Grant Agreement No.: 261527

Mantychore

IP Networks as a Service

Instrument: ***Combination of Collaborative Project and Coordination and Support Action***
Thematic Priority: **[INFRA-2010.1.2.3] Virtual Research Communities**

D3.1User Manual

Due date of the Deliverable: Month 6
Submission of release 1.0: 30th, March, 2011
Re-submission date: 2nd August, 2012
Start date of project: October 1st 2010 Duration: 30 months
Project Manager: Sergi Figuerola (i2CAT)
Version: v.1.1

Deliverable leader: i2CAT
Authors list: Evelyn Torras (i2CAT), Pau Minoves (I2CAT)
Technical Reviewers: Stefan Liström (NORDUnet), Alin Pastrama (NORDUnet),
Tangui Coulouarn (UNI-C)
Language reviewers: Peter Lavin (TCD).

Project co-funded by the European Commission in the 7th Framework Programme (2007-2013)		
Dissemination Level		
PU	Public	✓
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Document Revision History

Revision	Date	Description of change	Reference
1.0	30-March-2011		**First release**
1.1	2-Aug-2012	Section 5.2.1 - Topics	First Period Review: Recommendations concerning the period under review, milestones and deliverables
		Section 5.2.2 – Topics	
		Section 5.2.3 – Topics	
		Annex I: OpenNaaS Documentation: updated	

Abstract

This deliverable aims to give content guidelines and define requirements and procedure for the creation of the user documentation. The user documentation support users, serve as basis for training documentation and aims to boost participation and interest in the project. It also serves as technical documentation about the Mantychore tool and can be used as a presentation to show the current state of the project to external and internal members of the community.

Table of Contents

Figure Summary

Table Summary

1 Executive summary

The user documentation is a way to communicate with the Mantychore community, support users, serve as basis for training documentation and boost participation and interest in the project. It also serves as technical documentation about the Mantychore tool and can be used as a presentation to show the current state of the project to external and internal members of the community.Therefore it is important that the user documentation meets its goals and requirements.

The present document provides the guidelines and the requirements and procedures for the creation of the user documentation. The deliverable is organized as follows.

First, the main goals and requirements that user documentation has to achieve within the Mantychore project are presented. Next section will outline the procedures for maintenance of the user documentation, including the updated coming from the work packages and the user feedback process.

Then, the information contained on the user documentation is described. This section is divided in two parts. In one hand, it details the contents of the user documentation. It will expose a detailed table of contents of the user documentation and a detailed explanation of the topics included in the documentation.

On the other hand, the user documentation will contain a personalized page for each user type. The aim is to provide the expected cohesion between the Mantychore community and the project. The personalized table of contents created for each user type is presented in this section.

Finally, the user documentation is presented. This is the full document that users can consult through the wiki.

2 Introduction

This document presents the action plan to create the user documentation and is delivered under Work Package 3 (WP3). It will describe how users get the information and what the content should be. It will also outline the procedures for maintenance of the documentation, including updates to reflect interaction between work packages. Finally, this deliverable will expose a detailed table of contents of user documentation.

The Mantychore community consists of developers, end users and infrastructure providers. The project user community is drawn from a pool of groups which have an interest in IP Networks as a Service (IPaaS). The initial user community or end users of the software are: the Danish HDN (Health Data Network), the British UHDM (Ultra High Definition Media) group and the Irish Grid network (Grid-Ireland).

Within Mantychore community, the network infrastructure is provided and managed by National Research Educational Networks (NRENs). The initial NRENs belonging to Mantychore community are HEAnet, NORDUnet and UNI-C. They will use the Mantychore software at management and administration level.

WP3 is responsible for consolidating the Mantychore community and expanding the use of IPaaS. Within WP3, Task 3.1 is focused on extending contacts with existing user organizations and projects, requirements gathering and providing IP networks for their work and experiments. WP3 has a further goal to attract new NRENs that are willing to provide IPaaS on their e-infrastructure to *their* user communities. WP3 also involves training and related activities for NRENs and the user community (Task 3.2).

The use cases defined within the Mantychore project (Requirements Analysis Report **[D.4.1]**) contain the requirements of each of the project participants. Each use case describes the actors involved in each scenario and their software functionality expectations. The documentation will provide information about the software functions on a per actor basis as requested in the use cases.

The user documentation is a technical communication, intended to give assistance for use of particular components of the software. Typically, component capabilities, limitations, options, inputs and expected outputs, special instructions and error messages are provided. In this case of the Mantychore project, the main goals are:

- Give the user the necessary information to deploy and use and enhance their understanding of the software.
- Serve as the basis of a complete training program for the user community.
- Serve as technical resource for presentation documents about the Mantychore tool.
- Show the vitality and accurate state of the project.
- Consolidate and enlarge the user community.

3 Goals and focus

The Mantychore user documentation is focused on giving extended information to the Mantychore community, aiming to provide a full description of the software capabilities, installation and configuration.

3.1 Goals in relation to work packages

The user documentation will be useful to all work packages within the project, serving different tasks and objectives of each one. The main goals are described below. The main goals are described below and are classified according to the work packages they serve.WP2

WP2 is responsible for the dissemination of evaluation reports, publications and results about the deployment of Mantychore by NRENs and the selected user community. WP2 also has responsibility for liaising within the project, including management of mailing lists and standardization of presentations and maximising the impact of dissemination in general.

The user documentation serves as an initial basis for this dissemination materialand may be used as a resource for technical presenting about the project.

3.1.1 WP3

WP3 is responsible for documentation and training. Mantychore has an open project policy and aims to attract new users to join the community. The user manual will be the visible face of software, in particular for new users. Therefore it must properly reflect the functionalities and the potential of the software.

In addition to providing information about using the software, the user manual has the following aims to:

- Enlarge and consolidate the user community.
- Serve as the basis for a complete training program for the Mantychore community.
- To be understood by the entire Mantychore community, regardless of their technical knowledge.

Failure to fulfill these requirements will lead to difficulties in attracting new users. The documentation must provide an appropriate level of abstraction for a broad range of user backgrounds.

3.1.2 WP4

WP4 addresses software development, thus, the user documentation should provide developers with a complete description of the software, and should in particular aim to serve developers joining the project mid-way through the project cycle.

3.1.3 WP5, WP6 and WP7

- The main goal of WP5 is to deploy Mantychoreservices into an operational environment, where NRENs have the software installed and offer this new type of service to the user communities.

- WP6 is in charge of designing a Marketplace specifically for Mantychore.Mantychore will start collaboration with GSN (GreenStar Network) project.
- WP7 is in charge of analysing and describing the use case derived from that collaboration.

3.2 Documentation Requirements

The user documentation has to meet the following constraints and requirements within the bounded time and resources of the project:

Reusability: Documentation is time consuming. Therefore, it is desirable to be able to reuse information and material where possible without having to instigate a complete rewrite of sections of the manual.

Scale and Scope: Given the scale and volume of the documentation required by this project, a balance has to be found. The documentation should remain of a limited scale so that it remains manageable within the bounded constraints of the project. However, it should be comprehensive enough to provide the knowledge necessary to use all functionalities and to meet the other requirements outlined in this document.

Veracity and Staleness: The documentation has to be routinely amended at each software release, always reflecting the current state of the software. This is important both for internal users who are required to give feedback on the documentation, and also for external users who need to understand the software and how it works.

3.2.1 Different user group requirements

As mentioned in the introduction the Mantychore community consist primarily of three user groups; end users, providers and developers. These three groups of people have different information requirements in regards to the user manual. The user manual aims to provide a full description of the software capabilities. However below are the main required information for each group, that the user documentation has to cover.

For the end user the main information requirements regarding the Mantychore service are:

- How to access their customized user interface
- How to use it

For the provider the main information requirements regarding the Mantychore service are:

- How to install it
- How to use it
- How to manage it
- How it works
- How to troubleshoot it
- How to get help

For the developer the main information requirements regarding the Mantychore service are:

- How it works
- How to access the code base
- How to build it
- How to extend it or connect to it

4 Continuous updating

To reflect the development cycles of the software, the user documentation will constantly change over the life of the project. It is therefore essential to define an action plan to update the documentation to reflect software changes or when user's need change.

This section describes the procedures to be used to for updating the documentation. First of all, the existing interaction between other work packages and the user manual is analysed. Then the feedback process will be described.

4.1 Work package updating process

Each work package has a different function within the project. Communications between work package activities or tasks are necessary in order to preserve the unity of the project. This section outline how work packages will interact with WP3 for the purpose of keeping the user manual updated.

4.1.1 WP2 dissemination

WP2 will use the user documentation as a resource for make technical presentations. Therefore, the task of WP2 is more oriented to promote the use and the visibility of user documentation than to update the content.

The user documentation will be published on the project's wiki page; also, in the official project website a direct link to it will appear. Task 2.1 from WP2 is in charge of the dissemination. Accordingly, it is the responsible to make the content accessible to all users and to promote its use in presentations, documents, etc.

4.1.2 WP3

Task 3.2 of WP3, as responsible for generating the documentation guidelines, will be in charge of keeping the content coming from other work packages up-to-date and to keep the documentation inside the wiki page ordered.

4.1.3 WP4 software refinement

Developers will have firsthand exposure to dealing with user questions relating to software and routine bug fixing. Therefore, this group will be responsible for documenting solutions of such questions, clarifications and bugs. New information generated by this process will contribute to FAQs pages and bug reports. This information will be sent via mailing list to the Task 3.2 who will have sole responsibility for assembly of the manual.

4.1.4 WP5, WP6 and WP7

These work packages will be the responsible of the tool testing in real environments. For that reason they are in charge of reporting any suggestion they have regarding the tool or the user documentation. Figure 4.2 shows the life cycle of the software feedback process between WP4 and the other work packages in charge of tool testing. The software feedback has its own process to communicate feedbacks (e.g. periodical reports) different for the ones for the user documentation feedback. But the life cycle is common for both processes. The user documentation feedback will be done through the tools described in the next section and taking into account that WP3 is also involved.

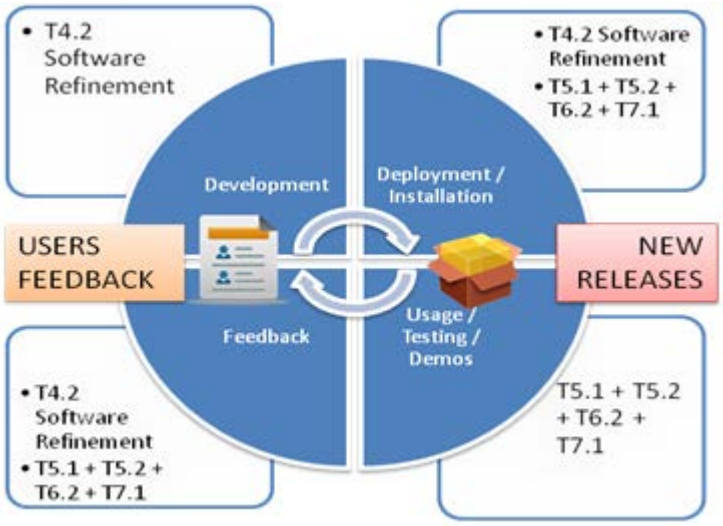


Figure4.1 Feedback cycle

4.2 Feedback

As Mantychore deployment will be a pre-operational activity with real users, it will be necessary to receive feedback from them to improve the Mantychore services and correct the bugs that could appear. Mantychore deployment is not in a pilot phase to correct bugs, but an evaluation that determines whether the Mantychore services are useful for each particular research community. When the pre-operational phase is successful, the service can be deployed on an operational level to a larger community.

The aim of a feedback procedure is to increase the vitality of the project and boost the interaction between Mantychore community members. The feedback provides the opportunity toimprove the quality of the documentation and adapting it to the user's needs. Any proposal of change about the user documentation must be submitted to WP3. This feedback will be done through comments posted on the wiki page where the user documentation is published. In the case the feedback is too extended the comments will be sent through the mailing list.

