



MARCH 18-22, 2024
SAN FRANCISCO, CA

MergeBot: Activision's Merge and Resolve Infrastructure

Damianos Gkouzkouris – Senior Tools Engineer

Who am I?



Who am I?



Compass



MergeBot

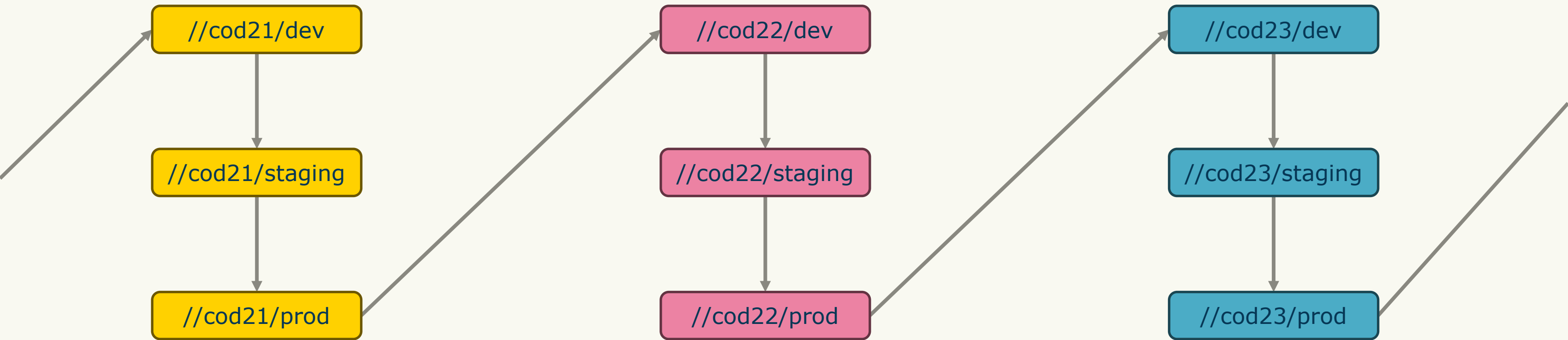


SENTRY

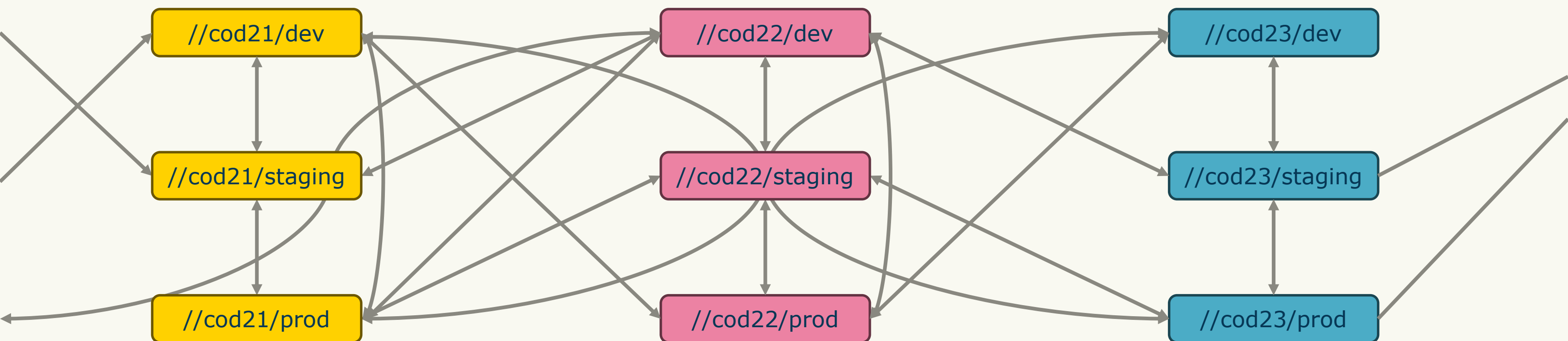
Agenda

- Problem Statement
- Prior Approaches
- Desired Features
- Mergebot Overview
- Lessons Learned
- Future Plans
- Questions

