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Exposing open-source Nagios plug-ins thru CIM

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Disclaimer

- The information in this presentation is part of a work in progress
- This information is subject to change

Agenda

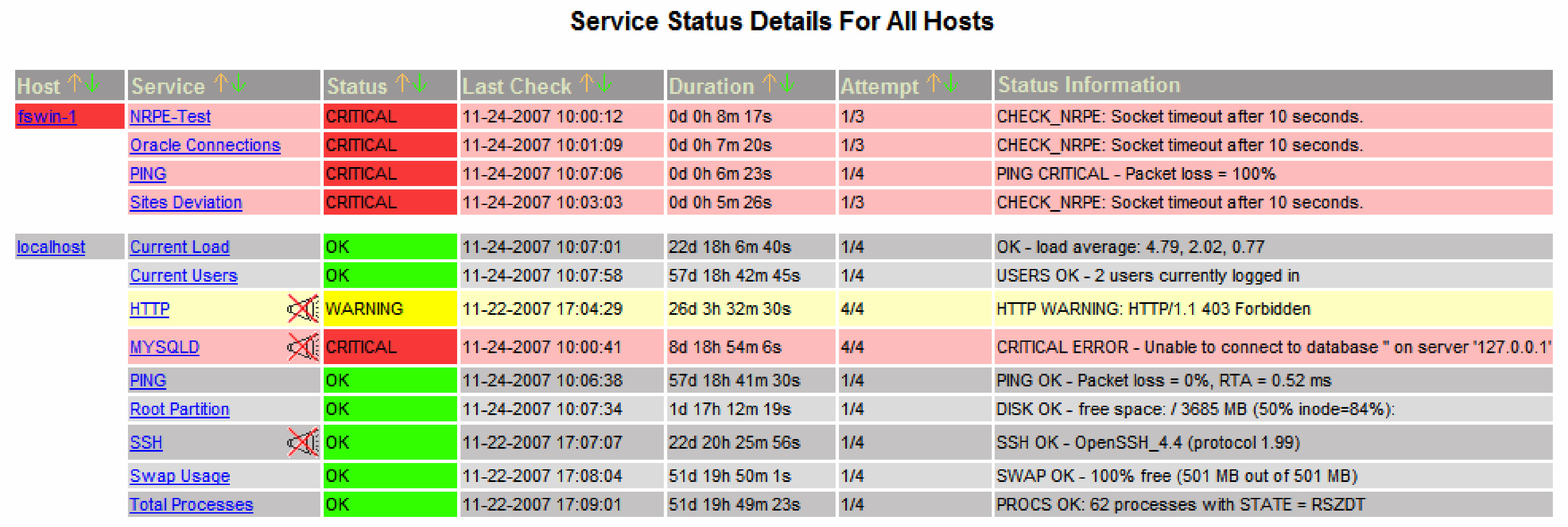
- Nagios*
  - Architecture
  - Plug-ins characteristics
- Nagios-CIM* Solution
  - Nagios-CIM integration
  - Nagios plug-ins thru CIM
  - Proposed framework
  - Indication Provider Implementation
- Demo
- Conclusions and future work

Why Nagios?

- Among the most used open-source monitoring tools
- Open and pretty simple plug-in based architecture
- Massive plug-in developers community
  - Enabling other management tools/frameworks to use these plug-ins thru a standard interface looks appealing
  - Nagios community plug-ins: www.nagiosexchange.org

Nagios console

- This is the high-level view of a host services status in Nagios Web page:

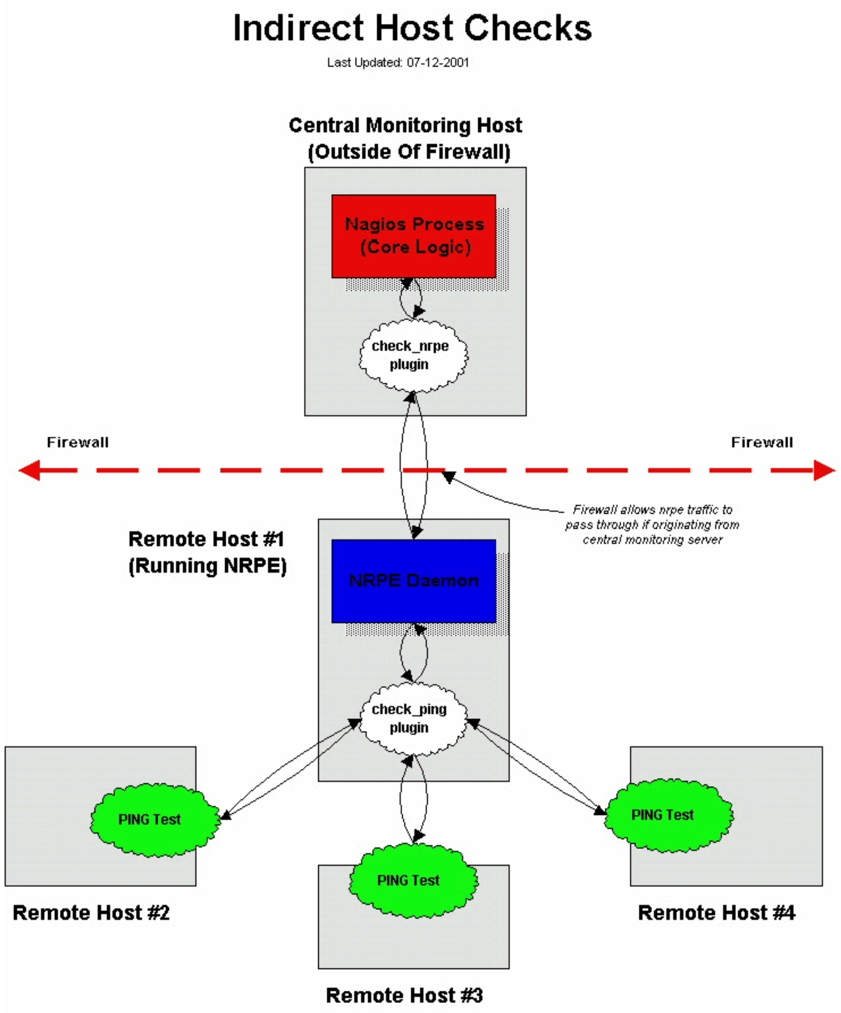


Service Status Details For All Hosts

Host ↑↓	Service ↑↓	Status ↑↓	Last Check ↑↓	Duration ↑↓	Attempt ↑↓	Status Information
fswin-1	NRPE-Test	CRITICAL	11-24-2007 10:00:12	0d 0h 8m 17s	1/3	CHECK_NRPE: Socket timeout after 10 seconds.
	Oracle Connections	CRITICAL	11-24-2007 10:01:09	0d 0h 7m 20s	1/3	CHECK_NRPE: Socket timeout after 10 seconds.
	PING	CRITICAL	11-24-2007 10:07:06	0d 0h 6m 23s	1/4	PING CRITICAL - Packet loss = 100%
	Sites Deviation	CRITICAL	11-24-2007 10:03:03	0d 0h 5m 26s	1/3	CHECK_NRPE: Socket timeout after 10 seconds.
localhost	Current Load	OK	11-24-2007 10:07:01	22d 18h 6m 40s	1/4	OK - load average: 4.79, 2.02, 0.77
	Current Users	OK	11-24-2007 10:07:58	57d 18h 42m 45s	1/4	USERS OK - 2 users currently logged in
	HTTP	WARNING	11-22-2007 17:04:29	26d 3h 32m 30s	4/4	HTTP WARNING: HTTP/1.1 403 Forbidden
	MYSQLD	CRITICAL	11-24-2007 10:00:41	8d 18h 54m 6s	4/4	CRITICAL ERROR - Unable to connect to database '' on server '127.0.0.1'
	PING	OK	11-24-2007 10:06:38	57d 18h 41m 30s	1/4	PING OK - Packet loss = 0%, RTA = 0.52 ms
	Root Partition	OK	11-24-2007 10:07:34	1d 17h 12m 19s	1/4	DISK OK - free space: / 3685 MB (50% inode=84%):
	SSH	OK	11-22-2007 17:07:07	22d 20h 25m 56s	1/4	SSH OK - OpenSSH_4.4 (protocol 1.99)
	Swap Usage	OK	11-22-2007 17:08:04	51d 19h 50m 1s	1/4	SWAP OK - 100% free (501 MB out of 501 MB)
	Total Processes	OK	11-22-2007 17:09:01	51d 19h 49m 23s	1/4	PROCS OK: 62 processes with STATE = RSZDT

