

CIS 692, Fall 2007

Sustainability, lecture #13, 12/04/07

## Sustainability

- Selling natural resources at extraction cost – inventory clearance
- Public goods – air, water, soil, resources
- Pollution and waste in electronics
- Search engines consume more power than Las Vegas
- Travel replaced by videoconferencing

## WIF

- Triple convergence
  - Platform convergence – less hardware to produce/trash
  - Business processes convergence – higher efficiency
  - People convergence – lower barriers to competition – increased drive to consume
- Genetics – impact on sustainability
- Quiet crisis
  - Population aging
  - Decline in skills
  - Decline in ambition – Bill Gates vs. Britney Spears
  - “The ideal country is one with no natural resources”
  - Infrastructure gap – access to broadband
- Cost to save a life in US \$5-6M, 3<sup>rd</sup> world \$100
- Changes in local economy are needed:
  - HP solar panel and camera
  - \$100 laptop

## Look at the big picture

- Do not automate broken business processes – nor broken economies
- Resources shortage
  - increase efficiency
  - rethink how we do things
    - hydraulic car
    - co-locate server farm with heating plant

- Systems thinking
  - Imitate nature
  - Reduce scale – nanotechnology
  - SCM – driven by cheap fuel costs – role of taxes
  - Smart objects – fly by wire, drive by wire, smart homes

### Google RE<C (Renewable Energy Cheaper Than Coal)

- solar thermal power, wind power technologies, and enhanced geothermal systems
- will be carbon neutral for 2007 and beyond
- Makani Power
  - 20x more power at 10 km altitude than at sea level
  - 10x more availability of wind speed
- Geothermal energy in Alaska – convert to hydrogen for transport
- Solar energy from Google's panels: 610 MWhr since June 18, 400 kWh in the last 24 hrs

### Intelligent Transportation Systems

- adaptive traffic signals
- traffic information systems to reroute travelers
- electronic toll payments/truck screening

### Case study

- Why load server with only one application? Don't need virtualization for more applications.
- \$1500/year in power and cooling costs per server!