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Common Intrusion Detection Signatures Standard

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Abstract

The purpose of the Common Intrusion Detection Signatures Standard (CIDSS) is to define a common data format for storing signatures from different intrusion detection systems.

This Internet-Draft describes a common data format to represent information contained in signatures of intrusion detection systems, and explains the rationale for using this common format. The proposed format is a dialect of the Extensible Markup Language (XML). An XML Document Type Definition is developed, and examples are provided.

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Conventions used in this document

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].

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1.
Introduction

1.1
About CIDSS

Common Intrusion Detection Signatures Standard is intended to be a standard format of signatures used widely in Network Intrusion Detection Systems (NIDS). An IDS is controlled by a set of decision rules. A decision rule of an IDS is composed of two components: a description of specific characteristics of an intrusion attempt (a signature) and an action that has to be carried out when the data provided by IDS sensors matches the signature. This document focuses on the remaining part of an IDS decision rule: the IDS signature.

Currently, every IDS uses a different format of signatures. CIDSS defines a common format of signatures that attempts to express all information contained in signatures of various IDS. The CIDSS signature format is based on XML to facilitate the adaptation and applications of the proposed standard. The CIDSS signature format is designed to be extensible, and therefore it SHOULD be simple to incorporate features of future and current IDS systems that have not been taken into account in the first design.

The main goal of CIDSS is to enable administrators of IDS systems to share, compare, evaluate and criticize signatures used to detect intrusion events. The increasingly dynamic, global, and frequent nature of intrusion attempts is a trend that forces administrators to greater efforts to protect increasingly valuable information. The possibility to disseminate knowledge and experience about IDS

systems' operation would be enhanced by the introduction of a common signature format. Therefore the use of a common IDS signature format SHOULD lead to a greater security of information. Other possible applications of CIDSS will be discussed in the next section.

CIDSS Homepage: <http://cidss.b59.net>

1.2

Potential Applications of CIDSS

One of the main applications of CIDSS is the translation of signatures between various IDS. The ability to translate a signature of an IDS into the common data format and to carry out a reverse translation implies that it SHOULD be possible to translate signatures of different IDS using the common data format as an intermediate form. The development of this standard has been carried out in parallel with the development of an IDS signature translator. Currently, the translator is able to translate signatures of Snort [[SNORTman](#)] and Dragon [[DRAGON](#)] IDS into the common format, and among the three systems. It's also partially tested with: Shoki [[SHOKIug](#)], ISS RealSecure(TM) [[ISSdoc](#)], and Cisco NetRanger(TM) [[CISCOdoc](#)].

The IDS translator is developed under the GNU General Public License and is available from <http://translator.b59.net>.

Another possible application of CIDSS would be the creation and maintenance of signature databases by independent providers of IDS signatures. The use of XML as a base for the common signature format enables a simple integration of collections of signatures into a database. This SHOULD improve the searching and management of a signature collection. The business model of an independent signature provider could be the delivery of up-to-date, comprehensive signature collections to increase security of specific services, systems and platforms.

```
-----  
|           First part of a signature           |  
| <Sources>...</Sources>                        |<-----|--|  
| <Destinations>...</Destinations>             |<-----|--|
```

