

Modernisation des
Applications IBM i
& Open Source
(webinaire)

Jeudi 25 mars – 14h00 – 17h00

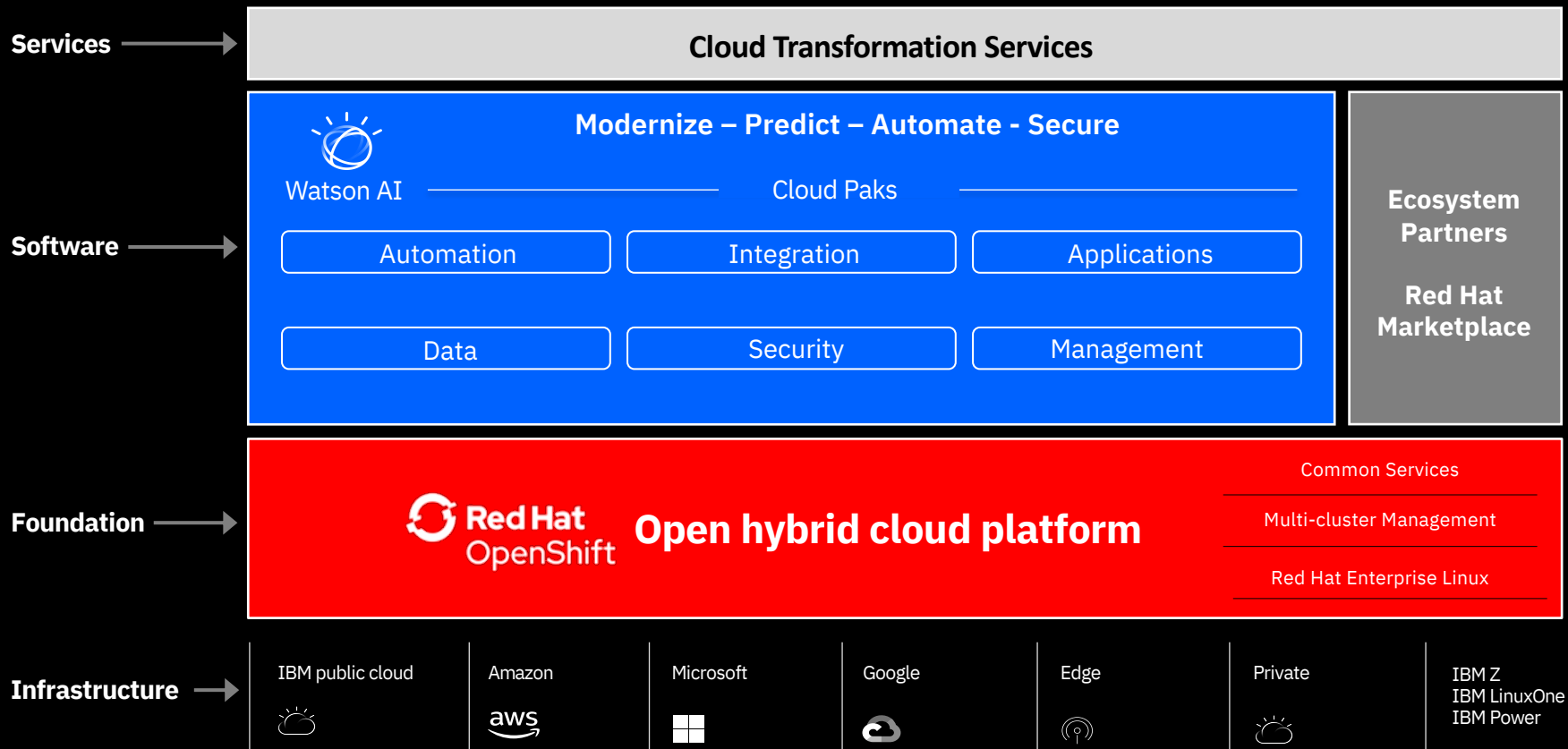
App Modernization & Open Source

Benoit MAROLLEAU – Cloud & AI Architect
IBM Garage for Systems / Red Hat CoC, Montpellier, France
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100 000 's Customers
120 countries
100,000's Systems
70% Small and Mid-sized
40 national languages
98% of Fortune 100

