

IBM CLOUD PRIVATE FUNDAMENTALS

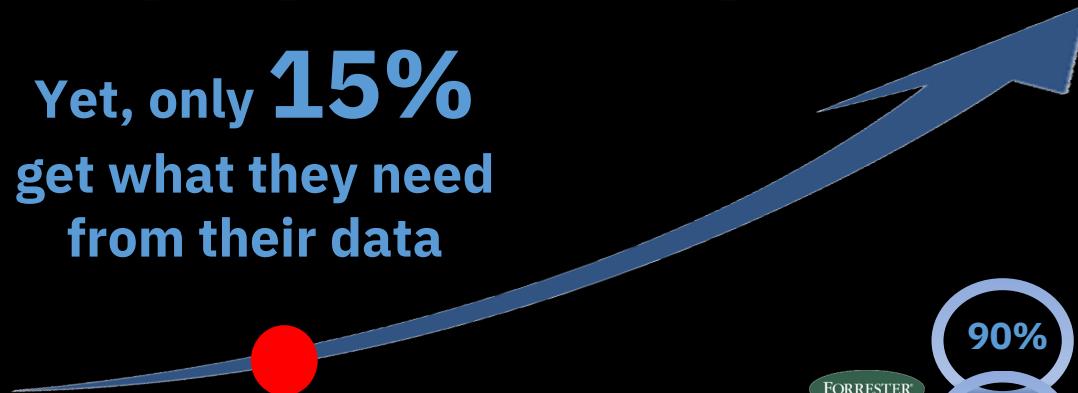
KRISHNA BALAGA

DEVELOPER ADVOCATE

KRBALAGA@IN.IBM.COM

DATA IS WHAT FUELS DIGITAL TRANSFORMATION

Yet, only **15%**
get what they need
from their data



FORRESTER

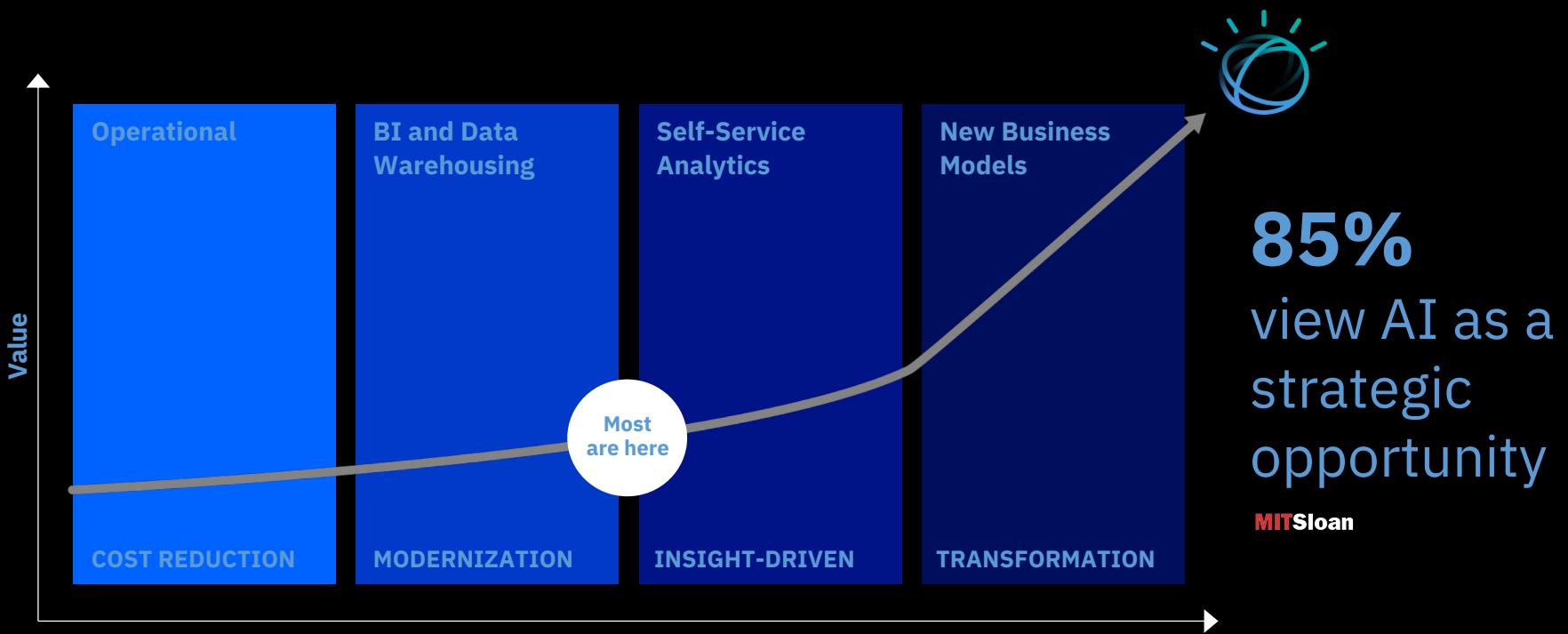


say improving the use of data
is a top priority

have a plan to build a system of
insights to become data-driven



ENTERPRISES HAVE DECLARED THE JOURNEY TO AI A STRATEGIC PRIORITY



However, AI is not magic



Achieved a 40% call deflection rate with virtual agents



Mercedes-Benz

Cognitive car manual explaining increased vehicle complexity



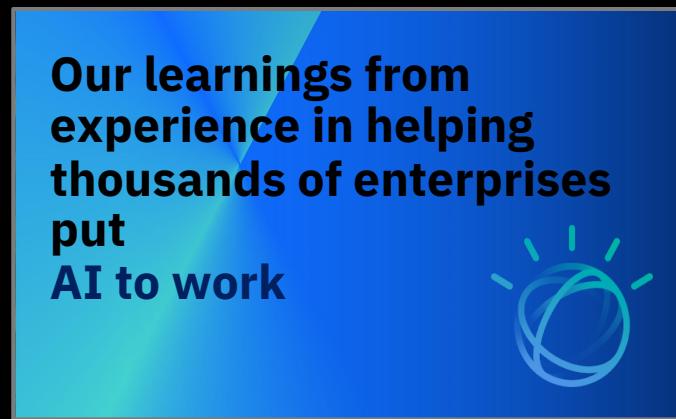
Identifies gaps in terms in complex RFPs



Predict power demand by for renewable energy



Intelligently provides info on an array of offerings



Visually categorize damage & instantly issues quote



Better predict outcomes in sepsis patients



Predict and target first-time buyers in the US



Surface hidden insights to optimize fantasy football outcomes



AI-powered advertising engagement

There is no AI without an IA

(information architecture)

81%

do not understand the data required for AI

80%

of data is either inaccessible, untrusted or unanalyzed

“

No amount of AI algorithmic sophistication will overcome a lack of data [architecture]

MIT Sloan

94%

74%

87%

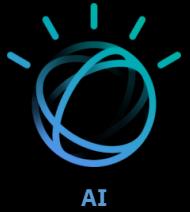
are committed to multicloud

use AI to modernize apps

of AI developers use open source

The AI Ladder

A prescriptive approach to accelerating the journey to AI



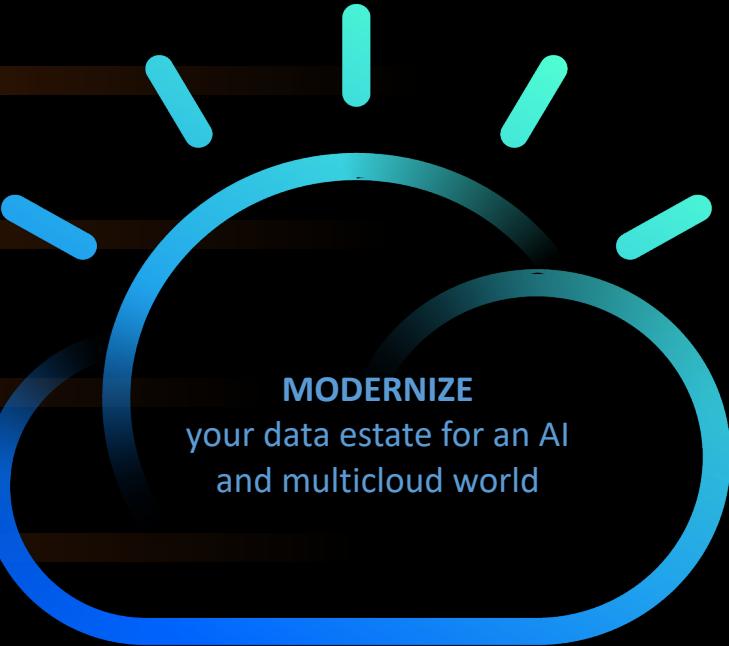
INFUSE – Operationalize AI in business processes

