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The MISRA AC documents are organized in a hierarchy representing the workflow of model-based development.The current focus of the MISRA AC guidelines is from the generic level (MISRA AC GMG) through to the use of graphical languages (currently MISRA AC SLSF).Historical documents have also covered automatic code generation (MISRA AC TL for TargetLink) and target languages (MISRA AC AGC for C). Guidelines for specific code generators are currently not maintained by MISRA. Guidelines for automatically generated C are now incorporated into MISRA C.MISRA would value suggestions for future items that should be covered, and volunteers to join Working Groups are very welcome. MISRA C was originally developed to fulfil the need for a restricted subset of a standardized programming language identified in the 1994 Development guidelines for vehicle based software and against the background of the emerging use of C for developing embedded software in automotive applications. Once MISRA C was published its relevance to other applications was quickly noted and subsequent revisions of the document have involved a number of experts from different industries and from tool vendors. Today MISRA C is the de facto standard for developing software in C where safety, security and code quality are important. Future developments of MISRA C will continue to extend support for newer versions of the language, and additional language features. The MISRA C 2012 guidelines are developed to enhance coding safety and security, particularly in automotive and embedded systems. Heres why these guidelines are important:Standardization of Code: MISRA C provides a standard set of coding rules that make the C code more predictable and easier to analyze.Enhanced Safety: By enforcing strict coding standards, MISRA C reduces the potential for software bugs that could lead to catastrophic failures, especially in automotive and aerospace sectors where malfunction can lead to serious consequences.Reduction in Risks: The guidelines restrict the use of certain C language functions and constructs that are prone to security vulnerabilities or undefined behaviors.Portability and Maintainability: Ensures that code is portable between compilers and platforms without unintentional side effects, thus reducing maintenance efforts.Security: Adds guidelines aimed at mitigating security vulnerabilities inherent in C code.Home/Hardcopies This link will take you to the Amazon UK marketplace to order hardcopies, please be sure to check your local marketplace for local printing and delivery options and prices. This link will take you to the Amazon UK marketplace to order hardcopies, please be sure to check your local marketplace for local printing and delivery options and prices. This link will take you to the Amazon UK marketplace to order hardcopies, please be sure to check your local marketplace for local printing and delivery options and prices. This link will take you to the Amazon UK marketplace to order hardcopies, please be sure to check your local marketplace for local printing and delivery options and prices. Subsequent to the publication of MISRA AC GMG:2023, a small number of errata have been found; these will be corrected in a future revision or update. Since its launch in 1998, the uptake and usage of MISRA C has far exceeded the authorss original expectations. MISRA C was originally developed to support the language requirements of the 1994 MISRA Guidelines, as noted above. Since that time, however, MISRA C has been adopted and used across a wide variety of industries and applications including the rail, aerospace, military and medical sectors. Furthermore, a significant number of tools are available that support enforcing the MISRA C rules. In Japan, a Japanese translation of MISRA C has been published by JSAE, and the MISRA C Study Group have produced a book (in Japanese) giving detailed explanations of the rules and additional code examples. Available White Papers IndividualMISRA SC: A structured argument for assuring SOTIFThis white paper was first presented at the WAISE conference in 2020 and looked to provide some practical guidance on how to construct a safety argument for automated driving. Within the paper, a high level structured safety argument is proposed using GSN that focusses on the Operational Design Domain (ODD) activation states and transitions. Automated Driving SeriesThe MISRA SC working group is currently producing a series of white papers that take a step back from the minutiae of technology and standards to consider the bigger picture of safety on the public roads. While we are motivated by the development of automated vehicles, we are actually starting with a consideration of the historic situation and what is effectively the undocumented safety argument. We hope that this will give an insight into what remains the same and what needs to change in the move to automated vehicles. These white papers can be downloaded from the Publications area or through the links on this page.Anyone currently working in the autonomous vehicle sector wishing to contribute to future white papers in this series can contact the MISRA SC Chair directly at MISRA SC WP1: Safety assurance argument context for automated drivingThe first white