Multy-level monitoring system for Multifunctional Information and Computing Complex at JINR

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26th International Symposium on Nuclear Electronics and Computing - NEC'2017

Multifunctional Information and Computing Complex

- **LAN**: 10 Gbps
- **WAN**: 100 Gbps + 2x10 Gbps
- **Tier-1**: 4160 core, 56 kHS06, 5.8 PB disk, 11 PB tape
- **CICC/Tier-2**: 3500 core, 48 kHS06, 2PB disk
- **HybriLIT**: 252 CPU, 77184 GPU cores, 182 PHI-cores, 2.4 TB RAM, 57.6 TB HDD, 142 Tflops
- **Cloud**: 700CPU, 1 TB RAM

LIT IT-infrastructure is the one of JINR basic facilities

JINR grid sites of WLCG/EGI: Tier-1 for CMS
Tier-2 for ALICE, ATLAS, CMS, STAR, LHCb, BES, biomed, fermilab

Cloud infrastructure

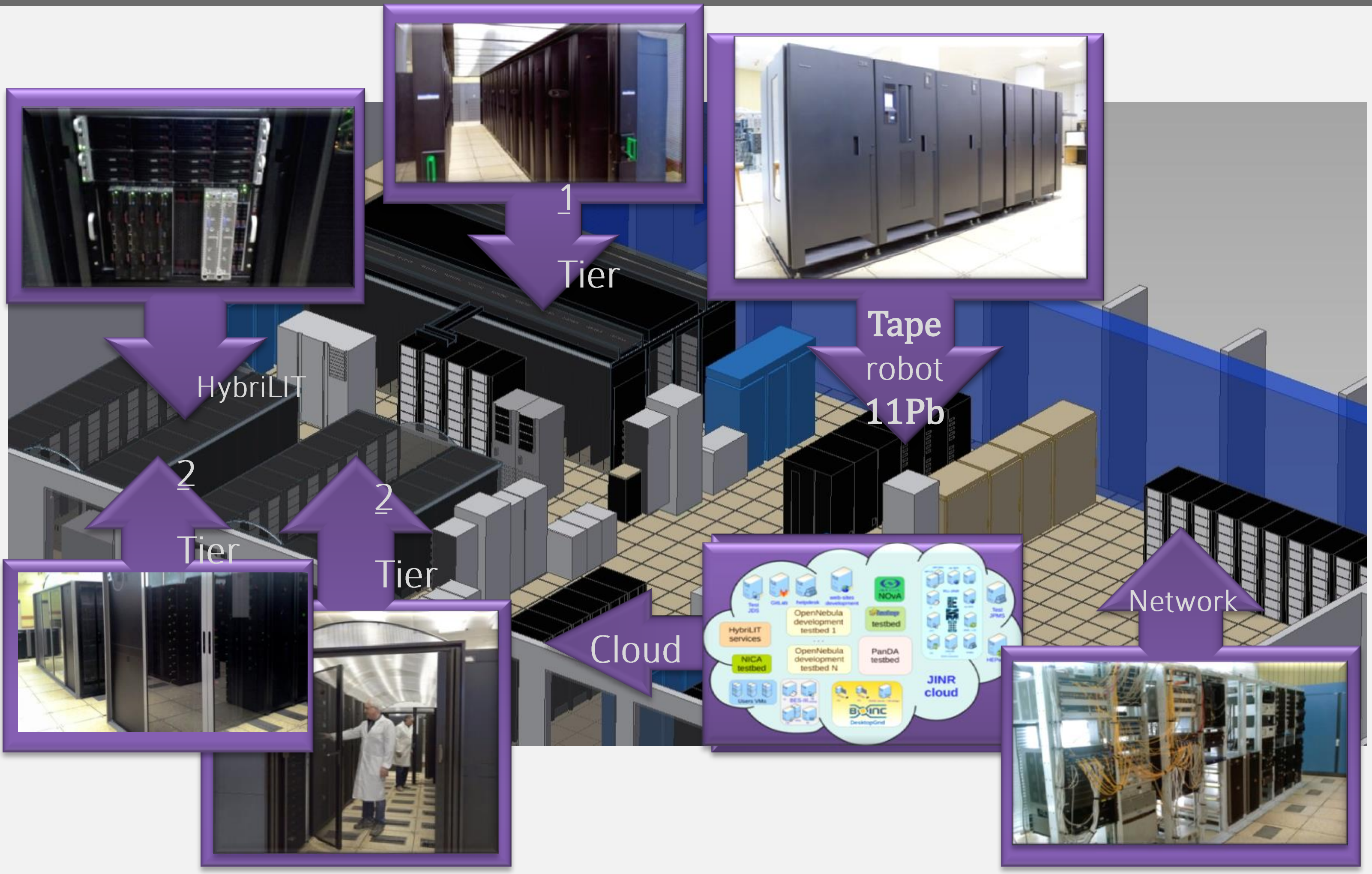
Heterogeneous(CPU + GPU) computing cluster HybriLIT

Off-line cluster and storage system for BM@N, MPD, SPD Storage and computing facilities for local users

Network infrastructure

Engineering infrastructure

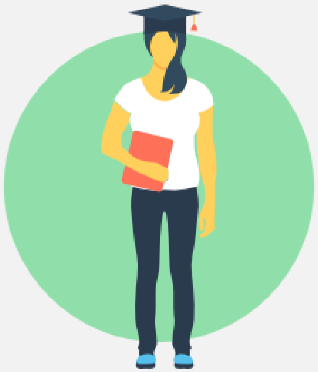
Data storage, processing, analysis



During three years more than **15 million** tasks have been carried out at the Computing center of JINR

Multifunctional Information and Computing Complex

Users



Admins

Executives

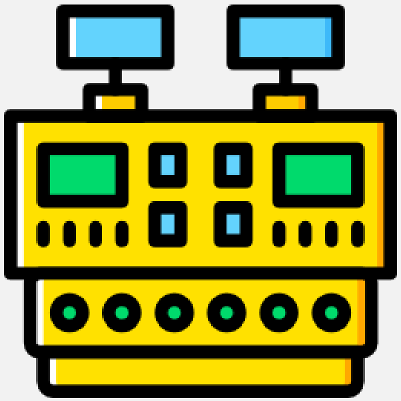
Network infrastructure

Engineering infrastructure

What is the "Monitoring"

Warning detection and notification

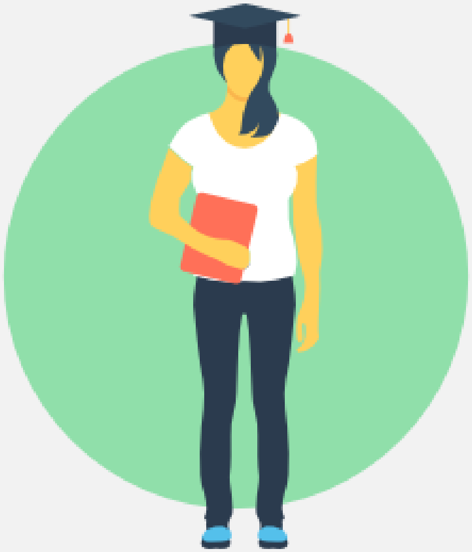
Properties visualization



Accounting

Immediate — Actual — Periodic

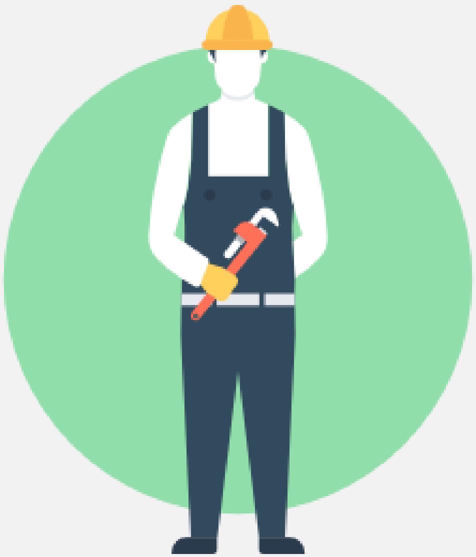
For Users



Important when:

- Information about component could form user behavior
- Information about component could explain occurring issues

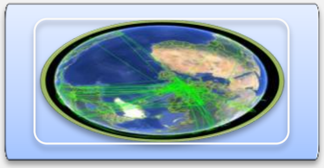
For Admins

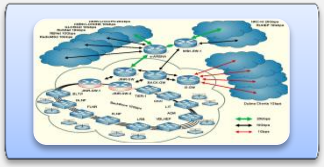


Important for:

- Issues alarming
- Debugging of complex systems
- Aggregated information source

For Executives



( )

Important for:

- Reports and statistics
- Finding “Bottle necks”
- Planning

Tier-1, Tier-2 monitoring

Custom plugins have been created to collect specific data from different nodes. Libraries used for gathering data:

- Netsnmp
- Subprocess (Popen, PIPE)

Computing servers

Check_smart
Check_cpu
...