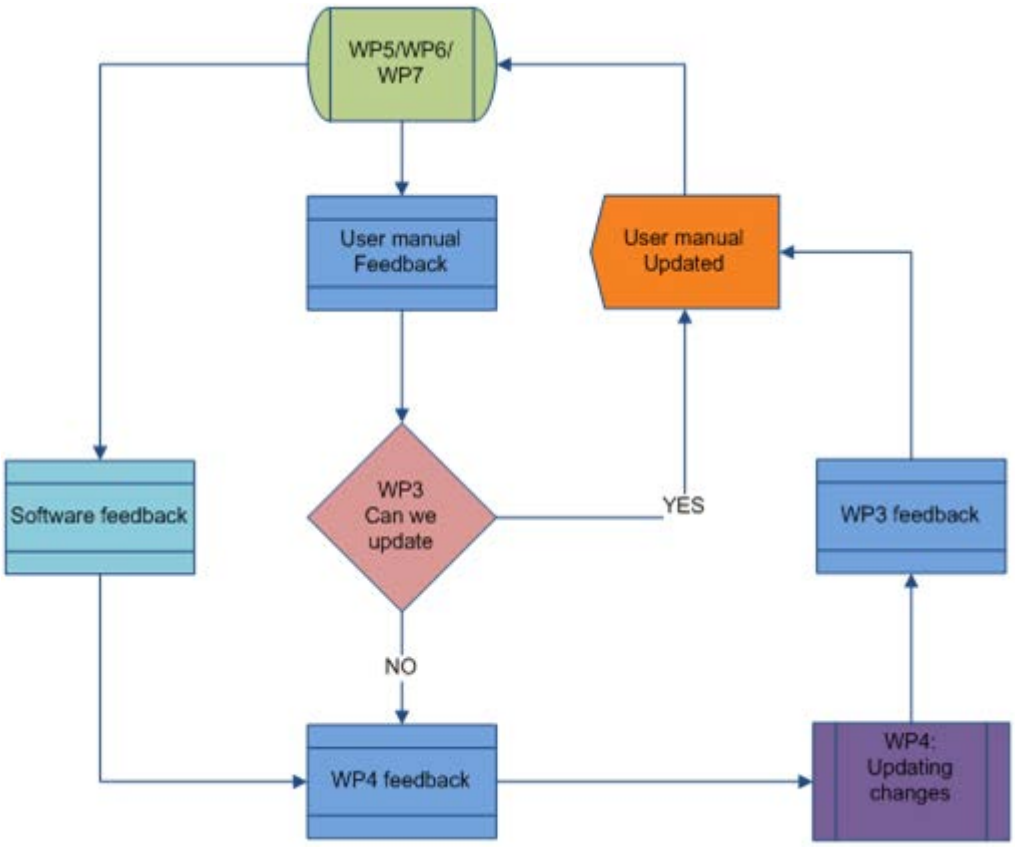


Figure4.2 User documentation feedback cycle

There are several kinds of feedback. Users can report bugs, questions about the use of the tool or misunderstandings about the documentation, etc... The responsible of handling the feedback can change; it depends on the kind of feedback reported. Figure 4.3 shown the steps followed by each work package in order to produce and report the different feedbacks.

Users from WP5, 6 and 7 will create the feedbacks which can be sent directly to WP4 (in the case of software feedback) or send to the WP3 which will evaluate if they can update the user documentation e.g. information misunderstanding. If they cannot, then the feedback will be sent to WP4 in order for them toanswer the user or make the necessary changes (it depends on the kind of feedback). Once the changes in documentation are done then it will be updated, always by WP3. Whenever there is an update the Mantychore community will be informed (mailing list) about the changes, in order to maintain the vitality of the project and the interaction with users.

5 Information and accessibility

This section defines the content of the user documentation.The goal is to detail the main headings and structure of the user documentation, each heading targeting different audiences and aiming to best fit prior levels of knowledge.

5.1 Content Structure

The users must be able to access content at a level appropriate to their needs. For this reason, information will be presented in a progressive and logical manner. Mantychore is an open project and uses software from many other open source projects. With an aim to attracting new community members, the user manual should contain common heading to other open source project. Examples are the Apache Software foundation [Apache] and OPS4J [OPS4J]. The headings which will be used to describe the software and project contents are:

1. Getting Started
    1. Project Overview
    2. Licensing
    3. Get involved
    4. Get the Source Code and build it.
    5. Quick Feature Set
    6. Deploying Mantychore
        1. Requirements
        2. Maintenance
2. System Architecture
    1. Overall architecture and components
    2. Protocols involved
3. Using the Mantychore API
    1. Creating your own client
    2. Adapting already existing clients
    3. API capabilities
4. Tools
    1. Resource Management Center
        1. [Previous Manticore 2 documentation on the GUI]
    2. Server Console
        1. How to access it
        2. Commands

5.1.1 Getting Started

This information should be of interest to everyone but is aimed at first time and entry-level users. It contains basic information about the project.

The following topics must be covered in this section:

- Brief description of the project and its goals.
- Contact details for the development team.
- The distribution license.
- How to become involved in the project and make contributions.

- System and software requirements
- How to get the latest version of the software.
- How to build the developing framework.
- A complete list of the features of the software using the following approach...
  - **What**: description of the feature, what it does.
  - **How**: the way it works.
  - **When**: possible use case.
  - **Who**: which users can use it.
  - **Configuration rules**: how the user can configure the feature for their purposes.
- Other software and project information: maintenance, release roadmap and repositories.

5.1.2 System architecture

This section is intended to serve NRENs and software developers. It gives information about the internal design of the tool and the protocols used for network configuration and management. The following points should be considered:

- Comprehensive information regarding these topics is important for technical users, in particular users who wish to integrate the Mantychore architecture with their existing infrastructure.
- This section will also be useful for external developers wishing to contribute to the project (by adding new features, plugins, new functionality or improvements). It should aim to provide such a developer with a complete overview of how Mantychore's system is structured, available APIs and the protocols used.

5.1.3 Tools and Existing User Interface

This section describes the user interface for the Mantychore software, its functionality set and associated tools.

The first Mantychore GUI will be based on the interface created for Manticore project [Manticore] (Resource Management Center) as the functionalities and operation will be almost the same. The documentation of the Mantychore interface will be available when the Task 5.2 is underway and will be added at that time.

Currently, the topics for in this section are:

- How to use the Resource Management Center GUI
  - Detailed guidelines of operations
- Administration Server Console for Mantychore Servers
  - Configuration commands

5.1.4 References and external API

This section will detail the Application Program Interface (API) of the Mantychore software, what it provides and how developers can use it.

WP3 aims to liaise with other projects; however external user's needs may not be fulfilled by the initial features of the software. Therefore it is important to meet the requirement of this user group.

For this reason, detailed documentation on how to use the API and create customized interfaces and clients is required for external users and developers. The topics described in this section are:

- How to create your own client.
- How API is used in already existing clients.
- Description of API capabilities and signatures.

5.2 Customized information and accessibility

The information will be presented via the "personal landing page", which contains the personalized table of contents created for each user. That kind of personalization provides the expected cohesion between the Mantychore community and the project besides to reflect the interest of the project to satisfy the user's needs.

The aim of the page is to improve the accessibility of the content, satisfy the needs of all users within the Mantychore community and give through the manual the right level of abstraction for each one.

The initial community of three end users will act as consumers for the Mantychore software. It is made up of the following groups:

- Trinity College Dublin
- University of Essex
- UNI-C, Danish IR-Centre for Education and Research

NRENs (as network infrastructure providers) have a role in configuration and management and can also be considered users. Hence, they have a documentation requirement in relation to using Mantychore within their infrastructure.

Based on analysis of the scenarios described in [D4.1], three roles have been identified which apply to the Mantychore user community.

Infrastructure Provider: In Mantychore, NRENs are the owners and providers of network infrastructure to user communities.

Service Provider or Virtual Operator: Can harvest infrastructure instances from one or more Infrastructure Providers and integrate them into their management domain. These are then used to provide services to end users.

End User: uses of the services offered by the Virtual Operator.They receive several infrastructure resources and create one or more IP Networks out of them. Users are empowered to make limited changes to the IP network service, but will not have the same permissions available to Infrastructure or Service Providers. In general, virtual operators will control the permissions of each individual user.

Table5.1 Actors in use case

	Virtual CPE for Health and Educational Institutions		Distributed and Private Cloud		
	UC1.Virtual CPE	**UC2. Multiple Network Support**	**UC3. Distributed Cloud Infrastructure**	**UC4. Distributed Virtualized Hosting**	**UC5.Ultra High Definition Applications**
Infrastructure Provider	HEAnet	UNI·C	HEAnet	NORDUnet	JANET
Service Provider	HEAnet	UNI·C	HEAnet	NORDUnet	JANET
End User	Campus	Hospital	Grid-Ireland Operations Centre (TCD)	Campus	UESSEX

The table 3.1 describes the actors involved in each use case. The actors are the individuals or organisations that play a role in the use case. This information allows creating a page that will point to customized documentation for each of the actors belonging to the Mantychore community.

All users have access to the whole user documentation but the intention of the landing page is to adapt the content to a specific type of user, according to their expectations of the tool. As Mantychore community use the tool, this information may be modified due to user needs are likely to evolve during usage.

Each landing page is classified according to user groups in the Mantychore community. But for users with the same role, some contents will be common but others, as “installation in user own infrastructure”, will be created specifically for each particular user.

5.2.1 Infrastructure provider and Service provider

The infrastructure provider and service provider have to know how to use Mantychore tool in their own infrastructure since they use the tool to manage and operate their IPaaS provided to the end users. For that reason, they are more focused on the Mantychore's system architecture and how it can be deployed in their infrastructure. The main topics for this page are:

1. System Architecture
    1. Overall architecture and components
    2. Protocols involved
2. Features Overview

    1. Supported infrastructure
3. Deploy and run OpenNaaS
    1. Installation in user own infrastructure
4. User Interfaces
    1. Server Console
    2. Remote API
5. Security

5.2.2 End users

End user only needs to know about what Mantychore is, which their features are and how to use the tool to configure their own scenario.The headings of this personalized landing page are

1. Getting Started
    1. Project Overview
2. Features Overview
3. Using OpenNaaS
    1. OpenNaaS known clients
    2. Remote API
    3.

5.2.3 Developers

Last kind of landing page is for developers, who are not considered in the scenarios but have a relevant importance within the project, since they are part of the Mantychore community and will deploy the tool. They need to know about how to get the source code, the system architecture and how to create their personal application. The detailed topics of the landing page are:

1. Getting Started
    1. Project Overview
    2. Licensing
    3. Get involved
    4. Get the Source Code and build it.
    5. Quick Feature Set
    6. Deploying OpenNaaS
        1. Requirements
        2. Maintenance
2. System Architecture
    1. Overall architecture and components
    2. Protocols involved
3. Using the OpenNaaS API
    1. User Interfaces
        1. Known clients
4. Extending OpenNaaS
    1. Adding support for other infrastructure
    2. Creating your own client

6 User Documentation

Now are presented the pages forming the user documentation. They are imported as appears on the wiki of the Mantychore project.

7 References

[D4.1] Mantychore consortium. February 2011. Deliverable 4.1 Requirements analysis report. Available http://jira.i2cat.net:8090/download/attachments/8028762/MANTYCHORE_WP4_D4.1-v1.1.pdf?version=1&modificationDate=1300183253000

[Apache] Apache foundation.Retrieved March 2011. Available on http://www.apache.org/

[OPS4J] Open Participation Software for Java. Retrieved March 2011. Available on: http://srv07.ops4j.org:8081/display/ops4j/Open+Participation+Software+for+Java

[Manticore] Manticore project. Available on: http://www.i2cat.net/en/projecte/manticore-1

8 Acronyms

IPaaS	IP Network as a Service
GUI	Graphical User Interface
HDN	Health Data Network
NREN	National Research Educational Network
UHDM	Ultra High Definition Media

ANNEX I

DOCUMENTATION

Getting started

Licensing

The OpenNaaS software is licensed as L-GPLv3, with the exception of the Router, Network and BoD extensions which are ASLv2. Third party extensions can have any license.

There are a variety of ways to participate. Mantychore is an open source project (licensed under a GPLlicense) providing a software toolset to the research community and their infrastructure operators. Any collaboration is more than welcomed. We provide a number of ways to participate and collaborate with the project.

Get involved

Mailing list

OpenNaaS has a mailing list which provide support and feedback for problems. The mailing list is a good starting point for collaboration in OpenNaaS and understanding design ideas and key concepts used in the OpenNaaS implementation like. If you have feedback or feature requests we would love to hear them!

Check out pointers to mailing lists here:

http://www.opennaas.org/community

Development

OpenNaaS is open to the collaboration of new developers, companies, universities, which want to participate in the implementation to any degree of implication.

If you want to build over it or just give it a try you can get the source code and built it youself. Check below for a quick setup guide. Additionally, some resources for developers can be found in the Developers Guide

Quick Setup

This section covers how to get the project and run it.

For a quicker, less explained, setup guide check here: http://www.opennaas.org/download/

Get the project

You can obtain stable binary releases of the software here.

If you prefer to build the project from source code, you can find more detailed information at the build the project sec tion.

Deploy and run

Once you have the software on you machine or VM, you are ready to Deploy and run OpenNaaS.

Enjoy!

Now, we have started OpenNaaS. Double tab ("Tab" key) on the CLI to see available commands or read about the

REST interface to operate it remotely.

