2.7182818)	Natural logarithm of Euler's constant e	1
4	=LN(EXP(10))	Natural logarithm of e raised to the power 10 (demonstration of EXP being the inverse of LN)	10
5	=LN(0)	Demonstration that the natural logarithm of a non-positive real number leads to an #NUM! error	#NUM!
6			

The A to Z of Excel Functions: LOG



Logarithm is a term coined by Scottish mathematician John Napier (1550-1617), from the Greek word *logos* meaning "proportion, ratio or word" and *arithmos* meaning "number", which therefore roughly translates to "ratio-number".

For a given base, a logarithm states the power that the base must be raised to for a given number, e.g.

$$5 = 5 = 5^1 \Leftrightarrow \log_5 5 = 1$$

$$25 = 5 \times 5 = 5^2 \Leftrightarrow \log_5 25 = 2$$

$$125 = 5 \times 5 \times 5 = 5^3 \Leftrightarrow \log_5 125 = 3$$

$$1 = 5^0 \Leftrightarrow \log_5 1 = 0$$

$$0.2 = \frac{1}{5} = 5^{-1} \Leftrightarrow \log_5 0.2 = -1$$

$$0.04 = \frac{1}{5} \times \frac{1}{5} = 5^{-2} \Leftrightarrow \log_5 0.04 = -2$$

Therefore,

$$y = a^b \Leftrightarrow \log_a y = b$$

$$y = \frac{a^b}{a^c} = a^{b-c} \Leftrightarrow \log_a y = b - c$$

$$y = a^b \cdot a^c \Leftrightarrow \log_a y = b + c$$

$$y = c^n \Leftrightarrow \log_a c^n = n \log_a c$$

The **LOG** function returns the logarithm of a number to the base you specify. Its syntax is given by

LOG(number, [base])

The **LOG** function has the following arguments:

- **number**: this is required and represents the positive real number for which you wish to determine the logarithm
- **base**: this argument is optional and denotes the base of the logarithm. If it is omitted, the **base** is assumed to be 10.

Please see our penultimate example below:

	A	B	C
1	Formula	Description	Result
2	=LOG(10)	Logarithm of 10. Since the second argument (base) is omitted, it is assumed to be 10. The result, 1, is the power to which the base must be raised to equal 10.	1
3	=LOG(27,3)	Logarithm of 27, with base 3. The result, 3, is the power to which the base must be raised to equal 27	3
4	=LOG(0.125,2)	Logarithm of 0.125, with base 2. The result, -3, is the power to which the base must be raised to equal 0.125	-3
5	=LOG(0)	Demonstration that the logarithm of a non-positive real number leads to an #NUM! error	#NUM!

The A to Z of Excel Functions: LOG10

AND IF ANY NUMBER OF EQUALS TO A FIRST
SINE BE MULTIPLIED TOGETHER PRODUCING
A SECOND, JUST SO MANY EQUALS TO THE
LOGARITHM OF THE FIRST ADDED TOGETHER
PRODUCE THE LOGARITHM OF THE SECOND.

- JOHN NAPIER -

For a given base, a logarithm states the power that the base must be raised to for a given number, e.g.

$$10 = 10 = 10^1 \Leftrightarrow \log_{10}10 = 1$$

$$100 = 10 \times 10 = 10^2 \Leftrightarrow \log_{10}100 = 2$$

$$1,000 = 10 \times 10 \times 10 = 10^3 \Leftrightarrow \log_{10}1,000 = 3$$

$$1 = 10^0 \Leftrightarrow \log_{10}1 = 0$$

$$0.1 = \frac{1}{10} = 10^{-1} \Leftrightarrow \log_{10}0.1 = -1$$

$$0.01 = \frac{1}{10} \times \frac{1}{10} = 10^{-2} \Leftrightarrow \log_{10}0.01 = -2$$

Therefore,

$$y = a^b \Leftrightarrow \log_a y = b$$

$$y = \frac{a^b}{a^c} = a^{b-c} \Leftrightarrow \log_a y = b - c$$

$$y = a^b \cdot a^c \Leftrightarrow \log_a y = b + c$$

$$y = c^n \Leftrightarrow \log_a c^n = n \log_a c.$$

The **LOG10** function is not the ninth sequel of the **LOG** function, but rather it returns the base 10 logarithm of a number you specify. Its syntax is given by

LOG10(number)

The **LOG10** function has the following argument:

- **number:** this is required and represents the positive real number for which you wish to determine the base 10 logarithm.

