TCG Infrastructure Working Group
Integrity Report Schema

Specification Version 2.0
Revision 0.1
5 May 2011
DRAFT

Contacts:
Wyllys.Ingersoll@oracle.com (IWG Co-Chair)
Paul_Sangster@symantec.com (IWG Co-Chair)

Work In Progress
This document is an intermediate draft for comment only and is subject to change without notice. Readers should not design products based on this document.
Copyright © 2011 Trusted Computing Group, Incorporated.

Disclaimer

THIS SPECIFICATION IS PROVIDED “AS IS” WITH NO WARRANTIES WHATSOEVER, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY WARRANTY OTHERWISE ARISING OUT OF ANY PROPOSAL, SPECIFICATION OR SAMPLE. Without limitation, TCG disclaims all liability, including liability for infringement of any proprietary rights, relating to use of information in this specification and to the implementation of this specification, and TCG disclaims all liability for cost of procurement of substitute goods or services, lost profits, loss of use, loss of data or any incidental, consequential, direct, indirect, or special damages, whether under contract, tort, warranty or otherwise, arising in any way out of use or reliance upon this specification or any information herein.

No license, express or implied, by estoppel or otherwise, to any TCG or TCG member intellectual property rights is granted herein.

Except that a license is hereby granted by TCG to copy and reproduce this specification for internal use only.

Contact the Trusted Computing Group at www.trustedcomputinggroup.org for information on specification licensing through membership agreements.

Any marks and brands contained herein are the property of their respective owners.
IWG Document Roadmap

Infrastructure Architecture: Part I: Interoperability Architecture
- TNC Architecture
  - Certificates Profile v1.0
  - Backup & Migration
  - SKAE
  - IWG Use Cases

Platform Trust Services
- Trust Credentials
- Schemas
- Credential Management

Integration Management Architecture
- TNC Interface Specifications
- TLS-Attestations
- TNC Use Case
- Other Use Cases
- PTS Interface (IF-PTS)
- PTS Protocol

Core Integrity Schema
- Integrity Report Schema
- RIMM Schema
- Security Qualities Schema
- Executable Image Schema
- Simple Objects
Acknowledgement

The TCG wishes to thank all those who contributed to this specification. This document builds on considerable work done in the various working groups in the TCG.

Special thanks to the members of the IWG contributing to this document:

Kazuaki Nimura
Malcolm Duncan
Diana Arroyo
Lee Terrell
Ned Smith
Greg Kazmierczak
Len Veil
Paul Sangster (co-chair)
Wyllys Ingersoll (editor, co-chair)
Jeff Nisewanger
Thomas Hardjono

Fujitsu Limited
CESG
IBM
IBM
Intel
Wave Systems
Wave Systems
Symantec
Oracle
SUN
SignaCert
1 Scope and Audience

2 Introduction

2.1 Schema Version

2.2 Schema Namespace

2.3 Dependent Schema Definitions

3 Integrity Report Schema

3.1 COMPLEX TYPES

3.1.1 complexType CapVersionInfoType

3.1.2 complexType CompositeHashType

3.1.3 complexType PcrCompositeType

3.1.4 complexType PcrInfoShortType

3.1.5 complexType PcrSelectionType

3.1.6 complexType Quote2Type

3.1.7 complexType QuoteDataType

3.1.8 complexType QuoteInfo2Type

3.1.9 complexType QuoteInfoType

3.1.10 complexType QuoteSignatureType

3.1.11 complexType QuoteType

3.1.12 complexType ReportType

3.1.13 complexType SnapshotType

3.1.14 complexType TpmDigestValueType

3.2 ELEMENTS

3.2.1 element PcrCompositeType/PcrSelection

3.2.2 element PcrCompositeType/ValueSize

3.2.3 element PcrCompositeType/PcrValue

3.2.4 element PcrInfoShortType/PcrSelection

3.2.5 element PcrInfoShortType/LocalityAtRelease

3.2.6 element PcrInfoShortType/CompositeHash

3.2.7 element PcrInfoShortType/PcrComposite

3.2.8 element Quote2Type/CapVersionInfo

3.2.9 element Quote2Type/QuoteInfo2

3.2.10 element QuoteDataType/Quote

3.2.11 element QuoteDataType/Quote2

3.2.12 element QuoteDataType/TpmSignature

3.2.13 element QuoteInfo2Type/PcrInfoShort

3.2.14 element QuoteSignatureType/CanonicalizationMethod

3.2.15 element QuoteSignatureType/KeyInfo

3.2.16 element QuoteSignatureType/ObjectType

3.2.17 element QuoteSignatureType/SignatureMethod

3.2.18 element QuoteSignatureType/SignatureValue
3.2.19 element QuoteType/PcrComposite .................................................................34
3.2.20 element QuoteType/QuoteInfo .................................................................35
3.2.21 element QuoteType/TpmInfo .................................................................35
3.2.22 element QuoteType/TpmInfo/CapVersionInfo .........................................35
3.2.23 element QuoteType/TpmInfo/TpmManufacturer .......................................36
3.2.24 element Report .......................................................................................36
3.2.25 element ReportType/QuoteInfo ..............................................................36
3.2.26 element ReportType/SnapshotCollection .................................................37
3.2.27 element SnapshotType/CompositeHash ..................................................37
3.2.28 element SnapshotType/PcrHash ..............................................................37
3.2.29 element Snapshot ..................................................................................37

4 Appendix A – Example Integrity Report .......................................................38
5 References ..................................................................................................40
1 Scope and Audience

This specification is integral to the TCG Infrastructure Working Group’s (IWG) reference architecture, and is directly related to the TCG’s Integrity Management Model. Specifically, the integrity report metadata XML schema defines the structure with which integrity information is communicated between entities.

Architects, designers, developers, and technologists interested in the development, deployment, and interoperation of trusted systems will find this document necessary in providing a specific mechanism for communicating integrity information.
2 Introduction

The purpose of this document is to provide a detailed description of the TCG Infrastructure Working Group’s integrity report XML schema, hereafter referred to as the report schema. The report schema is derived from the Core Integrity Schema [1].

The report schema allows instantiation of interoperable integrity reports and snapshots including data structures provided by a 1.1 or 1.2 Level TPM. Integrity reports based on the report schema are used to detail run-time measurements and assertions of the components of a system to a verifier. One use of integrity reports and structures is in the Trusted Network Connect (TNC) use models [7] whereby a Platform Trust Service (PTS) [8] creates integrity reports and snapshots to be sent by IMCs to their corresponding IMVs for verification of acceptable platform state prior to network access.

2.1 Schema Version

The report schema’s version number is defined using the version attribute of the schema’s root-level schema element:

```
version="version_number"
```

This document refers to version 2.0 of the report schema. Consumers of an integrity report should check the schema version prior to parsing the remainder of the integrity report to determine if the version is supported.

2.2 Schema Namespace

The report schema’s namespace is defined using the targetNamespace attribute of the schema’s root-level schema element:

```
targetNamespace="namespace"
```

The schema’s namespace reflects the schema version, and is currently defined as follows:

```
http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#
```

2.3 Dependent Schema Definitions

2.3.1 W3C XML Schema Syntax

The report schema relies upon data structures defined by the World Wide Web Consortium’s (W3C) XML-Schema syntax. Consequently, the report schema imports the W3C’s XML schema with the following namespace:

```
http://www.w3.org/2001/XMLSchema
```

The report schema associates the abovementioned schema with the “xs” namespace prefix.

2.3.2 W3C XML-Signature Syntax

The report schema relies upon data structures defined by the World Wide Web Consortium’s (W3C) XML-Signature digital signature syntax. Consequently, the report schema imports the W3C’s digital signature XML schema with the following namespace:

```
http://www.w3.org/2000/09/xmldsig#
```

The report schema associates the abovementioned schema with the “ds” namespace prefix.