ANALYZE - Scale AI everywhere with trust & transparency

ORGANIZE - Create a trusted analytics foundation

COLLECT - Make data simple and accessible

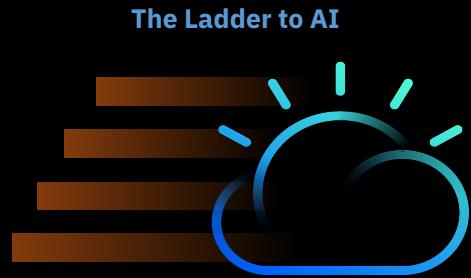
Data of every type, regardless of
where it lives



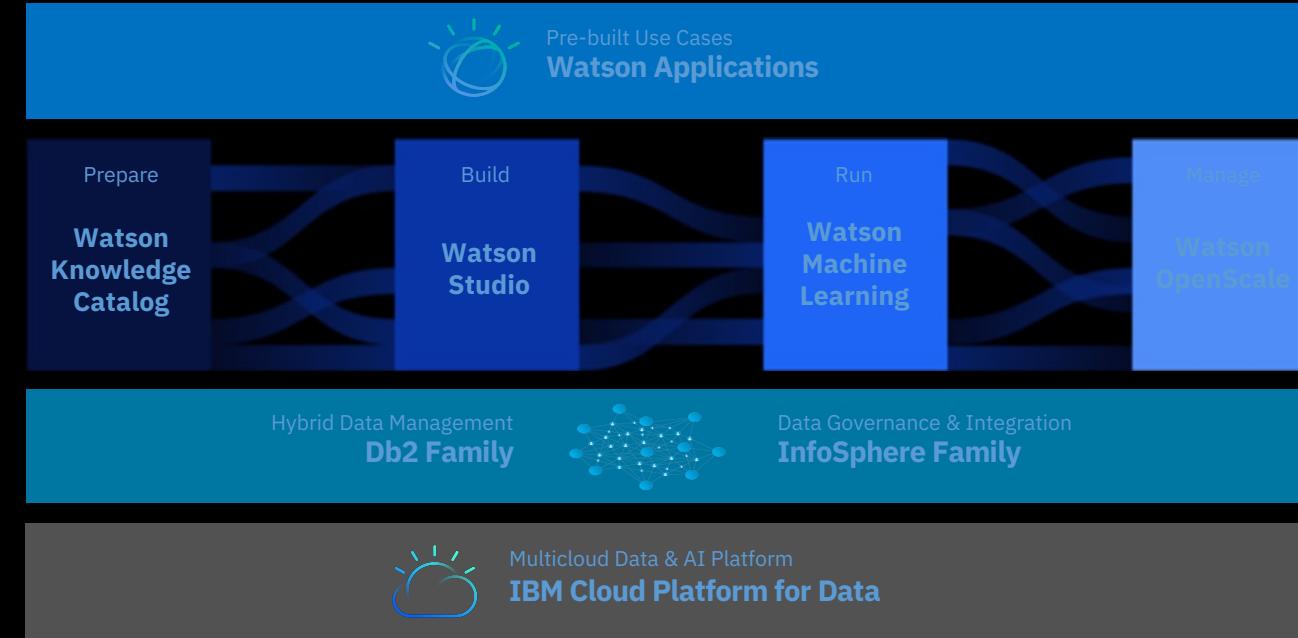
AI-optimized systems
infrastructure

IBM Data & AI Portfolio

Everything you need for Enterprise AI, on any cloud



Open Source meets a multicloud,
working as ONE



IBM Cloud



RED HAT
OPENSHIFT



amazon
webservices



Azure



openstack



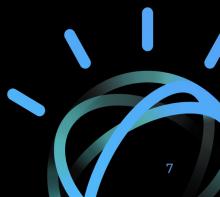
Google Cloud



intel

IBM Z

IBM Power Systems



Watson Data Science Platform

An integrated set of capabilities for AI model creation & lifecycle management

Prep

Unified catalog to data users find, curate, categorize and share data



Build

Design, build and train AI models, with visual modeling & generation



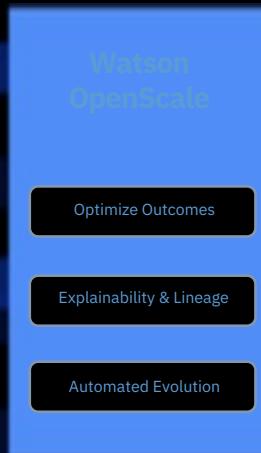
Run

A universal runtime to embed, share and optimize AI models



Manage

Operate and scaling AI value & usage with trust & transparency



Build and Deploy Upon Open Source Frameworks

Unify on a Multicloud Data & AI Platform



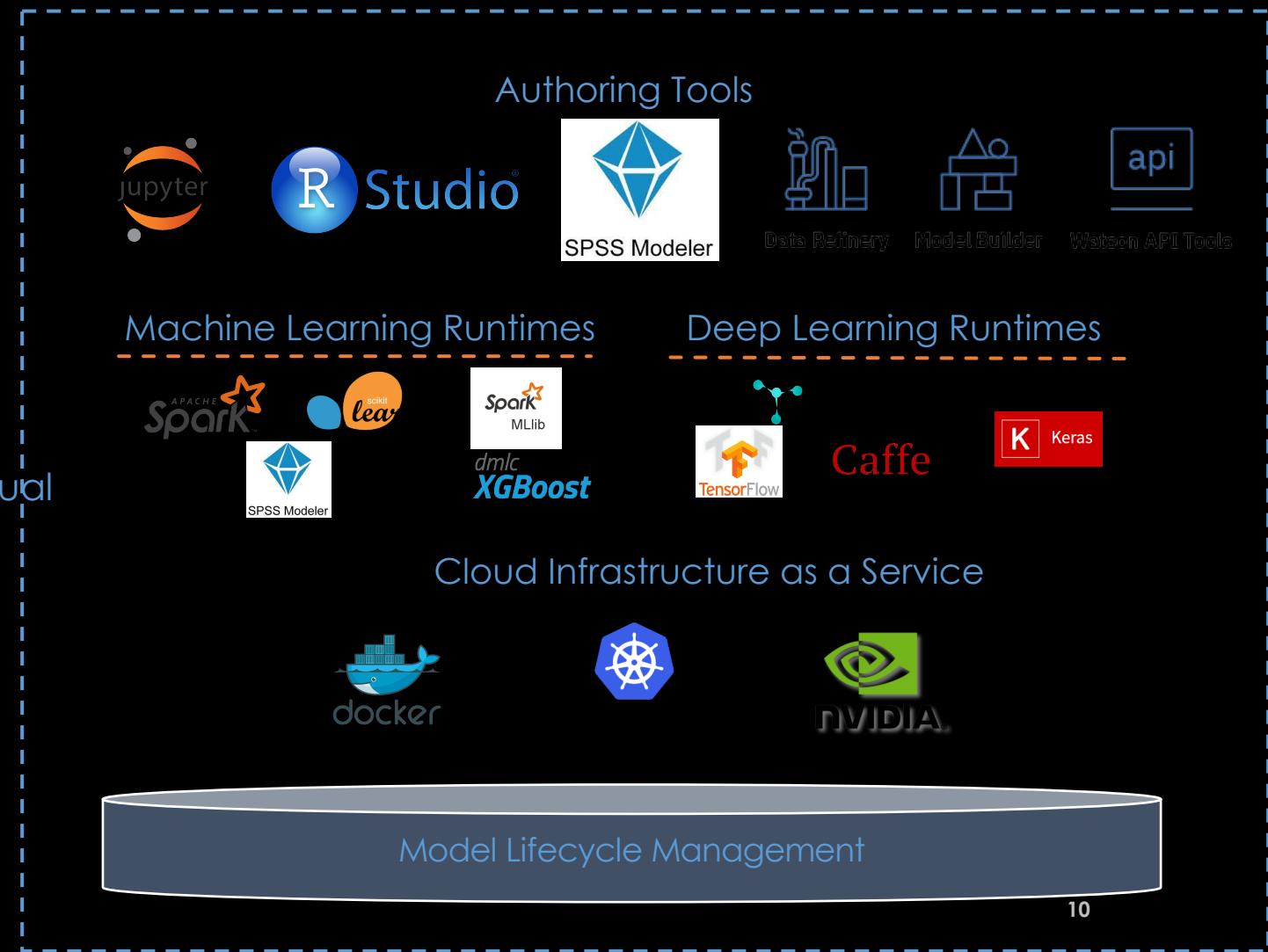
IBM WATSON STUDIO

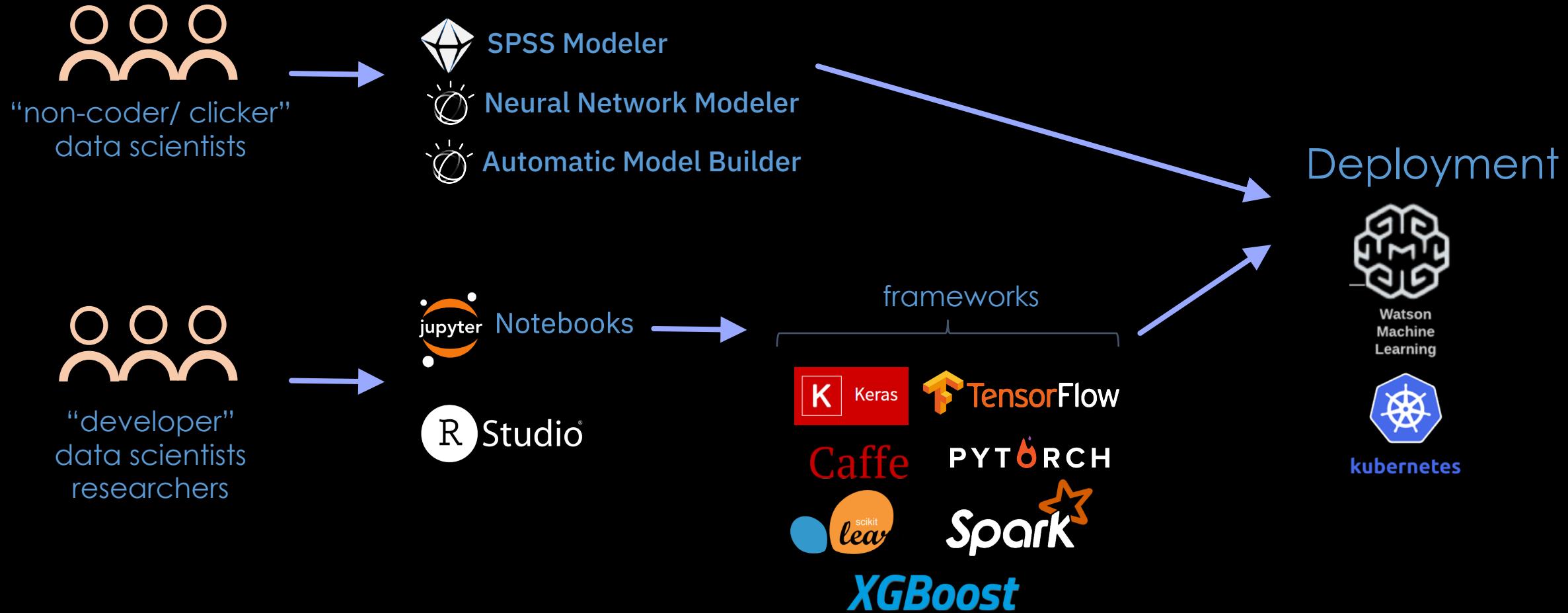


COMPREHENSIVE SET OF TOOLS FOR THE END-TO-END AI WORKFLOW

Watson Studio provides a suite of tools for data scientists, application developers and subject matter experts to collaboratively and easily work with data and use that data to build, train and deploy models at scale.

- Create, collaborate, deploy, and monitor
- Best of breed open source & IBM tools
- Code (R, Python or Scala) and no-code/visual modeling tools
- Most popular open source frameworks
- IBM best-in-class frameworks
- Fully managed service
- Container-based resource management
- Elastic pay as you go cpu/gpu power





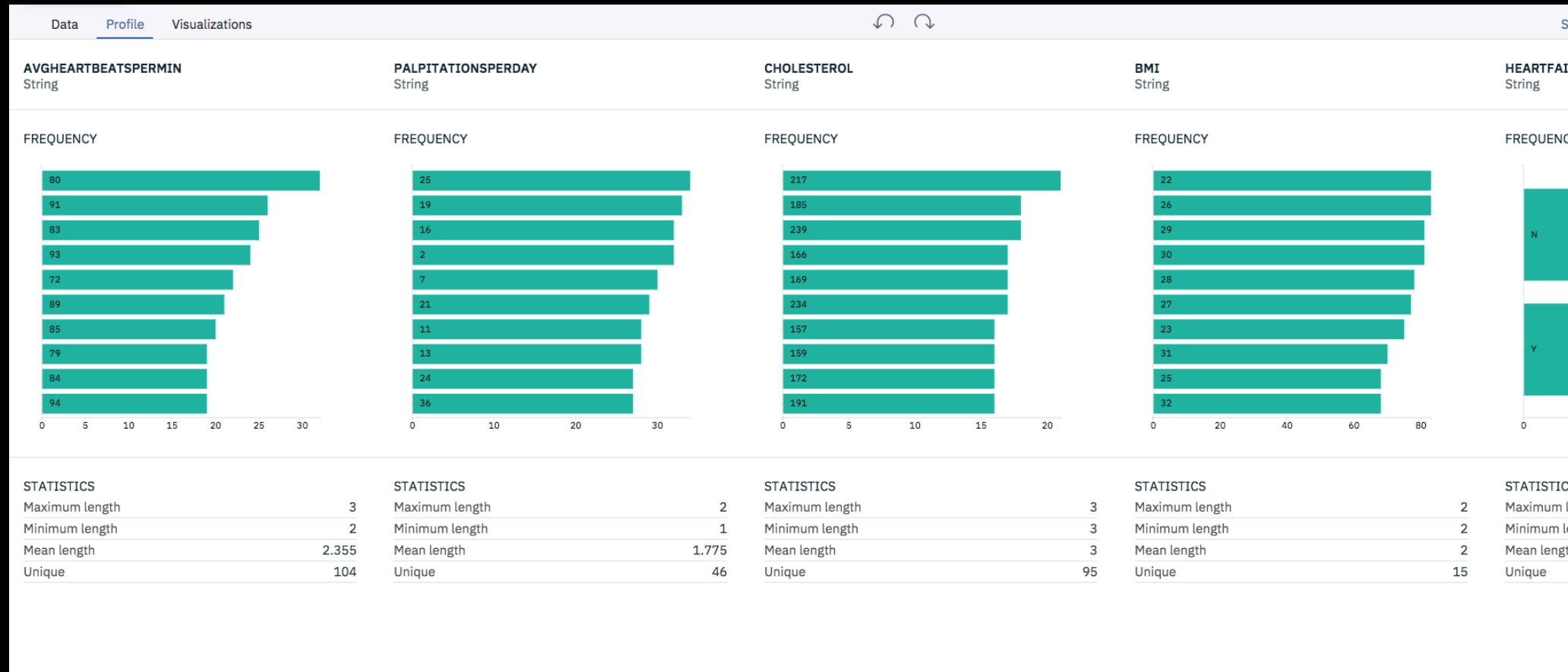
WATSON MACHINE LEARNING SERVICE (WML)

Machine Learning		
Features		
<p>Machine Learning features Take advantage of machine learning models management (continuous learning system) and deployment (online, batch, streaming). Select any of the widely supported machine learning frameworks: Tensorflow, Keras, Caffe, Pytorch, Spark MLlib, scikit learn, xgboost and SPSS.</p>		
