

An introduction to Interoperability Conformance Specifications

What is an ICS?

ICC has introduced the Interoperability Conformance Specification (ICS) as a key element in the ICC.2 color management architecture (also known as iccMAX).

ICC.2 (also published by ISO as ISO 20677) is a significant leap forward in the flexibility and functionality that can be included in a color managed workflow. It provides for a flexibly-defined connection space (which can be colorimetric, as in ICC.1, or spectral, or simply based on arbitrary channels), and a much greater range of transform elements. ICC.2 processing elements can be included in a profile in any number and sequence, and the flexibility is also enhanced by the inclusion of an optional calculator element that supports script-based transforms in addition to the usual diet of curves, matrices and look-up tables.

ICC.2 profiles can be connected in the same way as in ICC.1, whereby source and destination profiles define a transform via the ICC Profile Connection Space (PCS). However, in ICC.2 the flexibility in the way transforms are designed makes it possible to connect via a chain of profiles, and to use a non-standard PCS.

This greatly increased flexibility brings many benefits and enables ICC.2 to address color management needs that could not be addressed in ICC.1. However, with this flexibility comes a greater complexity, and it is not realistic to expect any one CMM to support all possible methods of connecting between two color spaces. Specifically, for a given workflow, this implies that:

- The specific transform elements and how they are encoded may vary between profiles
- A developer writing a color management application, profile creator or CMM does not know in advance what connection methods to support, leading to potential failures in the workflow
- Different interpretations of the specification may lead to differences in results and a lack of interoperability.

ICC envisages that ICS documents will reduce the burden of implementing ICC.2 through application-specific element sub-sets and well-specified connections. This should enable profile creators to employ a well-defined transform model and also enable CMM developers to target development efforts to specific applications.

More information about how profiles and transforms are connected and applied is given in [Making Connections with iccMAX](#).

Who uses an ICS?

The main users of an ICS are as follows:

Profile creators use an ICS to determine how to build an iccMAX profile for a given use case. By ensuring that all tags required by the ICS are present, in addition to any optional tags needed to produce the desired output, the profile creator can ensure maximum interoperability of their profile, since other users of the target application will have the same understanding of the connection. The profile creator can make use of the example profiles and XML files listed in the ICS, in conjunction with the Reference Implementation, as a guide to building a conforming profile and testing it to ensure correct results.

CMM developers use an ICS to target development efforts towards specific applications. This considerably simplifies the development effort in adding new functionality to an application, since there is no ambiguity in the tag elements and workflow that needs to be supported.

The CMM developer can also make use of the example profiles and XML files listed in the ICS, in conjunction with the Reference Implementation, as a benchmark to ensure correct results.

Color management users can use an ICS as a guide to aid selection of profiles and profile sub-classes. By selecting profiles that conform to an ICS, users can have confidence that their workflow should avoid interoperability problems, particularly when using profiles, CMM and workflow tools from different vendors.

Conformance tools can use an ICS as a target to check the validity of an iccMAX profile for a particular use case. Both the binary profile and an associated XML file can be used as the validation target. In the latter case, to ensure consistency of treatment, it is recommended that the binary profile to be validated is converted to XML using the current version of lccXml in the Reference Implementation.

Who writes an ICS?

Anyone can write an ICS and submit it to the ICC for approval. In many cases the ICC itself will identify the need for an ICS for a particular workflow and develop the document for publication. It is also envisaged that organizations such as trade associations, research institutes and individual manufacturers will also develop ICS documents in cases where they can expect to benefit their workflows. A template for ICS documents, and example ICSs, are available on the [ICS web page](#). An organization wishing to develop an ICS can contact the ICC for advice, or attend ICC meetings to discuss the requirements.

What goes into an ICS?

An ICS is a normative document, in that it clearly lays out what is required of conforming profiles and CMMs. The layout is similar to that of an ISO standard, and contains a clear statement of scope, a list of any external documents required for the

application of the ICS (such as ISO 20677), a list of definitions and a bibliography. The requirements part of the ICS contains the following sections:

- i. Use case (including the application domain)
- ii. Profile sub-classes (a list of all the sub-classes and their identifiers and signatures)
- iii. Processing scenarios (workflows through which conforming profiles are envisaged to connect, the associated options that are expected to be available for the user or application to select, and the relevant processing outcomes)
- iv. Sub-class profile requirements (a tabulation of the required header fields and the required tags for each profile sub-class, together with a tabulation of any optional tags relevant to the workflow that may be supported). The sub-class profile requirements also include a tabulation of multiProcessingElementTypes that must be supported by a conforming CMM.
- v. Conformance requirements (the criteria by which it shall be determined whether a profile or a CMM conforms to the ICS).
- vi. One or more reference profiles that provide an example of the profile sub-class, together with the .xml document(s) that were used to make the profile

How is an ICS approved?

ICS documents are submitted to the ICC Steering Committee for review and approval. Once approved they are posted in a registry on the ICC web site. Proposed ICS documents should be sent to the ICC Technical Secretary [Phil Green](#).

Once approved by ICC, ICS documents can also be submitted to other relevant standards bodies for publication. ICC has a co-publication agreement with ISO, and an ICS document can be proposed for standardization by an ISO member in, for example, ISO TC130 JWG7.

How can I find out if an ICS exists for my application?

The ICC will set up an ICS Registry which identifies all approved ICS documents and their associated example profiles, XML files and data files. The Registry can be accessed from the ICS page <http://www.color.org/iccmx/ics.xalter>

The Registry will identify the ICS name, domain of application, originating organization and intended use. Access to the Registry is free, and ICS documents posted there will be permanently available.