Prehľad cloudových služieb Microsoft Azure

ERIK KUČERA

ANALÝZA A INFORMATIZÁCIA DYNAMICKÝCH SYSTÉMOV | PREDNÁŠKA 6

Cloud computing

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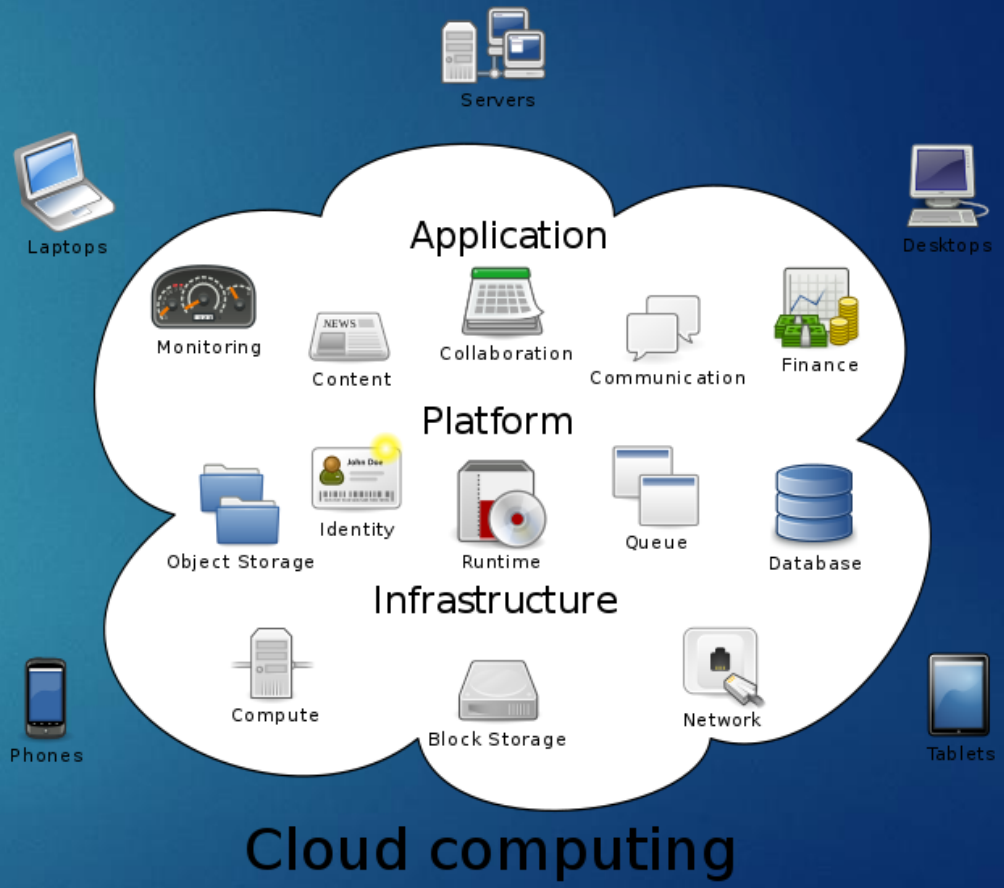
Cloud computing

- **Cloud computing** je na internete založený model vývoja a používania počítačových technológií
- Možno ho charakterizovať aj ako poskytovanie služieb alebo programov uložených na serveroch na Internete s tým, že používatelia k nim môžu pristupovať napríklad pomocou webového prehliadača alebo klienta danej aplikácie a používať prakticky odkiaľkoľvek
- Ponuka aplikácií sa pohybuje od kancelárskych aplikácií, cez systémy pre distribuované výpočty, až po operačné systémy prevádzkované v prehliadačoch



Čo je cloud?


CLOUD
COMPUTING
SERVICE
INTERNET
COMMUNICATION
MOBILE
APPS
WEB
MEDIA
CELL
SEND
DOWNLOAD
ACCESS
BROWSER
RECEIVE
TECHNOLOGY
MAINFRAME
CONNECTION
SERVER
CLIENT
ELECTRONIC
MOBILITY
RESOURCE
COMMUNITY
DEVICE
SHARE
INSTALL
BUSINESS
VIRTUAL
TECH
CONFIG
INNOVATION
DEVICES
INFORMATION
ROUTING
FIREWALL
CONNECTION
MAIL
UNIX
COMPUTER

Modely služieb cloud computingu

- **Infrastructure as a Service (IaaS)** – Infraštruktúra ako služba
- **Platform as a Service (PaaS)** – Platforma ako služba
- **Software as a Service (SaaS)** – Softvér ako služba

- **Infrastructure as a Service (IaaS)** – poskytovateľ služieb sa zaväzuje poskytnúť infraštruktúru. Typicky sa jedná a virtualizáciu. Hlavnou výhodou tohto prístupu je, že sa problémy s hardvérom stará poskytovateľ. Na druhú stranu, vzhľadom k tomu, že hardvér sa berie ako niečo, čo vlastníme, na čo si môžeme siahnuť a sme za to zodpovední, je niekedy nemožné toto akceptovať. IaaS je vhodné pre tých, ktorí vlastnia softvér (či licencie) a nechcú sa starať o hardvér.

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- **Platform as a Service (PaaS)** – poskytovateľ garantuje komplexné prostriedky pre podporu celého životného cyklu tvorby a poskytovania webových aplikácií a služieb – to všetko na internete bez možnosti stiahnutia softvéru. Koncepcia zahŕňa rôzne prostriedky pre vývoj aplikácií, ako je IDE alebo API, a tiež napríklad pre údržbu.
- PaaS poskytuje kompletné softvérové prostriedky pre vývoj aplikácii, teda napríklad nachystaný OS, databázy, webserver a užívateľ sa stará len o nasadenie a monitorovanie aplikácie v akomkoľvek prostredí (Node.JS, Java, C#, Python)

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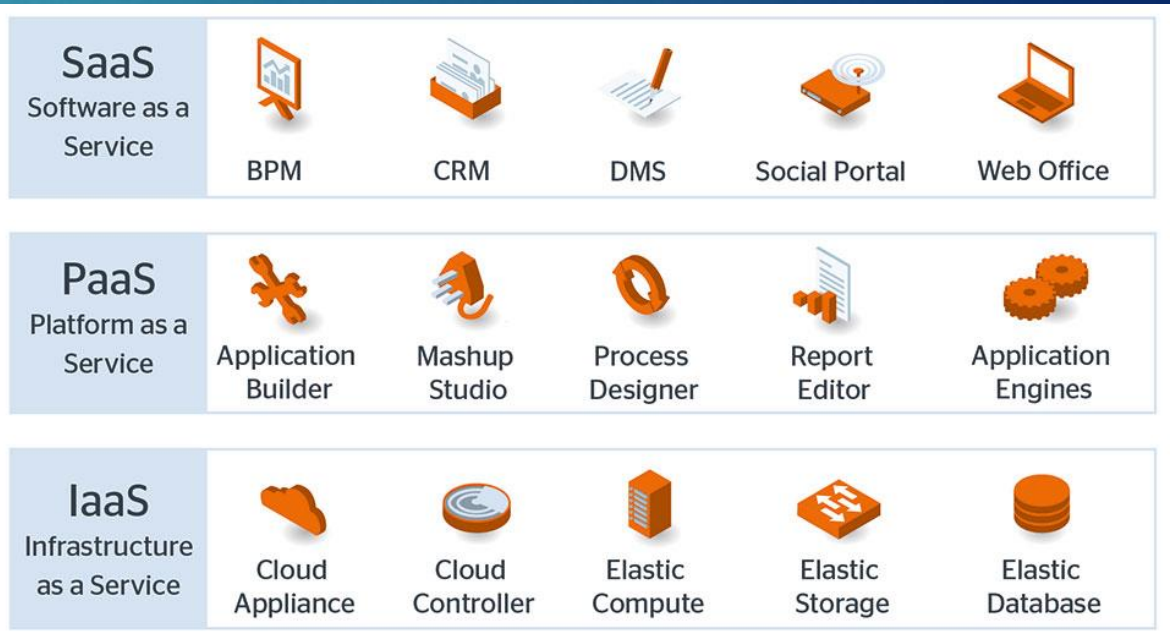
- **Software as a Service (SaaS)** – aplikácia je licencovaná ako služba prenajímaná užívateľovi. Užívatelia si teda priamo kupujú prístup k aplikácii a nie aplikáciu samotnú. SaaS je ideálne pre tých, ktorí potrebujú iba bežný aplikačný softvér a požadujú prístup odkiaľkoľvek a kedykoľvek. Príkladom môže byť sada aplikácií Google Apps.

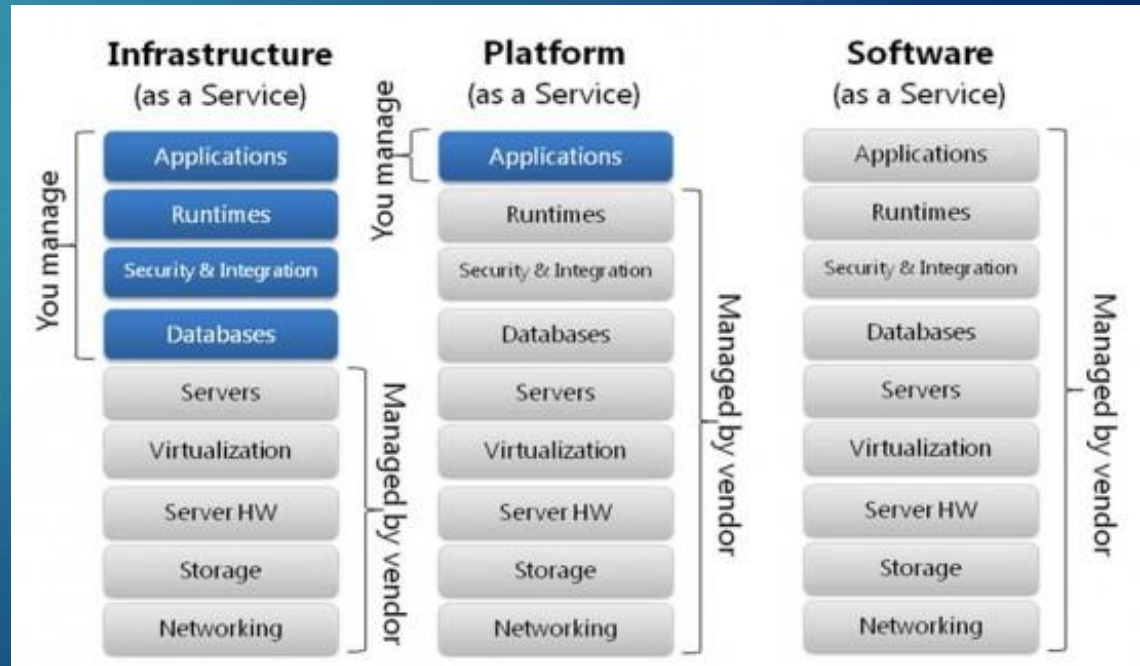
Výhody cloud computingu

- Absencia nutnosti poznať princípy funkčnosti SW a HW
- Efektívne riadenie a práca vďaka dostupnosti dát odkiaľkoľvek – rast produktivity práce vo firmách
- Jednoduchosť používateľského rozhrania
- Principiálne vyššie zabezpečenie dát
- Možnosť okamžitého zvýšenia výkonu dátového centra
- Rýchle prispôsobenie IT zázemia rastu a potrebám užívateľa



Nevýhody cloud computingu

- Závislosť na internetovom pripojení
- Závislosť na poskytovateľovi
- Zlá reputácia cloud computingu – „Big Brother“, otázky ohľadne súkromia, bezpečnosti
- Migračné náklady
- Menej funkcií a horšia stabilita – závisí od prípadu k prípadu
- Odlišné právne pravidlá poskytovateľa a klienta – poskytovateľ môže byť v USA a klient v inej krajine, ktorá je podriadená inej jurisdikcii



Poskytovatelia cloud computingu

- Amazon Web Services

- Google Cloud Platform

- Microsoft Azure

Microsoft Azure

Microsoft Azure

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Microsoft Azure

- Je cloudová platforma spoločnosti Microsoft
- Vývoj bol oznámený v októbri 2008 a dostupnosť bola od 1. februára 2010 ešte pod názvom **Windows Azure**
- Premenovanie na **Microsoft Azure** prebehlo 25. marca 2014

