# Modernizing business critical applications with open languages on z/OS

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Day 2

Deep-dive and demos of the open-source languages on z/OS – Go, Node.js, and Python

# Presenters

## Node.js

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**Software Developer, z/OS Node.js**

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**IBM Z Client Technical Professional**

## Python

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**Python Compiler Developer**

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## Go

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**Team lead for Go Language**

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# Panelists

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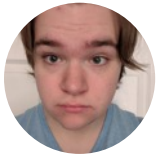

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**Senior Development Manager and Security Architect**

**Bill O'Farrell**
**Team lead for Go Language**

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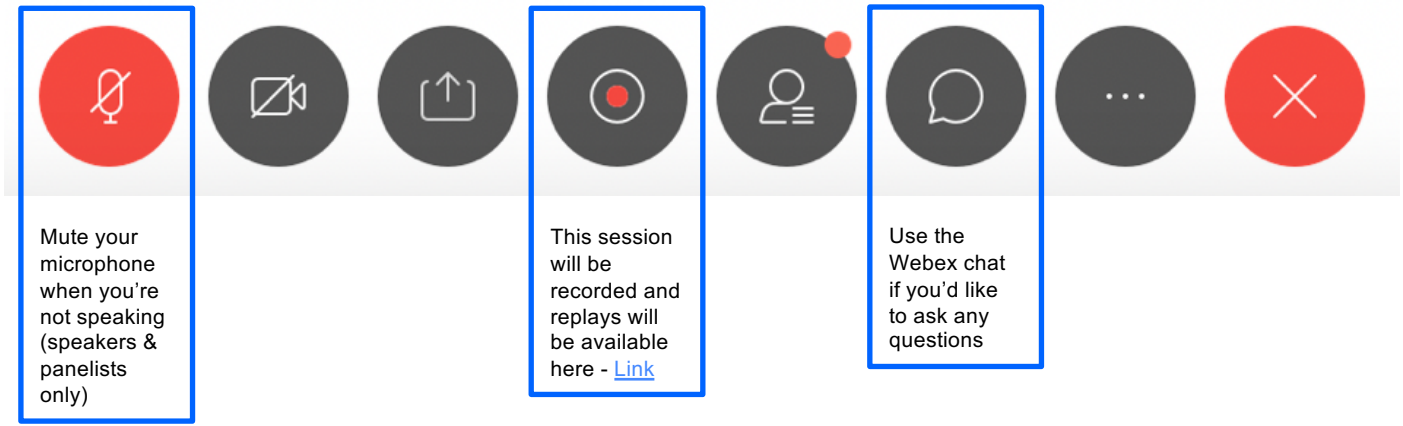
- Our technical team is standing by and ready to answer your questions through the Q&A panel. Please use the Q&A panel to post your questions.

- The slides for this presentation and some other resources are available for download in the chat window

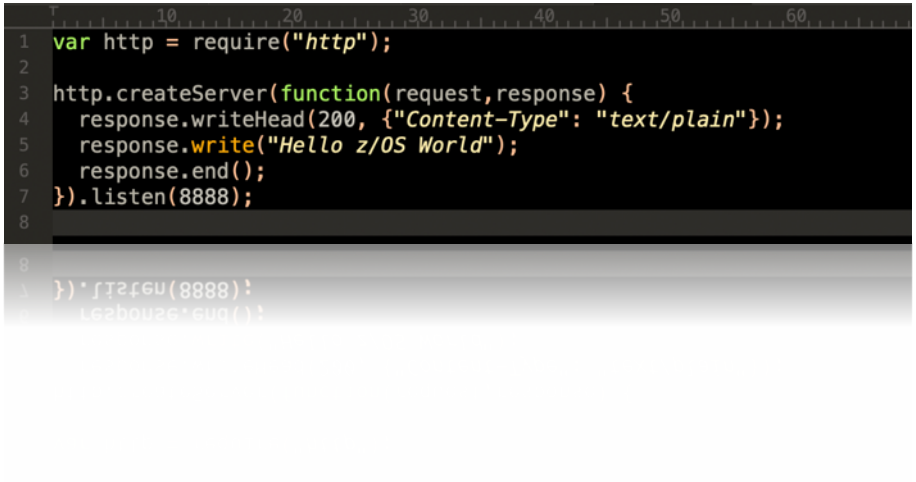


# IBM Open Enterprise SDK for Node.js

# What is Node.js?

- **Server side JavaScript runtime**
  Designed to build scalable network applications
- Lightweight and efficient
- Uses an event-driven, single-threaded, non-blocking I/O model
- Best suited for data-intensive (i.e. I/O bound) applications
- Provides a module-driven, highly scalable approach to application design and development that encourages agile practices

