

Monitoring system of the "Pi of the Sky" experiment.

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Presentation plan

- Introduction
- Why we need monitoring?
- Icinga and why we used it?
- Implementation in Pi of the Sky
- To do
- Conclusions

Introduction

Pi of the Sky:

- network of robotic telescopes,
- all telescopes operate fully autonomously, without human intervention.

Currently, there are two telescopes:

- Working prototype apparatus in San Pedro de Atacama in Chile,
- The first telescope of the final system in the INTA El Arenosillo test centre in Mazagón near Huelva, Spain.

Before the end of this year should be another 3 new units in the INTA.

Functionality expected from a monitoring system

- Monitoring any network and all its resources
 - Network services: SSH, HTTP, SNMP, PING, etc.
 - Host resources: CPU load, disk utilization, system logs, etc.
 - Server components: Switches, routers, temperature and humidity sensors, etc
 - **Any device or service** for which we are able to write a plugin that reads the parameters and returns them.
- Notify – when issues arise and are resolved

These requirements are met by Icinga

Why we need monitoring?

- The system work you need to keep control.
- In each telescope, we should check:
 - status of the dome
 - status of the computers that support the telescope (internet connection, harddisk, CPU temperature etc.)
 - Status mount.
 - Status of each of the 4 (INTA) cameras, such as:
 - chip temperature
 - frame size
 - number of stars
 - Astrometry
 - etc.

At 5 units, this can not be manually browse, we need a dedicated monitoring system.

What is Icinga?

- fork of Nagios, backward compatible.
- enterprise grade open source monitoring
 - licensed under GPL V2 and is free to use, distribute and modify,
- monitoring network and any network resource
 - notifies the user of errors and recoveries
 - generates performance data for reporting
- scalable and extensible,
 - can monitor complex, large environments across dispersed locations,

Why we used the Icinga and not Nagios?

What does Icinga have that Nagios doesn't?

- Retains all the existing features of its Nagios.
- Added many long awaited patches and features requested by the users.
- Icinga can store data in:
 - text files,
 - MySQL,
 - **PostgreSQL**,
 - Oracle.
- Nagios supports only text files and a MySQL database.

Why we used the Icinga and not Nagios?

cont.

- Icinga was forked from Nagios with a clear objective to preserve its open source nature,
- All its versions are available under GPL and will always remain to be.
- Is developed by a large team of monitoring enthusiasts from around the world.
- Bug fixes and new features are constantly released
- Public roadmap is testimony to the team's commitment.

