BoF Discussion Topic

CIFS Acceleration

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Discussion Agenda

- Introduction
  - Some CIFS drawbacks
  - When CIFS acceleration comes on
- How can we improve CIFS traffic?
  - What to improve?
  - How to improve?
- CAX – CIFS acceleration example
  - Positioning
  - Platforms
Introduction
Who are we?

- Our company – Visuality Systems Israel Ltd (VS).
  - 10 years experience developing and selling embedded/mobile CIFS.
  - More than 80 world wide mainly Blue Chip customers in just about every market space possible from Aerospace to Home Devices.
- New product introduction in November 2008
  - CAX – CIFS traffic accelerator
- Your speaker – Mark Rabinovich
  - 28 year in software development
  - From 2003: Architect and Project Manager in VS
Some CIFS Issues
Satellite networks introduce up to one second of latency.
International network might introduce 500 milliseconds of latency.

Synchronous protocols are ineffective when run over networks with latency.
Bandwidth Limitation

- Satellite networks usually have limited bandwidth
- Regular DSL/Cable end users accessing remote CIFS servers may experience significantly low bandwidth

Redundant traffic over a limited bandwidth link takes too long.
CIFS nature

- SMB protocol has synchronous nature. CIFS is mostly synchronous. Multiplexing is limited.
- Currently Microsoft CIFS client is redundant - many commands are repeatedly sent
Examples

- Opening a 1.5 MB Word document involves about 630 SMB packets and requires more than 5 minutes open time (with 0.8 sec round trip).
- Saving the same document involves about 2400 SMB packets and takes more than 13 minutes.
- Opening a remote folder in Windows File Explorer involves hundreds of sequential request/response round trips.

The above results make CIFS virtually unusable.
Examples (cont)

- Windows File Explorer uses a number of concurrent threads each one issuing the same or similar generic requests (SRVSVCC, QueryFSInfo, etc.) when browsing folders or opening files.
- Same information requests (QueryPathInfo) are often repeated at least three times
- One request uses low info level while subsequent requests asks for more details of the same file (FindFirst, QueryPathInfo)
The Problem

- Global corporate networks must provide reasonable file sharing connectivity over satellite/international links
- Regular home users should be able to benefit from CIFS over DSL/Cable connections
- This is virtually impossible with the current implementation of SMB
- SMB2 addresses some of the issues, but not all of them
Discussion

Your opinion …?
Accelerating CIFS Traffic
Saving on Round Trips

**Non accelerated CIFS model**

Client \[\rightarrow\text{CIFS Traffic}\] \[\rightarrow\] Remote File/Printer Server

**Accelerated CIFS model**

Client \[\rightarrow\text{CIFS Traffic}\] \[\rightarrow\text{CIFS Traffic}\] \[\rightarrow\] Remote File/Printer Server

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How to Save on Round Trips?

- Send less requests to server
- Send requests to server concurrently
- Utilize the entire MPX count
Acceleration Techniques

1. Caching
2. Predicting
3. Accumulating
Caching

Time without acceleration – two roundtrips, with acceleration – one roundtrip
Caching What?

- File Information
  - FindFirst/Next/QueryPathInfo
  - NtCreateAndX

- Share Information
  - SrvSvc

- Server Information
  - SrvSvc
  - WksSvc

- File data
  - Write/WriteAndX
  - Read/ReadAndX

- File nonexistence

- Stream-full/stream-less file
Time without acceleration – three roundtrips, with acceleration – one roundtrip
Predicting What?

- Almost always queried after TreeConnectAndX
  - FS Information
  - Root folder
- Force requests for complex scenarios
  - NTCreateAndX + IOCTL(function32) + Close
- Almost always succeed
  - Close
  - TreeDisconnect
  - Logoff
  - Subsequent Write/SetFileInfo
Accumulating data

Time without acceleration – two roundtrips, with acceleration – less then one roundtrip
Accumulating When?

- Sequential file read
- Always issue queries with the most comprehensive info level
Impact Analysis
Inaccuracy?

- CIFS Acceleration introduces some inaccuracy
  - Cache goes out of sync
  - Late (error) responses
- This inaccuracy is comparable with native Windows inaccuracy
- Windows Client always knows to recover
How to reduce inaccuracy?

- Analyzing NOTIFIES
- Sending preventive requests for cached info
CAX – CIFS Accelerator Example
Solution

- For any network with latency and/or limited bandwidth from satellite and long-range networks…
  … to DSL/Cable links
- Embedded into communication environment – communication equipment / gateway servers / client workstations
- Transparent to user – preserves file sharing namespace semantics
- Client-side – accelerator works on a CIFS clients’ side only
How does it work?

1. **Caches information/data**
   - Answers repeating (redundant) requests
   - File information
   - File data
   - File System/Server/Share information

2. **Predicts the answer**
   - We know which command will be next
   - We can send it concurrently

3. **Accumulates data in bigger messages**
   - We always use 60K buffers for reading
Macro scenarios

Accelerator improves the most common scenarios

- Folder browsing
- Big file upload/download
- MS Office document open/edit/save
MS Word File Open Acceleration

Client-side capture taken on satellite link simulator (RTT: 800 msec):

Upper graph: ~200 sec without acceleration

Lower graph: ~50 sec with acceleration
CIFS Accelerator Platforms

- Embedded into communication equipment

![Diagram showing CIFS Accelerator Platforms](image-url)
CIFS Accelerator Platforms

- Embedded into a gateway server
CIFS Accelerator Platforms

- Embedded into a client

- Any Communication Equipment

- Client Network

- CIFS Accelerator Enabled Client 1

- Client 2

- Client 3
Thank you

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