

CPSC-589

CSUF

Survey Presentation

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Presentation Topic

File System for Storage Area Networks (SAN)

- SAN = {HBAs, hubs, switches, NAS} [Kline 2003]

Problems

- Need data cross the networks
- Want high volume + high bandwidth + speed
- Like simple network configuration
- Cannot meet the demands with traditional network models
- Solutions ? SAN
- Need “good” File Systems for SAN !
- Agent-based FS may help !

Presentation Outline

- Survey Efforts (What and How)
- Project Plans (What and How)
- Project's Significant Points
- Comparison with others' work
- Project Status
- My Research Topic
- Summary

Survey Efforts

- Collected network storage models and agent-based applications on the models
- Tried to find agent-based file systems (**Failed !**)
- Used Internet papers and library resources

- Traditional network models [Kline 2003]
 - [Server-attached Storage](#)
 - [Network-attached Storage](#)

- Hybrid Network-attached Storage [[Kline 2003](#)]

Survey Efforts (cont.1)

- Ajanta Mobile-Agent System [Tripathi and Karnik 1998]
 - Agent server architecture
 - New programming paradigm for distributed processing
 - Increases network bandwidth
 - Increases asynchrony in client-server model
 - Low cost and flexible (electronic commerce, network maintenance, remote executions...)
- Ajanta Agent
 - Represents a user in the network
 - Traverses from node to node
 - Performs given tasks by its owner

Survey Efforts (cont.2)

- Ajanta Server Architecture [Tripathi and Karnik 1998]
 - Four Principles: agent, host, agent server and user
 - Agent server provides resources and services to agent
 - Host must run an agent server
 - Agent Environment (interface)
 - Domain Database
 - Agent Transfer
 - Resource
 - Resource Registry

Survey Efforts (cont.3)

- Ajanta Server Security Problems [Tripathi and Karnik 1998]
 - Agent transfer (faked agent->sensitive data disclosed)
 - Need "Credentials" (identity, owner, home-site, code base and restrictions)
 - Need Authentication Protocol
 - Agent execution (execution domain & resource access)
 - Domain problem
 - Task creates another tasks !
 - Need task groups. (domain database)
 - Resource access problem
 - Many tasks compete the resources !
 - Need Proxy-based resource access

Survey Efforts (cont.4)

- Logical Disk [Jonge et al 1993]
 - Define a middle layer to separate file management and physical disk management
- Benefits of LD
 - Easier to develop file systems
 - Flexible use of different hard drive architectures
 - Improve performance regarding to I/O bottleneck
 - Not constrain to sector (512-byte) block.
 - New hard disk technology allow multiple read/write

Survey Efforts (cont.5)

- Data and Attribute Caching [Pate 2003]
 - UNIX file system supports caching
 - “inode” stores file metadata
 - Metadata and data can be written to disk “later”
 - O_SYNC, O_DSYNC, O_RSYNC
- DMA (Direct Memory Access) improves I/O performance [Hennessey and Patterson 1998]
 - Examples

Project Plan (what)

- Find more information on mobile agent concept to employ it in caching technique for file system
- Apply agent-based objects to control load balance in network storage environment
- Improve agent transfer and agent execution security found in the paper [Tripathi and Karnik 1998]

Project Plan (how)

- Research MORE !
- Implement the agent structure similar to “agent server” [Tripathi and Karnik 1998] but with an appropriate programming language (Not Java ?)
- Caching technique would be implemented as “cache agents” to coordinate/synchronize between hosts and “Meta-data server” [Kline 2003]
- The file system supports Fibre Channel protocol !
 - Amazing performance model
 - Not expensive in the future.

Significances

- In theory, my proposal file system would:
 - Be adopted by future network storage models
 - Improve performance. (key feature)
 - Be flexible (portable and easy to include)
 - Be Incooperable (multiple Operating Systems)
 - Be simple
 - Be reasonable cost

Comparison with Others' Work

- “Meta-data server” in [Kline 2003] :
 - Not agent-based, very simple
 - Add agent-based caching function to it
- Caching method in [Pate 2003] :
 - Timestamps basis
 - Will do different way (block basis)
- “Agent Server” in [Tripathi and Karnik 1998]:
 - Too general and vulnerable to attack
 - Focus on only cache functionality
- Same LD technique as in [Jonge et al 1993] and consider extra caching benefit
- Focus more on Fibre Channel protocol

Project Status

- Almost finish survey document
- Found some more IEEE journals about agent-based application in network storage.
- Still trying to figure out how to fit the cache agent into my file system design
- Need help on choosing the “right” programming language for distributed environment.

