## Preliminary

# SC readout architecture for km3Net-Italy

#### Introduction

The following note is the proposed design for the Slow Control data readout of the 8 towers of km3Net-Italy. The estimated on-line throughput as well as the storage requirements is based on the experience of NEMO-Phase2 taking account the differences between the two systems.

#### The architecture

The Slow Control data readout architecture designed for NEMO-Phase2 has demonstrated to be performing, versatile and scalable. For this reason, it is natural that the first idea was to verify its compatibility with the km3Net-Italy specification.

The layout of the next stage of the submarine detector development foresees 8 towers of 15 floors including the base. If we consider that there will be 6 PMT per floor and almost the same density of environmental as well as structure parameter to be acquired and controlled, it is easy to demonstrate the full scalability of the previous architecture. In the following is reported the NEMO-Phase2 analysis and the consequent specifications for km3Net-Italy. Finally, this architecture will be scaled for future improvements.

#### The layout

Here is a simplified layout of the Slow Control data management. It is assumed that specific details are well known.



#### The protocols

Also for km3Net-Italy we decided to use the same protocol developed for Phase2. Here are the main specifications.

- 1. UDP based.
- 2. PDP (Periodic Data Packet) is the periodic packet containing the FCM board parameters. The DM receives this packet.
- 3. EDP (Environmental Data Packet) is the packet received from a generic external peripheral. The DM receives this packet.
- 4. CDP (Command Data Packet) is the packet containing the specific command sent to the tower. The DM transmits this packet.

Other protocols will be implemented to integrate the management of the remaining systems.

- 1. Power Supply.
- 2. Tower power distribution.
- 3. Positioning.
- 4. TRIDAS.
- 5. Others.

Many of these systems are under development. At the moment, we agree to keep unchanged the data format. The final version of protocols and formats to be used will be released as soon as fixed.

#### NEMO-Phase2 Slow Control data analysis (1 tower, 9 floors, 4 PMTs/floor)

- Throughput
  - ~ 3 kbit/sec/floor  $\rightarrow$  ~ 27 kbit/sec/tower
- DB Storage
  - ~ 15 MB/floor/day  $\rightarrow$  ~ 450 MB/floor/month  $\rightarrow$  ~ 5.4 GB/floor/year
  - ~ 133 MB/tower/day  $\rightarrow$  ~ 4 GB/tower/month  $\rightarrow$  ~ 48 GB/tower/year

### Km3Net Italy Slow Control specifications (8 towers, 15 floors, 6 PMTs/floor)

- Throughput
  - ~ 4 kbit/sec/floor  $\rightarrow$  ~ 60 kbit/sec/tower  $\rightarrow$  ~ 480 kbit/sec/8 towers
- DB Storage
  - ~ 20 MB/floor/day  $\rightarrow$  ~ 600 MB/floor/month  $\rightarrow$  ~ 7.2 GB/floor/year  $\rightarrow$  ~ 144 GB/floor/20 years
  - ~ 300 MB/tower/day  $\rightarrow$  ~ 9 GB/tower/month  $\rightarrow$  ~ 108 GB/tower/year  $\rightarrow$  ~ 2.1 TB/tower/20 years
  - ~ 2.4 GB/8 towers/day  $\rightarrow$  ~ 72 GB/8 towers/month  $\rightarrow$  ~ 864 GB/8 towers/year  $\rightarrow$  ~ 17.3 TB/8 towers/20 years

#### Km3 detector: future improvements (100 towers, 15 floors, 6 PMTs/floor)

- Throughput
  - ~ 6 Mbit/sec/100 towers
- DB Storage
  - ~ 30 GB/100 towers/day  $\rightarrow$  ~ 900 GB/100 towers/month  $\rightarrow$  ~ 10.8 TB/100 tower/year

Important Note: a realistic amount of qualified Slow Control data to be stored according to a long time storage policy is less than 10%. For this reason, several type of data backup policy can be decided.