

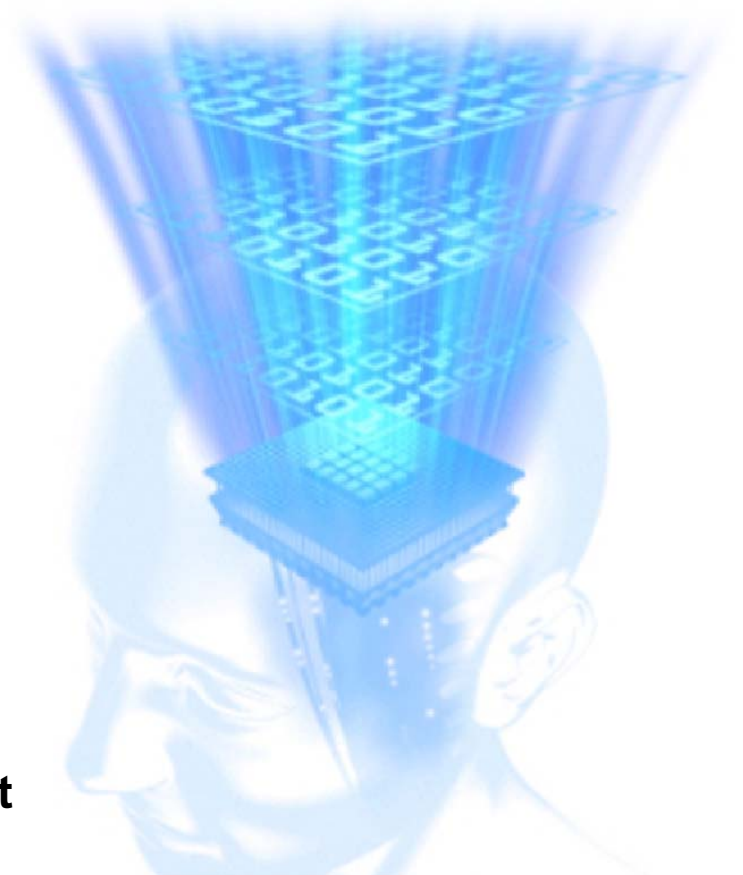


# Automated Eye on Nature (AEON) and the Were-Tigers of Belum

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1st International Workshop on "Creative Science - Science Fiction Prototyping for Research Innovation"



Intelligent Systems

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## Area of Interest: Biodiversity

- **Environmental biodiversity, of flora and fauna, is a direct indicator of the general health of the environment and surrounding ecosystem.**
- **Ecologists expend a great deal of time and effort collecting this raw data, targeting key biotic indicator taxa, also called *bio-indicators*.**



## Biodiversity Monitoring

- **To help us understand the complexities and sensitivities of our finely interwoven eco system and our effects on that system, we need to build accurate models from which we can derive theory, make predictions and define policy.**



## Biodiversity Monitoring



- **Ecologists have identified a small number of key indicator species, namely, Plants (Trees), Bats, Birds, Aquatic Macro Invertebrates, Moths, Ants, Figs & Frugivores, Dung Beetles, Stingless Bees and Large Mammals, as important general environmental indicator.**
- **Their sensitivity and stabilities to environmental conditions such as air pollution, climatic variation, foliage-densities and so on make them a practical bio-indicator**



## Example: Moths

- **Data collection typically involves a protracted manual process; a good example is the collection of moth data.**
- **The collection of moth data requires the ecologist to**
  - physically travel to the area of interest,
  - assemble the collection apparatus (light-trap(s) in this case) either camp overnight, especially if the area is in a remote location, or leave and return at a later point
- **After which an expert taxonomist will**
  - sift the raw data and catalogue, pick out the targeted moth species from the other collected moths and insects
- **Then the processed results will be used for modelling purposes**