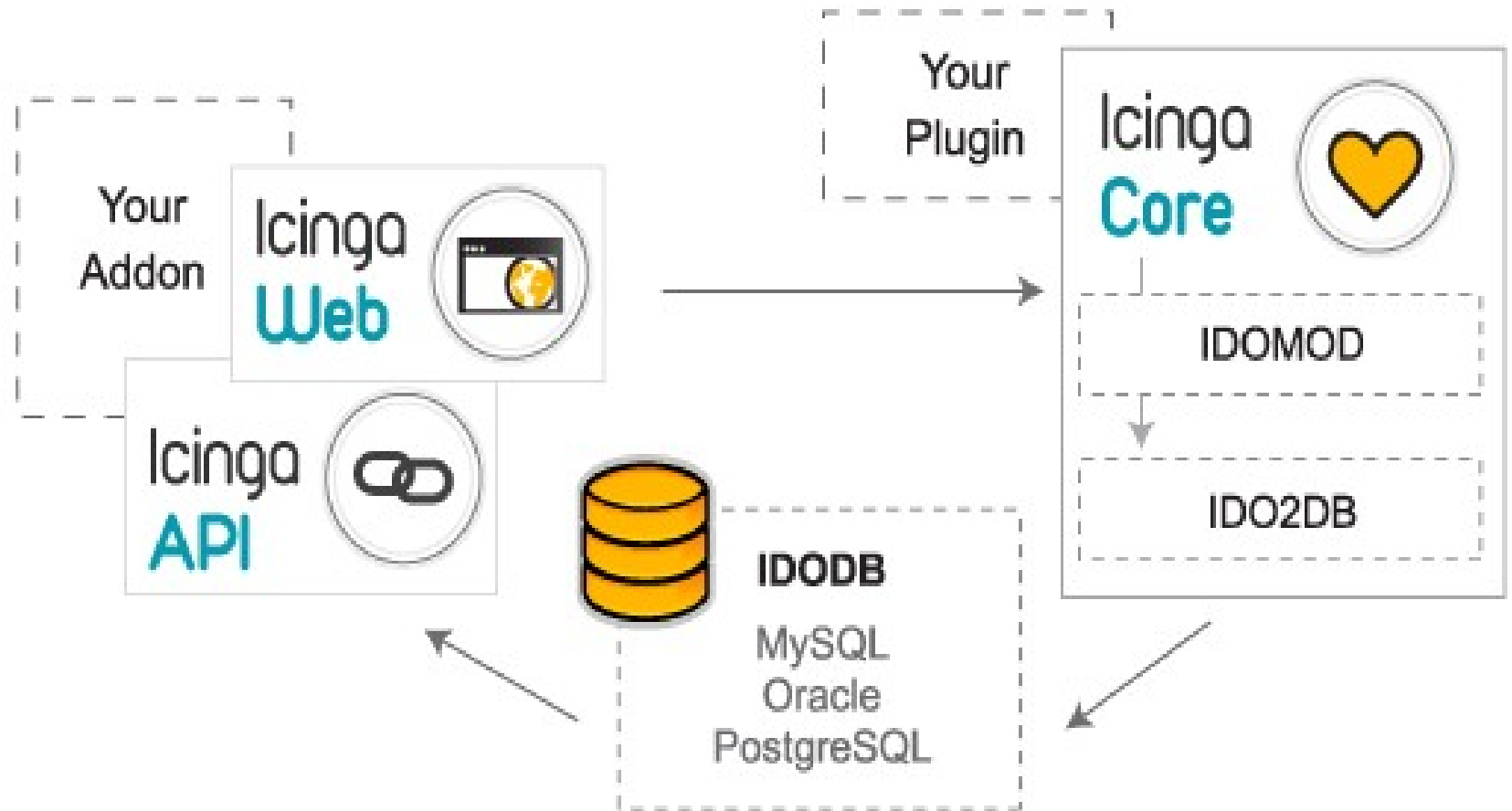
Enterprise grade extensibility & authentication

- From one to thousands of hosts, services, instances
 - Icinga's plugin and modular structure offers limitless extensibility.
- All Nagios extensions are Icinga compatible,
- Icinga's own Doctrine abstraction layer, REST and plugin APIs make designing new extensions easier.
- Highly refined authentication system which enables user access, notifications and views to be customised to the detail of server groups, servers and services per individual.

Icinga architecture

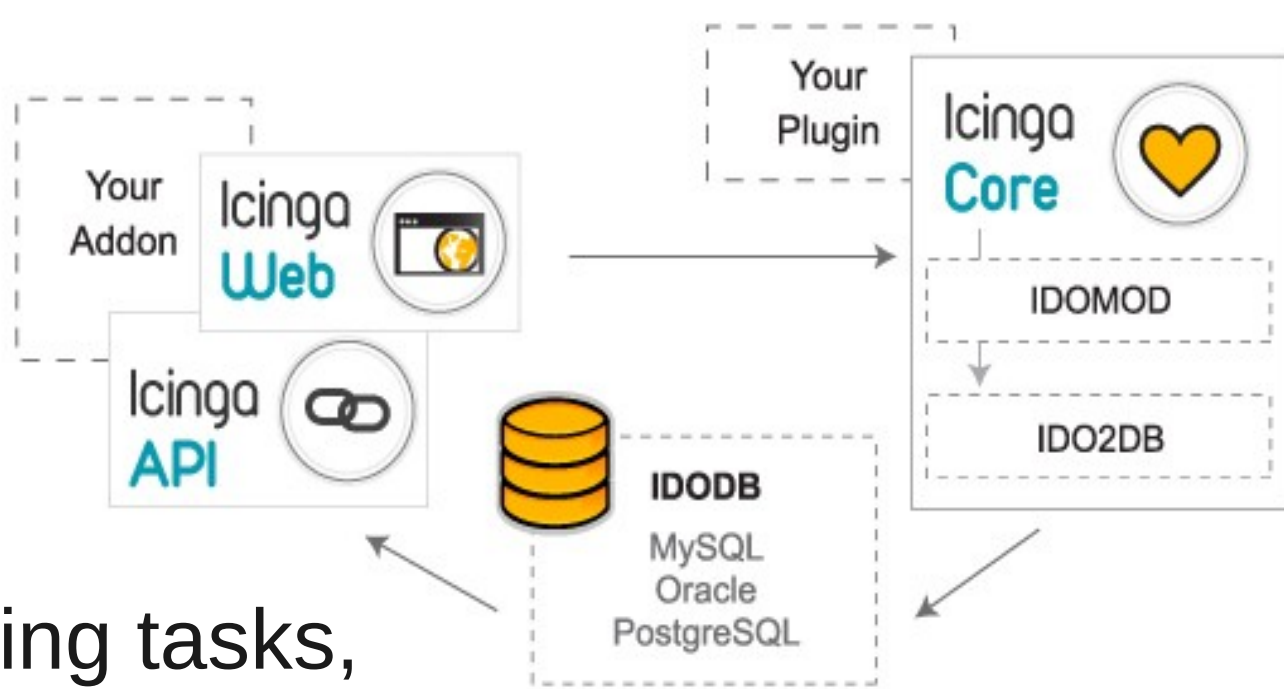
Icinga consists of 3 components which work in tandem:

- Core,
- API,
- Web.



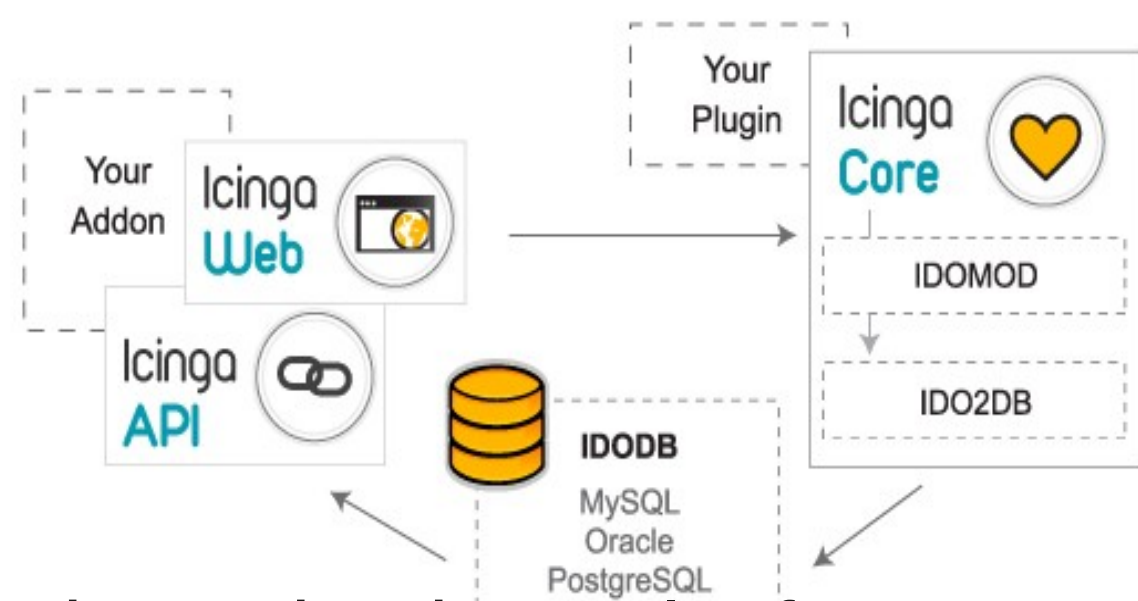
And common database, the IDODB (Icinga Data Out Database).