2.3.3 TCG Core Integrity Schema Syntax

The report schema relies upon data structures defined by the TCG Core Integrity Schema Syntax, [1]. Consequently, the report schema imports the TCG Core Integrity Schema with the following namespace:
The report schema associates the abovementioned schema with the "core" namespace prefix.

### 2.3.4 Schema Diagram Conventions

The schema diagrams in this specification contain attributes and elements that are either mandatory or optional to populate. Those that are mandatory to populate are depicted by solid lines surrounding the attributes and elements. Those that are optional to populate are depicted by dashed lines surrounding the attributes and elements.

### 2.3.5 Keywords

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 RFC 2119 [11]. This specification does not distinguish blocks of informative comments and normative requirements. Therefore, for the sake of clarity, note that lower case instances of must, should, etc. do not indicate normative requirements.
3 Integrity Report Schema

schema location: http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report
attribute form default: Unqualified
element form default: Qualified
targetNamespace: http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#

3.1 COMPLEX TYPES

The following complex types are specified in this document:

Complex types
CapVersionInfoType
CompositeHashType
DigestValueType
old-SnapshotRefType
PcrCompositeType
PcrInfoShortType
PcrSelectionType
Quote2Type
QuoteDataType
QuoteInfo2Type
QuoteInfoType
QuoteSignatureType
QuoteType
ReportType
SnapshotType
TpmDigestValueRestrictionType
TpmDigestValueType

Elements which are derived from these complex types are defined in section 3.2.

3.1.1 complexType CapVersionInfoType

3.1.1.1 Description

The CapVersionInfoType complex type represents in XML the information optionally returned by a 1.2 TPM from a call to the optional TPM command Quote2 or by a call to the TPM command GetCapability for CAP_VERSION_INFO – it is the identical information independent of the two origins. Quote2 is not supported in a 1.1b TPM, but is an optional command in a 1.2 TPM – however it is a required command in a PC Client platform. CapVersionInfoType represents in XML the TPM version and vendor information. Refer to [2] for definition of TPM structures.
3.1.1.2 Diagram

A diagram showing the attributes of CapVersionInfoType.

namespace: http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#

used by: elements QuoteType/TpmInfo/CapVersionInfo Quote2Type/CapVersionInfo

<table>
<thead>
<tr>
<th>attributes</th>
<th>Name</th>
<th>Type</th>
<th>Use</th>
<th>Default</th>
<th>Fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tag</td>
<td>xs:unsignedShort</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VersionMajor</td>
<td>xs:unsignedByte</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VersionMinor</td>
<td>xs:unsignedByte</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VersionRevMajor</td>
<td>xs:unsignedByte</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VersionRevMinor</td>
<td>xs:unsignedByte</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SpecLevel</td>
<td>xs:unsignedShort</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ErrataRev</td>
<td>xs:unsignedByte</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TpmVendorID</td>
<td>xs:normalizedString</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VendorSpecificSize</td>
<td>xs:unsignedShort</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VendorSpecific</td>
<td>xs:base64Binary</td>
<td>optional</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.1.1.3 Attribute Detail

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tag</td>
<td>The TPM specifications state this is TPM_TAG_CAP_VERSION_INFO and has a value of 0x0030.</td>
</tr>
<tr>
<td>VersionMajor</td>
<td>This is the TPM major version number. The TPM specifications state this attribute has a value of 0x0100. This number corresponds to the “1” in a 1.2 TPM.</td>
</tr>
<tr>
<td>VersionMinor</td>
<td>This is the TPM minor version number. The TPM specifications state this attribute is 0x0100 (for TPM 1.1b) or 0x0200 (for TPM 1.2).</td>
</tr>
<tr>
<td>VersionRevMajor</td>
<td>The TPM specifications state this attribute is the value of the TPM_PERMANENT_DATA -&gt; revMajor. I.e. this is the vendor specific major version number.</td>
</tr>
<tr>
<td>VersionRevMinor</td>
<td>The TPM specifications state this attribute is the value of the TPM_PERMANENT_DATA -&gt; revMinor. I.e. this is the vendor specific minor version number.</td>
</tr>
<tr>
<td>SpecLevel</td>
<td>SpecLevel is defined in the TCG document “Specification Naming and Numbering”. The SpecLevel corresponds to a TPM specification version release of a particular Major.Minor version. The number indicates the level of ordinals supported. A new Spec Level is assigned for each version of TPM specification that adds or deletes ordinals.</td>
</tr>
<tr>
<td>ErrataRev</td>
<td>A number indicating the errata version of the specification and indicates changes to a TPM specification that does not include new or deleted ordinals. For older TPMs (1.1 or early 1.2 TPMs), the errata revision was a “letter”. E.g.,</td>
</tr>
</tbody>
</table>
1.1.1“a” or 1.1.1“b”}; however the currently specification naming and numbering guidelines only support ErrataRev numbers.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TpmVendorID</td>
<td>TpmVendorID is a value unique to each vendor. The TPM specifications state this attribute is a 4-byte value that is usually the vendor’s stock ticker value in capitalized characters. If the string is less than 4 bytes long, it should be padded with trailing NULLs prior to use.</td>
</tr>
<tr>
<td>VendorSpecificSize</td>
<td>TPM vendor defined area to the TPM vendor’s needs.</td>
</tr>
<tr>
<td>VendorSpecific</td>
<td>The vendor specific area allows the TPM vendor to provide support for vendor options.</td>
</tr>
</tbody>
</table>

3.1.1.4 XML

```xml
t‹xs:complexType name=“CapVersionInfoType”
   ‹xs:attribute name=“Tag” type=“xs:unsignedShort” use=“required”/>
   ‹xs:attribute name=“VersionMajor” type=“xs:unsignedByte” use=“required”/>
   ‹xs:attribute name=“VersionMinor” type=“xs:unsignedByte” use=“required”/>
   ‹xs:attribute name=“VersionRevMajor” type=“xs:unsignedByte” use=“required”/>
   ‹xs:attribute name=“VersionRevMinor” type=“xs:unsignedByte” use=“required”/>
   ‹xs:attribute name=“SpecLevel” type=“xs:unsignedShort” use=“required”/>
   ‹xs:attribute name=“ErrataRev” type=“xs:unsignedByte” use=“required”/>
   ‹xs:attribute name=“TpmVendorID” type=“xs:normalizedString” use=“required”/>
   ‹xs:attribute name=“VendorSpecificSize” type=“xs:unsignedShort” use=“required”/>
   ‹xs:attribute name=“VendorSpecific” type=“xs:base64Binary” use=“optional”/>
›
</xs:complexType>
```

3.1.2 `complexType` CompositeHashType

3.1.2.1 Description

The `CompositeHashType` complex type is an extension of the `core:HashType` complex type defined in [2]. This is the end digest value in a snapshot of the values referenced by the `ExtendOrder` attribute. `CompositeHashType` extends `core:HashType` by adding the following optional attributes: Name, Number, StartHash, SyncRef, and TimeStamp. `CompositeHashType` complex types should be used for non-PCR digests, but may themselves be extended into a PCR. The digest is a hash across the measurements in a snapshot so that changes to any of the measurements can be detected. A verifier MUST use the `ExtendOrder` attribute to traverse the tree to correctly recreate this value.
3.1.2.2 Diagram

namespace http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#
type extension of core:HashType
properties base core:HashType
used by element SnapshotType/CompositeHash

