KQL KUNG FU

FINDING THE NEEDLE IN THE HAYSTACK IN YOUR AZURE ENVIRONMENT

CLOUD VILLAGE

DARWIN SALAZAR

DATADOG

DARWIN SALAZAR

DETECTION ENGINEER @ DATADOG

BACKGROUND

- Former Azure Security Consultant @ Accenture
  - Threat Detection Engineering
  - Kubernetes Security
  - CSPM Stuff
- IoT Device Security
  - Medical Device Security @ J&J
  - Red Team @ Ford Motors
- Hobbies
  - Reading, Yoga, Traveling, Learning, Napping

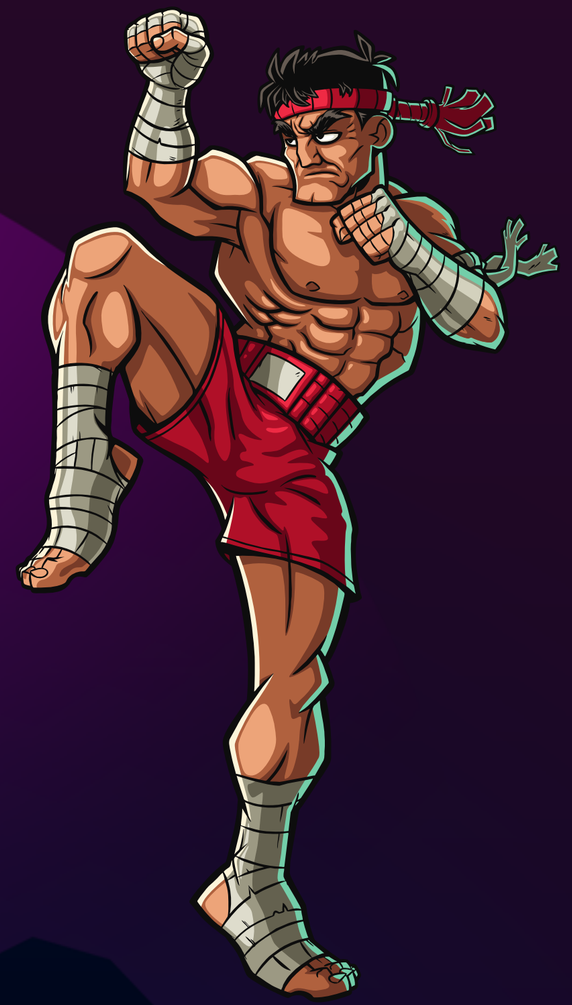
@Darwnsm

DarwinSec.com

DATADOG

AGENDA

- Prerequisites + Setup
- Kusto Query Language (KQL) Overview
    - Simple operators + basic queries
- KQL x Azure Resource Graph
    - Lab 1
- KQL x Microsoft Sentinel
    - Advanced queries + operators
    - Lab 2
- Clean up!



DATADOG

PREREQUISITES

- Laptop w/ network connectivity
- An Azure subscription
    - https://azure.microsoft.com/en-us/free/search/

HOUSEKEEPING ITEMS

- Beginner friendly.
- Interactive workshop. Ask questions.
- If you get stuck, ask for help!

DISCLAIMER

You may incur a small bill due to the nature of the workshop. Delete all of the resources you created to avoid unexpected charges.

WHAT IS KQL?

KQL OVERVIEW

- Microsoft-proprietary query language used to search across logs, databases and tables.
- Compatible with:
  - Azure Log Analytics
  - Microsoft Sentinel
  - Azure Resource Graph Explorer
  - Azure Data Explorer
  - Azure Monitor App Insights

AZURE RESOURCE GRAPH

- Query, explore, and analyze resources
- Powers the Azure Portal search bar
- Resource change tracking
- Requires 'Reader' role
- Cross-subscription + cross-tenant querying*
- Compatible w/ Python, Go, .NET, PowerShell etc.

