Software Implementations

Public-key Cryptography

- **Comparison of Public Domain Multi-precision Libraries**
- **Pairing-based cryptosystems**
- **Spectral Montgomery Exponentiation**

Cryptanalysis

- **Comparison and Optimization of Public Domain Implementations for Number Field Sieve**

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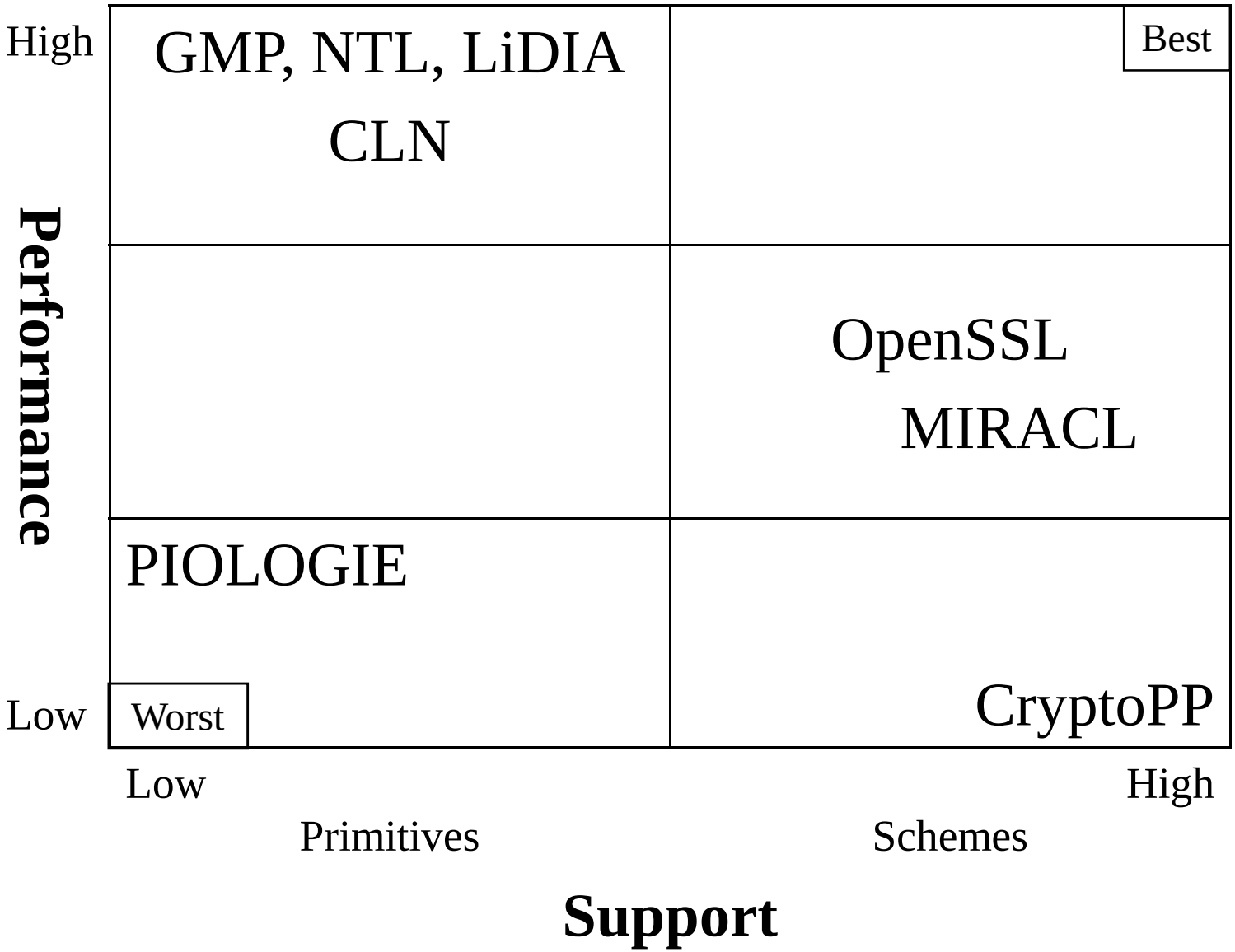
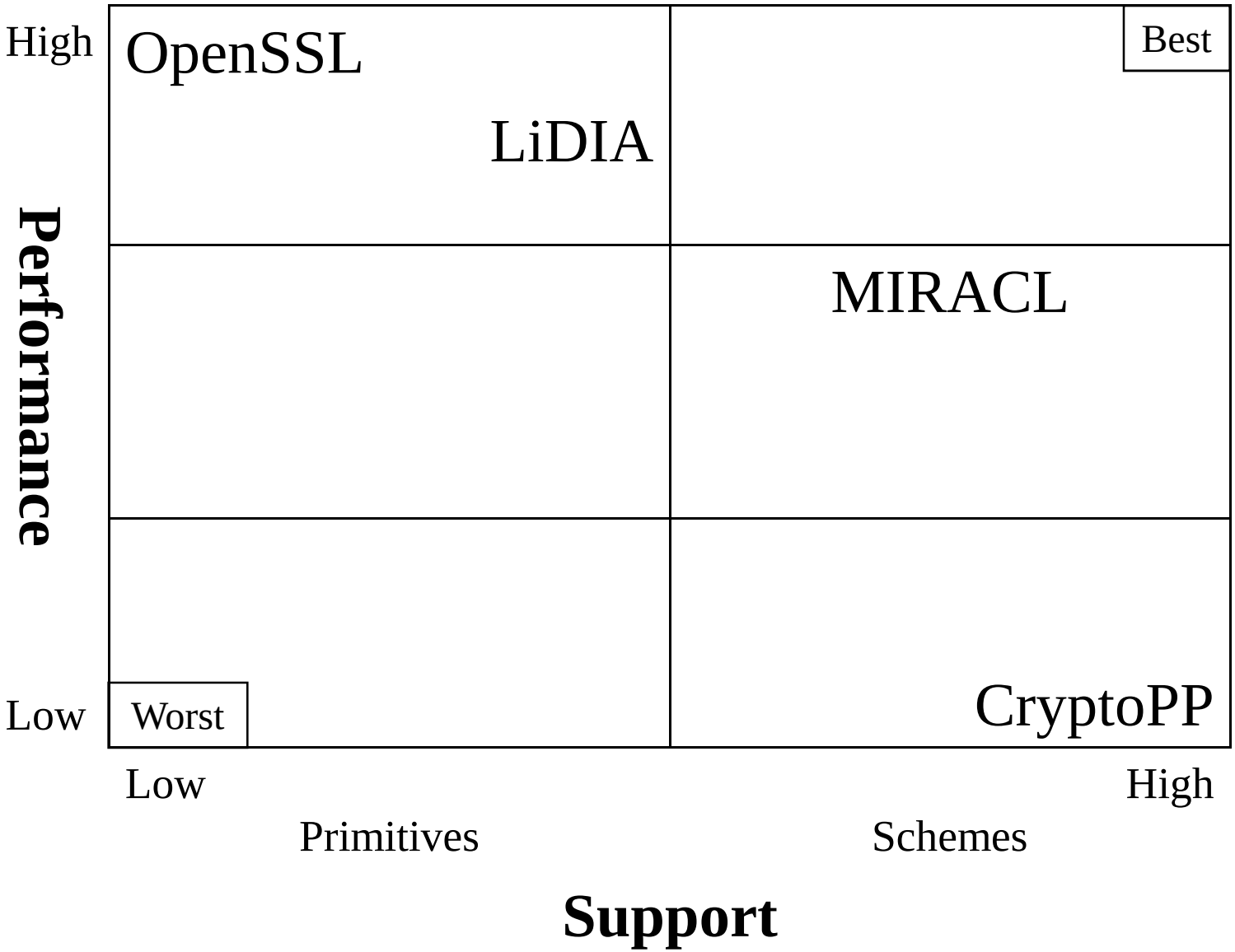
Comparison of Public Domain Libraries: Operations on Large Integers



