

CLAS12 Monitoring Framework

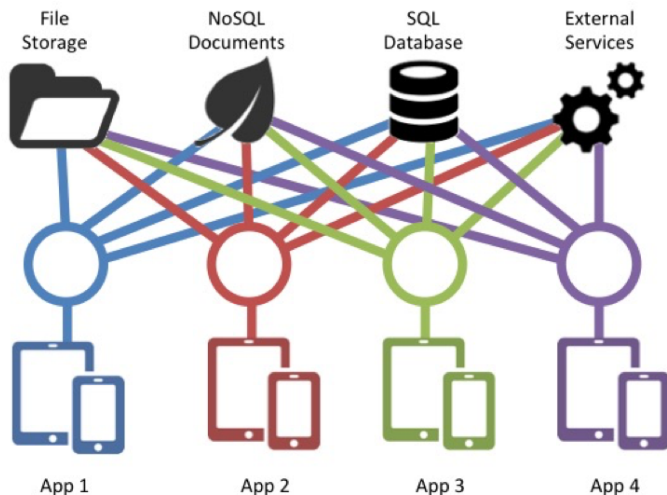
Andrey Kim
University of Connecticut

CLAS Collaboration
November 13, 2019, Newport News, VA



Complexity of data sources

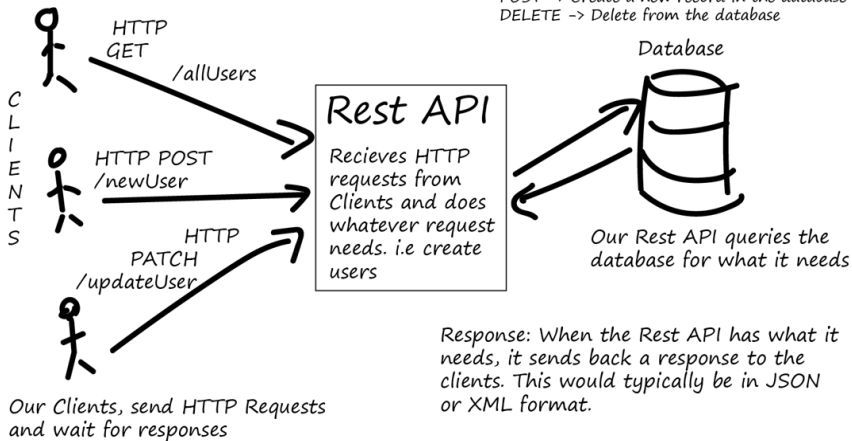
Increasing Backend Complexity



<https://dzone.com/articles/how-to-securely-mobilize-data-using-a-rest-api-bac-3>

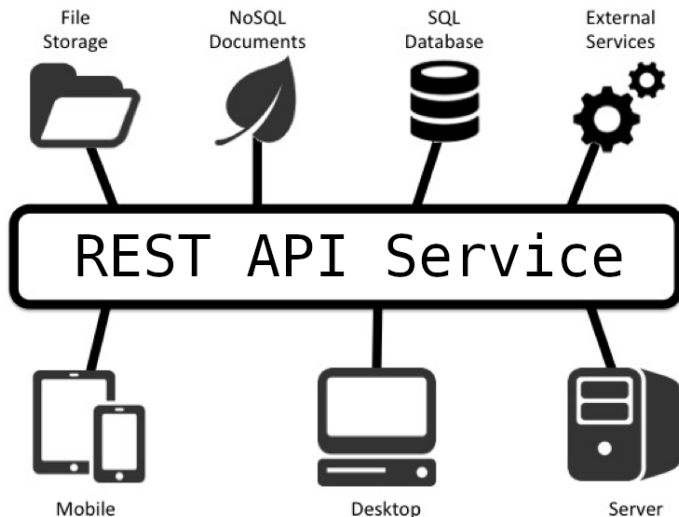
REpresentational State Transfer

Rest API Basics



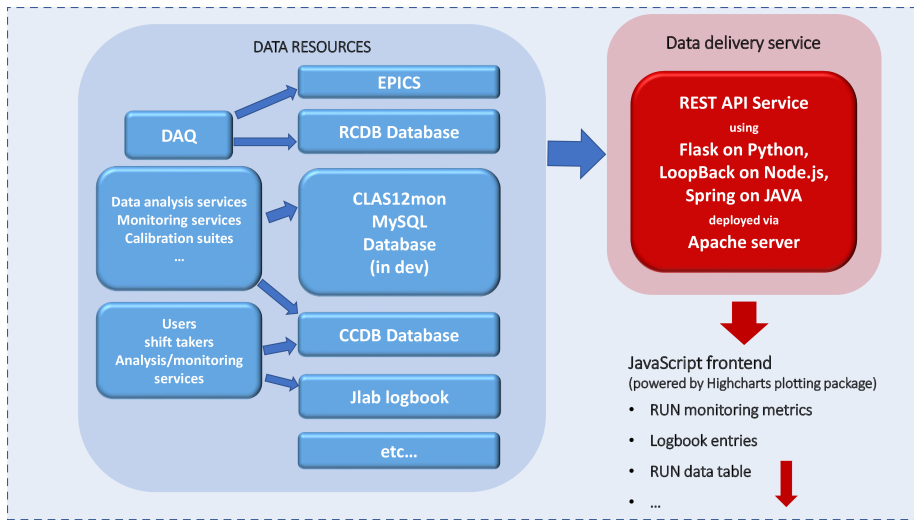
REST API Platform

Reusable, General-Purpose REST API Platform



<https://dzone.com/articles/how-to-securely-mobilize-data-using-a-rest-api-bac-3>