## ‘Hello World’ Web Application

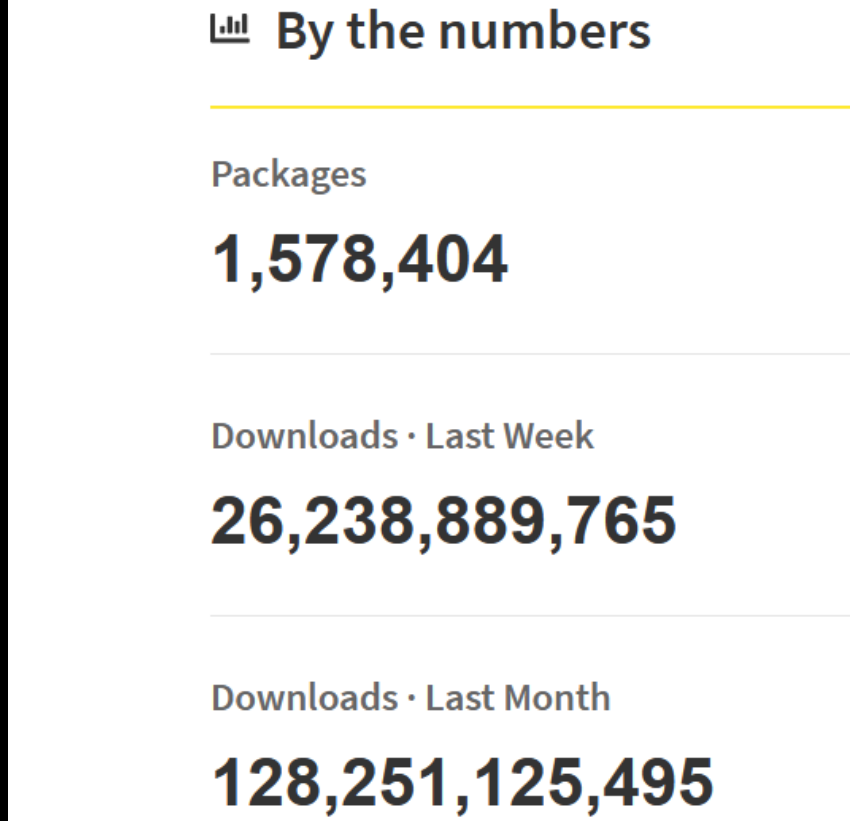


```
var http = require("http");

http.createServer(function(request,response) {
  response.writeHead(200, {"Content-Type": "text/plain"});
  response.write("Hello z/OS World");
  response.end();
}).listen(8888);
```

# Largest repository of modules

- **NPM (Node Package Manager)**
- **Repository of community contributed modules**
- **1.5M modules and growing**
- **3x growth rate vs other runtimes**