<p>Wide choice of interfaces Use the command line interface and Python client to manage your artifacts. Extend your application with artificial intelligence through the Watson Machine Learning REST API.</p>		
<p>Integration with Watson Studio Create and train machine learning models with the best tools and the latest expertise in a social environment built by and for data scientists.</p>		
<p>Pricing Plan: Monthly Process shown above reflect the: United States</p>		
PLAN	FEATURES	PRICING
<input type="radio"/> Enterprise (beta)	<p>Service instance Deploy models and functions in production Trace transactions, model and data lineage</p>	Free
<input checked="" type="radio"/> Lite	<p>Service instance (5 models per instance) 5,000 predictions 50 capacity unit-hours: Compute Tier: k80 = 2 capacity units for 1 training hour Compute Tier: k80x2 = 4 capacity units for 1 training hour Compute Tier: k80x4 = 8 capacity units for 1 training hour Otherwise 1 capacity unit for 1 computation hour Max 8 k80 GPUs (Deep Learning Training)</p>	Free
<p>The Lite plan instance of the IBM Watson Machine Learning service provides you with a maximum of 5 deployed models, 5,000 predictions per month, and 50 capacity unit-hours per month during which a model can be trained, evaluated, and deployed to be available to accept prediction events, with a minimum of 1 minute per training job.</p>		
<input type="radio"/> Standard	<p>Predictions Capacity unit-hours: Compute Tier: k80 = 2 capacity units for 1 training hour Compute Tier: k80x2 = 4 capacity units for 1 training hour Compute Tier: k80x4 = 8 capacity units for 1 training hour Compute Tier: p100 = 5 capacity units for 1 training hour Compute Tier: p100x2 = 10 capacity units for 1 training hour Compute Tier: v100 = 8 capacity units for 1 training hour Compute Tier: v100x2 = 16 capacity units for 1 training hour</p>	\$0.5 USD/1,000 predictions \$0.5 USD/capacity unit-hour

Our Free Offerings

- GPU Compute
- Distributed Deep Learning
- Neural Network Modeler
- Model Hosting
- Monitor lineage
- Continuous Learning System
- Visual Model Builder
- CoreML Models
- Notebooks
- DLaaS

DATA REFINERY



DATA REFINERY

FREQUENTLY USED	Age	Text	
Calculate	String	CLEANSE	43
Convert column type	23	Convert column value to missing	47
Filter	47	Extract date or time value	34
Math	47	Remove duplicates	43
Remove	28	Remove empty rows	74
Rename	61	Replace missing values	50
Sort ascending	22	Replace substring	16
	49		69
	41		43
			23