Microsoft Azure

>500m

Azure Active Directory Users

>250k

Active websites

Greater than 1,500,000

SQL Databases in Azure

>777 TRILLION storage transactions per day

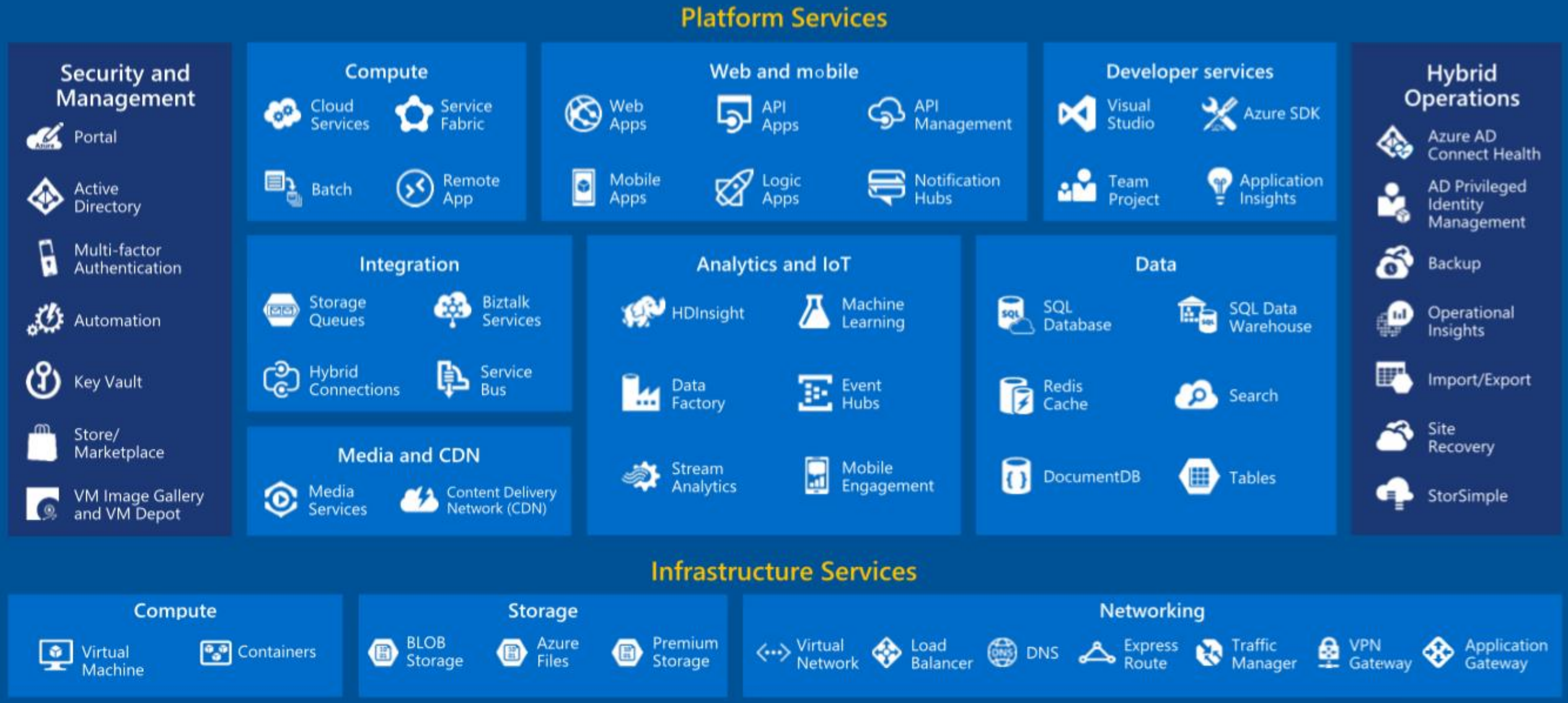
>80% Fortune 500 Use Azure

>1 MILLION Developers registered with Visual Studio Online

>1.5 TRILLION messages/mo processed by Azure IoT

>13 BILLION authentications/wk

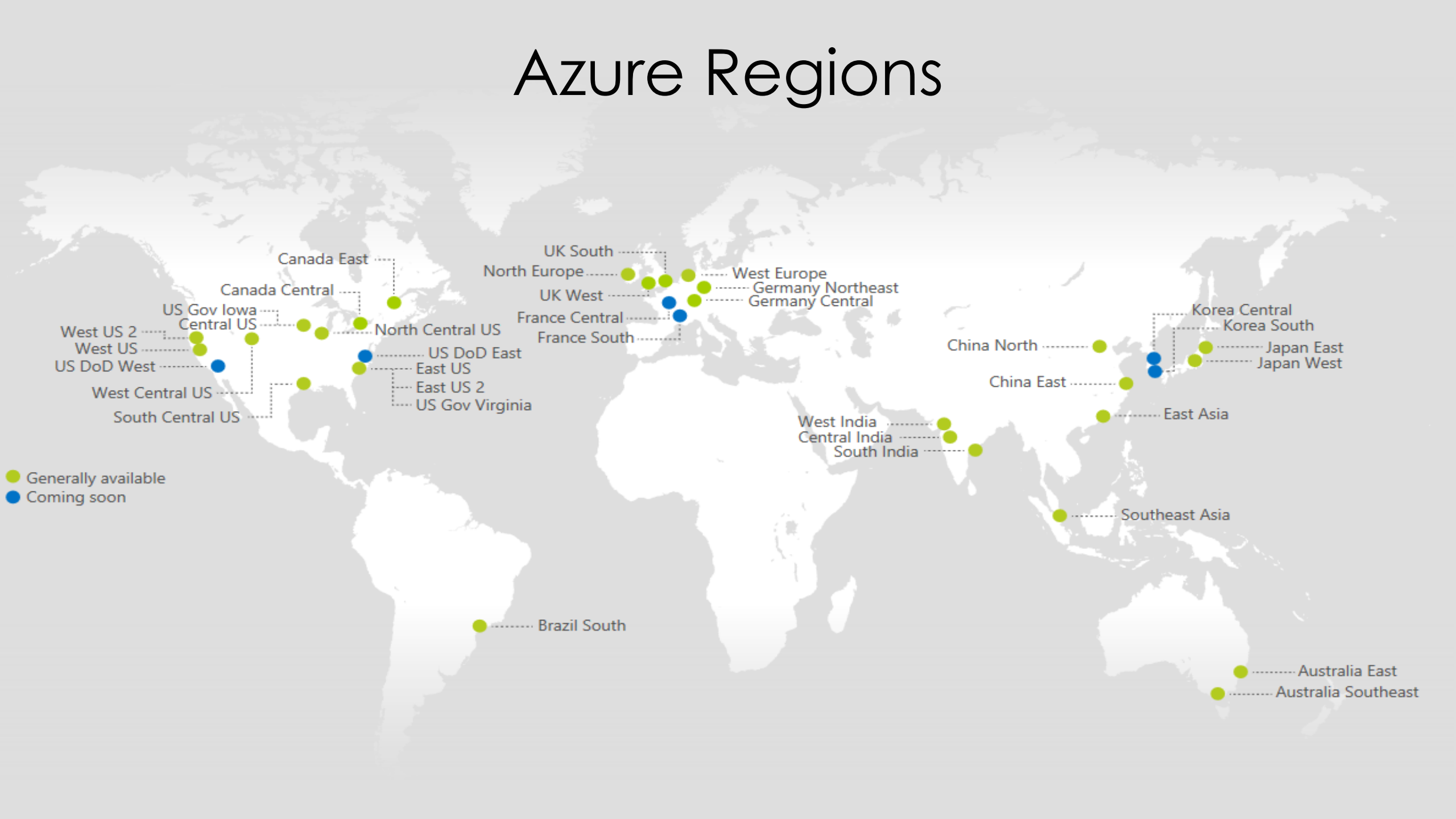
Azure Services



Základné pojmy Microsoft Azure

- **Subscription** – zjednodušene „z čoho sa daná služba platí“, výber z rôznych variant:
  - **Pay as you Go –** platím toľko, koľko miniem
  - **BizSpark** – program pre StartUpy, kredit na každý mesiac na cca 3 roky
  - **Student –** program pre študentov, netreba zadávať ani platobnú kartu pre overenie, iba telefónne číslo (budeme používať my)
  - **Trial** – 30-denný trial s obmedzeným kreditom, pre overenie je treba platobnú kartu
  - **a ďalšie...**
- **Resources –** zjednodušene znamená lokalitu (server), na ktorom moje služby bežia

Azure Regions



Microsoft  Linux

Many Languages, Many SDKs

- Write code in any language and for any platform
  - Azure SDKs available for a variety of languages and platforms (free)
  - Also available in package form from NuGet and NPM
- Ramp up quickly by using what you already know

Virtual Machines

Provision Windows and Linux virtual machines in seconds

App Service

Create web and mobile apps for any platform and any device

SQL Database

Managed relational SQL Database-as-a-service

Storage

Durable, highly available, and massively scalable cloud storage

Cloud Services

Create highly-available, infinitely-scalable cloud applications and APIs

DocumentDB

Managed NoSQL document database-as-a-service

Azure Active Directory

Synchronize on-premises directories and enable single sign-on

Backup

Simple and reliable server backup to the cloud

HDInsight

Provision cloud Hadoop, Spark, R Server, HBase, and Storm clusters

Batch

Run large-scale parallel and batch compute jobs

Azure Container Registry

Store and manage container images across all types of Azure deployments

StorSimple

Lower costs with an enterprise hybrid cloud storage solution

Visual Studio Team Services

Services for teams to share code, track work, and ship software

API Management

Publish APIs to developers, partners and employees securely and at scale

IoT Hub

Connect, monitor, and control billions of IoT assets

Content Delivery Network

Ensure secure, reliable content delivery with broad global reach

ExpressRoute

Dedicated private network fiber connections to Azure

Site Recovery

Orchestrate protection and recovery of private clouds

Azure DNS

Host your DNS domain in Azure

Machine Learning

Easily build, deploy, and manage predictive analytics solutions

Service Fabric

Build and operate always-on, scalable, distributed applications

Multi-Factor Authentication

Add security for your data and apps without adding hassles for users

Application Insights

Detect, triage, and diagnose issues in your web apps and services

SQL Data Warehouse

Elastic data warehouse-as-a-service with enterprise-class features

Virtual Network

Provision private networks, optionally connect to on-premises datacenters

Media Services

Encode, store, and stream video and audio at scale

Stream Analytics

Real-time data stream processing from millions of IoT devices

Azure Active Directory Domain Services

Join Azure virtual machines to a domain without domain controllers

Advisor

Your personalized Azure best practices recommendation engine

Event Hubs

Receive telemetry from millions of devices

Data Factory

Orchestrate and manage data transformation and movement

Key Vault

Safeguard and maintain control of keys and other secrets

Service Bus

Connect across private and public cloud environments

Azure Active Directory B2C

Consumer identity and access management in the cloud

Scheduler

Run your jobs on simple or complex recurring schedules

Azure DevTest Labs

Quickly create environments using reusable templates and artifacts

Notification Hubs

Send push notifications to any platform from any back end

Automation

Simplify cloud management with process automation

Log Analytics

Collect, search and visualize machine data from on-premises and cloud

Security Center

Prevent, detect, and respond to threats with increased visibility

Logic Apps

Automate the access and use of data across clouds without writing code

Traffic Manager

Route incoming traffic for high performance and availability

Redis Cache

Power applications with high-throughput, low-latency data acc...

Azure Search

Fully-managed search-as-a-service

Load Balancer

Deliver high availability and network performance to your applications

VPN Gateway

Establish secure, cross-premises connectivity

Application Gateway

Build scalable and highly-available web front ends in Azure

Data Catalog

Get more value from your enterprise data assets

Virtual Machine Scale Sets

Manage and scale 10s to 1000s of Linux and Windows VMs

Power BI Embedded

Embed fully interactive, stunning data visualizations in your applications

Mobile Engagement

Increase app usage and user retention

Data Lake Store

Hyperscale repository for big data analytics workloads

Data Lake Analytics

Distributed analytics service that makes big data easy

Cognitive Services

Add smart API capabilities to enable contextual interactions

Azure Bot Service

Intelligent, serverless bot service that scales on demand

Azure Container Service

Use Docker-based tools to deploy and manage containers

SQL Server Stretch Database

Dynamically stretch on-premises SQL Server databases to Azure

HockeyApp

Deploy mobile apps, collect feedback and crash reports, and monitor usage

Functions

Process events with serverless code

BizTalk Services

Seamlessly integrate the enterprise and the cloud

Managed Disks

Persistent, secured disk storage for Azure virtual machines

Azure Monitor

Highly granular and real-time monitoring data for any Azure resource

Security & Compliance

Enable threat detection and prevention through advanced cloud security

Protection & Recovery

Ensure application availability and data protection

Automation & Control

Centrally manage all automation and configuration assets

Insight & Analytics

Easily search, correlate, and analyze data from the cloud

Azure Analysis Services

Proven analytical engine in the cloud

Dynamics 365 for Customer Insights

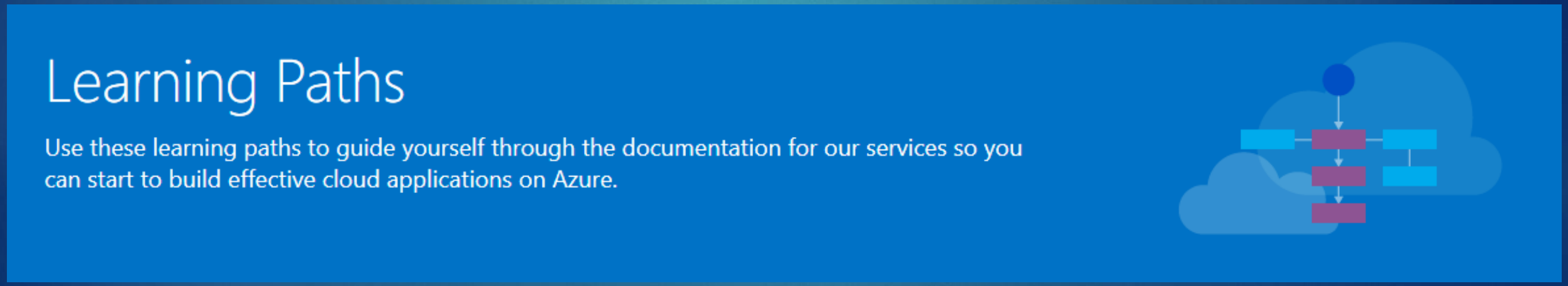
Transform your customer data into actionable insights