Monitoring framework



Back-End

- Data access: Flask on Python
- Data storage: SQLite, JSON, RCDB, text



FlaskRESTful

- Data access: LoopBack on Node.js
- Data storage: MySQL



LoopBack



Back-End

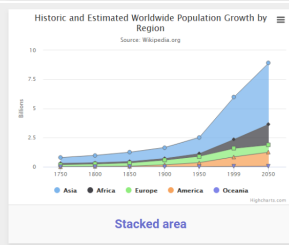
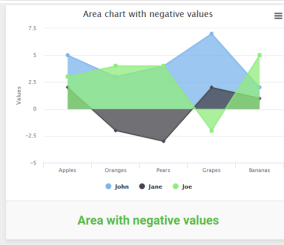
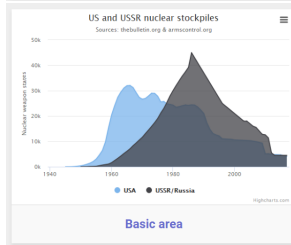
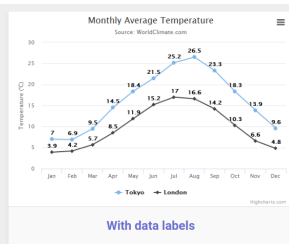
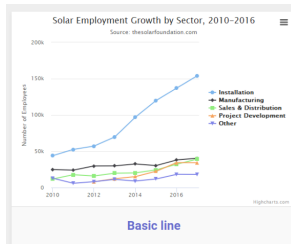
- Data access: Spring on JAVA
- Data storage: HIPO files



Native access to CLAS12 data in HIPO format



Front-End: JavaScript, Highcharts



REST API access examples

CURL

```
kenjo@uconn:~$ curl https://clas12mon.jlab.org/rcdb/data?runmin=4763&runmax=4770
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           % Done    0     0      0     0         0      0         0      0
100 1665 100 1665    0    0 23785    0 --:--:-- --:--:-- --:--:-- 24130

{
  "headers": [
    "run",
    "run_start_time",
    "run_end_time",
    "beam_energy",
    "beam_current_request",
    "run_type",
    "event_count",
    "events_rate",
    "evio_files_count",
    "target",
    "solenoid_scale",
    "torus_scale",
    "run_config",
    "half_wave_plate",
    "status",
    "operators",
    "is_valid_run_end",
    "user_comment"
  ],
  "runmin": 4763,
  "data": [
    {
      "run_start_time": "2018-09-27 01:49:02",
      "evio_files_count": 99,
      "run_type": "trigger_v20_1.cnf",
      "events_rate": null,
      "run": 4763,
      "target": "empty",
      "beam_energy": 10600,
      "solenoid_scale": -1,
      "operators": null,
      "event_count": 13800000,
      "user_comment": null,
      "run_config": null,
      "run_end_time": "2018-09-27 05:03:09",
      "status": null,
      "beam_current_request": "20",
      "is_valid_run_end": null,
      "torus_scale": -1,
      "half_wave_plate": null
    }
  ]
}
```

PYTHON

```
kenjo@uconn:~$ python3
# /usr/bin/python
import requests, pprint

data = requests.get("https://clas12mon.jlab.org/rcdb/data?runmin=4763&runmax=4770").json()
print(data)
pprint.PrettyPrinter().pprint(data)
```

Browser

```
https://clas12mon.jlab.org/rcdb/data?runmin=4763&runmax=4770 - Chromium

https://clas12mon.jlab.org/rcdb/data?runmin=4763&runmax=4770

{
  "headers": [
    "run",
    "run_start_time",
    "run_end_time",
    "beam_energy",
    "beam_current_request",
    "run_type",
    "event_count",
    "events_rate",
    "evio_files_count",
    "target",
    "solenoid_scale",
    "torus_scale",
    "run_config",
    "half_wave_plate",
    "status",
    "operators",
    "is_valid_run_end",
    "user_comment"
  ],
  "runmin": 4763,
  "data": [
    {
      "run_start_time": "2018-09-27 01:49:02",
      "evio_files_count": 99,
      "run_type": "trigger_v20_1.cnf",
      "events_rate": null,
      "run": 4763,
      "target": "empty",
      "beam_energy": 10600,
      "solenoid_scale": -1,
      "operators": null,
      "event_count": 13800000,
      "user_comment": null,
      "run_config": null,
      "run_end_time": "2018-09-27 05:03:09",
      "status": null,
      "beam_current_request": "20",
      "is_valid_run_end": null,
      "torus_scale": -1,
      "half_wave_plate": null
    }
  ]
}
```

[link to clas12mon page](#)

RGA

RGK

RGB

RGA [3000-4700,4760-5670,6605-6783]

