



blackbaud®  
**DEVELOPERS’  
CONFERENCE**  
June 15–17, 2021

# Scalable Development Practices for Distributed Teams

HOT TOPIC MEDLEY TRACK

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**PAUL GIBSON, MATT SMITH**

*Session Host: Michael Sullivan*



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- Providing direct support to answer questions regarding Subscription functionality, internal business practices, and troubleshooting processes to Your Non-Authorized Users
- Providing direct support to answer questions regarding Customization specifications, features, intended usage, and Error correction and troubleshooting processes to Your Non-Authorized Users



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Paul Gibson

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CHARLESTON, SC

AT BLACKBAUD: 27 YEARS



blackbaud®

Matt Smith

---

CHARLESTON, SC

AT BLACKBAUD: 17 YEARS



HELPING DELIVER  
GOOD **SINCE 1981**



**BLACKBAUD**

Helping You Make The World A Better Place

ACCOUNTS PAYABLE  
Network Version 5.40

Copyright (C) Blackbaud, Inc. 1985-2013

SYSTEM WAS LAST USED ON : 09/26/2013    TODAY'S DATE IS SET AT : 09/27/2013

PRESS ENTER TO CONTINUE TO MAIN MENU, ESCAPE TO CHANGE DATE : █

Num

# We support the entire social good community.



NONPROFITS



HIGHER EDUCATION INSTITUTIONS



K-12 SCHOOLS



HEALTHCARE ORGANIZATIONS



FAITH COMMUNITIES



ARTS AND CULTURAL ORGANIZATIONS



FOUNDATIONS



COMPANIES



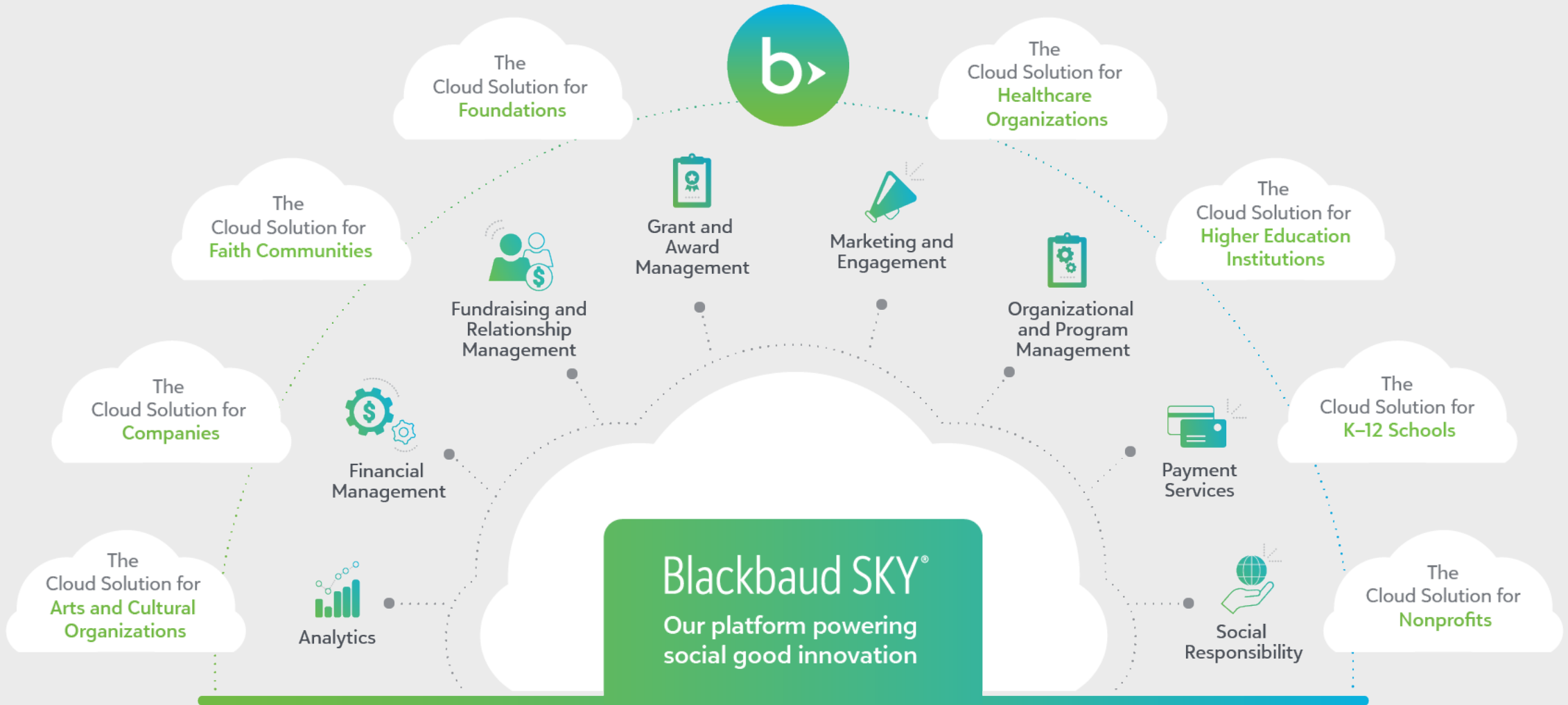
INDIVIDUAL CHANGE AGENTS



Our vision is to power an Ecosystem of Good<sup>®</sup> that builds a better world.



# Cloud solutions purpose-built to drive digital transformation and impact for the social good community

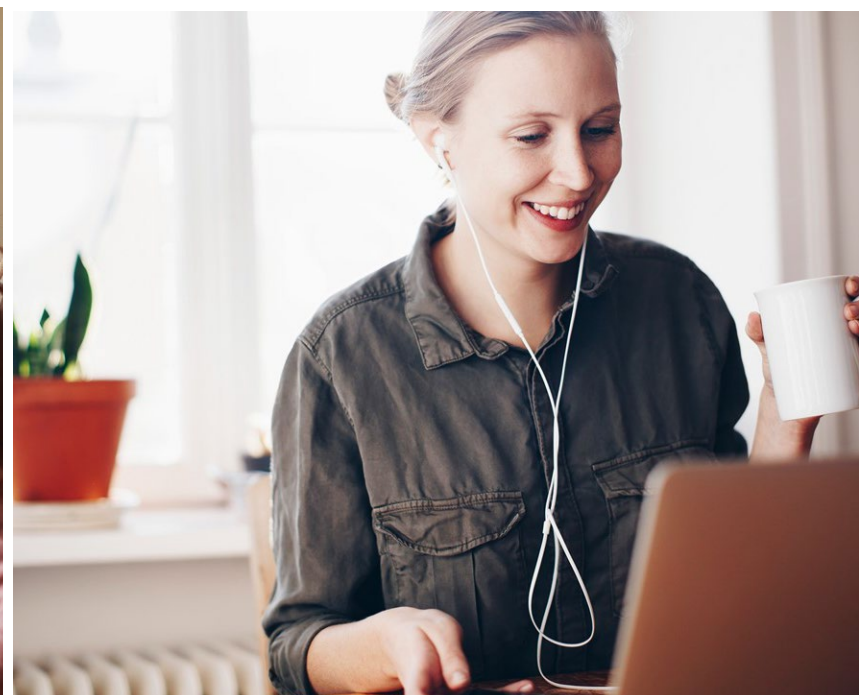






## Scale Challenges

- 100+ Scrum Teams
- 40K+ Customers
- Worldwide
- Broad Portfolio
- Broader Opportunity