Icinga Core:



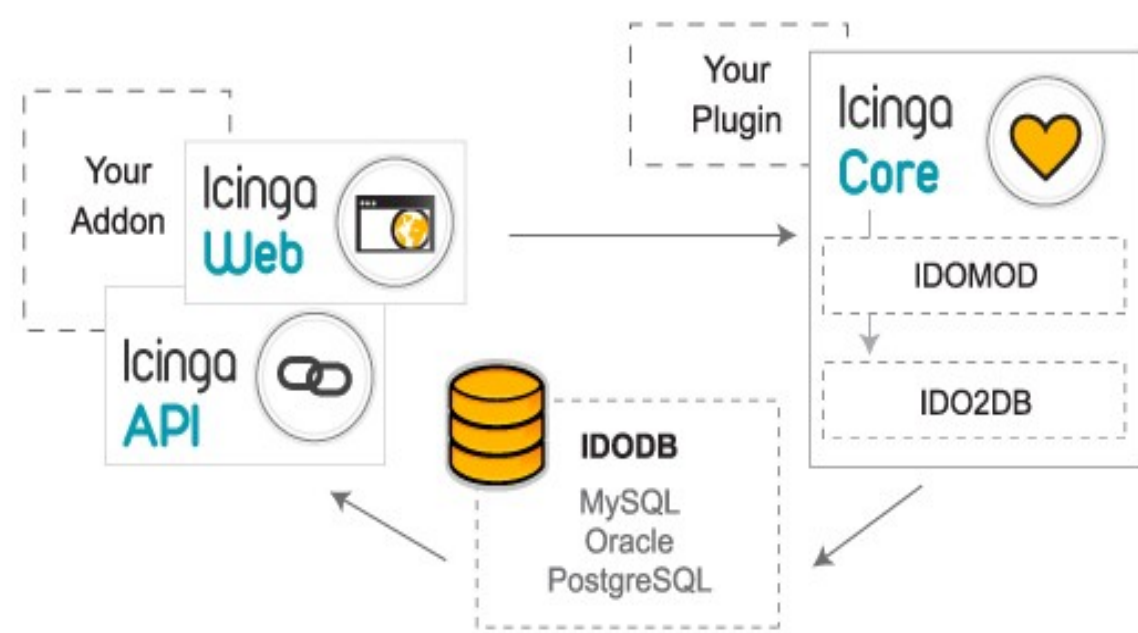
- manages monitoring tasks,
- receiving check results from various plugins.
- communicates these results to the IDODB through the IDOMOD interface and IDO2DB service daemon over SSL encrypted TCP sockets.

Though both come packaged (previously known as IDOUtils) with the Core; they are single standing components which can be separated to distribute the data and processes across multiple servers.



Icinga API:

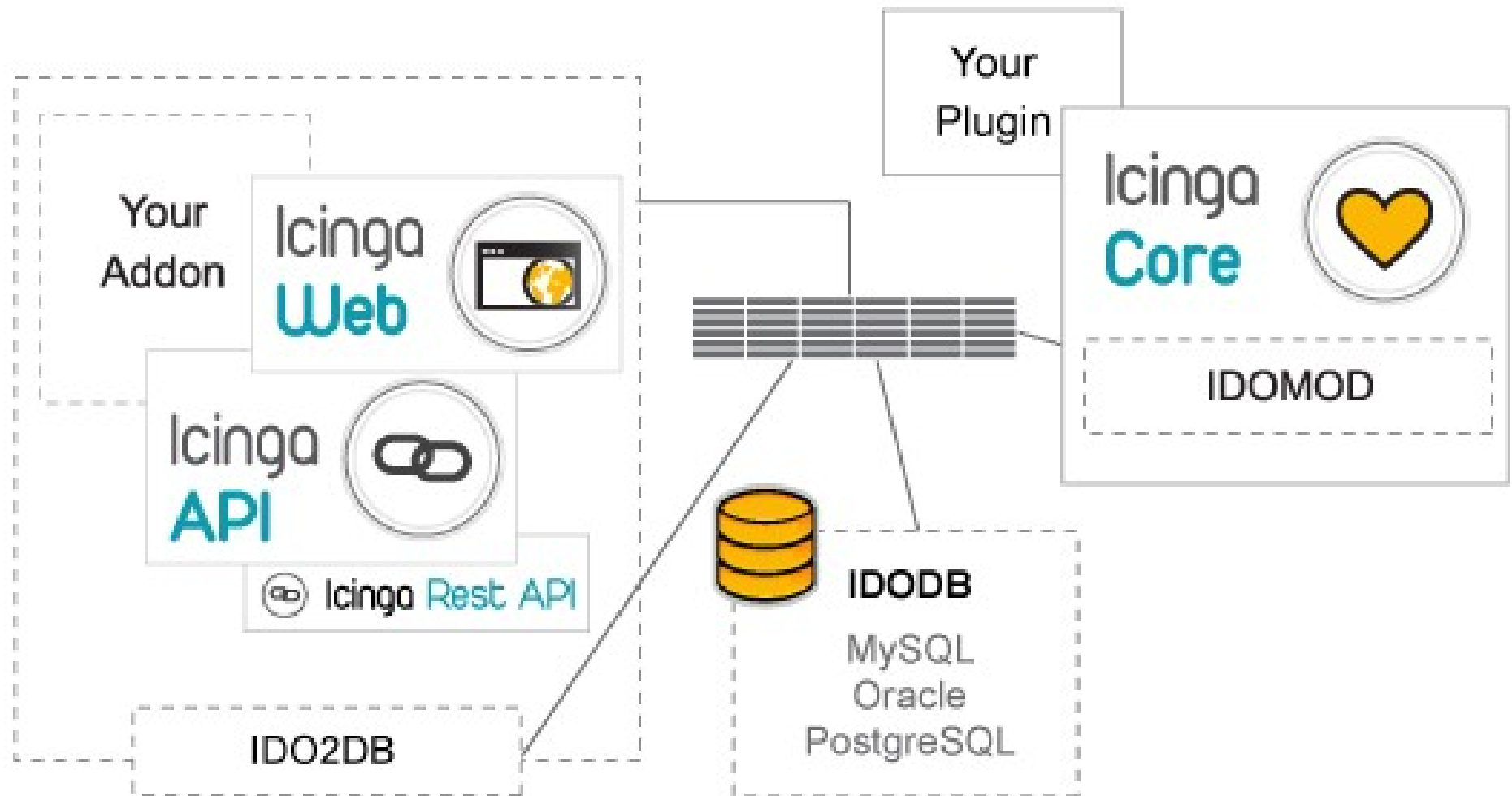
- Fetches information such as check results from the core, through the IDODB.
 - Icinga can support the most popular relational database management systems.
- PHP based, the Icinga API is free from complex data schemas, and has no dependencies on other libraries or frameworks.
- Supports various interfaces, from database PHP-PDO output to pipe and SSH input.



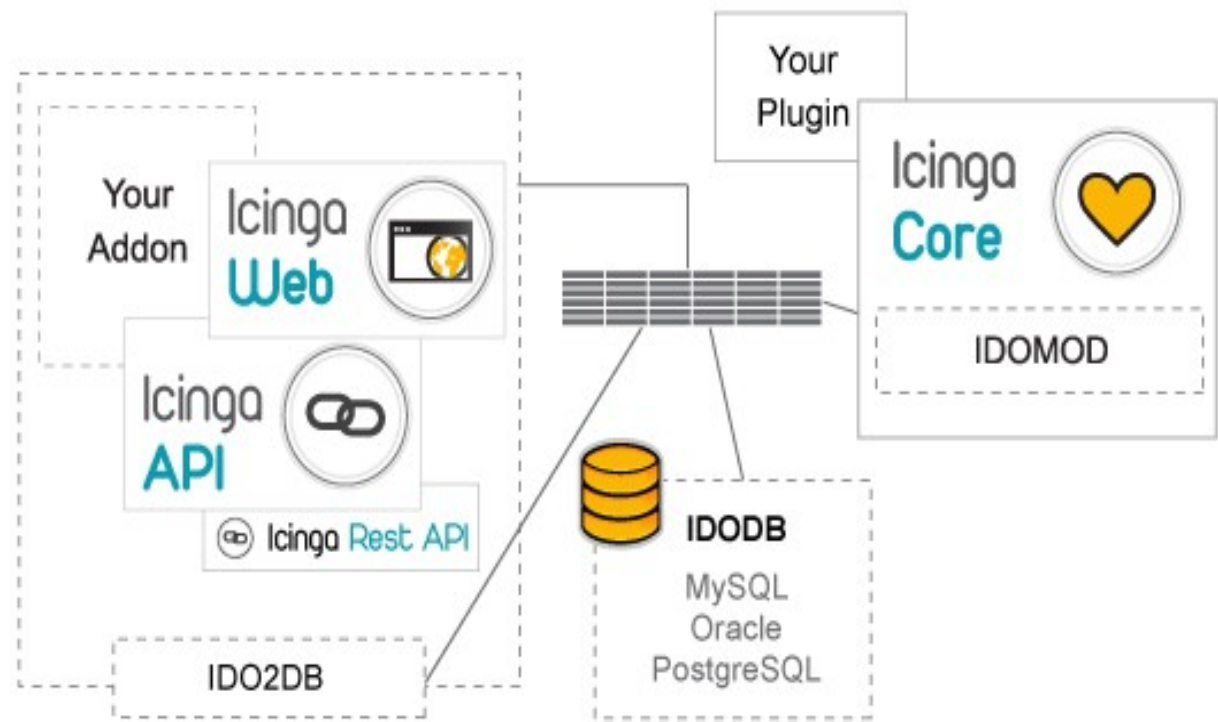
Icinga Web:

- Icinga Web is in essence an online portal to view Icinga monitoring results and send commands to Icinga Core.
- Here host and service status, history, notifications and status maps are available to keep a check on the health of your network in real-time.
- A graphing addon such as PNP or GrapherV2 can be integrated to Icinga Web to generate performance charts for reporting.

Icinga distributed architecture



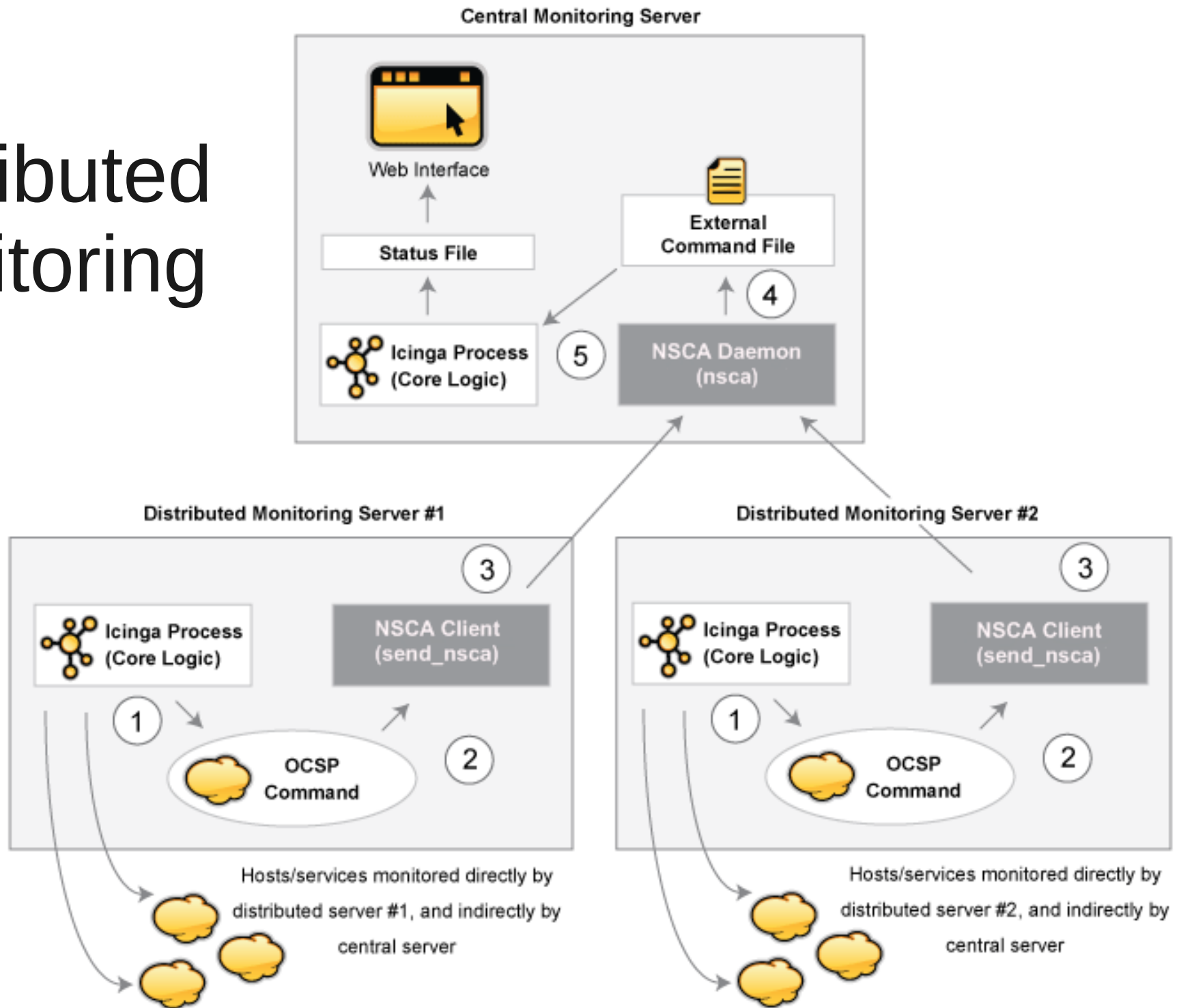
Icinga distributed architecture



Thanks to the loose bundling of Icinga Core, Web, API and database, these components can be distributed and connected by a switch or any other intermediary.

Such systems ensure that the monitoring system itself is fail safe, so should one component fall out, it can be replaced without disturbing the system as a whole.

Distributed Monitoring



Monitoring system of the "Pi of the Sky" experiment.

- First version of Icinga plugin to monitor different system components written.
 - Parses status files which are created by different system tasks (DAQ, mount, piman)
 - Standard plugins used to monitor network and computers
- Icinga monitoring implemented for telescopes in:
 - INTA (Spain)
 - SPdA (Chile)

To do:

- Creation of virtual machine disk image with installed Icinga, and necessary plugins, add-ons, and the initial configuration.
- Installation in the INTA and SPdA KVM(Kernel-based Virtual Machine) and so prepared virtual machines or direct install server Icinga.
 - parse status files locally instead of downloading them to Warsaw
 - store monitoring results locally in case of network problems
- Implement plugins for monitoring additional resources (eg. power supply voltages)
- Writing a plugin directly monitoring the condition of the dome and not by pressing the status file.