Our (ideal) integration needs

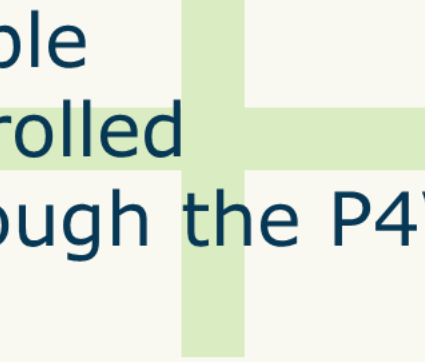


Our (real) integration needs



Previous Approaches

Local Integrations

- Easily customizable
 - 100% User Controlled
 - Can be done through the P4V UI
- 
-
- Need constant user communication
 - Resolves must be done by one user
 - Can be memory and disk intensive
 - High latency

Previous Approaches

Custom CI Jobs

- Easily monitored by everyone
- Can be scheduled
- Virtually unlimited resources

- Resolves require access to the integration worker
- Need different scripts per integration
- No access to dedicated UI
- Not resumable

Desired Features

- Universal UI accessible by everyone
- Easily customizable integrations
- Conflict resolution by multiple users at the same time
- Efficient logging
- Changelist cherry picking
- Testing the changes before submitting them in the CI
- History records of past integrations
- Integration triggers based on user input, cronjobs and commit tracking

Requirements and Features

Configuration

- Yaml files with strict schemas
- Auxiliary toggles in the UI for specific features

Conflict Resolution

- Installable app (Resolvvy) that communicates with the conflicts pod
- Email and slack notifications to users responsible for conflicts

Sample Configuration

```
- source: "//cod22/main"
  target: "//cod23/dev"
  view: ["//cod22/main/... //cod23/dev/...",
        | | | | "-//cod22/main/audio/... //cod23/dev/audio/..."]
  reviewers: [test_user_8]
  integration_mode: integrate_and_commit
  impersonate_user: True
  presubmit_url: https://compass.activision.com/api/presubmit/
  lock_stream: False
  resolver: mergebot.resolve_plugins.to_cod23.resolve
  cron: '0 0 * * *'
```

Mergebot UI (Overview)

The screenshot displays the Mergebot UI interface. At the top, a dark blue navigation bar contains the Mergebot logo, 'Home', 'Show all integrations' (with a toggle switch), 'Custom Integration', 'Force Reload Configs' (with a question mark icon), and 'logout'. Below the navigation bar, the 'Integrations' section is active, showing three tabs: '//cod21', '//cod22', and '//cod23'. The '//cod23' tab is selected. The main content area is divided into three sections: 'main', 'staging', and 'dev'. Each section shows a list of integration runs with their status, a 'Restart' button, and the source branch. The 'main' section shows a 'Files reverted' status for //cod21/main. The 'staging' section shows an 'Exception: Cannot acquire lock for //cod23/staging' for //cod23/dev, a 'Cancelled' status for //cod22/staging, and a 'Committed' status for //cod21/main. The 'dev' section shows a 'Committed' status for //cod22/main.

Branch	Integration	Status	Restart
main	//cod21/main	Files reverted (details)	Restart
	//cod21/main	Committed (details)	Restart
staging	//cod23/dev	Exception: Cannot acquire lock for //cod23/staging (details)	Restart
	//cod22/staging	Cancelled (details)	Restart
dev	//cod22/main	Committed (details)	Restart

Mergebot UI (Detailed View)

Mergebot

HomeCustom Integration

Force Reload Configs?logout

Integration

//cod23/.staging.//cod21/main.from (Paused)UnpauseRestartResumeRevertForce Copy>Show HistoryDisable Mails

Enable Slack Updates

//cod21/main→ //cod23/staging (28 Nov 2023 19:00:01)