# Tools for Distributed Teams





# Blackbaud Development Big Ideas

- Capability Oriented Architecture
- Specific Capabilities are “owned” by Specific Engineering Teams
- Engineering Teams are responsible for end-to-end customer success of the capability
  - Front End Experience
  - Back End Business Logic
  - Data Persistence
  - Usage and Adoption Metrics
  - Infrastructure Costs
  - Service Performance and Availability

# Capability Examples

Online Donation Forms

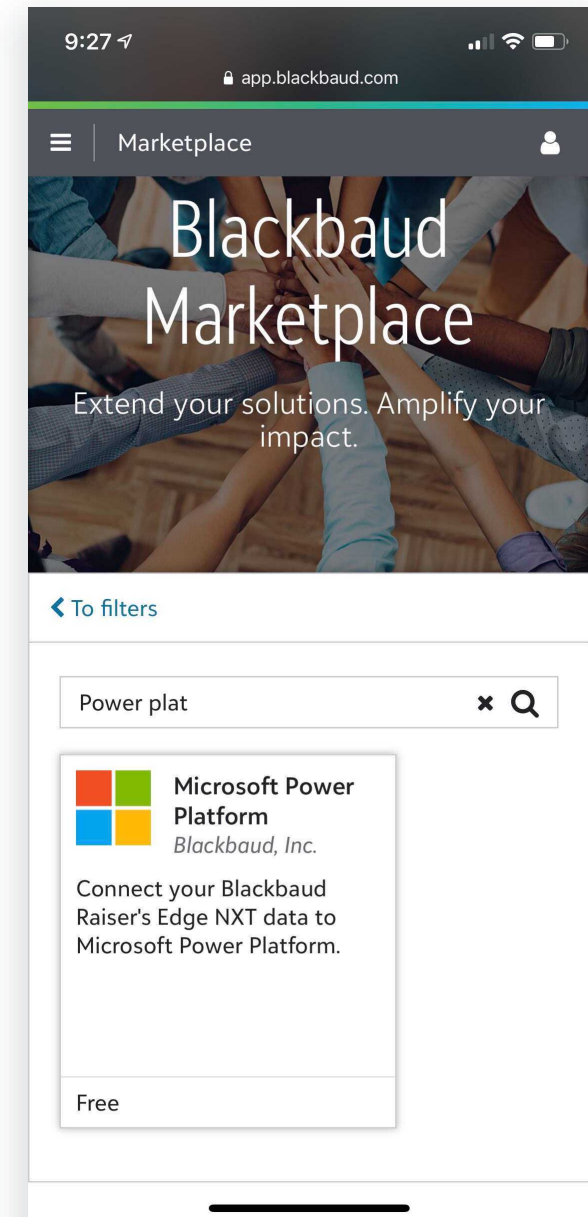
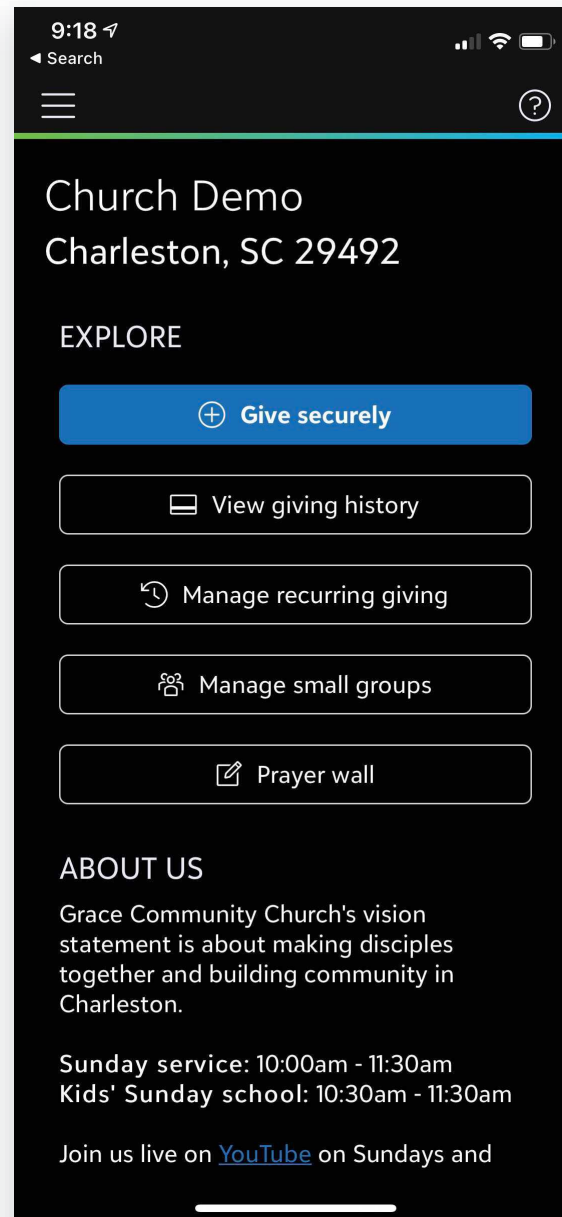
Gift Transactions

