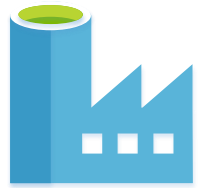
Complex Orchestration



With Dynamic Data Factory Pipelines

Paul Andrew | Principal Consultant & Solution Architect

Microsoft® Most Valuable Professional

@MrPaulAndrew

Microsoft Partner
Microsoft
Gold Cloud Platform
Gold Data Analytics
Gold Data Platform
Gold DevOps

adatis

GitHub

https://github.com/mrpaulandrew

CommunityEvents

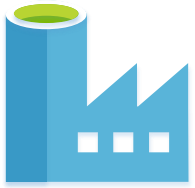
Demo code, content and slides from various community events.

C++

{Event/Location}-{Month}-{Year}

Agenda

Complex Orchestration



With Dynamic Data Factory Pipelines

Azure Data Factory	Extensibility & Parallelism	More Design Patterns
A very quick overview	Custom Activities SSIS IR & Packages	Bootstrapping Hosted IR vs IaaS Frameworks

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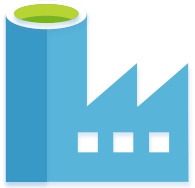
Agenda

Complex Orchestration



With Dynamic Data Factory Pipelines

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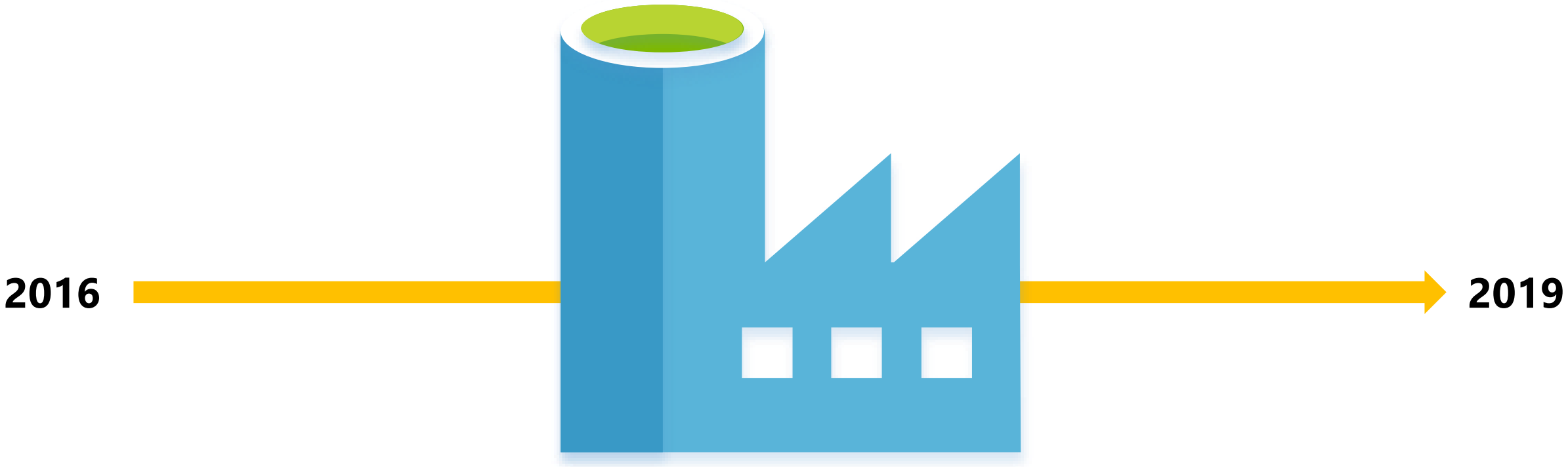
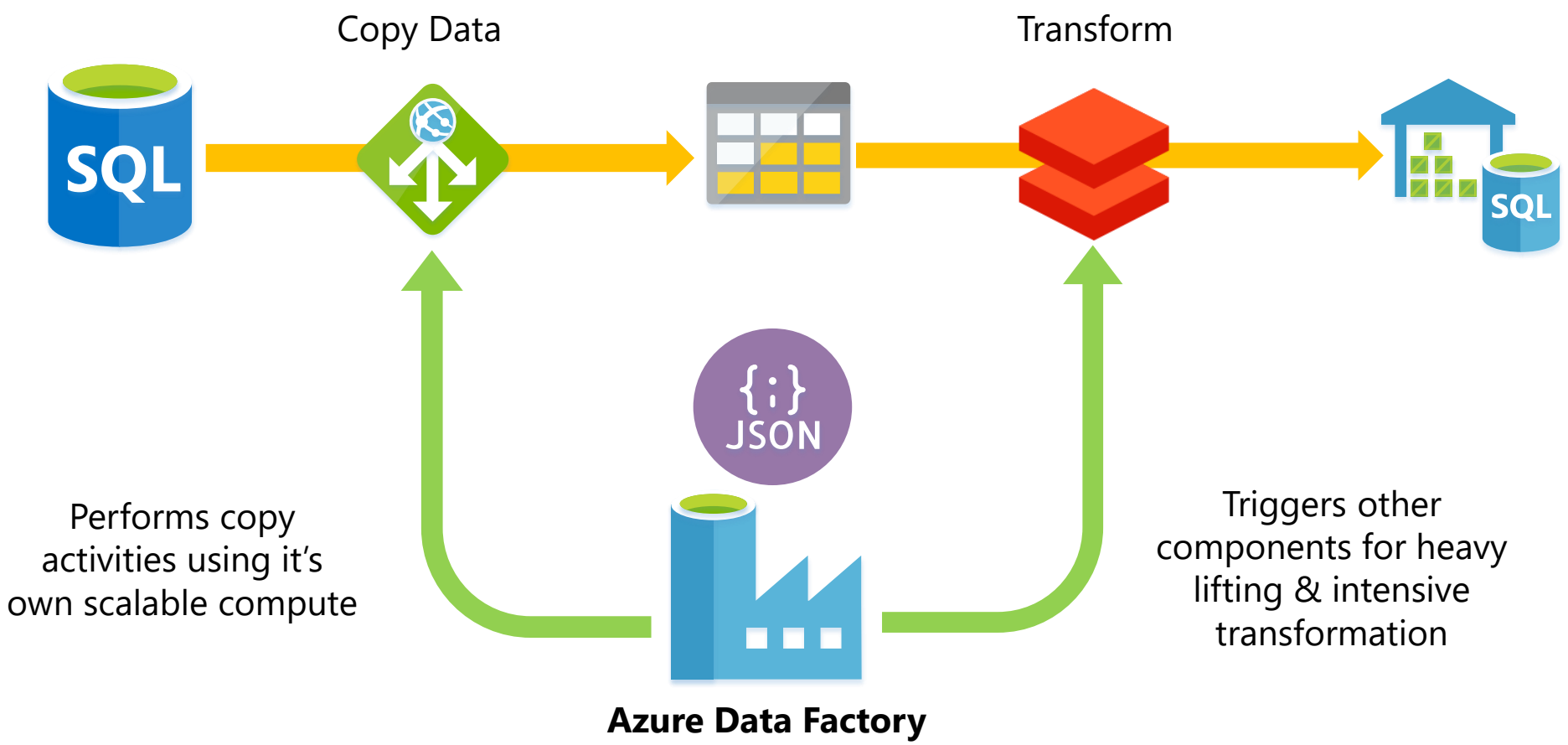
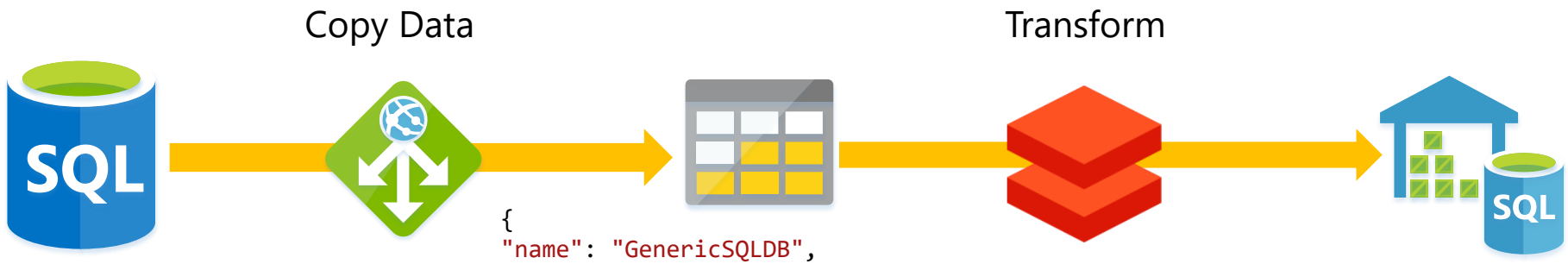
Azure Data Factory



What is Azure Data Factory?



Data Factory Components – Recap



1. **Linked Services** ✓
2. **Data Sets** ✓
3. **Activities** ✓
4. **Pipelines** ✓
5. **Triggers** ✗

JSON

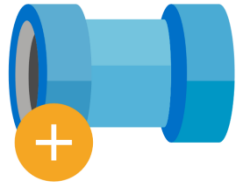
```
{
"name": "GenericSQLDB",
"type": "Microsoft.DataFactory/factories/linkedservices",
"properties": {
    "parameters": {
        "ServerInstance": {
            "type": "String"
        },
        "DatabaseName": {
            "type": "String"
        },
        "SQLUser": {
            "type": "String"
        },
        "SQLPassword": {
            "type": "String"
        }
    },
    "type": "AzureSqlDatabase",
    "typeProperties": {
        "connectionString": "Integrated Security=False;Encrypt=True;ConnectionTimeout=30;
            Data Source=@{linkedService().ServerInstance};
            InitialCatalog=@{linkedService().DatabaseName};
            UserID=@{linkedService().SQLUser};
            Password=@{linkedService().SQLPassword}"
    }
}
```

