ADDO
ALL DAY DEVOPS

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Julie Koesmarno (t: @MsSQLGirl | MsSQLGirl.com)

From Oops to Ops: Incident Response with Jupyter Notebooks

Julie Koesmarno

@MsSQLGirl | MsSQLgirl.com

Bringing value to data and insights through experiences users love

Principal Program Manager
at Microsoft

From Oops to Ops: Incident Response with Jupyter Notebooks

What if you can apply software engineering practices to your troubleshooting guides (TSGs) / knowledge base for your team's on-call or for your customers? What if you can reduce stress and mistakes in your incident response workflow and activate a more scientific approach?

Join this session to learn more about TSG Ops framework using Jupyter Notebook for executable and automatable troubleshooting guides / knowledge base. TSG Ops innovates incident response approach by applying software engineering practice in curating TSGs and activating our scientific approach when troubleshooting. We will share our learnings and our journey in implementing TSG Ops using open source technology, internally in Azure Data and externally for our Azure Data customers.

Slide deck / session notes

Our Learning Journey Today

1. Incident Response – why is it hard (to scale)?
2. Re-framing our approach to troubleshooting guides: software artefacts & Jupyter Notebooks
3. Implementation: Executable, reusable & automatable troubleshooting guides
4. Takeaways and other resources

"TSG"

TSG = Troubleshooting Guide
SOP = Standard Operating Procedure

Playbook = steps to identify issues
Runbook = procedures to achieve specific outcome

KB = Knowledge Base

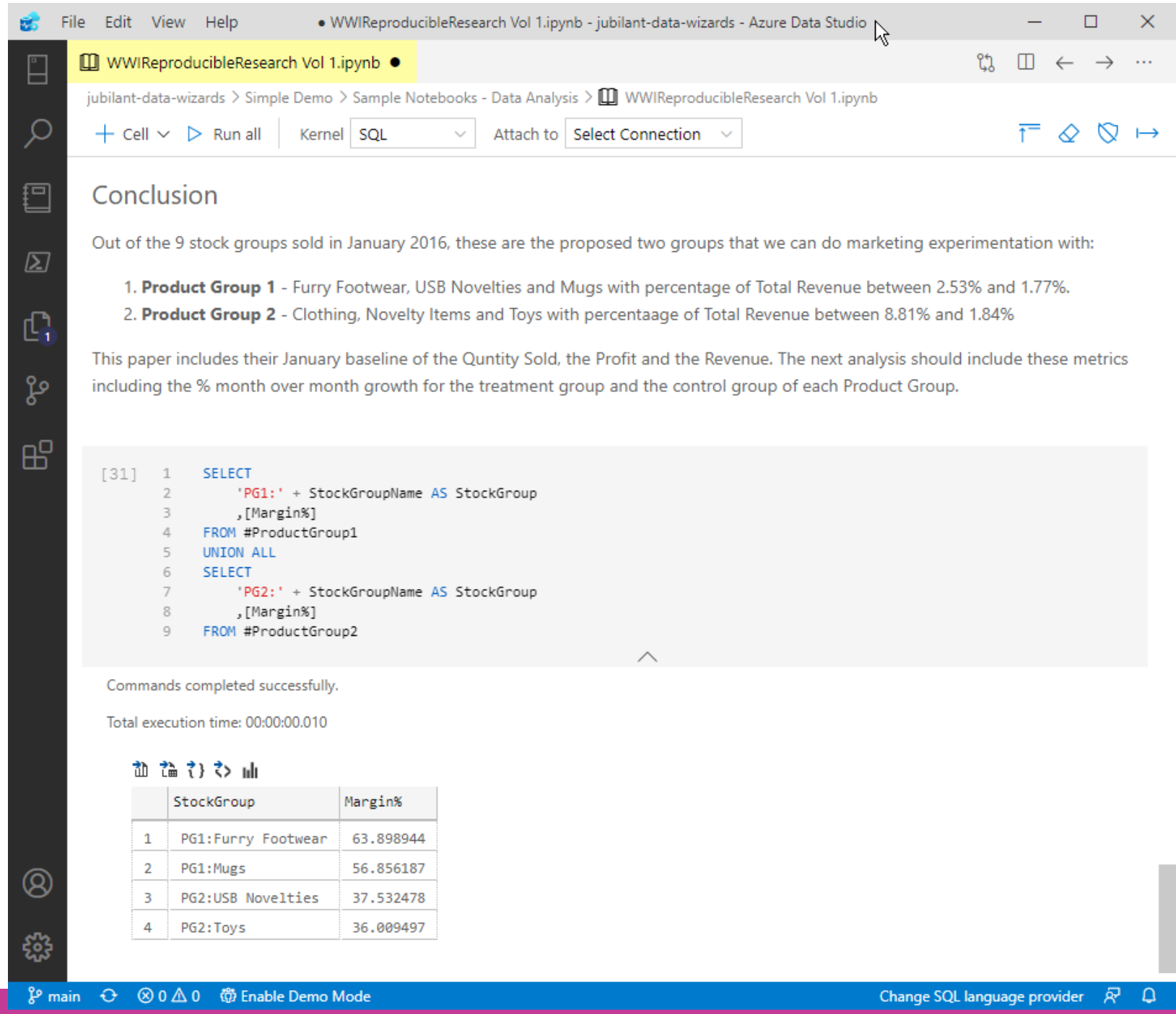
Learn more about notebooks

New to Jupyter Notebooks?

Watch Julie's Jupyter Notebooks for the Mere Mortals
youtu.be/-akGNOsaMg0

New to parameterized Notebooks?

Watch Aaron's Parameterization in Azure Data Studio (for PowerShell)
youtu.be/5DDeSb-mHP0



1. Incident Response – why is it so hard (to scale)?

Where do you store your TSGs today?

One Note?

Wiki?

Secure?

PDFs?

Word documents?

Confidential?

Scripts?

Local folder?

Permission?

SharePoint?

Source control?

Recoverable?

