

DevOps In Action



Dr. David Votaw (3D) – Automation Wizard
Northrop Grumman

ePROCS - Clearance Request Case #: 23-1902

GLOBAL PRODUCT DATA INTEROPERABILITY SUMMIT 2023



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Presenters Bio – This is TheDaVe

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- Software developer for 18 years – C# and Visual Studio are my weapons
- Doctorate of Computer Science (DCS) in Information Assurance
DevOps was my main driver for research – [Dissertation Link](#)
- I enjoy road trips, camping, movies, heavy metal, video games... and my dog 🐶 🙌 🚗 🏕️ 🎮 🎬 👨👩👧👦



DevOps is my brand!

- Dr. DevOps Dave (3D)
- DevOps Dave (DD / 2D)
- Automation Wizard
- DaveOps



“DevOps is hard, and most will fail.” – David Votaw

Agenda

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- Level-Setter
- Culture
- Resources
- DevOps In Action
- Resiliency
- Pipelines
 - Backup Pipelines
 - Nightly Deployment Pipelines
 - CAT1+ Pipelines
 - Pull Request (PR) Validation Pipelines
 - Automated Testing Pipelines
- Release Billabongs - Versioning
- Infrastructure as Code (IaC)
- Blue / Green
- Questions
- Links

All images are stock and referenced on the last slide

Level-Setter

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- DevOps is not a buzzword or something to take lightly
 - You cannot just say, yeah we have DevOps, so that is about as successful as those who say, yeah we are agile...
- A great deal of time is necessary for teams to be enabled to take advantage of DevOps.
- Dedicated resources are a requirement for success
 - Do not fall into the “many hats syndrome”



- Old-school meets new-school
Do not be Falsely Reporting Agile (FRAGile), only the Agilely strong can survive
There is no place for waterfall, it has served its purpose, and that ship has sailed.
- Failure is okay!
You will stumble and you will fall, and that is okay!
- Production is just a word



Resources

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- Dedicated resources
 - Time
 - Money
 - People
 - Innovation
 - Exploration
 - Collaboration
 - Research
 - Integration
 - Learning new things
 - Pioneering



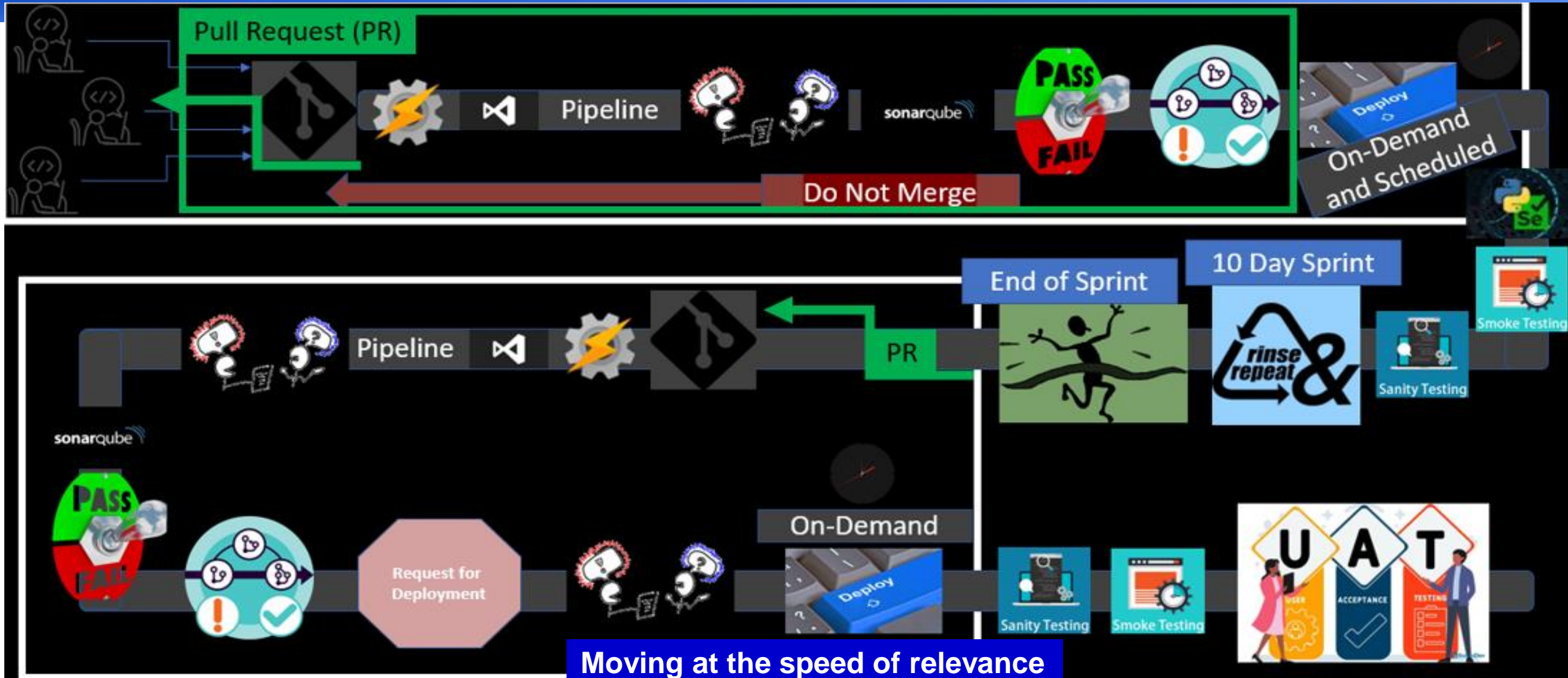


“There is no cheat code or quick ticket that can be bought, DevOps is hard, and only the prepared will reach their goals.”

