Sustainability

Game Development Foundations

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What is Sustainability

- *Sustainability*:
  “the capacity to endure… to remain diverse and productive indefinitely”
- Making sure we use resources in a way that ensures they can continue to be used in the future
- Environmental Sustainability is about making responsible decisions that will reduce your business' negative impact on the Environment

Our Focus

- For our industry, we will focus on sustainability practices specifically relating to electrical power
  - *Do high-end PC workstations use “too much” power?*
  - *Is it possible to do the same work and use less power?*

- Addressing these questions can help us reduce the cost of running our business, freeing financial resources for use in other areas

Energy Efficiency

- Getting the most ‘useful work’ from every unit of energy consumed, or
- Producing a product using the least amount of energy possible, without compromising quality
- Most CO_2 reduction gains can be achieved through increased efficiency
  - This saves energy, and thus money

Goals

- As an outcome of this session we want to:
  - Estimate the power consumption of your workstation
  - Discuss other resources we use in the workplace
  - Discuss ways we can conserve energy use and other resources

Monitoring Power Consumption

- There are two approaches we can take, according to our situation (on-campus or online)
- Measuring consumption with a power meter
  - This device (available on campus) will measure the exact power usage of your PC
- Worst-case estimation
  - Estimate (for online students) worst-case power consumption using the information on the power labels of your devices

Monitoring Power Consumption

- Complete the Power Consumption tutorial
- Using a power meter:
  - You will end up with a figure for ‘normal’ operation, and a figure for ‘conservative’ power use
- Using estimation calculations:
  - You will end up with a worst case (maximum) figure
- These figures will be in kilowatt hours

Terminology

- Watt
  - The amount of “power” used at a specific instant in time
  - Equivalent to 1 joule per second
    - 4.184 joules of heat energy (aka 1 calorie) is required to raise the temperature of 1g of water by 1°C
  - For example, a 100 watt light bulb
    - Uses 100 watts of power when switched on
    - A watt is a *very* small amount of power

Terminology

- Kilowatt
  - 1000 watts = 1kW
  - Because a watt is a small amount of power, a kilowatt is easier to work with
- Kilowatt-Hour (kWh)
  - This is a measure of power consumption per hour
  - Your power company will see you power in kWhs

Terminology

- Kilowatt-Hour
  - For example:
    - A 40 Watt light bulb operating for 25 hours uses 1 kWh or power
    - (25 hours * 40 watts) = 1 kWh