Good pointers to learn more are:

- System architecture
- Server Console (CLI)
- Remoting (REST API)
- Known clients you can use
- Developers Guide

For support, find us at:

http://www.opennaas.org/community/

OpenNaaS Roles

End-User

End-users don't run their own instance of OpenNaaS. Instead, they consume OpenNaaS enabled services either directly from the web service or via additional middle-ware (i.e. cloud managers). In any case, we try to maintain pointers to known clients and connectors so interfacing with OpenNaaS is effort-less as possible. Take into account that for third party front-ends, documentation and support should be provided by the service provider.

If, instead, the end-user wants or needs to make direct calls to the OpenNaaS remote API, glance over System Architecture to get a grasp of the basic concepts around resources and capabilities. An example work-flow for an end-user consuming directly the OpenNaaS services would be:

1. The user obtains OpenNaaS credentials via a Service Provider.
2. The Service Provider will grant some infrastructure rights on the user. How this is achieved depends largely on the concrete use case. Most of the time, OpenNaaS will be embedded on a higher level workflow.
3. Along with the credentials, an OpenNaaS REST API end-point for the appropriate OpenNaaS instance is provided.
4. The user can use the OpenNaaS REST API end-point to bootstrap one of the existing clients or write his own.
5. Once connected, the user can exercise his infrastructure rights against the OpenNaaS REST API. This might include instantiating or freeing infrastructure resources, as well as configuring those resources via their capabilities.

You'll need some kind of authentication in order to use the remote API. Which protocol is in place will depend on the OpenNaaS instance administrator setup. You can get and overall view of supported security protocols here. You can then explore the remote API.

Most interesting topics for end-users:

- Feature Overview
- Known clients
- Remote API

Service Provider

The service provider builds value services by, for example, aggregating third-party infrastructure resources and/or providing an improved infrastructure orchestration. Although this is traditionally a role performed by the infrastructure provider itself, the clear separation between infrastructure ownership and configuration rights enabled by

OpenNaaS, allows for a clear separation of this role.

As a service provider you can consume the services from Infrastructure Providers and/or other Service Providers. In that case, see the End-User section above for pointers on how to interface with OpenNaaS. You can also host your own OpenNaaS instance in order to power your infrastructure services.

You are now ready to extending OpenNaaS and develop your NaaS enabled applications.

The typical work-flow for a Service Provider looks like:

1. Deploy an OpenNaaS instance on a stable server or VM.
2. Configure the instance with your choice of database and security schema.
3. Acquire infrastructure or rights over third-party infrastructure owners or other service providers.
    a. Configure this infrastructure on your OpenNaaS instance.
4. Create new services by either extending OpenNaaS or embedding it in higher level work-flow.
5. Publish your services and gather your users 😉.

Most interesting topics for service providers:

- Deploy and run OpenNaaS
- System Architecture
- User Interfaces
- Security

Infrastructure Provider

Infrastructure owners can use OpenNaaS to expose all or part of their network resources and have tight control on how those are lent and exploited. This schema is for owners who prefer to rent raw infrastructure instead of creating value services themselves. For a mix role check Service Provider above.

The infrastructure provider should check the compatibility matrix for supported devices or additional needed drivers.

After getting an overview of OpenNaaS architecture and concepts, the provider needs to setup his own OpenNaaS instance. There are several security setups available that differ on the operator's policy and existing security infrastructure.

Infrastructure provider's work-flow is:

1. Deploy an OpenNaaS instance on a stable server or VM.
2. Configure the instance with your choice of database and security schema.
3. Register the infrastructure that you want to expose into OpenNaaS.
4. Lend to service providers.

Most interesting topics for infrastructure providers:

- Deploy and run OpenNaaS
- System Architecture
- Compatibility Matrix
- Server Console
- Security

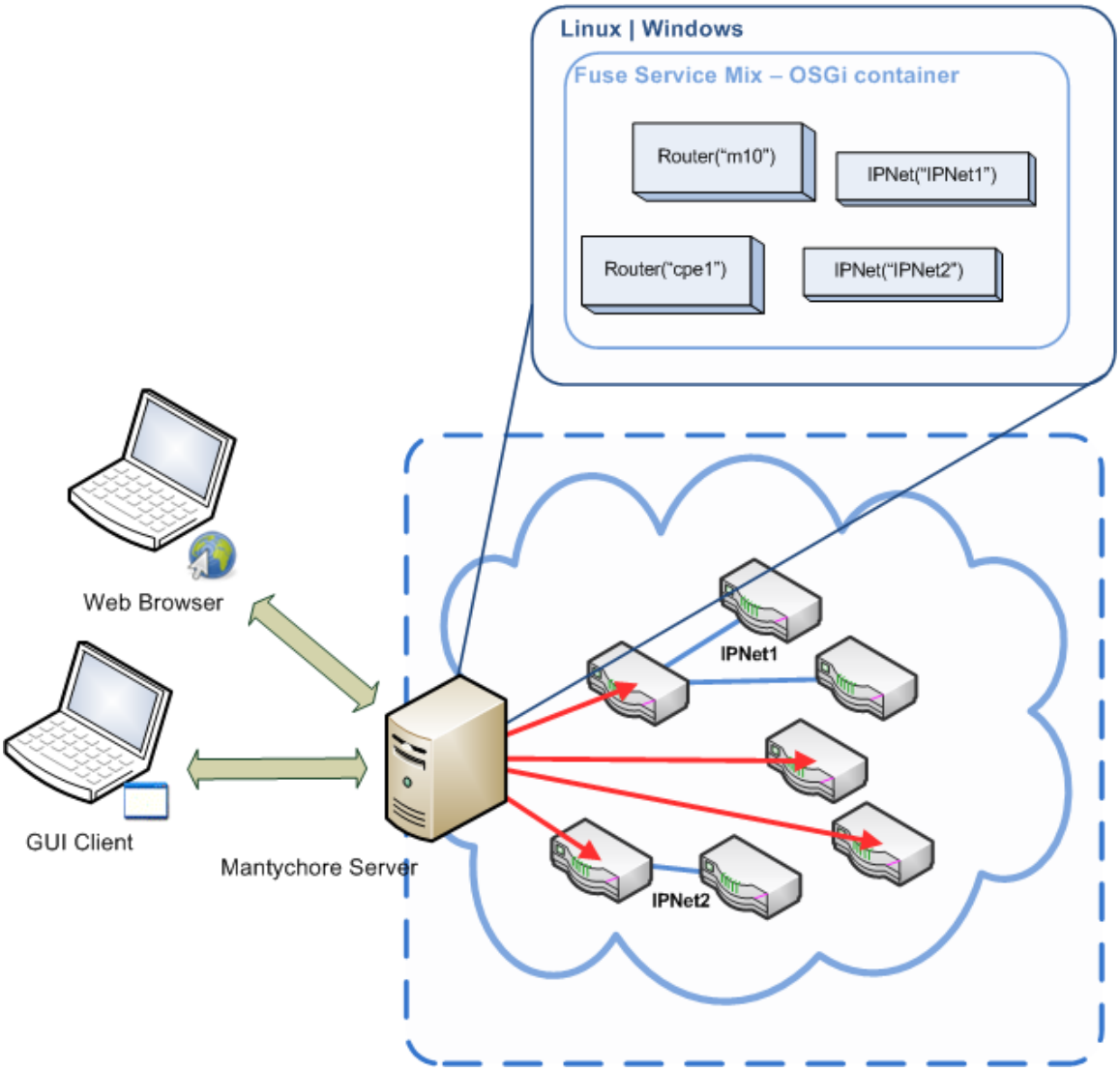
Users Guide

System Architecture

Overall architecture and components

OpenNaaS is implemented with the OSGi specification and works with Fuse Service Mix 4.4. Fuse works as a Service platform which implements the OSGi specification. It provides a set of libraries and tools to allow easier development of Fuse components.

This figure shows a typical architecture.



The picture shows how an OpenNaaS user connects to the Server and how OpenNaaS connects with the devices it manages.

The OpenNaaS software is multiplatform. To set up an OpenNaaS architecture, you need:

- A Computer which is going to act as a Server. It'll have Fuse Service Mix installed, along with the the OpenNaaS components.
- SSH setup that allows access to the routers (see compatible devices).

There are two types of OpenNaaS client:

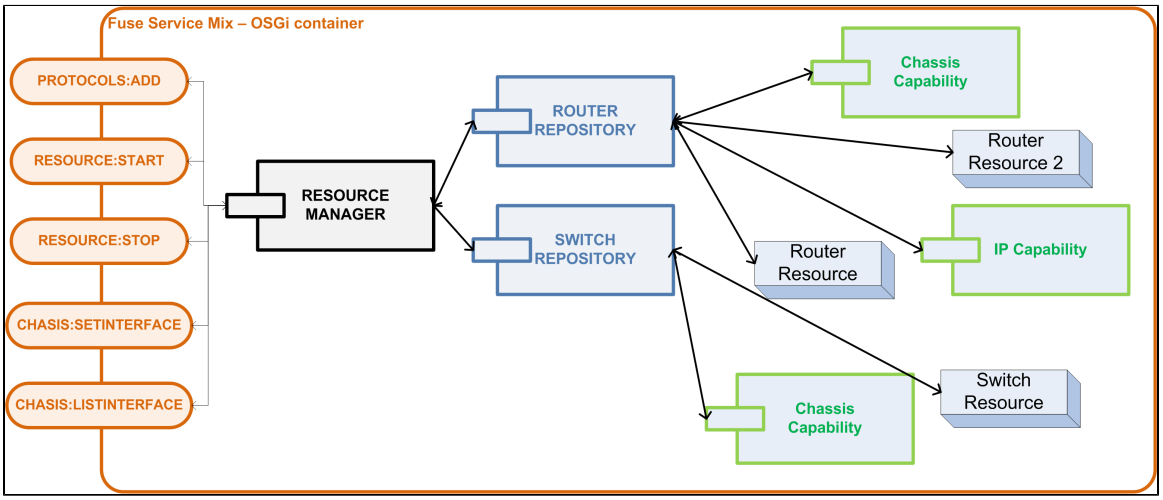
- GUI Client. A desktop program implemented with RCP.
- Web site. Through Ajax and RAP, it simulates the GUI client.

Internal architecture

At present, the OpenNaaS software is implemented on top of an architecture based around two core components: resources and capabilities. With these components, OpenNaaS can describe all the necessary virtual resources (a resource component). Resources contain the information (model) that represents itself and capability, which represents its features.

In order to manage the resources and their capabilities, there are other components to provide required features: SessionManager, Protocol, Model, ActionSets, ResourceManager, ...

ResourceManager, ResourceRepositories and Resources



OpenNaaS supports different types of resources (switch, routers, ...). In order to organise them, OpenNaaS can implement different kinds of repositories that group the resources according to their type. The resource repositories manage the resources created within the platform, it also allows persistence into the database. To allow OpenNaaS to support new resource types creating a new repository is needed for the new ones.

The feature set provided by a resource is represented through capabilities. Each capability must be associated to a specific type of resource according to functionalities their provide. For example, a BGP police is a feature of routers, thus the BGP capability has to be associated to a router resource, but the same capability doesn't make sense with switches because this resource type cannot configure BGP policies.

Since there will be a resource repository for each type of resource, it's necessary to have a global component to manage the different repositories. The ResourceManager will be in charge of this task. It will offer a set of actions to control the repositories and its resources.

Resource Descriptor

For the creation of a resource, the ResourceManager uses a description file (ResourceDescriptor) which provides the necessary parameters to configure a resource. For example, it contains the type, name and the capabilities that the resource supports. Here an example of a resource descriptor is provided.

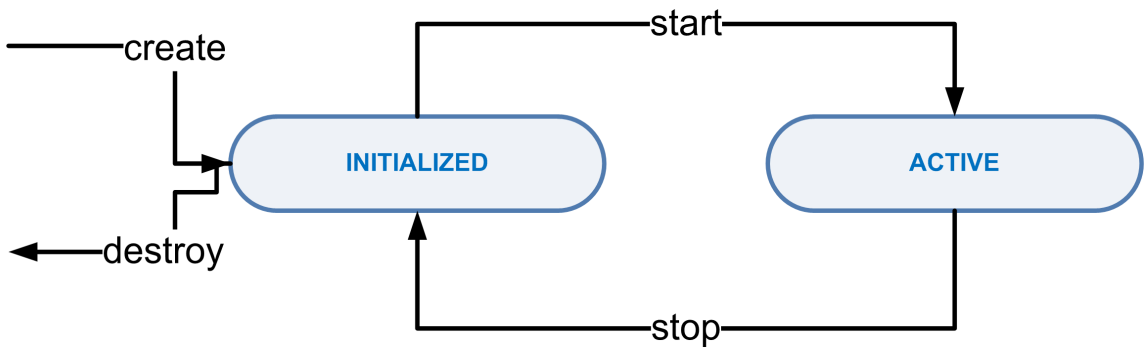
```
<resourceDescriptor>
    <!-- Capability information. It specifies device model and version -->
    <capabilityDescriptors>
        <capabilityProperty value="junos" name="actionset.name"/>
        <capabilityProperty value="10.10" name="actionset.version"/>
        <information><type>chassis</type></information>
    </capabilityDescriptors>
    <!--  Queue capability information. It specifies device model and version. IT IS
OBLIGATORY -->
    <capabilityDescriptors>
        <capabilityProperty value="junos" name="actionset.name"/>
        <capabilityProperty value="10.10" name="actionset.version" />
        <information><type>queue</type></information>
    </capabilityDescriptors>
    <!-- Resource information. It specify type and name-->
    <information>
        <type>router</type>
        <name>junos20</name>
    </information>
    <properties/>
</resourceDescriptor>
```

Resource

A resource is the logical representation of a physical or virtual device. As explained it contains the information (model) and features (capabilities) necessary to allow OpenNaaS to work with the device. To create a resource within the OpenNaaS platform a well defined life cycle is required.

