Internet X.509 Public Key Infrastructure -- Certificate Image

Abstract

This document specifies a method to bind a visual representation of a certificate in the form of a certificate image to a public key certificate as defined in RFC 5280, by defining a new "otherLogos" image type according to RFC 3709.

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1. Introduction

This standard specifies how to bind a certificate image to a certificate (defined in [RFC5280]), providing a visual representation of that certificate using the Logotype extension defined in [RFC3709] and specifying the certificate image as a new "otherLogos" type.

The purpose of the certificate image is to aid human interpretation of a certificate by providing meaningful visual information to the user interface (UI).

Typical situations when a human needs to examine the visual representation of a certificate are:

- A person establishes a secured channel with an authenticated service. The person needs to determine the identity of the service based on the authenticated credentials.

- A person validates the signature on critical information, such as signed executable code, and needs to determine the identity of the signer based on the signer’s certificate.

- A person is required to select an appropriate certificate to be used when authenticating to a service or Identity Management infrastructure. The person needs to see the available certificates in order to distinguish between them in the selection process.
The display of certificate information to humans is challenging due to lack of well-defined semantics for critical identity attributes. Unless the application has out-of-band knowledge about a particular certificate, the application will not know the exact nature of the data stored in common identification attributes such as serialNumber, organizationName, country, etc. Consequently, the application can display the actual data, but faces the problem of labeling that data in the UI and informing the human about the exact nature (semantics) of that data. It is also challenging for the application to determine which identification attributes are important to display and how to organize them in a logical order.

RFC 3709 [RFC3709] defines a certificate extension for binding images to a certificate, such as a community logo and issuer logo, enhancing the display of certificate information. The syntax is extensible and allows inclusion of new image types using the otherLogos structure. This standard defines how to include a complete certificate image using the extensibility mechanism of RFC 3709.

1.1. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

2. Certificate Image

This section defines the certificate image as a new otherLogos type according to Section 4.1 of [RFC3709].

The certificate image otherLogos type is identified by the Object Identifier (OID) id-logo-certimage.

id-pkix OBJECT IDENTIFIER ::= {
  iso(1) identified-organization(3) dod(6) internet(1)
  security(5) mechanisms(5) pkix(7) }

id-logo OBJECT IDENTIFIER ::= { id-pkix 20 }

id-logo-certimage OBJECT IDENTIFIER ::= { id-logo 3 }

When present, the certificate image MUST be a complete visual representation of the certificate. This means that the display of this certificate image represents all information about the certificate that the issuer subjectively defines as relevant to show to a typical human user within the typical intended use of the certificate, giving adequate information about at least the following three aspects of the certificate:
Certificate Context information is visual marks and/or textual information that helps the typical user to understand the typical usage and/or purpose of the certificate.

It is up to the issuer to decide what information -- in the form of text, graphical symbols, and elements -- represents a complete visual representation of the certificate. However, the visual representation of Certificate Subject and Certificate Issuer information from the certificate MUST have the same meaning as the textual representation of that information in the certificate itself.

Applications providing a Graphical User Interface (GUI) to the certificate user MAY present a certificate image according to this standard in any given application interface, as the only visual representation of a certificate.

3. LogotypeImageInfo

The optional LogotypeImageInfo structure is defined in [RFC3709] and is included here for convenience:

```plaintext
LogotypeImageInfo ::= SEQUENCE {
  type          [0] LogotypeImageType DEFAULT color,
  fileSize      INTEGER,  -- In octets
  xSize         INTEGER,  -- Horizontal size in pixels
  ySize         INTEGER,  -- Vertical size in pixels
  resolution    LogotypeImageResolution OPTIONAL,
  language      [4] IA5String OPTIONAL }  -- RFC 3066 Language Tag
```

NOTE: The referenced RFC 3066 in the structure above (from RFC 3709) is obsolete and is currently replaced by RFC 5646 [RFC5646]. The language tag may carry information about the language used to express any textual elements within the image as well as any audio information associated with the image.

When the optional LogotypeImageInfo is included with a certificate image, the parameters shall be used with the following semantics and restrictions.

xSize and ySize represent the recommended display size for the image. When a value of 0 (zero) is present, no recommended display size is specified. When non-zero values are present and these values differ...
from corresponding size values in the referenced image file, then the referenced image SHOULD be scaled to fit within the size parameters of LogotypeImageInfo, while keeping the $x$ and $y$ ratio intact.

The resolution parameter is redundant for all image formats that are relevant for certificate images and MUST NOT be specified.

