3. Conclusion

TEMPO will be hopefully recovered during summer 2007. Acquired imagery and environmental data will be analyzed to study the links between environmental changes and biotic factors, including composition, density, biomass and growth of visible species (mussels, shrimps, crabs), behaviour and, biological interactions such as predation.

4. Acknowledgements

We would like to thank Captain Philippe Guillemet of the R/V Pourquoi pas? and his crew for their never-failing collaboration to the success of this cruise. We also acknowledge the Victor 6000 ROV team for their patience and constant support. The authors also express their sincere thanks to all members of the EXOCET/D team for their hard work towards the development of the instruments tested and the methodologies used during this cruise.

5. References

[1] Sarradin, PM, and EXOCET/D consortium. InterRidge News. 12: 11, 2003.
[2] Sarrazin J., V. Robigou, S. K. Juniper and J. R. Delaney. MEPS, 153, 5-24, 1997.
[3] Sarradin, P.M., N. Le Bris, C. Le Gall and P. Rodier. Talanta 66: 1131-1138, 2005.
[4] Blandin J. and J.F. Rolin. Sea Tech., 46: 33-36, 2005.
[5] Sarrazin J., P.M. Sarradin and the MoMARETO cruise participants. InterRidge News, 24-33, 2006.

THE NEMO PROJECT: DEVELOPMENT OF PHASE 2

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1. Introduction

The detection of high-energy neutrinos coming from the deep universe is considered by the Astrophysics and Particle-Physics community one of the main scientific goals of the next years.

The Infn, (Istituto Nazionale di Fisica Nucleare), after the realization of a technological demonstrator (the NeMO Phase 1 project), at 2.000 m depth, has under way an advanced R&D program, the NeMO Phase 2, that include long term exploration close to the Sicilian coast for the installation of the detector.

The Phase 2 consist of a new electro-optical cabled facility at 3.500 m depth at 50 nautical miles from the south-east coast of Sicily.

This infrastructure it's also used for others scientific applications, (Acoustics, Geophysics, etc.) and operate as a multidisciplinary underwater laboratory.

2. Results and Discussion

Technical aspects under realisation will be presented with particular attention to:
- Cable Backbone
- Sub-sea Distribution Network
- Power and Data Transmission
- Connection System

3. Conclusions

An underwater infrastructure is under realization on the deep sea site selected by the NeMO collaboration as a candidate for the installation of the km3 neutrino telescope.
The infrastructure includes a 100 km long electro-optical cable, a shore station in Portopalo di Capo Passero and the power feeding and control equipments.
The installation of the backbone cable and power systems has started. The plant will be installed by the end of spring 2008.

4. References

[1] E. Migneco et al., Nucl. Phys. B, Proc. Suppl. 136 (2004) 61.
[2] E. Migneco et al., Status of NEMO, Nucl. Instr. And Methods in Physics Research, Proceed. of the 2nd Intern. Workshop on Very Large Volume Neutrino Telescope. Catania, Italy, Nov. 8-11, 2005
[3] Alcatel Submarine Network
[4] M. Sedita, Electro-optical cable and power feeding system for the NEMO Phase-2 project. Nucl. Instr. And Methods in Physics Research, Proceed. of the 2nd Intern. Workshop on Very Large Volume Neutrino Telescope. Catania, Italy, Nov. 8-11, 2005.

AN INFORMATION MODEL FOR A POLICY BASED MAGAMENT. EXTENSIONS TO MARINE SENSOR NETWORKS AND OCEAN OBSERVATORIES

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1. Introduction

Sensor networks for environmental data acquisition will play an important role in the development of future large data acquisition systems, particularly in oceanographic observation and operational oceanography.

This paper will show the application of Policy Based Network Management (PBNM) on Marine Sensor Networks (MSN) and Networked Ocean Observatories aiming to overcome the lack of flexibility imposed by more traditional network management paradigms.

The development of MSNs must deal with several technical challenges focused mainly on the management of the heterogeneity (equipment and data) and on the extension of the operational time. Different systems and technologies are concurrent in the same network, forced to share hardware resources and exchange data. At same time many acquisition devices, and the network itself, have limited resources that must be well managed. Their multidisciplinary nature creates particular problems in that different sensors may require completely different time scales of data acquisition. However the final users (scientific and non scientific) should be able to receive coherent and quality data from the whole network of observatories.

