

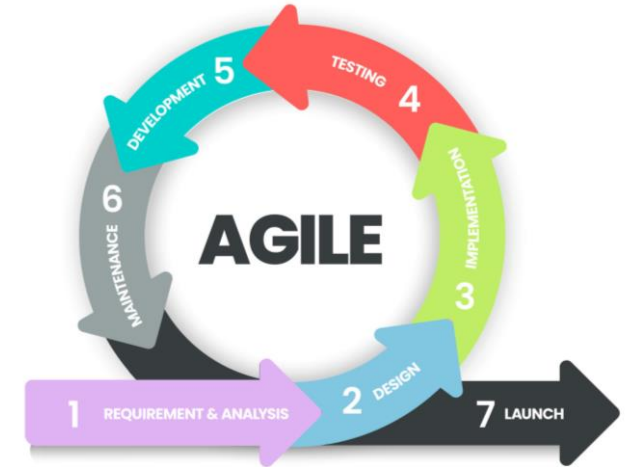
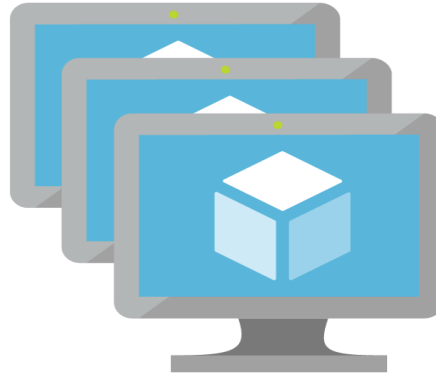
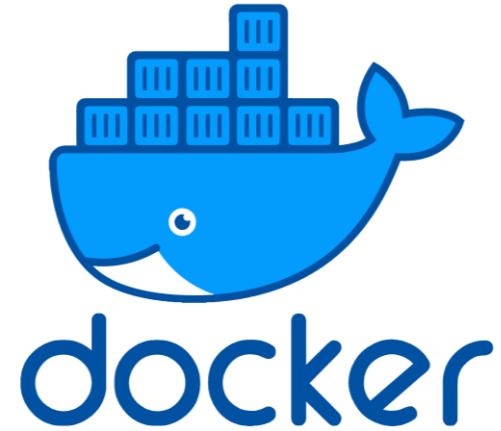
Automation Strategies for EPICS IOCs Deployment

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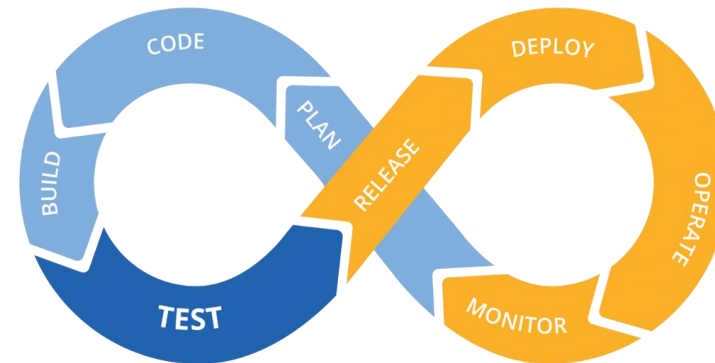
- Consistency and Standardization
- Version Control and Reproducibility
- Time Efficiency
- Improved Reliability
- Scalability
- Remote and Distributed Deployments