The next figure represents the resource life cycle. First of all, the resource must be created. This action concludes leaving an initialized resource in the platform. In this state the resource can show information of its features and the protocol context can be set. At this point, starting the resource will activate its features and allow the execution of actions on it.

Resource Life cycle



Using the commands provided by the OpenNaaS server console, the user can control the state of the resource. The following table lists the possible commands and their actions. The initial state indicates the state from which the command can run, while the final state indicates the state that the command induces.

Resource Command	Actions	Initial State	Final State
create	- read resource descriptor - store descriptor in the database	No resource	INITIALIZED
start	- get capabilities - get profiles - execute bootstrapper - create model	INITIALIZED	ACTIVE
stop	- reset capabilities - reset profiles - reset model	ACTIVE	INITIALIZED
remove	- delete resource descriptor from the database	INITIALIZED	No resource

Model

When a resource is initialized and started, it needs a component which maps the resource description. This description is all the information which OpenNaaS can access from the resource. For this purpose, OpenNaaS has a model component (based in the CIM specification) which loads all this information.

Capability

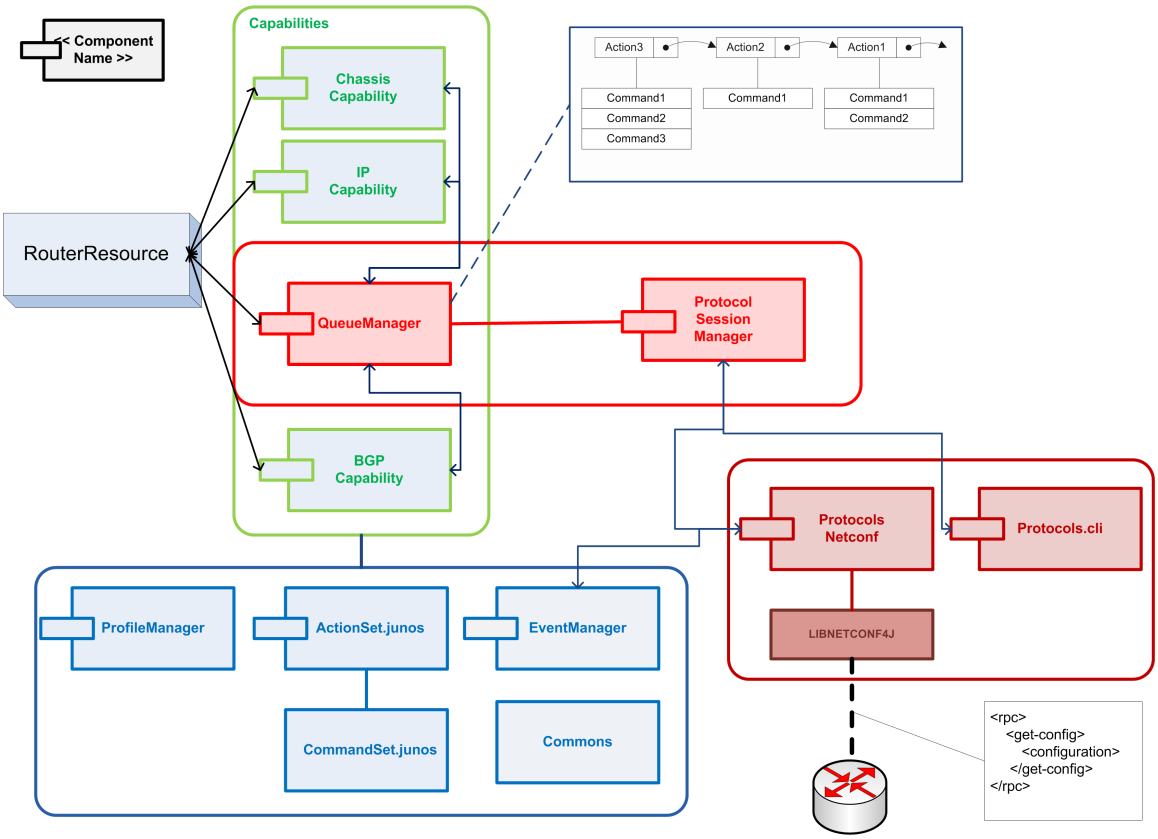
OpenNaaS links a set of capabilities to a resource where each capability represents a feature or ability which a resource can do. For example, a router resource will be able to have capabilities related with operations for the 1, 2 and 3 level network. However, a switch resource will only be able to use capabilities for the 1 and 2 level network.

Each capability has a set of actions (named ActionSet), used to send operations to a device. Each of these is implemented for a device and a protocol context which understands the operation.

Finally, there's a mandatory capability for all the resources, the queue capability, which main functionality is the management of the actions which are sent to a physical device.

The definition of an ActionSet, QueueManager and its functionality will be explained better in the next issue.

Architecture picture overview



ActionSet component

The ActionSet contains the implementation of the operations, called Actions, that can be sent to a device. For this reason, the ActionSet implementation will depend on the model and type of the resource and on the protocol to access to the resource. The Actions belonging to the same ActionSet are implemented for a specific device following this criteria (model, type and protocol). Each Action can be broken in different atomic operations, called Commands, which perform the action once run on the device.

ProfileManager component

The profile manager provides the functionality to overwrite configured actions. This feature allows end users to customize their actions in order to adapt them to their use cases.

Action customization is done via Profiles. A Profile is a end user provided bundle containing an implementation for some OpenNaaS configured actions. Profiles may be linked to a set of resources, meaning that when a resource is to execute an action, its profile is first checked for an implementation of that action.

ProfileManager stores loaded profiles and manages their lifecycle. It is implemented as a bundle which is continually listening for new profiles and registers them upon arrival. Registered profiles are then able to be linked to resources (with the restriction that a resource can be linked to only one profile).The resource descriptor must indicate, through the field *<profileId>,* the name of the profile that will be associated to the resource.

QueueManager component

This component is responsible of the execution of each action. It implements a queue and a list of operations to manage it. Furthermore, the queue implements a workflow where it is possible to restore the last working configuration if some operations did not work correctly. Prior to the execution of the list of actions, the queue goes in PREPARE state, where the working configuration is saved. After that, it starts to execute each queued action

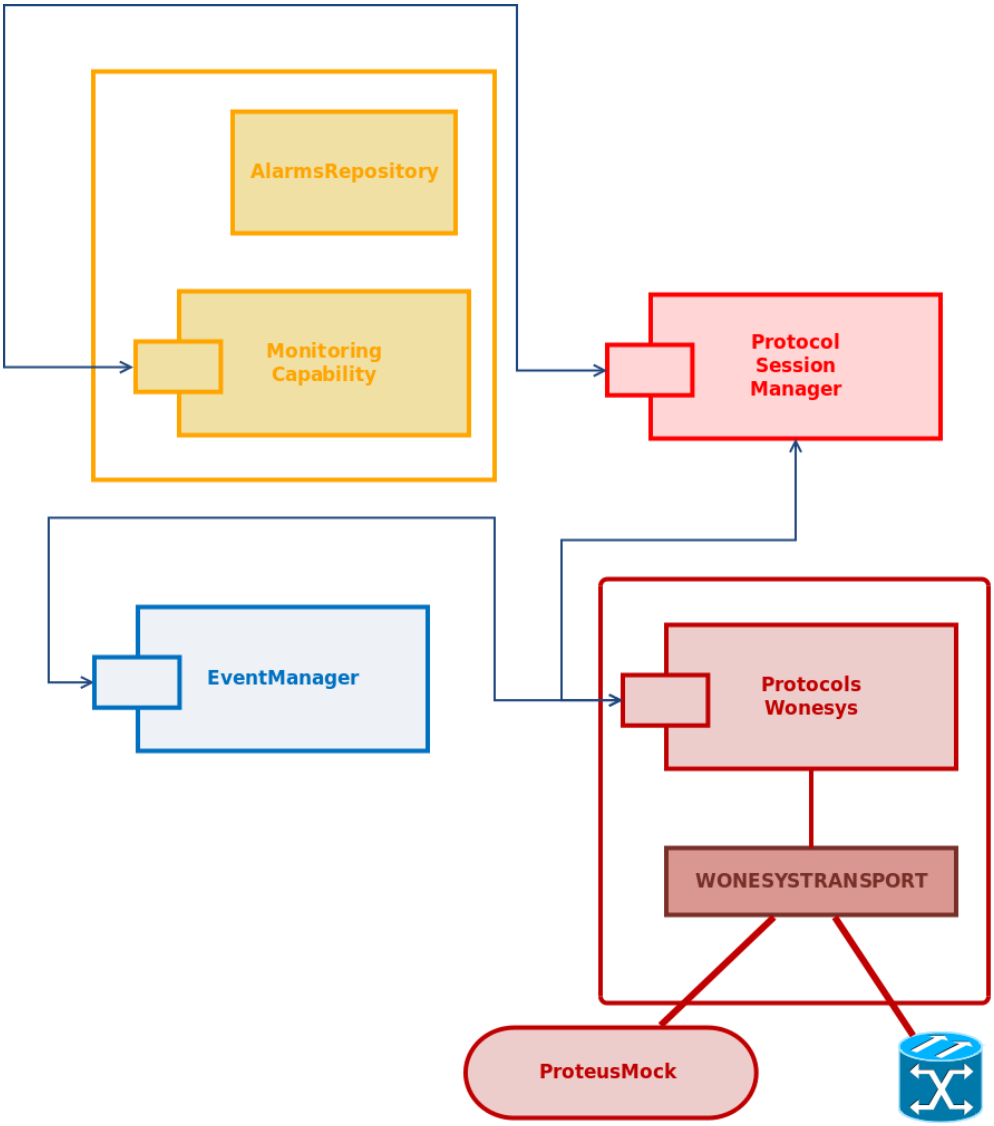
(EXECUTE state). If all actions are executed correctly, the queue commits all changes and discards then backup configuration (COMMIT state). If, on the contrary, some error happens during execution, the queue restores the backup configuration in the ROLLBACK state.

SessionManager and Protocol component

The SessionManager controls the protocol components and provides connectivity to the different devices. It searches available protocols among all services, registers them, and serves registered protocols' sessions upon request. eg: When the QueueManager needs to connect with some device, it asks the SessionManager, which searches among its configured protocol sessions a proper session to connect.

Event manager component

The Event Manager is a Karaf service which OpenNaaS uses to communicate the components. It provides an Event Notify-Listener service which is used to implement the alarm management in the Luminis module. This is an example about how this alarm management works for optical switches.