UPS

Check_capacity
Check_load
...

The tape library

Check_tape_status
...

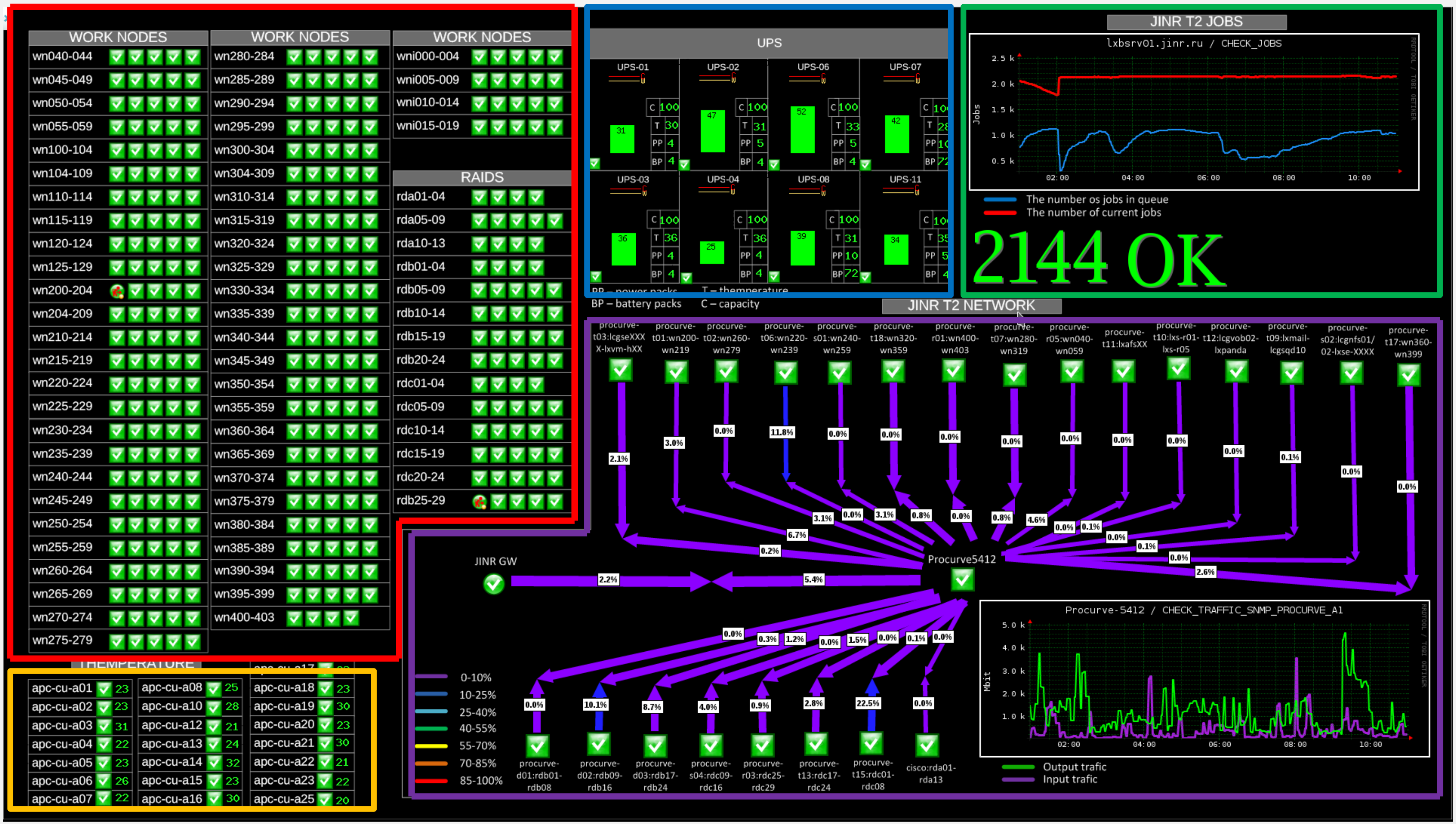
The cooling system

Check_temperature
Check_airflow
...

Storage servers

Check_raid_status
Check_dir
...