ANATOMY OF KQL QUERY

The table from which the data is being queried

A column from the 'resources' table

'Exact match' String Operator

'|' Pipe operator indicates start of next request

```
1  resources
2  | where type == "microsoft.compute/virtualmachines"
3  | where tags.app=~'payments'
4  | extend tostring(properties.osProfile.adminUsername)
5  // | extend tostring(properties.storageProfile.imageReference.offer)
6  | extend tostring(properties.storageProfile.imageReference.exactVersion)
7  // | project-away id, tenantId, kind, sku, plan, identity, properties, zones,
```

'//' to comment out a line

'Project' operator filters fields in output

DATADOG

LAB #1

In this lab, you'll learn to:

- Deploy an Azure Storage Account
- Identify misconfigured resources using Resource Graph Explorer + KQL
- Pinpoint and parse columns that have multiple fields of interest
- Modify query output

Slide Deck: https://github.com/DarwinSec/DEFCON-KQL-KUNG-FU-22

DATADOG

LAB #1 SET UP

Configure + Deploy an Insecure Storage Account

- Populate 'Basics' tab
- Disable 'Require secure transfer for REST API..'
- Skip to 'Tags' tab + use key:value pairs below:
    - env:prod
    - datatype:phi
- Deploy!

DATADOG

LAB #1

Locate the misconfigured storage account and do the following:

- Identify the misconfigured setting(s)
- Parse field(s) from the 'properties' column into their own column
- Clean up the output to remove empty fields

Hints

- 'extend tostring(<parentColumn>.<parsedfield>)'
- 'project-away'

PART 1 CONCLUDES

- Azure Resource Graph (ARG) x KQL combo:
  - Has many use cases
  - Can be used for blue teaming + red teaming
  - Navigate large Azure estates easily
  - Highly compatible w/ other Azure services including Logic Apps
- To learn more about ARG:
  - Visit the 'Learning Resources' slide
  - Watch my fwd:cloudsec talk on YouTube

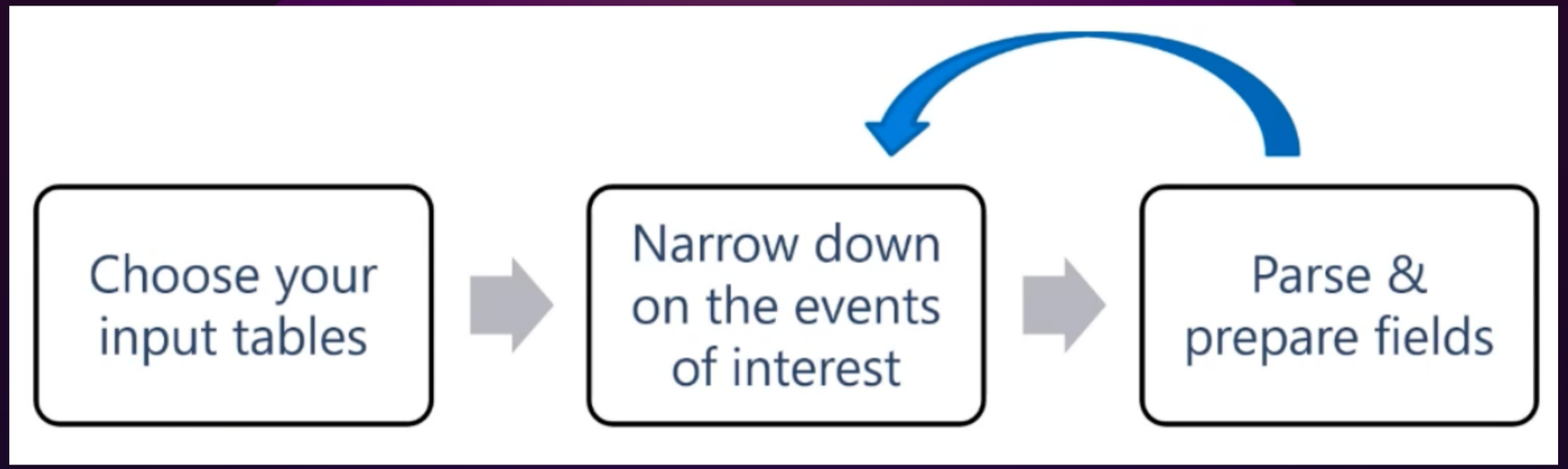
DATADOG

MICROSOFT SENTINEL

- Cloud-native SIEM + SOAR solution
- 31-day free trial
- Requires Log Storage Solution == Log Analytics Workspace
- 120+ data connectors
- Sentinel walkthrough time!