Please see our final example below:

	A	B	C
1	Formula	Description	Result
2	=LOG10(10)	Logarithm of 10. Since the second argument (base) is omitted, it is assumed to be 10. The result, 1, is the power to which the base must be raised to equal 10.	1
3	=LOG10(10000)	Base 10 logarithm of 10,000. The result, 4, is the power to which 10 must be raised to equal 10,000	4
4	=LOG10(0.001)	Base 10 logarithm of 0.001. The result, -3, is the power to which t19 must be raised to equal 0.001	-3
5	=LOG10(0)	Demonstration that the logarithm of a non-positive real number leads to an #NUM! error	#NUM!

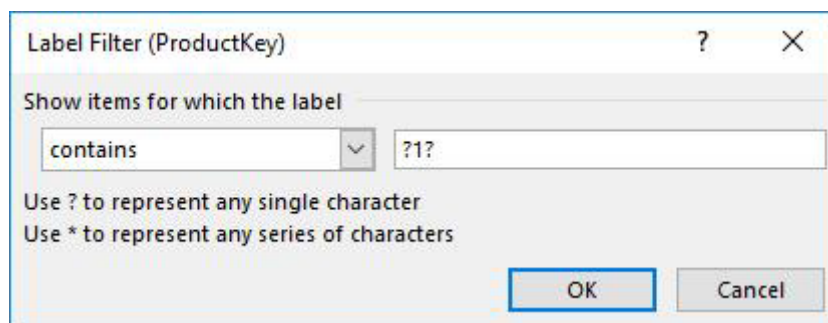
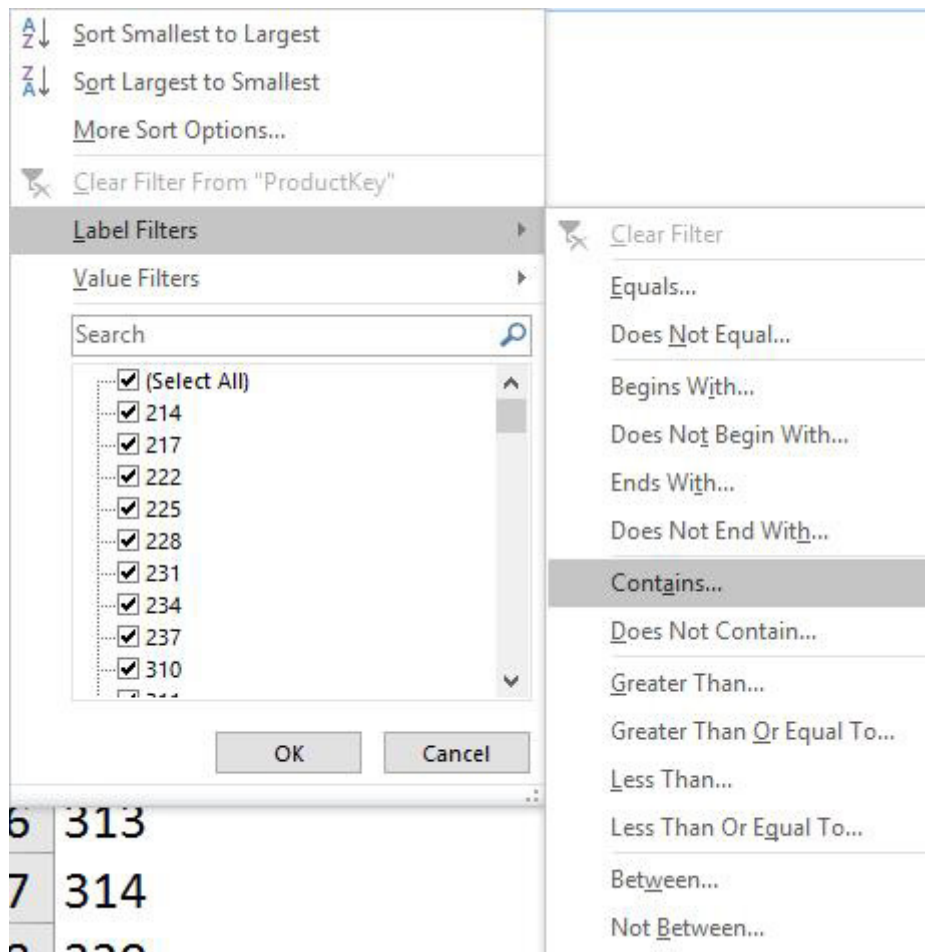
More Excel Functions next month.

Beat the Boredom Suggested Solution

Earlier in this newsletter, we asked you filter the following report so that only values with a '1' as the middle digit were to be reported from a PivotTable.

