# MLS Protocol

draft-ietf-mls-protocol-08

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# You Are Here

draft-11 issued Dec 22, after issue resolutions at IETF 109

Since then, we have been in feature freeze, allowing for implementation

Initial interop testing has begun!

Few issues/PRs since then with clarifications, bugfixes

# Interop!

# gRPC-based test harness

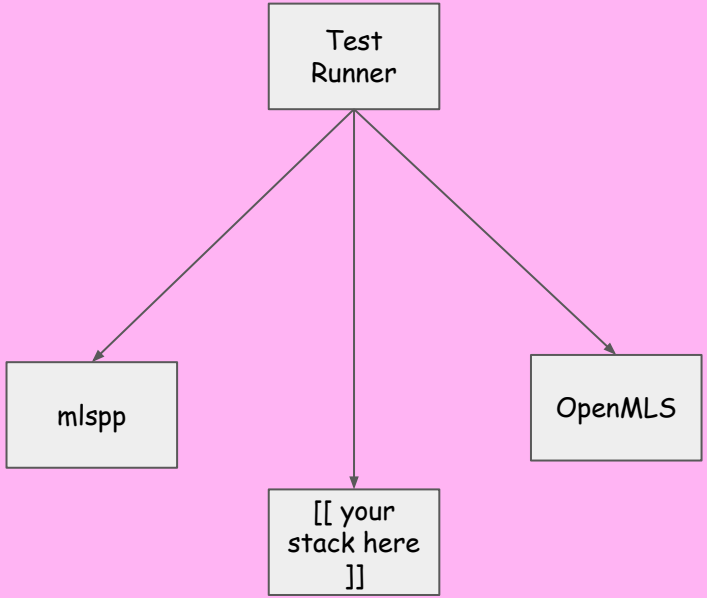
MLS client = gRPC server

Test runner = gRPC client, commands MLS implementations to do stuff

Two types of tests:

- Test vectors: Generate / Verify sample data from subsystems
- Scenarios: Actual protocol operations

Automatically generates permutations of ciphersuites / roles



# Progress so far

Two implementations: mlspp and OpenMLS

Interop verified on test vectors:

- Tree math
- ~~Key schedule~~ joiner_secret
- Encryption
- TreeKEM
- Message encoding
- Protocol scenarios

# First Interop!


```
{
  "test_vectors": {
    "tree_math": [{
        "generator": "mlspp",
        "verifier": "mlspp”
      }, {
        "generator": "mlspp",
        "verifier": "OpenMLS"
      }, {
        "generator": "OpenMLS",
        "verifier": "mlspp",
        "error": "rpc error: code = InvalidArgument desc = Error: parent  (nullopt) != 9"
      }, {
        "generator": "OpenMLS",
        "verifier": "OpenMLS"
      }]
  }
}
```