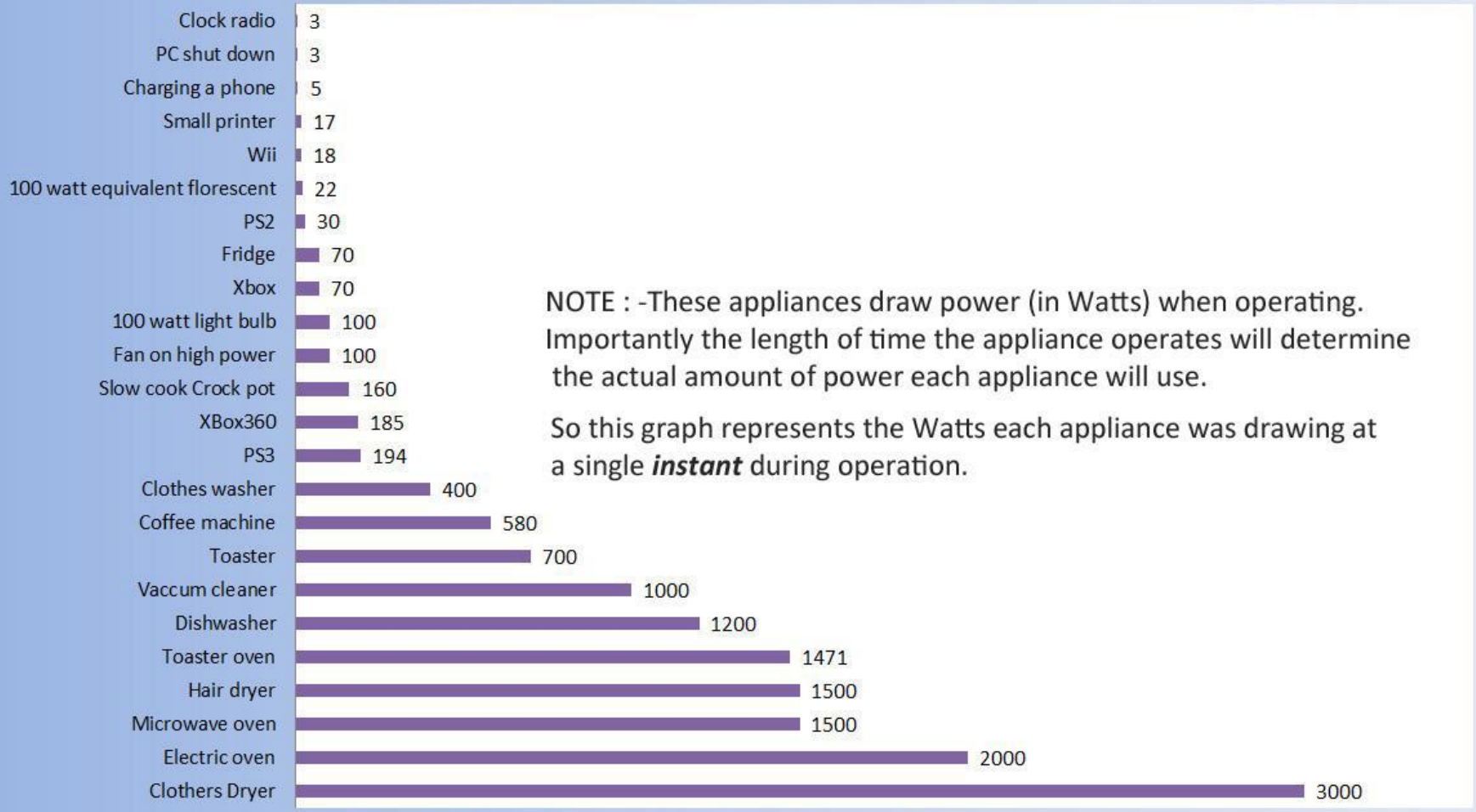
Computer power usage

- A typical desktop computer uses about 65 to 500 watts
- In the game industry, with work stations and gaming computers, we are at the higher end
- This does not include the computer screen witch adds 35-75 watts per screen

Computer sleep

- A computer in use will use ~100%
  - sleep mode will use ~10%
  - off mode will use ~5%
  - unplugged will use 0%
- Screensavers are bad as they do not reduce power usage in any way and keep the screen on.

Power usage in watts - Figures are approximate and represent peak usage



NOTE : -These appliances draw power (in Watts) when operating. Importantly the length of time the appliance operates will determine the actual amount of power each appliance will use.

So this graph represents the Watts each appliance was drawing at a single ***instant*** during operation.

Power Conservation

- So now we have a good idea of how much power our computer uses, but…
  - *Do high-end PC workstations use “too much” power?*
  - *Is it possible to do the same work and use less power?*

- Are there ways we can reduce our power consumption while maintaining productive?

Solutions

- Using Product/Service Vendors:
  - Think render farms, Amazon Web Services, Unity Cloud Build, Cloud Storage, etc.
  - No large initial investment (financial resources freed)
  - Flexibility to upgrade based on need
  - Vendor data centers will often be very optimized in terms of power consumption and emissions

Solutions

- Workstation Solutions
  - Activating power management options in the OS
    - Turning off monitors, hdd, display brightness
  - Don’t ‘overclock’
  - Upgrade less efficient power supplies
  - Shutdown when not in use
    - Turn off at the wall where practical
    - A laptop power supply may still consume up to 0.5W even when disconnected from the computer

Solutions

- Paperless
  - Being in a tech industry we have, in general embraced the paperless lifestyle and most companies prefer it.
- Working From Home
  - If possible working from home can also ebinifit the environment as it removes your need to travel to and from work.

Case Study: Google

- Google data centres use 50% less energy than the typical data canter
- Google data centres used 1.3% of the world's total in 2010.
- Visit www.google.com/green for how they do it and advancements they have made.

Case Study: EA

- EA is striving to reduce their carbon footprint by making more environmental choices with the goal of reducing the consumption of natural resources.
- There are a number of ways EA is addressing this, both globally and locally

Case Study: EA

- Transferring to Digital
  - delivering goods directly to consumers (bypassing manufacturing, packaging and distribution of physical disks)
- Streamlining Supply Chain Management
  - Eliminating physical manuals (now available in-game)
  - Making retail game display pallets double-stackable (reducing freight by 30%)
  - Shipping small packages in corrugated wrap vs boxes (freight down 15%, packaging down 22%)
  - Game disk cases use lower weight plastics (reduce plastic consumption by 20%)

Case Study: EA

- Initiatives at all Studios:
  - Using low-energy CFL and LED light bulbs
  - Timers shut off common area lights after hours
  - Using green cleaning products
  - Educating staff on sustainability

Case Study: EA

- EA Redwood Shores (Global HQ):
  - Variable frequency drive air-con units (saving 550,000 kWh per year)
  - Employee shuttle bus service
  - Battery charging for electric vehicles (available to public)
  - Recycled water, low flow toilets
  - Compost bins reduce green waste (4,280 kg/year)
  - Vegetable gardens used in cafeteria (180 kg/year)

Summary

- Sustainability focuses on reducing the consumption of resources to ensure business practices are sustainable
- In our industry, energy is one of the largest resources consumed
  - It can be a significant cost for business
- Reducing energy consumption can reduce business costs, as well as greenhouse gas emissions
- There are many other sustainable practices companies can adopt

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