

LA-UR- 09-05118

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*Title:* Kerberized Network File System for Clusters

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*Intended for:* Electronic/World-wide Web  
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# Abstracts

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## Kerberized Network File System for Clusters

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**Abstract:** With constantly looming cyber-security threats, protecting valuable data has become a very important issue. The implementation of security protocols should not compromise ease of use or performance. The Kerberos protocol provides a high level of security while minimizing overhead. A central Kerberos server needs to be able to provide authentication for a variety of services distributed over a number of connected networks. Though clustered environments traditionally have not required internal security, the landscape is changing rapidly.

It is important for any authorized person to be able to access their data from whatever computer they must use for their work. This could be a simple desktop workstation, or a large supercomputer. There needs to be a single, secure method of accomplishing this sharing for all environments. Kerberized NFS can be used to address this need for data mobility in a secure manner. However, the performance impact that Kerberos will have on NFS in a clustered setting is still largely unknown. Factors such as level of security and different types of encryption affect performance and usability greatly.

We will evaluate these impacts and make a general recommendation for suitable security levels and feasibility for possible deployments in current and future LANL systems.

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# Kerberized Network File System for Clusters

Presented on 08-03-2009 by:

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INFORMATION SCIENCE & TECHNOLOGY INSTITUTE



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# Introduction

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## Kerberized NFSv4 in an HPC Cluster

- Motivation
- Advantages & Disadvantages of Kerberos
- Changes in NFSv4
- Behaviour
- Performance

# Impetus

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## The Problem:

- Secure, light-weight, remote data access from nodes on supercomputer clusters.

## The Solution:

- Kerberos and NFSv4 are designed to accomplish this task on enterprise networks.

# Advantages of Kerberos Authentication

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- Single Sign-On
- Password Security
- Verified Clients
- Scalable
- Integration

# Disadvantages of Kerberos Authentication

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- Single Point of Compromise
- Requires Application Support

