



EVOLUTION OF THE EXPERIMENT PROBE SUBMISSION FRAMEWORK (SAM/NAGIOS)

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Motivation

- Functional testing of the WLCG site services
- Functional testing of the WLCG central services
- Execution of the functional tests on the worker nodes
- On demand functional testing of sites (e.g. middleware readiness, ipv6)
- Site-level service testing* (supporting only existing functional tests)

SAM/Nagios



- Probe Submission Framework (Nagios)
 - Schedule tests
 - Resolve test dependencies, detect flapping, sandboxing
 - Notifications (site, internal)
 - Transport (ActiveMQ)
 - Interfaces (scheduler APIs, event processors, web)
- Probes/Plugins (~30 probes, 113 metrics)
 - Standardized, re-usable tests (Nagios plugins)
 - Remote API tests or worker node tests
- Worker Node Test Framework
 - Probe submission framework on the worker nodes
 - Scheduler, Transport, Interfaces

Technology Evolution


- Nagios compatible systems became very popular
 - Nagios, Naemon, Sensu, Shinken, Icinga (see Related Work)
 - Nagios core has a sustained record of continued releases every 2-3 months for several years
 - 4.0 introduces many interesting performance improvements
 - Nagios plugins became de-facto standard (nagios-plugins.org, monitoring-plugins.org)
 - Interesting work in APIs (Livestatus, Livecheck), auto-configurations (check_mk config engine, WATO), new distributions (Open Monitoring Distribution) and visualizations (graphite instead of pnp4nagios)
- Messaging (ActiveMQ) became common
 - Fits well with geographically distributed monitoring
 - New versions, protocols and libraries became available

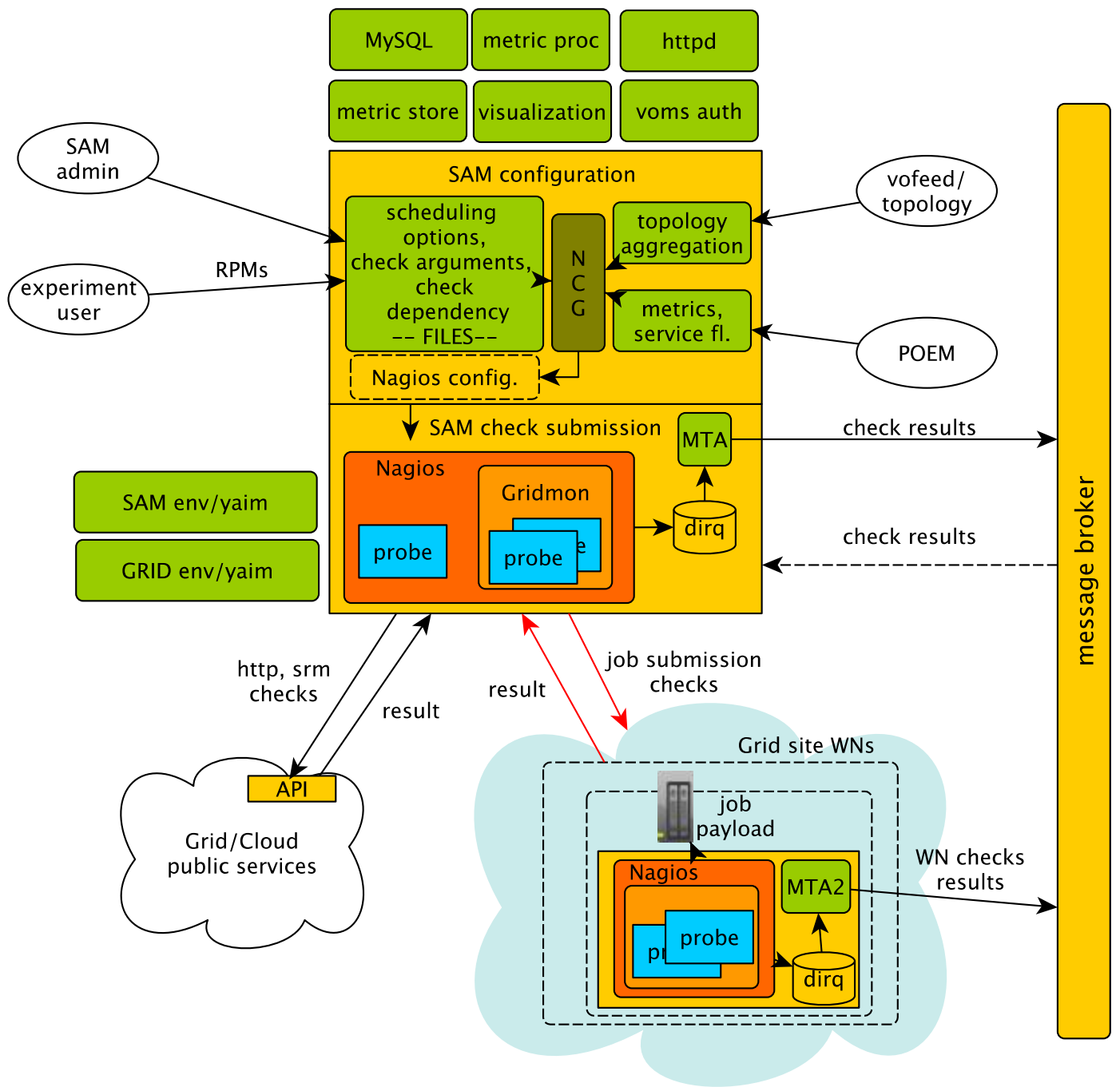
Requirements (short-list)