paper looks at personal transport modelled as a service and the implicit safety argument that could accompany it. It also considers the complete lifecycle safety argument for the vehicle and its parts. The white paper aims to lay the foundation to develop new insights in the way that we approach safety cases for future transportation. MISRA SC WP2: Uncovering the historical road safety argumentThis white paper explores the historical implicit argument for road safety, the roles of the parties involved and the differences between manually driven and AD-equipped vehicles. Available GuidelinesMISRA GASA Guidelines for Automotive Safety Arguments MISRA GASA Guidelines for Automotive Safety ArgumentsThe MISRA Guidelines for automotive safety arguments provide clarity on how to develop safety arguments in line with existing standards, with a view to justifying that the risk associated with an automotive system is within industry norms. Types of evidence to support the argument are also suggested, as well as advice on practical application.Though absolute safety, the absence of all risk, is an infeasible target, particularly for complex road vehicle systems involving embedded electronics and close interaction with human users, conformity with safety and quality standards and guidelines is necessary.Engineers have an obligation to investigate and communicate the level of risk associated with their systems and services, and are expected to produce and explain the evidence for the safe design and use of these systems. A key part of this is explicitly justifying why the available evidence is sufficient and trustworthy.The concept of Safety Cases has been widely adopted across the automotive industry and beyond. Most definitions of Safety Cases are centred on two concepts: evidence and argument. Current safety standards are, in general, good at providing detailed guidance on the different types of evidence that are recommended for meeting the compliance and safety requirements. However, there has been a lack of practical guidance on how safety arguments are developed, reviewed and maintained for automotive applications.These guidelines provide a more holistic framework through which to develop safety arguments, with practical guidance and examples.The concepts are applicable to safety standards used in all industries and are illustrated by detailed application to ISO 26262:2018. MISRA acts as the focal point for functional safety standardization activities in the UK automotive industry.MISRAs interests in functional safety go back to the early 1990s; our first publication Development guidelines for vehicle based software published in 1994 was the first automotive industry guidance on functional safety. It was published around 10 years before work started at the international level on ISO 26262. Many of the principles emerging in IEC 61508, such as safety integrity levels, were incorporated into this document. The approach to controllability in ISO 26262 can also be traced back to these guidelines and some EU research projects in the DRIVE Safely programme. MISRA C MISRA C++: Are you new to embedded systems programming and want to write safe, secure, and reliable C/C++ code? This beginner-friendly tutorial is your ultimate guide to understanding and applying MISRA-C and MISRA-C++ guidelines in real-world embedded projects. In this MISRA C MISRA C++ Guidelines 2025 edition, well walk you through: What is MISRA and why its important for automotive, aerospace, medical, and other safety-critical industries Detailed explanation of key MISRA-C and MISRA-C++ rules, including examples and rationale How to write compliant code step-by-step, avoiding undefined behavior and bugs Common pitfalls and how to fix violations in your code Using static analysis tools (like Parasoft, PC-lint, etc.) to check for compliance Practical tips for integrating MISRA compliance into your development workflow This tutorial is crafted to help beginners and professionals alike gain confidence in writing MISRA-compliant codeone concept at a time. Lets make your embedded software robust, maintainable, and industry-ready in 2025! MISRA stands for Motor Industry Software Reliability Association. It is a set of software development guidelines for the C and C++ programming languages, especially designed to: Improve code reliability, portability, and safety Avoid undefined behavior and compiler-specific behavior Ensure code can be used in critical systems, especially in automotive, aerospace, medical, and industrial software In embedded and safety-critical systems, even a small bug can lead to huge failures. MISRA helps you write safe, predictable, and standardized code that: Avoids risky language features Is easier to analyze and test Can be certified for safety (like ISO 26262 in automotive) FeatureMISRA-CMISRA-C++Language FocusC (especially C90, C99, C11)C++ (mainly C++03, some C++11)Use CaseWidely used in embedded CLess common, but used in modern automotive software (e.g., ADAS)Latest VersionMISRA C:2012 (with amendments)MISRA C++:2008 Each rule is categorized by: Mandatory Must always be followed Required Should be followed; deviations must be documented Advisory Good practice; optionalDirective High-level rule (e.g., All code should be traceable to a requirement) Rule Detailed code-specific