IBM hybrid cloud is the future architecture for enterprise IT



IBM hybrid cloud delivers a generational leap in value

2.5x
More Value*

vs. traditional, mono-cloud approaches



Digital acceleration



Developer Productivity



Infrastructure Cost efficiency



Compliance & Security



Strategic optionality

Only **20%** of value is captured from traditional cloud approaches

The remaining **80%** is captured by a hybrid cloud approach

Captured Cloud Value →

20%

100%

Traditional clouds



Hybrid cloud platform

IBM i Hybrid Cloud Use cases

IBM Garage for Systems - Examples 2020

1. DevOps & Efficiency

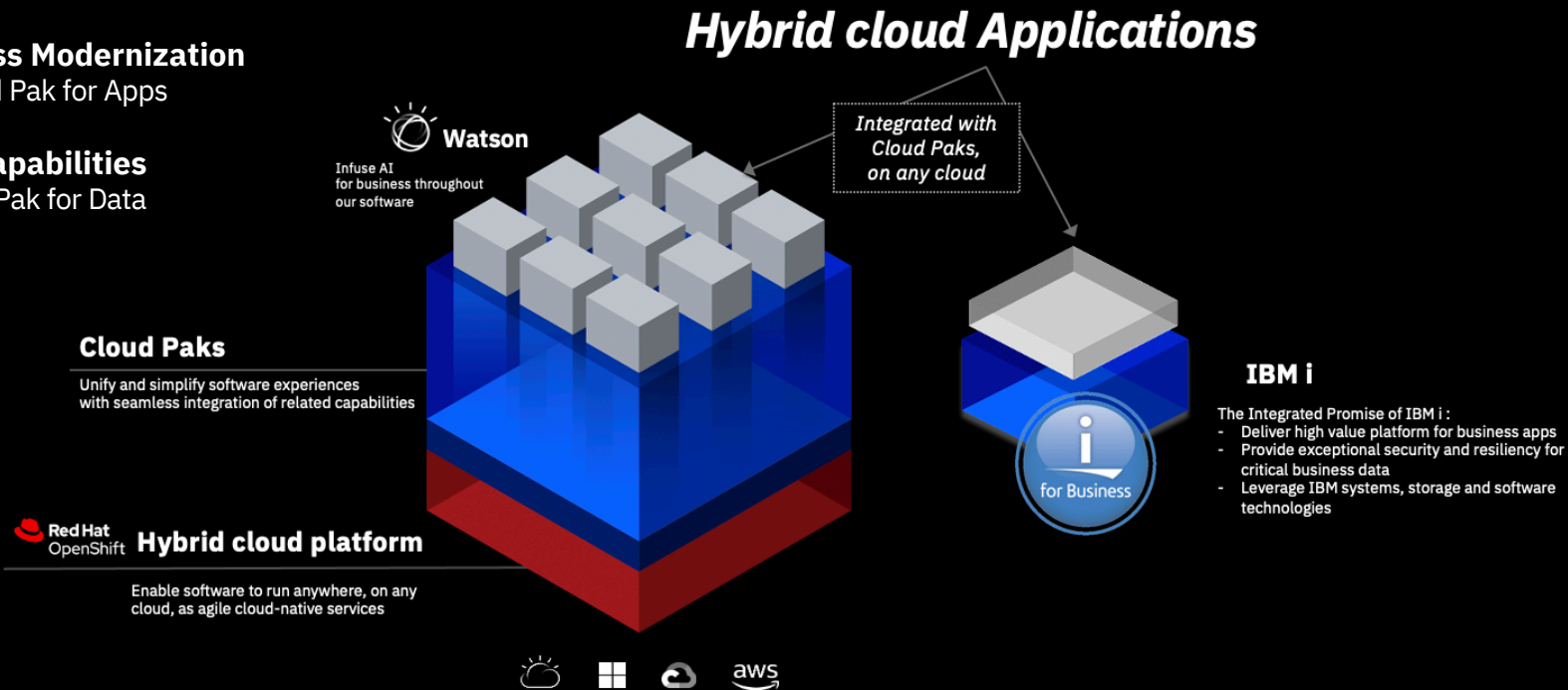
Cloud Pak for MCM

2. Core Business Modernization

OpenShift + Cloud Pak for Apps

3. Predictive capabilities

OpenShift, Cloud Pak for Data





Survey 1: IBMiOSS

Customers Concerns & Challenges in 2020



75% running Core Business Apps

80% On Premises

50% on 1 or 2 Servers

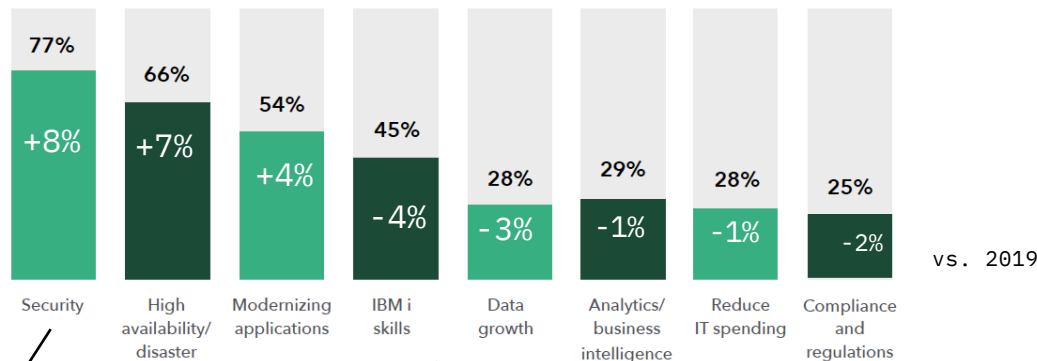
60% Already in 'HA and/or DR'

80% with Windows, 40% Linux

60% Plan to Upgrade(HW/SW) in 2020

5% Migration(2y) to SaaS/Win/Linux

What are your top concerns as you plan your IT environment?



Skills

RPG, Java, Node, Python

Training(Lab Services vouchers)
Open Source adoption (Ansible & 200+ other packages)
IBM i Fresh Faces program

CSP/MSP hosting
PVS in IBM Cloud
Ansible for i
SIEM integration
CP4Security

Open Source on IBM i
OCP / Cloud Paks : CP4A, CP4I
Watson Integration & ML, CP4D

SAN/PowerHA/Db2 Mirror
Cloud Object Storage integration (ICC)
PVS in IBM Cloud & Automation w/
CP4MCM



Source: Help Systems Survey 2020

IBM i Strategy

Power Solutions

- Enable clients to exploit latest POWER technology
- Enable clients to transform their solutions with new value
 - Mobile, Internet of Things, Cognitive, Machine Learning and AI
- Enable Solution Developers to modernize around services & hybrid cloud



Open Platform for Choice

- Grow IBM i solutions options including open source languages & applications
- Provide flexible options for Cloud ([inside or outside Data Center](#))
 - [Dynamic Capacity](#), [Virtual Serial](#), etc
- Entice new talent with popular open languages and tools



The *Integrated* Promise of IBM i

- Deliver a simple, high value platform for business applications
- Provide exceptional security and resiliency for critical business data
- Leverage IBM systems, storage and software technologies



IBM i modernization?



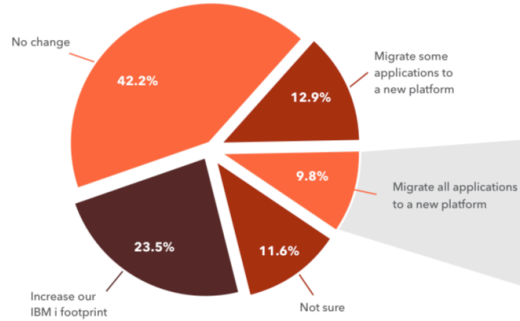
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IBM i – Old platform 😊 ?

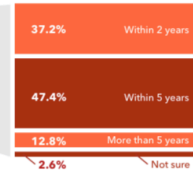
The IBM i market is highly stable with slightly more than 1.5% annual attrition.

Development on IBM i is evolving with 75% of respondents using open source development tools.

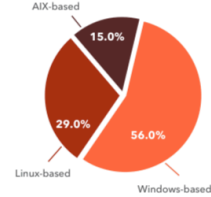
What are your plans for the IBM i platform?



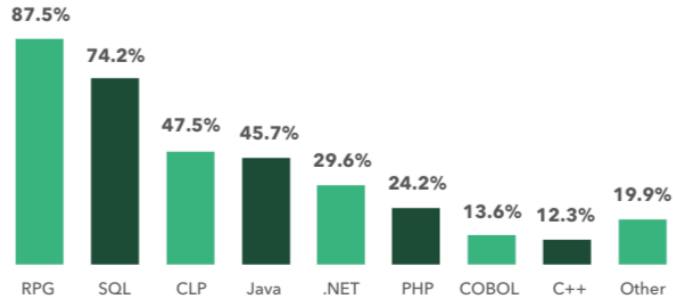
When will you migrate all applications from IBM i?



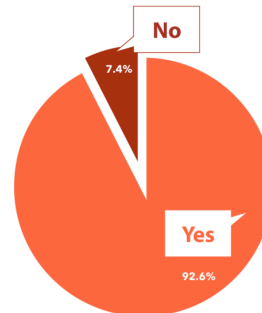
Which server are you moving applications to?



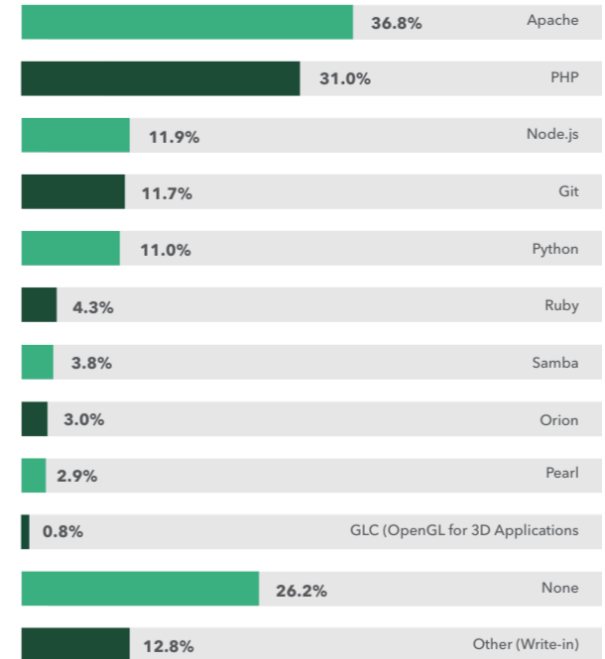
What development languages do you use today for new development? Check all that apply.



Do you believe your IBM i server gives you a better ROI than other servers?

