THE Open GROUP

Future Airborne Capability Environment (FACE™)

Conformance Certification Guide

Version 1.0
August 2016

Prepared by the FACE Consortium Business Working Group Conformance Subcommittee and The Open Group

US Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC) Public Release 2291

Future Airborne Capability Environment (FACE™): Conformance Certification Guide

Document Number: X1606

Authored by The Open Group FACE Consortium.
Published by The Open Group, August 2016.

Comments relating to the material contained in this document may be submitted to:

The Open Group, 800 District Avenue, Suite 150, Burlington, MA 01803, United States

or by electronic mail to:

ogface-admin@opengroup.org

Contents

Table of Figures

Table of Tables

1. Introduction

1.1 Purpose

The purpose of the Future Airborne Capability Environment (FACE) Conformance Certification Guide is to provide step-by-step instructions for the Software Supplier regarding the FACE Conformance Program and its associated policies and procedures/processes.

The Guide provides high-level descriptions, instructions, and references, including links, to FACE Conformance Program-related activities and authorities.

1.2 Ownership

This document is developed and maintained by the FACE Conformance Subcommittee and approved for use by the FACE Steering Committee. The Problem Report/Change Request (PR/CR) process allows users to submit comments regarding this document to the FACE Consortium. See Section 8 for more information on the PR/CR process.

1.3 Scope

The FACE Conformance Certification Guide assists the Software Supplier that is interested in FACE Conformance Certification. This Guide describes the steps and interactions required to prepare for, apply for, verify, certify, and ultimately register a Unit of Conformance (UoC) or UoC Package as FACE Certified. This Guide applies to all editions and versions of FACE publications.

1.4 The FACE Approach

The Open Group FACE Consortium was formed to address the affordability initiatives of today's military aviation community. The approach used by the FACE Consortium is to develop a technical standard for software and define the business strategy to enable its successful adoption. The FACE Technical Standard is designed to promote portability, allowing the creation of software product lines across the military aviation community.

The FACE Technical Standard restricts the interfaces that an application is allowed to use. Using the same standardized interfaces on multiple weapon platforms allows for simplified porting of functionality between those platforms.

The following documents provide the definition and support of the FACE environment:

- The FACE Business Guide
- The FACE Technical Standard
- The FACE Reference Implementation Guide
- The FACE Conformance Policy
- The FACE Library Policies and Procedures

- The FACE Contract Guide

NOTE: The FACE Technical Standard Edition1.0 was titled “FACE Reference Architecture Edition 1.0”, and the FACE Technical Standard Edition 2.0 was titled “Technical Standard for FACE Edition 2.0”.

These and other FACE documents can be found on the FACE Landing Page at: www.opengroup.org/face, along with other materials.

1.5 FACE Conformance Program

Defining conformance and creating a method for certifying software is vital to establishing an effective standard. The FACE Conformance Program provides the associated conformance criteria and processes necessary to assure that UoCs are developed according to the FACE Technical Standard.

Successful completion of the FACE Conformance Program leads to a FACE Conformance Certificate. Certification provides formal recognition of conformance to an industry standard, which allows the following:

- Software Suppliers and practitioners to make and substantiate clear claims of conformance to a standard
- Buyers to specify and successfully procure software from vendors who conform to and provide solutions that conform to that standard

The FACE Consortium has established conformance criteria and defined an associated Conformance Policy for the FACE Technical Standard. This program consists of Verification, Certification, and Registration.

- **FACE Verification** is the act of determining the conformance of an implementation to specification requirements, specifically it is determining that the UoC meets the FACE Technical Standard requirements. Verification is handled through an entity known as a Verification Authority (VA), a technical expert on the FACE Technical Standard and associated conformance verification processes.
- **FACE Certification** is the process of applying for a FACE Conformance Certificate once verification has been successfully completed. Certification is processed through the FACE Certification Authority (CA).
- **FACE Registration** is the process of listing FACE Certified UoCs in a public listing of FACE Certified UoCs known as the FACE Registry. Registration is processed through the FACE Library Administrator (LA). The FACE Registry is accessed from the FACE Landing Page.

1.6 Document Overview

This Guide was developed and is maintained by the FACE Consortium, a consortium of The Open Group.

This Guide provides information about aspects of the FACE Conformance Program to entities (known throughout this document as Software Suppliers) applying for a FACE Conformance Certificate. This information is provided with the Software Supplier in mind.

The Conformance Program processes are defined and guidance is provided for each step to the receipt of a FACE Conformance Certificate for a UoC or UoC Package. This includes the following:

- An overview of the Conformance Program and its processes
- A description of what defines a UoC and UoC Package that can be certified
- Advice on finding and interacting with an appropriate VA
- Guidance on generating Verification Evidence
- Detail on what comprises a Verification Package
- Detail on what comprises a Certification Package
- Guidance on completing a Software Supplier's Statement of Conformance
- A description of a FACE Conformance Certificate

2. Conformance Program Overview

The FACE Conformance Program has been designed to protect Intellectual Property (IP) and other proprietary information about UoCs in control of the owner of the IP while still allowing a VA to conduct conformance activities on a software product submitted for conformance verification.

Each step of the process is initiated by the Software Supplier. While information does flow between the various FACE conformance entities, information about UoCs only flows at the initiation of the Software Supplier.

2.1 Program Roles and Responsibilities

Roles in the FACE Conformance Program include the Software Supplier, Verification Authority, Certification Authority, and Library Administrator. The integrator is considered a Software Supplier in cases where the integrator is developing software.

- **Software Supplier** is any entity providing software to be certified. This may include the original software developer, an integrator, or another entity wishing to certify software developed by another party.
- **FACE Verification Authority (VA)** is one of several entities approved by the FACE Consortium Steering Committee to evaluate software against the FACE Technical Standard. See Section 4.3 for more information on the VA role.
- **FACE Certification Authority (CA)** is the singular entity that can provide a FACE Conformance Certificate. See Section 5.2 for more information on the CA.
- **FACE Library Administrator (LA)** manages a listing of FACE Certified UoCs known as the FACE Registry. See Section 6.2 for more information on the Registry.

2.2 Program Processes

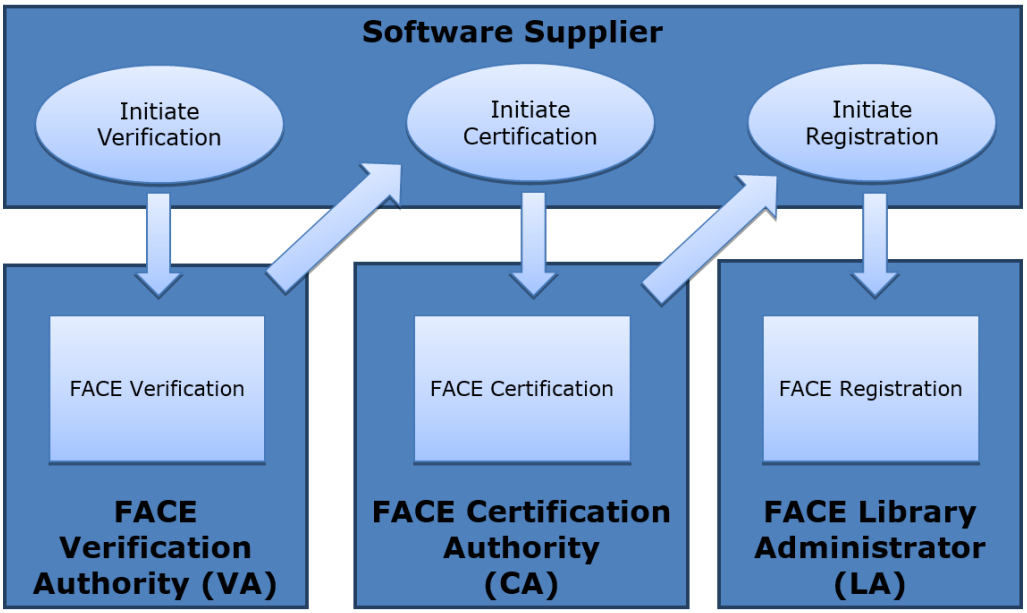

Figure 1: FACE Conformance Program Overview

The FACE Conformance Program is outlined in Figure 1. There are three processes in the FACE Conformance Program: Verification, Certification, and Registration. These must be conducted in order, and each represents different aspects of FACE Conformance. Each process is only initiated when the Software Supplier is ready to take that step. Delays in moving from one process to the next may be desirable due to schedule, product release announcements, budgetary concerns, or other reasons.

- **FACE Verification** is the first step a Software Supplier takes toward getting a UoC FACE certified. This is the technical evaluation of the software against the FACE Technical Standard. FACE Verification is completed by an approved FACE VA and leads to the Software Supplier receiving a Statement of Verification for the UoC.
- **FACE Certification** is the second step in the FACE Conformance Program and represents the business side of using the FACE brand. Certification is conducted by the FACE CA and leads to the Software Supplier receiving a FACE Conformance Certificate for the UoC.
- **FACE Registration** is the third and final step, which places the Certified UoC on the FACE Registry, a public listing of FACE Certified UoCs. This step is not mandatory for issuance of a FACE Conformance Certificate, but registration is required for publicly advertising a product as FACE conformant. See Section 6.3 for more information.

2.3 Control of Information

To keep the Software Supplier in control, the FACE Conformance Program has adopted the following principles:

- Visibility of source code to FACE entities is not required by the process. Visibility of requirements, object code, and other IP is restricted to the VA performing the technical evaluation. Approved VAs are required to protect Software Supplier IP.

- The interface between the VA and the CA is limited. The Statement of Verification provided by the VA to the CA is designed to eliminate proprietary information and contains only an overview of the test results. The CA does not have access to any Software Supplier IP. The CA does not receive any documents from a VA until the Software Supplier initiates the FACE Certification process.
- There is no publicly available listing of UoCs in the Verification or Certification processes. Even the CA cannot get a listing of UoCs that have completed the FACE Verification process.
- The only publicly available information about a UoC is the information contained in the FACE Registry. This registry contains only information provided by the Software Supplier.
- The FACE Registry does not contain the UoC. To acquire the UoC, a request must be made through the contact information provided in the Registry. The UoC resides in a repository that is under the control of the Software Supplier (or controlled by an entity chosen by the Software Supplier).

2.4 Interface Testing

The FACE Conformance Program focuses on the portability of software, not the functionality. The FACE Conformance Program does not require the execution of the software. The UoC source code is compiled to a single target by the Software Supplier. The resulting object code is delivered to the VA and is analyzed for conformance through a linking process to ensure the compiled code will interface with other FACE UoCs. Only a linking of the object code is performed; the interfaces are not executed as part of this test.

For some FACE Technical Standard requirements, a test suite cannot be developed to confirm the requirement. For these requirements, the FACE Verification process is completed by inspecting artifacts provided to the VA. These artifacts may include designs, requirements, and other documentation. In the cases where the FACE requirement can only be proved through functional testing, the Software Supplier will perform the functional tests and supply the test procedures and results to the VA. Functional testing is considered part of the software development lifecycle and is not conducted during the FACE Conformance Program.

3. Conformance Preparation

Proper and thorough preparation prior to application for the FACE Conformance Program is instrumental to successful FACE Conformance Certification. The paragraphs below serve to guide the Software Supplier through the areas and tasks recommended to prepare for successful Conformance Certification.

3.1 What Does the Software Supplier Need?

Prior to beginning the process of FACE Certification, Software Suppliers should assess the suitability of their UoC and software repository for the FACE Conformance Program.

3.1.1 A Unit of Conformance (UoC)

A FACE UoC is a piece of software that uses or provides functionality with other applications through the FACE architecture. A UoC is bounded within a single FACE segment and conforms to the requirements of the segment.

3.1.2 FACE Product Repository

FACE Conformance requires storage of certified UoCs in a repository satisfying the requirements of a FACE Product Repository. This is a requirement of the Certification Agreement. The requirements for a FACE Product Repository are defined in the FACE Library Requirements document. These requirements can often be met with a standard configuration management system that may already be in place within the supplier organization.