5005 [inf] RGA via Request Run Range

Enable Filter NONE

Search for run numbers: 3000,6000

Run	Run start	Run end	Beam Energy	Beam Current	Run Type	Event Count	Events/sec	Run Time (min)
3000	2018-12-18 17:58:25	2018-12-18 17:58:25	10.05 GeV	100 nA	PROG:RGK	1000000	1000000	1000
3001	2018-12-18 17:58:25	2018-12-18 17:58:25	10.05 GeV	100 nA	PROG:RGK	1000000	1000000	1000
3002	2018-12-18 17:58:25	2018-12-18 17:58:25	10.05 GeV	100 nA	PROG:RGK	1000000	1000000	1000
3003	2018-12-18 17:58:25	2018-12-18 17:58:25	10.05 GeV	100 nA	PROG:RGK	1000000	1000000	1000
3004	2018-12-18 17:58:25	2018-12-18 17:58:25	10.05 GeV	100 nA	PROG:RGK	1000000	1000000	1000
3005	2018-12-18 17:58:25	2018-12-18 17:58:25	10.05 GeV	100 nA	PROG:RGK	1000000	1000000	1000
3006	2018-12-18 17:58:25	2018-12-18 17:58:25	10.05 GeV	100 nA	PROG:RGK	1000000	1000000	1000
3007	2018-12-18 17:58:25	2018-12-18 17:58:25	10.05 GeV	100 nA	PROG:RGK	1000000	1000000	1000

list of runs from RCDB



timelines



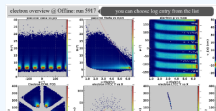
decoding status



accumulated charge



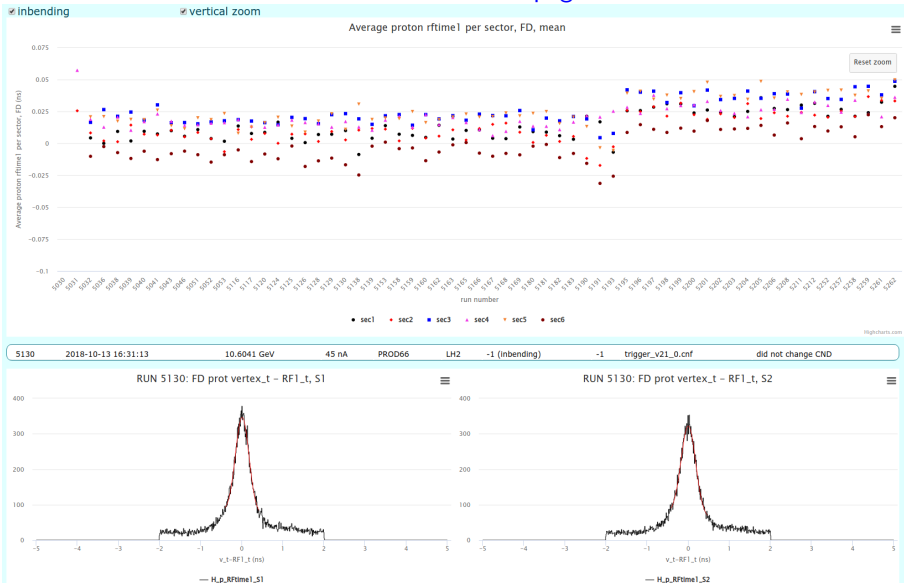
accumulated data size



offline plots from logbook

Monitoring variable: example

[link to clas12mon page](#)



Monitoring variables [per system]

[link to clas12mon page](#)

RF	• $n^{+/-}$ RTime1 per sector • Electron RTime1 per sector • Average RTime difference
TRIGGER	• Electrons/Protons per trigger per sector • Positives/Negatives/Neutrals per trigger per sector • Muons per trigger per sector • $n^{+/-}$ per trigger per sector • $K^{+/-}$ per trigger per sector
LTCC	• LTCC Number of Photoelectrons
HTCC	• Average Number of Photoelectrons per sector • HTCC Number of Photoelectrons
FTOF	• energy deposit at p1a/p1b for electron/pion • energy deposit at p2 • $mass^2$ at p1a/p1b for $n^{+/-}$/proton (mean/sigma) • time for all (mean/sigma) • time at p1a/p1b for electron/pion (mean/sigma) • time at p2 (mean/sigma)
FT	• FTH MIPS time, neutral • FTH MIPS energy per layer (Mean) • FTC time - start time, neutrals/charged • FTC pi0 mass
FORWARD	• VZ (peak value) per sector, positives/negatives/electrons • Average Forward Reconstruction chi2, positives/negatives/electrons
EC	• $n^{+/-}$ time • $M_{\gamma\gamma}$ • sampling fraction

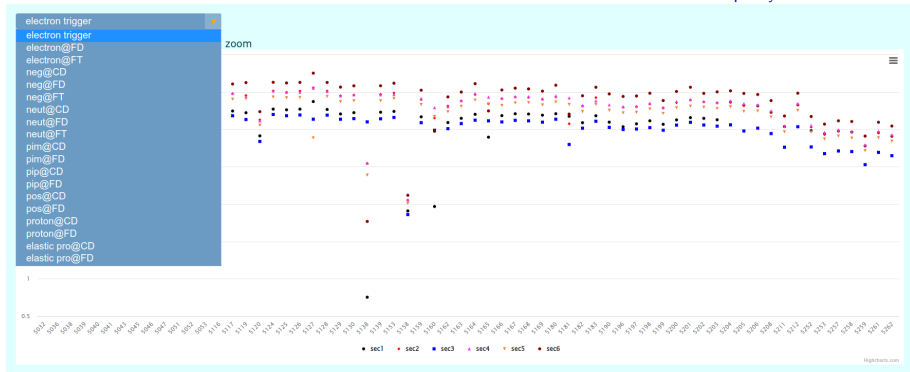
Monitoring variables [per system]

