

Drew Skwiers-Koballa



# Azure Data Studio Extension Development

# Hi

Drew Skwiers-Koballa

@sysadmindrew

[www.github.com/dzsquared](https://www.github.com/dzsquared)

Developer in the Microsoft ecosystem for 8 years, including SQL Server

Introverted but friendly



# Agenda

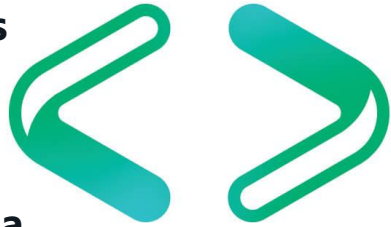
- What is Azure Data Studio
- Why Develop Extensions
- Extension Development Framework (demo)
- Publishing an extension
- Extension Type examples
- Extension Functionality examples



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- Your chance to help out the MN SQL community!





# Azure Data Studio

# Formerly Known as SQL Operations Studio

Multi-platform

SQL/data platform tool

Based on VS Code

Write Queries

Basic Server Management



# What Does It Do

Server and Database Dashboards

Query Editing

Object Explorer

Export Results to csv/xlsx/json

Query Plan

Data Notebooks

SQL Agent

SQL Profiler

Integrated Terminal

Extension API

Blog by Vicky Harp on  
capabilities as of  
September 2018:

<https://cloudblogs.microsoft.com/sqlserver/2018/09/25/azure-data-studio-for-sql-server/>

# What Doesn't It Do

Table Designer

Object Properties Pane

Results to File/Text

Query Stats

Client Statistics

Always On

Always Encrypted

Maintenance Plans

Data Tuning Advisor

Error Log Viewer





# Is Azure Data Studio Right For You?

## How to Find Out

- Read capability summaries
- Watch demo videos
- Ask someone on your team to try it out
- Test it

## Friendly Reminders

- Both ADS and SSMS are free
- The most recent version of ADS (v1.0) and SSMS (v17/v18 preview) work with most versions of SQL Server
- Ola Hallengren's scripts work in both



A large, stylized teal graphic on the left side of the slide. It consists of several overlapping, curved, ribbon-like shapes that form a complex, organic shape, possibly resembling a stylized letter 'C' or a series of nested curves. The color is a vibrant teal or seafoam green.

# Why Develop Extensions?

Do you have an enterprise workflow?

Do you want to create a shortcut?

Do you want to share something with the SQL community?

Do you like branching out, but not too far out?



# What Does It Take?

- Just about any computer
- Willingness to learn:
  - A little Git
  - A basic to intermediate understanding of Typescript
- 1 to 20+ hours





# Let's Build an Extension

[https://github.com/dzsquared/AzureDataStudio\\_ExtensionDevelopment](https://github.com/dzsquared/AzureDataStudio_ExtensionDevelopment)

# Install Prerequisites

- Azure Data Studio
- VS Code
- SQL Operations Studio  
Debugger extension for VS  
Code
- Git
- NodeJS

## Checking Installs

```
drewsk@drewsk-2018:~$ git --version  
git version 2.17.1  
drewsk@drewsk-2018:~$
```

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL  
drewsk@drewsk-2018:~$ nodejs -v  
v8.10.0  
drewsk@drewsk-2018:~$
```



# Install Prerequisites

- Typescript
- Yeoman Extension Generator
- VS Code Extension Manager

```
npm install -g typescript
```

```
npm install -g yo generator-sqlops
```

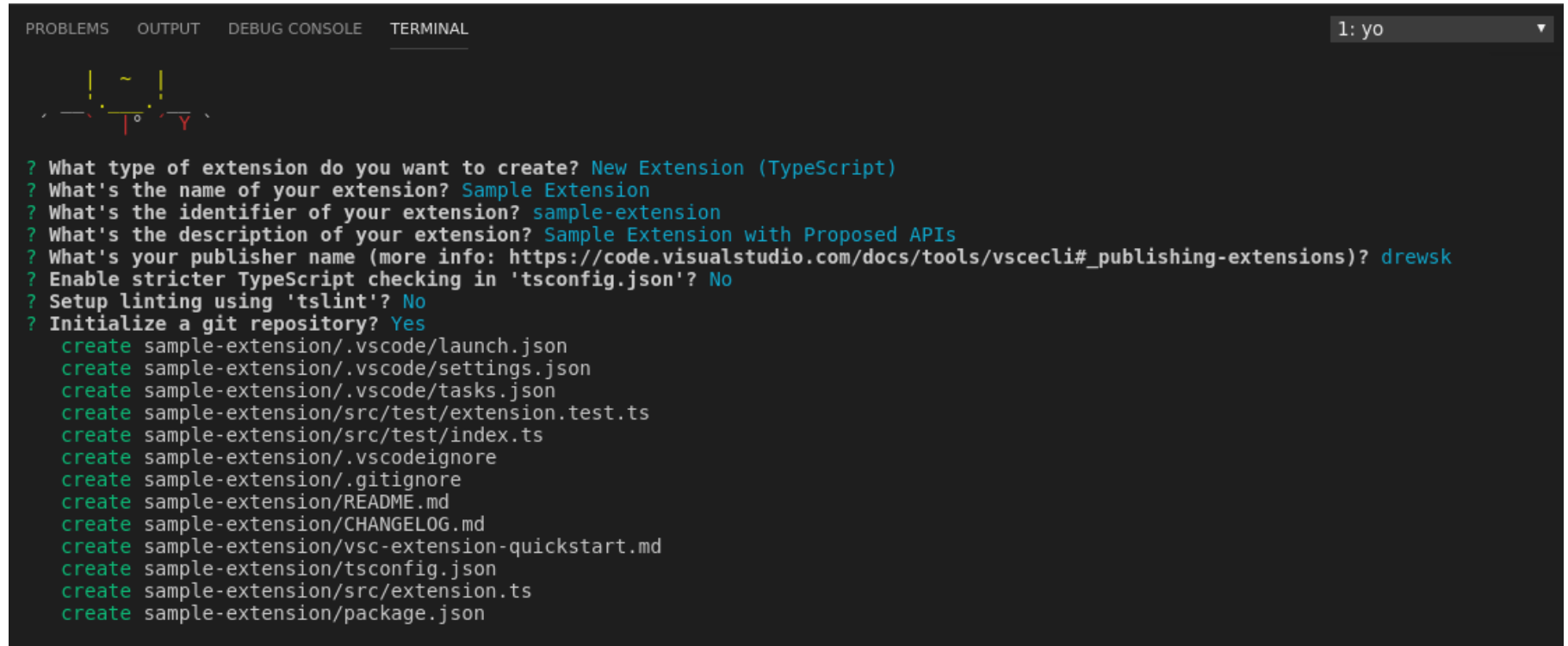
```
npm install -g vsce|
```

All 3 can be installed in VS Code terminal through npm  
(Node Package Manager)



# Yo

*yo sqlops*



