The Greening of Services

CYNET Presentation - Under the scope of GN3Plus Project / NA3-T3 Activity

Special Scientists: Nikoletta Tsioroli, Petros Ioannou
CYNET 2015

Agenda

- ❖ Introduction
- ❖ NA3-T3 Tasks - Quick Overview
- ❖ Environmental Sustainability Policy
- ❖ eCO2Meter Tool and GHG Audits
- ❖ Methods, Techniques and IT Equipment that can help to reduce power consumption
- ❖ CYNET outcome through NA3-T3
- ❖ Closing talk - Discussion - Questions

Introduction

- ❖ **GN3Plus Project** is a 2 year project, started in April 2013.
- ❖ **The NA3-T3 activity (The Greening of Services)** address to the Green aspects of networking, promoting environmental sustainability at NRENs.
- ❖ **Objectives:**
  - ➢ Challenge NRENs to evaluate their energy usage and the sources from which they obtain their energy supplies.
  - ➢ Perform Greenhouse Gas (GHG) Audits and expansion of the number of NRENs carrying out such audits.
  - ➢ Promote good practices of equipment usage and reduction of waste in support offices, data centres and network-deployment locations.
  - ➢ Actively demonstrate the advantages of IT technology, to allow users to help reduce their environmental impact.
  - ➢ Engage staff to assess the environmental impact of technology selection and solution deployment, reflected in their approach to procurement.
  - ➢ Encourage NRENs to generate their own environmental policy, and to live by such policies, where practical.
  - ➢ Seek out and collaborate with commercial and international groups working on "Green Networking" initiatives and projects.

CYNET NA3-T3 Tasks

- ❖ Creation of "CYNET Environmental Sustainability Policy"
- ❖ Evaluate Greenhouse Gas Audits Reports
- ❖ Evaluate CYNET energy consumption
- ❖ Market survey of power efficient equipment
- ❖ Demonstrate the importance of VCs and Working from Home
- ❖ Dissemination into the community
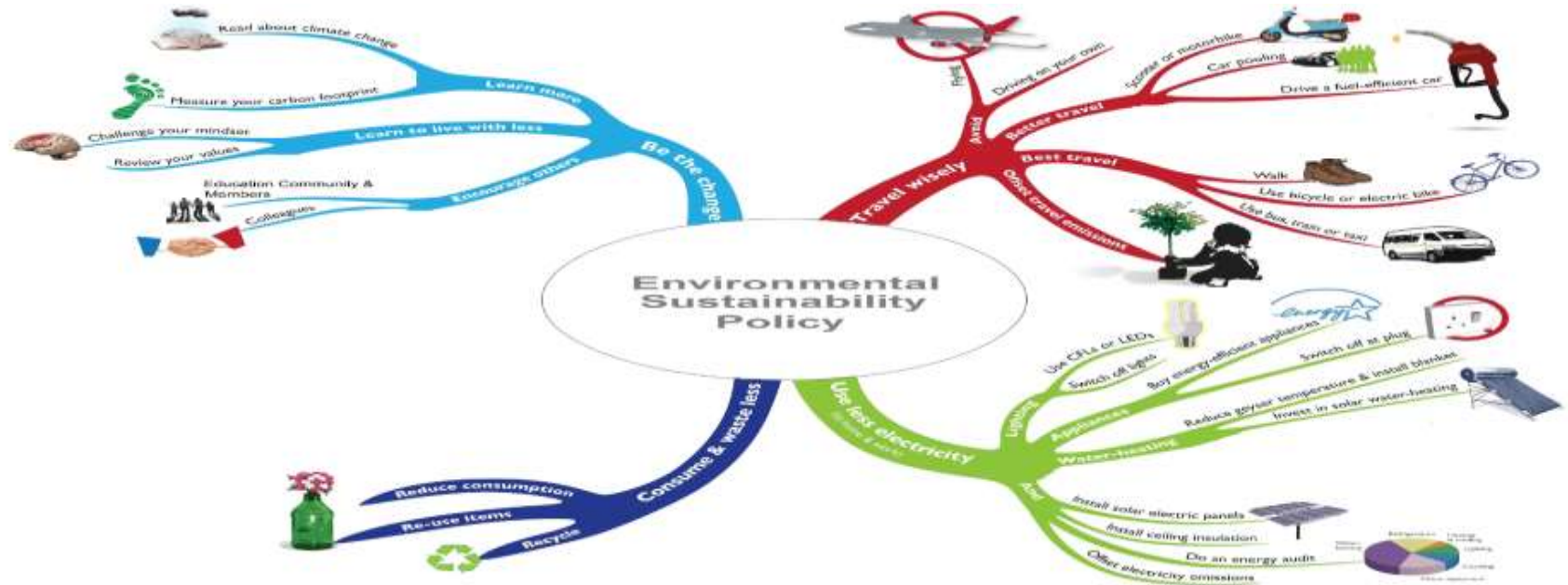
Environmental Sustainability Policy