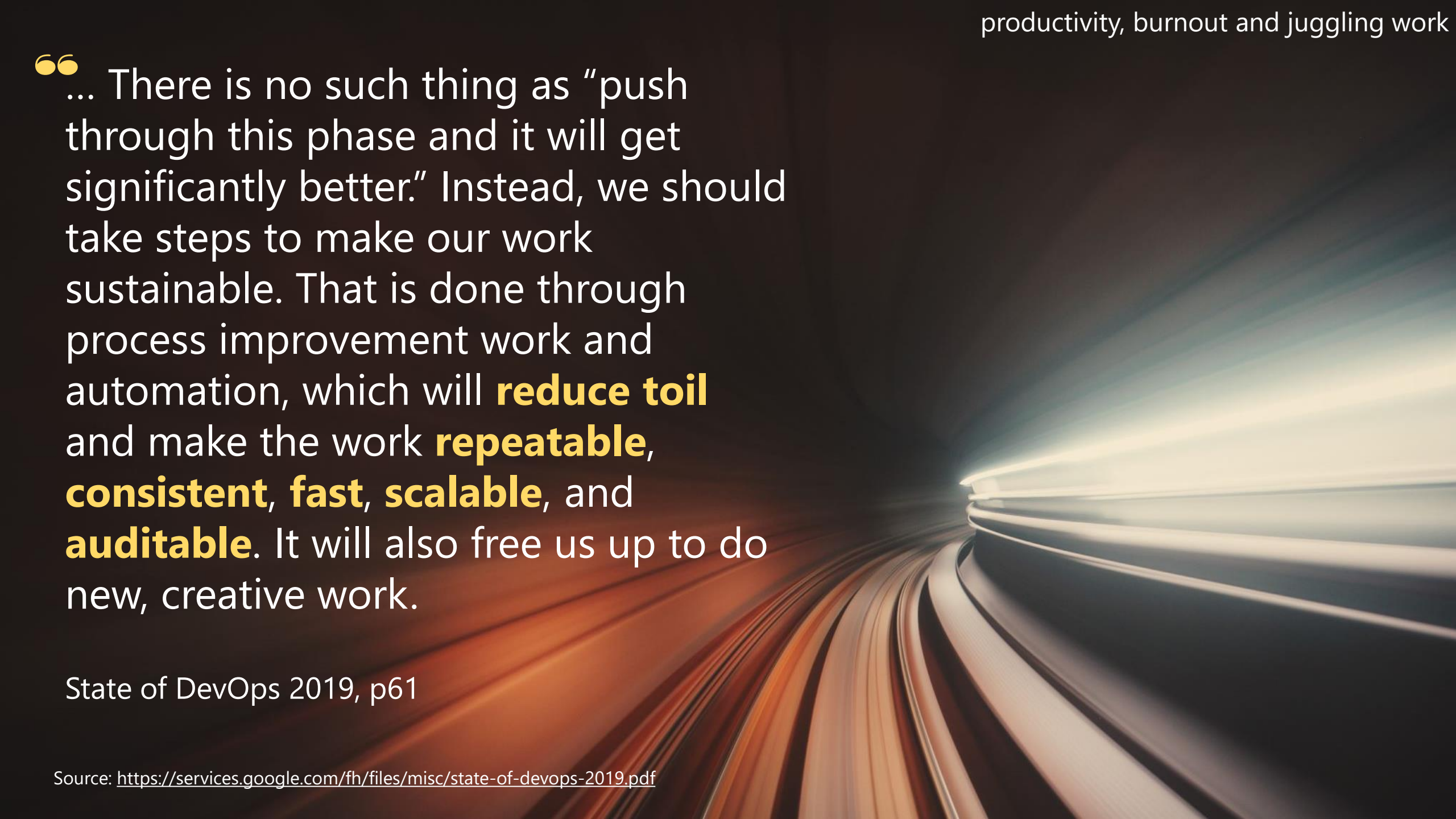
Network drive?


Ctrl C + Ctrl V
Toil! Subtle but can be erroneous

Troubleshooting Guides in the closet!

Challenges:

1. Static text in OneNote / wiki resulting in copy and paste code to execute
2. Discoverability - siloed TSG scripts
3. No version control to keep track quality
4. Sharing code and results with context is hard to do with OneNote or text files
5. Hard to crowd source code
6. Hard to search
7. Not reusable
8. Not automatable



> … There is no such thing as "push through this phase and it will get significantly better." Instead, we should take steps to make our work sustainable. That is done through process improvement work and automation, which will **reduce toil** and make the work **repeatable**, **consistent**, **fast**, **scalable**, and **auditable**. It will also free us up to do new, creative work.