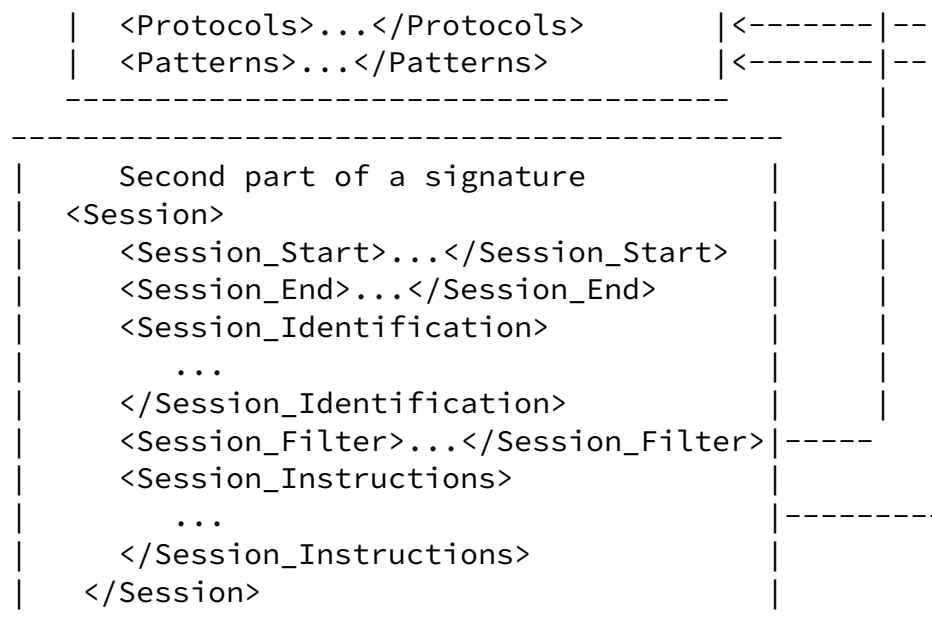


Figure 1. The main components and logical structure of a CIDSS signature

2.

XML CIDSS Signatures

This section describes the logical and structural rules for creating signatures in CIDSS format. Each XML element and attribute used in the CIDSS format are described and explained on examples. In [appendix A](#), a full CIDSS signature is provided that has been used to provide the examples used in this section.

CIDSS meets XML ver. 1.0 requirements [[XML10](#)]. CIDSS is defined as a

dialect of XML using the XML Schema Definition (XSD). The schema of CIDSS is an appendix to this document (see [appendix B](#): CIDSS XSD schema. cidss.xsd)

2.1

Structure of a CIDSS document

A CIDSS document is a collection of signatures. Each signature is independent, and can be stored in a separate CIDSS document or together with other signatures. The main XML element of a CIDS document is the "Signatures" element.

2.2

Structure of a CIDSS signature

A CIDSS signature is composed of several XML elements, contained in a common "Signature" element. A signature can be divided into two basic, logical parts. The first part, that includes (among others) the elements "Sources", "Destinations", "Protocols" and "Patterns", is used to define building blocks of a signature definition. These blocks are combined in the second part of a signature, and are kept separate in order to shorten the signature definition and avoid redundancy. For instance, the definition of relevant information about the TCP protocol might be kept inside the "Protocols" element and might be later combined with several patterns (defined inside the "Patterns" element). Rather than repeat the definition of the TCP protocol each time a new pattern is used, the signature definition will refer to the information kept inside the "Protocols" element. The second part of a signature contains information on how to use the building blocks defined in the first part. The main XML element of the second part of a signature is the "Session" element. A "Session" element defines the main signature behavior. A signature MAY use state managed by the IDS for a certain flow of packets (or session). However, it is possible to create stateless signatures, by omitting information REQUIRED for the state mechanisms to work. Then, the information contained in a "Session" element defines the conditions that MUST be fulfilled by sensor data in order to trigger the signature.

In the second part of a signature, the information contained in the first part is combined using logical expressions. Each element in the first part of a signature that contains a "building block" for the signature definition MUST have an identifier that is unique in the signature (not necessarily in the CIDSS document that contains the signature). This identifier can be used in the second part of a signature to refer to the "building block" defined by this element. The building blocks MAY be combined using logical expressions that are constructed by the "AND" and "OR" operators. The logical expressions are contained in special tags, and are treated as strings by the XML parser. CIDSS logical expressions are described in [section 2.4](#).

When the content of element contain "<" (less than), ">" (greater than), "&" (ampersand), "'" (apostrophe) or "\"" (quotation mark) signs, it MUST be put into CDATA section. A CDATA section starts with "<![CDATA[" and ends with "]]>".

Only the characters "<" and "&" are strictly illegal in XML.

Apostrophes, quotation marks and greater than signs are legal, but it is a good habit to replace them.

Note: A CDATA section cannot contain the string "]]>"

2.3

Data types used by the Pattern_Content element

The data types used in CIDSS signatures are compatible with the XML[XML10] and XML Schema (XSD) [[XSD](#)] specification. The following data types are supported:

- String values

You MUST use encoding defined by "encoding" attribute (e.g. <?xml version="1.0" encoding="UTF-8" ?>). UTF-8 RECOMMENDED. Refer to [Appendix A](#) and [Appendix B](#)

- Hexadecimal values

- Decimal values

2.4

Logical expressions used in CIDSS signature definitions

Some elements in the CIDSS signature contain information that describes how other elements MUST be combined in the signature definitions. The content of these elements is a String value that contains a logical expression. A translating software MUST be able to process these expressions.