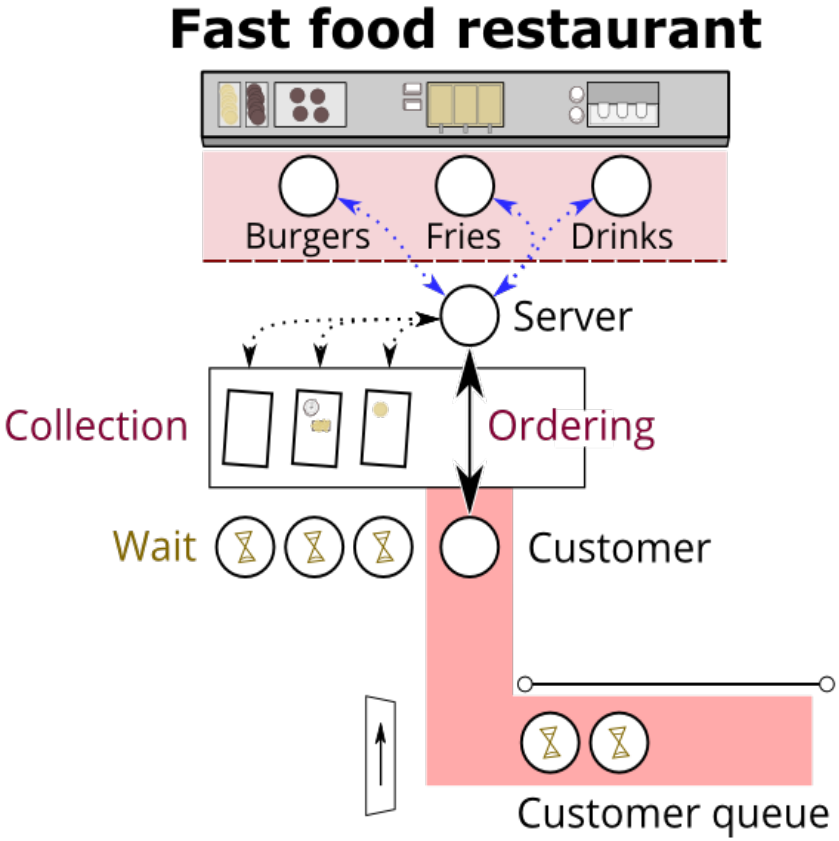

Data source: Link

# How Node.js Works?

## The Event Loop

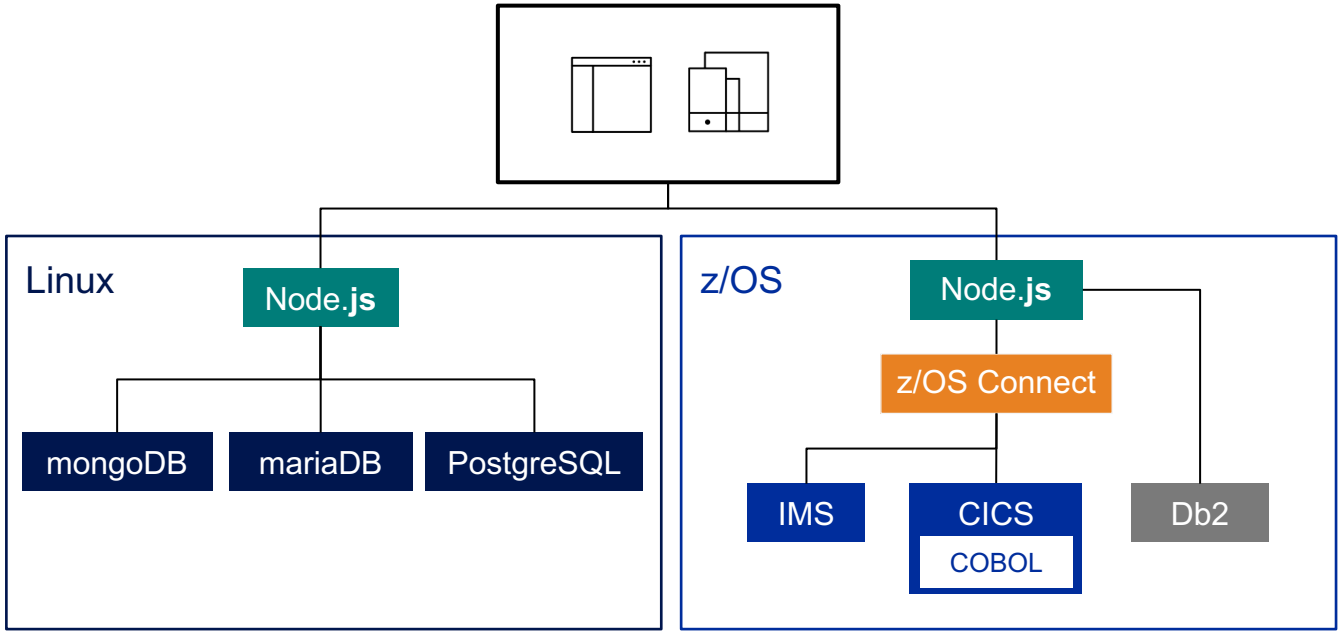
Allows Node.js to perform non-blocking and asynchronous operations

Node.js is a Single- threaded Application
Supports concurrency via events and callbacks
Loop that listens for events, and then triggers a callback function when one of those events is detected



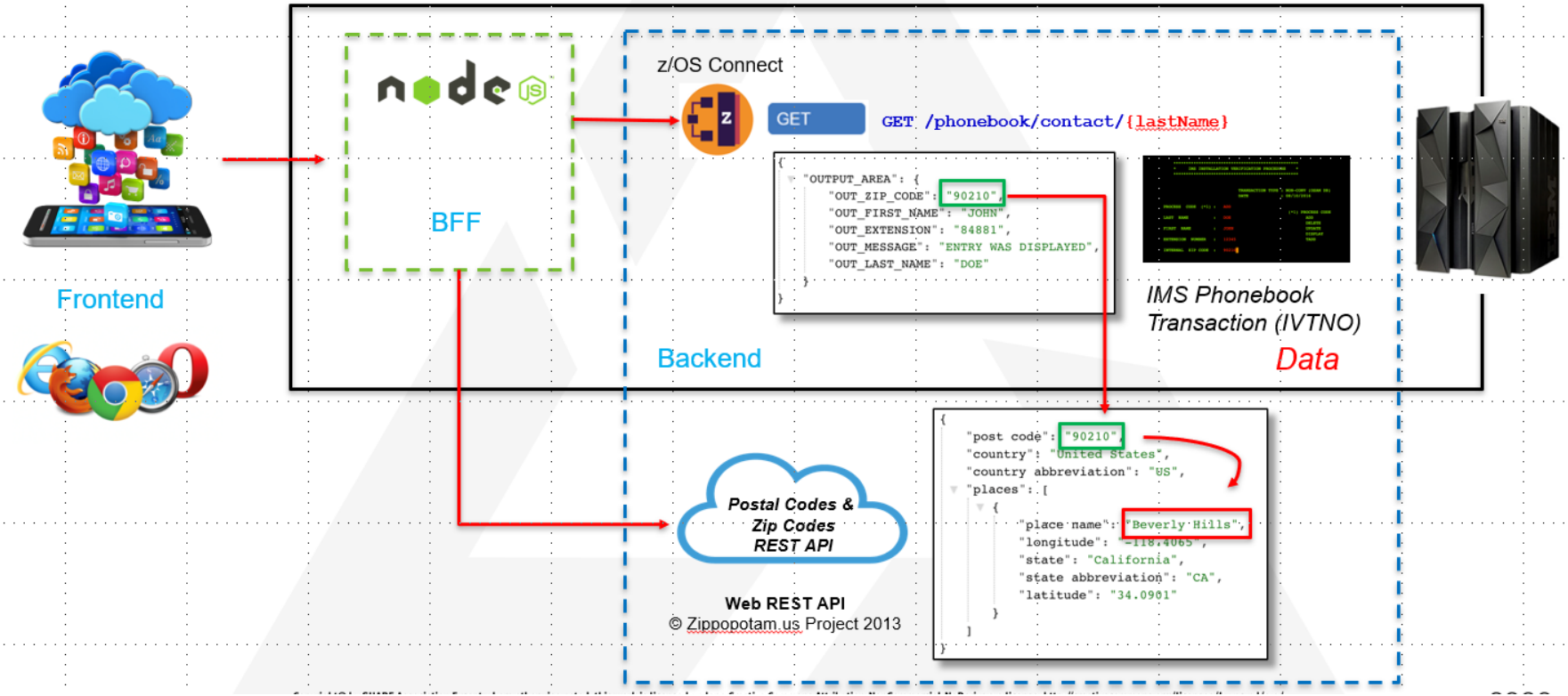
# Why use Node.js on z/OS

Co-locate applications and data on IBM Z to deliver better throughput and response time