David Votaw

DevOps In Action (1 of 2)

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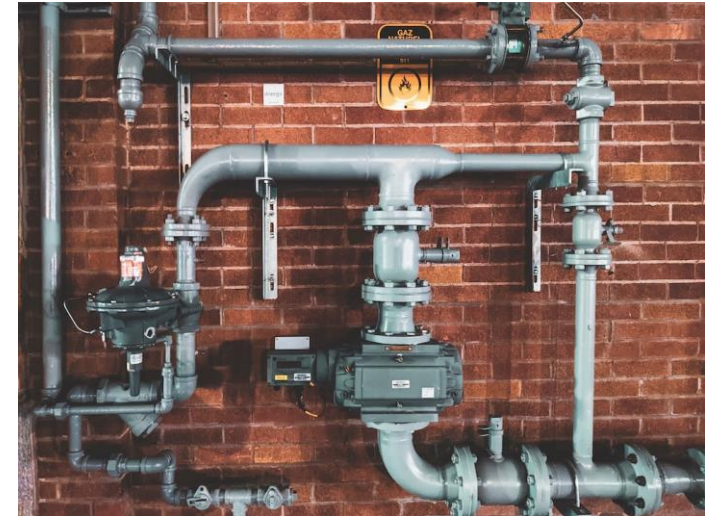


DevOps In Action (2 of 2)

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Every day the following occurs on multiple systems:

- 100 + builds
Average run-time is approximately 15 minutes
- 20 + deployments
Average run-time is approximately 30 minutes
- 50 + pipelines working together
- Hundreds of automated tests



Teamcenter (PLM in general) has a lot of moving parts, and it is often quite difficult to automate. Anything that has a repeatable, well-understood, and well-defined process, I can automate it!

Proactively monitoring systems

Checking:

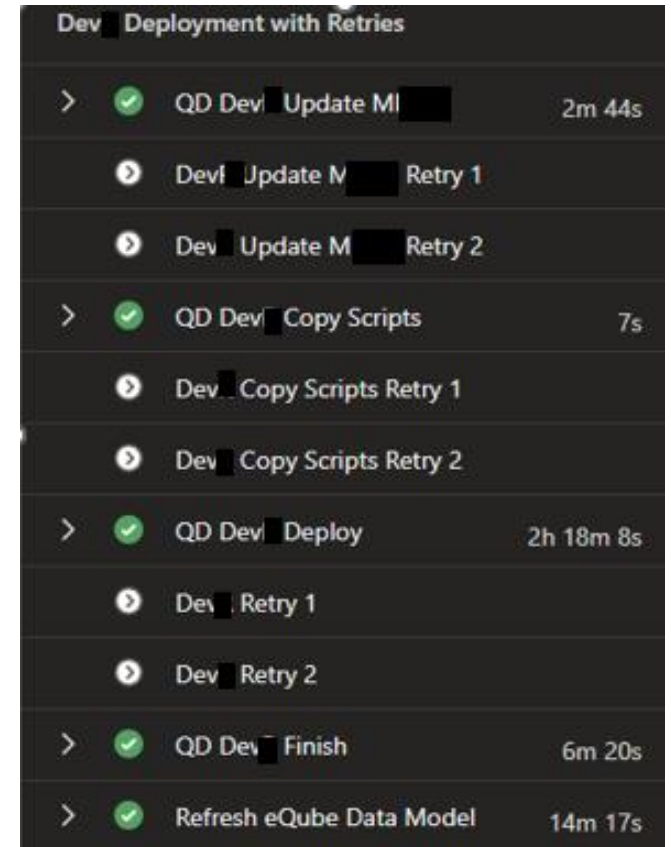
- Storage
- Passwords
- Database status



Resetting to a known good state and then retrying the process

yaml

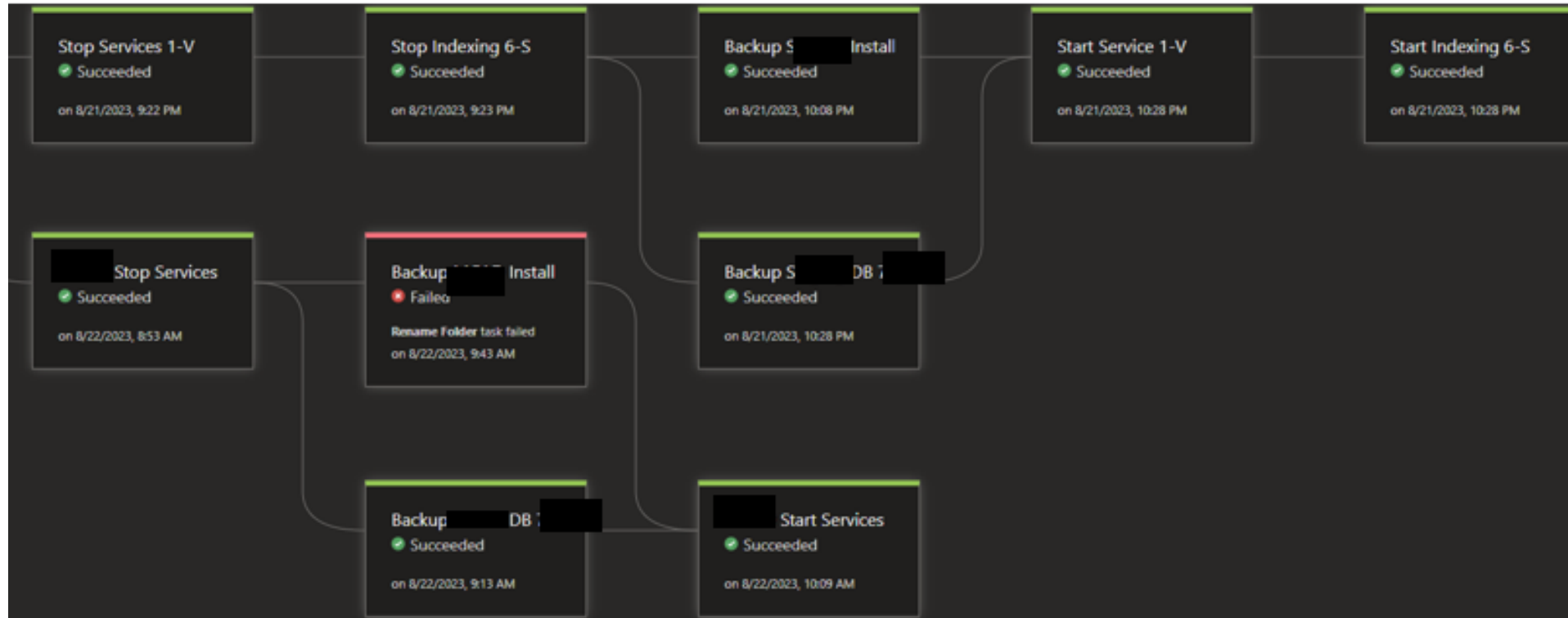
- conditions:
- dependsOn:



Backup Pipelines

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- Stop services and indexing
- Export database
- Backup file system
- Start services and indexing



Deployment Pipelines

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Code is scheduled for deployment each evening, because of the nature of the system, downtime is required. The last code drop of the day is automatically deployed to each development environment.



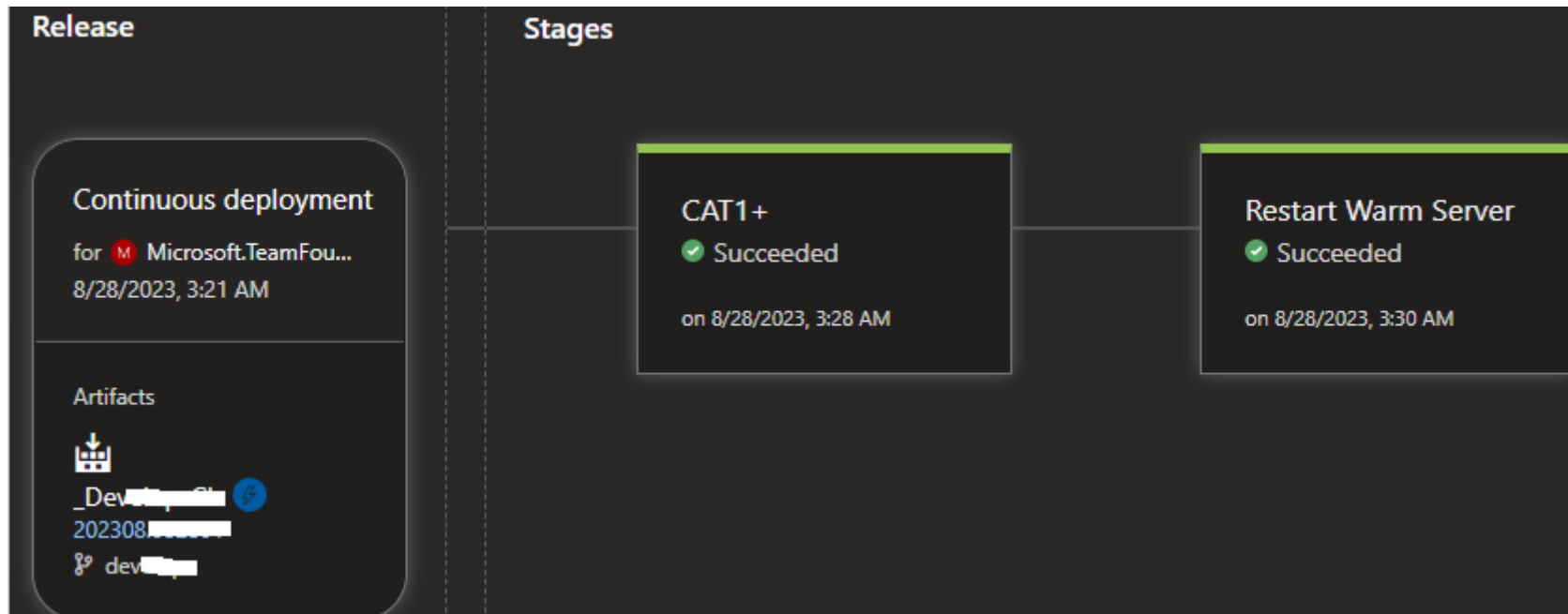
One system is deployed and if successful, then the remainder are parallelized

Automated using Tem or Deployment Center (DC) Quick Deploy (QD)

CAT1+ Pipelines

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- Detect Change
- Deploy AdminData
- Deploy DLLs
- Cycle Warm Servers



Zero downtime deployments!