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>Integrity Report document unique Record instance identifier – uniqueness is only guaranteed within the XML document. Id can be used in other parts of the XML document and by external systems to reference the CompositeHash instance in an integrity report.</td>
</tr>
<tr>
<td>AlgRef</td>
<td>AlgRef refers to a hash algorithm as defined by DigestMethodType</td>
</tr>
<tr>
<td>TransformRefs</td>
<td>Refers to transformation functions, used to modify the data prior to performing the digest, defined by TransformMethod elements of type TransformMethodType</td>
</tr>
<tr>
<td>ExtendOrder</td>
<td>ExtendOrder contains an ordered list of xs:IDREF values. Values at the beginning of the list occur before values at the end. Therefore, the first entry in the list would be the first value extended, the last entry would be the last value extended.</td>
</tr>
<tr>
<td>Name</td>
<td>A string name assigned to the CompositeHash. The string name may be useful to a verifier when referencing the snapshot digest value and an xs:Id does not provide</td>
</tr>
</tbody>
</table>
### 3.1.2.4 XML

```xml
<xs:complexType name="CompositeHashType">
  <xs:simpleContent>
    <xs:extension base="core:HashType">
      <xs:attribute name="Name" type="xs:normalizedString"/>
      <xs:attribute name="Number" type="xs:integer"/>
      <xs:attribute name="StartHash" type="ds:DigestValueType"/>
      <xs:attribute name="SyncRef" type="xs:idREF"/>
      <xs:attribute name="Timestamp" type="xs:dateTime"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```

### 3.1.3 complexType PcrCompositeType

#### 3.1.3.1 Description

The PcrCompositeType complex type is used to aggregate multiple PCR values in a single structure and represents, in XML, the TPM’s TPM_PCR_COMPOSITE structure returned from a call to Quote TPM PCRs. Refer to [2] for definition of TPM structures.

Elements of PcrCompositeType include:

- **PcrSelection** – identifies which TPM PCRs are quoted
- **ValueSize** – the length in bytes of the array of PcrValue complex types
- **PcrValue** - The array of PcrValue structures. Each PcrValue contains a PCR number attribute to correspond to a PCR identified in PcrSelection. The PCR value itself is not included, but may be found in the Quote structure. In addition, PcrValue contains an optional reference to the snapshot that provides the corresponding details including PCR value.

#### 3.1.3.2 Diagram

![Diagram of PcrCompositeType](http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#)

- **PcrSelection**
  - type: PcrSelectionType
- **ValueSize**
  - type: xs:unsignedLong
- **PcrValue**
  - type: ds:DigestValueType
  - 1..∞

namespace http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#
3.1.3.3 XML

```xml
<xs:complexType name="PcrCompositeType">
  <xs:sequence>
    <xs:element name="PcrSelection" type="PcrSelectionType"/>
    <xs:element name="ValueSize" type="xs:unsignedLong"/>
    <xs:element name="PcrValue" maxOccurs="unbounded">
      <xs:complexType>
        <xs:simpleContent>
          <xs:extension base="ds:DigestValueType">
            <xs:attribute name="SnapshotRef" type="xs:IDREF" use="optional"/>
            <xs:attribute name="PcrNumber" type="xs:unsignedLong" use="required"/>
          </xs:extension>
        </xs:simpleContent>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>
```

3.1.4 complexType PcrInfoShortType

3.1.4.1 Description

The PcrInfoShortType complex type is an XML representation of the TPM's TPM_PCR_INFO_SHORT structure. PcrComposite is not part of the TPM PCR_INFO_SHORT structure, however CompositeHash is a hash of PcrComposite, thus PcrComposite is included to provide the data necessary to compute and validate CompositeHash. Refer to [2] for definition of TPM structures.

Elements include:

- **PcrSelection** – PcrSelection defines which TPM PCRs are used in the TPM Quote.
- **LocalityAtRelease** - TPM_PCR_INFO_SHORT includes locality information to provide the requestor a more complete view of the current platform configuration
- **CompositeHash** – A hash of PcrComposite
- **PcrComposite** – A TPM_PCR_COMPOSITE structure containing the actual values of the PCRs quoted.

3.1.4.2 Diagram

```
namespace http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#
children PcrSelection LocalityAtRelease CompositeHash PcrComposite
```
3.1.5 complexType PcrSelectionType

3.1.5.1 Description
The PcrSelectionType complex type is used to render the TPM's TPM_PCR_SELECTION structure. PcrSelectionType contents specify which PCRs are quoted in an Integrity Report. Refer to [2] for definition of TPM structures.

3.1.5.2 Diagram

```
<xs:complexType name="PcrSelectionType">
  <xs:attribute name="SizeOfSelect" type="xs:unsignedShort" use="required"/>
  <xs:attribute name="PcrSelect" type="xs:base64Binary" use="required"/>
</xs:complexType>
```

3.1.5.3 Attribute Detail

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SizeOfSelect</td>
<td>The size in bytes of the PcrSelect structure</td>
</tr>
<tr>
<td>PcrSelect</td>
<td>PcrSelect is a contiguous bit map that shows which PCRs are selected. Each byte represents 8 PCRs. Byte 0 indicates PCRs 0-7, byte 1 8-15 and so on. For each byte, the individual bits represent a corresponding PCR.</td>
</tr>
</tbody>
</table>

3.1.6 complexType Quote2Type

3.1.6.1 Description
The Quote2Type complex type contains data returned from a call to the 1.2 TPM command Quote2 (not supported in a 1.1b TPM) except for the actual Quote2 signature (this is in the TpmSignature element), plus any other data necessary to compute and validate the Quote2 signature. Refer to [2] for definition of TPM structures.

Elements included are:
3.1.6.2 Diagram

![Diagram](http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#)

namespace http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#

children QuoteInfo2 CapVersionInfo

used by element QuoteDataType/Quote2

3.1.6.3 XML

```xml
<xs:complexType name="Quote2Type">
  <xs:sequence>
    <xs:element name="QuoteInfo2" type="QuoteInfo2Type"/>
    <xs:element name="CapVersionInfo" type="CapVersionInfoType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

3.1.7 complexType QuoteDataType

3.1.7.1 Description

The QuoteDataType complex type 1.1b contains all of the data quote-related data in an integrity report. A 1.1b TPM only supports the Quote command, thus the Quote2 element may not be instantiated for 1.1b TPMs. A 1.2 TPM supports both the Quote and Quote2 commands, thus either of one the Quote or Quote2 elements may be instantiated. The Quote2 command is an optional command in the TPM 1.2 specification [2], thus it will be necessary to instantiate the Quote element for 1.2 TPMs that do not implement the Quote2 command. However, the Quote2 command is mandatory in the PC Client specifications.

Elements included in a QuoteDataType complex type are:

- Quote – Data returned from a call to the TPM Quote command including data necessary to compute and validate the quote signature, except for the signature itself.
- Quote2 - Data returned from a call to the TPM Quote2 command including data necessary to compute and validate the quote signature, except for the signature itself.
- TpmSignature – Contains the quote signature and all quote key information.
3.1.7.2 Diagram

```
<xs:complexType name="QuoteDataType">
  <xs:sequence>
    <xs:choice>
      <xs:element name="Quote" type="QuoteType"/>
      <xs:element name="Quote2" type="Quote2Type"/>
    </xs:choice>
    <xs:element name="TpmSignature" type="QuoteSignatureType"/>
  </xs:sequence>
  <xs:attribute name="ID" type="xs:ID" use="required"/>
</xs:complexType>
```

namespace http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#
children Quote Quote2 TpmSignature
used by element ReportType/QuotInfo

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Integrity Report document unique Record instance identifier. ID can be used in other parts of the document and by external systems to reference the quote instance in an integrity report.</td>
</tr>
</tbody>
</table>

3.1.8 complexType QuoteInfo2Type

3.1.8.1 Description

The QuoteInfo2Type complex type is an XML representation of the 1.2 TPM’s TPM_QUOTE_INFO2 structure. The Quote2 command returns PcrInfoShort, but does not return the attributes in QuoteInfo2Type. However, these attributes are used in the computation of the Quote2 signature, thus they are included so that a verifier can compute and validate the Quote2 signature.