- Modifying the current plugin to collect data on the state service directly through CORBA. (This may require modifying the code of those services)

"Pi of the Sky" Monitoring sample screen shots

17 UP 0/0/0 DOWN 0/0/0 UNREACHABLE 0 PENDING 0/17 TOTAL
17 OK 1/0/0 WARNING 0/0/0 CRITICAL **37/0/0 UNKNOWN** 0 PENDING 38/55 TOTAL

icinga 17/0/0 0.02/4.34/1.256 s 55/0/0 0.00/4.01/0.513 s
 0.21/0.53/0.390 s 0.00/0.46/0.128 s

Tactical Monitoring Overview
 Last Updated: Tue May 29 13:55:10 CEST 2012 - Updated every 90 seconds
 [pause]
 Icinga 1.6.1 - Logged in as *icingaadmin*

Network Outages
 0 Outages

Network Health
 Host Health: █
 Service Health: █

Hosts
 0 Down 0 Unreachable 17 Up 0 Pending

Services
 0 Critical 1 Warning 37 Unknown 17 Ok 0 Pending
 Unhandled Problems 1 Active Unhandled Problems 37 Active

Service Checks		Host Checks	
Active	Passive	Active	Passive
Enabled 55 Enabled	Enabled No Passive Checks	Enabled 17 Enabled	Enabled No Passive Checks

Monitoring Features

Flap Detection	Notifications	Event Handlers
Enabled All Services Enabled No Services Flapping All Hosts Enabled No Hosts Flapping	Enabled All Services Enabled All Hosts Enabled	Enabled All Services Enabled All Hosts Enabled

General
 Home
 Documentation
 Search:

Status
 Tactical Overview
 Host Detail
 Service Detail
 Hostgroup Overview
 Hostgroup Summary
 Servicegroup Overview
 Servicegroup Summary
 Status Map

Problems
 Service Problems
 Unhandled Services
 Host Problems
 Unhandled Hosts
 All Unhandled Problems
 Network Outages

System
 Comments
 Downtime
 Process Info
 Performance Info
 Scheduling Queue

Reporting
 Trends
 Availability
 Alert Histogram
 Alert History
 Alert Summary
 Notifications
 Event Log

Configuration
 View Config

"Pi of the Sky" Monitoring sample screen shots (cont.)