rule (e.g., avoid goto) RuleDescriptionExampleRule 1.1Only standard headers must be used #include #include "myheader.h" (if non-standard)Rule 8.7Functions should have internal linkage if not used outside the file static void helper()Rule 11.4Avoid casting between pointers to different object types int *x = (int*)ptr;Rule 17.7Do not use goto goto error;Rule 21.1Use of standard library functions should be limited system("rm -rf /") RuleDescriptionExampleRule 0-1-1Avoid compiler-specific extensions __attribute__((packed))Rule 5-0-15Do not use reinterpret_cast reinterpret_cast(ptr)Rule 6-4-1Do not use multiple inheritance class A: public B, public CRule 7-1-1Avoid using new and deletePrefer static memory or smart pointers Read the GuidelinesOfficial documents are paid but summaries are available online Use a Static Code AnalyzerTools like:Parasoft PC-lint / FlexeLint Coverity Cppcheck (partial support) Write Clean and Portable CodeFollow:No goto No dangerous casts No dynamic memory unless necessary Always initialize variables Use Compiler WarningsSet high warning levels and treat warnings as errors. #include static int32_t add_numbers(int32_t a, int32_t b) { int32_t result = a + b; // Always initialized return result;}int main(void) { int32_t sum = add_numbers(5, 10); return 0; // No dynamic memory, no undefined behavior}MISRA Official Site Static analysis tools with MISRA support Open-source GitHub repos demonstrating MISRA compliance Automotive safety books (ISO 26262 + MISRA)Your project is written in CExample: Low-level firmware, device drivers, or bare-metal embedded systems. Youre working with microcontrollers with limited memory and no operating system. Safety and reliability are critical (automotive ECUs, medical devices, industrial sensors). You want to avoid risky or undefined behaviors in C (e.g., pointer misuse, buffer overflows). You need to follow standards like ISO 26262, DO-178C, IEC 61508, etc.Common Domains: Automotive, medical devices, industrial automation, robotics, defense.Your project uses C++ instead of C. Youre building complex embedded applications using object-oriented design (e.g., control systems, infotainment systems). You want to leverage C++ features (e.g., classes, inheritance, templates) but still need safety and predictability. Your team has C++ experience and your toolchain supports it. You need to comply with C++-specific safety standards (e.g., AUTOSAR Adaptive Platform).Common Domains: Automotive (infotainment, ADAS), drones, robotics, aerospace control systems.Use MISRA-C if youre writing in pure C, especially for low-level or real-time systems. Use MISRA-C++ if your embedded project uses modern C++, and you want to combine safety with high-level features. TermMeaningMISRACoding rules for safety-critical softwareMandatoryMust followRequiredShould follow (document if not)Static ToolTool to check MISRA violations What is MISRA? Why is it important? What are the goals of MISRA-C / MISRA-C++? What is the difference between MISRA-C and MISRA-C++? What do Mandatory, Required, and Advisory rules mean? What is undefined behavior in C, and how does MISRA help avoid it? Why does MISRA disallow the use of goto? Why should dynamic memory (malloc, new) be avoided in embedded systems according to MISRA? Why does MISRA suggest using static for functions not used outside the file? Why is type casting between incompatible types discouraged in MISRA? Can you name a few standard C functions that MISRA recommends avoiding?Explain the difference between a directive and a rule in MISRA. How does MISRA ensure portability across compilers and architectures? What are some limitations or criticisms of MISRA rules? How do you apply MISRA rules in a real project? What tools have you used to enforce MISRA compliance? What is a deviation? How is it handled in MISRA compliance? Explain Rule 11.4 (Avoid conversion between pointers to different object types). Why does MISRA-C++ restrict the use of multiple inheritance and virtual functions? How would you fix a violation of Rule 8.7 (Functions with internal linkage)? How do you handle third-party code that violates MISRA guidelines?How would you implement a MISRA compliance process in an existing codebase? What challenges do you face while using static analysis tools for MISRA? How do MISRA-C and ISO 26262 relate in terms of functional safety? What are the implications of using reinterpret_cast in C++ for safety-critical systems? Explain how MISRA helps in enabling formal verification or model-based design. Can you give an example of a rule violation that caused a bug or issue in production? How do you justify a deviation with traceability to requirements? How do you balance performance optimization and MISRA compliance? What is the difference between MISRA C:2004 and MISRA C:2012? Have you ever written custom rules in a static analysis tool to supplement MISRA? MISRA (Motor Industry Software Reliability Association) is a set of coding guidelines for C and C++ designed to help developers write safe, secure, and portable codeespecially in safety-critical industries like automotive, aerospace, and medical devices. MISRA-C applies to the C programming language (mostly used in embedded systems). MISRA-C++ applies to the C++ language, offering guidance for object-oriented programming in