Network Watcher

Network performance monitoring and diagnostics solution

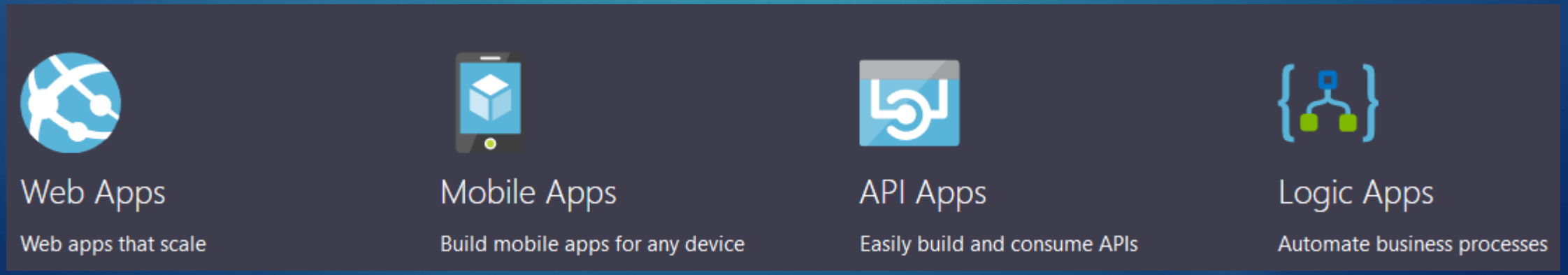
Ako začať?

- K mnohým službám existuje tzv. **learning path**
- https://azure.microsoft.com/en-us/documentation/learning-paths/



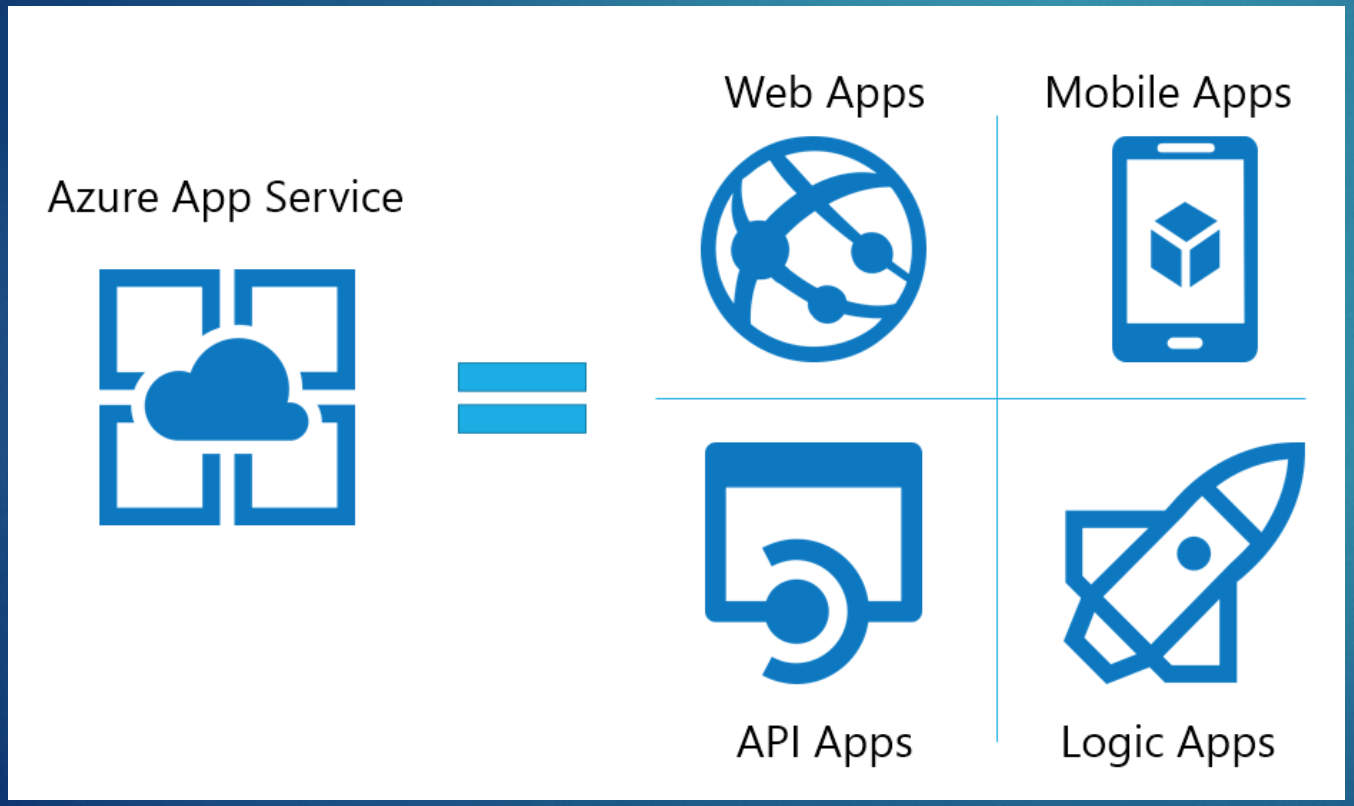
Azure App Service

- App Service zahŕňa služby, ktoré sa predtým nazývali **Azure Websites a Azure Mobile Services**, ide o služby typu **PaaS**
- Ide to tieto typy služieb:
  - **Web Apps** – pre hosting webových stránok a webových aplikácií
  - **Mobile Apps** – pre hosting back-endu mobilných aplikácií
  - **API Apps** – pre hosting RESTful API
  - **Logic Apps** – pre automatizovanie biznis procesov a integrovanie systémov a dát naprieč cloudmi bez nutnosti písania kódu



Publish a Web Site

Use prebuilt templates to build a personal Web site with technologies you know, or create a commercial Web site that scales to serve millions of customers



php MySQL

Joomla!

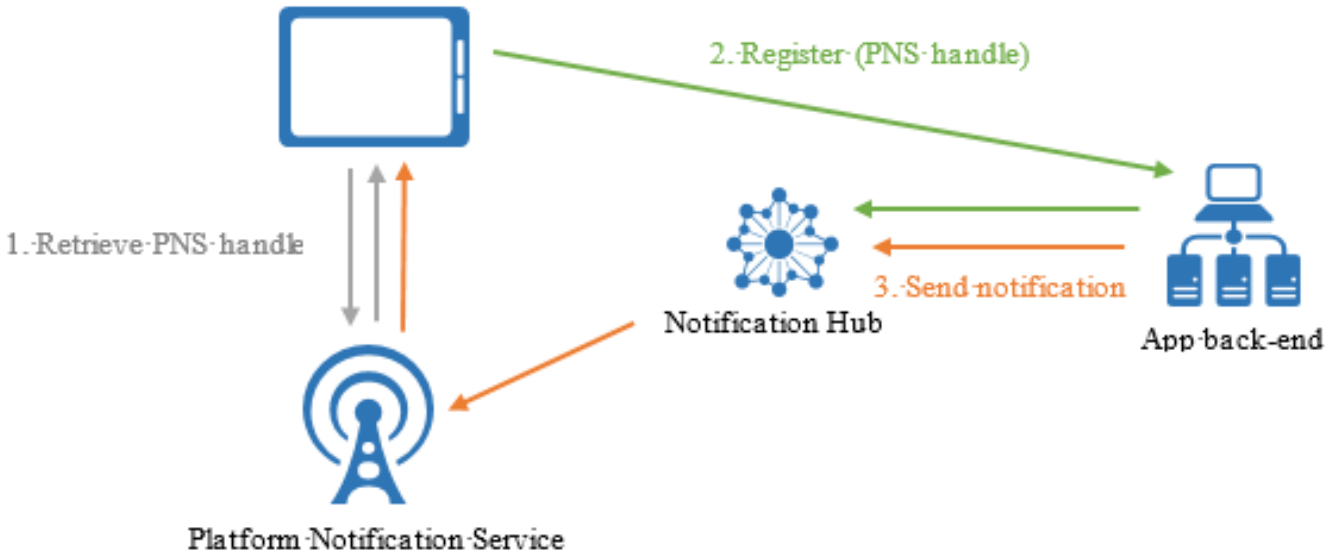
django
The web framework for perfectionists with deadlines.

WordPress

Microsoft .NET MVC

Azure Notification Hubs

- **Azure Notification Hubs** ponúka jednoduchý, multiplatformový a škálovateľný servis pre **push notifikácie**
- V aplikáciách nie je teda nutné implementovať notifikácie zvlášť pre rôzne platformy, ale iba odoslanie notifikáciu do tohto hubu, ktorý sa postará a zaslanie notifikácie pre zariadenia rôznych platforiem



Azure Storage

- Úložisko dát, ktoré ponúka rôzne typy týchto uložísk

Blob

Massively-scalable object storage for unstructured data

- Cost-effective for massive volume
- Tiered storage options
- Single infrastructure with global reach

Learn more

Table

Flexible NoSQL database

- Key-value table storage
- Structured or unstructured data
- Low latency at Internet scale

Learn more

Queue

Durable queues for large-volume cloud services

- Simple, cost-effective messaging
- Decoupled component flexibility
- Resilient scaling and buffering

Learn more

Disk

Premium storage for I/O intensive applications

- Low latency, high throughput
- Automatic triple replication
- Enterprise-grade durability

Learn more

File

Simple, distributed, cross-platform file system

- Lift and shift migration
- Low cost and complexity
- Client and deployment flexibility

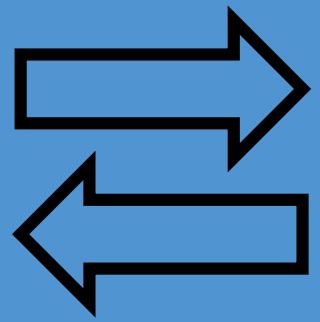
Learn more

Azure Storage - video

Azure Storage

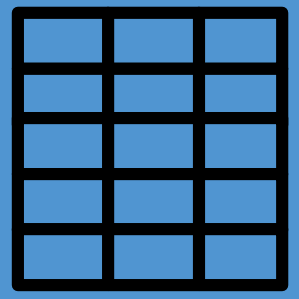
Blobs

Storage for any type of data, analogous to files in a file system, with individual blobs storing up to 1 TB of data



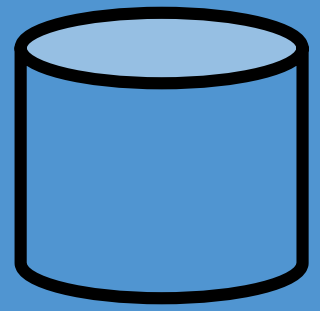
Queues

Reliable messaging for workflow processing and for communication between applications or application components