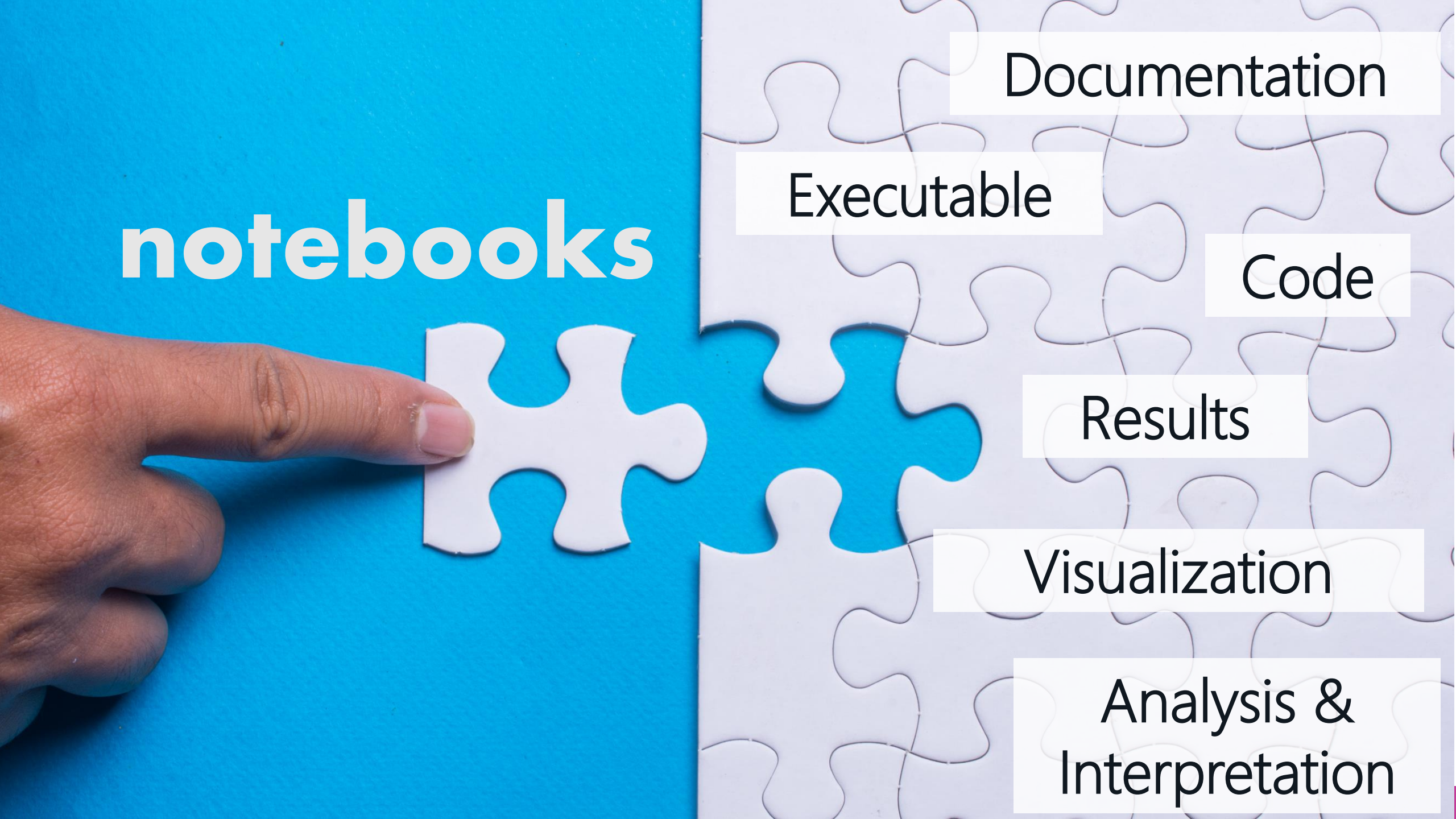
State of DevOps 2019, p61

Source: https://services.google.com/fh/files/misc/state-of-devops-2019.pdf

2. Re-framing our approach to troubleshooting guides: software artefacts & Jupyter Notebooks

Troubleshooting Guides as
software artefacts

executable
reusable
automatable


notebooks
Documentation
Executable
Code
Results
Visualization
Analysis &
Interpretation

Jupyter Notebook

Jupyter Notebook open source format

Jupyter Notebook dev tools – examples:
- Azure Data Studio
- VSCode
- Jupyter Lab

Jupyter Notebook viewers – examples:
- GitHub native notebook viewer
- Azure DevOps Jupyter Preview

Azure Data Studio

Modern data experiences, multi data-platforms
SQL: SQL Server, PostgreSQL, Azure SQL Edge, Azure SQL*
KQL: Azure Data Explorer
Environment: On-premises, poly-cloud

Client tool on multi-platforms: Windows, Linux, macOS

Extensible tool

Git support

Jupyter Notebook experiences

... and more ...

