

SACM
Internet-Draft
Intended status: Standards Track
Expires: October 29, 2017

D. Waltermire, Ed.
NIST
K. Watson
DHS
C. Kahn
L. Lorenzin
Pulse Secure, LLC
M. Cokus
D. Haynes
The MITRE Corporation
H. Birkholz
Fraunhofer SIT
April 27, 2017

SACM Information Model
draft-ietf-sacm-information-model-10

Abstract

This document defines the Information Elements that are transported between SACM components and their interconnected relationships. The primary purpose of the Secure Automation and Continuous Monitoring (SACM) Information Model is to ensure the interoperability of corresponding SACM data models and addresses the use cases defined by SACM. The Information Elements and corresponding types are maintained as the IANA "SACM Information Elements" registry.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on October 29, 2017.

Copyright Notice

Copyright (c) 2017 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

- [1. Introduction](#) [12](#)
- [2. Conventions used in this document](#) [13](#)
 - [2.1. Requirements Language](#) [13](#)
 - [2.2. Information Element Examples](#) [13](#)
- [3. Information Elements](#) [13](#)
 - [3.1. Context of Information Elements](#) [14](#)
 - [3.2. Extensibility of Information Elements](#) [14](#)
- [4. Structure of Information Elements](#) [14](#)
 - [4.1. Information Element Naming Convention](#) [17](#)
 - [4.2. SACM Content Elements](#) [18](#)
 - [4.3. SACM Statements](#) [18](#)
 - [4.4. Relationships](#) [20](#)
 - [4.5. Event](#) [22](#)
 - [4.6. Categories](#) [23](#)
- [5. Abstract Data Types](#) [23](#)
 - [5.1. Simple Datatypes](#) [23](#)
 - [5.1.1. IPFIX Datatypes](#) [23](#)
 - [5.2. Structured Datatypes](#) [24](#)
 - [5.2.1. List Datatypes](#) [24](#)
 - [5.2.2. Enumeration Datatype](#) [25](#)
 - [5.2.3. Category Datatype](#) [26](#)
- [6. Information Model Assets](#) [26](#)
 - [6.1. Asset](#) [27](#)
 - [6.2. Endpoint](#) [28](#)
 - [6.3. Hardware Component](#) [28](#)
 - [6.4. Software Component](#) [29](#)
 - [6.4.1. Software Instance](#) [29](#)
 - [6.5. Identity](#) [29](#)
 - [6.6. Guidance](#) [29](#)
 - [6.6.1. Collection Guidance](#) [30](#)
 - [6.6.2. Evaluation Guidance](#) [30](#)

- [6.6.3. Classification Guidance](#) [31](#)
- [6.6.4. Storage Guidance](#) [31](#)
- [6.6.5. Evaluation Results](#) [31](#)
- [7. Information Model Elements](#) [32](#)
 - [7.1. sacmStatement](#) [32](#)
 - [7.2. sacmStatementMetadata](#) [32](#)
 - [7.3. sacmContentElement](#) [32](#)
 - [7.4. sacmContentElementMetadata](#) [33](#)
 - [7.5. targetEndpoint](#) [33](#)
 - [7.6. targetEndpointIdentifier](#) [33](#)
 - [7.7. targetEndpointLabel](#) [33](#)
 - [7.8. anyIE](#) [34](#)
 - [7.9. accessPrivilegeType](#) [34](#)
 - [7.10. accountName](#) [34](#)
 - [7.11. administrativeDomainType](#) [34](#)
 - [7.12. addressAssociationType](#) [34](#)
 - [7.13. addressMaskValue](#) [35](#)
 - [7.14. addressType](#) [35](#)
 - [7.15. addressValue](#) [35](#)
 - [7.16. applicationComponent](#) [35](#)
 - [7.17. applicationLabel](#) [36](#)
 - [7.18. applicationType](#) [36](#)
 - [7.19. applicationManufacturer](#) [36](#)
 - [7.20. authenticator](#) [36](#)
 - [7.21. authenticationType](#) [36](#)
 - [7.22. birthdate](#) [37](#)
 - [7.23. bytesReceived](#) [37](#)
 - [7.24. bytesReceived](#) [37](#)
 - [7.25. bytesSent](#) [37](#)
 - [7.26. certificate](#) [38](#)
 - [7.27. collectionTaskType](#) [38](#)
 - [7.28. confidence](#) [38](#)
 - [7.29. contentAction](#) [38](#)
 - [7.30. countryCode](#) [38](#)
 - [7.31. dataOrigin](#) [39](#)
 - [7.32. dataSource](#) [39](#)
 - [7.33. default-depth](#) [39](#)
 - [7.34. discoverer](#) [39](#)
 - [7.35. emailAddress](#) [40](#)
 - [7.36. eventType](#) [40](#)
 - [7.37. eventThreshold](#) [40](#)
 - [7.38. eventThresholdName](#) [40](#)
 - [7.39. eventTrigger](#) [40](#)
 - [7.40. firmwareId](#) [41](#)
 - [7.41. hostName](#) [41](#)
 - [7.42. interfaceLabel](#) [41](#)
 - [7.43. ipv6AddressSubnetMask](#) [41](#)
 - [7.44. ipv6AddressSubnetMaskCidrNotation](#) [41](#)

7.45.	ipv6AddressValue	42
7.46.	ipv4AddressSubnetMask	42
7.47.	ipv4AddressSubnetMaskCidrNotation	42
7.48.	ipv4AddressValue	42
7.49.	layer2InterfaceType	42
7.50.	layer4PortAddress	42
7.51.	layer4Protocol	43
7.52.	locationName	43
7.53.	networkZoneLocation	43
7.54.	layer2NetworkLocation	43
7.55.	layer3NetworkLocation	44
7.56.	macAddressValue	44
7.57.	methodLabel	44
7.58.	methodRepository	44
7.59.	networkAccessLevelType	44
7.60.	networkId	45
7.61.	networkInterfaceName	45
7.62.	networkLayer	45
7.63.	networkName	45
7.64.	organizationId	45
7.65.	patchId	46
7.66.	patchName	46
7.67.	personFirstName	46
7.68.	personLastName	46
7.69.	personMiddleName	46
7.70.	phoneNumber	46
7.71.	phoneNumberType	47
7.72.	privilegeName	47
7.73.	privilegeValue	47
7.74.	protocol	47
7.75.	publicKey	48
7.76.	relationshipContentElementGuid	48
7.77.	relationshipStatementElementGuid	48
7.78.	relationshipObjectLabel	48
7.79.	relationshipType	48
7.80.	roleName	49
7.81.	sessionStateType	49
7.82.	statementGuid	49
7.83.	statementType	49
7.84.	status	50
7.85.	subAdministrativeDomain	50
7.86.	subInterfaceLabel	50
7.87.	superAdministrativeDomain	50
7.88.	superInterfaceLabel	51
7.89.	teAssessmentState	51
7.90.	teLabel	51
7.91.	teId	51
7.92.	timestampType	51

7.93.	unitsReceived	52
7.94.	unitsSent	52
7.95.	userDirectory	52
7.96.	sacmUserId	52
7.97.	webSite	53
7.98.	WGS84Longitude	53
7.99.	WGS84Latitude	53
7.100.	WGS84Altitude	53
7.101.	hardwareSerialNumber	53
7.102.	interfaceName	54
7.103.	interfaceIndex	54
7.104.	interfaceMacAddress	54
7.105.	interfaceType	54
7.106.	interfaceFlags	54
7.107.	networkInterface	55
7.108.	softwareIdentifier	55
7.109.	softwareTitle	55
7.110.	softwareCreator	56
7.111.	simpleSoftwareVersion	56
7.112.	rpmSoftwareVersion	56
7.113.	ciscoTrainSoftwareVersion	56
7.114.	softwareVersion	56
7.115.	softwareLastUpdated	57
7.116.	softwareClass	57
7.117.	softwareInstance	58
7.118.	globallyUniqueIdentifier	59
7.119.	creationTimestamp	59
7.120.	collectionTimestamp	59
7.121.	publicationTimestamp	59
7.122.	relayTimestamp	59
7.123.	storageTimestamp	60
7.124.	type	60
7.125.	protocolIdentifier	60
7.126.	sourceTransportPort	60
7.127.	sourceIPv4PrefixLength	61
7.128.	ingressInterface	61
7.129.	destinationTransportPort	61
7.130.	sourceIPv6PrefixLength	61
7.131.	sourceIPv4Prefix	62
7.132.	destinationIPv4Prefix	62
7.133.	sourceMacAddress	62
7.134.	ipVersion	62
7.135.	interfaceDescription	62
7.136.	applicationDescription	62
7.137.	applicationId	63
7.138.	applicationName	63
7.139.	exporterIPv4Address	63
7.140.	exporterIPv6Address	63

7.141	portId	63
7.142	templateId	64
7.143	collectorIPv4Address	64
7.144	collectorIPv6Address	64
7.145	informationElementIndex	65
7.146	informationElementId	65
7.147	informationElementDataType	65
7.148	informationElementDescription	65
7.149	informationElementName	66
7.150	informationElementRangeBegin	66
7.151	informationElementRangeEnd	66
7.152	informationElementSemantics	67
7.153	informationElementUnits	67
7.154	applicationCategoryName	68
7.155	mibObjectValueInteger	68
7.156	mibObjectValueOctetString	69
7.157	mibObjectValueOID	69
7.158	mibObjectValueBits	69
7.159	mibObjectValueIPAddress	70
7.160	mibObjectValueCounter	70
7.161	mibObjectValueGauge	71
7.162	mibObjectValueTimeTicks	71
7.163	mibObjectValueUnsigned	72
7.164	mibObjectValueTable	72
7.165	mibObjectValueRow	72
7.166	mibObjectIdentifier	73
7.167	mibSubIdentifier	73
7.168	mibIndexIndicator	73
7.169	mibCaptureTimeSemantics	74
7.170	mibContextEngineID	75
7.171	mibContextName	76
7.172	mibObjectName	76
7.173	mibObjectDescription	76
7.174	mibObjectSyntax	76
7.175	mibModuleName	76
7.176	interface	77
7.177	iflisteners	77
7.178	physicalProtocol	77
7.179	hwAddress	78
7.180	programName	79
7.181	userId	79
7.182	inetlisteningserver	79
7.183	transportProtocol	79
7.184	localAddress	79
7.185	localPort	80
7.186	localFullAddress	80
7.187	foreignAddress	80
7.188	foreignFullAddress	80

7.189	selinuxboolean	80
7.190	selinuxName	81
7.191	currentStatus	81
7.192	pendingStatus	81
7.193	selinuxsecuritycontext	81
7.194	filepath	82
7.195	path	82
7.196	filename	82
7.197	pid	82
7.198	role	82
7.199	domainType	83
7.200	lowSensitivity	83
7.201	lowCategory	83
7.202	highSensitivity	83
7.203	highCategory	83
7.204	rawlowSensitivity	84
7.205	rawlowCategory	84
7.206	rawhighSensitivity	84
7.207	rawhighCategory	84
7.208	systemdunitdependency	84
7.209	unit	85
7.210	dependency	85
7.211	systemdunitproperty	85
7.212	property	85
7.213	systemdunitValue	85
7.214	file	86
7.215	fileType	86
7.216	groupId	86
7.217	aTime	86
7.218	cTime	86
7.219	mTime	87
7.220	size	87
7.221	suid	87
7.222	sgid	87
7.223	sticky	87
7.224	hasExtendedAcl	88
7.225	inetd	88
7.226	serverProgram	88
7.227	inetdEndpointType	88
7.228	execAsUser	89
7.229	waitStatus	89
7.230	inetAddr	90
7.231	netmask	90
7.232	passwordInfo	90
7.233	username	91
7.234	password	91
7.235	gcos	91
7.236	homeDir	91

7.237	loginShell	91
7.238	lastLogin	92
7.239	process	92
7.240	commandLine	92
7.241	ppid	92
7.242	priority	93
7.243	startTime	93
7.244	routingtable	93
7.245	destination	93
7.246	gateway	93
7.247	runlevelInfo	94
7.248	runlevel	94
7.249	start	94
7.250	kill	94
7.251	shadowItem	94
7.252	chgLst	95
7.253	chgAllow	95
7.254	chgReq	95
7.255	expWarn	95
7.256	expInact	95
7.257	expDate	96
7.258	encryptMethod	96
7.259	symlink	96
7.260	symlinkFilepath	96
7.261	canonicalPath	97
7.262	sysctl	97
7.263	kernelParameterName	97
7.264	kernelParameterValue	97
7.265	uname	98
7.266	machineClass	98
7.267	nodeName	98
7.268	osName	98
7.269	osRelease	98
7.270	processorType	99
7.271	internetService	99
7.272	serviceProtocol	99
7.273	serviceName	99
7.274	flags	99
7.275	noAccess	100
7.276	onlyFrom	100
7.277	port	100
7.278	server	100
7.279	serverArguments	100
7.280	socketType	101
7.281	registeredServiceType	101
7.282	wait	101
7.283	disabled	102
7.284	windowsView	102

7.285	fileauditedpermissions	102
7.286	trusteeName	103
7.287	auditStandardDelete	103
7.288	auditStandardReadControl	103
7.289	auditStandardWriteDac	104
7.290	auditStandardWriteOwner	104
7.291	auditStandardSynchronize	105
7.292	auditAccessSystemSecurity	105
7.293	auditGenericRead	106
7.294	auditGenericWrite	106
7.295	auditGenericExecute	107
7.296	auditGenericAll	107
7.297	auditFileReadData	108
7.298	auditFileWriteData	108
7.299	auditFileAppendData	109
7.300	auditFileReadEa	109
7.301	auditFileWriteEa	110
7.302	auditFileExecute	110
7.303	auditFileDeleteChild	111
7.304	auditFileReadAttributes	111
7.305	auditFileWriteAttributes	112
7.306	fileeffectiverights	112
7.307	standardDelete	113
7.308	standardReadControl	113
7.309	standardWriteDac	113
7.310	standardWriteOwner	114
7.311	standardSynchronize	114
7.312	accessSystemSecurity	114
7.313	genericRead	114
7.314	genericWrite	114
7.315	genericExecute	115
7.316	genericAll	115
7.317	fileReadData	115
7.318	fileWriteData	115
7.319	fileAppendData	115
7.320	fileReadEa	116
7.321	fileWriteEa	116
7.322	fileExecute	116
7.323	fileDeleteChild	116
7.324	fileReadAttributes	116
7.325	fileWriteAttributes	117
7.326	groupInfo	117
7.327	group	117
7.328	subgroup	117
7.329	groupSidInfo	117
7.330	userSidInfo	118
7.331	userSid	118
7.332	subgroupSid	118

7.333	lockoutpolicy	118
7.334	forceLogoff	118
7.335	lockoutDuration	119
7.336	lockoutObservationWindow	119
7.337	lockoutThreshold	119
7.338	passwordpolicy	119
7.339	maxPasswdAge	120
7.340	minPasswdAge	120
7.341	minPasswdLen	120
7.342	passwordHistLen	121
7.343	passwordComplexity	121
7.344	reversibleEncryption	121
7.345	portInfo	121
7.346	foreignPort	121
7.347	printereffectiverights	122
7.348	printerName	122
7.349	printerAccessAdminister	122
7.350	printerAccessUse	122
7.351	jobAccessAdminister	122
7.352	jobAccessRead	123
7.353	registry	123
7.354	registryHive	123
7.355	registryKey	124
7.356	registryKeyName	124
7.357	lastWriteTime	124
7.358	registryKeyType	125
7.359	registryKeyValue	126
7.360	regkeyauditedpermissions	127
7.361	auditKeyQueryValue	128
7.362	auditKeySetValue	128
7.363	auditKeyCreateSubKey	129
7.364	auditKeyEnumerateSubKeys	129
7.365	auditKeyNotify	130
7.366	auditKeyCreateLink	130
7.367	auditKeyWow6464Key	131
7.368	auditKeyWow6432Key	131
7.369	auditKeyWow64Res	132
7.370	regkeyeffectiverights	132
7.371	keyQueryValue	133
7.372	keySetValue	133
7.373	keyCreateSubKey	133
7.374	keyEnumerateSubKeys	134
7.375	keyNotify	134
7.376	keyCreateLink	134
7.377	keyWow6464Key	134
7.378	keyWow6432Key	134
7.379	keyWow64Res	134
7.380	service	135

7.381	displayName	135
7.382	description	135
7.383	serviceType	135
7.384	startType	136
7.385	currentState	137
7.386	controlsAccepted	138
7.387	startName	140
7.388	serviceFlag	140
7.389	dependencies	140
7.390	serviceeffectiverights	140
7.391	trusteeSid	141
7.392	serviceQueryConf	141
7.393	serviceChangeConf	141
7.394	serviceQueryStat	141
7.395	serviceEnumDependents	141
7.396	serviceStart	142
7.397	serviceStop	142
7.398	servicePause	142
7.399	serviceInterrogate	142
7.400	serviceUserDefined	142
7.401	sharedresourceauditedpermissions	143
7.402	netname	143
7.403	sharedresourceeffectiverights	143
7.404	user	144
7.405	enabled	144
7.406	lastLogon	144
7.407	groupSid	144
7.408	endpointType	144
7.409	endpointPurpose	145
7.410	endpointCriticality	145
7.411	ingestTimestamp	145
7.412	vulnerabilityVersion	146
7.413	vulnerabilityExternalId	146
7.414	vulnerabilitySeverity	146
7.415	assessmentTimestamp	146
7.416	vulnerableSoftware	146
7.417	endpointVulnerabilityStatus	147
7.418	vulnerabilityDescription	147
8	Acknowledgements	147
9	IANA Considerations	148
10	Security Considerations	148
11	Operational Considerations	149
11.1	Endpoint Designation	149
11.2	Timestamp Accuracy	150
12	Privacy Considerations	151
13	References	151
13.1	Normative References	151
13.2	Informative References	151

[Appendix A](#). Change Log [152](#)

[A.1](#). Changes in Revision 01 [152](#)

[A.2](#). Changes in Revision 02 [154](#)

[A.3](#). Changes in Revision 03 [154](#)

[A.4](#). Changes in Revision 04 [154](#)

[A.5](#). Changes in Revision 05 [155](#)

[A.6](#). Changes in Revision 06 [155](#)

[A.7](#). Changes in Revision 07 [155](#)

[A.8](#). Changes in Revision 08 [156](#)

[A.9](#). Changes in Revision 09 [156](#)

[A.10](#). Changes in Revision 10 [157](#)

Authors' Addresses [157](#)

1. Introduction

The SACM Information Model (IM) serves multiple purposes:

- o to ensure interoperability between SACM data models that are used as transport encodings,
- o to provide a standardized set of Information Elements - the SACM Vocabulary - to enable the exchange of content vital to automated security posture assessment, and
- o to enable secure information sharing in a scalable and extensible fashion in order to support the tasks conducted by SACM components.

A complete set of requirements imposed on the IM can be found in [[I-D.ietf-sacm-requirements](#)]. The SACM IM is intended to be used for standardized data exchange between SACM components (data in motion). Nevertheless, the Information Elements (IE) and their relationships defined in this document can be leveraged to create and align corresponding data models for data at rest.

The information model expresses, for example, target endpoint (TE) attributes, guidance, and evaluation results. The corresponding Information Elements are consumed and produced by SACM components as they carry out tasks.

The primary tasks that this information model supports (on data, control, and management plane) are:

- o TE Discovery
- o TE Characterization
- o TE Classification

- o Collection
- o Evaluation
- o Information Sharing
- o SACM Component Discovery
- o SACM Component Authentication
- o SACM Component Authorization
- o SACM Component Registration

These tasks are defined in [[I-D.ietf-sacm-terminology](#)].

[2.](#) Conventions used in this document

[2.1.](#) Requirements Language

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](#) [[RFC2119](#)].

[2.2.](#) Information Element Examples

The notation used to define the SACM Information Elements (IEs) is based on a customized version of the IPFIX information model syntax [[RFC7012](#)] which is described in Figure 2. However, there are several examples presented throughout the document that use a simplified pseudo-code to illustrate the basic structure. It should be noted that while they include actual names of subjects and attributes as well as values, they are not intended to influence how corresponding SACM IEs should be defined in [Section 7](#). The examples are provided for demonstration purposes only.

[3.](#) Information Elements

The IEs defined in this document comprise the building blocks by which all SACM content is composed. They are consumed and provided by SACM components on the data plane. Every Information Element has a unique label: its name. Every type of IE defined by the SACM IM is registered as a type at the IANA registry. The Integer Index of the IANA SMI number tables can be used by SACM data models.

