



CRIC: A topology system for computing infrastructures and an interface for VO configuration

Panos Paparrigopoulos on behalf of the CRIC team

What is CRIC



CRIC is a framework providing a centralized (and flexible) way to describe which resources are provided by a computing infrastructure and also how the various organisations that run on the grid use them:

- Clear distinction between resources **provided by** (Sites) and resources **used by** (Experiments)
- **Experiment independent, but still experiment-oriented**
- **Plugin based** approach allows customization to address various experiment requirements and implementation of the dedicated experiment instances
- **Shared building blocks** to optimize development process and to ensure common look and feel. *Think about it in terms of lego bricks*
- **Flexibility** to address technology evolution and changes in the experiment computing models and applications. *Lego bricks again!*



Who is using CRIC

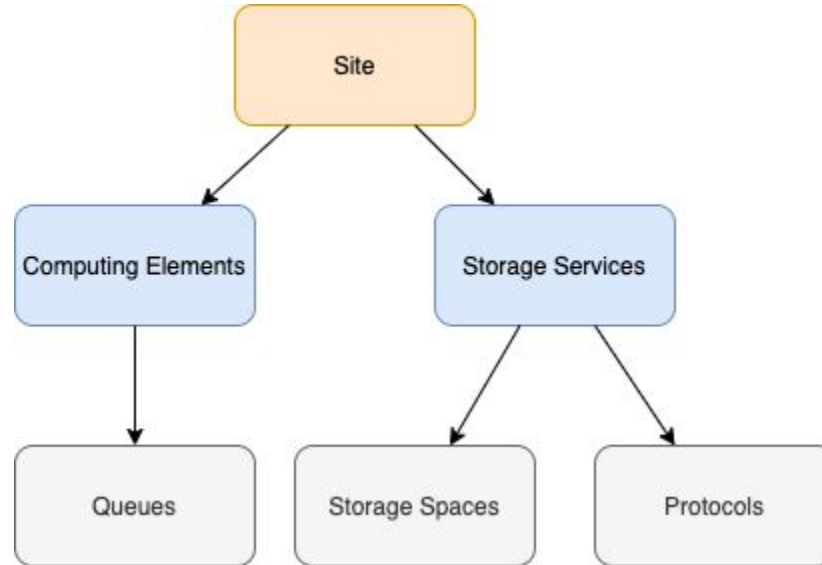
- CMS, ATLAS, DUNE and WLCG already have CRIC production instances
- datalake-cric is being developed for LSST
- CMS uses CRIC as the main source for topology and A&A:
 - Rucio, CRAB and CMSWeb are fetching users and topology data from CRIC
 - Plans to configure GlideinEntries through CRIC
- ATLAS uses CRIC as its main topology and configuration tool:
 - Configuration/Blacklisting of DDMEndpoints and PandaQueues
 - Downtime management, HammerCloud config
- WLCG is using CRIC as the main topology system and the place for central operations (Pledges declaration, accounting data validation, report generation and more)
 - WLCG-CRIC is the central place where all the topology of the different experiments is collected
 - Master source for WLCG monitoring, testing, accounting and network topology

CRIC Architecture and core features

- **Plugin based: VO can configure default behaviour**
- **Base** implementation for the Resource/Topology description
- **Customisable REST API** data export (filters, presets, various output formats)
- Shared engine/widgets for **WebUI** (downtime calendars, table view, tree view, inline editors, etc..)
- Pluggable **data sources**
- Enhanced **Authorization** (CERN SSO, SSL, password based; local accounts)
 - More means of authorization can be easily implemented and added
- Enhanced **Authentication** (instance specific permissions, groups, roles, etc, map permissions to e-groups, fetch info from ext sources)
- Detailed History of Changes (who, when, how interacted with object)

CRIC Features

Topology Information for Sites and Services



Site Topology - Pledges - Accounting - Downtime - Admin - Logs - Help - panos.paparr... - Q - P

