

*File System
Extended Attributes
in NFSv4*

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Why do we need xattrs in NFS?

- Widely supported by most OSes/filesystems...
 - ... but no standard specification
- Copying files with xattrs over NFS results in loss
- Strong interest in community
 - Different semantics from named attributes
 - Needs well-defined specification for requirements and interoperability

What has transpired so far...

- 10/2013: Mailing list discussion on xattrs
- 11/2013 IETF 88: Should we add xattrs in NFSv4?
 - Yes, widely used and well supported
- 3/2014 IETF 89: First draft
 - Extend existing bitmap4, propose other options
 - Consensus to define new ops for xattrs
- 7/2014 IETF 90: Second draft
 - Propose new operations (GETXATTR, SETXATTR)
- 10/2014: More mailing list discussion
 - Feedback on use cases, set of operations
- 7/2015: IETF 93: Third draft
 - Make it WG draft

What do we propose?

- Protocol enhancements to support xattrs
 - Clear interfaces for get/set/list/remove
 - Well-defined semantics
- Only user-specified xattrs
 - Opaque to NFS clients and servers
 - Discourage non-interoperable implementations

Basic Operations

- Given a file, return a list of all of the file's assigned extended attribute keys (`listxattr`)
- Given a file and a key, return the corresponding value (`getxattr`)
- Given a file, a key, and a value, assign that value to the key (`setxattr`)
- Given a file and a key, remove that extended attribute from the file (`removexattr`)

Protocol Enhancements

- New RECOMMENDED attributes
 - Query xattr support
- New OPTIONAL operations
 - Get, set, list, remove xattrs
- Extensions to ACE Access Mask Attributes
 - New bitmask constants for the access mask field

New Attributes

Extend bitmap4 for use with GETATTR

Name	Id	Data Type	Acc
xattr_support	82	bool	R

- xattr_support

- True, if object's file system supports extended attributes

New Definitions

- `typedef utf8str_cis xattrname4;`
- `typedef opaque xattrvalue4<>;`
- `struct xattr4 {
- xattrname4 xa_name;
- xattrvalue4 xa_value;
};`
- `const ACE4_GET_XATTRS = 0x00200000;`
- For GETXATTR & LISTXATTR
- `const ACE4_SET_XATTRS = 0x00400000;`
- For SETXATTR & REMOVEXATTR

GETXATTR

ARGUMENTS

```
struct GETXATTR4args {  
    /* CURRENT_FH: file */  
    xattrname4      name;  
};
```

RESULTS

```
union GETXATTR4res switch(nfsstat4 status) {  
    case NFS4_OK:  
        xattrvalue4      resok4;  
    default:  
        void;  
};
```

SETXATTR

ARGUMENTS

```
enum setxattr_type4 {
    SETXATTR4_CREATE          = 0,
    SETXATTR4_REPLACE        = 1
};
struct SETXATTR4args {
    /* CURRENT_FH: file */
    setxattr_type4          type;
    xattr4                  xattrs;
};
```

RESULTS

```
union SETXATTR4res switch (nfsstat4 status) {
    case NFS4_OK:
        void;
    default:
        void;
};
```

REMOVEXATTR

ARGUMENTS

```
struct REMOVEXATTR4args {
    /* CURRENT_FH: file */
    xattrname4    name;
};
```

RESULTS

```
union REMOVEXATTR4res switch (nfsstat4 status) {
    case NFS4_OK:
        void;
    default:
        void;
};
```

LISTXATTR

ARGUMENTS

```
struct REaddir4args {
    /* CURRENT_FH: file */
    nfs_cookie4      cookie;
    count4           maxcount;
};
```

RESULTS

```
struct LISTXATTR4resok {
    nfs_cookie4      cookie;
    verifier4        cookieverf;
    bool             eof;
    xattrname4       names<>;
};
union LISTXATTR4res switch (nfsstat4 status) {
    case NFS4_OK:
        LISTXATTR4resok  resok4;
    default:
        void;
};
```

Caching and Delegations

- Caching behavior similar to other attributes (not data)
- SETXATTR/REMOVE modifies “change” attribute
- Clients without delegations
 - can cache (unmodified) xattrs, validate using change attribute
 - must write-through changes (synchronously) may need to wait for delegation to be recalled
- Owner of read/write delegations
 - can cache (modified) xattrs
 - respond with new “change” value to CB_GETATTR

What's Next?

<http://tools.ietf.org/html/draft-naik-nfsv4-xattrs-02>

- Make it a WG document
- Develop reference implementation
- Improve on it
- Use new minor version for fast track

Questions?

<http://tools.ietf.org/html/draft-naik-nfsv4-xattrs-02>