Tables

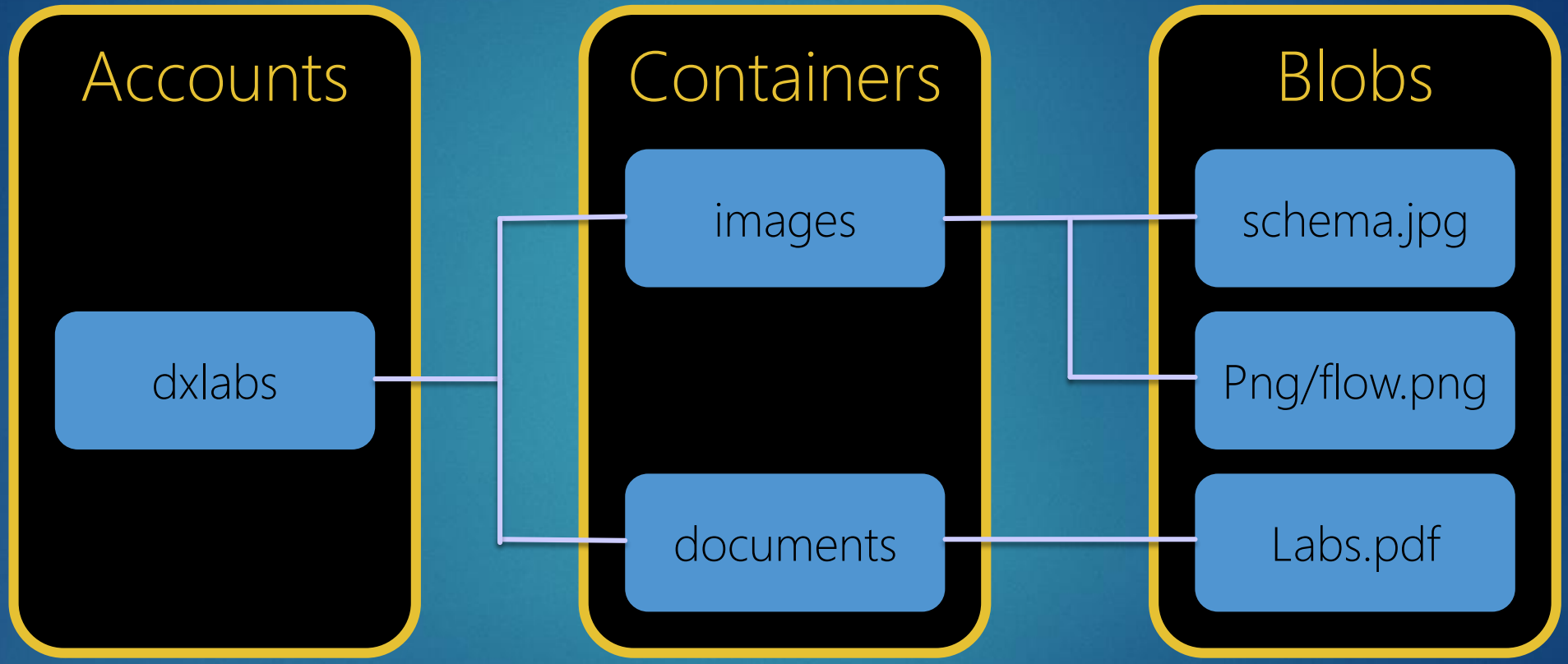
NoSQL data storage rapid development and fast access to large quantities of data



Files

File sharing using Server Message Block (SMB) protocol

Blob Storage

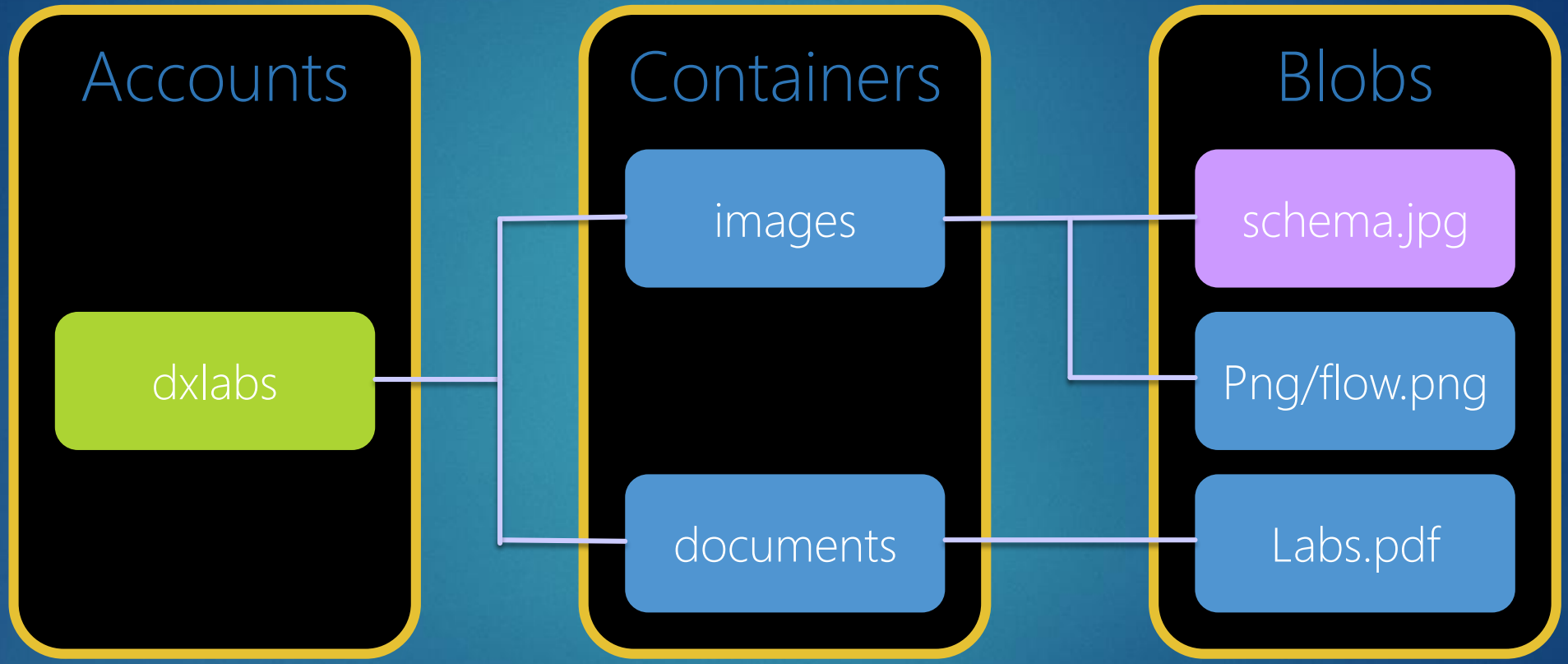


3 to 24 characters
0-9 and a-z
Unique within Azure

3 to 63 characters
0-9, a-z, and dashes

1 to 1,024 characters
Any characters (including slashes)
URL characters must be escaped
Max. 254 path segments

Blob URLs



https://dxlabs.blob.core.windows.net/images/schema.jpg

Accessing Blob Storage Programmatically

- Blob service can be accessed using REST APIs
  - Accessible to any programming language that supports HTTP(S)
- Blob service can also be accessed using Azure Storage SDKs available for popular languages and platforms

.NET	Node.js	Java	C++	PHP	Ruby	Python	iOS	Xamarin

- Also available from NuGet, NPM, and other package managers

Uploading a Blob (C#)

- Create a blob using the Azure Storage SDK for .NET
- Upload the contents of a local file to the blob

```
CloudStorageAccount account =
    CloudStorageAccount.Parse("connection_string);
CloudBlobClient client = account.CreateCloudBlobClient();
CloudBlobContainer container =
    client.GetContainerReference("container_name");
CloudBlockBlob blob =
    container.GetBlockBlobReference("blob_name"));
await blob.UploadFromFileAsync("file_name");
```

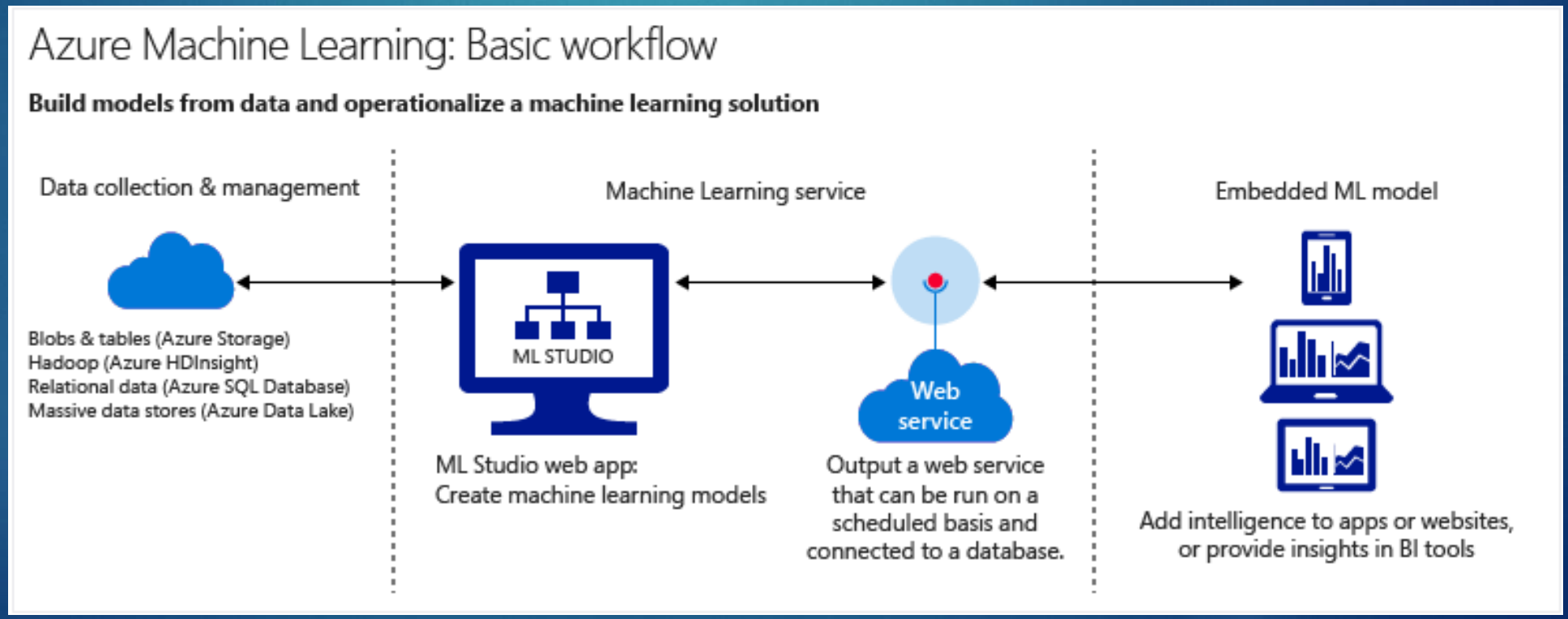
Uploading a Blob (Node.js)

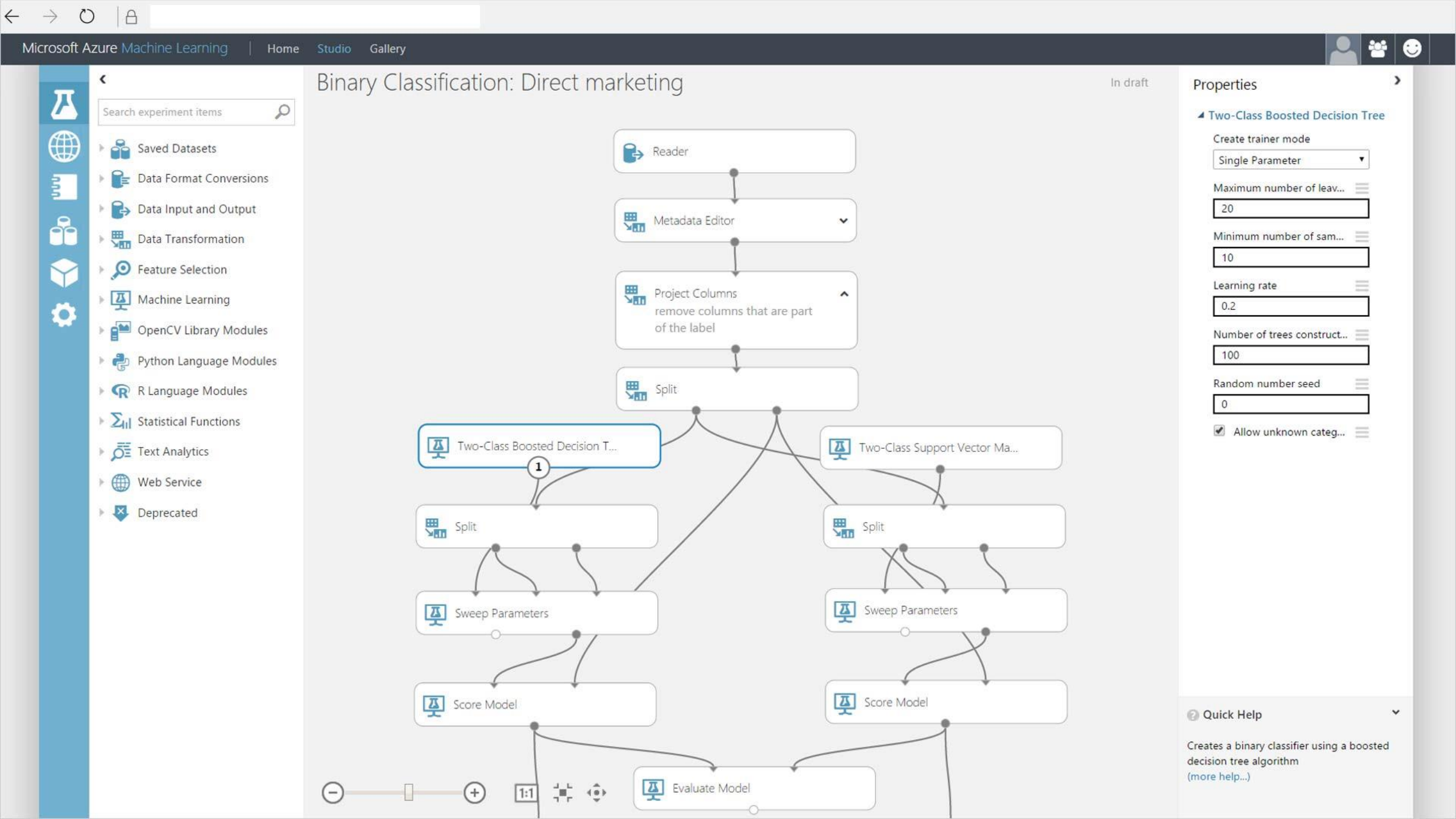
- Create a blob using the Azure Storage SDK for Node.js
- Upload the contents of a local file to the blob

```
var storage = require("azure-storage");
var service =
    storage.createBlobService("connection_string");
service.createBlockBlobFromLocalFile(
    "container_name", "blob_name", "file_name",
    function(error, result, response) {
    if (!error) {
        // File uploaded
    }
});
```