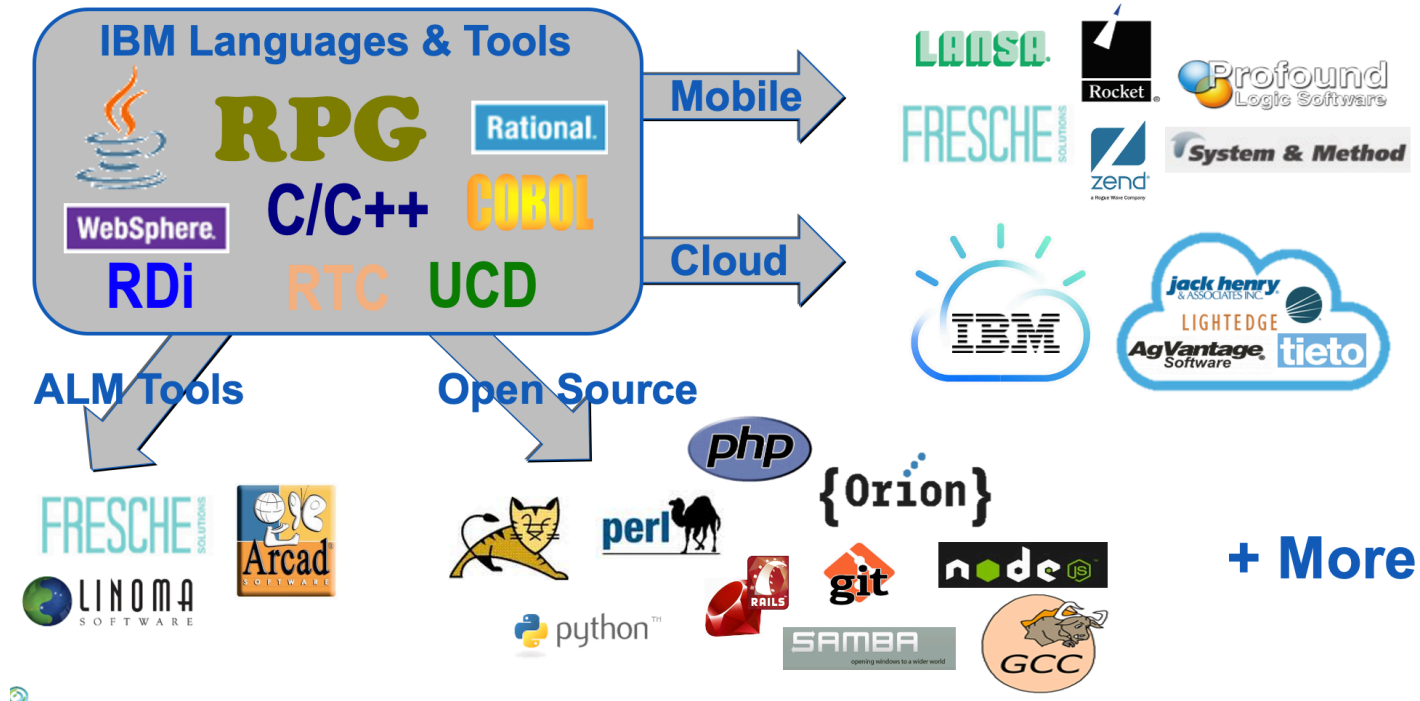


What open source development tools are you using for IBM i apps? Check all that apply.



Application Modernization

2. Partnering where Appropriate



Application Modernization

3. Extending Traditional Apps with Cloud Native

Capacity to Innovate vs. Risk



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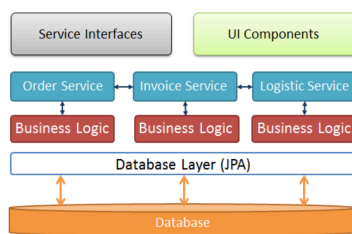
C:\Program Files\IBM\SPSS\Statistics\bin>spss /c:\temp\spss\spss.bat /n:\temp\spss\spss.nls /s:\temp\spss\spss.sps /r:\temp\spss\spss.rpt /t:\temp\spss\spss.tst /l:\temp\spss\spss.log /e:\temp\spss\spss.err /o:\temp\spss\spss.out /i:\temp\spss\spss.inp /p:\temp\spss\spss.prt /q:\temp\spss\spss.qry /m:\temp\spss\spss.mnt /d:\temp\spss\spss.dta /f:\temp\spss\spss.flt /g:\temp\spss\spss.grf /h:\temp\spss\spss.hlp /j:\temp\spss\spss.jnl /k:\temp\spss\spss.knt /l:\temp\spss\spss.lst /m:\temp\spss\spss.mnt /n:\temp\spss\spss.nls /o:\temp\spss\spss.out /p:\temp\spss\spss.prt /q:\temp\spss\spss.qry /r:\temp\spss\spss.rpt /s:\temp\spss\spss.sps /t:\temp\spss\spss.tst /u:\temp\spss\spss.usr /v:\temp\spss\spss.vrt /w:\temp\spss\spss.wrk /x:\temp\spss\spss.xls /y:\temp\spss\spss.yml /z:\temp\spss\spss.zst /aa:\temp\spss\spss.aaa /bb:\temp\spss\spss.bbb /cc:\temp\spss\spss.ccc /dd:\temp\spss\spss.ddd /ee:\temp\spss\spss.eee /ff:\temp\spss\spss.fff /gg:\temp\spss\spss.ggg /hh:\temp\spss\spss.hhh /ii:\temp\spss\spss.iii /jj:\temp\spss\spss.jjj /kk:\temp\spss\spss.kkk /ll:\temp\spss\spss.lll /mm:\temp\spss\spss.mmm /nn:\temp\spss\spss.nnn /oo:\temp\spss\spss.ooo /pp:\temp\spss\spss.ppp /qq:\temp\spss\spss.qqq /rr:\temp\spss\spss.rrr /ss:\temp\spss\spss.sss /tt:\temp\spss\spss.ttt /uu:\temp\spss\spss.uuu /vv:\temp\spss\spss.vvv /ww:\temp\spss\spss.www /xx:\temp\spss\spss.xxx /yy:\temp\spss\spss.yyy /zz:\temp\spss\spss.zzz /aa:\temp\spss\spss.aaa /bb:\temp\spss\spss.bbb /cc:\temp\spss\spss.ccc /dd:\temp\spss\spss.ddd /ee:\temp\spss\spss.eee /ff:\temp\spss\spss.fff /gg:\temp\spss\spss.ggg /hh:\temp\spss\spss.hhh /ii:\temp\spss\spss.iii /jj:\temp\spss\spss.jjj /kk:\temp\spss\spss.kkk /ll:\temp\spss\spss.lll /mm:\temp\spss\spss.mmm /nn:\temp\spss\spss.nnn /oo:\temp\spss\spss.ooo /pp:\temp\spss\spss.ppp /qq:\temp\spss\spss.qqq /rr:\temp\spss\spss.rrr /ss:\temp\spss\spss.sss /tt:\temp\spss\spss.ttt /uu:\temp\spss\spss.uuu /vv:\temp\spss\spss.vvv /ww:\temp\spss\spss.www /xx:\temp\spss\spss.xxx /yy:\temp\spss\spss.yyy /zz:\temp\spss\spss.zzz
  
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0002 DD PPMVWV SP E K DSK
0003 DD PPMVWV SP E WDSSTN
0004 DD C
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0006 DD C 4-LINE 26.75 TRUL 4 2
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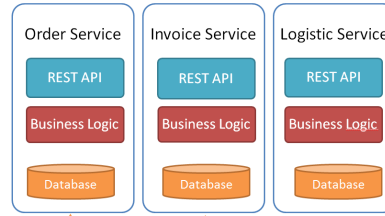
App Centric Monolith,
Single Program
Hard to Maintain & Change

DevOps Ready

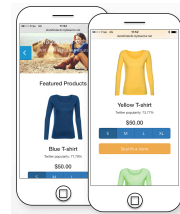


Data Centric, Modular & Layered,
Modern Techno, Design Patterns (MVC...)
Horizontal (technical) Layers

Verticals



Microservice, 12 Factor Design
Loosely coupled services
Vertical (business) layers

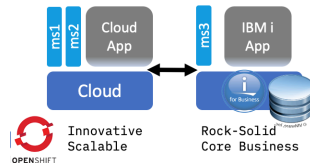


Why Microservices?