Home / Core / RC Site / CERN-PROD

RC Site: CERN-PROD

General Information

Institute Name	CERN
Extended name	European Organization for Nuclear Research, Geneva, Switzerland
Longitude	6.04
Latitude	46.23
Timezone	Europe/Zurich
Description	CERN
Country	Switzerland
Federations	CH-CERN
Admin email	grid-cern-prod-admins@cern.ch
Security email	cert-op@cern.ch
Networks (deprecated)	<ul style="list-style-type: none">128.142.0.0/16188.184.128.0/17188.185.128.0/17188.185.48.0/202001:1458:301::/482001:1458:302::/482001:1458:303::/482001:1459:301::/482001:1459:303::/48
GOCD Primary Key	268G0
OIM Primary Key	None
CRR JSON URL	Not set
SRR JSON URL	Not set
Last modification date	2020-04-15 14:35:26.891289

Capacity Information

Corepower	0.0
Site CPU Capacity	0
Logical CPUS	0
Physical CPUS	0
maxdiskio (per core, ...)	None
BDII Corepower	N/A
Corepower value used	CRIC
CPU Capacity	0 HEPSPEC06
Disk Capacity	180.69 PB
Tape Capacity	411.5 PB

Object References

ATLAS	pk=96, model=Site
GOCD	pk=268G0, model=Site

Status Information

Object state	ACTIVE
State comment	Auto ACTIVATED after the creation of Experiment site T2_CH_CERN.
State Updated	2019-06-06 14:34:17.296953
Status	production
Cert status	certified

[Edit](#)

CRIC WLOG Web Portal server: wlog-cric-2.cern.ch | release: core-0.3.0-72-g057b0b4 wlog-0.3.2-20-g08b508b

Detailed Pages

Associated Experiment Sites

ATLAS : CERN-EXTENSION CERN-P1 CERN-PROD CERN-T0 Microsoft-Azure **LHCb** : LCG.CERN.cern **CMS** : T0_CH_CERN T2_CH_CERN T3_CH_CERNBOX T3_CH_CERN_CAF T3_CH_CERN_DOMA T3_CH_CERN_OpenData T3_CH_CMSAtHome T3_CH_Volunteer **ALICE** : CERN

Add Experiment Site

Associated Services

Show 10 entries

Search:

Name	Type	Endpoint	State	Monitored	Virtual	VOs	Last Modified
CERN-IT-Squid	Squid	http://ca-proxy-atlas.cern.ch:3128	ACTIVE	True	False	ATLAS	Dec. 6, 2021, 2:48 p.m.
CERN-PROD-atlascern-frontier.openhtc.io	Frontier	http://atlascern-frontier.openhtc.io:8080/atlr	ACTIVE	False	False	ATLAS	Jan. 21, 2021, 1:13 p.m.
CERN-PROD-atlasfrontier-ai.cern.ch	Frontier	http://atlasfrontier-ai.cern.ch:8000/atlr	ACTIVE	False	False	ATLAS	Jan. 21, 2021, 1:13 p.m.
CERN-PROD-atlast0frontier-ai.cern.ch	Frontier	http://atlast0frontier-ai.cern.ch:8000/atlr	ACTIVE	False	False	ATLAS	Jan. 21, 2021, 1:13 p.m.
CERN-PROD-CE-CREAM-CE-v012.pnpi.nw.ru	CE	v012.pnpi.nw.ru:8443	DISABLED	False	False		June 6, 2019, 2:36 p.m.

```
1 // 20200302180622
2 // http://wlcg-cric.cern.ch/api/core/service/query/?json&name=USCMS-FNAL-WC1_SE_CMS
3
4 {
5   "USCMS-FNAL-WC1": Array[1][
6     {
7       "arch": "Disk",
8       "country": "United States",
9       "country_code": "US",
10      "description": "",
11      "endpoint": null,
12      "federation": "US-FNAL-CMS",
13      "flavour": null,
14      "id": 1839,
15      "impl": "dCache",
16      "info_url": "",
17      "is_monitored": false,
18      "is_virtual": true,
19      "name": "USCMS-FNAL-WC1_SE_CMS",
20      "protocols": {
21        "USCMS-FNAL-WC1_SE_CMS-SRM-cmsdcadisk.fnal.gov": {
22          "basepath": "",
23          "endpoint": "cmsdcadisk.fnal.gov:8443",
24          "flavour": "SRM",
25          "id": 607,
26          "impl": "",
27          "name": "USCMS-FNAL-WC1_SE_CMS-SRM-cmsdcadisk.fnal.gov",
28          "state": "ACTIVE"
29        };
30        "USCMS-FNAL-WC1_SE_CMS-SRM-cmsdcatape.fnal.gov": {
31          "basepath": "",
32          "endpoint": "cmsdcatape.fnal.gov:8443",
33          "flavour": "SRM",
34          "id": 606,
35          "impl": "",
36          "name": "USCMS-FNAL-WC1_SE_CMS-SRM-cmsdcatape.fnal.gov",
37          "state": "ACTIVE"
38        };
39        "USCMS-FNAL-WC1_SE_CMS-SRM-cmseos-gridftp.fnal.gov": {
40          "basepath": "",
41          "endpoint": "cmseos-gridftp.fnal.gov:2811",
42          "flavour": "SRM",
```