Integration Runtimes

1

Azure
Integration Runtime

Movement Hours



Activity
Orchestration

Flexible Region

2

SSIS
Integration Runtime

SSIS Package
Execution

Specified Region

3

Self Hosted
Integration Runtime

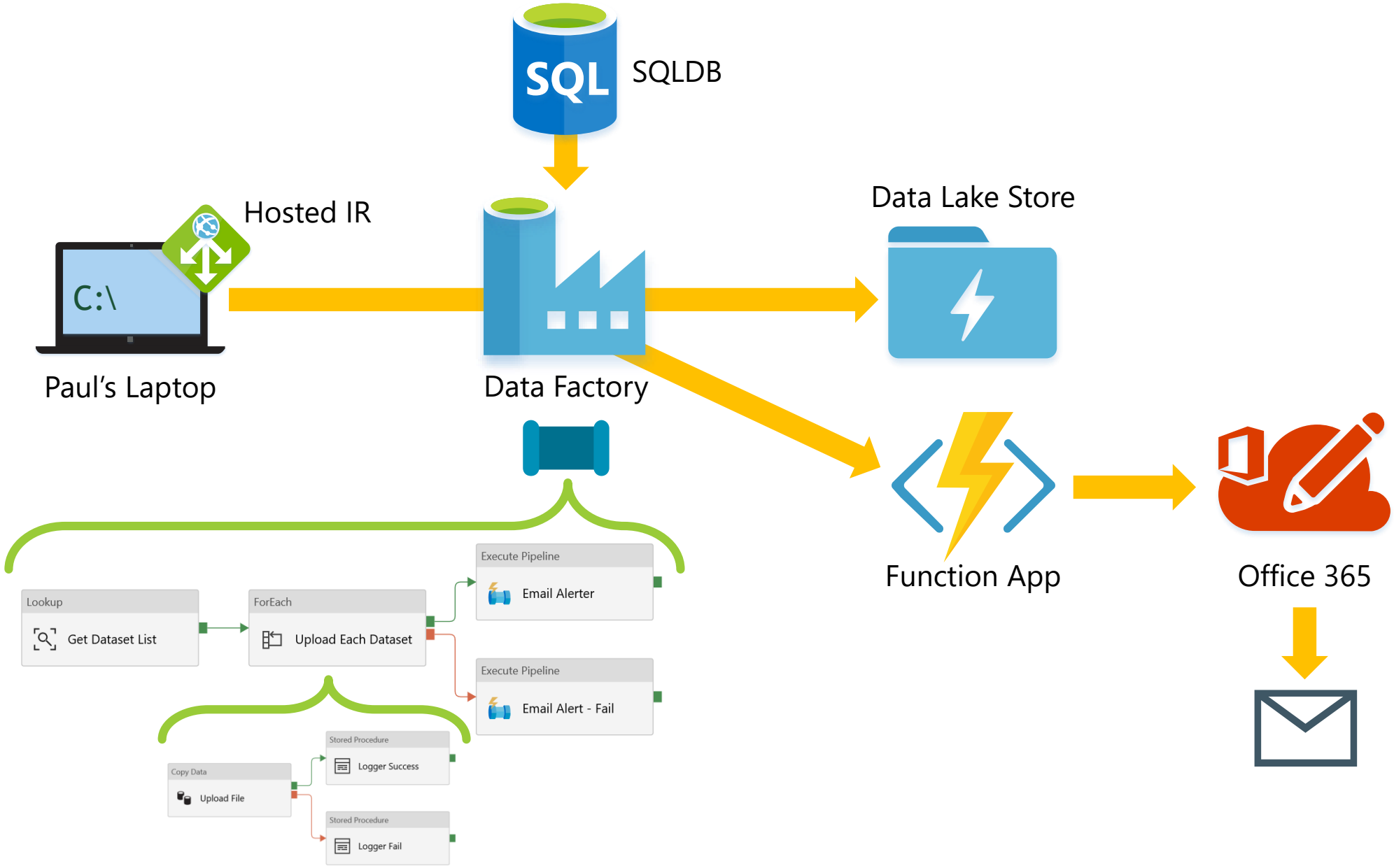
Gateway Access

Activity
Orchestration

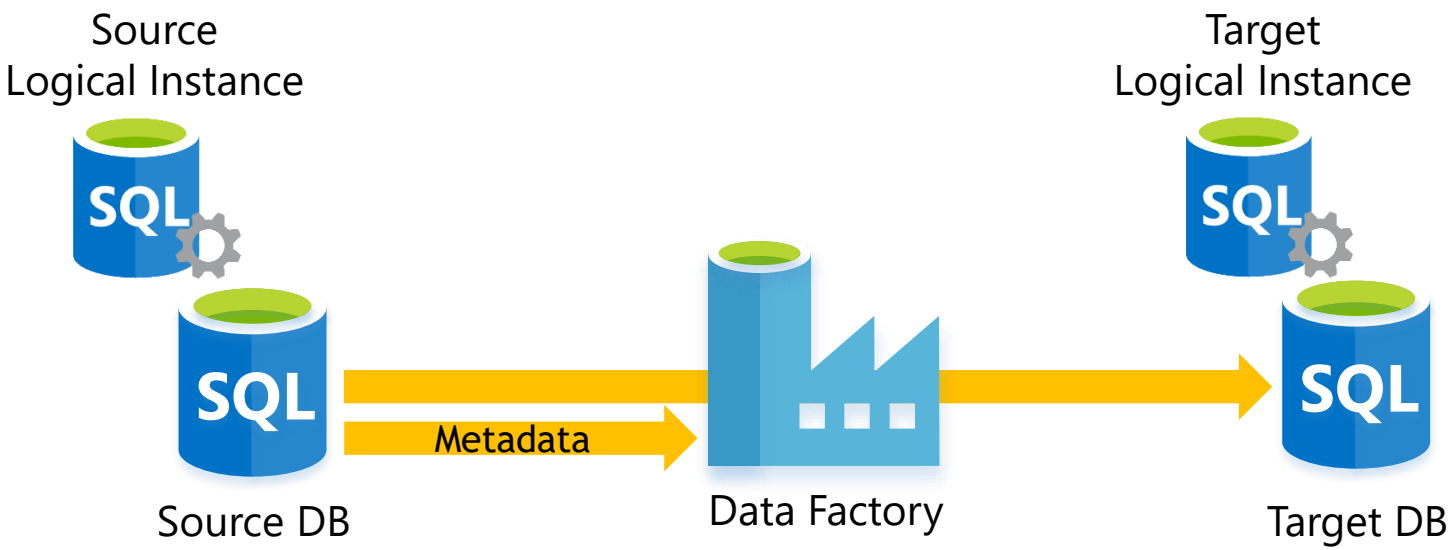
Virtual Machine

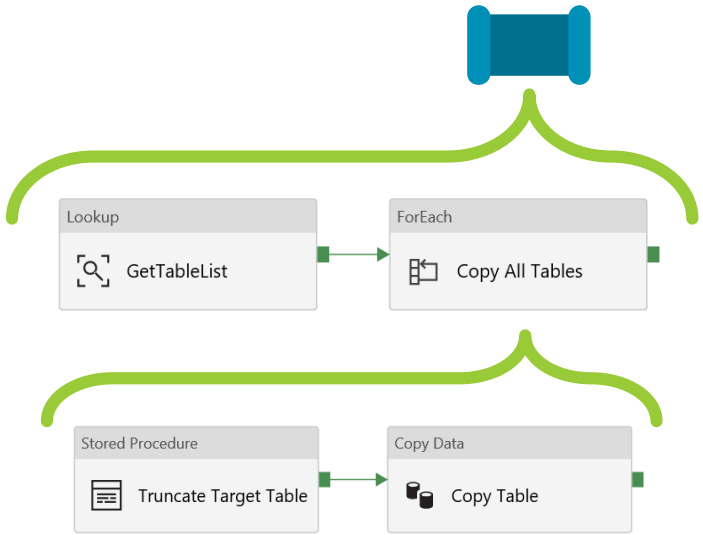
Demo

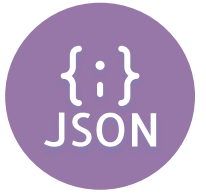
Demo Architecture 1



Demo Architecture 2





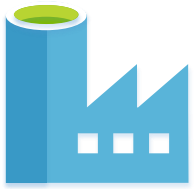


1x Linked Service

1x Dataset

Agenda

Complex Orchestration



With Dynamic Data Factory Pipelines

Azure Data Factory	Extensibility & Parallelism	More Design Patterns
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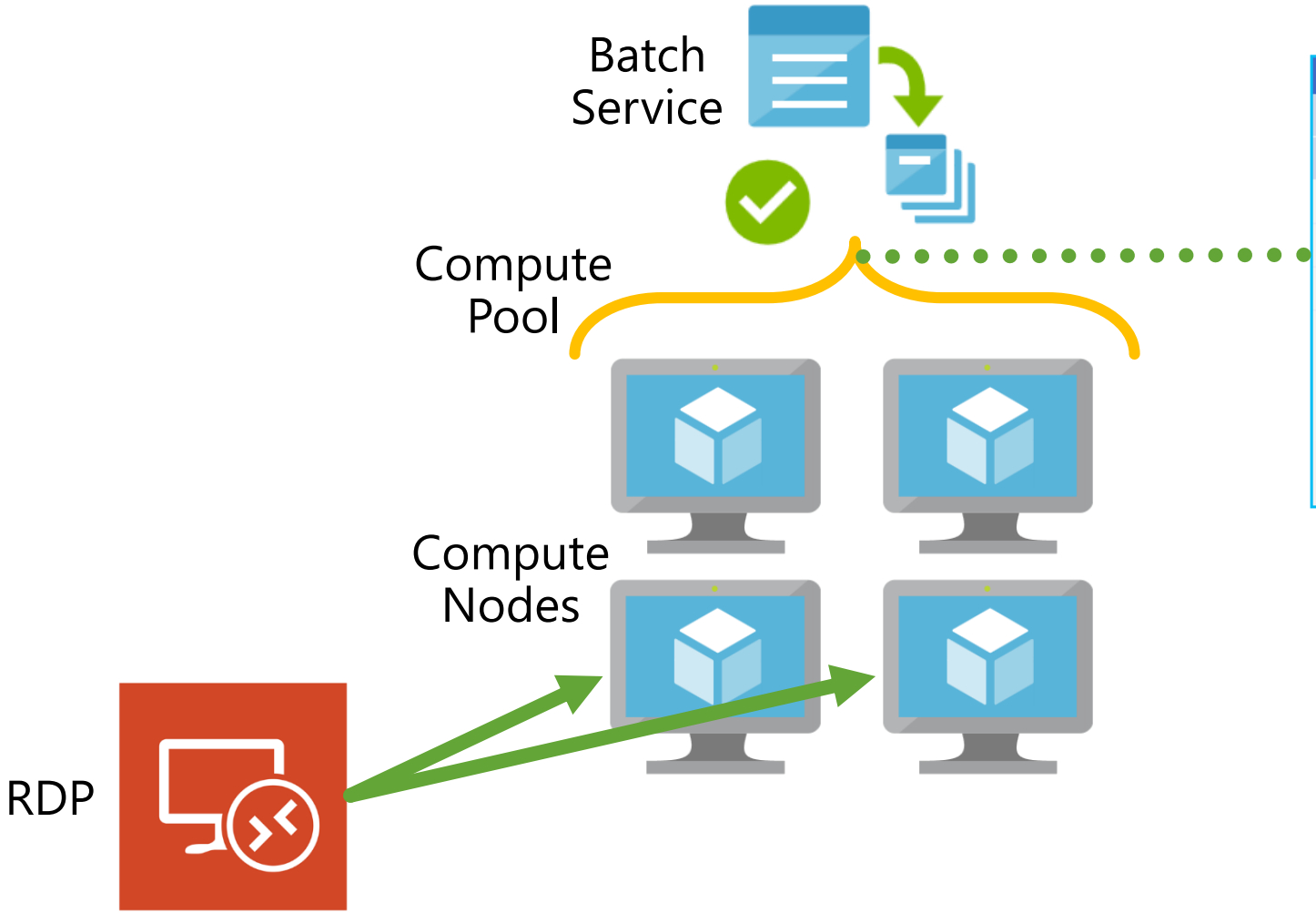
ADF Extensibility

1 **Custom Activities** – A .Net Console App Executed Using Azure Batch Service



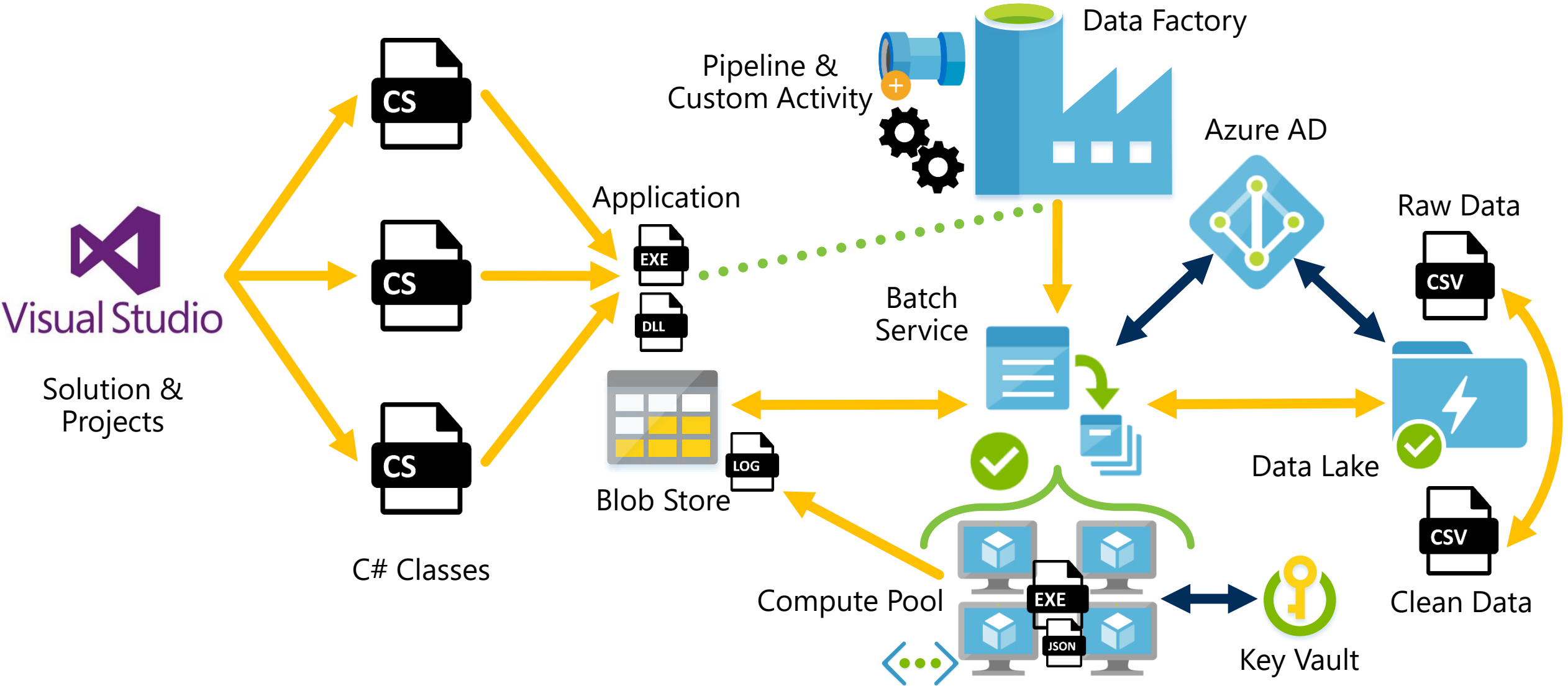
VM node size set per compute pool:

A1 Standard	A2 Standard	A3 Standard
1 Cores	2 Cores	4 Cores
1.8 GB	3.5 GB	7 GB
1 TB OS disk size	1 TB OS disk size	1 TB OS disk size
70 GB Resource disk size	135 GB Resource disk size	285 GB Resource disk size
2 Max data disk	4 Max data disk	8 Max data disk
Unable to display pricing	Unable to display pricing	Unable to display pricing

- 1 compute node = 1 virtual machine.
- 1 job per compute node.
- Max of 4 tasks per node.
- OS on D drive, not C.
- Special environment variables.

ADF Extensibility Continued

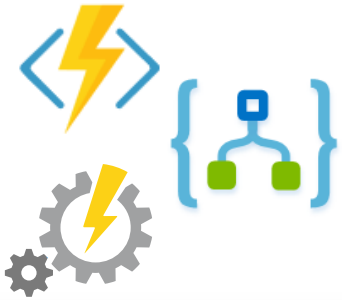
1 **Custom Activities** – A .Net Console App Executed Using Azure Batch Service

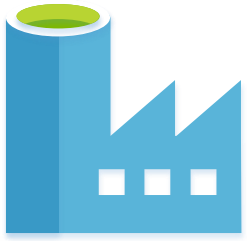


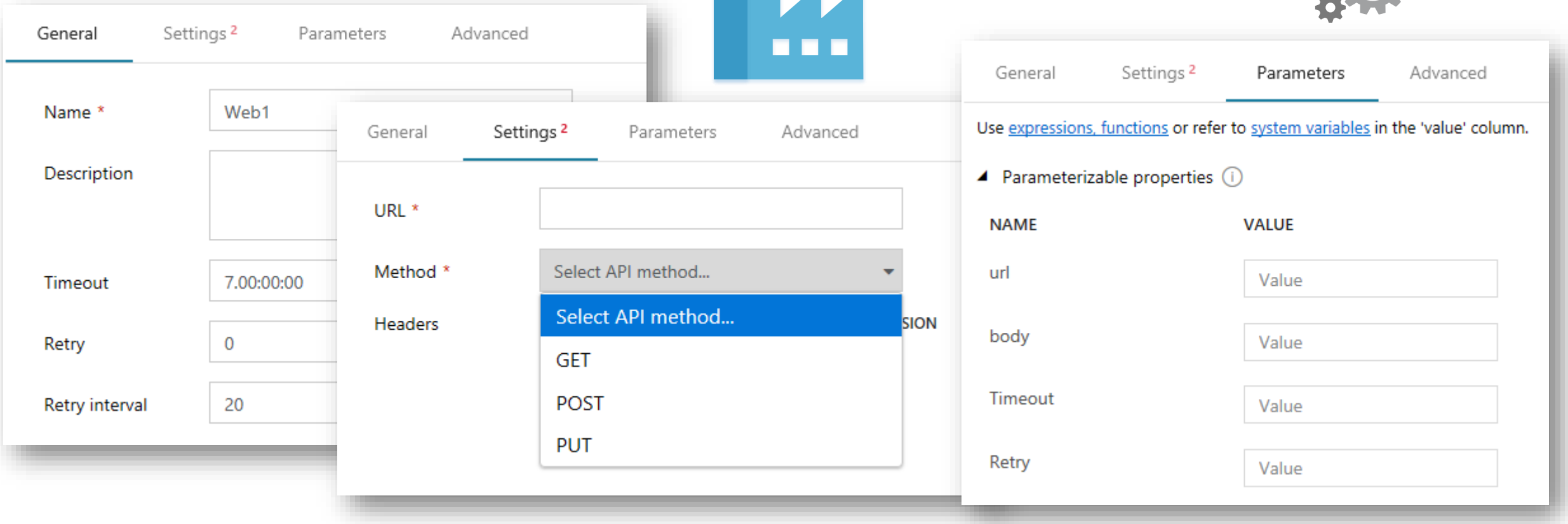
ADF Extensibility Continued

1. **Custom Activities** – A .Net Console App Executed Using Azure Batch Service
2. **Rest API Calls** – Eg. Web Activities Calling:

~~Azure Functions~~
Azure Logic Apps
Azure Automation

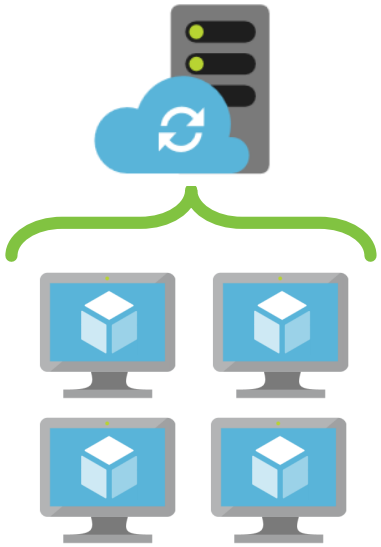




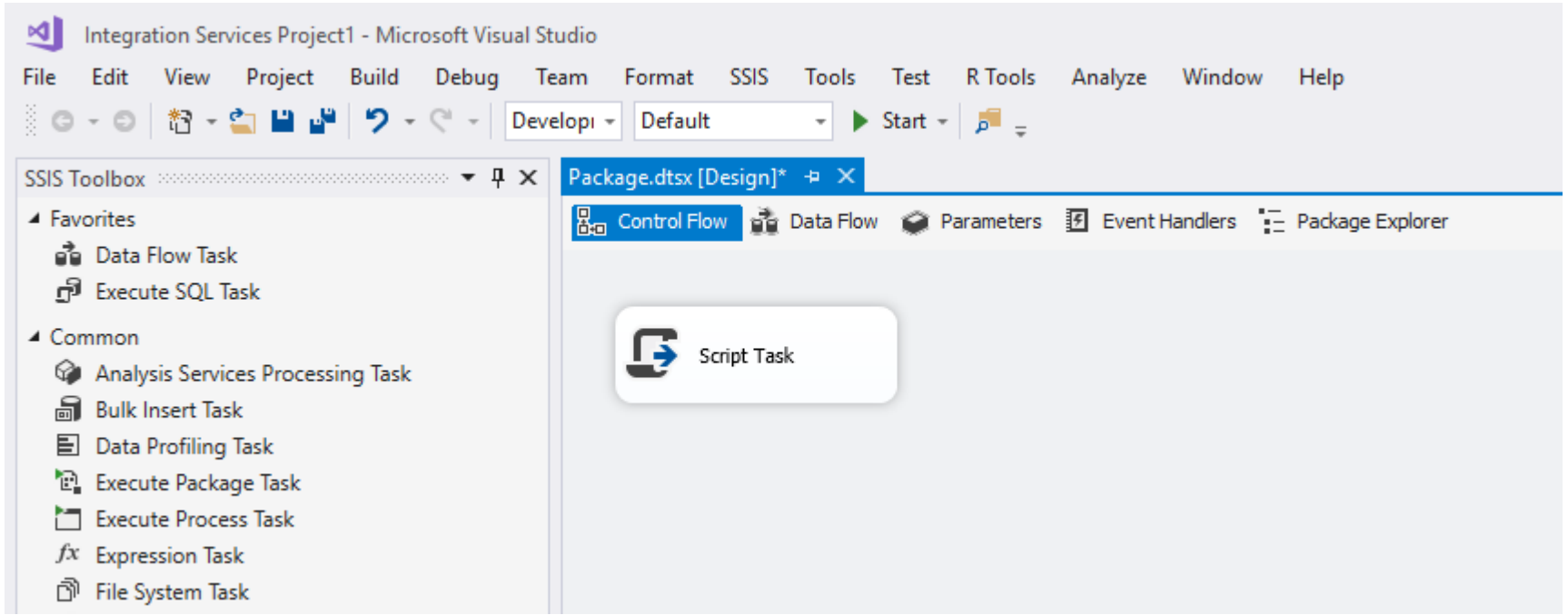


ADF Extensibility Continued

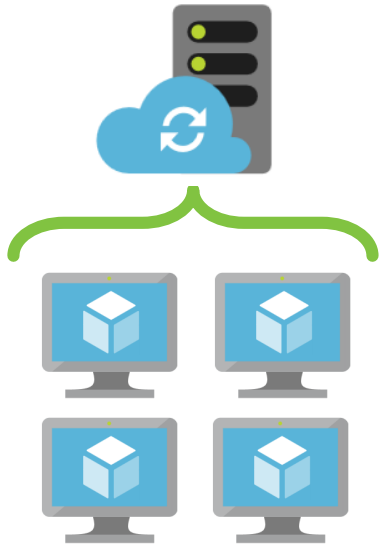
1. **Custom Activities**
2. **Rest API Calls**
3. **SSIS** – Packages with Control Flows and Data Flows