→ Continuous Innovation
vs. Business Needs

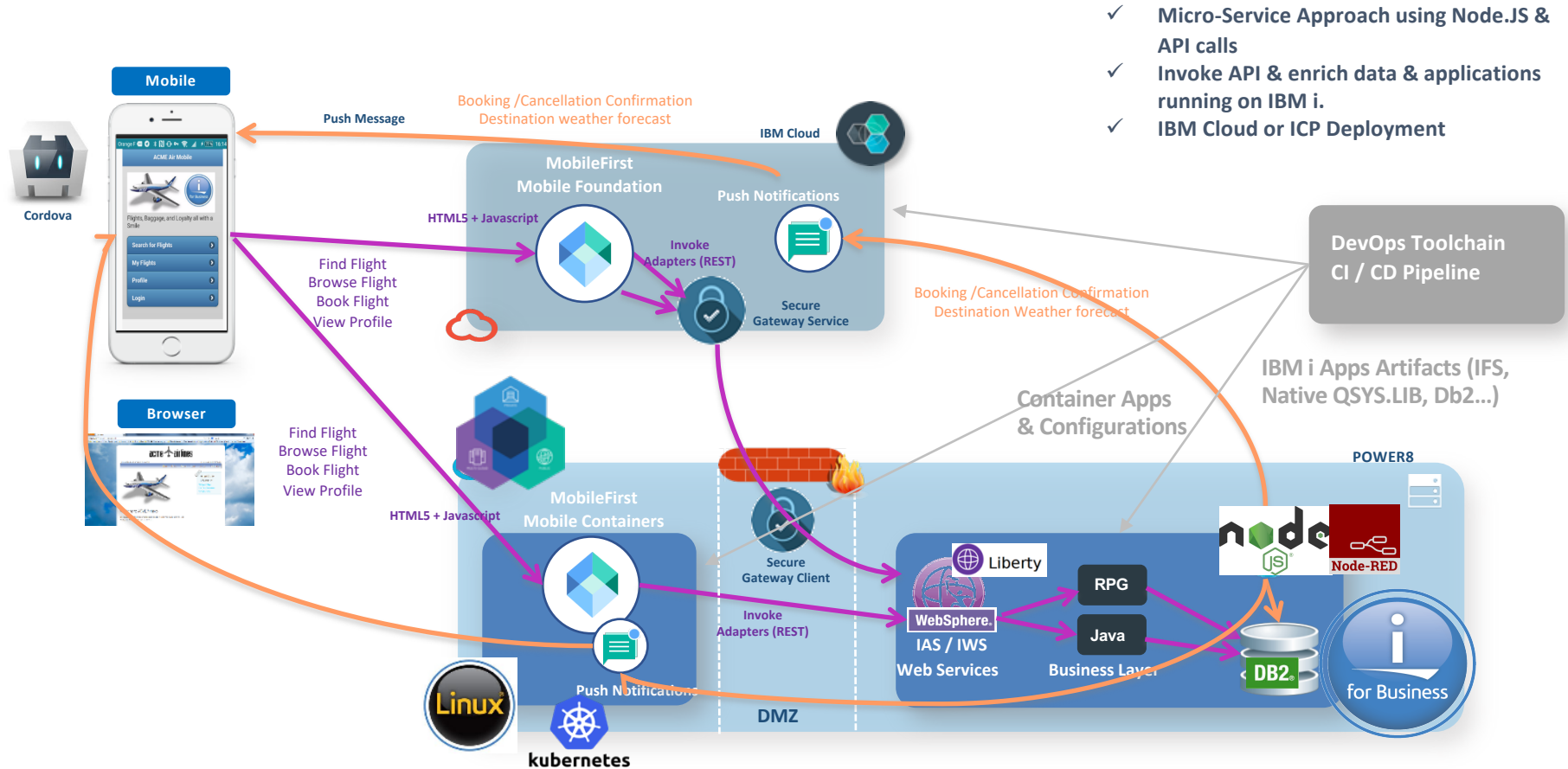
How?

→ Flexible User facing components
(Micro-Services, 12-Factor, K8s)
→ Integrated with rock solid core
Business apps.



Example: Develop new Mobile Services on IBM i with IBM Cloud

Hybrid Application – DevOps & Microservices



- ✓ Micro-Service Approach using Node.JS & API calls
- ✓ Invoke API & enrich data & applications running on IBM i.
- ✓ IBM Cloud or ICP Deployment

Modernization - Database

• What?

- Architecture
- Access
- Improved data integrity and data quality

• Why?

- To face new and future challenges
- A volume of data that grows considerably
- Increasingly complex data access requests
- The need for quick access to the right information and in various forms
- Analytics, Business Intelligence

• How?

- By a "Data-Centric" approach
- Use the market standard: SQL
 - definition of the database: DDS → SQL
 - access to the database: RLA → SQL
- Let DB2 do what it does well: relationships, security ...
- Transforming data into insights: metadata, ETL

Modernization - Application

- **Key messages**

- Give up the 90s RPG code
- Provide modern and graphic tools to developers
- Map and document existing
- Take an interest in open source solutions
- “API-ize” RPG / COBOL programs
- Use third-party APIs

- **News**

- RPG Full Free
- RDi and Orion (Eclipse Web)
- IWS & REST-type Web Services from RPG / COBOL
- Open-source: product 5733-OPS, yum repository (300+ packages for Web dev, Machine Learning etc.)

Modernization – Infrastructure & Cloud

- **Key messages**

- Each POWER generation = performance ++
- Each POWER generation = increased HW compatibility (SAN, VIOS) , consolidation
- Business Continuity? Db2 Mirror (RTO Zero), PowerHA , VM Recovery Manager HA or DR, Simplified Remote Restart, BRMS & SWA
- Hybrid Cloud Feature: Cloud backup with BRMS/Cloud (object) Storage
- Dynamic Infrastructure: Private Cloud & Multi-LPAR - DLPAR on x86?
- Interest in open source solutions , AI & Cloud
PowerVC (OpenStack), CAM (Terraform) , VMWare vRealize (Automation, Operations)

- **News**

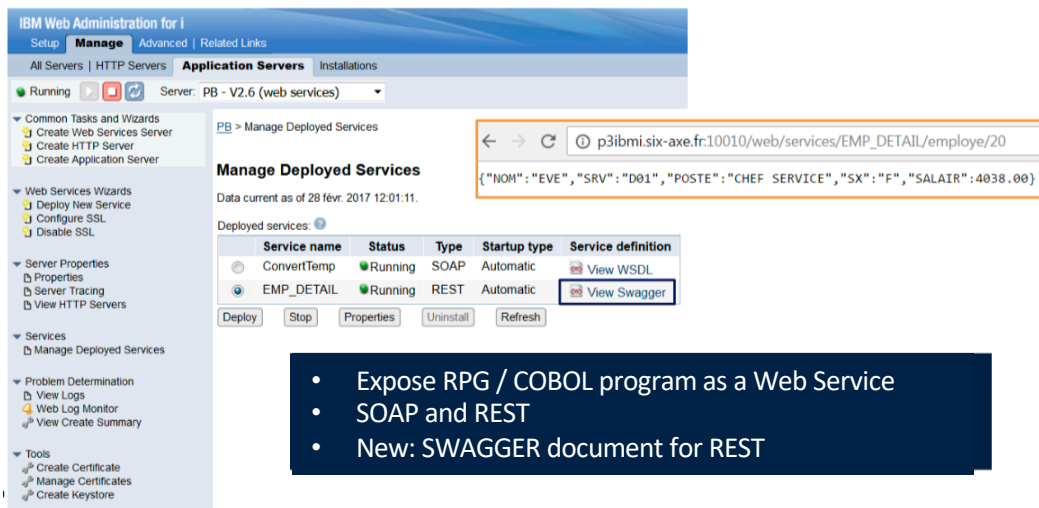
- More & More requests for IBM i hosting /Cloud – SMB / Large customers
Cloud Service Providers: IBM (4Q19), Google, MSPs, IBM GTS C4i
- ICP/ K8s for App Modernization – CAM + IBM i IaaS.