3.1. Context of Information Elements

The IEs in this information model represent information related to assets in the following areas (based on the use cases described in [[RFC7632](#)]):

- o Endpoint Management
- o Software Inventory Management
- o Hardware Inventory Management
- o Configuration Management
- o Vulnerability Management

3.2. Extensibility of Information Elements

A SACM data model based on this information model MAY include additional information elements that are not defined here. The labels of additional Information Elements included in different SACM data models MUST NOT conflict with the labels of the Information Elements defined by this information model, and the names of additional Information Elements MUST NOT conflict with each other or across multiple data models. In order to avoid naming conflicts, the labels of additional IEs SHOULD be prefixed to avoid collisions across extensions. The prefix MUST include an organizational identifier and therefore, for example, MAY be an IANA enterprise number, a (partial) name space URI, or an organization name abbreviation.

4. Structure of Information Elements

There are two basic types of IEs:

- o Attributes: Atomic information elements that are equivalent to name-value-pairs and can be components of Subjects.
- o Subjects: Composite information elements that have a name and are made up of Attributes and/or other Subjects. Every IE that is part of a Subject can have a quantity associated with it (e.g. zero-one, none-unbounded). The content IEs of a Subject can be ordered or unordered.


```
Example Instance of an Attribute:  
hostname = "arbutus"
```

```
Example Instance of a Subject:  
coordinates = (  
  latitude = N27.99619,  
  longitude = E86.92761  
)
```

Figure 1: Example instance of an attribute and subject.

In general, every piece of information that enables security posture assessment or further enriches the quality of the assessment process can be associated with metadata. In the SACM IM, metadata is represented by specific subjects and is bundled with other attributes or subjects to provide additional information about them. The IM explicitly defines two kinds of metadata:

- o Metadata focusing on the data origin (the SACM component that provides the information to the SACM domain)
- o Metadata focusing on the data source (the target endpoint that is assessed)

Metadata can also include relationships that refer to other associated IEs (or SACM content in general) by using referencing labels that have to be included in the metadata of the associated IE.

Subjects can be nested and the SACM IM allows for circular or recursive nesting. The association of IEs via nesting results in a tree-like structure wherein subjects compose the root and intermediary nodes and attributes the leaves of the tree. This semantic structure does not impose a specific structure on SACM data models regarding data in motion or data repository schemata for data at rest.

The SACM IM provides two conceptual top-level subjects that are used to ensure a homogeneous structure for SACM content and its associated metadata: SACM statements and SACM content-elements. Every set of IEs that is provided by a SACM component must provide the information contained in these two subjects although it is up to the implementer whether or not the subjects are explicitly defined in a data model.

The notation the SACM IM is defined in is based on a modified version of the IP Information Flow Export (IPFIX) Information Model syntax described in [Section 2.1 of \[RFC7012\]](#). The customized syntax used by the SACM IM is defined below in Figure 2.

- elementId (required):** The numeric identifier of the Information Element. It is used for the compact identification of an Information Element. If this identifier is used without an enterpriseID, then the elementId must be unique, and the description of allowed values is administrated by IANA. The value "TBD" may be used during development of the information model until an elementId is assigned by IANA and filled in at publication time.
- enterpriseId (optional):** Enterprises may wish to define Information Elements without registering them with IANA, for example, for enterprise-internal purposes. For such Information Elements, the elementId is not sufficient when used outside the enterprise. If specifications of enterprise-specific Information Elements are made public and/or if enterprise-specific identifiers are used by SACM components outside the enterprise, then the enterprise-specific identifier MUST be made globally unique by combining it with an enterprise identifier. Valid values for the enterpriseId are defined by IANA as Structure of Management Information (SMI) network management private enterprise numbers.
- name (required):** A unique and meaningful name for the Information Element.
- dataType (required):** There are two kinds of datatypes: simple and structured. Attributes are defined using simple datatypes and subjects are defined using structured datatypes. The contents of the datatype field will be either a reference to one of the simple

	datatypes listed in Section 5.1 , or the specification of structured datatype as defined in Section 5.2 .
status (required):	The status of the specification of the Information Element. Allowed values are "current" and "deprecated". All newly defined Information Elements have "current" status. The process for moving Information Elements to the "deprecated" status is TBD.
description (required):	Describes the meaning of the Information Element, how it is derived, conditions for its use, etc.
structure (optional):	A parsable property that provides details about the definition of structured Information Elements as described in Section 5.2 .
references (optional):	Identifies other RFCs or documents outside the IETF which provide additional information or context about the Information Element.

Figure 2: Information Element Specification Template

[4.1](#). Information Element Naming Convention

SACM Information Elements must adhere to the following naming conventions.

- o Names SHOULD be descriptive
- o Names MUST be unique within the SACM registry. Enterprise-specific names SHOULD be prefixed with a Private Enterprise Number [[PEN](#)].
- o Names MUST start with lowercase letters unless it begins with a Private Enterprise Number
- o Composed names MUST use capital letters for the first letter of each part

4.2. SACM Content Elements

Every piece of information that is provided by a SACM Component is always associated with a set of data source metadata (e.g. the timestamp when the information was collected, the target endpoint from which the this set of information is about, etc.) which is provided in the SACM Content Element Metadata. The SACM Content Element is the subject information element that associates the information with the SACM Content Element Metadata. The SACM Content Element Metadata may also include relationships that express associations with other SACM Content Elements.

```
content-element = (  
  content-metadata = (  
    collection-timestamp = 146193322,  
    data-source = fb02e551-7101-4e68-8dec-1fde6bd10981  
  ),  
  hostname = "arbutus",  
  coordinates = (  
    latitude = N27.99619,  
    longitude = E86.92761  
  )  
)
```

Figure 3: Example set of IEs associated with a timestamp and a target endpoint label.

4.3. SACM Statements

One or more SACM Content Elements are bundled in a SACM Statement. In contrast to SACM Content Element Metadata, SACM Statement Metadata focuses on the providing information about the SACM Component that provided it rather than the target endpoint that the content is about. The only content-specific metadata included in the SACM Statement is the statement-type IE. Therefore, multiple SACM Content Elements that share the same SACM Statement Metadata and are of the same statement-type can be included in a single SACM Statement. A SACM Statement functions similar to an envelope or a header and is the subject information element that associates SACM Statement Metadata with security automation information provided in its SACM Content Element(s). Its purpose is to enable the tracking of the origin of data inside a SACM domain and more importantly to enable the mitigation of conflicting information that may originate from different SACM Components. How a consuming SACM Component actually deals with conflicting information is out-of-scope of the SACM IM. Semantically, the term statement implies that the SACM content provided by a SACM Component might not be correct in every context,

but, rather is the result of a best-effort to produce correct information.

```
sacm-statement = (  
  statement-metadata = (  
    publish-timestamp = 1461934031,  
    data-origin = 24e67957-3d31-4878-8892-da2b35e121c2,  
    statement-type = observation  
  ),  
  content-element = (  
    content-metadata = (  
      collection-timestamp = 146193322,  
      data-source = fb02e551-7101-4e68-8dec-1fde6bd10981  
    ),  
    hostname = "arbutus"  
  )  
)
```

Figure 4: Example of a simple SACM statement including a single content-element.


```

sacm-statement = (
  statement-metadata = (
    publish-timestamp = 1461934031,
    data-origin = 24e67957-3d31-4878-8892-da2b35e121c2
    statement-type = observation
  ),
  content-element = (
    content-metadata = (
      collection-timestamp = 146193322,
      data-source = fb02e551-7101-4e68-8dec-1fde6bd10981
    ),
    coordinates = (
      latitude = N27.99619,
      longitude = E86.92761
    )
  )
)

sacm-statement = (
  statement-metadata = (
    publish-timestamp = 1461934744,
    data-origin = e42885a1-0270-44e9-bb5c-865cf6bd4800,
    statement-type = observation
  ),
  content-element = (
    content-metadata = (
      collection-timestamp = 146193821,
      te-label = fb02e551-7101-4e68-8dec-1fde6bd10981
    ),
    coordinates = (
      latitude = N16.67622,
      longitude = E141.55321
    )
  )
)

```

Figure 5: Example of conflicting information originating from different SACM components.

4.4. Relationships

An IE can be associated with another IE, e.g. a user-name attribute can be associated with a content-authorization subject. These references are expressed via the relationships subject, which can be included in a corresponding content-metadata subject. The relationships subject includes a list of one or more references. The SACM IM does not enforce a SACM domain to use unique identifiers as

references. Therefore, there are at least two ways to reference another

- o The value of a reference represents a specific content-label that is unique in a SACM domain (and has to be included in the corresponding content-element metadata in order to be referenced), or
- o The reference is a subject that includes an appropriate number of IEs in order to identify the referenced content-element by its actual content.

It is recommended to provide unique identifiers in a SACM domain and the SACM IM provides a corresponding naming-convention as a reference in [Section 4.1](#). The alternative highlighted above summarizes a valid approach that does not require unique identifiers and is similar to the approach of referencing target endpoints via identifying attributes included in a characterization record.

```
content-element = (  
  content-metadata = (  
    collection-timestamp = 1461934031,  
    te-label =  
    fb02e551-7101-4e68-8dec-1fde6bd10981  
    relationships = (  
      associated-with-user-account =  
      f3d70ef4-7e18-42af-a894-8955ba87c95d  
    )  
  ),  
  hostname = "arbutus"  
)  
  
content-element = (  
  content-metadata = (  
    content-label = f3d70ef4-7e18-42af-a894-8955ba87c95d  
  ),  
  user-account = (  
    username = romeo  
    authentication = local  
  )  
)
```

Figure 6: Example instance of a content-element subject associated with another subject via its content metadata.

4.5. Event

Event subjects provide a structure to represent the change of IE values that was detected by a collection task at a specific point of time. It is mandatory to include the new values and the collection timestamp in an event subject and it is recommended to include the past values and a collection timestamp that were replaced by the new IE values. Every event can also be associated with a subject-specific event-timestamp and a lastseen-timestamp that might differ from the corresponding collection-timestamps. If these are omitted the collection-timestamp that is included in the content-metadata subject is used instead.

```
sacm-statement = (  
  statement-metadata = (  
    publish-timestamp = 1461934031,  
    data-origin = 24e67957-3d31-4878-8892-da2b35e121c2,  
    statement-type = event  
  ),  
  event = (  
    event-attributes = (  
      event-name = "host-name change",  
      content-element = (  
        content-metadata = (  
          collection-timestamp = 146193322,  
          data-source =  
            fb02e551-7101-4e68-8dec-1fde6bd10981,  
          event-component = past-state  
        ),  
        hostname = "arbutus"  
      ),  
      content-element = (  
        content-metadata = (  
          collection-timestamp = 146195723,  
          data-source =  
            fb02e551-7101-4e68-8dec-1fde6bd10981,  
          event-component = current-state  
        ),  
        hostname = "lilac"  
      )  
    )  
  )  
)
```

Figure 7: Example of a SACM statement containing an event.

[4.6.](#) Categories

Categories are special IEs that refer to multiple types of IEs via just one name. Therefore, they are similar to a type-choice. A prominent example of a category is when identifying a target endpoint. In some cases, a target endpoint will be identified by a set of identifying attributes and in other cases a target endpoint will be identified by a target endpoint label which is unique within a SACM domain. If a subject includes the targetEndpoint information element as one of its components, any of the category members (targetEndpointIdentifier or targetEndpointLabel) are valid to be used in its place.

[5.](#) Abstract Data Types

This section describes the set of valid abstract data types that can be used for the specification of the SACM Information Elements in [Section 7](#). SACM currently supports two classes of datatypes that can be used to define Information Elements.

- o Simple: Datatypes that are atomic and are used to define the type of data represented by an attribute Information Element.
- o Structured: Datatypes that can be used to define the type of data represented by a subject Information Element.

Note that further abstract data types may be specified by future extensions of the SACM information model.

[5.1.](#) Simple Datatypes

[5.1.1.](#) IPFIX Datatypes

To facilitate the use of existing work, SACM supports the following abstract data types defined in [Section 3 of \[RFC7012\]](#).

- o unsigned8, unsigned16, unsigned32, unsigned64
- o signed8, signed16, signed32, signed64
- o float32, float64
- o boolean
- o macAddress
- o octetArray

- o string
- o dateTimeSeconds, dateTimeMilliseconds, dateTimeMicroseconds, dateTimeNanoSeconds
- o ipv4Address, ipv6Address

5.2. Structured Datatypes

5.2.1. List Datatypes

SACM defines the following abstract list data types that are used to represent the structured data associated with subjects.

- o list: indicates that the Information Element order is not significant but MAY be preserved.
- o orderedList: indicates that Information Element order is significant and MUST be preserved.

The notation for defining a SACM structured datatype is based on regular expressions, which are composed of the keywords "list" or "orderedList" and an Information Element expression. IE expressions use some of the regular expression syntax and operators, but the terms in the expression are the names of defined Information Elements instead of character classes. The syntax for defining list and orderedList datatypes is described below, using BNF:

```

<list-def> -> ("list"|"orderedList") "(" <ie-expression> ")"
<ie-expression> -> <ie-name> <cardinality>?
                  ( ("," | "|") <ie-name> <cardinality>?)*
<cardinality> -> "*" | "+" | "?" |
                  ( "(" <non-neg-int> ("," <non-neg-int>)? ")" )

```

Figure 8: Syntax for Defining List Datatypes

As seen above, multiple occurrences of an Information Element may be present in a structured datatype. The cardinality of an Information Element within a structured Information Element definition is defined by the following operators:

- * - zero or more occurrences
- + - one or more occurrences
- ? - zero or one occurrence
- (m,n) - between m and n occurrences

Figure 9: Specifying Cardinality for Structured Datatypes

The absence of a cardinality operator implies one mandatory occurrence of the Information Element.

Below is an example of a structured Information Element definition.

```
personInfo = list(firstName, middleNames?, lastName)
firstName = string
middleNames = orderedList(middleName+)
middleName = string
lastName = string
```

As an example, consider the name "John Ronald Reuel Tolkien". Below are instances of this name, structured according to the personInfo definition.

```
personInfo = (firstName="John", middleNames(middleName="Ronald",
middleName="Reuel"), lastName="Tolkien")

personInfo = (middleNames(middleName="Ronald", middleName=" Reuel"),
lastName="Tolkien", firstName="John")
```

The instance below is not legal with respect to the definition of personInfo because the order in middleNames is not preserved.

```
personInfo = (firstName="John", middleNames(middleName=" Reuel",
middleName="Ronald"), lastName="Tolkien")
```

Figure 10: Example of Defining a Structured List Datatype

5.2.2. Enumeration Datatype

SACM defines the following abstract enumeration datatype that is used to represent the restriction of an attribute value to a set of values.


```

name, hex-value, description
<enumeration-def> -> -> <name> ";" <hex-value> ";" <description>
<name> -> [0-9a-zA-Z]+
<hex-value> -> 0x[0-9a-fA-F]+
<description> -> [0-9a-zA-Z\.\,]+

```

Figure 11: Syntax for Defining an Enumeration Datatype

Below is an example of a structured Information Element definition for an enumeration.

```

Red      ; 0x1 ; The color is red.
Orange  ; 0x2 ; The color is orange.
Yellow  ; 0x3 ; The color is yellow.
Green   ; 0x4 ; The color is green.
...

```

Figure 12: Example of Defining a Structured Enumeration Datatype

5.2.3. Category Datatype

SACM defines the following abstract category datatype that is used to represent a type-choice between a set of information elements.

```

<category-def> -> "category(" <ie-expression> ")"
<ie-expression> -> <ie-name> ("|" <ie-name>)*
<name> -> [0-9a-zA-Z]+

```

Figure 13: Syntax for Defining an Category Datatype

Below is an example of a structured Information Element definition for a category.

```

targetEndpoint = category(targetEndpointIdentifier |
                          targetEndpointLabel)

```

Figure 14: Example of Defining a Structured Category Datatype

6. Information Model Assets

In order to represent the Information Elements related to the areas listed in [Section 3.1](#), the information model defines the information needs (or metadata about those information needs) related to following types of assets which are defined in [\[I-D.ietf-sacm-terminology\]](#) (and included below for convenience) which are of interest to SACM. Specifically:

- o Endpoint

- o Software Component
- o Hardware Component
- o Identity
- o Guidance
- o Evaluation Results

The following figure shows the make up of an Endpoint asset which contains zero or more hardware components and zero or more software components each of which may have zero or more instances running an endpoint at any given time as well as zero or more identities that act on behalf of the endpoint when interfacing with other endpoints, tools, or services. An endpoint may also contain other endpoints in the case of a virtualized environment.

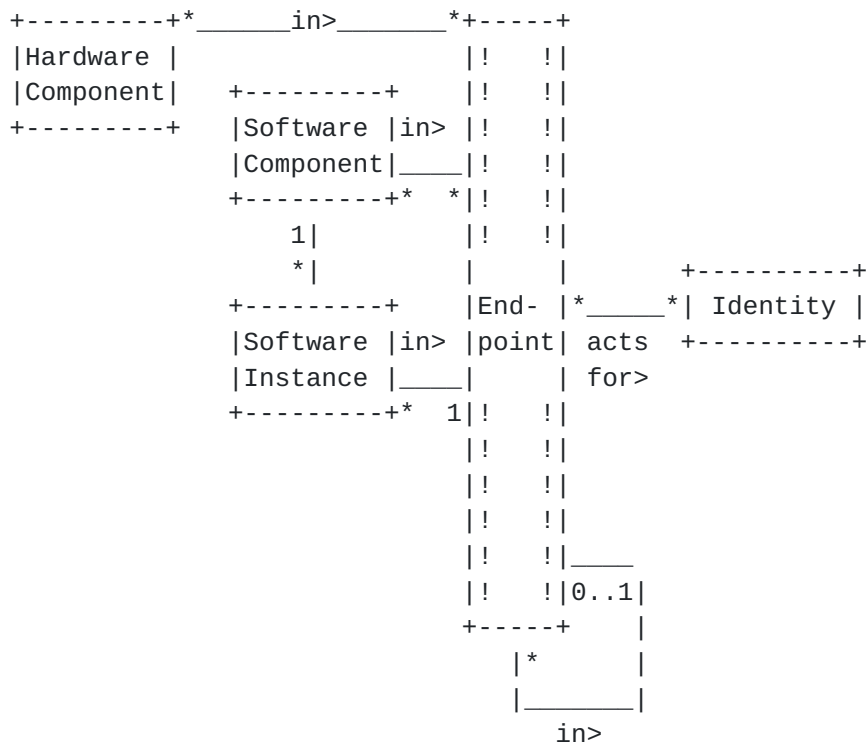


Figure 15: Model of an Endpoint

6.1. Asset

As defined in [RFC4949], an asset is a system resource that is (a) required to be protected by an information system's security policy,

(b) intended to be protected by a countermeasure, or (c) required for a system's mission.

In the scope of SACM, an asset can be composed of other assets. Examples of Assets include: Endpoints, Software, Guidance, or Identity. Furthermore, an asset is not necessarily owned by an organization.

6.2. Endpoint

From [[RFC5209](#)], an endpoint is any computing device that can be connected to a network. Such devices normally are associated with a particular link layer address before joining the network and potentially an IP address once on the network. This includes: laptops, desktops, servers, cell phones, or any device that may have an IP address.

To further clarify, an endpoint is any physical or virtual device that may have a network address. Note that, network infrastructure devices (e.g. switches, routers, firewalls), which fit the definition, are also considered to be endpoints within this document.

Physical endpoints are always composites that are composed of hardware components and software components. Virtual endpoints are composed entirely of software components and rely on software components that provide functions equivalent to hardware components.

The SACM architecture differentiates two essential categories of endpoints: Endpoints whose security posture is intended to be assessed (target endpoints) and endpoints that are specifically excluded from endpoint posture assessment (excluded endpoints).

6.3. Hardware Component

Hardware components are the distinguishable physical components that compose an endpoint. The composition of an endpoint can be changed over time by adding or removing hardware components. In essence, every physical endpoint is potentially a composite of multiple hardware components, typically resulting in a hierarchical composition of hardware components. The composition of hardware components is based on interconnects provided by specific hardware types (e.g. mainboard is a hardware type that provides local busses as an interconnect). In general, a hardware component can be distinguished by its serial number.

Examples of a hardware components include: motherboards, network interfaces, graphics cards, hard drives, etc.

[6.4.](#) Software Component

A software package installed on an endpoint (including the operating system) as well as a unique serial number if present (e.g. a text editor associated with a unique license key).

It should be noted that this includes both benign and harmful software packages. Examples of benign software components include: applications, patches, operating system kernel, boot loader, firmware, code embedded on a webpage, etc. Examples of malicious software components include: malware, trojans, viruses, etc.

[6.4.1.](#) Software Instance

A running instance of the software component (e.g. on a multi-user system, one logged-in user has one instance of a text editor running and another logged-in user has another instance of the same text editor running, or on a single-user system, a user could have multiple independent instances of the same text editor running).

[6.5.](#) Identity

Any mechanism that can be used to identify an asset during an authentication process. Examples include usernames, user and device certificates, etc. Note, that this is different than the identity of assets in the context of designation as described in [Section 11.1](#).