```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL 1: yo

? What type of extension do you want to create? New Extension (TypeScript)
? What's the name of your extension? Sample Extension
? What's the identifier of your extension? sample-extension
? What's the description of your extension? Sample Extension with Proposed APIs
? What's your publisher name (more info: https://code.visualstudio.com/docs/tools/vscecli#_publishing-extensions)? drewsk
? Enable stricter TypeScript checking in 'tsconfig.json'? No
? Setup linting using 'tslint'? No
? Initialize a git repository? Yes
create sample-extension/.vscode/launch.json
create sample-extension/.vscode/settings.json
create sample-extension/.vscode/tasks.json
create sample-extension/src/test/extension.test.ts
create sample-extension/src/test/index.ts
create sample-extension/.vscodeignore
create sample-extension/.gitignore
create sample-extension/README.md
create sample-extension/CHANGELOG.md
create sample-extension/vsc-extension-quickstart.md
create sample-extension/tsconfig.json
create sample-extension/src/extension.ts
create sample-extension/package.json
```

- For this sample, leave the *Typescript Extension* selection
- Enter a name, identifier, description, and your publishing name for the extension
- Decline stricter checking and linting
- Select the initialization of a Git repository





# Activation Events – package.json

onCommand

workspaceContains

onFileSystem

onView

*\* (only when necessary)*

```
13     ],  
14     "activationEvents": [  
15         "onCommand:extension.sayHello",  
16         "onCommand:extension.showCurrentConnection"  
17     ],  
18     "main": "out/extension"
```



# Contribution Points – package.json

Commands

...

Configuration

Menu

Keybindings

Themes

Snippets

Dashboard

Container

```
25     "contributes": {
26       "outputChannels": [
27         "sqlagent"
28       ],
29       "commands": [
30         {
31           "command": "agent.openNewStepDialog",
32           "title": "agent.openNewStepDialog"
33         }
34       ],
35       "dashboard.tabs": [
36         {
37           "id": "data-management-agent",
38           "description": "Manage and troubleshoot SQL Agent jobs",
39           "provider": "MSSQL",
40           "title": "SQL Agent",
41           "when": "connectionProvider == 'MSSQL' && !mssql:iscloud",
42           "container": {
43             "controlhost-container": {
44               "type": "agent"
45             }
46           }
47         }
48       ]
49     },
```

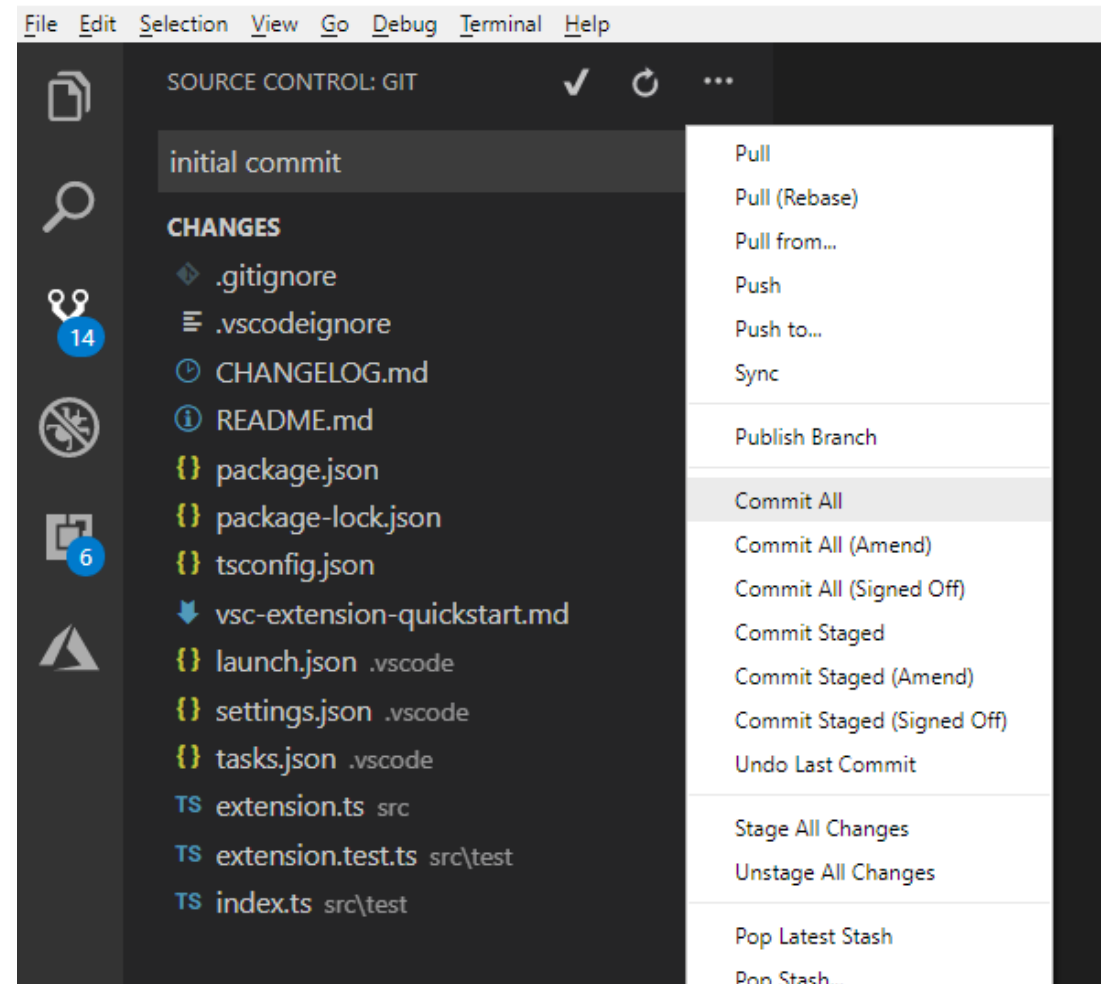


# Initial Git Commit

- Open the folder for your extension in VS Code
- Stage and Commit all changes

Optional:

- Create a repository on GitHub without initializing
- Run command to add Git remote in VS Code