CYNET's Ambition :

{ For CYNET, its environmental sustainability policy, is a key tool to demonstrate its environmental priorities to both the higher education community as well as the general and international society. CYNET believes having an environmental policy is an important step towards a truly sustainable organization }

Logical diagram of Environmental Sustainability Policy

<u>Environmental Sustainability Policy</u>

CYNET is continuously enrich and update the range of its services with newly developed and advanced services and equipment using high speeds of networking.

Utilizing both its existing infrastructure as well as its ideal position in the research and academic community, the provision of these services can be strengthened even more through new network services and technologies, methods and scientific advancements, that will enhance the environmental sustainability.

CYNET recognizes that the world's energy resources are limited and that its equipment is having an impact on the environment and can be improved. Therefore, appreciates its responsibility for the harmful effects on the environment and is committed to become more energy efficient and reduce its Greenhouse Gas impact on the environment and set targets for continuous improvement.

❖ **<u>Implement</u>** an effective and preventive environmental protection plan through constant updating, dissemination and sharing of information among CYNET employees and members on environmental matters and apply a training program for them to raise awareness of environmental issues.

❖ **<u>Support</u>** the implementation of specific actions by CYNET employees and its members to enhance environmental awareness. (such as the need to perform Greenhouse gas Audits, analyze the results and identify the areas for improvement as well as Minimize the amount of waste by recycling everything possible and by reusing equipment when possible).

❖ **<u>Reduce</u>** the consumption of energy and increase energy conservation and energy efficiency.

❖ **<u>Promote</u>** the use of appropriate ICT services as an environmentally positive alternative and participate in research activities to explore new innovations in Green ICT.

connect • communicate • collaborate

eCO2Meter & Greenhouse Gas Audits

❖ GHG Emissions Online Reporting Tool
  ➢ eCO2Meter Tool:
    ○ http://eco2meter.grnet.gr/

➔ "Initially created to support only NRENs"
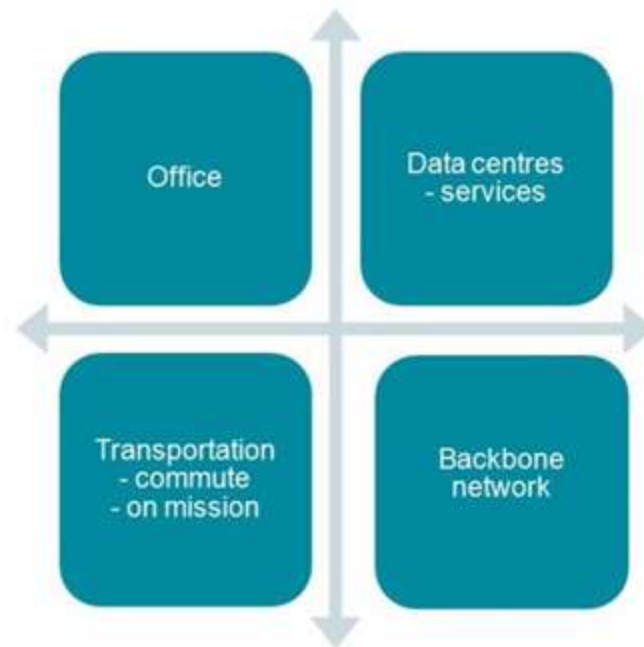
CYNET GHG Audits