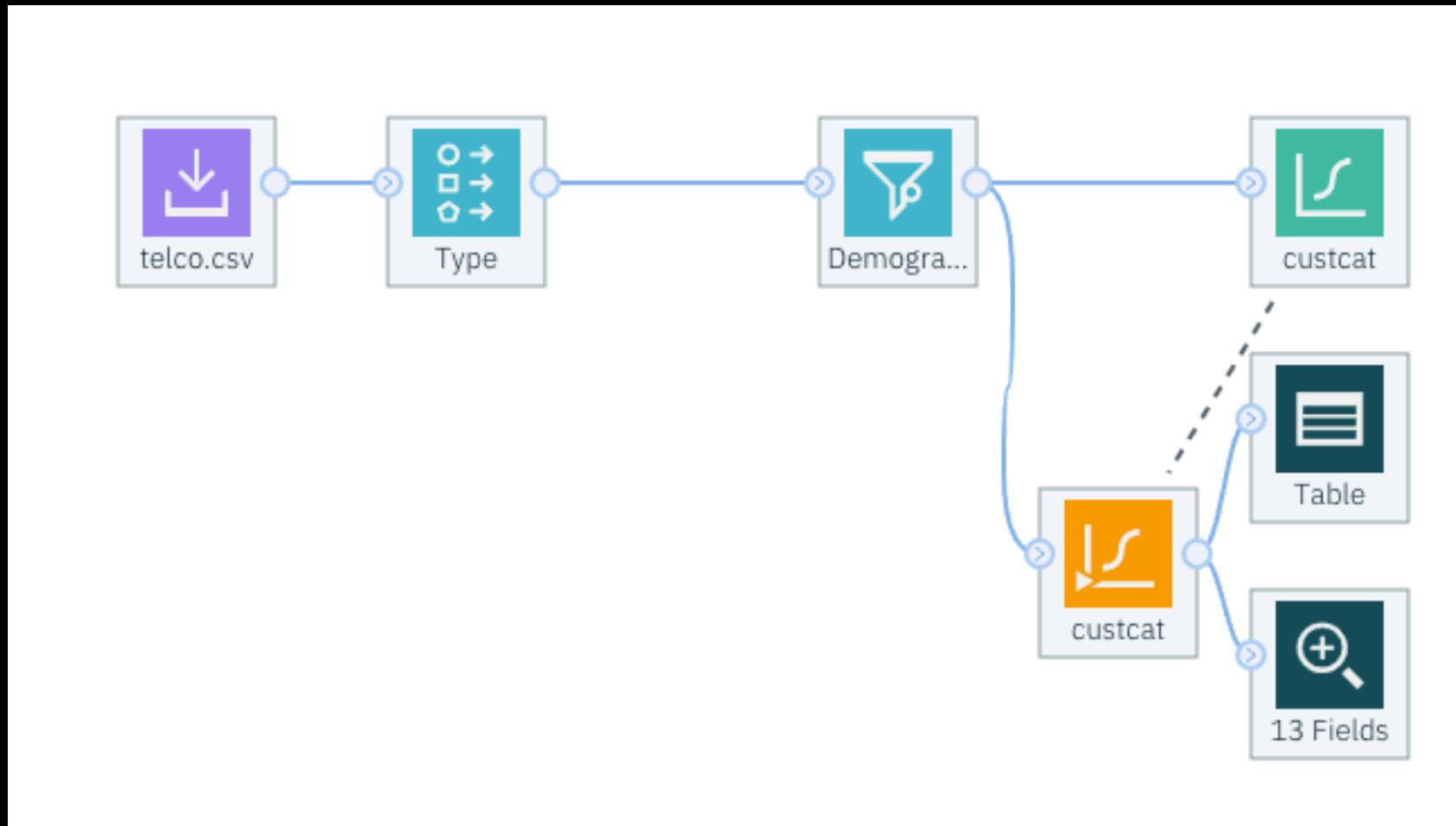
Model Builder

The screenshot shows the IBM Watson Studio Model Builder interface. The URL in the browser is <https://dataplatform.cloud.ibm.com/ml/model-builders/736e21ef-03ff-4111-a2da-19a5e18e0659/builder/load?projectId=9c92e82f-04d7-43a5-a441-d70>. The page title is "Select data asset". The main content area displays a table of data assets:

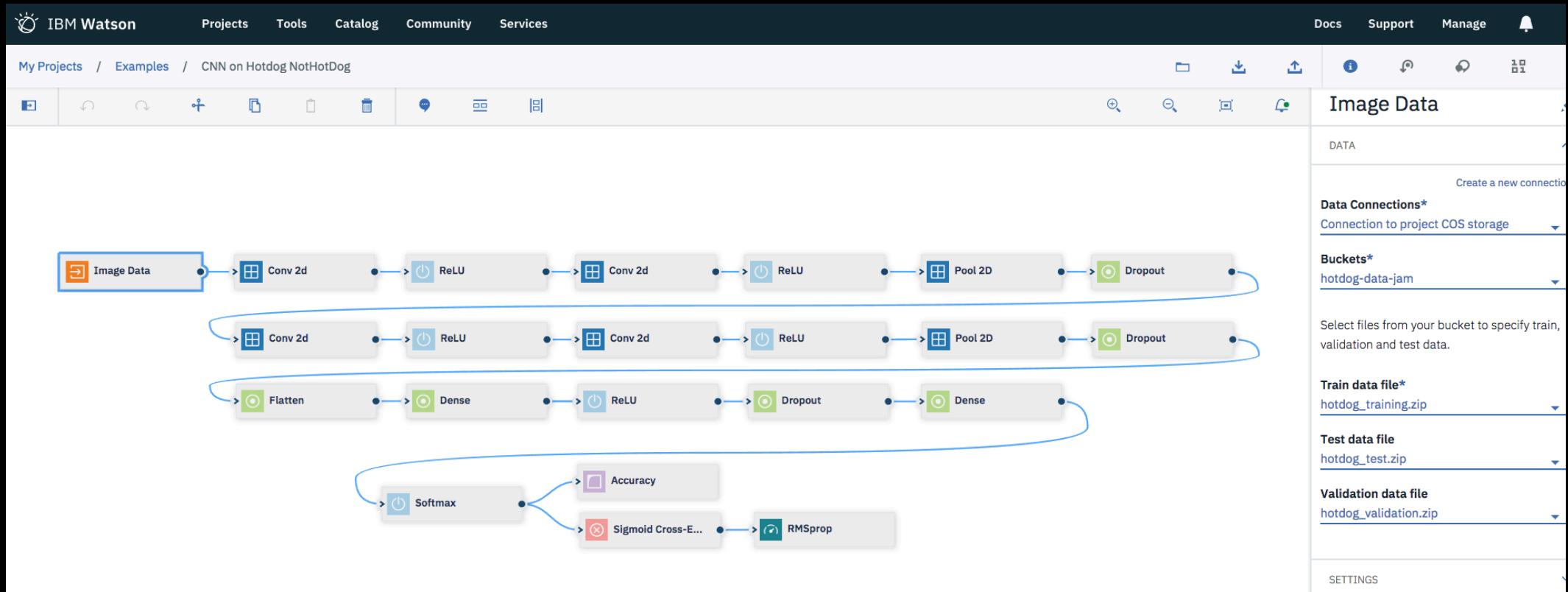
Name	Type	Service
patientdataV6.csv	Data Asset	Project
train_split.csv	Data Asset	Project

Below the table is a search bar with the placeholder text "What asset are you looking for?". At the bottom right of the modal are "Close" and "Next" buttons.

SPSS Modeler Flow



Neural Network Modeler



Notebooks

Projects > New York City Traffic Acc... > New York City Car Ac...

Adjust the scatter plot settings to use color codes to indicate collisions resulting in car body damage, personal injury, and fatal accidents:

```
In [14]: #adjust settings
plt.figure(figsize=(15,10))

#create scatterplots
plt.scatter(notnothing_pd.Longitude, notnothing_pd.Latitude, alpha=0.04, s=1, color='blue')
plt.scatter(injured_pd.Longitude, injured_pd.Latitude, alpha=0.1, s=1, color='yellow')
plt.scatter(killed_pd.Longitude, killed_pd.Latitude, color='red', s=5)

#create legend
blue_patch = mpatches.Patch( label='car body damage', alpha=0.2, color='blue')
yellow_patch = mpatches.Patch(color='yellow', label='personal injury', alpha=0.5)
red_patch = mpatches.Patch(color='red', label='lethal accidents')
plt.legend([blue_patch, yellow_patch, red_patch],['car body damage', 'personal injury', 'fatal accidents'],
           loc='upper left', prop={'size':20})

#adjust more settings
plt.title('Severity of Motor Vehicle Collisions in New York City', size=20)
plt.xlim((-74.26,-73.7))
plt.ylim((40.5,40.92))
plt.xlabel('Longitude',size=20)
plt.ylabel('Latitude',size=20)
plt.savefig('anothertry.png')

plt.show()
```

Severity of Motor Vehicle Collisions in New York City

The resulting scatter plot shows that there are fatal accident hot spots throughout the city. You can see that in some areas car body damage is prevalent, while in other areas personal injuries happen more often.