- The EventManager provides its methods to the ProtocolWonesys and ProtocolSessionManager
- The Protocol Wonesys events are listened for the ProtocolSessionManager
- The ProtocolSessionManager converts these events to Capability Alarms which is registered in the AlarmRepository
- The Monitoring Capability provides Karaf commands to control the Alarm Repository service

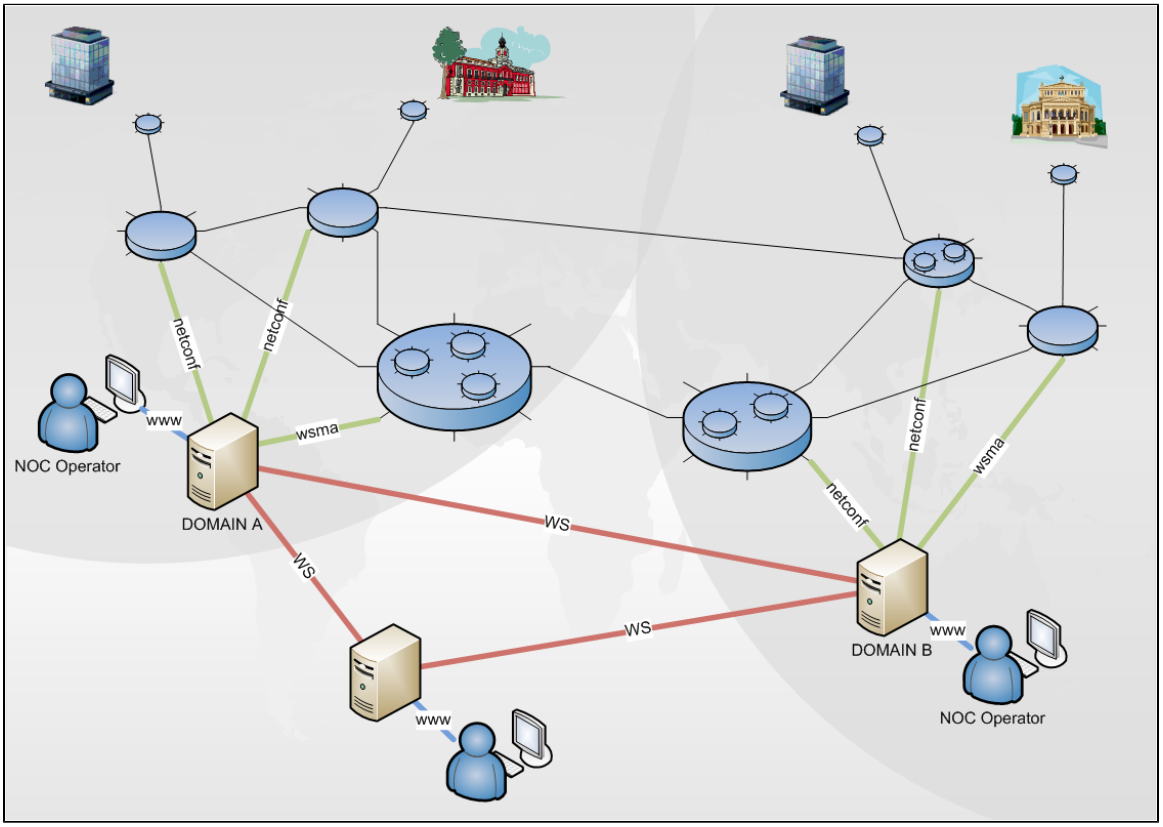
Protocols Used

Protocols

These are OpenNaaS main protocols used to configure and manage the network.

- HTTP (HyperText Transfer Protocol) - http://www.w3.org/Protocols/
- WS (Web Service) - http://www.w3schools.com/webservices/ws_intro.asp
- NETCONF - http://en.wikipedia.org/wiki/NETCONF
- WSMA (Web Services Management Agent) - http://www.cisco.com/en/US/docs/ios/netmgmt/configuration/guide/nm_cfg_wsma_ps6441_TSD_Products_Configuration_Guide_Chapter.html

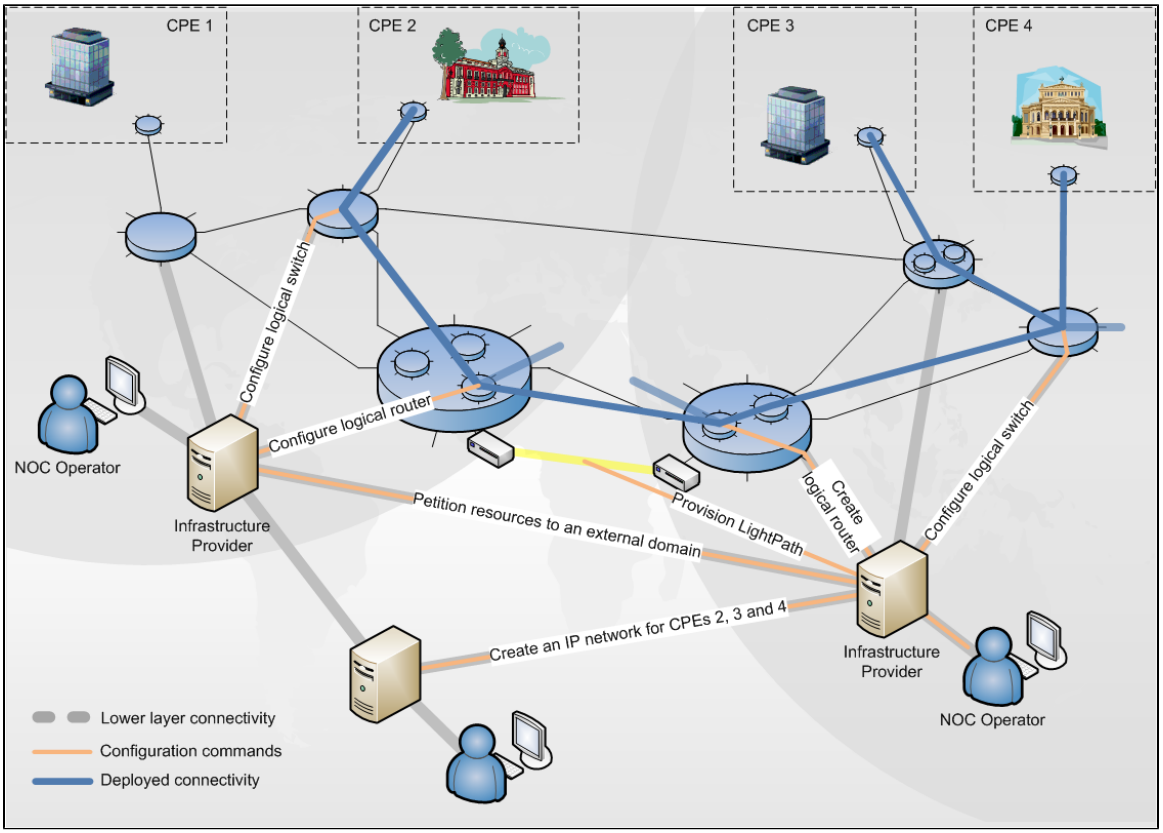
In the image, the different protocols involved in a OpenNaaS architecture can be seen. The green lines represent the communications to the devices.The red lines represent communication among servers, GUI and OpenNaaS software.



Workflow

This image presents a possible infrastructure configured using OpenNaaS. It shows where OpenNaaS works (brown

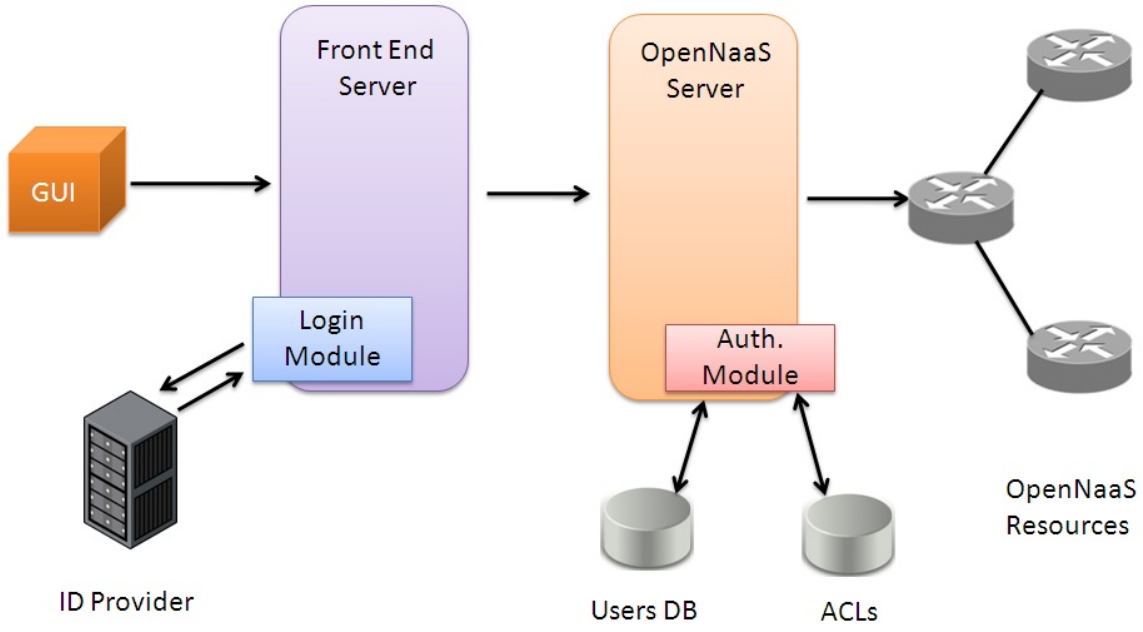
lines) to connect two public entities. In this case, OpenNaaS does not have complete control and it works above an external infrastructure.



Security

> This section is under develop and might change.

The Security Manager is responsable of restricting unauthorized access to the different OpenNaaS resources. It uses a set of rules defined by the NOC to specify which actions the user can launch over an specific resource (for example, a router). The architecture of the security module is the following:



The user logs in to the application through some Front End. Inside this Frond End there's a login module, which establishes a communication with an ID provider in order to confirm the user authenticity. If the ID provider can ensure the user authenticity, it sends a token to the Front End that will be used in all the future queries of the user to OpenNaaS server.

The Front End attaches this token to the query and redirects it to the OpenNaaS Remote API.This token is used by OpennNaaS to pass a credential process, implemented by the authorization module. It's based on a multivel delegation of rights over resources. For each incoming query, the authorization module checks if the specified user is allowed to execute the action on the resource he/she is requesting. Only if the query + token combination matches an allowed method stored at the database, the action will be added to the resource queue. Authorized queries are defined in the Access Control List (ACL), which stores the relation between a user, an action, a resource and a permission rule.

User Interfaces

Most of OpenNaaS components offer some entry points used to interact with them. This is the case of ResourceManager and ProtocolSessionManager, but also the one for each active capability.

In OpenNaaS there are two main type of entry points:

- the ones accessible through the local server console
- the remote ones, based on web services and grouped in the remote API.

Most of OpenNaaS components are available through both the server console and the remote API, although available operations may differ.

Server Console

Karaf shell

OpenNaaS server uses a Karaf shell to manage Fuse and the OSGi container.

The shell is local to the server (although it can be configured to be acceded remotely) and is the primary interface to administer OpenNaaS.

It supports scripting, among many other interesting features you would like to take advantage of, for sure

To get more information about karaf itself:

- Karaf shell - http://karaf.apache.org/
- Karaf user's guide - http://karaf.apache.org/manual/latest-2.2.x/users-guide/index.html
- Karaf complete list commands: https://cwiki.apache.org/KARAF/41-console-and-commands.html#4.1.ConsoleandCommands-OSGishell

CLI commands

Karaf command line console offers a set of pre-defined commands to manage osgi bundles and features, but it has been extended by exporting other customized commands required to operate OpenNaaS.

Each command has a namespace and a command name. The way to invoke them is as follows:

```
>namespace:commandname [options] arguments
```

As a quick reference, each OpenNaaS module exports commands required to interact with it. Namespaces are used to identify the context of a command or, more precisely, the component it comes from. In this manner, ResourceManager defines the "resources" namespace, ProtocolSessionManager the "protocols" one, and so on. Each capability defines a namespace that identifies its functionality, too.

The list of all available commands (and its namespaces) is accessible by pressing "tab" key twice form a clean prompt:

```
>[tab tab]
>Display all 341 possibilities? (y or n)
```

For a description of the commands, each one has a "--help" option that describes the command syntax, its semantics and how to invoke it, enumerating required arguments and available options. An example of this option output is shown just below:

```
>resource:list --help
DESCRIPTION
        resource:list

    List all resources in the platform

SYNTAX
        resource:list [options]

OPTIONS
        --help
                Display this help message
        --all, -a
                Extensive version
        --type, -t
                Specifies the type of resources to list (if specified, only
resources of this type will be listed)
```

If you are having problems using the shell, please refer to Getting Support section.

Remote API

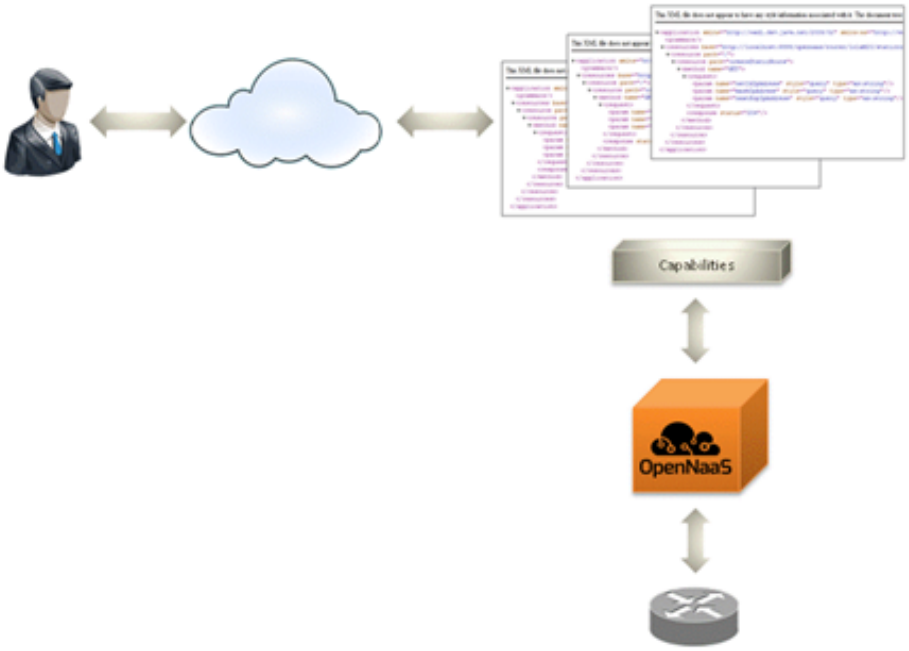
For accessing OpenNaaS functionalities remotely the system exports the OSGI services through RESTful web services.