Detailed Action Logging

Site Topology - Pledges - Accounting - Downtime - Admin - Logs - Help - panos.paparr... - Add Resource

Change logs

Show 10 entries Search:

Event ID	Object	PK	Op	User	Cron	IP	Data	Changes	Date
850783	AccountingData	71981	U	WAUInfoLoaderCron	✓	137.138.45.42	{\"generated\": \"30288300418010752\", \"id\": 71981, \"last_modified\": \"2022-02-09 14:30:04.943089\"}	{\"generated\": \"<type 'long'>]0 =><type 'int'>]30288300418010752\"}	2022-02-09T14:30:04.
850782	AccountingData	71763	U	WAUInfoLoaderCron	✓	137.138.45.42	{\"generated\": \"12000000000000000\", \"id\": 71763, \"last_modified\": \"2022-02-09 14:30:04.915979\"}	{\"generated\": \"<type 'long'>]0 =><type 'int'>]12000000000000000\"}	2022-02-09T14:30:04.
850781	AccountingData	71762	U	WAUInfoLoaderCron	✓	137.138.45.42	{\"generated\": \"10119276694628932\", \"id\": 71762, \"last_modified\": \"2022-02-09 14:30:04.893701\"}	{\"generated\": \"<type 'long'>]0 =><type 'int'>]10119276694628932\"}	2022-02-09T14:30:04.
850780	AccountingData	71481	U	WAUInfoLoaderCron	✓	137.138.45.42	{\"generated\": \"12000000000000000\", \"id\": 71481, \"last_modified\": \"2022-02-09 14:30:04.822225\"}	{\"generated\": \"<type 'long'>]0 =><type 'int'>]12000000000000000\"}	2022-02-09T14:30:04.
850779	AccountingData	71480	U	WAUInfoLoaderCron	✓	137.138.45.42	{\"generated\": \"111853184286290320\", \"id\": 71480, \"last_modified\": \"2022-02-09 14:30:04.798075\"}	{\"generated\": \"<type 'long'>]0 =><type 'int'>]111853184286290320\"}	2022-02-09T14:30:04.
850778	AccountingData	71879	U	WAUInfoLoaderCron	✓	137.138.45.42	{\"generated\": \"95000000000000000\", \"id\": 71879, \"last_modified\": \"2022-02-09 14:30:04.798075\"}	{\"generated\": \"<type 'long'>]0 =><type 'int'>]95000000000000000\"}	2022-02-09T14:30:04.

CRIC WLCG Web Portal server: wlcg-cric-2.cern.ch | release: core-0.3.8-72-g557b064 wlcg-0.2.2-39-g208b88b

Table views and live table editing

Site Topology - Pledges - Accounting - Downtime - Admin - Logs - Help - panos.paparr... - Search - Power

Export Filter Reload Revert Save Columns 0/16 Federation View Regional Centers and pledges provided by VOs Show 100 entries

Changes have not been saved yet! Please click the Save button!