How?



“API-ize” RPG / COBOL programs

- Integrated Web services server (+ RPG, Cobol ILE)
 - The goal of the wizard is to create a recommended production level server configuration while requiring minimal information from the user.



IBM Web Administration for i

Setup | **Manage** | Advanced | Related Links

All Servers | HTTP Servers | **Application Servers** | Installations

Running [Stop] [Refresh] Server: PB - V2.6 (web services)

Common Tasks and Wizards

- Create Web Services Server
- Create HTTP Server
- Create Application Server

Web Services Wizards

- Deploy New Service
- Configure SSL
- Disable SSL

Server Properties

- Properties
- Server Tracing
- View HTTP Servers

Services

- Manage Deployed Services

Problem Determination

- View Logs
- Web Log Monitor
- View Create Summary

Tools

- Create Certificate
- Manage Certificates
- Create Keystone

PB > Manage Deployed Services

Manage Deployed Services

Data current as of 28 févr. 2017 12:01:11.

Deployed services:

Service name	Status	Type	Startup type	Service definition
ConvertTemp	Running	SOAP	Automatic	View WSDL
EMP_DETAIL	Running	REST	Automatic	View Swagger

Deploy Stop Properties Uninstall Refresh

← → ↻ p3ibmi.six-axe.fr:10010/web/services/EMP_DETAIL/employe/20

```
{ "NOH": "EVE", "SRV": "D01", "POSTE": "CHEF SERVICE", "SX": "F", "SALAIR": 4038.00 }
```

- Expose RPG / COBOL program as a Web Service
- SOAP and REST
- New: SWAGGER document for REST

RPG Editor Feature Comparison

RDİ, vscode, ...

RPG Editor Feature Comparison

	RDİ	MİWorkplace	İLEditor	RPGNextGen	İBMİCmd	VSCode	Orion	EDTF	SEU
Run on Mac/Linux	x	x		x		x	x	x	x
File System Explorer	x	x	x	x	x			x	x
Compile From Editor	x	x	x	x	x				x
Integrated Debugger	x	x							x
Edit IFS Files	x	x	x	x	x	x	x	x	
Edit SRCPF Members	x	x	x	x	x			x	x
Outline view	x	x	x	x					
Database browser/table viewer	x								
Custom initial *LIBL	x	x		x					
F1 Help to RPG Manual	x								
Command prompting (F4)	x								
Visual App Diagram	x								
Spool File Viewer	x	x	x	x					
Syntax Coloring	x	x	x	x	x	x	x		
Auto-completion	x	x							
Templates/snippets	x	x							
Multi-system connections	x	x		x		x			
RPG convert fixed to free	x	x	x		x				
Inline error listing/position	x	x	x						
Git integration	x					x	x		
Source member diff	x		x						
Integrated shell						x			

Open-source & IBM i

- Why open-source
 - Rapid growth
 - Important adoption
 - Communities
 - Free
- Why open-source under IBM i?
 - Skills available
 - IBM i openness
 - New possibilities
 - Easy integration with the existing (data, programs)
 - Integration made by IBM
 - Optional Support by IBM TSS



Open-source & IBM i

→ Integration & Web

- API Management & Web Services
- Web Development
- Database Access (ODBC, REST...)

→ Cloud / Automation

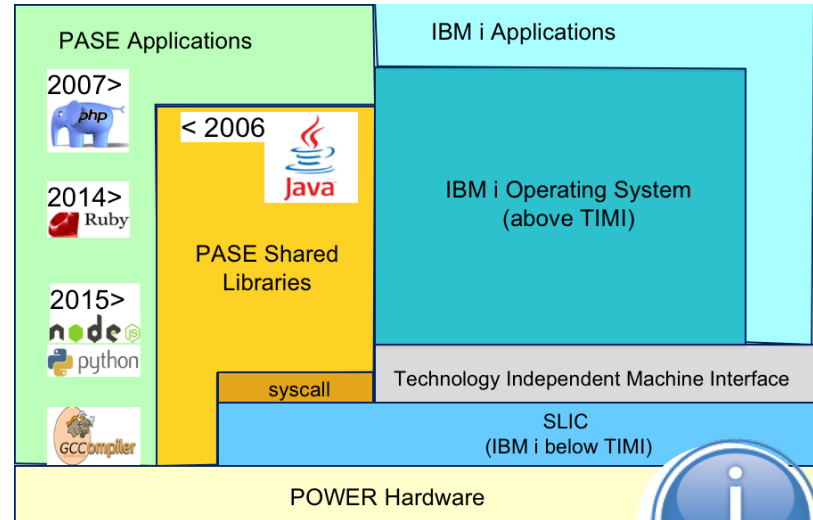
- Openstack, Cloudinit
- IaC: Terraform , Ansible (NEW:on AIX/i)

→ Data Science , Data Analysis

- Scikit-Learn, Jupyter, R
- H2O Scoring Pipeline

→ Various tools compilers & libraries (porting...)

Open Source & IBM i : Unix (AIX) Runtime aka PASE



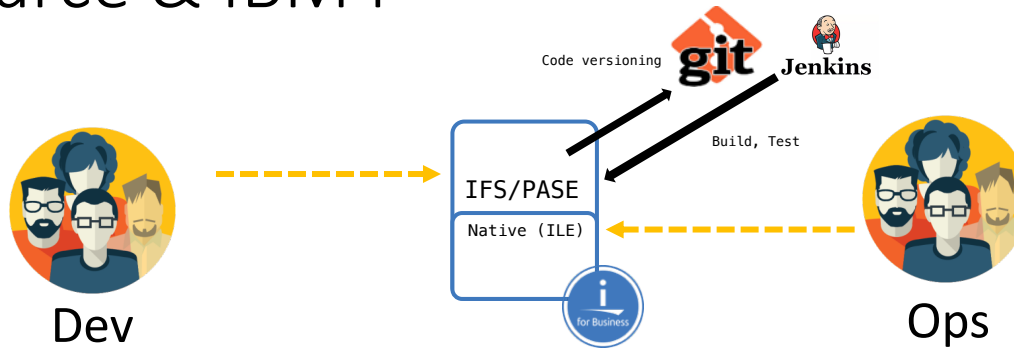
New Packages Available on IBM i

- Node.js v10, 12, 14. : Web Dev
- python v3.6. : Admin, Data Science
- Nginx : HTTP server
- GCC / chroot : Porting, Containers like
- OpenJ9 + OpenJDK Java 11
- Git : Versioning. DevOps era
- MariaDB
- PHP Community
- Ansible
- Scikit-learn , Pandas, Scipy: Data Science