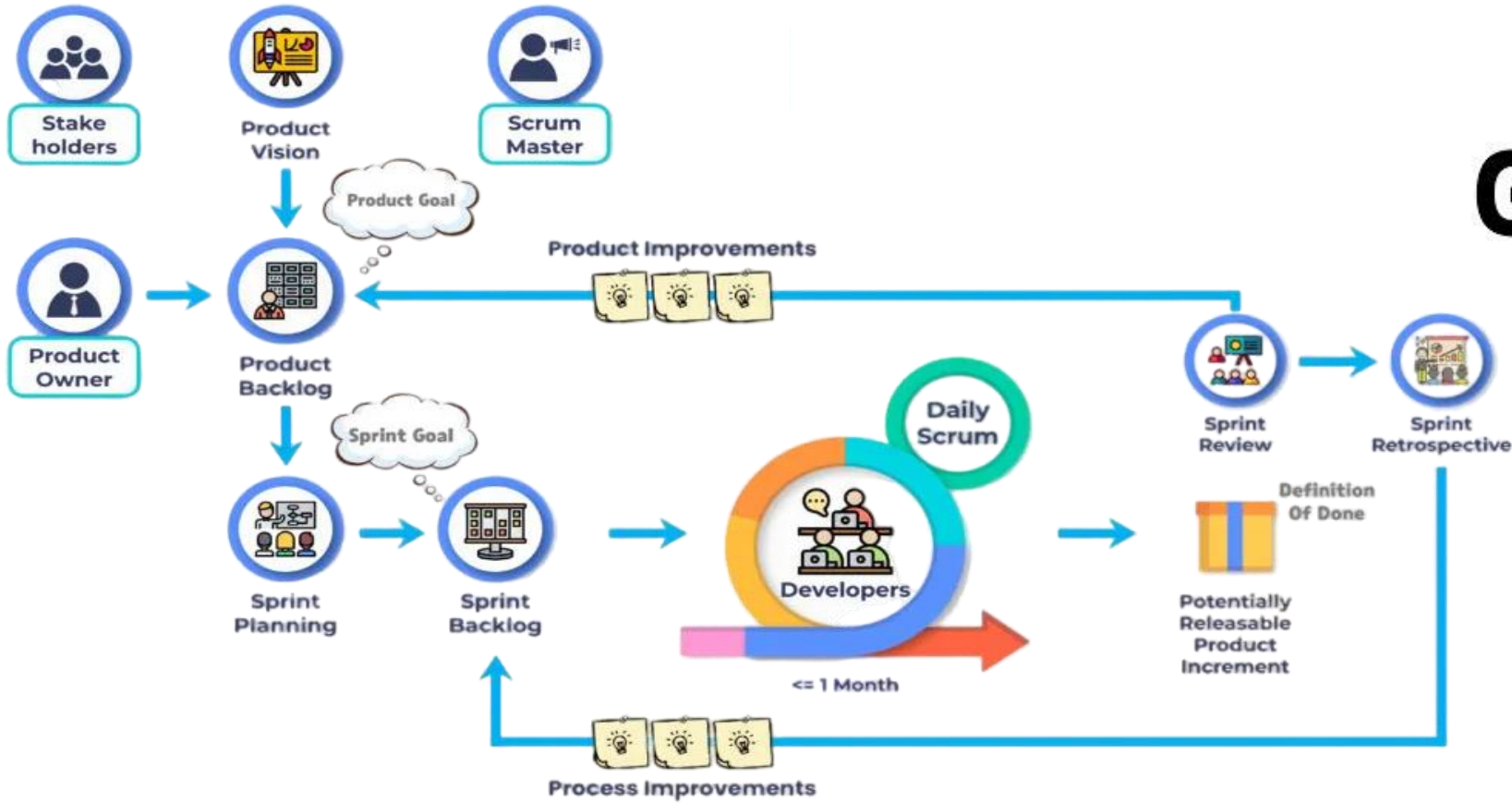
Automation Tools



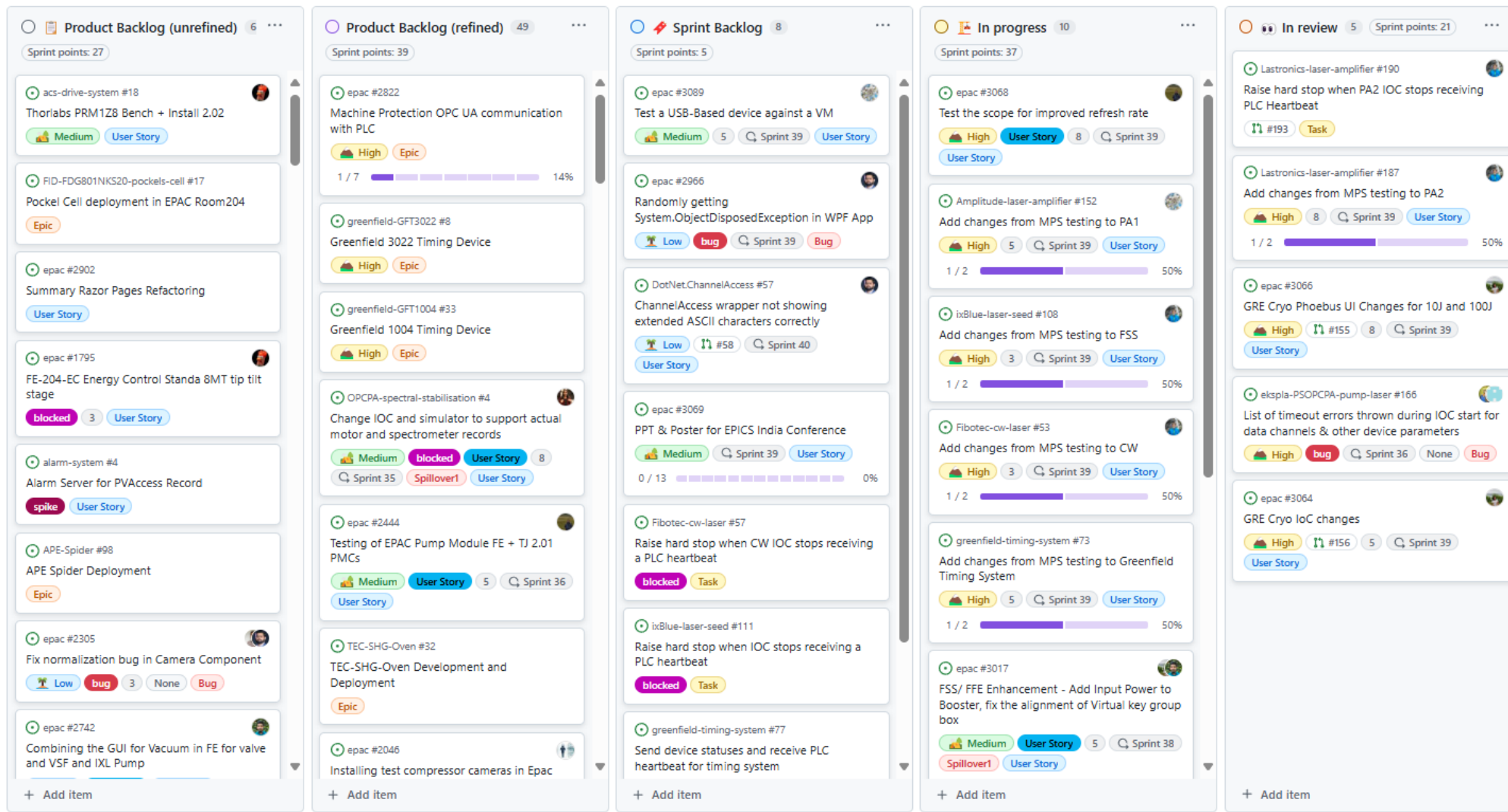
ANSIBLE



Development Process



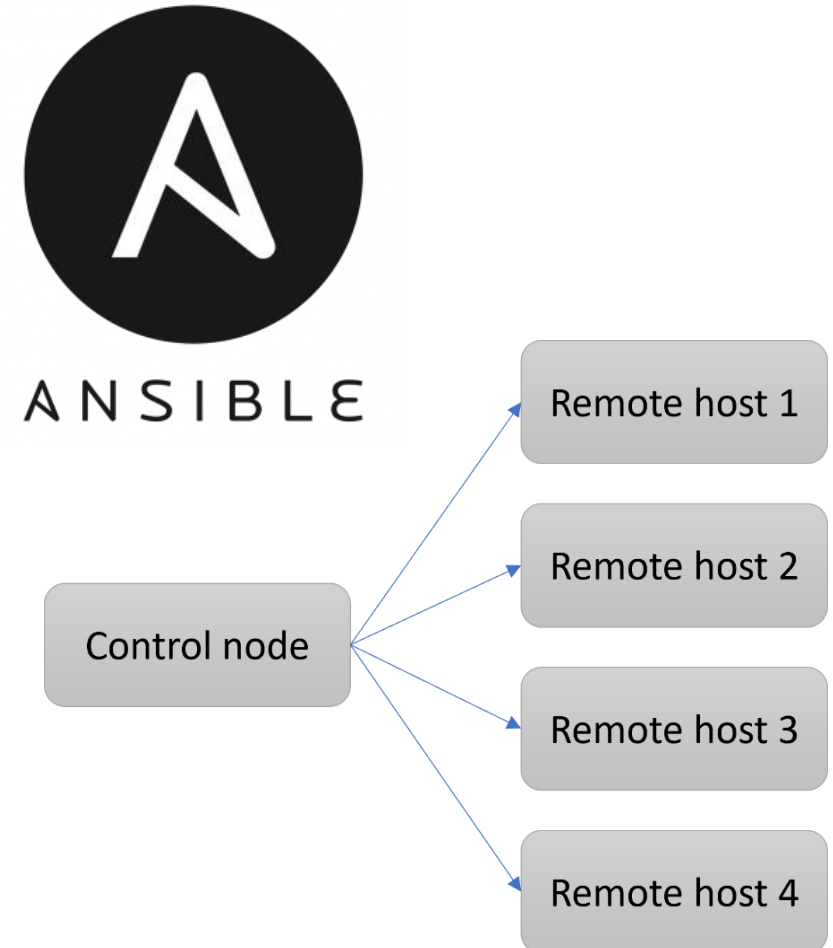
Development Process



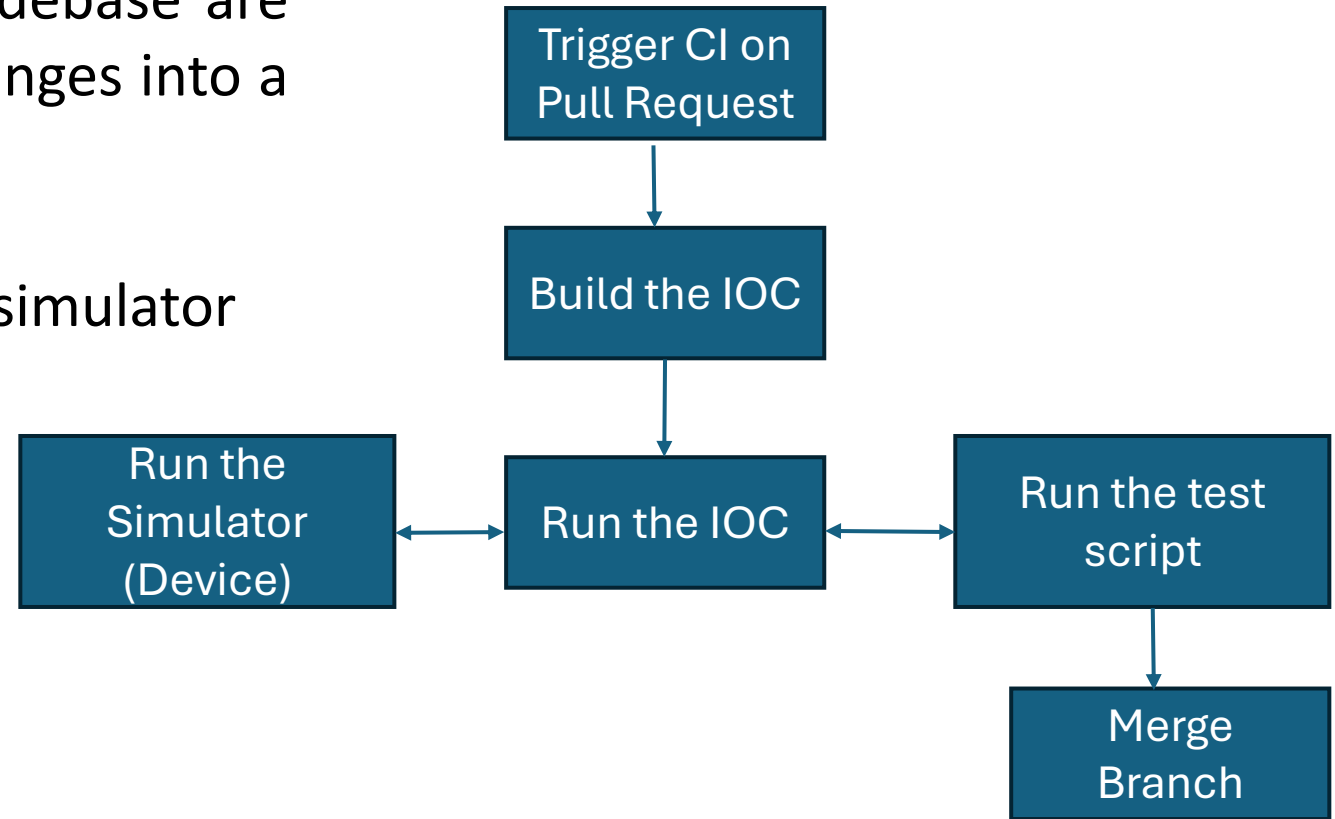
The image displays a Jira development process board with five columns:

- Product Backlog (unrefined):** 6 items. Sprint points: 27. Items include:
 - acs-drive-system #18 (Medium, User Story)
 - FID-FDG801NK520-pockels-cell #17 (Epic)
 - epac #2902 (User Story)
 - epac #1795 (blocked, 3, User Story)
 - alarm-system #4 (spike, User Story)
 - APE-Spider #98 (Epic)
 - epac #2305 (Low, bug, 3, None, Bug)
 - epac #2742
- Product Backlog (refined):** 49 items. Sprint points: 39. Items include:
 - epac #2822 (High, Epic, 14% progress)
 - greenfield-GFT3022 #8 (High, Epic)
 - greenfield-GFT1004 #33 (High, Epic)
 - OPCPA-spectral-stabilisation #4 (Medium, blocked, 8, User Story, Spillover1)
 - epac #2444 (Medium, User Story, 5, Sprint 36)
 - TEC-SHG-Oven #32 (Epic)
 - epac #2046
- Sprint Backlog:** 8 items. Sprint points: 5. Items include:
 - epac #3089 (Medium, 5, Sprint 39, User Story)
 - epac #2966 (Low, bug, 2, Sprint 39, Bug)
 - DotNet.ChannelAccess #57 (Low, 58, Sprint 40, User Story)
 - epac #3069 (Medium, Sprint 39, User Story)
 - Fibotec-cw-laser #57 (blocked, Task)
 - ixBlue-laser-seed #111 (blocked, Task)
 - greenfield-timing-system #77
- In progress:** 10 items. Sprint points: 37. Items include:
 - epac #3068 (High, User Story, 8, Sprint 39, User Story)
 - Amplitude-laser-amplifier #152 (High, 5, Sprint 39, User Story)
 - ixBlue-laser-seed #108 (High, 3, Sprint 39, User Story)
 - Fibotec-cw-laser #53 (High, 3, Sprint 39, User Story)
 - greenfield-timing-system #73 (High, 5, Sprint 39, User Story)
 - epac #3017 (Medium, User Story, 5, Sprint 38, Spillover1, User Story)
- In review:** 5 items. Sprint points: 21. Items include:
 - Lastronics-laser-amplifier #190 (#193, Task)
 - Lastronics-laser-amplifier #187 (High, 8, Sprint 39, User Story)
 - epac #3066 (High, 155, 8, Sprint 39, User Story)
 - ekspla-PSOPCPA-pump-laser #166 (High, bug, Sprint 36, None, Bug)
 - epac #3064 (High, 156, 5, Sprint 39, User Story)