Tier-2 monitoring



Computing and storage servers

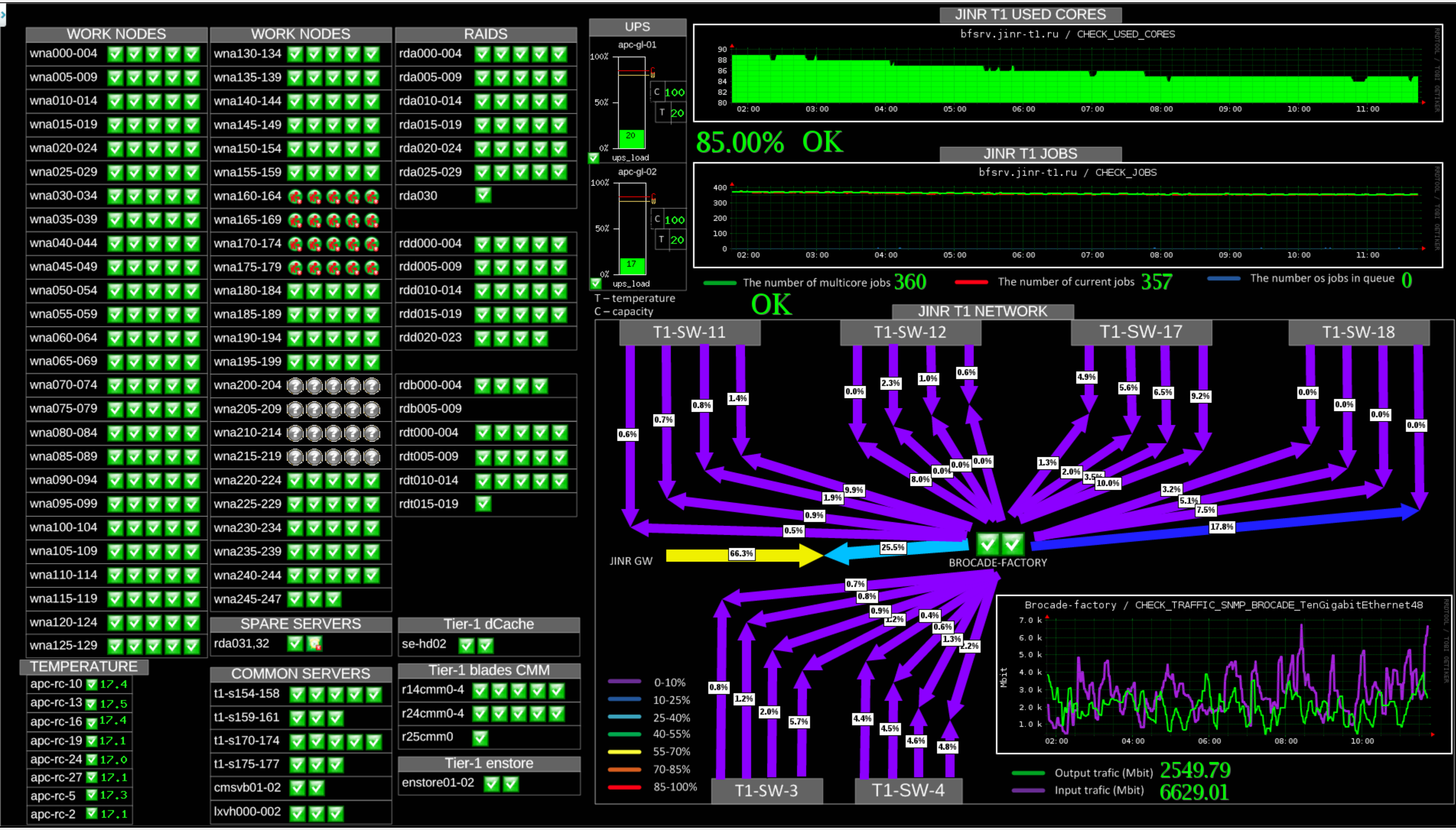
UPS

Network

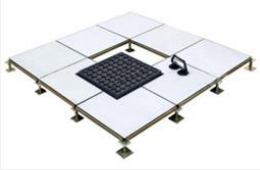
Cumputing cluster load

Cooling system

Tier-1 monitoring



Engineering infrastructure



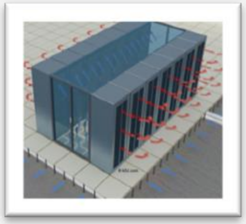
Raised Flooring System

Fibre Optic & Data Structured Cabling System

Diesel generator set

Uninterruptible power supply

High Density Heat Containment System



Computer Room Air Conditioner

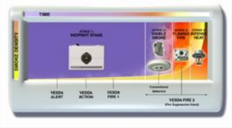
MICC Monitoring System

Water Detection System

Biometric Access System

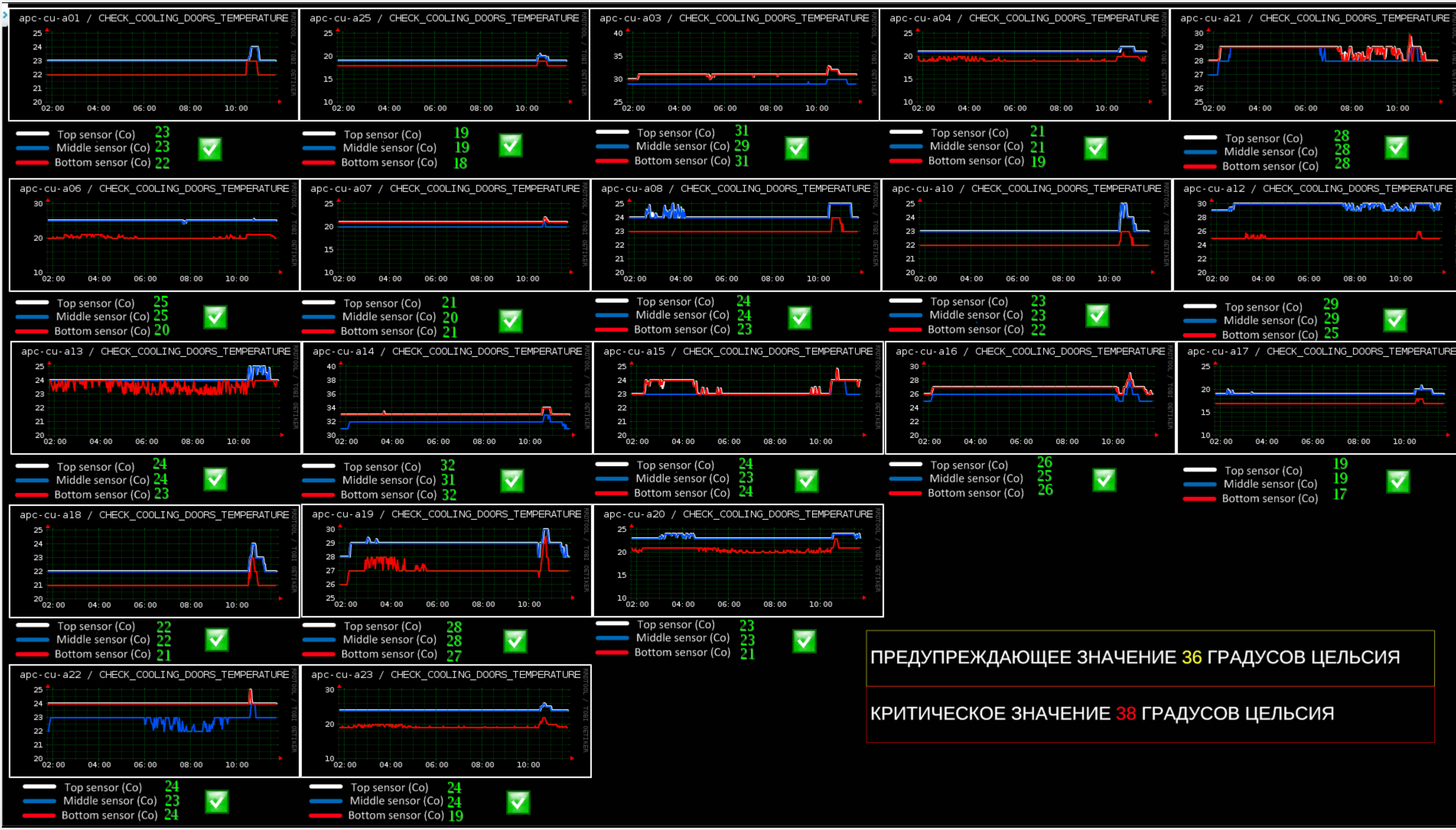
Fire Suppression System

Surveillance System



VESDA (Very Early Smoke Detection Apparatus)

