**Green Pace Developer: Security Policy Guide Template**



# Green Pace Secure Development Policy

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## Overview

Software development at Green Pace requires consistent implementation of secure principles to all developed applications. Consistent approaches and methodologies must be maintained through all policies that are uniformly defined, implemented, governed, and maintained over time.

## Purpose

This policy defines the core security principles; C/C++ coding standards; authorization, authentication, and auditing standards; and data encryption standards. This article explains the differences between policy, standards, principles, and practices (guidelines and procedure): [Understanding the Hierarchy of Principles, Policies, Standards, Procedures, and Guidelines](https://www.linkedin.com/pulse/understanding-hierarchy-principles-policies-standards-wally-beddoe/).

## Scope

This document applies to all staff that create, deploy, or support custom software at Green Pace.

## Module Three Milestone

### Ten Core Security Principles

| **Principles** | Write a short paragraph explaining each of the 10 principles of security. |
| --- | --- |
| 1. ValidateInput Data | Test inputs to make sure that only proper data is used which then enters an information system, and improper or malicious data is prevented. |
| 1. Heed Compiler Warnings | Such warnings exist to notify a developer of any potential errors or issues in code. An error prevents the code from compiling while warnings do not, but both are equally important to consider code modification in preventing any potential security risks. |
| 1. Architect and Design for Security Policies | Its important to consider software architecture and design when implementing security policies, such as separating a system into sub systems with different authorization or privilege levels. |
| 1. Keep It Simple | Its good practice to keep the design simple and small which reduces likelihood of errors in both coding and use. This principle can also potentially minimize the complexity of security required. |
| 1. Default Deny | By default, access is denied, and access is permitted through the conditions of the protection scheme used. |
| 1. Adhere to the Principle of Least Privilege | Processes should be able to be executed with minimal required privileges needed to complete the job, and elevated privileges should be used as minimally as possible and with as little time as needed. This helps lower the chance that an attacker must execute code with elevated privileges |
| 1. Sanitize Data Sent to Other Systems | Unused functions, or calls made from context may pass and cause damage such as SQL injection attacks. Sanitizing data before passing the data to other systems checks these potential issues prior to invoking these systems. |
| 1. Practice Defense in Depth | Having multiple layers to defense, can mitigate possible exploits or damage should one layer of defense be made vulnerable. |

|  |  |
| --- | --- |
| 1. Use Effective Quality Assurance Techniques | Proper testing, such as fuzz and penetration testing, as well as audits to code, can be part of an effective QA program. Security reviews, both internal and external, can help identify and correct possible issues. |
| 1. Adopt a Secure Coding Standard | Its good practice to apply coding standards in your language and platform of choice to be secure from the start. |

### C/C++ Ten Coding Standards

Complete the coding standards portion of the template according to the Module Three milestone requirements. In Project One, follow the instructions to add a layer of security to the existing coding standards. Please start each standard on a new page, as they may take up more than one page. The first seven coding standards are labeled by category. The last three are blank so you may choose three additional standards. Be sure to label them by category and give them a sequential number for that category. Add compliant and noncompliant sections as needed to each coding standard.

#### Coding Standard 1

| **Coding Standard** | **Label** | **Name of Standard** |
| --- | --- | --- |
| **Data Type** | [STD-001-CPP] | Obey the one-definition rule |

Source: <https://wiki.sei.cmu.edu/confluence/display/cplusplus/DCL60-CPP.+Obey+the+one-definition+rule>

| **Noncompliant Code** |
| --- |
| Two different translation units define a class of the same name with differing definitions. |
| // a.cpp  struct S {  **int** a;  };    // b.cpp  class S {  public:  **int** a;  }; |

| **Compliant Code** |
| --- |
| Use of a header file to introduce the object into both translation units. |
| // S.h  struct S {  **int** a;  };    // a.cpp  #include "S.h"    // b.cpp  #include "S.h" |

**Note: Stop here for the milestone. Complete this section for Project One in Module Six.**

| **Principles(s):**  3: Architect and Design for Security Policies  4: Keep It Simple  10: Adopt a Secure Coding Standard |
| --- |