- Deployment System based on Ansible helps to orchestrate software on multiple servers in reproducible way, making the whole process fast and safe
- Software environment dependencies are installed in automated manner using ansible



- DevOps best practice that uses automated testing to validate if changes to a codebase are correct and stable for merge code changes into a central repository
- Automated scripts validates unit test, simulator and EPICS software syntax



- Ansible to Install EPICS Base and Support Modules
- Configuration file to choose Release Version for installation

```
- import_playbook: epics_base.yml  
- import_playbook: epics_seq.yml  
- import_playbook: epics_asyn.yml  
- import_playbook: epics_autosave.yml  
- import_playbook: epics_pcre.yml  
- import_playbook: epics_ipac.yml  
- import_playbook: epics_busy.yml  
- import_playbook: epics_sscan.yml
```

```
# EPICS base version  
common_epics_base_version: "{{ version | default('R7.0.8.1') }}"  
  
# Name of EPICS base symlink  
common_epics_base_symlink: "{{ symlink | default('base') }}"  
  
# Version of area detector to install; Version R3-8 for ADVimba driver  
common_ad_version: "R3-12-1"  
  
# Version of asyn to install {4-33 for AD_VERSION-R3-5; 4-38 for AD_VERSION-R3-8}  
common_asyn_version: "R4-44"  
  
# Version of autosave to install  
common_autosave_version: "R5-11"  
  
# Version of busy to install  
common_busy_version: "R1-7-4"
```