3.2 Necessary FACE References

A thorough understanding of the FACE Technical Standard, business and contracting guidance, and other FACE documentation is necessary for success when creating FACE UoCs. The FACE Landing Page (www.opengroup.org/face) contains a Conformance tab, where a collection of recommended steps, technical references, guides, and contacts may be obtained. The FACE Reference Repository, a collection of FACE material used for development and conformance, may be accessed through this tab. In order to get started, the Software Supplier should access the FACE Landing Page Conformance tab where all required and recommended policy, specification, guidance documents, and contacts are available.

3.2.1 FACE Technical Standard

The Technical Standard for the FACE Reference Architecture establishes and details the requirements for FACE Conformance Certification. All approved editions of the Technical Standard are available from the FACE Reference Repository.

NOTE: Any Corrigendum to the Technical Standard or other conformance-related products will be used to generate a subsequent .x edition/version of said product inclusive of the associated changes. Any corrigenda and the associated FACE document will not be referenced for conformance; only the resulting .x edition/version will be used for conformance.

This document describes the technical requirements for FACE Conformance in terms of the FACE segments and allowable interfaces. The software must conform to the FACE Technical Standard

requirements for the chosen segment, including the requirements for the interfaces allowable by that segment.

The FACE Technical Standard also defines profiles. The profiles are defined in terms of safety (flight criticality) and security. The Program's intended use should aid in determining which profile is most appropriate. Guidance on use of profiles is contained within the FACE Reference Implementation Guide, available from the FACE Reference Repository.

The FACE Technical Standard is intended to evolve, creating multiple editions of the standard over time. UoCs conformant with one edition of the standard may not conform to other editions of the standard. The edition of the standard to which a UoC is certified is identified in the FACE Conformance Certificate and FACE Registry. Software Suppliers advertising UoCs as conformant to multiple editions of the FACE Technical Standard must have certificates for each standard edition advertised for the UoC.

3.2.2 Conformance Verification Matrix

The Conformance Verification Matrix provides a view of the related FACE Technical Standard with the appropriate verification method and Verification Evidence defined for each requirement in the standard. The matrix versions are tied to the FACE Technical Standard edition. Software Suppliers should ensure they are using a matrix for the appropriate standard edition.

The verification methods defined in the Conformance Verification Matrix are directly correlated to the capabilities of the FACE Test Suite approved for use with the specific FACE Technical Standard edition. Items marked "test" in the matrix can be tested with the approved Test Suite. Items marked "inspection" in the matrix must be proved with supporting documentation known as "Verification Evidence".

The Conformance Verification Matrix provides guidance on the content expected when providing Verification Evidence. The exact documents used should contain the expected content and links to the specific sections of those documents must be provided for each requirement marked as "inspection".

All approved editions of the Conformance Verification Matrix, along with a Matrix User's Guide, are available from the FACE Reference Repository.

3.2.3 FACE Conformance Test Suite

The FACE Conformance Test Suite is an automated test tool designed to test UoCs for conformance to the Application Program Interface (API) requirements, Data Model requirements, and limitations defined in the FACE Technical Standard as they apply to the various segments and profiles of the FACE Reference Architecture.

The Test Suite is a program that evaluates a UoC against the FACE Technical Standard. This is performed in two ways:

- An evaluation is performed by linking the UoC object code to sample applications that provide FACE conformant interfaces. Any failed linking is identified as non-conformance to the standard.
- The UoC Data Model files are analyzed by the Test Suite against the FACE Technical Standard. Any failure in this analysis is identified as a non-conformance to the standard.

NOTE: For FACE Technical Standard Edition 1.0, Data Model refers to the IDL.

All approved versions of the Test Suite are available free-of-charge from the FACE Landing Page (www.opengroup.org/face) within the Reference Repository.

Although a Software Supplier is not required to use the Test Suite during developmental testing, it is highly recommended to help ensure successful For-the-Record testing. A Software Supplier must have the correct version of the Test Suite in order to develop the object files needed for the verification process. Only approved versions of the Test Suite may be used by the VA during the FACE Verification process For-the-Record testing.

3.3 Required Legal Agreements

Three legal agreements are associated with the FACE Conformance Program. They are the Verification Agreement and the Certification Agreement.

3.3.1 Verification Agreement

The Verification Agreement is a document that covers the contracting of the UoC verification. It is an agreement between the Software Supplier and a VA.

An approved VA must conduct the formal evaluation of FACE Verification Evidence including the For-the-Record test using an approved version of the Test Suite and evaluation of the Verification Evidence. An agreement is necessary between Software Supplier and the selected VA.

The nature and content of the Verification Agreement depends on the business relationship between the VA and the Software Supplier, there is no required language. A single Verification Agreement might cover a single UoC or could cover all Verification Activities for all projects over a span of years.

For more information on VAs, see Section 4.3.

3.3.2 Certification Agreement

The Certification Agreement is a legal document that covers the process of UoC certification. It is an agreement between the Software Supplier and the FACE CA. The CA is the only entity that can grant FACE certification to a UoC. This process is described in Section 5.

3.4 UoC Definition

A FACE UoC is a single Unit of Portability (UoP), an I/O Service, or an Operating System (OS) that is developed and intended for FACE Conformance Certification. A UoP is software that provides one or more services or mission-level capabilities required for complete and correct execution of that capability. A UoC is an application that uses or provides functionality with other applications through the FACE architecture. Traditional software development programs consist of several of these components or UoPs. A Software Supplier should examine its product to determine how many UoCs are needed and the characteristics of each.

For the purposes of FACE conformance, a UoC is a piece of software that is developed to the requirements for a single segment of the FACE architecture and provides no external interfaces beyond those defined by the chosen segment. The UoC must be defined to the specifications in the FACE Technical Standard.

The FACE Technical Standard describes how some components can be bundled with other components to create UoCs. Only complete UoCs can achieve FACE Conformance Certification. Components using interfaces not defined within the Technical Standard cannot be certified without including the other components that will make up a full UoC. The only exposed interfaces of a FACE UoC are the FACE defined interfaces for the UoC's segment.

The FACE Technical Standard describes how some UoCs can be packaged. UoC Packages are allowed, but each individual UoC in the package must receive its own FACE Conformance Certificate. For the purposes of conformance, each UoC in the package is a separate UoC, requiring a distinct name and version.

The source code for a UoC can be developed to support optional features that can be activated or deactivated at compile time. The source code may also be developed to support multiple hardware systems or compilers. In these cases the UoC has "variants" in the objects that can be created from the source. A conformant UoC can have multiple such variants listed on its Conformance Certificate. The FACE Reference Implementation Guide offers guidance on creating UoCs appropriate for FACE Conformance Certification.

3.4.1 Selecting the Profile

The FACE Technical Standard defines profiles for functionality based on a level of rigor implied by the final installation of the software. If the software is destined for high criticality or high security use then the application should use only interfaces defined for the FACE Safety or Security Profiles. If the software has need of other services (or is not intended for higher criticality applications) it can utilize the FACE General-Purpose Profile.

If a non-OS UoC is intended for multiple profiles, then successfully completing the FACE Verification process to the most restrictive profile will permit claiming conformance in each of the less restrictive profiles. Profiles intended to be supported by a UoC must be documented in the Software Supplier's Statement of Conformance.

Table 1: FACE Profiles

Profile	Intended Use
Security	High-assurance, deterministic, security applications and services
Safety Base	Safety-related applications and services, based on the safety principles and limiting operating system services
Safety Extended	Safety-related applications and services, based on the safety principles, and including some more advanced operating system services
General-Purpose	General-purpose avionics applications and services supporting POSIX and ARINC 653

Software Suppliers may decide to alter functionality when addressing different profiles, such as making different use of memory resources or processor capabilities through use of functions that are restricted in some profiles. If the UoC compiles differently for each profile, then the Software Supplier can list these different compilations as variants within the single UoC.

3.4.2 Selecting the Segment

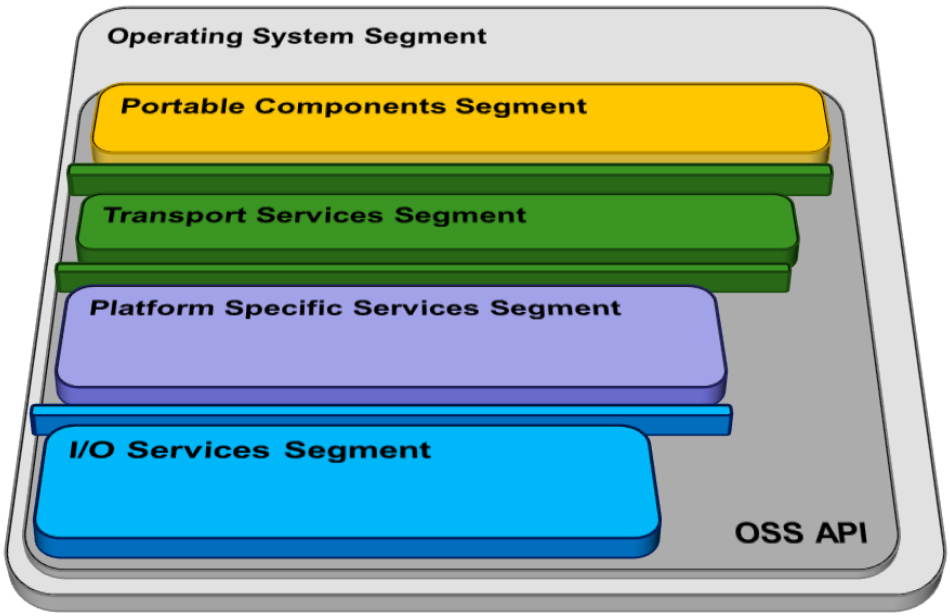

Figure 2: FACE Segments

Which FACE category best describes the UoC? The FACE Technical Standard defines five segments. A UoC can only exist in one segment.

Table 2: FACE Segments and Interfaces

Segment	Description	Interfaces
Operating System Segment (OSS)	The operating system providing basic application execution, memory management, and other services.	Hardware Operating System Interface (supplier of)
I/O Services Segment (IOSS)	Components used to interface with I/O hardware built into the computing platform. Typically associated with the physical I/O interface type.	Hardware Operating System Interface (user of) I/O Services (supplier of)
Platform-Specific Services Segment (PSSS)	Components designed to function with specific hardware, such as the configuring of and communicating with a specific radio.	Operating System Interface (user of) I/O Services (user of) Transport Services (user of)
Transport Services Segment (TSS)	Components designed to distribute, transfer, and/or transform data between applications.	Operating System Interface (user of) Transport Services (supplier of)
Portable Components Segment (PCS)	Any application that is developed independent of specific hardware, using only the Operating System and Transport Services interfaces.	Operating System Interface (user of) Transport Services (user of)

3.4.3 What is Included in the UoC?

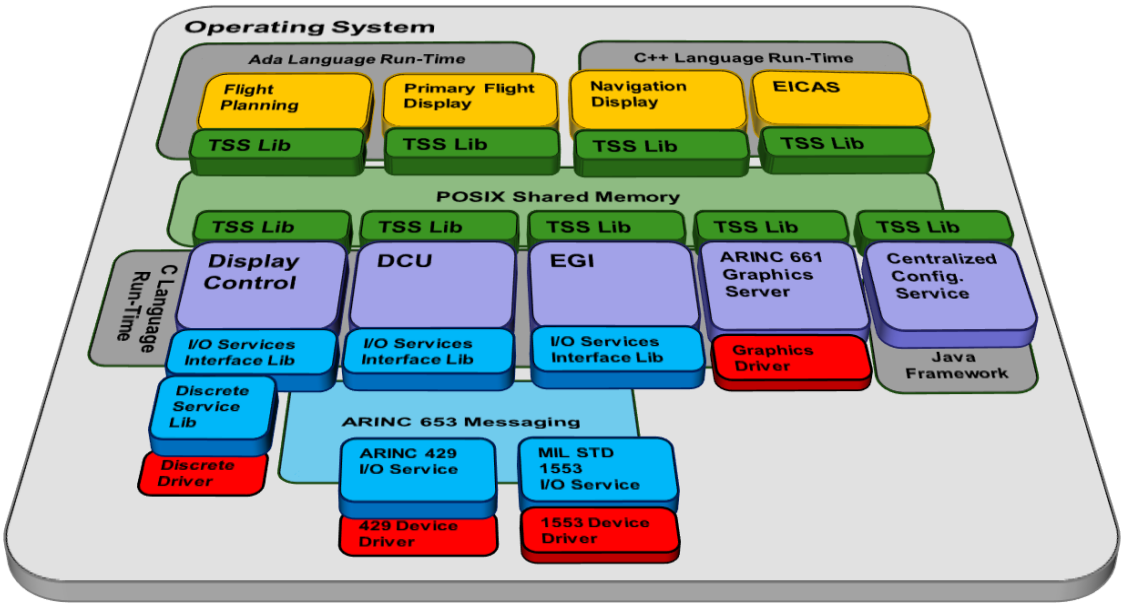

Figure 3: Example Architecture with Interfaces

The interfaces that are allowed are determined by the segment. The FACE Verification process focuses on testing the component's interfaces against the defined standards for the segment.

