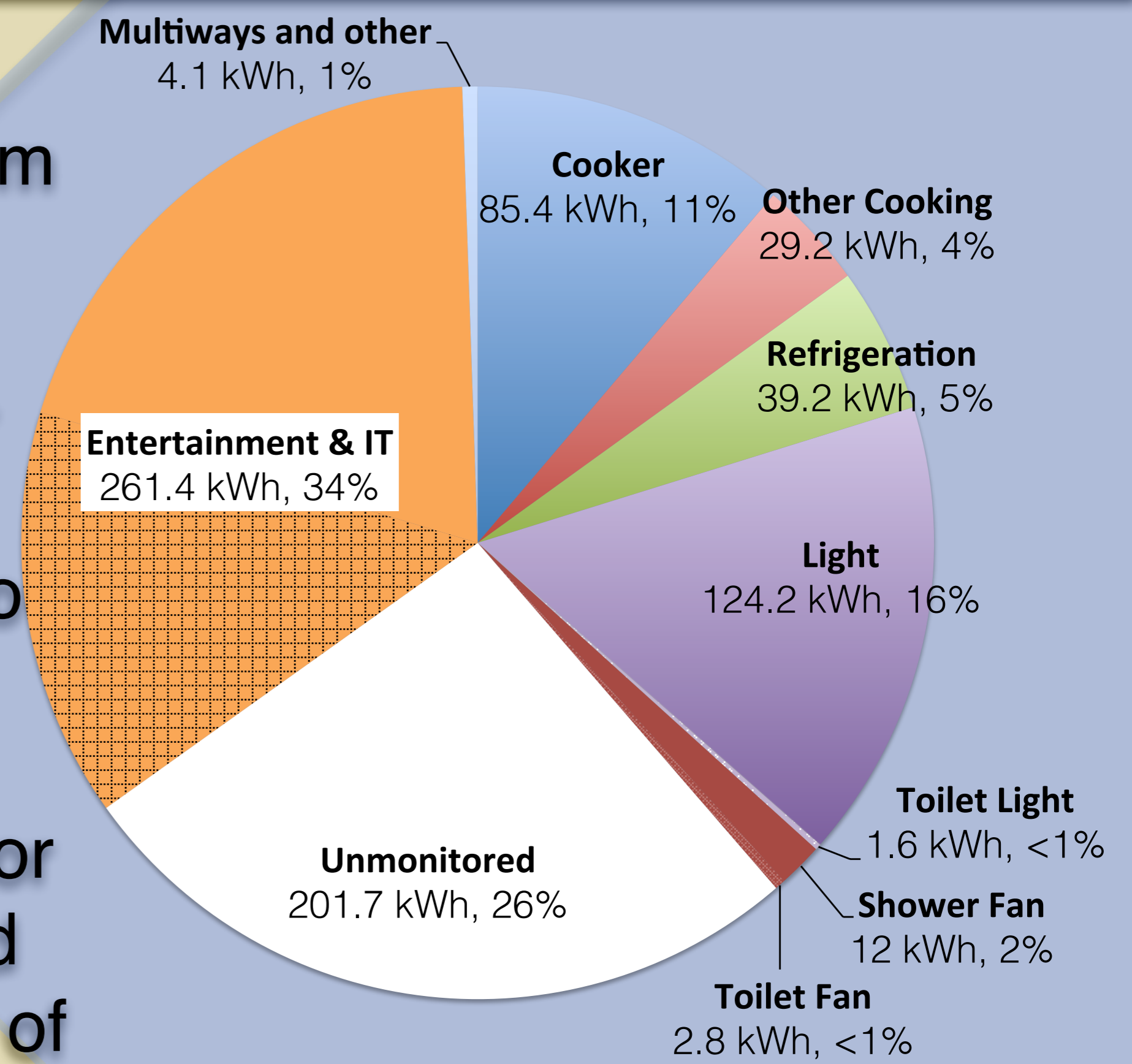# Towards activity-relevant attribution of IT energy usage