[link to clas12mon page](#)

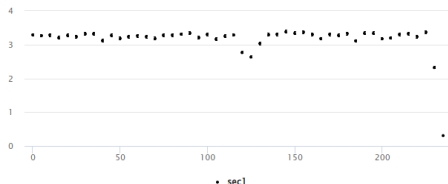
DC	• t max per sector per superlayer • DC residuals (peak value) per sector per superlayer • DC residuals (peak value) per sector
CVT	• Average vz, positives/negatives • CVT Track Multiplicity • CVT positive/negative track multiplicity • CVT positive/negative track multiplicity per trigger • CVT ndf • CVT chi2/ndf • CVT momentum • CVT transverse momentum • CVT pathlength • Average CVT chi2, positives/negatives/electrons
CTOF	• energy deposit for n^- • mass² for $n^-/+$ (mean/sigma) • time for neg/pos (mean/sigma) • time_n^- (mean/sigma)
CND	• CVT z - CND z per layer • CND time per layer • MIPS dE/dz
CENTRAL	• Protons per trigger • $n^{+/-}$ per trigger • $K^{+/-}$ per trigger
BMTBST	• BST/BMT layers per track • BST/BMT Occupancy

Monitoring: DST quality [work in progress]

[link to DST quality at clas12mon](#)



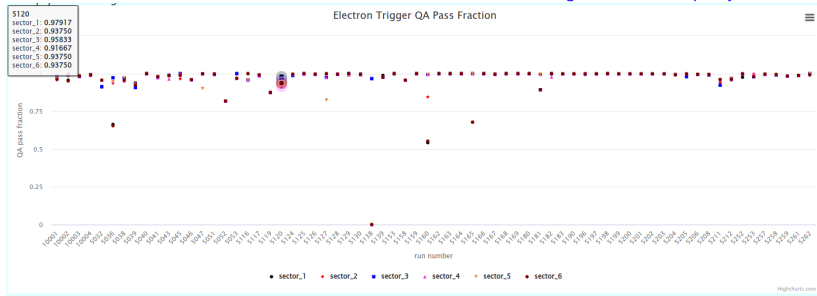
RUN 5120:



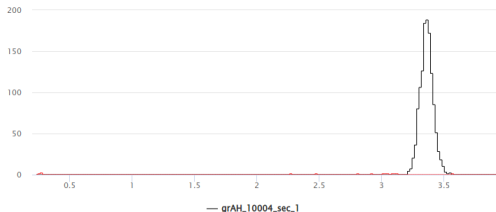
- Monitoring of DST data
- Higher level variables
- Pre-analysis of physics channels

Monitoring: Run quality [work in progress by C. Dilks]

[click to go to RGA RUN quality at clas12mon](#)

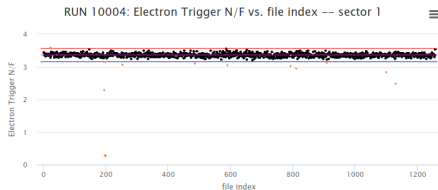


RUN 10004: Electron Trigger N/F -- sector 1

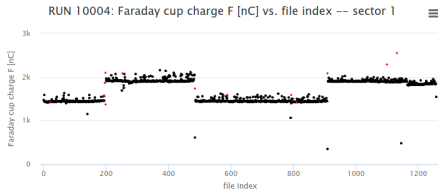


- Careful evaluation of DST data
- Exclusion of bad files from trains
- Determination of golden run list

Monitoring: Run quality [work in progress by C. Dilks]

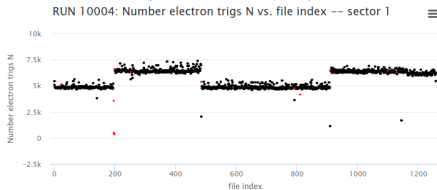


• grA_10004_sec_1

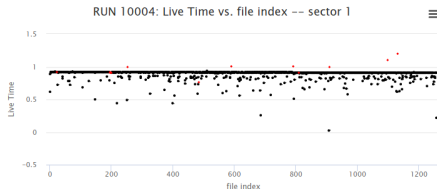


• grF_10004_sec_1

[click to go to RGA RUN quality at clas12mon](#)



• grN_10004_sec_1



• grT_10004_sec_1

Monitoring tools: RCDB table

[click to go to RUN table at clas12mon](#)