critical systems. Following MISRA helps: Prevent undefined behavior Improve code reliability and maintainability Ensure safety and compliance with industry standards (e.g., ISO 26262) No. Although MISRA was started by the automotive industry, it is now widely adopted in aerospace, medical, railway, industrial control, and defense sectors. Yes, most developers use static analysis tools like: PC-lint Parasoft Coverity Helix QACThese tools automatically detect violations of MISRA rules in your code. No. MISRA guidelines include: Mandatory rules (must always be followed) Required rules (must be followed unless a formal deviation is documented) Advisory rules (recommended best practices) Generally, MISRA discourages or forbids dynamic memory in embedded systems because of potential issues like fragmentation and non-determinism, especially in real-time systems. Start by: Understanding basic C/C++ syntax and behavior Reading MISRA rule categories (e.g., syntax, type safety, portability) Studying real-world code examples Using static analysis tools to get hands-on experience This tutorial covers: Introduction to MISRA-C and MISRA-C++ Deep dive into key rules with code examples Step-by-step guidance to write compliant code Static analysis integration How to document deviations and avoid common mistakes While the official MISRA documents provide complete rule sets and rationale, this tutorial offers simplified, beginner-friendly explanations. However, if youre working professionally, its recommended to purchase the official documentation from the MISRA website. Special thanks to @mr-raj for contributing to this article on EmbeddedPrepMr. Raj Kumar is a highly experienced Technical Content Engineer with 7 years of dedicated expertise in the intricate field of embedded systems. At Embedded Prep, Raj is at the forefront of creating and curating high-quality technical content designed to educate and empower aspiring and seasoned professionals in the embedded domain.Throughout his career, Raj has honed a unique skill set that bridges the gap between deep technical understanding and effective communication. His work encompasses a wide range of educational materials, including in-depth tutorials, practical guides, course modules, and insightful articles focused on embedded hardware and software solutions. He possesses a strong grasp of embedded architectures, microcontrollers, real-time operating systems (RTOS), firmware development, and various communication protocols relevant to the embedded industry.Raj is adept at collaborating closely with subject matter experts, engineers, and instructional designers to ensure the accuracy, completeness, and pedagogical effectiveness of the content. His meticulous attention to detail and commitment to clarity are instrumental in transforming complex embedded concepts into easily digestible and engaging learning experiences. At Embedded Prep, he plays a crucial role in building a robust knowledge base that helps learners master the complexities of embedded technologies.Software development standard for the C programming languageMISRA C is a set of software development guidelines for the C programming language developed by The MISRA Consortium. Its aims are to facilitate code safety, security, portability and reliability in the context of embedded systems, specifically those systems programmed in ISO C / C90 / C99.[1]There is also a set of guidelines for MISRA C++ not covered by this article.Draft: 1997[2]First edition: 1998 (rules, required/advisory)Second edition: 2004 (rules, required/advisory)Third edition: 2012 (directives; rules, Decidable/Undecidable)MISRA compliance: 2016, updated 2020MISRA C:2023 (MISRA C Third edition, Second revision)For the first two editions of MISRA-C (1998 and 2004) all Guidelines were considered as Rules. With the publication of MISRA C:2012 a new category of Guideline was introduced - the Directive whose compliance is more open to interpretation, or relates to process or procedural matters.Although originally specifically targeted at the automotive industry, MISRA C has evolved as a widely accepted model for best practices by leading developers in sectors including automotive, aerospace, telecom, medical devices, defense, railway, and others.For example:The Joint Strike Fighter project C++ Coding Standards[3] are based on MISRA-C:1998.The NASA Jet Propulsion Laboratory C Coding Standards[4] are based on MISRA-C:2004.IEC 81001-5-1:2021 Health software and health IT systems safety, effectiveness and security - Part 5-1: Security - Activities in the product lifecycle cites MISRA C as an example of secure coding best practices.ISO 26262 Functional Safety - Road Vehicles cites MISRA C as being an appropriate sub-set of the C language:ISO 26262-6:2011 Part 6: Product development at the software level[5] cites MISRA-C:2004 and MISRA AC AGC.ISO 26262-6:2018 Part 6: Product development at the software level[6] cites MISRA C:2012.The AUTOSAR General Software Specification (SRS_BSW_00007) likewise cites MISRA C:The AUTOSAR 4.2 General Software Specification[7] requires that If the BSW Module implementation is written in C language, then it shall conform to the MISRA C:2004 Standard.The AUTOSAR 4.3 General Software Specification[8] requires that If the BSW Module implementation is written in C language, then it shall conform to the MISRA C:2012 Standard.When a new software project is started, the latest MISRA standard should be used. Previous standards are still available for use with legacy software projects that need to refer to it.