QuoteInfo2Type includes the PcrInfoShort element. This element renders the TPM_PCR_INFO_SHORT structure returned by the Quote2 command.
3.1.8.2 Diagram

namespace http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#

children PcrInfoShort

used by element Quote2Type/QuoteInfo2

attributes

<table>
<thead>
<tr>
<th>Tag</th>
<th>xs:unsignedShort</th>
<th>required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed</td>
<td>xs:normalizedString</td>
<td>required</td>
</tr>
<tr>
<td>ExternalData</td>
<td>xs:base64Binary</td>
<td>required</td>
</tr>
</tbody>
</table>

3.1.8.3 Attribute Detail

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tag</td>
<td>From the TPM_QUOTE_INFO2 structure, the TPM specifications state this attribute is TPM_TAG_QUOTE_INFO2 which has a value of: 0x0036</td>
</tr>
<tr>
<td>Fixed</td>
<td>From the TPM_QUOTE_INFO2 structure, the TPM specifications state this attribute is the string &quot;QUT2&quot;</td>
</tr>
<tr>
<td>ExternalData</td>
<td>From the TPM_QUOTE_INFO2 structure, the TPM specifications state this attribute is 160 bits of externally supplied data – usually a freshness nonce</td>
</tr>
</tbody>
</table>

3.1.8.4 XML

```xml
<xs:complexType name="QuoteInfo2Type">
  <xs:sequence>
    <xs:element name="PcrInfoShort" type="PcrInfoShortType"/>
  </xs:sequence>
  <xs:attribute name="Tag" type="xs:unsignedShort" use="required"/>
  <xs:attribute name="Fixed" type="xs:normalizedString" use="required"/>
  <xs:attribute name="ExternalData" type="xs:base64Binary" use="required"/>
</xs:complexType>
```

3.1.9 complexType QuoteInfoType

3.1.9.1 Description

The QuoteInfoType complex type is an XML representation of a 1.1b or 1.2 TPM’s TPM_QUOTE_INFO structure. The Quote command returns a TPM_PCR_COMPOSITE structure, but does not return the attributes in QuoteInfoType. However, these attributes are used in the computation of the Quote signature, thus they are included so that a verifier can compute and validate the Quote signature.

The first 4 attributes comprise the TPM’s TPM_STRUCT_VER structure and are 1.1.0.0. Refer to [2] for definition of TPM structures.
3.1.9.2 Diagram

```
namespace http://wwwtrustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#

used by element QuoteType/QuoteInfo

<table>
<thead>
<tr>
<th>attributes</th>
<th>Name</th>
<th>Type</th>
<th>Use</th>
<th>Default</th>
<th>Fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>VersionMajor</td>
<td>xs:unsignedByte</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VersionMinor</td>
<td>xs:unsignedByte</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VersionRevMajor</td>
<td>xs:unsignedByte</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VersionRevMinor</td>
<td>xs:unsignedByte</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed</td>
<td>xs:normalizedString</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DigestValue</td>
<td>ds:DigestValueType</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ExternalData</td>
<td>xs:base64Binary</td>
<td>required</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

3.1.9.3 Attribute Detail

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VersionMajor</td>
<td>From the TPM_QUOTE_INFO structure’s TPM_STRUCT_VER, the TPM specifications</td>
</tr>
<tr>
<td></td>
<td>state this attribute has a value of 0x01.</td>
</tr>
<tr>
<td>VersionMinor</td>
<td>From the TPM_QUOTE_INFO structure’s TPM_STRUCT_VER, the TPM specifications</td>
</tr>
<tr>
<td></td>
<td>state this attribute has a value of 0x01.</td>
</tr>
<tr>
<td>VersionRevMajor</td>
<td>From the TPM_QUOTE_INFO structure’s TPM_STRUCT_VER, the TPM specifications</td>
</tr>
<tr>
<td></td>
<td>state this attribute has a value of 0x00.</td>
</tr>
<tr>
<td>VersionRevMinor</td>
<td>From the TPM_QUOTE_INFO structure’s TPM_STRUCT_VER, the TPM specifications</td>
</tr>
<tr>
<td></td>
<td>state this attribute has a value of 0x00.</td>
</tr>
<tr>
<td>Fixed</td>
<td>From the TPM_QUOTE_INFO structure, the TPM specifications state this attribute is the string 'QUOT'.</td>
</tr>
<tr>
<td>DigestValue</td>
<td>From the TPM_QUOTE_INFO structure, the TPM specifications state this attribute is the result of the composite hash algorithm using the current value of the requested PCR indices.</td>
</tr>
<tr>
<td>ExternalData</td>
<td>From the TPM_QUOTE_INFO structure, the TPM specifications state this attribute is 160 bits of externally supplied data – usually a freshness nonce.</td>
</tr>
</tbody>
</table>

3.1.9.4 XML

```
<xs:complexType name="QuoteInfoType">
    <xs:attribute name="VersionMajor" type="xs:unsignedByte" use="required"/>
    <xs:attribute name="VersionMinor" type="xs:unsignedByte" use="required"/>
    <xs:attribute name="VersionRevMajor" type="xs:unsignedByte" use="required"/>
    <xs:attribute name="VersionRevMinor" type="xs:unsignedByte" use="required"/>
    <xs:attribute name="Fixed" type="xs:normalizedString" use="required"/>
    <xs:attribute name="DigestValue" type="ds:DigestValueType" use="required"/>
    <xs:attribute name="ExternalData" type="xs:base64Binary" use="required"/>
</xs:complexType>
```
3.1.10 complexType QuoteSignatureType

3.1.10.1 Description

The QuoteSignatureType complex type contains the quote signature from either the TPM Quote or Quote2 command, information about the key used to quote PCRs, and any other data necessary to determine how to calculate the quote signature value.

Elements of QuoteSignatureType include:

- CanonicalizationMethod – This element defines the canonicalization algorithm used to create the signature. The method of calculating the TPM's quote signature is enforced in the TPM specification [4] and thus not germane to TPM 1.1b or 1.2 Quote structures and thus it is an optional element. However, it is included in order to leverage the XML signature structures and provide for future expansion in case future TPMs support a CanonicalizationMethod.

- SignatureMethod - Describes the signature algorithm used in the quote signature calculation.

- SignatureValue - Contains the TPM Quote or Quote2 signature. The Id attribute can be used to directly reference the signature value.

- Key Info - Describes the public key and its metadata used for the TPM Quote operation. For a 1.1b or 1.2 TPM, the following elements are germane: KeyName, KeyValue, and X509Data

- ObjectType – Optional element that describes any special encoding used in the signature process.

3.1.10.2 Diagram

3.1.10.3 XML