http://aka.ms/getAzureDataStudio

Notebooks as TSGs

Bring engineering discipline to incident response content

Notebooks can be checked into GIT repos to provide version control

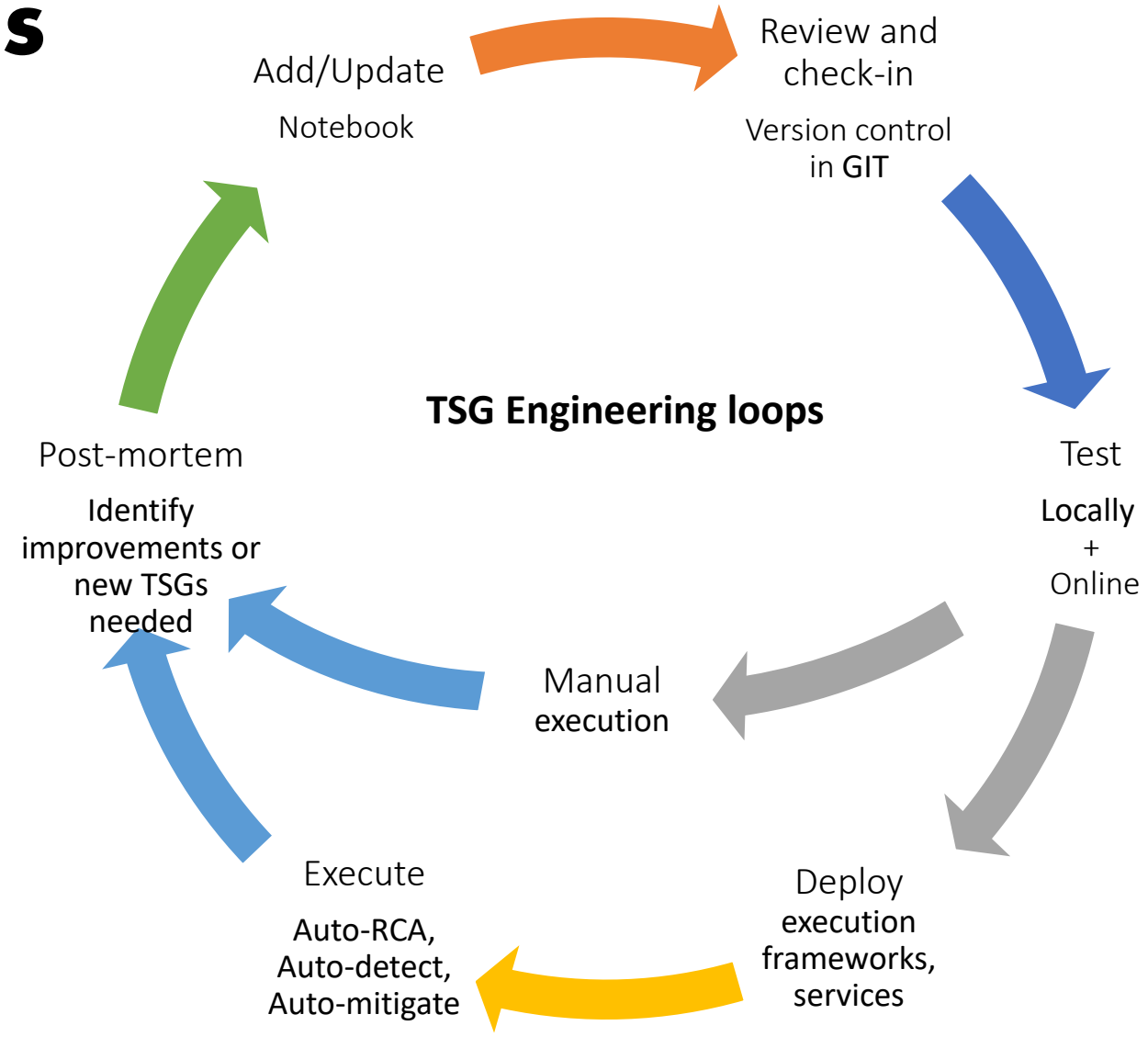
Review, test, deploy, similar to code

A simple system, with flexibility to create once and use everywhere

Notebooks can be shared easily

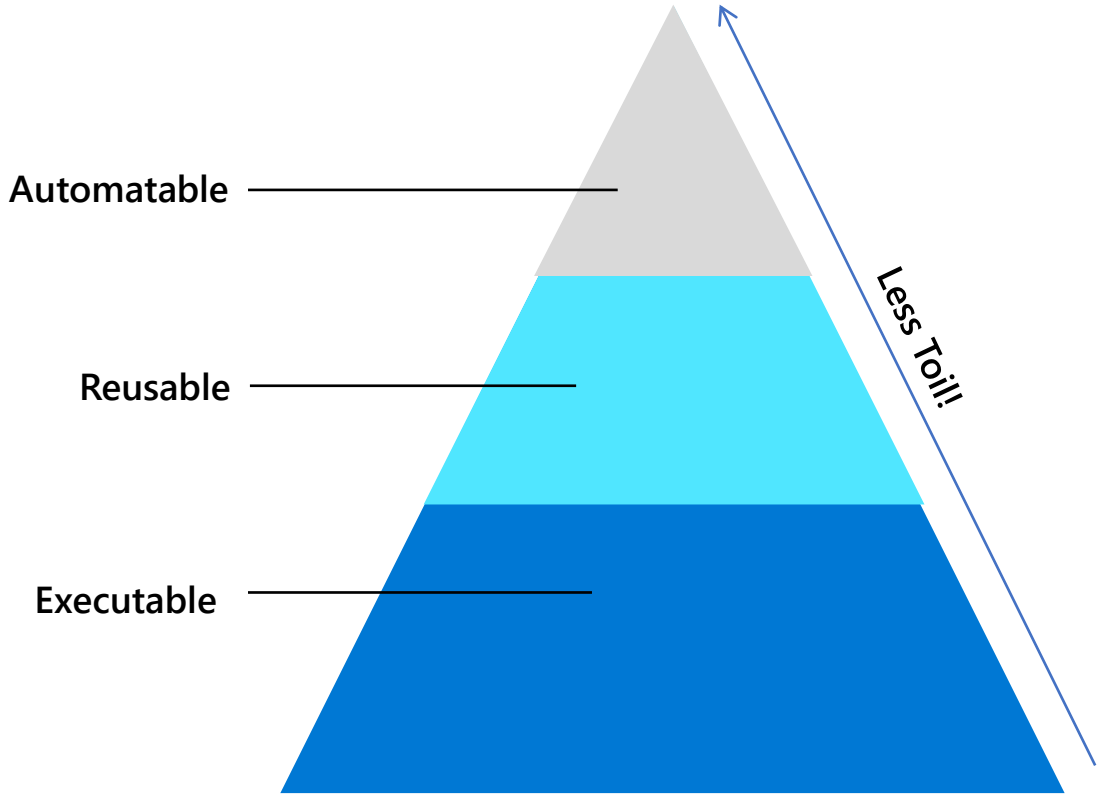
Notebooks inherently record every step executed with results/failures

A repeatable environment for debugging and investigation



3. Implementation: Executable, reusable & automatable troubleshooting guides

Notebooks – executable & beyond



Executable
Can be run on a UI

Reusable
Can be parameterized

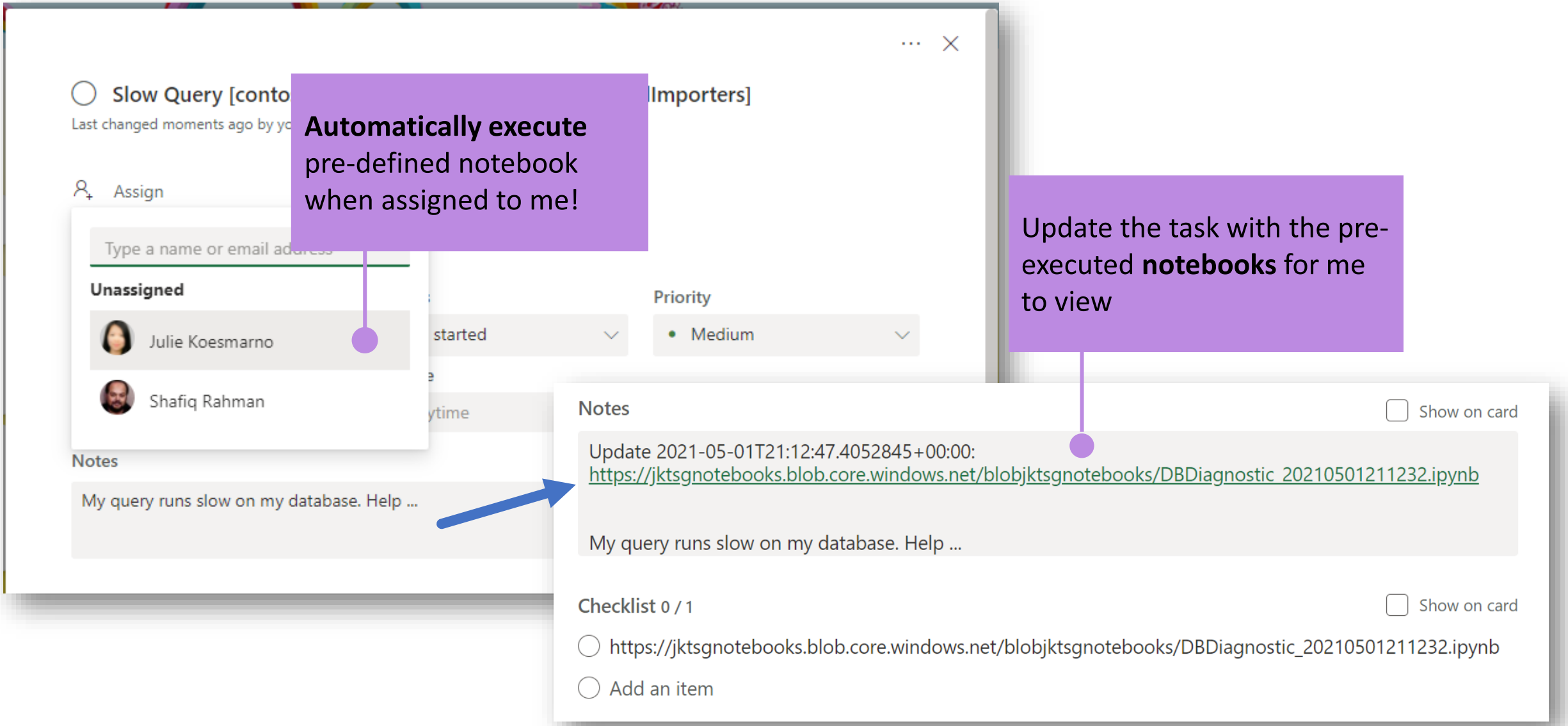
Automatable
Can be run in command-line (no UI needed)

- Use Invoke-SqlNotebook to run SQL notebooks via PowerShell
- Use Invoke-ExecuteNotebook to run PowerShell notebooks via PowerShell
- Use Papermill for Python notebooks via Python

What can we automate?