Azure Machine Learning

- Cloudová služba pre strojové učenie (neurónové siete, rozhodovacie stromy...), kde model je následne možné publikovať ako webservis
- Existuje mnoho návodov a **Cortana Intelligence Gallery**, kde sa možno inšpirovať



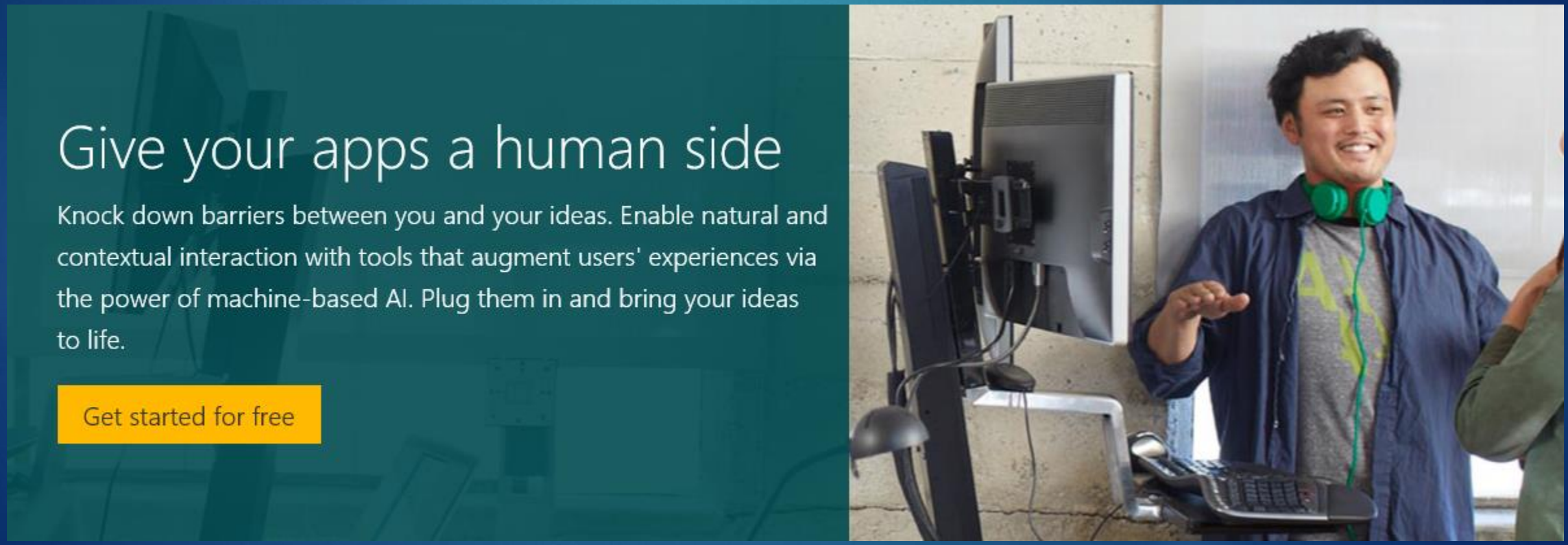

Microsoft Azure Machine Learning
Home
Studio
Gallery
Binary Classification: Direct marketing
In draft
Search experiment items
Saved Datasets
Data Format Conversions
Data Input and Output
Data Transformation
Feature Selection
Machine Learning
OpenCV Library Modules
Python Language Modules
R Language Modules
Statistical Functions
Text Analytics
Web Service
Deprecated
Reader
Metadata Editor
Project Columns
remove columns that are part of the label
Split
Two-Class Boosted Decision T...
Two-Class Support Vector Ma...
1
Split
Split
Sweep Parameters
Sweep Parameters
Score Model
Score Model
Evaluate Model
1:1
Properties
Two-Class Boosted Decision Tree
Create trainer mode
Single Parameter
Maximum number of leav...
20
Minimum number of sam...
10
Learning rate
0.2
Number of trees construct...
100
Random number seed
0
Allow unknown categ...
Quick Help
Creates a binary classifier using a boosted decision tree algorithm
(more help...)

Azure Machine Learning - video

Microsoft Cognitive Services

Microsoft Cognitive Services

- Služby pre výpočtovú inteligenciu, väčšinou hotové vo forme API
- Majú vlastnú web stránku a stoja trochu mimo Azure



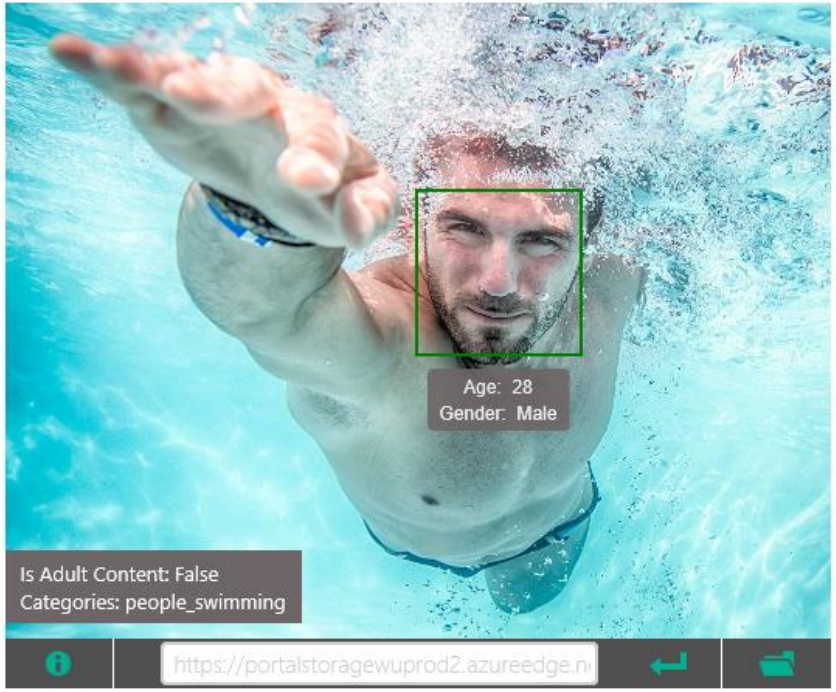
Cognitive Services APIs

Vision	Computer Vision	Emotion	Face	Video	
Speech	Bing Speech	Custom Recognition	Speaker Recognition		
Language	Bing Spell Check	Language Understanding	Linguistic Analysis	Text Analytics	Web Language Model
Knowledge	Academic Knowledge	Entity Linking	Knowledge Exploration	Recom-mendations	
Search	Bing Auto-suggest	Bing Image Search	Bing News Search	Bing Video Search	Bing Web Search

Computer Vision API

Analyze an image

This feature returns information about visual content found in an image. Use tagging, descriptions and domain-specific models to identify content and label it with confidence. Apply the adult/racy settings to enable automated restriction of adult content. Identify image types and color schemes in pictures.



Features:

Feature Name	Value
Description	{ "type": 0, "captions": [{ "text": "a man swimming in a pool of water", "confidence": 0.7850108693093019 }] }
Tags	[{ "name": "water", "confidence": 0.9996442794799805 }, { "name": "sport", "confidence": 0.9504992365837097 }, { "name": "swimming", "confidence": 0.9062818288803101, "hint": "sport" }, { "name": "pool", "confidence": 0.8787588477134705 }, { "name": "water sport", "confidence": 0.631849467754364, "hint": "sport" }]
Image Format	jpeg
Image Dimensions	1500 x 1155
Clip Art Type	0 Non-clipart
Line Drawing Type	0 Non-LineDrawing
Black & White Image	False

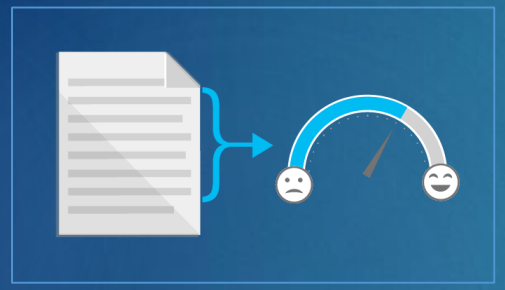
Identify Faces

Use the Cognitive Services **Face API** to compare faces, identify faces, search for similar faces, and more

Perform Sentiment Analysis

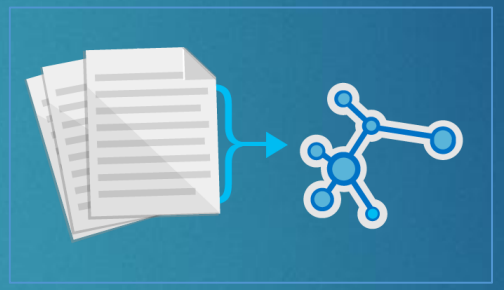
Use the Cognitive Services **Text Analytics API** to analyze sentiment in text files, Twitter feeds, and other sources

Sentiment Analysis

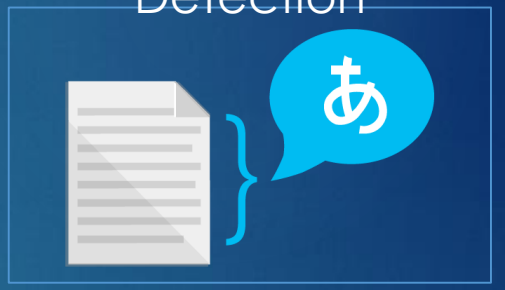


Key Phrase Extraction

Topic Detection



Language Detection



"Thanks to Text Analytics…we are able to incorporate guest sentiment into our actionable guest feedback platform that delivers a comprehensive view of guest satisfaction and server performance."

— Al Pappa, Head of Business Intelligence, Ziosk

Using the Computer Vision API (C#)

- Submit an image via URI to the Computer Vision API and ask for captions and descriptive tags
  - Optionally pass a stream instead of a URI
- Uses Microsoft.Project-Oxford.Vision NuGet package
- Other VisualFeatures include Adult, Category, Color, Faces, ImageType, and Tags

```
VisionServiceClient vision =
    new VisionServiceClient("subscription_key");
VisualFeature[] features =
    new VisualFeature[] { VisualFeature.Description };
AnalysisResult result =
    await vision.AnalyzeImageAsync(uri, features);

string caption = result.Description.Captions[0].Text);

foreach (string tag in result.Description.Tags)
{
    // tag holds descriptive tag for image (e.g., "river")
}
```

Using the Computer Vision API (Node.js)