```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\Users\dsk\Documents\GitHub\grid-summary> git remote add origin https://github.com/dzsquared/SQL0perationStudio_SampleExtension.git
```



# Test Extension

Open .vscode/launch.json

Change

"runtimeExecutable": "sqlops"

to

"runtimeExecutable":

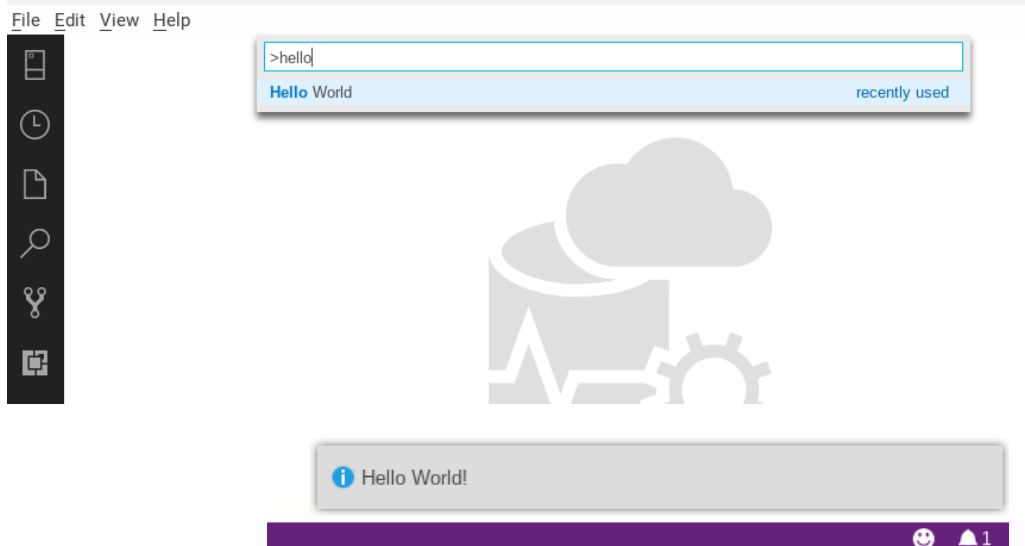
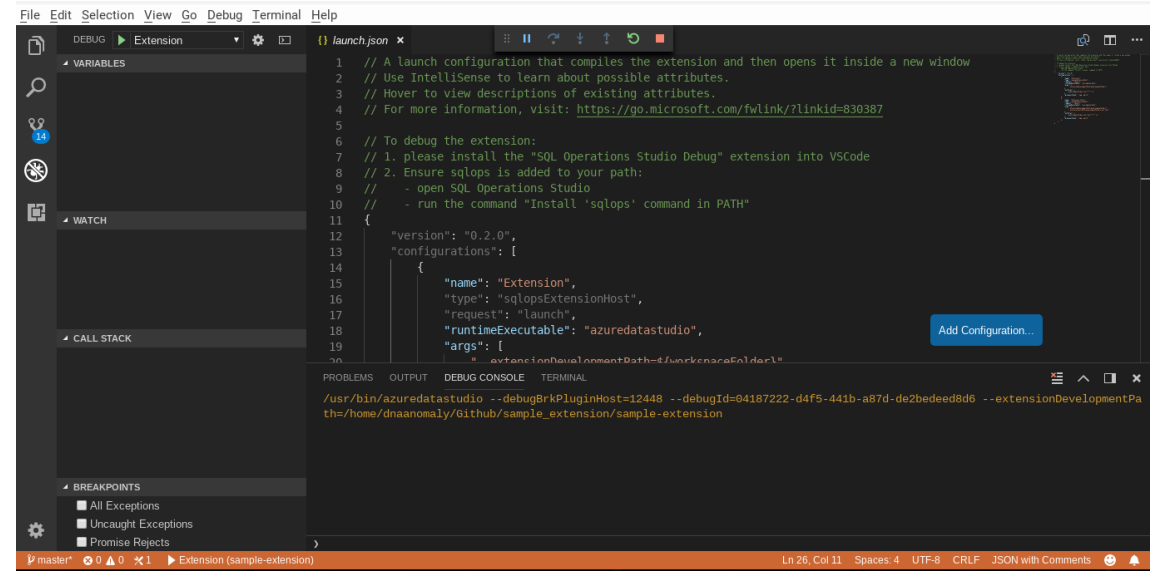
"azuredatatstudio"