1. Diagnosis / Root Cause Analysis (RCA)
2. Detection and mitigation

A simple demo to illustrate a Support Case System with automated TSG execution



Email with link to pre-executed notebook and the task

Slow Query [jukoesmasqldb.database.windo

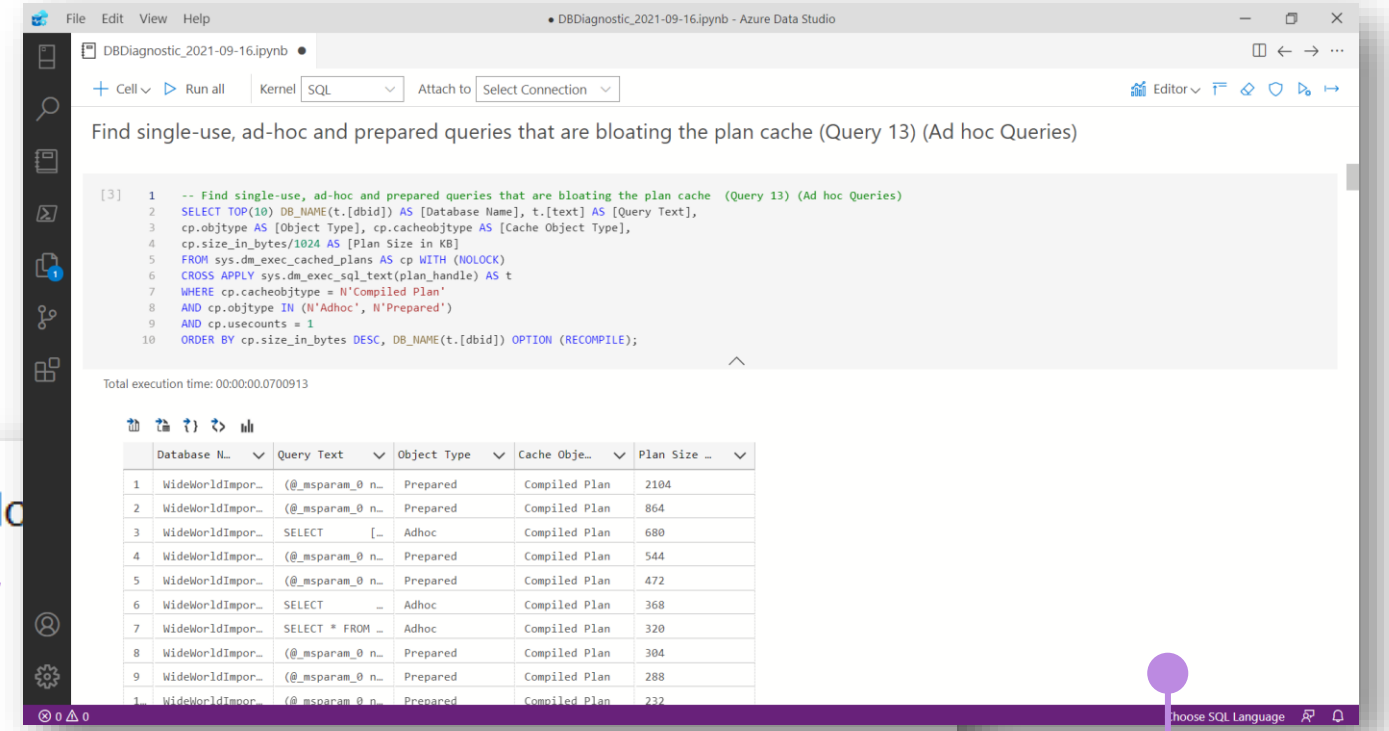
Cat-toso 'Sup-Bot

To Julie Koesmarno

This message was sent with Low importance.

Diagnostics output (TSG Notebook): Click to view in Azure Data Studio

Link to Planner: Slow Query [jukoesmasqldb.database.windows.net][WideWorldImporters]



Open the pre-executed notebook in **Azure Data Studio**

DemoTSGWorkflow

Logic app

Search (Ctrl+/)

Overview
Activity log
Access control (IAM)
Tags
Diagnose and solve problems

Development Tools

Logic app designer
Logic app code view
Versions
API connections
Quick start guides

Settings

Workflow settings
Authorization

Run Trigger | Refresh | Edit | Delete | Disable | Update Schema | Clone | Open in mobile | Export

Edit

Introducing the new portable Logic Apps runtime that supports local development and debugging. Click to learn more. →

Essentials

View Cost | JSON View

Resource group (change)
jukoesma_exe_rg

Location
West US 2

Subscription (change)