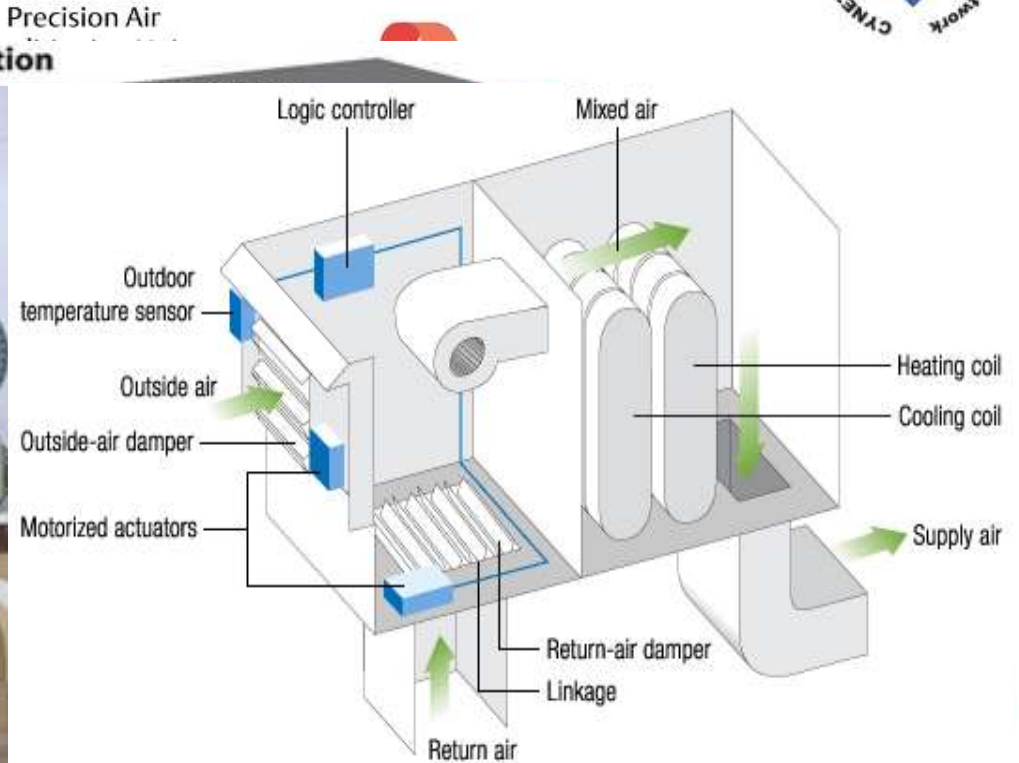| Item	Energy Consumption		CO2 Factor		Total (Tons CO2-eq)	
	2013	2014	2013	2014	2013	2014
Scope 1 - Direct Emissions						
Office					0	0
Scope 2 - Indirect Emissions						
1. Offices					15,47	21,87
1.1 Office 1 "Office 1"					3,76	4,33
Office 1 - Electricity	4,742.00 KWh	5,366.40 KWh	0.718 Kgr CO2-eq per KWh	0.7326 Kgr CO2-eq per KWh	3,4	3,93
Office 1 - Services Electricity	490.00 KWh	542.88 KWh	0.718 Kgr CO2-eq per KWh	0.7326 Kgr CO2-eq per KWh	0,35	0,40
1.2 Office 2 "Office 2"					3,98	4,33
Office 2 - Electricity	5,054.00 KWh	5,366.40 KWh	0.718 Kgr CO2-eq per KWh	0.7326 Kgr CO2-eq per KWh	3,63	3,93
Office 2 - Services Electricity	490.00 KWh	542.88 KWh	0.718 Kgr CO2-eq per KWh	0.7326 Kgr CO2-eq per KWh	0,35	0,40
1.3 Office 3 "Office 3"					3,98	4,56
Office 3 - Electricity	5,054.00 KWh	5,678.40 KWh	0.718 Kgr CO2-eq per KWh	0.7326 Kgr CO2-eq per KWh	3,63	4,16
Office 3 - Services Electricity	490.00 KWh	542.88 KWh	0.718 Kgr CO2-eq per KWh	0.7326 Kgr CO2-eq per KWh	0,35	0,40
1.4 Office 4 "Office 4"					3,76	4,33
Office 4 - Electricity	4,742.00 KWh	5,366.40 KWh	0.718 Kgr CO2-eq per KWh	0.7326 Kgr CO2-eq per KWh	3,4	3,93
Office 4 - Services Electricity	490.00 KWh	542.88 KWh	0.718 Kgr CO2-eq per KWh	0.7326 Kgr CO2-eq per KWh	0,35	0,40
1.5 Office 5 "Office 5"						4,33
Office 5 - Electricity		5,366.40 KWh		0.7326 Kgr CO2-eq per KWh		3,93
Office 5 - Services Electricity		542.88 KWh		0.7326 Kgr CO2-eq per KWh		0,40
2. Backbone					47,81	48,79
3. Data Centers					254,11	234,92
Data Center 1	353,911.00 KWh	320,666.80 KWh	0.718 Kgr CO2-eq per KWh	0.7326 Kgr CO2-eq per KWh	254,11	234,92
Scope 3 - Other Indirect Emissions						
Transport					3,06	3,36
Commuting					1,65	0,88
Car	7,757,200.00 Km	4,143,592.00 Km			1,65	0,88
On Mission					1,11	2,48
Total CO2-eq					**320,46**	**308,95**