## Example: Moths



Light traps in Forest Research Institute Malaysia



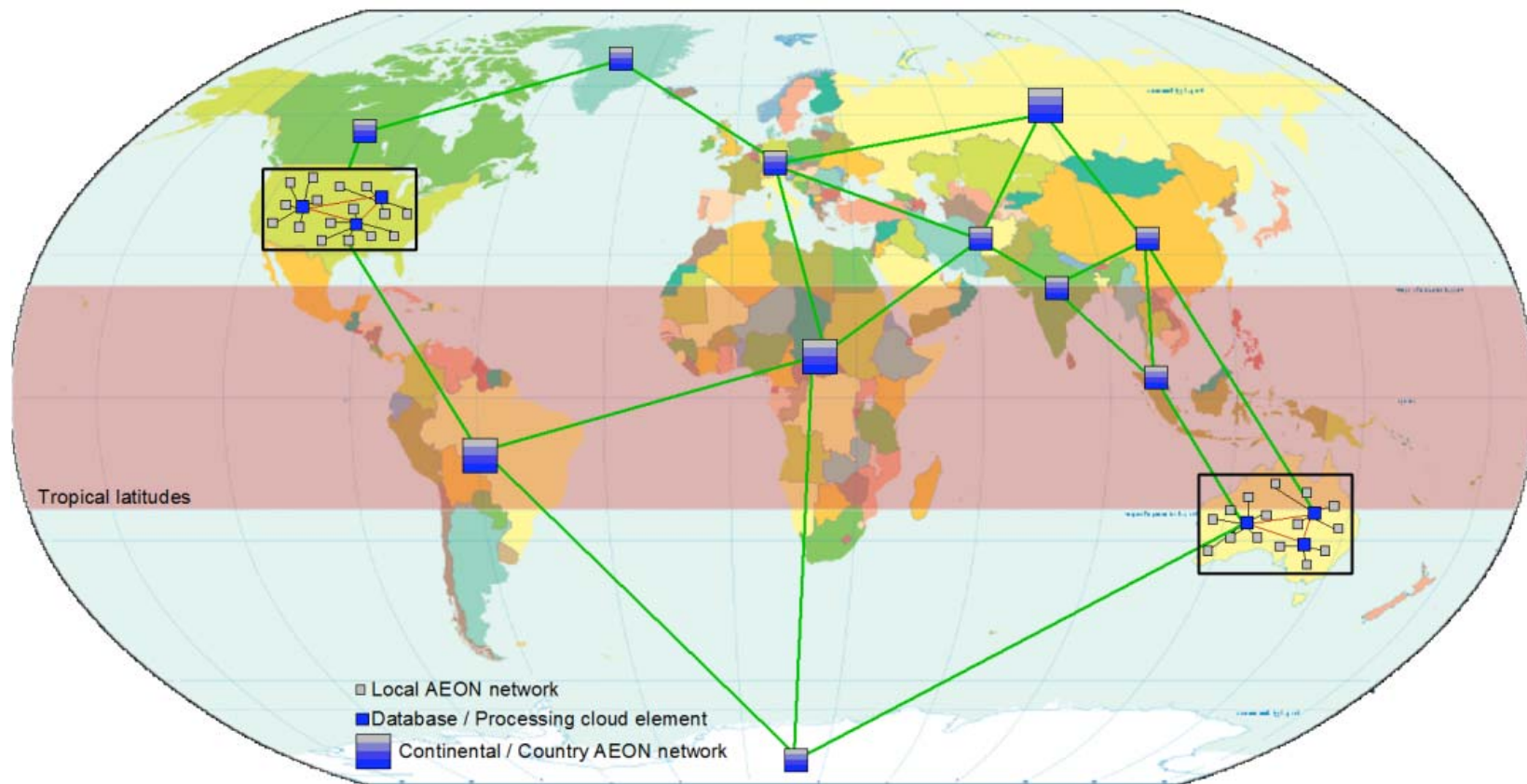
## Proposal: Automated Eye on Nature

- **AEON: an automated global sensor network for the collection of key bio-indicators**
- **A pervasive, global, sensor network of ruggedized, low power, low maintenance sensor nodes remotely connected to the internet, delivering raw and processed data to a distributed database network for processing by the cloud computing network with real-time statistics**





# AEON: Global Monitoring

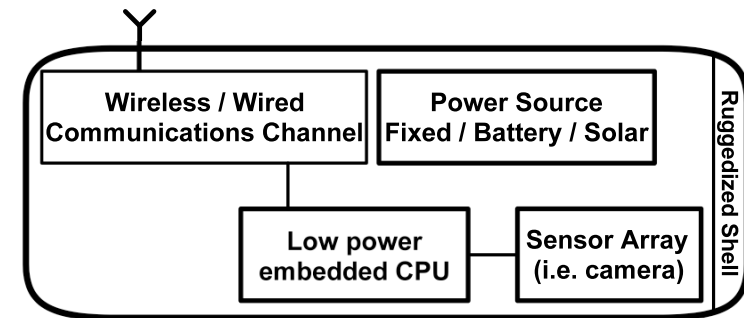






## AEON: Sensor Nodes

**The primary sensor array will be tailored to suit the bio-indicator being measured and environmental condition under which it is being measured, but typically the array will include at least one vision sensor.**

