CHEP 2024 | WARWICK | LHCb

Krakow, Poland

Streamlined Production and Submission of LHCb MC Requests

Scan me!

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A Anatomy of a Request

I want 100,000 events per magnet polarity of

$$D^+ \to K^-\pi^+\pi^+$$
$$B_S^0 \to K^{*0}\overline{K}^{*0} \to K^+\pi^-K^-\pi^+$$

In 2016 and 2024 pp conditions

Many 'basic' configs exist

- years 8+
- detector conditions 10+
- decays >?

Need a way to define what a request is

LbMCSubmit

- Def basic request w/ yaml
- Can convert to full request
- Runnable on the Grid
- Automatically used via GitLab
- Python package
  -> Easy to maintain

Basic Config

```
sim-version: 10
name: Ds2Kpipi + K*K*
inform:
  - a.user@cern.ch
WG: B2OC

samples:
  - event-types:
     23103005: 100k
     13104007: 100k
    data-types:
      - 2016
      - 2024
```

Complete Config

```
- type: Simulation
priority: 2a
name: Ds2KKpi 2012 pp MagUp
mc_config_version: '2012'
sim_condition: Beam4000GeV-2012-MagUp-Nu2.5-Pythia8
author: null
inform:
- auser
- firstname.surname@cern.ch
comment: ''
wg: Charm
retention_rate: 1.0
event_types:
- id: '21103030'
num_events: 100000
num_test_events: 10
- id: '27163001'
num_events: 100000
num_test_events: 10
steps:
- name: Sim091 - 2012 - MagUp - Pythia8
processing_pass: Sim091
visible: true
application:
name: Gauss
version: v49r24
binary_tag: x86_64-slc6-gcc48-opt
options:
- $APPCONFIGOPTS/Gauss/Sim08-Beam4000GeV-mu100-2012-nu2.5.py
- $APPCONFIGOPTS/Gauss/DataType-2012.py
- $APPCONFIGOPTS/Gauss/RICHRandomHits.py
- $APPCONFIGOPTS/Gauss/NoPacking.py
- $DECFILESROOT/options/@{eventType}.py
- $LBPYTHIA8ROOT/options/Pythia8.py
- $APPCONFIGOPTS/Gauss/G4PL_FTFP_BERT_EmNoCuts.py
data_pkgs:
- AppConfig.v3r412
- Gen/DecFiles.v30r87
input: []
output:
- type: SIM
visible: false
dbtags:
DDDB: dddb-20170721-2
CondDB: sim-20160321-2-vc-mu100
- name: Digi14c for 2012
processing_pass: Digi14c
visible: false
application: Boole/v30r4
options:
- $APPCONFIGOPTS/Boole/Default.py
- $APPCONFIGOPTS/Boole/DataType-2012.py
- $APPCONFIGOPTS/Boole/NoPacking.py
- $APPCONFIGOPTS/Boole/Boole-SetOdinRndTrigger.py
data_pkgs:
- AppConfig.v3r412
input:
- type: SIM
visible: false
output:
- type: DIGI
visible: false
- name: L0 emulation for 2012 - TCK 0x0045
processing_pass: L0Trig0x0045
visible: false
application: Moore/v24r4
options:
- $APPCONFIGOPTS/L0App/L0AppSimProduction.py
- $APPCONFIGOPTS/L0App/L0AppTCK-0x0045.py
- $APPCONFIGOPTS/L0App/DataType-2012.py
data_pkgs:
- AppConfig.v3r412
input:
- type: DIGI
visible: false
output:
- type: DIGI
visible: false
options_format: l0app
- name: TCK-0x409f0045 Flagged for 2012
processing_pass: Trig0x409f0045
visible: true
application:
name: Moore
version: v14r8p1g1
binary_tag: x86_64-slc5-gcc46-opt
options:
-
$APPCONFIGOPTS/Moore/MooreSimProductionForSeparateL0AppStep.py
- $APPCONFIGOPTS/Conditions/TCK-0x409f0045.py
- $APPCONFIGOPTS/Moore/DataType-2012.py
data_pkgs:
- AppConfig.v3r412
input:
- type: DIGI
visible: false
output:
- type: DIGI
visible: false
- name: Reco14c for MC 2012
processing_pass: Reco14c
visible: true
application:
name: Brunel
version: v43r2p13
binary_tag: x86_64-slc5-gcc46-opt
options:
- $APPCONFIGOPTS/Brunel/DataType-2012.py
- $APPCONFIGOPTS/Brunel/MC-WithTruth.py
- $APPCONFIGOPTS/Brunel/Sim09-Run1.py
- $APPCONFIGOPTS/Persistency/DST-multiplexTCK-2012.py
data_pkgs:
- AppConfig.v3r412
input:
- type: DIGI
visible: false
output:
- type: DST
visible: false
- name: Stripping21NoPrescalingFlagged for 2012
processing_pass: Stripping21NoPrescalingFlagged
visible: true
application: DaVinci/v36r1p5
options:
- $APPCONFIGOPTS/DaVinci/DV-Stripping21-Stripping-MC-NoPrescaling.py
- $APPCONFIGOPTS/DaVinci/DV-RedoCaloPID-Stripping21.py
- $APPCONFIGOPTS/DaVinci/DataType-2012.py
- $APPCONFIGOPTS/DaVinci/InputType-DST.py
- $APPCONFIGOPTS/DaVinci/DV-Stripping-MC-muDST.py
data_pkgs:
- AppConfig.v3r412
input:
- type: DST
visible: false
- name: Merge for ALLSTREAMS.MDST
processing_pass: Merging
visible: false
application: DaVinci/v46r5
options:
- $APPCONFIGOPTS/Merging/DVMergeDST.py
- $APPCONFIGOPTS/DaVinci/DataType-2012.py
- $APPCONFIGOPTS/Merging/WriteFSR.py
- $APPCONFIGOPTS/Merging/MergeFSR.py
- $APPCONFIGOPTS/DaVinci/Simulation.py
data_pkgs:
- AppConfig.v3r412
input:
- type: ALLSTREAMS.MDST
visible: true
output:
- type: ALLSTREAMS.MDST
visible: true
options_format: merge
- type: Simulation
priority: 2a
name: Ds2KKpi 2016 pp MagUp
mc_config_version: '2016'
sim_condition: Beam6500GeV-2016-MagUp-Nu1.6-25ns-Pythia8
author: null
inform:
- auser
- firstname.surname@cern.ch
comment: ''
wg: Charm
retention_rate: 1.0
event_types:
- id: '21103030'
num_events: 100000
num_test_events: 10
- id: '27163001'
num_events: 100000
num_test_events: 10
steps:
- name: Sim091 - 2016 - MagUp - Pythia8
processing_pass: Sim091
visible: true
application:
name: Gauss
version: v49r24
binary_tag: x86_64-slc6-gcc48-opt
options:
- $APPCONFIGOPTS/Gauss/Beam6500GeV-mu100-2016-nu1.6.py
- $APPCONFIGOPTS/Gauss/Enable4pSpillover-25ns.py
- $APPCONFIGOPTS/Gauss/DataType-2016.py
- $APPCONFIGOPTS/Gauss/RICHRandomHits.py
- $DECFILESROOT/options/@{eventType}.py
- $LBPYTHIA8ROOT/options/Pythia8.py
- $APPCONFIGOPTS/Gauss/G4PL_FTFP_BERT_EmNoCuts.py
data_pkgs:
- AppConfig.v3r412
- Gen/DecFiles.v30r87
input: []
output:
- type: SIM
visible: false
dbtags:
DDDB: dddb-20170721-3
CondDB: sim-20170721-2-vc-mu100
- name: Digi14c for 2016+spillover
processing_pass: Digi14c
visible: false
application: Boole/v30r4
options:
- $APPCONFIGOPTS/Boole/Default.py
- $APPCONFIGOPTS/Boole/Enable4pSpillover.py
- $APPCONFIGOPTS/Boole/DataType-2015.py
- $APPCONFIGOPTS/Boole/Boole-SetOdinRndTrigger.py
data_pkgs:
- AppConfig.v3r412
input:
- type: SIM
visible: false
output:
- type: DIGI
visible: false
- name: L0 emulation for 2016 - TCK 0x160F
processing_pass: L0Trig0x160F
visible: false
application: Moore/v25r4
options:
- $APPCONFIGOPTS/L0App/L0AppSimProduction.py
- $APPCONFIGOPTS/L0App/L0AppTCK-0x160F.py
- $APPCONFIGOPTS/L0App/ForceL0TVersionV8.py
- $APPCONFIGOPTS/L0App/DataType-2016.py
data_pkgs:
- AppConfig.v3r412
input:
- type: DIGI
visible: false
output:
- type: DIGI
visible: false
options_format: l0app
- name: TCK-0x5138160F (HLT1) Flagged for 2016
processing_pass: Trig0x5138160F
visible: false
application: Moore/v25r4
options:
-
$APPCONFIGOPTS/Moore/MooreSimProductionForSeparateL0AppStep
2015.py
- $APPCONFIGOPTS/Conditions/TCK-0x5138160F.py
- $APPCONFIGOPTS/Moore/DataType-2016.py
- $APPCONFIGOPTS/Moore/MooreSimProductionHlt1.py
data_pkgs:
- AppConfig.v3r412
input:
- type: DIGI
visible: false
output:
- type: DIGI
visible: false
- name: TCK-0x6139160F (HLT2) Flagged for 2016
processing_pass: Trig0x6139160F
visible: true
application: Moore/v25r4
```