Subscription ID

Definition
1 trigger, 5 actions

Status
Enabled

Runs last 24 hours
5 successful, 2 failed

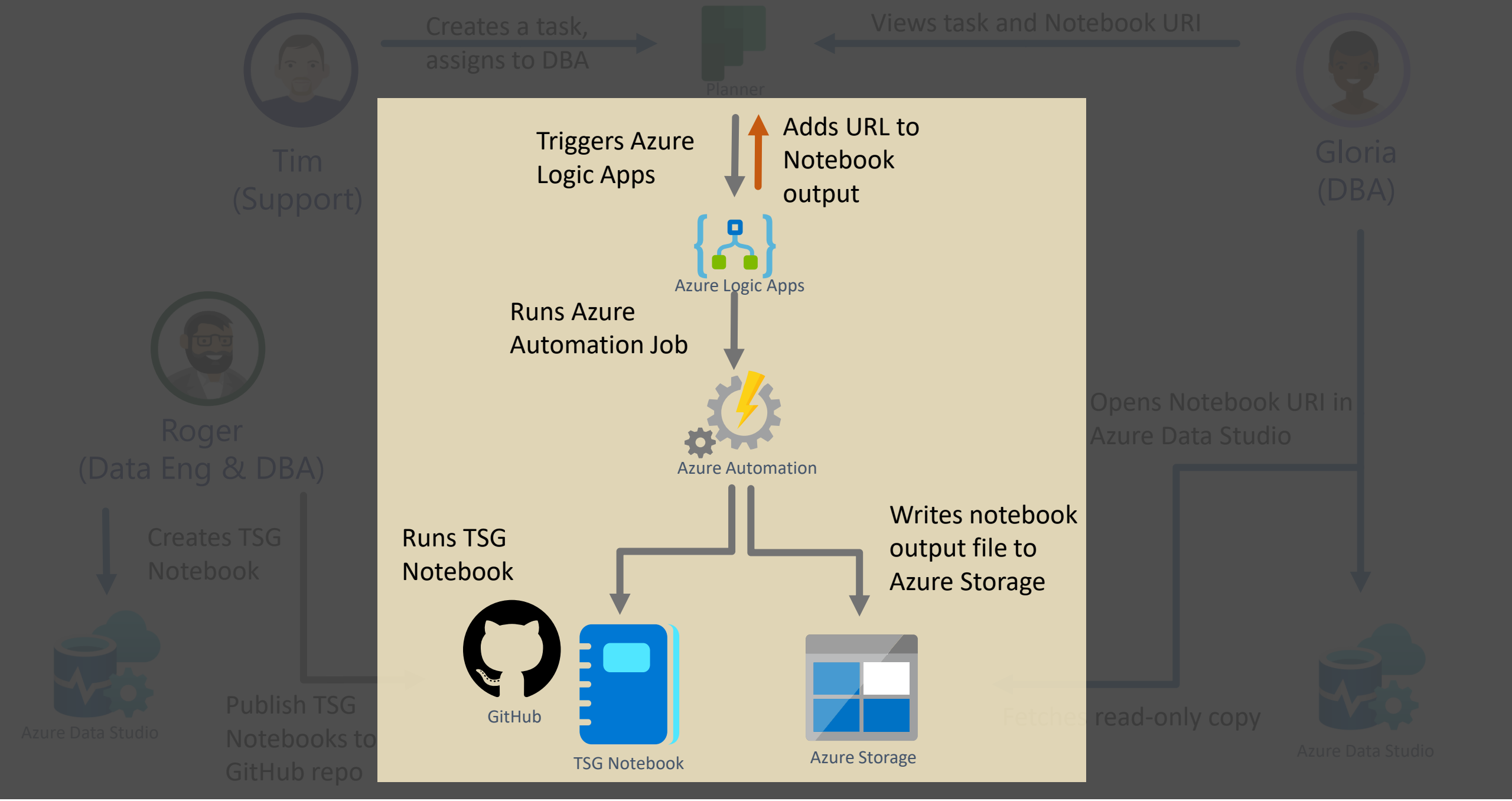
Integration Account
-- --

Get started | Runs history | Trigger history | Metrics

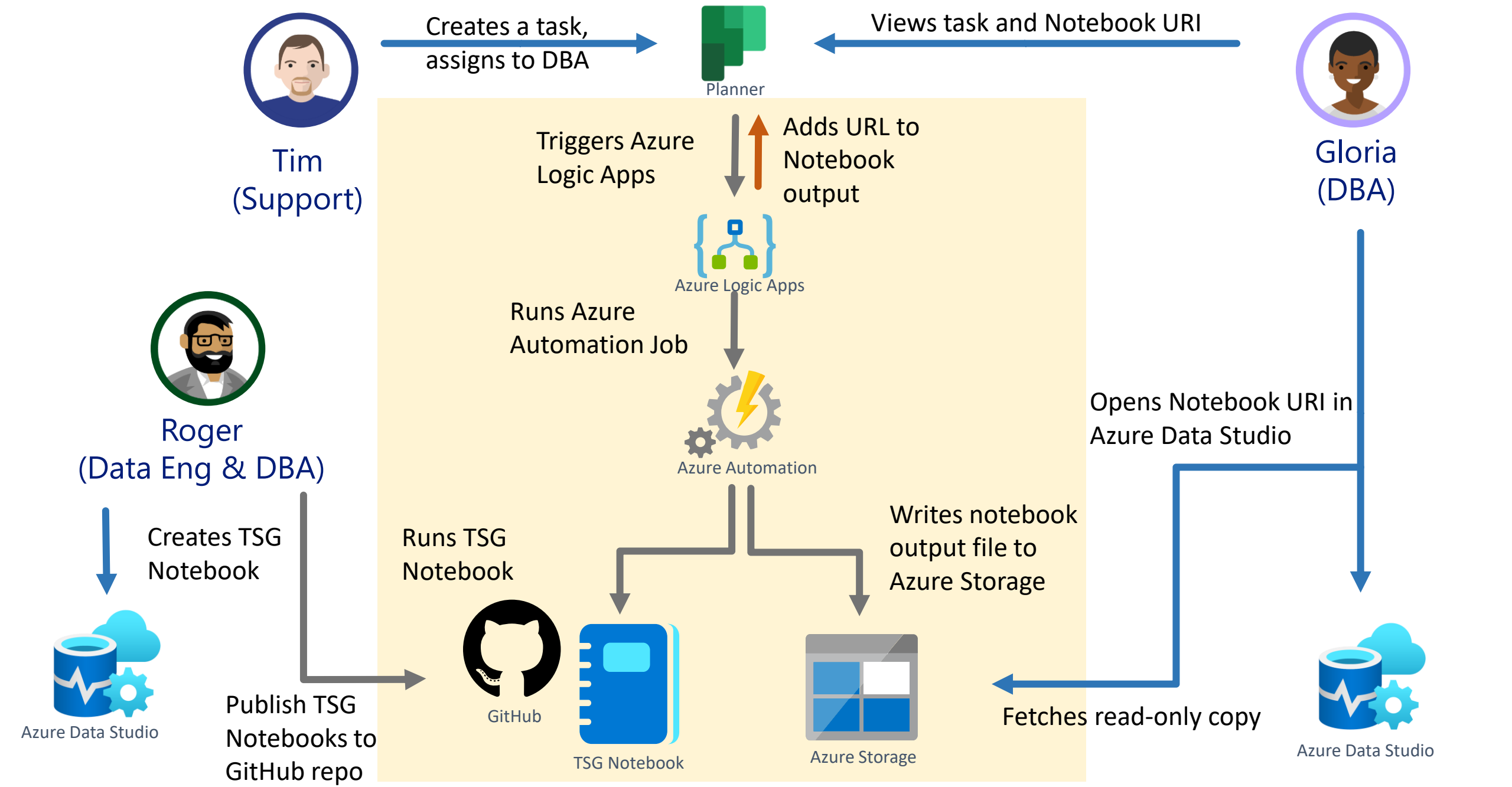
All | Start time earlier than | Pick a date | Pick a time