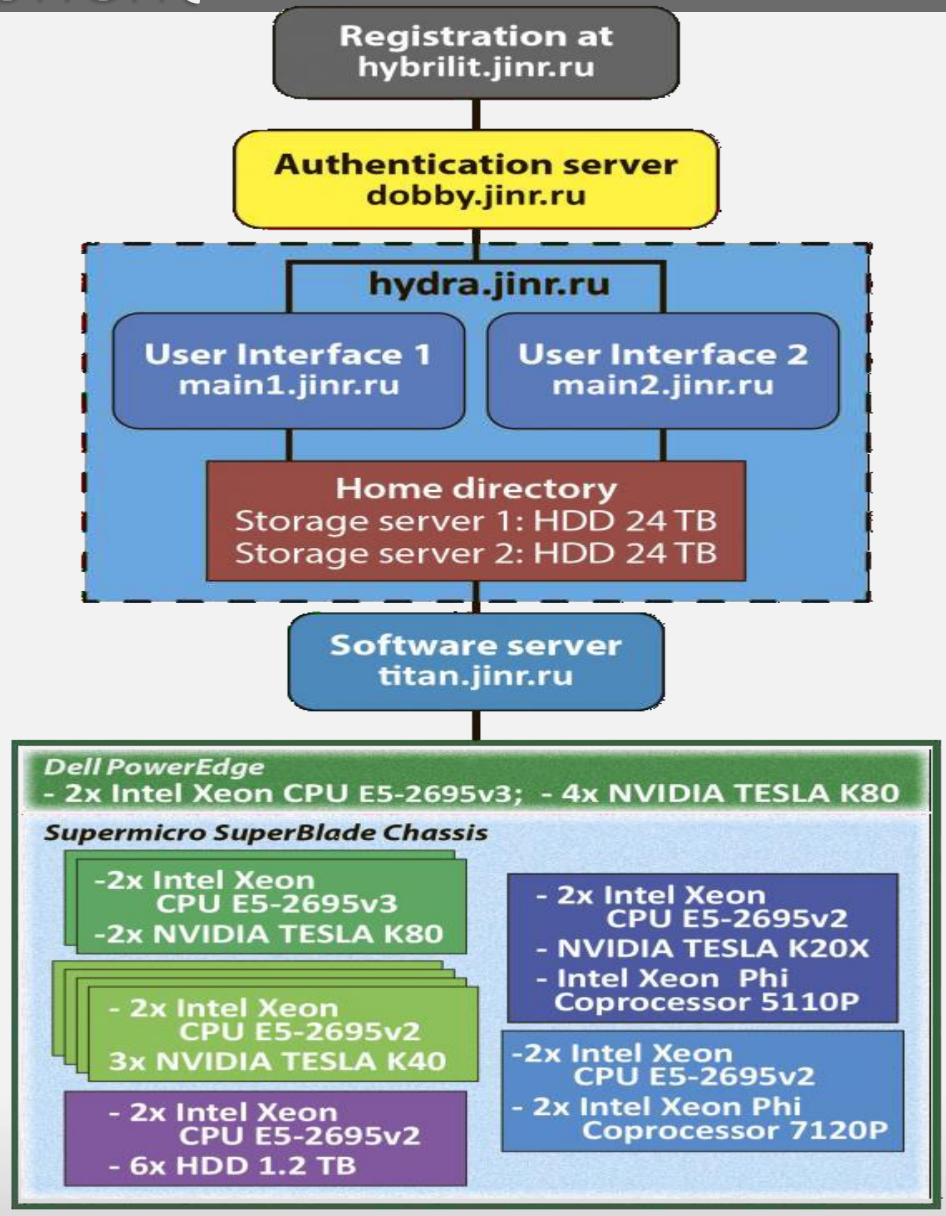
Tier-2 temperature



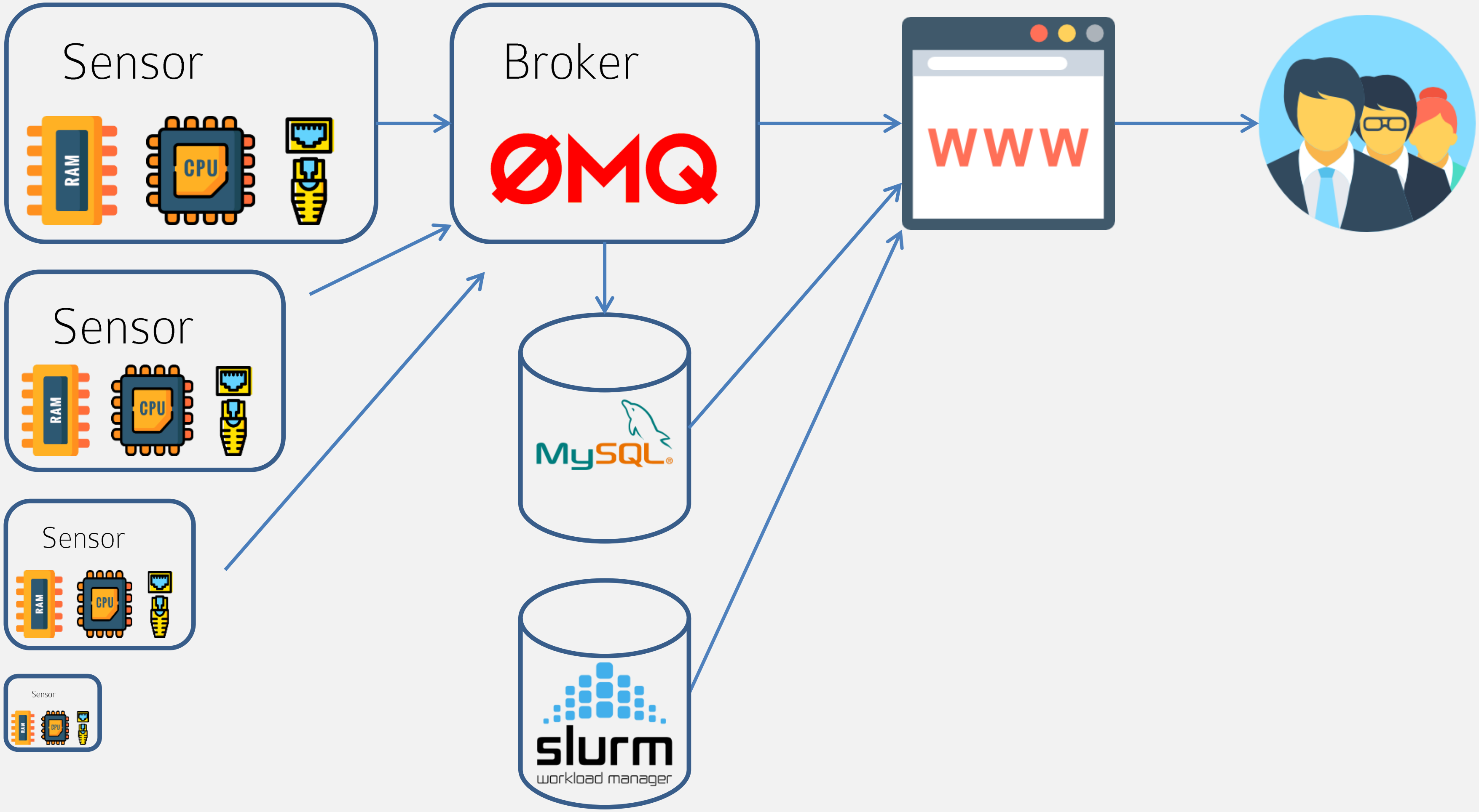
Heterogeneous computing component

In total, the cluster includes:
— 252 CPU-cores,
— 77184 CUDA-cores;
— 182 PHI-cores;
— 1920 GB RAM;
— 60 TB HDD.
Total performance:
142 TFlops for operations with single precision;
50 TFlops for operations with double precision.

At present, the cluster is used by:
120 persons, including **26** from JINR Member States and **19** – Russia Universities.



Heterogeneous computing component



MICC Control Room

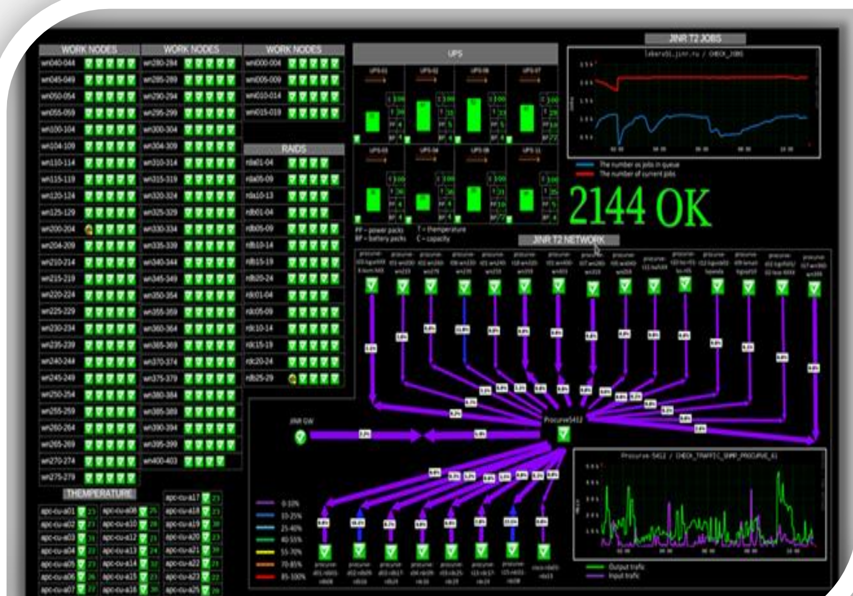
The monitoring system of the JINR Computing Complex has been developed and put into exploitation.

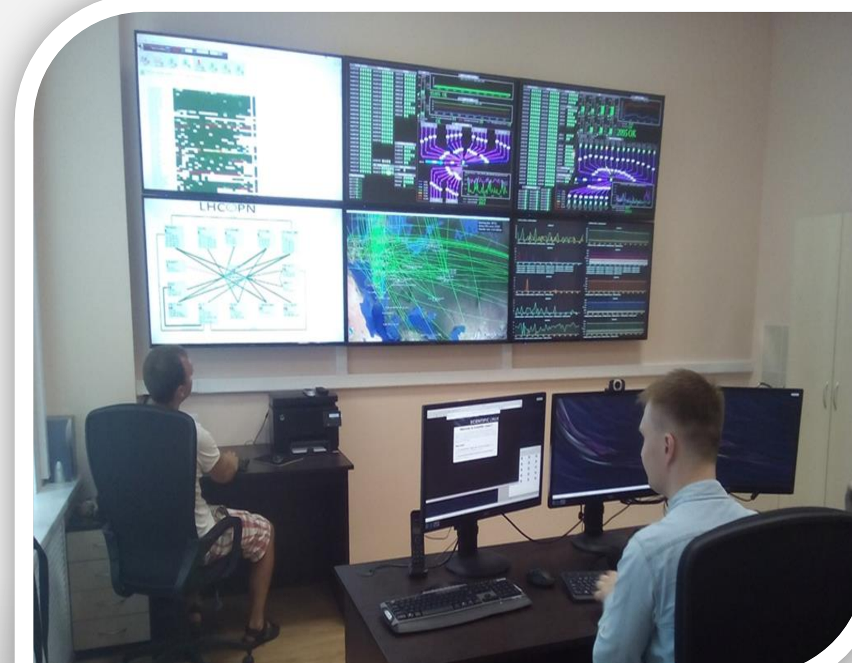
System allows one, in a real time mode, to observe the whole computing complex state and send the system alerts to users via e-mail, sms, etc.