CIDSS logical expressions MUST use operators "AND", "OR", and "NOT" (uppercase). The operators are interpreted as follows:

- AND - logical conjunction

- OR - logical alternative
- NOT - logical negation

The operator precedence in CIDSS logical expressions MUST be interpreted as follows: NOT precedes AND precedes OR. CIDSS logical expressions MAY contain ordinary braces "(" or ")" that are interpreted as in logical expressions. Apart from braces and operators, CIDSS logical expressions MUST contain unique identifiers of other XML elements in the CIDSS signature definition that MAY be used in logical expressions.

2.5

XML elements and attributes used in CIDSS

In this section, all XML elements defined by the CIDSS standard SHALL be introduced. Each element will be defined using a common template to simplify a presentation. This template is explained below:

Element name

Element description.

Presence: [mandatory | optional, single | multiple]

Location: element name

Attributes: attribute name [type [, unique]]

Contained elements: element names

mandatory - means that the element MUST exist in the signature

optional - the element MAY exist in the signature

single - if the element exists in the signature, then this element MUST exist in exactly one instance

multiple - if the element exists in the signature, then this element MAY exist many instances

unique - value of the element MUST NOT be repeated as value of the same element in other place

2.5.1

Signatures

A root element of a CIDSS XML document.

Presence: mandatory, single

Location: root element

Contained elements: Signature [multiple, mandatory]

Example:

```
<Signatures xsi:noNamespaceSchemaLocation="<schema_file.xsd>"\
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
```

where "<schema_file.xsd>" SHOULD be replaced by the filename of the XSD schema file (e.g. cidss.xsd)

2.5.2

Signature

This element contains all information about a signature. Describes conditions required to identify traffic as suspicious and to take an action.

Presence: mandatory

Location: element Signatures

Attributes: SID [type: integer, single, mandatory, unique]

Contained elements: Enabled [single, mandatory], Sig_Source [single, optional], Description [single, optional], Action [single, optional],

Protocols [single, mandatory], Sources [single, mandatory], Destinations [single, mandatory], Patterns [single, mandatory], Logged_Packets [single, optional], Message [single, mandatory], Comment [multiple, optional], Session [single, mandatory]
Example: See [Appendix A](#)

Enabled

Defines a current signature state. Setting this to true, the signature will be analyzed by the IDS. Otherwise the signature SHOULD be skipped.

Presence: mandatory

Type: Boolean

Default value: true

Location: element Signature

Example: <Enabled>true</Enabled>

Sig_Source

Optional element for use in translators. Specifies the IDS from which the signature was translated or ported. This element SHOULD contain string that identifies a signature source.

Presence: optional, single

Type: String

Location: element Signature

Example: <Sig_Source>Snort</Sig_Source>

Description

This element MAY contain a simple description of the signature.

Presence: optional

Type: String
Location: element Signature
Example: <Description>Try to get passwd file using ftp</Description>

Action

This MAY define actions performed by an IDS after intrusion detection
Suggested values: drop, allow, alert, and warning

Presence: optional, single
Type: String
Location: element Signature
Example: <Action>alert</Action>

2.5.3

Protocols

This element contains description of multiple protocols used in potential attack.

Location: Signature
Presence: mandatory, multiple
Attributes: ID[integer,unique]

Protocol

The element used to describe the network protocol. Options of the protocol used in this element depend on a protocol type.
The Proto_ID attribute is used for identification in the Proto_Logic element - it is REQUIRED only when there is more than one Protocol in the Protocols element.

Presence: mandatory, multiple.

Type: String

Attributes: Proto_ID [integer, unique], Type [enum: tcp, udp, ip, icmp, application]

Location: element Signature

Contained elements: TCP_Ack [single, optional], TCP_State [single, optional], TCP_Seq [single, optional], TCP_Dsize [single, optional], TCP_Flags [single, optional], TCP_Window [single, optional], UDP_Dsize [single, optional], ICMP_Dsize [single, optional], ICMP_Icmp_Id [single, optional], ICMP_Icmp_Seq [single, optional], ICMP_Icode [single, optional], ICMP_Itype [single, optional], IP_Ttl [single, optional], IP_Tos [single, optional], IP_Ipopts [single, optional], IP_Fragbits [single, optional], IP_Id [single, optional], IP_Ip_Proto [single, optional], IP_Dsize [single, optional], Isdataat [single, optional], Rpc [single, optional]

Isdataat

Checks that the data fields in the packet are in the specified offset. When the content of this element contain "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Allowed values: Integer or <integer (less than a given value) or >integer (more than a given value)

