Additional HW5 Question [10 pts]

Instructions: Answer this separately from your regular HW5 problem-set. Your report should **not exceed 4 pages** (excluding bibliography - be sure to include all sources including online URLs). It will be graded on the basis of coherence of your narrative that shows a) understanding of the engineering problems and b) ability to identify current solution methodologies along with a commentary on their pro’s and con’s and c) potential future improvements or other remaining challenges.

**Due: 5/31**

Data centers refer to hardware infrastructure consisting of groups of networked servers for storage and distribution of large amounts of content. Enterprises (universities, corporations) can choose to operate such right-sized data centers on-premises but the long-term trend is to outsource this to a Public Cloud Service provider (e.g. AWS, Azure etc.) that provides shared storage/computing. A public cloud comprises of massive server farms housing data that are internet accessible with the provider offering various cloud-based software services (e.g. Google Drive, Windows Office Suite etc.). Operating such large cloud data centers is a considerable engineering challenge with multiple facets that extend beyond the computing/networking aspects, some of which are indicated below.

**A.** Read up on Cloud Data Centers from an engineering and business operations perspective; the numerous facets include (only a partial list) –

- Cloud Data Center as a Network: choice of architecture, network protocols to ensure desired Quality of Service/performance
- Cloud Data Center as a Large Scale Computer – how computational resources (virtual machines) are allocated to users on demand
- Pricing/Economics of Cloud Services – how economies of scale of hardware and software impact pricing
- Facility Engineering/Operations – how siting, thermal management, energy consumption contribute to operational costs
- Security & Reliability – how redundancy, distribute computing/network and other architectural choices impact data provisioning, security

**B.** Pick one of the areas in part A (or any other pertinent theme) and

- describe the relevant engineering challenges,
- current solution approaches and their pros and cons,
- Future/open problems and potential solutions.

Wherever possible, provide quantification and/or logical arguments to illustrate your case and make a point.