Python

IBM Developer

IBM Data Science Experience Projects Tools Data Services Community

R File Edit Code View Plots Session Build Debug Profile Tools Help

Run App

delays_shiny2.csv global.R ui.R server.R

```
45 yearIn <- input$year
46 monthIn <- input$month
47 filt_delays <- delays[(delays$Year == yearIn) & (delays$Month == monthIn),]
48 selectedAirport <- filt_delays[(filt_delays$lat == lat) & (filt_delays$long == long),]
49 content <- as.character(tagList(
50   tags$h5("Airport:", selectedAirport$airport),
51   tags$h5("Average Arrival Delay (minutes):", round(selectedAirport$average_delay, 2)),
52   tags$h5("IATA:", selectedAirport$iata),
53   tags$h5("City:", selectedAirport$city),
54   tags$h5("State:", selectedAirport$state)
55 )
56 )
57
58
59
60
61
```

Console

```
R version 3.3.2 (2016-10-31) -- "Sincere Pumpkin Patch"
Copyright (C) 2016 The R Foundation for Statistical Computing
Platform: x86_64-redhat-linux-gnu (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> library("shiny", lib.loc="/usr/lib64/R/library")
> |
```

R

API Deployments

IBM Watson Projects Tools Catalog Community Services Docs Support Manage 

Create Deployment

Web Service Batch Prediction Real-time Streaming Predictions

Name
Heart Failure Prediction Model

Description
Web Service Deployment Description

300

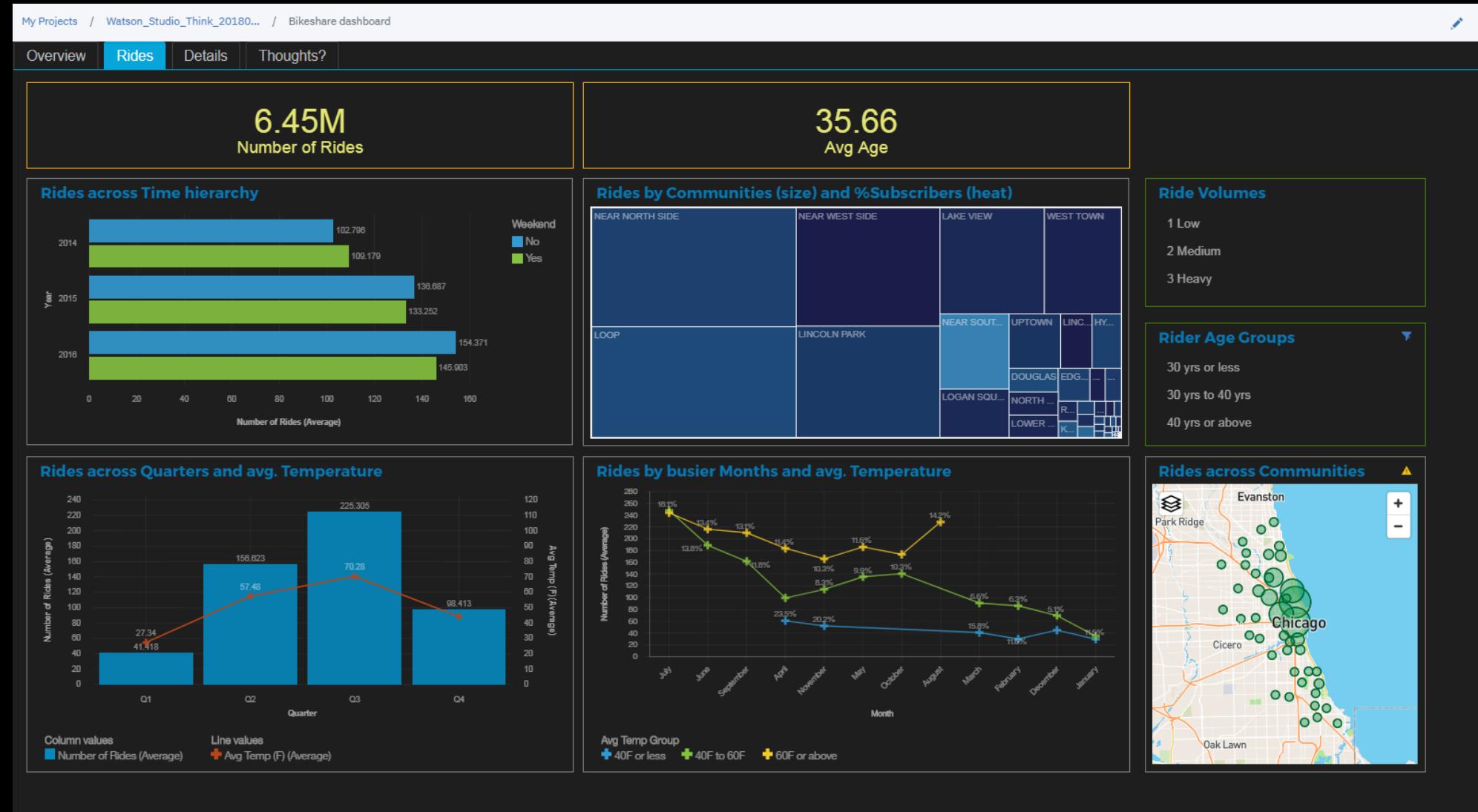
Out of the Box Implementation

The screenshot shows the IBM Watson Studio interface. The top navigation bar includes 'IBM Watson Studio', a bell icon, 'IBM', and a 'KB' button. Below the navigation is a breadcrumb path: 'My Projects / jigsaw / heart Model / heartModel'. On the right side of the header are icons for help, refresh, search, and more. The main content area has a title 'Implementation' and a 'View API Specification' link. It contains three sections: 'Scoring End-point' with the URL https://us-south.ml.cloud.ibm.com/v3/wml_instances/5ff5466f-7978-4d18-9a73-ee27871e1dd3/deployments/26f9a9ea-2462-42b9-9a32-0534378cfed9/online; 'Authorization: Bearer <token>' with a note to see code snippets for WML Authorization Token; and 'Content-type: application/json' with a note that it's required if the request body is sent in JSON format. Below this is a 'Code Snippets' section with tabs for 'cURL', 'Java' (selected), 'JavaScript', 'Python', and 'Scala'. The Java code snippet is as follows:

```
import java.io.*;
import java.net.MalformedURLException;
import java.util.Base64;
import java.util.HashMap;
import java.util.Map;
import java.net.HttpURLConnection;
import java.net.URL;
import java.nio.charset.StandardCharsets;
public class HttpClientTest {
    public static void main(String[] args) throws IOException {
        // NOTE: you must manually construct wml_credentials hash map below
        // using information retrieved from your IBM Cloud Watson Machine Learning Service instance.

        Map<String, String> wml_credentials = new HashMap<String, String>()
        {{
```

Highly Interactive Dashboards



Collaboration and Sharing

Share Migrate and Deploy Model on IBM Cloud

Share a read-only view of this notebook.



Share with anyone who has the link.

Cell content

- Only text and output
- All content excluding sensitive code cells
- All content, including code

 This option allows you to exclude code cells containing sensitive data. You can hide these code cells with a specific comment line in your code. When you share the notebook, for all code cells containing this comment line the code will not be displayed. A version is saved for your notebook. The link always points to the most recent version of the notebook.

Permalink to view notebook

<https://dataplatform.ibm.com/analytics/notebooks/v2/f448ffb2-e1f2-444b-8e3c-ee8d3e4841ee/view?a>



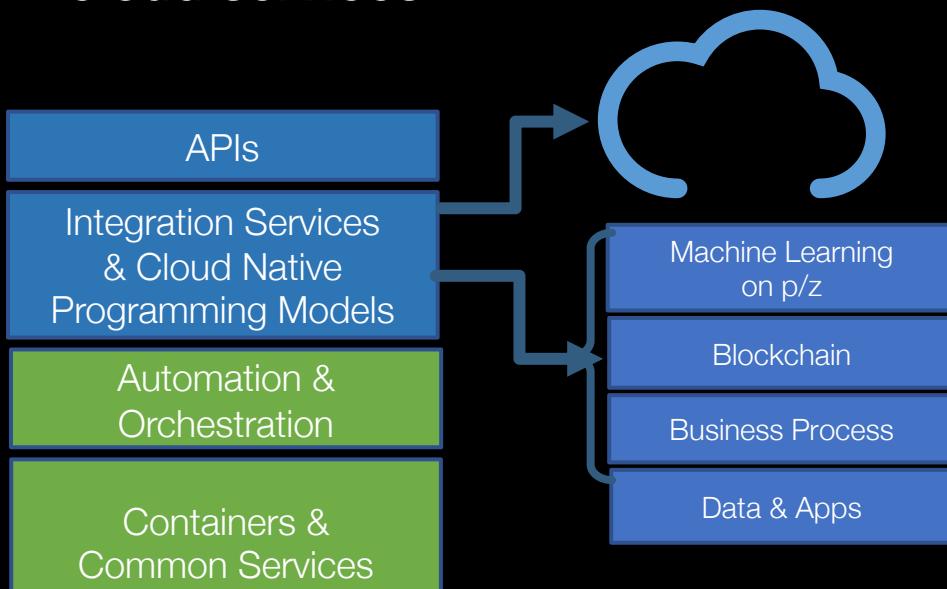
**IBM CLOUD PRIVATE
COMBINES CLOUD
NATIVE CONTAINER
SERVICES WITH THE
BEST OF IBM
MIDDLEWARE AND
OPEN SOURCE TOOLS**

