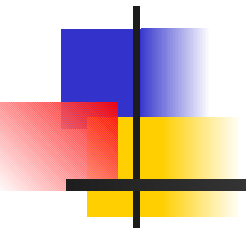
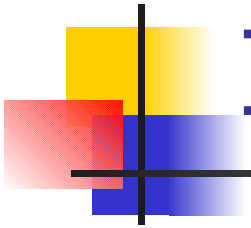


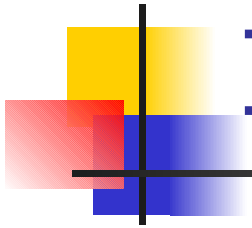
Adaptive Strategy for Secure Parallel Disk Systems

Mais Nijim



Introduction

- Parallel disk systems have been widely used in building networked and data intensive applications.
- Parallel disk systems alleviate the problem of disk I/O bottleneck.
- A number of parallel disk systems have been developed.



Introduction (cont)

- The systems lack a means to optimize quality of security for dynamically changing networked environments.
- We propose an adaptive quality of security control scheme for secure parallel disk systems (ASPAD).
- ASPAD makes it possible for parallel disk systems to adapt to changing security requirements and workload conditions.

System Model

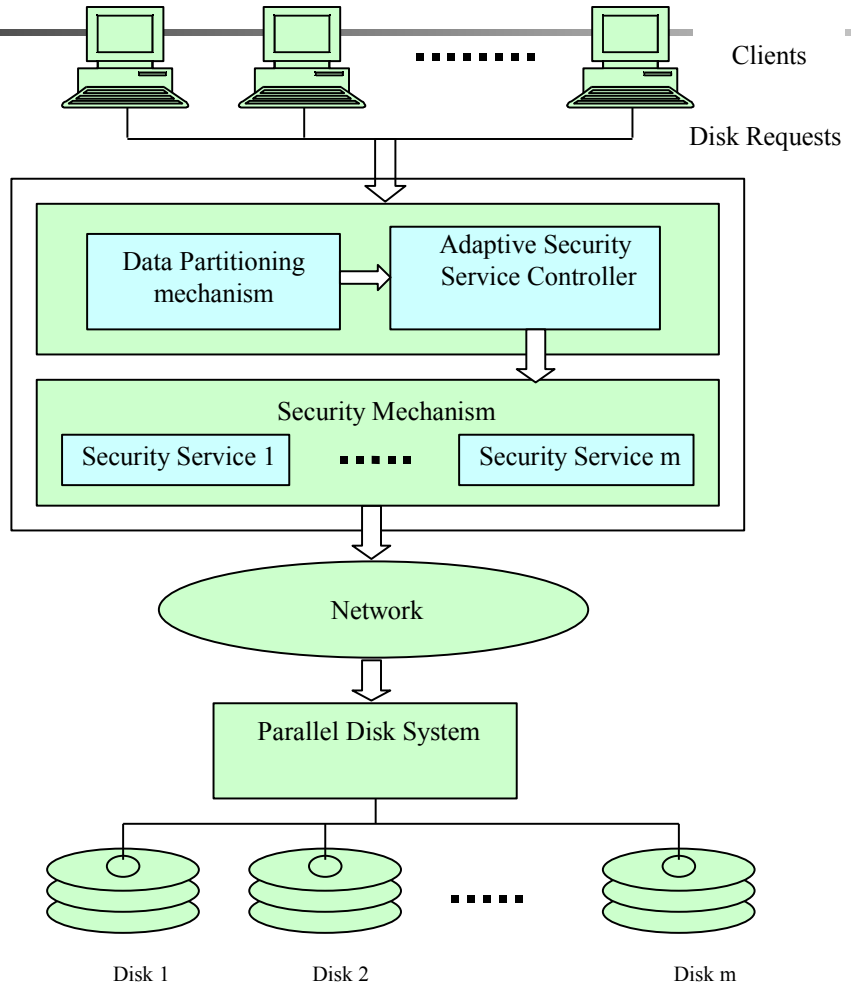
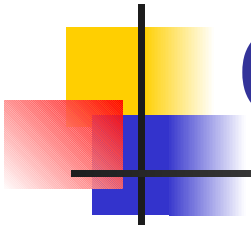


Fig1. Architecture of a security-aware networked parallel disk system.

Input: r: a newly arrived disk request
t_i: desired response time of the ith request
s_i: the ith request's lower bound on security level
Q, a waiting queue at the client side

1. Insert r into Q based on the earliest desired response time first policy
2. **for** each request r_j in the waiting queue Q **do**
   /* Phase 1: dynamic data partitioning */
3. Calculate the optimal parallelism degree p_i of r_i
4. Partition the request into p_i stripe units
5. **for** each stripe unit of r_i **do**
6. Initialize the security level σ_{ij} of the jth stripe unit to the minimal value s_i
   /* Phase 2: response time estimation */
7. Estimate the response time of the jth stripe unit
   /* Phase 3: adaptive security quality control */
8. **while** estimated response time < desired response time t_i **do**
9. **if** $\sigma_{ij} < 0.9$ **then** /* σ_{ij} can be further increased */
10. Increase security level σ_{ij} by 0.1
11. Estimate the response time of the jth stripe unit
12. **else** break /* σ_{ij} can not be further increased */
13. **end while**
14. **if** estimated response time > desired response time t_i **then**
15. Decrease security level σ_{ij} by 0.1;
16. Apply the security service with level σ_{ij} to the jth stripe unit
17. Deliver the jth unit through the network subsystem to the disk subsystem
18. **end for**

Fig. 2. The ASPAD algorithm for networked parallel disk systems.



Conclusion

- ASPAD aims at adapting to changing security requirements in parallel disk systems.
- ASPAD carried out in three phases.

3. Dynamic data partitioning.
4. Response time estimation.
5. Adaptive security quality control.