6000 6604 RRR aka Request Run Range

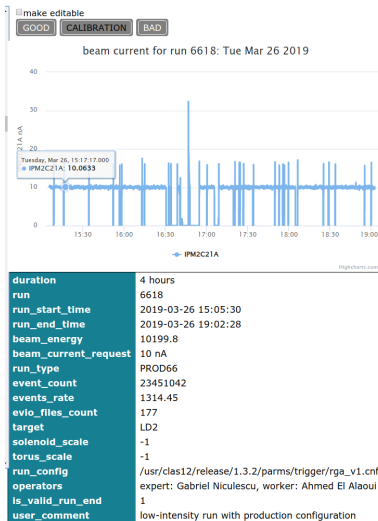
☐ Enable Filter ROW

Search for run number(s) 3000,3005

run	run start time	run end time	beam energy	beam current request	run type	event count	events rate	exof files count	target	solenoid scale	torus scale	run config	half wave plate	status	operators	is valid run end	user comment
6604	2019-03-25 14:37:13	2019-03-25 14:40:31	10199.8		PROD65	3988	0.00	1	LD2	-1	-1	rgb_v10.cnf	IN	0	GN,TC(A)	0	
6603	2019-03-25 07:20:53	2019-03-25 08:29:02	10199.8	150 nA	PROD66	10990314	1531.28	100	empty	-1	-1	rgb_v10.cnf	IN	0	JZ,TC(A)	1	empty target, 150nA
6602	2019-03-25 06:49:30	2019-03-25 07:14:43	10199.8		PROD66	828	0.00	1	empty	-1	-1	rgb_v10.cnf	IN	0	JZ,CAG	0	cosmic data, no beam;
6601	2019-03-25 03:38:44	2019-03-25 06:42:48	10199.8		PROD66	27904461	284.17	253	empty	-1	-1	rgb_v10.cnf	IN	0	JZ,CAG	1	empty target, 150nA, production
6600	2019-03-24 23:32:13	2019-03-25 03:35:03			PROD66	41479927	0.00	1	empty						JZ,CAG	1	empty target
6599	2019-03-24 23:10:07	2019-03-24 23:17:02	10199.8	150 nA	PROD66	41479927	1346.15	380	Empty	-1	-1	rgb_v10.cnf	IN	0	YI,CAG	1	empty target run
6598	2019-03-24 22:10:07	2019-03-24 23:17:02	10199.8	50 nA	PROD66	5147817	2635.55	77	LD2	-1	-1	rgb_v10.cnf	IN	0	YI,CAG	1	production run
6597	2019-03-24 22:12:18	2019-03-24 23:03:13	10199.8	50 nA	PROD66	30367011	240.97	453	LD2	-1	-1	rgb_v10.cnf	IN	0	YI,SJ	1	production run (end of run, no DAQ rates)
6596	2019-03-24 21:33:07	2019-03-24 22:14:19	10199.8	50 nA	PROD66	28335741	2142.44	423	LD2	-1	-1	rgb_v10.cnf	IN	0	YI,SJ	1	production run, sector 5 tdc pcal and ecal rca give error messages.
6595	2019-03-24 19:00:36	2019-03-24 21:23:14	10199.8	50 nA	PROD66	105110956	2437.61	1571	LD2	-1	-1	rgb_v10.cnf	IN	0	YI,SJ	1	production run
6594	2019-03-24 18:16:24	2019-03-24 18:50:16	10199.8	50 nA	PROD66_PIN	51108959	2099.38	666	LD2	-1	-1	rga_validation_Spring2019.cnf	IN	0	YI,SJ	1	FT trigger test for RGA
6593	2019-03-24 15:48:41	2019-03-24 18:04:06	10199.8	50nA	PROD66	100499946	3422.50	1500	LD2	-1	-1	rgb_v10.cnf	IN	0	KL,G,SJ	1	production run
6592	2019-03-24 14:50:47	2019-03-24 15:43:10	10199.8	50nA	PROD66	37010138	487.31	554	LD2	-1	-1	rgb_v10.cnf	IN	0	KL,G,ME	1	trigger reset alarm at the end of this run
6591	2019-03-24 12:22:59	2019-03-24 14:45:43	10199.8	50nA	PROD66	102008800	432.93	1523	LD2	-1	-1	rgb_v10.cnf	IN	0	KL,G,ME	1	
6590	2019-03-24 10:01:35	2019-03-24 12:18:27	10199.8	50nA	PROD66	103590572	13283.40	1548	LD2	-1	-1	rgb_v10.cnf	IN	0	KL,G,ME	1	
6589	2019-03-24 09:15:23	2019-03-24 09:56:34	10199.8	50nA	PROD66	16806286	138.08	250	LD2	-1	-1	rgb_v10.cnf	IN	0	KL,G,ME	0	
6588	2019-03-24 09:04:04	2019-03-24 09:11:36	10199.8	50nA	PROD65	22936	0.00	1	LD2	-1	-1	rgb_v10.cnf	IN	0	KL,G,ME	0	
6587	2019-03-24 07:31:12	2019-03-24 09:00:09	10199.8		PROD65	66991942	256.78	1000	LD2	-1	-1	rgb_v10.cnf	IN	0	JAT,ME	0	
6586	2019-03-24 05:11:06	2019-03-24 07:26:43	10199.8		PROD65	100064876	902.29	1495	LD2	-1	-1	rgb_v10.cnf	IN	0	JAT,CAG	1	
6585	2019-03-24 02:42:47	2019-03-24 03:03:59	10199.8		PROD65	100022584	1894.12	1492	LD2	-1	-1	rgb_v10.cnf	IN	0	JAT,CAG	1	
6584	2019-03-24 02:36:20	2019-03-24 02:37:55	10199.8		PROD65	607593	245.93	10	LD2	-1	-1	rgb_v10.cnf	IN	0	JAT,CAG	1	
6583	2019-03-24 02:23:54	2019-03-24 02:26:18	10199.8		PROD65	3475	0.00	1	LD2	-1	-1	rgb_v10.cnf	IN	0	JAT,CAG	1	

