
**Programming languages — Guidance
to avoiding vulnerabilities in
programming languages —**

**Part 2:
Ada**

*Langages de programmation — Conduite pour éviter les
vulnérabilités dans les langages de programmation —*

Partie 2: Ada

ITeX Standards
(<https://standards.iteh.ai>)
Document Preview

ISO/IEC TR 24772-2:2020

<https://standards.iteh.ai/catalog/standards/iso/ead037ff-3a1d-4e09-8f39-134134fc0579/iso-iec-tr-24772-2-2020>



Reference number
ISO/IEC TR 24772-2:2020(E)

© ISO/IEC 2020

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

ISO/IEC TR 24772-2:2020

<https://standards.iteh.ai/catalog/standards/iso/ead037ff-3a1d-4e09-8f39-134134fc0579/iso-iec-tr-24772-2-2020>



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	vii
Introduction	viii
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Language concepts	6
4.1 Enumeration type	6
4.2 Exception	6
4.3 Hiding	6
4.4 Implementation defined	6
4.5 Type conversions	6
4.6 Operational and Representation Attributes	7
4.7 User defined types	7
4.8 Pragma compiler directives	7
4.8.1 Pragma Atomic	7
4.8.2 Pragma Atomic_Components	7
4.8.3 Pragma Convention	7
4.8.4 Pragma Detect_Blocking	7
4.8.5 Pragma Discard_Names	7
4.8.6 Pragma Export	8
4.8.7 Pragma Import	8
4.8.8 Pragma Normalize_Scalars	8
4.8.9 Pragma Pack	8
4.8.10 Pragma Restrictions	8
4.8.11 Pragma Suppress	8
4.8.12 Pragma Unchecked_Union	8
4.8.13 Pragma Volatile	8
4.8.14 Pragma Volatile_Components	8
4.9 Separate compilation	8
4.10 Storage pool	8
4.11 Unsafe programming	9
5 General guidance for Ada	9
5.1 Ada language design	9
5.2 Top avoidance mechanisms	10
6 Specific guidance for Ada	11
6.1 General	11
6.2 Type system [IHN]	11
6.2.1 Applicability to language	11
6.2.2 Guidance to language users	11
6.3 Bit representation [STR]	11
6.3.1 Applicability to language	11
6.3.2 Guidance to language users	11
6.4 Floating-point arithmetic [PLF]	12
6.4.1 Applicability to language	12
6.4.2 Guidance to language users	12
6.5 Enumerator issues [CCB]	12
6.5.1 Applicability to language	12
6.5.2 Guidance to language users	13
6.6 Conversion errors [FLC]	13
6.6.1 Applicability to language	13
6.6.2 Guidance to language users	13
6.7 String termination [CJM]	14

6.8	Buffer boundary violation (buffer overflow) [HCB]	14
6.9	Unchecked array indexing [XYZ]	14
6.9.1	Applicability to language	14
6.9.2	Guidance to language users	14
6.10	Unchecked array copying [XYW]	14
6.11	Pointer type conversions [HFC]	14
6.11.1	Applicability to language	14
6.11.2	Guidance to language users	15
6.12	Pointer arithmetic [RVG]	15
6.13	Null pointer dereference [XYH]	15
6.13.1	Applicability to the language	15
6.13.2	Guidance to language users	15
6.14	Dangling reference to heap [XYK]	15
6.14.1	Applicability to language	15
6.14.2	Guidance to language users	16
6.15	Arithmetic wrap-around error [FIF]	16
6.16	Using shift operations for multiplication and division [PIK]	16
6.17	Choice of clear names [NAI]	16
6.17.1	Applicability to language	16
6.17.2	Guidance to language users	17
6.18	Dead store [WXQ]	17
6.18.1	Applicability to language	17
6.18.2	Guidance to language users	17
6.19	Unused variable [YZS]	17
6.19.1	Applicability to language	17
6.19.2	Guidance to language users	17
6.20	Identifier name reuse [YOW]	18
6.20.1	Applicability to language	18
6.20.2	Guidance to language users	18
6.21	Namespace issues [BJL]	18
6.22	Initialization of variables [LAV]	18
6.22.1	Applicability to language	18
6.22.2	Guidance to language users	19
6.23	Operator precedence/order of evaluation [JCW]	19
6.23.1	Applicability to language	19
6.23.2	Guidance to language users	19
6.24	Side-effects and order of evaluation [SAM]	20
6.24.1	Applicability to language	20
6.24.2	Guidance to language users	20
6.25	Likely incorrect expression [KOA]	20
6.25.1	Applicability to language	20
6.25.2	Guidance to language users	21
6.26	Dead and deactivated code [XYQ]	21
6.26.1	Applicability to language	21
6.26.2	Guidance to language users	21
6.27	Switch statements and static analysis [CLL]	21
6.27.1	Applicability to language	21
6.27.2	Guidance to language users	22
6.28	Demarcation of control flow [EOJ]	22
6.29	Loop control variables [TEX]	22
6.30	Off-by-one error [XZH]	22
6.30.1	Applicability to language	22
6.30.2	Guidance to language users	23
6.31	Unstructured programming [EWD]	23
6.31.1	Applicability to language	23
6.31.2	Guidance to language users	23
6.32	Passing parameters and return values [CSJ]	23
6.32.1	Applicability to language	23