Pull request (PR) Validation Pipelines (1 of 2)

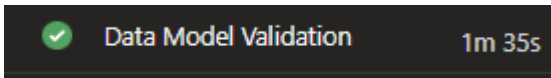
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A Branch Policy can be enabled to force adherence to coding and quality standards

Enabled	Name ↑	Path filter	Trigger
<input checked="" type="checkbox"/> On	AdminData - Access Manager Required	*/AdminData/install/_AccessManager/*	Automatic Expires after 12 hours

All AdminData is validated during the PR through a unique pipeline
Rinse and repeat for each section of AdminData



The Data Model is consolidated and compared to detect new or unexpected features



Unique IDs across workflows are validated



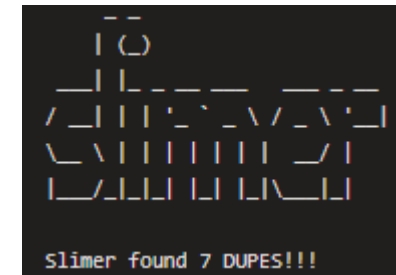
Checks

Required

- ✓ AdminData Validation - _AwTiles AdminData Validation - _AwTiles succeeded
- ✓ PR Validation PR Validation succeeded
- ✓ Work items must be linked Succeeded
- ✓ Comments must be resolved Succeeded

Optional

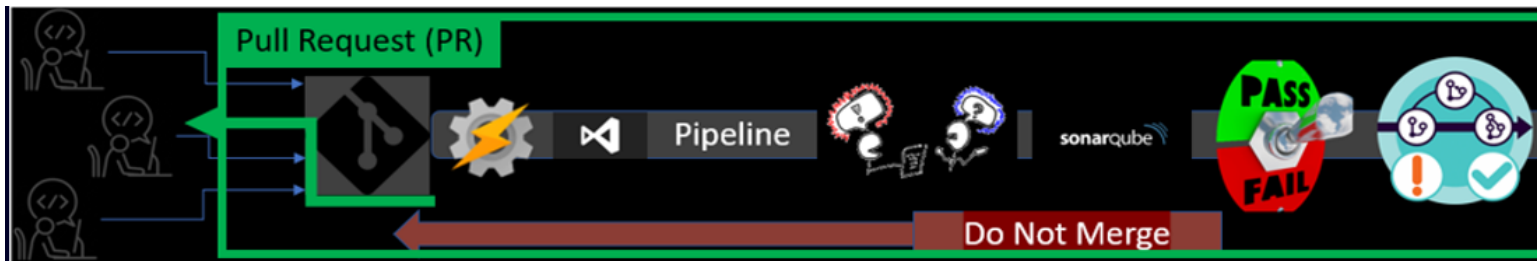
- ✓ Quality Gate passed Succeeded



Pull request (PR) Validation Pipelines (2 of 2)

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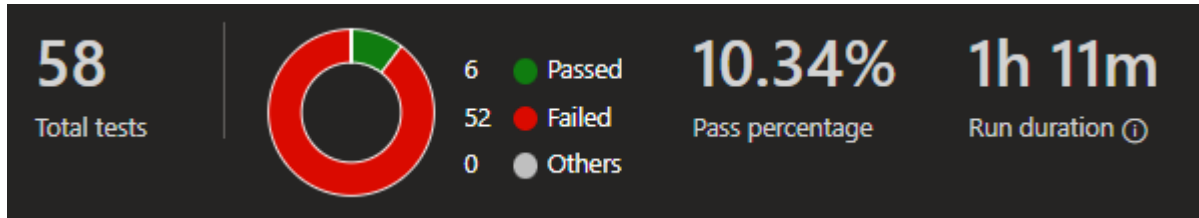
- Code is **ABLE**
 - Compile- **ABLE** – Microsoft Build (MSBuild)
 - Build- **ABLE** – Business Modeler Integrated Development Environment (BMIDE)
 - Generate- **ABLE**– Code and output are generated
 - Package- **ABLE** – Teamcenter package is created
 - Scan- **ABLE**– The code is scanned with SonarQube (SQ), CPP Check, Coverity
 - Merge- **ABLE** – Pre-merging of branches
 - Artifact- **ABLE** – Stored in AzDO/TFS/Nexus
 - Deploy- **ABLE** – TEM deploy dryrun, Deployment Center (DC) –diagnostics
 - Test- **ABLE** – Unit, integration, smoke, automated regression tests
 - Review- **ABLE** – Peer-reviewed and Architect reviewed
 - Approve- **ABLE** – Approved by Subject Matter Expert (SME) and leads
- BYOB-ABLE... Readable, teachable, manageable, likable...enjoyable!