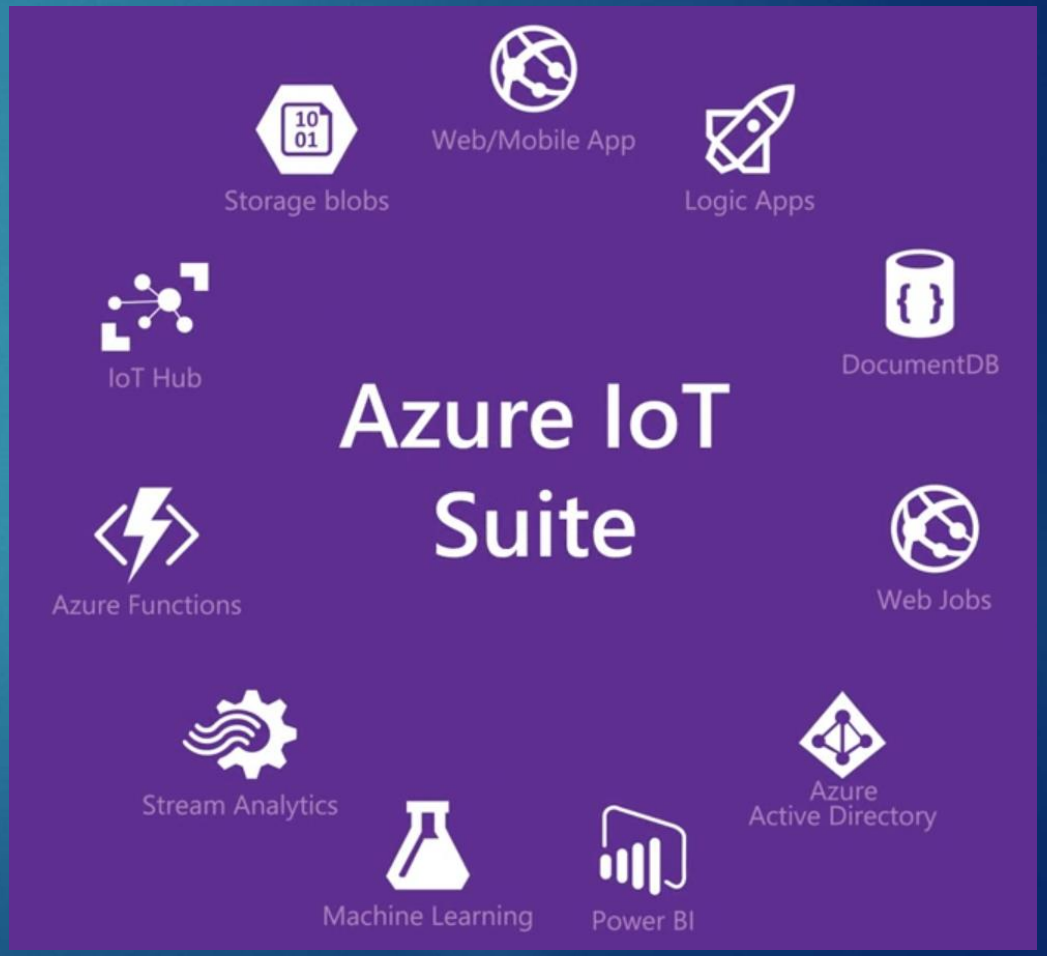
- Submit an image via URI to the Computer Vision API and ask for captions and descriptive tags
  - Optionally pass a stream instead of a URI
- Other VisualFeatures include Adult, Category, Color, Faces, ImageType, and Tags

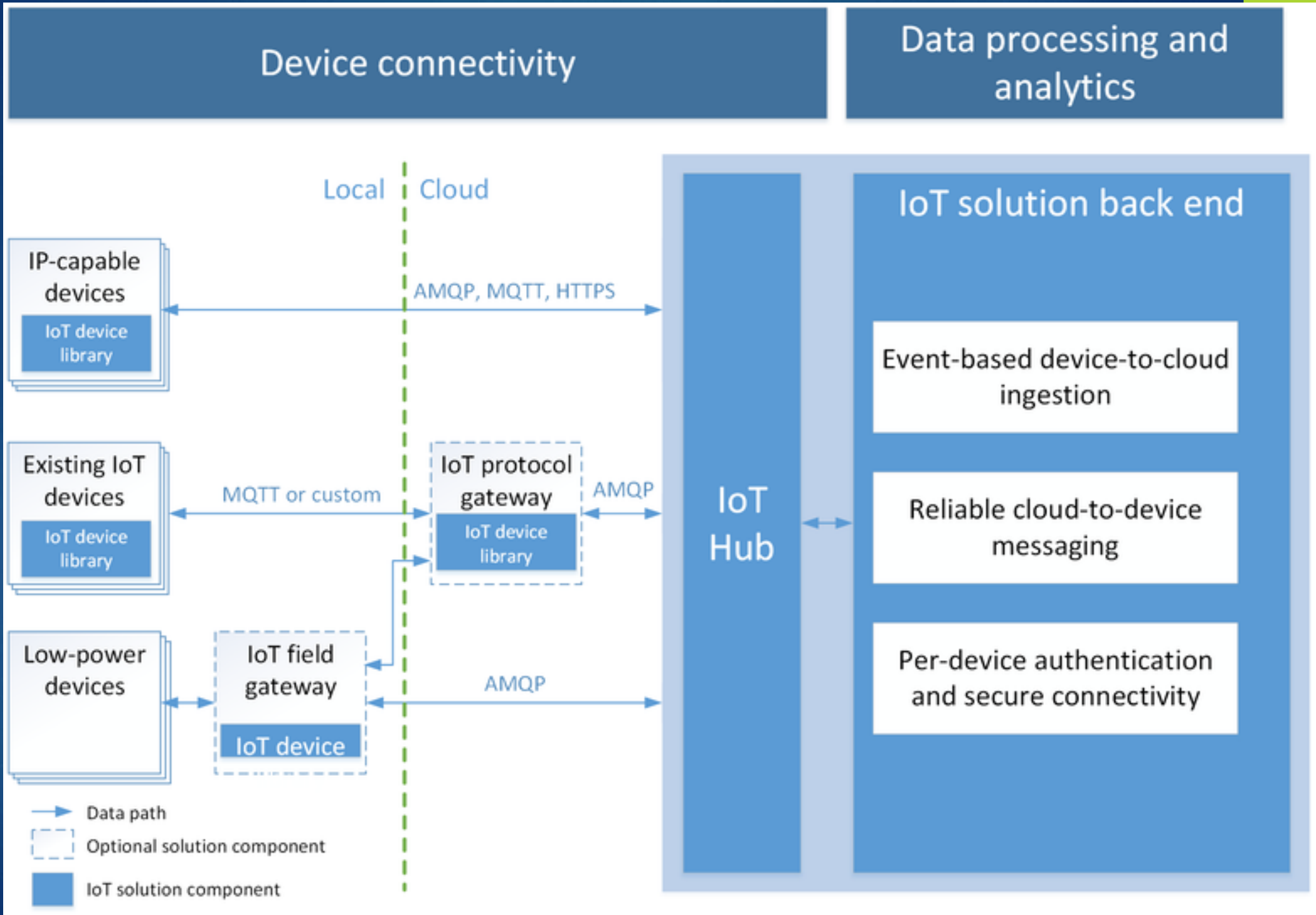
```
var options = {
    url: "https://api.projectoxford.ai/vision/v1.0/analyze",
    qs: { visualFeatures: "Description" },
    method: 'POST',
    headers: {
        'Content-Type': 'application/json',
        'Ocp-Apim-Subscription-Key': 'subscription_key'
    },
  ...
};
request(options, function(err, response, result) {
    if(!err) {
        var caption = result.description.captions[0].text;
    }
});
```

Microsoft Cognitive Services - video

Azure IoT Hub / Suite

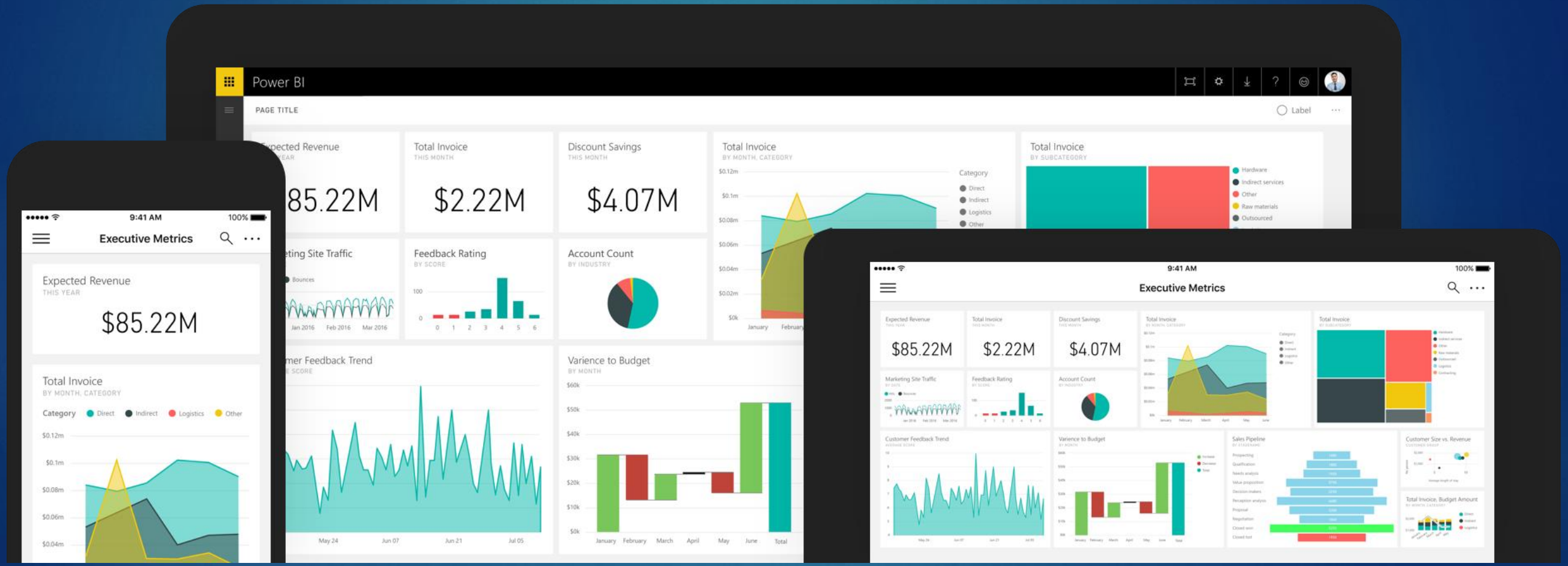
- Názov **Azure IoT Suite** zahŕňa rôzne Azure služby, ktoré môžu byť nápomocné pri riešení Internet of Things
- **IoT Hub** slúži na pripájanie, monitorovanie a riadenie IoT zariadení, pričom toto riadenie vieme spojiť so službami pre výpočtovú inteligenciu
- **Power BI** je nástroj pre tvorbu vizualizácii a rôznych štatistík dát prichádzajúcich z IoT zariadení, a to bez potreby písanie zdrojového kódu




Device connectivity
Data processing and analytics
Local
Cloud
IP-capable devices
IoT device library
AMQP, MQTT, HTTPS
Existing IoT devices
IoT device library
MQTT or custom
IoT protocol gateway
IoT device library
AMQP
Low-power devices
IoT field gateway
IoT device
AMQP
IoT Hub
IoT solution back end
Event-based device-to-cloud ingestion
Reliable cloud-to-device messaging
Per-device authentication and secure connectivity
Data path
Optional solution component
IoT solution component

Azure IoT - video

Power BI – tvorba vizualizácií



Fleet Management

California Logistics Supervisor

Home
Alerts
Assets
Staff
Admin

KPI Summary

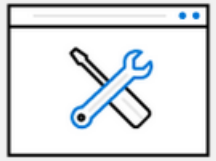
Fleet Status
In Transit
12% Alerts
At Depot
Critical Alerts
Backlog Status
On Time Delivery
91% Driver Utilization

California Operations Map

Alerts

Category
Maintenance
Driver Fatigue
Traffic
Delivery
Weather
Driver Fatigue
Maintenance
Weather
Maintenance
Delivery
Driver Fatigue
Weather
Maintenance
Construction
Maintenance
Maintenance

Transform your business with Microsoft IoT

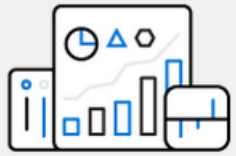


Build things

IoT begins with your things. Build with your things, from adding sensors to creating smart devices, to start your IoT solution.

Control your things

Deploy IoT solutions that control, monitor, and manage your things, allowing you to capture real-time data.



Analyze data

Take the data you collect and apply advanced analytics to uncover new business insights.

Act on insights

Transform insights into action through powerful applications—creating new revenue and business opportunities.

Explore our IoT solutions >

Why choose Microsoft IoT?

Access a comprehensive portfolio

Find the products, services, and solutions you need to make the most of IoT business opportunities across devices, cloud, analytical capabilities, and business systems.

Bring IoT to any device, any platform

Deliver a flexible, scalable solution that adapts to your needs and processes. Connect to your choice of devices and operating systems, while using your existing infrastructure.

Rely on a commitment to IoT

Get more than an IoT vision. Because we've been investing in the Internet of Things before it was even called that, you can rely on a commitment to bring support and rapid innovation to your solutions, helping you stay ahead of the competition.

Get trusted support

Trust decades of experience and security working with companies like yours. Support your solution with enterprise technology designed for the needs of business, as well as our vast network of partners.