- Consolidation
 - Complexity reduction
 - Currently 14 components (+ deps) – many no longer actively developed, only maintained
 - Decouple configuration, plugins, submission technology
 - Pending maintenance (environment evolution)
 - UMD3, SLC6/7, Messaging libraries, yaim/puppet
- Plugin requests
 - HT-Condor, RFC proxies, GFAL2 plugins
- New use cases
 - IPv6, Middleware readiness
- Scalability and HA
 - Reaching limits on number of tests for single Nagios
 - Single point of failure (no backup instance solution)



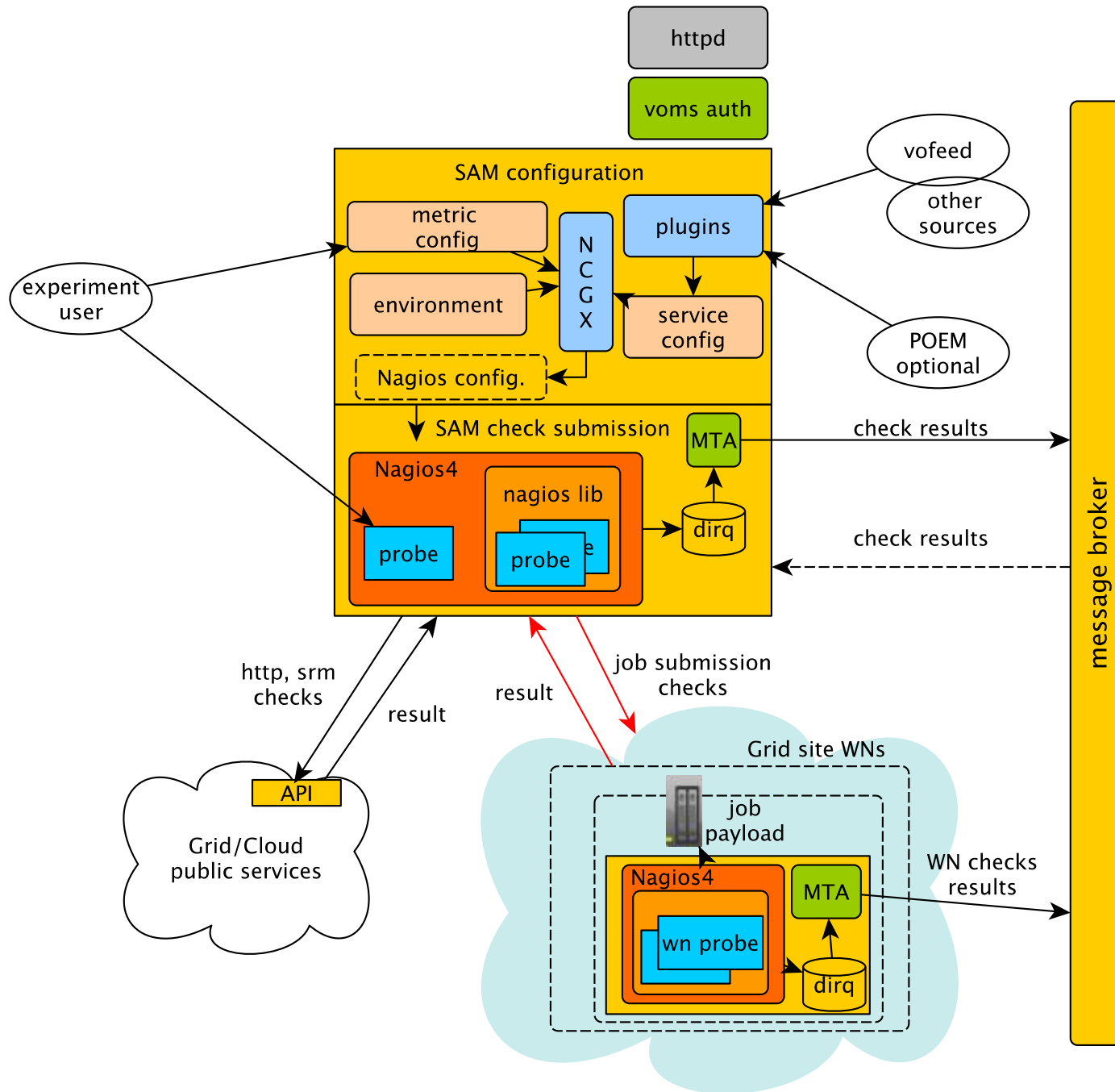
PROBE SUBMISSION FRAMEWORK





Proposed changes

- Nagios-compatible system and Messaging will be kept
- Site and service managers notifications via Nagios will be kept
- New Nagios configuration component will be introduced
 - Auto-generation of the Nagios configuration
 - Creating separation between input sources (topology, metrics) and Nagios core configuration concepts.
- Messaging changes
 - Refactoring current Nagios-Messaging-Nagios bridge
 - Migration to stompctl will be performed to process the message queue and publish/consume messages
- New authorization service (Nagios access)
- Migration to Open Monitoring Distribution
- Moving SAM/Nagios specific packages to EPEL



Service Configuration

- Binds metrics with services
 - Intermediate serialization (json) – enables snapshotting, manual configs, getting config via messaging
- Generated using plugins – enables different sources
 - Interesting for Site and On demand use cases

```
{
host-tags: {
  "CEs" : "host1 host2 host3 host4"