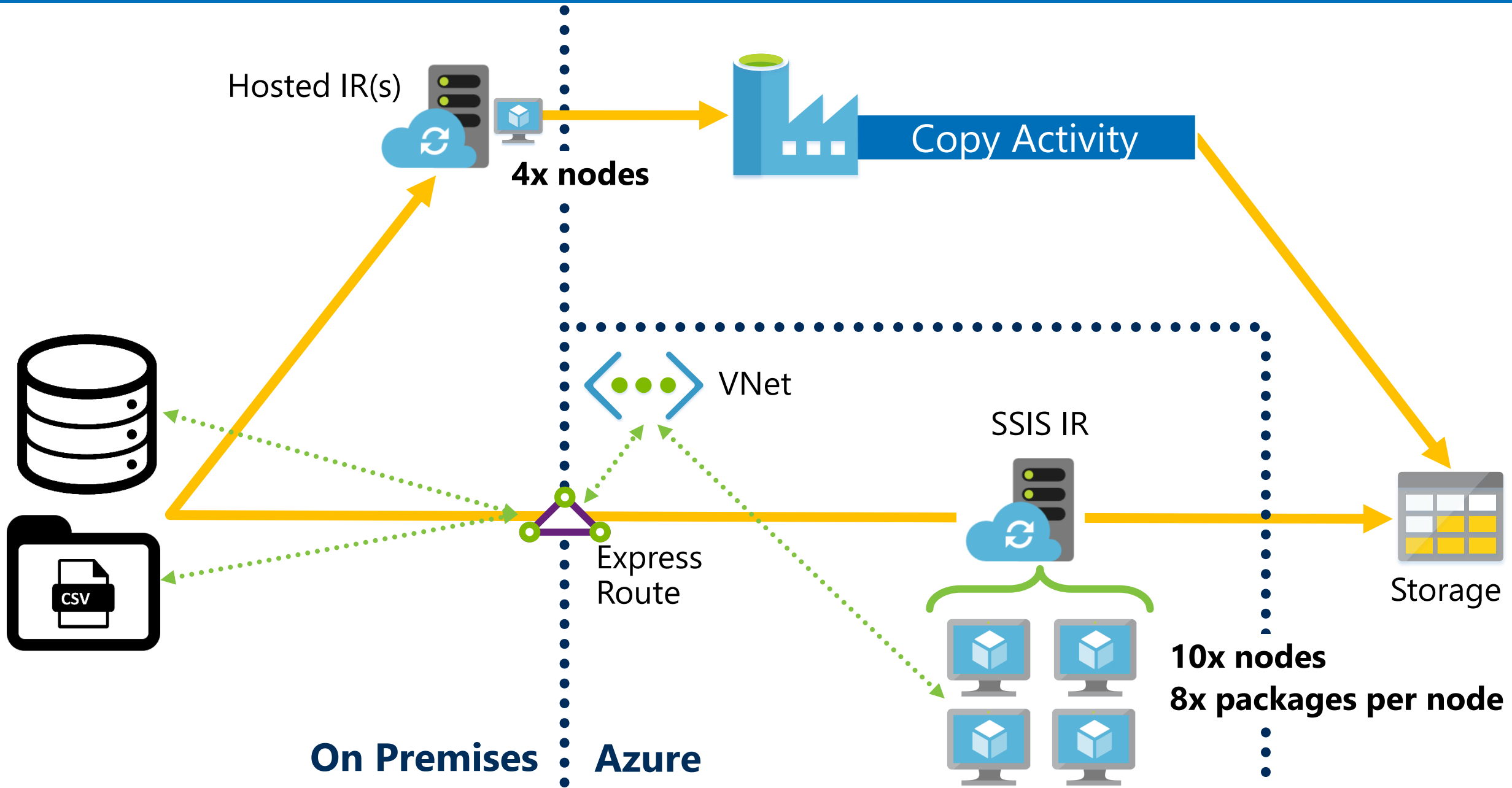
ADF SSIS IR



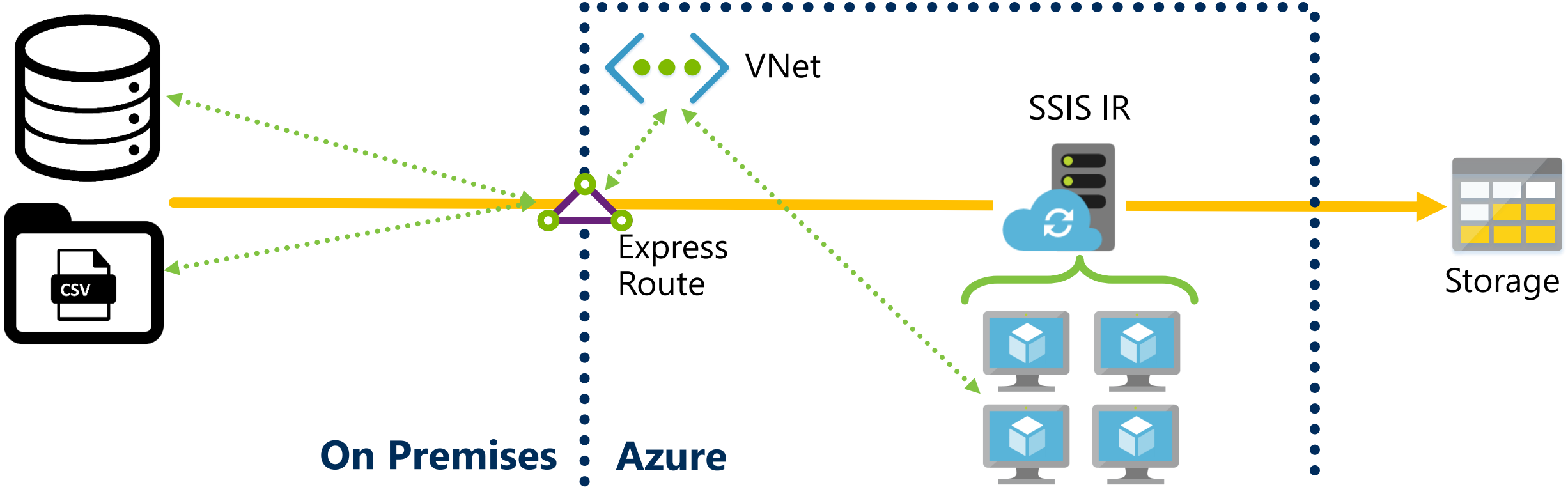
ADF Extensibility Continued



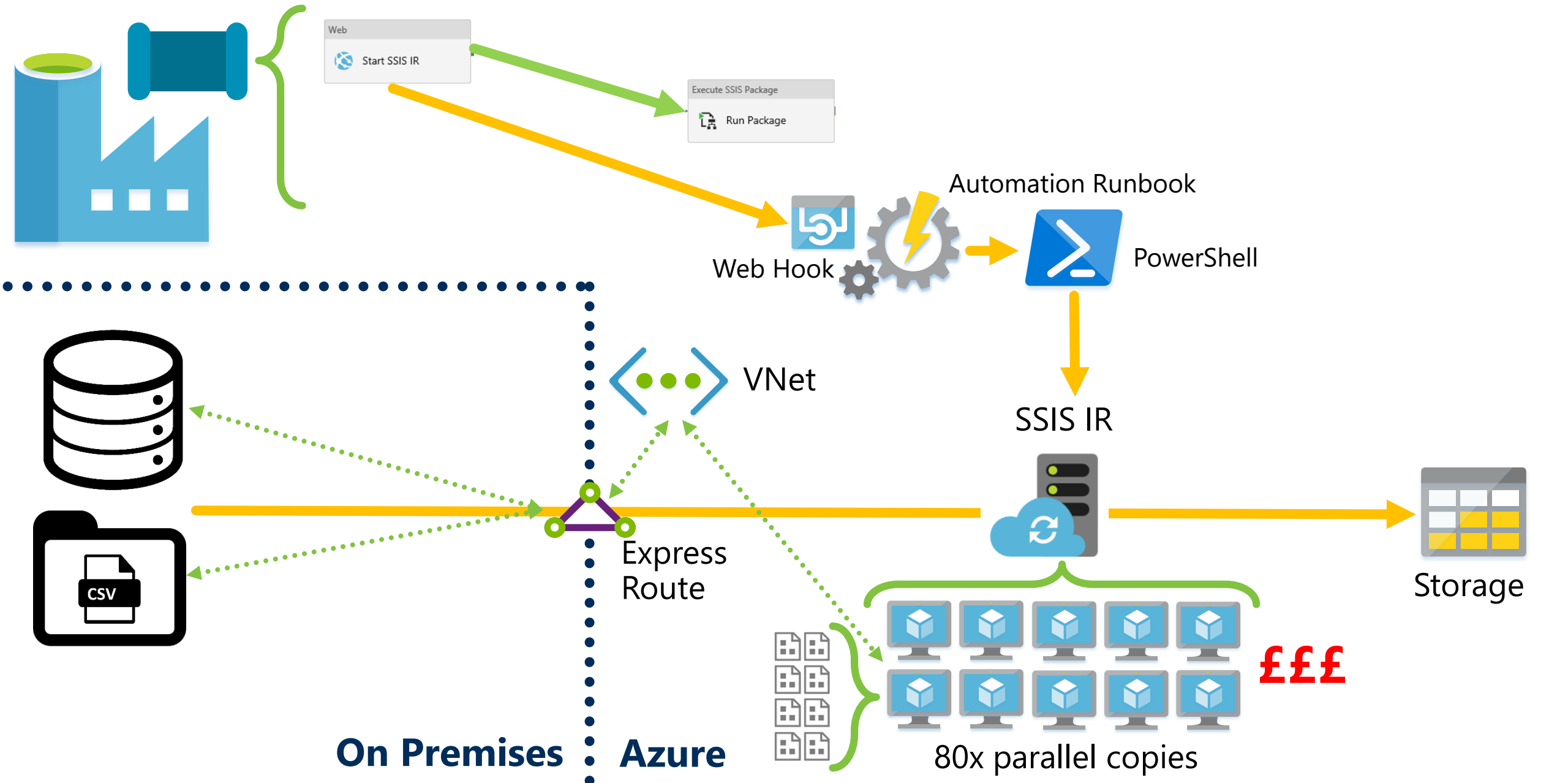
The SSIS IR vs Hosted IR with Express Route