Methods, Techniques and IT Equipment

❖ This section focus on the investigation of recent developments of power efficient equipment in the market and the examination of methods that could lead in that way:

  ➢ **Datacenter reengineering**
  ➢ **Datacenter reorganization**
  ➢ **Efficient cooling and heating**
  ➢ **Virtualization**
  ➢ **Equipment upgrades**
  ➢ **Power over Ethernet (PoE) technology**
  ➢ **Energy Star Certified Products**

Hot Aisle/ Cold Aisle Approach

Plenum-to-Plenum Cooling Configuration

Precision Air

Logic controller

Mixed air

Outdoor temperature sensor

Outside air

Outside-air damper

Motorized actuators

Heating coil

Cooling coil

Supply air

Return-air damper

Linkage

Return air

[Perforated Tiles]

Energy Efficiency Techniques

⑤ Implementing virtualization technologies.
⑥ Consider moving to the cloud, which is the ultimate in virtualization and consolidation.
⑦ Organize and improve stored data.
⑧ Use Smart Power Distribution Units (PDUs).
⑨ Invest in technologies that use energy more efficiently - Energy Star Certified Products.
⑩ Switch your computer to sleep mode or just turn it off.
  o Emailing information instead of printing.
  o Print on both sides of the paper.

Energy Efficient IT Equipment

- ❖ **Routers**
  - ➤ **Consolidation** of capabilities of multiple single-function devices into one device. This approach offers direct benefits, such as reduced rack space, power, and cooling requirements.
  - ➤ Significant **reduction in power consumption**.
  - ➤ Require **less cooling**.
- ❖ **Switches**
  - ➤ **Power over Ethernet (PoE):** This capability simplifies the deployment of IP telephony, wireless, video surveillance, and other solutions by allowing you to send data and power to network endpoints over the same network cable.
  - ➤ **Energy-Efficient Ethernet (EEE, the IEEE 802.3az standard):** EEE improves the efficiency of network equipment and provides standardized signaling mechanisms that can enable rapid transitions between normal operation and low power idle (LPI) states in systems on either end of the physical layer link.

Energy Efficient IT Equipment

❖ **Switches**
  ➢ **Automatic power down** on Gigabit Ethernet ports when a link is not active.
  ➢ **Embedded intelligence** to adjust power based on cable length.
  ➢ **Fanless design**, which reduces power consumption, increases reliability, and provides quieter operation.
  ➢ **Variable-speed fans** that adjust their speed based on existing conditions, reducing power consumption.
  ➢ **Network Virtualization:** Capability of multiple switches to be interconnected and operate as a single system. With Virtual Chassis technology, users get the reliability, availability and high-port densities of traditional chassis-based systems in a cost-effective, compact form factor.
❖ **Power over Ethernet (PoE)**
  ➢ VoIP Phones
  ➢ IP Cameras
  ➢ Access Points
  ➢ IP Access Readers
❖ **Servers - PCs - Laptops - Monitors – Printers**
  ➢ Energy Star Products:
    [https://www.energystar.gov/products/certified-products]

connect • communicate • collaborate

Energy Efficient IT Equipment

❖ **Smart Power Distribution Units (PDUs)**
- ➢ **Real-time monitoring** and alerting to enable quick resolution of problem.
- ➢ **Identify high power consumption** equipment by using logs and port monitoring.
- ➢ Use logs to **identify erratic power consumption**.
- ➢ Use environmental monitoring to **identify overcooling situations** where temperatures could be increased for energy cost reduction.
- ➢ **Find opportunities for consolidation** of underutilized equipment such as near-idle servers.
- ➢ Use individual **outlet control to remotely restart equipment or shut down** specific units.
- ➢ Use real-time remote monitoring to understand usage versus capacity and **make informed decisions on equipment additions and data center changes**.
- ➢ **Evaluate actual usage versus design assumptions** using equipment nameplate ratings to understand true power needs which may help increase densities.
- ➢ Use environmental monitoring to **evaluate planned versus actual temperatures** to identify insufficient cooling areas.