**Threat Level**

| **Severity** | **Likelihood** | **Remediation Cost** | **Priority** | **Level** |
| --- | --- | --- | --- | --- |
| High | Unlikely | High | P3 | L3 |

**Automation**

| **Tool** | **Version** | **Checker** | **Description Tool** |
| --- | --- | --- | --- |
| Astrée | 20.10 | type-compatibility  definition-duplicate  undefined-extern  undefined-extern-pure-virtual  external-file-spreading  type-file-spreading | Partially checked |
| Axivion Bauhaus Suite | 7.2.0 | CertC++-DCL60 | - |
| Parasoft C/C++test | 2021.1 | CERT\_CPP-DCL60-a | A class, union or enum name (including qualification, if any) shall be a unique identifier |
| LDRA tool suite | 9.7.1 | 286 S, 287 S | Fully Implemented |

#### Coding Standard 2

| **Coding Standard** | **Label** | **Name of Standard** |
| --- | --- | --- |
| **Data Value** | [STD-002-CPP] | Do not read uninitialized memory |

Source: <https://wiki.sei.cmu.edu/confluence/display/cplusplus/EXP53-CPP.+Do+not+read+uninitialized+memory>

| **Noncompliant Code** |
| --- |
| Uninitialized local variable is evaluated as part of an expression to print its value, resulting in undefined behavior. |
| #include <iostream>    void f() {  **int** i;    std::cout << i;  } |

| **Compliant Code** |
| --- |
| Object is initialized prior to printing its value. |
| #include <iostream>    void f() {  **int** i = 0;    std::cout << i;  } |

**Note: Stop here for the milestone. Complete this section for Project One in Module Six.**

| **Principles(s):**  1: ValidateInput Data  4: Keep It Simple  10: Adopt a Secure Coding Standard |
| --- |

**Threat Level**

| **Severity** | **Likelihood** | **Remediation Cost** | **Priority** | **Level** |
| --- | --- | --- | --- | --- |
| High | Probable | Medium | P12 | L1 |

**Automation**

| **Tool** | **Version** | **Checker** | **Description Tool** |
| --- | --- | --- | --- |
| Astrée | 20.10 | uninitialized-read | Partially checked |
| Helix QAC | 2021.2 | C++2726, C++2727, C++2728, C++2961, C++2962, C++2963, C++2966, C++2967, C++2968, C++2971, C++2972, C++2973, C++2976, C++2977, C++2978 | - |
| LDRA tool suite | 9.7.1 | 53 D, 69 D, 631 S, 652 S | Partially implemented |
| Polyspace Bug Finder | R2021a | CERT C++: EXP53-CPP | Checks for:   * Non-initialized variable * Non-initialized pointer   Rule partially covered. |

#### Coding Standard 3

| **Coding Standard** | **Label** | **Name of Standard** |
| --- | --- | --- |
| **String Correctness** | [STD-003-CPP] | Do not attempt to create a std::string from a null pointer |

Source: <https://wiki.sei.cmu.edu/confluence/display/cplusplus/STR51-CPP.+Do+not+attempt+to+create+a+std%3A%3Astring+from+a+null+pointer>

| **Noncompliant Code** |
| --- |
| A std::string object is created from the results of a call to std::getenv(). However, because std::getenv() returns a null pointer on failure, this code can lead to undefined behavior when the environment variable does not exist. |
| #include <cstdlib>  #include <string>    void f() {    std::string tmp(std::getenv("TMP"));    if (!tmp.empty()) {      // ...    }  } |

| **Compliant Code** |
| --- |
| The results from the call to std::getenv() are checked for null before the std::string object is constructed. |
| #include <cstdlib>  #include <string>    void f() {    const **char** \*tmpPtrVal = std::**getenv**("TMP");    std::string tmp(tmpPtrVal ? tmpPtrVal : "");    if (!tmp.empty()) {      // ...    }  } |