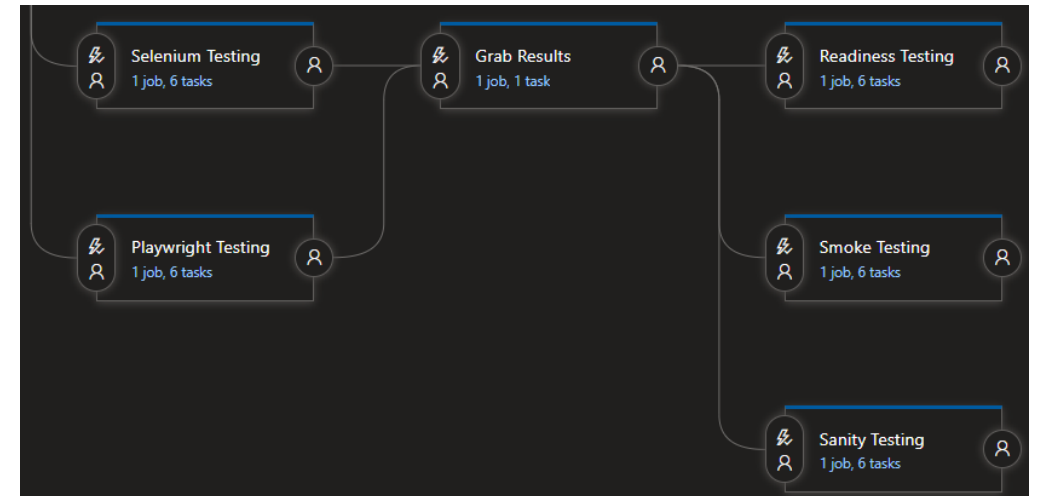
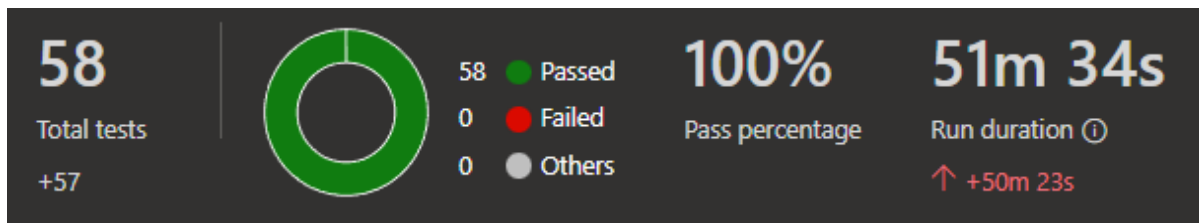
Pipelines: Automated Testing Pipelines

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- Readiness checking
- Smoke testing
- Sanity testing
- Functionality checking
- User emulation



Is the environment up and ready for user interaction?



Workplace Automation

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Additional automation needs are likely, invest in a wizard of your own!

- Graboid – Generates release notes
- 1000Sunny – Aids in capacity and planning
- Rinnegan – Traverses thousands of work items and updates Weighted Shortest Job First (WSJF)
- Business Item – Custom work item to track the needs of the business, correlates to Features and Epics
- FateOfStates – Manages the state of work items based on task completion
- Versioner – Integrates version control with software versioning
- Playwright – When we have a lacking REST/API solution we automate using Playwright
- PasswordChanger – So many passwords for a variety of accounts and stacks, timeless coordination

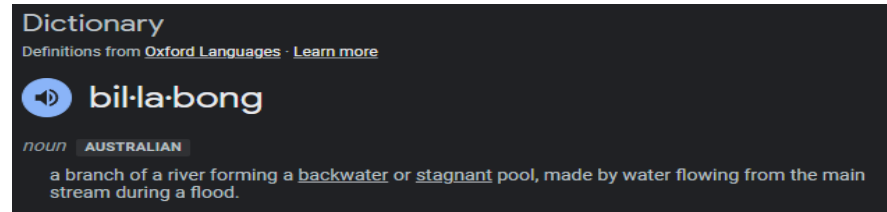


Release Billabongs – Versioning (1 of 3)

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Versioning Strategy: We produced the term Release Billabongs to make a play on words:

- Branches
- Streams
- Flows
- Rivers
- Main



- Software version string must be incremental
- Software version string must be compatible with Deployment Center managed environments
- Software version digits must be meaningful

Teamcenter version arbitrarily named ##.# 15.9

Release Billabongs – Versioning (2 of 3)