[9]Each Guideline is classified[10] as Mandatory (new for MISRA C:2012), Required or Advisory. Furthermore, the MISRA Compliance document permits Advisory guidelines to be Disapplied.Mandatory guidelines shall always be complied withRequired guidelines shall be complied with, unless subject to a DeviationAdvisory guidelines are considered good practice, but compliance is less formal.The rules can be divided logically into a number of categories:Avoiding possible compiler differences, for example, the size of C's int type may vary but int16_t (standardized in C99) is always 16 bits.Avoiding using functions and constructs that are prone to failure, for example, malloc may fail.Produce maintainable and debuggable code, for example, naming conventions and commenting.Best practice rules.Complexity limits.MISRA C:2012 separately classifies each guideline as either Single Translation Unit or System.[10]MISRA C:2012 classifies the rules (but not the directives) as Decidable or Undecidable.MISRA published documents to provide additional guidance to understand and achieve MISRA compliance.MISRA Compliance:2016, was released by MISRA in April 2016.[11]MISRA Compliance:2020, revised edition, was released in February 2020.[12]In order for a piece of software to claim to be compliant to the MISRA C Guidelines, all mandatory rules shall be met and all required rules and directives shall either be met or subject to a formal deviation. Advisory rules may be disapplied without a formal deviation, but this should still be recorded in the project documentation.Note: For compliance purposes, there is no distinction between rules and directives.Many MISRA C rules can be characterized as guidelines because under certain condition software engineers may deviate from rules and still be considered compliant with the standard. Deviations must be documented either in the code or in a file. In addition; proof must be provided that the software engineer has considered the safety of the system and that deviating from the rule will not have a negative impact, requirements for deviations also include:The rule deviated from.Rationale for deviation.[13]The first edition of MISRA C, "Guidelines for the use of the C language in vehicle based software", which was published in 1998 and is officially known as MISRA-C:1998.[14]MISRA-C:1998 has 127 rules, of which 93 are required and 34 are advisory; the rules are numbered in sequence from 1 to 127.In 2004, a second edition "Guidelines for the use of the C language in critical systems", or MISRA-C:2004 was produced, with many substantial changes to the guidelines, including a complete renumbering of the rules.MISRA-C:2004 contains 142 rules, of which 122 are "required" and 20 are "advisory"; they are divided into 21 topical categories, from "Environment" to "Run-time failures".In 2013, the third edition, MISRA C:2012, was published. MISRA C:2012 extends support to the C99 version of the C language (while maintaining guidelines for C90), in addition to including a number of improvements that can reduce the cost and complexity of compliance, whilst aiding consistent, safe use of C in critical systems.[15]MISRA-C:2012 contains 143 rules and 16 "directives" (that is, rules whose compliance is more open to interpretation, or relates to process or procedural matters); each of which is classified as mandatory, required, or advisory. They are separately classified as either Single Translation Unit or System. Additionally, the rules are classified as Decidable or Undecidable.In April 2016, MISRA published (as a free download) MISRA C:2012 - Amendment 1: Additional Security Guidelines[16] which added fourteen new security guidelines.In February 2020, MISRA published (as a free download) MISRA C:2012 - Amendment 2: Updates for ISO/IEC 9899:2011/18 Core functionality[17] which adds mapping for the undefined, unspecified and implementation defined behaviours within C11/C18.MISRA have published the following addenda to support MISRA C:2012:MISRA C:2012 - Addendum 1: Rule Mappings,[18] which contains bi-directional rule mappings between MISRA C:2004 and the new version. It is intended to assist users in migration.MISRA C:2012 - Addendum 2: Coverage of MISRA C:2012 against ISO/IEC TS 17961:2013 "C Secure"[19]MISRA C:2012 - Addendum 3:Coverage of MISRA C:2012 against CERT C[20]In May 2023 MISRA published MISRA C:2023 (MISRA C Third edition, Second revision) which incorporates Amendments 2 4 (AMD2, AMD3, AMD4) and Technical Corrigendum 2 (TC2) and incorporates support for C11 and C17 language features. [21]An exemplar suite (for MISRA-C:2004 and MISRA C:2012) is available from the MISRA GitLab[22] repository (login required). This allows tool-users to evaluate and compare the checking support provided by the various MISRA tools; additionally, it gives tool-implementers some guidance as to the intent of the MISRA Guidelines.See also: List of tools for static code analysisWhile there exist many software tools that claim to check code for "MISRA conformance", there is no MISRA certification process.