The screenshot displays the Icinga monitoring interface. At the top, a status bar shows overall system health: 17 UP, 0 DOWN, 0 UNREACHABLE, 0 PENDING, 0/17 TOTAL. Below this, a more detailed status bar shows 17 OK, 1 WARNING, 0 CRITICAL, 37 UNKNOWN, 0 PENDING, 38/55 TOTAL. The Icinga logo and version information (17/0/0) are also visible.

The main content area is divided into three sections:

- General:** Includes navigation links like Home, Documentation, and a search bar.
- Status:** Lists various monitoring views such as Tactical Overview, Host Detail, Service Detail, etc.
- Problems:** Lists service, host, and network outages.
- System:** Lists system information like Comments, Downtime, Process Info, etc.
- Reporting:** Lists reporting features like Trends, Availability, Alert Histogram, etc.
- Configuration:** Includes a link to View Config.

The central focus is on the host **cam36_status_on_Hoza** and service **chiptemp**. Two performance graphs are shown:

- 25 Hours 28.05.12 13:04 - 29.05.12 14:04:** A line graph showing temperature fluctuations. The y-axis ranges from -20.0 to -5.0. The x-axis shows time from Tue 00:00 to Tue 12:00. Summary statistics: `chiptemp` -10.0000, Last -7.3200, Max -10.1007, Average [blank]. Command: `check_ini_file_by_ssh`.
- One Week 22.05.12 7:04 - 29.05.12 14:04:** A bar graph showing temperature over a week. The y-axis ranges from -20 to 30. The x-axis shows days from 22 to 29. Summary statistics: `chiptemp` -10.4133, Last 26.3053, Max -9.9000, Average [blank]. Command: `check_ini_file_by_ssh`.

On the right side, there are navigation links for Overview, 4 Hours, 25 Hours, One Week, One Month, and One Year. Below these are service links for `astrometry`, `chiptemp`, `failed_astro`, `fitc_size_Kb`, `prev_astro`, and `stars`. A PNP (Performance Number) of 0.6.16 is also displayed.

"Pi of the Sky" Monitoring sample screen shots (cont.)

The screenshot displays the Icinga monitoring interface. At the top, a status bar shows overall system health: 17 UP, 0 DOWN, 0 UNREACHABLE, 0 PENDING, 0/17 TOTAL. A secondary bar shows 17 OK, 1 WARNING, 0 CRITICAL, 37 UNKNOWN, 0 PENDING, 38/55 TOTAL. The Icinga logo and version information (17/0/0) are visible on the right.

The left sidebar contains navigation menus for General, Status, Problems, System, Reporting, and Configuration.

The main content area shows two performance graphs for the service 'stars' on host 'cam34_status_on_Hoza'. The top graph covers a 25-hour period from 13:00 to 14:00 on 28.05.12. The bottom graph covers a one-week period from 7:00 to 14:00 on 22.05.12 to 14:00 on 29.05.12. Both graphs show a blue area chart representing the 'stars#' metric, with a y-axis ranging from 0 to 30 k. The bottom graph includes summary statistics: 10.7185 k Last, 26.9152 k Max, 18.9516 k Average. Both graphs specify the Default Template as 'Default Template' and the Command as 'check_ini_file_by_ssh'.

On the right side, there are links for Overview (4 Hours, 25 Hours, One Week, One Month, One Year) and a list of Services including astrometry, chiptemp, failed_astro, fitc_size_Kb, prev_astro, and stars. A PNP (Passive By Name) button is also present.

Summary.

- The system allows to continuously monitor vital parameters of detectors and computers which control them.
- It facilitates a fast response to anomalies or failures in system's performance.
- Automatic recording of parameters of all components of the "Pi of the Sky" system allows an efficient identification of possible causes of eventual failures.