4. Embedded Images

The certificate image otherLogos type defined in this specification and all logotype types defined in RFC 3709 [RFC3709] MAY be stored within the logotype extension using the "data" URL scheme defined in RFC 2397 [RFC2397] if the logotype image is provided through direct addressing, i.e., the image is referenced using the LogotypeDetails structure.

The syntax of Logotype details defined in RFC 3709 is included here for convenience:

```
LogotypeDetails ::= SEQUENCE {
    mediaType       IA5String, -- MIME media type name and optional
                    -- parameters (see Section 5)
    logotypeHash    SEQUENCE SIZE (1..MAX) OF HashAlgAndValue,
    logotypeURI     SEQUENCE SIZE (1..MAX) OF IA5String }
```

The syntax of the "data" URL scheme defined in RFC 2397 is included here for convenience:

```
dataurl    := "data:" [ mediatype ] [ ";base64" ] "," data
mediatype  := [ type "/" subtype ] *( ";" parameter )
data      := *urlchar
parameter  := attribute "=" value
```

When including the image data in the logotype extension using the "data" URL scheme, the following conventions apply.

- The value of mediaType in LogotypeDetails MUST be identical to the media type value in the "data" URL.
- The hash of the image MUST be included in logotypeHash and MUST be calculated over the same data as it would have been, had the image been referenced through a link to an external resource.

NOTE: As the "data" URL scheme is processed as a data source rather than as a URL, the image data is typically not limited by any URL length limit settings that otherwise apply to URLs in general.
NOTE: Implementations need to be cautious about the size of images included in a certificate in order to ensure that the size of the certificate does not prevent the certificate from being used as intended.

5. Certificate Image Formats

Implementations of this specification MUST support JPEG and GIF as defined in RFC 3709 [RFC3709]. In addition to these mandatory-to-implement formats, this specification specifies the use of the Portable Document Format (PDF), Scalable Vector Graphics (SVG), and Portable Network Graphics (PNG) as image formats.

5.1. PDF

A certificate image MAY be provided in the form of a Portable Document Format (PDF) document according to [ISO32000] and following the conventions defined in this section. When a certificate image is formatted as a PDF document, it MUST also be formatted according to the profile PDF/A [ISO19005].

When including a PDF document as a certificate image, the following MIME media type as specified in [RFC3778] MUST be used as mediaType in LogotypeDetails:

application/pdf

5.2. SVG

A certificate image MAY be provided in the form of a Scalable Vector Graphics (SVG) image, which MUST follow the SVG Tiny profile [SVGT] with the following amendments:

- The SVG image MUST NOT contain any Internationalized Resource Identifier (IRI) references to information stored outside of the SVG image of type B, C, or D, according to Section 14.1.4 of SVG Tiny 1.2 [SVGT].

- The SVG image MUST NOT contain any ‘script’ element, according to Section 15.2 of SVG Tiny 1.2 [SVGT].

- The XML structure in the SVG file MUST use <LF> (linefeed 0x0A) as the end-of-line (EOL) character when calculating a hash over the SVG image.

The referenced SVG file MAY be provided in GZIP-compressed [RFC1952] form as an SVGZ file. In this case, the extension ‘svgz’ is used as an alias for ‘svg.gz’ [RFC1952], i.e., octet streams of type
image/svg+xml, subsequently compressed with gzip as specified in [SVGR]. The hash over the SVGZ file is calculated over the decompressed SVG content with canonicalized EOL characters (<LF>) as specified above.

The following MIME media type, defined in Appendix M of [SVGT], MUST be included as mediaType in LogotypeDetails for all SVG and SVGZ images:

```
image/svg+xml
```

When the SVG image is embedded using the "data" URL scheme as defined in Section 4, SVG image data MUST be provided in SVGZ (GZIP compressed) form (i.e., it MUST NOT be provided in uncompressed SVG form).

Compliant implementations of this specification SHOULD be able to process SVG images that are formatted according to this section.

5.3. PNG

If a certificate image is provided as a bitmapped image, the PNG [ISO15948] format SHOULD be used.

PNG images are identified by the following mediaType in LogotypeDetails:

```
image/png
```

6. Security Considerations

This document is based on and inherits all security considerations from RFC 3709 [RFC3709]. In particular, RFC 3709 discusses several issues a Certificate Authority (CA) should take into consideration when evaluating a request to issue a certificate with a certificate image.