```
13     "configurations": [  
14         {  
15             "name": "Extension",  
16             "type": "sqlopsExtensionHost",  
17             "request": "launch",  
18             "runtimeExecutable": "azuredatatstudio",  
19             "args": [  
20                 "--extensionDevelopmentPath=${workspaceFolder}"  
21             ],  
22             "outFiles": [  
23                 "${workspaceFolder}/out/**/*.js"  
24             ],  
25             "preLaunchTask": "npm: watch"  
26         },  
27         {  
28             "name": "Extension Tests",  
29             "type": "sqlopsExtensionHost",  
30             "request": "launch",  
31             "runtimeExecutable": "azuredatatstudio",  
32             "args": [  
33                 "--extensionDevelopmentPath=${workspaceFolder}",  
34                 "--extensionTestsPath=${workspaceFolder}/out/test"  
35             ],  
36             "outFiles": [  
37                 "${workspaceFolder}/out/test/**/*.js"  
38             ],  
39             "preLaunchTask": "npm: watch"  
40         }  
41     ]
```



# Test Extension

Select **Start Debugging** from the **Debug** menu



A special *Extension Development* instance of ADS opens

Test the extension from the command palette (ctrl+shift+P)



# Edit The Extension

Activation events: when the extension is started

Contribution points:  
additions to the application

VS Code APIs + Azure Data  
Studio APIs

```
TS extension.ts x
1 |use strict';
2
3 // access to VS Code and Azure Data Studio APIs and objects
4 import * as vscode from 'vscode';
5 import * as sqlops from 'sqlops';
6
7 // function called when extension is activated
8 export function activate(context: vscode.ExtensionContext) {
9
10     // executed by command with the associated ID ('extension.sayHello')
11     context.subscriptions.push(vscode.commands.registerCommand('extension.sayHello', () => {
12         vscode.window.showInformationMessage('Hello World!');
13     }));
14
15     context.subscriptions.push(vscode.commands.registerCommand('extension.showCurrentConnection', () => {
16         sqlops.connection.getCurrentConnection().then(connection => {
17             let connectionId = connection ? connection.connectionId : 'No connection found!';
18             vscode.window.showInformationMessage(connectionId);
19         }, error => {
20             console.info(error);
21         });
22     }));
23 }
24
25 // function is called when your extension is deactivated
26 export function deactivate() {
27 }
```



# Available APIs – VS Code

Messages

Language

Tasks

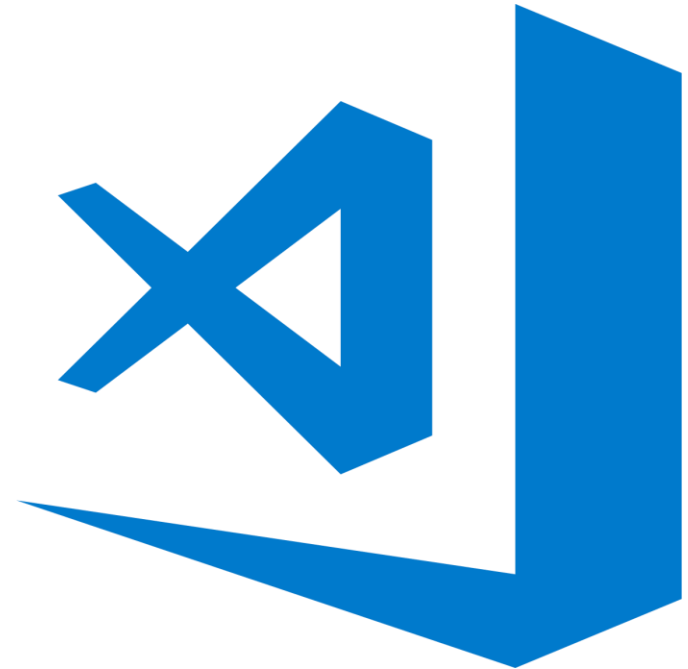
Text Editors

Terminal

Status Bar

Files/Workspace

Webview



# Available APIs – Azure Data Studio

Connection management

Object Explorer

Server Info

Object Metadata

Query Manipulation

SQL Agent

Backups

XEvents

*Proposed:*

*Dashboard containers*

*Wizard pages*

*Background operations*

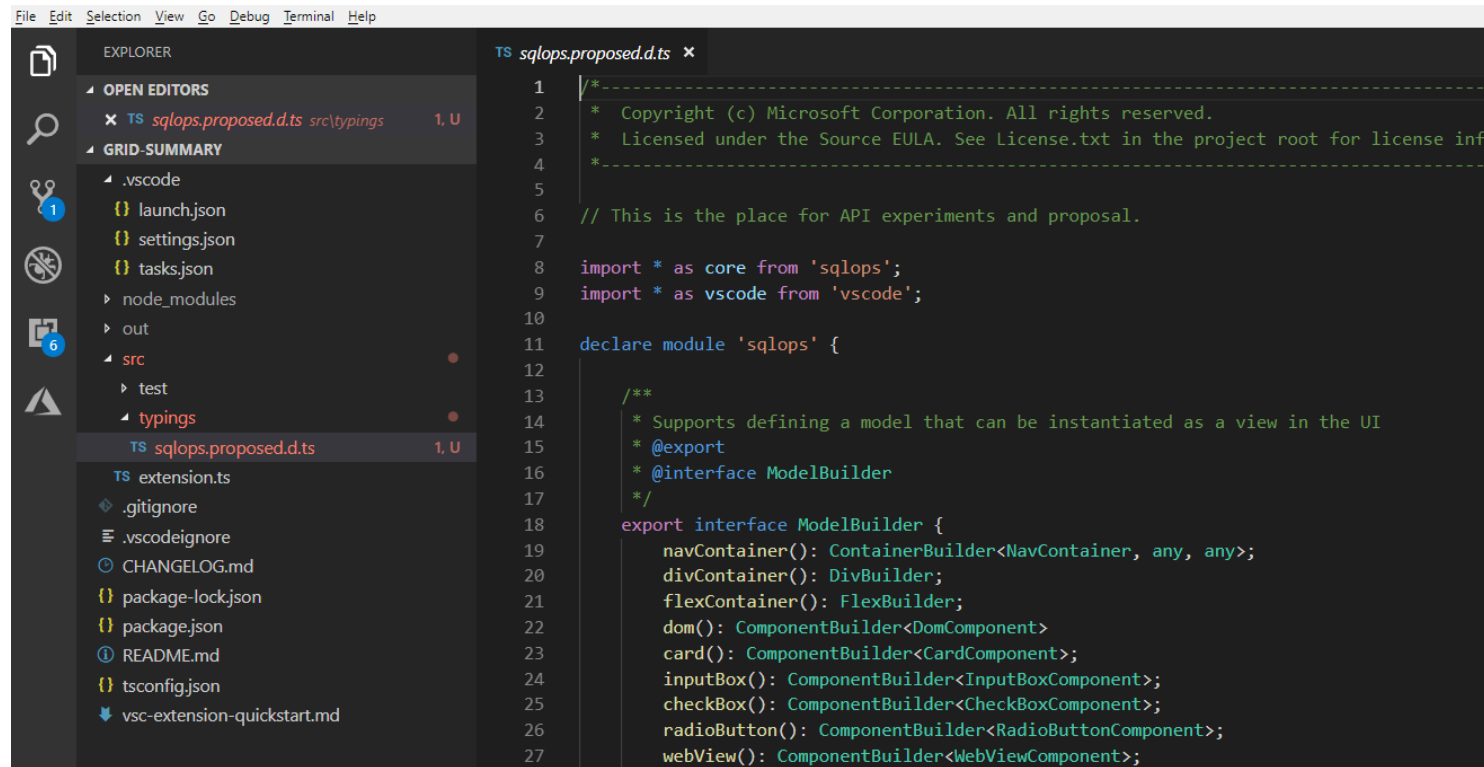




# Using Proposed APIs

Add **typings** folder to **src** folder

Add **sqlops.proposed.d.ts** file to folder