# Why use Node.js on z/OS?

*Put your Backend for Frontend (BFF) closer to your data*



# Connect to your z/OS assets

**z/OS Connect Enterprise Edition (EE)**

- Access z/OS assets that are exposed through IBM z/OS Connect EE
- zosconnect-node: link
- Loopback connector for z/OS Connect EE: link

**CICS**

- Can deploy Node.js application in CICS the same way as COBOL: link

**Db2**

- Provide direct access to Db2 on z/OS via npm module: link

**VSAM**

- Interact with z/OS VSAM datasets and records via npm module: here

# Connect to your z/OS assets

**z/OS Node Accessor**

- Module to interact with z/OS MVS dataset and z/OS UNIX files and simple JCL operations: link

**zREXX**

- It calls z/OS REXX scripts residing in PDS from Node.js: link

**RACF**

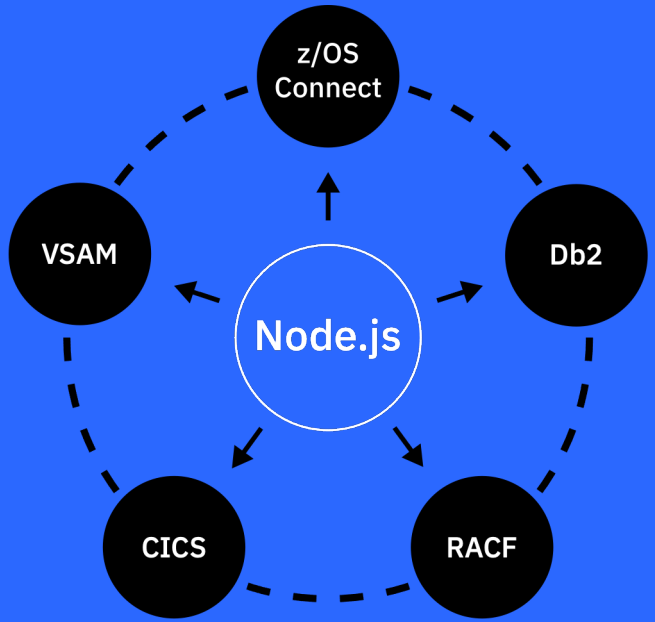
- This Node.js module enables your application to validate against RACF: link