Status

Files revertedAutocommit: On

Resolve Conflicts (Resolvvy) | Resolvvy Utility | Integration id: 251346

//cod23/staging/audio/gunshot.wavQuick ResolveLast User:

Changelist

15402781p4 infoRun Command

Presubmit Build

-

Changes

Search

Select VisibleDeselect Visible

1535278515359712

☐ Check recursively

☒ Include Extensionsexe,doc,py

Select Dependent CLs

☐ Change @15359712 by: Reverting's changelist

☐ Change @15352847 by: New gunshot sound

☐ Change @15352785 by: Updated all sound effects for cod23

Cherrypick

Integrating up to

CL15397157

Integrate up to a different changelist:15397157IntegrateForce Copy

Mergebot UI (Custom Integration)

Mergebot

Home

Show all integrations

Custom Integration

Force Reload Configs

logout

Integration

test_user_8.custom

Source

//cod22/dev

Target

//cod22/staging

Folder

audio/...

P4 Username

test_user_8

Changelist

Branchspec

Detect Changes

Info

Revert

//cod22/dev → //cod22/staging

Status

Conflicts successfully resolved

Commit

Changelist

1358473

p4 info

Run Command

Changes

Search

Select Visible

Deselect Visible

☐ Check recursively

☒ Include Extensions

exe,doc,py

Select Dependent CLs

☐ Change @1245746 by test_user_8: Updating gunshot sounds

Cherrypick

Requirements and Features

Architecture

- Backend: Python w/ Flask
- Frontend: JS w/ ReactJS (One Page App)

Metrics / Telemetry

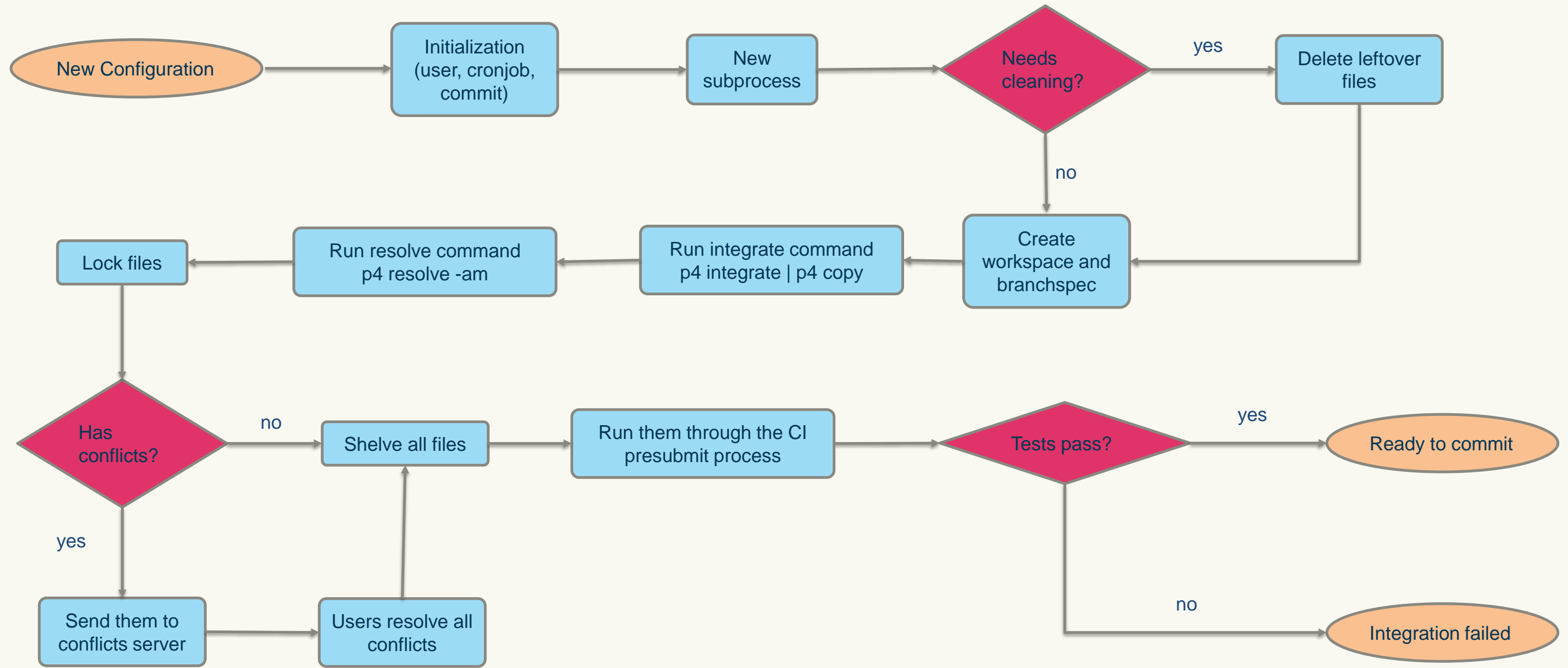
- Sentry for crash reporting
- Prometheus/Grafana for resource monitoring
- Elasticsearch/Kibana for logging