Sum of SalesAmount	Column Labels				
Row Labels	2001	2002	2003	2004	Grand Total
214			31,421.02	46,606.68	78,027.70
217			31,176.09	41,778.06	72,954.15
222			29,986.43	44,367.32	74,353.75
225			7,956.15	11,731.95	19,688.10
228			7,448.51	13,997.20	21,445.71
231			8,348.33	13,747.25	22,095.58
234			9,498.10	13,097.38	22,595.48
237			8,848.23	11,797.64	20,645.87
310	593,992.82	608,305.90			1,202,298.72
311	500,957.80	504,536.07			1,005,493.87
312	547,475.31	658,401.68			1,205,876.99
313	472,331.64	608,305.90			1,080,637.54
314	486,644.72	568,944.93			1,055,589.65

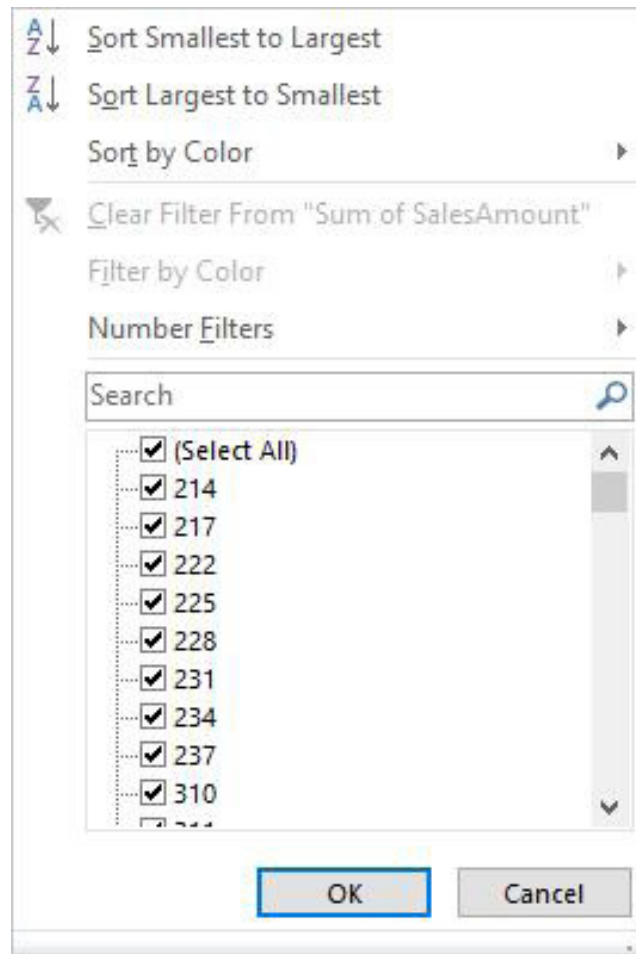
This challenge might seem trivial to experienced users – but bear with us. Usually, you can just use the Labels filter, viz.



By using the “?” delimiter, we can specify that we want any single character, followed by a ‘1’, followed by another single character, to get our final filtered result:

Sum of SalesAmount	Column Labels	2001	2002	2003	2004	Grand Total
Row Labels						
214				31,421.02	46,606.68	78,027.70
217				31,176.09	41,778.06	72,954.15
310		593,992.82	608,305.90			1,202,298.72
311		500,957.80	504,536.07			1,005,493.87
312		547,475.31	658,401.68			1,205,876.99
313		472,331.64	608,305.90			1,080,637.54
314		486,644.72	568,944.93			1,055,589.65
Grand Total		2,601,402.29	2,948,494.48	62,597.11	88,384.74	5,700,878.62

This may have seemed to be the obvious solution to people who have used text labels in the past, and the nice thing is that you can apply this logic to numerical values as well as text ones. However, what makes this challenging sometimes is that the Label Filter isn't an available option:



This can happen in the following instance. One of the tricks that you can do in Excel is to put what is commonly known as an AutoFilter (now just called 'Filter', found in the 'Sort & Filter' group of the Data tab) onto a PivotTable. This allows you to filter the results of the PivotTable, which isn't normally possible using the standard filter options.

However, doing this results in the normal PivotTable row filters being overridden by the 'Sort & Filter' filter, which is why we can sometimes 'filter by color' (colour for those of us who spell English correctly!), which we normally wouldn't be able to do in a PivotTable.

Therefore, in this instance, to solve the problem it's as simple as

removing the filter from the table, and the PivotTable filters are restored and can be used again.

Fun fact: if you need to keep the Filter in place, but you still want to use the Label Filter, then let me introduce you to a useful shortcut. **ALT + Down Arrow** can generally be used in Excel to pull open dropdown lists, which include filter dropdown menus. Interestingly, even though clicking on the arrow will open the Filter menu, using the shortcut will firstly pull open the PivotTable filter menu first, and only once that's cancelled or activated, will it then open the Filter menu.