**BPXWDYN** Dynamic Allocation

- Node.js interface to the BPXWDYN program, used for dynamic allocation: link

**zCRYPTO** - Interface to RACF Keyrings

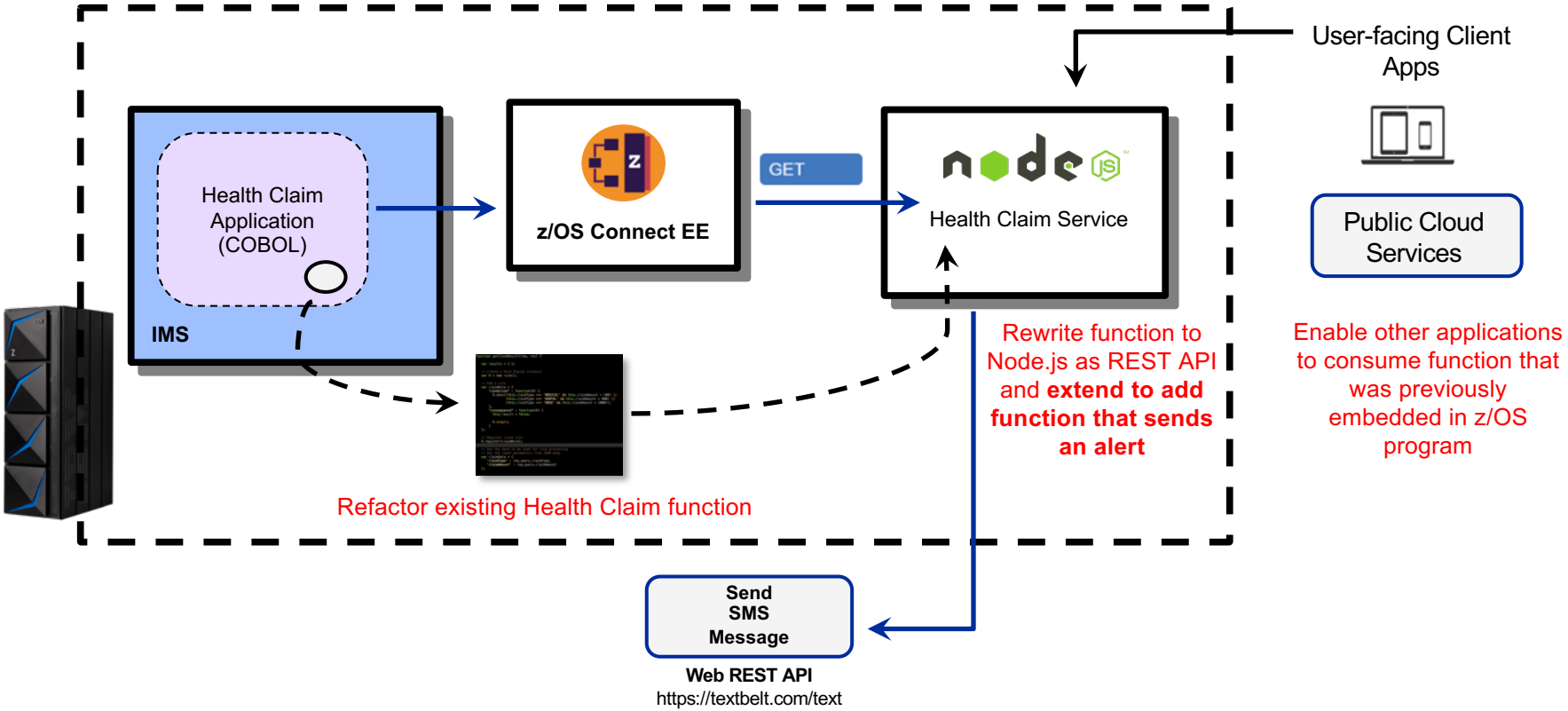
- Provides APIs to RACF key rings link



# Demo time!

# Refactor elements of an existing z/OS application into discrete services

*Rewriting a COBOL function as a Microservice in Node.js and invoked as a REST API*



# Demo Take-aways

- Revitalize existing monolithic application with APIs
- Develop new functions using open languages and invoked as APIs to extend existing core applications on z/OS
- Refactor specific functions of existing z/OS application using open languages to simplify maintenance

# IBM Open Enterprise SDK for Python

# What is Python?

Python is an interpreted, object-oriented high-level language with simple and easy to learn syntax.

Python encourages code reuse through packages & modules, which are available through the Python Package Index (PyPI) repository, where users can share open-source projects.

# Extensive Package Ecosystem

The Python Package Index (PyPI) is a repository of community contributed packages  for the Python programming language

There are over 200,000 packages covering all domains (web hosting, scientific computing, databases, etc.)

# What's included in IBM Open Enterprise SDK for Python

**Full port of Python™ 3.9 to z/OS®**
**UNIX Systems Services:**

- The cpython interpreter
- The Python standard library
- Enhancements to support interaction with EBCDIC data
- Support for ctypes and calling native language libraries
- Distutils customization to enable packaging Python applications on z/OS

# z/OS tailored PyPI packages

- numpy tuned for IBM Z® hardware
- cffi
- cryptography
- ebcdic
- zos_util (IBM Python module for file tagging utilities for z/OS)
- pycparser
- six
- pip
- setuptools

# Why Python for z/OS?

IBM Z clients can develop applications with IBM Open Enterprise SDK for Python in the same way as they would on any other platform.

Simple, easy to learn, vast group developers readily available

**By Co-locating** Python applications with **critical assets** (i.e. applications and data) on z/OS you can increase throughput and maintain better security

- Perform advanced analytics from the same machine where the data is stored

**Extend existing code**

- CFFI/Ctypes
- Extensions
- Embedding
- JCL with Z Open Automation Utilities (ZOAU)
- Call from REXX, JCL and etc.