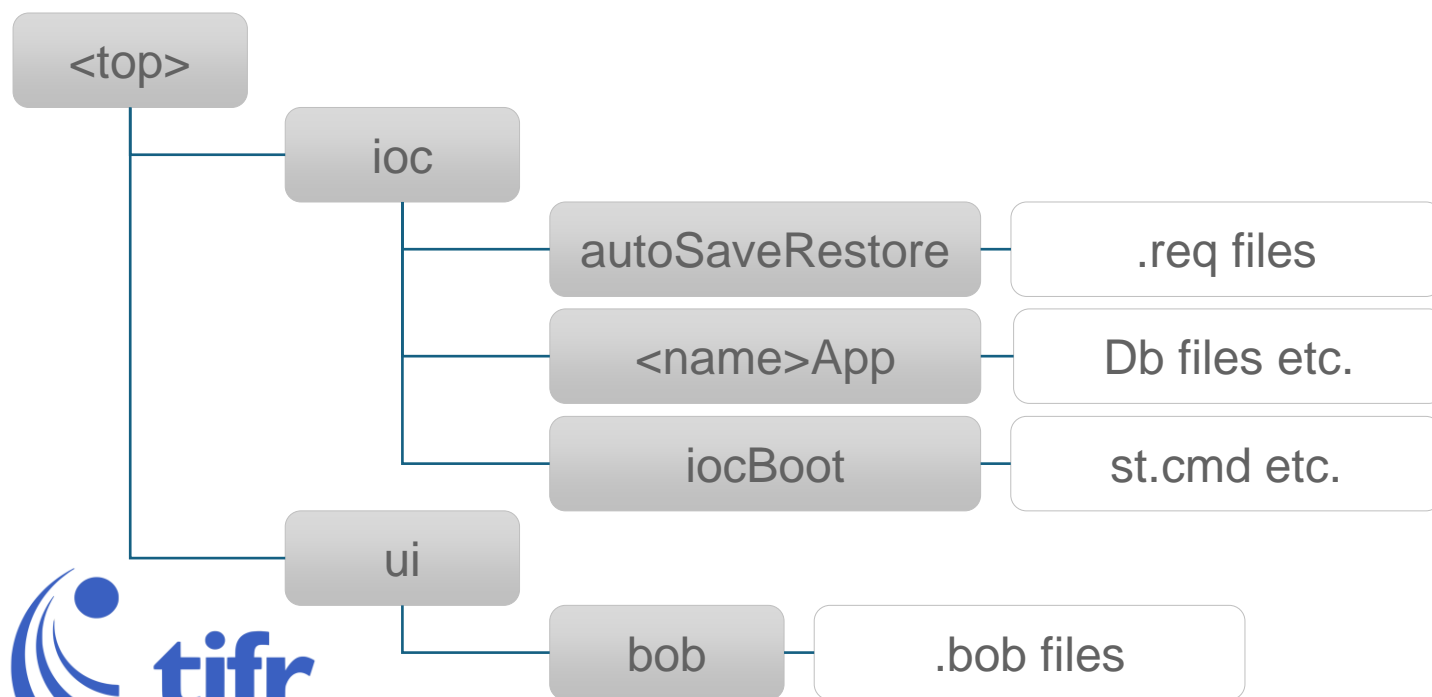

Process Setup

- Deployment system assumes one repository per IOC and a standardised directory structure
- No changes required to IOC
- Create one playbook per IOC
- repository_name and sha determine which repo and branch to clone
- The extra parameters are usually macros in st.cmd

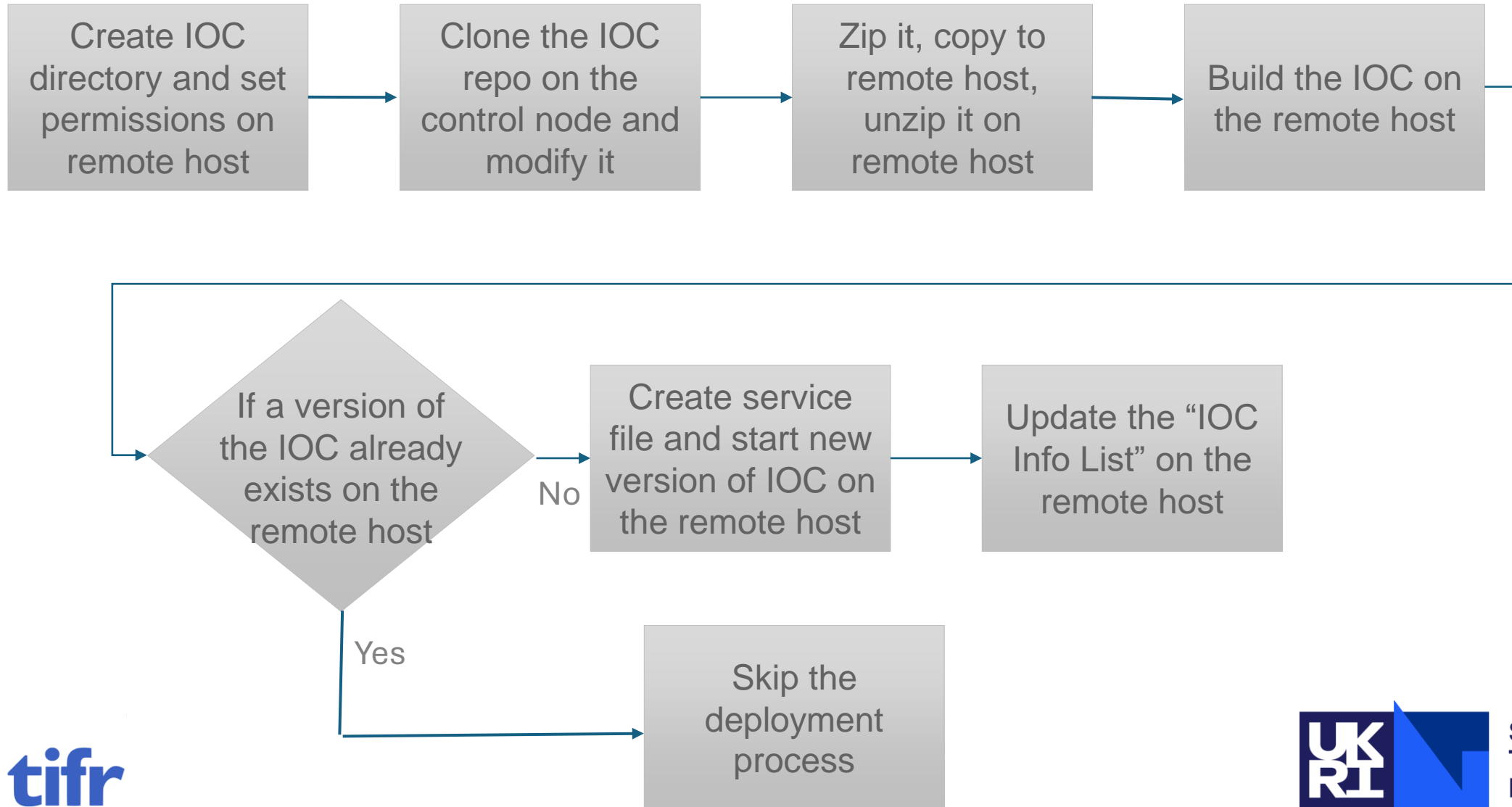
roles:

```
- role: ioc
  repository_name: gentec-maestro-energy-meter
  ioc_id: PM-201-FE-1-EM-1
  sha: development_epac
  vars:
    params:
      SHORT_NM: PM-201-FE-1-EM-1
      PORT: EM1
      DEVICE_IP: 192.168.211.66
      DEVICE_PORT: 5001
```

```
- role: ioc
  repository_name: gentec-maestro-energy-meter
  ioc_id: PM-201-FE-1-EM-2
  sha: development_epac
  vars:
    params:
      SHORT_NM: PM-201-FE-1-EM-2
      PORT: EM2
      DEVICE_IP: 192.168.211.67
      DEVICE_PORT: 5001
```