```
File Edit Selection View Go Debug Terminal Help

EXPLORER
├─ OPEN EDITORS
│   └─ TS sqlops.proposed.d.ts src\typings 1, U
├─ GRID-SUMMARY
│   └─ .vscode
│       ├── {} launch.json
│       ├── {} settings.json
│       └── {} tasks.json
│   └─ node_modules
│   └─ out
│   └─ src
│       ├── test
│       └─ typings
│           └─ TS sqlops.proposed.d.ts 1, U
└─ TS extension.ts
    ├── .gitignore
    ├── .vscodeignore
    ├── CHANGELOG.md
    ├── {} package-lock.json
    ├── {} package.json
    ├── ① README.md
    ├── {} tsconfig.json
    └─ vsc-extension-quickstart.md

TS sqlops.proposed.d.ts x
1  /*-----
2  * Copyright (c) Microsoft Corporation. All rights reserved.
3  * Licensed under the Source EULA. See License.txt in the project root for license info
4  *-----
5
6  // This is the place for API experiments and proposal.
7
8  import * as core from 'sqlops';
9  import * as vscode from 'vscode';
10
11 declare module 'sqlops' {
12
13     /**
14     * Supports defining a model that can be instantiated as a view in the UI
15     * @export
16     * @interface ModelBuilder
17     */
18     export interface ModelBuilder {
19         navContainer(): ContainerBuilder<NavContainer, any, any>;
20         divContainer(): DivBuilder;
21         flexContainer(): FlexBuilder;
22         dom(): ComponentBuilder<DomComponent>
23         card(): ComponentBuilder<CardComponent>;
24         inputBox(): ComponentBuilder<InputBoxComponent>;
25         checkBox(): ComponentBuilder<CheckBoxComponent>;
26         radioButton(): ComponentBuilder<RadioButtonComponent>;
27         webView(): ComponentBuilder<WebViewComponent>;
```



# Package to .vsix

Update README.md

Run **vsce package** from terminal

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  1: bash
drewsk@drewsk-2018:~/Documents/Git/Projects/sample-extension$ vsce package
Executing prepublish script 'npm run vscode:prepublish'...

> sample-extension@0.0.1 vscode:prepublish /home/drewsk/Documents/Git/Projects/sample-extension
> npm run compile

> sample-extension@0.0.1 compile /home/drewsk/Documents/Git/Projects/sample-extension
> tsc -p ./

Error: Make sure to edit the README.md file before you publish your extension.
drewsk@drewsk-2018:~/Documents/Git/Projects/sample-extension$
```

SQLOPS-FIRSTRESPONDERKIT

- .vscode
- images
- node\_modules
- out
- src
- ▾ typings
  - TS sqlops.proposed.d.ts
- ◆ .gitignore
- ≡ .vscodeignore
- 🕒 CHANGELOG.md
- { } extension\_listing.json
- ≡ firstresponderkit-0.1.1.vsix
- ≡ firstresponderkit-0.2.0.vsix**
- 🔑 LICENSE
- { } package-lock.json
- { } package.json
- 📖 README.md
- ≡ resources.txt
- { } tsconfig.json
- 📄 vsc-extension-quickstart.md



A large, stylized teal graphic element on the left side of the image, resembling a thick, curved arrow or a bracket pointing towards the right. It has a smooth, rounded shape with a slight inward curve at the top and bottom.

Publish Your Extension

# Publish

Project hosted publicly or has an available download page

Fork the *release/extensions* tree of Azure Data Studio

0.2.0 ⓘ

✓ Existing tag

Azure Data Studio and Server Connections

Write Preview MD Markdown supported

This release adds server context awareness for new editor windows and is setup to debug with Azure Data Studio.

### To Install:

- download the vsix
- In SQL Operations Studio, open the command palette (ctrl/command+shift+p) and select `Extensions: Install from VSIX...`
- grab the vsix file you downloaded and click the `Reload` prompt in the lower right corner

Attach files by dragging & dropping, [selecting them](#), or pasting from the clipboard.

firstresponderkit-0.2.0.vsix (2.22 MB) ✕

↓ Attach binaries by dropping them here or [selecting them](#).