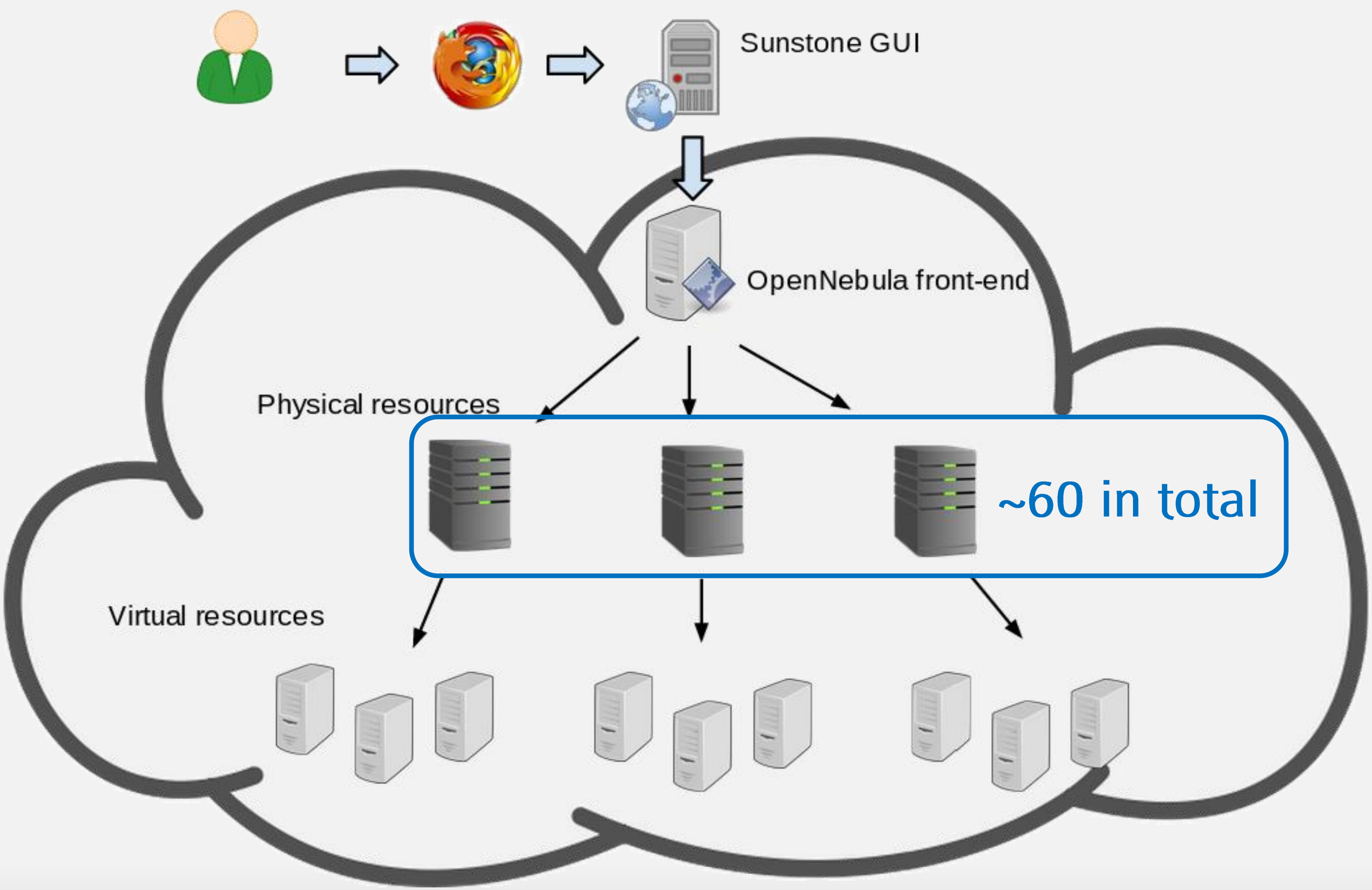
~ 850 elements are under observation

~ 8000 checks in real time

~ 100 scripts

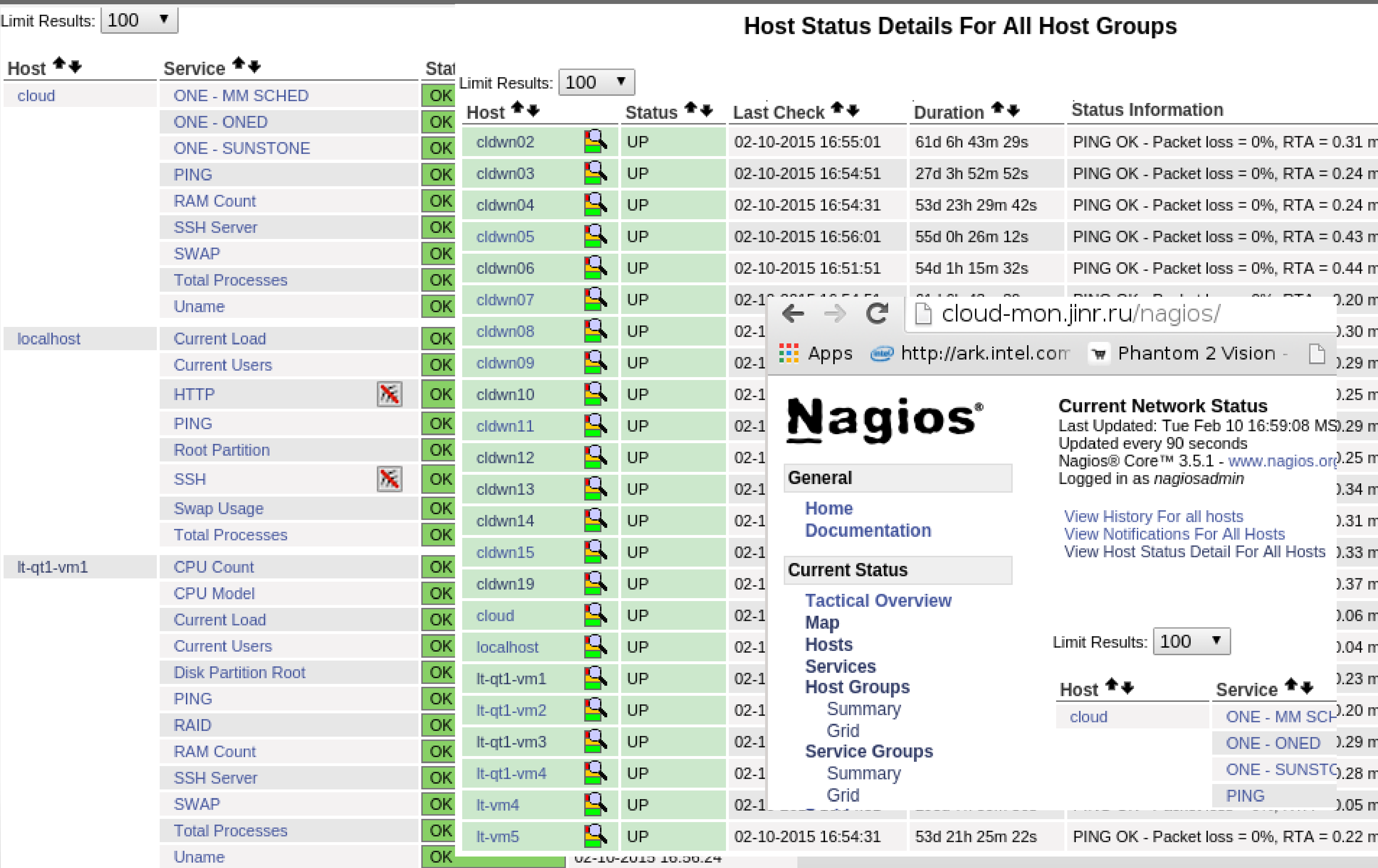


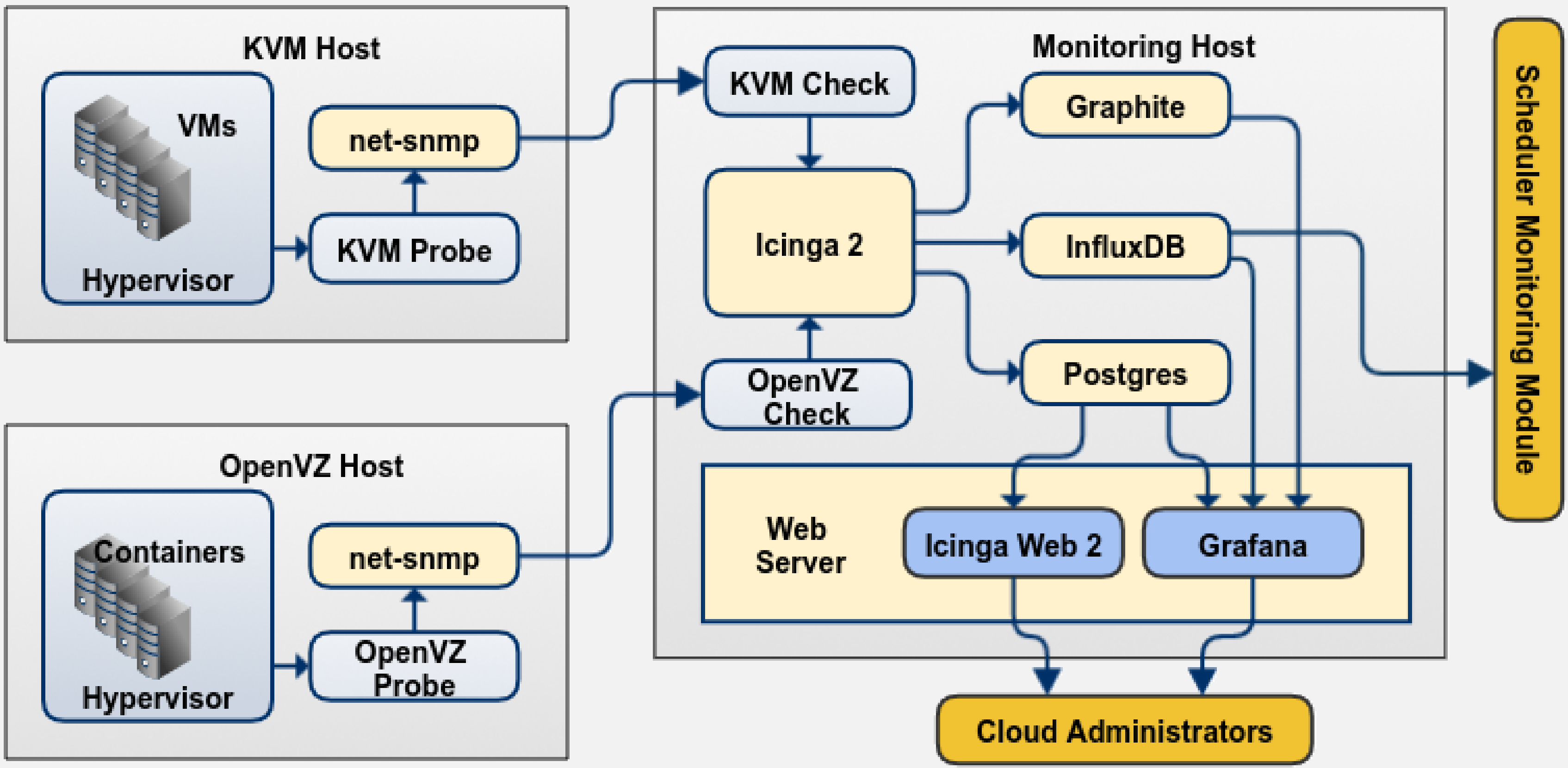




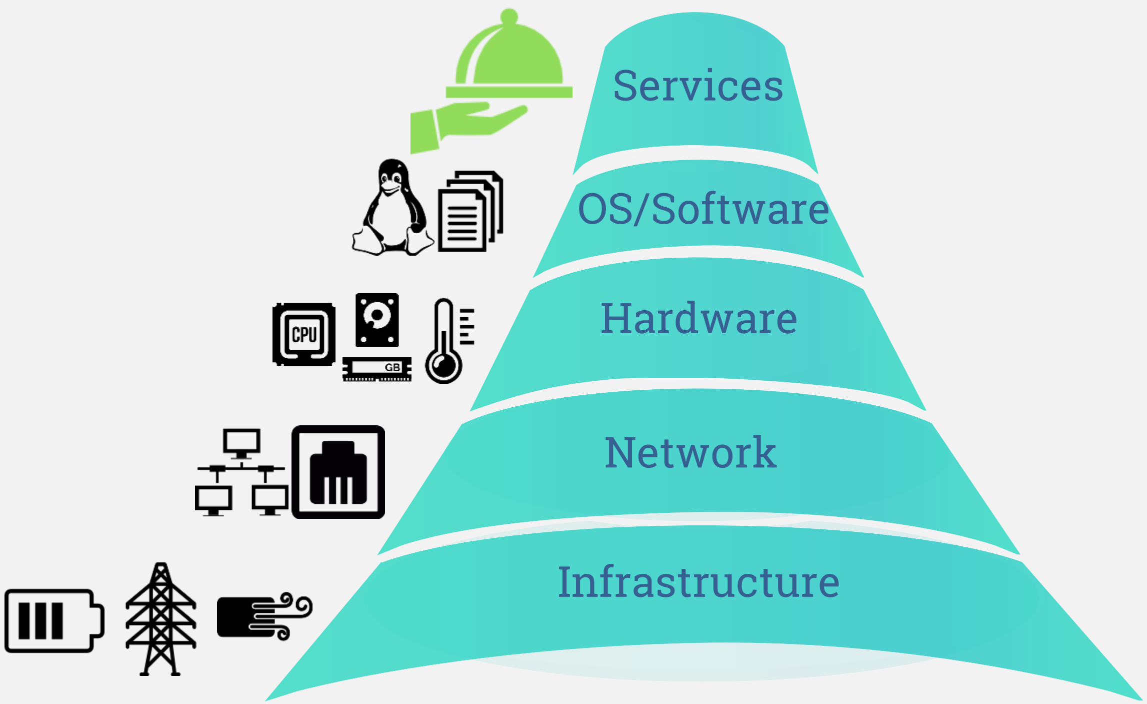
Sunstone GUI
OpenNebula front-end
Physical resources
~60 in total