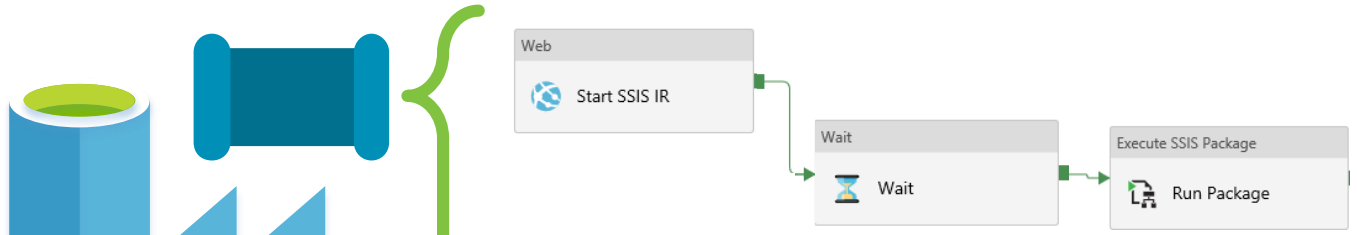
The SSIS IR Start/Stop

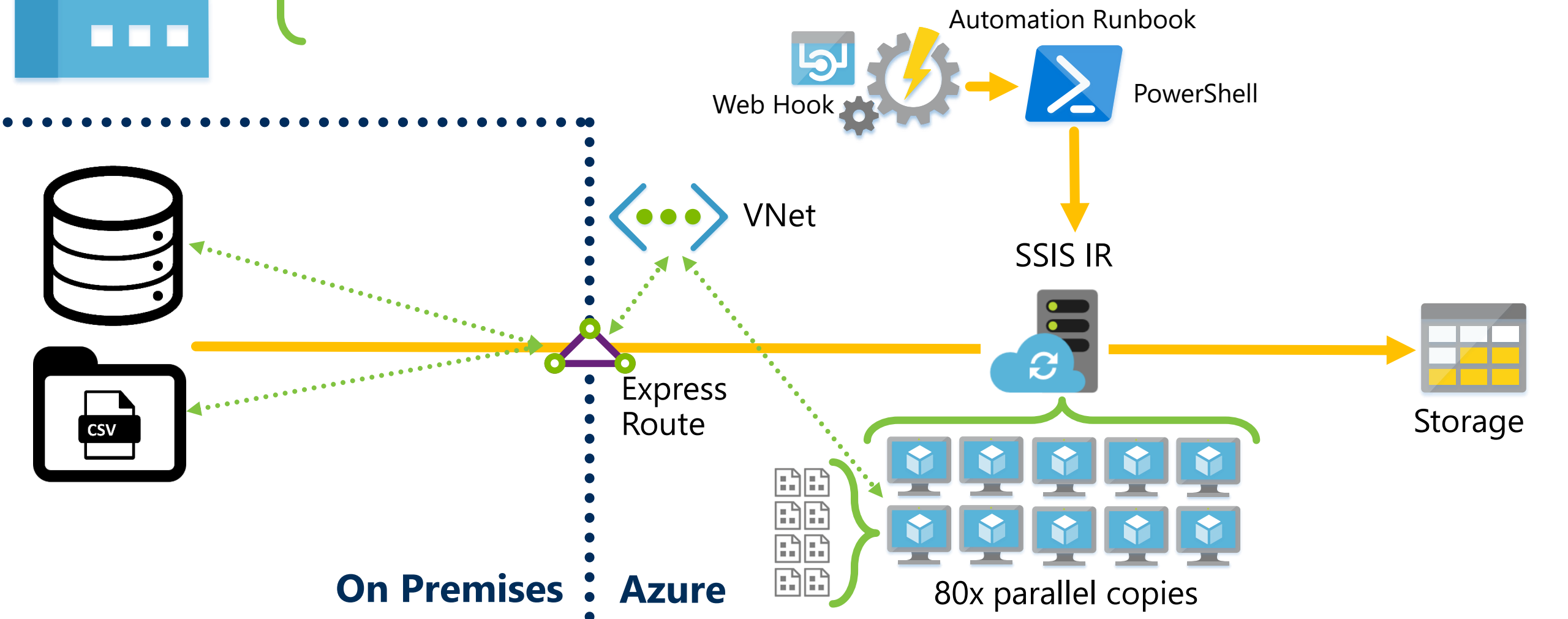


The SSIS IR Start/Stop



The SSIS IR Start/Stop





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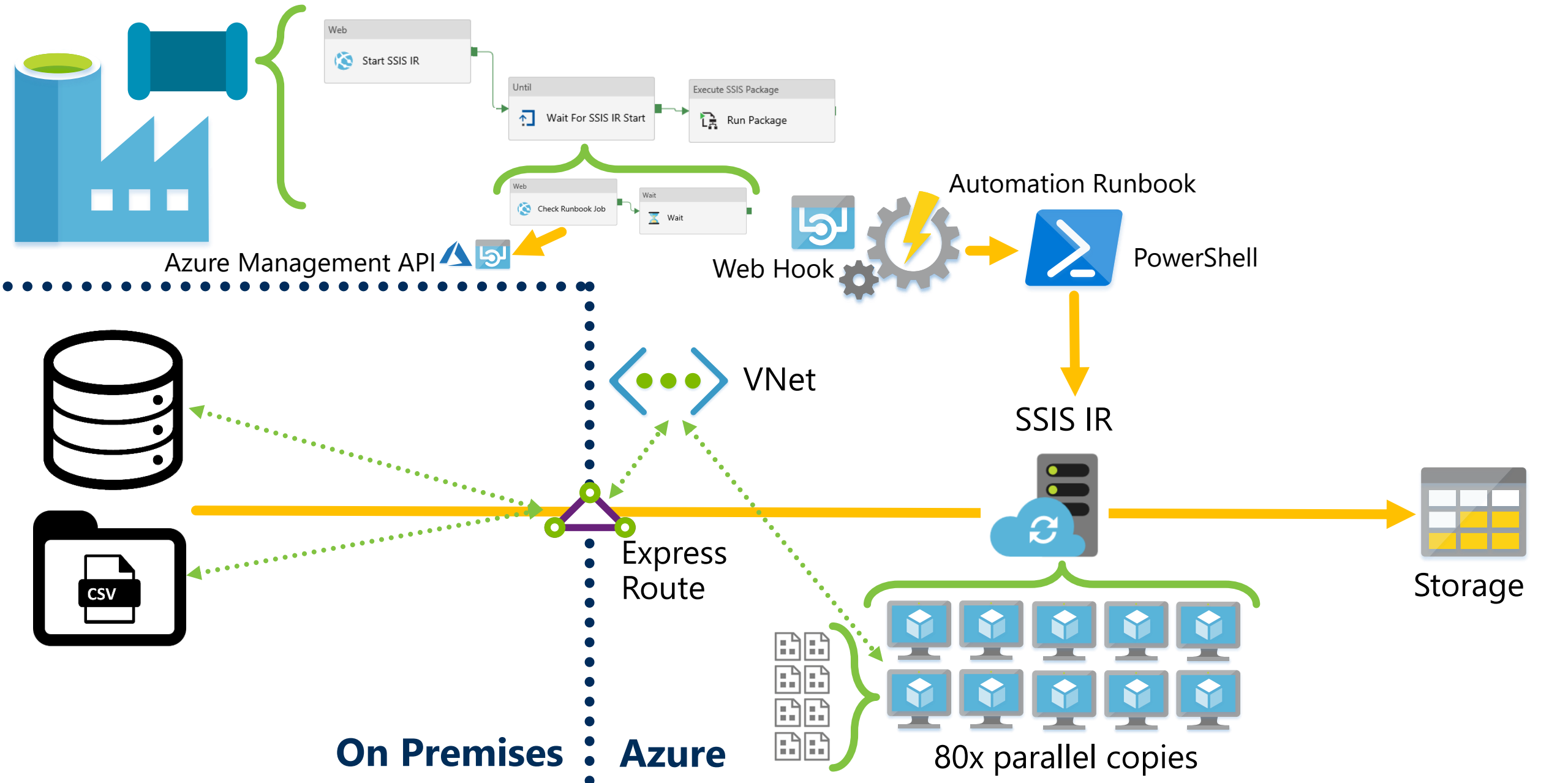
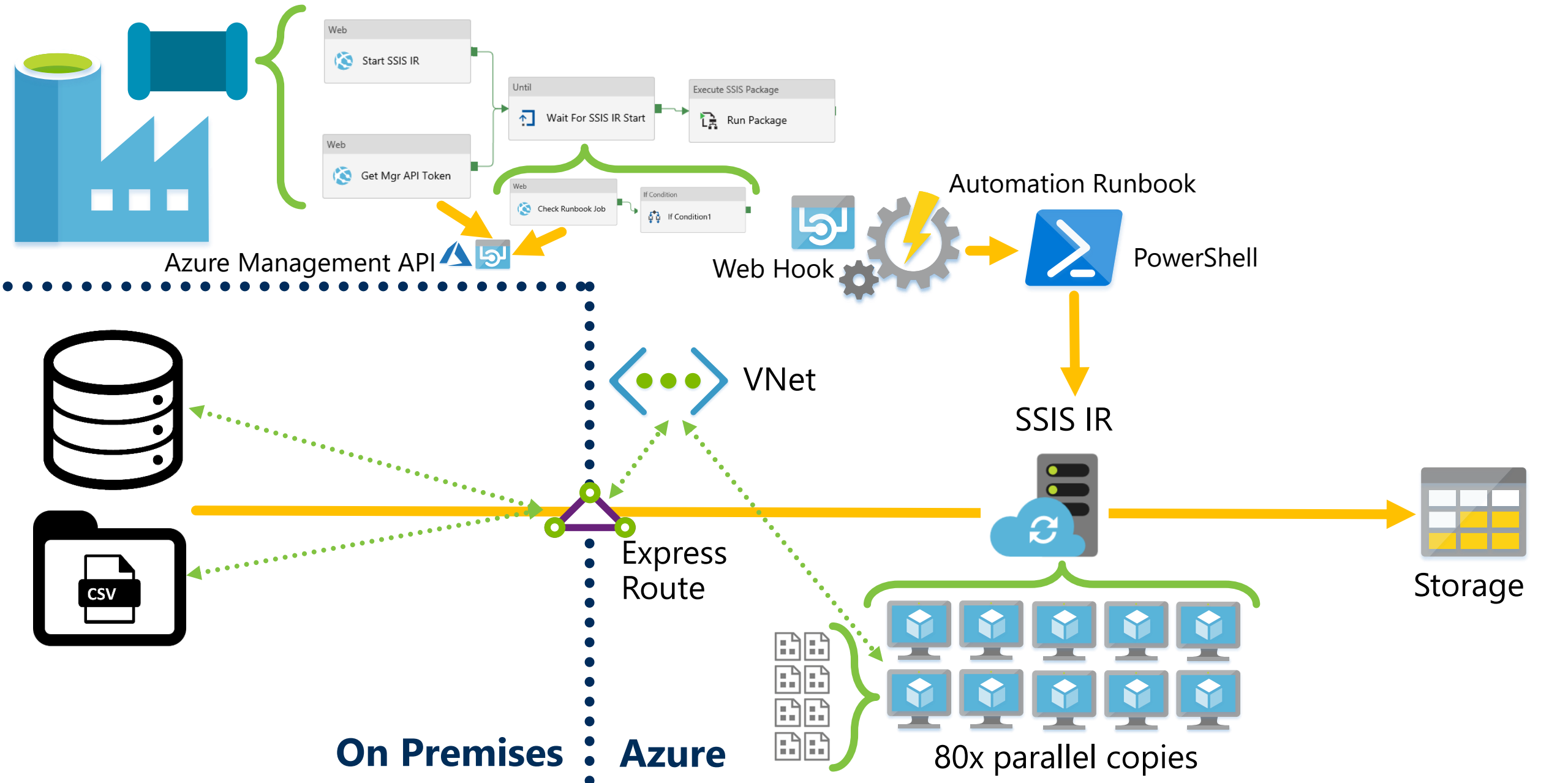
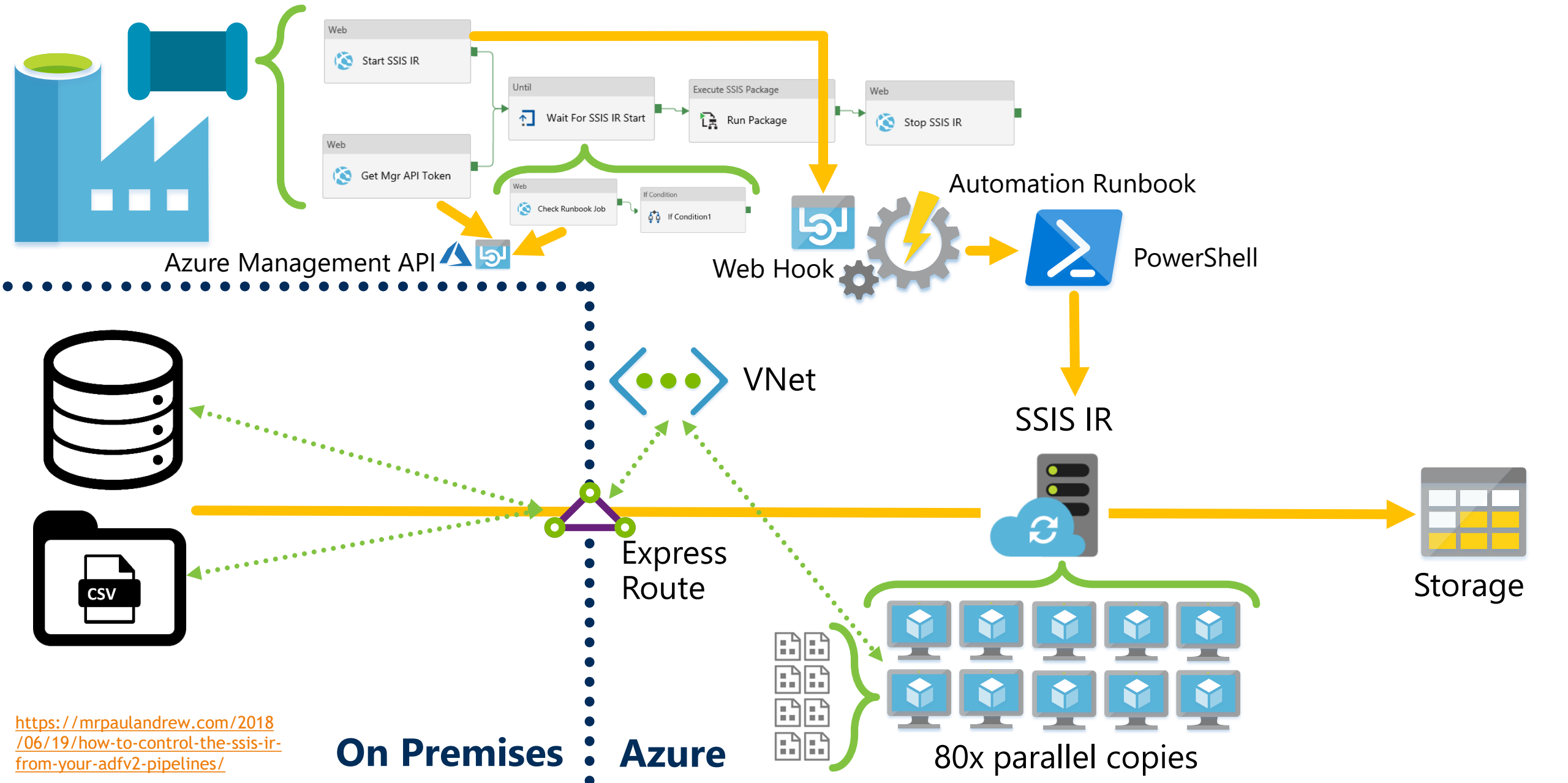


The SSIS IR Start/Stop

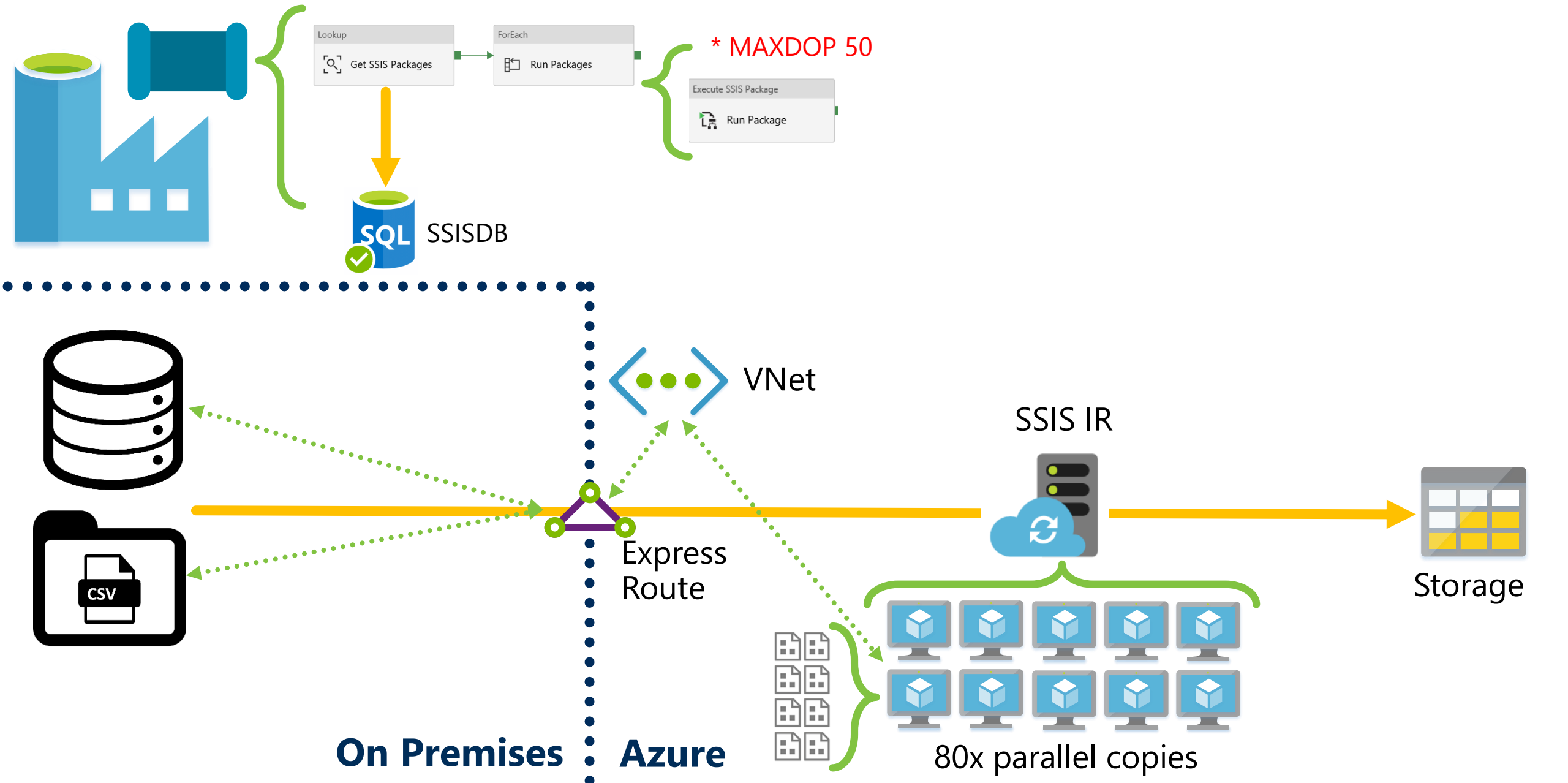


The SSIS IR Start/Stop

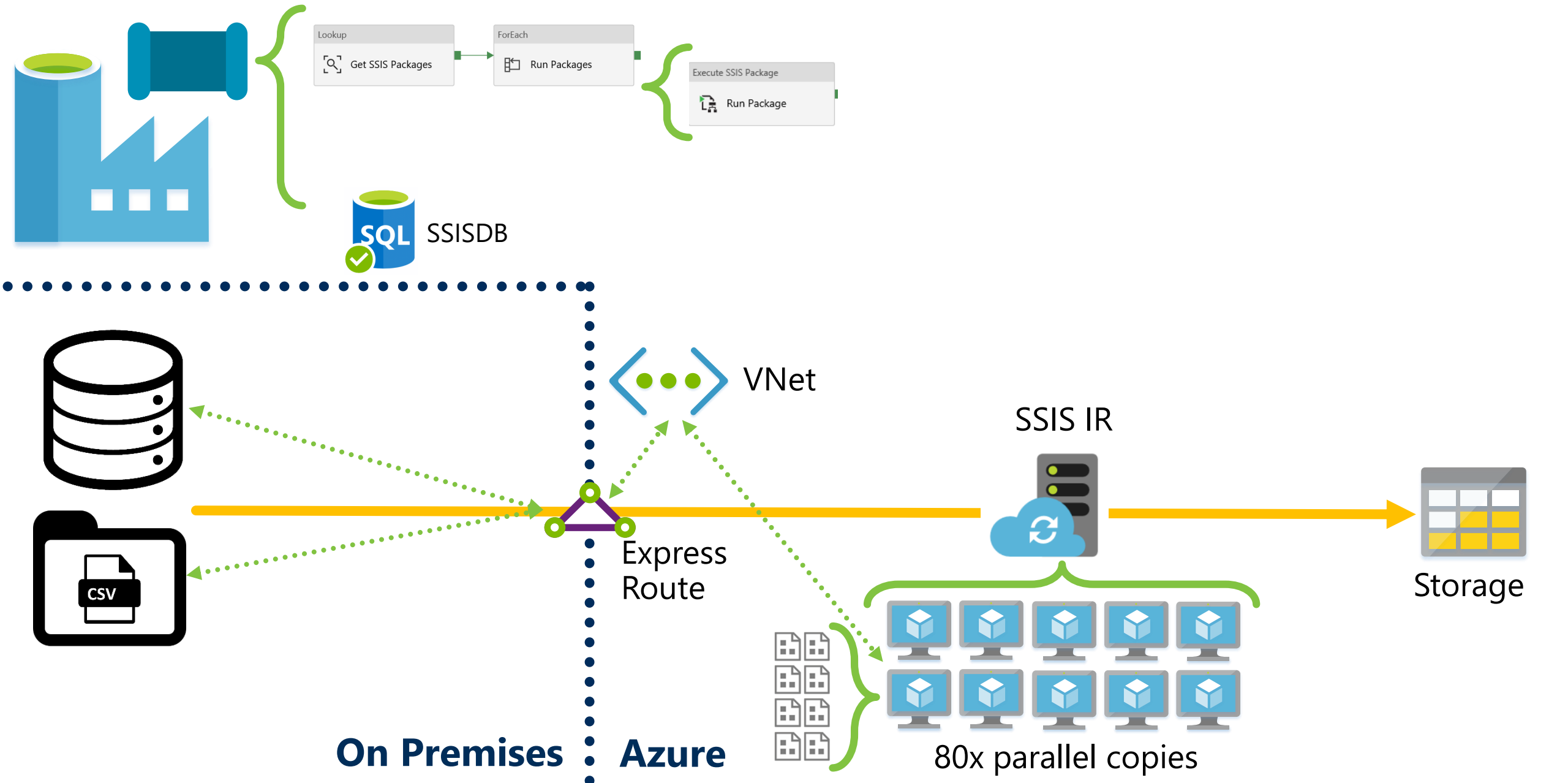


https://mrpaulandrew.com/2018/06/19/how-to-control-the-ssis-ir-from-your-adfv2-pipelines/