[6.6.](#) Guidance

Guidance is input instructions to processes and tasks, such as collection or evaluation. Guidance influences the behavior of a SACM component and is considered content of the management plane. Guidance can be manually or automatically generated or provided. Typically, the tasks that provide guidance to SACM components have a low-frequency and tend to be sporadic. A prominent example of guidance are target endpoint profiles, but guidance can have many forms, including:

Configuration, e.g. a SACM component's name, or a CMDB's IPv6 address.

Profiles, e.g. a set of expected states for network behavior associated with target endpoints employed by specific users.

Policies, e.g. an interval to refresh the registration of a SACM component, or a list of required capabilities for SACM components in a specific location.

6.6.1. Collection Guidance

A collector may need guidance to govern what it collects and when. Collection Guidance provides instructions for a Collector that specifies which endpoint attributes to collect, when to collect them, and how to collect them. Collection Guidance is composed of Target Endpoint Attribute Guidance, Frequency Guidance, and Method Guidance.

- o Target Endpoint Attribute Guidance: Set of endpoint attributes that are supposed to be collected from a target endpoint. The definition of the set of endpoint attributes is typically based on an endpoint characterization record.
- o Frequency Guidance: Specifies when endpoint attributes are to be collected.
- o Method Guidance: Indicates how endpoint attributes are to be collected.

6.6.2. Evaluation Guidance

An evaluator typically needs guidance to govern what it considers to be a good or bad security posture. Evaluation Guidance provides instructions for an Evaluator that specifies which endpoint attributes to evaluate, the desired state of those endpoint attributes, and any special requirements that enable an Evaluator to determine if the endpoint attributes can be used in the evaluation (e.g. freshness of data, how it was collected, etc.). Evaluation Guidance is composed of Target Endpoint Attribute Guidance, Expected Endpoint Attribute Value Guidance, and Frequency Guidance.

- o Target Endpoint Attribute Guidance: Set of target endpoint attributes that are supposed to be used in an evaluation as well as any requirements on the endpoint attributes. The definition of the set of endpoint attributes is typically based on an endpoint characterization record.
- o Expected Endpoint Attribute Value Guidance: The expected values of the endpoint attributes described in the Target Endpoint Attribute Guidance.
- o Frequency Guidance: Specifies when endpoint attributes are to be evaluated.
- o Method Guidance: Indicates how endpoint attributes are to be collected.

6.6.3. Classification Guidance

A SACM Component carrying out the Target Endpoint Classification Task may need guidance on how to classify an endpoint. Specifically, how to associate endpoint classes with a specific target endpoint characterization record. Target Endpoint Classes function as guidance for collection, evaluation, remediation and security posture assessment in general. Classification Guidance is composed of Target Endpoint Attribute Guidance and Class Guidance.

- o Target Endpoint Attribute Guidance: Set of target endpoint attributes that are supposed to be used to identify the endpoint characterization record.
- o Class Guidance: A list of target endpoint classes that are to be associated with the identified target endpoint characterization record.

6.6.4. Storage Guidance

An SACM Component typically needs guidance to govern what information it should store and where. Storage Guidance provides instructions for a SACM Component that specifies which security automation information should be stored, for how long, and on which endpoint. Storage Guidance is composed of Target Endpoint Attribute Guidance, Expected Security Automation Information Guidance, and Retention Guidance.

- o Target Endpoint Attribute Guidance: Set of target endpoint attributes that are supposed to be used to identify the endpoint where the security automation information is to be stored.
- o Expected Security Automation Information Guidance: The security automation information that is expected to be stored (guidance, collected posture attributes, results, etc.).
- o Retention Guidance: Specifies how long the security automation information should be stored.

6.6.5. Evaluation Results

Evaluation Results are the output of comparing the actual state of an endpoint against the expected state of an endpoint. In addition to the actual results of the comparison, Evaluation Results should include the Evaluation Guidance and actual target endpoint attributes values used to perform the evaluation.

7. Information Model Elements

This section defines the specific Information Elements and relationships that will be implemented by data models and transported between SACM Components.

7.1. sacmStatement

```
elementId: TBD
name: sacmStatement
dataType: orderedList
status: current
description: Associates SACM Statement Metadata
which provides data origin information about
the providing SACM Component with one or more
SACM Content Elements that contain security
automation information.
structure: orderedList(sacmStatementMetadata,
sacmContentElement+)
```

7.2. sacmStatementMetadata

```
elementId: TBD
name: sacmStatementMetadata
dataType: orderedList
status: current
description: Contains IEs that provide
information about the data origin of the
providing SACM Component as well as the
information necessary for other SACM
Components to understand the type of
security automation information in the
SACM Statement's SACM Content Element(s).
structure: orderedList(publicationTimestamp,
dataOrigin, anyIE*)
```

7.3. sacmContentElement

```
elementId: TBD
name: sacmContentElement
dataType: list
status: current
description: Associates SACM Content Element
Metadata which provides information about the
data source and type of security automation
information with the actual security automation
information.
structure: TODO
```


[7.4.](#) **sacmContentElementMetadata**

```
elementId: TBD
name: sacmContentElementMetadata
dataType: orderedList
status: current
description: Contains IEs that provide
information about the data source and type of
security automation information such that other
SACM Components are able to parse and understand
the security automation information contained
within the SACM Statement's SACM Content Element(s).
structure: orderedList(collectionTimestamp,
                        targetEndpoint, anyIE*)
```

[7.5.](#) **targetEndpoint**

```
elementId: TBD
name: targetEndpoint
dataType: category
status: current
description: Information that identifies a target
            endpoint on the network. This may be a set of
attributes that can be used to identify an endpoint
on the network or a label that is unique to a SACM
domain.
structure: category(targetEndpointIdentifier |
                    targetEndpointLabel)
```

[7.6.](#) **targetEndpointIdentifier**

```
elementId: TBD
name: targetEndpointIdentifier
dataType: list
status: current
description: A set of attributes that uniquely
            identify a target endpoint on the network.
structure: list(anyIE+)
```

[7.7.](#) **targetEndpointLabel**

```
elementId: TBD
name: targetEndpointLabel
dataType: string
status: current
description: A label that uniquely identifies
            a target endpoint on SACM domain.
```


[7.8.](#) anyIE

elementId: TBD
name: anyIE
dataType: category
status: current
description: This category is a placeholder
for any information element defined within
the SACM Information Model. Its purpose is
to provide an extension point in other
information elements that enable them to
support the specific needs of an enterprise,
user, product, or service.

[7.9.](#) accessPrivilegeType

elementId: TBD
name: accessPrivilegeType
dataType: string
status: current
description: A set of types that represent access
privileges (read, write, none, etc.).

[7.10.](#) accountName

elementId: TBD
name: accountName
dataType: string
status: current
description: A label that uniquely identifies an account
that can require some form of (user) authentication to
access.

[7.11.](#) administrativeDomainType

elementId: TBD
name: administrativeDomainType
dataType: string
status: current
description: A label the is supposed to uniquely
identify an administrative domain.

[7.12.](#) addressAssociationType

elementId: TBD
name: addressAssociationType
dataType: string
status: current
description: A label the is supposed to uniquely identify an administrative domain.

[7.13.](#) **addressMaskValue**

elementId: TBD
name: addressMaskValue
dataType: string
status: current
description: A value that expresses a generic address subnetting bitmask.

[7.14.](#) **addressType**

elementId: TBD
name: addressType
dataType: string
status: current
description: A set of types that specifies the type of address that is expressed in an address subject (e.g. ethernet, modbus, zigbee).

[7.15.](#) **addressValue**

elementId: TBD
name: addressValue
dataType: string
status: current
description: A value that expresses a generic network address.

[7.16.](#) **applicationComponent**

elementId: TBD
name: applicationComponent
dataType: string
status: current
description: A label that references a "sub"-application that is part of the application (e.g. an add-on, a cipher-suite, a library).

7.17. applicationLabel

elementId: TBD
name: applicationLabel
dataType: string
status: current
description: A label that is supposed to uniquely reference an application.

7.18. applicationType

elementId: TBD
name: applicationType
dataType: string
status: current
description: A set of types (FIXME maybe a finite set is not realistic here - value not enumerator?) that identifies the type of (user-space) application (e.g. text-editor, policy-editor, service-client, service-server, calendar, rouge-like RPG).

7.19. applicationManufacturer

elementId: TBD
name: applicationManufacturer
dataType: string
status: current
description: The name of the vendor that created the application.

7.20. authenticator

elementId: TBD
name: authenticator
dataType: string
status: current
description: A label that references a SACM component that can authenticate target endpoints (can be used in a target-endpoint subject to express that the target endpoint was authenticated by that SACM component).

7.21. authenticationType

elementId: TBD
name: authenticationType
dataType: string
status: current
description: A set of types that express which type of authentication was used to enable a network interaction/connection.

[7.22.](#) **birthdate**

elementId: TBD
name: birthdate
dataType: string
status: current
description: A label for the registered day of birth of a natural person (e.g. the date of birth of a person as an ISO date string).
references: <http://rs.tdwg.org/ontology/voc/Person#birthdate>

[7.23.](#) **bytesReceived**

elementId: TBD
name: bytesReceived
dataType: string
status: current
description: A value that represents a number of octets received on a network interface.

[7.24.](#) **bytesReceived**

elementId: TBD
name: bytesReceived
dataType: string
status: current
description: A value that represents the number of octets received on a network interface.

[7.25.](#) **bytesSent**

elementId: TBD
name: bytesSent
dataType: string
status: current
description: A value that represents the number of octets sent on a network interface.

7.26. certificate

elementId: TBD
name: certificate
dataType: string
status: current
description: A value that expresses a certificate that can be collected from a target endpoint.

7.27. collectionTaskType

elementId: TBD
name: collectionTaskType
dataType: string
status: current
description: A set of types that defines how collected SACM content was acquired (e.g. network-observation, remote-acquisition, self-reported, derived, authority, verified).

7.28. confidence

elementId: TBD
name: confidence
dataType: string
status: current
description: A representation of the subjective probability that the assessed value is correct. If no confidence value is given, it is assumed that the confidence is 1. Acceptable values are between 0 and 1.

7.29. contentAction

elementId: TBD
name: contentAction
dataType: string
status: current
description: A set of types that express a type of action (e.g. add, delete, update). It can be associated, for instance, with an event subject or with a network observation.

7.30. countryCode

elementId: TBD
name: countryCode
dataType: string
status: current
description: A set of types according to ISO 3166-1.

[7.31.](#) **dataOrigin**

elementId: TBD
name: dataOrigin
dataType: string
status: current
description: A label that uniquely identifies a SACM component in and across SACM domains.

[7.32.](#) **dataSource**

elementId: TBD
name: dataSource
dataType: string
status: current
description: A label that is supposed to uniquely identify the data source (e.g. a target endpoint or sensor) that provided an initial endpoint attribute record.

[7.33.](#) **default-depth**

elementId: TBD
name: default-depth
dataType: string
status: current
description: A value that expresses how often a circular reference of subject is allowed to repeat, or how deep a recursive nesting may occur, respectively.

[7.34.](#) **discoverer**

elementId: TBD
name: discoverer
dataType: string
status: current
description: A label that refers to the SACM component that discovered a target endpoint (can be used in a target-endpoint subject to express, for example, that the target endpoint was authenticated by that SACM component).

[7.35.](#) emailAddress

elementId: TBD
name: emailAddress
dataType: string
status: current
description: A value that expresses an email-address.

[7.36.](#) eventType

elementId: TBD
name: eventType
dataType: string
status: current
description: a set of types that define the categories of an event (e.g. access-level-change, change-of-privilege, change-of-authorization, environmental-event, or provisioning-event).

[7.37.](#) eventThreshold

elementId: TBD
name: eventThreshold
dataType: string
status: current
description: If applicable, a value that can be included in an event subject to indicate what numeric threshold value was crossed to trigger that event.

[7.38.](#) eventThresholdName

elementId: TBD
name: eventThresholdName
dataType: string
status: current
description: If an event is created due to a crossed threshold, the threshold might have a name associated with it that can be expressed via this value.

[7.39.](#) eventTrigger

elementId: TBD
name: eventTrigger
dataType: string
status: current
description: This value is used to express more complex trigger conditions that may cause the creation of an event.

[7.40.](#) firmwareId

elementId: TBD
name: firmwareId
dataType: string
status: current
description: A label that represents the BIOS or
firmware ID of a specific target endpoint.

[7.41.](#) hostName

elementId: TBD
name: hostName
dataType: string
status: current
description: A label typically associated with an
endpoint, but, not always intended to be unique given
scope.

[7.42.](#) interfaceLabel

elementId: TBD
name: interfaceLabel
dataType: string
status: current
description: A unique label that can be used to
reference a network interface.

[7.43.](#) ipv6AddressSubnetMask

elementId: TBD
name: ipv6AddressSubnetMask
dataType: string
status: current
description: An IPv6 subnet bitmask.

[7.44.](#) ipv6AddressSubnetMaskCidrNotation

elementId: TBD
name: ipv6AddressSubnetMaskCidrNotation
dataType: string
status: current
description: An IPv6 subnet bitmask in CIDR notation.

[7.45.](#) ipv6AddressValue

elementId: TBD
name: ipv6AddressValue
dataType: ipv6Address
status: current
description: An IPv6 subnet bitmask in CIDR notation.

[7.46.](#) ipv4AddressSubnetMask

elementId: TBD
name: ipv4AddressSubnetMask
dataType: string
status: current
description: An IPv4 subnet bitmask.

[7.47.](#) ipv4AddressSubnetMaskCidrNotation

elementId: TBD
name: ipv4AddressSubnetMaskCidrNotation
dataType: string
status: current
description: An IPv4 subnet bitmask in CIDR notation.

[7.48.](#) ipv4AddressValue

elementId: TBD
name: ipv4AddressValue
dataType: ipv4Address
status: current
description: An IPv4 address value.

[7.49.](#) layer2InterfaceType

elementId: TBD
name: layer2InterfaceType
dataType: string
status: current
description: A set of types referenced by IANA ifType.

[7.50.](#) layer4PortAddress

elementId: TBD
name: layer4PortAddress
dataType: unsigned32
status: current
description: A layer 4 port address typically associated with TCP and UDP protocols.

[7.51.](#) **layer4Protocol**

elementId: TBD
name: layer4Protocol
dataType: string
status: current
description: A set of types that express a layer 4 protocol (e.g. UDP or TCP).

[7.52.](#) **locationName**

elementId: TBD
name: locationName
dataType: string
status: current
description: A value that represents a named region of physical space.

[7.53.](#) **networkZoneLocation**

elementId: TBD
name: networkZoneLocation
dataType: string
status: current
description: The zone location of an endpoint on the network (e.g. internet, enterprise DMZ, enterprise WAN, enclave DMZ, enclave).

[7.54.](#) **layer2NetworkLocation**

elementId: TBD
name: layer2NetworkLocation
dataType: string
status: current
description: The location of a layer-2 interface on the network (e.g. link-layer neighborhood, shared broadcast domain).

[7.55.](#) layer3NetworkLocation

elementId: TBD
name: layer3NetworkLocation
dataType: string
status: current
description: The location of a layer-3 interface on the network (e.g. next-hop routing neighbor).

[7.56.](#) macAddressValue

elementId: TBD
name: macAddressValue
dataType: string
status: current
description: A value that expresses an Ethernet address.

[7.57.](#) methodLabel

elementId: TBD
name: methodLabel
dataType: string
status: current
description: A label that references a specific method registered and used in a SACM domain (e.g. method to match and re-identify target endpoints via identifying attributes).

[7.58.](#) methodRepository

elementId: TBD
name: methodRepository
dataType: string
status: current
description: A label that references a SACM component methods can be registered at and that can provide guidance in the form of registered methods to other SACM components.

[7.59.](#) networkAccessLevelType

elementId: TBD
name: networkAccessLevelType
dataType: string
status: current
description: A set of types that express categories of network access-levels (e.g. block, quarantine, etc.).

[7.60.](#) networkId

elementId: TBD
name: networkId
dataType: string
status: current
description: Most networks such as AS, OSBF domains,
or VLANs can have an ID.

[7.61.](#) networkInterfaceName

elementId: TBD
name: networkInterfaceName
dataType: string
status: current
description: A label that uniquely identifies an
interface associated with a distinguishable endpoint.

[7.62.](#) networkLayer

elementId: TBD
name: networkLayer
dataType: string
status: current
description: A set of layers that expresses the specific
network layer an interface operates on.

[7.63.](#) networkName

elementId: TBD
name: networkName
dataType: string
status: current
description: A label that is associated with a network.
Some networks, for example, effective
layer2-broadcast-domains are difficult to "grasp" and
therefore quite difficult to name.

[7.64.](#) organizationId

elementId: TBD
name: organizationId
dataType: string
status: current
description: A label that uniquely identifies an
organization via a PEN.

[7.65.](#) patchId

elementId: TBD
name: patchId
dataType: string
status: current
description: A label that uniquely identifies a specific software patch.

[7.66.](#) patchName

elementId: TBD
name: patchName
dataType: string
status: current
description: The vendor's name of a software patch.

[7.67.](#) personFirstName

elementId: TBD
name: personFirstName
dataType: string
status: current
description: The first name of a natural person.

[7.68.](#) personLastName

elementId: TBD
name: personLastName
dataType: string
status: current
description: The last name of a natural person.

[7.69.](#) personMiddleName

elementId: TBD
name: personMiddleName
dataType: string
status: current
description: The middle name of a natural person.

[7.70.](#) phoneNumber

elementId: TBD
name: phoneNumber
dataType: string
status: current
description: A label that expresses the U.S. national phone number (e.g. pattern value="((\d{3}))?\d{3}-\d{4}").

[7.71.](#) **phoneNumberType**

elementId: TBD
name: phoneNumberType
dataType: string
status: current
description: A set of types that express the type of a phone number (e.g. DSN, Fax, Home, Mobile, Pager, Secure, Unsecure, Work, Other).

[7.72.](#) **privilegeName**

elementId: TBD
name: privilegeName
dataType: string
status: current
description: The attribute name of the privilege represented as an AVP.

[7.73.](#) **privilegeValue**

elementId: TBD
name: privilegeValue
dataType: string
status: current
description: The value content of the privilege represented as an AVP.

[7.74.](#) **protocol**

elementId: TBD
name: protocol
dataType: string
status: current
description: A set of types that defines specific protocols above layer 4 (e.g. http, https, dns, ipp, or unknown).

[7.75.](#) publicKey

elementId: TBD
name: publicKey
dataType: string
status: current
description: The value of a public key (regardless of its method of creation, crypto-system, or signature scheme) that can be collected from a target endpoint.

[7.76.](#) relationshipContentElementGuid

elementId: TBD
name: relationshipContentElementGuid
dataType: string
status: current
description: A reference to a specific content element used in a relationship subject.

[7.77.](#) relationshipStatementElementGuid

elementId: TBD
name: relationshipStatementElementGuid
dataType: string
status: current
description: A reference to a specific SACM statement used in a relationship subject.

[7.78.](#) relationshipObjectLabel

elementId: TBD
name: relationshipObjectLabel
dataType: string
status: current
description: A reference to a specific label used in content (e.g. a te-label or a user-id). This reference is typically used if matching content attribute can be done efficiently and can also be included in addition to a relationship-content-element-guid reference.

[7.79.](#) relationshipType

elementId: TBD
name: relationshipType
dataType: string
status: current
description: A set of types that is in every instance of a relationship subject to highlight what kind of relationship exists between the subject the relationship is included in (e.g. associated_with_user, applies_to_session, seen_on_interface, associated_with_flow, contains_virtual_device).

[7.80.](#) **roleName**

elementId: TBD
name: roleName
dataType: string
status: current
description: A label that references a collection of privileges assigned to a specific entity.

[7.81.](#) **sessionStateType**

elementId: TBD
name: sessionStateType
dataType: string
status: current
description: A set of types a discernible session (an ongoing network interaction) can be in (e.g. Authenticating, Authenticated, Postured, Started, Disconnected).

[7.82.](#) **statementGuid**

elementId: TBD
name: statementGuid
dataType: string
status: current
description: A label that expresses a global unique ID referencing a specific SACM statement that was produced by a SACM component.

[7.83.](#) **statementType**

elementId: TBD
name: statementType
dataType: string
status: current
description: A set of types that define the type of content that is included in a SACM statement (e.g. Observation, DirectoryContent, Correlation, Assessment, Guidance, Event).

[7.84.](#) **status**

elementId: TBD
name: status
dataType: string
status: current
description: A set of types that defines possible result values for a finding in general (e.g. true, false, error, unknown, not applicable, not evaluated).

[7.85.](#) **subAdministrativeDomain**

elementId: TBD
name: subAdministrativeDomain
dataType: string
status: current
description: A label for related child domains an administrative domain can be composed of (used in the subject administrativeDomain).

[7.86.](#) **subInterfaceLabel**

elementId: TBD
name: subInterfaceLabel
dataType: string
status: current
description: A unique label a sub network interface (e.g. a tagged vlan on a trunk) can be referenced with.