Grove Starter Kit for IoT based on Raspberry Pi

- Štartovací kit pre IoT
- Works with Microsoft Windows 10 IoT Core
- Works with Microsoft Azure
- GrovePi+ that compatible with Raspberry Pi B/B+/A+/2/3
- Easy-to-use Grove system
- HDMI display and RGB LED included
- Cena: $154.99
- https://www.seeedstudio.com/Grove-Starter-Kit-for-IoT-based-on-Raspberry-Pi-p-2694.html

Grove IoT Developer Kit - Microsoft Azure Edition

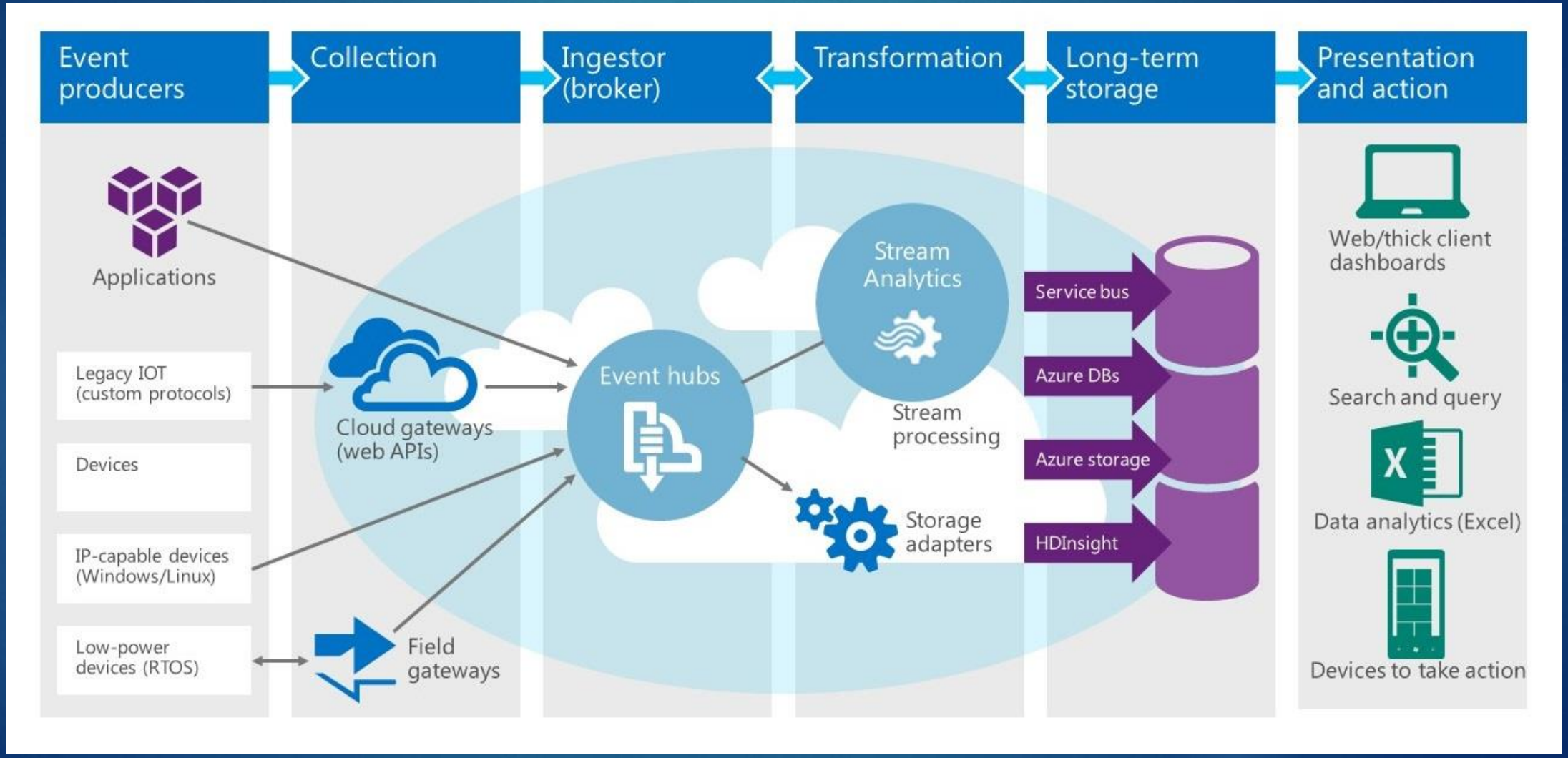
- Grove IoT Developer Kit - Microsoft Azure Edition contains an Intel® Edison module, an Intel® Edison for Arduino board, a Grove Base Shield, a set of Grove sensors and actuators with build-in Grove ports for rapid prototyping
- Simply plug in the modules and you are ready to create
- Part of Microsoft Azure IoT ecosystem
- **Intel® Edison module:** Uses a 22nm Intel® SoC that includes a dual core, dual threaded Intel® Atom; CPU at 500MHz and a 32-bit Intel® Quark; microcontroller at 100 MHz
  - It supports 40 GPIOs and includes 1GB LPDDR3, 4 GB EMMC, and dual-band WiFi and BTLE on a module slightly larger than a postage stamp.

Microsoft Connected Vehicle Platform - video

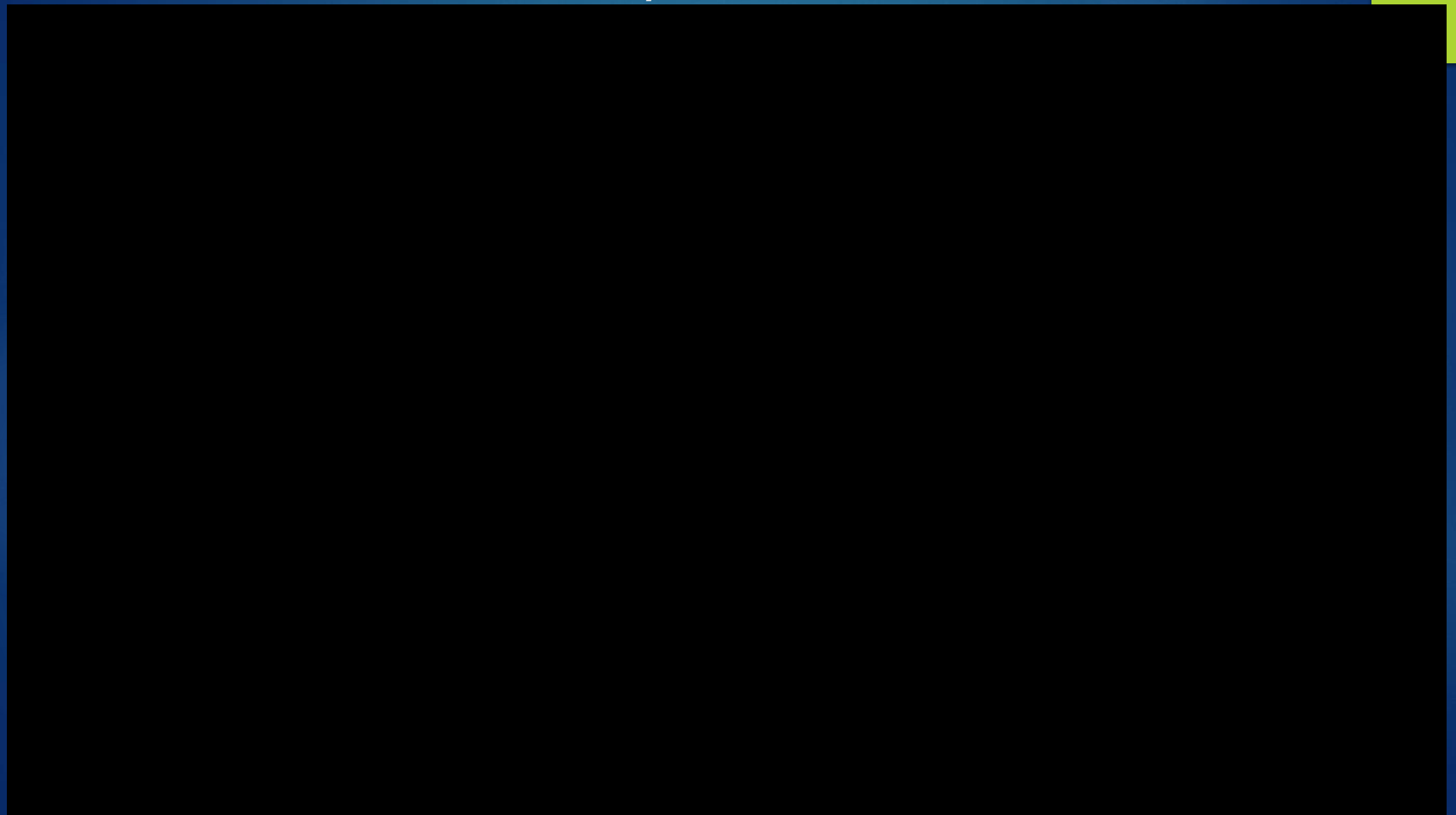
Azure Stream Analytics

- Real-time spracovanie prúdu dát z cloudu / IoT
- Podporuje podobný dopytovací jazyk ako SQL
- Learning map - https://azure.microsoft.com/en-us/documentation/learning-paths/stream-analytics/

Stream Analytics at Work



Azure Stream Analytics - video



Stream Analytics Query Language

- SQL-like language for querying live data streams
  - Subset of T-SQL
  - Supports bigint, float, nvarchar(max), datetime, record, and array
  - Supports SELECT, FROM, WHERE, GROUP BY, and other common Data Manipulation Language (DML) statements
  - Supports COUNT, AVG, DATEDIFF, and other common functions
- Adds extensions such as TIMESTAMP BY and System.Timestamp
- Supports temporal grouping of events via "windowing"

Querying a Data Stream

- List all Connecticut cars that enter a toll booth, and include the entry time, toll booth ID, and license-plate number

```
SELECT EntryTime, TollId, LicensePlate
FROM EntryData
WHERE State = 'CT'
```

ENTRYTIME	TOLLID	LICENSEPLATE
2014-09-10T12:02:00+00:00	3	ABC 1004
2014-09-10T12:03:00+00:00	2	XYZ 1003
2014-09-10T12:11:00+00:00	1	NJB 1006

Designating a Field as the Event Time

- Designate the EntryTime field as the event time for calculations that involve event time

```
SELECT System.Timestamp AS [Entry Time],
    TollId, LicensePlate
FROM EntryData TIMESTAMP BY EntryTime
WHERE State = 'CT'
```

ENTRYTIME	TOLLID	LICENSEPLATE
2014-09-10T12:02:00+00:00	3	ABC 1004
2014-09-10T12:03:00+00:00	2	XYZ 1003
2014-09-10T12:11:00+00:00	1	NJB 1006

JOINing Two Data Streams

- How long does it take each car that enters a tool booth to pay the toll and exit the booth?

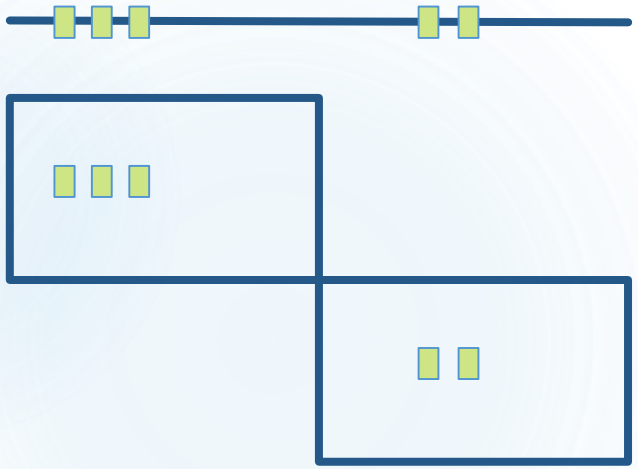
```
SELECT EN.TollId, EN.EntryTime, EN.LicensePlate,
    DATEDIFF(minute, EN.EntryTime, EX.ExitTime) AS Minutes
FROM EntryData EN TIMESTAMP BY EntryTime
JOIN ExitData EX TIMESTAMP BY ExitTime
    ON EN.TollId = EX.TollId
    AND EN.LicensePlate = EX.LicensePlate
    AND DATEDIFF(minute, EN, EX) BETWEEN 0 AND 60
```

TOLLID	ENTRYTIME	LICENSEPLATE	MINUTES
1	2014-09-10T12:01:00.000Z	JNB 7001	2
1	2014-09-10T12:02:00.000Z	YXZ 1001	1
3	2014-09-10T12:02:00.000Z	ABC 1004	2