Monitoring tools: run status

[click to go to RUN status at clas12mon](#)



Day Shift Summary 03/25/2019 <---- [link to original logbook entry](#)

08:00 Shift starts. MCC just informed us that they will take the beam away for RF recovery.
13:16 MCC calls. They think they are ready to restore beam. Hall goes to Beam permit.
15:00 Beam is re-established in the Hall. Harp Scans look good. Asking for 10 nA
15:05 Low current (10 nA) run started: Run # 6618
16:00 Shift ends. Run 6618 ongoing.

Swing Shift Summary <---- [link to original logbook entry](#)

16:00 Swing shift begins. Run 6618 in progress. 10 nA, production configuration.

16:27 Noticed the following rates on the Halo Counters in the FSD system: 150 Hz (Upstr), 30 Hz (Midstr), 65 kHz (Downstr), and 2.2 kHz (BOM). For the upstream and downstream counters, these are higher than the rates we had at 50 nA last night: 12 Hz, 20 Hz, 320 kHz, and 9.4 kHz. Since the SVT currents are reasonable (below 700 nA), we continue with the run.

Will check if the halo rates are due to bleed-through after the 10 nA ends. If the halo is of our beam, we most likely will not be able to get back up to 50 nA without tripping the FSD. Will follow up later on that.

16:55 MCC delivers beam back after a few unsuccessful efforts to do so in the past 20 min. The halo-counter rates on Upstream and Midstream now look good (0 Hz (Up), <10 Hz (Mid)).

18:20 So far, 18.6 M events in this run. Running smoothly.

19:02 Run 6618 stopped with 23.5 M events.

19:03 RICH recovery as per RC instructions. Ask MCC for 50 nA.

19:11 Run 6619 started at 50 nA. PROD66, rga_v1.trg.

The event rate at this production config and beam current is about 11500 Hz.

19:50 In the past 15 min, we observe increased amplitude of Y-position fluctuations with occasional spikes of up to about 0.5 mm on 2H01. The spikes occurred when beam was steadily delivered (no beam trips). Called MCC, they will look into it.

20:15 The beam position fluctuations are now gone and we have same beam params as prior to 19:30.

22:35 Called MCC to look into the rising Upstream Halo Counter rates, which have been steadily rising since 21:00 and are now at 150 Hz (see log entry <https://logbooks.jlab.org/entry/3672557>).

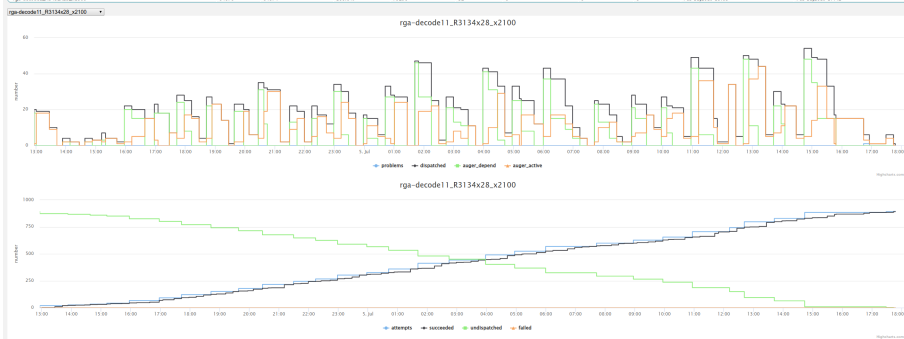
23:25 MCC calls back with an update: it is expected to take awhile before beam can be restored.

23:27 Run 6619 stopped with 133.8 M events.

Monitoring tools: status of decoding progress

[click to go to decoding progress at clas12mon](#)

workflow_name	jobs	succeeded	success	attempts	phase	dispatched	depend	active	update_date	current_date
rga-decode11_R3134x28_x2100	892	892	100.0%	893	30	0	0	0	Jul 5, 2019 17:47	Jul 5, 2019 18:00
rga-decode10-1130_R4150x1_A2100	35	35	100.0%	35	3	0	0	0	Jul 3, 2019 12:02	Jul 3, 2019 12:15
rga-decode11_R3135x176_x1300	63872	63865	100.0%	63813	1300	0	0	0	Jul 1, 2019 13:08	Jul 1, 2019 18:15
rga-decode11_R3131x65_x1300	65646	65642	100.0%	65613	67	0	0	0	May 11, 2019 11:03	May 11, 2019 15:44
rga-decode7_R3216x43_x2100	67203	67200	100.0%	72843	45	0	0	0	Apr 21, 2019 02:20	Apr 21, 2019 10:40
rga-decode11_R3466x34_x2100	67597	67597	100.0%	83442	36	0	0	0	Apr 10, 2019 17:35	Apr 10, 2019 17:40
rga-decode5_R3335x70_x2100	69162	69162	100.0%	69044	32	0	0	0	Mar 25, 2019 09:16	Mar 25, 2019 09:20
rga-decode4_R3301x20_x2100	67620	67620	100.0%	69532	32	0	0	0	Mar 13, 2019 14:06	Mar 13, 2019 14:10
rga-decode3_R3275x50_x2100	66583	66583	100.0%	67863	31	0	0	0	Mar 4, 2019 10:32	Mar 4, 2019 10:40
rga-decode2_R3454x28_x1300	66415	66415	100.0%	66666	58	0	0	0	Feb 24, 2019 04:54	Feb 24, 2019 05:00
rga-decode1_R3412x25_x1300	64076	64074	100.0%	79280	32	0	0	0	Feb 11, 2019 19:03	Feb 11, 2019 17:42