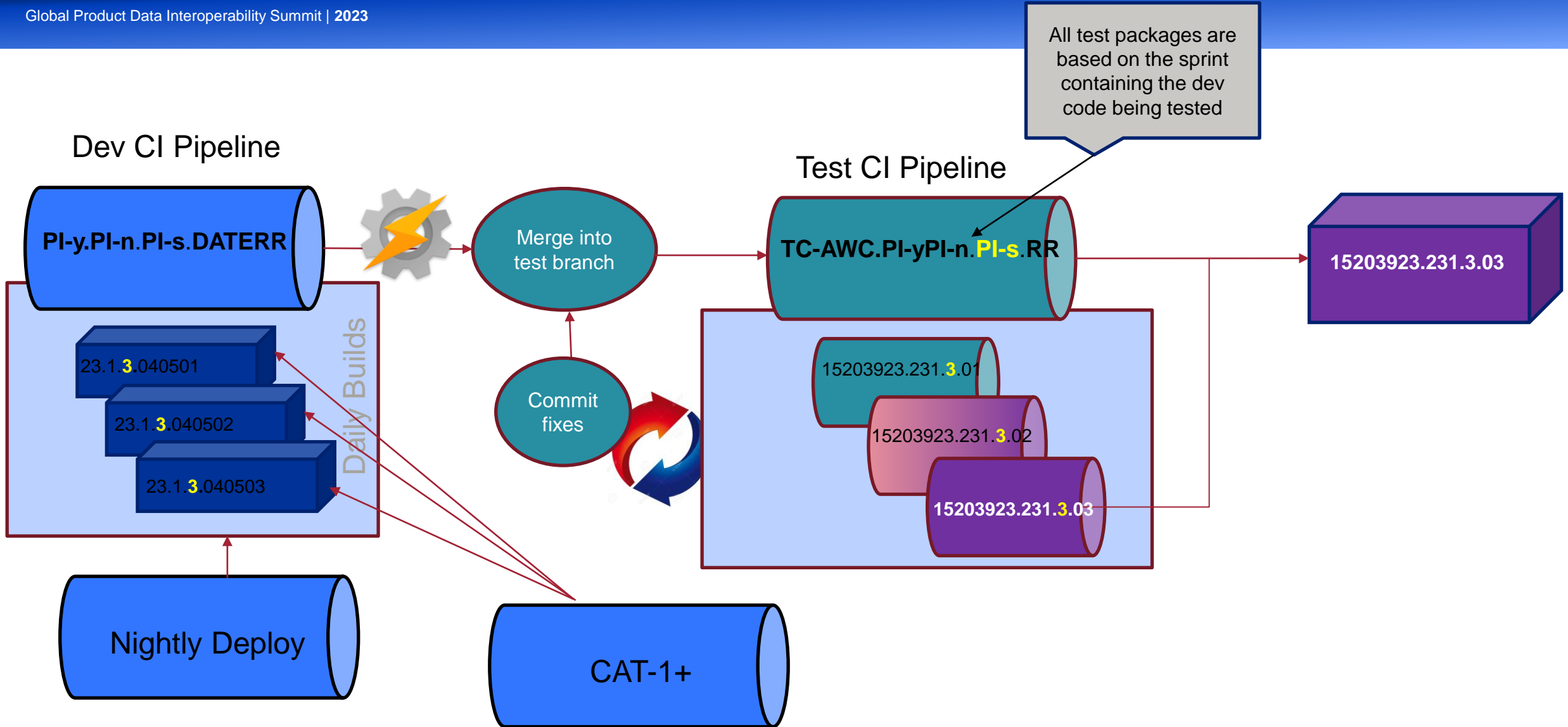
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Key	Description	Format	Change Frequency	Significance
TC-AWC	Teamcenter Foundation and Active Workspace version	XXXXYYY	Quarterly/Bi-Yearly	Level of change in Core software (major/minor/patch)
PI-y	Program Increment Year	XX	Yearly	None
PI-n	Program Increment Number	Y	Quarterly	Used with PI-s to indicate deployment frequency and amount of change between versions
PI-s	Iteration/Sprint number	X	Bi-weekly	Indicates deploy frequency
RC	Release candidate rev generated by Azure DevOps (AzDO)	XX	Per testing cycle	Testing iteration, Bug/fix increment
RR	AzDO generated Rev, resets bi-weekly	XX	Every Maintenance Build	Testing iteration
DATE	Date generated by AzDO	MMDD	Daily	None
Rev	AzDO generated Rev, resets daily	XX	Every Build	Number of PRs merged in a day

Example: 15203923.231.3.03

Release Billabongs – Versioning (3 of 3)

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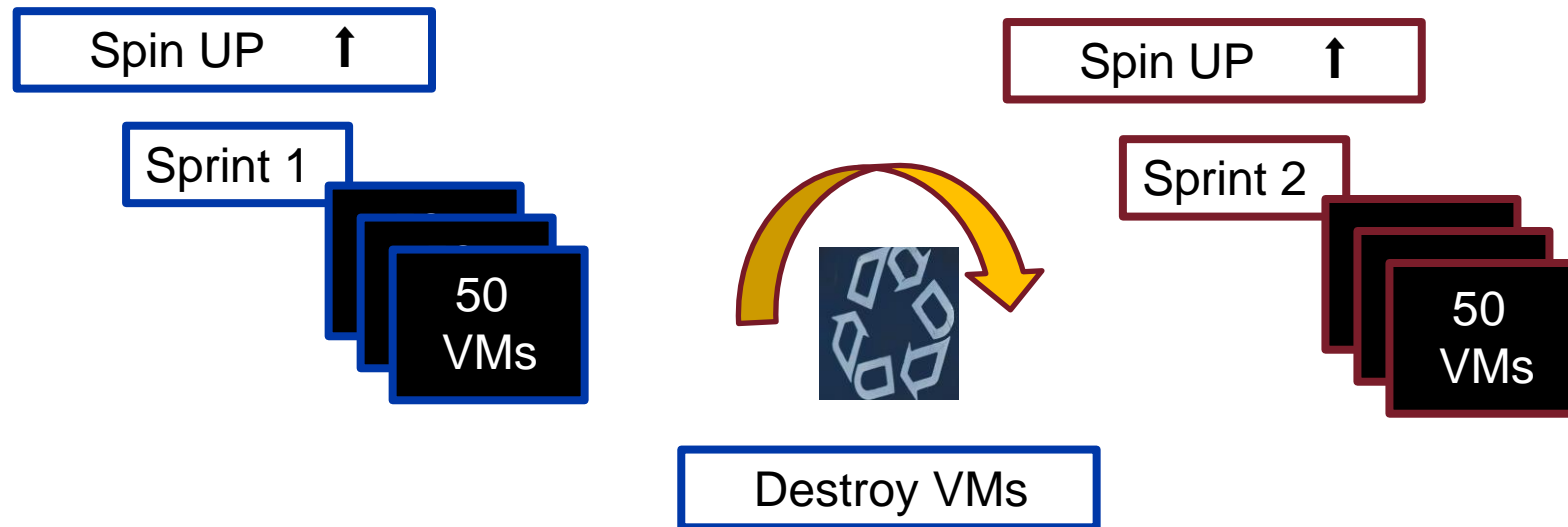
Infrastructure as Code (IaC) (1 of 2)