Recurring Gift Processing

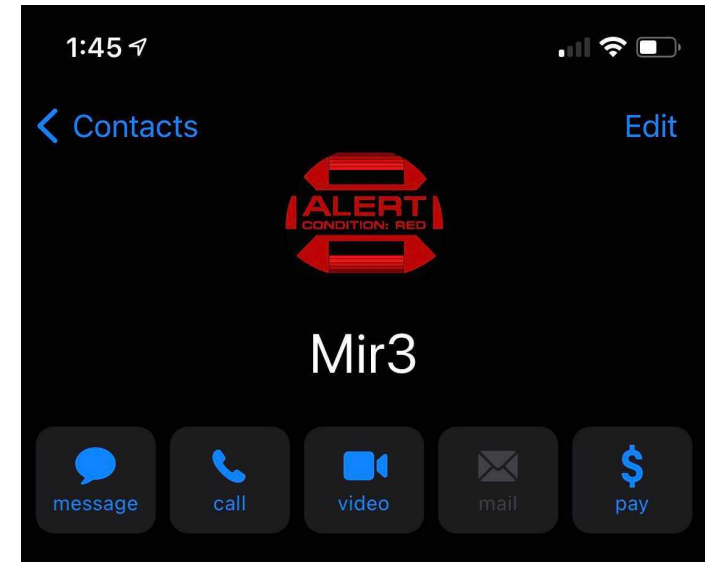
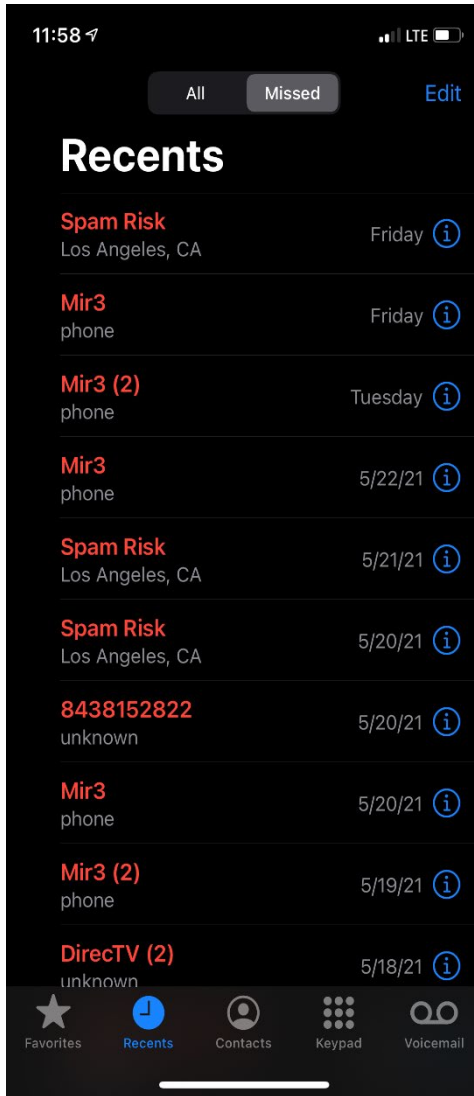
Church Groups

Prayer Wall



App Marketplace







“Owning” = “On Duty”



Production CHU - On Call Azure PaaS issued at 6/1/21 12:53 PM

 RDO-Incidents <54d7a8fe-0005-3002-80c0-fceb55463ffe@operations.blackbaud.co>  
To Paul Gibson  
 This message was sent with High importance.

 Reply  Reply All  Forward  ...  
Tue 06/01/2021 1:54 PM

Paul Gibson,

**\*\*\* Mir3 Notification - Church SCS Splunk Alert Fired \*\*\***

Please join the #church-team-alerts slack channel

SCS: chu  
Microservice: apigw  
SubscriptionCode: p-usa01

# Empowered, Engaged, Consistent, and Compliant

- We want Team Autonomy, Creativity, Culture of Experimentation and Learning
- We must have compliance with Standards and Governance



# OTG → SLA



The Off the Grid Day to Service Level Agreement Chasm

Engineering System Docs

https://docs.blackbaud.com/engineering-system-docs/

Engineering System Home Work Learn

# Blackbaud Engineering System

Supporting relentless standardization to enable focus on business value

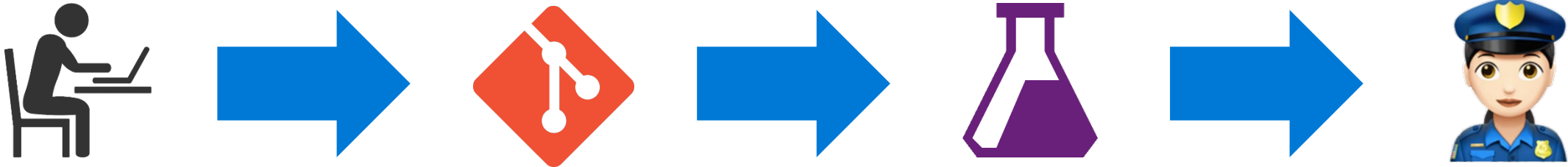
The Engineering System includes standardized processes and tooling for how teams develop, test, release, host, monitor, secure, and integrate microservices and other common assets in the Blackbaud Mission Driven Architecture.

- Self-contained systems**  
Manage your SCS, including adding resources.
- Handbook**  
Learn what you need to understand before and during the creation of your self-contained system (SCS).
- Developer setup**  
Set up and prepare for Engineering System work.





# Continuous Delivery Pipeline



pra-prayr-v2 > pra-prayr-v2-124

Pipeline Variables History | + Deploy Cancel Refresh Edit ...

### Release

Manually triggered

by svc-AzureAutoVSTS  
5/27/2021, 10:02 AM

Artifacts

pra-prayr-svc  
pra-prayr-  
svc\_master\_2021.5.21.1  
master

### Stages

t-usa01a  
Succeeded

1 warning  
on 5/27/2021, 10:07 AM

p-usa01a  
Succeeded

1 warning  
on 5/27/2021, 10:13 AM

t-usa01b  
Succeeded

1 warning  
on 5/27/2021, 10:08 AM

p-usa01b  
Succeeded

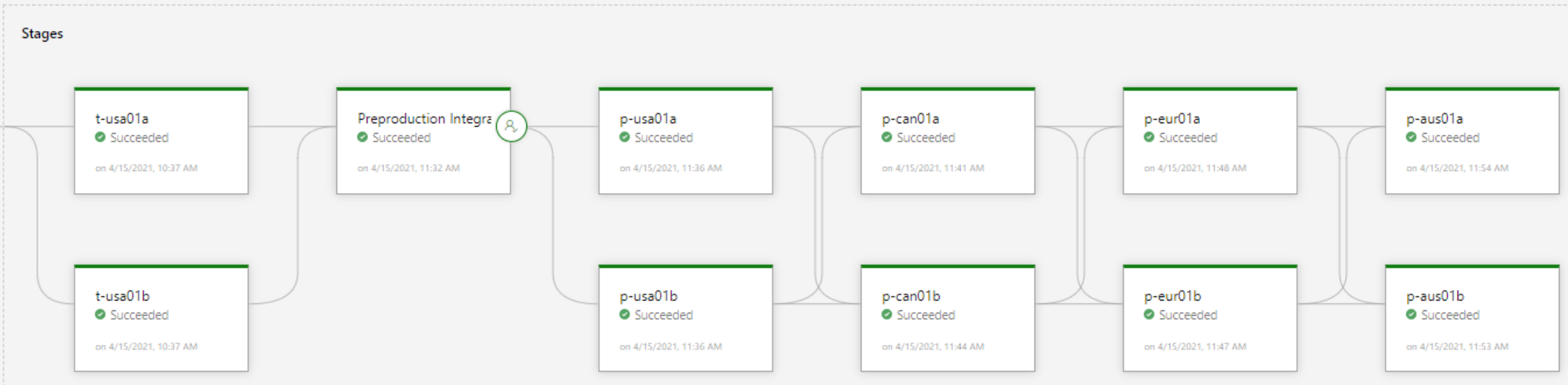
1 warning  
on 5/27/2021, 10:14 AM

**Release**

Continuous deployment  
for John Nelson  
4/15/2021, 10:34 AM

Artifacts

installment-engine  
installment-engine\_master\_2021.4.15.1  
master





# Engineering System NFRs

- CI/CD Pipeline
- Multi-region failover deployments
- CDN for SPAs
- Blackbaud domain SSL certs
- Security Static Code Analysis
- Canary Deployments
- Monitoring and Alerting
- Observability
- SKY API Publishing

# NXT Data Integration SKY API™ Available Now!

General availability of 60+ endpoints designed to enable faster and deeper integrations of Blackbaud with other solutions in your tech stack.