Virtual resources

cloud.jinr.ru

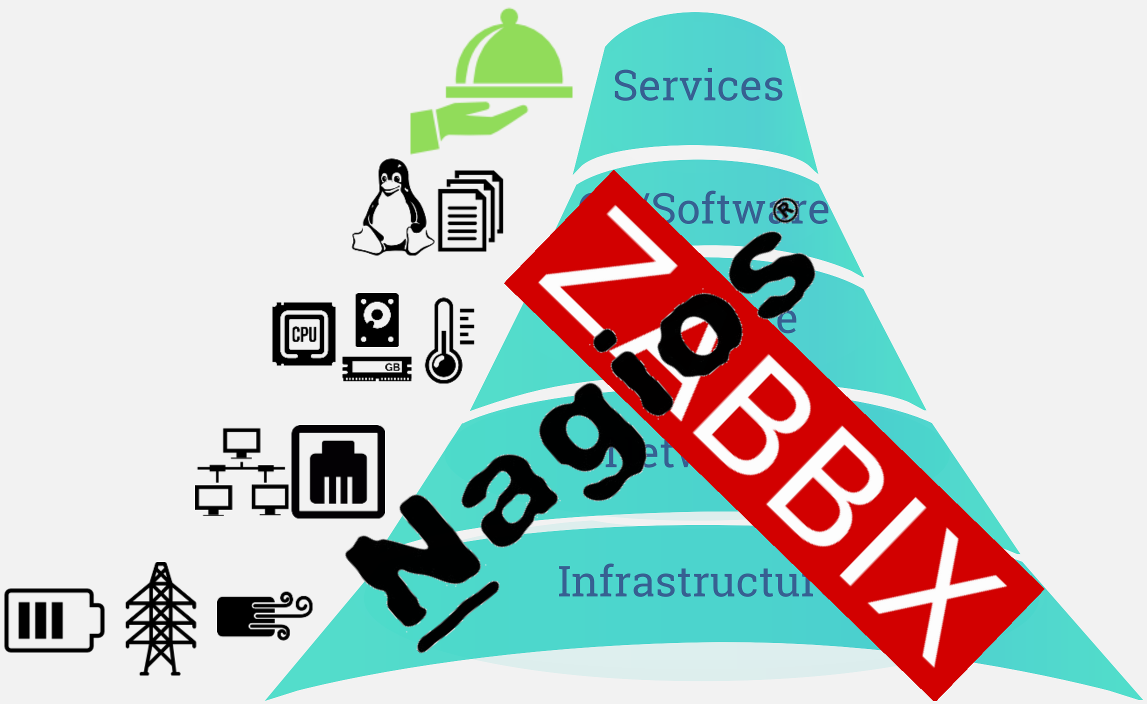



KVM Host
VMs
Hypervisor
net-snmp
KVM Probe
OpenVZ Host
Containers
Hypervisor
net-snmp
OpenVZ Probe
Monitoring Host
KVM Check
Icinga 2
OpenVZ Check
Graphite
InfluxDB
Postgres
Web Server
Icinga Web 2
Grafana
Scheduler Monitoring Module
Cloud Administrators