<http://ibm.biz/ibmi-rpms>



Open-source & IBM i



Dev

Free-Format
RPG



Build

```
[[13:23:28][BENOIT.ICC.LOCAL][~]# ls -ltr /home/BENOIT/RPG/rpgdev/
total 8816
-rw-r--r-- 1 benoit 0      8 Feb 3 2020 README.md
-rw-r--r-- 1 benoit 0    1801 Feb 3 2020 DSPUSR.SQLRPGLE
-rw-r--r-- 1 benoit 0     92 Feb 3 2020 HELLOWORLD.RPGLE
-rw-r--r-- 1 benoit 0     538 Feb 3 2020 package.json
-rw-r--r-- 1 benoit 0   14425 Feb 3 2020 package-lock.json
drwxr-sr-x 14 benoit 0   24576 Feb 3 2020 node_modules
-rw-r--r-- 1 qsecofr 0 8582304 Feb 3 2020 core
-rw-r--r-- 1 qsecofr 0     802 Feb 3 2020 testIpgm.js
-rw-r--r-- 1 benoit 0     562 Feb 3 2020 itoolkit-db2.js
-rw-r--r-- 1 benoit 0     911 Feb 3 2020 myapp.js
```

```
[BENOIT.ICC.LOCAL][~]# system "CRTBNDRPG PGM(*CURLIB/DSPUSRINFO)
SRCSTMF('/HOME/BENOIT/RPG/RPGDEV/DSPUSR.SQLRPGLE') OPTION(*EVENTF) DBGVIEW(*SOURCE)
REPLACE(*YES)      "
RNS9304: Program DSPUSRINFO placed in library QGPL. 10 highest severity. Created on 03/22/21 at 13:11:27.
***** END OF FINAL SUMMARY *****
Program DSPUSRINFO placed in library QGPL. 10 highest severity. Created on 03/22/21 at 13:11:27.
***** END OF COMPILATION *****
```

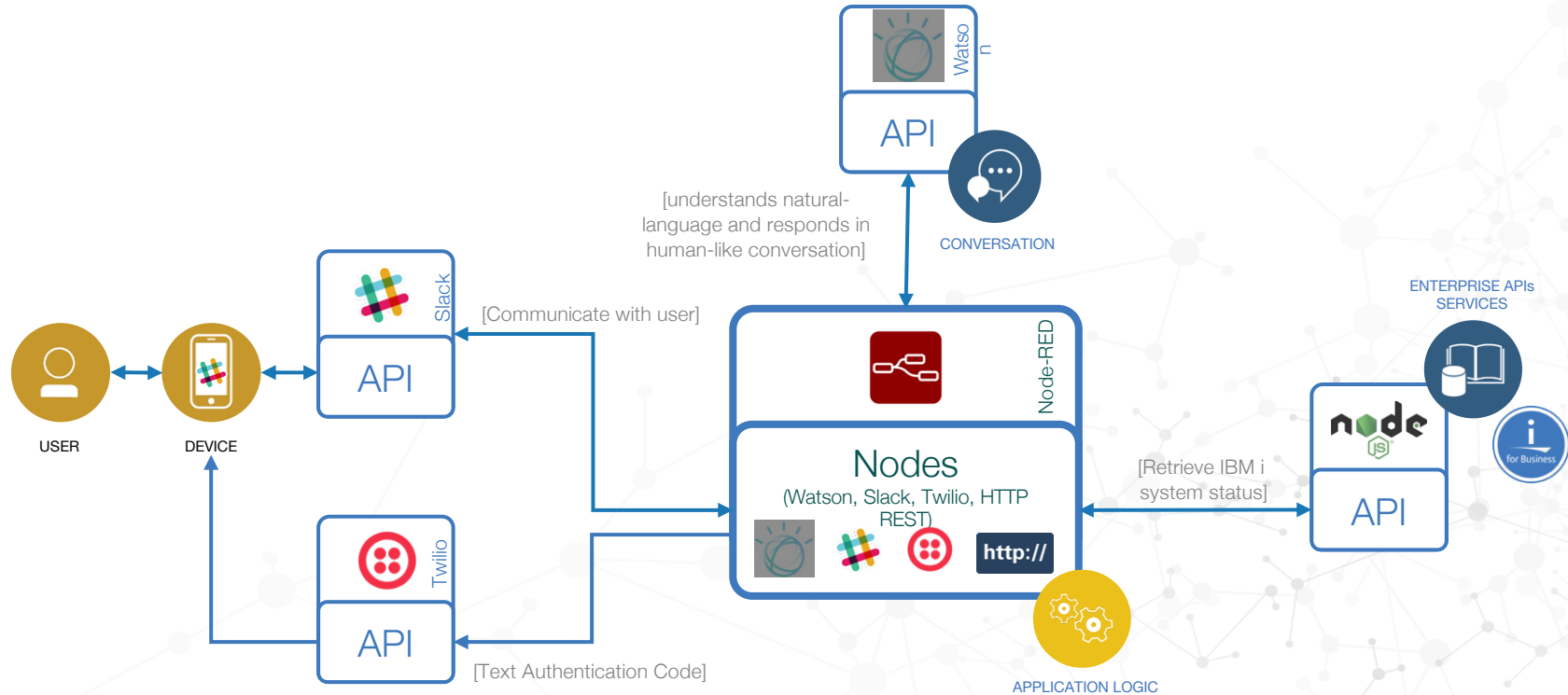
Run

```
[BENOIT.ICC.LOCAL][~]# system -i "CALL PGM(QGPL/DSPUSRINFO) PARM('uid0@email.com' '')"
```

```
Selection or command
==> CALL PGM(QGPL/DSPUSRINFO) PARM('uid0@email.com' '')

F3=Exit    F4=Prompt    F9=Retrieve    F12=Cancel    F13=Infor
F23=Set initial menu
```

Open-source & IBM i



How can we help you?



100 000 's Customers
120 countries
100,000's Systems
70% Small and Mid-sized
40 national languages
98% of Fortune 100

IBM Garage Assets in ISCEP - IBM i, Cloud & Red Hat

[Visit the IBM Systems Client Experience Portal \(ISCEP\)](#)

Title	Description / Offering	URL
Automation with Terraform, IBM Cloud Pak for MCM	OpenShift - MCM - PVS	Youtube ISCEP
App Modernization with Red Hat OpenShift & IBM Cloud Paks on Power Systems – Part1	OpenShift - WebSphere	YouTube ISCEP
Get Started with IBM Cloud Power Virtual Server & IBM i	Power VS	Youtube ISCEP
Why OpenShift & Opensource for IBM i ? DevOps, Arc42 Drops & MCM demo	OpenShift - Ansible	Box
“Containerize your IBM i” – OpenShift, Micro service & IBM i	OpenShift	Box
Automation with Ansible and IBM i	Ansible	ISCEP
Deploy a Two-Tier open source application with Openshift Container Platform 4.6 on Power	OpenShift 101 demo or Lab	ISCEP

Drivers & Customer requests - Examples

Dev

1- Modernization Example

Q: How do I modernize my existing RPG ILE app in this OpenShift context ?

how do I integrate this modernized app with Cloud native apps on OCP?

what components to replatform/redevelop on OCP (IBM i as an App Server and/or database server)

what protocols or middleware for integration and how to get started ? role of open source on IBM i

DevOps

2- Modernization/DevOps

Q: Dev env as a service. How to use Terraform/Ansible/CP4MCM with IBM i for on prem / off prem automation ? in a CI/CD pipeline? Next: What if the IBM i DevOps and CI/CD pipeline tooling runs on OCP?

Ops

3- Ansible Automation & IBM i.