Summary

- Today, we need massive data volume cross the networks with high speed, security, and high bandwidth.
- Traditional network storage models lack of ability to fulfill the needs
- “Hybrid Network-attached Storage” model is introduced [Kline 2003]
- As a result, “new and good” file systems for SAN are needed
- My proposal Agent-based caching file system would provide some benefits

My Research Topic

Agent-Based Caching File System for Storage Area Networks

(ABC File System for SAN)

References

- [Hennessey and Patterson 1998] Hennessey, John and Patterson, David. 1998. [Computer Organization and Design](#). Morgan Kaufmann Publishers.
- [Jonge et al 1993] Jonge, Wiebren D, Kaashoek, Frans M and Hsieh, Wilson C. 1993. [The Logical Disk: A New Approach to Improving File Systems](#), <http://www.cs.utah.edu/~wilson/papers/logical-disk.pdf>.
- [Kline 2003] Kline, Brad. 2003. [Distributed File System For Storage Area Networks](#). http://hsi.web.cern.ch/HSI/HNF-rope/SEM3_2000/DistFileSystems.pdf.

Web References

- [Pate 2003] Pate, Steve. 2003. [UNIX Filesystems: Evolution, Design, and Implementation](#). Wiley Publishing.
- [Tripathi and Karnik 1998] Tripathi, Anand and Karnik, Neeran. 1998. [Agent Server Architecture for the Ajanta Mobil Agent System](#).
<http://citeseer.nj.nec.com/cache/papers/cs/4902/http:zSzzSzwww.cs.umn.edu/zSzAjantazSzpaperszSzpdpta98.pdf/karnik98agent.pdf>.

Figure-1 [Kline 2003]

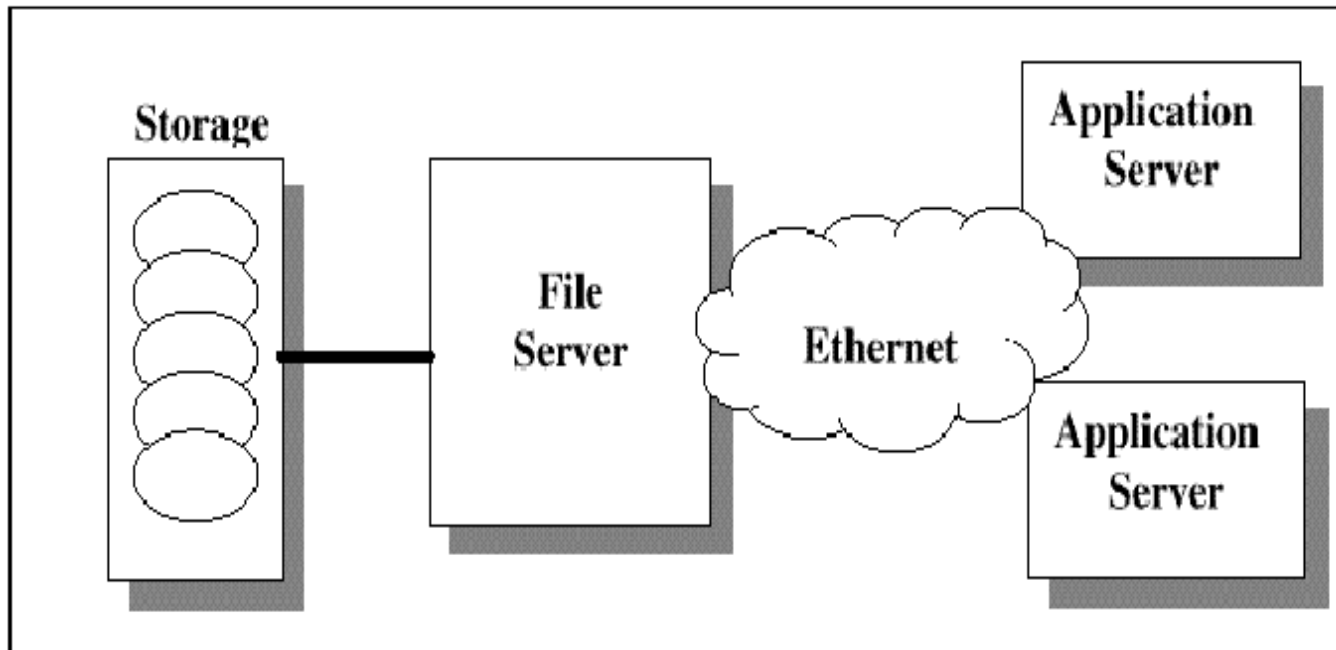


Figure 1. A server-attached shared storage model.