PRIVATE CLOUD USE CASES

1. Optimize legacy apps with cloud



2. Open your datacenter to work with cloud services



3. Create new cloud native applications



Cloud-enabled middleware

Integration & Hybrid Cloud

New Applications

IBM CLOUD PRIVATE - BUILT WITH OPEN STANDARDS, PREVENTING VENDOR LOCK-IN



Executable package of software that includes everything needed to run it

Containers



kubernetes

Automate deployment, scaling, and management of containerized applications

Orchestration



Define, install, and upgrade Kubernetes applications

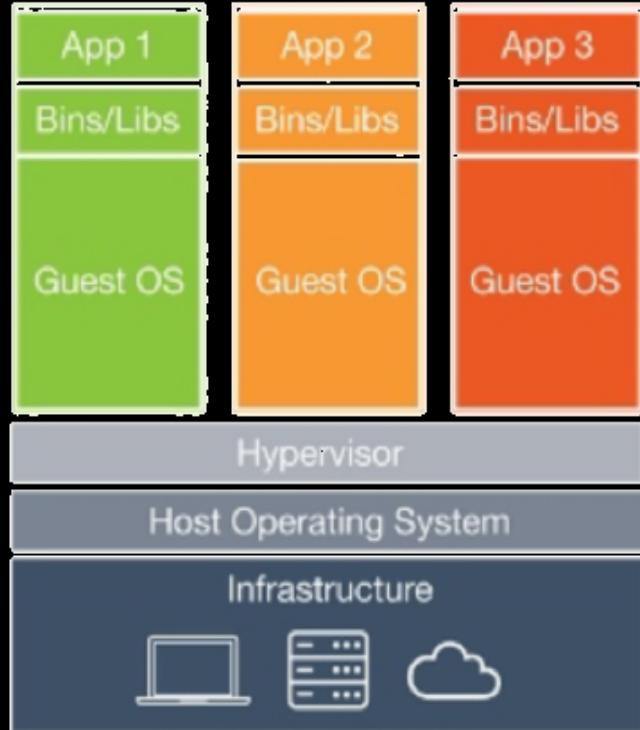
Management



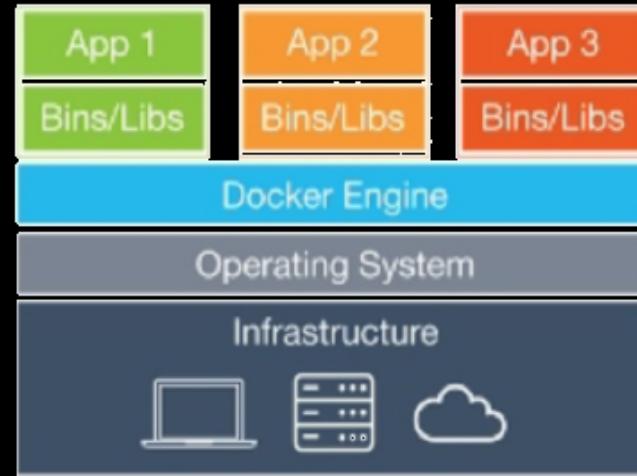
Infrastructure as code to provision public cloud and on-premises environments

Provisioning

Why Docker?