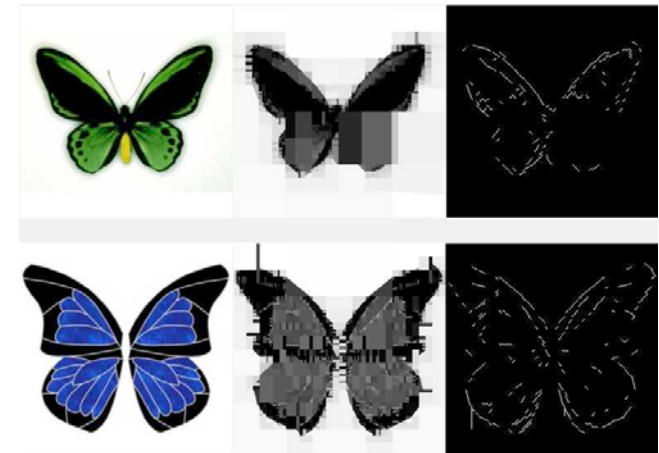


**A node will implement specific sensor filtering, processing and machine learning techniques for the specific environmental conditions and the specific bio-indicator being monitored. It may be possible for one sensor node to monitor more than one indicator.**



## Current Work

- We are currently developing a sensor node for the automatic monitoring of moths in urban and tropical forest environments.
- Our sensor node features an image sensor which integrates with a modified light trap.
- We expect a preliminary set of results later this year. Moreover, this network could be multitasked for other conservation purposes, monitoring endangered species for example, such as tigers





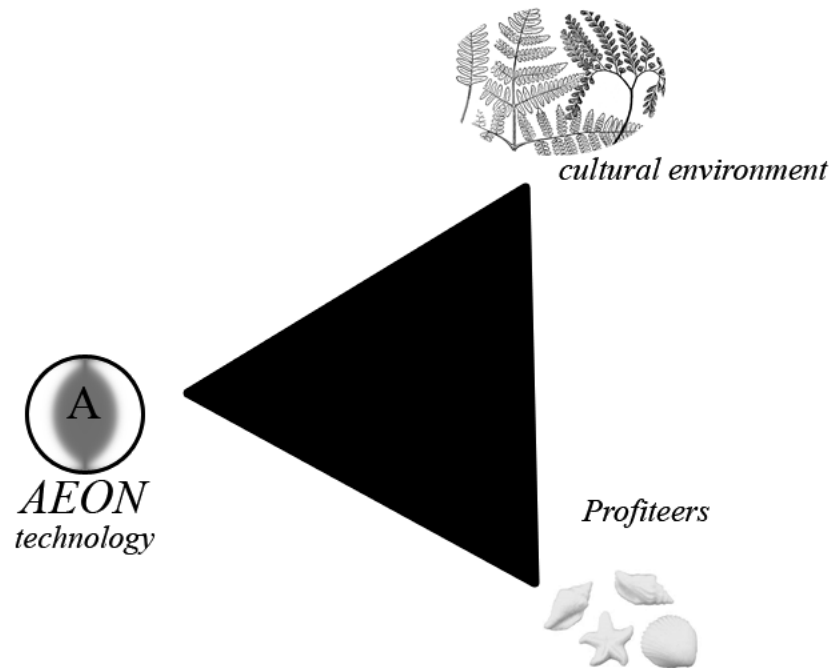
# Fictional Prototype: Were-tigers of Belum





## Were-tigers of Belum

- **Story explores on the confluence of Technology, Culture and Exploitation**
- **Use technology to monitor biodiversity and illegal wildlife trafficking.**





## Background: Belum-Temengor Forest

- **Largest continuous forest complex in Peninsular Malaysia**
- **Perak-Thai border**
- **Royal Belum Park: 100+K Hectares**



## Background: Tigers

- **Largest Cat: Panthera Tigris**
- **Powerful symbol among different cultures**
- **Hunted as status symbols, etc.**
- **Critically endangered**



## Background: Tigers of Malaysia

- **Locally known as *harimau*, *Pak Belang* or *Datuk Harimau*, they number at least 490 - mainly in Kelantan, Terengganu, Perak, and Pahang.**
- **The Malayan tiger is found in peat swamps although they prefer lowland dipterocarp forests.**
- **The tigers' stripes are like finger prints; no two tigers have the same stripe pattern**