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Problem

A newly created VM required 8+ hours of execution followed by validation and verification for Teamcenter activities (dev, test, use)

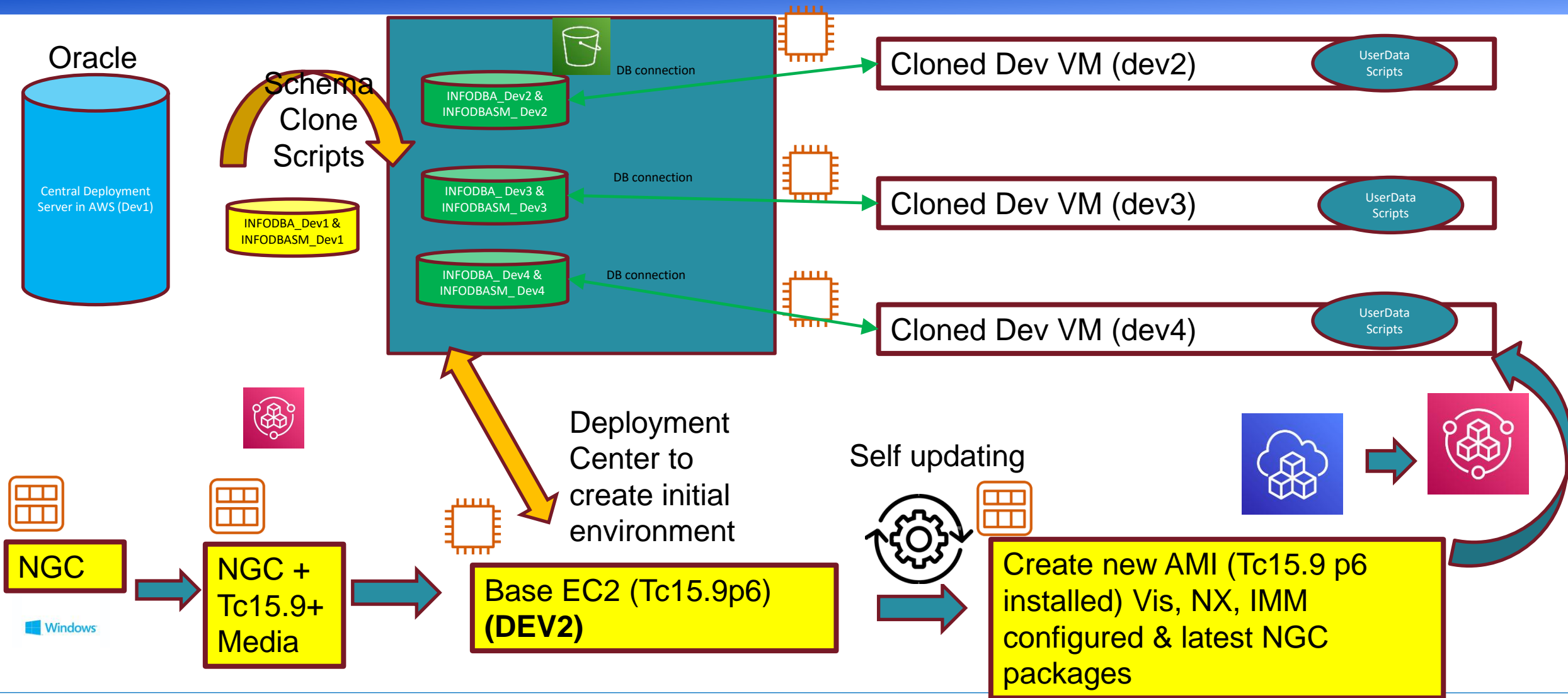
Every workstation needs a corresponding database schema that is ready and available



Objective: Create Dev workstations quickly (< 15 mins) with Teamcenter releases

Infrastructure as Code (IaC) (2 of 2)

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Blue / Green Exploration (1 of 3)