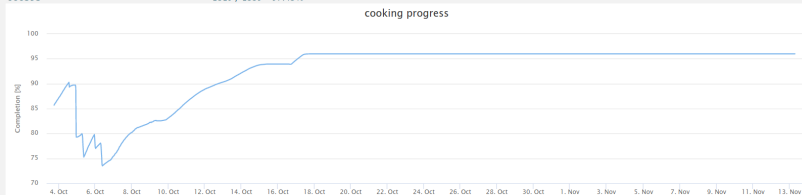


Monitoring tools: short-time cooking progress for chefs

total completion: 70193 / 73130 = 95.98%

006302	2616 / 2626	99.62%
006303	1818 / 1840	98.8%
006305	1588 / 1602	99.13%
006307	2347 / 2360	99.45%
006310	2537 / 2586	98.11%
006311	2306 / 2312	99.74%
006313	2459 / 2489	98.79%
006321	2510 / 2518	99.68%
006326	2332 / 2392	97.49%
006327	2485 / 2485	100%
006328	2403 / 2540	94.61%
006346	2515 / 2532	99.33%
006347	973 / 989	98.38%
006349	1091 / 1120	97.41%
006420	2196 / 2211	99.32%
006428	2020 / 2021	99.95%
006433	2596 / 2598	99.92%
006442	2323 / 2325	99.91%
006450	2257 / 2261	99.82%
006467	2272 / 2272	100%
006474	2554 / 2555	99.96%
006481	2456 / 2463	99.72%
006489	0 / 2215	0%
006492	2257 / 2257	100%
006501	2545 / 2550	99.8%
006502	2425 / 2484	97.62%
006515	2245 / 2246	99.96%
006522	2246 / 2259	99.42%
006524	2331 / 2381	97.9%
006546	1535 / 1541	99.61%
006559	1480 / 1500	98.67%
006571	1488 / 1547	96.19%
006586	1468 / 1494	98.26%
006595	1519 / 1559	97.43%

- go to rgb status
- go to rgk status



Monitoring tools: short-time cooking progress for chefs

Example of usage by RGA cook, N. Markov

DNP cook

Data Processing

RGF Fall18 out: 500M events

total completion: 1927 / 2112 = 91.24%

005425	147 / 226	65.04%
005426	36 / 60	60%
005428	231 / 231	100%
005429	199 / 205	97.07%
005430	209 / 220	95%
005432	196 / 219	89.5%
005434	177 / 219	80.82%
005435	219 / 219	100%
005436	227 / 227	100%
005437	91 / 91	100%
005438	195 / 195	100%

RGF Fall18 inb: 2.3 B events

total completion: 100%

005032	23 / 23	100%
005036	110 / 110	100%
005038	248 / 248	100%
005039	65 / 65	100%
005040	96 / 96	100%
005041	108 / 108	100%
005043	84 / 84	100%
005045	87 / 87	100%
005046	223 / 223	100%
005047	10 / 10	100%
005051	162 / 162	100%
005052	22 / 22	100%
005053	32 / 32	100%
005116	24 / 24	100%
005117	242 / 242	100%
005119	8 / 8	100%
005120	48 / 48	100%
005124	243 / 243	100%
005125	242 / 242	100%
005126	241 / 241	100%
005127	40 / 40	100%
005128	242 / 242	100%
005129	102 / 102	100%
005130	239 / 239	100%
005138	30 / 30	100%
005139	85 / 85	100%
005153	42 / 42	100%
005158	23 / 23	100%
005159	140 / 140	100%
005160	188 / 188	100%
005162	47 / 47	100%
005163	237 / 237	100%
005164	5 / 5	100%
005165	255 / 255	100%
005166	238 / 238	100%
005167	239 / 239	100%
005168	121 / 121	100%
005169	242 / 242	100%
005180	128 / 128	100%
005181	233 / 233	100%
005182	44 / 44	100%
005183	186 / 186	100%
005190	96 / 96	100%
005196	226 / 226	100%
005197	227 / 227	100%
005198	229 / 229	100%
005199	227 / 227	100%
005200	85 / 85	100%
005201	45 / 45	100%
005202	228 / 228	100%
005203	229 / 229	100%
005204	230 / 230	100%
005205	49 / 49	100%
005206	165 / 165	100%
005208	190 / 190	100%
005211	51 / 51	100%
005212	232 / 232	100%
005252	199 / 199	100%
005253	53 / 53	100%
005257	233 / 233	100%
005258	307 / 307	100%
005259	117 / 117	100%
005261	236 / 236	100%
005262	113 / 113	100%