Specify the run identifier to open monitor view directly

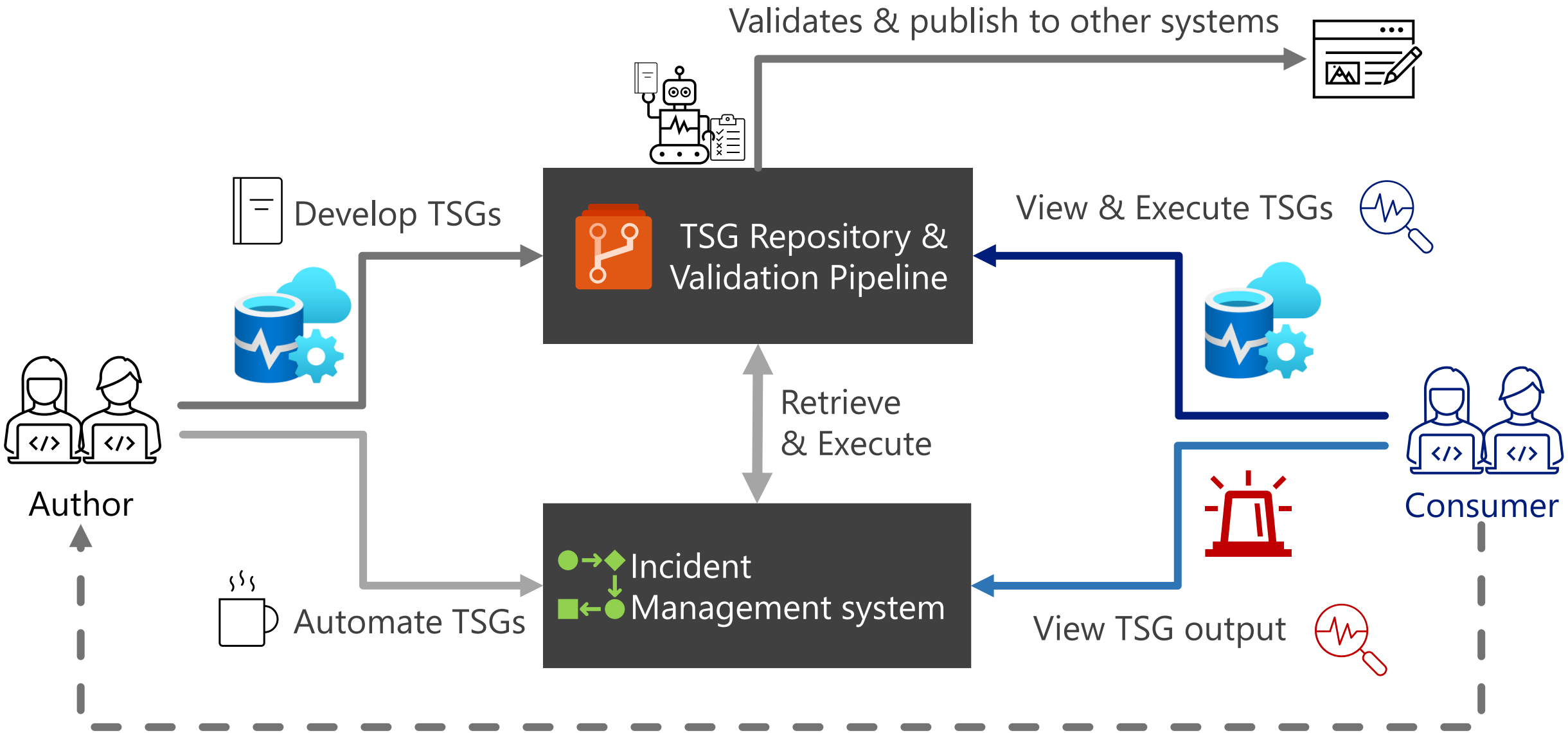
Status	Start time	Identifier	Duration	Static Results
Succeeded	5/1/2021, 1:39 PM	08585817052871593324217...	1.34 Minutes	
Succeeded	5/1/2021, 12:56 PM	08585817078908637089165	45.74 Seconds	



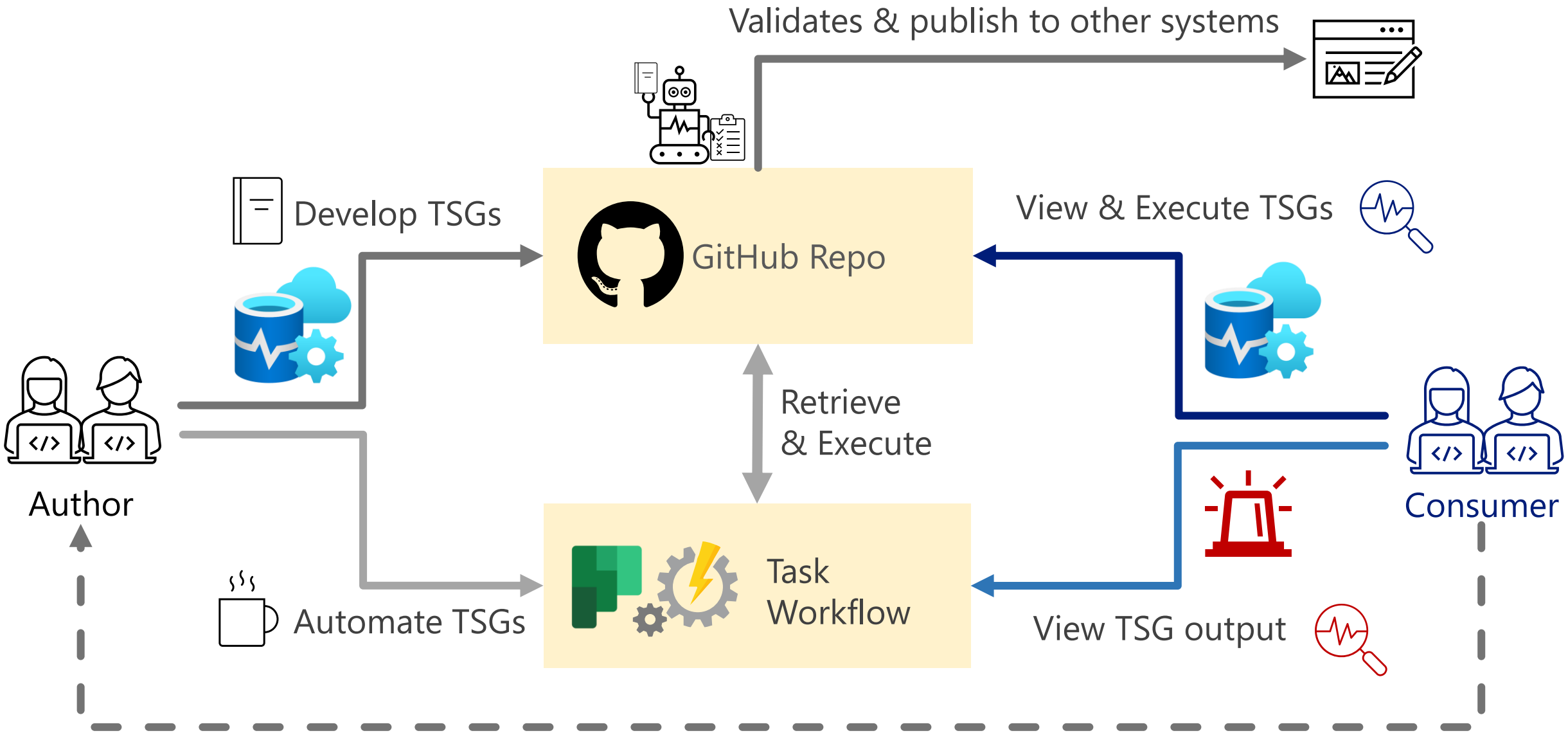
Demo: Automated task workflow with notebooks