Requirements and Features

Kubernetes Orchestration

- Main pod for running the integrations.
>100GB RAM, >32 Cores CPU, ~10TB Disk
- Redis pod for integration historic metadata + user info
- Conflicts api server
- Mysql pod for conflict data
- Elasticsearch for storing logs

Sample Workflow



Conflict Resolution

- Arguably the most important functionality
- It is applied in 4 parts:
 1. p4 resolve -am
 2. custom user script resolution
 3. dedicated tools
 4. local user resolves
- Optimizing methods 2 and 3 minimizes the time needed for 4

Resolvvy

File Edit View Help

Integration

312627

From: //cod21/main
To: //cod23/staging

Filter

☒ Unresolved ☒ Resolved

☐ User Name P4 username

☐ Filename Search for files

Interactive Merge

Clear Resolution

Accept Original

Accept Incoming

Custom Resolver

Show in P4V

Diff Files

YIRA ira

Dump Conflicts

Refresh

File	Resolution	Last User	User (incon	Resolved By	Original	Incoming	Base	Resolve Type	Conflicts
audio/car2.wav	user resolved	test_user_6	test_user_9	test_user_9 (Sat, 09...	//cod23/staging #74 (text, edit)	//cod21/main #54 (text, integrate)	//cod21/dev #73 (text, integrate)	content (3waytext)	22
audio/car3.wav	accept ...	test_user_7	test_user_6	test_user_6 (Sat, 09...	//cod23/staging #9 (text, edit)	//cod21/main #84 (text, edit)	//cod21/dev #15 (text, integrate)	content (3waytext)	15
audio/car4.wav	undecided	test_user_4	test_user_7		//cod23/staging #11 (text, edit)	//cod21/main #75 (text, edit)	//cod21/dev #53 (text, integrate)	content (3waytext)	1
audio/gunshot.wav	undecided	test_user_4	test_user_1		//cod23/staging #84 (text, edit)	//cod21/main #1 (text, edit)	//cod21/dev #67 (text, edit)	content (3waytext)	13
audio/laugh1.wav	undecided	test_user_2	test_user_3		//cod23/staging #87 (text, edit)	//cod21/main #41 (text, edit)	//cod21/dev #2 (text, integrate)	content (3waytext)	1
audio/laugh2.wav	undecided	test_user_7	test_user_5		//cod23/staging #58 (text, edit)	//cod21/main #87 (text, integrate)	//cod21/dev #74 (text, edit)	content (3waytext)	10
audio/laugh3.wav	user resolved	test_user_4	test_user_7	test_user_4 (Sat, 09...	//cod23/staging #2 (text, integrate)	//cod21/main #48 (text, edit)	//cod21/dev #94 (text, integrate)	content (3waytext)	10
audio/laugh5.wav	undecided	test_user_9	test_user_6		//cod23/staging #68 (text, edit)	//cod21/main #34 (text, edit)	//cod21/dev #89 (text, edit)	content (3waytext)	23
audio/laugh6.wav	keep original	test_user_5	test_user_3	test_user_9 (Sat, 09...	//cod23/staging #22 (text, edit)	//cod21/main #87 (text, edit)	//cod21/dev #14 (text, edit)	content (3waytext)	22
audio/scream2.wav	accept ...	test_user_5	test_user_3	test_user_7 (Sat, 09...	//cod23/staging #12 (text, edit)	//cod21/main #57 (text, edit)	//cod21/dev #69 (text, edit)	content (3waytext)	4
audio/scream3.wav	user resolved	test_user_8	test_user_3	test_user_3 (Sat, 09...	//cod23/staging #69 (text, edit)	//cod21/main #79 (text, integrate)	//cod21/dev #27 (text, integrate)	content (3waytext)	14