[23]Most of the guidelines can be checked using tools that perform static code analysis. The remaining guidelines require the use of dynamic code analysis.Tools that check code for MISRA conformance include:Astre by AbsIntAxivion Bauhaus Suite by Axivion GmbH. MISRA C:2004, C:2012, C:2012 Amendment 1, C++:2008, Compliance:2016.CodeSonar by GrammaTechCoverity by Synopsys - Static AnalysisCppcheck - Open source Static Analysis tool for C/C++ECLAIR by BUGSENG srl. MISRA C:2004, C:2012, C:2012 Amendment 1, C++:2008.Helix QAC by Perforce Software. MISRA C:1998, C:2004, C:2012, C++:2008.[24]Klocwork by Rogue Wave Software (now owned by Perforce Software[25]). MISRA C:2012, C:2012 Amendment 1, C++:2008.[26]LDRA Testbed by Liverpool Data Research AssociatesParasoft C/C++test by Parasoft. MISRA C 1998, MISRA C 2004, MISRA C 2012 AMD1, AMD2 and AMD3, MISRA C++ 2008, Draft version of MISRA C++ 202x.[27]PC-Lint by Gimpel Software (now owned by Vector Informatik GmbH). MISRA C:1998, C:2004, C:2012, C++:2008.[28]Polyspace by MathWorksPVS-Studio by Program Verification SystemsSonarQube by SonarSource (open source with some commercial plug-in components)SQuORE by Squoring TechnologiesUnderstand by SciToolsC/C++ compilers that support MISRA conformance include:Green Hills SoftwareIAR Systems - MISRA C:1998, C:2004, C:2012, C++:2008.[29]TASKING - MISRA C:1998, C:2004, C:2012.Some research results question the effectiveness of MISRA C 2004.In a paper that compares earlier work on MISRA C:1998 with MISRA C:2004, Les Hatton comes to the conclusion that:[30]In view of the apparent widening influence of the MISRA C standard, this paper attempts to assess whether important deficiencies in the original standard have been addressed satisfactorily. Unfortunately, they have not and the important real to false positive ratio is not much better in MISRA C 2004 than it was in MISRA C 1998 and it is unacceptably low in both.He goes on to state:[30]In its present form, the only people to benefit from the MISRA C 2004 update would appear to be tool vendors and it is to be hoped that steps will be taken both to simplify the wording and to reduce the false positive ratio in future revisions by taking a little more notice of published experimental data and being less tempted to invent rules on the basis that they seem a good idea.A study at the TU Delft, by Cathal Boogerd and Leon Moonen, empirically assesses the value of MISRA C:2004. It comes to similar results:[31]From the data obtained, we can make the following key observations. First, there are 9 out of 72 rules for which violations were observed that perform significantly better (= 0.05) than a random predictor at locating fault-related lines. The true positive rates for these rules range from 24-100%. Second, we observed a negative correlation between MISRA rule violations and observed faults. In addition, 29 out of 72 rules had a zero true positive rate. Taken together with Adams' observation that all modifications have a non-zero probability of introducing a fault, this makes it possible that adherence to the MISRA standard as a whole would have made the software less reliable.Programming style^ "MISRA clarifies safe and secure uses of the C language". www.misra.org.uk. Archived from the original on 2020-08-04. Retrieved 2019-10-09.^ In spring 1997 software engineers at the Austin Rover Group (ARG) sent a draft C coding standard to Programming Research Ltd (PRL) for review. The review was performed by PRL's then senior consultant, David Blyth, who proposed replacing the draft with an appreciably stronger set of coding rules. Those rules, with minor changes, formed the basis of the first edition of MISRA C.^ "Joint Strike Fighter Air Vehicle C++ Coding Standards" (PDF). Retrieved 2019-07-16.^ "JPL Institutional Coding Standard for the C Programming Language" (PDF). Retrieved 2019-07-16.^ "ISO 26262-6:2011 Road vehicles -- Functional safety -- Part 6: Product development at the software level". iso.org. ISO. Retrieved 2019-07-16.^ "ISO 26262-6:2018 Road vehicles -- Functional safety -- Part 6: Product development at the software level". iso.org. ISO. Retrieved 2019-07-16.^ "AUTOSAR 4.2 General Software Specification" (PDF). autosar.org. Archived from the original (PDF) on 2018-09-20. Retrieved 2019-07-16.^ "AUTOSAR 4.3 General Specification of Basic Software Modules" (PDF). autosar.org. AutoSAR. 2016-11-30. Archived from the original (PDF) on 2018-09-20. Retrieved 2019-07-16.^ "MISRA publications". Archived from the original on 2016-06-14. Retrieved 2016-06-18.^ a b "Fact Sheet: MISRA C:2012 (PDF)" (PDF). programmingresearch.com. Retrieved 10 June 2013.^ "MISRA Compliance:2016 (PDF)". MISRA. Retrieved 22 July 2016.^ "MISRA Compliance:2020 (PDF)" (PDF). MISRA. Retrieved 8 April 2020.^ "Achieving MISRA C:2012 Compliance". Parasoft. Retrieved May 29, 2017.^ "A brief history of MISRA C". MISRA. 2013-03-18. Archived from the original on 2017-06-07. Retrieved 2014-06-30.^ "MISRA C:2012 release date announced". MISRA. 26 February 2013. Retrieved 10 June 2013.^ "MISRA C:2012 - Amendment 1 (PDF)". MISRA. April 2016. Retrieved 31 October 2019.^ "MISRA C:2012 - Amendment 2 (PDF)". MISRA. February 2020. Retrieved 6 January 2021.^ "MISRA C:2012 - Addendum 1: Rule Mapping (PDF)".^ "MISRA C:2012 - Addendum 2: Coverage of MISRA C:2012 against ISO/IEC TS 17961:2013 "C Secure" (PDF)".