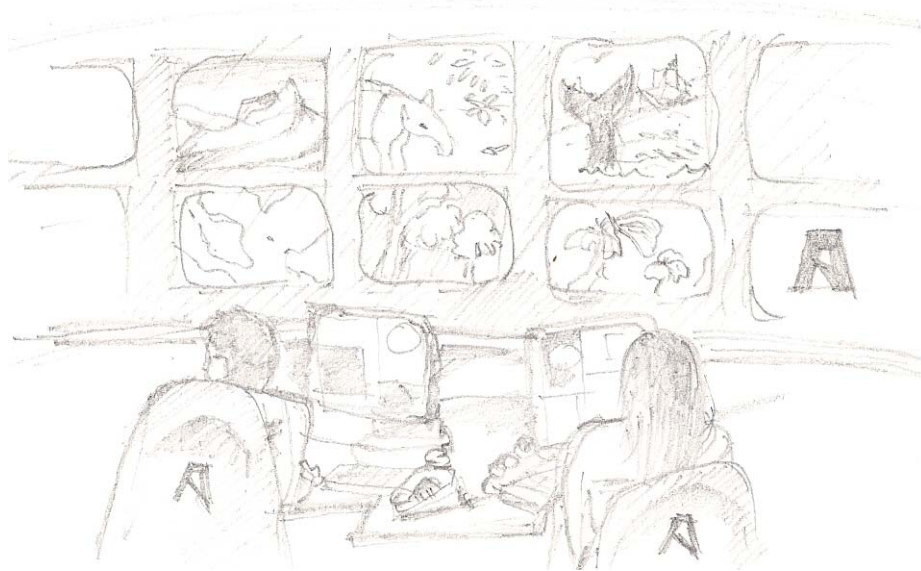
Source: WWF Malaysia website



## The Were-tigers of Belum



*AEON*  
technology

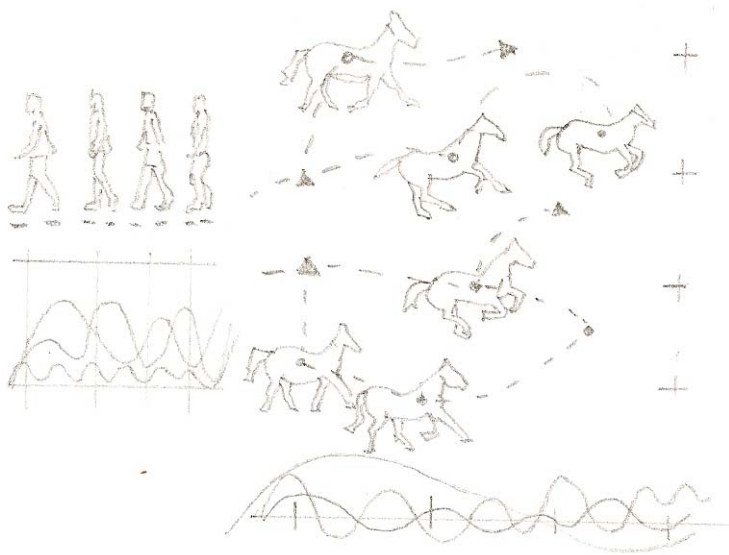


**The AEON center in  
Kuala Lumpur discovers  
unusual source of signal**





## The Were-tigers of Belum



**Unusual gait signals with tiger stripe patterns were detected by Artificial Intelligence sensors.**





## The Were-tigers of Belum

- **Traditional stories tell of were-tigers with a reverse heel gait, maybe this is what the sensors detected?**
- **How/why did they appear?**





## The Were-tigers of Belum

- Did the indigenous people summon the were-tigers for protection?
- Driven by technological development and economic pressures what about the indigenous peoples' response?





## The Were-tigers of Belum

- **Wildlife trade:**  
**Southeast Asia is a top exporter – big money.**
- **Trapped tiger = >150K MYR**
- **What about those who seek to subvert the technology to their own profit, e.g the wildlife traffickers?**



*See: An exposé of the world's most notorious wildlife dealer [in Malaysia], his special government friend, and his ambitious new plan*

<http://ngm.nationalgeographic.com/2010/01/asian-wildlife/christy-text>



## The Were-tigers of Belum

- **Are these were-tigers real?**
- **Are these manifestations a result of our intrusion into the deep forest? (spiritual)**
- **Did these intrusions trigger cultural memories? (psychological)**
- **Or are they a hoax perpetuated by those that seek to mislead, so that they can continue their exploitation? (economical)**



## Broad Issues

- **The proposed use of automated monitoring (AEON) technology on Nature**
- **Adoption of technology as panacea without studying the environmental, cultural and psychological responses**
- **Intrusion of technology and its impact to culture, environment and psychology.**



## Conclusion

- **What if we had AEON today? Would it be useful? How would it be useful? What could it show us? What might the real-time data models reveal? What new theories might emerge?**
- **While we put these questions to the ecologists, and we hope to get some interesting views, in the mean time, our aim is to build a local AEON prototype**



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**Thank You.**