Images incorporated according to RFC 3709 provide an additional possibility for a CA with bad intentions or bad security procedures to include false, conflicting, or malicious information to relying parties. Such a CA may, for example:

- include information in graphical form that is in conflict with information in provided text-based attributes or other name forms, and

- include malicious data that could exploit known security bugs in common software libraries used to render graphical images.
This underlines the necessity for CAs to provide reliable services, and the relying party’s responsibility and need to carefully select which CAs are trusted to provide public key certificates.

This also underlines the general necessity for relying parties to use up-to-date software libraries to render or dereference data from external sources (such as certificates), to minimize risks related to processing potentially malicious data before the data has been adequately verified and validated.

Referenced image files are hashed in order to bind the image to the signature of the certificate. Some image types, such as SVG, allow part of the image to be collected from an external source by incorporating a reference to an external image file. If this feature were used within a certificate image file, the hash of the image file would only cover the URI reference to the external image file, but not the referenced image data. Clients SHOULD verify that SVGT images meet all requirements listed in Section 5.2 and reject images that contain references to external data.

CAs issuing certificates with embedded certificate images should be cautious when accepting graphics from the certificate requestor for inclusion in the certificate if the hash algorithm used to sign the certificate is vulnerable to collision attacks. In such a case, the accepted image may contain data that could help an attacker to obtain colliding certificates with identical certificate signatures.

Certificates, and hence their certificate images, are commonly public objects and as such usually will not contain privacy-sensitive information. However, when a certificate image that is referenced from a certificate contains privacy-sensitive information, appropriate security controls should be in place to protect the privacy of that information. Details of such controls are outside the scope of this document.

7. Acknowledgements

The authors recognize valuable contributions from members of the PKIX working group, the CA Browser Forum, and James Manger, for their review and sample data.
8. References

8.1. Normative References


8.2. Informative References


[SVGR] "Media Type Registration for image/svg+xml", http://dev.w3.org/SVG/profiles/1.1F2/master/mimereg.html.
Appendix A. ASN.1 Module

CERT-IMAGE-MODULE { iso(1) identified-organization(3) dod(6)
internet(1) security(5) mechanisms(5) pkix(7) id-mod(0)
id-mod-logotype-certimage(68) }

DEFINITIONS EXPLICIT TAGS ::= BEGIN

EXPORTS ALL;  -- export all items from this module

id-logo-certImage OBJECT IDENTIFIER ::= 
{ iso(1) identified-organization(3) dod(6) internet(1)
security(5) mechanisms(5) pkix(7) id-logo(20) 3 }

END
Appendix B. Example

The following example stores an embedded svgz-encoded SVG image using the "data" URL scheme.