Network Energy Efficiency

Why???
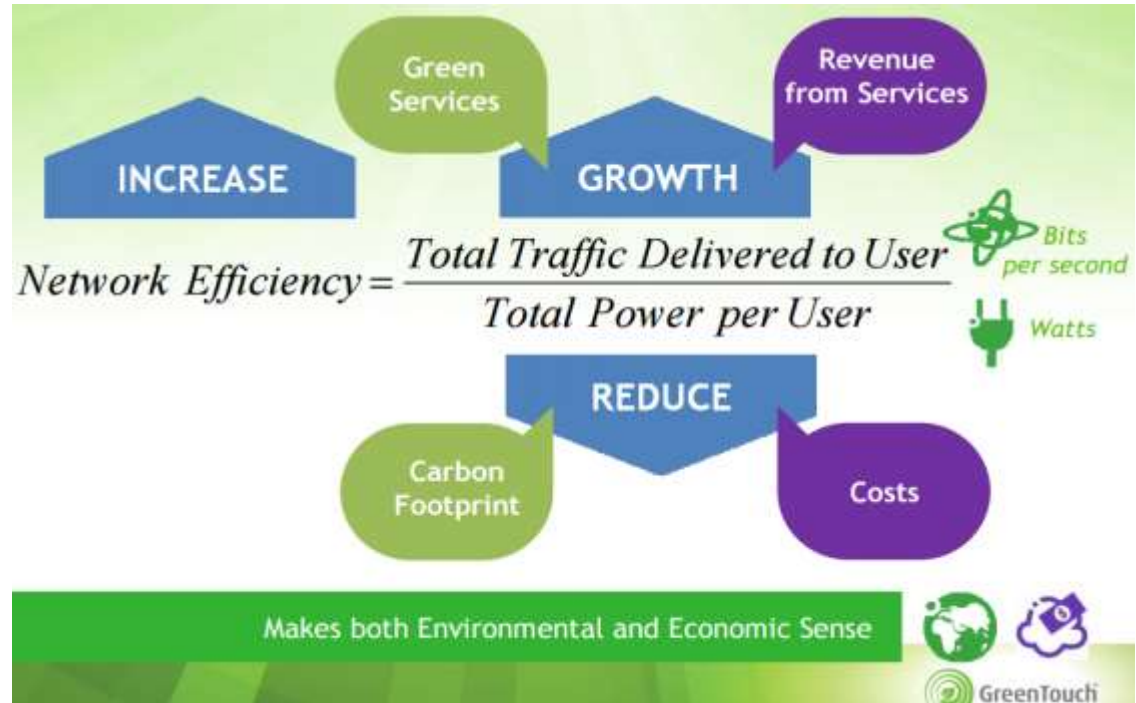
CYNET outcome through NA3-T3

- ❖ Purchase of Smart PDUs
- ❖ Adopted the ability to create GHG reports
- ❖ Evaluate yearly energy usage
- ❖ Adopted "Green Thinking" as a part of the organization culture
- ❖ Upgrade backbone equipment considering the "Greening of Services" activity

<u>Upgrade Backbone Equipment</u>

❖ CYNET is in process to expand its network, starting with new more powerful and efficient Core Routers.

❖ In coordination with the Network Support Team we have made a market research, in order to identify the most appropriate equipment for us. This equipment, except the predefined basic specifications must be more friendly (from the existing) to the environment.

❖ To do that, we have identified and evaluated several routers satisfying our basic requirements, with more emphasis given to the Green Features and the Maximum Power Consumption of each product.

Upgrade Backbone Equipment

Description	Power Consumption (Electric Power - Watt/hr)	Energy (kWh/day)	Energy (kWh/month)	Energy (kWh/year)	Yearly Cost (€0,1596/kWh)
Existing Router	3000W	72,0	2160,0	26280,0	€4194,28
Router 1	600W	14,4	432,0	5256,0	€838,85
Router 2	550W	13,2	396,0	4818,0	€768,95
Router 3	920W	22,08	662,4	8059,2	€1286,24
Router 4	521W	12,504	375,12	4563,96	€728,40
Router 5	851W	20,424	612,72	7454,76	€1189,77
Consumption					

Make it Happen

Following the aforementioned steps and purchasing Energy Efficient products will lead in the reduction of our impact in the environment.
If we start thinking green now, we can transform our Data Centers to "Green Infrastructures" in few years.

connect • communicate • collaborate