```xml
<xs:complexType name="QuoteSignatureType">
  <xs:sequence>
    <xs:element name="CanonicalizationMethod" type="ds:CanonicalizationMethodType" minOccurs="0" />
    <xs:element name="SignatureMethod" type="ds:SignatureMethodType" />
    <xs:element name="SignatureValue" type="ds:SignatureValueType" />
    <xs:element name="KeyInfo" type="ds:KeyInfoType" />
    <xs:element name="ObjectType" type="ds:ObjectType" />
  </xs:sequence>
</xs:complexType>
```
3.1.11 complexType QuoteType

3.1.11.1 Description

The QuoteType complex type is used to detail the data used by the TPM to calculate the Quote signature plus information describing the TPM. The Quote signature is included in the QuoteSignatureType complex type. The Quote command may be called on both a 1.1b TPM as well as on a 1.2 TPM. Elements of QuoteType complex type include:

- PcrComposite - This data is the only data output by the Quote command in addition to the signature itself. This data details which PCRs were quoted and their values.
- QuoteInfo – This data is not output from the TPM, but the structure is created in the TPM and used in the calculation of the Quote signature. It must be reconstructed in order to verify the Quote signature. It contains both the composite hash value and the externally supplied nonce.
- TpmInfo – TpmInfo is optional data describing the TPM used to create Quote data that may be useful in case there are any vendor-specific differences in rendering the Quote signature.

Refer to [2] for definition of TPM structures.

3.1.11.2 Diagram

namespace http://www.trustedcomputinggroup.org/XML/SCHHEMA/2_0/integrity_report#
children PcrComposite QuoteInfo TpmInfo
used by element QuoteDataType/Quote

3.1.11.3 XML

```xml
<xs:complexType name="QuoteType">
  <xs:sequence>
    <xs:element name="PcrComposite" type="PcrCompositeType"/>
    <xs:element name="QuoteInfo" type="QuoteInfoType"/>
    <xs:element name="TpmInfo" minOccurs="0" type="xs:base64Binary"/>
  </xs:sequence>
</xs:complexType>
```
3.1.12 complexType ReportType

3.1.12.1 Description
The ReportType complex type defines an integrity report. The integrity report MUST contain one or more snapshots in the SnapshotCollection elements. Integrity reports should include either a TPM Quote or Quote2 attestation of PCRs or a Signature over the integrity report or both. If both are missing then a verifier will not be able to verify that the data included in the integrity report is authentic. Elements include:

- **SignerInfo** – The signature over the integrity report plus all information describing the key used to create the signature value. This element also optionally includes a confidence value and a time stamp designating when the integrity report was created and signed. Also included are Nonce and DateTime attributes. The Nonce is provided by the verifier as a means of ensuring the integrity report is fresh. The DateTime is when the integrity report was created (i.e. the data and time as obtained by the component constructing the integrity report). This element is defined by the core:SignerInfo complex type [1].

- **ConfidenceValue** – A numerical representation of trust to identify the level of confidence with which to trust the entire integrity report. This element is defined by the core:ConfidenceValue complex type [1].

- **QuoteInfo** – The TPM Quote or Quote2 signature, all data required by a verifier to calculate and verify the quote signature, and all the data describing the key used to create the quote signature.

- **SnapshotCollection** – The collection of all snapshots included in the integrity report. These elements are defined by the SnapshotType complex type.

3.1.12.2 Diagram

![Diagram of ReportType complex type](image-url)
3.1.12.3 Attribute Detail

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Integrity Report document unique Record instance identifier. ID can by external systems to reference the integrity report.</td>
</tr>
<tr>
<td>UUID</td>
<td>Universally unique identifier for the report – allows external systems to reference this report</td>
</tr>
<tr>
<td>SyncSnapshotRefs</td>
<td>References to the Sync Snapshots</td>
</tr>
<tr>
<td>TransitiveTrustPath</td>
<td>References to the set of snapshots that comprise the transitive trust path</td>
</tr>
</tbody>
</table>

3.1.13 complexType SnapshotType

3.1.13.1 Description

The SnapshotType complex type is used to describe integrity attributes of program code, discrete logic and collections of components. Any element that can be placed under change control is a candidate for being described using the SnapshotType complex type. SnapshotType complex type inherits its structure from Core:IntegrityManifestType complex type [1] and adds a UUID attribute and choice of CompositeHash or PcrHash digest structures.

Elements of SnapshotType include:

- ComponentID – is a unique complex identifier linking the component to a change management process. For a sync snapshot (a snapshot whereby the PcrHash value is a PCR value - see [8]), the ComponentID SHOULD be the Vendor GUID of the component that constructed the snapshot (i.e. PTS). Version 2.0 of this specification adds the additional required attributes for ComponentVendorID and FunctionalComponentID. ComponentVendorID is a 24-bit SMI value for the vendor. FunctionalComponentID is the 64-bit Integer ID associated with the functional component itself.

- SignerInfo – is a signature over the Snapshot. It includes information about the entity that produced the signature. A single signature may be applied.

- ConfidenceValue – a numerical representation of trust to identify the level of confidence with which to trust the integrity values (Values) and assertions (AssertionInfo) in the snapshot.
• Collector – is a reference to the utility (component) used to construct the snapshot. A snapshot for the Collector may be separately obtained to find information relating to the environment that produced this snapshot. A single collector may be referenced.

• TransformMethod – contains algorithm identifiers for transforms that may have been applied prior to applying a digest method. Multiple transformation methods may be defined.

• DigestMethod – contains algorithm identifiers for hash algorithms that are used to compute message digests. Multiple digest methods may be defined.

• Values – contains integrity measurements (message digests) that pertain to this component. It is reasonable (even desirable) that schemas capturing domain specific structure should incorporate a composite hash structure that is incorporated into the Snapshot CompositeHash or PcrHash. Multiple instances of Values elements may be supplied. If TransformMethod and DigestMethod are not populated, then Values MUST include these structures. ValuesType as defined in the core integrity schema [1] is intended to be extended with one or more schemas such as the Simple Object Schema [9].

• AssertionInfo – contains domain specific description of attributes affecting quality, assurance or reliability assessments, but where it isn’t possible for measurement engines to collect actual values. Multiple instances of AssertionInfo elements may be supplied. AssertionInfo as defined in the core integrity schema [1] is to be extended with one or more schemas such as the Quality Qualities Schema [10].

• PlatformClass – identifies the type of platform that integrity values pertain to. In particular, the methodology for PCR allocation is specified by platform specific specifications.

• SubComponents – are references to finer grain components that make up this component.

• CompositeHash – contains a composite hash calculation of elements in a Snapshot. This element MUST be populated if the snapshot does not detail a PCR (i.e. not a sync snapshot). It SHOULD be included in the hash calculation for the snapshot signature. The schema allows for multiple CompositeHash elements; however more than one CompositeHash elements SHOULD only be included if more than one digest method is used within the snapshot. If a composite hash is not included and a signature is included, the integrity value for the snapshot is taken to be the signature hash. CompositeHash and PcrHash are mutually exclusive, but a snapshot may not have either one.

• PcrHash – contains a composite hash calculation of elements in a Snapshot. This element MUST be populated if the snapshot details a PCR (i.e. it is a sync snapshot). It SHOULD be included in the hash calculation for the snapshot signature. It is used to correlate a composite hash to a TPM PCR value. The schema allows for multiple PcrHash elements; this feature is included for future expansion as the current PTS specification only uses a single TPM PCR and thus only a single PcrHash element SHOULD be included in a snapshot. If a PcrHash is not included, the integrity value for the snapshot is taken to be the signature hash. CompositeHash and PcrHash are mutually exclusive, but a snapshot may not have either one.
3.1.13.2 Diagram

diagram

core:incentityManifestType

- attributes
  - Id
  - RevLevel
  - TemplateVersion

- ComponentID
  - type: ComponentIDType

- SignerInfo
  - type: SignerInfoType

- ConfidenceValue
  - type: ConfidenceValueType

- Collector
  - type: ComponentRefType

- TransformMethod
  - type: TransformMethodType
  - minOccurs: 0

- DigestMethod
  - type: DigestMethodType
  - minOccurs: 0

- Values
  - type: ValueType
  - minOccurs: 0

- AssertionInfo
  - type: AssertionType
  - minOccurs: 0

- PlatformClass
  - type: PlatformClassType

- SubComponents
  - type: ComponentRefType
  - minOccurs: 0

- attributes
  - UUID

- CompositeHash
  - type: CompositeHashType
  - minOccurs: 1

- FpHash
  - type: FpHashType
  - minOccurs: 1

TCG CONFIDENTIAL
namespace http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#

type extension of core:IntegrityManifestType

properties base core:IntegrityManifestType

children ComponentID SignerInfo Collector TransformMethod DigestMethod Values AssertionInfo PlatformClass SubComponents CompositeHash PcrHash

Used by elements Snapshot ReportType/SnapshotCollection

attributes Name Type Use Default Fixed
ID xs:id required
RevLevel xs:integer required
UUID xs:NMTOKEN required
TemplateVersion xs:integer required

3.1.13.3 Attribute Detail

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Snapshot unique record instance identifier. ID can be used in other parts of the document and by external systems to reference the snapshot instance in an integrity report.</td>
</tr>
<tr>
<td>RevLevel</td>
<td>RevLevel is a revision number (increment for more recent revision) to distinguish revisions of an integrity manifest structure. RevLevel applies to instances of snapshot structures having the same ID value. This is how a verifier can determine if a snapshot has the full desired structure for its verification process.</td>
</tr>
<tr>
<td>UUID</td>
<td>Globally unique identifier to allow XML documents, external systems and this XML document to refer to a snapshot instance.</td>
</tr>
<tr>
<td>TemplateVersion</td>
<td>TemplateVersion indicates the revision of the structure of this Integrity Manifest. All new Integrity Manifests should use a 1 in this field and each time the structure of the Integrity Manifest changes, this field should be incremented. The structure indicates the organization of component/sub-component hierarchy described by the document. If a new component is added or the sub-component set changes this reflects a different organization of the document. This field is used during attestation to detect when the two parties have the same Integrity Manifest so it can be used as the basis for organizing the resulting Integrity Report.</td>
</tr>
</tbody>
</table>

3.1.14 XML

