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Client-Server Multi-threaded Repo Testing Documentation

All Unit/Security Tests are handled in the *run_tests.sh* file in tests/.

Required Setup:

- Server machine (Linux or Windows)
- 2-3 client machines or terminals
- Network connectivity
- Test files of various sizes (1KB, 1MB, 10MB, 100MB, 1GB)

Test Data Preparation

Create test files:

```
echo "Test content" > test_1kb.txt
dd if=/dev/urandom of=test_1mb.bin bs=1M count=1
dd if=/dev/urandom of=test_10mb.bin bs=1M count=10
dd if=/dev/urandom of=test_100mb.bin bs=1M count=100
dd if=/dev/urandom of=test_1gb.bin bs=1M count=1024
```

Unit Tests

Test 1: Platform Wrapper - Socket Creation

Expected Result:

```
=== Testing Byte Order Conversion ===
Byte order conversion: PASSED

=== Testing Mutex ===
Mutex locked
TryLock failed as expected
Mutex unlocked

=== Testing Threads ===
Thread started with value: 42
Thread finished
All threads completed
```

Pass Criteria: All tests show "PASSED" or expected behavior

Test 2: Platform Wrapper - Echo Server/Client

Expected Result:

- Client connects successfully
- Server echoes messages back
- Clean disconnection

Pass Criteria: All messages echoed correctly, no errors

Test 3: Protocol Serialization

Test Cases:

Test	Input	Expected Output
Short string	"hello"	Serialized and deserialized correctly
Long string	200 chars	Serialized and deserialized correctly
Empty string	""	Handled without crash
Unicode	"héllo"	Preserved correctly
File info	name, size, timestamp	All fields correct

Pass Criteria: All data types serialize/deserialize without corruption

Integration Tests

Test 4: Server Startup

```
./fileserver_mt 8080 test_storage 5 testpass
```

Expected Output:

```
========================================
Multi-Threaded File Server Started
========================================
Port: 8080
Storage Directory: test_storage
Max Concurrent Clients: 5
```

```
========================================
Waiting for connections...
```

Pass Criteria:

- Server starts without errors
- Storage directory created
- Listening on specified port

Test 5: Client Authentication - Success

Objective: Verify correct password grants access

Steps:

1. Start server with password "testpass"
2. Connect client with correct password
3. Attempt file operation (list)

Expected Result:

```
Connecting to localhost:8080...
Connected!
Server: Authentication successful - Welcome to File Server
```

Pass Criteria: Client authenticated and can perform operations

- Wrong password rejected
- After 3 attempts, connection closed
- Server logs failed attempts

Test 6: File Upload - Large File

Expected Result:

```
Uploading: test_100mb.bin (104857600 bytes)
Progress: 25%
Progress: 50%
Progress: 75%
Progress: 100%
```

```
Upload complete!
```

Pass Criteria:

- Progress updates display
- Upload completes without timeout
- File size correct on server

Test 7: File Download

Commands:

```
md5sum test_1mb.bin > original.md5
./fileclient localhost 8080 upload test_1mb.bin
rm test_1mb.bin
./fileclient localhost 8080 download test_1mb.bin test_1mb.bin
md5sum -c original.md5
```

Expected Result: test_1mb.bin: OK

Pass Criteria: Checksums match

Test 8: File Deletion

Expected Result:

```
File deleted: test.txt
[After listing again]
Files on server (0):
```

Pass Criteria: File successfully removed

Test 9: List Files - Multiple Files

Expected Result:

```
Files on server (5):
----------------------------------------
file1.txt (1024 bytes)
file2.pdf (2048 bytes)
file3.jpg (4096 bytes)
```

```
file4.doc (8192 bytes)
file5.zip (16384 bytes)
----------------------------------------
```

Pass Criteria: All 5 files listed with correct sizes

Security Tests

Test 10: Path Traversal Attack Prevention

Objective: Block directory traversal attempts

Test Cases:

Malicious Filename	Expected Result
../../../etc/passwd	Rejected
..\\..\\windows\\system32\\config\\sam	Rejected
./secret/file.txt	Rejected
directory/file.txt	Rejected
file..txt	Rejected (contains ..)

Expected Result:

```
Invalid filename - may contain path traversal or illegal characters
[Server log]
SECURITY ALERT: Rejected filename: ../../../etc/passwd
```

Pass Criteria: All malicious filenames rejected

Test 11: File Size Limit Enforcement

Commands:

```
dd if=/dev/zero of=toobig.bin bs=1M count=1100
./fileclient localhost 8080 upload toobig.bin
```

Expected Result:

```
File too large - maximum 1GB allowed
[Server log]
SECURITY ALERT: Rejected large file: 1153433600 bytes
```

Pass Criteria: Upload rejected before transfer starts

Test 12: Password Brute Force Protection

Expected Result:

```
[Attempt 1] Authentication failed
[Attempt 2] Authentication failed
[Attempt 3] Too many failed attempts - disconnecting
Connection closed by server
```

Pass Criteria: Connection closed after 3 failures

Test 13: Connection Timeout

Expected Result:

```
[After 5 minutes of inactivity]
Timeout - disconnecting
Connection closed
```

Pass Criteria: Client disconnected after 5 minutes idle

Test 14: Special Characters in Filename

Test Cases:

Filename	**Expected**
file*.txt	Rejected
file?.txt	Rejected
file<>.txt	Rejected
file|.txt	Rejected
file name.txt	Allowed
file-name_2.txt	Allowed

Pass Criteria: Only alphanumeric, dash, underscore, dot allowed