RGK 7.5 GeV: 1.5B events

total completion: 5803 / 5865 = 98.94%

005694	56 / 56	100%
005695	52 / 52	100%
005696	160 / 160	100%
005698	187 / 188	99.47%
005699	189 / 189	100%
005700	189 / 189	100%
005701	202 / 202	100%
005702	211 / 212	99.53%
005703	203 / 203	100%
005704	202 / 202	100%
005705	200 / 201	99.5%
005706	81 / 94	86.17%
005707	175 / 201	87.06%
005708	42 / 42	100%
005715	200 / 200	100%
005716	200 / 200	100%
005717	199 / 199	100%
005718	200 / 200	100%
005720	198 / 201	98.51%
005722	201 / 204	98.53%
005723	200 / 200	100%
005724	202 / 202	100%
005725	224 / 224	100%
005726	192 / 193	99.48%
005727	190 / 191	99.48%
005728	36 / 36	100%
005729	197 / 198	99.49%
005732	195 / 198	98.48%
005733	206 / 209	98.56%
005734	201 / 205	98.05%
005735	203 / 203	100%
005736	202 / 202	100%
005739	208 / 209	99.52%

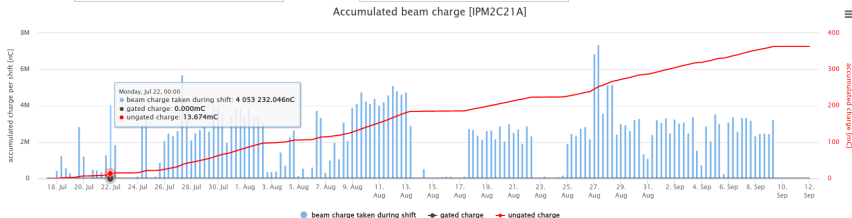
~ 10 Talks on DNP out of RGA/RGK

Monitoring tools: EPICS tools

start date: 07/17/2019

end date: 09/11/2019

[go to page at clas12mon](#)



Highcharts.com

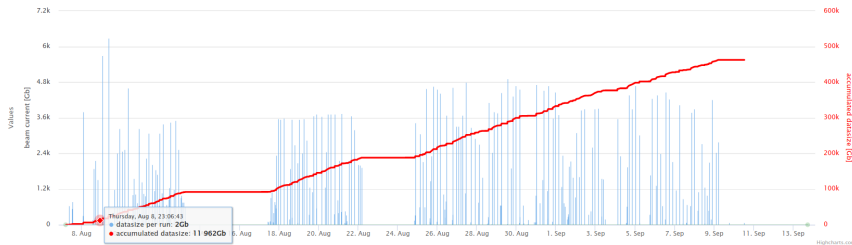
start date: 08/07/2019

end date: 09/11/2019

[go to page at clas12mon](#)

Accumulated datasize (calculated via RCDB using number of files and assuming each file is 2 Gb)

equivalent to data taking at constant rate of 146 Mb/sec



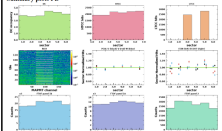
Highcharts.com

Monitoring tools: Logbook API

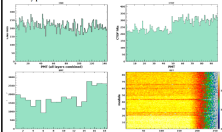
[click to go to histograms comparison at clas12mon](#)



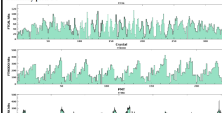
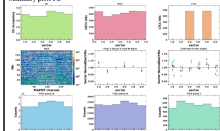
2019-04-15 05:53
Summary plots FD



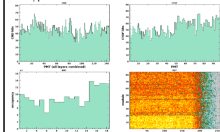
Summary plots CI



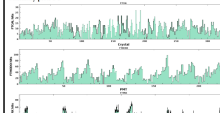
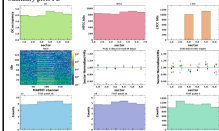
Summary plots FT

2019-04-15 05:42
Summary plots FD

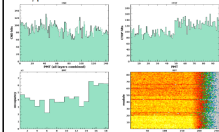
Summary plots CD



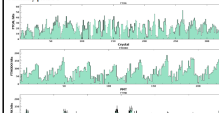
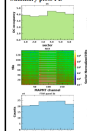
Summary plots FT

2019-04-15 02:4
Summary plots FD

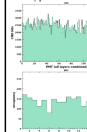
Summary plots CD



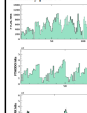
Summary plots FT

2019-04-15 01:27
Summary plots FD

Summary plots CD



Summary plots FT



Future plans: online monitoring

- Offline monitoring with minor delay?
[built on existing workflow]
 - Analyze the first 10 files of each run
 - Provide timelines with a short delay [tens of minutes-hours]
- Online monitoring directly from ET ring of running DAQ
[prototype exists]
 - CLARA decoding
 - CLARA reconstruction
- Temporary data storage?
- Online monitoring variables: subsystems, DST?

Any suggestions for tools or improvements are welcome!