GreenDataFlow: Minimizing the Energy Footprint of Global Data Movement

PI: Tevfik Kosar, University at Buffalo
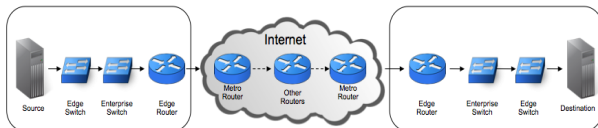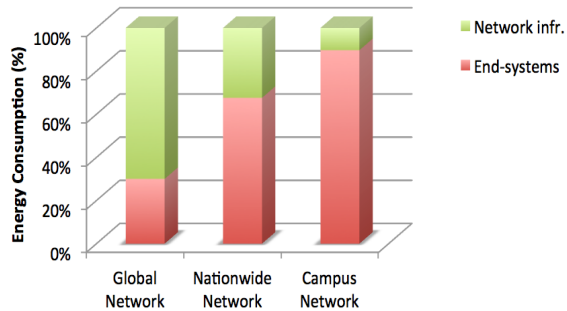
Background:

- **1+ Zettabytes** of data is moved globally in a year;
- Consumes **200 Terawatt hours** of electricity, costing **40 billion Dollars** per year.
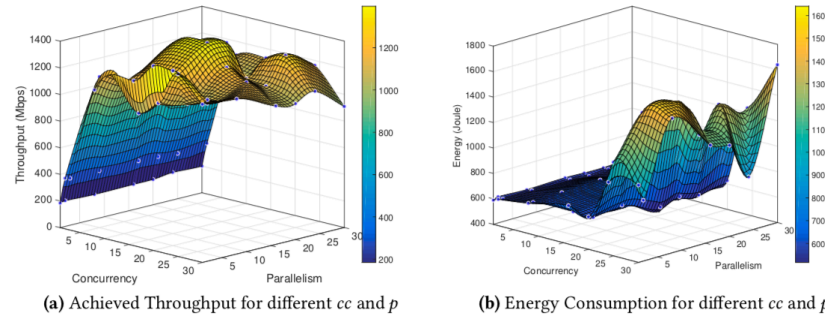
Goal:

- **Minimize energy consumption** during data movement through **application-level tuning** and optimization at the end systems.

Application Areas:

- Bulk data replication, cloud-hosted web services, mobile/IoT data transfers

Energy Consumption

(a) Achieved Throughput for different cc and p

(b) Energy Consumption for different cc and p

Offline Analysis

- Clustering
- Construct surfaces
- Model unknown load
- Find sampling regions

$$ch = ch \times \frac{bw}{avgTput}$$

SLOW START

neutral feedback   negative feedback

INCREASE   WARNING

positive or neutral feedback

positive feedback
increaseChannels()

negative feedback
increaseChannels()

negative feedback
decreaseChannels()

positive or neutral feedback

RECOVERY

Our algorithms