Advanced Computer Systems

Assignment 4

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1 Exercises

1.1 Questions 1: Fundamental Abstractions

1. The top-level abstraction makes use of location addressed memory, i.e. an N-bit memory address mapping a byte of the address space. Each machine m_i in the cluster contains n_i bytes of memory and the memory is directly mapped to address ranges in the single address space in a contigous manner. This entails that the only valid addresses of the address space are 0 through $\sum_{i=1}^{K} n_i$.

   The naming scheme consists of issuing READ/WRITE request to a central server, which looks up what intervals of the memory map to which machines. The lookup function is implemented with a table. A name identifying the machine is returned to the client, which in turn issues the request to machine holding the requested data.

   The design is scalable in the sense that adding a machine machine, m_{K+1}, to the array essentially means adding a table entry with the interval corresponding to the address space range in constant time. In this case the entry $([\sum_{i=1}^{K} n_i; \sum_{i=1}^{K+1} n_i], m_{K+1})$. This increases the range of valid addresses by n_{k+1}.

   Client-machine communication is assumed to facilitate positive acknowledgments with retransmissions for requests. In the case a request can not be properly delivered, the central server or machine holding the requested data is assumed to be in an erronous state or unavailable. If the central server is down, it will not be possible