[7.87.](#) **superAdministrativeDomain**

elementId: TBD
name: superAdministrativeDomain
dataType: string
status: current
description: a label for related parent domains an administrative domain is part of (used in the subject administrativeDomain).

[7.88.](#) superInterfaceLabel

elementId: TBD
name: superInterfaceLabel
dataType: string
status: current
description: a unique label a super network interface (e.g. a physical interface a tunnel interface terminates on) can be referenced with.

[7.89.](#) teAssessmentState

elementId: TBD
name: teAssessmentState
dataType: string
status: current
description: a set of types that defines the state of assessment of a target-endpoint (e.g. in-discovery, discovered, in-classification, classified, in-assessment, assessed).

[7.90.](#) teLabel

elementId: TBD
name: teLabel
dataType: string
status: current
description: an identifying label created from a set of identifying attributes used to reference a specific target endpoint.

[7.91.](#) teId

elementId: TBD
name: teId
dataType: string
status: current
description: an identifying label that is created randomly, is supposed to be unique, and used to reference a specific target endpoint.

[7.92.](#) timestampType

elementId: TBD
name: timestampType
dataType: string
status: current
description: a set of types that express what type of action or event happened at that point of time (e.g. discovered, classified, collected, published). Can be included in a generic timestamp subject.

[7.93.](#) **unitsReceived**

elementId: TBD
name: unitsReceived
dataType: string
status: current
description: a value that represents a number of units (e.g. frames, packets, cells or segments) received on a network interface.

[7.94.](#) **unitsSent**

elementId: TBD
name: unitsSent
dataType: string
status: current
description: a value that represents a number of units (e.g. frames, packets, cells or segments) sent on a network interface.

[7.95.](#) **userDirectory**

elementId: TBD
name: userDirectory
dataType: string
status: current
description: a label that identifies a specific type of user-directory (e.g. ldap, active-directory, local-user).

[7.96.](#) **sacmUserId**

elementId: TBD
name: sacmUserId
dataType: string
status: current
description: a label that references a specific user known in a SACM domain.

7.97. webSite

elementId: TBD
name: webSite
dataType: string
status: current
description: a URI that references a web-site.

7.98. WGS84Longitude

elementId: TBD
name: WGS84Longitude
dataType: float64
status: current
description: a label that represents WGS 84 rev 2004 longitude.

7.99. WGS84Latitude

elementId: TBD
name: WGS84Latitude
dataType: float64
status: current
description: a label that represents WGS 84 rev 2004 latitude.

7.100. WGS84Altitude

elementId: TBD
name: WGS84Altitude
dataType: float64
status: current
description: a label that represents WGS 84 rev 2004 altitude.

7.101. hardwareSerialNumber

elementId: TBD
name: hardwareSerialNumber
dataType: string
status: current
description: A globally unique identifier for a particular piece of hardware assigned by the vendor.

7.102. interfaceName

elementId: TBD
name: interfaceName
dataType: string
status: current
description: A short name uniquely describing an interface, e.g. "Eth1/0". See [[RFC2863](#)] for the definition of the ifName object.

7.103. interfaceIndex

elementId: TBD
name: interfaceIndex
dataType: unsigned32
status: current
description: The index of an interface installed on an endpoint. The value matches the value of managed object 'ifIndex' as defined in [[RFC2863](#)]. Note that ifIndex values are not assigned statically to an interface and that the interfaces may be renumbered every time the device's management system is re-initialized, as specified in [[RFC2863](#)].

7.104. interfaceMacAddress

elementId: TBD
name: interfaceMacAddress
dataType: macAddress
status: current
description: The IEEE 802 MAC address associated with a network interface on an endpoint.

7.105. interfaceType

elementId: TBD
name: interfaceType
dataType: unsigned32
status: current
description: The type of a network interface. The value matches the value of managed object 'ifType' as defined in [IANA registry ianaiftype-mib].

7.106. interfaceFlags

elementId: TBD
name: interfaceFlags
dataType: unsigned16
status: current
description: This information element specifies the flags associated with a network interface. Possible values include:
structure:
 Up ; 0x1 ; Interface is up.
 Broadcast ; 0x2 ; Broadcast address valid.
 Debug ; 0x4 ; Turn on debugging.
 Loopback ; 0x8 ; Is a loopback net.
 Point-to-point ; 0x10 ; Interface is point-to-point link.
 No trailers ; 0x20 ; Avoid use of trailers.
 Resources allocated ; 0x40 ; Resources allocated.
 No ARP ; 0x80 ; No address resolution protocol.
 Receive all ; 0x100 ; Receive all packets.

7.107. networkInterface

elementId: TBD
name: networkInterface
dataType: orderedList
status: current
description: Information about a network interface installed on an endpoint. The following high-level diagram describes the structure of networkInterface information element.
structure: orderedList(interfaceName, interfaceIndex, macAddress, interfaceType, flags)

7.108. softwareIdentifier

elementId: TBD
name: softwareIdentifier
dataType: string
status: current
description: A globally unique identifier for a particular software application.

7.109. softwareTitle

elementId: TBD
name: softwareTitle
dataType: string
status: current
description: The title of the software application.

7.110. softwareCreator

elementId: TBD
name: softwareCreator
dataType: string
status: current
description: The software developer (e.g., vendor or author).

7.111. simpleSoftwareVersion

elementId: TBD
name: simpleSoftwareVersion
dataType: string
status: current
description: The version string for a software application that conforms to the format of a list of hierarchical non-negative integers separated by a single character delimiter format.

7.112. rpmSoftwareVersion

elementId: TBD
name: rpmSoftwareVersion
dataType: string
status: current
description: The version string for a software application that conforms to the EPOCH:VERSION-RELEASE format.

7.113. ciscoTrainSoftwareVersion

elementId: TBD
name: ciscoTrainSoftwareVersion
dataType: string
status: current
description: The version string for a software application that conforms to the Cisco IOS Train string format.

7.114. softwareVersion

elementId: TBD
name: softwareVersion
dataType: category
status: current
description: The version of the software application. Software applications may be versioned using a number of schemas. The following high-level diagram describes the structure of the softwareVersion information element.
structure: category(simpleSoftwareVersion | rpmSoftwareVersion | ciscoTrainSoftwareVersion)

[7.115.](#) softwareLastUpdated

elementId: TBD
name: softwareLastUpdated
dataType: dateTimeSeconds
status: current
description: The date and time when the software instance was last updated on the system (e.g., new version installed or patch applied)

[7.116.](#) softwareClass

[7.118.](#) globallyUniqueIdentifier

elementId: TBD
name: globallyUniqueIdentifier
dataType: unsigned8
status: current
description: TODO.

[7.119.](#) creationTimestamp

elementId: TBD
name: creationTimestamp
dataType: dateTimeSeconds
status: current
description: The date and time when the posture
information was created by a SACM Component.

[7.120.](#) collectionTimestamp

elementId: TBD
name: collectionTimestamp
dataType: dateTimeSeconds
status: current
description: The date and time when the posture
information was collected or observed by a SACM
Component.

[7.121.](#) publicationTimestamp

elementId: TBD
name: publicationTimestamp
dataType: dateTimeSeconds
status: current
description: The date and time when the posture
information was published.

[7.122.](#) relayTimestamp

elementId: TBD
name: relayTimestamp
dataType: dateTimeSeconds
status: current
description: The date and time when the posture
information was relayed to another SACM Component.

7.123. storageTimestamp

elementId: TBD
name: storageTimestamp
dataType: dateTimeSeconds
status: current
description: The date and time when the posture information was stored in a Repository.

7.124. type

elementId: TBD
name: type
dataType: enumeration
status: current
description: The type of data model use to represent some set of endpoint information. The following table lists the set of data models supported by SACM.
structure: TBD

7.125. protocolIdentifier

elementId: TBD
name: protocolIdentifier
dataType: unsigned8
status: current
description: The value of the protocol number in the IP packet header. The protocol number identifies the IP packet payload type. Protocol numbers are defined in the IANA Protocol Numbers registry.

In Internet Protocol version 4 (IPv4), this is carried in the Protocol field. In Internet Protocol version 6 (IPv6), this is carried in the Next Header field in the last extension header of the packet.

7.126. sourceTransportPort

elementId: TBD
name: sourceTransportPort
dataType: unsigned16
status: current
description: The source port identifier in the transport header. For the transport protocols UDP, TCP, and SCTP, this is the source port number given in the respective header. This field MAY also be used for future transport protocols that have 16-bit source port identifiers.

7.127. sourceIPv4PrefixLength

elementId: TBD
name: sourceIPv4PrefixLength
dataType: unsigned8
status: current
description: The number of contiguous bits that are relevant in the sourceIPv4Prefix Information Element.

7.128. ingressInterface

elementId: TBD
name: ingressInterface
dataType: unsigned32
status: current
description: The index of the IP interface where packets of this Flow are being received. The value matches the value of managed object 'ifIndex' as defined in [[RFC2863](#)]. Note that ifIndex values are not assigned statically to an interface and that the interfaces may be renumbered every time the device's management system is re-initialized, as specified in [[RFC2863](#)].

7.129. destinationTransportPort

elementId: TBD
name: destinationTransportPort
dataType: unsigned16
status: current
description: The destination port identifier in the transport header. For the transport protocols UDP, TCP, and SCTP, this is the destination port number given in the respective header. This field MAY also be used for future transport protocols that have 16-bit destination port identifiers.

7.130. sourceIPv6PrefixLength

elementId: TBD
name: sourceIPv6PrefixLength
dataType: unsigned8
status: current
description: The number of contiguous bits that are relevant in the sourceIPv6Prefix Information Element.

7.131. sourceIPv4Prefix

elementId: TBD
name: sourceIPv4Prefix
dataType: ipv4Address
status: current
description: IPv4 source address prefix.

7.132. destinationIPv4Prefix

elementId: TBD
name: destinationIPv4Prefix
dataType: ipv4Address
status: current
description: IPv4 destination address prefix.

7.133. sourceMacAddress

elementId: TBD
name: sourceMacAddress
dataType: macAddress
status: current
description: The IEEE 802 source MAC address field.

7.134. ipVersion

elementId: TBD
name: ipVersion
dataType: unsigned8
status: current
description: The IP version field in the IP packet header.

7.135. interfaceDescription

elementId: TBD
name: interfaceDescription
dataType: string
status: current
description: The description of an interface, e.g.
"FastEthernet 1/0" or "ISP connection".

7.136. applicationDescription

elementId: TBD
name: applicationDescription
dataType: string
status: current
description: Specifies the description of an application.

[7.137.](#) applicationId

elementId: TBD
name: applicationId
dataType: octetArray
status: current
description: Specifies an Application ID per [[RFC6759](#)].

[7.138.](#) applicationName

elementId: TBD
name: applicationName
dataType: string
status: current
description: Specifies the name of an application.

[7.139.](#) exporterIPv4Address

elementId: TBD
name: exporterIPv4Address
dataType: ipv4Address
status: current
description: The IPv4 address used by the Exporting Process.
This is used by the Collector to identify the Exporter in cases where the identity of the Exporter may have been obscured by the use of a proxy.

[7.140.](#) exporterIPv6Address

elementId: TBD
name: exporterIPv6Address
dataType: ipv6Address
status: current
description: The IPv6 address used by the Exporting Process.
This is used by the Collector to identify the Exporter in cases where the identity of the Exporter may have been obscured by the use of a proxy.

[7.141.](#) portId

elementId: TBD
name: portId
dataType: unsigned32
status: current
description: An identifier of a line port that is unique per IPFIX Device hosting an Observation Point. Typically, this Information Element is used for limiting the scope of other Information Elements.

[7.142.](#) **templateId**

elementId: TBD
name: templateId
dataType: unsigned16
status: current
description: An identifier of a Template that is locally unique within a combination of a Transport session and an Observation Domain.

Template IDs 0-255 are reserved for Template Sets, Options Template Sets, and other reserved Sets yet to be created. Template IDs of Data Sets are numbered from 256 to 65535.

Typically, this Information Element is used for limiting the scope of other Information Elements. Note that after a re-start of the Exporting Process Template identifiers may be re-assigned.

[7.143.](#) **collectorIPv4Address**

elementId: TBD
name: collectorIPv4Address
dataType: ipv4Address
status: current
description: An IPv4 address to which the Exporting Process sends Flow information.

[7.144.](#) **collectorIPv6Address**

elementId: TBD
name: collectorIPv6Address
dataType: ipv6Address
status: current
description: An IPv6 address to which the Exporting Process sends Flow information.

[7.145.](#) informationElementIndex

elementId: TBD
name: informationElementIndex
dataType: unsigned16
status: current
description: A zero-based index of an Information Element referenced by informationElementId within a Template referenced by templateId; used to disambiguate scope for templates containing multiple identical Information Elements.

[7.146.](#) informationElementId

elementId: TBD
name: informationElementId
dataType: unsigned16
status: current
description: This Information Element contains the ID of another Information Element.

[7.147.](#) informationElementDataType

elementId: TBD
name: informationElementDataType
dataType: unsigned8
status: current
description: A description of the abstract data type of an IPFIX information element. These are taken from the abstract data types defined in [section 3.1](#) of the IPFIX Information Model [[RFC5102](#)]; see that section for more information on the types described in the informationElementDataType sub-registry.

These types are registered in the IANA IPFIX Information Element Data Type subregistry. This subregistry is intended to assign numbers for type names, not to provide a mechanism for adding data types to the IPFIX Protocol, and as such requires a Standards Action [[RFC5226](#)] to modify.

[7.148.](#) informationElementDescription

elementId: TBD
name: informationElementDescription
dataType: string
status: current
description: A UTF-8 [[RFC3629](#)] encoded Unicode string containing a human-readable description of an Information Element. The content of the informationElementDescription MAY be annotated with one or more language tags [[RFC4646](#)], encoded in-line [[RFC2482](#)] within the UTF-8 string, in order to specify the language in which the description is written. Description text in multiple languages MAY tag each section with its own language tag; in this case, the description information in each language SHOULD have equivalent meaning. In the absence of any language tag, the "i-default" [[RFC2277](#)] language SHOULD be assumed. See the Security Considerations section for notes on string handling for Information Element type records.

[7.149.](#) informationElementName

elementId: TBD
name: informationElementName
dataType: string
status: current
description: A UTF-8 [[RFC3629](#)] encoded Unicode string containing the name of an Information Element, intended as a simple identifier. See the Security Considerations section for notes on string handling for Information Element type records.

[7.150.](#) informationElementRangeBegin

elementId: TBD
name: informationElementRangeBegin
dataType: unsigned64
status: current
description: Contains the inclusive low end of the range of acceptable values for an Information Element.

[7.151.](#) informationElementRangeEnd

elementId: TBD
name: informationElementRangeEnd
dataType: unsigned64
status: current
description: Contains the inclusive high end of the range of acceptable values for an Information Element.

[7.152.](#) informationElementSemantics

elementId: TBD
name: informationElementSemantics
dataType: unsigned8
status: current
description: A description of the semantics of an IPFIX Information Element. These are taken from the data type semantics defined in [section 3.2](#) of the IPFIX Information Model [[RFC5102](#)]; see that section for more information on the types defined in the informationElementSemantics sub-registry. This field may take the values in Table ; the special value 0x00 (default) is used to note that no semantics apply to the field; it cannot be manipulated by a Collecting Process or File Reader that does not understand it a priori.

These semantics are registered in the IANA IPFIX Information Element Semantics subregistry. This subregistry is intended to assign numbers for semantics names, not to provide a mechanism for adding semantics to the IPFIX Protocol, and as such requires a Standards Action [[RFC5226](#)] to modify.

[7.153.](#) informationElementUnits

elementId: TBD
name: informationElementUnits
dataType: unsigned16
status: current
description: A description of the units of an IPFIX Information Element. These correspond to the units implicitly defined in the Information Element definitions in [section 5](#) of the IPFIX Information Model [[RFC5102](#)]; see that section for more information on the types described in the informationElementsUnits sub-registry. This field may take the values in Table 3 below; the special value 0x00 (none) is used to note that the field is unitless.

These types are registered in the IANA IPFIX Information Element Units subregistry; new types may be added on a First Come First Served [[RFC5226](#)] basis.

[7.154.](#) applicationCategoryName

elementId: TBD
name: applicationCategoryName
dataType: string
status: current
description: An attribute that provides a first level categorization for each Application ID.

[7.155.](#) mibObjectValueInteger

elementId: TBD
name: mibObjectValueInteger
dataType: signed64
status: current
description: An IPFIX Information Element which denotes that the integer value of a MIB object will be exported. The MIB Object Identifier ("mibObjectIdentifier") for this field MUST be exported in a MIB Field Option or via another means. This Information Element is used for MIB objects with the Base Syntax of Integer32 and INTEGER with IPFIX Reduced Size Encoding used as required. The value is encoded as per the standard IPFIX Abstract Data Type of signed64.

[7.156.](#) mibObjectValueOctetString

elementId: TBD
name: mibObjectValueOctetString
dataType: octetArray
status: current
description: An IPFIX Information Element which denotes that an Octet String or Opaque value of a MIB object will be exported. The MIB Object Identifier ("mibObjectIdentifier") for this field MUST be exported in a MIB Field Option or via another means. This Information Element is used for MIB objects with the Base Syntax of OCTET STRING and Opaque. The value is encoded as per the standard IPFIX Abstract Data Type of octetArray.

[7.157.](#) mibObjectValueOID

elementId: TBD
name: mibObjectValueOID
dataType: octetArray
status: current
description: An IPFIX Information Element which denotes that an Object Identifier or OID value of a MIB object will be exported. The MIB Object Identifier ("mibObjectIdentifier") for this field MUST be exported in a MIB Field Option or via another means. This Information Element is used for MIB objects with the Base Syntax of OBJECT IDENTIFIER. Note - In this case the "mibObjectIdentifier" will define which MIB object is being exported while the value contained in this Information Element will be an OID as a value. The mibObjectValueOID Information Element is encoded as ASN.1/BER [BER] in an octetArray.

[7.158.](#) mibObjectValueBits

elementId: TBD
name: mibObjectValueBits
dataType: octetArray
status: current
description: An IPFIX Information Element which denotes that a set of Enumerated flags or bits from a MIB object will be exported. The MIB Object Identifier ("mibObjectIdentifier") for this field MUST be exported in a MIB Field Option or via another means. This Information Element is used for MIB objects with the Base Syntax of BITS. The flags or bits are encoded as per the standard IPFIX Abstract Data Type of octetArray, with sufficient length to accommodate the required number of bits. If the number of bits is not an integer multiple of octets then the most significant bits at end of the octetArray MUST be set to zero.

7.159. mibObjectValueIPAddress

elementId: TBD
name: mibObjectValueIPAddress
dataType: ipv4Address
status: current
description: An IPFIX Information Element which denotes that the IPv4 Address of a MIB object will be exported. The MIB Object Identifier ("mibObjectIdentifier") for this field MUST be exported in a MIB Field Option or via another means. This Information Element is used for MIB objects with the Base Syntax of IPAddress. The value is encoded as per the standard IPFIX Abstract Data Type of ipv4Address.

7.160. mibObjectValueCounter

elementId: TBD
name: mibObjectValueCounter
dataType: unsigned64
status: current
description: An IPFIX Information Element which denotes that the counter value of a MIB object will be exported. The MIB Object Identifier ("mibObjectIdentifier") for this field MUST be exported in a MIB Field Option or via another means. This Information Element is used for MIB objects with the Base Syntax of Counter32 or Counter64 with IPFIX Reduced Size Encoding used as required. The value is encoded as per the standard IPFIX Abstract Data Type of unsigned64.

7.161. mibObjectValueGauge

elementId: TBD
name: mibObjectValueGauge
dataType: unsigned32
status: current
description: An IPFIX Information Element which denotes that the Gauge value of a MIB object will be exported. The MIB Object Identifier ("mibObjectIdentifier") for this field MUST be exported in a MIB Field Option or via another means. This Information Element is used for MIB objects with the Base Syntax of Gauge32. The value is encoded as per the standard IPFIX Abstract Data Type of unsigned64. This value will represent a non-negative integer, which may increase or decrease, but shall never exceed a maximum value, nor fall below a minimum value.

7.162. mibObjectValueTimeTicks

elementId: TBD
name: mibObjectValueTimeTicks
dataType: unsigned32
status: current
description: An IPFIX Information Element which denotes that the TimeTicks value of a MIB object will be exported. The MIB Object Identifier ("mibObjectIdentifier") for this field MUST be exported in a MIB Field Option or via another means. This Information Element is used for MIB objects with the Base Syntax of TimeTicks. The value is encoded as per the standard IPFIX Abstract Data Type of unsigned32.

7.163. mibObjectValueUnsigned

elementId: TBD
name: mibObjectValueUnsigned
dataType: unsigned64
status: current
description: An IPFIX Information Element which denotes that an unsigned integer value of a MIB object will be exported. The MIB Object Identifier ("mibObjectIdentifier") for this field MUST be exported in a MIB Field Option or via another means. This Information Element is used for MIB objects with the Base Syntax of unsigned64 with IPFIX Reduced Size Encoding used as required. The value is encoded as per the standard IPFIX Abstract Data Type of unsigned64.