**Note: Stop here for the milestone. Complete this section for Project One in Module Six.**

| **Principles(s):**  2: Heed Compiler Warnings |
| --- |

**Threat Level**

| **Severity** | **Likelihood** | **Remediation Cost** | **Priority** | **Level** |
| --- | --- | --- | --- | --- |
| High | Likely | Medium | P18 | L1 |

**Automation**

| **Tool** | **Version** | **Checker** | **Description Tool** |
| --- | --- | --- | --- |
| Astrée | 20.10 | Assert\_failure | - |
| Helix QAC | 2021.2 | C++4770, C++4771, C++4772, C++4773, C++4774 | - |
| Klocwork | 2021.1 | NPD.CHECK.CALL.MIGHT  NPD.CHECK.CALL.MUST  NPD.CHECK.MIGHT  NPD.CHECK.MUST  NPD.CONST.CALL  NPD.CONST.DEREF  NPD.FUNC.CALL.MIGHT  NPD.FUNC.CALL.MUST  NPD.FUNC.MIGHT  NPD.FUNC.MUST  NPD.GEN.CALL.MIGHT  NPD.GEN.CALL.MUST  NPD.GEN.MIGHT  NPD.GEN.MUST  RNPD.CALL  RNPD.DEREF | - |
| Parasoft C/C++test | 2021.1 | CERT\_CPP-STR51-a | Avoid null pointer dereferencing |

#### Coding Standard 4

| **Coding Standard** | **Label** | **Name of Standard** |
| --- | --- | --- |
| **SQL Injection** | [STD-004-CPP] | Prevent SQL injection |

Java version source (for reference): <https://wiki.sei.cmu.edu/confluence/display/java/IDS00-J.+Prevent+SQL+injection>

| **Noncompliant Code** |
| --- |
| Without precautions, the untrusted data may maliciously alter the query. |
| uName = getRequestString("username");  uPass = getRequestString("userpassword");  sql = “SELECT \* FROM Users WHERE Name = " + uName + " AND Pass = " +  uPass + ” |

| **Compliant Code** |
| --- |
| The primary means of preventing SQL injection are sanitization and validation, which are typically implemented as parameterized queries and stored procedures. |
| PreparedStatement pStmt = PreparedStatement();  std::cin >> username;  std::cin >> userpassword;  sql = “SELECT \* FROM Users WHERE Name = %s AND Pass = %s;”, username,  userpassword}; |

**Note: Stop here for the milestone. Complete this section for Project One in Module Six.**

| **Principles(s):**  1: ValidateInput Data  7: Sanitize Data Sent to Other Systems  10: Adopt a Secure Coding Standard |
| --- |

**Threat Level**

| **Severity** | **Likelihood** | **Remediation Cost** | **Priority** | **Level** |
| --- | --- | --- | --- | --- |
| High | Probable | Medium | P12 | L1 |

**Automation**

| **Tool** | **Version** | **Checker** | **Description Tool** |
| --- | --- | --- | --- |
| Coverity | 7.5 | SQLI  FB.SQL\_PREPARED\_STATEMENT\_GENERATED\_  FB.SQL\_NONCONSTANT\_STRING\_PASSED\_TO\_EXECUTE | Implemented |
| The Checker Framework | 2.1.3 | Tainting Checker | Trust and security errors (see Chapter 8) |
| Fortify | 1.0 | HTTP\_Response\_Splitting  SQL\_Injection\_\_Persistence  SQL\_Injection | Implemented |
| Parasoft Jtest | 2021.1 | CERT.IDS00.TDSQL | Protect against SQL injection |

#### Coding Standard 5

| **Coding Standard** | **Label** | **Name of Standard** |
| --- | --- | --- |
| **Memory Protection** | [STD-005-CPP] | Do not access freed memory |