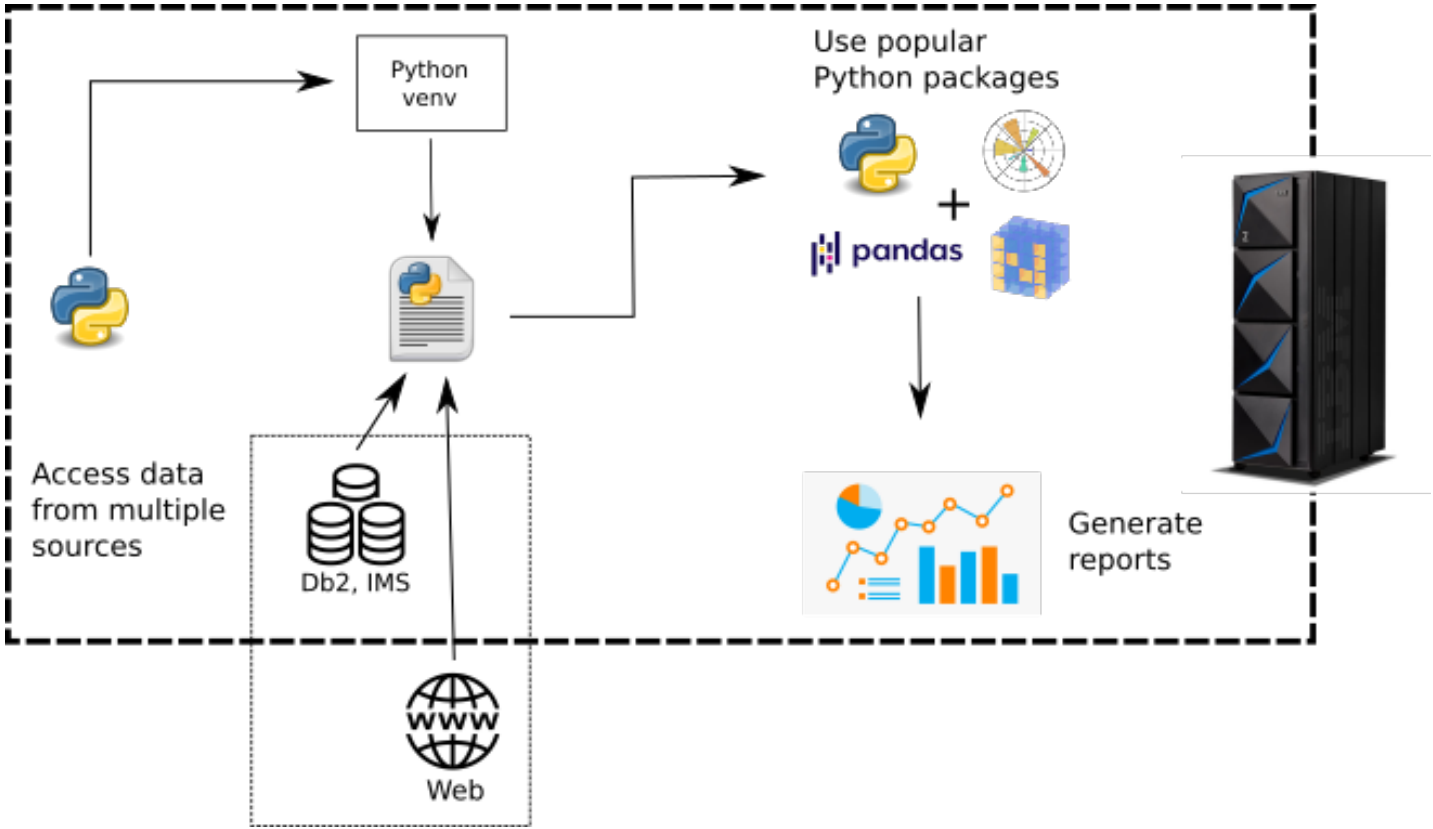
# Ansible

**Infrastructure management tool:**

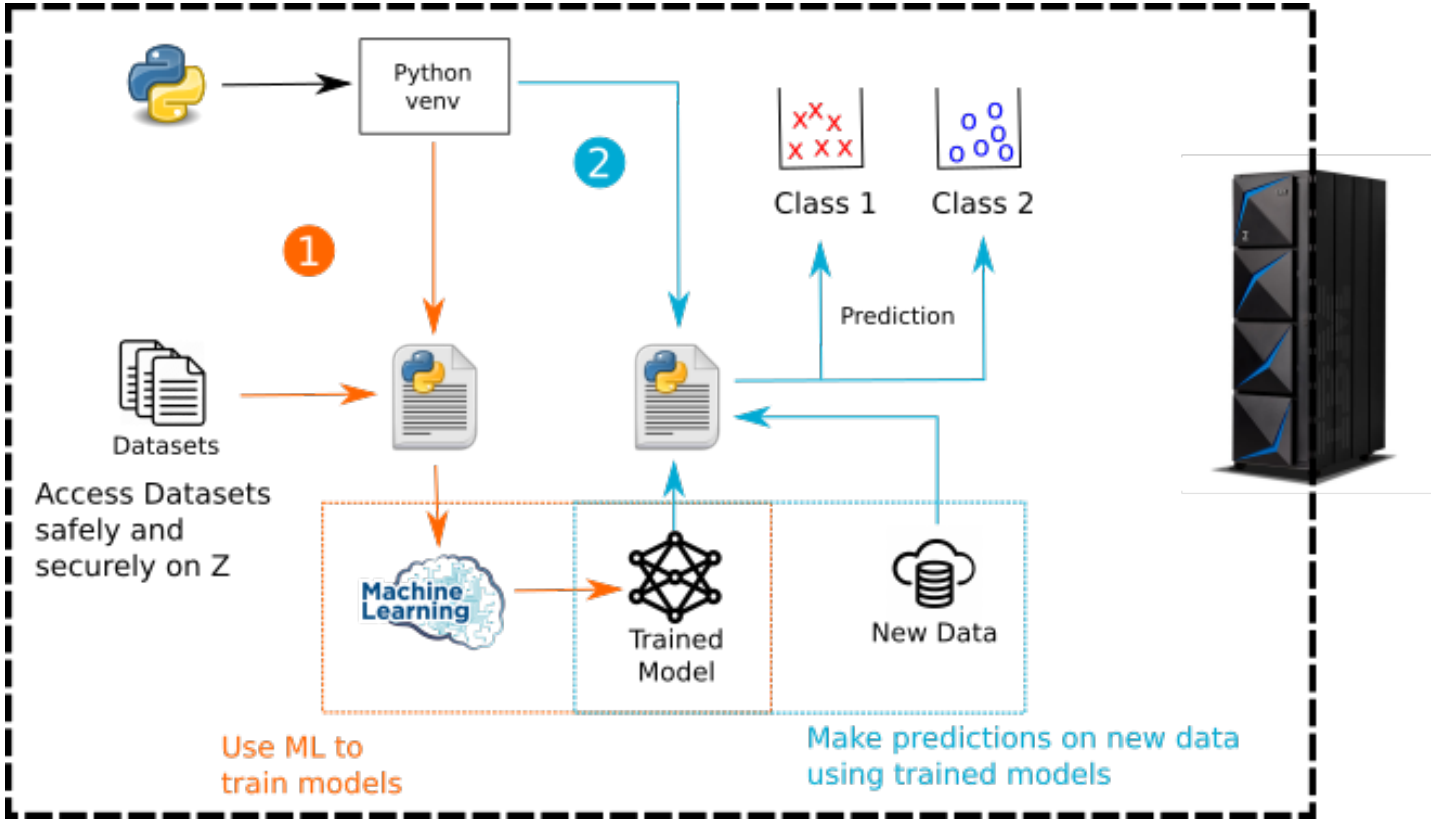
- Written in python
- Can be used to deploy apps, manage machines and more
- Runs entirely through python over ssh