	filter by Federation	filter by Tier	filter by VO	filter by Country	2021	filter by Type	filter by Pledge	filter by Comment
Edit	Federation	Tier	VO	Country	Year	Type	Pledge	Comment
Edit	CH-CERN	0	ALICE	Switzerland	2021	CPU	471000 HEP-SPEC06	
Edit	CH-CERN	0	ALICE	Switzerland	2021	Tape	86000 TBytes	
Edit	CH-CERN	0	ALICE	Switzerland	2021	Disk	45500 TBytes	
Edit	DE-KIT	1	ALICE	Germany	2021	Tape	13750 TBytes	<input type="text" value="New Comment"/>
Edit	DE-KIT	1	ALICE	Germany	2021	Disk	13325 TBytes	
Edit	DE-KIT	1	ALICE	Germany	2021	CPU	124500 HEP-SPEC06	
Edit	FR-CCIN2P3	1	ALICE	France	2021	CPU	54780 HEP-SPEC06	
Edit	FR-CCIN2P3	1	ALICE	France	2021	Tape	8550 TBytes	
Edit	FR-CCIN2P3	1	ALICE	France	2021	Disk	6396 TBytes	
Edit	IT-INFN-CNAF	1	ALICE	Italy	2021	Tape	11948 TBytes	
Edit	IT-INFN-CNAF	1	ALICE	Italy	2021	Disk	8228 TBytes	
Edit	IT-INFN-CNAF	1	ALICE	Italy	2021	CPU	71400 HEP-SPEC06	
Edit	KR-KISTI-GSDC	1	ALICE	Korea, Republic of	2021	Tape	12000 TBytes	
Edit	KR-KISTI-GSDC	1	ALICE	Korea, Republic of	2021	Disk	4500 TBytes	
Edit	KR-KISTI-GSDC	1	ALICE	Korea, Republic of	2021	CPU	44800 HEP-SPEC06	
Edit	NDGF	1	ALICE	Nordic	2021	Tape	4890 TBytes	
Edit	NDGF	1	ALICE	Nordic	2021	Disk	5370 TBytes	
Edit	NDGF	1	ALICE	Nordic	2021	CPU	55410 HEP-SPEC06	
Edit	NI-T1	1	ALICE	Netherlands	2021	Tape	1200 TBytes	

CRIC WLCG Web Portal server: wlcg-cric-2.cern.ch | release: core-0.1.0-72-g5576bb4 wlcg-0.2.2-39-g088b88b

Authorization - Authentication

Log in to account

Sign in with CERN SSO

Sign in with SSL Certificate

— OR —

Log in using local CRIC account

Username:

Username

Password:

Password

Remember me

Sign In

Multiple authentication methods (plugin based implementation)

Request Site Admin groups

User: Panos Paparrigopoulos (panos.paparrigopoulos@cern.ch)

✓ **Already approved groups:**

- SITE_IN2P3-CC-T2_Admin
- SITE_IN2P3-CC_Admin

⊕ **Please select new privileges if need:**

SITE_AEGIS01-IPB-SCL_Admin, SITE_AEGIS04-KG_Admin, SITE_AEGIS07-IPB-ATLAS_A

3 / 5

Go back Next step Skip Step

Request permissions wizard

Aggregation of info like DNs, usernames, institutes etc

Email	DN	Username	First Name	Last name	Date Joined	Is Active
panos.paparrigopoulos@cern.ch	/DC=ch/DC=cern/OU=Organic Units/OU=Users/CN=ppaparr/CN=779320/CN=Panos Paparrigopoulos	ppaparr	Panos	Paparrigopoulos	2019-05-27T16:46:05	✓

CRIC as a Rucio interface

CRIC as an interface for Rucio

- Rucio is a powerful data management framework.
- With great power comes great configuration.
- CRIC already hosts information about the topology of storage services, protocols, shares and their characteristics.
- Interfaces, APIs, users and permissions were already there, offered by CRIC.
- We decided to create a CRIC extension for Rucio configuration (RSEs, Transfer Matrix, Accounts and Identities)
- With the help of a couple of Rucio probes CRIC information can be easily synced into Rucio.
- ESCAPE instance is already using CRIC for it's configuration.