Comparison of Public Domain Libraries: Elliptic Curve Operations

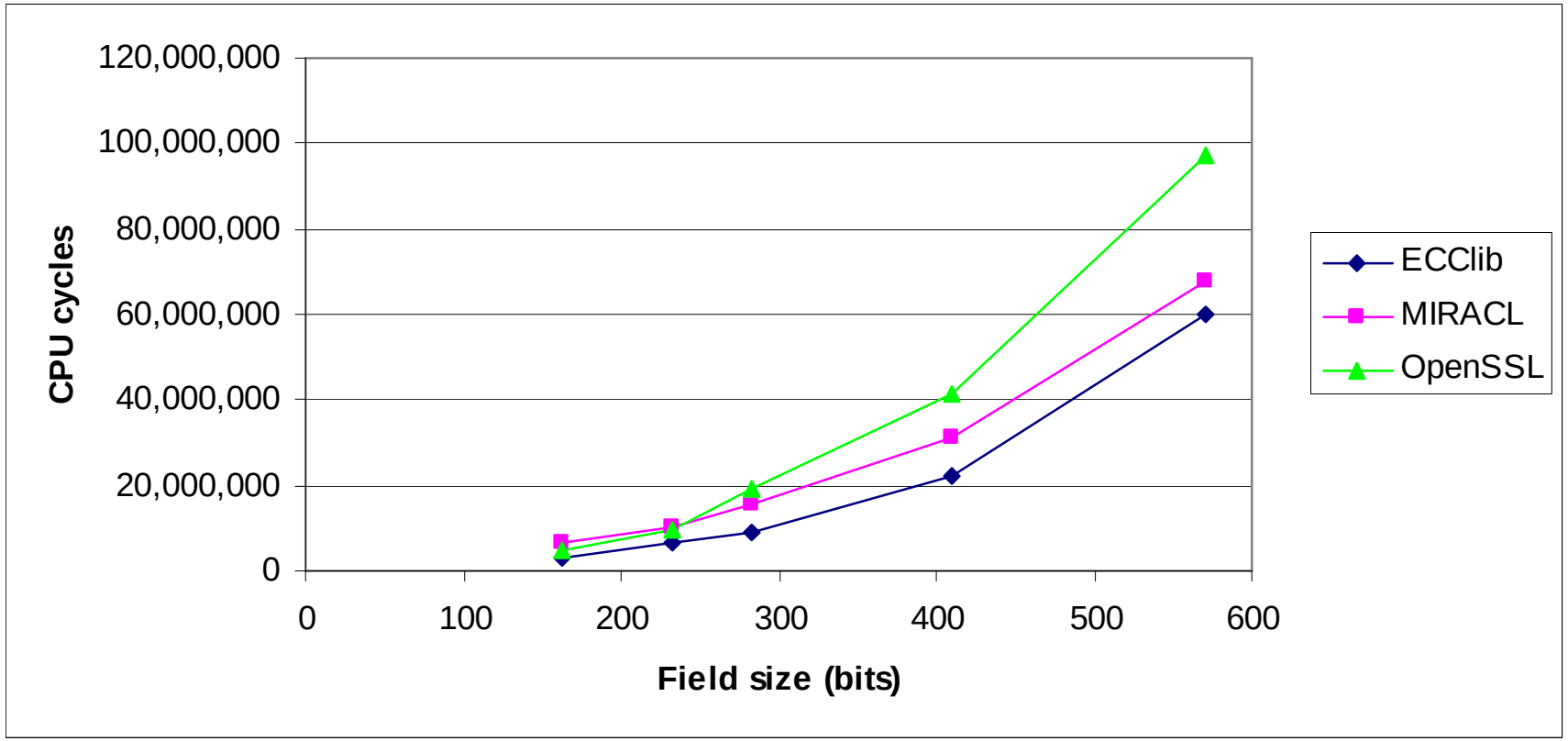


ECClib

- GMU-based software library for Elliptic Curve Cryptography on binary fields
  - Implements multiple algorithms for same operation
    - e.g. 5 different scalar multiplication functions
  - Optimizes the modular reduction time in binary fields
- Includes NIST recommended curves FIPS 186-2
- Operations are optimized for performance
  - 46% faster than OpenSSL for scalar multiplication