Location: Protocol

Presence: single, optional

Example: <Isdataat><![CDATA[<5]]></Isdataat>

Rpc

This element specifies the RPC application, version, and procedure numbers in SUNRPC call requests. It MUST contain a string in the following format:

Allowed format: <Rpc><application number>, [<version number>|*], [<procedure number>|*]></Rpc>

Location: Protocol, Type=="Application"

Presence: single, optional

Type: String

Example: <Rpc>100000,*,3</Rpc>

TCP_Ack

Checks the specific TCP ack number

Location: Protocol, Type=="TCP"

Presence: single, optional

Type: integer

Example: <TCP_Ack>0</TCP_Ack>

TCP_Seq

Checks the specific TCP seq number

Location: Protocol, Type=="TCP"

Presence: single, optional

Type: integer

Example: TCP_Seq>0</TCP_Seq>

TCP_State

Describes current protocol state e.g. established, stateless

Location: Protocol, Type=="TCP"

Allowed values: [established|stateless]

Presence: single, optional

Type: string

Example: <TCP_State>established</TCP_State>

TCP_Flags

Check if the specific TCP Flags are present

Location: Protocol, Type=="TCP"

Allowed values: [!|*|+][FSRPAU120]

Values description: F-FIN, S-SYN, R-RST, P-PSH, A-ACK, U-URG, 1-Reserved bit 1, 2-Reserved bit 2, 0-No Flags set.

Modifiers description: + - match on the specific bits, plus any others, * - match if any of the specified bits are set, ! - match if specified bits are not set

Presence: single, optional

Type: String

Example: <TCP_Flags>+SA</TCP_Flags>

TCP_Window

Checks value of the TCP window size

Location: Protocol, Type=="TCP"

Presence: single, optional

Type: integer

Example: <TCP_Window>34000</TCP_Window>

TCP_Dsize

Checks the packet data field size in TCP protocol. When the content of this element contain "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Allowed signs: <, >, <=, >=, number

Location: Protocol, Type=="TCP"

Presence: single, optional

Type: String

Example: <TCP_Dsize><![CDATA[<=40000]]></TCP_Dsize>

UDP_Dsize

Checks packet data field size in UDP protocol. When the content of this element contain "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Allowed signs: <, >, <=, >=, number

Location: Protocol, Type=="UDP"

Presence: single, optional

Type: String

Example: <UDP_Dsize><![CDATA[<=33400]]></UDP_Dsize>

ICMP_Dsize

Checks the packet data field size in ICMP protocol. When the content of this element contain "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section,

but it is not REQUIRED.

Allowed signs: <, >, <=, >=, number

Location: Protocol, Type=="ICMP"

Presence: single, optional

Type: String

Example: <ICMP_Dsize><![CDATA[>=64]]></ICMP_Dsize>

ICMP_Icmp_Id

Checks the value of specific ICMP ID

Location: Protocol, Type=="ICMP"

Presence: single, optional

Type: integer

Example: <ICMP_Icmp_Id>0</ICMP_Icmp_Id>

ICMP_Icmp_Seq

Checks the value of ICMP sequence

Location: Protocol, Type=="ICMP"

Presence: single, optional

Type: integer

Example: <ICMP_Icmp_Seq>0</ICMP_Icmp_Seq>

ICMP_Icode

Checks the value of specific ICMP code. When the content of this element contain "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Allowed signs: <, >, number

Location: Protocol, Type=="ICMP"

Presence: single, optional

Type: String

Example: <ICMP_Icode><![CDATA[>25]]></ICMP_Icode>

ICMP_Itype

Checks the value of specified ICMP type. When the content of this element contain "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Allowed signs: <, >, number

Location: Protocol, Type=="ICMP"

Presence: single, optional

Type: String

Example: <ICMP_Itype><![CDATA[>25]]></ICMP_Itype>

IP_Ttl

Specifies IP time-to-live value. When the content of this element contain "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Allowed signs: <, >, <=, >=, -, number

Location: Protocol, Type=="IP"

Presence: single, optional

Type: string

Example: <IP_Ttl>6-8<IP_Ttl> - values between 6 and 8

IP_Tos

Check the IP ToS field for specified value

Location: Protocol, Type=="IP"

Presence: single, optional

Type: integer

Example: <IP_Tos>2</IP_Tos>

IP_Fragbits

Checks fragmentations bits for the specified value

Location: Protocol, Type=="IP"

Presence: single, optional

Type: String

Example: <IP_Fragbits>DM+</IP_Fragbits>

IP_Id

Checks ID field in IP protocol for the specified value

Location: Protocol, Type=="IP"

Presence: single, optional

Type: integer

Example: <IP_Id>34222</IP_Id>

IP_Ipopts

This element checks if the specified IP option is present.