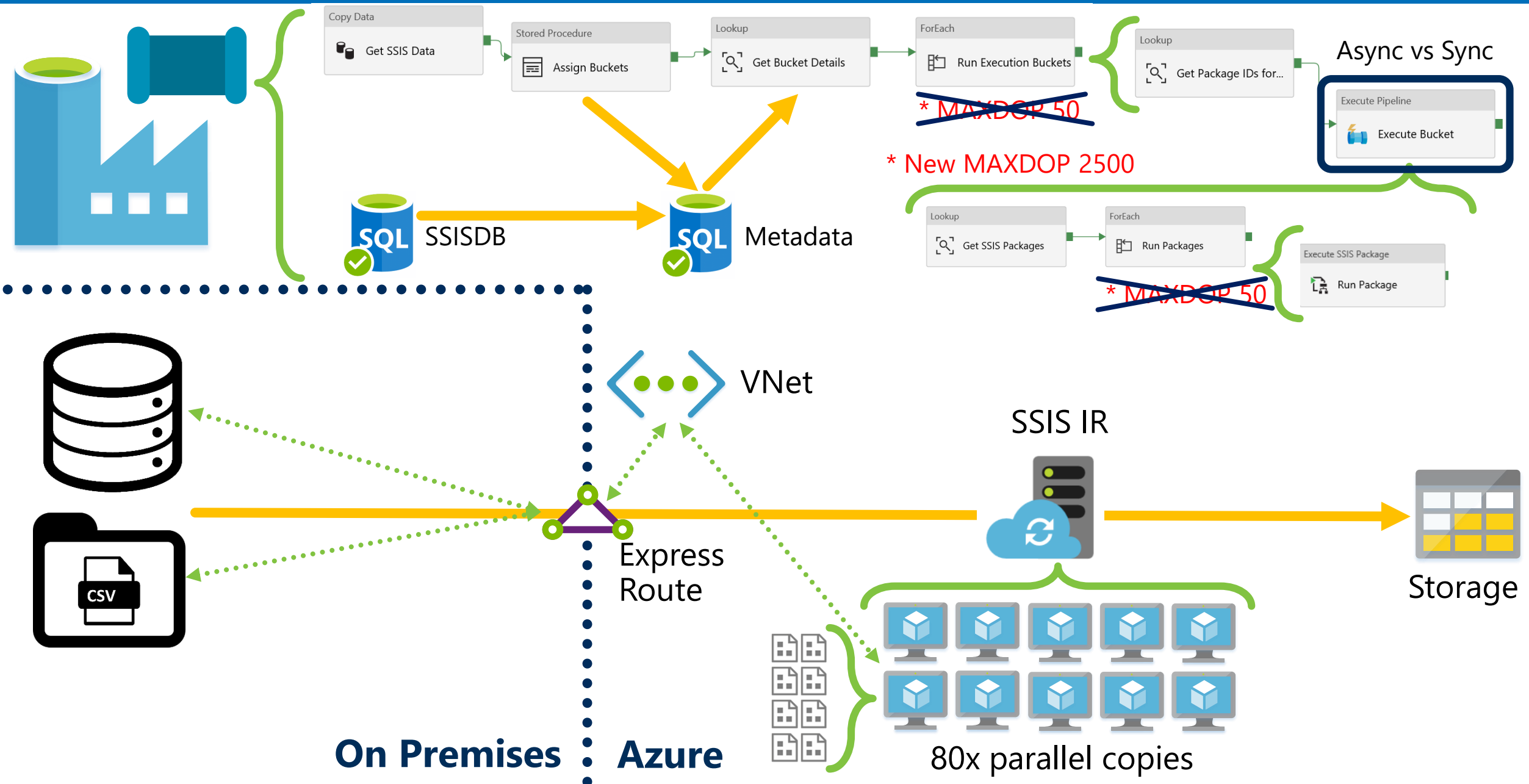
The SSIS IR Parallelism



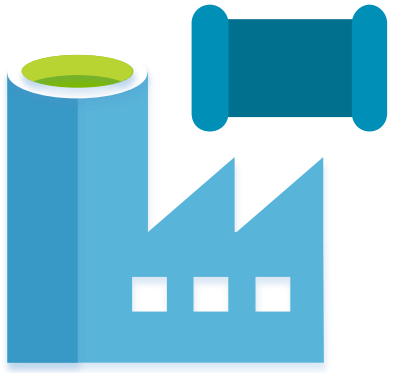
The SSIS IR Parallelism

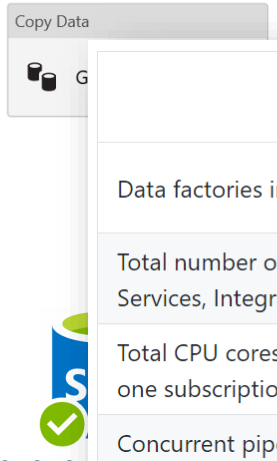


The SSIS IR Parallelism

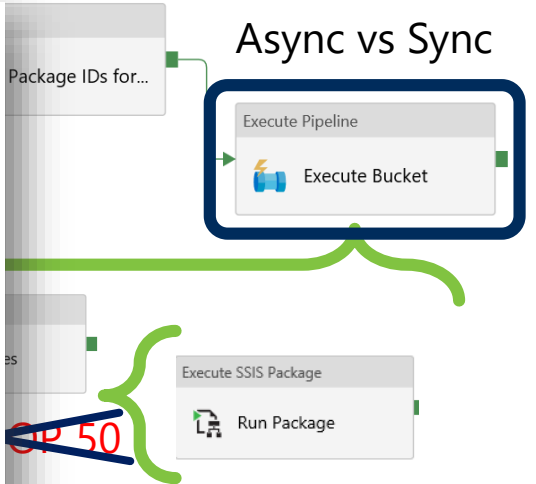


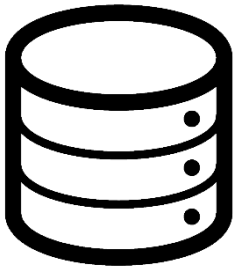
The SSIS IR Parallelism





Resource	Default Limit	Maximum Limit
Data factories in an Azure subscription	50	Contact support
Total number of entities (Pipeline, Datasets, Triggers, Linked Services, Integration runtimes) within a data factory	5000	Contact support
Total CPU cores for Azure-SSIS Integration Runtime(s) under one subscription	256	Contact support
Concurrent pipeline runs per data factory (shared among all pipelines in the factory)	10,000	Contact support
Max activities per pipeline (includes inner activities for containers)	40	40
Max number of Linked Integration Runtime that can be created against a single Self-hosted Integration Runtime	20	Contact support
Max parameters per pipeline	50	50
ForEach items	100,000	100,000
ForEach parallelism	20	50
Characters per expression	8,192	8,192
Minimum Tumbling Window Trigger interval	15 min	15 min
Max Timeout for pipeline activity runs	7 days	7 days
Bytes per object for pipeline objects [1]	200 KB	200 KB
Bytes per object for dataset and linked service objects [1]	100 KB	2000 KB
Data integration units per copy activity run [3]	256	Contact support





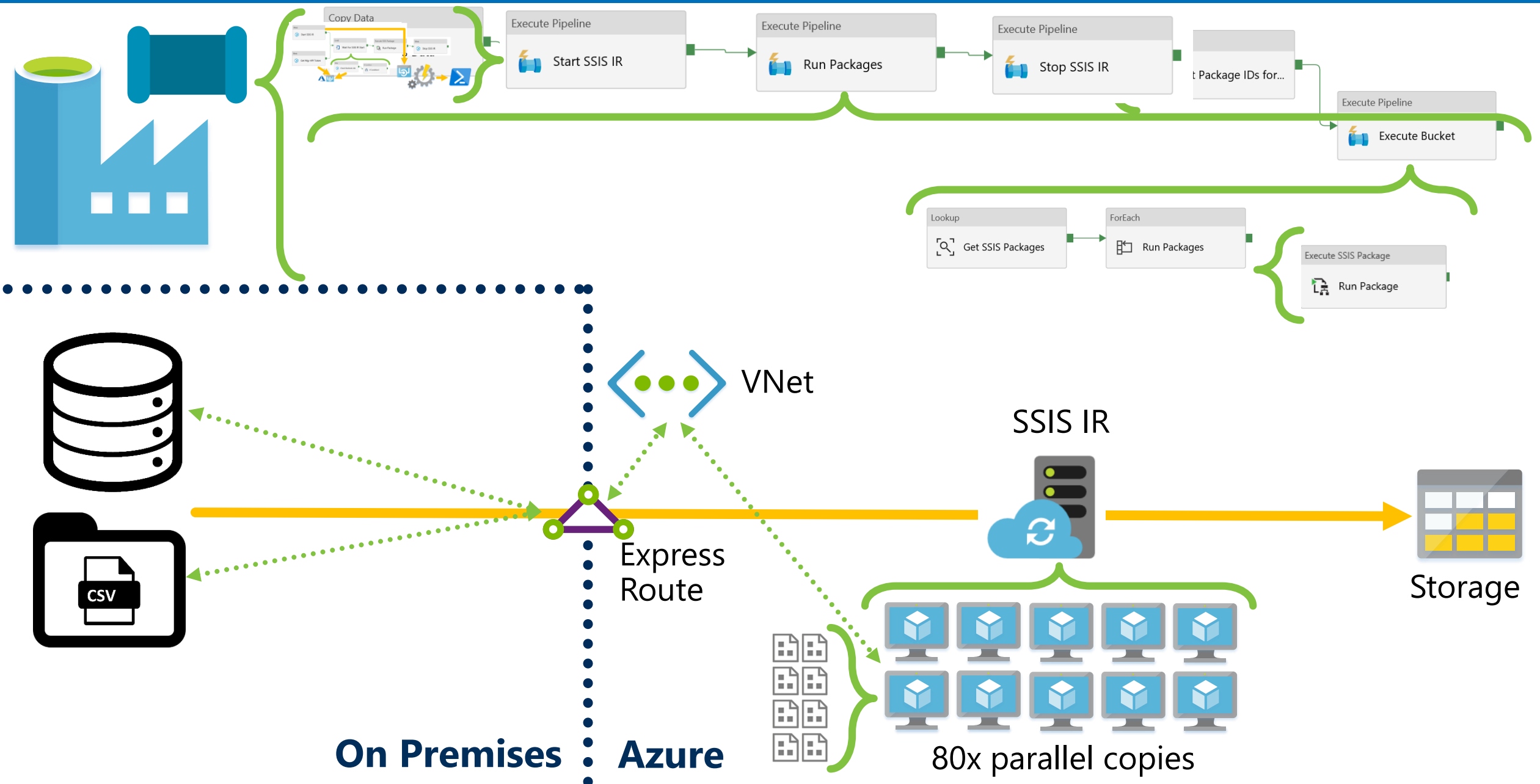
Storage

https://github.com/MicrosoftDocs/azure-docs/blob/master/includes/azure-data-factory-limits.md

On Premises : Azure

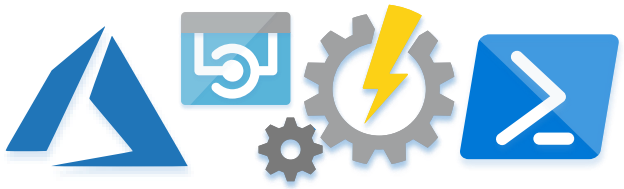
80x parallel copies

SSIS IR & Package Complete Orchestration Solution



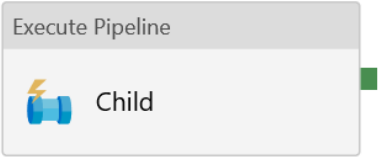
Pattern Summary

High Level Control Flow and Pipeline Triggers



Platform Component Control

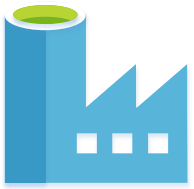
Manage Parallel Streams



Service Level Executions

Agenda

Complex Orchestration



With Dynamic Data Factory Pipelines

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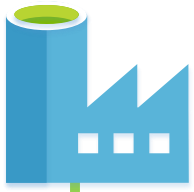
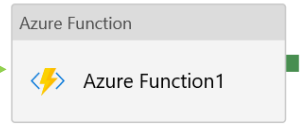
Bootstrapping

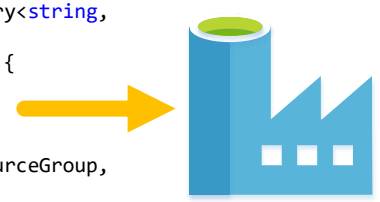


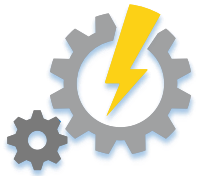
Data Factory



Functions

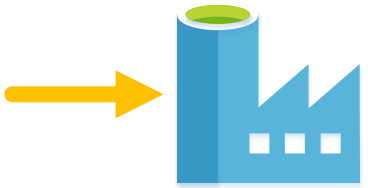
```
Console.WriteLine("Creating pipeline run...");
Dictionary<string, object> parameters = new Dictionary<string,
object> {
                    {"inputPath", inputBlobPath }, {
"outputPath", outputBlobPath }
                    };
CreateRunResponse runResponse =
client.Pipelines.CreateRunWithHttpMessagesAsync(resourceGroup,
dataFactoryName, pipelineName, parameters:
parameters).Result.Body;
Console.WriteLine("Pipeline run ID: " + runResponse.RunId);
```

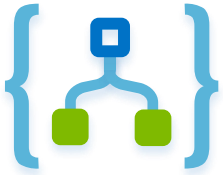




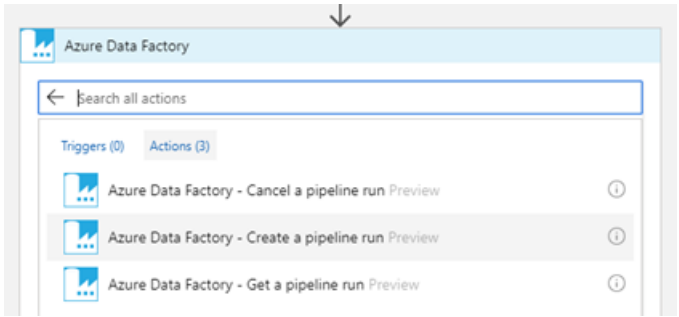
Automation
Runbooks

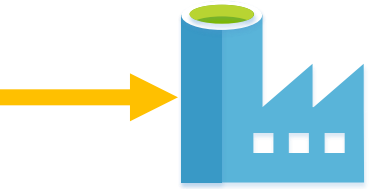
```
Invoke-AzureRmDataFactoryV2Pipeline
-DataFactoryName $dataFactoryName
-ResourceGroupName $resourceGroupName
-PipelineName $pipelineName
```



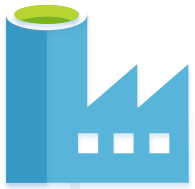


Logic Apps

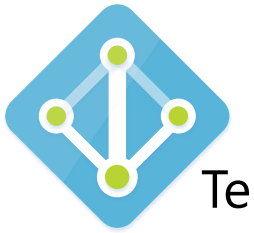




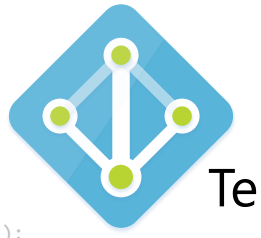
Bootstrapping – Why?