Nagios architecture

- 3 core building blocks:
  - Core engine
    - components definition
    - orchestration
  - Add-ons
    - firewalls bypassing
      - NSCA
      - NRPE
    - DB historical data
  - Plug-ins
    - measuring work



[Picture Source: Nagios 3.0 online Documentation]

Nagios plug-ins

- Nagios acquires measurements only through plug-ins
- Almost anything that can generate output to the STDOUT is a potential Nagios plug-in
  - Required: OK | WARNING | CRITICAL
  - Optional: Raw Data – Statistical data
- Its output depends on received parameters
- The Nagios core engine is agnostic to the type and semantics of the reported metric

Nagios plug-ins distribution

- Some of them comes with Nagios official distribution
  - Examples: check_http, check_disk, check_mem, …
- A huge percentage of them are developed by the community for a wide range of resources monitoring, including special hardware as well as very unusual uses
  - check_dell_sensors (Dell* chassis)
  - oracle_writeaccess
  - check_pcoweb (air conditioning)
  - 100+ for SNMP usage
  - 50+ for Windows monitoring thru NT NRPE version
  - …

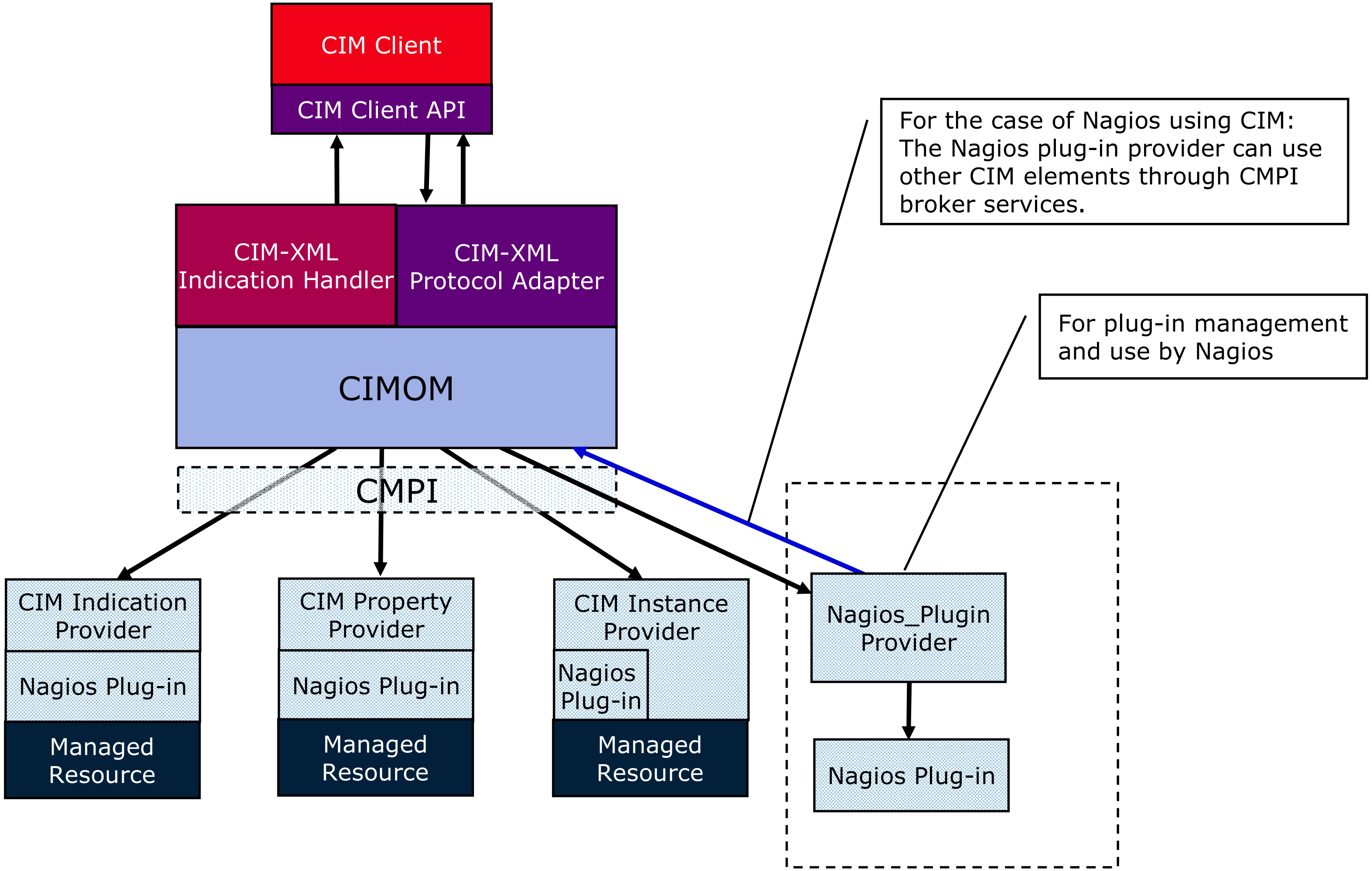
Nagios-CIM integration

- Two aspects
  - Seamless utilization of Nagios plug-ins thru CIM
  - Utilization of CIM by Nagios
- This work is focused on plug-ins utilization thru CIM

Nagios plug-ins thru CIM

- Nagios plug-ins can be used to implement specific providers
  - Indication Providers (Alert indications)
  - Property Providers
  - Certain properties population in Instance Providers
- Different design approaches
- Plug-in usage should be seamless
- The provider-CIMOM interface should be CMPI

Nagios plug-ins thru CIM diagram



For the case of Nagios using CIM: The Nagios plug-in provider can use other CIM elements through CMPI broker services.