- POST Create a campaign
- POST Create a code table
- POST Create a constituent appeal
- POST Create a country
- POST Create a custom field cate...
- POST Create a fund
- POST Create a gift note
- POST Create a name format con...
- POST Create a name format con...
- POST Create a phone type
- POST Create a table entry
- POST Create an appeal
- DELETE Delete a campaign
- DELETE Delete a code table
- DELETE Delete a constituent
- DELETE Delete a constituent appeal
- DELETE Delete a country
- DELETE Delete a custom field categ...
- DELETE Delete a fund
- DELETE Delete a gift note
- DELETE Delete a name format confi...
- DELETE Delete a name format confi...
- DELETE Delete a phone type
- DELETE Delete a proposal
- DELETE Delete a table entry
- DELETE Delete an appeal
- PATCH Edit a campaign

Home / API Reference / NXT Data Integration / Endpoint Reference

## NXT Data Integration

API definition Comments

This API supports an expanded set of endpoints optimized for data integration scenarios.

### POST Create a campaign

Creates a new campaign.

Try it Please sign in to use the console.

#### Request URL

<https://api.sky.blackbaud.com/nxt-data-integration/v1/re/campaigns>

#### Request headers

Header	Required	Type	Description
Content-Type		string	Media type of the body sent to the API.
Bb-Api-Subscription-Key	✓	string	Subscription key which provides access to this API. Found in your <a href="#">Profile</a> .
Authorization	✓	string	OAuth 2.0 access token obtained from Blackbaud OAuth 2.0 Service. Supported grant types: <i>Authorization code</i> , <i>Implicit</i> .

#### Request body

The campaign to add.

A record from the dbo.CAMPAIGN table in Raiser's Edge.

The **CampaignCreate** entity has the following properties:

Property	Required	Type	Description
----------	----------	------	-------------

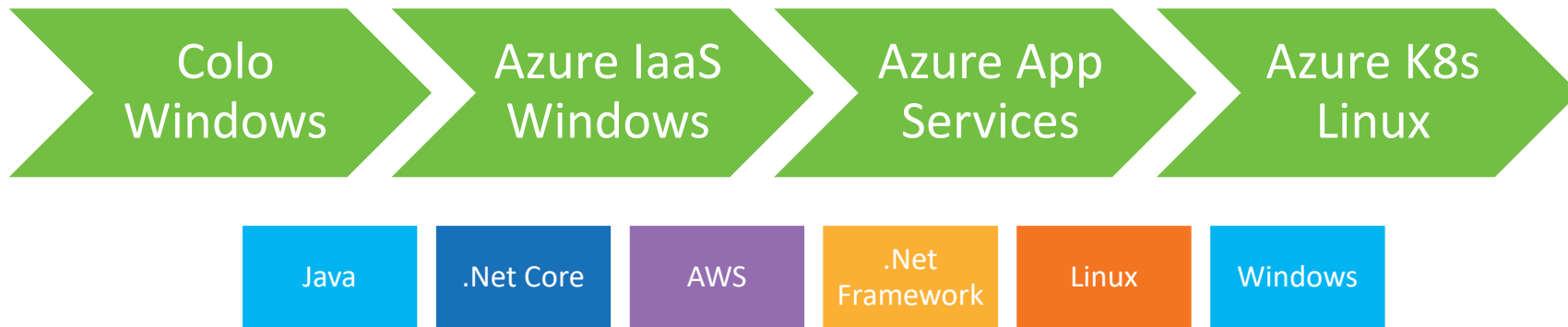


# Engineering System Benefits

- Team Productivity
- NFR Compliance
- Community Contribution & Continuous Improvement

# Capability Integration

- Cross team integration happens via REST or Async Contracts
- Implementation details *tend* to be consistent
  - but are not required by the architecture
- Evolution can be graceful and at a pace that works for a team
- Asynchronous Infrastructure Evolution
- Asynchronous Tech Stack Evolution



# Team accelerate metrics

Calculated from May 4, 2021 through Jun 1, 2021 accounting for 20 business days.

**\$10,200.62 ↑ 5%**  
 Total costs for displayed teams

**Complete**  
 Remaining AKS migrations for displayed teams

**88%**  
 .NET Core 3.1 upgrade completion for displayed teams

**100%**  
 SKYUX4 upgrade completion for displayed teams

Find in this list  Filter teams A-Team REx Zeus Thor

Team	Deployment frequency	Lead time	Service health	Cost trend	AKS migrations	.NET Core 3.1 upgrades	SKYUX4 upgrades
A-Team	Multiple times daily Deployment frequency	Less than an hour Lead time	≥ 99.99% Service health	\$2,162.30 - ↑ 81% Cost trend	Complete AKS migrations	100% .NET Core 3.1 upgrades	100% SKYUX4 upgrades
REx Zeus	Multiple times daily 116 deploys / 20 days = 5.800 deploys per day	Less than an hour Lead time	≥ 99.99% Service health	\$4,501.90 - ↓ -10% Cost trend	Complete AKS migrations	80% .NET Core 3.1 upgrades	100% SKYUX4 upgrades
Thor	Multiple times daily Deployment frequency	Less than an hour Lead time	≥ 99.99% Service health	\$3,536.42 - ↑ 0% Cost trend	Complete AKS migrations	82% .NET Core 3.1 upgrades	100% SKYUX4 upgrades





