Green Usage Monitoring Information Base

http://www.ietf.org/id/draft-suganuma-greenmib-02.txt

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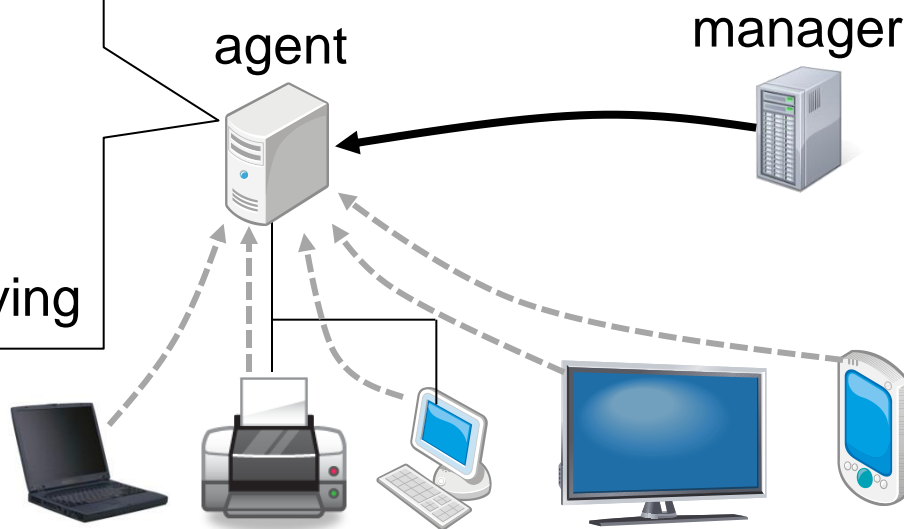[1] Tohoku University
[2] Tohoku Institute of Technology
[3] Cyber Solutions

- Feature

Only 6 MOs

  – Simple & easy to use / Generic MIB

- Desktop : power on
- Printer : power off
- Laptop : sleep
- TV : power off
- Mobile : power saving

agent

manager

- Aim

 – Experimental MIB

    - Used widely for various experiments

    - Lessons learned from usage

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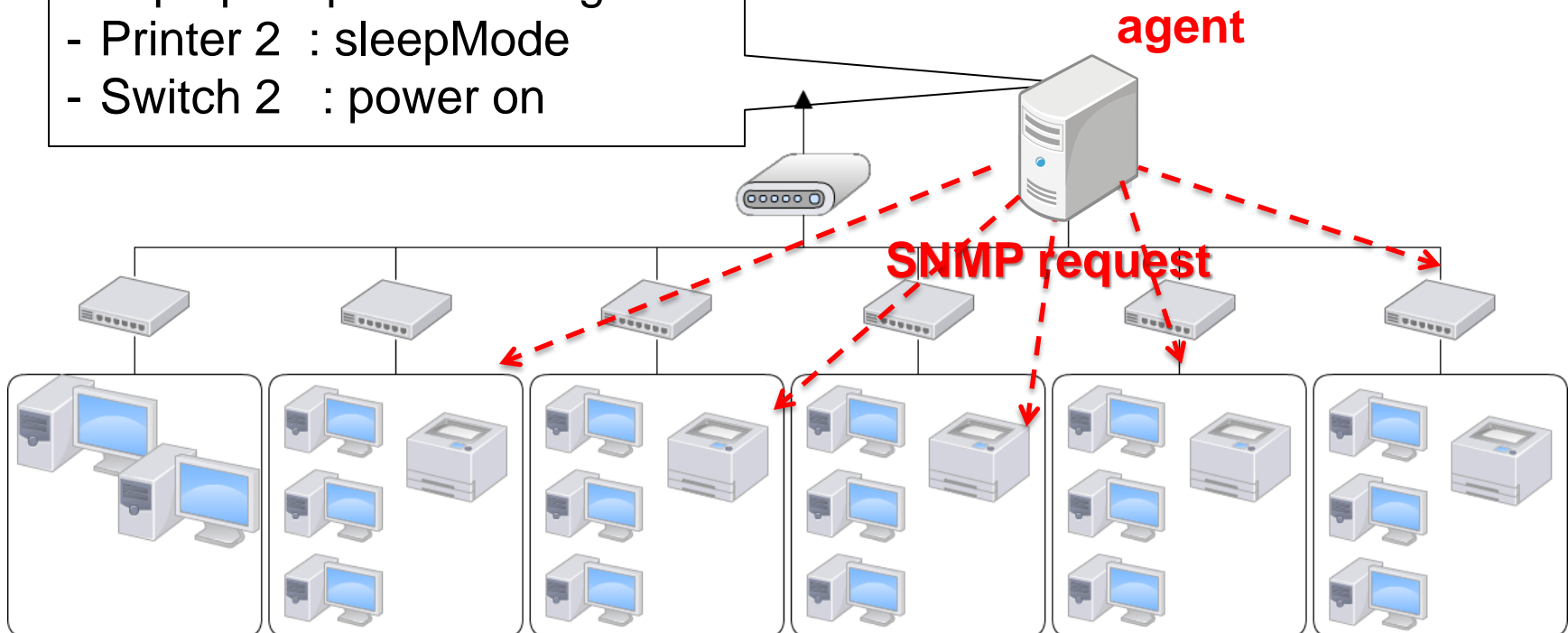# Previous Experiment (Reported in IETF 86 Meeting)