Q: How to get started with Ansible? Pre-packaged Ansible / AWX / Tower for IBM i Security compliance /System Mgt ?

- ex: Ansible + IBM i for PTF management

- **ex:** Ansible + IBM i for HA/DR automation

Workshops – IBM i , Cloud & OpenShift

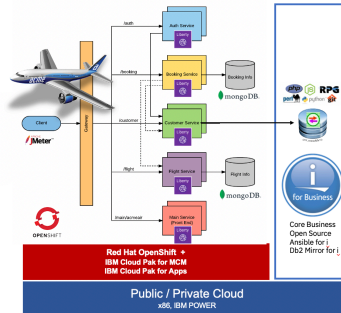
Workshop: [Get Started with Ansible for i](#)

IBM Systems Technical Sales
Lab Services | IBM Garage for Systems

Ansible for i
BP Enablement &
Hands-on Webinar

4 sessions in 2020
Full house

Workshop OpenShift 101
“A day in the life of an IBM i shop”
Demo Showcase



In progress

Workshop: [Get Started with IBM Cloud PVS](#)

IBM Systems Technical Sales
Lab Services | IBM Garage for Systems

**PowerVS BP Enablement
& Hands-on Webinar**

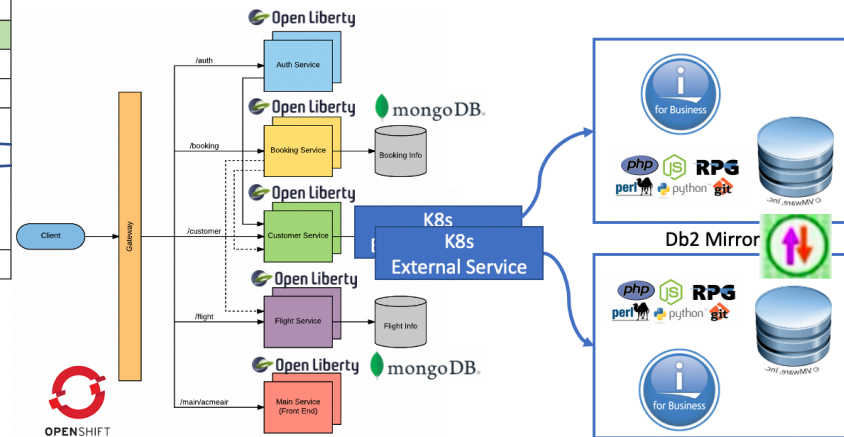
4 sessions in 2020
Full house

Interested?

Workshops – OpenShift & Red Hat Solutions

IBM Montpellier CoC for Red Hat – 101 , 201 workshops for customers, partners, and *NEW* ISVs

Webinar Agenda Samples	
<ul style="list-style-type: none"> 2h OCP 4 on Power Discovery Webinar for a shared & solid foundation 2h OCP 4 on Power Exploration Webinar to explore the use-case(s) that matters the most to you 	
2h Webinar – OCP 4 on Power Discovery Webinar for Customers or Partners	
30 min	Introduction to the Red Hat OpenShift & IBM Power Systems Strategy
45 min	Introduction to OCP on Power, Micro-Services & Containers, Hybrid Architecture & Cloud.
30 min	Live Demonstrations of OCP on Power in actions
15 min	Q&A – Next Steps - Conclusion
2h Webinar – OCP 4 on Power Exploration Webinar for Customers or Partners	
15 min	Introduction to the Red Hat OpenShift & IBM Power Systems Strategy
30 min	Introduction to RH OCP 4 on Power Architecture
60 min	Deep Dive with Subject Matters Experts from the IBM CoC for Red Hat: <ul style="list-style-type: none"> - Understand Enterprise Modernization with OCP, Ansible, IBM Cloud (VPS) for IBM i Customers - Understand deployment of OCP on Power with PowerVC 2.0 - Understand Oracle DB on Power Automated deployment with PowerVC & Ansible - Understand OCP for ISV – Understand the integration of your application in OCP 4.x
15 min	Q&A – Next Steps - Conclusion



Training & Prototyping:

fig: OCP+ IBM i + Demo

App Modernization & Cloud Journey Showcase

A day in the life of an IBM i shop

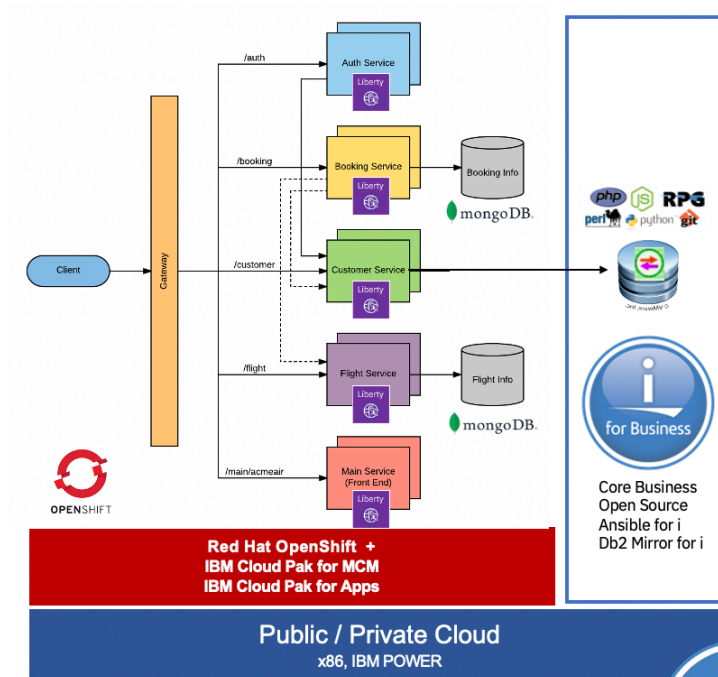
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Dev:

- Cloud Pak for Applications
- Hybrid OCP+IBM i applications
- DevOps : 3rd party tools + CP4MCM

Ops:

- OpenShift vs. IBM i administration
- Cloud Pak for MCM w/ IBM
- IBM i on PowerVS (IBM Cloud)



Dev:

- RDi
- Open Source (Vscode, Node.js...)
- APIIm / Web Services (IWS, Loopback)

Ops:

- Db2 Mirror
- Ansible for i
- Ansible AWX/Tower (GUI with RBAC)
- PowerHA/NVMe/Storage

AI/ Analytics:

- Db2 Web Query (Db2 for i + data sources on OCP)
- AI on IBM i (PASE) , H2O.ai

Security :

- IBM i + Qradar , IBM i Security



Micro-Service App : OpenShift + IBM i



Stateless & Distributed Front-end Apps

Unleash: Build new cloud-native solutions

OpenShift : Enterprise Kubernetes for Cloud Native

- ✓ OCP on Power: 2.5 X more container density vs. x86 and Unequaled Reliability
- ✓ IBM Cloud Pak for Apps for easy Re-platforming & DevOps