Figure-2 [Kline 2003]

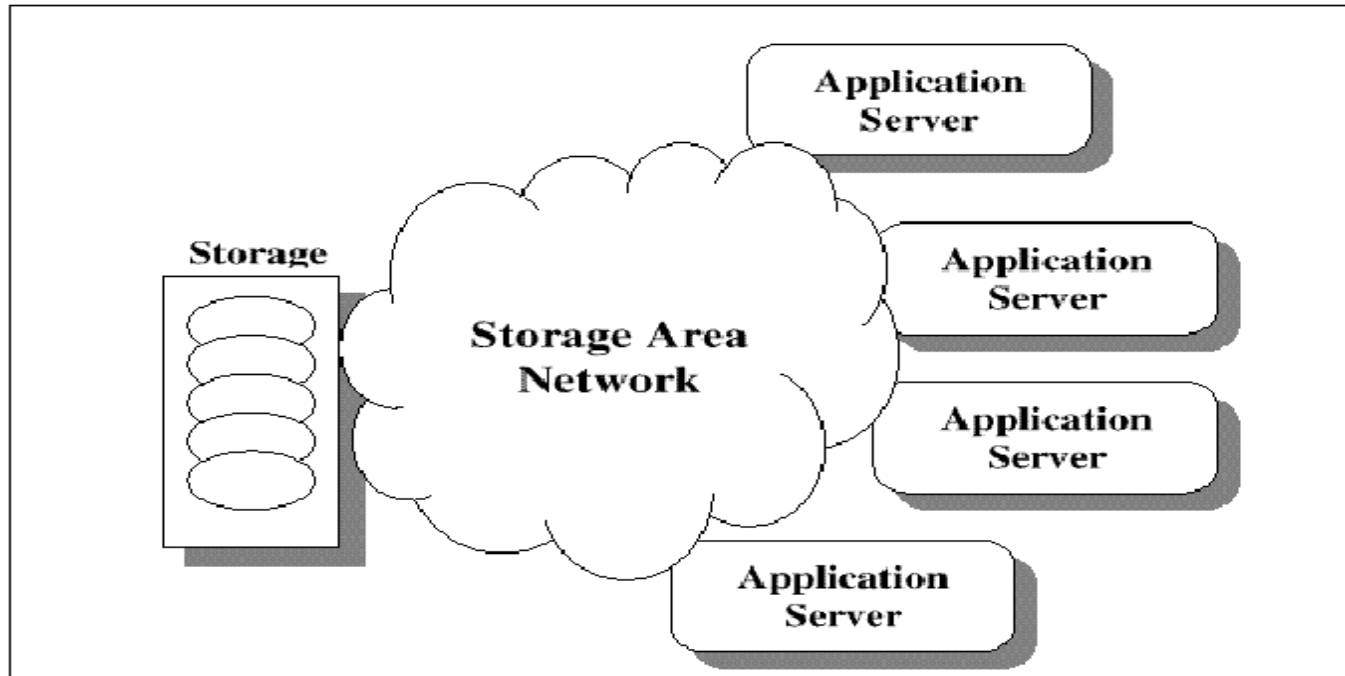


Figure 2. A distributed network-attached storage model.

Figure-3 [Kline 2003]

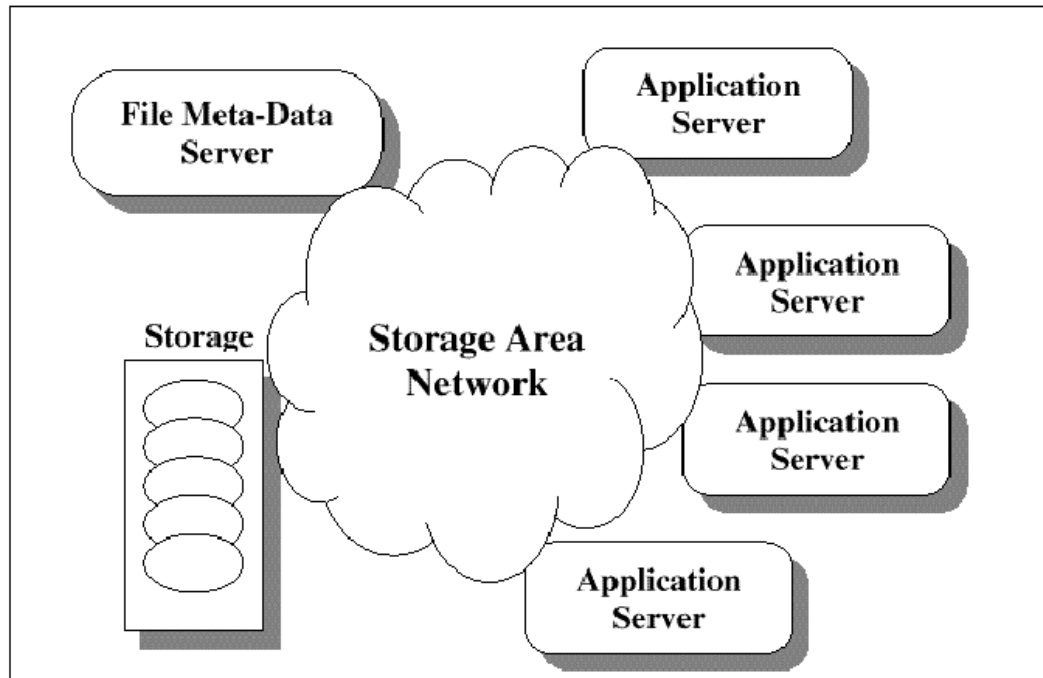


Figure 3. A hybrid network-attached storage model.

Figure-4 [Tripathi and Karnik 1998]