Source: <https://wiki.sei.cmu.edu/confluence/display/cplusplus/MEM50-CPP.+Do+not+access+freed+memory>

| **Noncompliant Code** |
| --- |
| S is dereferenced after it has been deallocated. If this access results in a write-after-free, this can be exploited to run arbitrary code with the permissions of the vulnerable process. |
| #include <new>    struct S {    void f();  };    void g() noexcept(false) {    S \*s = new S;    // ...    delete s;    // ...    s->f();  } |

| **Compliant Code** |
| --- |
| The dynamically allocated memory is not deallocated until it is no longer required. |
| #include <new>    struct S {    void f();  };    void g() noexcept(false) {    S \*s = new S;    // ...    s->f();    delete s;  } |

**Note: Stop here for the milestone. Complete this section for Project One in Module Six.**

| **Principles(s):**  2: Heed Compiler Warnings  5: Default Deny  6: Adhere to the Principle of Least Privilege  9: Use Effective Quality Assurance Techniques |
| --- |

**Threat Level**

| **Severity** | **Likelihood** | **Remediation Cost** | **Priority** | **Level** |
| --- | --- | --- | --- | --- |
| High | Likely | Medium | P18 | L1 |

**Automation**

| **Tool** | **Version** | **Checker** | **Description Tool** |
| --- | --- | --- | --- |
| Clang | 3.9 | clang-analyzer-cplusplus.NewDelete  clang-analyzer-alpha.security.ArrayBoundV2 | Checked by clang-tidy but does not catch all violations of this rule. |
| Coverity | V7.5.0 | USE\_AFTER\_FREE | Can detect the specific instances where memory is deallocated more than once or read/written to the target of a freed pointer |
| Parasoft C/C++test | 2021.1 | CERT\_CPP-MEM50-a | Do not use resources that have been freed |
| Parasoft Insure++ | - | - | Runtime detection |

#### Coding Standard 6

| **Coding Standard** | **Label** | **Name of Standard** |
| --- | --- | --- |
| **Assertions** | [STD-006-CLG] | Use a static assertion to test the value of a constant expression |

Source: <https://wiki.sei.cmu.edu/confluence/display/c/DCL03-C.+Use+a+static+assertion+to+test+the+value+of+a+constant+expression>

| **Noncompliant Code** |
| --- |
| Uses the assert() macro to assert a property concerning a memory-mapped structure that is essential for the code to behave correctly. |
| #include <assert.h>    struct timer {    unsigned **char** MODE;    unsigned **int** DATA;    unsigned **int** COUNT;  };    **int** func(void) {  **assert**(sizeof(struct timer) == sizeof(unsigned **char**) + sizeof(unsigned **int**) + sizeof(unsigned **int**));  } |

| **Compliant Code** |
| --- |
| For constant expressions, a preprocessor conditional statement may be used. |
| struct timer {    unsigned **char** MODE;    unsigned **int** DATA;    unsigned **int** COUNT;  };    #if (sizeof(struct timer) != (sizeof(unsigned char) + sizeof(unsigned int) + sizeof(unsigned int)))    #error "Structure must not have any padding"  #endif |

**Note: Stop here for the milestone. Complete this section for Project One in Module Six.**

| **Principles(s):**  2:Heed Compiler Warnings  10: Adopt a Secure Coding Standard |
| --- |

**Threat Level**

| **Severity** | **Likelihood** | **Remediation Cost** | **Priority** | **Level** |
| --- | --- | --- | --- | --- |
| Low | Unlikely | High | P1 | L3 |

**Automation**

| **Tool** | **Version** | **Checker** | **Description Tool** |
| --- | --- | --- | --- |
| Axivion Bauhaus Suite | 7.2.0 | CertC-DCL03 | - |
| Clang | 3.9 | misc-static-assert | Checked by clang-tidy |
| ECLAIR | 1.2 | CC2.DCL03 | Fully implemented |
| LDRA tool suite | 9.7.1 | 44 S | Fully implemented |

#### Coding Standard 7

| **Coding Standard** | **Label** | **Name of Standard** |
| --- | --- | --- |
| **Exceptions** | [STD-007-CPP] | Do not abruptly terminate the program |