Data Factory



Tenant 1

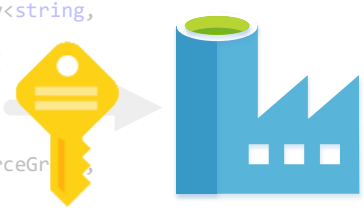


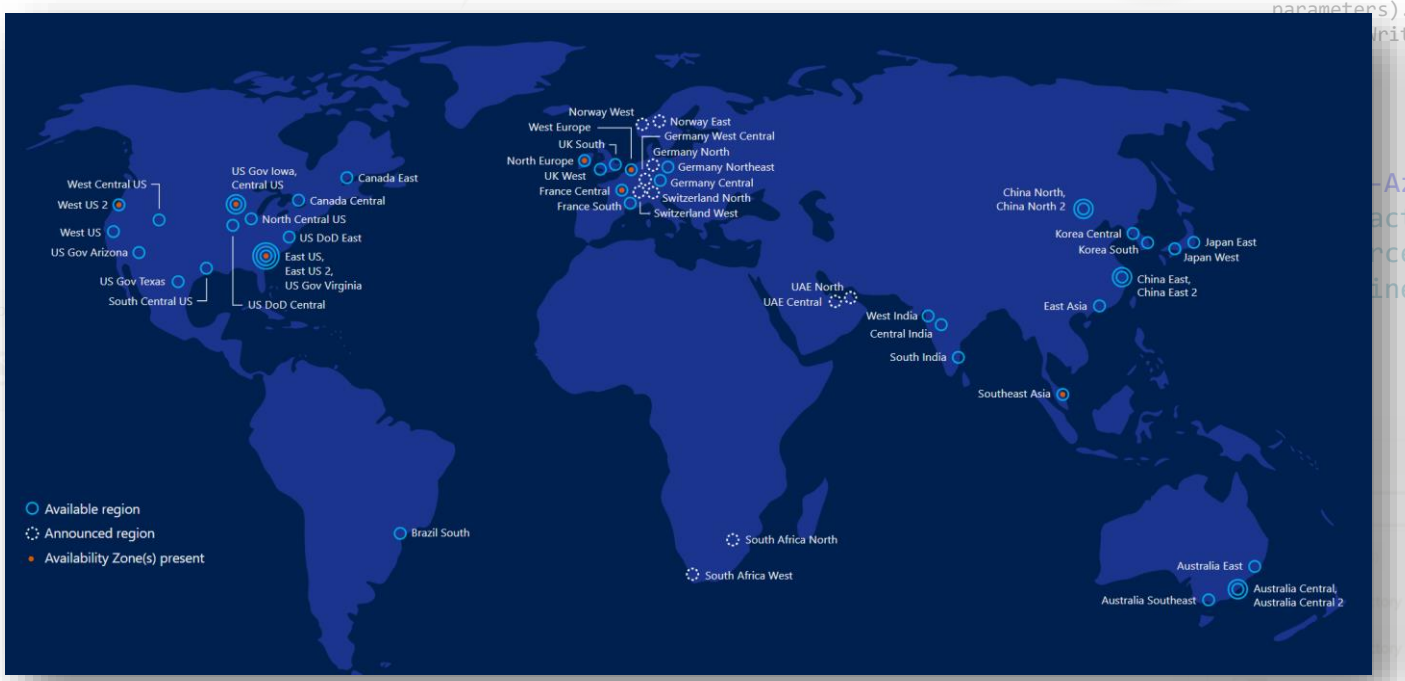
Tenant 2

Subscription 1

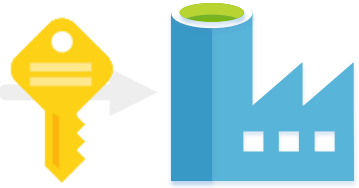
Functions

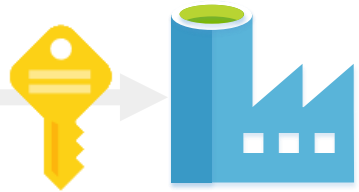

```
Console.WriteLine("Creating pipeline run...");
Dictionary<string, object> parameters = new Dictionary<string,
object> {
                        {"inputPath", inputBlobPath }, {
"outputPath", outputBlobPath }
                        };
CreateRunResponse runResponse =
client.Pipelines.CreateRunWithHttpMessagesAsync(resourceGr
dataFactoryName, pipelineName, parameters:
parameters).Result.Body;
WriteLine("Pipeline run ID: " + runResponse.RunId);
```





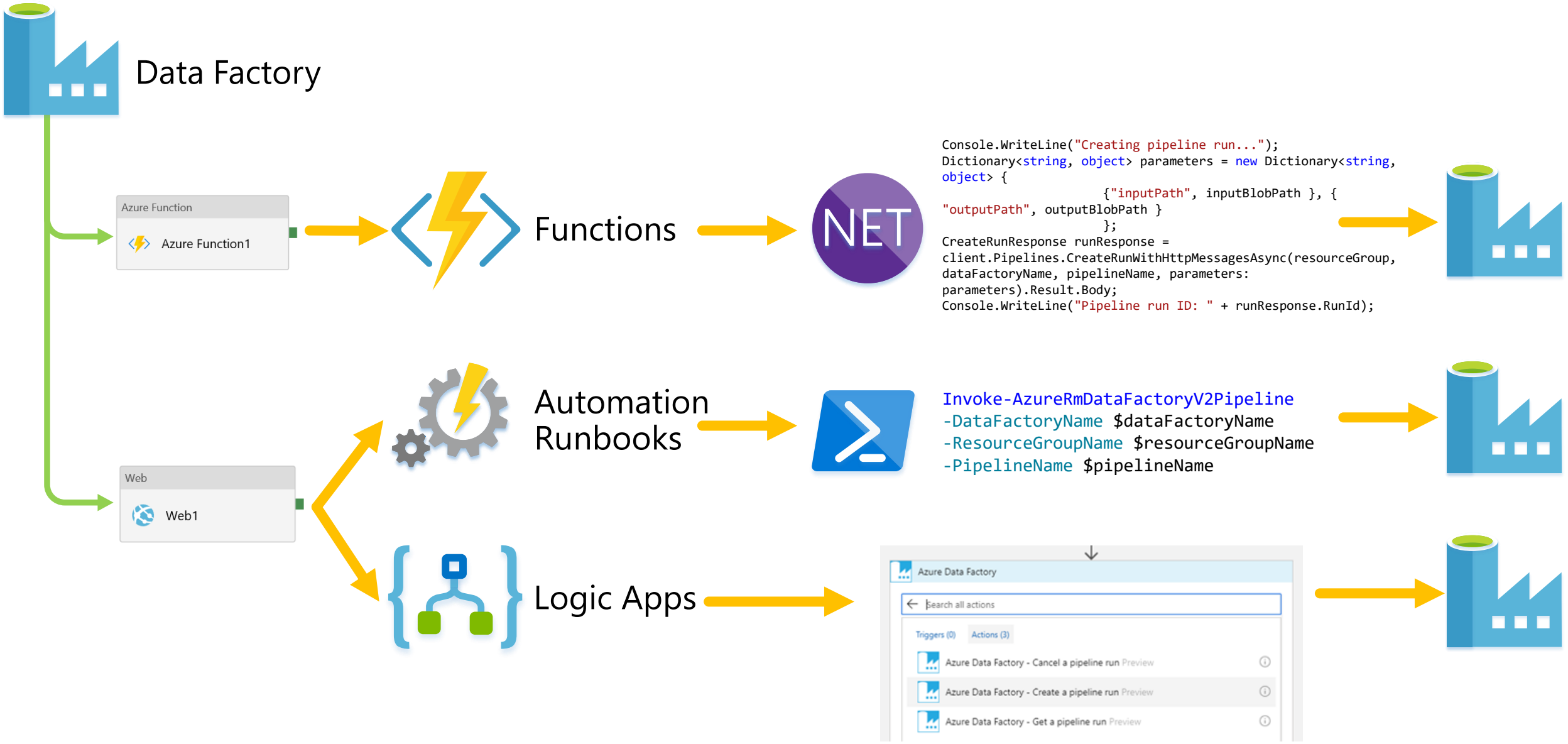

```
-AzureRmDataFactoryV2Pipeline
actoryName $dataFactoryName
rceGroupName $resourceGroupName
ineName $pipelineName
```



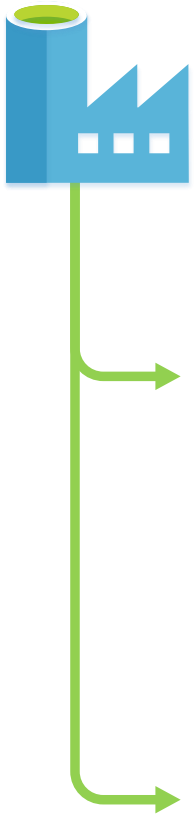


Subscription 2

Bootstrapping – Why?

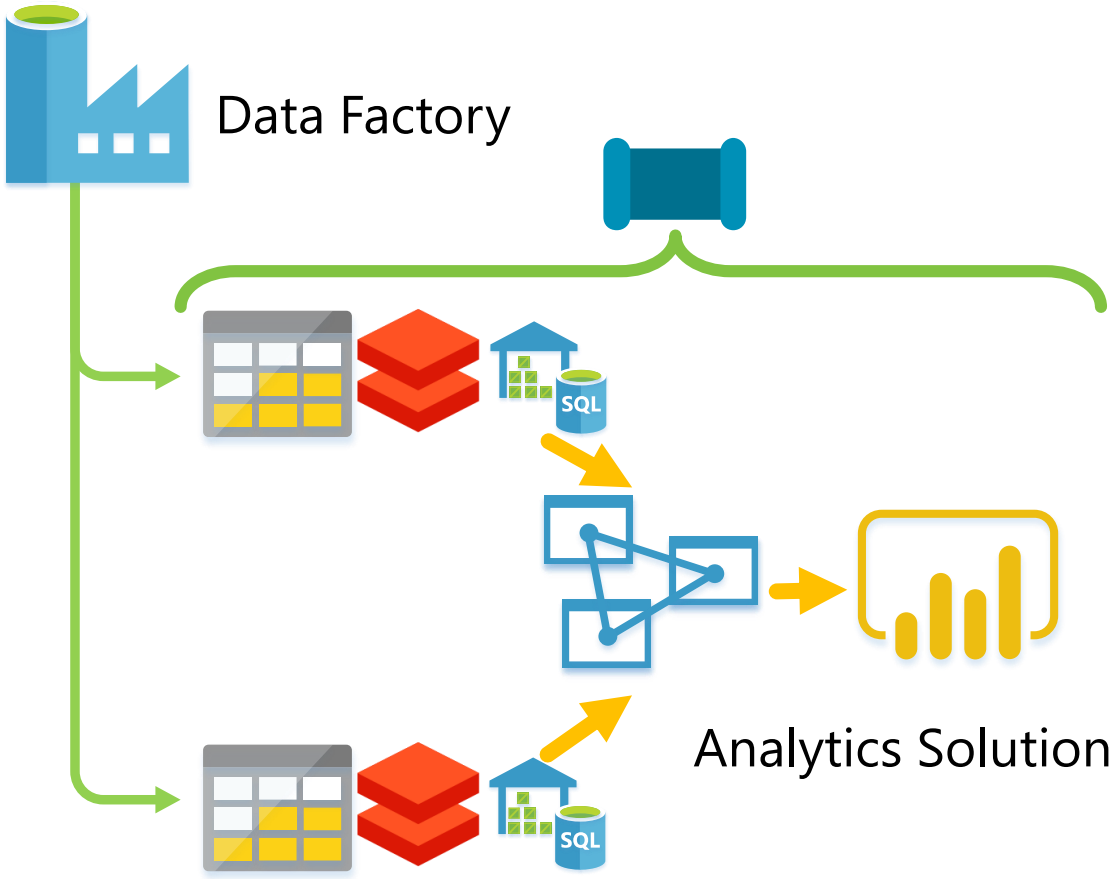


Bootstrapping – Why?