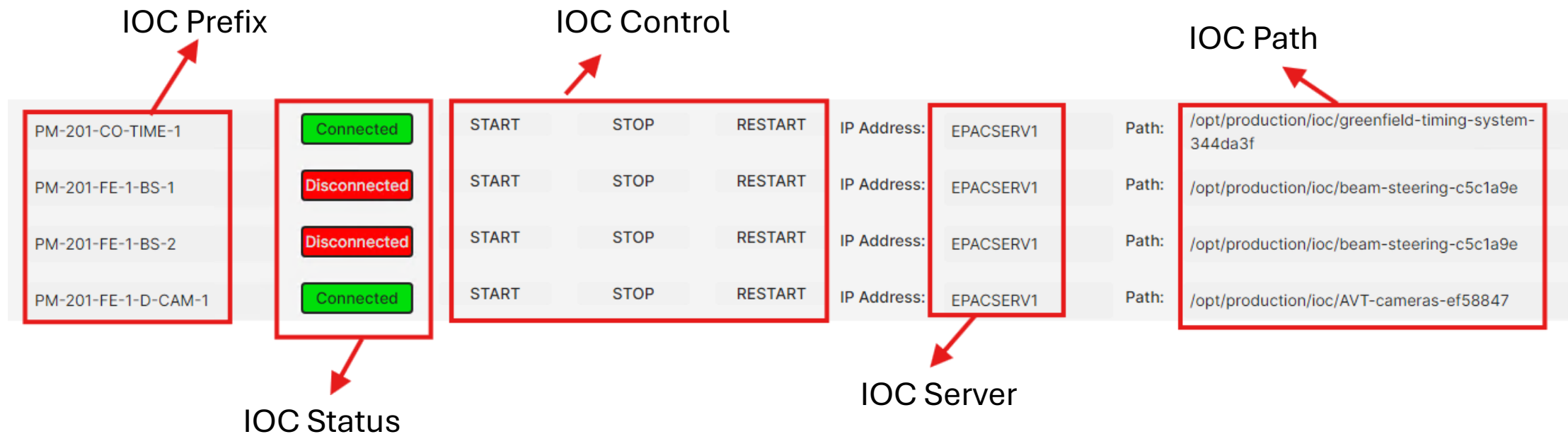
IOCs deployment Flow



- Uses *procServ* tool to launch an IOC
- Ensures IOCs start automatically at boot.
- Centralized control with systemd commands
- Automatic recovery and restart on failures
- Easy debugging with system logs
- Manages multiple IOCs effortlessly with separate service files

- Process Server - A utility to manage IOC processes in a controlled manner
- Runs as a daemon into the background
- Use of UNIX socket (rather than traditional telnet port)
- Logs IOC console messages

Managing IOCs on UI page



- ioc – The CLI tool to manage *IOCs* running on Linux server

Usage:

```
pqo22979@EPACSERV2:~$ ioc help
```

```
This CLI tool helps you manage IOC installed on this server.
```

```
Usage:
```

```
  ioc {flags}  
  ioc <command> {flags}
```

```
Commands:
```

```
  attach          attach to running IOC  
  help           displays usage informationn  
  ls             list iocs  
  start          start IOC  
  stop           stop IOC  
  version        displays version number
```

```
Flags:
```

```
  -h, --help      displays usage information of the application or a command (default: false)  
  -v, --version   displays version number (default: false)
```

```
pqo22979@EPACSERV2:~$ ioc ls
```