# Blackbaud Development Big Ideas

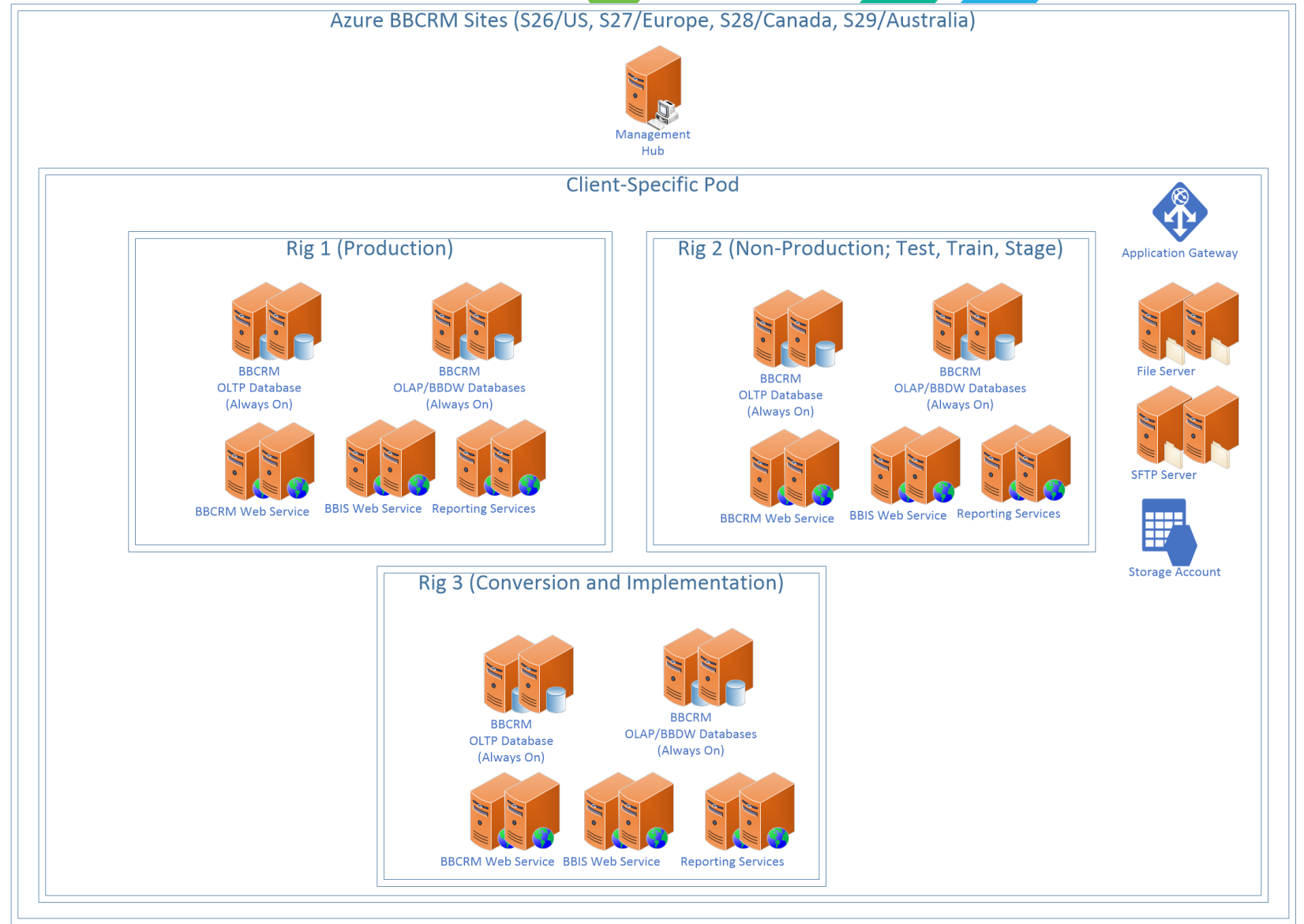
- Capability Oriented Architecture
- Specific Capabilities are “owned” by Specific Engineering Teams
- The Blackbaud Engineering System ensures Cloud Scale Productivity & Compliance

# Engineering System Case Study

Blackbaud Enterprise CRM in Azure



# Enterprise CRM in Azure



# Software Defined Infrastructure (SDI)

- PowerShell modules using Engineering System CI/CD Pipelines
- Log into the Management Hub and run commands to create and initialize resources (SQL, Web, etc) or manage applications



## 2016 SQL Cluster

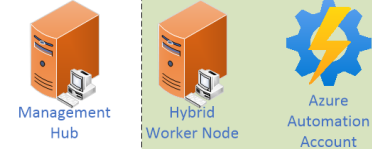
PowerShell

```
[string]$SiteName = '' # Site name where the machines are being created - Ex. 'S22'
[string]$ProductCode = '' # Product Code for New SQL Cluster - Ex. 'RNX'
[int]$Group = [Group] # Group for New SQL Cluster
[int]$Instance = [Instance] # Instance Number for New SQL Cluster
[string]$ClusterServerSize = '' # Ex. 'Standard_DS13_v2' (d01)= 'Standard_D4s_V3'
[int]$DataDiskSize = '' # Ex. '4095'
[int]$LogDiskSize = '' # Ex. '2047'
[int]$TempDiskSize = '' # Ex. '2047'

Write-Host "Creating Pod $Group, SQL Cluster $Instance" -ForegroundColor Green
$pod = Get-BBHostAzPod -SiteName $SiteName -ProductCode $productcode -Group $Group
$pod | New-BBHostAzSQLCluster -DataSize $DataDiskSize -Instance $Instance -InstanceSize $ClusterServerSize -Log
```

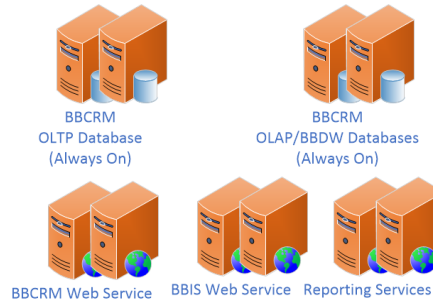
# Azure Automation and Runbooks

Azure BBCRM Sites (S26/US, S27/Europe, S28/Canada, S29/Australia)



Client-Specific Pod

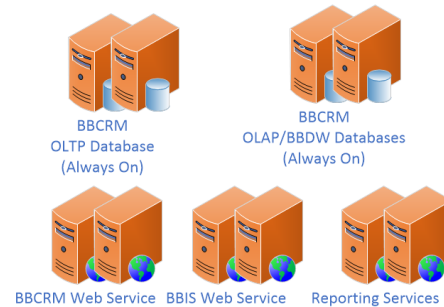
Rig 1 (Production)



Rig 2 (Non-Production; Test, Train, Stage)



Rig 3 (Conversion and Implementation)



Azure Portal

Automation Account Runbooks

SDI PowerShell Modules

# Azure Automation Accounts and Runbooks

- Start Runbooks from the Azure Portal
- Code executes on the Hybrid Worker in our domain
- Leverage our SDI PowerShell modules
- Runbooks are designed to handle Azure and Domain authentication