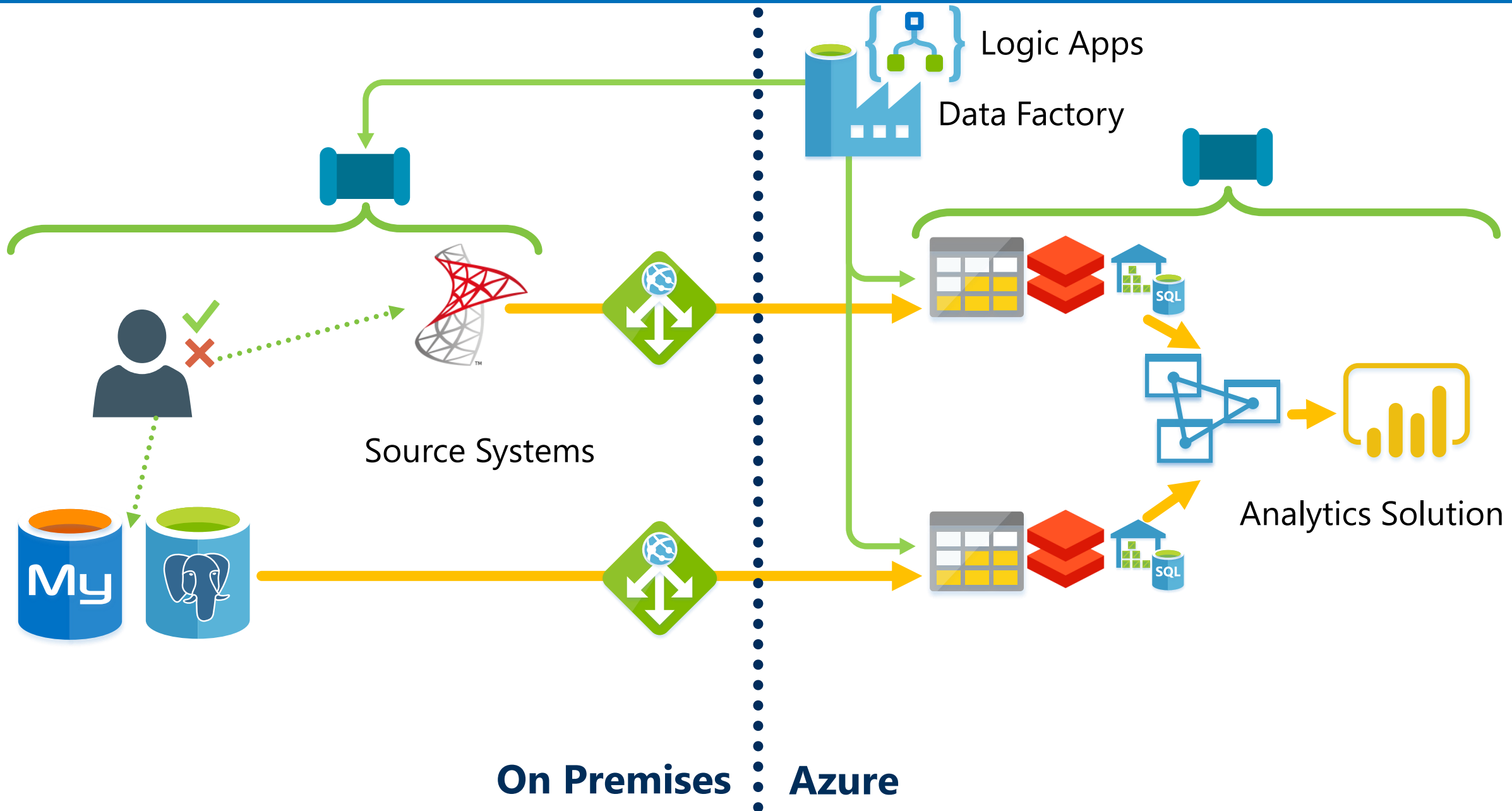


Data Factory

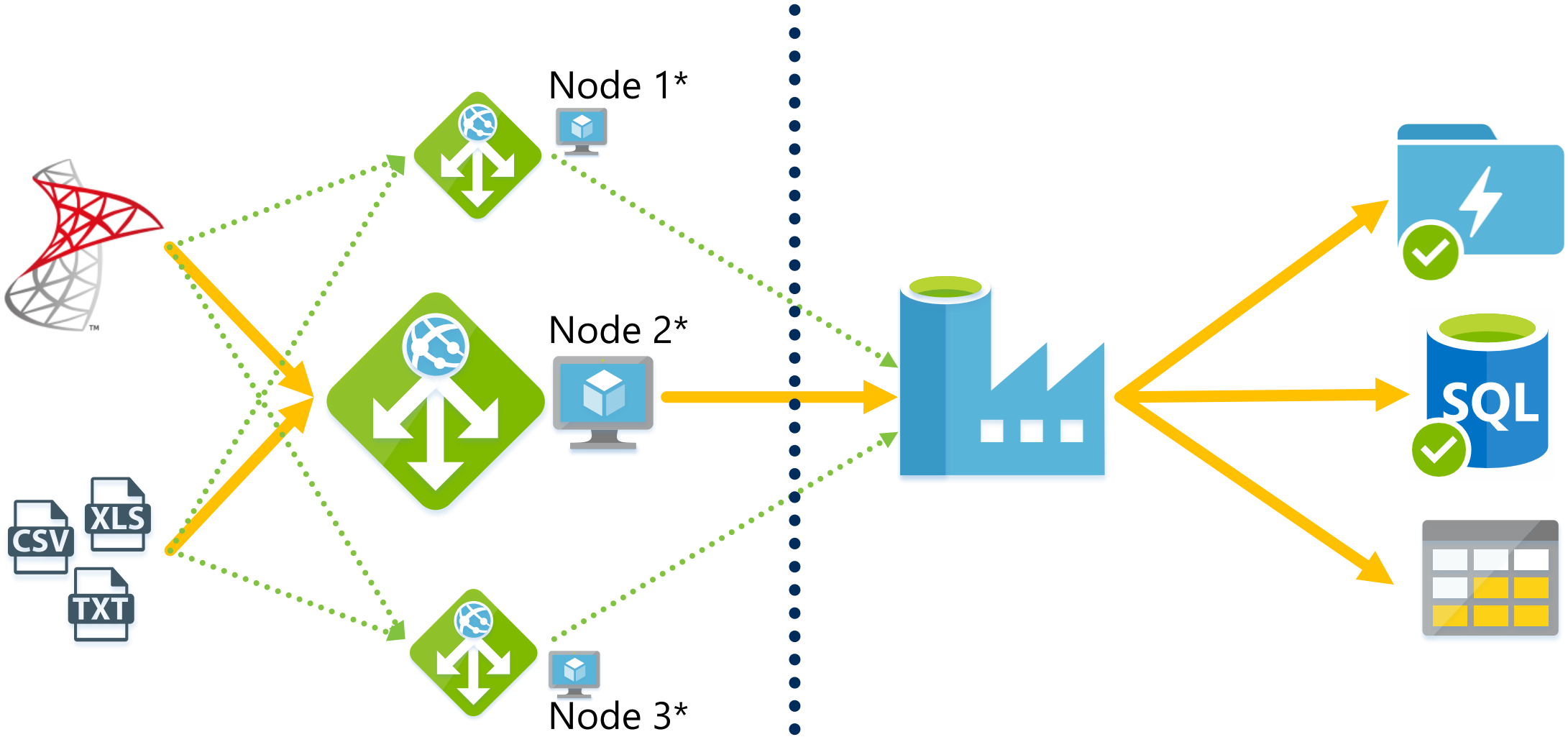
Bootstrapping – Why?



Bootstrapping vs Data Ingestion



The Hosted Integration Runtime



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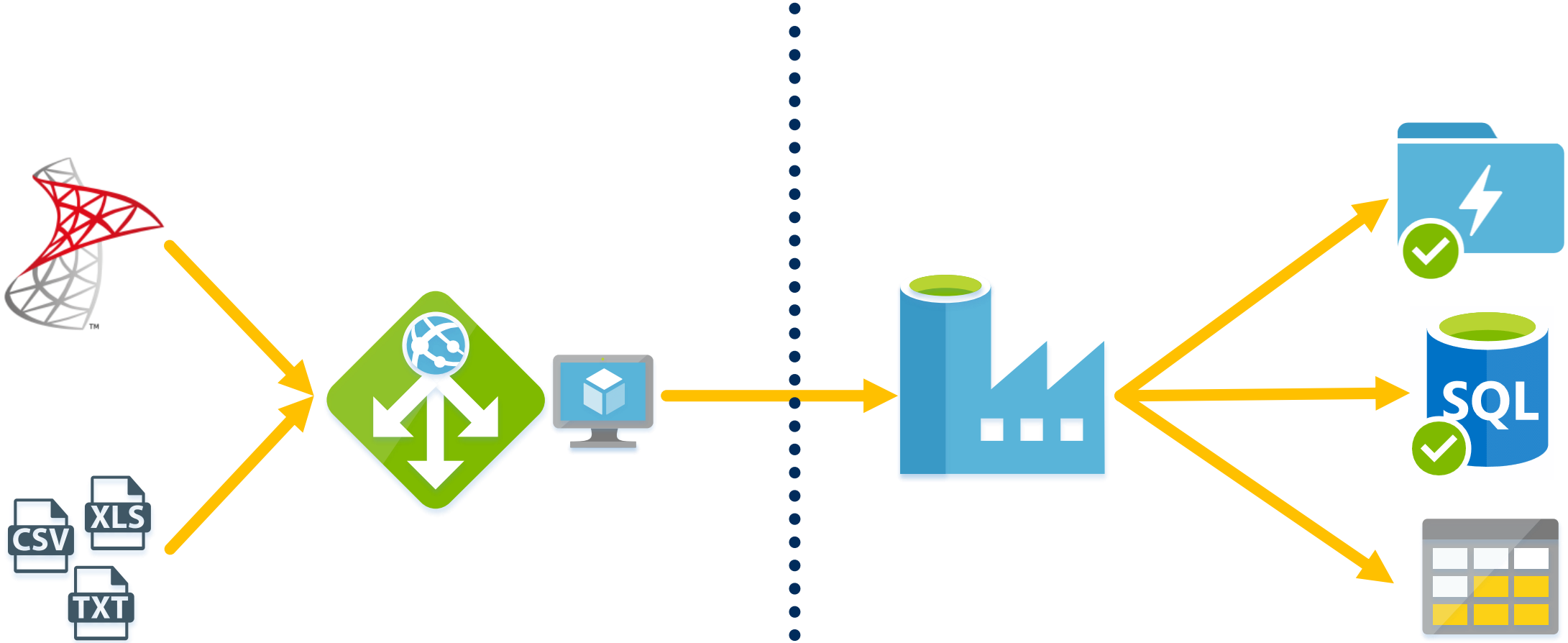
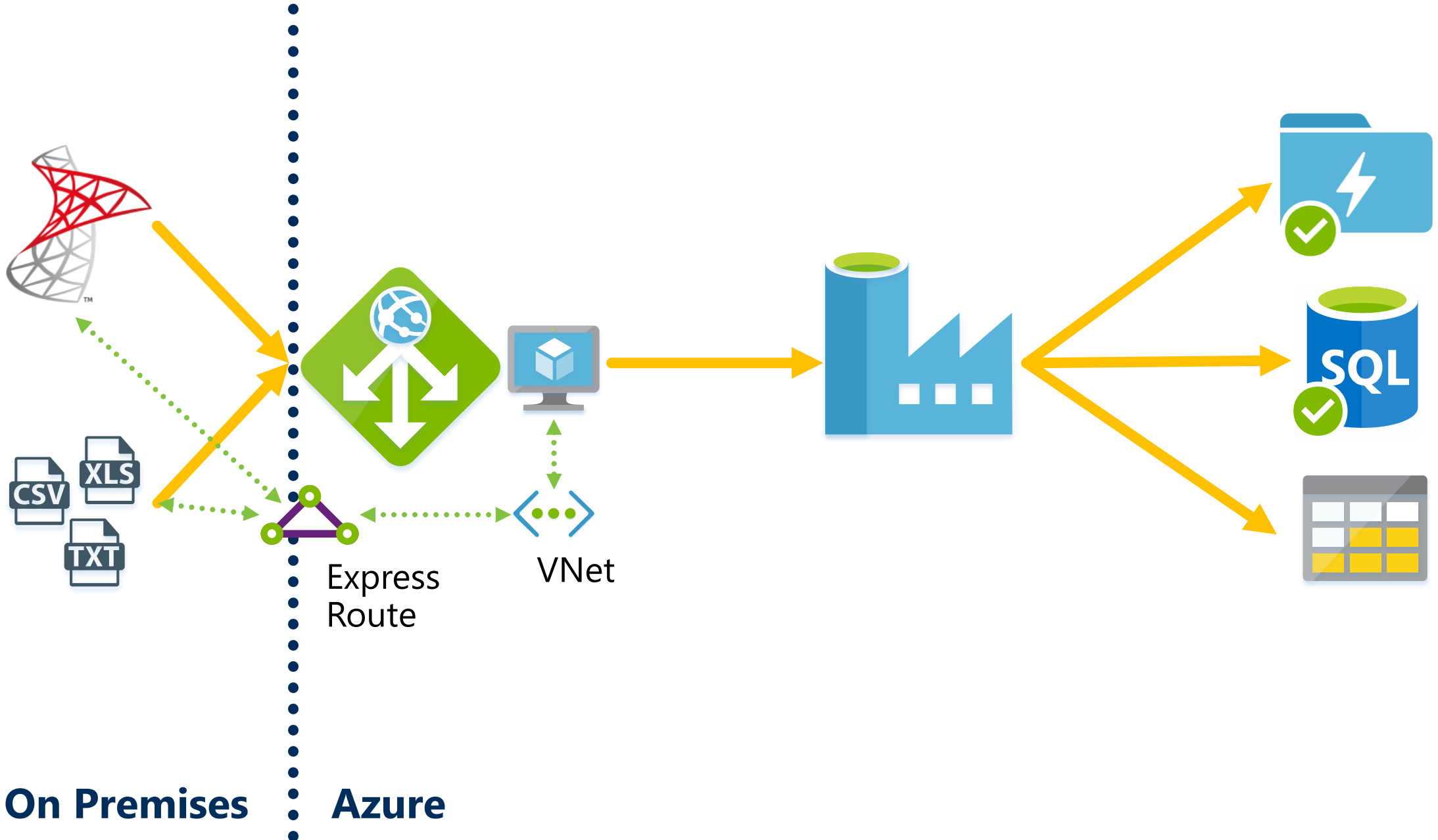


On Premises **Azure**

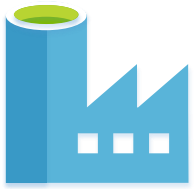
*Failover & Load Balancing

The Hosted Integration Runtime with Express Route



Agenda

Complex Orchestration



With Dynamic Data Factory Pipelines

Azure Data Factory	Extensibility & Parallelism	More Design Patterns
A very quick overview	Custom Activities SSIS IR & Packages	Bootstrapping Hosted IR vs IaaS Frameworks

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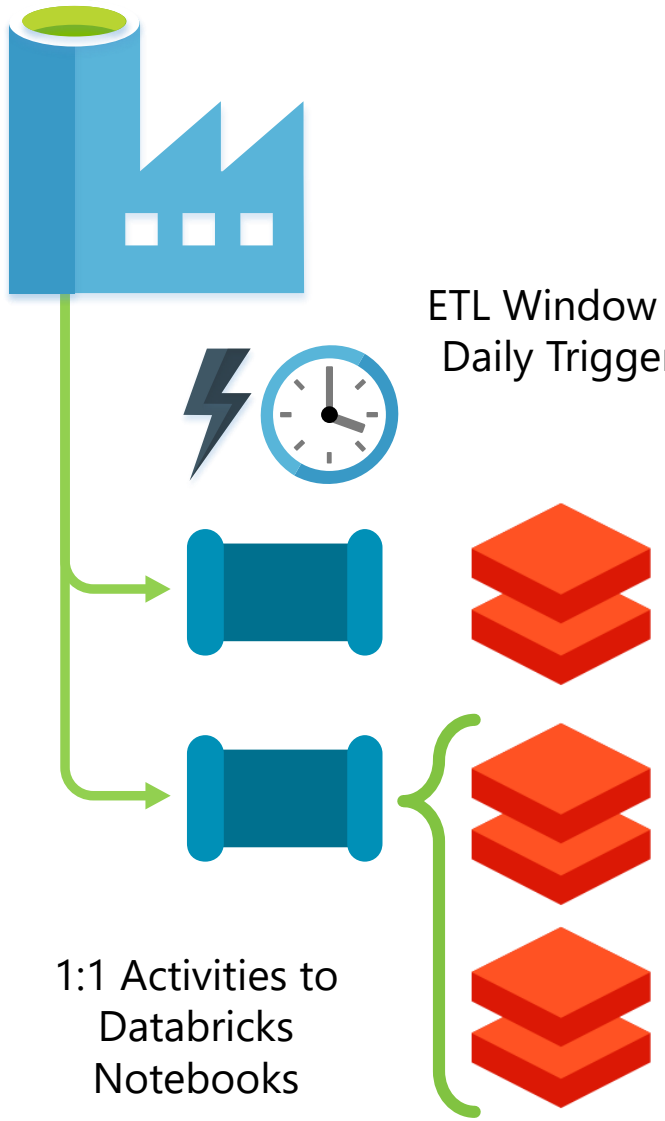
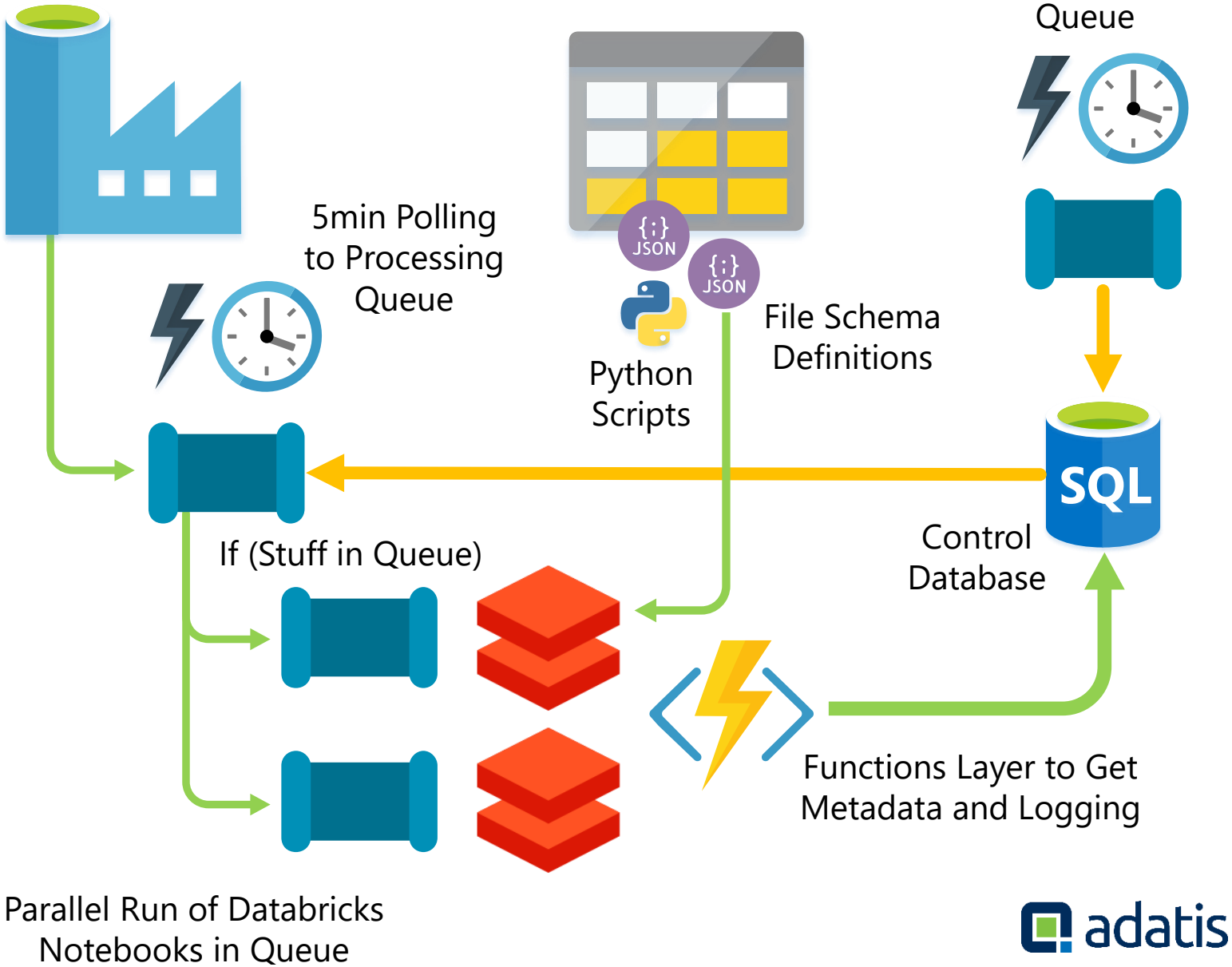
Framework Processing with Dynamic Pipelines