The external interfaces of each FACE component must consist entirely of FACE conformant interfaces. The FACE Conformance Test Suite ensures this by linking only conformant interfaces to the UoC object code. Any non FACE conformant interface is flagged as undefined, and fails the test.

The component must include all code and libraries required to eliminate all non-conformant interfaces. This includes run-time libraries for support functions, I/O drivers for IOS components, and frameworks used.

Any component using the Transport Services (TS) interface must include the Data Model definitions (or IDL for Edition 1.0). The FACE Technical Standard and the Test Suite establish the format and files needed to properly define the Data Model. These files are essential.

As the interfaces to all other FACE UoCs follow the FACE standard interfaces, header files for interfacing to other specific UoCs are not explicitly needed. Only the Data Model (or IDL) definitions are needed to communicate with other FACE components.

Stated simply, to be conformant the UoC must include all files needed to link the component into a system following the FACE Reference Architecture.

3.4.4 UoC Variants

To provide optimal portability, the source code for a single UoC may include options on how the executable software is generated. Variations of executables are generated from the source by selecting different options during compilation. The FACE Conformance Certificate for a UoC can cover such variants when the Software Supplier documents the conformant variants.

Most software programming languages and software development environments include techniques that can alter compiled software functionality without modifying the UoC's source code. For example, in C and C++ the #ifdef and #ifndef directives can be used to include or exclude lines of source code based on symbol definitions passed to the compiler.

A UoC should not use these techniques to specifically support the Test Environment. A UoC, as tested within the FACE Verification process, should be representative of a delivered product. The intent of the FACE architecture is to eliminate the need to alter the source code based on the environment.

Suppliers are encouraged to avoid use of these techniques within code associated with interfaces to other UoCs. This can lead to functional differences not easily detected by the FACE Verification process. This is particularly true in the inclusion of objects represented by the Data Model.

Acceptable variations could include settings for target hardware and settings for enabling and disabling features.

Unacceptable variants include any addition to or modification of the APIs defining the segment boundaries, such as a call to a specific operating system.

When producing the Software Product Set, the Software Supplier must create multiple sets of object code to cover the source used in the conformant variants. In some cases the number of variations is small and object files for each variant can be provided. In other cases the number of variants is large and the Software Supplier must analyze the code to determine a set of variants to test that are representative of all variants that are to be certified.

On the Software Supplier's Statement of Conformance, the Software Supplier asserts that the variations provided to the VA are truly representative of all variants listed on the Software Supplier's Statement of Conformance.

The Software Supplier is responsible for continuity of a fielded UoC to the configuration used in the FACE Verification process. Techniques utilized within a UoC that could impact the functionality of the delivered product should be explicitly documented in the Software Supplier's Statement of Conformance. Files containing compiler settings and directives necessary to generate the Test Environment object code should be submitted to the VA.

Example 1: Target Hardware

A PSS Device Service is developed to function on ARM, x86, and PPC hardware. The ARM variant includes some calls to ARM-specific functions. On the x86, software must be included to switch the endianness of numeric values. In this case, only the x86 and PPC versions are FACE conformant.

The Software Supplier's Statement of Conformance would list "PPC" and "x86" as the variants to be covered by the Conformance Certificate.

NOTE: The non-conformant variants are not listed or addressed.

The Software Supplier would create two sets of object files for use in the Test Suite, one with the x86 variant and the other with the PPC variant.

The VA would test both sets of object files, and include the results on the Statement of Verification.

Example 2: Enable/Disable Features

A Primary Flight Display is developed to include Flight Director Cues, Marker Beacon Alerts, Targeting symbology, and a horizon line based on Synthetic Vision. Not all aircraft utilizing the UoP will have a flight director or weapon targeting. Some aircraft will have requirements to maintain the traditional straight line horizon.

The source code includes conditional compilation to include or exclude each of these functions. In this case there are four features that can be separately enabled or disabled. The number of possible variants has increased to 16 (or 2^4).

The Software Supplier's Statement of Conformance would include the variants to be covered by the Conformance Certificate. Here, the Software Supplier would like to say: "All possible combinations of the following features: Flight Director Cues (Enabled/Disabled), Marker Beacon Alerts (Enabled/Disabled), Targeting Symbology (Enabled/Disabled), and Synthetic Vision (Enabled/Disabled)".

The Software Supplier determines that the Flight Director Cues depend on the Synthetic Vision setting. In order to support the source supplying all variants, the Software Supplier must provide three sets of objects.

1. All features enabled
2. All features disabled
3. Flight Director Cues enabled while Synthetic Vision is disabled

For the third set of objects, the Software Supplier recognizes that the other settings do not matter to meet the coverage objective, but the actual settings are documented for the VA.

The VA would test all three sets of object files, and include the results on the Statement of Verification.

3.4.5 Defining the Initial Test Environment

FACE Verification is an evaluation of a UoC and its adherence to the FACE Technical Standard. This is, essentially, an evaluation of the portability of the software source code. In order to protect Software Supplier IP and simplify the overall evaluation, a test is performed on a compilation of the source code to a Test Environment. This Test Environment is agreed between the Software Supplier and the VA.

The initial Test Environment is a description of the compile used for the conformance testing of the UoC. The environment definition includes the compiler, compiler settings, and target hardware.

When the UoC is tested using the FACE Test Suite it is linked to Test Suite interfaces compiled with the same compiler and compiler settings. These settings are communicated to the VA and become part of the Statement of Verification.

The compile used for testing should be for the target hardware. Although the tests are not run on a target computer, the compile should not be a host compile. FACE UoCs should use hardware and operating systems as abstractly as possible.

For FACE UoCs that are not operating systems, the operating systems used by the UoC must conform to a specific FACE Operating System (OS) interface. The specific OS is abstracted away from the source code. The OS does not need to be a factor in the environment, but the use of frameworks or language run

times may require that the specific OS used in generating the object code also be used in the Test Environment.

The specific compiler used is part of the environment. The FACE Verification testing of the UoC object code is to statically link it to other object code. In most cases, language standards are not so strict as to allow objects from one compiler to successfully link to objects from another compiler. The Test Suite compiles sample interface code that is then linked to the UoC. To ensure a successful link this compile should use the same compiler and linker used by the UoC.

3.5 Ensure the UoC Conforms to the FACE Technical Standard Requirements

Prior to initiating the FACE Verification process some groundwork is necessary to ensure a pass result. The FACE Technical Standard describes the technical requirements that must be satisfied for FACE conformance. A UoC must prove conformance to these requirements in order to be labeled as FACE conformant.

To ensure all requirements in the FACE Technical Standard are satisfied, the Software Supplier must produce, as part of the Verification Evidence, a record of all requirements in the FACE Technical Standard and evidence of how the software satisfies the requirements.

The FACE Technical Standard includes requirements specific to segments and profiles. The Verification Evidence must include explicit indication of requirements that are not applicable due to being associated with a segment or profile the product is not intended to satisfy.

The FACE Technical Standard also includes requirements for how some features must be implemented if they are supported. These are conditional requirements. For cases where a UoC does not support a feature described in the FACE Technical Standard, a statement must be made in the Verification Evidence. The Verification Evidence, supplied to the VA, must be complete and detailed. The Software Supplier's Statement of Conformance, visible to the CA, requires a summary of the supported conditional requirements.

The Conformance Verification Matrix provides guidance on these items through defining appropriate segments as well as through a "Conditional Requirements" column.

The Conformance Verification Matrix defines verification methods for each requirement. These methods must be used to verify the UoC conformance to the requirements. When a verification method is or includes "Inspection", the Software Supplier must provide Verification Evidence to the VA. The Conformance Verification Matrix and Matrix User's Guide contain detailed information about what evidence should be provided for each requirement.

When the verification method is "Test," the requirement can be tested by running the FACE Test Suite against the compiled UoC.

Some requirements will be marked both "Test" and "Inspection" when the FACE Test Suite tests only a portion of the requirement and the remainder of validation must be completed through inspection.

NOTE: Requirements that are not supported by the software cannot be tested by the Test Suite and should not be marked as "Test" in the Software Supplier's documentation. Such requirements should be marked as "not applicable".

With the exception of designated verification method(s), the Conformance Verification Matrix is to be used as a guide only. All requirements in the FACE Technical Standard must be addressed in the Software Supplier's documentation, even if only to make statements as to why they are not applicable.

3.5.1 Establish Software Verification Evidence

The Software Supplier is required to provide detailed information about how their documentation supports the requirements in the FACE Technical Standard. This information is referred to as Verification Evidence. The format, timing, and method of delivery of Verification Evidence are established between the Software Supplier and the VA before the FACE Verification process begins.

The Conformance Verification Matrix and Matrix User's Guide contain the descriptions of Conformance Artifacts intended to be used as Verification Evidence. The Software Supplier should provide documentation that contains the content as referenced by the Conformance Verification Matrix. The Software Supplier should discuss the documents that will be provided as evidence to the VA to ensure the format of the evidence meets the VA's expectations.

Inspection is applied to requirements that cannot be confirmed using the Test Suite. The Software Supplier is responsible for completing activities that produce Verification Evidence necessary to ensure the FACE Technical Standard requirement is satisfied. The VA will inspect this evidence to ensure the Software Supplier has properly addressed each of these requirements.

For example, if the Conformance Verification Matrix lists "Restricted APIs" – design documents indicating the UoC meets the restrictions – the Software Supplier is required to provide high-level software architectural design documents or low-level functional software design documentation specifying how the APIs are used. If the low-level design is provided in the form of comments in the source code, Software Suppliers may submit the source code as documentation.

In many cases the designated documentation is in the form of "Fully Tested Requirements". In these cases the Verification Evidence provided to the VA should include software requirements supporting the requirements in the FACE Technical Standard, test cases completely testing the requirements, and a Test Report showing the successful completion of the test. It is recommended that the Software Supplier integrate these activities to generate Verification Evidence into the software lifecycle early.

A Software Supplier must accurately and thoroughly trace and identify specific Verification Evidence in associated documentation for each requirement. One method of providing this evidence is filling in columns in a copy of the Conformance Verification Matrix. Another possible solution is to include the entire FACE Technical Standard in a requirements traceability tool and trace each FACE requirement to other requirements or statements that support it. If a tool is used, the VA must be provided with access to the tool or sufficient reports from the tool to analyze the data.

The Verification Evidence should allow the VA the capability to readily review it and have a high level of confidence that the UoC conforms to the requirements. The VA has the responsibility to reject evidence that does not completely support the FACE requirements.

In order to reduce risk and schedule, the Software Supplier may wish to provide some evidence to the VA prior to the formal testing of the UoC. In the cases where a Software Test Report (STR) is needed, the VA may evaluate most evidence prior to final testing, and evaluate only the STR and any changes to the other evidence after the STR of the finished UoC is available.