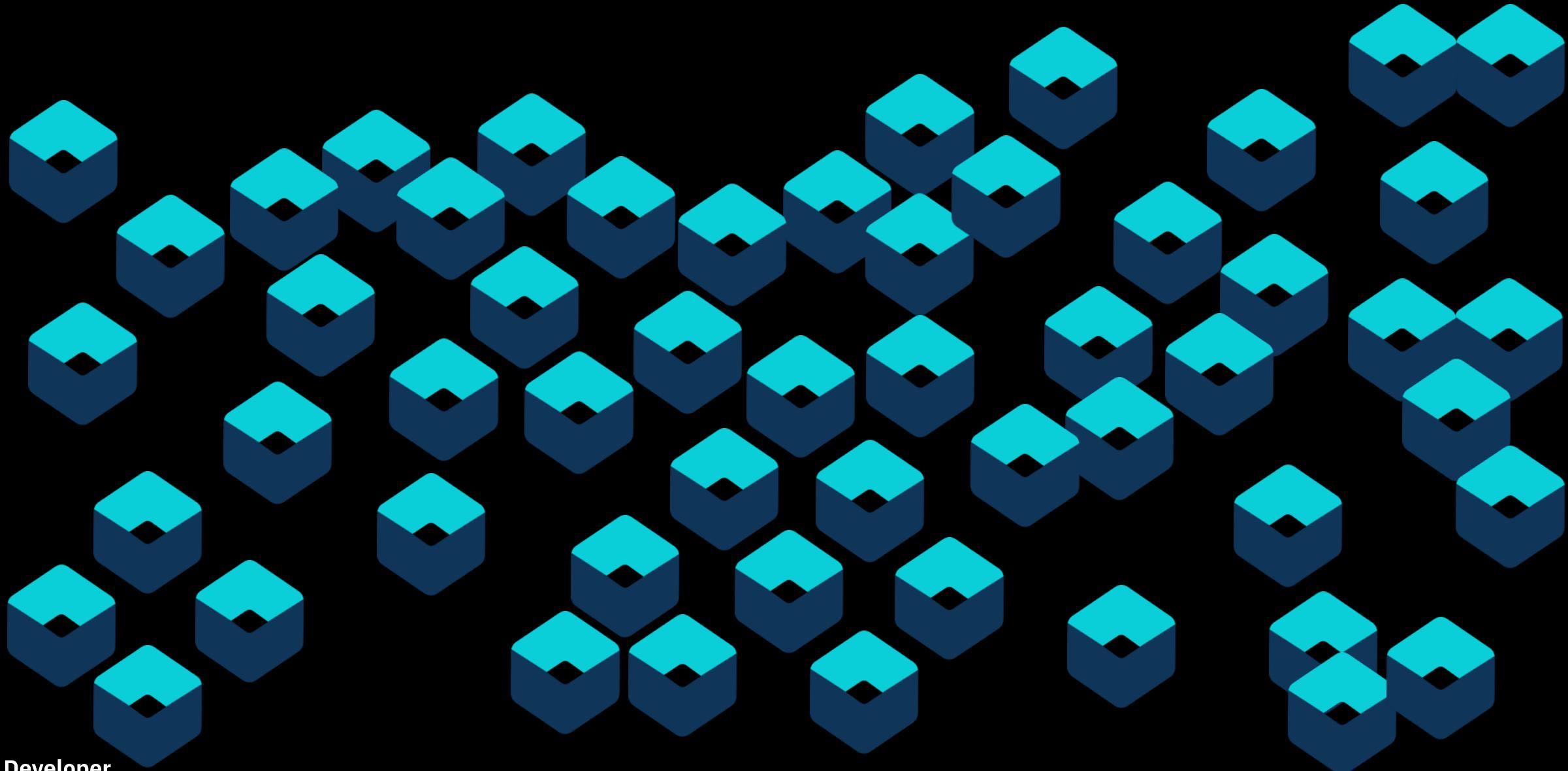


vmware®



 docker

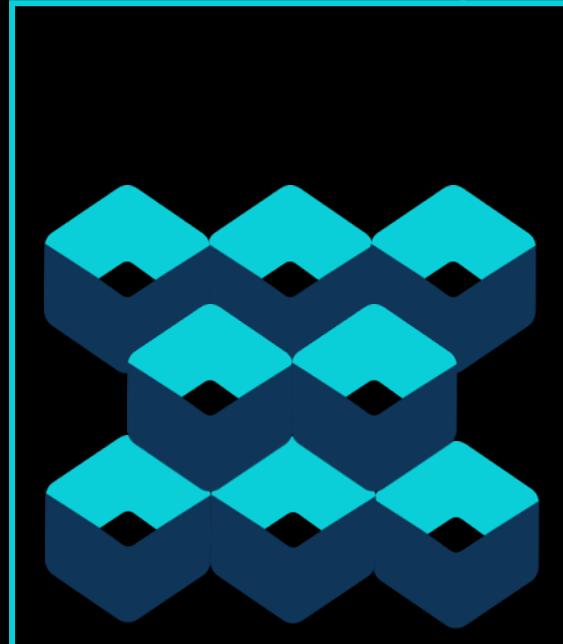
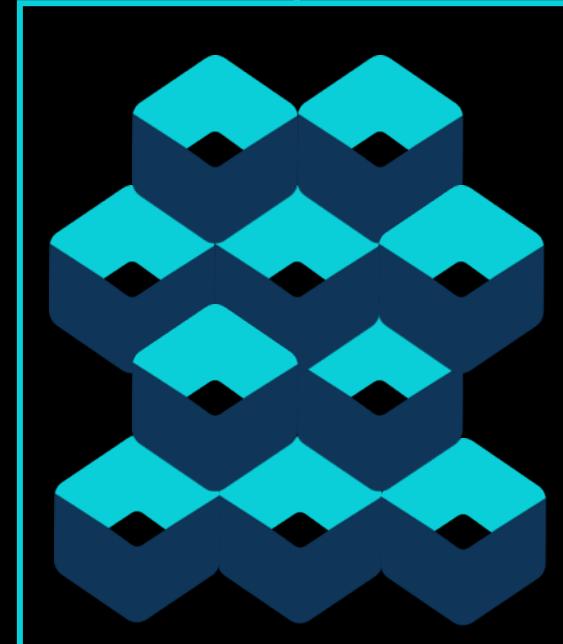
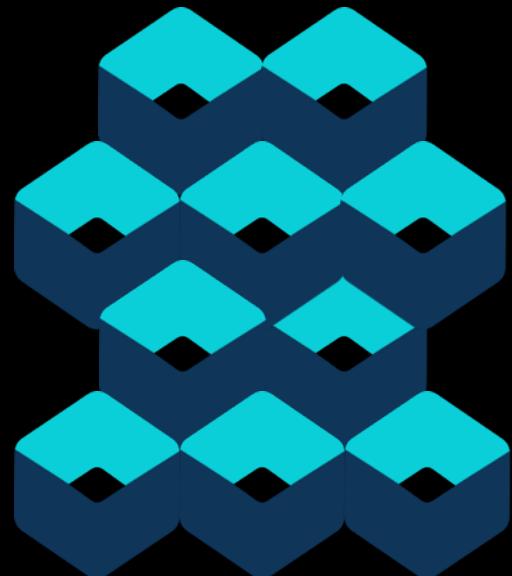
Containers are great but ... can lead into lack of control & chaos



Kubernetes – (Κυβερνήτης - Captain in Greek)

Regain control with Containers and Kubernetes

- Organize and Govern the Container Chaos





What is Helm?

Helm helps you manage Kubernetes applications — Helm Charts helps you define, install, and upgrade even the most complex Kubernetes application.

Charts are easy to create, version, share, and publish — so start using Helm and stop the copy-and-paste madness.

The latest version of Helm is maintained by the **CNCF** - in collaboration with **Microsoft**, **Google**, **Bitnami** and the **Helm contributor community**.

★ Star

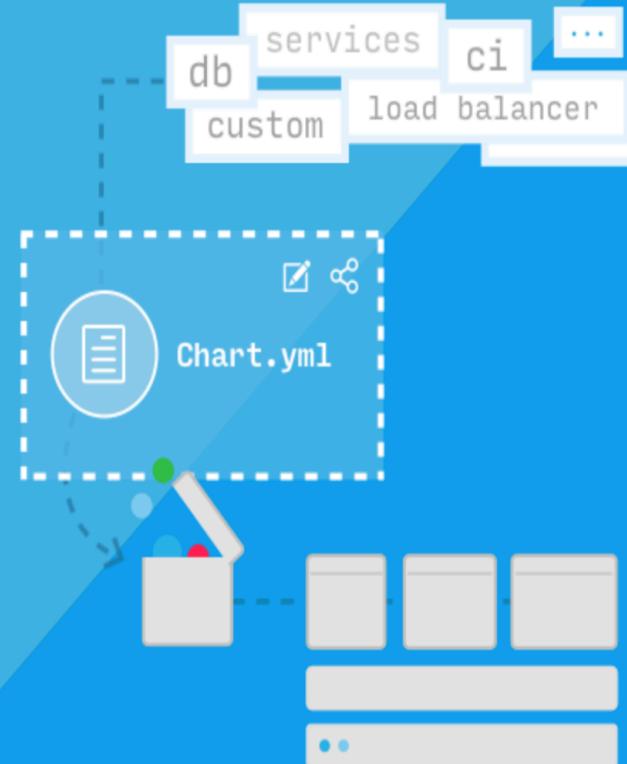
4,009

Watch

4,009

Fork

1,413



- **Rapid development and deployment:**
 - Minutes or hours vs. days or weeks, huge catalogue of OS and IBM Services , advanced Analytics and Machine learning options ...
 - Non-disruptive upgrade of platform integrated with enterprise network, storage, security, performance and production needs
 - Enablement of new and existing developers & integration with existing Dev/Sec/Ops tools
- **Investment leverage:**
 - Infrastructure choice and complete portability
 - Leverage existing applications and skills while reducing TCO
 - Open community-based platforms for choice and flexibility, on- and off-premises
 - No Vendor lock in !
- **Application modernization:**
 - Modernization and optimization across multi-cloud environments – Develop Once, deploy anywhere
 - Reduced risk by running applications on enterprise-grade software & data platforms optimized for cloud
- **Differentiated enterprise integration:**
 - Set of new services available on-premises, complemented with public cloud services (Watson)
 - Integration of applications with services for operational simplicity and reduced cost
 - Integrated cloud management solutions to automatically provision and govern multi-cloud environments with speed and control , Coupled with IBM's expertise & Services

So Much Open Source ... Why Not Build my own then ?

- Over 50 OS Services and Technologies to stitch together
- Many to Many Interfaces to maintain
- Regular changes to versions and APIs (at least every 2 to 3 months)
- HA/DR ,Security & management frameworks for production at scale need to be developed
- Need to participate in OS communities for support
- Almost Impossible to get a consistent support Model and handle dependencies

Web Terminal

Elk



LDAP

Open Liberty



Jenkins



Mongo DB

Galera



Njinx



Redis

RabbitMQ

Terraform

```
resource "softlayer_virtual_guest" "worker" {
  count          = "${var.worker_count}"
  hostname       = "docker-swarm-worker${count.index}"
  domain         = "demo.com"
  os_reference_code = "UBUNTU_LATEST"
  datacenter     = "${var.datacenter}"
  cores          = 1
  memory         = 1024
  local_disk     = true

  ssh_key_ids = [
    "${data.softlayer_ssh_key.my_key.id}"
  ]
}
```



Terraform is an infrastructure as code software. It allows users to define a datacenter infrastructure in a high-level configuration language, from which it can create an execution plan to build the infrastructure in a service provider such as IBM SL , AWS, Google, MSFT as well as Open Stack & VMWare

VULNERABILITY ADVISOR

Image Scan for identification of security risks

Identify Policy Violations

Determine best practice improvements

Take Corrective Actions

ibm_containers/elasticsearch:latest Container Image IBM_Containers | prod

Policy Status: ⚠ Warn
Time Scanned : 10/22/2016 8:20:01 AM
[Manage Policies](#)

Policy Violations: 1 of 3
Vulnerable Packages: 4 of 167
Best Practice Improvements: 5 of 26
Security Misconfigurations: 4 of 4
Container Instances: 0

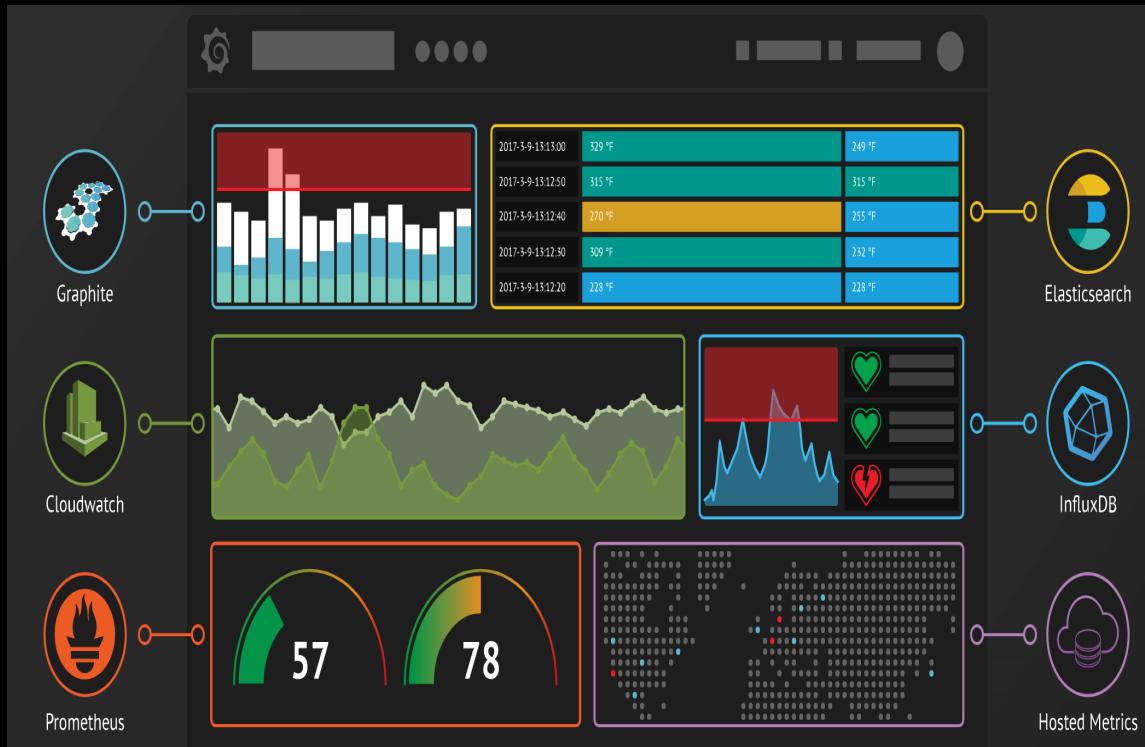
Status	Policy
✗ Failed	Image has installed packages with known vulnerabilities
✓ Passed	Image has remote logins enabled
✓ Passed	Image has remote logins enabled and some users have easily guessed passwords

