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RaptorQ Forward Error Correction Scheme for Object Delivery

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Overview

- RaptorQ code comparison to Raptor in RFC 5053*
  - Similarities
    - Systematic fountain code
    - Same range of symbol sizes
    - Linear time encoding and decoding
  - Improvements
    - Number of supported source symbols 56,403 **(x7)**
    - Number of supported repair symbols 16 million **(x256)**
    - Smaller reception overheads **(x12)**
- RaptorQ for object delivery
  - Same parameters as RFC 5053
  - Similar derivation of FEC OTI as RFC 5053

*__Bold red__ is the Improvement factor of RaptorQ over Raptor in RFC 5053

Changes from -02 to -03

- Cleaned up presentation
  - Small errors/typos fixed
  - Cleaned up symbol operation descriptions
    - Removed scattered mathematical descriptions of GF[256]
    - Descriptions are now all table driven and self-contained in Section 5.7
  - Eliminated duplicated descriptions
    - Kept and cleaned up the implementor-friendly descriptions
- Added decoder requirements Section 5.8
- No technical changes
  - Exception: changed the systematic index values in Section 5.6
- Changes were based on feedback from implementors

Implementation status

- Qualcomm commercial implementation in development
  - Highly optimized
- Two independent implementations from spec
  - Implemented by those with no previous Raptor experience
    - Implementation by an individual in a separate QC business unit
    - Implementation by two individuals from Technical University Munich
  - Valuable feedback on the spec provided by implementors
- All three implementations have been cross-verified
  - Output of encoder developed by X feeds into decoder developed by Y, for all combinations of X and Y
  - All tests pass

Next steps

- Incorporate comments from WGLC
- Update the systematic index values in Section 5.6
  - Expect a slightly improved decoding failure probability as a function of reception overhead
  - Massive simulations to verify in progress
  - Final values to be available by mid-August
  - Does not effect any other part of the specification