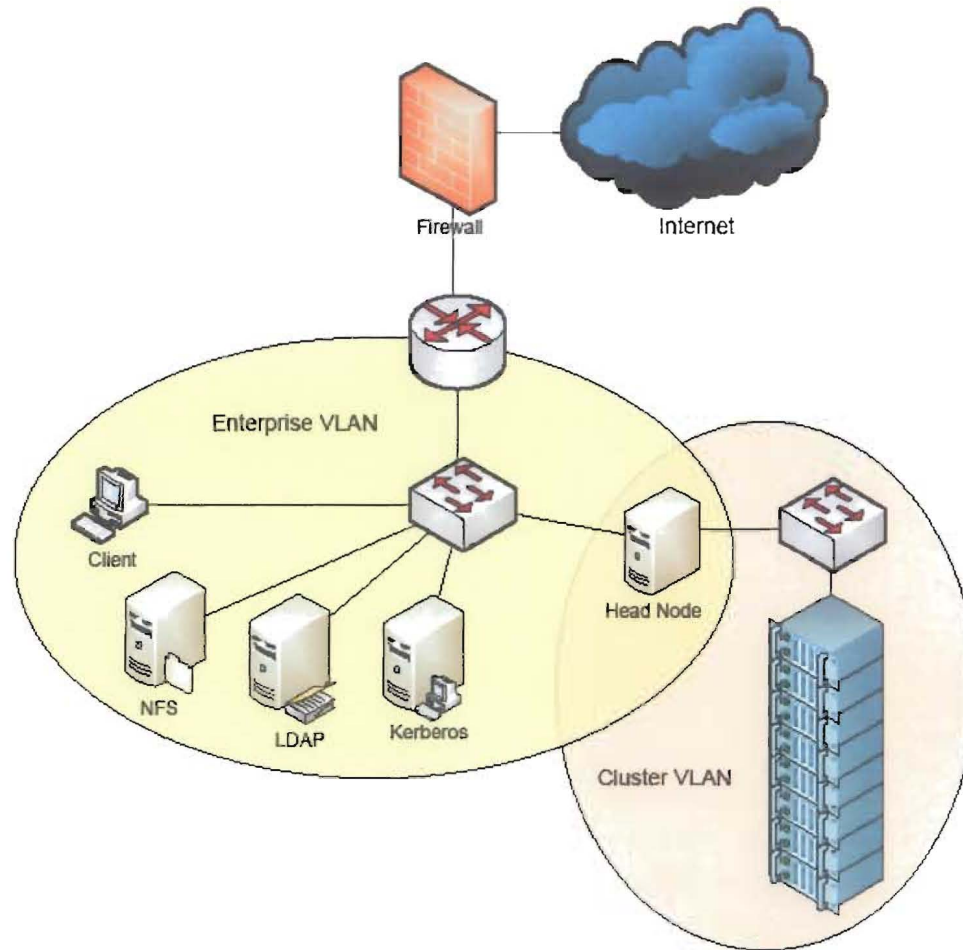
# Changes in NFSv4

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- Native Support for Authentication Protocols
- Kerberos Integration Options:
  - KRB5 = Authentication
  - KRB5i = Authentication & Integrity
  - KRB5p = Authentication, Integrity, & Encryption
- Non-Unix Compatibility
- Virtual Filesystem



# Test Environment



# Behaviour in a Clustered Environment

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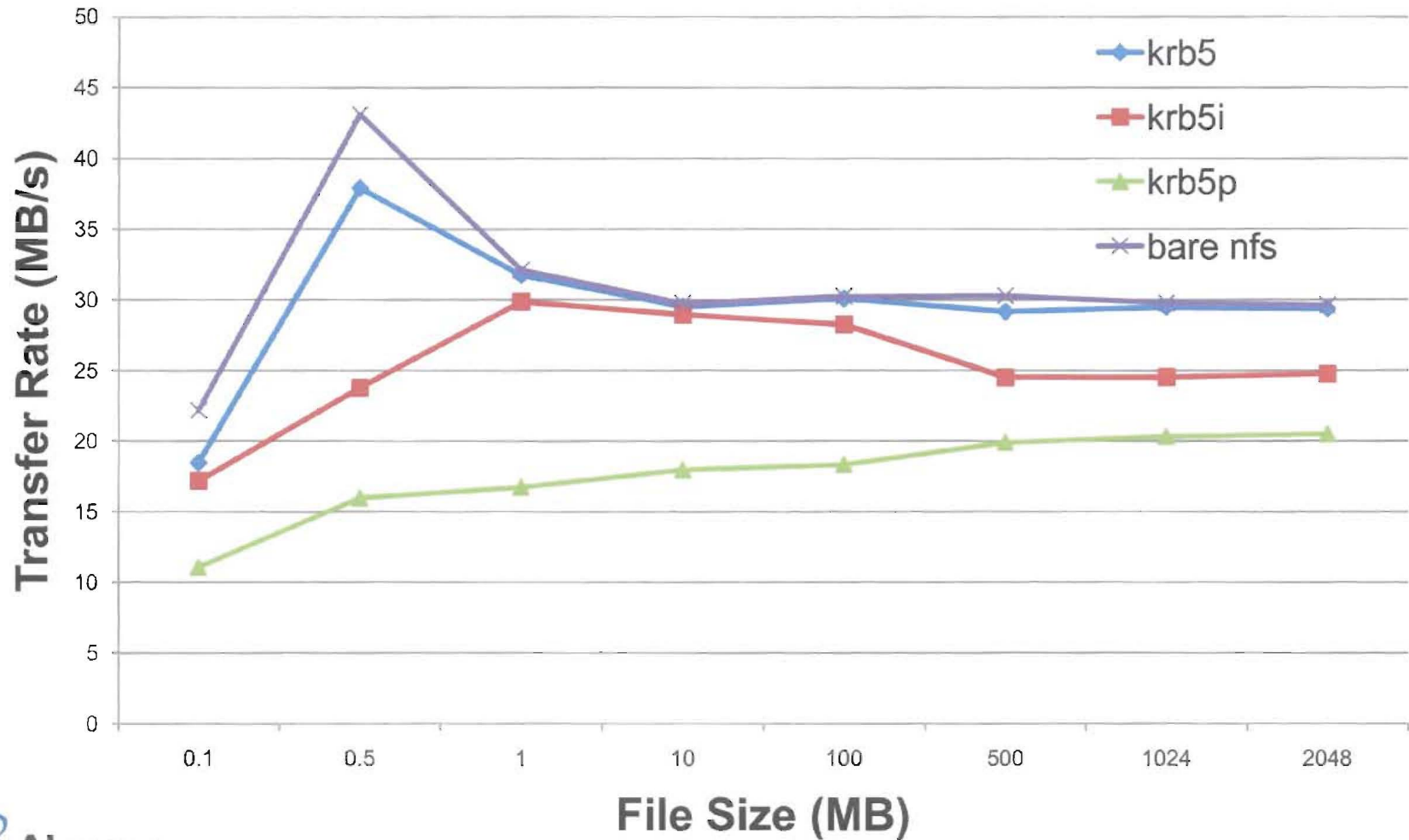
- Network Address Translation
- Addressless ticketing
- Torque Job Scheduler