**Start Runbook** ↗ ✕  
Update-BBGuestRBCRMSite

**Parameters**

WEBSERVICENAME \* ⓘ  
d05atst01web01 ✓  
*Mandatory, String*

TENANTID \* ⓘ  
1234 ✓  
*Mandatory, String*

VERSION \* ⓘ  
4.0.182.2705 ✓  
*Mandatory, String*

**Run Settings**

Run on ⓘ  
Azure **Hybrid Worker**

Choose Hybrid Worker group  
D05AOPS01HybridWorkers ✓

# IaaS Operations Management (IOM)

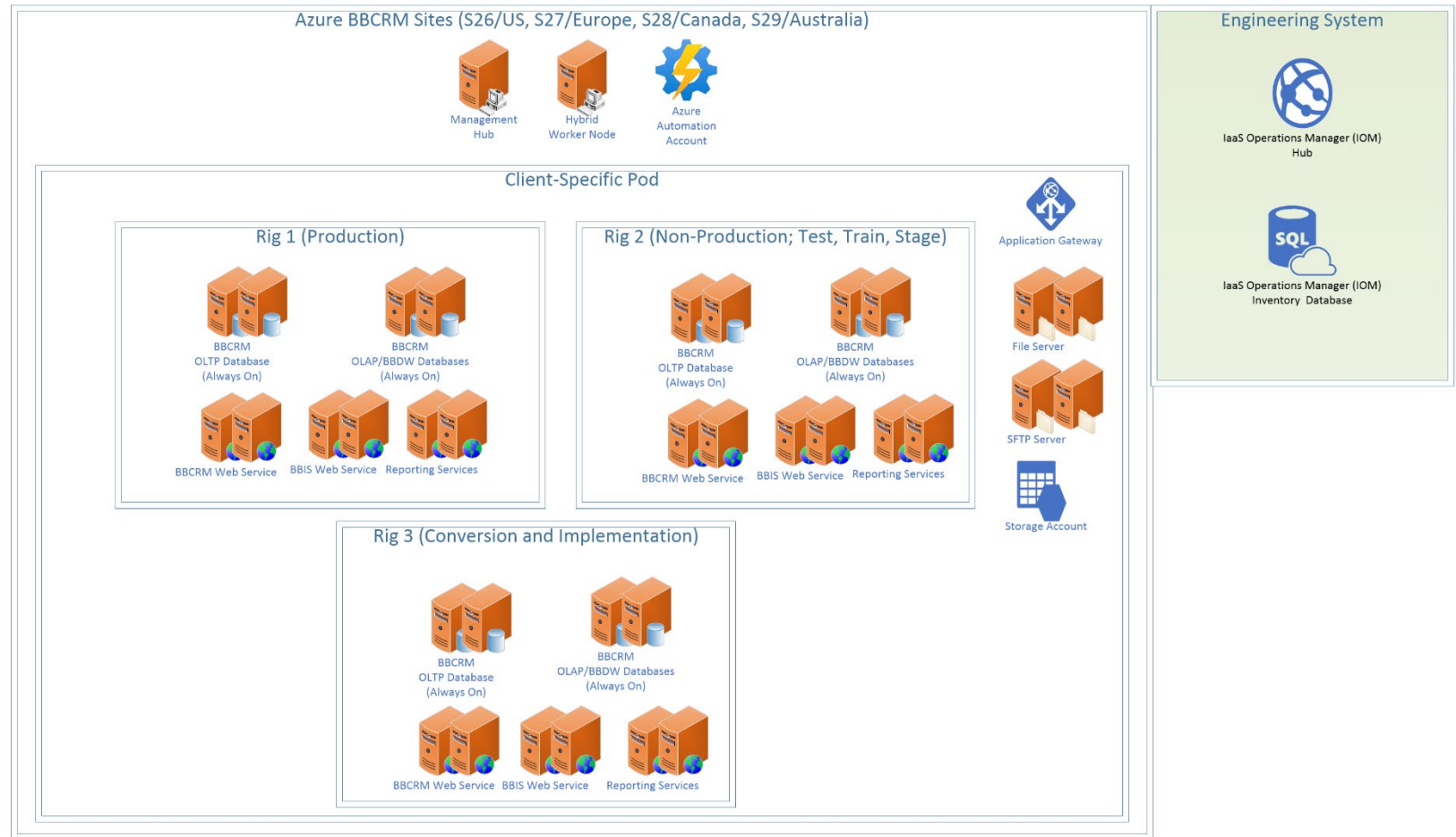
Azure Portal

IOM UI

IOM Services/DB

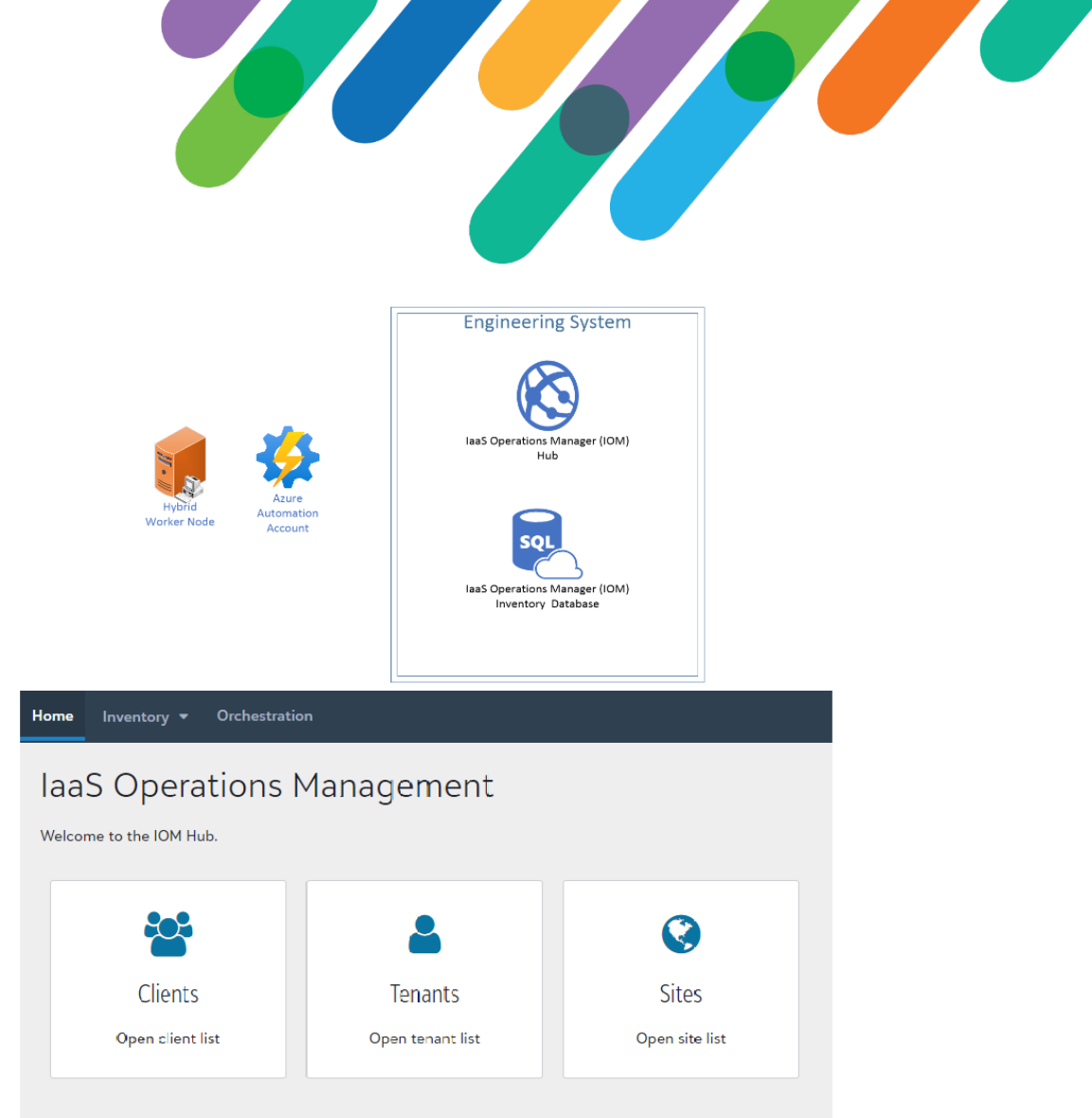
Automation Account Runbooks

SDI PowerShell Modules



# IaaS Operations Management (IOM)

- Built with Engineering System services
- Inventory Database and Service to manage IaaS resources
- Orchestration service to execute groups of Runbooks through the Azure SDK





# IOM

## CRM Client

Client: Example Org

Identifier: 1234

### Pods

+ Create pod

Find in this list



	Site	Name	Resource...	Orchestration status
...	T99A	CRM06	12	✔ Complete

### Tenants

Add tenant

	Rig	Tenant Id	Type	Version	Live
...	T99A - CRM06 - 1	1234s	NonProd	4.0.182.2702	
...	T99A - CRM06 - 1	1234t	NonProd	4.0.181.2300	
...	T99A - CRM06 - 1	1234tr	NonProd	4.0.181.2300	
...	T99A - CRM06 - 2	1234p	Prod	4.0.182.2702	✔

### Rigs

+ Create rig

Name: T99a - CRM06 - 1

Non-production

- Sequence 1
- Resources
- T99Acrm06dbs01, CRM
  - T99Acrm06dbs02, CRMOLAP
  - T99Acrm06web01, CRM
  - T99Acrm06web02, BBIS
  - T99Acrm06web03, CRMSSRS

Search Splunk

+ Add tenant

Delete rig

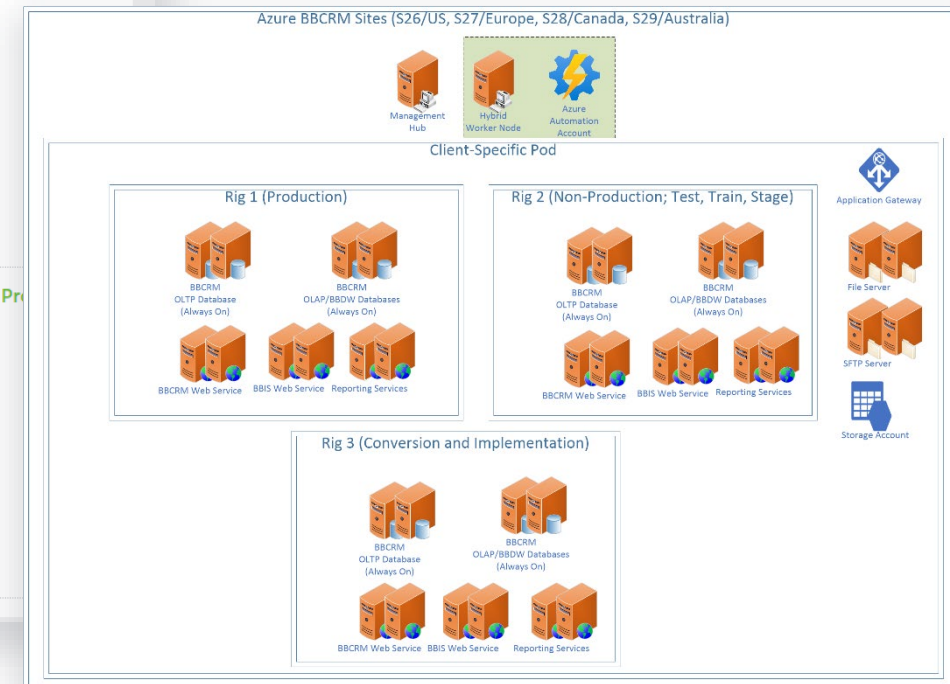
Name: T99a - CRM06 - 2

- Sequence 2
- Resources
- T99Acrm06dbs03, CRM
  - T99Acrm06dbs04, CRMOLAP
  - T99Acrm06web04, CRM
  - T99Acrm06web05, BBIS
  - T99Acrm06web06, CRMSSRS

Search Splunk

+ Add tenant

Delete rig



# IOM

## Create Rig

### Create rig

Rig

Size \*