^ "MISRA C:2012 - Addendum 3: Coverage of MISRA C:2012 against CERT C (PDF)".^ "MISRA".^ MISRA GitLab repository^ "MISRA C FAQ list." Archived 2017-07-06 at the Wayback Machine MISRA Consortium^ "Helix QAC for C and C++ | Perforce".^ "Clearlake Capital-Backed Perforce Software to Acquire Rogue Wave Software | Perforce".^ "Klocwork for C, C++, C#, Java, and JavaScript | Perforce".^ "C/C++ Built-in Test Configurations". Parasoft. 17 October 2022. Retrieved 9 March 2023.^ MISRA conformance checking, PC-lint/FlexeLint, Gimpel Software.^ Languages and Standards; iar.com^ a b Language subsetting in an industrial context: a comparison of MISRA C 1998 and MISRA C; Les Hatton; University of Kingston; 2004.^ Assessing the Value of Coding Standards: An Empirical Study; C.J. Boogerd and L. Moonen; Delft University of Technology; 2008.Official website "Introduction to MISRA C". embedded.com. July 2002."MISRA C: Safer Is Better". Electronic Design magazine. 3 February 2003."Commentary on the first edition of the MISRA C guidelines". knosof.co.uk."New Version of MISRA C: Why Should You Care?". Electronic Design magazine. 25 February 2013."MISRA C:2012: Plenty Of Good Reasons To Change". Electronic Design magazine. 25 February 2013."MISRA C:2012 fact sheet" (PDF). programmingresearch.com."MISRA C:2012 ensures automotive software safety". EE Times magazine."Compliance to MISRA C: Code Generation". Mathworks. Archived from the original on 2015-12-08. Retrieved 2016-02-07.Retrieved from " Share copy and redistribute the material in any medium or format for any purpose, even commercially. Adapt remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Attribution You must give appropriate credit , provide a link to the license, and indicate if changes were made . You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. ShareAlike If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. No additional restrictions You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits. You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation . No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. MISRA C is the most widely used set of coding guidelines for C around the world. There have been three releases of the MISRA C standard.MISRA C:1998MISRA C:1998 was published in 1998 and remains widely used today. It was written for C90. There are 127 coding rules, including:Rule 59The statement forming the body of an "if", "else if", "else", "while", "do ... while", or "for" statement shall always be enclosed in bracesMISRA C:2004MISRA C:2004 is the second edition of MISRA C, published in 2004. It was written for C90. There are 142 coding rules, including:Rule 14.9An if (expression) construct shall be followed by a compound statement. The else keyword shall be followed by either a compound statement, or another if statement.Rule 14.10All if else if constructs shall be terminated with an else clause.MISRA C:2012MISRA C:2012 is the third edition of MISRA C, published in 2012. It was written for C99 and C90 to provide better rationales for the guidelines and more precise descriptions. There are 143 rules, including:Rule 18.1A pointer resulting from arithmetic on a pointer operand shall address an element of the same array as that pointer operand Related White Paper: 6 Key Changes in MISRA:C 2012MISRA C:2012 Amendment 1MISRA C 2012 Amendment 1 was released in 2016. The aim of AMD1 was to add security guidelines. With this amendment, MISRA C:2012 includes 156 rules and 17 directives for a total of 173 guidelines, including:Rule 12.5Thesizeofoperator shall not have an operand which is a function parameter declared as "array of type"MISRA C:2012 Amendment 2MISRA C 2012 Amendment 2 was released in 2020 and adds coverage for C11 core functionality. It adds two new rules. With this amendment, MISRA C:2012 includes 158 rules and 17 directives for a total of 175 guidelines. The new rules are:Rule 1.4Emergent language features shall not be usedRule 21.21The Standard Library function system of shall not be usedMISRA C:2012 Amendment 3MISRA C 2012 Amendment 3 was released in 2022 and adds guidance for C11 and C18 new features previously prevented by Rule 1.4. It adds 24 new rules and 1 new directive. This makes a total of 182 rules and 18 directives, for a total of 200 guidelines.Additionally, a number of existing guidelines have been revised together with supporting materials.The new rules include further guidance on some of the emergent features previously covered by Rule 1.4, specifically:Rules 8.15-8.17Alignment of objects ()Rules 17.9-17.13No-return functions ()Rules 23.1-23.7Type generic expressions (_Generic)Rule 1.4 has been updated to remove the guidance on these features provided in Amendment 2.Further guidance is provided with:Rule 1.5Obsolescent language features shall not be usedRule 6.3Bit field in unionsRule 7.5Integer-constant macrosRule 18.9Object lifetimeRules 21.22-21.23Type generic math macros ()Rule 21.24The random number generator functions of Directive 4.15Floating point (including comparisons, NaNs, and infinities)The essential type model has been extended to include of essentially complex floating.MISRA C:2012 Amendment 4Amendment 4 was released in 2023 and completes guidance for C11 and C18 new features to include multithreading (Rules 22.11 - 