For plug-in management and use by Nagios

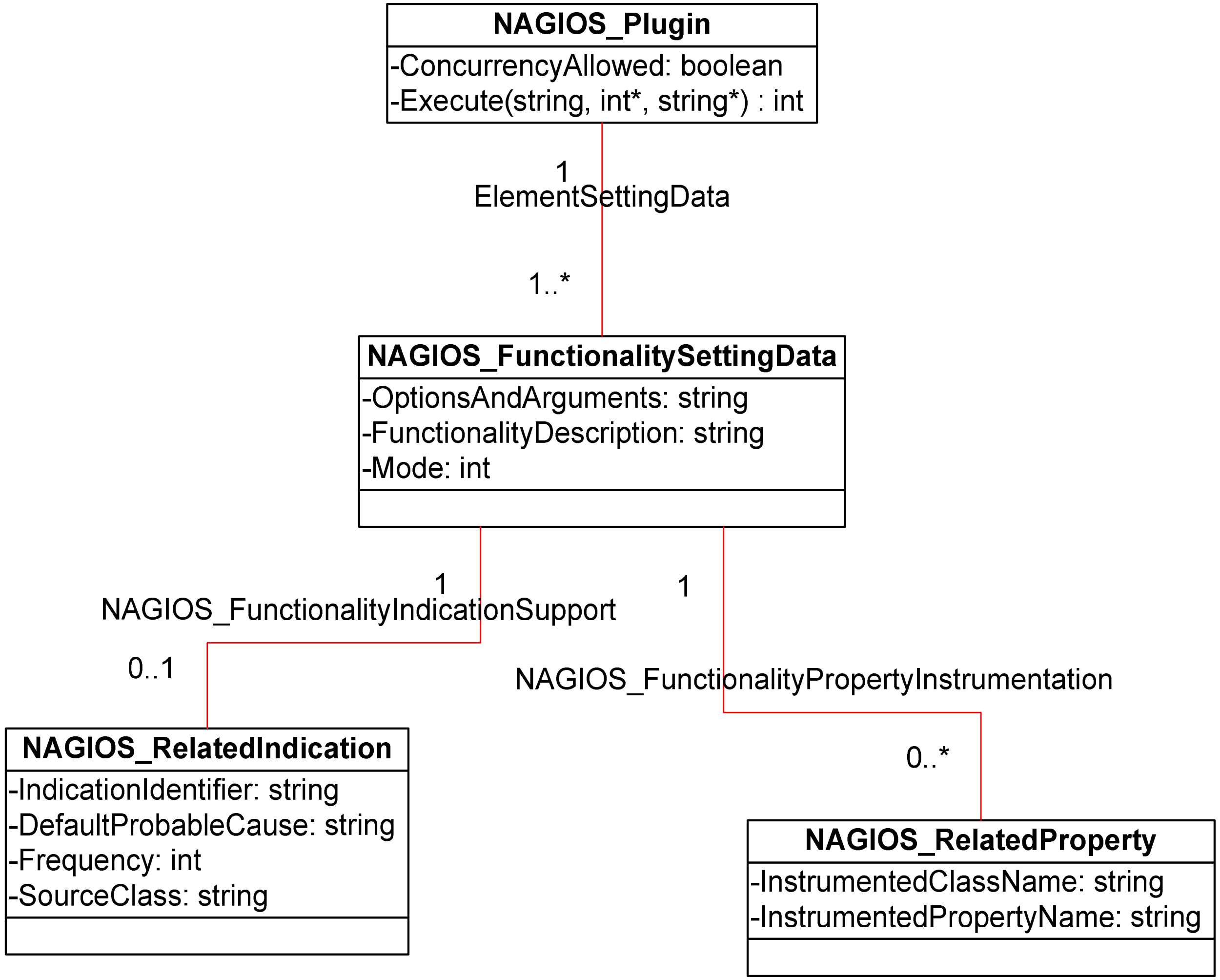
Nagios plug-ins considerations

- A plug-in can provide different information
  - Depending on the options and arguments passed
- A plug-in can be concurrently run by different providers
  - Possibility of race conditions in some plug-ins
- A plug-in is executed in a periodic basis
- Configuration must take place before plug-in usage
- Dynamic management of plug-ins is desirable

Proposed framework

- The framework allows an easy and straightaway method for using third-party plug-ins
- A script finds all plug-ins and asks the operator to enter the required configuration values for each plug-in
- The configuration data is stored in the CIM repository
  - Specific extension schema has been created for Nagios plug-ins
- A general Nagios plug-in indication provider has been designed to execute all Nagios plug-ins
- When a subscription is received the indication provider reads the configuration data for each plug-in and executes it
- For properties, the provider searches the appropriate plugin functionality for the class/property