7.164. mibObjectValueTable

elementId: TBD
name: mibObjectValueTable
dataType: orderedList
status: current
description: An IPFIX Information Element which denotes that a complete or partial conceptual table will be exported. The MIB Object Identifier ("mibObjectIdentifier") for this field MUST be exported in a MIB Field Option or via another means. This Information Element is used for MIB objects with a SYNTAX of SEQUENCE. This is encoded as a subTemplateList of mibObjectValue Information Elements. The template specified in the subTemplateList MUST be an Options Template and MUST include all the Objects listed in the INDEX clause as Scope Fields.
structure: orderedList(mibObjectValueRow+)

7.165. mibObjectValueRow

elementId: TBD
name: mibObjectValueRow
dataType: orderedList
status: current
description: An IPFIX Information Element which denotes that a single row of a conceptual table will be exported. The MIB Object Identifier ("mibObjectIdentifier") for this field MUST be exported in a MIB Field Option or via another means. This Information Element is used for MIB objects with a SYNTAX of SEQUENCE. This is encoded as a subTemplateList of mibObjectValue Information Elements. The subTemplateList exported MUST contain exactly one row (i.e., one instance of the subtemplate). The template specified in the subTemplateList MUST be an Options Template and MUST include all the Objects listed in the INDEX clause as Scope Fields.
structure: orderedList(mibObjectValue+)

7.166. mibObjectIdentifier

elementId: TBD
name: mibObjectIdentifier
dataType: octetArray
status: current
description: An IPFIX Information Element which denotes that a MIB Object Identifier (MIB OID) is exported in the (Options) Template Record. The mibObjectIdentifier Information Element contains the OID assigned to the MIB Object Type Definition encoded as ASN.1/BER [BER].

7.167. mibSubIdentifier

elementId: TBD
name: mibSubIdentifier
dataType: unsigned32
status: current
description: A non-negative sub-identifier of an Object Identifier (OID).

7.168. mibIndexIndicator

elementId: TBD
name: mibIndexIndicator
dataType: unsigned64
status: current
description: This set of bit fields is used for marking the Information Elements of a Data Record that serve as INDEX MIB objects for an indexed Columnar MIB object. Each bit represents an Information Element in the Data Record with the n-th bit representing the n-th Information Element. A bit set to value 1 indicates that the corresponding Information Element is an index of the Columnar Object represented by the mibFieldValue. A bit set to value 0 indicates that this is not the case.

If the Data Record contains more than 64 Information Elements, the corresponding Template SHOULD be designed such that all INDEX Fields are among the first 64 Information Elements, because the mibIndexIndicator only contains 64 bits. If the Data Record contains less than 64 Information Elements, then the extra bits in the mibIndexIndicator for which no corresponding Information Element exists MUST have the value 0, and must be disregarded by the Collector. This Information Element may be exported with IPFIX Reduced Size Encoding.

[7.169](#). **mibCaptureTimeSemantics**

elementId: TBD
name: mibCaptureTimeSemantics
dataType: unsigned8
status: current
description: Indicates when in the lifetime of the flow the MIB value was retrieved from the MIB for a mibObjectIdentifier. This is used to indicate if the value exported was collected from the MIB closer to flow creation or flow export time and will refer to the Timestamp fields included in the same record. This field SHOULD be used when exporting a mibObjectValue that specifies counters or statistics.

If the MIB value was sampled by SNMP prior to the IPFIX Metering Process or Exporting Process retrieving the value (i.e., the data is already stale) and it's important to know the exact sampling time, then an additional observationTime* element should be paired with the OID using structured data. Similarly, if different mibCaptureTimeSemantics apply to different mibObject elements within the Data Record, then individual mibCaptureTimeSemantics should be paired with each OID using structured data.

Values:

0. undefined
1. begin - The value for the MIB object is captured from the MIB when the Flow is first observed
2. end - The value for the MIB object is captured from the MIB when the Flow ends
3. export - The value for the MIB object is captured from the MIB at export time
4. average - The value for the MIB object is an average of multiple captures from the MIB over the observed life of the Flow

7.170. mibContextEngineID

elementId: TBD
name: mibContextEngineID
dataType: octetArray
status: current
description: A mibContextEngineID that specifies the SNMP engine ID for a MIB field being exported over IPFIX. Definition as per [\[RFC3411\] section 3.3](#).

7.171. mibContextName

elementId: TBD
name: mibContextName
dataType: string
status: current
description: This Information Element denotes that a MIB Context Name is specified for a MIB field being exported over IPFIX. Reference [\[RFC3411\] section 3.3](#).

7.172. mibObjectName

elementId: TBD
name: mibObjectName
dataType: string
status: current
description: The name (called a descriptor in [\[RFC2578\]](#)) of an object type definition.

7.173. mibObjectDescription

elementId: TBD
name: mibObjectDescription
dataType: string
status: current
description: The value of the DESCRIPTION clause of an MIB object type definition.

7.174. mibObjectSyntax

elementId: TBD
name: mibObjectSyntax
dataType: string
status: current
description: The value of the SYNTAX clause of an MIB object type definition, which may include a Textual Convention or Subtyping. See [\[RFC2578\]](#).

7.175. mibModuleName

elementId: TBD
name: mibModuleName
dataType: string
status: current
description: The textual name of the MIB module that defines a MIB Object.

7.176. interface

elementId: TBD
name: interface
dataType: list
structure: list (interfaceName, hwAddress, inetAddr, netmask)
status: current
description: Represents an interface and its configuration options.

7.177. iflisteners

elementId: TBD
name: iflisteners
dataType: list
structure: list (interfaceName, physicalProtocol, hwAddress, programName, pid, userId)
status: current
description: Stores the results of checking for applications that are bound to an ethernet interface on the system.

7.178. physicalProtocol

elementId: TBD
name: physicalProtocol
dataType: enumeration
structure:
ETH_P_LOOP ; 0x1 ; Ethernet loopback packet.
ETH_P_PUP ; 0x2 ; Xerox PUP packet.
ETH_P_PUPAT ; 0x3 ; Xerox PUP Address Transport packet.
ETH_P_IP ; 0x4 ; Internet protocol packet.
ETH_P_X25 ; 0x5 ; CCITT X.25 packet.
ETH_P_ARP ; 0x6 ; Address resolution packet.
ETH_P_BPQ ; 0x7 ; G8BPQ AX.25 ethernet packet.
ETH_P_IEEE8023PUP ; 0x8 ; Xerox IEEE802.3 PUP packet.
ETH_P_IEEE8023PUPAT ; 0x9 ; Xerox IEEE802.3 PUP address transport packet.
ETH_P_DEC ; 0xA ; DEC assigned protocol.
ETH_P_DNA_DL ; 0xB ; DEC DNA Dump/Load.
ETH_P_DNA_RC ; 0xC ; DEC DNA Remote Console.
ETH_P_DNA_RT ; 0xD ; DEC DNA Routing.
ETH_P_LAT ; 0xE ; DEC LAT.
ETH_P_DIAG ; 0xF ; DEC Diagnostics.
ETH_P_CUST ; 0x10 ; DEC Customer use.
ETH_P_SCA ; 0x11 ; DEC Systems Comms Arch.
ETH_P_RARP ; 0x12 ; Reverse address resolution packet.
ETH_P_ATALK ; 0x13 ; Appletalk DDP.
ETH_P_AARP ; 0x14 ; Appletalk AARP.

ETH_P_8021Q ; 0x15 ; 802.1Q VLAN Extended Header.
ETH_P_IPX ; 0x16 ; IPX over DIX.
ETH_P_IPV6 ; 0x17 ; IPv6 over bluebook.
ETH_P_SLOW ; 0x18 ; Slow Protocol. See 802.3ad 43B.
ETH_P_WCCP ; 0x19 ; Web-cache coordination protocol.
ETH_P_PPP_DISC ; 0x1A ; PPPoE discovery messages.
ETH_P_PPP_SES ; 0x1B ; PPPoE session messages.
ETH_P_MPLS_UC ; 0x1C ; MPLS Unicast traffic.
ETH_P_MPLS_MC ; 0x1D ; MPLS Multicast traffic.
ETH_P_ATMMPOA ; 0x1E ; MultiProtocol Over ATM.
ETH_P_ATMFATE ; 0x1F ; Frame-based ATM Transport over Ethernet.
ETH_P_AOE ; 0x20 ; ATA over Ethernet.
ETH_P_TIPC ; 0x21 ; TIPC.
ETH_P_802_3 ; 0x22 ; Dummy type for 802.3 frames.
ETH_P_AX25 ; 0x23 ; Dummy protocol id for AX.25.
ETH_P_ALL ; 0x24 ; Every packet.
ETH_P_802_2 ; 0x25 ; 802.2 frames.
ETH_P_SNAP ; 0x26 ; Internal only.
ETH_P_DDCMP ; 0x27 ; DEC DDCMP: Internal only
ETH_P_WAN_PPP ; 0x28 ; Dummy type for WAN PPP frames.
ETH_P_PPP_MP ; 0x29 ; Dummy type for PPP MP frames.
ETH_P_PPPTALK ; 0x2A ; Dummy type for Atalk over PPP.
ETH_P_LOCALTALK ; 0x2B ; Localtalk pseudo type.
ETH_P_TR_802_2 ; 0x2C ; 802.2 frames.
ETH_P_MOBITEX ; 0x2D ; Mobitex.
ETH_P_CONTROL ; 0x2E ; Card specific control frames.
ETH_P_IRDA ; 0x2F ; Linux-IrDA.
ETH_P_ECONET ; 0x30 ; Acorn Econet.
ETH_P_HDLC ; 0x31 ; HDLC frames.
ETH_P_ARCNET ; 0x32 ; 1A for ArcNet.
; 0x33 ; The empty string value is permitted here
to allow for detailed error reporting.

status: current

description: The physical layer protocol used by the AF_PACKET socket.

7.179. hwAddress

elementId: TBD

name: hwAddress

dataType: string

status: current

description: The hardware address associated with the interface.

7.180. programName

elementId: TBD
name: programName
dataType: string
status: current
description: The name of the communicating program.

7.181. userId

elementId: TBD
name: userId
dataType: unsigned32
status: current
description: The numeric user id.

7.182. inetlisteningserver

elementId: TBD
name: inetlisteningserver
dataType: list
structure: list (transportProtocol, localAddress, localPort, localFullAddress, programName, foreignAddress, foreignPort, foreignFullAddress, pid, userId)
status: current
description: Stores the results of checking for network servers currently active on a system. It holds information pertaining to a specific protocol-address-port combination.

7.183. transportProtocol

elementId: TBD
name: transportProtocol
dataType: string
status: current
description: The transport-layer protocol (tcp or udp).

7.184. localAddress

elementId: TBD
name: localAddress
dataType: ipAddress
status: current
description: This is the IP address being listened to. Note that the IP address can be IPv4 or IPv6.

[7.185.](#) localPort

elementId: TBD
name: localPort
dataType: unsigned32
status: current
description: This is the TCP or UDP port
being listened to.

[7.186.](#) localFullAddress

elementId: TBD
name: localFullAddress
dataType: string
status: current
description: The IP address and network port on which the program
listens, including the local address and the local port. Note
that the IP address can be IPv4 or IPv6.

[7.187.](#) foreignAddress

elementId: TBD
name: foreignAddress
dataType: ipAddress
status: current
description: The IP address with which the program is
communicating, or with which it will communicate. Note that the
IP address can be IPv4 or IPv6.

[7.188.](#) foreignFullAddress

elementId: TBD
name: foreignFullAddress
dataType: ipAddress
status: current
description: The IP address and network port to which the program
is communicating or will accept communications from, including
the foreign address and foreign port. Note that the IP address
can be IPv4 or IPv6.

[7.189.](#) selinuxboolean

elementId: TBD
name: selinuxboolean
dataType: list
structure: list (selinuxName, currentStatus,
pendingStatus)
status: current
description: Describes the current and pending status of a
SELinux boolean.

[7.190.](#) **selinuxName**

elementId: TBD
name: selinuxName
dataType: string
status: current
description: The name of the SELinux
boolean.

[7.191.](#) **currentStatus**

elementId: TBD
name: currentStatus
dataType: boolean
status: current
description: Indicates current state of
the specified SELinux boolean.

[7.192.](#) **pendingStatus**

elementId: TBD
name: pendingStatus
dataType: boolean
status: current
description: Indicates the pending
state of the specified SELinux boolean.

[7.193.](#) **selinuxsecuritycontext**

elementId: TBD
name: selinuxsecuritycontext
dataType: list
structure: list (filepath, path, filename, pid,
username, role, domainType, lowSensitivity, lowCategory,
highSensitivity, highCategory, rawlowSensitivity,
rawlowCategory, rawhighSensitivity, rawhighCategory)
status: current
description: Describes the SELinux security
context of a file or process on the local system.

7.194. filepath

elementId: TBD
name: filepath
dataType: string
status: current
description: Specifies the absolute path for a file on the machine. A directory cannot be specified as a filepath.

7.195. path

elementId: TBD
name: path
dataType: string
status: current
description: Specifies the directory component of the absolute path to a file on the machine.

7.196. filename

elementId: TBD
name: filename
dataType: string
status: current
description: The name of the file.

7.197. pid

elementId: TBD
name: pid
dataType: unsigned32
status: current
description: The process ID of the process.

7.198. role

elementId: TBD
name: role
dataType: string
status: current
description: Specifies the types that a process may transition to (domain transitions).

7.199. domainType

elementId: TBD
name: domainType
dataType: string
status: current
description: Specifies the domain in which the file is accessible
or the domain in which a process executes.

7.200. lowSensitivity

elementId: TBD
name: lowSensitivity
dataType: string
status: current
description: Specifies the current sensitivity of a file or
process.

7.201. lowCategory

elementId: TBD
name: lowCategory
dataType: string
status: current
description: Specifies the set of
categories associated with the low sensitivity.

7.202. highSensitivity

elementId: TBD
name: highSensitivity
dataType: string
status: current
description: Specifies the maximum
range for a file or the clearance for a process.

7.203. highCategory

elementId: TBD
name: highCategory
dataType: string
status: current
description: Specifies the set of
categories associated with the high sensitivity.

7.204. rawlowSensitivity

elementId: TBD
name: rawlowSensitivity
dataType: string
status: current
description: Specifies the current sensitivity of a file or process but in its raw context.

7.205. rawlowCategory

elementId: TBD
name: rawlowCategory
dataType: string
status: current
description: Specifies the set of categories associated with the low sensitivity but in its raw context.

7.206. rawhighSensitivity

elementId: TBD
name: rawhighSensitivity
dataType: string
status: current
description: Specifies the maximum range for a file or the clearance for a process but in its raw context.

7.207. rawhighCategory

elementId: TBD
name: rawhighCategory
dataType: string
status: current
description: Specifies the set of categories associated with the high sensitivity but in its raw context.

7.208. systemdunitdependency

elementId: TBD
name: systemdunitdependency
dataType: list
structure: list (unit, dependency)
status: current

description: Stores the dependencies of the systemd unit.

7.209. unit

elementId: TBD
name: unit
dataType: string
status: current
description: Refers to the full systemd unit name, which has a form of "\$name.\$type". For example "cupsd.service". This name is usually also the filename of the unit configuration file.

7.210. dependency

elementId: TBD
name: dependency
dataType: string
status: current
description: Refers to the name of a unit that was confirmed to be a dependency of the given unit.

7.211. systemdunitproperty

elementId: TBD
name: systemdunitproperty
dataType: list
structure: list (unit, property, systemdunitValue)

status: current
description: Stores the properties and values of a systemd unit.

7.212. property

elementId: TBD
name: property
dataType: string
status: current
description: The property associated with a systemd unit.

7.213. systemdunitValue

elementId: TBD
name: systemdunitValue
dataType: string
status: current
description: The value of the property associated with a systemd unit. Exactly one value shall be used for all property types except dbus arrays - each array element shall be represented by one value.

7.214. file

elementId: TBD
name: file
dataType: list
structure: list (filepath, path, filename, fileType, userId, aTime, cTime, mTime, size)
status: current
description: The metadata associated with a file on the endpoint.

7.215. fileType

elementId: TBD
name: fileType
dataType: string
status: current
description: The file's type (e.g., regular file (regular), directory, named pipe (fifo), symbolic link, socket or block special.)

7.216. groupId

elementId: TBD
name: groupId
dataType: unsigned32
status: current
description: The group owner of the file, by group number.

7.217. aTime

elementId: TBD
name: aTime
dataType: dateTimeSeconds
status: current
description: The time that the file was last accessed.

7.218. cTime

elementId: TBD
name: cTime
dataType: dateTimeSeconds
status: current
description: The time of the last change to the file's inode.

[7.219.](#) mTime

elementId: TBD
name: mTime
dataType: dateTimeSeconds
status: current
description: The time of the last change to
the file's contents.

[7.220.](#) size

elementId: TBD
name: size
dataType: unsigned32
status: current
description: This is the size of the file in
bytes.

[7.221.](#) suid

elementId: TBD
name: suid
dataType: boolean
status: current
description: Indicates whether the program runs with the uid
(thus privileges) of the file's owner, rather than the calling
user.

[7.222.](#) sgid

elementId: TBD
name: sgid
dataType: boolean
status: current
description: Indicates whether the program runs with the gid
(thus privileges) of the file's group owner, rather than the
calling user's group.

[7.223.](#) sticky

elementId: TBD
name: sticky
dataType: boolean
status: current
description: Indicates whether users can delete each other's
files in this directory, when said directory is writable by
those users.

7.224. hasExtendedAc1

elementId: TBD
name: hasExtendedAc1
dataType: boolean
status: current
description: Indicates whether the file or directory hasACL permissions applied to it. If a system supports ACLs and the file or directory doesn't have an ACL, or it matches the standard UNIX permissions, the entity will have a status of 'exists' and a value of 'false'. If the system supports ACLs and the file or directory has an ACL, the entity will have a status of 'exists' and a value of 'true'. Lastly, if a system doesn't support ACLs, the entity will have a status of 'does not exist'.

7.225. inetd

elementId: TBD
name: inetd
dataType: list
structure: list (serviceProtocol, serviceName, serverProgram, serverArguments, inetdEndpointType, execAsUser, waitStatus)
status: current
description: Holds information associated with different Internet services.

7.226. serverProgram

elementId: TBD
name: serverProgram
dataType: string
status: current
description: Either the pathname of a server program to be invoked by inetd to perform the requested service, or the value internal if inetd itself provides the service.

7.227. inetdEndpointType

elementId: TBD
name: inetdEndpointType
dataType: enumeration
structure:
stream ; 0x1 ; The stream value is used to describe a stream socket.
dgram ; 0x2 ; The dgram value is used to describe a datagram socket.
raw ; 0x3 ; The raw value is used to describe a raw socket.
seqpacket ; 0x4 ; The seqpacket value is used to describe a sequenced packet socket.
tli ; 0x5 ; The tli value is used to describe all TLI endpoints.
sunrpc_tcp ; 0x6 ; The sunrpc_tcp value is used to describe all SUNRPC TCP endpoints.
sunrpc_udp ; 0x7 ; The sunrpc_udp value is used to describe all SUNRPC UDP endpoints.
; 0x8 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: The endpoint type (aka, socket type) associated with the service.

7.228. execAsUser

elementId: TBD
name: execAsUser
dataType: string
status: current
description: The user id of the user the server program should run under.

7.229. waitStatus

elementId: TBD
name: waitStatus
dataType: enumeration
structure: wait ; 0x1 ; The value of 'wait' specifies that the server that is invoked by inetd will take over the listening socket associated with the service, and once launched, inetd will wait for that server to exit, if ever, before it resumes listening for new service requests.

nowait ; 0x2 ; The value of 'nowait' specifies that the server that is invoked by inetd will not wait for any existing server to finish before taking over the listening socket associated with the service.

; 0x3 ; The empty string value is permitted here to allow for detailed error reporting.

status: current
description: Specifies whether the server that is invoked by inetd will take over the listening socket associated with the service, and whether once launched, inetd will wait for that server to exit, if ever, before it resumes listening for new service requests. The legal values are "wait" or "nowait".

7.230. inetAddr

elementId: TBD
name: inetAddr
dataType: ipAddress
status: current
description: The IP address of the specific interface. Note that the IP address can be IPv4 or IPv6.

7.231. netmask

elementId: TBD
name: netmask
dataType: ipAddress
status: current
description: The bitmask used to calculate the interface's IP network.

7.232. passwordInfo

elementId: TBD
name: passwordInfo
dataType: list
structure: list (username, password, userId, groupId, gcos,
homeDir, loginShell, lastLogin)
status: current
description: Describes user account information for a
system.

[7.233.](#) **username**

elementId: TBD
name: username
dataType: string
status: current
description: The name of the user.