Source: <https://wiki.sei.cmu.edu/confluence/display/cplusplus/ERR50-CPP.+Do+not+abruptly+terminate+the+program>

| **Noncompliant Code** |
| --- |
| The call to f(), which was registered as an exit handler with std::at\_exit(), may result in a call to std::terminate() because throwing\_func() may throw an exception. |
| #include <cstdlib>    void throwing\_func() noexcept(false);    void f() { // Not invoked by the program except as an exit handler.    throwing\_func();  }    **int** main() {    if (0 != std::**atexit**(f)) {      // Handle error    }    // ...  } |

| **Compliant Code** |
| --- |
| f() handles all exceptions thrown by throwing\_func() and does not rethrow. |
| #include <cstdlib>    void throwing\_func() noexcept(false);    void f() { // Not invoked by the program except as an exit handler.    try {      throwing\_func();    } catch (...) {      // Handle error    }  }    **int** main() {    if (0 != std::**atexit**(f)) {      // Handle error    }    // ...  } |

**Note: Stop here for the milestone. Complete this section for Project One in Module Six.**

| **Principles(s):**  9: Use Effective Quality Assurance Techniques  10: Adopt a Secure Coding Standard |
| --- |

**Threat Level**

| **Severity** | **Likelihood** | **Remediation Cost** | **Priority** | **Level** |
| --- | --- | --- | --- | --- |
| Low | Probable | Medium | P4 | L3 |

**Automation**

| **Tool** | **Version** | **Checker** | **Description Tool** |
| --- | --- | --- | --- |
| CodeSonar | 6.1p0 | BADFUNC.ABORT  BADFUNC.EXIT | Use of abort  Use of exit |
| Klocwork | 2021.1 | MISRA.CATCH.ALL  CERT.ERR.ABRUPT\_TERM | - |
| LDRA tool suite | 9.7.1 | 122 S | Enhanced Enforcement |
| Polyspace Bug Finder | R2021a | CERT C++: ERR50-CPP | Checks for implicit call to terminate() function (rule partially covered) |

#### 

#### Coding Standard 8

| **Coding Standard** | **Label** | **Name of Standard** |
| --- | --- | --- |
| Object Oriented Programming | [STD-008-CPP] | Write constructor member initializers in the canonical order |

Source: <https://wiki.sei.cmu.edu/confluence/display/cplusplus/OOP53-CPP.+Write+constructor+member+initializers+in+the+canonical+order>

| **Noncompliant Code** |
| --- |
| The member initializer list for C::C() attempts to initialize someVal first and then to initialize dependsOnSomeVal to a value dependent on someVal. Because the declaration order of the member variables does not match the member initializer order, attempting to read the value of someVal results in an unspecified value being stored into dependsOnSomeVal. |
| class C {  **int** dependsOnSomeVal;  **int** someVal;    public:    C(**int** val) : someVal(val), dependsOnSomeVal(someVal + 1) {}  }; |

| **Compliant Code** |
| --- |
| Change the declaration order of the class member variables so that the dependency can be ordered properly in the constructor's member initializer list. |
| class C {  **int** someVal;  **int** dependsOnSomeVal;    public:    C(**int** val) : someVal(val), dependsOnSomeVal(someVal + 1) {}  }; |

**Note: Stop here for the milestone. Complete this section for Project One in Module Six.**

| **Principles(s):**  4: Keep It Simple |
| --- |

**Threat Level**

| **Severity** | **Likelihood** | **Remediation Cost** | **Priority** | **Level** |
| --- | --- | --- | --- | --- |
| Medium | Unlikely | Medium | P4 | L3 |

**Automation**

| **Tool** | **Version** | **Checker** | **Description Tool** |
| --- | --- | --- | --- |
| Astrée | 20.10 | initializer-list-order | Fully checked |
| Axivion Bauhaus Suite | 7.2.0 | CertC++-OOP53 | - |
| LDRA tool suite | 9.7.1 | 206 S | Fully implemented |
| Parasoft C/C++test | 2021.1 | CERT\_CPP-OOP53-a | List members in an initialization list in the order in which they are declared |

#### Coding Standard 9

| **Coding Standard** | **Label** | **Name of Standard** |
| --- | --- | --- |
| Containers | [STD-009-CPP] | Use valid iterator ranges |