CRIC as an interface for Rucio - RSEs



Core ▾

Core API ▾

DOMA ▾

DOMA API ▾

Admin ▾

Logs ▾

Help ▾

panos512 ▾

Request privileges

Exit

Define New RSE Object

Basic relations

RSE Name:



AGLT2_RSE



Storage Unit:



AGLT2_SU



Storage Resource:



ATLASCALIBDISK (AGLT2_SE_0_ATLAS)



Attributes

Space Usage URL:



Deterministic:



True



Volatile:



True



LFN to PFN Algorithm:



identity

Credentials:



RSE Type:



DISK

Relation to FTS:



https://fts3-devel.cern.ch:8446

CRIC as an interface for Rucio - RSEs

Define New RSE Object

Basic relations

RSE Name: *

Storage Unit: *

Storage Resource: *

Attributes

Space Usage URL:

Deterministic: True

Volatile: True

LFN to PFN Algorithm:

Credentials:

RSE Type:

Relation to FTS:

This is the Resource from CORE. Part of the configuration is stored there and in the respected StorageElement.

This means that you configure this one time and you can then link it to any RSEs that will inherit attributes.

CRIC as an interface for Rucio - RSEs

Define New RSE Object

Basic relations

RSE Name:	<input type="text" value="AGLT2_RSE"/>	*
Storage Unit:	<input type="text" value="AGLT2_SU"/>	*
Storage Resource:	<input type="text" value="ATLASCALIBDISK (AGLT2_SE_0_ATLAS)"/>	*

Storage Unit is another abstraction that can host Site level configuration for all the RSES

Attributes

Space Usage URL:	<input type="text"/>
Deterministic:	<input checked="" type="checkbox"/>
Volatile:	<input checked="" type="checkbox"/>
LFN to PFN Algorithm:	<input type="text" value="identity"/>
Credentials:	<input type="text"/>
RSE Type:	<input type="text" value="DISK"/>
Relation to FTS:	<input type="text" value="https://fts3-devel.cern.ch:8446"/>

CRIC as an interface for Rucio - RSEs

Home / DOMA / DOMA RucioStorageElement / AGLT2_RSE

DOMA RucioStorageElement AGLT2_RSE

General Information

RSE Name	AGLT2_RSE
Storage Unit	AGLT2_SU
Storage Resource	ATLASCALIBDISK (AGLT2_SE_0_ATLAS)
Last modification date	2020-03-04 17:40:57.312713

State

Object state	ACTIVE
State comment	

Attributes

Space Usage URL	
Deterministic	True
Volatile	True
Write Availability	True
Read Availability	True
Delete Availability	True
LFN to PFN Algorithm	identity
Credentials	
RSE Type	DISK
Relation to FTS	https://fts3-devel.cern.ch:8446
Is a staging area	True
Minimum free space	0
Max Being Deleted Fil...	0
Impl	

[Edit](#)

DELETE LAN [DELETE WAN](#) [READ LAN](#) [READ WAN](#) [Third party copy Read](#) [Third party copy Write](#) [WRITE LAN](#) [WRITE WAN](#)

No DELETE LAN Protocols are available.

[Use new Protocol](#) [Create new Protocol](#)

CRIC as an interface for Rucio - RSEs

Home / DOMA / DOMA RucioStorageElement / AGLT2_RSE

DOMA RucioStorageElement AGLT2_RSE

General Information

RSE Name	AGLT2_RSE
Storage Unit	AGLT2_SU
Storage Resource	ATLASCALIBDISK (AGLT2_SE_0_ATLAS)
Last modification date	2020-03-04 17:40:57.312713

State

Object state	ACTIVE
State comment	

Attributes

Space Usage URL	
Deterministic	True
Volatile	True
Write Availability	True
Read Availability	True
Delete Availability	True
LFN to PFN Algorithm	identity
Credentials	

[Edit](#)

DELETE LAN [DELETE WAN](#) [READ LAN](#) [READ WAN](#) [Third party copy Read](#) [Third party copy Write](#) [WRITE LAN](#) [WRITE WAN](#)

Priority	Rucio Priority	Endpoint	Protocol	Activity	Edit protocol	Deattach protocol
1	0	davs://head01.aglt2.org:2880	WEBDAV	delete_lan	✎	✖
2	1	gsiftp://dcdum02.aglt2.org	GRIDFTP	delete_lan	✎	✖