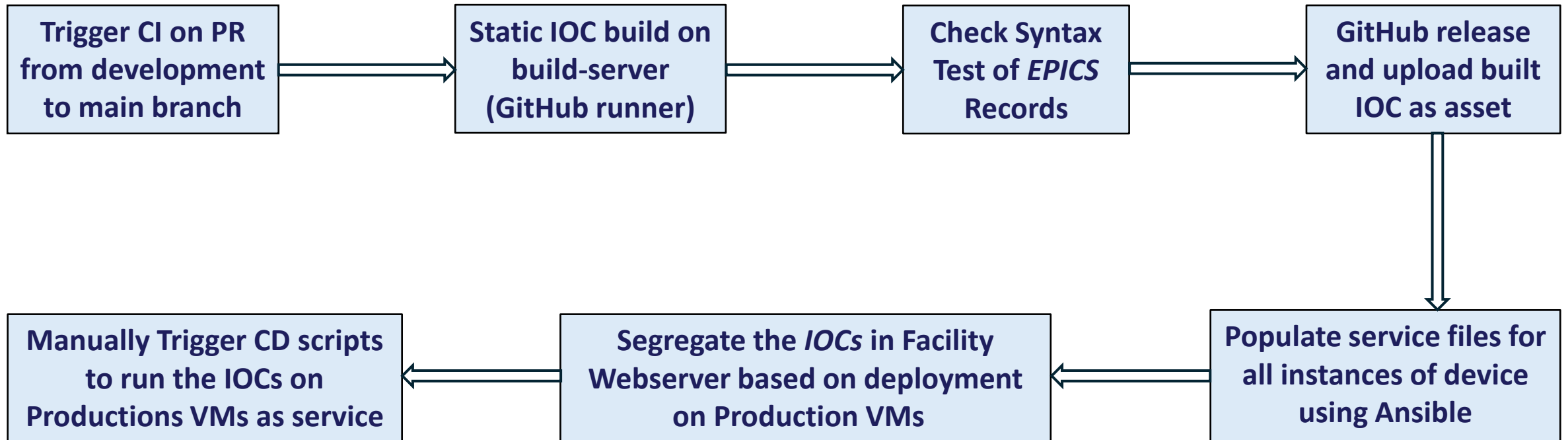
NAME	VERSION	STATUS	AGE	CREATED
PM-201-BT-D-CAM-1	8579512	running	3 weeks	2024-10-24 06:49:32.568707787 +0100 BST
PM-201-BT-D-CAM-2	8579512	running	3 weeks	2024-10-24 06:50:23.616308999 +0100 BST
PM-201-BT-D-CAM-3	8579512	running	3 weeks	2024-10-24 06:51:15.095932443 +0100 BST
PM-201-BT-D-CAM-4	8579512	running	3 weeks	2024-10-24 06:52:05.23155887 +0100 BST
PM-201-CO-CW-1	2392447	running	1 week	2024-10-24 09:06:02.921361683 +0100 BST
PM-201-FE-1-D-CAM-CR-PA-2	8579512	running	3 weeks	2024-10-24 06:37:33.158254732 +0100 BST
PM-201-HJ-1-DF-D-CAM-1	8a5a5ca	running	3 weeks	2024-06-11 14:20:37.76825574 +0100 BST
PM-201-HJ-1-P-1-D-CAM-1	8579512	running	3 weeks	2024-10-24 06:38:24.717872306 +0100 BST

```
pqo22979@EPACSERV2:~$ ioc attach PM-201-BT-D-CAM-1
```

```
@@@ Welcome to procServ (procServ Process Server 2.7.0)
@@@ Use ^X to kill the child, auto restart is OFF, use ^T to toggle auto restart
@@@ procServ server PID: 3541554
@@@ Server startup directory: /opt/production/ioc/AVT-cameras-8579512/PM-201-BT-D-CAM-1/ioc/iocBoot/iocavt
@@@ Child startup directory: /opt/production/ioc/AVT-cameras-8579512/PM-201-BT-D-CAM-1/ioc/iocBoot/iocavt
@@@ Child started as: ./st.cmd
@@@ Child "./st.cmd" PID: 3541573
@@@ procServ server started at: Mon Nov  4 04:41:13 2024
@@@ Child "./st.cmd" started at: Mon Nov  4 04:41:13 2024
@@@ 0 user(s) and 0 logger(s) connected (plus you)
epics>
epics>
```

What about IOCs on Windows?

- No automation as of now.
- PowerShell bat file to launch IOCs using *procServ*.



- Replace Physical server with VM
- Developers will have restricted access to production VMs, limited to starting and stopping IOCs.
- Each environment will have a dedicated Debug VM with necessary tools. Once an issue is resolved, the standard deployment cycle will resume based on the issue's severity.
- Developers should use VMs on their PCs for development instead of their local machines.



- Open-source virtualization management platform.
- Cluster Management: Seamless management of multiple nodes
- Live migration of VMs for High Availability



PROXMOX

Thank You!