3.5.2 Preparing for Testing

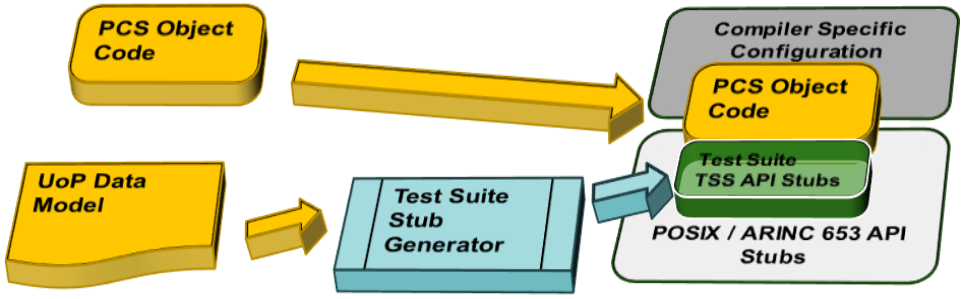

Figure 4: Test Suite Stubs Linked to PSS Component

To ensure the UoC conforms to the requirements verified by the Test Suite, the Software Supplier must download the Test Suite from the FACE Reference Repository. In order to test the conformance of the software, the source must be compiled using the header files for the "Gold Standard Libraries" as provided by the Test Suite. These header files are written to the FACE Technical Standard and the standards that form the normative references.

The Software Supplier is encouraged to run the Test Suite on the software on several iterations of the UoC lifecycle prior to the For-the-Record test.

The Test Suite verifies the component conformance with the interfaces by evaluating the Data Model files (for components using the Test Suite interface) and linking the object code to its interface stubs. Each interface used by the component is tested.

The Test Suite includes stubs for both providers and users of the FACE interfaces. This allows the Test Suite to test both sides of an interface (as a provider or a user).

The Test Suite requires a configuration file that contains the settings for the Test Suite on the UoC being tested. The Software Supplier should provide this configuration file to the VA to reduce the risk of erroneous setup during the For-the-Record testing.

4. The FACE Verification Process

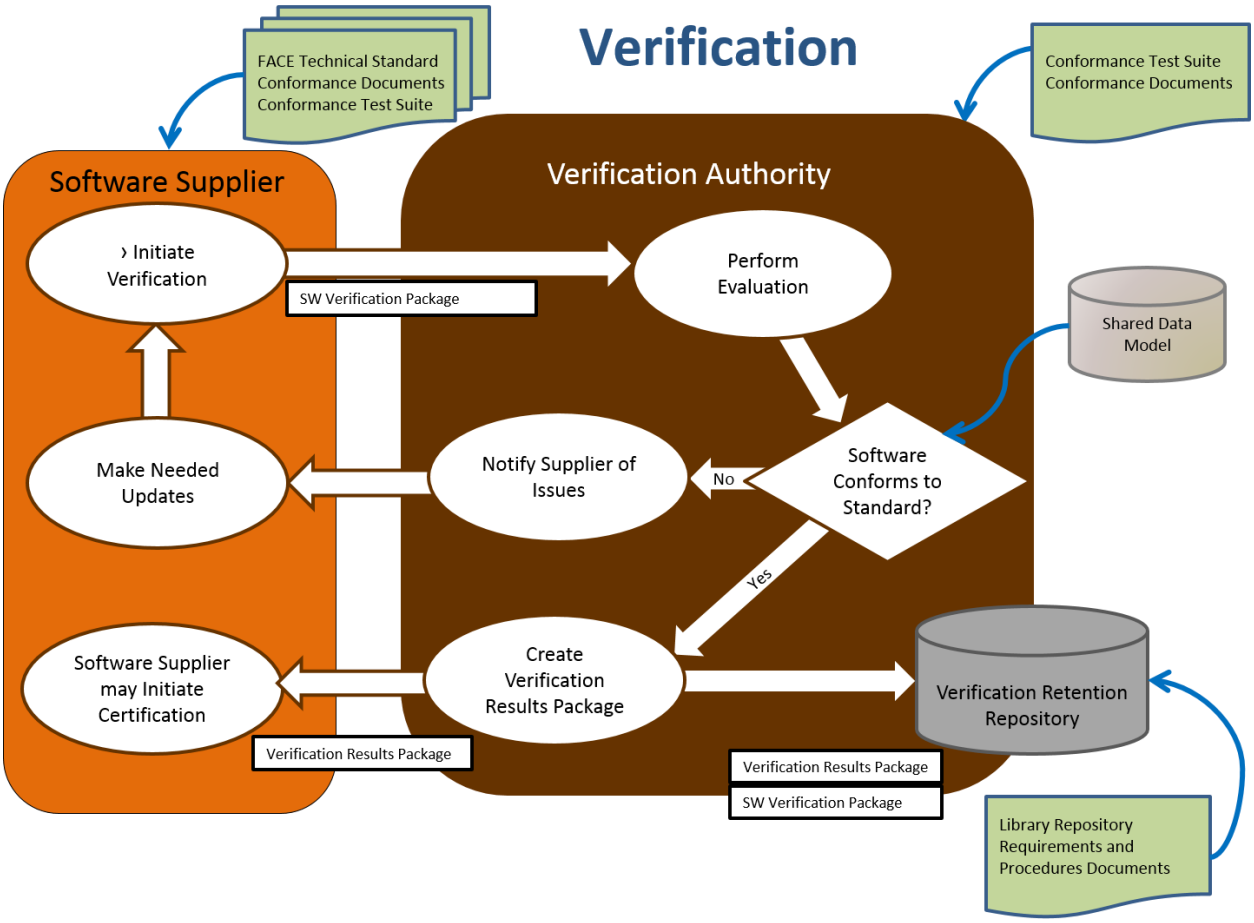

Figure 5: FACE Verification Process

The first step a UoC takes toward obtaining a FACE Conformance Certificate is the FACE Verification process. This is the technical evaluation of the software against the FACE Technical Standard.

4.1 FACE Verification Overview

The FACE Verification process ensures the UoC conforms to the requirements of the FACE Technical Standard. Software Suppliers provide Verification Evidence, Data Model files, and access to UoC object code for evaluation and assessment by a FACE approved VA. Upon successful verification, Software Suppliers may choose to proceed with the FACE Certification and Registration processes of the FACE Conformance Program.

The FACE Verification process is the process of ensuring that a specific version of the UoC conforms to the FACE Technical Standard. Verification is performed on the final version of the UoC and is repeated if any changes in the UoC affect the final version of the object code.

The FACE Verification process is also performed against a particular FACE Technical Standard edition. If a Software Supplier wishes to show the UoC is conformant to multiple standard editions, separate FACE Verification and Certification efforts are needed.

The FACE Verification process is a test against the FACE architecture and is primarily a test against the interfaces used by a UoC. It is not necessary to execute the software in order to test the interfaces. The FACE Test Suite uses a compiled version of the software to test the linking of the software with sample software that supports the other side of these interfaces.

The FACE requirements, contained in the FACE Technical Standard, delineate the provision for, use of, and conformance to a set of interfaces (APIs). The FACE Conformance Program does not place requirements on the functionality supporting these interfaces. Proof of conformance to FACE requirements through the Test Suite does not exercise UoC functionality, but to support some Technical Standard requirements the Software Supplier may conduct functional tests and provide results in the form of Verification Evidence.

4.1.1 Evaluation of Verification Evidence

The VA is required to review all of the supporting documentation for all requirements in the FACE Technical Standard for which the UoC is seeking certification. The Software Supplier should format the Verification Evidence in a way to support review of this information. Verification Evidence should be produced per Section 3.5.1.

4.1.2 For-the-Record Testing

The For-the-Record test of the UoC is conducted or witnessed by an approved VA with an approved FACE Conformance Test Suite (per Section 3.2.3).

The test is run for each UoC Variant provided, with a passing result only if all variants provided to the VA pass.

4.2 When Verification Is Needed

FACE Verification is performed on the final build of any UoC the Software Supplier intends to market as FACE Certified. After completing the FACE Certification process, if changes are made in a Certified UoC, due to bug fixes or enhancements, a new FACE Verification must be performed. Similarly, if an existing UoC is applied to a new edition of the FACE Technical Standard, a new FACE Verification is needed.

NOTE: It is not required to pace UoC FACE Certifications to the latest standard editions, nor do the latest versions of Software Supplier UoCs need to become FACE Certified. It is not permitted to advertise other UoC versions as FACE Certified without completing the FACE Conformance Program, including registration, to support such claims.

4.2.1 A New UoC

When a Software Supplier has a new UoC to certify, the Software Supplier should prepare for the FACE Verification process by developing the Verification Evidence well in advance of the final UoC. The Software Supplier should also run the Test Suite against several versions of the software leading up to the

final version. This will allow the Software Supplier to correct the software and test procedures prior to the final version.

4.2.2 A New FACE Technical Standard

In the event that a new FACE Technical Standard is released, a Software Supplier may decide to seek certification of an existing UoC under the new standard edition without a change in the UoC. Under these conditions the Software Supplier must provide Verification Evidence to the new standard to the VA, along with the UoC object code for testing.

This requires some work on the part of the Software Supplier (finding/tracing evidence for new requirements in the standard) and a typical verification for the VA.

This may not always be possible. Changes in the FACE Technical Standard may lead to requirements to which a UoC is not conformant. The Software Supplier should run the Test Suite for the new standard to ensure the UoC will pass the testing portion. Changes in the standard may also lead to new requirements that will need additional functional test procedures on the Software Supplier side. An examination of the changes in the FACE Technical Standard should be made by the Software Supplier prior to attempting certification without altering the UoC.

4.2.3 A Modified UoC

If a UoC with a FACE Conformance Certificate is modified, either due to bug fixes or new features, a new FACE Conformance Program effort is required. The Software Supplier updates the Verification Evidence to represent the changes in the UoC. The VA performs a new For-the-Record test on the modified UoC.

If a UoC in the Transport Services Segment is modified only by the addition of Data Model items in support of new UoCs, analysis of the Verification Evidence is not required; only the VA execution of a For-the-Record test using the new Data Model is required.

For Conformance Maintenance Releases the VA only examines any changes in the Verification Evidence and executes a new For-the-Record test.

4.3 FACE Verification Authority (VA)

The Verification Authority (VA) is responsible for assessing the Verification Evidence provided by the Software Supplier and for conducting or witnessing the For-the-Record Verification test using an approved Test Suite. The VA employs a uniform and repeatable verification approach for each segment of the FACE Technical Standard and issues a Statement of Verification only for a passing verification. Deficiency reports are provided to the Software Supplier if the verification does not pass. Software Suppliers are encouraged to identify a VA and establish a Verification Agreement well before verification is needed.

VAs are required to know the FACE requirements and have experience in verification so that they can quickly assess the Verification Evidence provided by the Software Supplier. It is expected that VAs know the FACE Technical Standard very well and the technical aspects of producing software to a segment reasonably well. It is not expected that VAs will have significant knowledge of the Software Supplier's UoC.

4.3.1 Find a VA

A listing of approved VAs, along with their contact information, is available via the FACE Landing Page, on the Conformance tab. In order to properly verify the UoC, the selected VA will have access to some of the Software Supplier IP related to the UoC. Software Suppliers should consider VA security policies, foreign access plans, and clearance levels as they relate to the project. Some VAs may choose to only work in specific segments, with specific compilers, or may have a restricted list of suppliers. The Software Supplier's customer may contractually require the use of a specific VA. In other cases, Software Suppliers can select any willing approved VA that satisfies the needs of their projects.

4.3.2 Things to Consider in VA Negotiations

The Software Supplier and their selected VA need to reach agreement on the timeline for verification activities, including submission of the Verification Package that will be used as part of For-the-Record testing, along with detailed agreement on acceptable Verification Evidence.

Table 3 lists several aspects of the VA activities that ensure successful conformance in a timely manner.