[Re-arrange protocols](#) [Use new Protocol](#) [Create new Protocol](#)

CRIC as an interface for Rucio - RSEs

DOMA RucioStorageElement AGLT2_RSE

General Information

RSE Name	AGLT2_RSE
Storage Unit	AGLT2_SU
Storage Resource	ATLASCALIBDISK (AGLT2_SE_0_ATLAS)
Last modification date	2020-03-04 17:40:57.312713

Re-arrange protocols

Available Protocols:

↕↕ <davs://head01.aglt2.org:2880> (WEBDAV)

↕↕ <gsiftp://dcdum02.aglt2.org> (GRIDFTP)

Submit

1	0	davs://head01.aglt2.org:2880	WEBDAV	delete_lan	↗	✕
2	1	gsiftp://dcdum02.aglt2.org	GRIDFTP	delete_lan	↗	✕

Re-arrange protocols

Use new Protocol

Create new Protocol

CRIC as an interface for Rucio - RSEs

```
"AGLT2_RSE": {
  "MaxBeingDeletedFiles": 0,
  "MinFreeSpace": 0,
  "availability_delete": true,
  "availability_read": true,
  "availability_write": true,
  "country_name": "United States",
  "deterministic": true,
  "fts": "https://fts3-devel.cern.ch:8446",
  "id": 3,
  "impl": "",
  "latitude": 0.0,
  "lfn2pfn_algorithm": "Identity",
  "longitude": 0.0,
  "protocols": Array[2][
    {
      "domains": {
        "lan": {
          "delete": 0
        }
      },
      "ext_attrs": "",
      "hostname": "dcum02.aglt2.org",
      "id": 333,
      "name": "AGLT2-SE-GRIDFTP-dcum02.aglt2.org",
      "port": null,
      "prefix": "/atlasalibdisk/rucio/",
      "scheme": "GRIDFTP"
    },
    {
      "domains": {
```

Admin ▾ Logs ▾

AGLT2_RSE

ent AGLT2_F

E_0_ATLAS)

n ▾ Logs ▾

Re-arran

EBDAV)

FTP)