- a packet probe as an agent
  - A part of parameters of MIB
    - GumDeviceStatus : powerOn, powerOff
    - GumStatusDetectionMethod : arpSensing, icmpEchoProbing

- Wasted usage of devices could be detected

- Laptop 1 : power off
- Printer 2 : power on
- Switch 2   : power on

packet probe (**agent**)
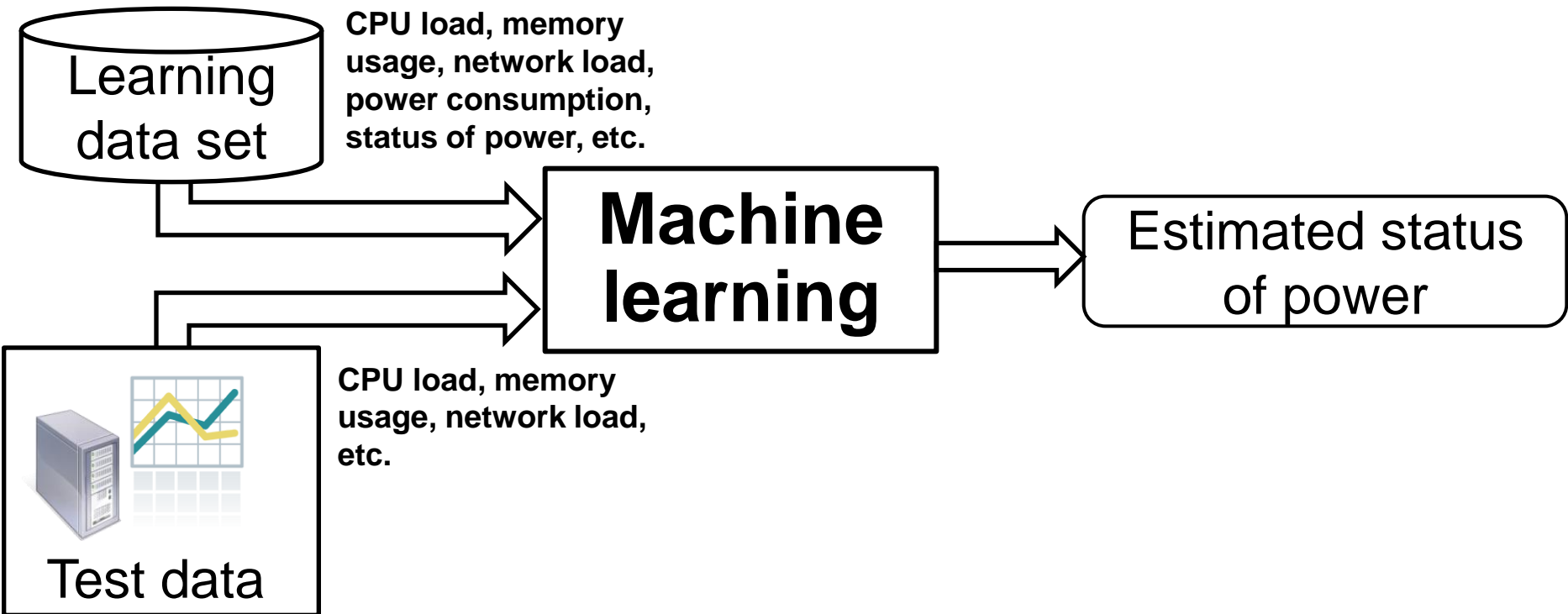
ARP packets

Ping
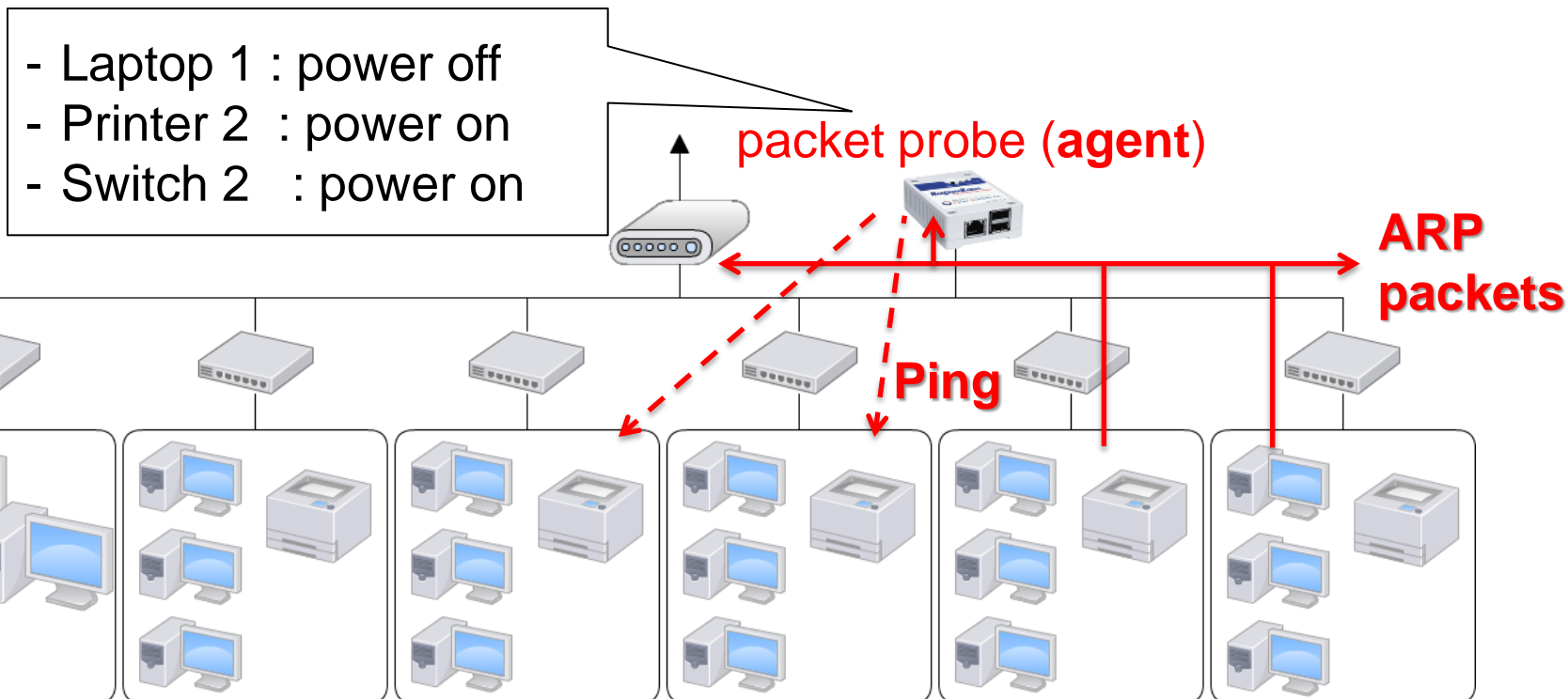
Next Experiment

- Estimate more detailed status of power by using machine learning
  - Extend parameters of MIB
    - GumDeviceStatus : powerOn, powerOff, sleepMode, powerSavingMode
    - GumStatusDetectionMethod : switchMonitoring, deviceMonitoring

- Laptop 1 : powerSavingMode
- Printer 2 : sleepMode
- Switch 2   : power on

agent

SNMP request

Next Experiment

- Structure of agent

Learning data set

CPU load, memory usage, network load, power consumption, status of power, etc.

Machine learning

Estimated status of power

Test data

CPU load, memory usage, network load, etc.

