

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Historical Remarks . . . . .	1
1.2	Who Has Contributed? . . . . .	3
1.3	Who Should Read this Report? . . . . .	6
1.4	Notice . . . . .	8
<b>2</b>	<b>Scope of the Workshop</b>	<b>11</b>
2.1	The Rôle of Public-Key Cryptography . . . . .	11
<b>3</b>	<b>List of Topics Chosen Through Self-Assessment</b>	<b>13</b>
<b>4</b>	<b>Short Classification and Description of the Most Prominent Public-Key Systems</b>	<b>15</b>
4.1	One-Way Functions . . . . .	16
4.1.1	General Knapsacks . . . . .	17
4.1.2	Discrete Log Problems (Diffie-Hellman, etc.) . . . . .	17
4.2	Trapdoor One-Way Functions . . . . .	20

4.2.1	Trapdoor Systems Based on Transformed NP-Complete Problems . . . . .	22
4.2.2	Trapdoor Systems Based on the Decomposition of Algebras (RSA, etc.) . . . . .	24
4.3	Hash Functions . . . . .	27
5	<b>Public-Key Cryptography Depending on Computational Number Theory</b>	33
5.1	Factorisation of Large Integers . . . . .	34
5.1.1	The Elliptic Curve Method . . . . .	35
5.1.2	Double Large Prime Variation of the Multiple Polynomial Quadratic Sieve . . . . .	36
5.1.3	The Number Field Sieve (NFS) . . . . .	40
5.1.4	Exploiting the Power of Distributed Computing . . . . .	44
5.2	Discrete Logarithms . . . . .	45
5.2.1	The Multiplicative Group of Finite Fields of Characteristic 2 . . . . .	47
5.2.2	The Multiplicative Group of Fields of Prime Order . . . . .	49

5.2.3	The Elliptic Curve Group over Finite Fields . . . . .	51
<b>6</b>	<b>Public-Key Systems: Mistakes and Problems</b>	<b>55</b>
6.1	Formal Approach to Design and Analysis . . . . .	55
6.2	Flow of Trust . . . . .	60
<b>7</b>	<b>Projection of Needs and Requirements for Public-Key Systems</b>	<b>63</b>
7.1	Assessment and Prediction: Guide Public-Key Systems Implementations in the 1990s . . . . .	68
7.2	Some Remarks Concerning Exponentiation Schemes . . .	73
	<b>References</b>	<b>83</b>