# Performance Test

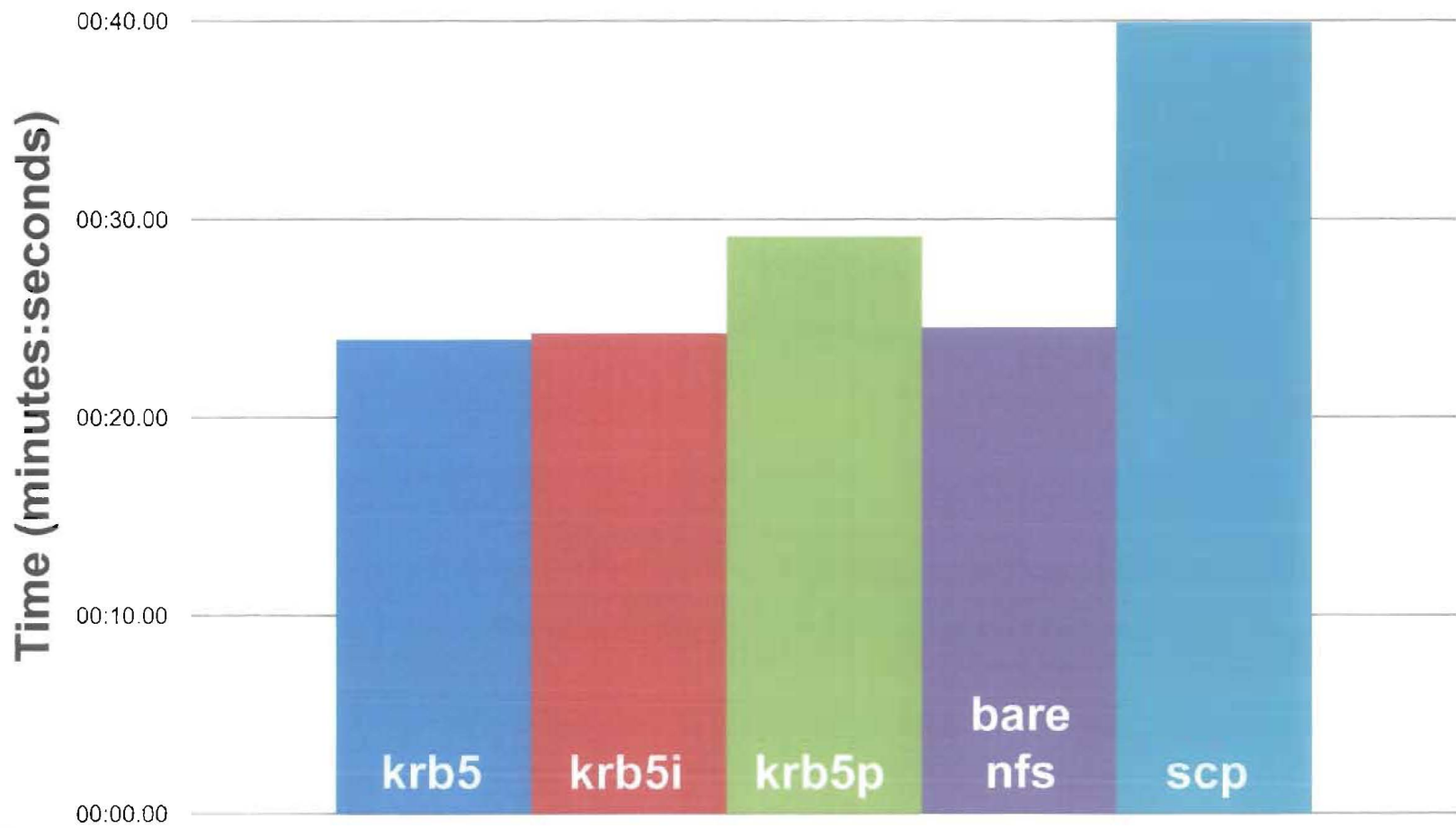
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- Levels of Security
- Large vs. Small Files
- SCP vs. Bare NFSv4 vs. Kerberized NFSv4  
over Gigabit Ethernet