Allowed values: rr - Record route, eol - end of list, nop - no op, ts - Time Stamp, sec - IP security option, lsrr - Loose source routing, ssrr - Strict source routing, satid - Stream identifier, any - any IP options are set

Location: Protocol, Type=="IP"

Presence: single, optional

Type: String

Example: <IP_Ipopts>lsrr</IP_Ipopts>

IP_Dsize

Checks size of packet data field. When the content of this element contain "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Allowed signs: <, >, <=, >=, number
Location: Protocol, Type=="IP"
Presence: single, optional
Type: String
Example: <IP_Dsize>34000</IP_Dsize>

IP_Ip_Proto

Checks IP protocol header for the specified value. When the content of this element contain "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Allowed signs: <, >, <=, >=, number, name
Location: Protocol, Type=="IP"
Presence: single, optional
Type: String
Example: <IP_Ip_Proto>igmp</IP_Ip_Proto>

Proto_Logic

This element describes logical rules to combine the information in Protocol elements contained in one Protocols element. Logical operators in Proto Logic element are described in [section 2.4](#).

Presence: optional, single
Location: element Protocols
Example: <Proto_Logic>1 OR (2 AND 3)</Proto_Logic>

2.5.4

Sources

This element contains information that describes properties of a

source of network communications. If Sources occurs more than once, then every Sources MUST have an unique id (attribute) used in Src_Logic that defines logical dependences between each of them.

Presence: mandatory, single

Location: element Signature

Attributes: ID

Contained elements: Source[multiple, mandatory], Src_Logic [single, optional]

Example: See [Appendix A](#)

Source

This element contains descriptions of source hosts. Src_ID attribute is local (in one Sources element) id for use with the Src_Logic element.

Presence: mandatory, multiple

Location: element Sources

Attributes: Src_ID [presence: mandatory if more than one Source_ in one Sources element, type: integer, unique]

Contained elements: Source_IP[single, mandatory], Source_Port[single, optional]

Example: See [Appendix A](#)

2.5.5

Destinations

This element contains information that describes properties of a destination of network communications. If Destinations occurs more than once, then every Destination MUST have an unique id (attribute) used in Dst_Logic to define logical dependences between each of them.

Presence: mandatory, single

Location: element Signature

Contained elements: Destination [multiple, mandatory]

Example: See [Appendix A](#)

Destination

This element contains descriptions of destination hosts. Dst_ID attribute is local (in one Destinations element) id for use with the Dst_Logic element.

Presence: mandatory, multiple

Location: element Destinations

Attributes: Dst_ID [presence: mandatory if more than one Destination_ in one Destinations element, type: integer, unique]

Contained elements: Destination_IP [single, mandatory],

Destination_Port [single, optional]

Example: See [Appendix A](#)

Source_IP

This element contains an IPv4 or IPv6 network address in any notation. The value "any" means that all addresses will be considered and is an alias for 0.0.0.0 IPv4 address and ::0 for IPv6. If the value of Neg attribute is "true", then the values specified in the Source_IP element are interpreted as addresses that MUST NOT match the source address in order for the signature to apply. Mask attribute defines IP mask for current IP.

Allowed values: Any string

Attributes: Neg [presence: mandatory, type: boolean, allowed values: true|false, default: false], Mask [presence: mandatory, type: string, allowed values: mask in octet or bit notation]

Presence: mandatory, single

Type: String

Location: element Source

Example: <Source_IP Neg="false" Mask="8">\$EXTERNAL_NET</Source_IP>

Variable \$EXTERNAL_NET is defined in an IDS. (e.g.

\$EXTERNAL_NET=1.2.3.4)

Destination_IP

This element contains an IPv4 or IPv6 network address in any notation. The value "any" means that all addresses will be considered and is an alias for 0.0.0.0 IPv4 address and ::0 for IPv6. If the value of Neg attribute is "true", then the values specified in the Destination_IP element are interpreted as addresses that MUST NOT match the source address in order for the signature to apply. Mask attribute defines IP mask for current IP.