Schema diagram



NAGIOS_Plugin

-ConcurrencyAllowed: boolean
-Execute(string, int*, string*) : int

1
ElementSettingData
1..*

NAGIOS_FunctionalitySettingData

-OptionsAndArguments: string
-FunctionalityDescription: string
-Mode: int

1
NAGIOS_FunctionalityIndicationSupport
0..1

1
NAGIOS_FunctionalityPropertyInstrumentation
0..*

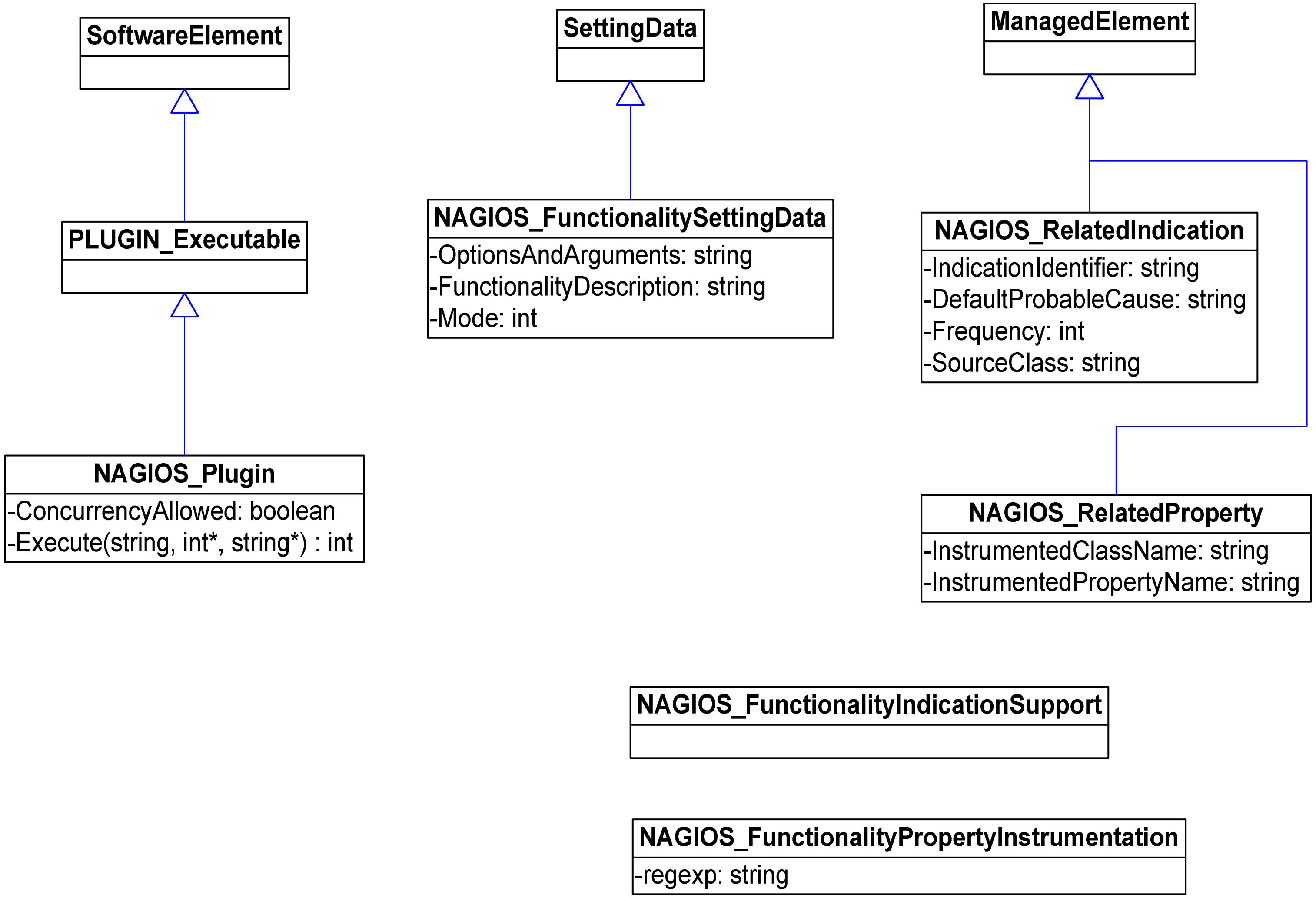
NAGIOS_RelatedIndication

-IndicationIdentifier: string
-DefaultProbableCause: string
-Frequency: int
-SourceClass: string

NAGIOS_RelatedProperty

-InstrumentedClassName: string
-InstrumentedPropertyName: string

Class hierarchy



SoftwareElement

PLUGIN_Executable

NAGIOS_Plugin
-ConcurrencyAllowed: boolean
-Execute(string, int*, string*) : int

SettingData

NAGIOS_FunctionalitySettingData
-OptionsAndArguments: string
-FunctionalityDescription: string
-Mode: int

ManagedElement

NAGIOS_RelatedIndication
-IndicationIdentifier: string
-DefaultProbableCause: string
-Frequency: int
-SourceClass: string