# Demo time!

# Demo 1: Data Analysis with Python



# Demo 2: Machine Learning with Python



# Demo Take-aways

- Safely and securely gain access to dataset contents on z machines with a few lines of python code
- Access data, analyze and generate reports on Z, similar to how you would on a distributed system
- Deploy your machine learning models on the same machine where your data resides

# IBM Open Enterprise SDK for Go

# Go compiler on z/OS

## What

- New language, Go 1.0 released by Google in 2012, now at 1.16
- Design goals:
  - Efficient code, native compiler
  - No included files
  - Interface to C
  - Simple syntax, static typing
  - Built-in framework for testing and benchmarking
  - Built-in concurrency
  - Built in networking
  - Garbage collection
  - Portable community contributions

## Why

efficiency + productivity

Get out of “dependency hell”

When you need to call. C libraries

Programmers can “keep it in their heads”

No excuses for not writing tests as you code

Full use of multi-core power with goroutines, channels and synchronization

All common networking and security protocols + built-in http server

Because modern GC is fast and efficient and prevents obscure memory errors

Thousands of open-source, endian-independent packages available

# Large Ecosystem

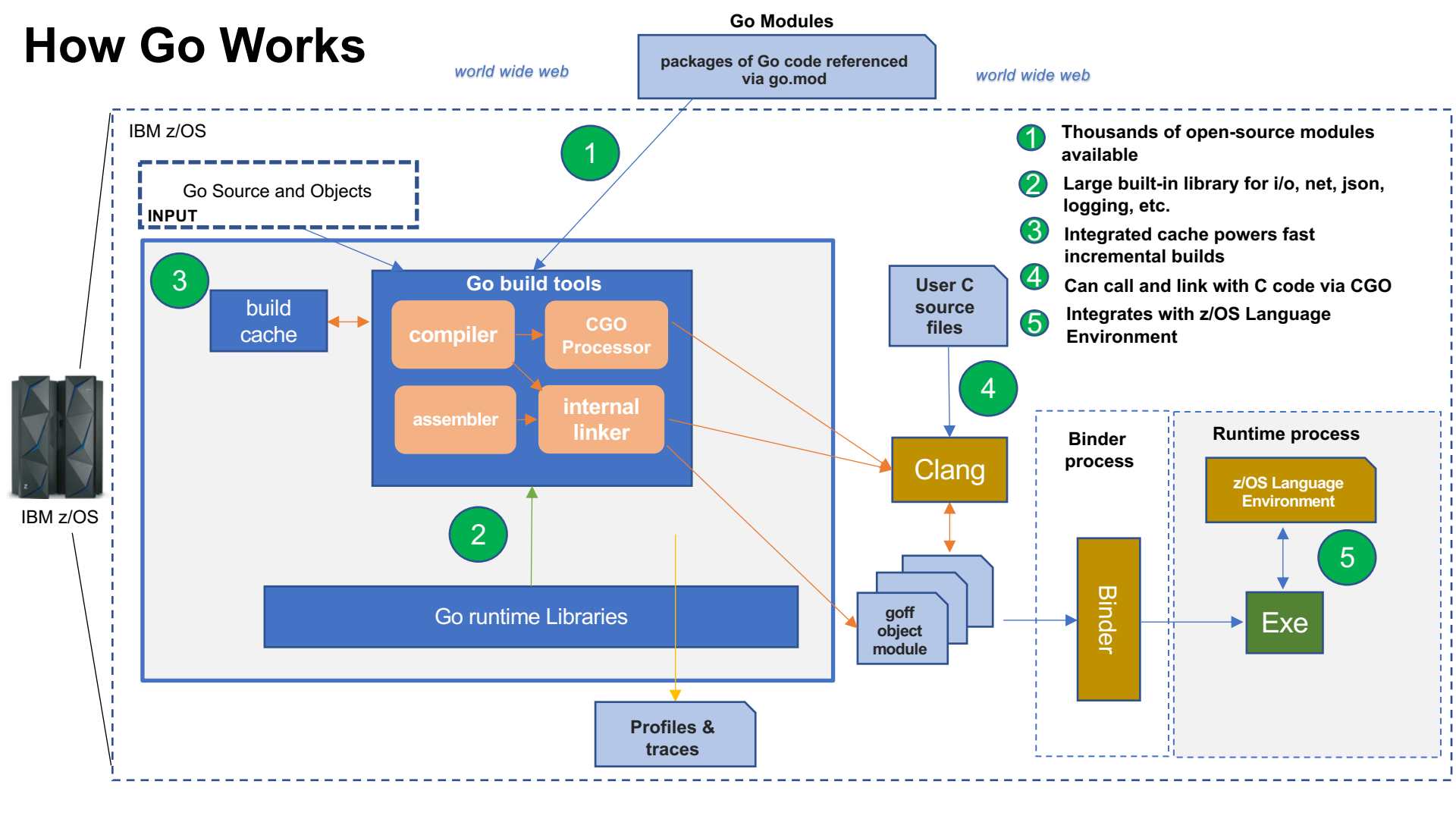
Extensive standard library and growing list of third-party packages

Standard and 3rd party libraries - cryptology, archiving, mail operations, encoding/decoding, networking, error manipulation, OS interfaces, and other popular functions. These packages encourage **code reuse and expedite time to market**.