Next Experiment

- Types of learning data set and test data
  - Level 1: Packet information by monitoring switch
    - GumStatusDetectionMethod : switchMonitoring
  - Level 2: Status of device (e.g., CPU load, memory usage, network load)
    - GumStatusDetectionMethod : deviceMonitoring
  - Level 3: Detailed status of device (e.g., CPU load of each running process)
    - GumStatusDetectionMethod : deviceMonitoring

Experimental Environment

Target device
- OS: Windows7
- CPU: Intel(R) Core(TM) i7-2600 CPU@3.40GHz
- Memory：8GB
- SNMP Agent: Microsoft SNMP Service

CPU load, memory usage
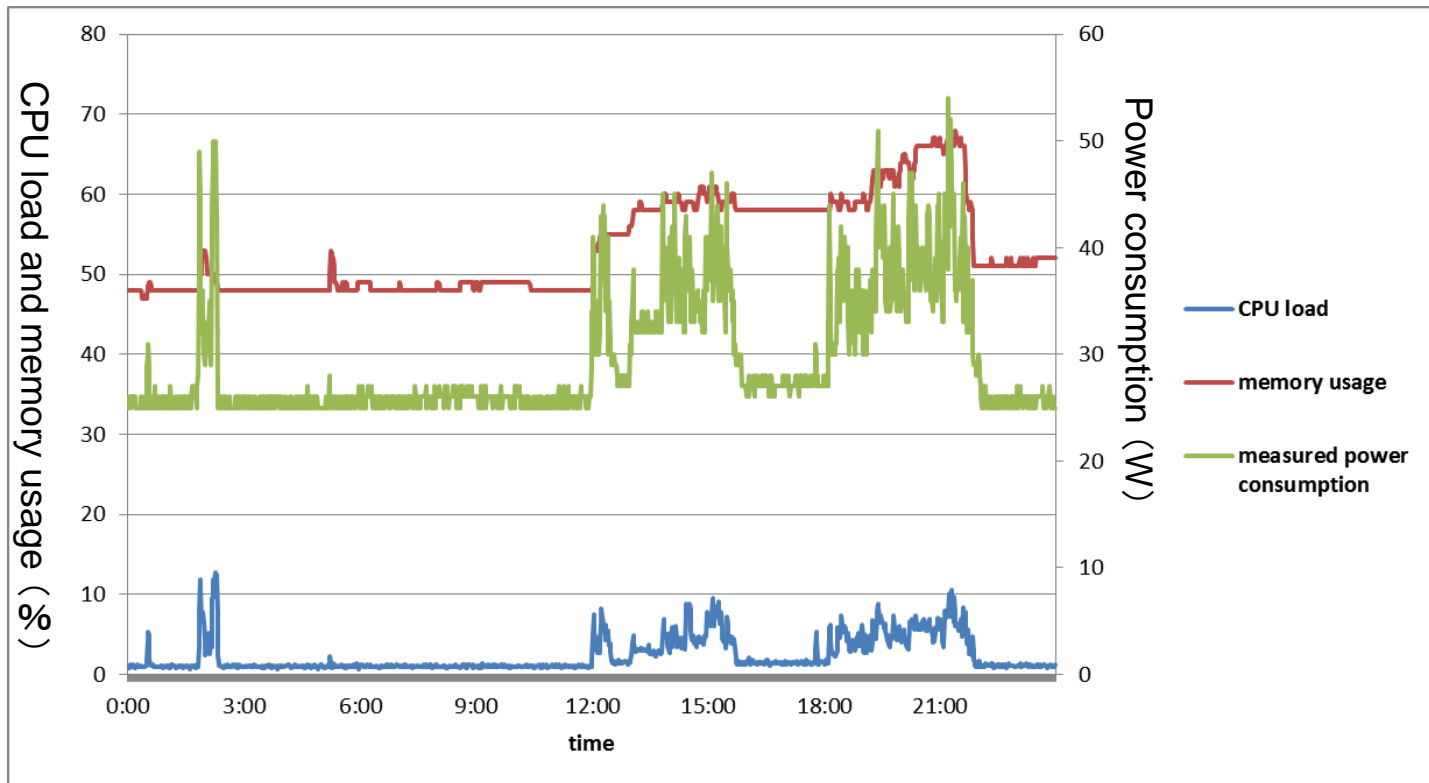
power consumption

Monitoring device
- SNMP Manager: implemented by using Java
  - collect CPU load and memory usage once a second
  - collect power consumption once a second