```xml
<xs:complexType name="SnapshotType">
  <xs:complexContent>
    <xs:extension base="core:IntegrityManifestType">
      <xs:sequence minOccurs="0">
        <xs:choice>
          <xs:element name="PcrHash" type="TpmDigestValueType" maxOccurs="unbounded"/>
          <xs:element name="CompositeHash" type="CompositeHashType" maxOccurs="unbounded"/>
        </xs:choice>
      </xs:sequence>
      <xs:attribute name="UUID" type="xs:NMTOKEN" use="required"/>
      <xs:attribute name="TemplateVersion" type="xs:integer" use="required"/>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

3.1.14 complexType TpmDigestValueType

3.1.14.1 Description

The TpmDigestValueType complex type is an extension of the core:HashType complex type defined in [1]. This is the end digest value in a snapshot of the values referenced by the ExtendOrder attribute. TpmDigestValueType extends core:Hash type by adding the following optional attributes: Locality IsResetable, Name, Number, StartHash, SyncRef, and TimeStamp. TpmDigestValueType complex type MUST be used for PCR digests (instead of CompositeHashType complex type).
3.1.14.2 Diagram

```xml
<TpmDigestValueType>
  <id/>
  <AlgRef/>
  <TransformRefs/>
  <ExtendOrder/>
  <Locality/>
  <IsResetable/>
  <Name/>
  <Number/>
  <StartHash/>
  <SyncRef/>
  <Timestamp/>
</TpmDigestValueType>
```

```xml
<core:HashType>
  <Id/>
  <AlgRef/>
  <TransformRefs/>
  <ExtendOrder/>
  <Locality/>
  <IsResetable/>
  <Name/>
  <Number/>
  <StartHash/>
  <SyncRef/>
  <Timestamp/>
</core:HashType>
```

**namespace** http://www.trustedcomputinggroup.org/XML/SCHHEMA/2.0/integrity_report#

**type** extension of core:HashType

**properties**

- **base** core:HashType
- **used by** element SnapshotType/PcrHash

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Use</th>
<th>Default</th>
<th>Fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>xs:ID</td>
<td>required</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AlgRef</td>
<td>xs:IDREF</td>
<td>required</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TransformRefs</td>
<td>xs:IDREFS</td>
<td>optional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ExtendOrder</td>
<td>xs:IDREFS</td>
<td>optional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locality</td>
<td>xs:integer</td>
<td>optional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IsResetable</td>
<td>xs:boolean</td>
<td>required</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>xs:normalizedString</td>
<td>optional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>xs:integer</td>
<td>optional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>StartHash</td>
<td>ds:DigestValueType</td>
<td>required</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SyncRef</td>
<td>xs:IDREF</td>
<td>optional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timestamp</td>
<td>xs:dateTime</td>
<td>optional</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.1.14.3 Attribute Detail

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>TPM PCR Digest unique record instance identifier. ID can be used in other parts of the document and by external systems to reference the snapshot instance in an integrity report.</td>
</tr>
<tr>
<td>AlgRef</td>
<td>AlgRef refer to a hash algorithm as defined by DigestMethodType</td>
</tr>
<tr>
<td>TransformRefs</td>
<td>TransformRefs Refers to transformation functions defined by TransformMethod elements of type TransformMethodType.</td>
</tr>
</tbody>
</table>
ExtendOrder contains an ordered list of xs:IDREF values. Values at the beginning of the list occur before values at the end. Therefore, the first entry in the list would be the first value extended, the last entry would be the last value extended.

Locality The locality indicator for the TPM PCR.

IsResetable IsResetable indicates whether it is possible to reset the TPM PCR without rebooting the platform.

Name Friendly name assigned to the TPM PCR – this reference provides a reference to the TPM PCR that is meaningful to a human.

Number Number is the PCR number that is recognized by the TPM

StartHash The initial digest value of the TPM PCR prior to extending values.

SyncRef Reference (xs:IDREF) to the Id of the sync snapshot.

Timestamp Time stamp when the snapshot was completed.

3.1.14.4 XML

```xml
<xs:complexType name="TpmDigestValueType">
  <xs:simpleContent>
    <xs:extension base="core:HashType">
      <xs:attribute name="Locality" type="xs:integer" use="required"/>
      <xs:attribute name="IsResetable" type="xs:boolean" use="required"/>
      <xs:attribute name="Name" type="xs:normalizedString"/>
      <xs:attribute name="Number" type="xs:integer"/>
      <xs:attribute name="StartHash" type="ds:DigestValueType" use="required"/>
      <xs:attribute name="SyncRef" type="xs:IDREF"/>
      <xs:attribute name="Timestamp" type="xs:dateTime"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```
3.2 ELEMENTS

3.2.1 element PcrCompositeType/PcrSelection

3.2.1.1 Description
PcrSelection element is a single instance of PcrSelectionType - see section 3.1.5. The contents specify which PCRs are Quoted in an Integrity Report.

3.2.1.2 XML
source 
<xs:element name="PcrSelection" type="PcrSelectionType"/>

3.2.2 element PcrCompositeType/ValueSize

3.2.2.1 Description
ValueSize is the total size in bytes of the array of PcrValue structures in PcrCompositeType (see 3.1.3).

3.2.2.2 Diagram

```
diagram
ValueSize
  type :xs:unsignedLong
```

namespace http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#
type xs:unsignedLong
properties isRef 0
content simple

3.2.2.3 XML
source 
<xs:element name="ValueSize" type="xs:unsignedLong"/>

3.2.3 element PcrCompositeType/PcrValue

3.2.3.1 Description
The PcrValue element extends the XML W3C DigestValueType [3] simple type by adding the SnapshotRef and PcrNumber attributes. The PcrValue element is a single PCR digest value in a Quote. The Array of PcrValue structures (see PcrCompositeType 3.1.3) details the combination of PCR digest values for all PCRs chosen for the Quote.

The mandatory PcrNumber attribute allows the recipient of an array of PcrValue structures to map this digest value with the corresponding PCR from the PcrSelection structure (see 3.2.1) in PcrCompositeType. The optional SnapshotRef is a reference to the corresponding snapshot that has the same end hash value.

3.2.3.2 Diagram