Table 3: Topics for VA Discussions

Topic	Notes
Proprietary Information Agreement (PIA)	The VA will need access to Software Supplier Proprietary Information.
Contact Information	Names, email addresses, phone numbers, and approved communication methods
Rates	Firm Fixed or Hourly
Schedule	Initial Verification Evidence Delivery, Expected For-the-Record test dates
Number of Tests	Number of environments/Number of UoCs/Number of Variants/Number of lifecycles
Handling of Failures	Handling of failed verification, number of attempts covered by contract
Compiler Licensing	The Software Supplier must ensure the VA has access to the chosen compiler and linker to conduct the For-the-Record test.
Software Supplier Site Access	If For-the-Record testing will occur at the Software Supplier site, the VA must have access to the facility.
Format of Verification Evidence	Discuss what format will be used, including whether the Software Supplier will use the Conformance Verification Matrix as a means for supplying evidence, what documents are expected by the VA, and whether there are any VA-specific requirements or preferences.
VA Storage of Information	The VA will have a Verification Retention Repository for storage of artifacts from verification. The information stored may include some Software Supplier IP. The Retention Repository must comply with access requirements established by the FACE Library requirements.
Shared Data Model (SDM)	The Software Supplier must select the version of SDM to which any UoC will be developed. This information will also be used for conformance testing.

4.3.3 The VA and Independence

A VA is as an expert on answering questions regarding the FACE processes and requirements. The VA must remain independent of the development effort. If the VA finds a problem, the VA must provide feedback (e.g., deficiency report, potential resolution statement), but the VA cannot update a development artifact.

It is possible that a VA provides services beyond FACE Verification, and the Software Supplier may wish to use those services. FACE Conformance policies do not prevent the use of a VA in other aspects of the verification of software. Regardless of how the VA is utilized, it must remain independent of the development of the software.

4.3.4 The VA and Intellectual Property

In order to evaluate the Verification Evidence, the VA will need access to design documents, requirements, test procedures, and other Software Supplier Intellectual Property (IP). The Software Supplier and the VA should establish Proprietary Information Agreement (PIA) prior to the exchange of this data.

The VA is required to keep Software Supplier IP separate from the IP of other Software Suppliers and must limit access to only those VA personnel who need access to the specific project.

4.3.5 The VA and Source Code

The FACE Consortium has analyzed the requirements in the FACE Technical Standard and developed a Conformance Verification Matrix for each standard that defines a way the Software Supplier can gain certification without supplying source code as part of the Verification Evidence. In some cases, verification of a requirement is easier if source code is supplied; the nature of the evidence supplied is established with the VA prior to the For-the-Record test.

There are some header file and data type requirements needed by the Test Suite (IDL or Data Model depending on the FACE Technical Standard used). The Software Supplier must provide these data definitions to the VA for use with the Test Suite.

4.3.6 Verification Retention Repository

For each FACE Verification Process submittal, a VA is required to maintain the following items in a retention repository:

- Software Supplier’s Statement of Conformance
- Pass/Fail

The VA may store additional information for his or her own records or to support an audit. Any Software Supplier IP retained in this repository should be established in the Verification Agreement. The VA retention repository is kept for a minimum of ten years.

4.4 Initiating Verification with the VA

The FACE Verification process is initiated by contacting one of the approved VAs listed on the FACE Landing Page.

4.4.1 Software Verification Package

The VA will need the following information and documentation in order to conduct verification activities:

- FACE Conformance Verification Agreement
- FACE Conformance Verification Evidence
- Software Product Set composed of object code, Data Model files, compiler settings, and supporting files for use with the Test Suite
- Software Supplier's Statement of Conformance

These items are collectively referred to as the Verification Package. The contents of the Verification Package are provided to the VA. The content of the Verification Package remains with the selected VA under any IP agreements made. Only the Software Supplier's Statement of Conformance will be available to other parties, and then only to the CA when the Software Supplier initiates the FACE Certification Process.

4.4.2 Initial Evidence

Software Suppliers can provide Verification Evidence to the VA in advance of the development of the finished UoC. This will greatly reduce the risk of a failure impacting the development schedule. Software Suppliers should give the VA evidence prior to the final For-the-Record test. This evidence should include all documentation short of the final test reports and will allow the VA to provide feedback if the Software Supplier needs to do additional work prior to the For-the-Record test.

4.4.3 Final Evidence

When a final Software Test Report (STR) is available in support of the Verification Evidence, the Software Supplier should provide the final versions of all Verification Evidence along with a record of changes from the initial evidence to the VA.

4.4.4 UoC Files

The UoC, in its final compiled form (i.e., as object code), is supplied to the VA. This must include all object code for the UoC, including libraries, and any Data Model files needed for the TS interface.

When conformance is to include variants for the UoC, the Software Supplier must provide multiple sets of object files representative of all variants. Many variants can be proved with a few sets of object files, provided the Software Supplier analyzes the source code to prove the set of objects is reflective of all of the source code for the supported variants. This analysis must be provided to the VA.

4.4.5 Supporting Files

In order to conduct the For-the-Record test, the VA may request access to files other than what are considered UoC deliverables.

Any third-party libraries used by the UoC must be provided to the VA in object code form. These will be used for linking purposes only.

It is not required that the Software Supplier run the Conformance Test Suite. If the Test Suite is utilized by the Software Supplier, the supporting files can include artifacts from that use. The Software Supplier

must supply to the VA the version of the Conformance Test Suite used, any files the Software Supplier used to configure the Test Suite, and the settings they used.

4.4.6 Software Supplier's Statement of Conformance

The Software Supplier must provide a Software Supplier's Statement of Conformance to the VA. See Section 7.1 for guidance on preparing the statement.

4.5 What Happens During Verification

During the FACE Verification process the VA will execute or witness the For-the-Record test of the Test Suite. The VA will review the Verification Evidence to ensure all requirements of the FACE Technical Standard are met by the software.

The For-the-Record testing with the VA must be on the final version of the software. This For-the-Record test can be conducted before, during, or after any other formal functional testing performed on the final version. Keep in mind that a failure of any test that leads to a change in the software will require another For-the-Record Verification test.

Proper preparation for FACE Verification testing will reduce the risk of a FACE conformance issue leading to a change. This should allow the For-the-Record test to occur after all other formal tests with little risk.

4.5.1 Conducting Verification Evidence Assessment

The inspection of Verification Evidence provided by the Software Supplier is conducted by the VA per the Verification Agreement. The Software Supplier is expected to provide the VA with all of the Verification Evidence as well as information linking each required FACE Technical Standard requirement to specific locations in the provided evidence (see Section 3.5.1 for more information).

4.5.2 For-the-Record Test

The For-the-Record test is one or more executions of the FACE Test Suite. It is conducted per the agreed time and location and is conducted or witnessed by the VA.

For-the-Record tests require the use of the test environment compiler and linker (as established in Section 3.4.5). In the event that the Software Supplier has chosen a compiler with limited licensing, or if the Software Supplier's development environment is complex, the VA may need to travel for the For-the-Record test.

For-the-Record testing must use an approved FACE Conformance Test Suite obtained from the FACE Reference Repository. The VA will record the Test Suite version and configuration used along with other information about the test in the Statement of Verification.

For-the-Record tests involving a Data Model must ensure the Data Model is in alignment with the Shared Data Model listed on the Software Supplier's Statement of Conformance. The VA must obtain the official version of the Shared Data Model from the Shared Data Model repository (usually the FACE Reference Repository) and configure the Test Suite to use the official version.

4.6 Results

The VA is required to provide feedback to the Software Supplier on the Verification Evidence and For-the-Record test in accordance with the Verification Agreement between the Software Supplier and VA.

4.6.1 Issues with Evidence

If the VA finds problems or gaps in the Verification Evidence, the Software Supplier is notified of the exact areas of concern. In accordance with the Verification Agreement established with the VA, the Software Supplier has the opportunity to provide additional evidence to support the requirement. Any new evidence or supporting statements become part of the Verification Evidence.

4.6.2 Failures in For the Record Testing

In the event that For-the-Record testing fails, the VA will notify the Software Supplier of the failure and provide the Test Suite results. If the failure is the result of Test Suite configuration, the Software Supplier is given the opportunity to update any configuration requirements. After making necessary corrections, the Software Supplier may resubmit to the VA for an additional For-the-Record test in accordance with the Verification Agreement.

It is recommended practice that Software Suppliers give the Test Suite configuration files to the VA to reduce the likelihood of failed tests due to configuration issues.

4.6.3 Success

Upon successful completion of the FACE Verification process, Software Suppliers will receive a Verification Results Package, comprising the associated Software Supplier's Statement of Conformance and a Statement of Verification.

The Statement of Verification is signed by the VA and is used as evidence that the FACE Verification process was completed. A copy of the statement is maintained at the VA in the Verification Retention Repository to be provided to the CA should the Software Supplier initiate the FACE Certification process, the next step in the FACE Conformance Program.

The Statement of Verification includes some specific information about the test and will be used by the CA along with the Software Supplier's Statement of Conformance to ensure the UoC has met all requirements to receive a FACE Conformance Certificate. The information on the Statement of Verification is visible to only the Software Supplier, the VA, and the CA.

Receipt of a Statement of Verification indicates a UoC is technically conformant to the FACE Technical Standard, but the Software Supplier must initiate the FACE Certification process in order to gain a FACE Conformance Certificate. The CA is NOT notified of the successful completion of the FACE Verification process by anyone other than the Software Supplier.

5. The FACE Certification Process

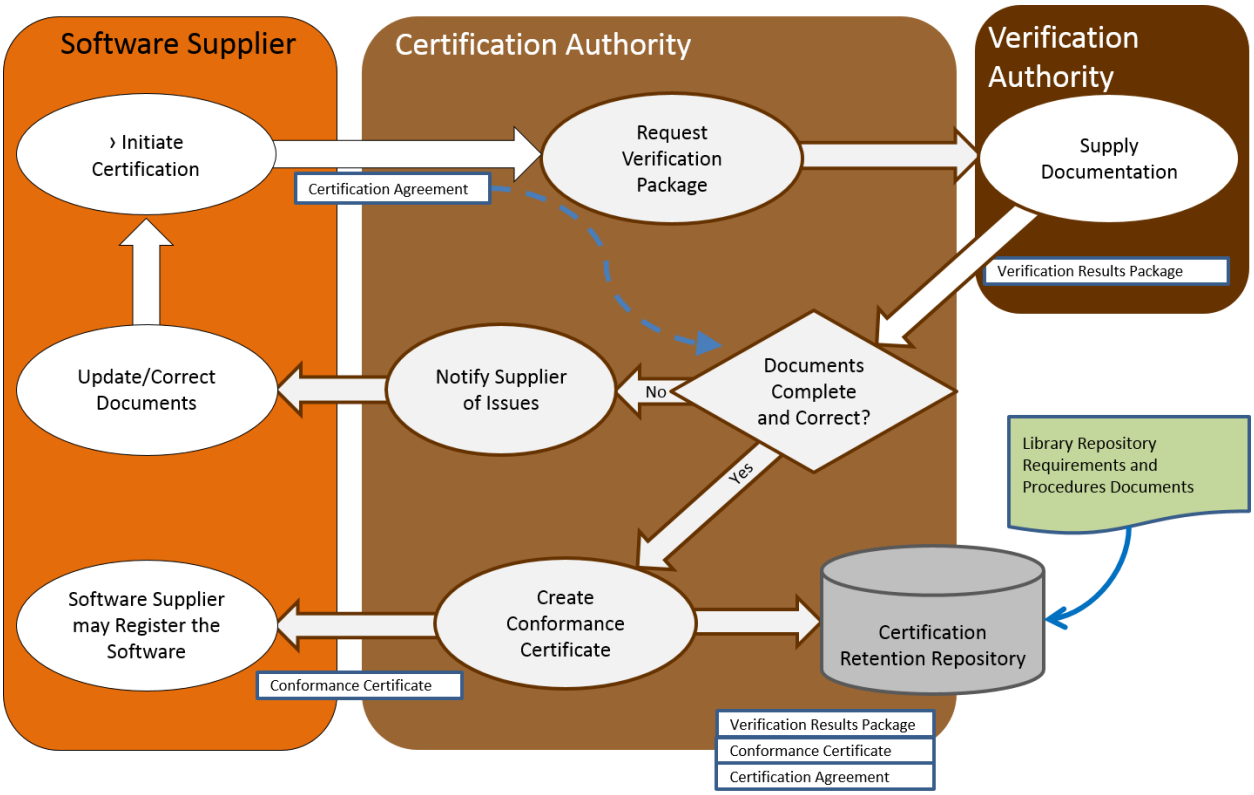

Figure 6: FACE Certification Process

The FACE Certification process is the second step in the FACE Conformance Program and represents the business side of using the FACE brand.