Demo: Automated task workflow with notebooks



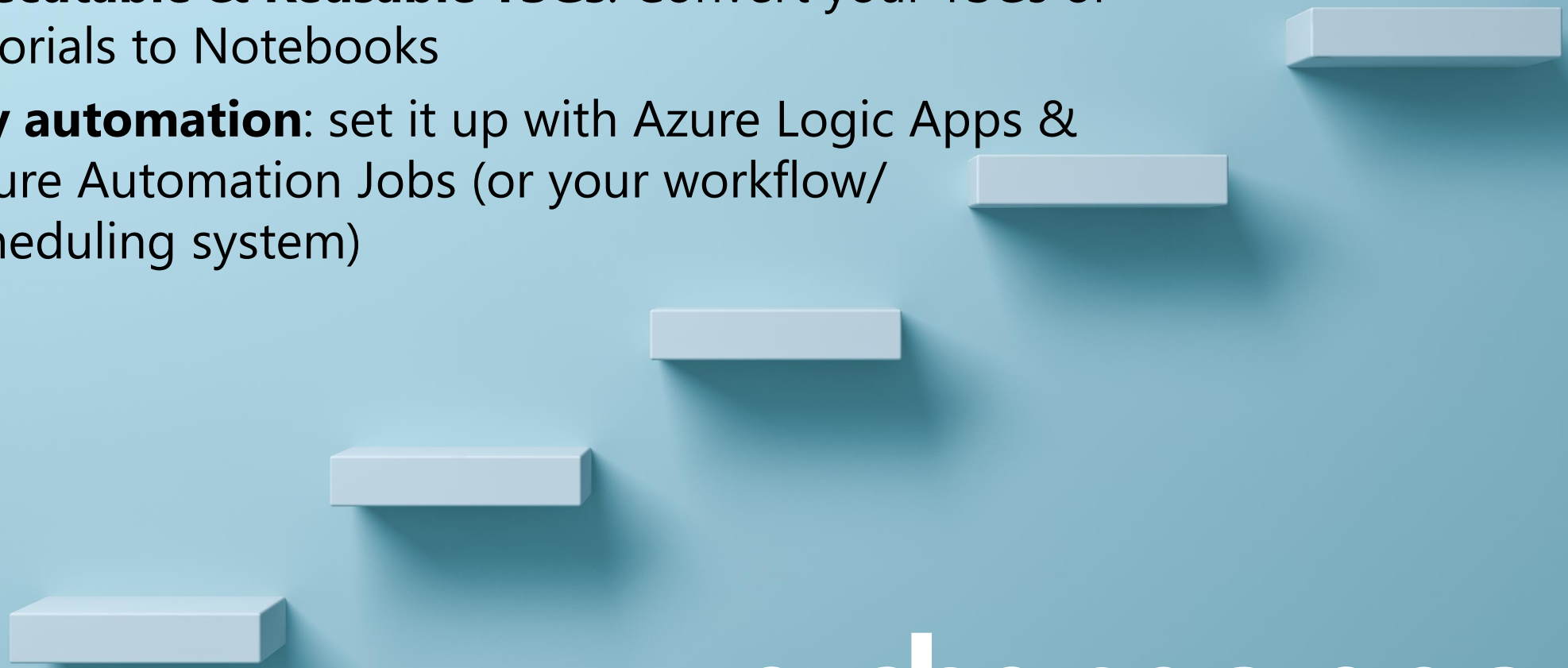
Demo: Automated task workflow with notebooks



Demo: Automated task workflow with notebooks

4. Takeaways & Resources

1. **Learn Jupyter Notebooks:** use Azure Data Studio, VSCode, JupyterLab and many others.
2. **Executable & Reusable TSGs**: Convert your TSGs or tutorials to Notebooks
3. **Try automation**: set it up with Azure Logic Apps & Azure Automation Jobs (or your workflow/ scheduling system)



a change agent

Useful resources

Azure Data Studio: http://aka.ms/AzureDataStudio
https://github.com/microsoft/azuredatastudio/issues

SQL Assessment Toolkit: https://github.com/microsoft/sql-server-samples/tree/master/samples/manage/sql-assessment-api/notebooks

Glenn Berry's Diagnostic Notebooks for SQL Server and Azure SQL DB:
https://glennsqlperformance.com/resources/

Rob Sewell's Notebook http://sqldbawithabeard.com
https://github.com/SQLDBAWithABeard/JupyterNotebooks

The SQL Diagnostic (Jupyter) Book by Emanuele Meazzo
https://tsql.tech/the-sql-diagnostic-jupyter-book/

Session Notes at MsSQLGirl.com

Notebooks 101:
https://bit.ly/2Ryu9uW

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Thank You!

Jump start to Notebooks!

Bulk conversions -

- SQL Scripts to Notebooks with ConvertTo-SqlNoteBook
- PowerShell scripts to Notebooks with ConvertTo-PowerShellNotebook

Demo: https://youtu.be/80L-UTOlknw?t=1627

Individual conversions -

- Export as Notebook UI in Azure Data Studio from a SQL Script
- PowerShell history to a Notebook

  Get-History 7,14 | % comm* | Export-AsPowerShellNotebook -OutputNotebook d:\temp\testthis.ipynb

Tips: Notebook Parameterization

Watch how to use Notebooks parameterization in Azure Data Studio: https://youtu.be/5DDeSb-mHP0

Notebook Language or Kernel	Execution Method	Parameterization support
Python	Papermill	Yes – all https://docs.microsoft.com/sql/azure-data-studio/notebooks/parameterize-papermill
PowerShell or .net interactive PowerShell	Invoke-ExecuteNotebook from PowerShellNotebook module built by Doug Finke	Yes – must be executed on PowerShell v7.1. https://github.com/dfinke/PowerShellNotebook#parameterizing-a-powershell-notebook
SQL	Invoke-SqlNotebook from SqlServer module	Limited – parameters supported are database connection details. https://docs.microsoft.com/powershell/module/sqlserver/invoke-sqlnotebook

Invoke SQL notebook from a command line

Invoke-SqlNotebook

```
dir 'SQLSERVER:\SQLRegistration\Database Engine Server Group' |
WHERE { $_.Mode -ne 'd'} |
foreach {
    $datetime = Get-Date -Format yyyyMMddhhmm;
    Get-SqlInstance -ServerInstance $_.Name |
    foreach {
            Invoke-SqlNotebook -ServerInstance $_.Name -Database master -InputFile
'$home\Documents\SQL Server Management Studio\BPCheck.ipynb' `
            -OutputFile "BPCheck_output_$($_.NetName)_$($datetime).ipynb";
            }
        }
```

Invoke PowerShell notebook from a command line

Invoke-ExecuteNotebook by Doug Finke
https://github.com/dfinke/PowerShellNotebook#executing-a-notebook

```
Import-Module PowerShellNotebook

Invoke-ExecuteNotebook `
    -InputNotebook 'path/to/input.ipynb' `
    -OutputNotebook 'path/to/output.ipynb' `
    -Parameters @{ alpha=0.6; ratio=0.1 }
```