DATADOG

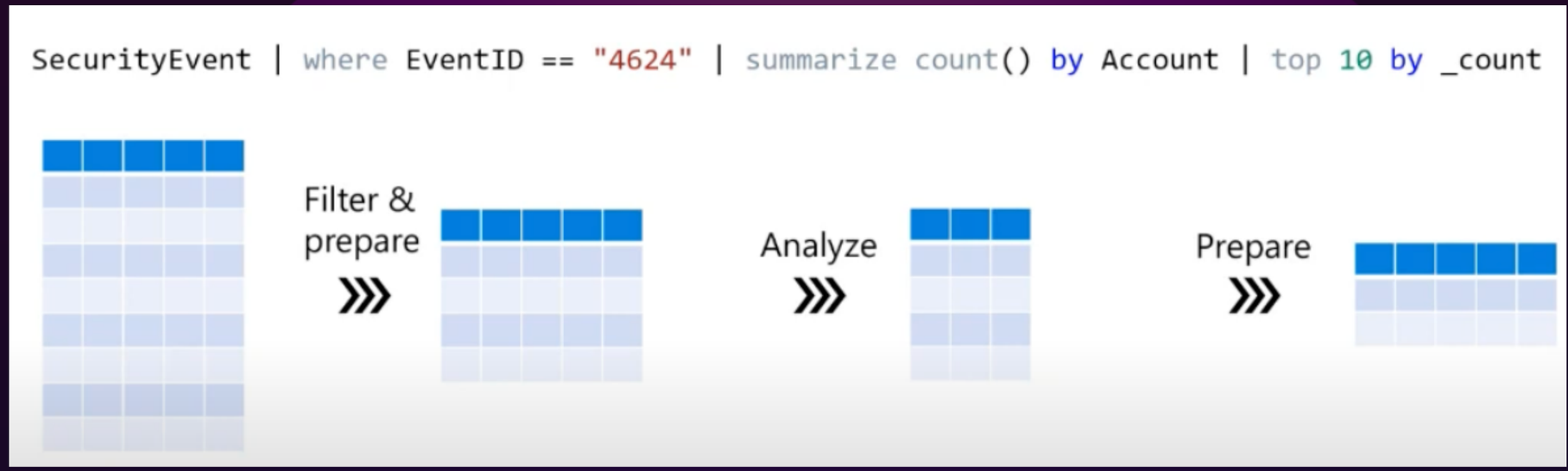
KQL QUERY DEV FLOW



DATADOG

Source: Azure Sentinel webinar: KQL part 1 of 3 - Learn the KQL you need for Azure Sentinel (YouTube)

KQL QUERY DEV FLOW



EventID 4624: An account was successfully logged on

DATADOG

Source: Azure Sentinel webinar: KQL part 1 of 3 - Learn the KQL you need for Azure Sentinel (YouTube)

KEY TABULAR OPERATORS

Operator	Description	Example
Where	Filters a table to the subset of log entries with row values that satisfy the predicate*	SecurityEvent | where Account contains "DC"
Search	Multi-table/multi-column search	search "172.18.0.4"
Distinct	Produces a table with the distinct combinations for the fields provided	AzureNetworkAnalytics_CL | distinct SrcIP_s, DestIP_s, DestPort_d, FlowStatus_s | where isnotempty(SrcIP_s) and isnotempty(DestIP_s)
Summarize	Multi-functional operator with tons of utility. In this example is used to aggregate total count of log entries for each distinct combination for the given fields	AzureNetworkAnalytics_CL | summarize count() by SrcIP_s, DestIP_s, DestPort_d, FlowStatus_s | where isnotempty(SrcIP_s) and isnotempty(DestIP_s)
Limit	Limits the query results to specified number	SigninLogs | limit 5
Project	Select the columns to include, rename, or drop. (project-keep, project-rename, project-away)	SecurityEvent | project-keep TenantId, Account, Computer, EventData, Activity

KEY STRING OPERATORS

Operator	Description	Example
==	Equals (Case sensitive)	SecurityEvent | where Account == "NA\\SQL12$"
=~	Equals (Case insensitive)	SecurityEvent | where Account =~ "na\\sql12$"
!=	Returns all log entries where the 'Account' field does not equal specified string (Case sensitive)	SecurityEvent | where Account != "NA\\SQL12$"
contains	Returns log entries and fields with specified string included in value (Case insensitive)	SecurityEvent | where EventData contains ".exe"
endswith	Returns log entries for the specified field ending with specified string (Case insensitive)	AzureDiagnostics | where OperationName endswith "write"
startswith	Returns log entries for the specified field starting with specified string (Case insensitive)	KubeEvents | where Name startswith "minecraft"
in	Returns entries where specified string(s) in list are included in events (Case insensitive)	SecurityEvent | where EventID in (4619, 4624, 4625)