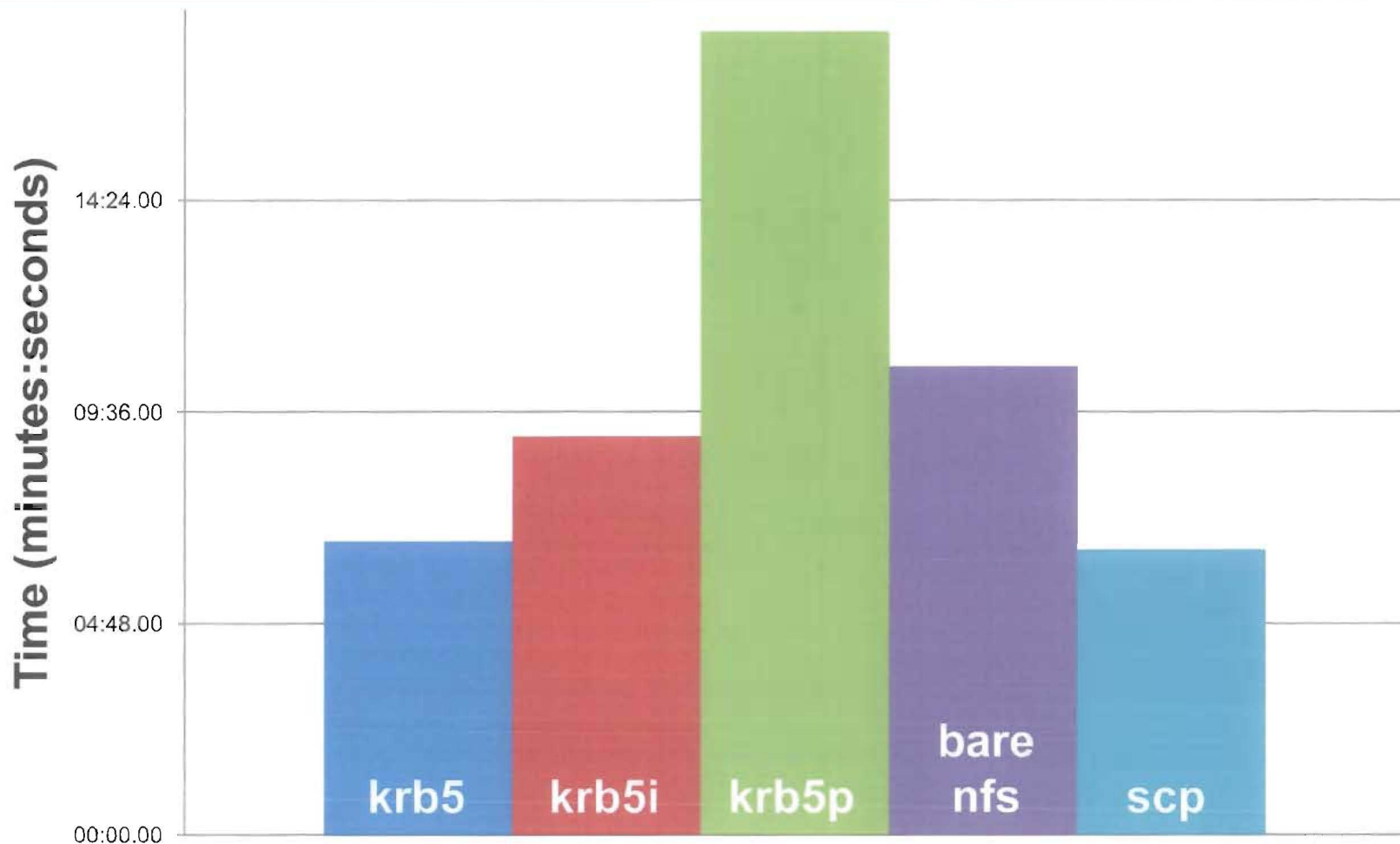
# Average File Transfer Rate



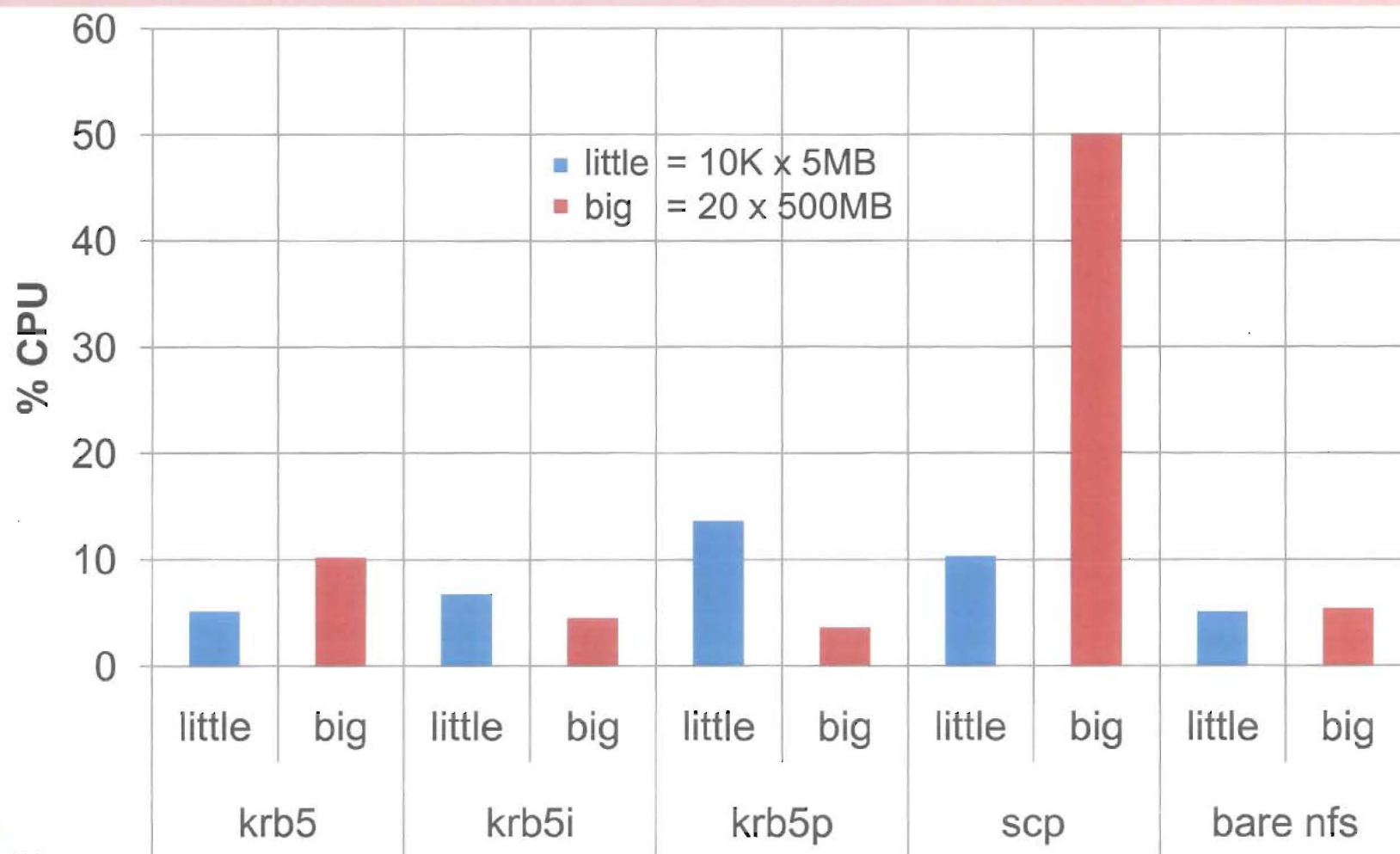
# Average Time to Copy 10,000 5-kB Files



# Average Time to Copy 20 500-MB Files



# CPU Utilization by Protocol



# Summary

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## Kerberized NFSv4 in an HPC Cluster

- Motivation
- Advantages & Disadvantages of Kerberos
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- Performance



# Questions?

## Answers!