Policy Violations: 1 of 3
Vulnerable Packages: 4 of 167
Best Practice Improvements: 5 of 26
Security Misconfigurations: 4 of 4
Container Instances: 0

Affected Packages	Security Notice	Description	Corrective Action
gnupg	DSA-3649-1	Felix Dörre and Vladimir Klebanov from the Karlsruhe Institute of Technology discovered a flaw in the mixing functions of GnuPG's random number generator. An attacker who obtains 4640 bits from the RNG can trivially predict the next 160 bits of output.	Upgrade gnupg to at least version 1.4.18-7+deb8u2
openssl	DSA-3673-2		Upgrade openssl to at least version 1.0.1t-1+deb8u5
openssl	DSA-3673-1	Several vulnerabilities were discovered in OpenSSL:	Upgrade openssl to at least version 1.0.1t-1+deb8u5
libgcrypt20	DSA-3650-1	Felix Dörre and Vladimir Klebanov from the Karlsruhe Institute of Technology discovered a flaw in the mixing functions of Libgcrypt's random number generator. An attacker who obtains 4640 bits from the RNG can trivially predict the next 160 bits of output.	Upgrade libgcrypt20 to at least version 1.6.3-2+deb8u2
curl	DSA-3638-1	Several vulnerabilities were discovered in cURL, an URL transfer library:	Upgrade curl to at least version 7.38.0-4+deb8u4

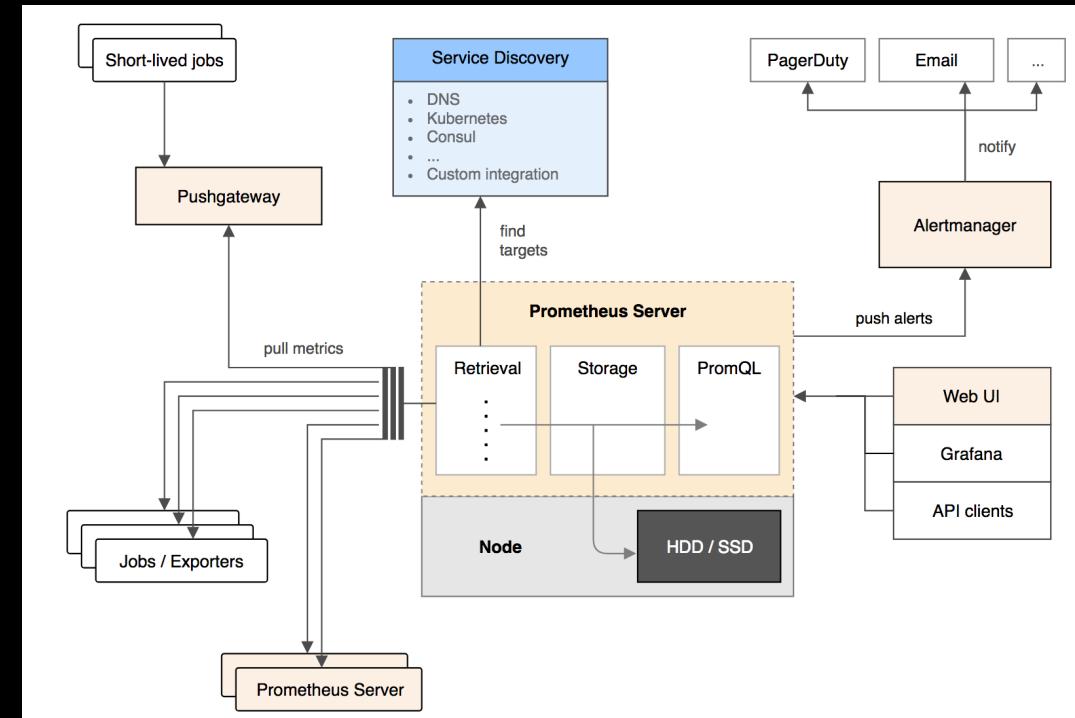
Grafana & Prometheus

Grafana : The **open** platform for **beautiful** analytics and monitoring



IBM Developer

Prometheus : is an open-source systems monitoring and alerting toolkit

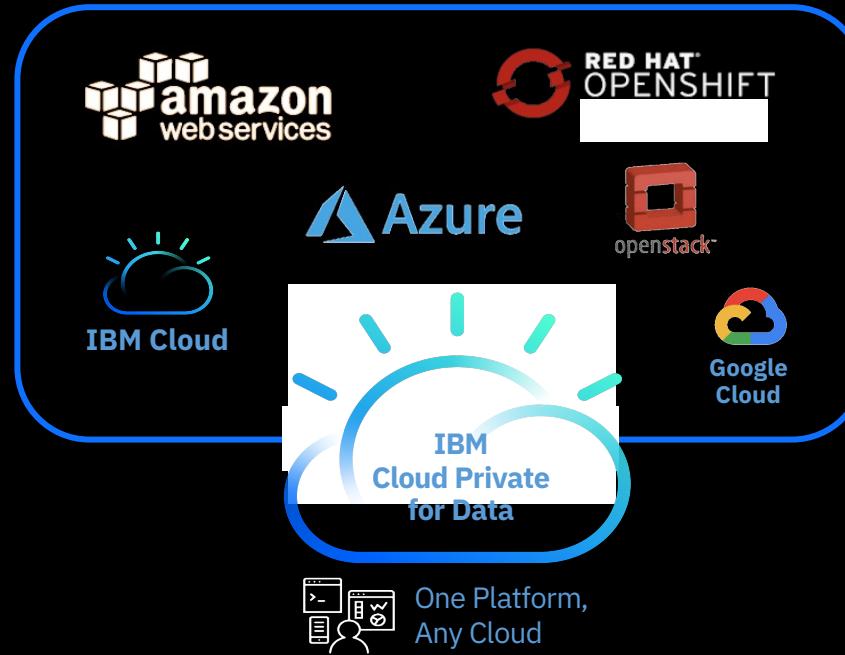


IBM WATSON ANYWHERE

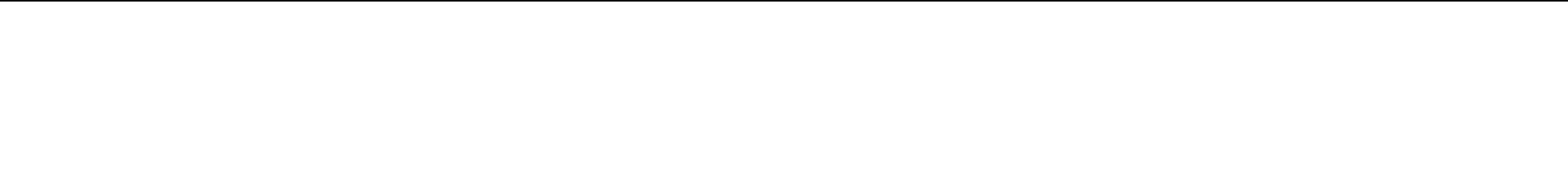
- Deploy Watson capabilities anywhere, on the Cloud(s) of your choice
- Align your AI models and workflows with the data they rely on
- Put open source to work using an array of cloud-native, data and AI frameworks



- Watson Studio
- Watson Machine Learning
- Watson Knowledge Catalog
- Watson APIs
- Watson OpenScale
- Watson Assistant & Discovery



THE MOST COMPLETE MULTICLOUD SOLUTION IN THE MARKET!



IBM Cloud Application Platform
Modernize applications

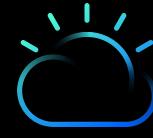
IBM Cloud Private for Data
Collect, organize, and analyze data

IBM Digital Business Automation for Multicloud
Transform business processes, decisions, and content

IBM Cloud Integration Platform
Integrate apps, data, cloud services, and APIs

IBM Cloud Private

Build and run cloud-native applications



IBM Z



Google Cloud



Have you Tried it yet?

Lets put AI to Work!



 KRISHNA BALAGA

KRBALAGA@IN.IBM.COM