ADVANCED OPERATORS

Operator	Description
join (inner, fullouter, leftsemi, rightouter, innerunique etc.)	Merges the rows of two tables to form a new table by matching values of the specified column(s) from each table. (i.e., inner-join produces a table with matching records/values from both left-side and right-side tables)
externaldata	Allows you to call in an data from an external storage artifact such as a .csv file in a Azure Blob Storage or a file in Azure Data Lake
union	Takes 2 or more tables and returns all rows from specified tables
isnotempty(<columnName>)	Returns all events where the given column entry is not empty

NSG FLOW LOGS PRIMER

What is it?

- Must be enabled through Network Watcher service
- Logs IP traffic flowing through a Network Security Group (NSG)
- Has two versions; version 2 is more verbose

```
"1584032449,10.0.0.5,20.45.123.90,37848,443,T,O,A,C,14,3564,16,10115",
```

1584032449	10.0.0.5	20.45.123.90	37848	443	T	O	A	C	14	3564	16	10115
Timestamp UNIX epoch	**Source IP**	**Destination IP**	**Source Port**	**Destination Port**	**Protocol** **T** = TCP **U** = UDP	**Traffic Flow** **I** = Inbound **O** = Outbound	**Traffic Decision** **A** = Allowed **D** = Denied	**Flow State** **B** = Begin **C** = Continue **E** = End	**Packets** Source to Destination	**Bytes** Source to Destination	**Packets** Destination to Source	**Bytes** Destination to Source

Version 1 + 2

Version 2 only

DATADOG

LAB #2

Visit aka.ms/lademo

Using the "AzureNetworkAnalytics_CL" table, do the following:

- Identify the IP address with most denied inbound requests in past 48 hours
- Which Network Security Group (NSG) rule blocked the request?
- What are some other interesting findings about the traffic associated with this IP address?

Key Concepts

- Query NSG Flow Logs
- Identify noisiest IP address

Hints

- Use the NSG Flow Logs Primer slide

DATADOG

SOLUTION

Identifying the IP address w/ most denied connection attempts:

```
AzureNetworkAnalytics_CL
| where FlowStatus_s == "D"
| where FlowDirection_s == "I"
| where isnotempty(SrcIP_s)
| summarize count() by SrcIP_s
```

What are some other interesting findings about this IP address?

```
AzureNetworkAnalytics_CL
| where SrcIP_s == "<IP.ADDRESS>"
```

LEARNING RESOURCES

- KQL Query Best Practices: https://docs.microsoft.com/en-us/azure/data-explorer/kusto/query/best-practices
- Free Sentinel Data Sources: https://docs.microsoft.com/en-us/azure/sentinel/billing?tabs=commitment-tier#free-data-sources
- Populated Sandbox Log Analytics Env.: https://aka.ms/lademo
- Sentinel Ninja Training: https://techcommunity.microsoft.com/t5/microsoft-sentinel-blog/become-a-microsoft-sentinel-ninja-the-complete-level-400/ba-p/1246310
- MSFT Security Webinars: https://techcommunity.microsoft.com/t5/security-compliance-and-identity/recordings-security-community-webinars/ba-p/2865990
- Must Learn KQL BOOK by Rod Trent: https://techcommunity.microsoft.com/t5/security-compliance-and-identity/recordings-security-community-webinars/ba-p/2865990
- SQL to KQL Cheat Sheet: https://docs.microsoft.com/en-us/azure/data-explorer/kusto/query/sqlcheatsheet
- KQL Cheat Sheet (VERY HELPFUL): https://github.com/marcusbakker/KQL/blob/master/kql_cheat_sheet_dark.pdf
- Twitter Accounts:
  - @DebugPrivilege
  - @rodtrent
  - @RPargman
  - @SCAutomation
  - @Reprise_99
  - @Cyb3rMonk
  - @OlafHartong
  - @Krelkci
  - @Darwnsm

THANK YOU

I HOPE YOU LEARNED SOMETHING NEW!
DON'T FORGET TO DELETE YOUR
RESOURCES!