

# NSF/IUCRC CAC PROJECT

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## MONITORING, VISUALIZING, AND PREDICTING HEALTH STATUS OF HPC CENTERS

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## MonSTer: **M**onitoring **S**lurm & **T**elemetry

- ▶ Inspired by slurm-rest-api
- ▶ Talk to Slurm **directly** instead of slurm-rest-api
- ▶ Utilize Slurm API such as **slurm\_load\_jobs**, **slurm\_load\_node**, **slurm\_get\_statistics** etc.

# MONITORING FILEDS

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Field	SLURM API	Description
Job	slurm_load_jobs	Issue RPC to get all <b>job information</b> if changed since update time
Node	slurm_load_node	Issue RPC to get all <b>node information</b> if changed since update time
Statistics	slurm_get_statistics	Get <b>scheduling</b> statistics

# Demo

# JOB

```
"18": {
  "account": "root",
  "accrue_time": "Unknown",
  "admin_comment": null,
  "alloc_node": "headnode",
  "alloc_sid": 4540,
  "array_job_id": null,
  "array_task_id": null,
  "array_task_str": null,
  "array_max_tasks": null,
  "assoc_id": 2,
  "batch_flag": 0,
  "batch_features": null,
  "batch_host": "compute-0",
  "billable_tres": 1.0,
  "bitflags": 503318592,
  "boards_per_node": 0,
  "burst_buffer": null,
  "burst_buffer_state": null,
  "command": "sleep",
  "comment": null,
  "contiguous": false,
  "core_spec": null,
  "cores_per_socket": null,
  "cpus_per_task": 1,
  "cpus_per_tres": null,
  "cpu_freq_gov": null,
  "cpu_freq_max": null,
  "cpu_freq_min": null,
  "dependency": null,
  "derived_ec": "0:0",
  "eligible_time": 1581028561,
  "end_time": 1581028581,
  "exc_nodes": [],
  "exit_code": "0:0",
  "features": [],
  "group_id": 0,
  "job_id": 18,
  "job_state": "COMPLETED",
  "last_sched_eval": "2020-02-06T17:36:01",
  "licenses": {},
```

```
  "max_cpus": 0,
  "max_nodes": 0,
  "mem_per_tres": null,
  "name": "sleep",
  "network": null,
  "nodes": "compute-0",
  "nice": 0,
  "ntasks_per_core": null,
  "ntasks_per_core_str": "UNLIMITED",
  "ntasks_per_node": 0,
  "ntasks_per_socket": null,
  "ntasks_per_socket_str": "UNLIMITED",
  "ntasks_per_board": 0,
  "num_cpus": 1,
  "num_nodes": 1,
  "partition": "low",
  "mem_per_cpu": false,
  "min_memory_cpu": null,
  "mem_per_node": true,
  "min_memory_node": 0,
  "pn_min_memory": 0,
  "pn_min_cpus": 1,
  "pn_min_tmp_disk": 0,
  "power_flags": 0,
  "preempt_time": null,
  "priority": 4294901750,
  "profile": 0,
  "qos": "normal",
  "reboot": 0,
  "req_nodes": [],
  "req_switch": 0,
  "requeue": true,
  "resize_time": 0,
  "restart_cnt": 0,
  "resv_name": null,
  "run_time": 20,
  "run_time_str": "00:00:20",
  "sched_nodes": null,
  "shared": "OK",
  "show_flags": 22,
  "sockets_per_board": 0,
  "sockets_per_node": null,
```

```
  "start_time": 1581028561,
  "state_reason": "None",
  "std_err": null,
  "std_in": null,
  "std_out": null,
  "submit_time": 1581028561,
  "suspend_time": 0,
  "system_comment": null,
  "time_limit": 2880,
  "time_limit_str": "2-00:00:00",
  "time_min": 0,
  "threads_per_core": null,
  "tres_alloc_str": "cpu=1,node=1,billing=1",
  "tres_bind": null,
  "tres_freq": null,
  "tres_per_job": null,
  "tres_per_node": null,
  "tres_per_socket": null,
  "tres_per_task": null,
  "tres_req_str": "cpu=1,node=1,billing=1",
  "user_id": 0,
  "wait4switch": 0,
  "wckey": null,
  "work_dir": "/root/test",
  "cpus_allocated": {
    "compute-0": 1
  },
  "cpus_alloc_layout": {
    "compute-0": [
      0
    ]
  }
}
```

# NODE

```
"compute-0": {
  "arch": "x86_64",
  "boards": 1,
  "boot_time": 1581020598,
  "cores": 1,
  "core_spec_cnt": 0,
  "cores_per_socket": 1,
  "cpus": 1,
  "cpu_load": 1,
  "cpu_spec_list": [],
  "features": [],
  "features_active": [],
  "free_mem": 2281,
  "gres": [],
  "gres_drain": "N/A",
  "gres_used": null,
  "mcs_label": null,
  "mem_spec_limit": 0,
  "name": "compute-0",
  "node_addr": "compute-0",
  "node_hostname": "compute-0",
  "os": "Linux 3.10.0-1062.9.1.el7.x86_64 #1 SMP Fri Dec 6 15:49:49 UTC 2019",
  "owner": null,
  "partitions": [
    "low"
  ],