}
checks: {
  [ "emi.cream.glexec.CREAMCE-DirectJobState-/Role/pilot", ["host1",
"host2", "host3"]]
```

but also via host tags

```
  [ "emi.cream.glexec.CREAMCE-DirectJobState-/Role/pilot", "CEs"]
with additional possibility to add params here:
  ["glexec_js", "CEs", {"params": { "interval": 60, args : {"--x":
"/proxy_path"} } } ]
}
```

Metric Configuration Changes

- Metric identifiers will be the same as Nagios service description
 - will include FQANs, so we will have emi.cream.CREAMCE-JobSubmit-
/Role/atlas=lcgadmin instead of emi.cream.CREAMCE-JobSubmit)
- Join all existing command attributes (path, binary, arguments, attributes, etc.) into a single space called command
 - command: /path/binary -arg1 val1 -arg2 val2 ...
- Include worker node metric definitions
 - Auto-configured with all other metrics
- Introduce possibility to define multiple metric dependencies
 - Easily discover all needed metrics (submit <- state, monitor <- proxy-valid <- proxy-get)
- Discontinue all other customization files (e.g. /etc/ncg/ncg-localdb.d/
etc.)



PROBES/PLUGINS



Probes	Used by	Maintained by
Job Submission		
WMS ² CREAMCE ² CONDOR ²	LHCb LHCb, ALICE ATLAS, CMS	SAM
ARC	ALICE (?)	ARC PT
Storage		
LFC ²	LHCb	LHCb (DPM)
SRM ^{1,2}	ATLAS, CMS, LHCb	ATLAS, CMS, LHCb
Worker Nodes		
ATLAS WN (4) ¹ CMS WN (11) ¹ LHCb WN (5) ¹	ATLAS CMS LHCb	ATLAS CMS LHCb
GLEXEC	ATLAS, LHCb, ALICE	GLEXEC PT + SAM
CMS-GLEXEC	CMS	CMS

¹ some parts/plugins are common, others are experiments specific

² based on python-gridmon (Nagios plugins library)