audio/scream1.wav	undecided	test_user_6	test_user_8		//cod23/staging #87 (text, edit)	//cod21/main #99 (text, integrate)	//cod21/dev #67 (text, edit)	content (3waytext)	24
audio/speech2.wav	user resolved	test_user_1	test_user_8	test_user_1 (Sat, 09...	//cod23/staging #30 (text, integrate)	//cod21/main #45 (text, edit)	//cod21/dev #38 (text, integrate)	content (3waytext)	14
audio/laugh4.wav	keep original	test_user_5	test_user_7	test_user_8 (Sat, 09...	//cod23/staging #39 (text, integrate)	//cod21/main #67 (text, edit)	//cod21/dev #81 (text, edit)	content (3waytext)	15
audio/speech1.wav	undecided	test_user_5	test_user_8		//cod23/staging #36 (text, edit)	//cod21/main #14 (text, edit)	//cod21/dev #39 (text, integrate)	content (3waytext)	21
audio/car1.wav	accept ...	test_user_6	test_user_8	test_user_1 (Sat, 09...	//cod23/staging #10 (text, edit)	//cod21/main #99 (text, integrate)	//cod21/dev #27 (text, edit)	content (3waytext)	16

Details

Interchanges History

Resolvvy (cont'd)

Resolvvy

File Edit View Help

Integration

312627

From: //cod21/main
To: //cod23/staging

Filter

☒ Unresolved ☒ Resolved

☒ User Name test_user_8

☐ Filename Search for files

Interactive Merge Clear Resolution Accept Original Accept Incoming Custom Resolver Show in P4V Diff Files JIRA Jira Dump Conflicts Refresh

File	Resolution	Last User	User (incon	Resolved By	Original	Incoming	Base	Resolve Type	Conflicts
audio/scream3.wav	user resolved	test_user_8	test_user_3	test_user_3 (Sat, 09...	//cod23/staging #69 (text, edit)	//cod21/main #79 (text, integrate)	//cod21/dev #27 (text, integrate)	content (3waytext)	14
audio/scream1.wav	undecided	test_user_6	test_user_8		//cod23/staging #87 (text, edit)	//cod21/main #99 (text, integrate)	//cod21/dev #67 (text, edit)	content (3waytext)	24
audio/speech2.wav	user resolved	test_user_1	test_user_8	test_user_1 (Sat, 09...	//cod23/staging #30 (text, integrate)	//cod21/main #45 (text, edit)	//cod21/dev #38 (text, integrate)	content (3waytext)	14
audio/laugh4.wav	keep original	test_user_5	test_user_7	test_user_8 (Sat, 09...	//cod23/staging #39 (text, integrate)	//cod21/main #67 (text, edit)	//cod21/dev #81 (text, edit)	content (3waytext)	15
audio/speech1.wav	undecided	test_user_5	test_user_8		//cod23/staging #36 (text, edit)	//cod21/main #14 (text, edit)	//cod21/dev #39 (text, integrate)	content (3waytext)	21
audio/car1.wav	accept ...	test_user_6	test_user_8	test_user_1 (Sat, 09...	//cod23/staging #10 (text, edit)	//cod21/main #99 (text, integrate)	//cod21/dev #27 (text, edit)	content (3waytext)	16
audio/scream4.wav	keep original	test_user_3	test_user_8	test_user_8 (Sat, 09...	//cod23/staging #81 (text, integrate)	//cod21/main #8 (text, edit)	//cod21/dev #70 (text, integrate)	content (3waytext)	13
audio/scream5.wav	user resolved	test_user_3	test_user_8	test_user_4 (Sat, 09...	//cod23/staging #61 (text, edit)	//cod21/main #97 (text, integrate)	//cod21/dev #99 (text, edit)	content (3waytext)	10