5.1 FACE Certification Overview

The FACE Certification process requires that all necessary documentation is complete. The principle concern is the Certification Agreement and successful completion of the FACE Verification process that supports the conformance claim defined in the Software Supplier's Statement of Conformance. In addition, the Software Supplier needs to have an agreement in place with the CA.

5.1.1 What Is Certification?

Certification involves the business side of getting a FACE Conformance Certificate. The CA will ensure that the FACE Certification Agreement is in place.

The CA will review the following information provided by the VA:

- Software Supplier's Statement of Conformance for completeness and correctness of the scope of conformance claimed for the UoC

- Statement of Verification to ensure completion of the FACE Verification process for the specific UoC in line with the Software Supplier's Statement of Conformance

The successful result of the FACE Certification process is the receipt of a FACE Conformance Certificate for the UoC.

5.1.2 When is Certification Needed?

Completion of the FACE Certification process is required prior to the FACE Registration process and making public claims to UoC conformance.

In some cases the Certification process serves only to update information on an existing certificate. A Conformance Maintenance Release of any UoC or the update of a UoC in the Transport Services Segment for the addition of Data Model elements leads to an update of the certificate information.

If the Software Supplier wishes to change the information provided as part of the FACE Conformance Certificate that has no impact on the verification of the UoC (such as the UoC name), the Software Supplier would request such changes at any time by contacting the CA. The Software Supplier is required to affirm to the CA that the UoC is identical to the one verified.

5.1.3 Removal of Certification

A UoC will remain certified as long as the certified version of the UoC remains available and the Certification Agreement remains in effect.

If the version of the UoC that was certified is no longer available or supported, the Software Supplier should notify the CA to have the certificate revoked and the UoC removed from the FACE Registry.

If the Software Supplier fails to adhere to any of the conditions of the signed agreements, the certificate is revoked and the UoC removed from the FACE Registry.

5.2 FACE Certification Authority (CA)

The Certification Authority (CA), a singular organizational entity, is responsible for the day-to-day operations of the FACE Conformance Program as defined in the FACE Conformance Policy. This includes assessing applications for certification, awarding certification, and issuing FACE Conformance Certificates.

Contact information for the CA is available on the FACE Landing Page.

5.2.1 The CA and Intellectual Property

The CA does not need to see any Software Supplier's IP to perform its duties. The CA uses only the Statement of Verification (pass result) from the VA, along with the Software Supplier's Statement of Conformance and the Certification Agreement. The VA is required to keep any IP provided by the Software Supplier confidential and not share it with the CA.

5.3 Initiating Certification with the CA

The FACE Certification process happens after the Software Supplier receives a Statement of Verification from the VA and decides to pursue certification. The Software Supplier initiates the FACE Certification process with the CA by executing the Certification Agreement. Upon receipt of the Certification Package, the CA will contact the associated VA in order to obtain the following:

- Software Supplier's Statement of Conformance (as provided to the VA by the Software Supplier)
- Statement of Verification (as written by the VA)

5.4 What Happens during Certification

When the CA receives a Certification Package from the Software Supplier, the CA contacts the associated VA to get the Statement of Verification and Software Supplier's Statement of Conformance. The CA then reviews the Software Supplier's Statement of Conformance and the Certification Package for accuracy and completeness.

The Software Supplier's Statement of Conformance defines the scope of the UoC's certification with respect to things such as profile, segment supported, and UoC Variants. The CA will also review the Software Supplier's Statement of Conformance against the Statement of Verification to ensure that the verification performed is appropriate for the scope of certification as claimed on the Software Supplier's Statement of Conformance. If all agreements and statements are in order, the CA will grant certification for the UoC and issue a FACE Conformance Certificate for the UoC to the Software Supplier.

5.5 Results

The CA will notify the Software Supplier of both positive and negative results.

5.5.1 What if Things Go Wrong

If the CA discovers any errors, omissions, or missing documentation during this review, the CA will contact the Software Supplier to rectify any issues. If the error is with any VA-supplied information, the Software Supplier must work with the associated VA to remedy the deficiency. This keeps the Software Supplier in control and fully aware of any situation regarding the certification.

5.5.2 What is the FACE Conformance Certificate

Once the CA determines a UoC has met the requirements for FACE Certification, the CA will issue a FACE Conformance Certificate to the Software Supplier. This is done via electronic delivery means and will include a serial numbered, digitally signed FACE Conformance Certificate in PDF format for the associated UoC. A copy of the Certificate is stored in the FACE Certification Retention Repository.

At this point, the Software Supplier is the only entity who has access to the FACE Conformance Certificate outside of the CA. There is no public announcement or list of certificates.

6. FACE Registration Process

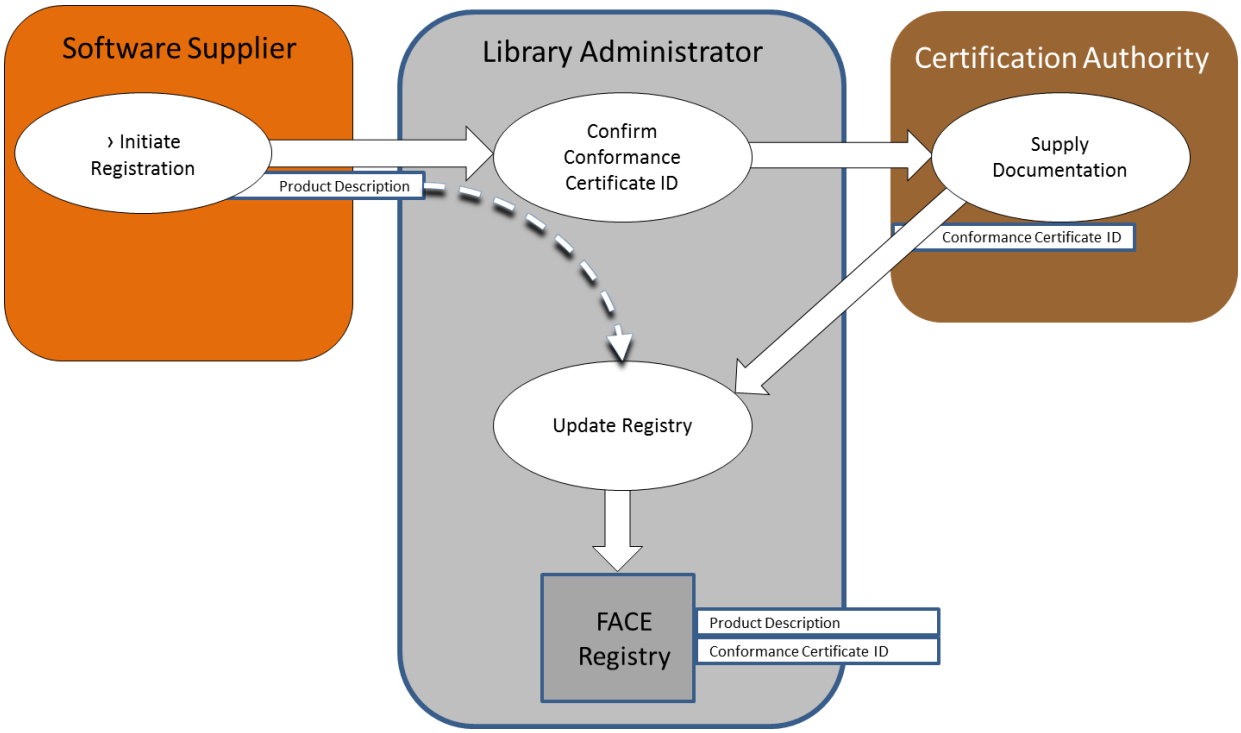

Figure 7: FACE Registration

The final step in the FACE Conformance Program is the FACE Registration process. While not mandatory, FACE Registration is highly encouraged and likely desirable to the Software Supplier. This listing of UoCs in the FACE Registry allows other Software Suppliers, integrators, developers, and program managers to advertise and find reusable FACE Certified software for their systems.

6.1 What Is Registration?

The FACE Registration process is the process of listing a UoC in the FACE Registry. It involves the Software Supplier requesting a UoC listing and providing a description, other metadata, and contact information for the Registry entry. The CA will send the FACE Conformance Certificate number to the FACE LA as proof that the UoC is indeed certified. This information is then posted to the FACE Registry.

6.2 FACE Registry

The FACE Registry is the public display of information regarding a FACE Certified UoC, not the UoC itself. The FACE Registry is not an Apps Store. It is a catalog with information about the UoCs that are certified FACE conformant and includes the contact information for sales and further information on the UoC.

Additional information on the FACE Registry can be accessed through the FACE Landing Page (www.opengroup.org/face) or the FACE Registry requirements in the FACE Library Policies and Procedures document (also available from the FACE Landing Page).

6.3 When is Registration Needed?

Completion of the FACE Registration process is required to publicly advertise any UoC as FACE Certified. The Conformance Policy and Certification Agreement limit making public claims of conformance prior to completing registration.

The FACE Registry will only contain UoCs the Software Supplier wishes to list. UoCs gaining FACE Conformance Certificates are not automatically added. This allows the control of public knowledge of UoCs to remain with the Software Supplier.

6.4 Registering a FACE Certified UoC

To register the UoC, a Software Supplier contacts the FACE LA through the FACE Landing Page and provides the required information and the UoC's FACE Conformance Certificate serial number.

7. Conformance Records

The FACE Conformance Program utilizes three records to provide information about a UoC and its conformance.

7.1 Software Supplier's Statement of Conformance

The Software Supplier's Statement of Conformance is written by the Software Supplier and is visible to the VA, the CA, and potential buyers through information presented in the FACE Registry. Software Suppliers can obtain a blank form to fill out through the FACE Landing Page (www.opengroup.org/face).

The Software Supplier's Statement of Conformance contains the following data:

Supplier Organization Name	The name of the Software Supplier organization
Supplier Point of Contact Name	The name of the individual completing the Software Supplier's Statement of Conformance
UoC Name or Identifier	The name of the UoC as used in the Conformance Program
UoC Part Number	The part number
UoC Version (if applicable)	The version of the UoC
FACE Segment	The FACE segment within which the software executes
FACE Profile	The applicable FACE Profile
FACE Technical Standard	The edition of the FACE Technical Standard used
Conformance Verification Matrix Version	The version of the Conformance Verification Matrix used (if applicable)
Conformance Test Suite Version	The version of the Test Suite used
Shared Data Model	The version of the Shared Data Model (SDM) used
UoC Variants	A supplier formatted listing of variations of the UoC that can be selected at compile time
Implementation Details	A table as to the software support of features in the FACE Technical Standard that are not supported by the UoC (items marked as conditional requirements in the Conformance Verification Matrix)

The FACE Conformant Statement is a reflection of how the UoC applies the requirements within the FACE Technical Standard. The Software Supplier's Statement of Conformance includes the explicit identification of the UoC version and Technical Standard Edition.

Each FACE Technical Standard Edition contains requirements for all segments and profiles. The Software Supplier's Statement of Conformance includes a declaration of Segment and Profile to identify more specifically which requirements in the Technical Standard are applicable to the UoC.

Each FACE Technical Standard Edition also contains requirements for specific components within some of those segments. There are also requirements applicable only if certain features are implemented. These requirements are considered "conditional requirements" and must be listed in the Implementation Details section.