Comparison of ECCLib with Other Libraries

- EC-DSA Signature Generation, Ordinary Curves



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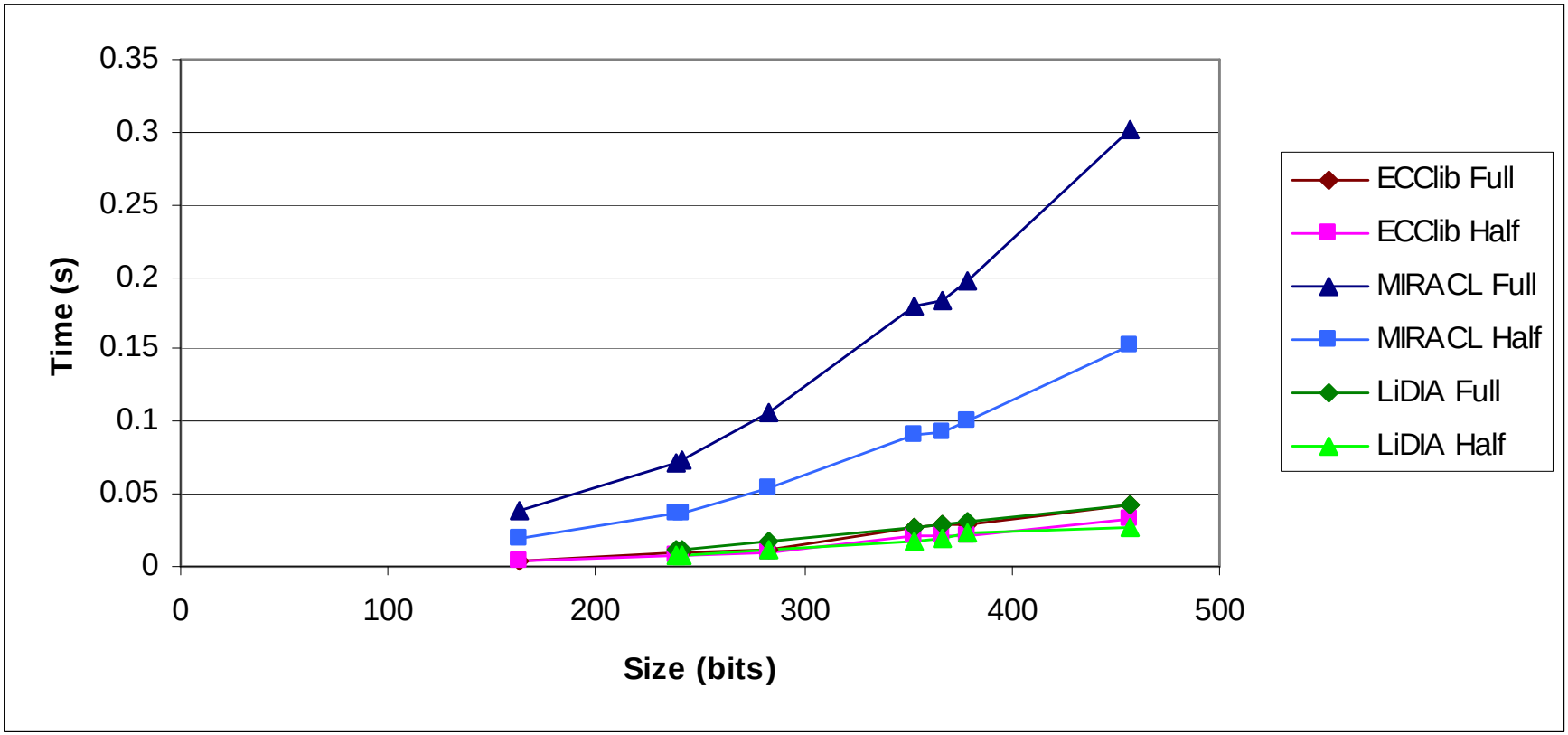
Adding Pairings to ECClib

- Added pairing-friendly curves to library
- Added operations in extension field GF(2^{4m})
- Implemented pairing algorithms over binary fields



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Comparison of Public Domain Implementations of Number Field Sieve

Evaluated NFS implementations:

1. Chris Monico: GNU General Number Field Sieve (GGNFS)
2. Per Leslie Jensen: Pleslie's General Number Field Sieve (pGNFS)
3. Chris Card: factor-by-gnfs
4. Jason Papadopoulos: msieve

Msieve is the most efficient–and freely licensed implementation.

GGNFS is a close second–and recommended by the Msieve author and users groups.

GGNFS selected for optimization and further extensions.