data:image/svg+xml;base64,H4sICLXutU0AA0NlcnRJbWFnZURlbW8uc3ZnANVa
W2/bOB2z+1n9BqBi gwdoS7x9jmeapB0EWHQHezz2WZzoRitZMiQ5jvvr95CSL7G1E
mB9cdnIERSPOd85+1bLoYyI1Pfhl3lYgfPMrjJTe0v/661M/cFBZhvk
pmmL50sd34b/TIsa6YoiS+da11YYsS3wkJqjr1k4IQCDbNyUMSTS+e+qiYDzisul+
6sUxkk9PqU67QPRk1RkqC6x35Wmuva+/uGy9cwE0ghQ0vr/LHWscj7jGtI/GHZ
914no/sk1M4Wvckt7i6X7/sGEy0dNAL5/WeRT5UIDm5bLVWNo02cQCIhXyoKNN8s
ux0igvW8Q1f0FOv0IP16em6awqPeIisZxn9go1zXYvXMlWUpFLCwC0nOpVpg3y8
n8wzGkbr4GtefEiNMBznc7D8erKOpOBjPM8IWqPETYGAt+BvoMfS2EUfuF7Q7Rfyv
NFEelWenolpIv31ZVpGntW9ukn6K8df0+9BrFmBMeVwhtxzbMVRLUobYpVpWjXk
B7asix2vH5w6Yh0X05xb7YsuVFVPqGQOHf16fxSxglPlksCv9mDfM4FIdc1wov
8IF2WzhN1VuqMPRiiDD3hGPytUUMC6KqKAjxaptq1bouVjQFsvi+LOJxyZkKp
ev/OCuuAmxmoj1AarnRBatzkgkv7cK55s20rFwM/voS/G51URqZxxOnDNXKZw55j
y1HFKOOB6D6hARXSD6Ffzq77H7qOeJAOQiUSPvFIRUHoFui3zrF15dYVeAmpecOCob
u63vLjake4kXY4ylRyFprA2S1MigyYo+dChEvGADMLDLH66SH4RyXRep16g3Y02fN
z1RA1+czSKh66qSIVa80fsqMnWqZjpmxAwPyoNaQ5u9NIasPKwhxGzQzXMIZI
BKahmnLl470zfJjWNN+kvpvLQg91ll3yc8guZ0uysEcakDCFy3MKx+105X0oIP
1cJL7EPTulZ2P4tnM70k8kkCycSt92MwfIXP0eTeOpu4dnYbpd7/kwxWnS0eoy0/1
qbiCxsDJKWMwc37QekBcAUPFSKCPcnUJF5wwBacDK5ClEple4BC21YoJcrNNGVCG7Dl
qTx4TCKSp1rAGbmL8whRejiQe9EmIAIoAoz3dss9X4PRZExzqzgb7c3Q89u3WQKY9ae
gbsh/AUJb/bJs6fPfjt89BFHqEuk5wMIIzOQ55Uo2StlLawcQJ5G66MyIhMTAcfLa6B1i
AQMAnnHHN1s61WtUhDVjuihkrQ5b17v7cL95B9yqJw4eWOLBfWNMYPiXQANB8sm
9Gx2zgddG6KMG6W8balFqH4dfrmVr+pcPfE/2/7Qn2Os8C1okb2 /ggwLdxlCD16DFP
2D998tv8X8q5T7Ec7Axx62yAD6Bc4Ky1wKMCmtqzlpo+UMchAtlA3eqh9QM3Z83s8
b/XO6LySzpGv5Y5++LxdWwY+NaKorO/01JXIL3dBJzhGw0+XNxm53XStShleogfeo
vJ35BTuq/thcmPUE2mdp91Pq6p2cJWO02ko7amh01HBDLJm66n6iaajq4bn02oCmN
FxDR/x2mC5S+KHallUA3Ne3P8lqPqDjff9uu+vHXWxSFwN0h4uQuGmTadYMcoc7yj
EED9UehyWEEOcD5KQ+yhn5vUYRH8miQo2FK5CTcJWZGKS8WbhIPudl1AwpnCvTozjI
Faj97QDcax+aaddOTi4a01xJvDQgMrkx+Ydaj6iwJQG0vaSdWYvpT4wHVRAP3Z6O9NoJ
unEiKErVmhupjA2+wPmQ9W9WFAPhh9BQzFEXXX+WOnXQ8pV35P2acdm0gPebeGmc7Q
ogQaEd0KEakfl/9KuKEGBVwucce4ajnJ/LBY9uhWYWY1FH0B12cy1uytF5808p+
admWuUtY9ox/1WrtAC9NADaByguEB3Y5R98u/7TGYx9/xj8Pb2B/2/FB98sghBk+4xx
f1rgwTRCEQGcoqd99VRFpEvA+26BidgSmpM8mWrrzQsT7Epmoorh3+a4vjc7cJb0/
vIp/uzmEekHAE6/F7VH8Hj8HdhrRQ3ymcgZfrvfjwfmOnN3GuWR+FzhcPmPqiptHca
yact8T87j3Cs0/1QQwO6j21YxP4RS8aSobjFegusJoHqH7LSv26rPcA56bqk
BywETNTP/1a2PcUerR1xMsUIZTzRVF5P5pbas0lfk24asB5kj3bKljguxLJcyDw7Tpi3u
nxzexMSTNqHzbhpFkGkg2N3a0m/7b6Sev0xeICpYSYS+69ckcm9al1Qw3YeCtUAaS
TcqbK6F14yPfY+7nG7mzpZWCD50FDc79To86RHDpadbg71tmvlgz9SnLiw61zj
Q7/cG7039hB846uEzrnODMAADlm71G2ieXfUtuiU9STeNGHithE9nY/2/jRJGZQemK
3v7ykJOvlXiBsdCPmpqg6exR3KX3QSKQpW+qWJammubjtqkxMhr4ospojPiP
dCrxKq6u8ROR+LDeqCRkrxsc5VxRdv5sP1v+ggwR0RkyBfOh91KZvWGAKVdz31cuvcvO/Q
emCIIPMYEFIE70i+vpkekk4s4bCMqB+3mHQU16Dp/oylyp2/6pwK31XJPeagP04evP
1c5050Um61QZeQM7+01742+eHfphHNC70jffQ/HeV0X8BopoDkG3EAAA=

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