Distributed OSGI has been used for the integration of REST in the OpenNaaS platform. DOSGi allows integrating REST or SOAP technologies with OSGi allowing dynamic registration of resources, capabilities and other services as a web service.

When a resource is created, for example, all its capabilities are published dynamically to access remotely.

Each capability of each resource has its own web service and its own URL to access it.

The future security layer should control access to different capabilities according to the resource that is running.



Known clients

This page (and its child) contains information about software that uses the OpenNaaS via its remoting interface in order to perform some action and/or integrate it with additional middleware.

Please also check the /clients folder on the latest OpenNaaS distribution for the latests updates:

https://github.com/dana-i2cat/opennaas/tree/develop/clients

Feature Overview

Router configuration

- Support of different models of router (Juniper M10, M20, M7i).
- Support of logical routers including creation, modifications and deletion.
- Configuration of physical interfaces.
- Support of logical interfaces, including creation, modifications and deletion.
- Compatibility with IPv6. Although IPv6 not implemented yet.

Resources management

- Manage virtualized routers and IP networks.

Logical IP Networks

- Permits the creation of logical IP networks as resources which are formed using virtual routers.
- IPv6 networks compatibility.
- Allows configuration of routing protocols on a per network basis (e.g. OSPF)

The complete list of supported resources and their capabilities is available at this section.

Supported resources, capabilities and drivers

As stated in system architecture section, OpenNaaS supports different types of resources, and it can be extended to support other ones.A resource is the representation of a device in the software, and it is associated to a set of features which are represented as capability components. Capabilities are designed per resource type and are loaded for a particular resource if the ResourceDescriptor says to. However, most capabilities require a driver to interact with a real device and perform their actions. Hence, there is a relationship between resource types, capabilities and drivers which determines what kind of operations can be done with OpenNaaS to which specific network devices.

This relationship is illustrated in the compatibility matrix

Compatibility Matrix

OpenNaaS supports five different types of resources: router, optical switch, bandwidth on demand, mac bridge and network. The resources are abstracted from concrete devices and technologies/vendor details, except from the network, which involve a set of router resources. In this section you can find a list of all available drivers and the functionalities they implement depending on the resource they belong to.

Router Resource

	Capabilities				
Drivers	**Chassis**	**IP**	**OSPF**	**GRE**	**Static Route**
Junos 10.10	✅	✅	✅	✅	✅

BoD Resource

	Capabilities
Driver	**L2BoD**
Autobahn	✅

Optical Switch Resource

	Capabilities	
Driver	**Monitoring**	**Connection**
W-onesys	✅	✅

Mac Bridge Resource

	Capabilities
Driver	**VLAN-Aware Bridge**
IOS	✅

Deploy and run OpenNaaS

System requirements

OpenNaaS is tested to both build and run in:

- Windows 7
- Linux system (Ubuntu +10.10 and Debian)

Although not tested, there is no reason to believe OpenNaaS should not be able to run in other systems.

> **Build only**
> Note that you will need internet connectivity for the build too, as the dependencies are fetched during build by Maven.

Run OpenNaaS

To start OpenNaaS, launch the executable named opennaas in the following folder:

`/platform/target/opennaas-${project.version}/opennaas-${project.version}/bin`

> Notice that there is a .sh and a .bat file.
>
> Please use .bat if you are using Windows, and .sh if you are in a GNU-Linux or Mac OS box.

So, for version 0.10 on linux, you will run it as follows:

```
cd opennaas/platform/target/opennaas-0.10/opennaas-0.10/
./bin/opennaas.sh
```

By default, OpenNaaS will open a CLI prompt on the terminal. To avoid this you can execute it this way:

```
cd opennaas/platform/target/opennaas-0.10/opennaas-0.10/
./bin/opennaas.sh server
```

Please note that you will have to configure Karaf's SSH daemon to login the CLI via regular SSH.

Creating resources

First step in OpenNaaS is registering existing infrastructure. For this tutorial, let's assume there is a single router device to be registered.

In order to register a resource, a resource descriptor file is required. This file describes resource device type and

name, all capabilities OpenNaaS should load for it, and what drivers will it use. More information about the Resource descriptor concept is available in System Architecture section.

A descriptor from the project examples directory, or a custom one can be used.

The CLI command to register a device with this descriptor will be:

```
resource:create /path/to/descriptor/resource.descriptor
```

Note: For this guide, we used a router descriptor, specifying junos20 as name.

Registering protocol contexts

Each resource can use many different protocols to communicate with the physical device it represents. Required protocols are determined by the driver in use. For a resource to be able to use a required protocol, a Protocol Context is needed. Protocol Context stores all required information to communicate with the device using a protocol known to OpenNaaS.

In this example we're going to use netconf protocol. Hence, we introduce all netconf Protocol Context required data:

- protocol type
- authentication type
- uri
- authentication parameters

The following command illustrates how to register a protocol context for our resource using password authentication:

```
protocols:context router:junos20 netconf password
ssh://myuser:mypassword@193.1.190.254:22/netconf
```

and the following, using key authentication:

```
protocols:context router:junos20 netconf publickey
ssh://myuser@193.1.190.254.22/netconf privateKeyPath {key-passphrase}
```

Notice that only one context per protocol type is registered in a resource. Last one lasts.

Starting resources

A resource will populate its model and enable all its capabilities when started. Hence, in order to operate with it using opennaas, it must be started.

To start it, we use the following command:

```
resource:start router:junos20
```

Doing operations with resources

A resource includes a set of capabilities or features. These capabilities determine the set of available operations for this resource.

OpenNaaS supported capabilities are specified in this section.

Please, remember that capabilities to load for a particular resource are specified in the resource descriptor.

Removing resources

Finally, if the resource isn't needed anymore, it can be stopped and removed. First, we stop it:

```
resource:stop router:junos20
```

The resource will deactivate all its capabilities and it will be reset. After, we'll destroy it and delete any resource information in OpenNaaS.

```
resource:remove router:junos20
```

> ⚠ Notice that stopping and removing a resource causes no changes in real device configuration (e.g. resource:remove router:logicalrouter1 does not delete the logical router, but only removes it from OpenNaaS.)

Getting support

Users feedback is key to OpenNaaS success. That's why we put much effort in having a good documentation and several channels to help users solve their doubts, communicate their needs and report errors. This page offers an overview these channels.

FAQ

Frequently asked questions are being gathered in FAQ section. This should be the first place to look in when facing usage problems or issues that might have already been reported.

Mailing lists

OpenNaaS has a mailing list which provide support and feedback for problems. The mailing list is a good starting point for understanding design ideas and key concepts used in the OpenNaaS implementation, and also for collaborations. If you have feedback or feature requests we would love to hear them!

Check out pointers to mailing lists here:

http://www.opennaas.org/community

Issue tracker

OpenNaaS has an issue tracker, accessible at http://jira.i2cat.net:8080. There you can check for already reported issues and find solutions to them.

Error reporting

If you have found an error in OpenNaaS software, or an unexpected behaviour that looks like an error to you, please don't hesitate to report it.

> In order to help the development team to reproduce the error, please include following information in the error report:
>
> - Description of the error or undesired behaviour.
> - Shell history file or script to reproduce the error. Shell history is placed in ${usr_home}/.karaf/karaf.history in the server
> - Support files used in the script (e.g. resource descriptors)
> - A zip with OpenNaaS log files. Log files are placed in ${opennaas-path}/data/log/ folder in the server.

Issue tracker registered users can create bug tickets to report the error, attaching collected information.

While we work out public access to the issue tracker, non registered users can use mailing lists for reporting. If you are becoming an active participant or plan to report periodically, consider to ask for issue tracker registration in our mailing list.

Remote support

In case we can not reproduce a bug, then remote access to your OpenNaaS installation may be needed. You can check this tutorial as base material to enable remote access.

Frequently Asked Questions

1) When creating a new protocol session, it fails with a Configuration Error.

It's likely the context for the given protocol doesn't contain enough information for a session to be created, or it's just wrong. Use the protocols:context command to register a context with corrected information. Check that the URI contains the user/password, host, schema, etc... Concrete context information, however, depends on the underlying protocol implementation.

2) When trying to start a new resource, it fails with the following error: "The subsystem request failed".

The netconf subsystem for ssh connections is not set in the router. You can find the problem description and it solution at http://jira.i2cat.net:8080/browse/OPENNAAS-238

3) When building OpenNaaS, the build randomly fails with a: java.lang.OutOfMemoryError: PermGen space

This is due to the space that the JVM devotes to loaded classes running out. The reason for this is probably some uncleaned reference on a ClassLoader that prevents the GC to do its job.The temporary workaround is to prepend this to the maven calls:

MAVEN_OPTS="-Xmx512m -XX:MaxPermSize=128m" mvn install

Related to known bug: jira.i2cat.net/browse/OPENNAAS-417

4) When executing OpenNaaS platform, I only see 175 available commands.

None of the bundles are being loaded. There are several reasons why this might happen. In this case, we recommend you to report your situation using our bug reporting system, by creating a ticket in the following link: http://jira.i2cat.net:8080/secure/CreateIssue!default.jspa

It will be very helpful for the developer team if you attach the log in the ticket. You can find them at **platform/target/opennaas-{version}/opennaa-{version}/data/log/**

5) What are the system requirements for running OpenNaaS?

We have successfully tested OpenNaaS in Windows 7, Ubuntu and MAC OSX systems. There's a limitation by using Windows XP. The reason is that OpenNaaS uses Fuse 4.4 version, which requires at least either a Windows 2003 Server, a Windows 2008 Server or Windows 7, in case you're using a Microsoft OS.

Developers Guide

Build the project

Get the source code

To get the code, you will need the git application and the git address for the code. We recommend you to follow this guide in github. The guide also includes how to get the git tool installed in your system.

Once git is configured in your system, you can get the source code. OpenNaaS code is available as a github repository at:

https://github.com/dana-i2cat/opennaas

To download the code, just run the following command.

```
git clone https://github.com/dana-i2cat/opennaas.git
```

Releases

By default, git will clone the master branch only. This branch contains the latest stable release of OpenNaaS. You can get the development branch (highly unstable), which is named "develop". Alternatively, you can stick to a given release from master.

Master contains the latest release, and older releases are tagged so you can get the release from the tag, by launching the following git command:

```
git checkout <tag_name>
```

So, in order to fetch the development version (you should always do this if you plan to contribute code) you need to:

```
git checkout develop
```

Build requirements

OpenNaaS is build using Maven and Java. You will need:

- Java SDK 1.6. http://www.oracle.com/technetwork/java/javase/downloads/index.html
- **Apache-maven 3.*** http://maven.apache.org/download.html

Maven is available for most of platforms. You only need to decompress the project in a folder and configure your terminal by setting of the path variable. Different binary releases will be published in the web. However, any version of the source code can be downloaded from the code repository.

Also you will need Netconf4j if you are willing to develop OpenNaaS. It's a spin-off of Manticore 2 and Mantychore projects that serves as a netconf client but also provides mock transport that is used in OpenNaaS tests. Feel free to get it and play with it. If you only need to build opennaas, maven will fetch it for you.

Netconf4j resides in github, too. Go to the directory you want to install it and run the following commands:

```
git clone https://github.com/dana-i2cat/netconf4j
cd netconf4j/
mvn clean install
```

Build the project

Once you've installed all required software, and also downloaded OpenNaaS source code, you can start the building process . Go to OpenNaaS directory and execute the next command.

```
mvn clean install
```

This will cause maven to download all required dependencies, install them to your local repository and build our application.

> ⚠ Populating your local repository with all required dependencies may take its time, especially the first time you do it.

Upgrade your code

To upgrade your code to the last released version (last version in master, in this case), you can use pull command from master (or any other branch):

```
git checkout master
git pull git://github.com/dana-i2cat/opennaas.git master
mvn clean
mvn install
```

Tips and tricks

Skip Tests

If you want to build the project but skip the tests, you can do so using

```
mvn clean install -DskipTests
```

> ⚠ Given flag will cause maven not to run tests, but tests will be compiled anyway.