Go community – additional freely available packages available just by specifying package in import section

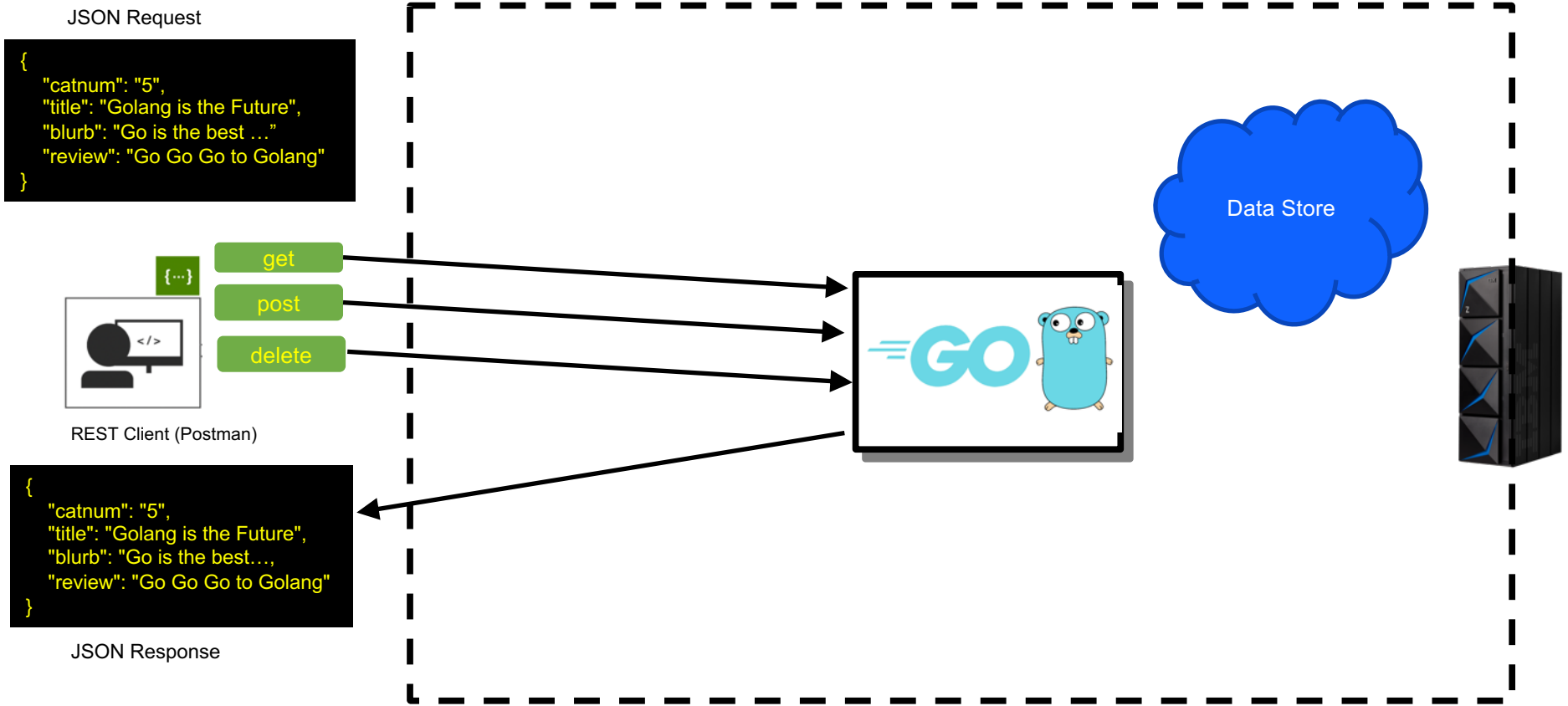
Developers can implement business functions with fewer lines of code, which help **shorten development times and reduce costs**. The continued contribution of modules from the community ensures a steady stream of new libraries and tools

# How Go Works


Go Modules
packages of Go code referenced via go.mod
world wide web
world wide web
IBM z/OS
Go Source and Objects
INPUT
1
Thousands of open-source modules available
2
Large built-in library for i/o, net, json, logging, etc.
3
Integrated cache powers fast incremental builds
4
Can call and link with C code via CGO
5
Integrates with z/OS Language Environment
3
build cache
Go build tools
compiler
CGO Processor
assembler
internal linker
User C source files
4
Clang
2
Go runtime Libraries
goff object module
Binder process
Binder
Runtime process
z/OS Language Environment
5
Exe
Profiles & traces
IBM z/OS

# Demo time!

# Create a RESTful Server



# Demo Take-aways

- Built in Go libraries for many common functions, including json, i/o, logging, webserver
- Use of community-provided module – no porting needed (”mux”)
- Very little code needed to setup a working REST server
- Tight integration with json
- Module versioning is a first-class capability – stability for completed code


謝謝
DZIĘKUJĘ CI
TAPADH LEIBH
KEA LEBOHA
NGIYABONGA
БАЯРЛАЛАА
MISAOTRA ANAO
TEŞEKKÜR EDERIM
WHAKAWHETAI KOE
DANKIE
TERIMA KASIH
DANKON
TANK
TAPADH LEAT
СПАСИБО
GRAZIE
MATUR NUWUN
ХВАЛА ВАМ
MULȚUMESC
РАКМЕТ СІЗГЕ
고맙습니다
GRAZIE
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FAAFETAI
GO RAIBH MAITH AGAT
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ありがとうございました
DI OU MÈSI
ĎAKUJEM
HATUR NUHUN
PAXMAT САГА
SIPAS JI WERE
TERIMA KASIH
CẢM ƠN BẠN
UA TSAUG RAU KOJ
WAZVIITA
ТИ БЛАГОДАРАМ
СИПОС
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