Source: <https://wiki.sei.cmu.edu/confluence/display/cplusplus/CTR53-CPP.+Use+valid+iterator+ranges>

| **Noncompliant Code** |
| --- |
| On each iteration of its internal loop, std::for\_each() compares the first iterator (after incrementing it) with the second for equality; as long as they are not equal, it will continue to increment the first iterator. Incrementing the iterator representing the past-the-end element of the range results in undefined behavior. |
| #include <algorithm>  #include <iostream>  #include <vector>    void f(const std::vector<**int**> &c) {    std::for\_each(c.end(), c.begin(), [](**int** i) { std::cout << i; });  } |

| **Compliant Code** |
| --- |
| The iterator values passed to std::for\_each() are passed in the proper order. |
| #include <algorithm>  #include <iostream>  #include <vector>    void f(const std::vector<**int**> &c) {    std::for\_each(c.begin(), c.end(), [](**int** i) { std::cout << i; });  } |

**Note: Stop here for the milestone. Complete this section for Project One in Module Six.**

| **Principles(s):**  3: Architect and Design for Security Policies  4: Keep It Simple  10: Adopt a Secure Coding Standard |
| --- |

**Threat Level**

| **Severity** | **Likelihood** | **Remediation Cost** | **Priority** | **Level** |
| --- | --- | --- | --- | --- |
| High | Probable | High | P6 | L2 |

**Automation**

| **Tool** | **Version** | **Checker** | **Description Tool** |
| --- | --- | --- | --- |
| Astrée | 20.10 | overflow\_upon\_dereference | - |
| Helix QAC | 2021.2 | C++3802 | - |
| Parasoft C/C++test | 2021.1 | CERT\_CPP-CTR53-a  CERT\_CPP-CTR53-b | Do not use an iterator range that isn't really a range  Do not compare iterators from different containers |
| PVS-Studio | 7.14 | V539, V662, V789 | - |

#### Coding Standard 10

| **Coding Standard** | **Label** | **Name of Standard** |
| --- | --- | --- |
| Expressions | [STD-010-CPP] | Do not access an object outside of its lifetime |

Source: <https://wiki.sei.cmu.edu/confluence/display/cplusplus/EXP54-CPP.+Do+not+access+an+object+outside+of+its+lifetime>

| **Noncompliant Code** |
| --- |
| A pointer to an object is used to call a non-static member function of the object prior to the beginning of the pointer's lifetime, resulting in undefined behavior. |
| struct S {    void mem\_fn();  };    void f() {    S \*s;    s->mem\_fn();  } |

| **Compliant Code** |
| --- |
| Storage is obtained for the pointer prior to calling S::mem\_fn(). |
| struct S {    void mem\_fn();  };    void f() {    S \*s = new S;    s->mem\_fn();    delete s;  } |

**Note: Stop here for the milestone. Complete this section for Project One in Module Six.**

| **Principles(s):**  2: Heed Compiler Warnings  10: Adopt a Secure Coding Standard |
| --- |

**Threat Level**

| **Severity** | **Likelihood** | **Remediation Cost** | **Priority** | **Level** |
| --- | --- | --- | --- | --- |
| High | Probable | High | P6 | L2 |

**Automation**

| **Tool** | **Version** | **Checker** | **Description Tool** |
| --- | --- | --- | --- |
| Astrée | 20.10 | return-reference-local  dangling\_pointer\_use | Partially checked |
| Clang | 3.9 | -Wdangling-initializer-list | Catches some lifetime issues related to incorrect use of std::initializer\_list<> |
| CodeSonar | 6.1p0 | IO.UAC  ALLOC.UAF | Use after close  Use after free |
| Parasoft C/C++test | 2021.1 | CERT\_CPP-EXP54-a  CERT\_CPP-EXP54-b  CERT\_CPP-EXP54-c | Do not use resources that have been freed  The address of an object with automatic storage shall not be returned from a function  The address of an object with automatic storage shall not be assigned to another object that may persist after the first object has ceased to exist |

### Defense-in-Depth Illustration

This illustration provides a visual representation of the defense-in-depth best practice of layered security.