Until next month.

Upcoming SumProduct Training Courses - COVID-19 update

Due to the COVID-19 pandemic that is currently spreading around the globe, we are suspending our in-person courses until further notice. However, to accommodate the new working-from-home dynamic, we are switching our public and in-house courses to an online delivery stream, presented via Microsoft Teams, with a live presenter running through the same course material, downloadable workbooks to complete the hands-on exercises during the training session, and a recording of the sessions for

your use within 1 month for you to refer back to in the event of technical difficulties. To assist with the pacing and flow of the course, we will also have a moderator who will help answer questions during the course.

If you're still not sure how this will work, please contact us at training@sumproduct.com and we'll be happy to walk you through the process.

Location	Course	Date	Date	Duration	Duration
Online (Australia)	Power Pivot, Power Query and Power BI	15 - 17 Aug 2023	09:00-17:00 AEST	(-1 day) 23:00-17:00 GMT	3 Days
Online (Australia)	Excel Tips and Tricks	11 Sep 2023	09:00-17:00 AEST	(-1 day) 23:00-17:00 GMT	1 Day
Online (Australia)	Financial Modelling	12 - 13 Sep 2023	09:00-17:00 AEST	(-1 day) 23:00-17:00 GMT	2 Days
Online (Australia)	Power Pivot, Power Query and Power BI	22 - 24 Nov 2023	09:00-17:00 AEDT	(-1 day) 22:00-17:00 GMT	3 Days
Online (Australia)	Excel Tips and Tricks	5 Dec 2023	09:00-17:00 AEDT	(-1 day) 22:00-17:00 GMT	1 Day
Online (Australia)	Financial Modelling	6 - 7 Dec 2023	09:00-17:00 AEDT	(-1 day) 22:00-17:00 GMT	2 Days

Key Strokes

Each newsletter, we'd like to introduce you to useful keystrokes you may or may not be aware of. This month, we start with the A, B, Cs of it all...

Keystroke	What it does
CTRL + <u>A</u> dd (+)	Open 'Insert' dialog
<u>B</u> ackspace	Edit and clear
ALT + <u>B</u> ackspace	Undo
CTRL + <u>B</u> ackspace	Scroll to show active cell
SHIFT + <u>B</u> ackspace	Collapse section to the active cell
ALT + <u>C</u> lick	Open Research pane

There are c.550 keyboard shortcuts in Excel. For a comprehensive list, please download our Excel file at www.sumproduct.com/thought/keyboard-shortcuts. Also, check out our new daily **Excel Tip of the Day** feature on the www.sumproduct.com homepage.

Our Services

We have undertaken a vast array of assignments over the years, including:

- **Business planning**
- **Building three-way integrated financial statement projections**
- **Independent expert reviews**
- **Key driver analysis**
- **Model reviews / audits for internal and external purposes**
- **M&A work**
- **Model scoping**
- **Power BI, Power Query & Power Pivot**
- **Project finance**
- **Real options analysis**
- **Refinancing / restructuring**
- **Strategic modelling**
- **Valuations**
- **Working capital management**

If you require modelling assistance of any kind, please do not hesitate to contact us at contact@sumproduct.com.

Link to Others

These newsletters are not intended to be closely guarded secrets. Please feel free to forward this newsletter to anyone you think might be interested in converting to "the SumProduct way".

If you have received a forwarded newsletter and would like to receive future editions automatically, please subscribe by completing our newsletter registration process found at the foot of any www.sumproduct.com web page.

Any Questions?

If you have any tips, comments or queries for future newsletters, we'd be delighted to hear from you. Please drop us a line at newsletter@sumproduct.com.

Training

SumProduct offers a wide range of training courses, aimed at finance professionals and budding Excel experts. Courses include Excel Tricks & Tips, Financial Modelling 101, Introduction to Forecasting and M&A Modelling.

Check out our more popular courses in our training brochure:



Drop us a line at training@sumproduct.com for a copy of the brochure or download it directly from www.sumproduct.com/training.

Sydney Address: SumProduct Pty Ltd, Suite 803, Level 8, 276 Pitt Street, Sydney NSW 2000
New York Address: SumProduct Pty Ltd, 48 Wall Street, New York, NY, USA 10005
London Address: SumProduct Pty Ltd, Office 7, 3537 Ludgate Hill, London, EC4M 7JN, UK
Melbourne Address: SumProduct Pty Ltd, Ground Floor, 470 St Kilda Road, Melbourne, VIC 3004
Registered Address: SumProduct Pty Ltd, Level 14, 440 Collins Street, Melbourne, VIC 3000

contact@sumproduct.com
www.sumproduct.com
 +61 3 9020 2071