When a UoC has variants determined at compile time, and the Software Supplier wishes to list those variants as conformant, the Software Supplier's Statement of Conformance must include the list of such variants.

7.1.1 UoC Variants

The Software Supplier must identify variants in a clear manner. If there are no variants, just one compiled version of the software is supplied to the VA and this section is blank.

If the software is written to support multiple target environments, such as in Example 1 from Section 3.4.4, the UoC Variants field could contain a statement like "Variants include PPC and x86 compiler settings".

If the software is written to have optional features, such as in Example 2 from Section 3.4.4, the UoC Variants field could contain a statement like "Variants include the enabling and disabling of software features including Flight Director Cues, Marker Beacon Alerts, Targeting Symbology, and Synthetic Vision".

When the UoC Variants section is completed, the Software Supplier must provide multiple sets of object code to the VA, along with an analysis showing that the supplied object file sets cover all listed variants.

NOTE: The text supplied in this field becomes part of the official record, it will be on the Conformance Certificate, and will be displayed to customers in the FACE Registry if and when the UoC is registered.

7.1.2 Implementation Details

When providing evidence to all requirements in the FACE Technical Standard, some requirements are answered by statements indicating features that are not supported by the UoC. Many of these requirements are defined for other segments or profiles. Requirements not supported due to segment and profile selections are covered by the segment and profile selections on the Software Supplier's Statement of Conformance.

The UoC's capability with regard to features in the FACE Technical Standard for reasons other than segment or profile must be declared in the Implementation Details. The Conformance Verification Matrix for the chosen standard identifies these requirements in the "Conditional Requirements" column. The statement should include the requirement text from the FACE Technical Standard and a statement as to the software support of that requirement.

All conditional requirements for the selected segment must be listed in the Implementation Details section on the Software Supplier's Statement of Conformance.

Implementation Details Example: Operating System Partitioning

The FACE Technical Standard Edition 1.0 lists time and space partitioning as required for the Operating System Segment (OSS) in the Security Profile, but leaves the requirement as conditional for the Safety and General-Purpose Profiles. If an Operating System is tested in the Security Profile, then no statement

is needed for time and space partitioning. If an Operating System is tested in another profile, a statement about time and space partitioning is included.

The Implementation Details information would be:

Requirement:	Time and space partitioning MAY apply to a General-Purpose computing platform when safety or security requirements warrant.
Implementation:	The UoC provides for time and space partitioning.

Implementation Details Example: I/O Segment Data Tagging

The FACE Technical Standard Edition 1.0 specifies that the I/O Data Movement capability must support data tagging when required. Software not operating in the IOS Segment does not need to make a claim on this requirement, but all software executing in the IOS Segment must make a claim.

An example of an Implementation Details statement would be:

Requirement:	The I/O Data Movement capability SHALL support data tagging (e.g., for security) as required.
Implementation:	Data tagging is not supported by this component.

NOTE: In this case the VA ensures the "not required" claim is accurate.

Implementation Details Example: Transport Services Segment Capabilities

The FACE Technical Standard Edition 1.0 lists a set of capabilities that a TSS component must provide if required by the system. This is a list of items and for completeness a TSS Implementation Details statement must include all items in the list, even if the answers are different. For example:

Requirement:	The Transport Services Segment SHALL support instantiation of the following capabilities if required by the system: Message Association Capability, QoS Capability, Data Transformation Capability, Paradigm Translation Capabilities.
Implementation:	The application provides Message Association and QoS capabilities. Data Transformation and Paradigm Translation are not supported.

7.2 Statement of Verification

The Statement of Verification is written by the VA upon successful completion of the FACE Verification process. The Statement of Verification is shared with the Software Supplier and the CA. Information on the Statement of Verification is not provided to any other entity by FACE authorities.

The Statement of Verification contains the following data:

Verification Authority Name	The name of the registered VA organization who performed the verification
VA Point of Contact Name	The name of the individual at the VA to contact regarding this verification
VA ID	The unique identifier assigned to each VA
Supplier Organization Name	The name of the Software Supplier organization

Supplier Point of Contact Name	The name of the individual at the Software Supplier organization to contact regarding this UoC
UoC Name or Identifier	The name of the UoC as used in the Conformance Program
UoC Part Number	The part number
UoC Version (if applicable)	The version of the UoC
Statement of Passed Verification	A statement that the software passed the FACE Verification process This statement contains several questions that are answered by the VA in relation to information on the Software Supplier's Statement of Conformance, Verification Evidence, Test Suite execution, and, if any, Approved Corrections to Problem Reports (PRs) that were used.
Verification Complete Date	The date the VA completed the verification efforts
Test Suite Version	The version of the Test Suite used in the FACE Verification process
Conformance Verification Matrix Version	The version of the Conformance Verification Matrix used
Target Hardware	The target hardware (PPC, ARM, x86)
Compiler	The compiler and version used in the test
Compiler Settings	The compiler settings used to complete the testing
Shared Data Model	The version of the Shared Data Model (SDM) used
Approved Corrections Used	If the VA or Software Supplier used an Approved Correction to a registered PR in order to complete the FACE Verification process, the text of the Approved Correction must be entered along with the date that authorization to use this solution was received from the CA.

7.3 FACE Conformance Certificate

The Conformance Certificate is generated by the CA on successful completion of the FACE Certification process. It is provided to the Software Supplier and may be displayed to potential customers, including if the Software Supplier has not completed the FACE Registration process.

The FACE Conformance Certificate contains the following information:

Supplier Organization Name	The name of the Software Supplier organization
UoC Name or Identifier	The name of UoC as used in the Conformance Program
Conformant Variants	The text from the Software Supplier's Statement of Conformance "UoC Variants" stating the compile time options tested in the verification process
UoC Part Number	The part number
UoC Version (if applicable)	The version of the UoC

FACE Segment	The FACE segment within which the software executed
FACE Profile	The FACE profile against which the software was verified
FACE Technical Standard	The edition of the FACE Technical Standard used
Certificate ID	The serial number of the individual certificate
Certificate Date	The date the certificate was issued

8. Problem Reports/Change Requests and Appeals

The FACE Consortium has established a Problem Report/Change Request (PR/CR) capability enabling users to suggest changes to the Conformance Program and to raise problems preventing progression through the Conformance Program processes. The FACE Consortium has also established an appeals process to appeal decisions made by the VA and/or CA.

A Change Request (CR) is an issue or suggested improvement to one or more FACE Consortium maintained documents or tools. When acted upon, a CR will be incorporated into a new edition or version of the affected products. The completion of a CR will lead to a new version or edition of the product.

A Problem Report (PR) is an issue with one or more FACE Consortium maintained documents or tools that prevents a UoC or UoC Package from completing the Conformance Program. The resolution of a PR is an Approved Correction. An Approved Correction applies to the published document or tool and does not lead to a new version or edition.

In many cases an issue will be treated as both a PR and a CR. This will lead to an Approved Correction for the published product as well as drive a change into the next version of the published product.

An appeal is a request to have a decision reviewed by the FACE Consortium. The decisions that can be reviewed are decisions made by approved entities of the FACE Consortium. A Software Supplier might ask for the review of decisions made by VA, CA, or LA among other possibilities.

8.1 Problem Reporting

The FACE Consortium is responsible for implementing a PR/CR process that supports conformance-related problem reporting, ensures submitter anonymity, and provides for Approved Corrections in order to expeditiously address any valid problem(s) identified with Conformance Program processes, the Conformance Policy, Test Suite(s), or the Technical Standard which may cause undue delay in executing conformance certification.

A Software Supplier or other entity can access the PR/CR system though the FACE Landing Page. When entering a new item, checking the “Conformance Need” will identify the issue as a PR. The types of problems that may be classified as a PR include:

- Errors, conflicts, or ambiguities in the Technical Standard or Conformance Verification Matrix.
- Errors in the Test Suite(s) used to assess conformance with the specifications; specifically, in the FACE Conformance Test Suite(s), or other test suites referenced by the FACE Conformance Program (if any). Errors, conflicts, or ambiguities in the set-up requirements of the FACE Conformance Test Suite(s) may also be addressed through PRs.
- Errors, conflicts, or ambiguities in the conformance verification and certification processes; specifically, those related to the Registration process, legal agreements, and completion of the Software Verification Package (set of artifacts to support conformance verification).
- Any other published document or tool directly limiting the conformance of a UoC or UoC Package that the Software Supplier believes is conformant to the intent of the FACE Technical Standard.

A submitter may file PRs to address issues that arise for any of these items. The identity of the submitter will be protected throughout this process. The PR is used specifically for the types of errors listed above which are inhibiting the conformance effort.

For issues or suggested improvements not directly related to the conformance of a UoC, any entity can enter a CR though the same system, without checking the Conformance Need indication.

For general questions on the conformance verification and certification processes, running the test suites, or other problems not covered above, the FACE Consortium Program Manager can provide information on obtaining further assistance. Issues not resolved through this assistance may be followed-up with a PR or CR.

Figure 8 provides an overview of the Problem Reporting process.

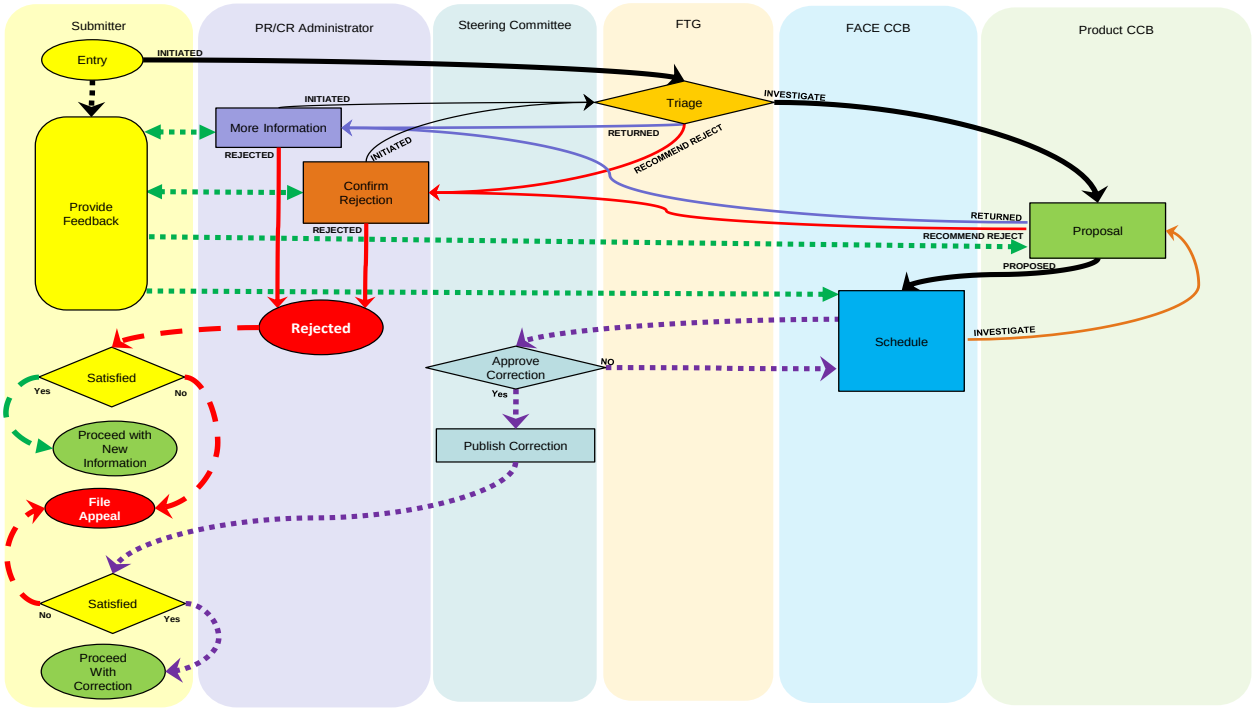

Figure 8: FACE Conformance Program Problem Reporting Process

When PRs are submitted, the first action is triage to review and route the PRs to the appropriate Product Configuration Control Board (CCB). These CCBs include:

- BWG CCB
- TWG CCB
- Conformance Tools CCB
- Library Tools CCB

The process for responding to the PRs is the same for each of the CCBs.