## Project One

There are seven steps outlined below that align with the elements you will be graded on in the accompanying rubric. When you complete these steps, you will have finished the security policy.

### Revise the C/C++ Standards

You completed one of these tables for each of your standards in the Module Three milestone. In Project One, add revisions to improve the explanation and examples as needed. Add rows to accommodate additional examples of compliant and noncompliant code. Coding standards begin on the security policy.

### Risk Assessment

Complete this section on the coding standards tables. Enter high, medium, or low for each of the headers, then rate it overall using a scale from 1 to 5, 5 being the greatest threat. You will address each of the seven policy standards. Fill in the columns of severity, likelihood, remediation cost, priority, and level using the values provided in the appendix.

### Automated Detection

Complete this section of each table on the coding standards to show the tools that may be used to detect issues. Provide the tool name, version, checker, and description. List one or more tools that can automatically detect this issue and its version number, name of the rule or check (preferably with link), and any relevant comments or description—if any. This table ties to a specific C++ coding standard.

### Automation

Provide a written explanation using the image provided.



Automation will be used for the enforcement of and compliance with the standards defined in this policy. Green Pace already has a well-established DevOps process and infrastructure. Define guidance on where and how to modify the existing DevOps process to automate enforcement of the standards in this policy.

By integrating security measures into each step of the DevOps toolchain, DevOps becomes DevSecOps. In the “Assess and Plan” phase, threat modeling in the “Design” and “Build” phases, IDE security is addressed. Static application testing and automated security scans are added to the “Verify & Test” phase along with unit, integration and other tests.

Once in production, the automated testing will continue with prevention by using integrity checks and defense-in-depth measures. Network monitoring, penetration testing, network monitoring and performance logs are some methods of continuous threat detection. Just as with testing in the QA sense, testing in the security sense should also be performed early and often.

### Summary of Risk Assessments

Consolidate all risk assessments into one table including both coding and systems standards, ordered by standard number.

| Rule | Severity | Likelihood | Remediation Cost | Priority | Level |
| --- | --- | --- | --- | --- | --- |
| STD-002-CPP | High | Probable | Medium | High (12) | 1 |
| STD-003-CPP | High | Likely | Medium | High (18) | 1 |
| STD-004-CPP | High | Probable | Medium | High (12) | 1 |
| STD-005-CPP | High | Likely | Medium | High (18) | 1 |
| STD-010-CPP | High | Probable | High | Medium (6) | 2 |
| STD-006-CLG | Low | Unlikely | High | Low (1) | 3 |
| STD-007-CPP | Low | Probable | Medium | Low (4) | 3 |
| STD-008-CPP | Medium | Unlikely | Medium | Low (4) | 3 |
| STD-001-CPP | High | Unlikely | High | Low (3) | 3 |

### Create Policies for Encryption and Triple A

Include all three types of encryption (in flight, at rest, and in use) and each of the three elements of the Triple-A framework using the tables provided***.***

* 1. Explain each type of encryption, how it is used, and why and when the policy applies.
  2. Explain each type of Triple-A framework strategy, how it is used, and why and when the policy applies.

Write policies for each and explain what they are, how it should be applied in practice, and why it should be used.

| 1. **Encryption** | **Explain what it is and how and why the policy applies.** |
| --- | --- |
| Encryption in rest | Encryption in rest protects stored data. This may include hard drives, phones, computers, and cloud assets, among others. Protection of this data can be done through encryption tools, disk encryption and security for mobile devices and computers. |
| Encryption at flight | Encryption at flight is about protecting data that is moving. This can be between two devices within a network or moving outside of a network. This can be protected through examples such as email encryption, DLP solutions, and solid network security features, such as firewalls and authentication. It is also important to consider the path data may be taking, and the security of this path. |
| Encryption in use | Encryption in use protects data that is created, edited, or otherwise defined as in-use. Protection of this data can be done by ensuring data control and protection exists prior to use, and in place in the first place. Managing access rights and identity will also minimize risk to this data. |