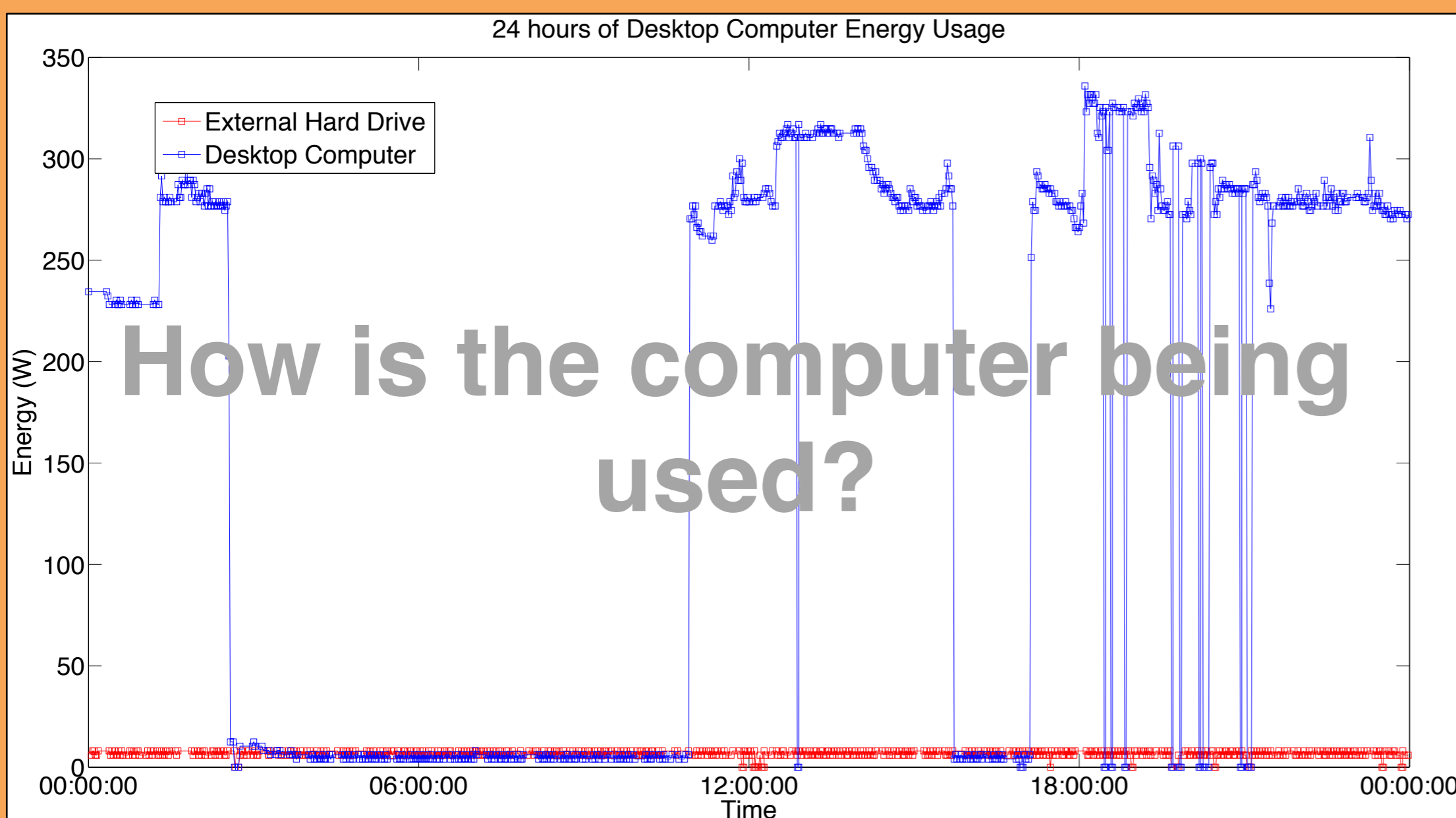Oliver Bates - Lancaster University

From a previous study we were able to disaggregate per socket energy consumption from whole domicile energy consumption. We discovered that Home Entertainment and IT devices are centric in many people's lives. Other than heating(cooling), lighting and food preparation/storage, it is the largest contributor to personal energy consumption.

Understanding how and when IT devices, alone or in conjunction with other devices, are used would give a better understanding of how this category of devices contributes to energy consumption.

In a student flat...

Pie chart:
- Multiways and other 4.1 kWh, 1%
- Cooker 85.4 kWh, 11%
- Other Cooking 29.2 kWh, 4%
- Refrigeration 39.2 kWh, 5%
- Light 124.2 kWh, 16%
- Toilet Light 1.6 kWh, <1%
- Shower Fan 12 kWh, 2%
- Toilet Fan 2.8 kWh, <1%
- Unmonitored 201.7 kWh, 26%
- Entertainment & IT 261.4 kWh, 34%

What Don't We Know?

24 hours of Desktop Computer Energy Usage

- External Hard Drive
- Desktop Computer

Energy (W) vs Time (00:00:00 to 00:00:00)

How is the computer being used?

- How can we capture activities and account for them on IT devices?
- What applications account for what portion of the energy consumption of an IT device?
- How can we tell what multipurpose applications are being used for?
- Are there any other connected devices contributing to the energy consumption?
- What are the energy implications of having a low powered device that connects, via cable or wirelessly, to other devices?
- How does a charging cycle contribute to the energy footprint?

Previous Work

Socket Sensors

Data Collection

Current Work

Monitoring Software
- Desktop
- Laptop
- Phone
- Tablet

Output:
Times-of-use
Applications and activities
Connected devices
Batteries drain
Charge Cycles

Analysis

Future Work
(Accounting for the full IT energy footprint)

Wired and Wireless Connections

Network Monitor (Local and Remote)
Detection of where traffic is heading/coming from

Extend Displays
Connected displays
Streaming TVs

External Media (Local)

External Hard Drives and Back Up Devices

Media Servers