When the issue is a PR, the assigned CCB will perform a preliminary review and assessment of the PR and develop a plan.

If, at any time, the Triage Group or the Product CCB does not understand the problem or needs clarification, the ticket may be returned to the submitter for more clarification. This process is handled by the PR/CR Administrator to maintain the anonymity of the submitter.

If the Triage Group or the Product CCB believe the issue should not be addressed, they can mark the issue as "Recommend Reject", which will give the submitter a chance to provide feedback before actual rejection of the issue.

If the Product CCB agrees the issue is a valid PR, a Proposed Correction will be created as a draft form of an Approved Correction. If the Product CCB believes the issue should be fixed in a future version or corrigendum to the product, a proposal will be written to address the changes in each affected product.

When a proposal is created by a Product CCB, the FACE CCB will vote on the proposal. If the proposal includes a Proposed Correction, the Steering Committee will vote to approve it. When the Steering Committee approves the Proposed Correction it becomes an Approved Correction and will be published on the FACE Landing Page.

Approved Corrections can be used immediately following the vote but must be listed on the Statement of Verification.

The assigned CCB will perform its initial assessment as soon as practicable, with the goal within 15 calendar days of the submission. This initial response allows simple problems to be dealt with expeditiously. A detailed review will be undertaken for issues that are more complicated, or when the preliminary review does not resolve the issue. Final resolution will be provided as soon as practicable, with the goal within an additional 30 calendar days. In most cases, 45 calendar days are sufficient to provide a final resolution. However, in exceptional circumstances, final resolution may take longer. In such cases, the PR/CR Administrator will notify the submitter prior to the 45th day, of the delay and provide a preliminary resolution, if available.

If the submitter is not satisfied with the final resolution, the submitter may invoke the appeals process.

The Problem Reporting process will allow the submitter to remain anonymous, so that pre-certification activity is kept entirely confidential and vendor-neutral.

8.2 Appeals

The occasions that may give rise to an appeal include, but are not limited to, the following:

- The Software Supplier disagrees with the resolution of a PR.
- The Software Supplier disagrees with the CA's grounds for denying the award of certification.
- The Software Supplier of a FACE Certified UoC disagrees with a formal notification from the CA of the need to rectify a non-conformance.

The incidence of a UoC having been found to be non-conformant will be handled on a case-by-case basis under Conformance Maintenance Release policies.

Appeal requests will be made to the Steering Committee in writing. Figure 9 provides an overview of the appeals process.

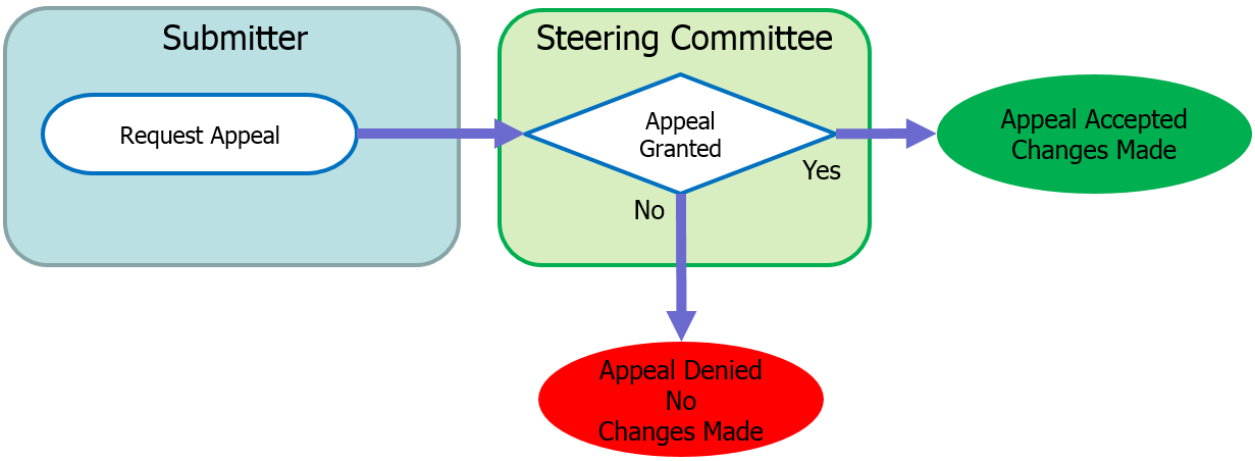

Figure 9: FACE Conformance Program Appeals Process

The Steering Committee may ask for technical reports from the relevant working groups and may also ask for reports from independent experts. The Steering Committee Review will be completed within 30 calendar days of the submitter's written request. The results of a Steering Committee Review are final and cannot be further appealed.

9. References and Resources

Other resources for FACE can be found on the FACE Landing Page or in the FACE Reference Repository accessed from the FACE Landing Page at www.opengroup.org/face.

Table 4 lists the other documents a Software Supplier may wish to consult as a supplement to this Guide. These documents are produced by the FACE Consortium, published by The Open Group, and available from the FACE Landing Page.

Table 4: FACE References

Title	Use
FACE Conformance Policy	The rules of the FACE Conformance Program.
FACE Reference Architecture Edition 1.1	The technical requirements for FACE UoCs (Edition 1.1).
Technical Standard for FACE Edition 2.1	The technical requirements for FACE UoCs (Edition 2.0).
Technical Standard for FACE Edition 2.2	The technical requirements for FACE UoCs (Edition 2.1).
Conformance Verification Matrix	Contains a breakdown of the Technical Standard and describes an acceptable method of testing requirements.
FACE Conformance Verification Matrix User's Guide	A user's guide to the Conformance Verification Matrix.
FACE Conformance FAQ	A Frequently Asked Questions (FAQ) on FACE Conformance available on the FACE Landing Page.
FACE Reference Implementation Guide	Guidance on the technical aspects of producing FACE UoCs.
FACE Library Policies and Procedures	The requirements for FACE Library repositories.
FACE Business Guide	Guidance on the agreements and recommended practices related to FACE UoCs.
FACE Contract Guide	Guidance on the agreements and recommended practices related to FACE UoCs.

Table 5 lists the entities which support the Software Suppliers with the FACE Conformance Program. These entities can be contacted through the FACE Landing Page.

Table 5: FACE Authorities and Entities

Title	Use
FACE Certification Authority (CA)	In addition to handling the FACE Certification process, the Certification Authority is the first point of contact for most FACE questions, problem reports, and appeals.

Title	Use
FACE Verification Authority (VA)	Verification Authorities are responsible for providing the technical evaluation of software during the FACE Verification process. There are several Verification Authorities. A complete listing is provided on the FACE Landing Page.
FACE Library Administrator (LA)	Contact the Library Administrator to register FACE Certified UoCs and to update UoC information.

10. Terms and Definitions

Table 6 defines terms or clarifies the meaning of words used within this document. Where an acronym is also used, it is provided in parentheses.

Table 6: Terms and Definitions

Term	Definitions
Certification Agreement	The agreement between the Software Supplier and the Certification Authority that defines the certification service to be provided and contains the legal commitment by the Software Supplier to the conditions of the FACE Conformance Program.
Certification Authority (CA)	The entity officially sanctioned to manage the day-to-day operations of the FACE Conformance Program in accordance with the policies defined in the Conformance Policy.
Conformance Verification Matrix (CVM)	Requirements traceability spreadsheet assigning verification methods and conformance evidence recommendations for each conformance requirement within the Technical Standard.
FACE Certified Unit of Conformance (UoC)	A Unit of Conformance that has successfully completed the FACE Conformance Program. The Software Supplier has accepted the Certification Agreement, and has received the Conformance Certificate from the Certification Authority.
FACE Certified Unit of Conformance (UoC) Package	A valid collection of Units of Conformance that have each individually and collectively successfully completed the FACE Conformance Program. The Software Supplier has accepted the Certification Agreement, and has received the Conformance Certificate from the Certification Authority.
FACE Conformance Certificate	A document issued to a Software Supplier formally declaring that a Unit of Conformance, any associated conformant variants, and/or UoC Package has successfully met the requirements for certification.
FACE Conformance Certification Guide	(This document) The document that describes the processes for how a Software Supplier achieves FACE Conformance Certification for a Unit of Conformance. The Guide is used in conjunction with the policy document. The Guide provides detailed instructions on the steps a Software Supplier must take to get a Unit of Conformance certified and where to obtain relevant information and documents.
FACE Conformance Test Suite(s)	A test suite that will accept the Unit of Conformance and produce a pass/fail with respect to all Conformance Requirements covered by the test suite plus a detailed report of the test results. Use of only approved test suite versions is mandatory for For-the-Record Verification testing.
FACE Library Administrator	The organization responsible for maintaining the FACE Registry.
FACE Registry	The single online reference point for listing and managing all FACE Certified Units of Conformance. As the gateway to discovering certified products, it will include descriptions and locations of available FACE conformant products and the publishable standard licensing terms for each product.

Term	Definitions
FACE Technical Standard	The requirements a Unit of Conformance must meet to be certified FACE conformant. For Edition 1.0 this document was named the FACE Reference Architecture; for Edition 2.0 and later it is named the Technical Standard for FACE.
Problem Report (PR)	A question of clarification, intent, or correctness of a specification, a test suite, or the web-based certification system.
Shared Data Model	Referred to as IDL in Edition 1.0 of the FACE Technical Standard, the Shared Data Model contains definitions of a product's use of the Transport Services Segment (TSS) interface.
Software Product Set	The set of deliverables provided by the Software Supplier to the Verification Authority in order to execute the FACE Conformance Test Suite on a Unit of Conformance.
Software Supplier	A vendor who is interested in, is applying for certification in, or has certified a Unit of Conformance in the FACE Conformance Program. During the period in which a Software Supplier is going through the conformance verification and certification process to get a Unit of Conformance certified, the Software Supplier may be referred to as an Applicant.
Software Supplier's Statement of Conformance	The Software Supplier's documented set of claims describing precisely the way in which the Unit of Conformance meets the Conformance Requirements, including which conditional requirements are supported. It provides a precise identification of the FACE Certified UoC and the environment in which conformance is guaranteed.
Software Verification Package	Documentation required by the Verification Authority from the Software Supplier in order to conduct verification activities.
Statement of Verification	A statement completed by the Verification Authority indicating the Unit of Conformance has successfully completed the FACE Verification process.
Steering Committee (SC)	The governing body of the FACE Consortium. The FACE Consortium Steering Committee directs all activities of the FACE Consortium, including approval to submit all Consortium work products to The Open Group for official publication, creating new working groups and approving their charters, and defining and approving roles and responsibilities of the FACE Advisory Board.
Unit of Conformance (UoC)	Software designed to meet the requirements for an individual FACE segment (OSS, IOS, PSSS, TSS, and PCS) and profile. Units of Conformance must be verified as conformant to the FACE Technical Standard to be certified.
Unit of Conformance (UoC) Package	A valid collection of Units of Conformance that traverse FACE segments to create a singular software logical entity.
Unit of Portability (UoP)	A Unit of Conformance in the PCS, PSSS, or TSS. These Units of Conformance are inherently more portable due to the requirements placed on these sections by the FACE Technical Standard.
Verification Agreement	The agreement between Software Supplier and a Verification Authority that covers the contracting of the Unit of Conformance FACE Verification process.

Term	Definitions
Verification Authority (VA)	An entity officially sanctioned by the Steering Committee to conduct or witness For-the-Record Verification testing using an approved version of the Conformance Test Suite and assess the Verification Evidence provided by the Software Supplier in support of the FACE Conformance Program. The Verification Authority may be an independent third-party entity or a designated internal, independent entity of the Software Supplier.
Verification Evidence	Documentation required by the Verification Authority from the Software Supplier that details how the FACE Technical Standard requirements have been satisfied.