Microsoft / azuredatstudio

Unwatch 266 Unstar 4,415 Fork 292

[Code](#) [Issues 743](#) [Pull requests 12](#) [Projects 0](#) [Wiki](#) [Insights](#)

Azure Data Studio is a data management tool that enables working with SQL Server, Azure SQL DB and SQL DW from Windows, macOS and Linux.



# Publish

Add your extension to  
extensions/extensionsGallery.json

Commit changes and submit a  
Pull Request

sqlpsstudio / extensionsGallery.json or cancel

```
<> Edit file Preview changes Tabs 4 No wrap
1 {
2   "results": [{
3     "extensions": [
4       {
5         "extensionId": "10",
6         "extensionName": "agent",
7         "displayName": "SQL Server Agent",
8         "shortDescription": "Manage and troubleshoot SQL Agent jobs (early preview)",
9         "publisher": {
10          "displayName": "Microsoft",
11          "publisherId": "Microsoft",
12          "publisherName": "Microsoft"
13        },
14        "versions": [
15          {
16            "version": "0.32.7",
17            "lastUpdated": "8/29/2018",
18            "assetUri": "",
19            "fallbackAssetUri": "fallbackAssetUri",
20            "files": [
21              {
22                "assetType": "Microsoft.VisualStudio.Services.VSIXPackage",
23                "source": "https://sqlopsextensions.blob.core.windows.net/extensions/agent/agent-0.32.7.vsix"
24              },
25              {
26                "assetType": "Microsoft.VisualStudio.Services.Icons.Default",
27                "source": "https://raw.githubusercontent.com/Microsoft/vscode-mssql/master/images/sqlserver.png"
28              },
29            ]
30          }
31        ]
32      }
33    ]
34  }
35 }
```



## Commit changes

adding my sample extension

Add an optional extended description...

☒ Commit directly to the `release/extensions` branch.

☐ Create a new branch for this commit and start a pull request. [Learn more about pull requests.](#)

Commit changes

Cancel

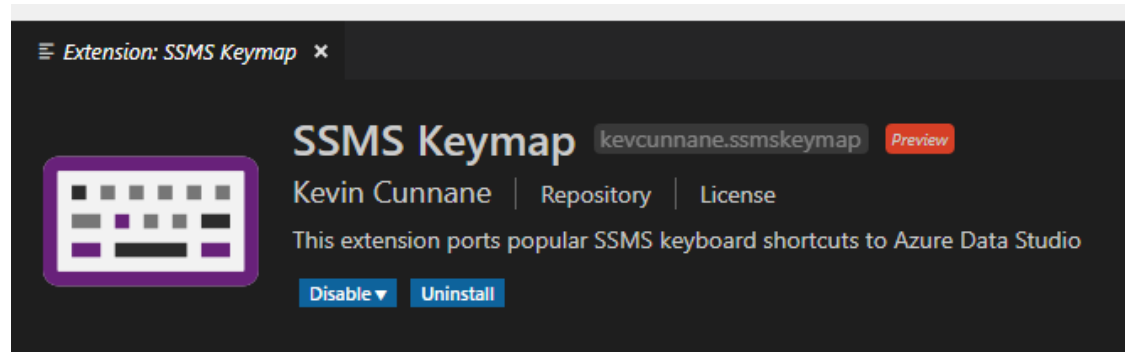




# Extension Types

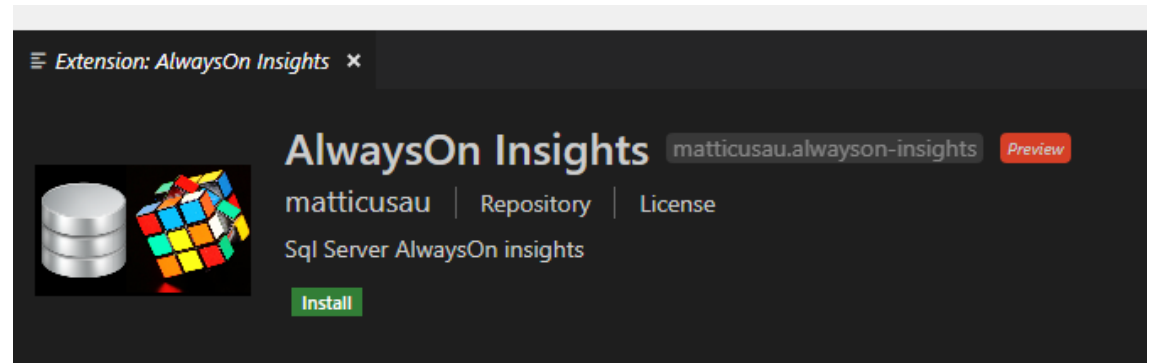
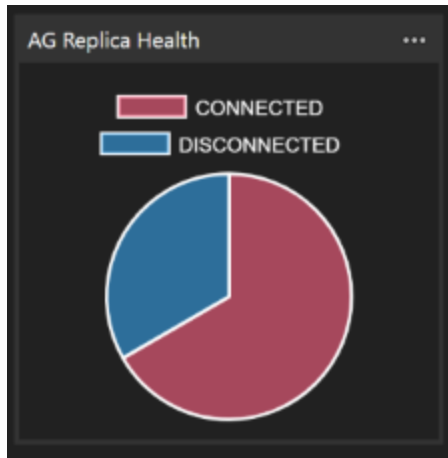
# Keymap