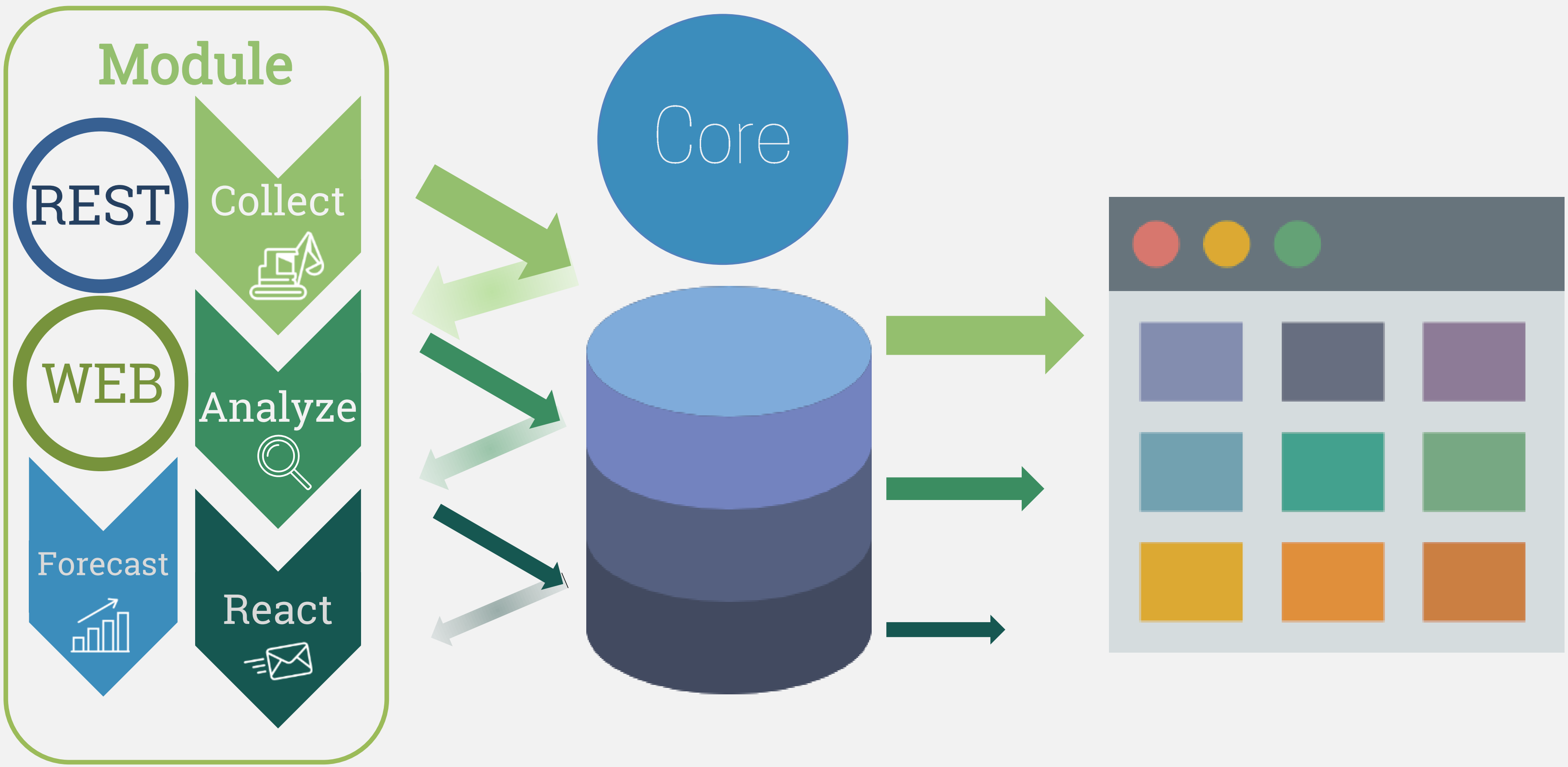
Tier-1 Service monitoring



Tier-1 Service monitoring



Tier-1 Service monitoring



Tier-1 Service monitoring

python™

DataTables

django

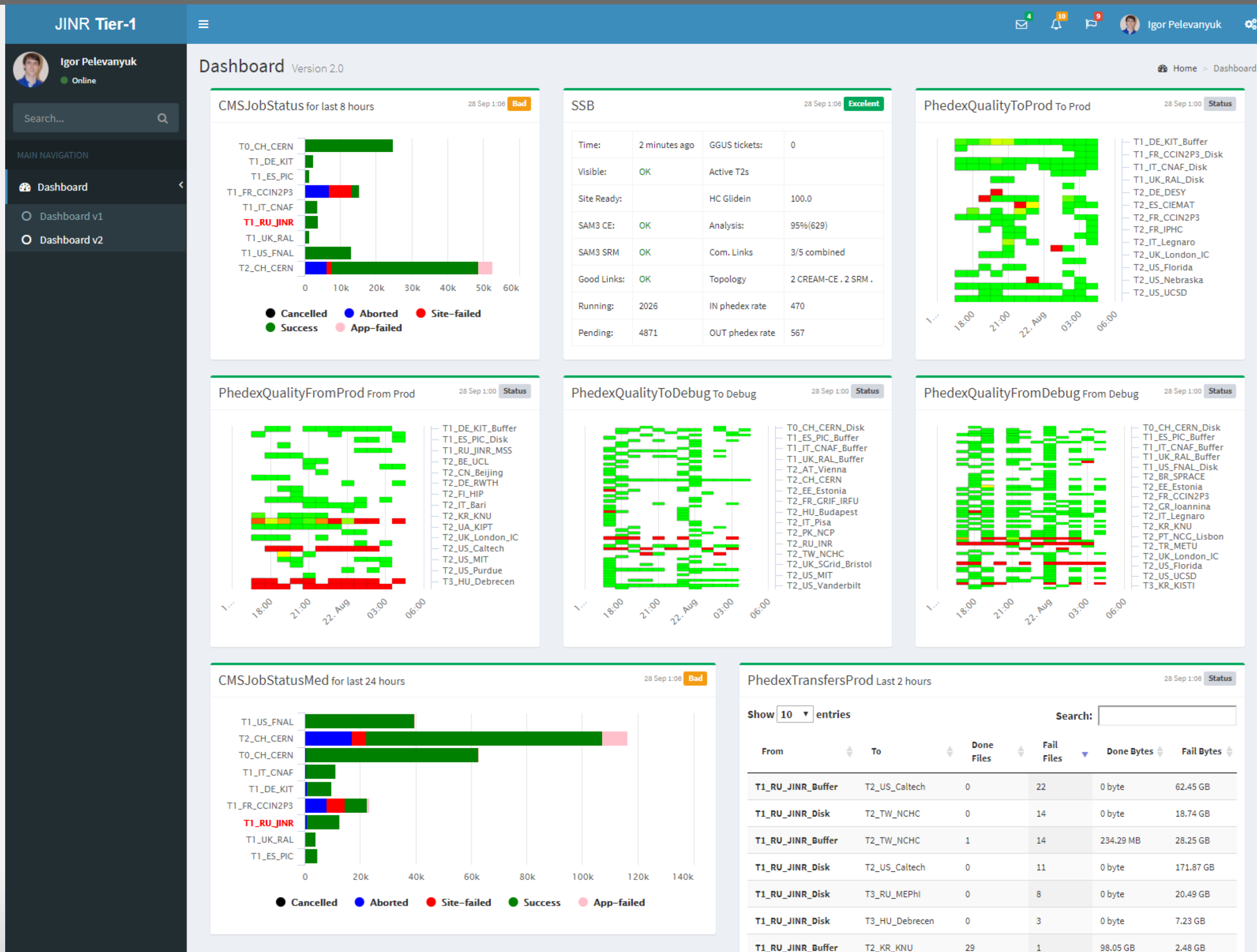
ANGULARJS by Google

Bootstrap

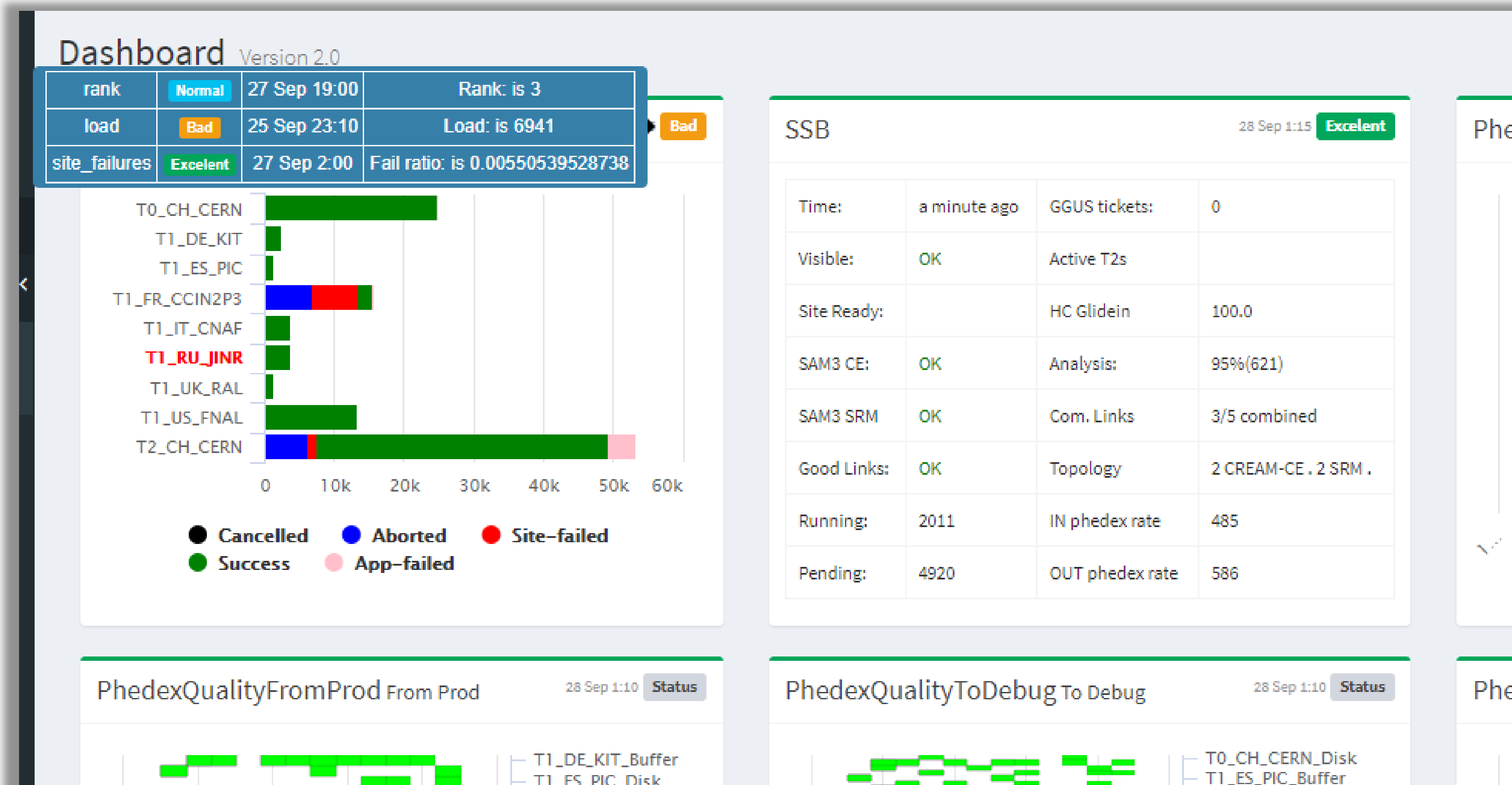
HIGHCHARTS

HTML CSS JS

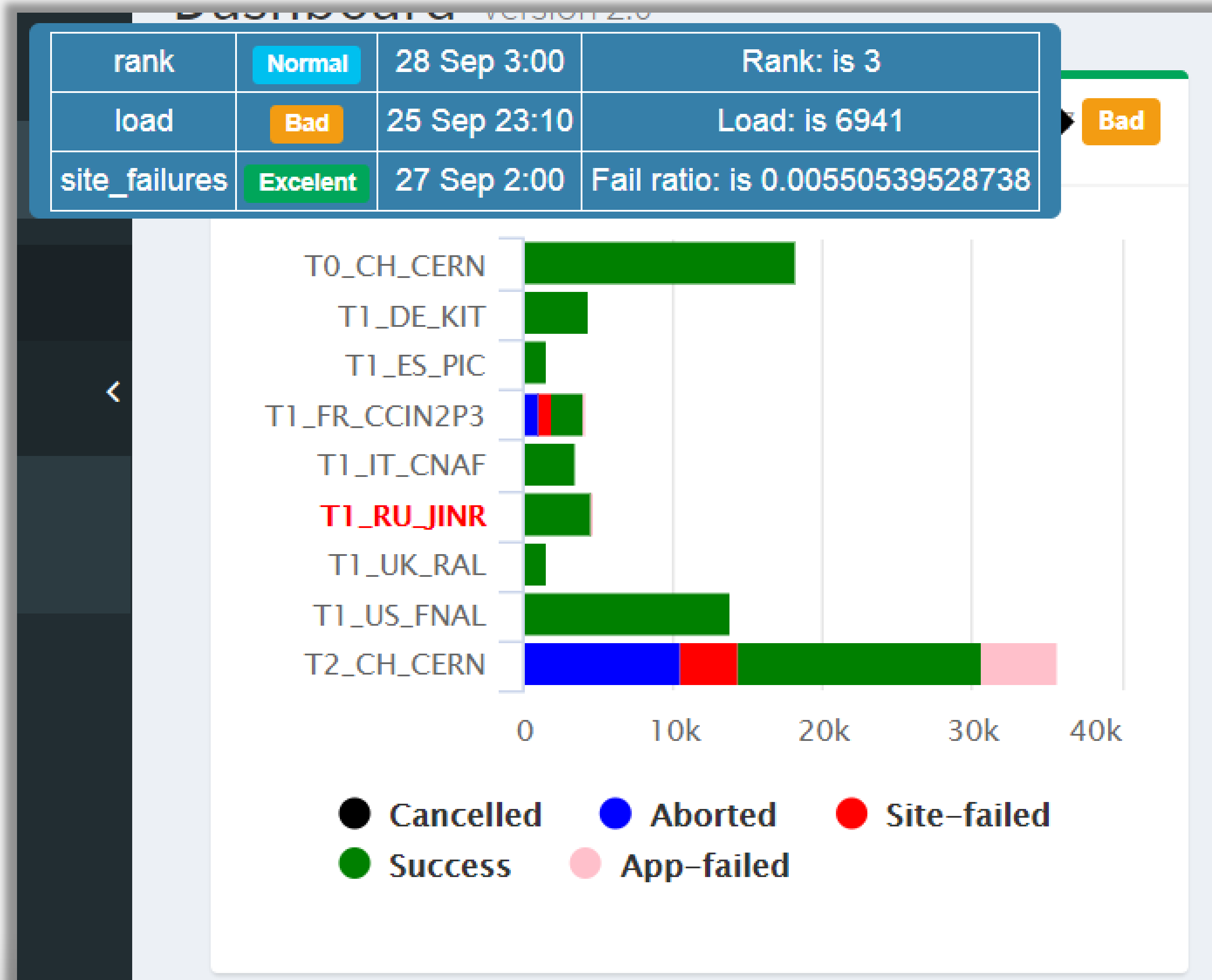
Tier-1 Service monitoring



Tier-1 Service monitoring

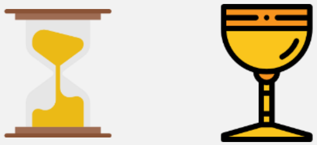


Tier-1 Service monitoring

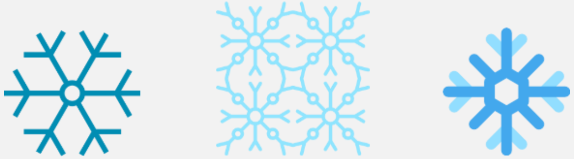


rank	Normal	28 Sep 3:00	Rank: is 3
load	Bad	25 Sep 23:10	Load: is 6941
site_failures	Excelent	27 Sep 2:00	Fail ratio: is 0.00550539528738

Conclusion



Software development is expensive (time, qualification)



Same but different

Definitely require SOME unification

Thank you for attention!