

ISO/IEC TR 24772:2010-10 (E)

Information technology — Programming languages — Guidance to avoiding vulnerabilities in programming languages through language selection and use

Contents		Page
Foreword		vi
Introduction		vii
1	Scope	1
2	Normative references	1
3	Terms and definitions, symbols and conventions	1
3.1	Terms and definitions, symbols and conventions.....	1
3.2	Symbols and conventions.....	3
4	Basic Concepts	4
4.1	Not in Scope.....	4
4.2	Approach	4
4.3	Intended Audience.....	4
4.4	How to Use This Document	5
5	Vulnerability issues	8
5.1	Issues arising from incomplete or evolving language specifications	8
5.2	Issues arising from human cognitive limitations	11
5.3	Issues arising from a lack of predictable execution	12
5.4	Issues arising from the lack of portability and interoperability	12
5.5	Issues arising from inadequate language intrinsic support.....	13
5.6	Issues arising from language features prone to erroneous use.....	13
6	Programming Language Vulnerabilities	14
6.1	General	14
6.2	Obscure Language Features [BRS]	14
6.3	Unspecified Behaviour [BQF].....	15
6.4	Undefined Behaviour [EWF]	17
6.5	Implementation-defined Behaviour [FAB]	18
6.6	Deprecated Language Features [MEM].....	20
6.7	Pre-processor Directives [NMP].....	21
6.8	Choice of Clear Names [NAI].....	23
6.9	Choice of Filenames and other External Identifiers [AJN].....	25
6.10	Unused Variable [XYR]	26
6.11	Identifier Name Reuse [YOW]	27
6.12	Namespace Issues [BJL].....	30
6.13	Type System [IHN].....	31
6.14	Bit Representations [STR].....	34
6.15	Floating-point Arithmetic [PLF]	35
6.16	Enumerator Issues [CCB]	38
6.17	Numeric Conversion Errors [FLC]	40

6.18	String Termination [CJM]	42
6.19	Boundary Beginning Violation [XYX]	43
6.20	Unchecked Array Indexing [XYZ]	44
6.21	Unchecked Array Copying [XYW]	46
6.22	Buffer Overflow [XZB].....	47
6.23	Pointer Casting and Pointer Type Changes [HFC].....	49
6.24	Pointer Arithmetic [RVG]	50
6.25	Null Pointer Dereference [XYH]	51
6.26	Dangling Reference to Heap [XYK]	52
6.27	Templates and Generics [SYM]	54
6.28	Inheritance [RIP].....	56
6.29	Initialization of Variables [LAV].....	57
6.30	Wrap-around Error [XYY]	59
6.31	Sign Extension Error [XZI]	60
6.32	Operator Precedence/Order of Evaluation [JCW].....	61
6.33	Side-effects and Order of Evaluation [SAM]	63
6.34	Likely Incorrect Expression [KOA]	64
6.35	Dead and Deactivated Code [XYQ].....	66
6.36	Switch Statements and Static Analysis [CLL]	68
6.37	Demarcation of Control Flow [EOJ]	69
6.38	Loop Control Variables [TEX]	70
6.39	Off-by-one Error [XZH].....	71
6.40	Structured Programming [EWD]	73
6.41	Passing Parameters and Return Values [CSJ].....	74
6.42	Dangling References to Stack Frames [DCM].....	77
6.43	Subprogram Signature Mismatch [OTR].....	79
6.44	Recursion [GDL].....	80
6.45	Returning Error Status [NZN]	81
6.46	Termination Strategy [REU]	84
6.47	Extra Intrinsics [LRM].....	85
6.48	Type-breaking Reinterpretation of Data [AMV]	87
6.49	Memory Leak [XYL].....	89
6.50	Argument Passing to Library Functions [TRJ].....	90
6.51	Dynamically-linked Code and Self-modifying Code [NYY].....	91
6.52	Library Signature [NSQ]	92
6.53	Unanticipated Exceptions from Library Routines [HJW]	93
7	Application Vulnerabilities.....	95
7.1	Adherence to Least Privilege [XYN]	95
7.2	Privilege Sandbox Issues [XYO]	95
7.3	Executing or Loading Untrusted Code [XYS]	97
7.4	Unspecified Functionality [BVQ]	98
7.5	Distinguished Values in Data Types [KLK].....	99
7.6	Memory Locking [XZX].....	100

7.7	Resource Exhaustion [XZP]	101
7.8	Injection [RST].....	102
7.9	Cross-site Scripting [XYT].....	105
7.10	Unquoted Search Path or Element [XZQ].....	108
7.11	Improperly Verified Signature [XZR]	108
7.12	Discrepancy Information Leak [XZL]	109
7.13	Sensitive Information Uncleared Before Release [XZK].....	110
7.14	Path Traversal [EWR]	111
7.15	Missing Required Cryptographic Step [XZS]	113
7.16	Insufficiently Protected Credentials [XYM]	113
7.17	Missing or Inconsistent Access Control [XZN]	114
7.18	Authentication Logic Error [XZO]	115
7.19	Hard-coded Password [XYP]	117
Annex A (informative) Guideline Selection Process.....		118
A.1	Selection Process.....	118
A.2	Cost/Benefit Analysis	118
A.3	Documenting of the selection process	119
Annex B (informative) Template for use in proposing programming language vulnerabilities		120
B.1	6.<x> <short title> [<unique immutable identifier>].....	120
Annex C (informative) Template for use in proposing application vulnerabilities		122
C.1	7.<x> <short title> [<unique immutable identifier>]	122
Annex D (informative) Vulnerability Outline and List		123
D.1	Vulnerability Outline	123
D.2	Vulnerability List	125
Annex E (informative) Language Specific Vulnerability Template		127
E.1	<language>.1 Identification of standards.....	127
E.2	<language>.2 General terminology and concepts	127
E.3	<language>.<x> <Vulnerability Name> [<3 letter tag>]	127
Bibliography		129