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Allowed values: Any string

Attributes: Neg [presence: mandatory, type: boolean, allowed values: true|false, default: false], Mask [presence: mandatory, type: string, allowed values: mask in octet or bit notation]

Presence: mandatory, single

Type: String

Location: element Destination

Example: Similar as in Source_IP element

Source_Port

The value of this element is a port number or range of ports expressed by two port numbers divided with a ":" sign. The "135:139" expression means that all ports between 135 and 139 will be considered, accounting ports 135 and 139. The value "any" means that all ports will be considered.

Presence: If Protocol Type is set to tcp, udp or ip then mandatory, if Protocol Type value is icmp then MUST NOT be set.

Type: String

Location: element Source

Example: <Source_Port>any</Source_Port>

Destination_Port

The value of this element is a port number or range of ports expressed by two port numbers divided with a ":" sign. The "135:139" expression means that all ports between 135 and 139 will be considered, accounting ports 135 and 139. The value "any" means that all ports will be considered.

Presence: If Protocol Type value is set to tcp, udp or ip then mandatory, if Protocol Type value is icmp then MUST NOT be set.

Type: String

Location: element Destination

Example: <Destination_Port>445</Destination_Port>

Src_Logic

Defines logical dependences between each Source description. Logical operators: (,), AND, OR

Location: Sources

Example: 2 OR (1 AND 3)

Dst_Logic

Defines logical dependences between each Destination description. Logical operators: (,), AND, OR

Location: Destinations

Example: 1 AND 2

2.5.6

Patterns

This element contains multiple Pattern elements.

Presence: single, mandatory (if Protocol is to tcp, udp, ip or application than element is present)

Location: element Signature

Contained elements: Pattern [multiple, optional]

Attributes: ID[integer, unique]

Example: See [Appendix A](#)

Pattern

This element contains information about the content of a packet that is considered as potentially dangerous. Attribute Pat_ID is used in Pat_Logic element to define logical expressions using multiple

Pattern elements

Presence: mandatory, multiple

Location: element Patterns

Contained elements: Pattern_Type [single, mandatory], Pattern_Content [single, optional], Pattern_Depth [single, optional], Pattern_Uricontent [single, optional], Pattern_Offset [single, optional], Pattern_Within [single, optional], Pattern_Distance [single, optional]

Attributes: Pat_ID [integer, unique]

Example: See [Appendix A](#)

Pattern_Type

Using CIDSS you can specify patterns in hexadecimal, decimal, or string

Presence: mandatory

Type: String

Location: element Pattern

Permitted values: "hex", "dec", "string", "pcre"

Default value: "string"

Example: <Pattern_Type>string</Pattern_Type>

Pattern_Content

Defines packet content that is interpreted as an intrusion and considered dangerous. To define the content, regular expressions can be used in the Pattern_Content element. Regular expression MUST be in the PCRE format (Perl Compatible Regular Expressions) [[PCRE](#)]. If Rawbytes attribute value is "true" it means pattern is searched in

raw packets ignoring decoding that was done by preprocessors. If Neg attribute is true, it means pattern MUST NOT contain specified value. If the content of this element contain "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Presence: mandatory, single

Attributes: CaseSensitive [allowed values: true|false, default value: true], Rawbytes [allowed values: true|false, default value: false], Neg [allowed values: true|false, default: false]

Type: Same as value of Pattern_Type

Location: element Pattern

Example: <Pattern_Content CaseSensitive="false">RETR
passwd</Pattern_Content>

Pattern_Pcre_Flags

Contains standard Perl Compatible_Regular_Expressions modifiers and Perl compatible modifiers or Snort modifiers (used for Snort compatibility)

Presence: optional, single

Location: element Pattern

Type: string

Example: <Pattern_Pcre_Flags>iRm</Pattern_Pcre_Flags>

Pattern_Depth

Defines how many bytes of the packet MUST be searched in order to find the content defined in the Pattern_Content element that is contained by the same Pattern element as this element.

Presence: optional, single

Location: element Pattern

Type: Integer

Example: <Pattern_Depth>10</Pattern_Depth>

Pattern_Uricontent

This element describes content of packet in URI format. If this element contains restricted characters (as described in [section 2.2](#)) it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Type: string

Location: Pattern

Presence: optional, single

Example:

```
<Pattern_Uricontent><![CDATA[local/apache/htdocs/]]></Pattern_Uricontent>
```

Pattern_Offset

Specifies offset in bytes from beginning of packet to search for the pattern.