```

```
  "real_memory": 3950,
  "slurmd_start_time": 1581020645,
  "sockets": 1,
  "threads": 1,
  "tmp_disk": 1975,
  "weight": 1,
  "tres_fmt_str": "cpu=1,mem=3950M,billing=1",
  "version": "18.08",
  "reason": null,
  "reason_time": null,
  "reason_uid": null,
  "power_mgmt": {
    "cap_watts": null
  },
  "energy": {
    "current_watts": 0,
    "base_consumed_energy": 0,
    "consumed_energy": 0,
    "base_watts": 0,
    "previous_consumed_energy": 0
  },
  "alloc_cpus": 1,
  "err_cpus": 0,
  "state": "ALLOCATED",
  "alloc_mem": 0
}
```

# STATISTICS

```
"parts_packed": 1,
"req_time": 1581028638,
"req_time_start": 1581020440,
"server_thread_count": 3,
"agent_queue_size": 0,
"schedule_cycle_max": 692,
"schedule_cycle_last": 9,
"schedule_cycle_sum": 2479,
"schedule_cycle_counter": 148,
"schedule_cycle_depth": 1,
"schedule_queue_len": 0,
"jobs_submitted": 11,
"jobs_started": 10,
"jobs_completed": 9,
"jobs_canceled": 0,
"jobs_failed": 0,
"bf_backfilled_jobs": 0,
"bf_last_backfilled_jobs": 0,
"bf_cycle_counter": 0,
"bf_cycle_sum": 0,
"bf_cycle_last": 0,
"bf_cycle_max": 0,
"bf_last_depth": 0,
"bf_last_depth_try": 0,
"bf_depth_sum": 0,
"bf_depth_try_sum": 0,
"bf_queue_len": 0,
"bf_queue_len_sum": 0,
"bf_when_last_cycle": 0,
"bf_active": 0,
```

```
"rpc_type_stats": {
  "ACCOUNTING_REGISTER_CTLD": {
    "id": 10003,
    "count": 1,
    "ave_time": 85790,
    "total_time": 85790
  },
  "MESSAGE_NODE_REGISTRATION_STATUS": {
    "id": 1002,
    "count": 12,
    "ave_time": 312,
    "total_time": 3751
  },
  "REQUEST_JOB_INFO": {
    "id": 2003,
    "count": 13,
    "ave_time": 263,
    "total_time": 3431
  },
  "REQUEST_FED_INFO": {
    "id": 2049,
    "count": 14,
    "ave_time": 211,
    "total_time": 2959
  },
  "REQUEST_JOB_STEP_INFO": {
    "id": 2005,
    "count": 11,
    "ave_time": 188,
    "total_time": 2068
  },
  "REQUEST_NODE_INFO": {
    "id": 2007,
    "count": 15,
    "ave_time": 242,
    "total_time": 3637
  },
  "REQUEST_PARTITION_INFO": {
    "id": 2009,
    "count": 14,
    "ave_time": 194,
    "total_time": 2720
  },
  "REQUEST_STATS_INFO": {
    "id": 2035,
    "count": 10,
    "ave_time": 171,
    "total_time": 1712
  },
  "REQUEST_SUBMIT_BATCH_JOB": {
    "id": 4003,
    "count": 1,
    "ave_time": 10421,
    "total_time": 10421
  },
  "REQUEST_COMPLETE_BATCH_SCRIPT": {
    "id": 5018,
    "count": 1,
    "ave_time": 758,
    "total_time": 758
  },
  "REQUEST_RESOURCE_ALLOCATION": {
    "id": 4001,
    "count": 10,
    "ave_time": 1025,
    "total_time": 10257
  },
  "REQUEST_JOB_READY": {
    "id": 4019,
    "count": 9,
    "ave_time": 241,
    "total_time": 2174
  },
  "REQUEST_JOB_STEP_CREATE": {
    "id": 5001,
    "count": 9,
    "ave_time": 675,
    "total_time": 6081
  },
  "REQUEST_COMPLETE_JOB_ALLOCATION": {
    "id": 5017,
    "count": 8,
    "ave_time": 767,
    "total_time": 6143
  },
  "REQUEST_STEP_COMPLETE": {
    "id": 5016,
    "count": 8,
    "ave_time": 534,
    "total_time": 4275
  },
  "REQUEST_JOB_INFO_SINGLE": {
    "id": 2021,
    "count": 3,
    "ave_time": 225,
    "total_time": 675
  }
},
"rpc_user_stats": {
  "root": {
    "id": 0,
    "count": 138,
    "ave_time": 442,
    "total_time": 61062
  },
  "slurm": {
    "id": 202,
    "count": 1,
    "ave_time": 85790,
    "total_time": 85790
  }
}
```

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  "id": 2009,
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  "count": 1,
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  "total_time": 758
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  "count": 10,
  "ave_time": 1025,
  "total_time": 10257
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**QUESTIONS?/COMMENTS?**