```
diagram
PcrValue
  type ds:DigestValueType
```

attributes

SnapshotRef

PcrNumber
namespace http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#

type extension of ds:DigestValueType

properties isRef 0 complex

attributes
Name SnapshotRef xs:IDREF optional
PcrNumber xs:unsignedLong required

3.2.3.3 Attribute Detail

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SnapshotRef</td>
<td>SnapshotRef is an IDREF reference to the snapshot that has this PCR value as it's end digest value.</td>
</tr>
<tr>
<td>PcrNumber</td>
<td>PcrNumber is the TPM's identifier for the PCR.</td>
</tr>
</tbody>
</table>

3.2.4 element PcrInfoShortType/PcrSelection

3.2.4.1 Description

PcrSelection element is a single instance of PcrSelectionType (see section 3.1.5). The contents specify which PCRs are Quoted in an Integrity Report.

3.2.4.2 XML

source <xs:element name="PcrSelection" type="PcrSelectionType"/>

3.2.5 element PcrInfoShortType/LocalityAtRelease

3.2.5.1 Description

The LocalityAtRelease element is a single unsigned byte that specifies the locality modifier to provide the requestor a more complete view of the current (while Quoting) platform configuration. This is a mandatory element of complex type PcrInfoShortType (see 3.1.4) and the data is required to validate the Quoted digest value.

3.2.5.2 Diagram

```
namespace http://www.trustedcomputinggroup.org/XML/SCHEMA/2_0/integrity_report#
type xs:unsignedByte

properties isRef 0
  content 0
```

3.2.5.3 XML

source <xs:element name="LocalityAtRelease" type="xs:unsignedByte"/>
3.2.6 element PcrInfoShortType/CompositeHash

3.2.6.1 Description
The CompositeHash element is defined by the XML W3C DigestValueType simple type [3] and is a digest of the PcrInfoShortType/PcrComposite structure.

3.2.6.2 Diagram

```
<diagram>
  <CompositeHash
    type="ds:DigestValueType"/>
</diagram>
```

3.2.6.3 XML

```
<xs:element name="CompositeHash" type="ds:DigestValueType"/>
```

3.2.7 element PcrInfoShortType/PcrComposite

3.2.7.1 Description
The PcrComposite element is defined by the PcrCompositeType complex type (see 3.1.3). It is not part of a TPM PCR_INFO_SHORT structure; however CompositeHash is a hash of PcrComposite, thus PcrComposite is included in PcrInfoShortType to provide the necessary detail used to compute CompositeHash.

3.2.7.2 XML

```
<xs:element name="PcrComposite" type="PcrCompositeType"/>
```

3.2.8 element Quote2Type/CapVersionInfo

3.2.8.1 Description
The CapVersionInfo element is defined by the CapVersionInfoType complex type (see 3.1.1). The 1.2 TPM Quote2 command supports an optional request to return CapVersionInfo and include it in the quoted digest calculation. It is optional in Quote2Type complex type (see 3.1.6) since it is optional in the TPM Quote2 command.

3.2.8.2 XML

```
<xs:element name="CapVersionInfo" type="CapVersionInfoType" minOccurs="0"/>
```

3.2.9 element Quote2Type/QuoteInfo2

3.2.9.1 Description
The QuoteInfo2 element is defined by the QuoteInfo2Type complex type (see 3.1.8). This is the non-optional output from a TPM Quote command.

3.2.9.2 XML

```
<xs:element name="QuoteInfo2" type="QuoteInfo2Type"/>
```
3.2.10 element QuoteDataType/Quote

3.2.10.1 Description
The Quote element is defined by the QuoteType complex type (see 3.1.11).

3.2.10.2 XML

```xml
<xs:element name="Quote" type="QuoteType"/>
```

3.2.11 element QuoteDataType/Quote2

3.2.11.1 Description
The Quote2 element is defined by the Quote2Type complex type (see 3.1.6).

3.2.11.2 XML

```xml
<xs:element name="Quote2" type="Quote2Type"/>
```

3.2.12 element QuoteDataType/TpmSignature

3.2.12.1 Description
The TpmSignature element is defined by the QuoteSignatureType complex type (see 3.1.10). This structure contains the Quote signature value and information describing the key used and method of signature computation.

3.2.12.2 XML

```xml
<xs:element name="TpmSignature" type="QuoteSignatureType"/>
```

3.2.13 element QuoteInfo2Type/PcrInfoShort

3.2.13.1 Description
The PcrInfoShort element is defined by the PcrInfoShortType complex type (see 3.1.4).

3.2.13.2 XML

```xml
<xs:element name="PcrInfoShort" type="PcrInfoShortType"/>
```

3.2.14 element QuoteSignatureType/CanonicalizationMethod

3.2.14.1 Description
The CanonicalizationMethod element is defined by the XML W3C CononiicalizationMethodType complex type [3] and specifies the canonicalization algorithm used to create a signature. The method of calculating the TPM’s quote signature is enforced in the TPM specification [4] and thus not germane to TPM 1.1b or 1.2 Quote structures, thus it is an optional element. However, it is included in order to leverage the XML signature structures and provide for future expansion in case TPMs support CanonicalizationMethod.

3.2.14.2 XML

```xml
<xs:element name="CanonicalizationMethod" type="ds:CanonicalizationMethodType"/>
```
3.2.15 element QuoteSignatureType/KeyInfo

3.2.15.1 Description
The KeyInfo element is defined by the XML W3C KeyInfoType complex type [3] and describes the keys used for the TPM Quote operation. For a 1.1b or 1.2 TPM, the following elements are germane:

- **KeyName** – String name for the Quote key
- **KeyValue** – The RSA Quote key modulus and exponent (the public key)
- **X509Data** – Certificate data for the Quote key

3.2.15.2 XML

```xml
<xs:element name="KeyInfo" type="ds:KeyInfoType"/>
```

3.2.16 element QuoteSignatureType/ObjectType

3.2.16.1 Description
The ObjectType element is defined by the XML W3C ObjectType complex type [3]. Use of this element is optional and describes any special encoding used in the signature process.

3.2.16.2 XML

```xml
<xs:element name="ObjectType" type="ds:ObjectType" minOccurs="0"/>
```

3.2.17 element QuoteSignatureType/SignatureMethod

3.2.17.1 Description
The SignatureMethod element is defined by the XML W3C SignatureMethodType complex type [3] and describes signature algorithm used in the quote signature calculation.

3.2.17.2 XML

```xml
<xs:element name="SignatureMethod" type="ds:SignatureMethodType"/>
```

3.2.18 element QuoteSignatureType/SignatureValue

3.2.18.1 Description
The SignatureValue element is defined by the XML W3C SignatureValueType complex type [3] and contains the TPM Quote or Quote2 signature. The Id attribute can be used to directly reference the signature value.

3.2.18.2 XML

```xml
<xs:element name="SignatureValue" type="ds:SignatureValueType"/>
```

3.2.19 element QuoteType/PcrComposite

3.2.19.1 Description
The PcrComposite element is defined by the PcrCompositeType complex type (see 3.1.3)
3.2.19.2 XML

```xml
<x:s:element name="PcrComposite" type="PcrCompositeType"/>
```

3.2.20 element QuoteType/QuoteInfo

3.2.20.1 Description

The QuoteInfo element is defined by the QuoteInfoType complex type (see 3.1.9).

3.2.20.2 XML