Small  Medium  Large

Type \*

Non-production  Production  Implementation

Pod \*

SQL clusters

SQL Server Version \*

Database Engine collation \*

Analysis Services collation \*

Data disk size (GB) ⓘ \*

**Create rig** Cancel

## Orchestration: Create New Rig (S27 CRM12)

Site: S27A

Status ✔ Complete  
Submitted by Brian.Swick-cld@blackbaud.me  
Submit time May 13, 2021, 8:32:42 AM  
Complete time May 13, 2021, 2:59:48 PM  
Input data

**Reorchestrate**

### Steps (11)

Name	Runbook	Leve...	Status	Start time	Complete time
New SQL Cluster Step	New-BBGuestRBSQLCluster	1	✔ Complete	May 13, 2021, 8:32:47 AM	May 13, 2021, 8:50:41 AM
New SQL Cluster Step	New-BBGuestRBSQLCluster	1	✔ Complete	May 13, 2021, 8:32:47 AM	May 13, 2021, 8:41:33 AM
New Web Service Step	New-BBGuestRBWebService	1	✔ Complete	May 13, 2021, 8:32:47 AM	May 13, 2021, 8:40:52 AM
New Web Service Step	New-BBGuestRBWebService	1	✔ Complete	May 13, 2021, 8:32:47 AM	May 13, 2021, 8:42:33 AM
New Web Service Step	New-BBGuestRBWebService	1	✔ Complete	May 13, 2021, 8:32:48 AM	May 13, 2021, 8:45:44 AM
Publish Pod Step	Publish-BBGuestRBPod	2	✔ Complete	May 13, 2021, 8:52:56 AM	May 13, 2021, 8:55:03 AM
Initialize SQL Service Step	Initialize-BBGuestRBSQLCluster	3	✔ Complete	May 13, 2021, 8:57:59 AM	May 13, 2021, 11:08:58 AM
Initialize SQL Service Step	Initialize-BBGuestRBSQLCluster	3	✔ Complete	May 13, 2021, 8:57:59 AM	May 13, 2021, 11:22:38 AM
Initialize Web Service Step	Initialize-BBGuestRBWebService	4	✔ Complete	May 13, 2021, 11:23:44 AM	May 13, 2021, 1:30:07 PM
Initialize Web Service Step	Initialize-BBGuestRBWebService	4	✔ Complete	May 13, 2021, 11:23:44 AM	May 13, 2021, 1:27:01 PM
Initialize Web Service Step	Initialize-BBGuestRBWebService	4	✔ Complete	May 13, 2021, 11:23:44 AM	May 13, 2021, 2:58:20 PM