[7.234.](#) **password**

elementId: TBD
name: password
dataType: string
status: current
description: The encrypted version of the
user's password.

[7.235.](#) **gcos**

elementId: TBD
name: gcos
dataType: string
status: current
description:

[7.236.](#) **homeDir**

elementId: TBD
name: homeDir
dataType: string
status: current
description: The user's home
directory.

[7.237.](#) **loginShell**

elementId: TBD
name: loginShell
dataType: string
status: current
description: The user's shell
program.

[7.238.](#) **lastLogin**

elementId: TBD
name: lastLogin
dataType: unsigned32
status: current
description: The date and time when the
last login occurred.

[7.239.](#) **process**

elementId: TBD
name: process
dataType: list
structure: list (commandLine, pid, ppid, priority, startTime)

status: current
description: Information about a process running on an endpoint.

[7.240.](#) **commandLine**

elementId: TBD
name: commandLine
dataType: string
status: current
description: The string used to start the
process. This includes any parameters that are part of the
command line.

[7.241.](#) **ppid**

elementId: TBD
name: ppid
dataType: unsigned32
status: current
description: The process ID of the process's
parent process.

[7.242.](#) priority

elementId: TBD
name: priority
dataType: unsigned32
status: current
description: The scheduling priority with
which the process runs.

[7.243.](#) startTime

elementId: TBD
name: startTime
dataType: string
status: current
description: The time of day the process
started.

[7.244.](#) routingtable

elementId: TBD
name: routingtable
dataType: list
structure: list (destination, gateway, flags,
interfaceName)
status: current
description: Holds information about an individual routing table
entry found in a system's primary routing table.

[7.245.](#) destination

elementId: TBD
name: destination
dataType: ipAddress
status: current
description: The destination IP address
prefix of the routing table entry.

[7.246.](#) gateway

elementId: TBD
name: gateway
dataType: ipAddress
status: current
description: The gateway of the specified
routing table entry.

7.247. runlevelInfo

elementId: TBD
name: runlevelInfo
dataType: list
structure: list (serviceName, runlevel, start, kill)

status: current
description: Information about the start or kill state of a specified service at a given runlevel.

7.248. runlevel

elementId: TBD
name: runlevel
dataType: string
status: current
description: Specifies the system runlevel associated with a service.

7.249. start

elementId: TBD
name: start
dataType: boolean
status: current
description: Specifies whether the service is scheduled to start at the runlevel.

7.250. kill

elementId: TBD
name: kill
dataType: boolean
status: current
description: Specifies whether the service is scheduled to be killed at the runlevel.

7.251. shadowItem

elementId: TBD
name: shadowItem
dataType: list
structure: list (username, password, chgLst, chgAllow, chgReq, expWarn, expInact, expDate, flags, encryptMethod)
status: current
description:

[7.252.](#) chgLst

elementId: TBD
name: chgLst
dataType: dateTimeSeconds
status: current
description: The date of the last password change.

[7.253.](#) chgAllow

elementId: TBD
name: chgAllow
dataType: unsigned32
status: current
description: Specifies how often in days a user may change their password. It can also be thought of as the minimum age of a password.

[7.254.](#) chgReq

elementId: TBD
name: chgReq
dataType: unsigned32
status: current
description: Describes how long a user can keep a password before the system forces her to change it.

[7.255.](#) expWarn

elementId: TBD
name: expWarn
dataType: unsigned32
status: current
description: Describes how long before password expiration the system begins warning the user.

[7.256.](#) expInact

elementId: TBD
name: expInact
dataType: unsigned32
status: current
description: Describes how many days of account inactivity the system will wait after a password expires before locking the account.

7.257. expDate

elementId: TBD
name: expDate
dataType: dateTimeSeconds
status: current
description: Specifies when will the
account's password expire.

7.258. encryptMethod

elementId: TBD
name: encryptMethod
dataType: enumeration
structure: DES ; 0x1 ; The DES method corresponds to the (none)
prefix.
 BSDi ; 0x2 ; The BSDi method corresponds to BSDi modified
 DES or the '_' prefix.
 MD5 ; 0x3 ; The MD5 method corresponds to MD5 for Linux/BSD
 or the \$1\$ prefix.
 Blowfish ; 0x4 ; The Blowfish method corresponds to Blowfish
 (OpenBSD) or the \$2\$ or \$2a\$ prefixes.
 Sun MD5 ; 0x5 ; The Sun MD5 method corresponds to the \$md5\$
 prefix.
 SHA-256 ; 0x6 ; The SHA-256 method corresponds to the \$5\$
 prefix.
 SHA-512 ; 0x7 ; The SHA-512 method corresponds to the \$6\$
 prefix. ; 0x8 ; The empty string value is permitted here to
 allow for empty elements associated with variable references.
status: current
description: Describes method that is used for hashing
passwords.

7.259. symlink

elementId: TBD
name: symlink
dataType: list
structure: list (symlinkFilepath, canonicalPath)
status: current

description: Identifies the result generated for a symlink.

7.260. symlinkFilepath

elementId: TBD
name: symlinkFilepath
dataType: string
status: current
description: Specifies the filepath to
the subject symbolic link file.

[7.261.](#) **canonicalPath**

elementId: TBD
name: canonicalPath
dataType: string
status: current
description: Specifies the canonical
path for the target of the symbolic link file specified by
the filepath.

[7.262.](#) **sysctl**

elementId: TBD
name: sysctl
dataType: list
structure: list (kernelParameterName, kernelParameterValue+,
uname, machineClass, nodeName, osName, osRelease,
osVersion, processorType)
status: current
description: Stores
information retrieved from the local system about a kernel
parameter and its respective value(s).

[7.263.](#) **kernelParameterName**

elementId: TBD
name: kernelParameterName
dataType: string
status: current
description: The name of a kernel
parameter that was collected from the local system.

[7.264.](#) **kernelParameterValue**

elementId: TBD
name: kernelParameterValue
dataType: string
status: current
description: The current value(s)
for the specified kernel parameter on the local system.

7.265. uname

elementId: TBD
name: uname
dataType: list
structure: list (machineClass, nodeName, osName, osRelease,
osVersion, processorType)
status: current
description: Information about the hardware the machine is running
on.

7.266. machineClass

elementId: TBD
name: machineClass
dataType: string
status: current
description: Specifies the machine
hardware name.

7.267. nodeName

elementId: TBD
name: nodeName
dataType: string
status: current
description: Specifies the host
name.

7.268. osName

elementId: TBD
name: osName
dataType: string
status: current
description: Specifies the operating system
name.

7.269. osRelease

elementId: TBD
name: osRelease
dataType: string
status: current
description: Specifies the build
version.

[7.270.](#) processorType

elementId: TBD
name: processorType
dataType: string
status: current
description: Specifies the processor
type.

[7.271.](#) internetService

elementId: TBD
name: internetService
dataType: list
structure: list (serviceProtocol, serviceName, flags,
noAccess, onlyFrom, port, server, serverArguments,
socketType, registeredServiceType, user, wait, disabled)

status: current
description: Holds information associated with Internet services.

[7.272.](#) serviceProtocol

elementId: TBD
name: serviceProtocol
dataType: string
status: current
description: Specifies the protocol
that is used by the service.

[7.273.](#) serviceName

elementId: TBD
name: serviceName
dataType: string
status: current
description: Specifies the name of the
service.

[7.274.](#) flags

elementId: TBD
name: flags
dataType: string
status: current
description: Specifies miscellaneous settings
associated with the service with executing a program.

[7.275.](#) noAccess

elementId: TBD
name: noAccess
dataType: string
status: current
description: Specifies the remote hosts to
which the service is unavailable.

[7.276.](#) onlyFrom

elementId: TBD
name: onlyFrom
dataType: ipAddress
status: current
description: Specifies the remote hosts to
which the service is available.

[7.277.](#) port

elementId: TBD
name: port
dataType: unsigned32
status: current
description: The port entity specifies the port
used by the service.

[7.278.](#) server

elementId: TBD
name: server
dataType: string
status: current
description: Specifies the executable that is
used to launch the service.

[7.279.](#) serverArguments

elementId: TBD
name: serverArguments
dataType: string
status: current
description: Specifies the arguments
that are passed to the executable when launching the service.

7.280. socketType

elementId: TBD
name: socketType
dataType: string
status: current
description: Specifies the type of socket
that is used by the service. Possible values include: stream,
dgram, raw, or seqpacket.

7.281. registeredServiceType

elementId: TBD
name: registeredServiceType
dataType: enumeration
structure: INTERNAL ; 0x1 ; The INTERNAL type is used to describe
services like echo, chargen, and others whose functionality is
supplied by xinetd itself.
RPC ; 0x2 ; The RPC type is used to describe services that
use remote procedure call ala NFS.
UNLISTED ; 0x3 ; The UNLISTED type is used to describe
services that aren't listed in /etc/protocols or /etc/rpc.
TCPMUX ; 0x4 ; The TCPMUX type is used to describe services
that conform to [RFC 1078](#). This type indicates that the service
is responsible for handling the protocol handshake.
TCPMUXPLUS ; 0x5 ; The TCPMUXPLUS type is used to describe
services that conform to [RFC 1078](#). This type indicates that
xinetd is responsible for handling the protocol
handshake.
; 0x6 ; The empty string value is permitted here to allow
for detailed error reporting.
status: current

description: Specifies the type of internet service.

7.282. wait

elementId: TBD
name: wait
dataType: boolean
status: current
description: Specifies whether or not the service is single-threaded
or multi-threaded and whether or not xinetd accepts the connection
or the service accepts the connection. A value of 'true' indicates
that the service is single-threaded and the service will accept the
connection. A value of 'false' indicates that the service is multi-
threaded and xinetd will accept the connection.

7.283. disabled

elementId: TBD
name: disabled
dataType: boolean
status: current
description: Specifies whether or not the service is disabled. A value of 'true' indicates that the service is disabled and will not start. A value of 'false' indicates that the service is not disabled.

7.284. windowsView

elementId: TBD
name: windowsView
dataType: enumeration
structure: 32_bit ; 0x1 ; Indicates the 32_bit windows view.
64_bit ; 0x2 ; Indicates the 64_bit windows view.
; 0x3 ; The empty string value is permitted here to allow for empty elements associated with error conditions.
status: current
description: Indicates from which view (32-bit or 64-bit), the information was collected. A value of '32_bit' indicates the Item was collected from the 32-bit view. A value of '64-bit' indicates the Item was collected from the 64-bit view.

7.285. fileauditedpermissions

elementId: TBD
name: fileauditedpermissions
dataType: list
structure: list (filepath, path, filename, trusteeSid, trusteeName, auditStandardDelete, auditStandardReadControl, auditStandardWriteDac, auditStandardWriteOwner, auditStandardSynchronize, auditAccessSystemSecurity, auditGenericRead, auditGenericWrite, auditGenericExecute, auditGenericAll, auditFileReadData, auditFileWriteData, auditFileAppendData, auditFileReadEa, auditFileWriteEa, auditFileExecute, auditFileDeleteChild, auditFileReadAttributes, auditFileWriteAttributes, windowsView)
status: current
description: Stores the audited access rights of a file that a system access control list (SACL) structure grants to a specified trustee. The trustee's audited access rights are determined checking all access control entries (ACEs) in the SACL.

7.286. trusteeName

elementId: TBD
name: trusteeName
dataType: string
status: current
description: Specifies the trustee name. A trustee can be a user, group, or program (such as a Windows service).

7.287. auditStandardDelete

elementId: TBD
name: auditStandardDelete
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: The right to delete the object.

7.288. auditStandardReadControl

elementId: TBD
name: auditStandardReadControl
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: The right to read the information in the object's security descriptor, not including the information in the SACL.

7.289. auditStandardWriteDac

elementId: TBD
name: auditStandardWriteDac
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: The right to modify the DACL in the object's security descriptor.

7.290. auditStandardWriteOwner

elementId: TBD
name: auditStandardWriteOwner
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: The right to change the owner in the object's security descriptor.

7.291. auditStandardSynchronize

elementId: TBD
name: auditStandardSynchronize
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: The right to use the object for synchronization. This enables a thread to wait until the object is in the signaled state. Some object types do not support this access right.

7.292. auditAccessSystemSecurity

elementId: TBD
name: auditAccessSystemSecurity
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Indicates access to a system access control list (SACL).

7.293. auditGenericRead

elementId: TBD
name: auditGenericRead
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Read access.

7.294. auditGenericWrite

elementId: TBD
name: auditGenericWrite
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Write access.

7.295. auditGenericExecute

elementId: TBD
name: auditGenericExecute
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Execute access.

7.296. auditGenericAll

elementId: TBD
name: auditGenericAll
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Read, write, and execute access.

7.297. auditFileReadData

elementId: TBD
name: auditFileReadData
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Grants the right to read data from the file.

7.298. auditFileWriteData

elementId: TBD
name: auditFileWriteData
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Grants the right to write data to the file.

7.299. auditFileAppendData

elementId: TBD
name: auditFileAppendData
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Grants the right to append data to the file.

7.300. auditFileReadEa

elementId: TBD
name: auditFileReadEa
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Grants the right to read extended attributes.

7.301. auditFileWriteEa

elementId: TBD
name: auditFileWriteEa
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Grants the right to write extended attributes.

7.302. auditFileExecute

elementId: TBD
name: auditFileExecute
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Grants the right to execute a file.

7.303. auditFileDeleteChild

elementId: TBD
name: auditFileDeleteChild
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Right to delete a directory and all the files it contains (its children), even if the files are read-only.

7.304. auditFileReadAttributes

elementId: TBD
name: auditFileReadAttributes
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Grants the right to read file attributes.

7.305. auditFileWriteAttributes

elementId: TBD
name: auditFileWriteAttributes
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: Grants the right to change file attributes.

7.306. fileeffectiverights

elementId: TBD
name: fileeffectiverights
dataType: list
structure: list (filepath, path, filename, trusteeSid, trusteeName, standardDelete, standardReadControl, standardWriteDac, standardWriteOwner, standardSynchronize, accessSystemSecurity, genericRead, genericWrite, genericExecute, genericAll, fileReadData, fileWriteData, fileAppendData, fileReadEa, fileWriteEa, fileExecute, fileDeleteChild, fileReadAttributes, fileWriteAttributes, windowsView)
status: current
description: Stores the effective rights of a file that a discretionary access control list (DACL) structure grants to a specified trustee. The trustee's effective rights are determined checking all access-allowed and access-denied access control entries (ACEs) in the DACL.

7.307. standardDelete

elementId: TBD
name: standardDelete
dataType: boolean
status: current
description: The right to delete the object.

7.308. standardReadControl

elementId: TBD
name: standardReadControl
dataType: boolean
status: current
description: The right to read the information in the object's security descriptor, not including the information in the SACL.

7.309. standardWriteDac

elementId: TBD
name: standardWriteDac
dataType: boolean
status: current
description: The right to modify the DACL in the object's security descriptor.

7.310. standardWriteOwner

elementId: TBD
name: standardWriteOwner
dataType: boolean
status: current
description: The right to change
the owner in the object's security descriptor.

7.311. standardSynchronize

elementId: TBD
name: standardSynchronize
dataType: boolean
status: current
description: The right to use the
object for synchronization. This enables a thread to wait
until the object is in the signaled state. Some object
types do not support this access right.

7.312. accessSystemSecurity

elementId: TBD
name: accessSystemSecurity
dataType: boolean
status: current
description: Indicates access to
a system access control list (SACL).

7.313. genericRead

elementId: TBD
name: genericRead
dataType: boolean
status: current
description: Read access.

7.314. genericWrite

elementId: TBD
name: genericWrite
dataType: boolean
status: current
description: Write access.

[7.315.](#) genericExecute

elementId: TBD
name: genericExecute
dataType: boolean
status: current
description: Execute access.

[7.316.](#) genericAll

elementId: TBD
name: genericAll
dataType: boolean
status: current
description: Read, write, and execute access.

[7.317.](#) fileReadData

elementId: TBD
name: fileReadData
dataType: boolean
status: current
description: Grants the right to read data from the file

[7.318.](#) fileWriteData

elementId: TBD
name: fileWriteData
dataType: boolean
status: current
description: Grants the right to write data to the file.

[7.319.](#) fileAppendData

elementId: TBD
name: fileAppendData
dataType: boolean
status: current
description: Grants the right to append data to the file.

[7.320.](#) fileReadEa

elementId: TBD
name: fileReadEa
dataType: boolean
status: current
description: Grants the right to read
extended attributes.

[7.321.](#) fileWriteEa

elementId: TBD
name: fileWriteEa
dataType: boolean
status: current
description: Grants the right to write
extended attributes.

[7.322.](#) fileExecute

elementId: TBD
name: fileExecute
dataType: boolean
status: current
description: Grants the right to execute
a file.

[7.323.](#) fileDeleteChild

elementId: TBD
name: fileDeleteChild
dataType: boolean
status: current
description: Right to delete a
directory and all the files it contains (its children),
even if the files are read-only.

[7.324.](#) fileReadAttributes

elementId: TBD
name: fileReadAttributes
dataType: boolean
status: current
description: Grants the right to
read file attributes.

[7.325.](#) fileWriteAttributes

elementId: TBD
name: fileWriteAttributes
dataType: boolean
status: current
description: Grants the right to
change file attributes.

[7.326.](#) groupInfo

elementId: TBD
name: groupInfo
dataType: list
structure: list (group, username, subgroup)
status: current
description: Specifies the different users and subgroups, that
directly belong to specific groups.

[7.327.](#) group

elementId: TBD
name: group
dataType: string
status: current
description: Represents the name of a particular
group.

[7.328.](#) subgroup

elementId: TBD
name: subgroup
dataType: string
status: current
description: Represents the name of a
particular subgroup in the specified group.

[7.329.](#) groupSidInfo

elementId: TBD
name: groupSidInfo
dataType: list
structure: list (groupSid, userSid, subgroupSid)
status: current
description: Specifies the different users and subgroups, that
directly belong to specific groups
(identified by SID).

[7.330.](#) userSidInfo

elementId: TBD
name: userSidInfo
dataType: list
structure: list (userSid, enabled, groupSid, lastLogon)

status: current
description: Specifies the different groups (identified by SID) that a user belongs to.

[7.331.](#) userSid

elementId: TBD
name: userSid
dataType: string
status: current
description: Represents the SID of a particular user.

[7.332.](#) subgroupSid

elementId: TBD
name: subgroupSid
dataType: string
status: current
description: Represents the SID of a particular subgroup.

[7.333.](#) lockoutpolicy

elementId: TBD
name: lockoutpolicy
dataType: list
structure: list (forceLogoff, lockoutDuration, lockoutObservationWindow, lockoutThreshold)
status: current
description: Specifies various attributes associated with lockout information for users and global groups in the security database.

[7.334.](#) forceLogoff

elementId: TBD
name: forceLogoff
dataType: unsigned32
status: current
description: Specifies, in seconds, the amount of time between the end of the valid logon time and the time when the user is forced to log off the network.

7.335. lockoutDuration

elementId: TBD
name: lockoutDuration
dataType: unsigned32
status: current
description: Specifies, in seconds, how long a locked account remains locked before it is automatically unlocked.

7.336. lockoutObservationWindow

elementId: TBD
name: lockoutObservationWindow
dataType: unsigned32
status: current
description: Specifies the maximum time, in seconds, that can elapse between any two failed logon attempts before lockout occurs.

7.337. lockoutThreshold

elementId: TBD
name: lockoutThreshold
dataType: unsigned32
status: current
description: Specifies the number of invalid password authentications that can occur before an account is marked "locked out."

7.338. passwordpolicy

elementId: TBD
name: passwordpolicy
dataType: list
structure: list (maxPasswdAge, minPasswdAge,
minPasswdLen, passwordHistLen, passwordComplexity,
reversibleEncryption)
status: current
description: Specifies
policy information associated with passwords.

7.339. maxPasswdAge

elementId: TBD
name: maxPasswdAge
dataType: unsigned32
status: current
description: Specifies, in seconds (from
a DWORD), the maximum allowable password age. A value of
TIMEQ_FOREVER (max DWORD value, 4294967295) indicates
that the password never expires. The minimum valid value
for this element is ONE_DAY (86400). See the
USER_MODAL_INFO_0 structure returned by a call to
NetUserModalsGet().

7.340. minPasswdAge

elementId: TBD
name: minPasswdAge
dataType: unsigned32
status: current
description: Specifies the minimum
number of seconds that can elapse between the time a password
changes and when it can be changed again. A value of
zero indicates that no delay is required between password
updates.

7.341. minPasswdLen

elementId: TBD
name: minPasswdLen
dataType: unsigned32
status: current
description: Specifies the minimum
allowable password length. Valid values for this element are
zero through PWLEN.

7.342. passwordHistLen

elementId: TBD
name: passwordHistLen
dataType: unsigned32
status: current
description: Specifies the length of password history maintained. A new password cannot match any of the previous `usrmod0_password_hist_len` passwords. Valid values for this element are zero through `DEF_MAX_PWHIST`.