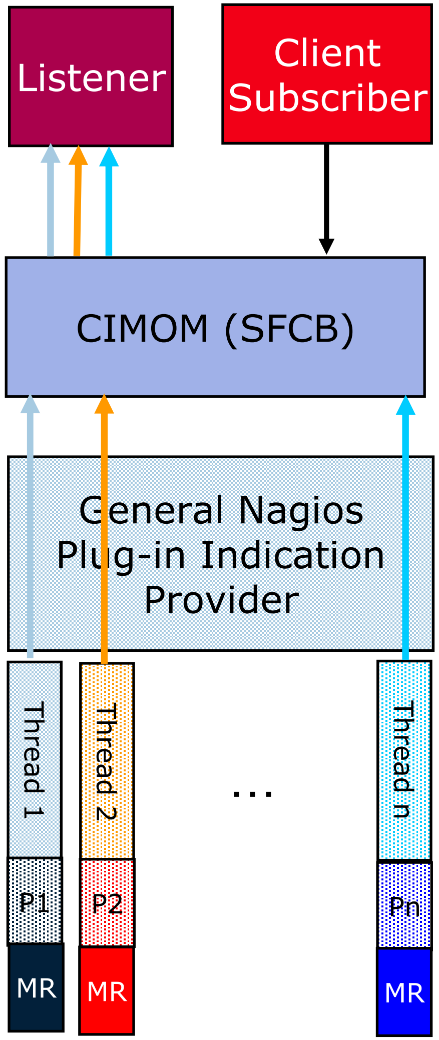
NAGIOS_RelatedProperty
-InstrumentedClassName: string
-InstrumentedPropertyName: string

NAGIOS_FunctionalityIndicationSupport

NAGIOS_FunctionalityPropertyInstrumentation
-regexp: string

Nagios plug-in indication provider implementation

- Subscription for Alert Indications is received
- One or more plug-ins are executed depending on the filter
- Available plug-ins information is read from the repository
- For each plug-in/args one thread is created
- Each plug-in/args generates a unique indication



Demo

- There are 6 Nagios plug-ins for monitoring:
  - check_procs: process processor-time usage (Nagios distribution)
  - check_disk: disk status (Nagios distribution)
  - check_users: users in the system (Nagios distribution)
  - check_xen: Xen domains (Nagiosexchange web site)
  - check_system_pp: services up in the system (Nagiosexchange web site)
  - check_my_test: random value (developed)
- The plug-ins are configured in a configuration file ℹ
- A script reads the configuration file and creates the appropriate instances and associations in the repository
- A client console creates a CIM subscription for all AlertIndications
- The Indication Provider creates one thread per plug-in
- Each plug-in is executed in a periodic basis with the configured arguments
- For each plug-in, the associated indication is published if the execution output is Warning or Critical
- The client displays the indications received

Configuration

Subscription

Working

Demo

Conclusions

- This work enables any CIM-compliant management software to seamlessly use all existing Nagios plug-ins for indication-based monitoring and property querying
- The proposed framework provides a simple and fast procedure to configure and enable Nagios plug-ins
- It sets the basis of a CIM profile for reusing already existing monitoring plug-ins thru CIM

Future work

- To implement indications delivery for dynamic thresholds (ThresholdIndication)
- To implement the solution for property provider
- To modify or extend Nagios core engine as to use CIM as the standard for modeling and accessing managed assets
- This work could contribute to a future profile for exposing third-party monitoring plug-ins thru CIM

Questions & Answers

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Backup slides

Nagios

Core Engine

- The core engine is basically in charge of the orchestration of the monitoring
  - Triggers the measurement polling
  - Processes the measurements that are pushed by the monitored services
  - Generates alerts/notifications/reactions based on service status
- Uses the Add-ons for avoiding firewalls
  - NRPE (Nagios Remote Plug-in Executor)
  - NSCA (Nagios Service Check Acceptor)

Plug-in configuration

```
[PLUGIN]
Name=check_procs
Optargs="-w 20 -c 50 --metric=CPU"
Functionality="Check processes processor usage"
SWElemID=1
Mode=Indication
FunctionalityInstanceID=check_procs_001
IndicationID=0xFFEF0091
ProbableCause="Process consuming too much CPU"
Frequency=5
SourceClass=CIM_Process
```