and many more lines after..

Can be manually edited for expert requests!

Context.md

Generating Monte Carlo simulation is *expensive...*

Users don't want to fiddle with countless request configurations

Experts don't want to waste time fixing bugs in production

Both need to review the request

What if we leverage GitLab with a custom application to streamline the submission process?

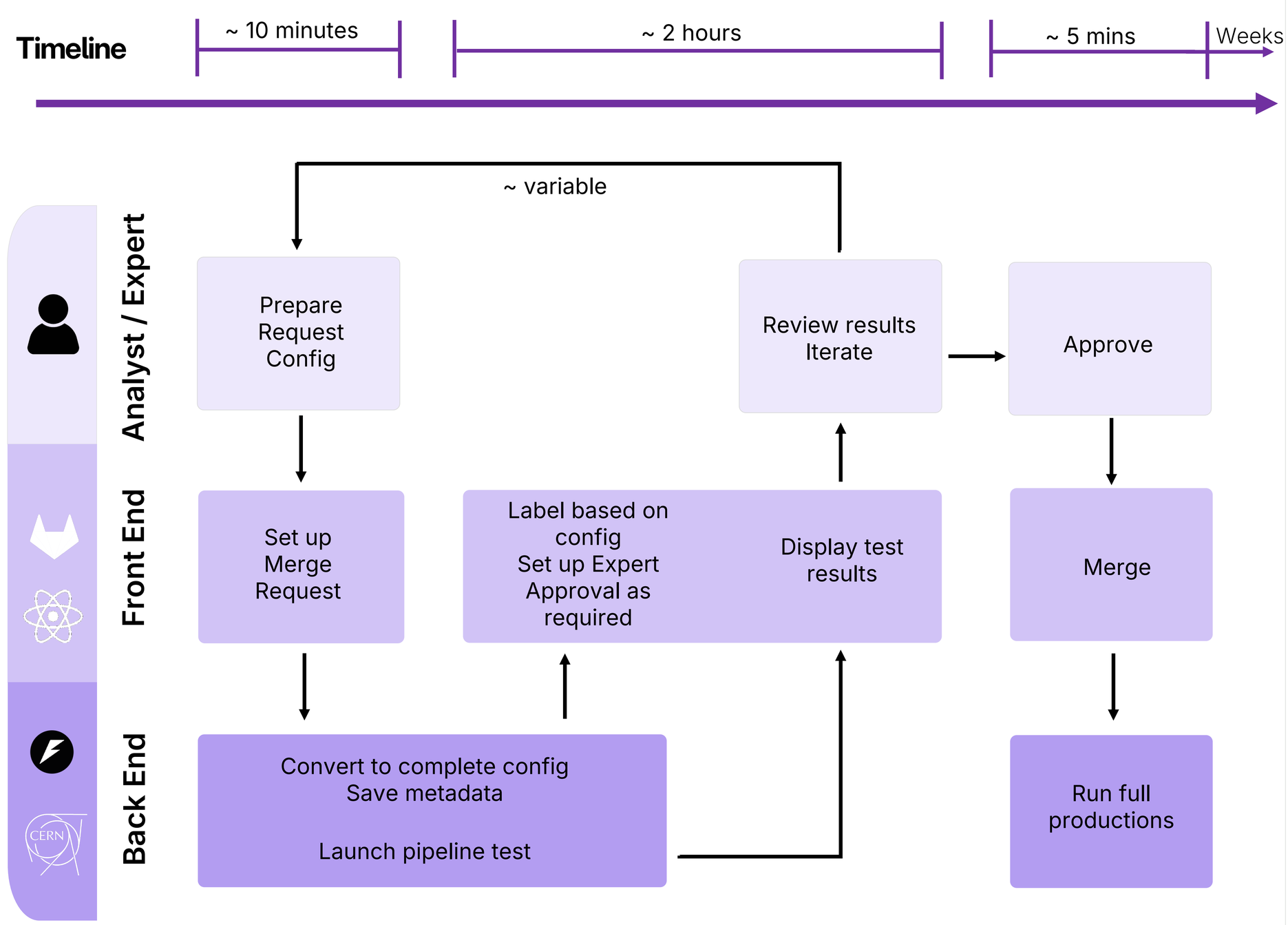
Features

Discussions: Collated | Testing: Auto | Labelling: Auto | UI/UX: Intuitive

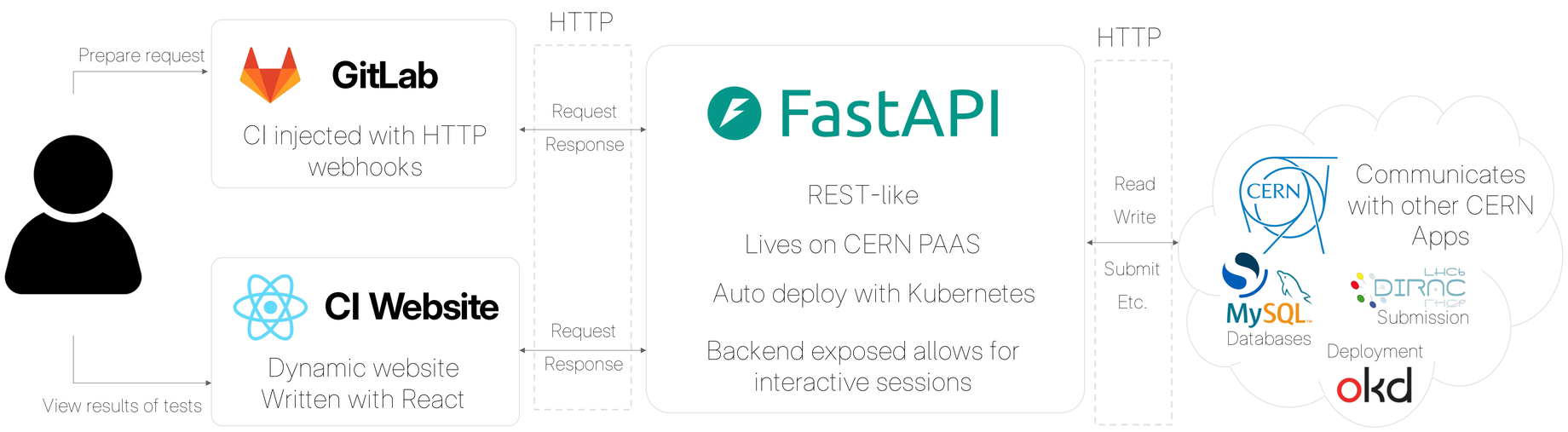
650+	Requests handled
5 days	Mean time to submit
1B+	Events produced
1 PB+	Storage used

Created on: March 22, 2023

ServiceBlueprint.md



SoftwareEcosystem.md



References

Academic tools
Stagni, F., et al. "LHCbDirac: Distributed computing in LHCb," in *J. Phys.: Conf. Ser.*, vol. 396, pp. 032104, 2012.
Tsaregorodtsev, A., et al. "DIRAC - The Distributed MC Production and Analysis for LHCb," in *"Computing in High Energy Physics and Nuclear Physics 2004*, 2004.
Burr, C. (2023). LbMCSubmit: A new flexible and scalable request submission system for LHCb simulation. *CHEP*.

With thanks to the tools we use:
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