Resume from a given point

If you want to build artifacts starting in a specific one (useful after fixing an error in that artifact), use:

```
mvn clean install -rf :<artifactId>
```

Do not stop at first failure

Maven stops building the project when a tests suite fails. To force maven to keep on building and testing use the "fail never" flag:

```
mvn clean install -fn
```

At the end of the building process, a summary of the execution will show you per artifact results.

Adding memory to maven

Depending on your system specifications, you may need to increase the amount of memory maven can use to compile the project.

Typical related errors are:

- Java heap space
- PermGen space

Apache Maven project has this web that may help to solve the problem.

How to create a new bundle

Steps to activate a bundle

In order for a bundle to be active in the shell:

1) Create bundle

A bundle is a group of Java classes and additional resources equipped with a detailed manifest file on all its contents, as well as additional services needed to give the included group of Java classes more sophisticated behaviors. Bundles are managed within an OSGi container.

From the developer point of view, a bundle is a project, with an associated pom.xml file. That pom.xml contains instructions for maven and its plug-ins (typically maven-bundle-plugin) to build the project as a bundle. That means, creating the artifact with its associated manifest.

If the building of a bundle succeeds, typically a jar file is created, containing compiled classes, the bundle MANIFEST.MF and other resources (e.g. the blueprint core.xml file from step 2).

It is important to check that MANIFEST.MF has an "Export-Package" section with all packages this bundle offers to other bundles. In the same way, a section named "Export-Service" tells the container what services are offered. Instruction for maven to build the manifest are given in the pom-xml file, through maven-bundle-plugin. More information on that plug-in is available on its website.

A bundle can be manually created (create required folders and files, edit pom.xml...) but there are tools that can do that for us. With karaf archetypes a bundle is generated automatically from the following information:

```
mvn archetype:generate \
    -DarchetypeGroupId=org.apache.karaf.archetypes \
    -DarchetypeArtifactId=karaf-blueprint-archetype \
    -DarchetypeVersion=2.2.5 \
    -DgroupId=com.mycompany \
    -DartifactId=com.mycompany.blueprint \
    -Dversion=1.0-SNAPSHOT \
    -Dpackage=com.mycompany.blueprint
```

> In the example above, karaf-blueprint-archetype is used, generating a bundle with a blueprint file exporting a sample service. Please modify this file in order to export desired services, or remove it if no interaction with blueprint is required. Other archetypes are available, so check the Apache Karaf website for the appropriate one for each case.

2) Offer and consume services.

If your bundle should offer or consume services in the OSGi container, you should specify this within a blueprint core.xml file.

This file should be located inside your bundle, in src/main/resources/OSGI-INF/blueprint/core.xml. It will be included in the bundle jar when building it.

This is a typical xml file defining beans, services, and notification bindings. You may check already existent bundles for examples on its use.

More information about how to configure blueprint is available here.

> This link is part of Fuse ESB guide for deploying into OSGi container containing detailed information on interacting with the OSGi container. It covers a wide range of topics, including steps 1 and 2 of this page. It is worth to look at .

3) Add bundle to main project building process.

Add this bundle to its parent pom (modules section). This will cause this bundle to be build when building the parent.

Check for your bundle name in maven reactor when starting the build.

4) Add this bundle in OpenNaaS features.xml.

A feature is a group of bundles tied together providing certain functionality.

OpenNaaS features are defined in core/features/src/main/resources/features.xml file.

If your bundle extends an existent feature, you may add it to that one. Instead, if your bundle implements a new feature, it may be better to create a new feature with it.

5) Update platform to load new features.

If applicable, add new features to platform config file, to load them at boot time.

Platform config file is platform/src/main/filtered-resources/etc/org.apache.karaf.features.cfg.

Features included in "featuresBoot" section will be picked up and activated when platform loads. This way, those features functionality will be available to the user.

Please, check the feature your bundle belongs is included here.

6) Check all is correct

After building the whole project (or just your bundle, features and platform), when running the platform shell if you execute osgi:list command it should list the bundle among all the rest.

If it offers services using blueprint. Blueprint column for your bundle should display "Active".

References

Interesting references about pom files and OSGi bundles:

- **[Introduction to the POM]** http://maven.apache.org/guides/introduction/introduction-to-the-pom.html
- **[POM reference]** http://maven.apache.org/pom.html
- **[Bundle Plugin for Maven]** http://felix.apache.org/site/apache-felix-maven-bundle-plugin-bnd.html
- **[How to build OSGi bundles]** http://wso2.org/library/tutorials/develop-osgi-bundles-using-maven-bundle-plugin#Exporting%20packages

How to create a resource

In order to illustrate how to create a resource, a sample resource bundle has been created.

Sample Resource

Sample resource is an example included in the source code, with very simple functionality.

A sample resource has only one available capability, called "example" with a single "sayHello" operation. We strongly recommend to read the readme file and navigate the code to get familiar with it.

Using sample resource

When launching OpenNaas, the Sample Resource bundle is loaded, as can be seen with the list command:

```
OpenNaaS>list

     [147] [Active] [Created] [ ] [60] OpenNaaS :: Sample Resource (0.12.0.SNAPSHOT)
```

Having this bundle activated allows OpenNaaS to operate with resources of this type.

To create a resource, a resource descriptor is required. There is a sample resource descriptor in opennaas/utils/examples/descriptors

```
<resourceDescriptor>
  <!-- Capability information -->
     <capabilityDescriptors>
                <information><type>example</type></information>
      </capabilityDescriptors>
  <!-- Resource information. It specify type and name-->
     <information>
                <type>sampleresource</type>
                <name>resource1</name>
     </information>
 <properties/>
</resourceDescriptor>
```

If a resource with the above descriptor (type=sampleresource, name=resource1) has been created and started, its example capability should be available:

```
OpenNaaS>example:sayhello sampleresource:resource1 Adam
[INFO] sampleresource:resource1 says : Hello Adam
```

Developing from sample resource

Sample resource can be cloned and used to create your own resource types.

Publishing Capabilities

After defining capabilities for your resource and implement them, you'd commonly want them to be exported to OpenNaaS user interfaces, that is the server console and the remote API.

To publish them in the remote API, you'll need to publish the instance of the capability as an OSGi service using a set of pre-defined options. For that, we recommend to override following lifecycle methods and introduce registration calls:

```
@Override
 public void activate() throws CapabilityException {
  registerService(Activator.getContext(), CAPABILITY_TYPE, getResourceType(),
getResourceName(), IIPCapability.class.getName());
  super.activate();
 }

 @Override
 public void deactivate() throws CapabilityException {
  registration.unregister();
  super.deactivate();
 }
```

To make your capabilities available through the server console, you'll need to craft you own commands and publish them as OSGi services for Karaf shell to find them. ExampleCommand will serve you as an implementation guide. For publishing them, please refer to sample resource blueprint file. To know more about this file, there is a guide to publishing OSGi services that can be found here.

Putting things together

A part from capabilities, other components must be registered as OSGi services in order to interact with OpenNaaS platform. This is the case of resource repository and bootstrapper, and also any driver you may need. All these components are registered using blueprint configuration file in the bundle they belong to. Again, check sample resource blueprint file.

Drivers will be commonly placed in a different bundle from the resource one. Please, don't forget to register them as OSGi services (a new blueprint file will do the work). Although sample resource has no drivers, you can check junos one for an example.

Resources, capabilities and drivers

Drivers

Junos 10 router driver

Protocols

Uses netconf protocol to communicate with the physical router.

Netconf4j is the library providing netconf protocol.

Actions are responsible for creating required RPC commands and parsing its response, when necessary.

Mapping Junos configuration to router model

Apache digester 2.1 is used to parse junos configuration xml and create a router model with its data.

Apache Velocity is used to craft netconf rpc commands to change Junos configuration.

RouterID details

Description

Router ID

Many routing protocols require that the source of routing information be uniquely identified using the concept of a RID. A RID normally takes the form of an IPv4 address, and in most cases does not have to be reachable to correctly function as a RID. Stated differently, a router can receive a BGP or OSPF route update from a router identified as 1.1.1.1, and correctly process the related routing information, even though it may

not have a route to 1.1.1.1. With that said, it is common to use a routable IP address as the RID because this can simplify operations by enabling pings or telnet to the RID.

You can specify only one RID, and the same value is used by all protocols that require a RID (OSPF, OSPFv3, and BGP). The current best practice is to base the RID on the router's globally routable `lo0` address. You explicitly configure a RID as follows:

```
[edit routing-options]
lab@PBR# set router-id 1.1.1.1

[edit routing-options]
lab@PBR# show
router-id 1.1.1.1;
```

When you explicitly configure a RID that is based on an address assigned to the router's `lo0` interface, you will have to run an explicit IGP instance (typically passive) on that interface to advertise reachability to the RID, when desired. When a RID is not explicitly configured, the router obtains its RID from the primary address of the first interface that comes online. This is typically the loopback interface, when it has been assigned a nonmartian (non-127.0.0.1) address. Because changes in RID are disruptive to protocol operation, it's a good practice to manually configure a RID to ensure that changes to `lo0` addressing do not cause unanticipated churn.

Historically, Junos software automatically advertised a stub route to the interface from which the RID is obtained. This meant that you did not need to run an IGP instance on the loopback interface to advertise reachability to the RID. Starting with Junos Release 8.5, this behavior has changed. Now, whether you use an explicit or an automatically generated RID that is `lo0`–based, you need to enable OSPF on the loopback interface to advertise reachability to the related loopback address, even when it is the source of an automatically selected RID.

How it is modeled

Router ID must be set in every RouteCalculationService of the router model. That includes OSPF and BGP among others.

Releases

Available release announcements

Starting at release 0.9, release announcements will be done in http://www.opennaas.org under the tag "release":

http://www.opennaas.org/tag/release/

This page will no longer host newer announcements.

For the older ones, you have the links just below.

Releases

No content found for label(s) release.

Mantychore 0.1

Date: 29/7/2011

Releases Notes - Mantychore - Version 0.1

The Mantychore developer team is proud to announce the Mantychore 0.1 Release. This is an early beta release, the functionality is minimal (see below) but will be useful to test the deployment experience and the feedback cycle.

Mantychore will follow the Infrastructure as a Service (IAAS) paradigm to enable National Research and Education Networks (NRENs) and other e-Infrastructure providers to enhance their service portfolio by building and deploying software and tools to provide infrastructure resources like routers, switches, optical devices, and IP networks as a service to virtual research communities.

The key features of Mantychore 0.1 include

- Initial support for management of resources. Create, start, stop and remove operations are supported.
- Support to list and set interfaces.
- Support for CLI (Karaf gogo based shell).
- Support for resource profiles
- Support for JunOS (>10.10) systems with Netconf protocol enabled.
- Persistence support.
- Remote access to debug and fix errors.

Downloads

Linux (tar.gz) - mantychore-0.1.tar.gz
Windows (zip) - mantychore-0.1.zip

Installing

Please read our wiki page: deploying Mantychore

Compiling

You can also find the source code here:

http://svn.i2cat.net/repos/manticore/release/0.1/

and compile it youself. Please go to get the source code and build it for concrete instructions.

Documentation and user support

Please check our documentation here. Especially important for this release are the Getting started and System Architecture sections.

Don't hesitate to contact us at the mantychore-technical mailing list.

Bug reporting

Mantychore FP7 project members can issue a bug ticket directly at:

http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa\|http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa (http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa)

However, it doesn't allows for anonymous access yet. While we sort this out, feedback will be handled in the mailing list.

Mantychore 0.4

Releases Notes - Mantychore - Version 0.4

This release of Mantychore is based off of the Karaf 2.2 series and it represents an important update in Mantychore. It includes the necessary features to manage logical routers and configure subinterfaces. It is added support of two type of encapsulation: vlan and ethernet. Finally, There were a set of bugs and needed improvements which Mantychore has implemented.

OPENNAAS-2 - Create logical routers

OPENNAAS-23 - Set a description on an interface

OPENNAAS-30 - Fix problem to use configure interface action

OPENNAAS-43 - Refactorize helpers, Mantychore to OpenNaaS

OPENNAAS-81 - Network resource support in Mantychore

OPENNAAS-47 - Update capability to permit model

OPENNAAS-96 - Remove --refresh option in karaf commands

Dependency upgrade

- Updated first tests to Pax-Exam 2.3
- Updated Fuse to 2.4.0-fuse-00-27
- Updated Apache Karaf to 2.2.2
- Updated Maven to 3.0

Improvement

OPENNAAS-44 - Move one Mantychore test from Pax-exam 1.x to 2.3

OPENNAAS-85 - Lock | Unlock actions

Task

OPENNAAS-90 - Check spelling in all karaf commands

Downloads

Linux (tar.gz) - opennaas-0.4.tar.gz (101 MB)
Windows (zip) - opennaas-0.4.zip (102 MB)

Installing

Please read our wiki page: deploying Mantychore

Compiling

You can also find the source code here:

http://svn.i2cat.net/repos/manticore/release/sprint_0_4/

and compile it youself. Please go to get the source code and build it for concrete instructions.