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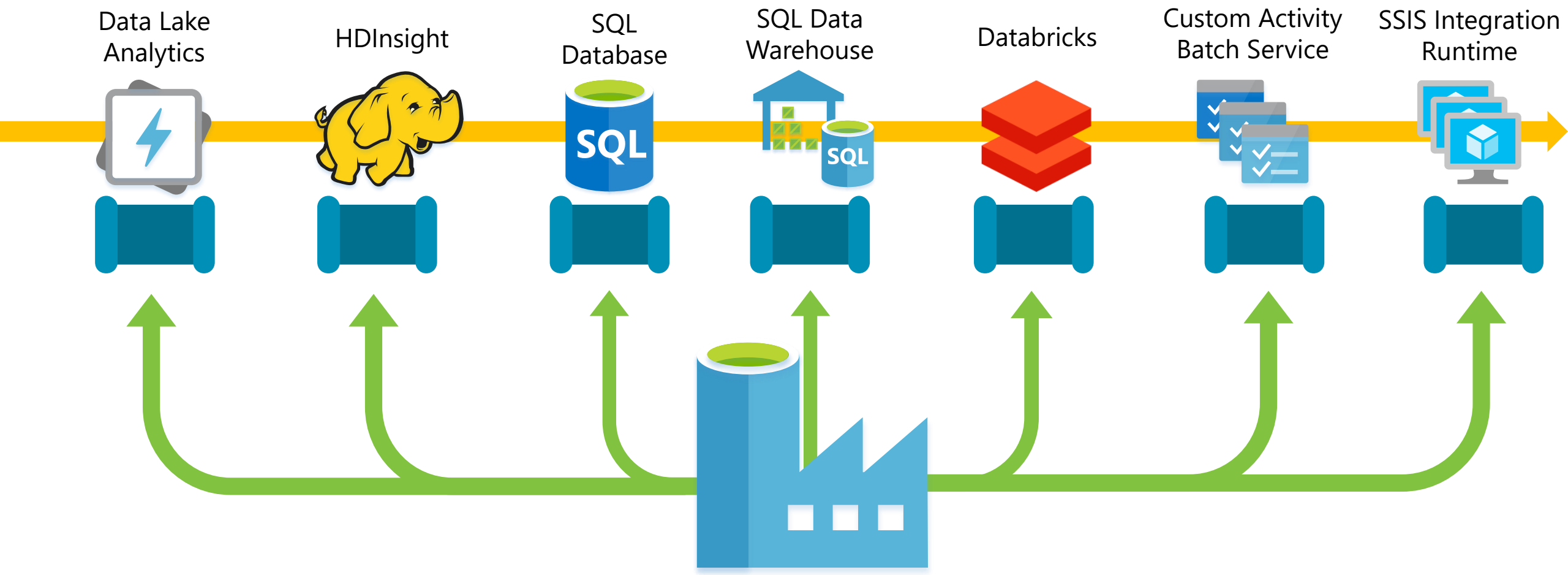
Data Transformation in Azure



Future Uncertain

Expensive Clusters

Only Scales Up

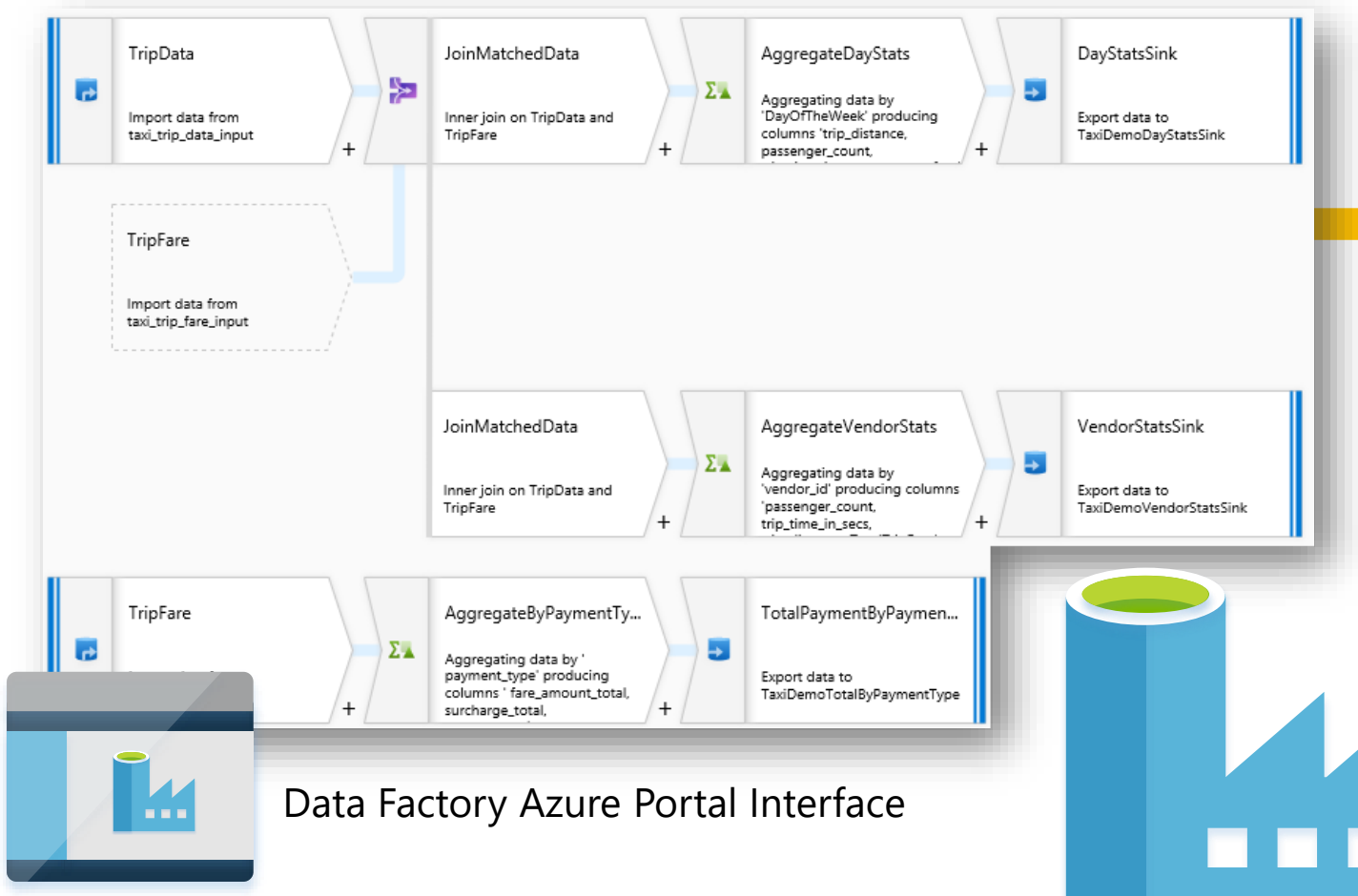
Requires at least 1TB

Learn Spark, Python/Scala

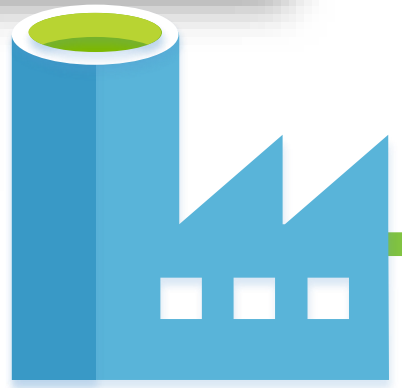
Custom Apps on IaaS

IaaS VMs 20min start

What is a Mapping Data Flow?



Data Factory Azure Portal Interface



Data Factory

Mapping Data Flow

Azure Databricks

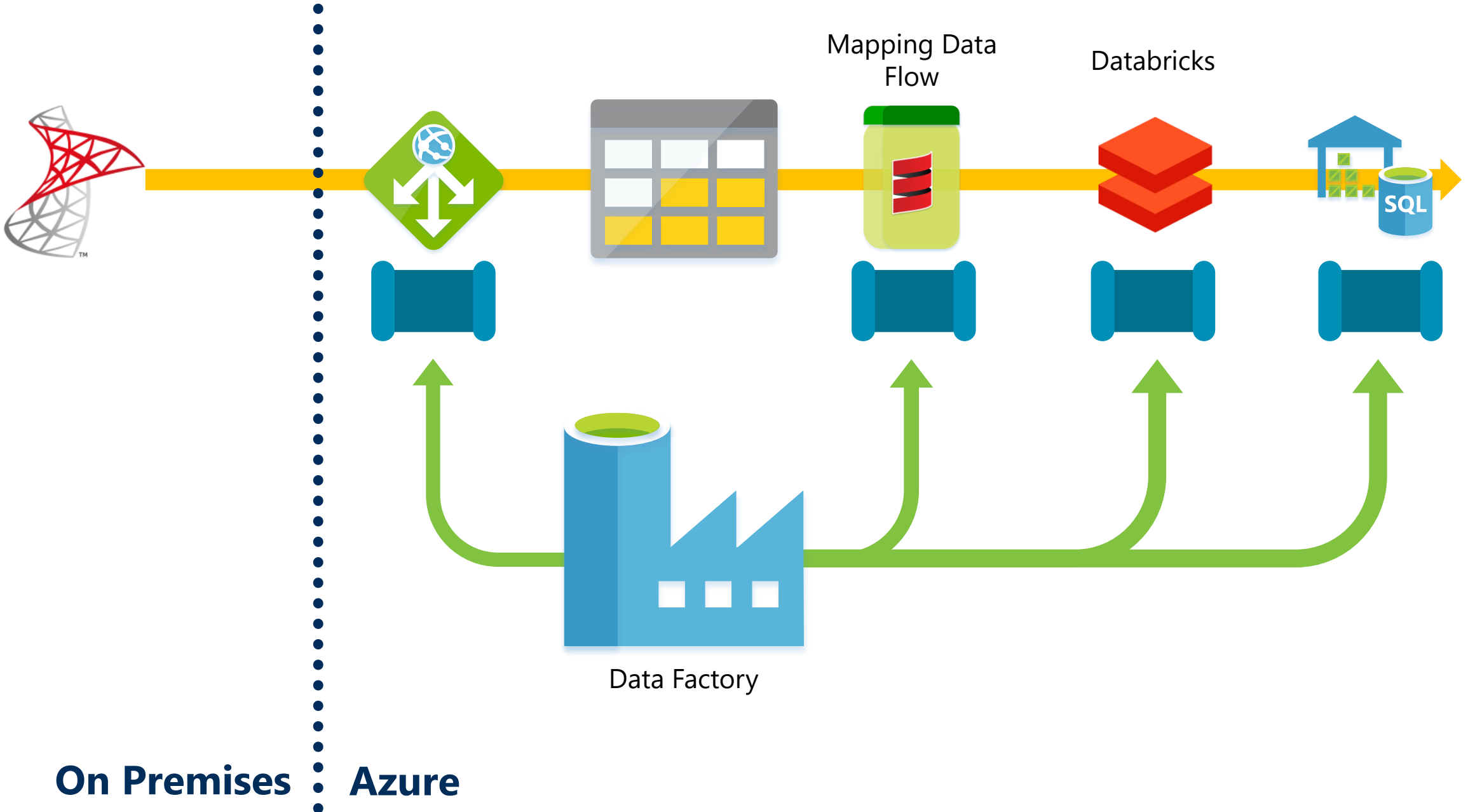
Databricks VNet

Express Route

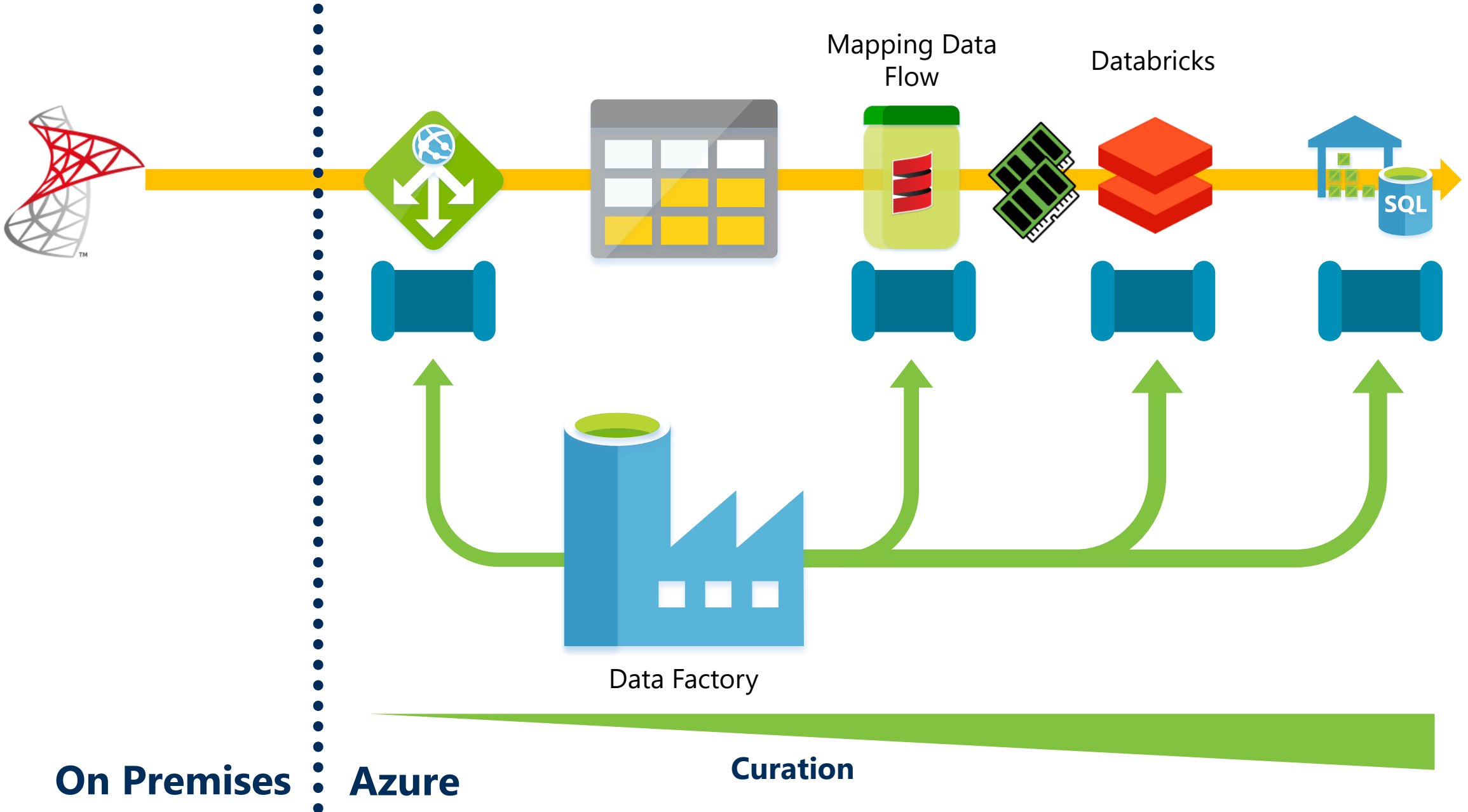
Production VNet

https://mrpaulandrew.com/2018/10/22/what-is-azure-data-factory-data-flow/

Mapping Data Flow Future Design Patterns ???



Mapping Data Flow Future Design Patterns ???



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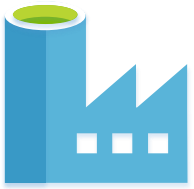

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Thanks for Listening

Paul Andrew

@MrPaulAndrew

Microsoft® Most Valuable Professional

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Blog: mrpaulandrew.com
Email: paul@mrpaulandrew.com
GitHub: github.com/mrpaulandrew

Slides