ROA Contents & Format Proposal

Brian Weis

Overview

- An informal study was conducted considering
  - ROA Contents
    - Based on Steve Kent’s earlier presentations
  - ROA Format
    - Design Considerations
    - Three possible formats studied

ROA Contents

- Data necessary to have a fully specified ROA:
  - **Object type** (I.e., “ROA”)
    - Plan ahead for other object types (e.g., signed AS policy)
  - **Object version** (I.e., “1”)
  - **Address prefix(es)**
    - May be a subset of addresses in the EE set?
  - **AS number(s)** authorized to advertise the address prefixes in the ROA
  - **Validity interval** (I.e., start/stop times)
    - May be shorter than the EE validity period in an emergency?
  - **Signature list**
    - Including certificate pointers and other necessary parameters

ROA Design Considerations

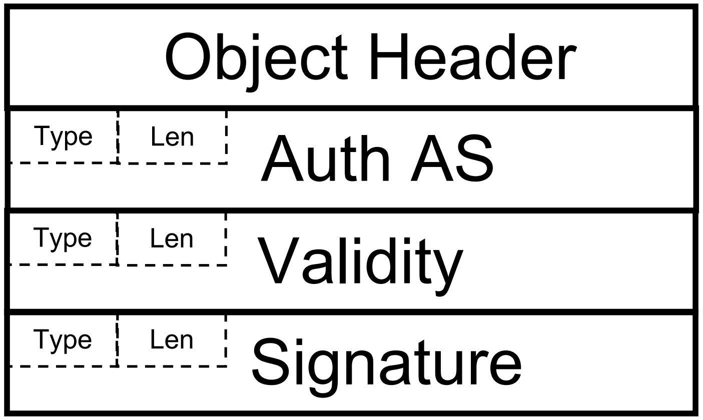
- Design Considerations
  - **Size**. Distribution through a network protocol may be advantageous in some cases
  - **Extensibility**. Format should allow standards-track additions to the format.
  - **Open source tool availability.** Tool availability is crucial to adoption.
  - **Clearly defined canonicalization rules**. Needed to support reliable digital signatures

ROA Format

- Three data formats considered
  - – Simple TLVs
    - Header + Type-Length-Value attributes representation of the data
  - – ASN.1
  - – XML

TLV Format

- Header
  - Object Type
  - Version
  - Object Length
- Attributes



Object Header

Type Len Auth AS

Type Len Validity

Type Len Signature

ASN.1 Format

- Imports many definitions from RFC 3280 and RFC 3779
  - No reason to re-specify common fields
  - ASN.1 open source tools already contain support for these definitions
- New ASN.1 definitions create an ROA framework for imported definitions.

ASN.1 Format (Abridged)

```
so OBJECT IDENTIFIER  ::=  {joint-iso-ccitt(2) ds(5) 40 }
so-roa OBJECT IDENTIFIER ::= { so 1 }

SO ::= SEQUENCE {
        sObject                 SObject,
        signatures              SEQUENCE OF Signatures }

SObject ::= SEQUENCE {
        signedObjectType        Type,
        version            [0]  EXPLICIT SOVersion DEFAULT v1,
        validity                Validity,
        ipAddrBlocks            SEQUENCE OF IPAddressFamily,
        asIdentifiers           SEQUENCE OF ASIdentifiers }

Type    ::=     INTEGER  { roa(1) }
SOVersion  ::=  INTEGER  {  v1(0) }

Signatures ::= SEQUENCE {
        certificatePointer      AuthorityKeyIdentifier,
        authorityInfo           AuthorityInfoAccessSyntax,
        signatureAlgorithm      AlgorithmIdentifier,
        signatureValue          BIT STRING }
```

XML Format

- Basic ROA Document Type Definition (.dtd file) is simple
- The digital signature specification is taken from RFC 3275
  - Signature XML elements are added during the signature process

XML ROA

```
<!ELEMENT SO         (sObject)>
<!ELEMENT sObject    (signedObjectType,version, validity,
                     ipAddrBlocks*, asIdentifiers*)>
<!ELEMENT signedObjectType (#PCDATA)>
<!ELEMENT version (#PCDATA)>
<!ELEMENT validity (notBefore,notAfter)>
<!ELEMENT notBefore (uctTime)>
<!ELEMENT notAfter (uctTime)>
<!ELEMENT uctTime (#PCDATA)>
<!ELEMENT ipAddrBlocks (IPAddressFamily,addressPrefix)>
<!ELEMENT IPAddressFamily (addressFamily)>
<!ELEMENT addressFamily (#PCDATA)>
<!ELEMENT addressPrefix (#PCDATA)>
<!ELEMENT asIdentifiers (id*)>
<!ELEMENT id (#PCDATA)>
```

Sample ROA

- Comparison of an ROA in the three formats
  - Type: ROA
  - Version: 1
  - Two prefixes
  - Two authorized ASes
  - One signature (RSA 1024-bit)

Design Considerations

	TLV	ASN.1	XML
Size (bytes) of sample ROA	286	445	1654
Extensible	Yes	Yes	Yes
Open Source Tools?	No	Yes (asn1c)	Yes (XMLSec)
Canonicalizaton?	TBD	Yes (DER)	Yes (RFC 3275)

Conclusion: ASN.1 is the best compromise

- While DER is substantially larger than a simple TLV format (35% larger) it remains manageable.
- ASN.1 is easily extensible.
- Canonicalization rules are well defined.
- Use of ASN.1 has some synergy with Resource Certificates.
- Open source ASN.1 compiler tools appear to hide much of ASN.1 required knowledge from tools developers.

Next steps

- Get consensus on the content & format
- Generate a -00 draft describing the ROA prior to IETF 68