6.32.2	Guidance to language users.....	23
6.33	Dangling references to stack frames [DCM].....	23
6.33.1	Applicability to language.....	23
6.33.2	Guidance to language users.....	24
6.34	Subprogram signature mismatch [OTR].....	24
6.34.1	Applicability to language.....	24
6.34.2	Guidance to language users.....	24
6.35	Recursion [GDL].....	25
6.35.1	Applicability to language.....	25
6.35.2	Guidance to language users.....	25
6.36	Ignored error status and unhandled exceptions [OYB].....	25
6.36.1	Applicability to language.....	25
6.36.2	Guidance to language users.....	25
6.37	Type-breaking reinterpretation of data [AMV].....	25
6.37.1	Applicability to language.....	25
6.37.2	Guidance to language users.....	26
6.38	Deep vs. shallow copying [YAN].....	26
6.38.1	Applicability to language.....	26
6.38.2	Guidance to language users.....	26
6.39	Memory leak and heap fragmentation [XYL].....	26
6.39.1	Applicability to language.....	26
6.39.2	Guidance to language users.....	27
6.40	Templates and generics [SYM].....	27
6.41	Inheritance [RIP].....	27
6.41.1	Applicability to language.....	27
6.41.2	Guidance to language users.....	27
6.42	Violations of the Liskov substitution principle or the contract model [BLP].....	28
6.42.1	Applicability to language.....	28
6.42.2	Guidance to language users.....	28
6.43	Redispatching [PPH].....	28
6.43.1	Applicability to language.....	28
6.43.2	Guidance to language users.....	28
6.44	Polymorphic variables [BKK].....	29
6.44.1	Applicability to language.....	29
6.44.2	Guidance to language users.....	29
6.45	Extra intrinsics [LRM].....	29
6.46	Argument passing to library functions [TR].....	29
6.46.1	Applicability to language.....	29
6.46.2	Guidance to language users.....	30
6.47	Inter-language calling [DJS].....	30
6.47.1	Applicability to language.....	30
6.47.2	Guidance to language users.....	30
6.48	Dynamically-linked code and self-modifying code [NYY].....	30
6.49	Library signature [NSQ].....	30
6.49.1	Applicability to language.....	30
6.49.2	Guidance to language users.....	31
6.50	Unanticipated exceptions from library routines [HJW].....	31
6.50.1	Applicability to language.....	31
6.50.2	Guidance to language users.....	31
6.51	Pre-processor directives [NMP].....	31
6.52	Suppression of language-defined run-time checking [MXB].....	31
6.52.1	Applicability to Language.....	31
6.52.2	Guidance to language users.....	32
6.53	Provision of inherently unsafe operations [SKL].....	32
6.53.1	Applicability to Language.....	32
6.53.2	Guidance to language users.....	32
6.54	Obscure language features [BRS].....	32
6.54.1	Applicability to language.....	32

6.54.2	Guidance to language users.....	32
6.55	Unspecified behaviour [BQF].....	32
6.55.1	Applicability to language.....	32
6.55.2	Guidance to language users.....	33
6.56	Undefined behaviour [EWF].....	33
6.56.1	Applicability to language.....	33
6.56.2	Guidance to language users.....	34
6.57	Implementation-defined behaviour [FAB].....	34
6.57.1	Applicability to language.....	34
6.57.2	Guidance to language users.....	35
6.58	Deprecated language features [MEM].....	35
6.58.1	Applicability to language.....	35
6.58.2	Guidance to language users.....	35
6.59	Concurrency — Activation [CGA].....	35
6.59.1	Applicability to language.....	35
6.59.2	Guidance to language users.....	35
6.60	Concurrency — Directed termination [CGT].....	36
6.60.1	Applicability to language.....	36
6.60.2	Guidance to language users.....	36
6.61	Concurrent data access [CGX].....	36
6.61.1	Applicability to language.....	36
6.61.2	Guidance to language users.....	36
6.62	Concurrency — Premature termination [CGS].....	36
6.62.1	Applicability to language.....	36
6.62.2	Guidance to language users.....	36
6.63	Protocol lock errors [CGM].....	37
6.63.1	Applicability to language.....	37
6.63.2	Guidance to language users.....	37
6.64	Reliance on external format strings [SHL].....	37
7	Language-specific vulnerabilities for Ada.....	37
8	Implications for standardization.....	37
Bibliography.....		39
Index.....		41

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 22, *Programming languages, their environments and system software interfaces*.

This first edition cancels and replaces ISO/IEC TR 24772:2013, which has been split into several parts.

This document is intended to be used with ISO/IEC TR 24772-1, which discusses programming language vulnerabilities in a language independent fashion.

A list of all parts in the ISO/IEC 24772 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.