7.343. passwordComplexity

elementId: TBD
name: passwordComplexity
dataType: boolean
status: current
description: Indicates whether passwords must meet the complexity requirements put forth by the operating system.

7.344. reversibleEncryption

elementId: TBD
name: reversibleEncryption
dataType: boolean
status: current
description: Indicates whether or not passwords are stored using reversible encryption.

7.345. portInfo

elementId: TBD
name: portInfo
dataType: list
structure: list (localAddress, localPort, transportProtocol, pid, foreignAddress, foreignPort)
status: current
description: Information about open listening ports.

7.346. foreignPort

elementId: TBD
name: foreignPort
dataType: string
status: current
description: The TCP or UDP port to which the program communicates.

[7.347.](#) printereffectiverights

elementId: TBD
name: printereffectiverights
dataType: list
structure: list (printerName, trusteeSid, standardDelete, standardReadControl, standardWriteDac, standardWriteOwner, standardSynchronize, accessSystemSecurity, genericRead, genericWrite, genericExecute, genericAll, printerAccessAdminister, printerAccessUse, jobAccessAdminister, jobAccessRead)
status: current
description: Stores the effective rights of a printer that a discretionary access control list (DACL) structure grants to a specified trustee. The trustee's effective rights are determined checking all access-allowed and access-denied access control entries (ACEs) in the DACL.

[7.348.](#) printerName

elementId: TBD
name: printerName
dataType: string
status: current
description: Specifies the name of the printer.

[7.349.](#) printerAccessAdminister

elementId: TBD
name: printerAccessAdminister
dataType: boolean
status: current
description:

[7.350.](#) printerAccessUse

elementId: TBD
name: printerAccessUse
dataType: boolean
status: current
description:

[7.351.](#) jobAccessAdminister

elementId: TBD
name: jobAccessAdminister
dataType: boolean
status: current
description:

[7.352.](#) jobAccessRead

elementId: TBD
name: jobAccessRead
dataType: boolean
status: current
description:

[7.353.](#) registry

elementId: TBD
name: registry
dataType: list
structure: list (registryHive, registryKey, registryKeyName,
lastWriteTime, registryKeyType, registryKeyValue,
windowsView)
status: current
description: Specifies information that can be
collected about a particular registry key.

[7.354.](#) registryHive

elementId: TBD
name: registryHive
dataType: enumeration
structure: HKEY_CLASSES_ROOT ; 0x1 ; This registry subtree contains information that associates file types with programs and configuration data for automation (e.g. COM objects and Visual Basic Programs).
HKEY_CURRENT_CONFIG ; 0x2 ; This registry subtree contains configuration data for the current hardware profile.
HKEY_CURRENT_USER ; 0x3 ; This registry subtree contains the user profile of the user that is currently logged into the system.
HKEY_LOCAL_MACHINE ; 0x4 ; This registry subtree contains information about the local system.
HKEY_USERS ; 0x5 ; This registry subtree contains user-specific data.
; 0x6 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description: The hive that the registry key belongs to.

[7.355.](#) registryKey

elementId: TBD
name: registryKey
dataType: string
status: current
description: Describes the registry key.
Note that the hive portion of the string should not be included, as this data can be found under the hive element.

[7.356.](#) registryKeyName

elementId: TBD
name: registryKeyName
dataType: string
status: current
description: Describes the name of a registry key.

[7.357.](#) lastWriteTime

elementId: TBD
name: lastWriteTime
dataType: unsigned64
status: current
description: The last time that the key or any of its value entries were modified. The value of this entity represents the FILETIME structure which is a 64-bit value representing the number of 100-nanosecond intervals since January 1, 1601 (UTC). Last write time can be queried on any key, with hives being classified as a type of key. When collecting only information about a registry hive or key the last write time will be the time the key or any of its entries were modified. When collecting only information about a registry name the last write time will be the time the containing key was modified. Thus when collecting information about a registry name, the last write time does not correlate directly to the specified name. See the RegQueryInfoKey function lpftLastWriteTime.

7.358. registryKeyType

elementId: TBD
name: registryKeyType
dataType: enumeration
structure: reg_binary ; 0x1 ; The reg_binary type is used by registry keys that specify binary data in any form.
reg_dword ; 0x2 ; The reg_dword type is used by registry keys that specify an unsigned 32-bit integer.
reg_dword_little_endian ; 0x3 ; The reg_dword_little_endian type is used by registry keys that specify an unsigned 32-bit little-endian integer. It is designed to run on little-endian computer architectures.
reg_dword_big_endian ; 0x4 ; The reg_dword_big_endian type is used by registry keys that specify an unsigned 32-bit big-endian integer. It is designed to run on big-endian computer architectures.
reg_expand_sz ; 0x5 ; The reg_expand_sz type is used by registry keys to specify a null-terminated string that contains unexpanded references to environment variables (for example, "%PATH%").
reg_link ; 0x6 ; The reg_link type is used by the registry keys for null-terminated unicode strings. It is related to target path of a symbolic link created by the RegCreateKeyEx function.
reg_multi_sz ; 0x7 ; The reg_multi_sz type is used by registry keys that specify an array of null-terminated strings, terminated by two null characters.

reg_none; 0x8 ;

The reg_none type is used by registry keys that have no defined value type.

reg_qword; 0x9 ; The reg_qword type is used by registry keys that specify an unsigned 64-bit integer.

reg_qword_little_endian; 0xA ; The reg_qword_little_endian type is used by registry keys that specify an unsigned 64-bit integer in little-endian computer architectures.

reg_sz; 0xB ; The reg_sz type is used by registry keys that specify a single null-terminated string.

reg_resource_list; 0xC ; The reg_resource_list type is used by registry keys that specify a resource list.

reg_full_resource_descriptor; 0xD ; The reg_full_resource_descriptor type is used by registry keys that specify a full resource descriptor.

reg_resource_requirements_list; 0xE ; The reg_resource_requirements_list type is used by registry keys that specify a resource requirements list.

; 0xF ; The empty string value is permitted here to allow for detailed error reporting.

status: current

description:

Specifies the type of data stored by the registry key.

[7.359](#). registryKeyValue

elementId: TBD
name: registryKeyValue
dataType: string
status: current
description: Holds the actual value of the specified registry key. The representation of the value as well as the associated datatype attribute depends on type of data stored in the registry key. If the value being tested is of type REG_BINARY, then the datatype attribute should be set to 'binary' and the data represented by the value entity should follow the xsd:hexBinary form. (each binary octet is encoded as two hex digits) If the value being tested is of type REG_DWORD, REG_QWORD, REG_DWORD_LITTLE_ENDIAN, REG_DWORD_BIG_ENDIAN, or REG_QWORD_LITTLE_ENDIAN then the datatype attribute should be set to 'int' and the value entity should represent the data as an unsigned integer. DWORD and QWORD values represent unsigned 32-bit and 64-bit integers, respectively. If the value being tested is of type REG_EXPAND_SZ, then the datatype attribute should be set to 'string' and the pre-expanded string should be represented by the value entity. If the value being tested is of type REG_MULTI_SZ, then only a single string (one of the multiple strings) should be tested using the value entity with the datatype attribute set to 'string'. In order to test multiple values, multiple OVAL registry tests should be used. If the specified registry key is of type REG_SZ, then the datatype should be 'string' and the value entity should be a copy of the string. If the value being tested is of type REG_LINK, then the datatype attribute should be set to 'string' and the null-terminated Unicode string should be represented by the value entity.

[7.360](#). **regkeyauditedpermissions**

elementId: TBD
name: regkeyauditedpermissions
dataType: list
structure: list (registryKey, trusteeSid, trusteeName, standardDelete, standardReadControl, standardWriteDac, standardWriteOwner, standardSynchronize, accessSystemSecurity, genericRead, genericWrite, genericExecute, genericAll, keyQueryValue, keySetValue, keyCreateSubKey, keyEnumerateSubKeys, keyNotify, keyCreateLink, keyWow6464Key, keyWow6432Key, keyWow64Res, windowsView)
status: current
description: Stores the audited access rights of a registry key that a system access control list (SACL) structure grants to a specified trustee. The trustee's audited access rights are determined checking all access control entries (ACEs) in the SACL.

7.361. auditKeyQueryValue

elementId: TBD
name: auditKeyQueryValue
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description:

7.362. auditKeySetValue

elementId: TBD
name: auditKeySetValue
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description:

7.363. auditKeyCreateSubKey

elementId: TBD
name: auditKeyCreateSubKey
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description:

7.364. auditKeyEnumerateSubKeys

elementId: TBD
name: auditKeyEnumerateSubKeys
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description:

7.365. auditKeyNotify

elementId: TBD
name: auditKeyNotify
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description:

7.366. auditKeyCreateLink

elementId: TBD
name: auditKeyCreateLink
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description:

7.367. auditKeyWow6464Key

elementId: TBD
name: auditKeyWow6464Key
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description:

7.368. auditKeyWow6432Key

elementId: TBD
name: auditKeyWow6432Key
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description:

7.369. auditKeyWow64Res

elementId: TBD
name: auditKeyWow64Res
dataType: enumeration
structure: AUDIT_FAILURE ; 0x1 ; The audit type AUDIT_FAILURE is used to perform audits on all unsuccessful occurrences of specified events when auditing is enabled.
AUDIT_NONE ; 0x2 ; The audit type AUDIT_NONE is used to cancel all auditing options for the specified events.
AUDIT_SUCCESS ; 0x3 ; The audit type AUDIT_SUCCESS is used to perform audits on all successful occurrences of the specified events when auditing is enabled.
AUDIT_SUCCESS_FAILURE ; 0x4 ; The audit type AUDIT_SUCCESS_FAILURE is used to perform audits on all successful and unsuccessful occurrences of the specified events when auditing is enabled.
; 0x5 ; The empty string value is permitted here to allow for detailed error reporting.
status: current
description:

7.370. regkeyeffectiverights

elementId: TBD
name: regkeyeffectiverights
dataType: list
structure: list (registryHive, registryKey, trusteeSid, trusteeName, standardDelete, standardReadControl, standardWriteDac, standardWriteOwner, standardSynchronize, accessSystemSecurity, genericRead, genericWrite, genericExecute, genericAll, keyQueryValue, keySetValue, keyCreateSubKey, keyEnumerateSubKeys, keyNotify, keyCreateLink, keyWow6464Key, keyWow6432Key, keyWow64Res, windowsView)
status: current
description: Stores the effective rights of a registry key that a discretionary access control list (DACL) structure grants to a specified trustee. The trustee's effective rights are determined checking all access-allowed and access-denied access control entries (ACEs) in the DACL.

7.371. keyQueryValue

elementId: TBD
name: keyQueryValue
dataType: boolean
status: current
description: Specifies whether or not permission is granted to query the key's value.

7.372. keySetValue

elementId: TBD
name: keySetValue
dataType: boolean
status: current
description: Specifies whether or not permission is granted to set the key's value.

7.373. keyCreateSubKey

elementId: TBD
name: keyCreateSubKey
dataType: boolean
status: current
description: Specifies whether or not permission is granted to create a subkey.

[7.374.](#) keyEnumerateSubKeys

elementId: TBD
name: keyEnumerateSubKeys
dataType: boolean
status: current
description: Specifies whether or
not permission is granted to list the subkeys associated
with key.

[7.375.](#) keyNotify

elementId: TBD
name: keyNotify
dataType: boolean
status: current
description:

[7.376.](#) keyCreateLink

elementId: TBD
name: keyCreateLink
dataType: boolean
status: current
description:

[7.377.](#) keyWow6464Key

elementId: TBD
name: keyWow6464Key
dataType: boolean
status: current
description:

[7.378.](#) keyWow6432Key

elementId: TBD
name: keyWow6432Key
dataType: boolean
status: current
description:

[7.379.](#) keyWow64Res

elementId: TBD
name: keyWow64Res
dataType: boolean
status: current
description:

7.380. service

elementId: TBD
name: service
dataType: list
structure: list (serviceName, displayName, description,
serviceType, startType, currentState, controlsAccepted,
startName, path, pid, serviceFlag, dependencies)
status: current
description: Stores information about Windows services that are
present on the system.

7.381. displayName

elementId: TBD
name: displayName
dataType: string
status: current
description: Specifies the name of the
service as specified in administrative tools.

7.382. description

elementId: TBD
name: description
dataType: string
status: current
description: Specifies the description of
the service.

7.383. serviceType

elementId: TBD
name: serviceType
dataType: enumeration
structure: SERVICE_FILE_SYSTEM_DRIVER ; 0x1 ; The SERVICE_FILE_SYSTEM_DRIVER type means that the service is a file system driver. The DWORD value that this corresponds to is 0x00000002.
SERVICE_KERNEL_DRIVER ; 0x2 ; The SERVICE_KERNEL_DRIVER type means that the service is a driver. The DWORD value that this corresponds to is 0x00000001.
SERVICE_WIN32_OWN_PROCESS ; 0x3 ; The SERVICE_WIN32_OWN_PROCESS type means that the service runs in its own process. The DWORD value that this corresponds to is 0x00000010.
SERVICE_WIN32_SHARE_PROCESS ; 0x4 ; The SERVICE_WIN32_SHARE_PROCESS type means that the service runs in a process with other services. The DWORD value that this corresponds to is 0x00000020.
SERVICE_INTERACTIVE_PROCESS ; 0x5 ; The SERVICE_WIN32_SHARE_PROCESS type means that the service runs in a process with other services. The DWORD value that this corresponds to is 0x00000100.
; 0x6 ; The empty string value is permitted here to allow for empty elements associated with error conditions.
status: current
description:
 Specifies the type of the service.

[7.384.](#) startType

elementId: TBD
name: startType
dataType: enumeration
structure: SERVICE_AUTO_START ; 0x1 ; The SERVICE_AUTO_START type means that the service is started automatically by the Service Control Manager (SCM) during startup. The DWORD value that this corresponds to is 0x00000002.
SERVICE_BOOT_START ; 0x2 ; The SERVICE_BOOT_START type means that the driver service is started by the system loader. The DWORD value that this corresponds to is 0x00000000.
SERVICE_DEMAND_START ; 0x3 ; The SERVICE_DEMAND_START type means that the service is started by the Service Control Manager (SCM) when StartService() is called. The DWORD value that this corresponds to is 0x00000003.
SERVICE_DISABLED ; 0x4 ; The SERVICE_DISABLED type means that the service cannot be started. The DWORD value that this corresponds to is 0x00000004.
SERVICE_SYSTEM_START ; 0x5 ; The SERVICE_SYSTEM_START type means that the service is a device driver started by IoInitSystem(). The DWORD value that this corresponds to is 0x00000001.
; 0x6 ; The empty string value is permitted here to allow for empty elements associated with error conditions.
status: current
description: Specifies when the service should be started.

[7.385.](#) **currentState**

elementId: TBD
name: currentState
dataType: enumeration
structure: SERVICE_CONTINUE_PENDING ; 0x1 ; The SERVICE_CONTINUE_PENDING type means that the service has been sent a command to continue, however, the command has not yet been executed. The DWORD value that this corresponds to is 0x00000005. SERVICE_PAUSE_PENDING ; 0x2 ; The SERVICE_PAUSE_PENDING type means that the service has been sent a command to pause, however, the command has not yet been executed. The DWORD value that this corresponds to is 0x00000006. SERVICE_PAUSED ; 0x3 ; The SERVICE_PAUSED type means that the service is paused. The DWORD value that this corresponds to is 0x00000007. SERVICE_RUNNING ; 0x4 ; The SERVICE_RUNNING type means that the service is running. The DWORD value that this corresponds to is 0x00000004. SERVICE_START_PENDING ; 0x5 ; The SERVICE_START_PENDING type means that the service has been sent a command to start, however, the command has not yet been executed. The DWORD value that this corresponds to is 0x00000002. SERVICE_STOP_PENDING ; 0x6 ; The SERVICE_STOP_PENDING type means that the service has been sent a command to stop, however, the command has not yet been executed. The DWORD value that this corresponds to is 0x00000003. SERVICE_STOPPED ; 0x7 ; The SERVICE_STOPPED type means that the service is stopped. The DWORD value that this corresponds to is 0x00000001. ; 0x8 ; The empty string value is permitted here to allow for empty elements associated with error conditions.
status: current
description: Specifies the current state of the service.

7.386. controlsAccepted

elementId: TBD
name: controlsAccepted
dataType: enumeration
structure:
SERVICE_ACCEPT_NETBINDCHANGE ; 0x1 ;
The SERVICE_ACCEPT_NETBINDCHANGE type means that the service is a network component and can accept changes in its binding without being stopped or restarted. The DWORD value that this corresponds to is 0x00000010.
SERVICE_ACCEPT_PARAMCHANGE ; 0x2 ; The SERVICE_ACCEPT_PARAMCHANGE

type means that the service can re-read its startup parameters without being stopped or restarted. The DWORD value that this corresponds to is 0x00000008.

SERVICE_ACCEPT_PAUSE_CONTINUE ; 0x3 ; The SERVICE_ACCEPT_PAUSE_CONTINUE type means that the service can be paused or continued. The DWORD value that this corresponds to is 0x00000002.

SERVICE_ACCEPT_PRESHUTDOWN ; 0x4 ; The SERVICE_ACCEPT_PRESHUTDOWN type means that the service can receive pre-shutdown notifications. The DWORD value that this corresponds to is 0x00000100.

SERVICE_ACCEPT_SHUTDOWN ; 0x5 ; The SERVICE_ACCEPT_SHUTDOWN type means that the service can receive shutdown notifications. The DWORD value that this corresponds to is 0x00000004.

SERVICE_ACCEPT_STOP ; 0x6 ; The SERVICE_ACCEPT_STOP type means that the service can be stopped. The DWORD value that this corresponds to is 0x00000001.

SERVICE_ACCEPT_HARDWAREPROFILECHANGE ; 0x7 ; The SERVICE_ACCEPT_HARDWAREPROFILECHANGE type means that the service can receive notifications when the system's hardware profile changes. The DWORD value that this corresponds to is 0x00000020.

SERVICE_ACCEPT_POWEREVENT ; 0x8 ; The SERVICE_ACCEPT_POWEREVENT type means that the service can receive notifications when the system's power status has changed. The DWORD value that this corresponds to is 0x00000040.

SERVICE_ACCEPT_SESSIONCHANGE ; 0x9 ; The SERVICE_ACCEPT_SESSIONCHANGE type means that the service can receive notifications when the system's session status has changed. The DWORD value that this corresponds to is 0x00000080.

SERVICE_ACCEPT_TIMECHANGE ; 0xA ; The SERVICE_ACCEPT_TIMECHANGE type means that the service can receive notifications when the system time changes. The DWORD value that this corresponds to is 0x00000200.

SERVICE_ACCEPT_TRIGGEREVENT ; 0xB ; The SERVICE_ACCEPT_TRIGGEREVENT type means that the service can receive notifications when an event that the service has registered for occurs on the system. The DWORD value that this corresponds to is 0x00000400.

; 0xC ; The empty string value is permitted here to allow for empty elements associated with error conditions.

status: current

description: Specifies the control codes that a service will accept and process.

7.387. startName

elementId: TBD
name: startName
dataType: string
status: current
description: Specifies the account under
which the process should run.

7.388. serviceFlag

elementId: TBD
name: serviceFlag
dataType: boolean
status: current
description: Specifies whether the
service is in a system process that must always run (true)
or if the service is in a non-system process or is not
running (false).

7.389. dependencies

elementId: TBD
name: dependencies
dataType: string
status: current
description: Specifies the dependencies
of this service on other services.

7.390. serviceeffectiverights

elementId: TBD
name: serviceeffectiverights
dataType: list
structure: list (serviceName, trusteeSid,
standardDelete, standardReadControl, standardWriteDac,
standardWriteOwner, genericRead, genericWrite,
genericExecute, serviceQueryConf, serviceChangeConf,
serviceQueryStat, serviceEnumDependents, serviceStart,
serviceStop, servicePause, serviceInterrogate,
serviceUserDefined)
status: current
description: Stores the
effective rights of a service that a discretionary access
control list (DACL) structure grants to a specified
trustee. The trustee's effective rights are determined by
checking all access-allowed and access-denied access
control entries (ACEs) in the DACL.

7.391. trusteeSid

elementId: TBD
name: trusteeSid
dataType: string
status: current
description: Specifies the SID that is associated with a user, group, system, or program (such as a Windows service).

7.392. serviceQueryConf

elementId: TBD
name: serviceQueryConf
dataType: boolean
status: current
description: Specifies whether or not permission is granted to query the service configuration.

7.393. serviceChangeConf

elementId: TBD
name: serviceChangeConf
dataType: boolean
status: current
description: Specifies whether or not permission is granted to change service configuration.

7.394. serviceQueryStat

elementId: TBD
name: serviceQueryStat
dataType: boolean
status: current
description: Specifies whether or not permission is granted to query the service control manager about the status of the service.