Details Interchanges History

Resolvvy (cont'd)

Resolvvy

File Edit View Help

Integration

312627

From: //cod21/main
To: //cod23/staging

Filter

☒ Unresolved ☒ Resolved

☒ User Name P4 username

☒ Filename laugh

Interactive Merge Clear Resolution Accept Original Accept Incoming Custom Resolver Show in P4V Diff Files JIRA Jira Dump Conflicts Refresh

File	Resolution	Last User	User (incon	Resolved By	Original	Incoming	Base	Resolve Type	Conflicts
audio/laugh1.wav	undecided	test_user_2	test_user_3		//cod23/staging #87 (text, edit)	//cod21/main #41 (text, edit)	//cod21/dev #2 (text, integrate)	content (3waytext)	1
audio/laugh2.wav	undecided	test_user_7	test_user_5		//cod23/staging #58 (text, edit)	//cod21/main #87 (text, integrate)	//cod21/dev #74 (text, edit)	content (3waytext)	10
audio/laugh3.wav	user resolved	test_user_4	test_user_7	test_user_4 (Sat, 09...	//cod23/staging #2 (text, integrate)	//cod21/main #48 (text, edit)	//cod21/dev #94 (text, integrate)	content (3waytext)	10
audio/laugh4.wav	keep original	test_user_5	test_user_7	test_user_8 (Sat, 09...	//cod23/staging #39 (text, integrate)	//cod21/main #67 (text, edit)	//cod21/dev #81 (text, edit)	content (3waytext)	15
audio/laugh5.wav	undecided	test_user_9	test_user_6		//cod23/staging #68 (text, edit)	//cod21/main #34 (text, edit)	//cod21/dev #89 (text, edit)	content (3waytext)	23
audio/laugh6.wav	keep original	test_user_5	test_user_3	test_user_9 (Sat, 09...	//cod23/staging #22 (text, edit)	//cod21/main #87 (text, edit)	//cod21/dev #14 (text, edit)	content (3waytext)	22

Details Interchanges History

Presubmit Testing on Compass

- Testing is an integral part of Call of Duty
- In-house CI platform (Compass) needs to verify changes
- Not every integration should be committed after resolving conflicts
- Not every integration can pass the presubmit tests
- 2 solutions:
 1. Revert the integration and fix the issues on source branch
 2. Commit the changes and start work on fixing the issues on target branch

Lessons Learned

- Perforce monitoring is crucial
- Overconfiguration can become an issue
- Not everything can be automated
- Not everything can be predicted
- Fine-tuned alerts **WILL** save time and money
- Reliability always beats speed

Current State of Mergebot

279 Different Configurations

112 Active Configurations

>30 Configuration changes per week

>400 Successful Merges per week

>10TB worth of files integrated per week

Future Plans

- Improve custom integrations
- UI revamp
- Containerize individual integration jobs
- Stale configuration archiving

Special Thanks

Jan Van Valburg

Bryan Nogradi

John Goldsworthy

Daniel Gleason

The Central Tech team

Questions?