Source: <https://www.mimecast.com/blog/data-in-transit-vs-motion-vs-rest/>

| 1. **Triple-A Framework\*** | **Explain what it is and how and why the policy applies.** |
| --- | --- |
| Authentication | Authentication is the act of confirming one’s identity. This can cover a range of types, but often are examples such as static passwords, one-time passwords, certifications, and biometric credentials. These forms of identification work to ensure a person is who they claim to be. |
| Authorization | Authorization specifies the access rights and privileges of a user and are an important part of information and computer security. Where authentication confirms an identity, authorization determines what a user can and cannot access in the first place, limiting possible vulnerabilities when someone may interact with sensitive data they may not need to access, or the permissions one may have during access. |
| Accounting | Accounting is the process of keeping track of activity while interacting with a system, showing timestamps, accessed resources, and data transfer information. This is valuable in both creating a “bread crumb trail” in user activity, and for the purposes of forensic analysis and investigation, should it be required. |

Source: <https://www.ccsinet.com/blog/aaa-identity-management/>

**\***Use this checklist for the Triple A to be sure you include these elements in your policy:

* User logins
* Changes to the database
* Addition of new users
* User level of access
* Files accessed by users

### Map the Principles

Map the principles to each of the standards and provide a justification for the connection between the two. In the Module Three milestone, you added definitions for each of the 10 principles provided. Now it’s time to connect the standards to principles to show how they are supported by principles. You may have more than one principle for each standard, and the principles may be used more than once. Principles are numbered 1 through 10. You will list the number or numbers that apply to each standard, then explain how each of these principles supports the standard. This exercise demonstrates that you have based your security policy on widely accepted principles. Linking principles to standards is best practice.

**NOTE:** Green Pace has already successfully implemented the following:

* Operating system logs
* Firewall logs
* Anti-malware logs

The only item you must complete beyond this point is the Policy Version History table.

## Audit Controls and Management

Every software development effort must be able to provide evidence of compliance for each software deployed into any Green Pace managed environment.

Evidence will include the following:

* Code compliance to standards
* Well-documented access-control strategies, with sampled evidence of compliance
* Well-documented data-control standards defining the expected security posture of data at rest, in flight, and in use
* Historical evidence of sustained practice (emails, logs, audits, meeting notes)

## Enforcement

The office of the chief information security officer (OCISO) will enforce awareness and compliance of this policy, producing reports for the risk management committee (RMC) to review monthly. Every system deployed in any environment operated by Green Pace is expected to be in compliance with this policy at all times.

Staff members, consultants, or employees found in violation of this policy will be subject to disciplinary action, up to and including termination.

## Exceptions Process

Any exception to the standards in this policy must be requested in writing with the following information:

* Business or technical rationale
* Risk impact analysis
* Risk mitigation analysis
* Plan to come into compliance
* Date for when the plan to come into compliance will be completed

Approval for any exception must be granted by the chief information officer (CIO) and the chief information security officer (CISO) or their appointed delegates of officer level.

Exceptions will remain on file with the office of the CISO, which will administer and govern compliance.

## Distribution

This policy is to be distributed to all Green Pace IT staff annually. All IT staff will need to certify acceptance and awareness of this policy annually.

## Policy Change Control

This policy will be automatically reviewed annually, no later than 365 days from the last revision date. Further, it will be reviewed in response to regulatory or compliance changes, and on demand as determined by the OCISO.

## Policy Version History

| Version | Date | Description | Edited By | Approved By |
| --- | --- | --- | --- | --- |
| 1.0 | 08/05/2020 | Initial Template | David Buksbaum |  |
| 1.1 | 07/21/2024 | Module 3 Milestone | Alex Walrond |  |
| 1.2 | 08/18/2024 | Module 6 Project one | Alex Walrond |  |

## Appendix A Lookups

### Approved C/C++ Language Acronyms

| Language | Acronym |
| --- | --- |
| C++ | CPP |
| C | CLG |
| Java | JAV |