An extension that ties keystrokes to commands



# Dashboard/Insight

Packaged visualizations for database or server dashboards





# Color Themes

```
▶ Run  Cancel  Disconnect  Change Connection  APP_IEX
1 DECLARE @TESTDATE DATETIME2 = '10/7/2017'
2 |
3 --primary keys created this year
4 SELECT *
5 FROM sys.objects
6 WHERE [type] = 'PK'
7 |     AND create_date > @TESTDATE
```

```
▶ Run  Cancel  Disconnect  Change Connection  APP_IEX
1 DECLARE @TESTDATE DATETIME2 = '10/7/2017'
2 |
3 --primary keys created this year
4 SELECT *
5 FROM sys.objects
6 WHERE [type] = 'PK'
7 |     AND create_date > @TESTDATE
```

```
▶ Run  Cancel  Disconnect  Change Connection  APP_IEX
1 DECLARE @TESTDATE DATETIME2 = '10/7/2017'
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3 --primary keys created this year
4 SELECT *
5 FROM sys.objects
6 WHERE [type] = 'PK'
7 |     AND create_date > @TESTDATE
```

```
▶ Run  Cancel  Disconnect  Change Connection  APP_IEX
1 DECLARE @TESTDATE DATETIME2 = '10/7/2017'
2 |
3 --primary keys created this year
4 SELECT *
5 FROM sys.objects
6 WHERE [type] = 'PK'
7 |     AND create_date > @TESTDATE
```



# Snippets

Packaged code with placeholder tab stops

Snippets can be defined per user or by an extension

```
▶ Run  Cancel  Disconnect  Change Connection  APP_IEX  ▼
1  -- Create a new table called '[TableName]' in schema '[SchemaName]' in database '[DatabaseName]'
2  -- Drop the table if it already exists
3  IF OBJECT_ID('[DatabaseName].[SchemaName].[TableName]', 'U') IS NOT NULL
4  DROP TABLE [DatabaseName].[SchemaName].[TableName]
5  GO
6  -- Create the table in the specified database and schema
7  CREATE TABLE [DatabaseName].[SchemaName].[TableName]
8  (
9      [ColumnName]Id INT NOT NULL PRIMARY KEY, -- Primary Key column
10     [ColumnName1] [NVARCHAR](50) NOT NULL,
11     [ColumnName2] [NVARCHAR](50) NOT NULL
12     -- Specify more columns here
13 );
14 GO
```



A large, stylized teal graphic element on the left side of the slide, resembling a thick, curved arrow or a bracket pointing towards the right. It has a smooth, rounded shape with a slight inward curve at the bottom.


# Functionality Examples

# Full Webview

msp-sql3 SQL Search Results: tsheets x

Object name	Option	Schema	Database	Type	Matches on
TSHEETS_EMPLOYEE_ADD	⋮	dbo	APP_IEX	StoredProcedure	Text
TEAMINH_PULL_TIMESHEET	⋮	dbo	APP_IEX	StoredProcedure	Text
TEAMINH_ADD_TIMESHEET_EMP	⋮	dbo	APP_IEX	StoredProcedure	Text
TSheets_Timesheets	⋮	dbo	APP_IEX	UserTable	Column
TSheets_Employees	⋮	dbo	APP_IEX	UserTable	Column
TSHEETS_EMPLOYEE_UPDATE	⋮	dbo	APP_IEX	StoredProcedure	Text
TeamIT_TSHEETS_Keys	⋮	dbo	APP_IEX	UserTable	Column
TSHEETS_TIMESHEET_ADD	⋮	dbo	APP_IEX	StoredProcedure	Name
TSHEETS_TIMESHEET_ADD	⋮	dbo	APP_IEX	StoredProcedure	Text
PK_TSheets_Timesheets	⋮	dbo	APP_IEX	PrimaryKeyConstraint	Name
TSheets_Timesheets	⋮	dbo	APP_IEX	UserTable	Name
TSHEETS_EMPLOYEE_PROCESS	⋮	dbo	APP_IEX	StoredProcedure	Name