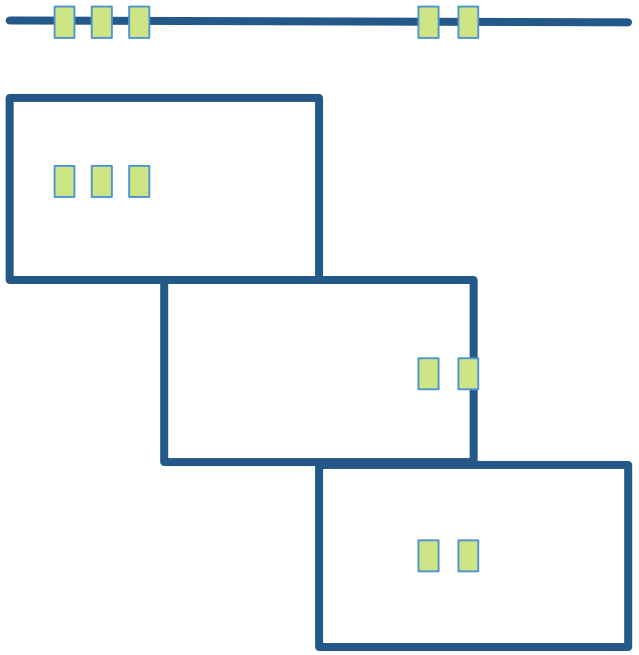
Windowing

- Count or aggregate events over a specified time period

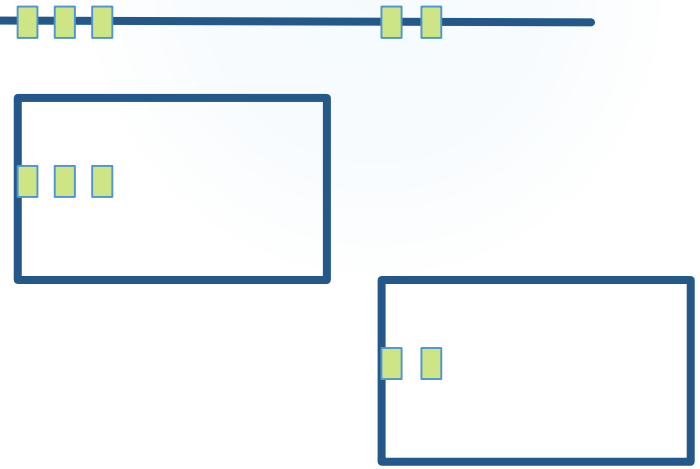
TumblingWindow



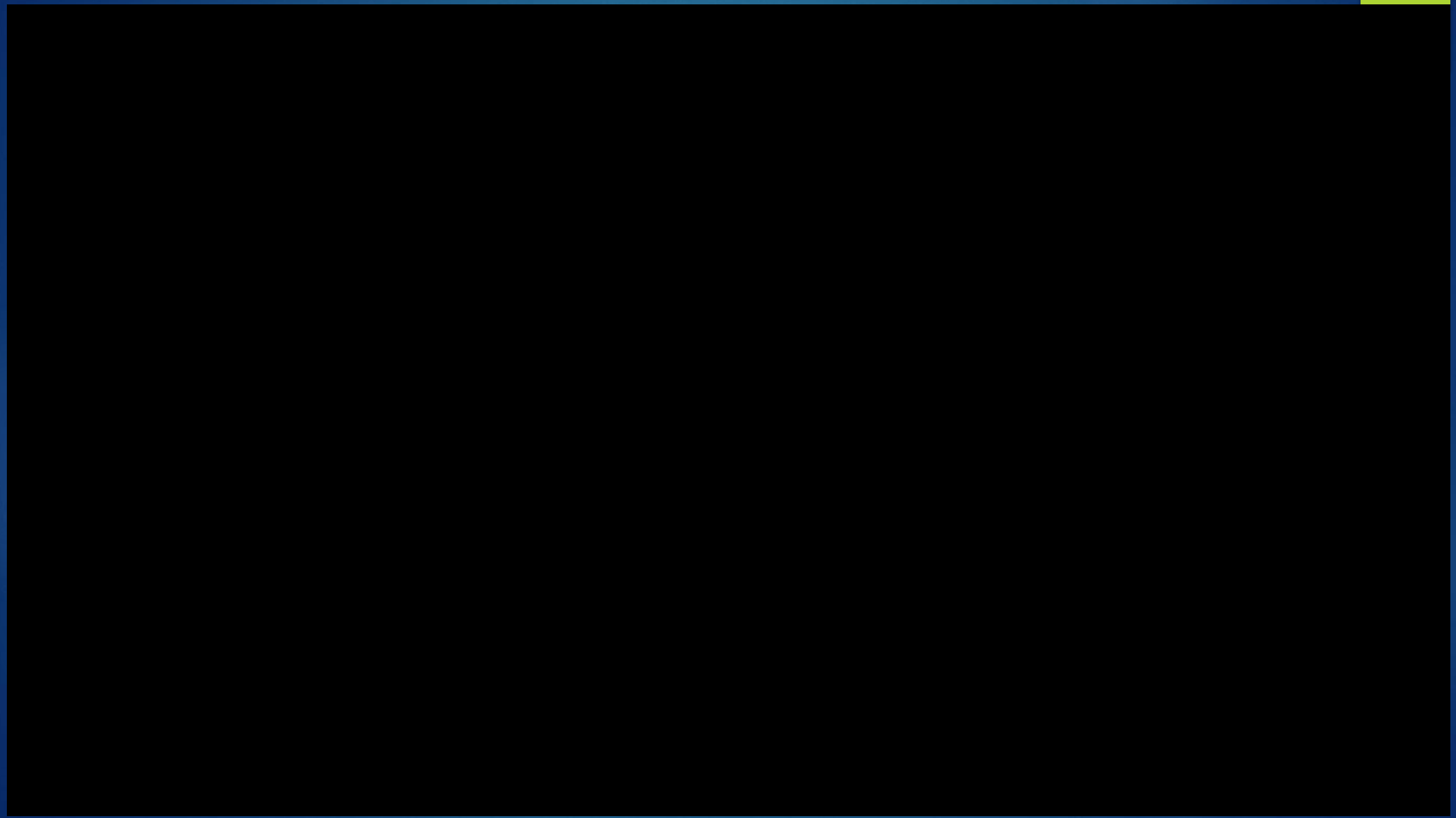
HoppingWindow



SlidingWindow



Cortana Analytics - Vehicle Telemetry Analytics

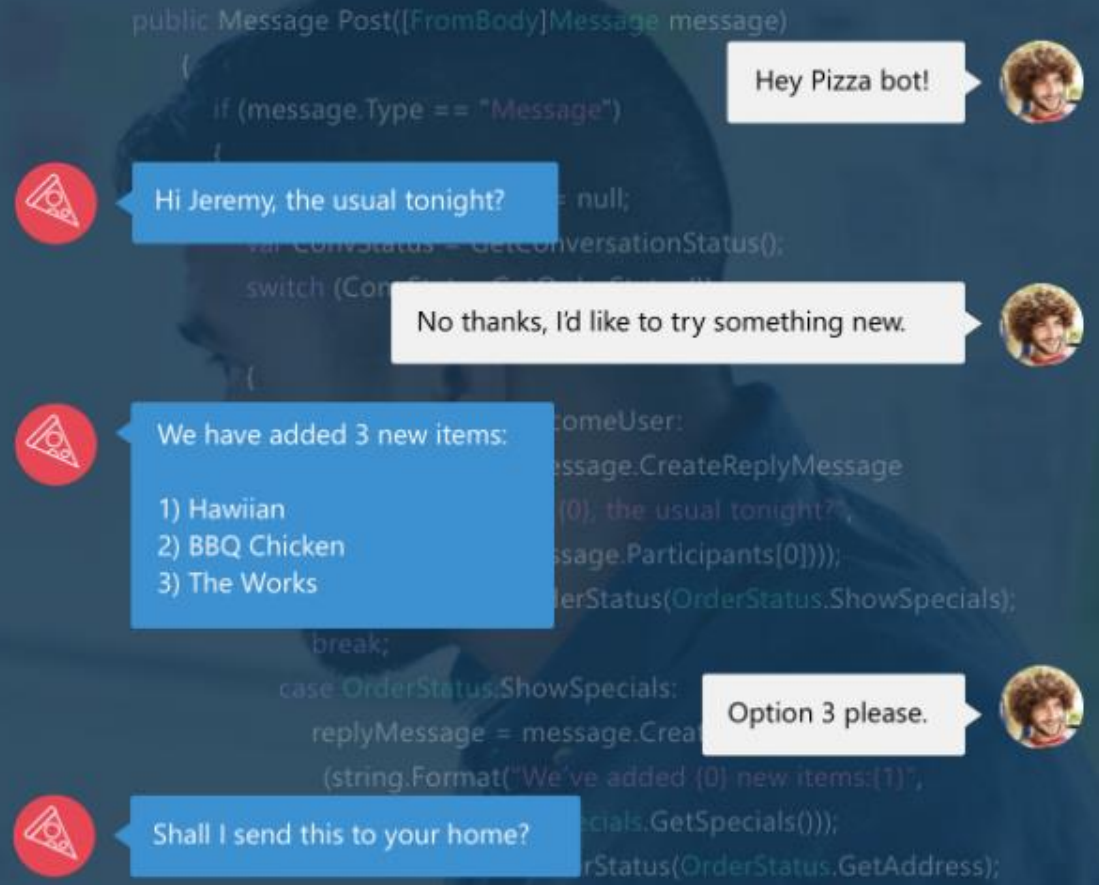


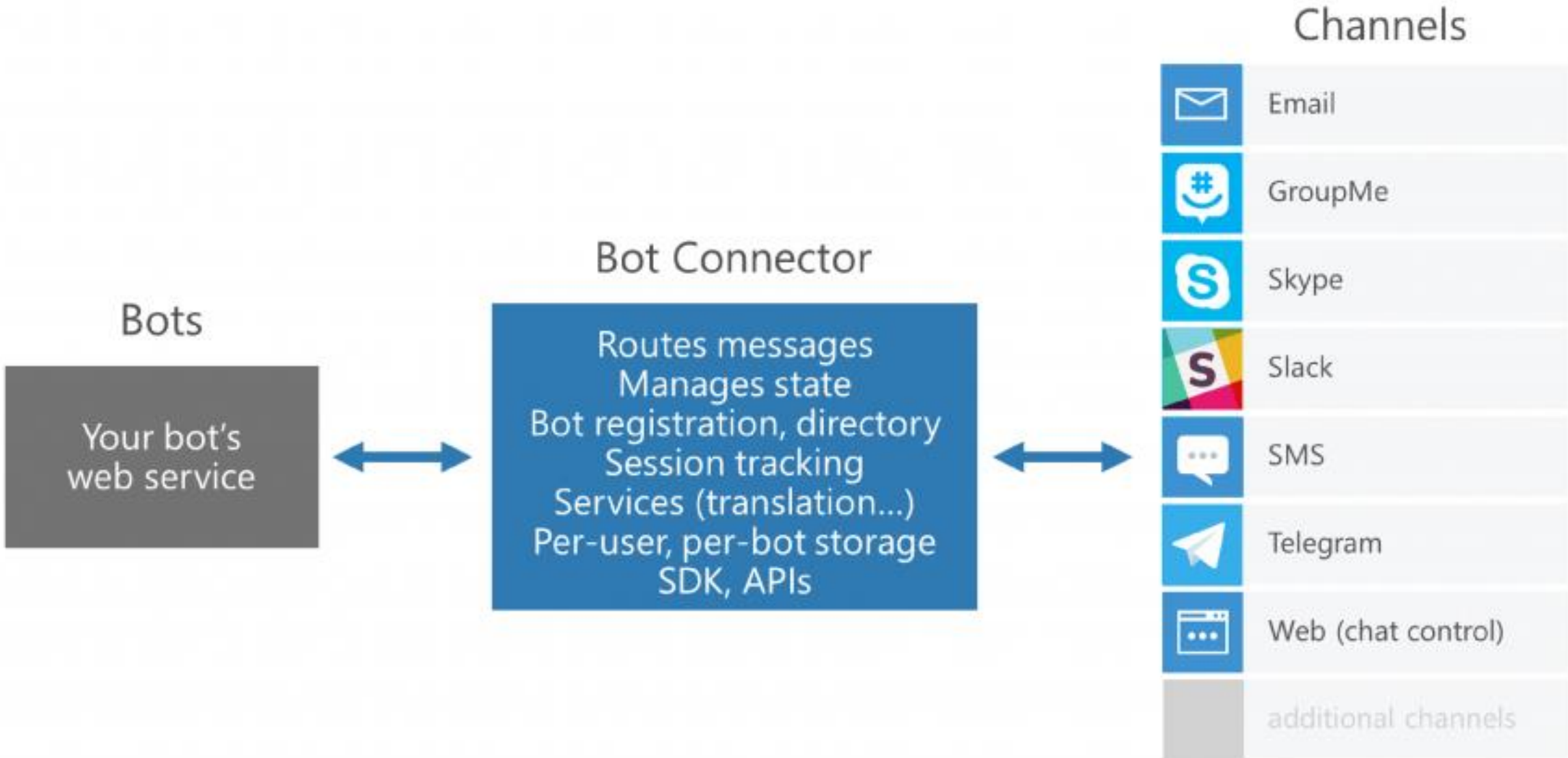
Microsoft Bot Framework

Your bots — wherever your users are talking.

Build and connect intelligent bots to interact with your users naturally wherever they are, from text/sms to Skype, Slack, Office 365 mail and other popular services.

Get started




Channels
Email
GroupMe
Skype
Slack
SMS
Telegram
Web (chat control)
additional channels
Bot Connector
Routes messages
Manages state
Bot registration, directory
Session tracking
Services (translation…)
Per-user, per-bot storage
SDK, APIs
Bots
Your bot's
web service

Použité zdroje

- Microsoft Virtual Academy
- http://www.microsoft.com
- http://youtube.com