> ⚠ In this Sprint, the Mantychore source code has disable some modules (testing modules) in order to refactorize in the next sprint. For these reason, these modules are not compiled

Some machines can need more memory to compile Mantychore, check this link if it is your case

Documentation and user support

Please check our documentation here. Especially important for this release are the Getting started and System Architecture sections.

Don't hesitate to contact us at the mantychore-technical mailing list.

Bug reporting

Mantychore FP7 project members can issue a bug ticket directly at:

http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa\ (http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa)

However, it doesn't allows for anonymous access yet. While we sort this out, feedback will be handled in the mailing list.

Mantychore 0.5

Mantychore - Version Mantychore 0.5 sprint

This Mantychore release aims to stabilize the Mantychore software. For this reason, the main tasks have the objective to refactore the necessary tests and include new features to work with Mantychore. Moreover, it has added the first design for the network supporting and parsing of XML-NDL messages.

- OPENNAAS-57 - Support addResourceToNetwork feature
- OPENNAAS-58 - Support deleteResourceToNetwork feature
- OPENNAAS-59 - Create add/delete resourceToNetwork karaf command
- OPENNAAS-60 - List ResourceToNetwork Karaf Command
- OPENNAAS-141 - create mappings java to RDF-XML
- OPENNAAS-143 - create export model command
- OPENNAAS-147 - test java2ndl mappings

Improvements

- OPENNAAS-126 - CLI - Clear CLI prompt
- OPENNAAS-131 - CLI - remove separator lines
- OPENNAAS-118 - Reformat netconf messages

Bug

- OPENNAAS-160 - Mantychore assembly does not include mantychore features and repo
- OPENNAAS-149 - Make sprint0_2 tests pass
- OPENNAAS-150 - Make sprint0_3 tests pass
- OPENNAAS-151 - Make sprint0_4 tests pass
- OPENNAAS-152 - Make week26 tests pass
- OPENNAAS-153 - Make nexus.resources integration tests pass
- OPENNAAS-154 - Make net.i2cat.mantychore.tests.capability integration tests pass
- OPENNAAS-155 - Make net.i2cat.mantychore.tests.commandsKaraf integration tests pass
- OPENNAAS-156 - Make net.i2cat.luminis.tests.repository integration tests pass
- OPENNAAS-157 - Make net.i2cat.luminis.tests.commandsKaraf integration tests pass
- OPENNAAS-158 - Make commented tests pass

Dependency upgrade

- Moved some tests to Opennaas

Downloads

Linux (tar.gz) - opennaas-0.5-bin.tar.gz (101 MB)
Windows (zip) - opennaas-0.5-bin.zip (102 MB)

Installing

Please read our wiki page: deploying Mantychore

Compiling

You can also find the source code here:

http://svn.i2cat.net/repos/manticore/release/sprint_0_5/

and compile it youself. Please go to get the source code and build it for concrete instructions.

Some machines can need more memory to compile Mantychore, check this link if it is your case

Documentation and user support

Please check our documentation here. Specially important for this release is the documentation regarding networks (not yet updated).

If you are new to Mantychore we recommend you to read the Getting started and System Architecture sections.

Don't hesitate to contact us at the mantychore-technical mailing list.

Bug reporting

Mantychore FP7 project members can issue a bug ticket directly at:

http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa\ (http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa)

However, it doesn't allows for anonymous access yet. While we sort this out, feedback will be handled in the mailing list.

Mantychore 0.6

Mantychore - Version Mantychore 0.6 sprint

Release Notes - Mantychore 0.6 sprint

This release mainly adds support for a BoD (Bandwith on Demand) resource and increases network functionality by adding attach/detach interfaces feature. From the internal point of view, some bugs has been solved and network model has been extended to store references to other resources.

The complete list of changes is as follows:

Bug

- [OPENNAAS-161] - Mantychore platform is unable to load Mantychore features due to incorrect features file name (when generated from project root)
- [OPENNAAS-170] - Bad use of Properties in Events
- [OPENNAAS-183] - Problem to execute BoD Tests: FileNotFound paxexam.lock

Improvement

- [OPENNAAS-165] - Add support for Bandwith on Demand (BoD) resource.
- [OPENNAAS-166] - Add attach command to L2 network.
- [OPENNAAS-180] - Remove Examples folder from OpenNaaS platform

Technical task

- [OPENNAAS-167] - Create BoD repository
- [OPENNAAS-168] - Create a L2BoD capability
- [OPENNAAS-169] - Create BoD resource model
- [OPENNAAS-171] - Create L2BoD capability ActionSet (dummy)
- [OPENNAAS-174] - Define how network stores references to Resources
- [OPENNAAS-179] - Integration test for a BoD resource
- [OPENNAAS-181] - Create the Bootstrapper class for the BoD Repository
- [OPENNAAS-182] - Add the shell commands to the L2BoD capability
- [OPENNAAS-185] - Create Queue ActionSet for BoD resource

Known issues:

This release is affected by following known issues:

OPENNAAS-162	Fresh build throws java.util.NoSuchElementException on Enter
OPENNAAS-164	Mantychore tests fails to resolve opennaas features and bundles
OPENNAAS-176	CommandNotFound in integration tests

OPENNAAS-177	NDL parser fails to resolve interfaces names when exporting.
OPENNAAS-184	Interfaces are duplicated in networkModel

Downloads

Linux (tar.gz) - opennaas-0.6-bin.tar.gz (101 MB)
Windows (zip) - opennaas-0.6-bin.zip (102 MB)

Installing

Please read our wiki page: deploying Mantychore

Compiling

You can also find the source code here:

http://svn.i2cat.net/repos/manticore/release/sprint_0_6/

and compile it youself. Please go to get the source code and build it for concrete instructions.

Some machines can need more memory to compile Mantychore, check this link if it is your case

Documentation and user support

Please check our documentation here. Specially important for this release is the documentation regarding network and BoD resource (not yet updated).

If you are new to Mantychore we recommend you to read the Getting started and System Architecture sections.

Don't hesitate to contact us at the mantychore-technical mailing list.

Bug reporting

Mantychore FP7 project members can issue a bug ticket directly at:

http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa\ (http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa)

However, it doesn't allows for anonymous access yet. While we sort this out, feedback will be handled in the mailing list.

Mantychore 0.8

Release Notes - Mantychore 0.8 sprint

This release extends the network resource with two capabilities (see stories) and fixes several bugs in the software. Network capabilities are very basic, and they are likely to be improved in the near future. Concretely, queue has to be designed and implemented to use a two-face commit pattern. An also stubby static-route capability has been created for routers. It does not yet parse static routes information, but allows inserting static routes.

The sprint has been also dedicated to prepare the EC review demo. Hence, there are some technical tasks or improvements related to it.

The complete list of changes is as follows:

Bug

- [OPENNAAS-133] - LTs don't print its description
- [OPENNAAS-162] - Fresh build throws java.util.NoSuchElementException on Enter
- [OPENNAAS-164] - Mantychore tests fails to resolve opennaas features and bundles
- [OPENNAAS-175] - Commands not displayed in karaf shell but present
- [OPENNAAS-176] - CommandNotFound in integration tests
- [OPENNAAS-177] - NDL parser fails to resolve interfaces names when exporting.
- [OPENNAAS-224] - Resolve bugs reported by the users.
- [OPENNAAS-226] - Queue response shows pending state when an action throws exception
- [OPENNAAS-228] - Interfaces OperationalStatus is not set into model
- [OPENNAAS-229] - ospf:configureInterfacesInArea only work with interfaces, but not with service endpoints (like GRE)
- [OPENNAAS-231] - Bug in Resource Lifecycle
- [OPENNAAS-232] - NullPointerException adding a topology without NetworkDomain
- [OPENNAAS-237] - Router capability error
- [OPENNAAS-238] - Can't access to Myra and GSN in OpenNaaS
- [OPENNAAS-239] - resource:start <logical system> does not appear to update model correctly
- [OPENNAAS-242] - NullPointerException adding resource to network with topology
- [OPENNAAS-245] - Wrong interface for GRE.
- [OPENNAAS-248] - Every protocol accept different contexts
- [OPENNAAS-249] - chassis:showInterfaces throws an Exception if there's no GRE configured on the device.
- [OPENNAAS-254] - queue:remove with bad index shows Array index out of bounds

Improvement

- [OPENNAAS-218] - Test GRE Tunnel between VMs and Lola
- [OPENNAAS-219] - Update TNC script
- [OPENNAAS-220] - Add testbed to OpenNaaS
- [OPENNAAS-223] - Configure the VMs for the TNC demo.
- [OPENNAAS-235] - Create a default static route in LR
- [OPENNAAS-251] - Add descriptions to all resource descriptors.
- [OPENNAAS-252] - DeleteTunnelAction should not delete the "unit" tag.

Story

- [OPENNAAS-221] - Create Queue Capability in network
- [OPENNAAS-222] - OSPF for the Network resource.

Technical task

- [OPENNAAS-88] - Add router response message to queue.confirm action error messages
- [OPENNAAS-134] - Rename mantychore packages with functional names.
- [OPENNAAS-190] - Update demo script with demo topology
- [OPENNAAS-230] - List interfaces and IPs that will be used in the EC and TNC demos.

Downloads

Linux (tar.gz) - opennaas-0.8.tar.gz (101 MB)
Windows (zip) - opennaas-0.8.zip (102 MB)

Installing

Please read our wiki page: deploying Mantychore

Compiling

You can also find the source code here:

https://github.com/dana-i2cat/opennaas

and compile it youself. Please go to get the source code and build it for concrete instructions.

Some machines can need more memory to compile Mantychore, check this link if it is your case

Documentation and user support

Please check our documentation here.

If you are new to Mantychore we recommend you to read the Getting started and System Architecture sections.

Don't hesitate to contact us at the mantychore-technical mailing list.

Bug reporting

Mantychore FP7 project members can issue a bug ticket directly at:

http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa\ (http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa)

However, it doesn't allows for anonymous access yet. While we sort this out, feedback will be handled in the mailing list.

Mantychore 0.9

Release Notes - Mantychore 0.9 sprint

This release adds support for autobahn, creates a web service (ws) skeleton, and refactors all capabilities interface so they are exportable through ws.
It also collapses some bundles and remove code duplication, mainly in tests, helpers, and mocks.

The complete list of changes is as follows:

Bug

- [OPENNAAS-280] - Gave up waiting for service

Improvement

- [OPENNAAS-305] - QueueManager Capability refactor
- [OPENNAAS-307] - Pretask for WS: Merge pull requests for Model (with WS) and itest
- [OPENNAAS-308] - Upload to Github the CXF client, which is a separate maven project

Story

- [OPENNAAS-284] - As a user I want to call a BoD service so that I can provision links

Technical task

- [OPENNAAS-99] - Mov required helpers to OpenNaaS
- [OPENNAAS-107] - Get rid of test helpers duplication
- [OPENNAAS-258] - Deploy sample CXF service (prototype)
- [OPENNAAS-273] - Implement WS facade

- [OPENNAAS-276] - Re-structure capabilities design (ICapability, ICapabilityLifecycle, AbstractCapability, functional interfaces)
- [OPENNAAS-277] - Adapt each existing capability to new design and define its interface
- [OPENNAAS-290] - export whole model in web services wsdl
- [OPENNAAS-311] - QueueManager Capability refactor
- [OPENNAAS-312] - 1-Merge pull requests for WS ,Model. 2-Pull request for itest and merge
- [OPENNAAS-314] - Upload CXF client

Downloads

Linux - opennaas-0.9.tar.gz (101 Mb)

Windows - opennaas-0.9.zip (102Mb)

Installing

Please read our wiki page: deploying Mantychore

Compiling

You can also find the source code here:

https://github.com/dana-i2cat/opennaas

and compile it youself. Please go to get the source code and build it for concrete instructions.

Some machines can need more memory to compile Mantychore, check this link if it is your case

Documentation and user support

Please check our documentation here.

If you are new to Mantychore we recommend you to read the Getting started and System Architecture sections.

Don't hesitate to contact us at the mantychore-technical mailing list.

Bug reporting

Mantychore FP7 project members can issue a bug ticket directly at:

http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa\ (http://jira.i2cat.net:8080/secure/CreateIssue\!default.jspa)

However, it doesn't allows for anonymous access yet. While we sort this out, feedback will be handled in the mailing list.