1.1 Network Management and Policy Network Management
Network Management (NM) is defined as a group of tasks and techniques related to the planning, organization and supervision of all elements within a network, independently of their nature and location. Policy Based Network Management (PBNM) is an administrative approach that is used to simplify management tasks by establishing policies to deal with situations that are likely to occur. PBNM architecture has four essential components [1]

• Policy Management Tool: Is the interface that provides definition, update and monitoring to policy rules to system managers.
• Policy Repository: Is the place where policy rules are stored. It is handled by the Policy Management Tool and must be accessed by all elements of management system.
• Policy Enforcement Point: Is the entity where the policies are applied.
• Policy Decision Point (PDP): A set of functions whose responsibility is to develop and translate policy rules in form of messages to the PEP. In some cases PDP and PEP can be located at same device.

1.2 Benefits of using Network Management on MSN
Some of the challenges related with the operation and maintenance of large MSN could be tackled using network management techniques:
Network management could provide performance checking and fault notifications to the network operator, and could be used for searching alternative data sources or communication routes in order to maintain the data consistency and to avoid data loss.
It could be used to maintain a global view of the environment and to modify accordingly the data acquisition conditions in each instrument and sensor (sampling acquisition or transmission rates). This adaptive procedure obtains more significant data sets and preserves the limited resources of the system (energy, bandwidth, storage capacity, etc.).
Network management could also supply data quality logs showing accuracy measurement of the error related to any instrument and to its references (time, position...).
Because policies provide more dynamism the application of PBNM on MSNs can open new operational scenarios in MSN management. The application of appropriated policies designed for a specific scenario avoids reconfiguring individually each instrument and sensor. MSNs functionality could be adapted to variable scientific criteria on the definition of experiments.

2. Proposed Information Model

The main element of any networking management system is the description of the managed entities. In the case of a PBNM is also the definition the policy structure.

An Information Model (IM) is an abstraction and a representation of the managed entities, through the description of their properties, functionality, and relationships. It is independent of any specific repository, application, protocol, or platform. The IETF Policy Working Group has developed the Common Information Model (CIM) that represents policies and managed entities using an object-oriented paradigm [2].

The work presented in this paper is the definition of an IM based on the DTMF CIM, version 2.14 (released on 04 Dec 2006), with the necessary extensions to be applied in a MSN scenario [3].
Our IM is composed by a Data Model, a Managed Entities Model and a Policy Model

2.1 Data Model
Characterization of the marine scientific data obtained in a MSN will provides the base knowledge of how the monitored environment is. At the moment there is no consensus about any marine data model, and a great number of efforts have been focused in the identification of all different data types that may be present in a marine system.

Our model provide a basic framework to virtually construct any data structure to be used in a marine data acquisition system, through the description of basic data entities -as bricks in a constructive work- their relationships, and the grouping techniques that allow us to create more complex data on demand.

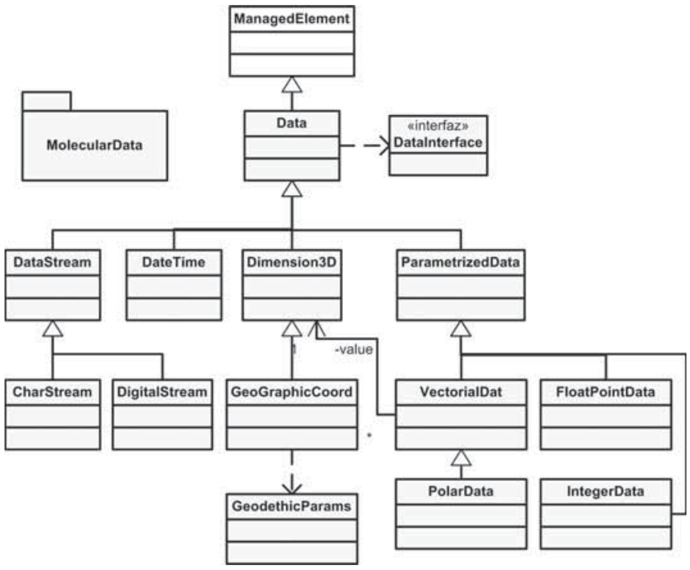

Figure 1. UML Data class hierarchy for atomic data.