Type: integer

Location: Pattern

Presence: optional, single

Example: <Pattern_Offset>5</Pattern_Offset>

Pattern_Within

Used to describe how many packets MUST be at most between two patterns.

Type: integer

Location: Pattern

Presence: optional, single

Example: <Pattern_Within>4</Pattern_Within>

Pattern_Distance

Defines how far the IDS SHOULD look into a packet for the specified pattern relative to last match.

Type: integer

Location: Pattern

Presence: optional, single

Example: <Pattern_Distance>3</Pattern_Distance>

Pat_Logic

This element describes logical rules to combine the information in Pattern elements contained in one Patterns element. Logical operators in Pat_Logic expressions SHOULD be: OR, AND, NOT (as described in [section 2.4](#)).

Presence: optional, single

Location: element Patterns

Example: <Pat_Logic>(NOT 1 AND 2) OR 3</Pat_Logic>

Logged_Packets

Number of packets logged when the system detects an intrusion

Presence: optional, single

Location: element Signature

Type: Integer

Example: <Logged_Packets>0</Logged_Packets>

Message

Contains the message generated by the IDS when a packet described by this signature was detected. If the content of this element contain "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Presence: mandatory, single

Location: element Signature

Type: String

Example: <Message>FTP password file GET request</Message>

Comment

This element MAY be used for additional comments and information about the signature. The element MAY contain additional information about signature vendor, vulnerability description, http links etc. If the content of this element contains "<" and ">" signs, it MUST be put into <![CDATA[...]]> section. In other way it MAY contain CDATA section, but it is not REQUIRED.

Presence: optional, multiple

Location: element Signature

Type: String

Example: <Comment>Vendor: Arachnids</Comment>

2.5.7

Session

Defines a session that could be identified by the signature if the state mechanisms of an IDS could be used. Otherwise, the information contained in this element describes the conditions that MUST be satisfied by the sensor data in order to trigger the signature.

Location: Signature

Presence: single, mandatory

Contained elements: Session_Filter [single, optional], Session_Start [single, optional], Session_End [single, optional], Session_Identification [single, optional], Session_Instructions [single, optional]

Session_Filter

Contains IDs of Source, Destination, Protocol and Pattern elements, combined using logical expressions in the format described in [section 2.4](#). The information contained in this element specifies the conditions that MUST be met by sensor data so that the packet will be included in this session.

Location: Session

Presence: single, optional

Allowed values: CIDSS logical expressions.

Session_Start

Contains IDs of Source, Destination, Protocol or Pattern elements, combined using logical expressions in the format described in [section 2.4](#). The information contained in this element specifies the conditions that MUST be met by sensor data so that the packet will define the beginning of a new session. All session state MUST be reset by the IDS when a new session begins.

Location: Session

Presence: single, optional

Allowed values: CIDSS logical expressions.

Session_End

Contains IDs of Source, Destination, Protocol or Pattern elements, combined using logical expressions in the format described in [section 2.4](#). The information contained in this element specifies the conditions that MUST be met by sensor data so that the packet will define the beginning of a new session.

Instead of or in addition to conditions for sensor data, this element MAY include the element Session_Timeout, that specifies a timeout for the session or MAY include Session_Pckt_Count, that defines maximum number of packets considered in current session. When both conditions are specified, then the one that is fulfilled first will terminate the session.

Location: Session

Presence: single, mandatory if the Session_Start element is present

Contained elements: Session_Timeout [single, optional],

Session_Pckt_Count [single, optional]

Session_Pckt_Count

Defines maximum number of packets that are considered during session.

Presence: single, optional

Location: Session_End

Type: Integer

Example: <Session_Pckt_Count>5</Session_Pckt_Count>

Session_Timeout

Defines a timeout for the session. The time MUST be specified in the format: an integer and a single character (the character MUST be one of: ms,s,m,h - milliseconds, seconds, minutes, hours).

Presence: optional, single

Type: String

Location: Session_End

Example: <Session_Timeout>10s</Session_Timeout>

Example description: The timeout for the session is 10 seconds.

Session_Identification

Defines additional conditions that MUST be met by sensor data so that a packet will be included in this session. These conditions apply after a session has started. For instance, a TCP session will include only the packets that have the same source and destination as the source and destination of packets that started the session. The conditions are specified by including special elements in this element.

Location: Session

Presence: single, mandatory if the Session_Start attribute is present

Contained elements: Same_Source_IP [single, optional], Same_Source_Port [single, optional], Same_Destination_IP [single, optional], Same_Destination_Port [single, optional], Same_Protocol [single, optional], Same_Direction [single, optional]

Same_Source_IP

If this element is present in Session_Identification, packets that will be included in the session MUST have the same source IP address as the starting packet.