Extension: Redgate SQL Search x



## Redgate SQL Search

redgate.sql-search Preview

Redgate | License

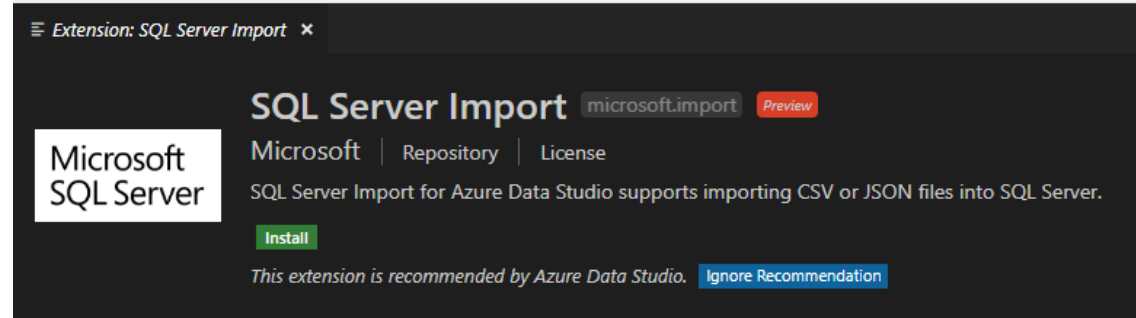
Search across multiple databases

Install

*This extension is recommended by Azure Data Studio.* Ignore Recommendation



# Wizard UI



## Import flat file wizard

Step 1

New Table Details

Server the database is in

localhost, <default> (default) ▼

Database the table is created in

AdventureWorks2014 ▼

Location of the file to be imported

Browse

New table name

Table schema

dbo ▼


Next Cancel

Multi-step window  
sequence to guide  
user through decisions



# Internet Connectivity

HTTP request responses dropped to new query editor



Extension: First Responder Kit ✕

## First Responder Kit

drewsk.firstresponderkit Preview

Drew Skwiers-Koballa | Repository | License

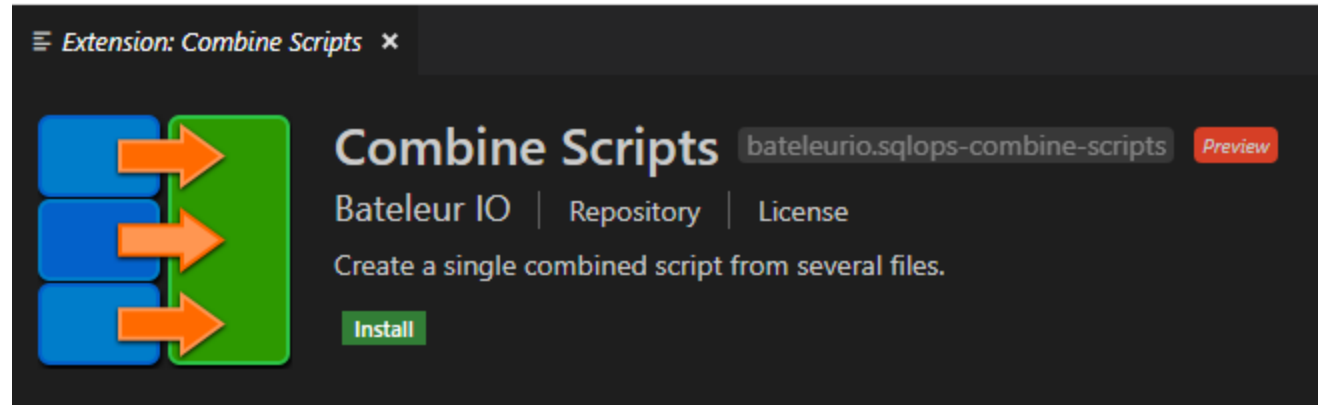
Access current versions of scripts from the First Responder Kit

Install



# File Access

File access provided through VS Code APIs



# Additional Dashboard Tab

sqltools2017-2 - test - SQL Operations Studio Dev [Administrator]

File Edit View Help

SERVERS

Search server names

Home > sqltools2017-2

HOME SQL AGENT SP\_WHOISACTIVE

### Jobs

Name	Last Run	Next Run	Enabled	Status	Category	Runnable			
collection_set_2_upload	9/18/2017 5:40:36 PM	4/18/2018 2:45:00 AM	No	Idle	Data Collector	Yes	Yes	Succeeded	
collection_set_3_upload	4/17/2018 2:32:45 PM	4/18/2018 2:45:00 AM	No	Idle	Data Collector	Yes	Yes	Succeeded	
syspolicy_purge_history	4/23/2018 2:00:00 AM	4/24/2018 2:00:00 AM	Yes	Idle	[Uncategorized (Local)]	Yes	Yes	Succeeded	
MaintenancePlan.Subplan_1	2/23/2018 7:11:16 PM	Not Scheduled	Yes	Idle	Database Maintenance	Yes	No	Succeeded	
sysutility_get_cache_tables_data_into_aggre	4/23/2018 12:01:00 AM	4/24/2018 12:01:00 AM	Yes	Idle	[Uncategorized (Local)]	Yes	Yes	Succeeded	
Job	2/6/2018 5:21:11 AM	Not Scheduled	Yes	Idle	[Uncategorized (Local)]	Yes	No	Succeeded	
CDW	10/20/2017 3:00:17 AM	Not Scheduled	Yes	Idle	[Uncategorized (Local)]	Yes	No	Failed	
Error: No Steps available for this job.									
mdw_purge_data [keep_MDW]	4/23/2018 2:00:00 AM	4/24/2018 2:00:00 AM	Yes	Idle	Data Collector	Yes	Yes	Failed	
Error: The job failed. The owner of job mdw_purge_data [keep_MDW] does not have server access.									
Job	2/6/2018 5:20:56 AM	Not Scheduled	Yes	Idle	[Uncategorized (Local)]	Yes	No	Succeeded	
collection_set_3_collection	3/21/2018 12:37:11 AM	Not Scheduled	No	Idle	Data Collector	Yes	Yes	Succeeded	
Job	Never Run	Not Scheduled	Yes	Idle	[Uncategorized (Local)]	No	Yes	Status Unknown	
collection_set_1_noncached_collect_and_up	4/17/2018 12:00:00 PM	4/18/2018 6:00:00 AM	No	Idle	Data Collector	Yes	Yes	Failed	
Error: The job failed. The Job was invoked by Schedule 7 (CollectorSchedule_Every_6h). The last step to run was step 1 (collection_set_1_noncached_collect_and_upload_collect).									
sysutility_get_cache_tables_data_into_aggre	4/23/2018 10:01:00 PM	4/23/2018 11:01:00 PM	Yes	Idle	[Uncategorized (Local)]	Yes	Yes	Succeeded	
MaintenancePlan1.Subplan_1	Never Run	Not Scheduled	Yes	Idle	Database Maintenance	Yes	No	Status Unknown	
sysutility_get_views_data_into_cache_tables	4/23/2018 10:00:00 PM	4/23/2018 10:15:00 PM	Yes	Idle	[Uncategorized (Local)]	Yes	Yes	Succeeded	
collection_set_2_collection	9/18/2017 5:25:31 PM	Not Scheduled	No	Idle	Data Collector	Yes	Yes	Failed	
Error									

Extension: SQL Server Agent x

SQL Server Agent microsoft.agent Preview

Microsoft  
SQL Server

Microsoft | Repository | License  
Manage and troubleshoot SQL Agent jobs

Disable ▼

Uninstall

This extension is recommended by Azure Data Studio. Ignore Recommendation







Recap

# Developing Extensions for Azure Data Studio

Additional capabilities added regularly

Opportunity to improve the toolset we have available for the data platform

Exciting time to dive in!





Any Questions?

# SQLSaturday #796 – After Party



Location: 4th Floor of Mall of America

Time: 6:30PM – 10PM

There will be drinks and appetizers as well as free game cards and bowling!

Hang out with some new friends you've made.



The logo features a stylized 'A' shape composed of two overlapping curved lines. The left line is light blue and the right line is red, both with a slight gradient.

# PASS SUMMIT 2018

Join the brightest data professionals focused on the  
Microsoft Data Platform!

November 5<sup>th</sup> Through November 9<sup>th</sup>

- Pre-Conference Sessions – Monday/Tuesday
- Conference – Wednesday through Friday