The description of mechanisms and rules of grouping the atomic data to form complex and composite data types can be expressed using as a new set of data classes grouped under the name molecular data

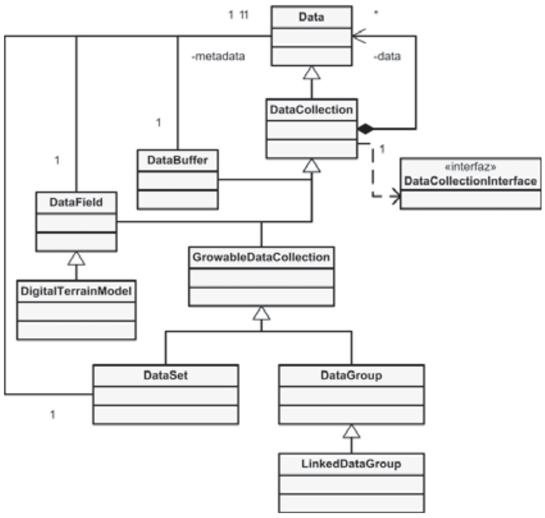

Figure 2 UML class diagram for Molecular data entities

2.2 Managed Entities Model
The managed Entities Model represents the managed elements, physical and logical objects, from networking devices and computing systems to sensors and applications.
In our work we expand the hierarchy to identify any element present in a MSN.

We can distinguish two different types of "devices": Those whose function is to acquire data from the marine environment, and those dedicated to the transmission of acquired data over the network and between components.

Under first one are included all the acquisition systems composed by instruments and sensors, storage devices and also software that controls the acquisition data. Under the second type we could include junction-boxes, switching and routing devices, software connectivity modules and also the cable itself.

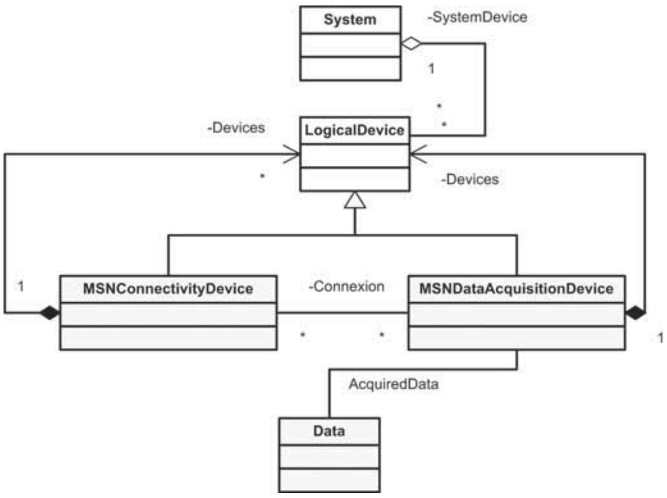

Figure 3 UML class diagram for MSN Devices and their relationship with CIM classes and Data classes

2.3 Policy Model

The Policy Model [13] is a the key component that represents and manages policies across a spectrum of technical domains, enabling to represent policies in a vendor-independent and device-independent way.

The CIM approach to modelling a policy-controlled network is to model the system as a state machine, and then use policies to control which state a device should be in at any given time. Policies are applied using a set of policy rules. Each policy rule consists of a set of conditions and a set of actions, and may be aggregated into policy groups that can be nested, to represent a hierarchy of policies [13]. The set of conditions associated with a policy rule specifies when the policy rule is applicable. The set of conditions can be expressed as either an ORed set or ANDed sets. If the set of conditions associated with a policy rule evaluates to TRUE, then a set of actions may be executed. Policy rules themselves can be prioritized.