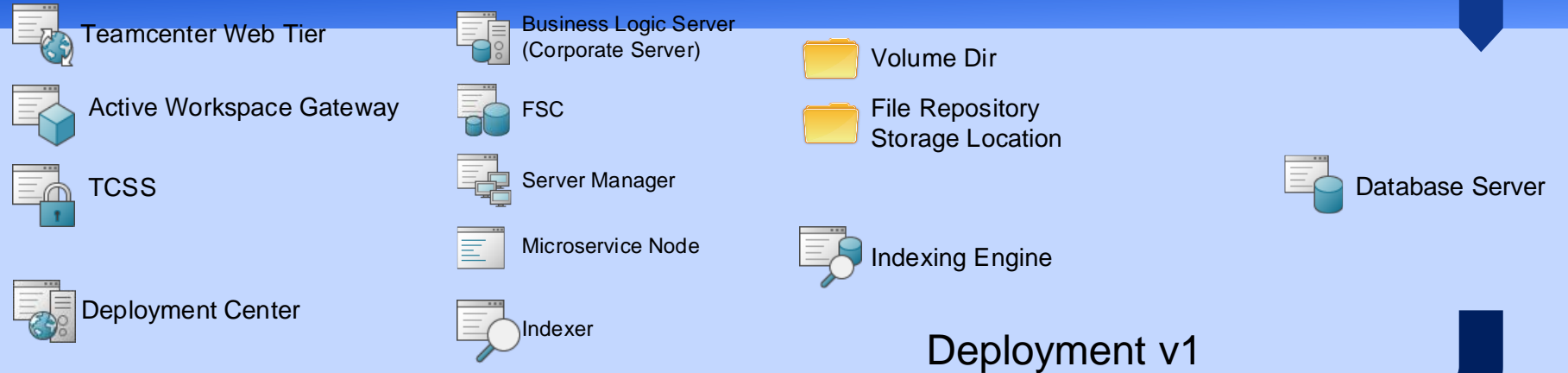
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Blue / Green Exploration (2 of 3)

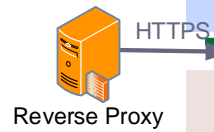
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INACTIVE



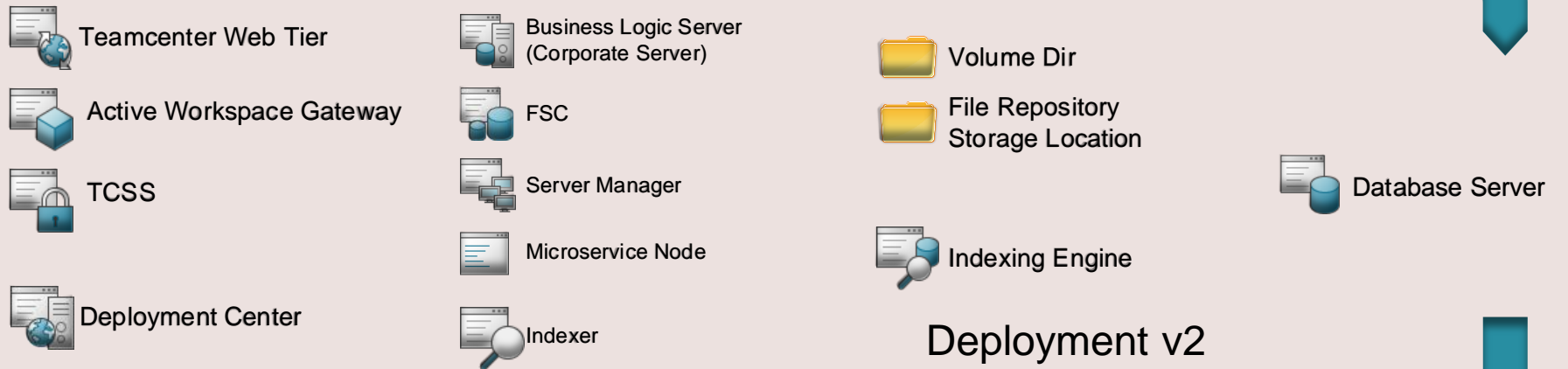
Deployment v1

Replication



HTTPS

ACTIVE



Deployment v2

Blue / Green Exploration (3 of 3)

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Questions?

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Links

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- AWS – vanilla images harnessed from NG AWS GovCloud
- Azure DevOps – scrubbed images harnessed from the NG on-prem version
- Cookie - <https://unsplash.com/photos/z8kriatLFdA>
- Cup of water - <https://unsplash.com/photos/aFbow3dw8QA>
- Hagrid Lego - <https://unsplash.com/photos/X8NBHEcGOll>
- Horse - <https://unsplash.com/photos/EXuKQaf3Ei8>
- Many hats - <https://unsplash.com/photos/vU2MmvDCmUo>
- Mjolnir – Thor’s Hammer - <https://unsplash.com/s/photos/thor>
- Matrix code - https://unsplash.com/photos/tiSE_paTt0A
- Own your error - <https://unsplash.com/photos/XWar9MbNGUY>
- Pipelines - drawn and designed by David Votaw
- Pipelines shiny - <https://unsplash.com/photos/7s2Szvqghd8>
- Puzzle piece - <https://unsplash.com/photos/DnXqvmS0eXM>
- Recycle - <https://unsplash.com/photos/aI4RJ--Mw4I>
- Ring - <https://unsplash.com/photos/QjLE11j5FT8>
- Skull - <https://unsplash.com/photos/1PtM6b85sdw>
- Slime - https://unsplash.com/photos/FNeDH_nWfcQ
- Questions - <https://unsplash.com/photos/AoqgGAqrLpU>