```xml
<x:s:element name="QuoteInfo" type="QuoteInfoType"/>
```

3.2.21 element QuoteType/TpmInfo

3.2.21.1 Description

The TpmInfo element – TpmInfo is optional data identifying the TPM used to create Quote data in the QuoteType complex type (see 3.1.11). This information may be useful in case there are any vendor-specific differences in rendering the Quote signature. If the TPM is a 1.1b TPM, then TpmManufacturer should be instantiated from a call to the TPM GetCapability command. If the TPM is a 1.2 TPM, then CapVersionInfo should be instantiated from a call to the TPM GetCapability command.

3.2.21.2 Diagram

```xml
diagram
<xs:complexType>
  <xs:choice>
    <xs:element name="CapVersionInfo" type="CapVersionInfoType"/>
    <xs:element name="TpmManufacturer" type="xs:normalizedString"/>
  </xs:choice>
</xs:complexType>
```

3.2.21.3 XML

```xml
<x:s:element name="TpmInfo" minOccurs="0">
  <xs:complexType>
    <xs:choice>
      <xs:element name="CapVersionInfo" type="CapVersionInfoType"/>
      <xs:element name="TpmManufacturer" type="xs:normalizedString"/>
    </xs:choice>
  </xs:complexType>
</xs:element>
```

3.2.22 element QuoteType/TpmInfo/CapVersionInfo

3.2.22.1 Description

The CapVersionInfo element is defined by the CapVersionInfoType complex type (see 3.1.1). There are no additional context dependent semantics.
3.2.22 XML

```xml
<xs:element name="CapVersionInfo" type="CapVersionInfoType"/>
```

3.2.23 element QuoteType/TpmInfo/TpmManufacturer

3.2.23.1 Description

The TpmManufacturer element is defined by the XML W3C normalizedString simple type [3]. The TpmManufacturer element should be instantiated in a TpmInfo element (see 3.2.21) if the TPM is a 1.1b TPM. The content is the result of calling the TPM GetCapability command and requesting the CAP_PROP_MANUFACTURER for a 1.1b or 1.2 TPM. The value returned is a UInt32 and must be converted into a string of 4 bytes with any following NULL bytes removed. Alternatively this data may be retrieved by calling the TPM GetCapability command and requesting CAP_VERSION_INFO for a 1.2 TPM and using the tpmVendorID field. The TPM returns the same string for both calls. This is a 4-byte value that is usually the vendor’s stock ticker value in capitalized characters. If the string is less than 4 bytes long, it must be padded with trailing NULLs prior to use.

3.2.23.2 Diagram

```
<xs:element name="TpmManufacturer" type="xs:normalizedString"/>
```

3.2.23.3 XML

```xml
<xs:element name="TpmManufacturer" type="xs:normalizedString"/>
```

3.2.24 element Report

3.2.24.1 Description

The Report element is defined by the ReportType complex type (see 3.1.12). This is an integrity report. There are no additional context dependent semantics.

3.2.24.2 XML

```xml
<xs:element name="Report" type="ReportType"/>
```

3.2.25 element ReportType/QuoteInfo

3.2.25.1 Description

The QuoteInfo element is defined by the QuoteDataType complex type (see 3.1.7). This structure contains all of the quote-related data for the integrity report. There are no additional context dependent semantics.

3.2.25.2 XML

```xml
<xs:element name="QuoteInfo" type="QuoteDataType" minOccurs="0" maxOccurs="unbounded"/>
```
3.2.26 element ReportType/SnapshotCollection

3.2.26.1 Description
The SnapshotCollection element is defined by the SnapshotType complex type (see 3.1.13). SnapshotCollection is an unbounded element containing all of the snapshots included in the integrity report.

3.2.26.2 XML

```xml
<xs:element name="SnapshotCollection" type="SnapshotType" maxOccurs="unbounded"/>
```

3.2.27 element SnapshotType/CompositeHash

3.2.27.1 Description
The CompositeHash element is defined by the CompositeHashType complex type (see 3.1.2). This is the final hash value of the snapshot after including all values and assertions. There should only be one CompositeHash element unless the snapshot utilizes more than one digest method.

3.2.27.2 XML

```xml
<xs:element name="CompositeHash" type="CompositeHashType" maxOccurs="unbounded"/>
```

3.2.28 element SnapshotType/PcrHash

3.2.28.1 Description
The PcrHash element is defined by the TpmDigestValueType complex type (see 3.1.14). This is the final hash value of the snapshot after including all values and assertions. There may only be a single PcrHash element for a 1.1b or 1.2 TPM for a PTS that may only utilize a single PCR (as the initial IF-PTS specification requires).

3.2.28.2 XML

```xml
<xs:element name="PcrHash" type="TpmDigestValueType" maxOccurs="unbounded"/>
```

3.2.29 element Snapshot

3.2.29.1 Description
The Snapshot element is defined by the SnapshotType complex type (see 3.1.13). There may be an unlimited number of Snapshot elements in an integrity report.

3.2.29.2 XML

```xml
<xs:element name="Snapshot" type="SnapshotType"/>
```
4 Appendix A – Example Integrity Report

The following XML is provided as an example integrity report. The integrity report document contains 2 snapshots and a Quote from a TPM using PCR #13. The data contained within the XML is provided for example purposes only and should not be interpreted as real data.
<CompositeHash Id="_779ADB1F-E75B-4b94-9EFE-0FAD9C125549"
    AlgRef="sha1">7EbI2D2FLhcDFxGdQE9/ZjskOGcw=
</CompositeHash>

<SnapshotCollection Id="_1901366E-1409-4eeb-99E1-1F4880034EEB" RevLevel="0" UUID="1901366E-1409-4eeb-99E1-1F4880034EEB">
    <templateVersion="1">
        <ComponentId Id="_234234" VersionBuild="4" VersionMajor="1" VersionMinor="2" SimpleName="PTS Service"
            ModelSystemClass="NTRU">
            <VendorID Name="Wave Systems">
                <SmiVendorId>15997</SmiVendorId>
            </VendorID>
            <Collector>
                <ComponentId Id="a12345" VersionBuild="4" VersionMajor="1" VersionMinor="2" SimpleName="PTS Service"
                    ModelSystemClass="NTRU">
                    <VendorID Name="Wave Systems">
                        <SmiVendorId>15997</SmiVendorId>
                    </VendorID>
                </Collector>

                <Values>
                    <SimpleSnapshotObject
                        <Objects Name="C:\Program Files\Wave Systems Corp\PTS\ptsserver.exe">
                            <Hash Id="_D4D8A65C-EE5F-4693-BE21-56DE1BFC72DD"
                                AlgRef="sha1">
                                7EbfD2FLhcDFxGdQE9/ZjskOGcw=
                            </Hash>
                        </Objects>
                        <Objects Name="C:\Program Files\Wave Systems Corp\PTS\ptssdk.dll">
                            <Hash Id="_32D24FF8-8D52-49cb-9C21-430233E81576"
                                AlgRef="sha1">
                                7EbfD2FLhcDFxGdQE9/ZjskOGcw=
                            </Hash>
                        </Objects>
                    </SimpleSnapshotObject>

                    <PcrHash IsResetable="false" Id="S29934"
                        ExtendOrder="_1901366E-1409-4eeb-99E1-1F4880034EEB"
                        StartHash="7EbI2D2FLhcDFxGdQE9/ZjskOGcw=">
                        SinjXkRRXpMteFROEGrTuxwa8=
                    </PcrHash>
                </Values>
            </ComponentId>

        </ComponentId>
    </templateVersion>
</SnapshotCollection>
5 References