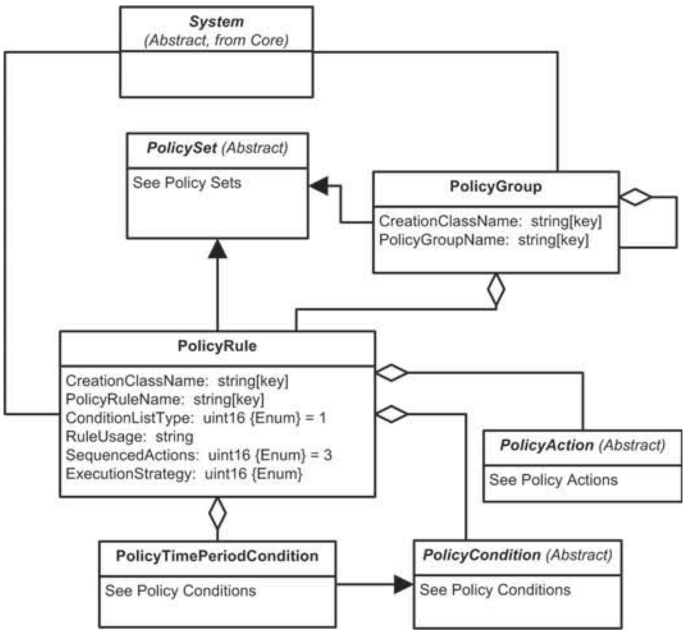

Figure 4 UML class diagram for Policy entities from CIM Policy Model. Redrawn from [3]

From this general analysis, we can conclude that in most of them at least a data entity is present in a policy condition. A new subclass, DataPolicyCondition, has been added to policy class hierarchy. This class provides an association to data entities that allows evaluating them as a part of condition enunciate. An example of this could be the following simplified policy: <change data acquisition conditions> IF <acquired "seismic signal" has this pattern>. In this case a policy enforcement point can only evaluate the policy if "seismic signal" has been well defined as a data type inside the policy condition

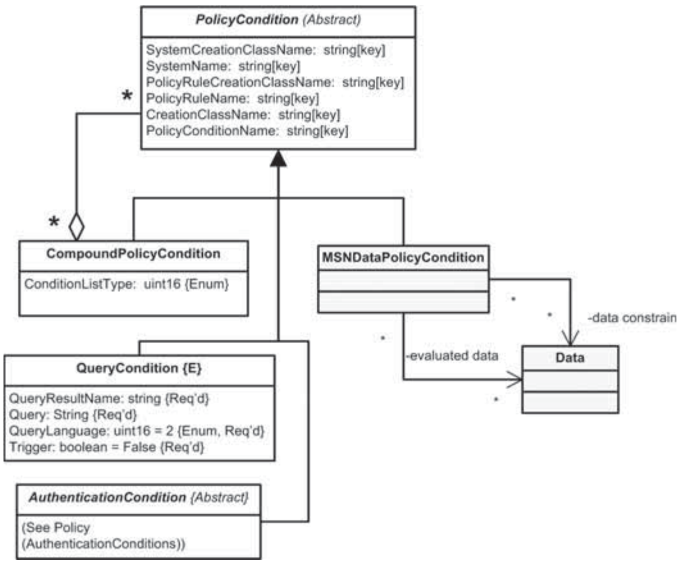

Figure 5 UML class diagram of MSNDataPolicyCondition. Relations with Data entity.

3. Conclusions

In this paper the benefits of using policy based management on MSN have been outlined. PBNM could be used not also to monitoring the health of the network but to modify the functionality of the network to new conditions. PBNM through policy rules, provide mechanisms to do adaptive management a large set of network nodes at same time and when certain conditions have been reached.

We have presented an Information Model to be used as the basis of a PBNM deployment on a MSN. We have extended the CIM from DMTF with a new hierarchy of classes that handle the data acquired in any MSN, and also complemented the CIM common model with the addition of two new classes that represent into the IM the instrumentation present in a MSN. We also outline a simple taxonomy of the policies that could be applied, and we propose also an extension of the CIM Policy Model in order to handle policy conditions that contains marine data entities as a constrains or evaluation arguments.

4. References

[1] M. Sloman. "Policy Driven Management For Distributed Systems," Journal of Network and System Management, vol. 2, no. 4, Dec. 1994, pp. 333–60.
[2] The IETF Policy Framework Working Group: RFC 3198. http://www.ietf.org/rfc/rfc3198.txt.
[3] DMTF, CIM CORE-model specification V214. http://www.dmtf.org/standards/cim/cim_schema_v214/CIM_Core.pdf.