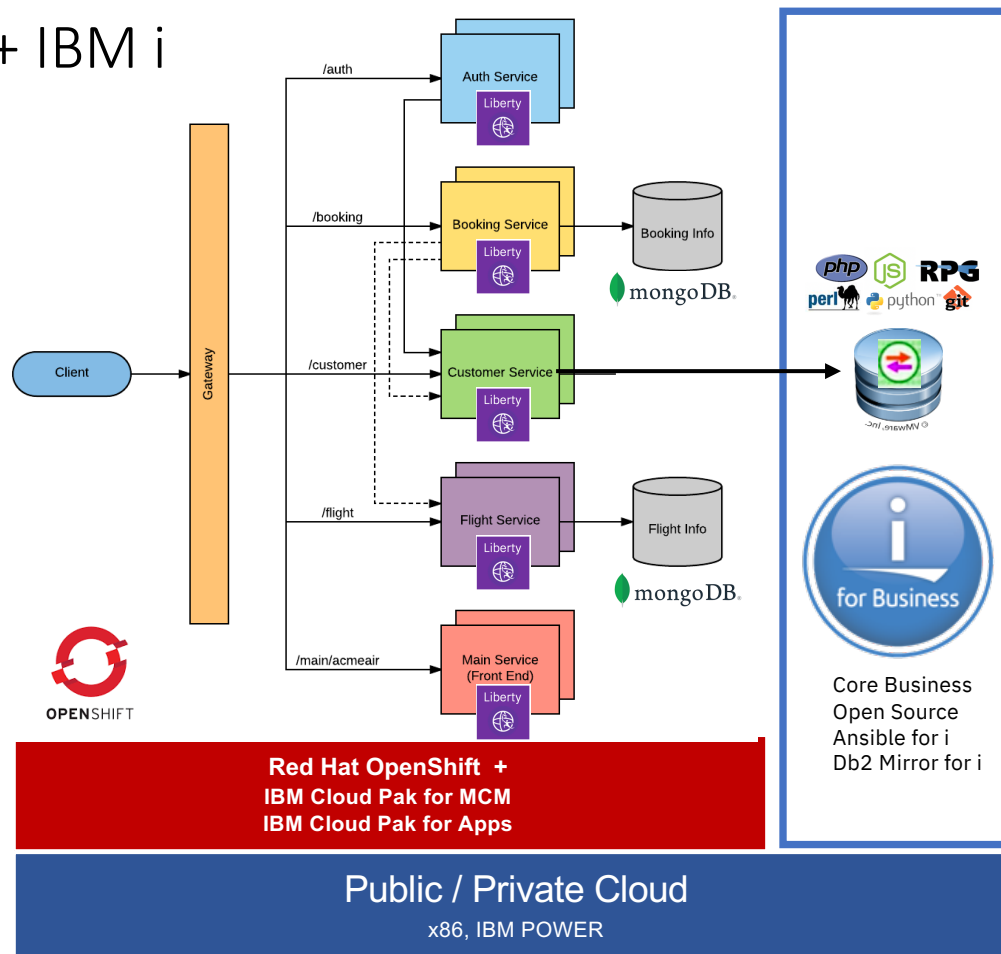


Stateful & Transactional Apps

Unlock: Modernize and leverage existing investments

IBM i : Unrivaed Application & Database Server

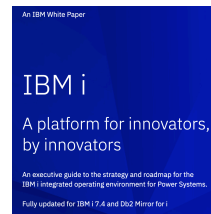
- ✓ Real time replication w/ **PowerHA**
- ✓ Zero downtime with **Db2 Mirror for i**
- ✓ Maximum Resilience, Security (CVS Reports)
- ✓ Modernize and Expose existing Business Logic (RPG, COBOL, Node.js, Python etc.)



How can we help you? Links & Assets

C Level Presentations

- > C-Level Presentation: "[Answering Executive Questions About IBM i - May 2019](#)". by Steve Will - IBM i Chief Architect
- > Help Systems [IBM i Market Study \(2020\)](#)
- > [IBM i Application Development Update - by Steve Will - IBM i Chief Architect](#)



An IBM White Paper

App Modernization & Red Hat - MOP Assets (Presentations, Videos)

- > Examples of [modernisation use cases & assets presentation](#) & [Modernization Introduction \(September 2020\)](#)
 - [Illustration #1](#) (video) Infrastructure Modernisation & **Ops efficiency** by automation - Infrastructure as code , Ansible/ CP4MCM
 - [Illustration #2](#) (video) Leverage your existing estate, **DevOps efficiency** : Monolith to Microservice & Integration with Micro-Service Apps
 - [Transformation Advisor / Replatforming](#) demo (traditional WebSphere on IBM i to OpenShift)
 - [Illustration #3](#) (video) Enrich / Augment your apps with Micro-services , **API** integration, **AI** with Watson, containerized ML - H2O, CP4D
- [Why Open Source & OpenShift](#) (V1) and [\(V2 Reloaded\)](#) for traditional environments (AIX/IBM i) ? CP4MCM, CP4Apps & micro-service journey

Why Ansible ? [Business Value of Ansible and IBM i](#)

Integration / API Mgt : [Web Services / API Management For IBM i](#) Node-RED/ LoopBack on IBM i short (draft PPTX) presentation

Infrastructure Modernization - MOP Assets (Presentations, Videos)

[IBM i - Infrastructure Modernization](#) What's new : Business Continuity (PowerHA, Db2 Mirror) , Cloud Computing (IBM Cloud..)

[IBM i in the IBM Cloud](#) - Deep Dive (Offering, HA/DR, Backup) - [Demonstration](#)

Customer stories & References

<https://www.ibm.com/it-infrastructure/us-en/resources/power/ibm-i-customer-stories/>

MOP Design Workshops - Flyer : How can we help you?

Example of previous [workshops](#) on similar subjects (focus IBMi here, on specific customer use case)

IBM i & Open Source

yum / RPM package management support

- New way to install packages on i & get access to additional packages & versions
- Same process than on Unix & Linux ☺ ... with IBM Test & Support
- More information on the [Getting Started Wiki](#)
- Example: Get the latest Node.js version (ex: 8.10) on IBM i..

```
bash-4.4$ /QOpenSys/pkgs/bin/yum --version  
3.4.3  
bash-4.4# /QOpenSys/pkgs/bin/yum install nodejs  
Setting up Install Process  
Resolving Dependencies  
--> Running transaction check  
---> Package nodejs.ppc64 0:8.10.0-0 will be installed  
bash-4.4# node -v  
v6.9.1  
bash-4.4# /QOpenSys/pkgs/bin/node -v  
v8.10.0
```

CHROOT Example

- Isolate your users & applications. Chroot (Unix) is the foundation of any container technologies.
- Ex: Create a chroot jail for my developers – Developer User profile OBIWAN

```
#Create chroot and home directories
```

```
mkdir /QOpenSys/dev-chroot
```

```
mkdir /QOpenSys/dev-chroot/./home/OBIWAN
```

```
# Install binaries & dependencies in the chroot container
```

```
cd /QOpenSys/QIBM/ProdData/OPS/GCC
```

```
./chroot_setup.sh chroot_bins.lst /QOpenSys/dev-chroot
```

```
./chroot_setup.sh chroot_OPS_GCC.lst /QOpenSys/obiwan-root
```

```
./chroot_setup.sh chroot_minimal.lst /QOpenSys/obiwan
```

```
CHROOT_DIR=/QOpenSys/dev-chroot
```

```
yum -y --installroot=$CHROOT_DIR install wget curl nano rpm openssh make-gnu less openssl openssl gzip bash git nodejs python2
```

```
# Evaluate the chroot size once all installed - 1GB
```

```
du -sm /QOpenSys/dev-chroot/
```

```
967.42 /QOpenSys/dev-chroot/
```

```
# Change user profile and home dir authorities. The user will be contained in the chroot once logged in with ssh/scp/sftp (SC1)
```

```
# The "." (dot) in the HOMEDIR path is only there for telling SSHD to use chroot and keep user OBIWAN in the chroot jail.
```

```
system "CHGUSRPRF USRPRF(OBIWAN) LOCALE(*NONE) HOMEDIR('/QOpenSys/dev-chroot/./home/OBIWAN')"
```

```
chown -R obiwan /QOpenSys/dev-chroot/./home/OBIWAN
```