mlspp accepts its own test vector

OpenMLS accepts a test vector from mlspp

Mlspp is unhappy OpenMLS didn’t do all the cases

OpenMLS accepts its own test vector

# Bugs found so far

Not generating full tree math test vectors

Swapped order of HKDF.Extract inputs

Wrong algorithms associated with a ciphersuite

**No spec bugs … yet**

More to come as we test more surface…

# Spec Issues / PRs

# Breaking Changes (editorial omitted)

#461 - Truncate tree size on remval / #459 - Trim tree after removal

#455 - Make PreSharedKeys non-optional in GroupSecrets

#453 - Use the GroupContext to derive the joiner_secret

#439 - Identities SHOULD be unique per group

#457 - Clarify ParentHash verification

#443 - External commit for resync used with PSK

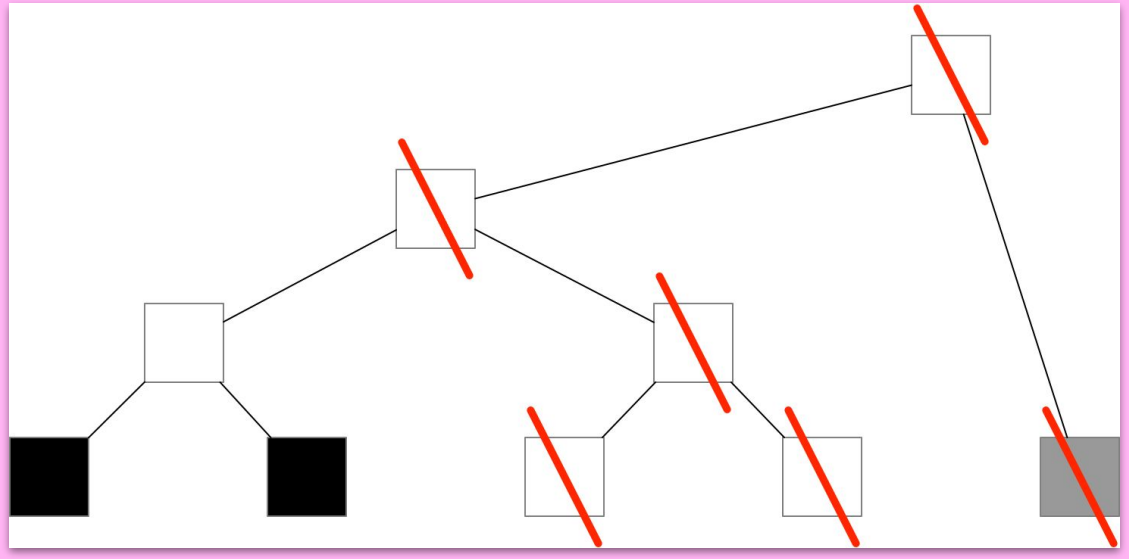
#XXX - Resolve ambiguity around which context is used when

# #459 / #461 - Tree Trimming

In draft-07, we made the tree smaller on Remove:

- Truncate the tree such that the rightmost non-blank leaf is the last node of the tree, for the time of the computation

This got lost in draft-08 and later, just need to restore it



# #455 - Make PreSharedKeys non-optional

Ambiguity in GroupSecrets:

PSK field is optional…

… but can also be zero length

What if it is present, but empty?

In other words, no need for the field to be optional

```
struct {
    PreSharedKeyID psks<0..2^16-1>;
} PreSharedKeys;

struct {
    opaque joiner_secret<1..255>;
    optional<PathSecret> path_secret;
    optional<PreSharedKeys> psks;
    PreSharedKeys psks;
} GroupSecrets;
```

# #453 - GroupContext to derive joiner_secret

Incorporate GroupContext_[n] earlier in the key schedule

=> faster divergence on disagreement

```
      commit_secret -> KDF.Extract
                             |
                             V
-                    DeriveSecret(., "joiner")
+                    ExpandWithLabel(., "joiner", GroupContext_[n], KDF.Nh)
                             |
                             V
                      joiner_secret
```

# #439 - Identities SHOULD be unique per group

… or rather, unique within the context of a group

Each leaf has a Credential => (identity, signature public key) pair

The current spec allows an identity or signature key to appear multiple times

Proposal is to require that both **identities** and **public keys** be unique

# #457 – Clarify ParentHash verification

Obvious problem just a typo:

```
If R is a blank leaf node, the check fails
```

More broadly: “I suggest to add a more formal description of the parent hash generation and verification (e.g. pseudocode) to reduce ambiguity”

# #443 - External commit for resync with PSK

External commit introduces the possibility of a "resync" operation

Remove(old self) + Add(new self) within same external Commit

But "new self" doesn't have to prove past membership

… notionally, with a PSK derived from an earlier epoch

**Should we RECOMMEND / REQUIRE that this be done?**

With identity uniqueness, this case is clearly recognizable

… but assumes that a client that has otherwise lost state still has PSK(s)

# #XXX - Resolve GroupContext usage ambiguity

Generating and handling commits requires that committer/processor use a few different GroupContexts:

1. Encap/decap an UpdatePath - “provisional” GroupContext, proposals applied

2. Ratcheting forward the key schedule - GroupContext for next epoch

3. Signing the MLSPlaintext of the Commit - GroupContext for last epoch

Propose to clarify, align terminology around **old / provisional / new**

# Way Forward

# Final TODOs

1. Finish interop testing based on draft-11 (without further changes)
    a. ETA: April?
    b. **EVERYONE GET ANY LAST ISSUES / PRS IN WHILE THIS IS HAPPENING**
2. Issue draft-12 with the last round of changes
    a. ETA: As soon as we're done with interop testing
3. Update implementations and re-validate interop
    a. ETA: A couple of weeks after draft-12
4. Final WGLC and on to the IESG!
    a. ETA: May?