22.20) and atomics (updates to various rules). AMD4 adds 19 new rules and directives, with 221 guidelines total.MISRA C:2023A new revision of MISRA C:2012 was published in 2023. It is a rollup of all the previous amendments and technical corrigenda and is known as MISRA C:2023. MISRA C:2023 covers C90, C99, and C11/C18. It adds 200 new rules and 21 directives, with 221 guidelines total. MISRA C:2023 is also referred to as MISRA C Third Edition, second revision.MISRA C:2025A new release of MISRA C was published in 2025. It is stand-alone and is known as MISRA C:2025. MISRA C:2025 covers C90, C99, and C11/C18 and adds new guidelines to MISRA C:2023. It also reorganizes, renumbers or rationalizes some of the existing guidelines to provide more continuity across the standard. It includes 5 new guidelines, and one disapplied (a new category introduced in MISRA C:2025) to give a total of 225 active guidelines.What Are Important MISRA C++ Rules? And MISRA C++ Rules With ExamplesMISRA C++ is widely used by safety-critical developers.MISRA C++2008MISRA C++:2008 was published in 2008. It was written for C++03. There are 228 coding rules, including:Rule 5-0-13The condition of an if-statement and the condition of an iteration statement shall have type bool.MISRA C++:2023 (formerly referred to as MISRA C++:202x)MISRA C++:2023 is a new standard for use with modern C++ up to C++17 and incorporatingAUTOSAR guidelines. Related Resource: MISRA and AUTOSAR to Unite C++ Coding Guidelines What This MeansHow to Achieve MISRA C and MISRA C++ Compliance?Achieving MISRA compliance takes knowledge, skill, and the right tools.Here are seven steps to comply with MISRA:1. Know the RulesYou need to know the MISRA coding rules pertinent to which version of C or C++ youre using.2. Check Your Code ConstantlyContinuously inspecting your code for violations is the best way to improve quality.3. Set BaselinesEmbedded systems come with legacy codebases. By setting baselines, you can focus on making sure your new code is compliant.4. Prioritize Violations Based on RiskYou could have hundreds or even thousands of violations in your code. Thats why its important to prioritize rule violations based on risk severity. Some static code analysis tools can do this for you.5. Document Your DeviationsSometimes there are exceptions to the rule. But when it comes to compliance, every rule deviation needs to be well-documented.6. Monitor Your MISRA ComplianceKeep an eye on how MISRA compliant your code is. Using a static code analyzer makes this easier by automatically generating a compliance report.7. Choose the Right Static Code AnalyzerChoosing the right static code analyzer makes everything else easy. It takes care of scanning your code new and legacy for violations. It prioritizes vulnerabilities based on risk.Complying with MISRA is important for many development teams today. Especially as virtualization rises. Related Resource: See how an automotive hypervisor achieves MISRA complianceBut not all MISRA checkers are the same Related Resource: How to Compare MISRA CheckersUsing Perforce QAC For MISRA C RulesPerforce QAC finds and reports on violations of MISRA rules and directives in C and C++.Here's a short demo using Perforce QAC with MISRA C:2012 guidelines.Why Use Perforce QAC for MISRA Compliance? Independently certified for use in the development of safety-critical software.Fully documented rule enforcement and message interpretation.Supplied with extensive example code.Fully configurable rules processing.Compliance reports for functional safety audits.How Embedded Developers Use Perforce QAC For MISRA?See how leaders in embedded industries automotive, aerospace, and rail use Helix QAC and MISRA. It aims to facilitate code safety, security, portability and reliability in the context of embedded systems, specifically those systems programmed in ISO C / C99 / C11. Quality Attributes Required or Emphasized The guidelines are designed to enforce a safer subset of the C language, which directly impacts several quality attributes: Attribute Relevance in MISRA C Safety The primary goal. The rules are designed to prevent undefined behavior and common programming errors that can lead to safety hazards. Reliability Enforced by rules that reduce the likelihood of defects and unexpected behavior. Maintainability Promoted through rules that improve code clarity, consistency, and comprehensibility. Portability Addressed by rules that avoid implementation-defined behavior, making the code more portable across different compilers and platforms. Security Many rules that enhance safety also contribute to security by preventing vulnerabilities such as buffer overflows and data corruption. Note: Compliance with MISRA C is often a requirement in safety-critical industries such as automotive, aerospace, and medical devices. References Official Standards Documents The MISRA C guidelines are published by the Motor Industry Software Reliability Association (MISRA). ISO/IEC 9899 - The C programming language standard. Additional Resources 162 qualities found.

C coding standards. Misra coding standards. Misra coding style. Misra coding guidelines. Misra coding standards for embedded c programming. Embedded c coding standards misra. Misra c coding standards pdf.

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