rg:2880

2.org

Re-arrange protocols

Use new Protocol

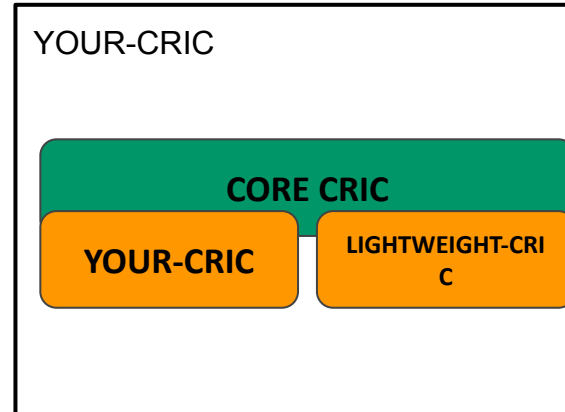
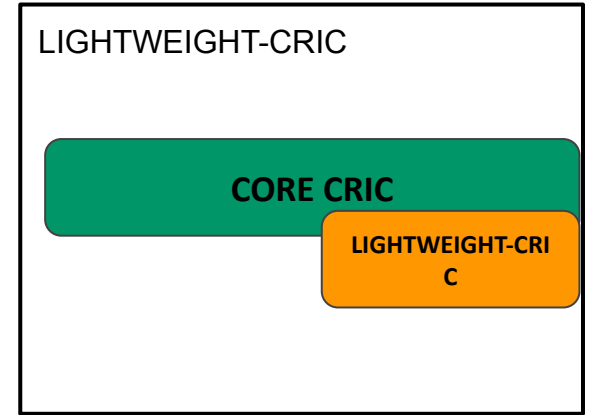
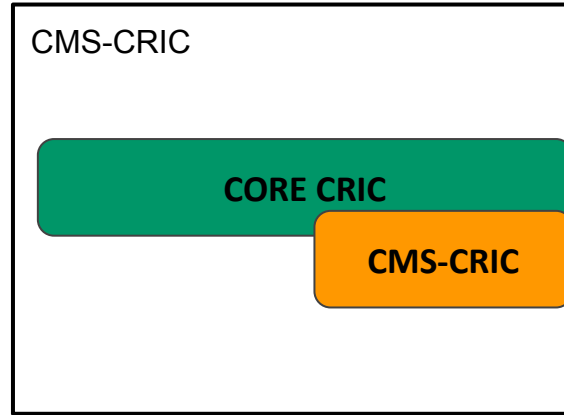
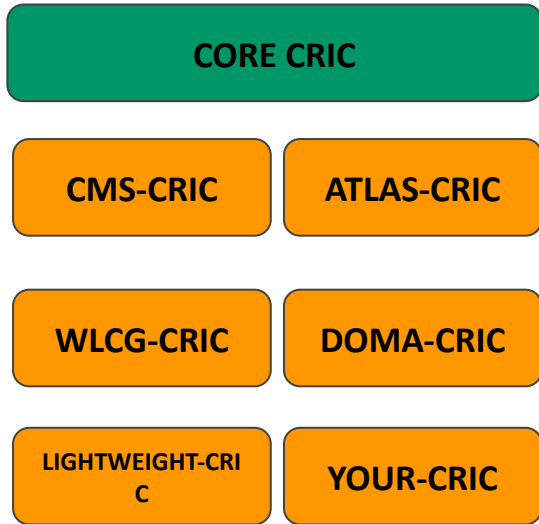
Create new Protocol

```
},
  {
    "domains": {
      "lan": {
        "delete": 0
      }
    },
    "ext_attrs": "",
    "hostname": "head01.aglt2.org",
    "id": 334,
    "name": "AGLT2-SE-WEBDAV-head01.aglt2.org",
    "port": "2880",
    "prefix": "/atlasalibdisk/rucio/",
    "scheme": "WEBDAV"
  }
],
"region_code": "US",
"rse": "AGLT2_RSE",
"rse_type": "DISK",
"site": "AGLT2",
"space_usage_method": "",
"staging_area": true,
"state": "ACTIVE",
"timezone": "",
"updated_at": "2020-03-08T14:23:01.175954",
"volatile": true
},
```

CRIC Deployment

- Puppet module for fast deployment
- You can easily deploy, with minimum configurations, a generic CRIC instance that comes with selected core cric functionality
- You can easily develop your own plugin and customise APIs and interfaces or add extra functionality
 - E.g. adding doma-cric plugin on top gives out of the box Rucio functionalities.
- Detailed documentation is available in our GitLab repo

CRIC Architecture



The DUNE cric experience

- DUNE decided to use CRIC as its main topology system
- In a couple of weeks a new dune-cric plugin was developed and two instances were created: <https://dune-cric.cern.ch> and <https://dune-cric-dev.cern.ch>
- DUNE developers were able to easily overwrite the core-cric forms and APIs and:
 - Create pledges for the DUNE experiment
 - Create a custom dune-sites table
 - Create a custom VOFeed file to enable SAM testing for the experiment services
- Overall they reported a very fast and smooth experience

Possible scenarios of using CRIC

Possible scenarios of using CRIC by non-LHC VOs

- VO is sharing WLCG infrastructure with LHC VOs as well as common tools (FTS, Rucio).
No need for advanced VO-specific configuration
 - VO resources can be described in the central WLCG CRIC instance. Already partially implemented for VOs which use FTS to improve transfer monitoring applications
- GRID infrastructure like OSG or a particular VO would like to have a dedicated CRIC instance. No need for advanced VO-specific configuration
 - Light-weight generic CRIC instance can be easily configured for this use case
- VO would like to have a dedicated CRIC instance with VO-specific configurations
 - Light-weight generic CRIC instance would need to be extended with VO-specific models

➤ CRIC instances:

- <https://cms-cric.cern.ch>
- <https://atlas-cric.cern.ch>
- <https://wlcg-cric.cern.ch>
- <https://escape-cric.cern.ch>
- <https://dune-cric.cern.ch>

➤ For testing purposes you can log-in at our dev instance: <https://wlcg-cric-dev-2.cern.ch> and request any permissions.

Contact cric-devs@cern.ch for any questions or feedback.

Questions?