# IOM

## Upgrade Tenant

### Upgrade tenant

Client \*

Example Org

Please type 'Example Org' as confirmation

Tenant \*

1234s

Please type '1234s' as confirmation

Current version

4.0.182.2702

Target version \*

Start time \*

Run now

Scheduled

Upgrade tenant Cancel

Current environment: **prod**

### Orchestration: Upgrade Client Tenant (5740supus)

Site: **S26A**

Status **✔ Complete**

Submitted by **Jeremy.Maher-cld@blackbaud.me**

Submit time **Mar 2, 2021, 12:16:18 PM**

Complete time **Mar 2, 2021, 1:13:40 PM**

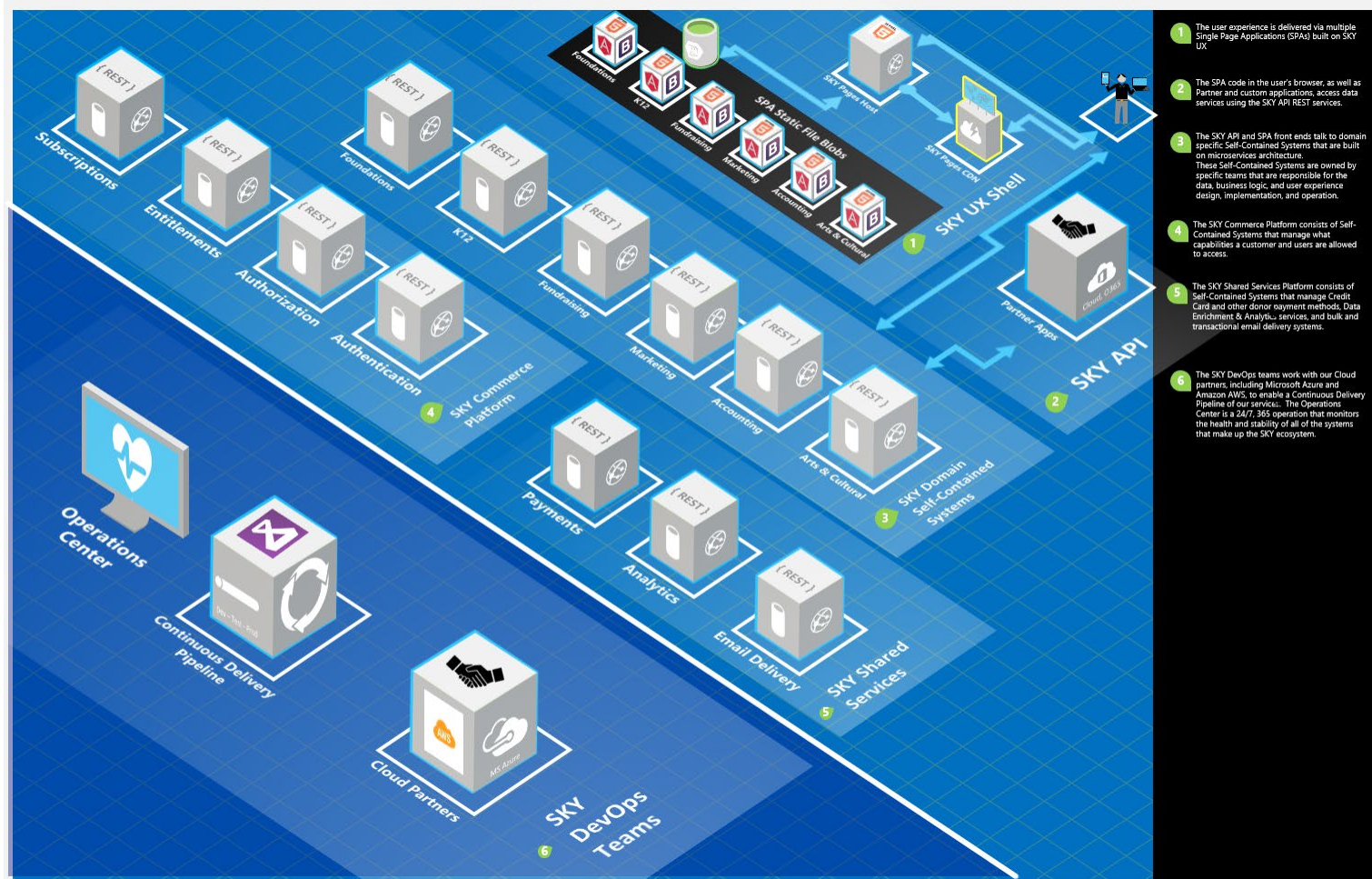
Input data

**Reorchestrate**

#### Steps (13)

Name	Runbook	Leve...	Status	Start time	Complete time
Enable maintenance mode (CR...	Enable-BBGuestRBIInfinityMaintenanceMode	1	✔ Complete	Mar 2, 2021, 12:16:21 PM	Mar 2, 2021, 12:17:21 PM
Enable maintenance mode (BBI...	Enable-BBGuestRBIInfinityMaintenanceMode	1	✔ Complete	Mar 2, 2021, 12:16:21 PM	Mar 2, 2021, 12:17:18 PM
Upgrade database	Update-BBGuestRBIInfinityDatabase	2	✔ Complete	Mar 2, 2021, 12:18:23 PM	Mar 2, 2021, 12:23:09 PM
Update CRM website	Update-BBGuestRBCRMsite	3	✔ Complete	Mar 2, 2021, 12:23:24 PM	Mar 2, 2021, 12:40:05 PM
Update BBIS website	Update-BBGuestRBBBISite	3	✔ Complete	Mar 2, 2021, 12:23:24 PM	Mar 2, 2021, 12:32:33 PM
Delete database snapshot	Remove-BBGuestRBSQLDatabaseSnapshot	3	✔ Complete	Mar 2, 2021, 12:23:24 PM	Mar 2, 2021, 12:24:00 PM
Disable maintenance mode (CR...	Disable-BBGuestRBIInfinityMaintenanceMo...	4	✔ Complete	Mar 2, 2021, 12:40:29 PM	Mar 2, 2021, 12:41:27 PM
Disable maintenance mode (BB...	Disable-BBGuestRBIInfinityMaintenanceMo...	4	✔ Complete	Mar 2, 2021, 12:40:30 PM	Mar 2, 2021, 12:41:29 PM
Configure SSRS	Set-BBGuestRBIInfinityReportServerConfig...	5	✔ Complete	Mar 2, 2021, 12:42:33 PM	Mar 2, 2021, 12:44:32 PM

# Bonus Big Idea: Test Tenancy





#bbdevdays

Thank you!