7.395. serviceEnumDependents

elementId: TBD
name: serviceEnumDependents
dataType: boolean
status: current
description: Specifies whether or not permission is granted to query for an enumeration of all the services dependent on the service.

[7.396.](#) serviceStart

elementId: TBD
name: serviceStart
dataType: boolean
status: current
description: Specifies whether or not
permission is granted to start the service.

[7.397.](#) serviceStop

elementId: TBD
name: serviceStop
dataType: boolean
status: current
description: Specifies whether or not
permission is granted to stop the service.

[7.398.](#) servicePause

elementId: TBD
name: servicePause
dataType: boolean
status: current
description: Specifies whether or not
permission is granted to pause or continue the service.

[7.399.](#) serviceInterrogate

elementId: TBD
name: serviceInterrogate
dataType: boolean
status: current
description: Specifies whether or not permission is granted to
request the service to report its status immediately.

[7.400.](#) serviceUserDefined

elementId: TBD
name: serviceUserDefined
dataType: boolean
status: current
description: Specifies whether or
not permission is granted to specify a user-defined
control code.

7.401. sharedresourceauditedpermissions

elementId: TBD
name: sharedresourceauditedpermissions
dataType: list
structure: list (netname, trusteeSid, standardDelete, standardReadControl, standardWriteDac, standardWriteOwner, standardSynchronize, accessSystemSecurity, genericRead, genericWrite, genericExecute, genericAll)
status: current
description: Stores the audited access rights of a shared resource that a system access control list (SACL) structure grants to a specified trustee. The trustee's audited access rights are determined checking all access control entries (ACEs) in the SACL.

7.402. netname

elementId: TBD
name: netname
dataType: string
status: current
description: Specifies the name associated with a particular shared resource.

7.403. sharedresourceeffectiverights

elementId: TBD
name: sharedresourceeffectiverights
dataType: list
structure: list (netname, trusteeSid, standardDelete, standardReadControl, standardWriteDac, standardWriteOwner, standardSynchronize, accessSystemSecurity, genericRead, genericWrite, genericExecute, genericAll)
status: current
description: Stores the effective rights of a shared resource that a discretionary access control list (DACL) structure grants to a specified trustee. The trustee's effective rights are determined checking all access-allowed and access-denied access control entries (ACEs) in the DACL.

[7.404.](#) user

elementId: TBD
name: user
dataType: list
structure: list (username, enabled, group, lastLogon)
status: current
description: Specifies the groups to which a user belongs.

[7.405.](#) enabled

elementId: TBD
name: enabled
dataType: boolean
status: current
description: Represents whether the particular user is enabled or not.

[7.406.](#) lastLogon

elementId: TBD
name: lastLogon
dataType: unsigned32
status: current
description: The date and time when the last logon occurred.

[7.407.](#) groupSid

elementId: TBD
name: groupSid
dataType: string
status: current
description: Represents the SID of a particular group. If the specified user belongs to more than one group, then multiple groupSid elements are applicable. If the specified user is not a member of a single group, then a single groupSid element should be included with a status of 'does not exist'. If there is an error determining the groups that the user belongs to, then a single groupSid element should be included with a status of 'error'.

[7.408.](#) endpointType

elementId: TBD
name: endpointType
dataType: enumeration
status: current
description: The possible types of endpoint in the enterprise.
structure:
workstation; 0x1; Workstation Endpoint
printer; 0x2; Printer Endpoint
router; 0x3; Router Endpoint
tablet; 0x4; Tablet Endpoint

[7.409.](#) endpointPurpose

elementId: TBD
name: endpointPurpose
dataType: string
status: current
description: A description of how the endpoint is used within the enterprise.
Examples include end user system, and public web server.

[7.410.](#) endpointCriticality

elementId: TBD
name: endpointCriticality
dataType: string
status: current
description: An enterprise-defined rating which indicates the criticality of the endpoint. The rating should be specific enough to assess the impact to the overall enterprise if the endpoint is attacked or lost.

[7.411.](#) ingestTimestamp

elementId: TBD
name: ingestTimestamp
dataType: dateTimeSeconds
status: current
description: The point in time that the description of a vulnerability was received by the enterprise.

[7.412.](#) vulnerabilityVersion

elementId: TBD
name: vulnerabilityVersion
dataType: string
status: current
description: The version or iteration of the vulnerability description information (reported by the author, if applicable).

[7.413.](#) vulnerabilityExternalId

elementId: TBD
name: vulnerabilityExternalId
dataType: string
status: current
description: An external or third-party ID assigned to the vulnerability description. This could be multiple IDs in some cases (e.g., vendor bug ID, global ID, discoverer's local ID, third-party vulnerability database ID, etc.).

[7.414.](#) vulnerabilitySeverity

elementId: TBD
name: vulnerabilitySeverity
dataType: string
status: current
description: The severity of the vulnerability (reported by the author, if applicable).

[7.415.](#) assessmentTimestamp

elementId: TBD
name: assessmentTimestamp
dataType: dateTimeSeconds
status: current
description: The point in time that the assessment was performed against an endpoint.

[7.416.](#) vulnerableSoftware

elementId: TBD
name: vulnerableSoftware
dataType: list
status: current
description: A listing of software products
 installed on the endpoint which are
 known to have vulnerabilities.
structure: list(softwareInstance*)

7.417. endpointVulnerabilityStatus

elementId: TBD
name: endpointVulnerabilityStatus
dataType: enumeration
status: current
description: Overall vulnerability status of an
 enterprise endpoint.
structure: Pass; 0x1; Endpoint passed the
 vulnerability test(s).
 Fail; 0x2; Endpoint failed the
 vulnerability test(s).

7.418. vulnerabilityDescription

elementId: TBD
name: vulnerabilityDescription
dataType: string
status: current
description: A human-readable description of the
 vulnerability.

8. Acknowledgements

Many of the specifications in this document have been developed in a public-private partnership with vendors and end-users. The hard work of the SCAP community is appreciated in advancing these efforts to their current level of adoption.

Over the course of developing the initial draft, Brant Cheikes, Matt Hansbury, Daniel Haynes, Scott Pope, Charles Schmidt, and Steve Venema have contributed text to many sections of this document.

9. IANA Considerations

This document specifies an initial set of Information Elements for SACM in [Section 7](#). An Internet Assigned Numbers Authority (IANA) registry will be created and populated with the Information Elements in [Section 7](#). New assignments for SACM Information Elements will be administered by IANA through Expert Review [[RFC2434](#)]. The designated experts MUST check the requested Information Elements for completeness and accuracy of the submission with respect to the template and requirements expressed in [Section 4](#) and [Section 4.1](#). Requests for Information Elements that duplicate the functionality of existing Information Elements SHOULD be declined. The smallest available Information Element identifier SHOULD be assigned to a new Information Element. The definition of new Information Elements MUST be published using a well-established and persistent publication medium.

10. Security Considerations

Posture Assessments need to be performed in a safe and secure manner. In that regard, there are multiple aspects of security that apply to the communications between components as well as the capabilities themselves. This information model only contains an initial listing of items that need to be considered with respect to security and will need to be augmented as the model continues to be developed.

Security considerations include:

Authentication: Every SACM Component and asset needs to be able to identify itself and verify the identity of other SACM Components and assets.

Confidentiality: Communications between SACM Components need to be protected from eavesdropping or unauthorized collection. Some communications between SACM Components and assets may need to be protected as well.

Integrity: The information exchanged between SACM Components needs to be protected from modification. Some exchanges between assets and SACM Components will also have this requirement.

Restricted Access: Access to the information collected, evaluated, reported, and stored should only be viewable and consumable to authenticated and authorized entities.

Considerations with respect to the operational aspects of collection, evaluation, and storage security automation information can be found in [Section 11](#).

Considerations concerning the privacy of security automation information can be found in [Section 12](#).

11. Operational Considerations

The following sections outline a series of operational considerations for SACM deployments within an organization. This section may be expanded to include other considerations as the WG gains additional operational experience with SACM deployments and extending the information model.

11.1. Endpoint Designation

In order to successfully carry out endpoint posture assessment, it is necessary to be able to identify the endpoints on a network and track the changes to them over time. Specifically, enabling SACM Components to:

- o Tell whether two endpoint attribute assertions concern the same endpoint
- o Respond to compliance measurements, for example by reporting, remediating, and quarantining (SACM does not specify these responses, but SACM exists to enable them).

Ideally, every endpoint would be identified by a unique identifier present on the endpoint, but, this is complicated due to different factors such as the variety of endpoints on a network, the ability of tools to reliably access such an identifier, and the ability of tools to correlate disparate identifiers. As a result, it is necessary for an endpoint to be identified by a set of attributes that uniquely identify it on a network. The set of attributes that uniquely identify an endpoint on a network will likely vary by organization; however, there are a number of properties to consider when selecting identifying attributes as some are better suited for identification purposes than others.

Multiplicity: Is the attribute typically associated with a single endpoint or with multiple endpoints? If the attribute is associated with a single endpoint, it is better for identifying an endpoint on a network.

Persistence: How likely is the attribute to change? Does it never change? Does it only change when the endpoint is reprovisioned? Does it only change due to an event? Does it change on an ad-hoc and often unpredictable basis? Does it constantly change? The less likely it is for an attribute to

change over time, the better it is for identifying an endpoint on a network.

Immutability: How difficult is it to change the attribute? Is the attribute hardware rooted and never changes? Can the attribute be changed by a user/process with the appropriate access? Can the attribute be changed without controlled access. The less likely an attribute is to change over time, the better chance it will be usable to identify an endpoint over time.

Verifiable: Can the attribute be corroborated? Can the attribute be externally verified with source authentication? Can the attribute be externally verified without source authentication? Is it impossible to externally verify the attribute. Attributes that can be externally verified are more likely to be accurate and are better for identifying endpoints on a network.

With that said, requiring SACM Components and end users to constantly refer to a set of attributes to identify an endpoint, is particularly burdensome. As a result, SACM supports the concept of a target endpoint label which associates an identifier (unique to a SACM domain) with the set of attributes used by an organization to identify endpoints on a network. Once defined for an endpoint, the target endpoint label can be used in place of the set of identifying attributes.

11.2. Timestamp Accuracy

An organization will likely have different collectors deployed across the network that will be configured to collect posture attributes on varying frequencies (periodic, ad-hoc, event-driven, on endpoint, off endpoint, etc.). Some collectors will detect changes as soon as they occur whereas others will detect them at a later point during a periodic scan or when an event has triggered the collection of posture attributes. Furthermore, some changes will be detected on the endpoint and others will be observed off of the endpoint. As a result of these differences, the accuracy of the timestamp associated with the collected information will vary. For example, if a collector is only running once every 12 hours, the change probably happened at some point in time prior to the scan and the timestamp is likely not accurate. Due to this, it is important for system administrators to determine if the accuracy of a timestamp is good enough for their intended purposes.

12. Privacy Considerations

In the IETF, there are privacy concerns with respect to endpoint identity and monitoring. This is especially true when the activity on an endpoint can be linked to a particular person. For example, by correlating endpoint attributes such as usernames, certificates, etc. with browser activity, it may be possible to gain insight in to user behavior and trends beyond what is required to carry out endpoint posture assessments. In the hands of the wrong person, this information could be used to negatively influence a user's behavior or to plan attacks against the organization's infrastructure.

As a result, SACM data models should incorporate a mechanism by which an organization can designate which endpoint attributes are considered sensitive with respect to privacy. This will allow SACM Components to handle endpoint attributes in a manner consistent with the organization's privacy policies. Furthermore, organization's should put the proper mechanism in place to ensure endpoint attributes are protected when transmitted, stored, and accessed to ensure only authorized parties are granted access.

It should also be noted that some of this is often mitigated by organizational policies that require a user of an organization's network to consent to some level of monitoring in return for access to the network and other resources. The information that is monitored and collected will vary by organization and further highlights the need for a mechanism by which an organization can specify what constitutes privacy sensitive information for them.

13. References

13.1. Normative References

- [PEN] Internet Assigned Numbers Authority, "Private Enterprise Numbers", July 2016, <<https://www.iana.org/assignments/enterprise-numbers/enterprise-numbers>>.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<http://www.rfc-editor.org/info/rfc2119>>.

13.2. Informative References

- [I-D.ietf-sacm-requirements] Cam-Winget, N. and L. Lorenzin, "Secure Automation and Continuous Monitoring (SACM) Requirements", [draft-ietf-sacm-requirements-01](#) (work in progress), October 2014.

[I-D.ietf-sacm-terminology]

Waltermire, D., Montville, A., Harrington, D., and N. Cam-Winget, "Terminology for Security Assessment", [draft-ietf-sacm-terminology-05](#) (work in progress), August 2014.

[RFC2434] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", [RFC 2434](#), DOI 10.17487/RFC2434, October 1998, <<http://www.rfc-editor.org/info/rfc2434>>.

[RFC3580] Congdon, P., Aboba, B., Smith, A., Zorn, G., and J. Rouse, "IEEE 802.1X Remote Authentication Dial In User Service (RADIUS) Usage Guidelines", [RFC 3580](#), DOI 10.17487/RFC3580, September 2003, <<http://www.rfc-editor.org/info/rfc3580>>.

[RFC4949] Shirey, R., "Internet Security Glossary, Version 2", FYI 36, [RFC 4949](#), DOI 10.17487/RFC4949, August 2007, <<http://www.rfc-editor.org/info/rfc4949>>.

[RFC5209] Sangster, P., Khosravi, H., Mani, M., Narayan, K., and J. Tardo, "Network Endpoint Assessment (NEA): Overview and Requirements", [RFC 5209](#), DOI 10.17487/RFC5209, June 2008, <<http://www.rfc-editor.org/info/rfc5209>>.

[RFC7012] Claise, B., Ed. and B. Trammell, Ed., "Information Model for IP Flow Information Export (IPFIX)", [RFC 7012](#), DOI 10.17487/RFC7012, September 2013, <<http://www.rfc-editor.org/info/rfc7012>>.

[RFC7632] Waltermire, D. and D. Harrington, "Endpoint Security Posture Assessment: Enterprise Use Cases", [RFC 7632](#), DOI 10.17487/RFC7632, September 2015, <<http://www.rfc-editor.org/info/rfc7632>>.

[Appendix A](#). Change Log

[A.1](#). Changes in Revision 01

Added some proposed normative text.

For provenance:

Added a class "Method"

Added the produced-using relationship between an AVP and a method

Added the produced-by relationship between a Guidance and a SACM Component

Added the hosted-by relationship between a SACM Component and an Endpoint

asserted-by and summarized-by have been renamed to produced-by.

"User" is now "Account". If a user has different credentials, SACM cannot know that they belong to the same user. But, per Kim W, many organizations do have accounts that associate credentials.

The multiplicity of the based-on relationships has been corrected.

More relationships now have labels, per UML convention.

The diagram no longer has causal arrow. They had become redundant and were nonstandard and clutter.

Renamed "credential" to "identity", following industry usage. A credential includes proof, such as a key or password. A username or a distinguished name is called an "identity".

Removed Session, because an endpoint's network activity is not SACM's initial focus

Removed Authorization, for the same reason

Added many-to-many relationship between Hardware Component and Endpoint, for clarity

Added many-to-many relationship between Software Component and Endpoint, for clarity

Added "contains" relationship between Network Interface and Network Interface

Removed relationship between Network Interface and Account. The endpoint knows the identity it used to gain network access. The PDP also knows that. But they probably do not know the account.

Added relationship between Network Interface and Identity. The endpoint and the PDP will typically know the identity.

Made identity-to-account a many-to-one relationship.

A.2. Changes in Revision 02

Added Section Identifying Attributes.

Split the figure into Figure Model of Endpoint and Figure Information Elements.

Added Figure Information Elements Take 2, proposing a triple-store model.

Some editorial cleanup

A.3. Changes in Revision 03

Moved [Appendix A.1](#), [Appendix A.2](#), and Mapping to SACM Use Cases into the Appendix. Added a reference to it in [Section 1](#)

Added the [Section 4](#) section. Provided notes for the type of information we need to add in this section.

Added the [Section 6](#) section. Moved sections on Endpoint, Hardware Component, Software Component, Hardware Instance, and Software Instance there. Provided notes for the type of information we need to add in this section.

Removed the Provenance of Information Section. SACM is not going to solve provenance rather give organizations enough information to figure it out.

Updated references to the Endpoint Security Posture Assessment: Enterprise Use Cases document to reflect that it was published as an RFC.

Fixed the formatting of a few figures.

Included references to [[RFC3580](#)] where RADIUS is mentioned.

A.4. Changes in Revision 04

Integrated the IPFIX [[RFC7012](#)] syntax into [Section 4](#).

Converted many of the existing SACM Information Elements to the IPFIX syntax.

Included existing IPFIX Information Elements and datatypes that could likely be reused for SACM in [Section 7](#) and [Section 4](#) respectively.

Removed the sections related to reports as described in <https://github.com/sacmwg/draft-ietf-sacm-information-model/issues/30>.

Cleaned up other text throughout the document.

A.5. Changes in Revision 05

Merged proposed changes from the I-D IM into the WG IM (<https://github.com/sacmwg/draft-ietf-sacm-information-model/issues/41>).

Fixed some formatting warnings.

Removed a duplicate IE and added a few IE datatypes that were missing.

A.6. Changes in Revision 06

Clarified that the SACM statement and content-element subjects are conceptual and that they do not need to be explicitly defined in a data model as long as the necessary information is provided.

Updated the IPFIX syntax used to define Information Elements. There are still a couple of open issues that need to be resolved.

Updated some of the Information Elements contained in [Section 7](#) to use the revised IPFIX syntax. The rest of the Information Elements will be converted in a later revision.

Performed various clean-up and refactoring in [Sections 6](#) and [7](#). Still need to go through [Section 8](#).

Removed appendices that were not referenced in the body of the draft. The text from them is still available in previous revisions of this document if needed.

A.7. Changes in Revision 07

Made various changes to the IPFIX syntax based on discussions at the IETF 96 Meeting. Changes included the addition of a structure property to the IE specification template, the creation of an enumeration datatype, and the specification of an IE naming convention.

Provided text to define Collection Guidance, Evaluation Guidance, Classification Guidance, Storage Guidance, and Evaluation Results.

Included additional IEs related to software, configuration, and the vulnerability assessment scenario.

Added text for the IANA considerations, security considerations, operational considerations, and privacy considerations sections.

Performed various other editorial changes and clean-up.

A.8. Changes in Revision 08

Clarified text that describes subjects and attributes.

Clarified text that describes SACM Statements and Content Elements.

Removed stray metadata property fields from the definitions of several IEs.

Specified a syntax for defining category IEs.

Added an anyCategory IE that represents any IE in the IM.

Fixed several errors reported by the Travis-CI continuous integration service.

Performed various other editorial changes and clean-up.

A.9. Changes in Revision 09

Added "derived", "authority", and "verified" to the collectionTaskType IE (<https://github.com/sacmwg/draft-ietf-sacm-information-model/issues/18>).

Updated IE examples that use content-type to use statement-type (<https://github.com/sacmwg/draft-ietf-sacm-information-model/issues/56>).

Added "networkZoneLocation", "layer2NetworkLocation", and "layer3NetworkLocation" IEs (<https://github.com/sacmwg/draft-ietf-sacm-information-model/issues/9>).

Created a softwareClass attribute IE and added it to the softwareInstance subject IE. Also, removed the os* attribute IEs (<https://github.com/sacmwg/draft-ietf-sacm-information-model/issues/10>).

A.10. Changes in Revision 10

Added several IEs necessary for the SACM Vulnerability Assessment Scenario (<https://github.com/sacmwg/draft-ietf-sacm-information-model/issues/43>).

Fixed various typos and formatting issues.

Authors' Addresses

David Waltermire (editor)
National Institute of Standards and Technology
100 Bureau Drive
Gaithersburg, Maryland 20877
USA

Email: david.waltermire@nist.gov

Kim Watson
United States Department of Homeland Security
DHS/CS&C/FNR
245 Murray Ln. SW, Bldg 410
MS0613
Washington, DC 20528
USA

Email: kimberly.watson@hq.dhs.gov

Clifford Kahn
Pulse Secure, LLC
2700 Zanker Road, Suite 200
San Jose, CA 95134
USA

Email: cliffordk@pulsesecure.net

Lisa Lorenzin
Pulse Secure, LLC
2700 Zanker Road, Suite 200
San Jose, CA 95134
USA

Email: llorenzin@pulsesecure.net

Michael Cokus
The MITRE Corporation
903 Enterprise Parkway, Suite 200
Hampton, VA 23666
USA

Email: msc@mitre.org

Daniel Haynes
The MITRE Corporation
202 Burlington Road
Bedford, MA 01730
USA

Email: dhaynes@mitre.org

Henk Birkholz
Fraunhofer SIT
Rheinstrasse 75
Darmstadt 64295
Germany

Email: henk.birkholz@sit.fraunhofer.de