Proposed changes

- python-gridmon (Nagios plugin library)
 - Remove old, obsolete and no longer used code, migrate to higher version of python
 - Keep backwards compatibility with existing plugins
 - Promote code reuse for experiment specific plugins
 - Make it easier to transfer data from external sources into plugin's command line arguments (e.g. space tokens or service endpoint URIs in storage plugins, but also optional forwarding of the arguments to the worker node plugins)
- Job Submission plugins – refactor focusing on removing duplicate, obsolete and no longer used code.
- Upgrade all plugins to support SLC6 and UMD3
- Clean up environment configuration and dependencies
 - Move package deps to probes
 - Central vs per-plugin environment configuration



WORKER NODE TEST FRAMEWORK



Worker Node Test Framework

- Execution of Nagios complaint plugins
 - via Nagios scheduler (including all its options)
 - Creates sandbox for checks
- Establishes environment for Nagios plugins
 - SAM specific environment (brokers, more recently also name of the CE)
- Provides bootstrapping script to
 - setup worker node environment
 - generates Nagios config (nagios.cfg) – and setup of nagios-messaging bridge
 - runs Nagios and message publisher and cleans up
- Provides messaging publisher that reads from the message queue and publishes to the broker
 - specifically designed to work on the worker node environment (lightweight with minimal requirements, python 2.3+ compliant)

Proposed changes

- Changing the current messaging client
 - Testing stompctl on the worker nodes or refactoring the current one
 - Add additional authentication methods to connect to the broker (ideally based on job's proxies)
- Refactoring current bootstrapping script
 - Streamlining configuration of the environment and propagating command line arguments from SAM/Nagios
 - Introduce possibility to have multiple Nagios binaries and/or messaging clients
- Upgrading worker node Nagios binary to a higher version
 - currently 3.2.1, most recent stable is 4.0.8



SUMMARY



Summary

- Areas of work
 - Experiment probe submission framework
 - New configuration and environment setup
 - New messaging and Nagios/Messaging bridge
 - Establishing more open system while taking advantage of the recent developments in open source monitoring
 - Plugins
 - Refactoring python-gridmon – Nagios plugin library
 - Refactoring job submission probes
 - Plugin environment changes
 - Worker node test framework
 - Refactoring messaging and bootstrapping
- Changes critical to keep SAM/Nagios running
 - will introduce more flexible and open system (enable new use cases), decrease operational effort and preserve investments already made in plugins

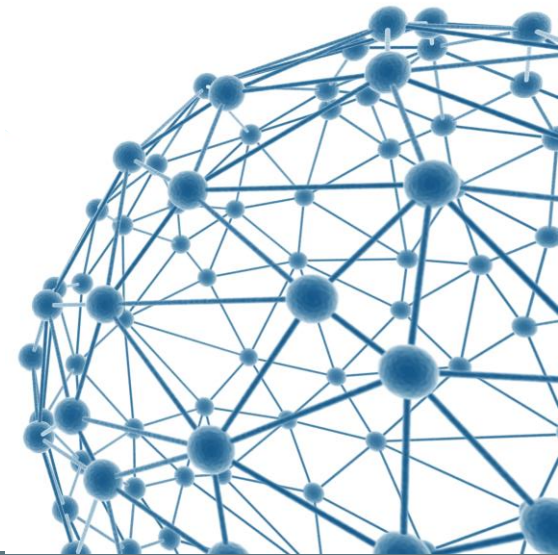
REF

Comments welcome:

<https://docs.google.com/document/d/1Ea1ZDiqJVXzYFeAwC2ZreGJM9-INe-npkK8cwUCk9JY/edit?usp=sharing>



BACKUP



Probes	Used by	Maintained by
CREAMCE (WMS)	OPS, ATLAS, ALICE, CMS, LHCb	CREAM PT
DirectCREAMCE	OPS, LHCb, ALICE	
ARC	OPS	ARC PT
GLEXEC	ATLAS, LHCb, ALICE, OPS	GLEXEC PT + SAM
CMS-GLEXEC	CMS	CMS
BDII	OPS	BDII PT
SRM	OPS	dCache PT
LFC	ATLAS, LHCb, OPS	DPM PT
ATLAS SRM	ATLAS	ATLAS
CMS SRM	CMS	CMS
LHCb SRM	LHCb	LHCb
ATLAS WN	ATLAS	ATLAS
CMS WN	CMS	CMS
LHCb WN	LHCb	LHCb
gen. WN	OPS, ALICE	OPS
WN replication tests	OPS	DPM PT