Power consumption monitoring device
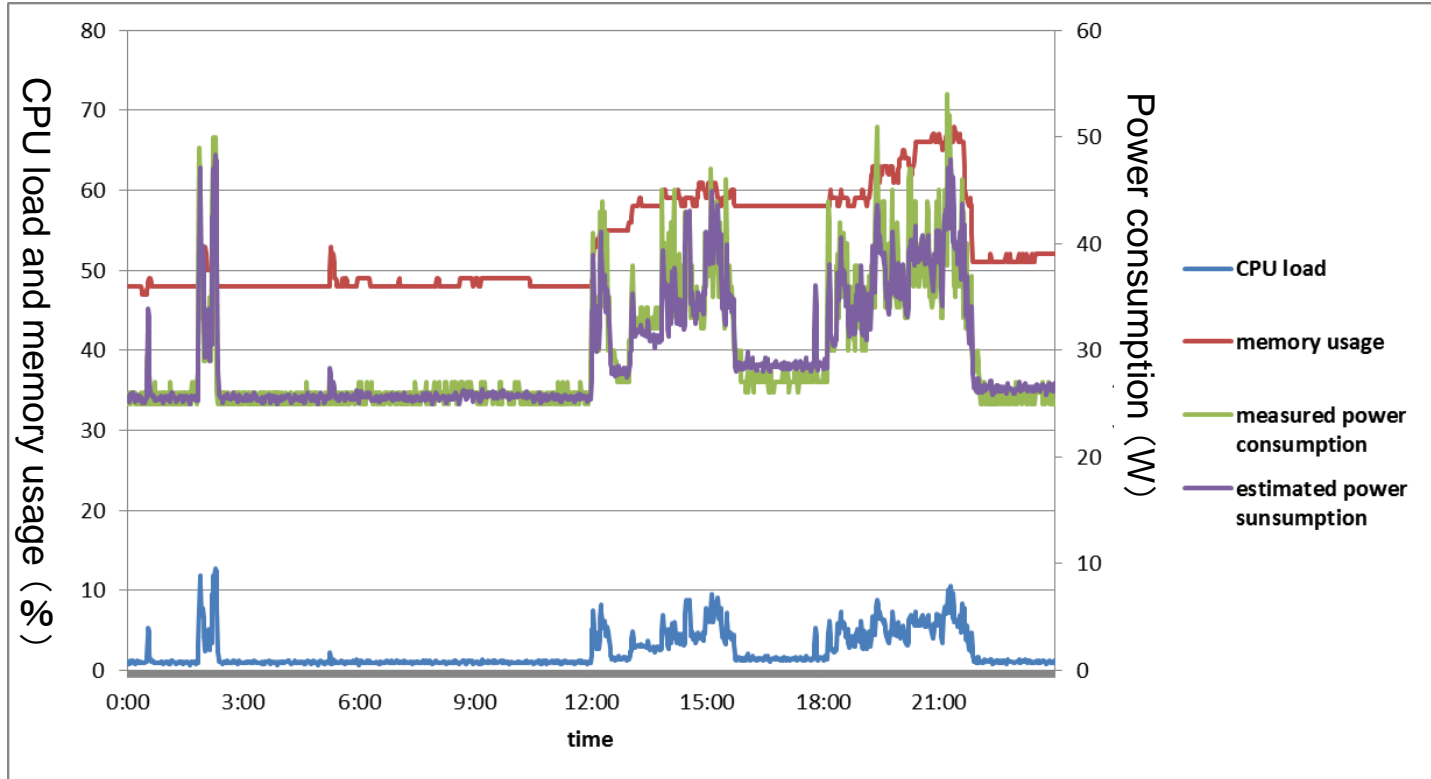- Raritan Dominion PX

Experimental Result

- Power consumption seems to have a high correlation with CPU load and memory usage. -> derive the following regression equation based on regression analysis.

Power Consumption = 1.9361 × CPU load + 0.2209 × memory usage + 12.9828

Experimental Result

- correlation coefficient : R = 0.9283 -> high correlation

We can estimate power consumption based on CPU load and memory usage.

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What did we learn from usage

- Estimation of power consumption based on status of device with accuracy

- This results is used for estimation of more detailed status of power

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- We show one of the concrete examples of deriving the power of the device which does not have the ability to measure its energy use

What did we learn from usage

- Without using power consumption monitoring device (energy meter)

-> Easy to use (low cost and no change in network environment)

Next step

- Implementation and experiment report in large-scale network

- Discussion in link into Framework and other MIBs

- Updated version according to the framework model

- Suggestions welcome