Type: boolean
Presence: single, optional
Location: Session_Identification

Same_Source_Port

If this element is present in Session_Identification, packets that will be included in the session MUST have the same source port as the starting packet.

Type: boolean
Presence: single, optional
Location: Session_Identification

Same_Destination_IP

If this element is present in Session_Identification, packets that will be included in the session MUST have the same destination IP address as the starting packet.

Type: boolean
Presence: single, optional
Location: Session_Identification

Same_Destination_Port

If this element is present in Session_Identification, packets that will be included in the session MUST have the same destination port as the starting packet.

Type: boolean
Presence: single, optional
Location: Session_Identification

Same_Protocol

If this element is present in Session_Identification, packets that will be included in the session MUST be of the same protocol as the starting packet.

Type: boolean
Presence: single, optional
Location: Session_Identification

Same_Direction

If this element is present in Session_Identification, packets that will be included in the session MUST have been sent in the same direction as the starting packet.

Type: boolean
Presence: single, optional
Location: Session_Identification

Session_Instructions

This element works like a switch statement for the state mechanism of an IDS. The information contained in this element defines the statefull behavior of an IDS for this session. The element contains several Session_Case elements that include conditions for the case to apply, as well as instructions to be carried out if the case applies.

For efficiency reasons, it is assumed that all conditions for state instructions will be brought down into a conjunctive normal form (a logical expression that includes alternatives only at the highest level). That means that in every case element, all case conditions are treated as a logical conjunction (logical AND). This ought to simplify the processing of these instructions.

Location: Session
Presence: single, optional
Contained elements: Session_Case [multiple]

Session_Case

This element contains the conditions and instructions of a case in the switch statement that is defined by the containing Session_Instructions element. For readability, the conditions are split up into three groups: additional conditions for sensor data that MUST be satisfied so that the packet will apply to this case, the direction of the packet, and the conditions that MUST be satisfied by the state variables of a session in order for the case to apply. The instructions of a case are contained in the mandatory Case_State_Instructions element.

Location: Session_Instructions
Presence: multiple
Contained elements: Case_Filter [single, optional], Direction [single, optional], Case_State_Condition [single, optional], Case_State_Instructions [single, mandatory]

Case_Filter

Contains IDs of Source, Destination, Protocol or Pattern elements, combined using logical expressions in the format described in [section 2.4](#). The information contained in this element specifies the conditions that MUST be met by sensor data so that the packet will apply to this case.

Location: Session_Case
Presence: single, optional
Allowed values: CIDSS logical expressions.

Direction

Defines a direction of network traffic, once a source and destination of traffic are specified (e.g. after the start of a session). Allowed values are: "sd" and "ds". If direction value is "sd" it means that the packet has been sent from source to destination. If the value of this element is "ds" it means that traffic goes from destination to source.

Allowed values: sd|ds
Default value: sd
Location: Session_Case
Presence: single, optional

Case_State_Condition

This element contains conditional state expressions that MUST all be satisfied (evaluate to a boolean value of "true") in order for the case to apply. These instructions MAY check the values of state variables stored by the IDS for this session.

Location: Session_Case
Presence: single, optional
Contained elements: Isset_Var, Compare_Var

Case_State_Instructions

This element contains state instructions that MUST all be sequentially carried out by the IDS if the case applies. These instructions MAY set, unset or modify the values of state variables stored by the IDS for this session.

Location: Session_Case
Presence: single, optional
Contained elements: Set_Var, Unset_Var, Isset_Var, IsNotset_Var, Compare_Var, Toggle_Var

Isset_Var

A conditional state expression that evaluates to a boolean value of "true" if the variable of a name that is specified in the "var" attribute is set in the state of this session.

Location: Case_State_Condition
Presence: multiple, optional
Attributes: var [type: string; single, mandatory]

Isnotset_Var

A conditional state expression that evaluates to a boolean value of "true" if the variable of a name that is specified in the "var" attribute is not set in the state of this session.

Location: Case_State_Condition

Presence: multiple, optional

Attributes: var [type: string; single, mandatory]

Compare_Var

Location: Case_State_Condition

Presence: multiple, optional

Attributes: var [type: string; single, mandatory], value [type: string; single, mandatory]

Set_Var

Sets value of "var" attribute in state of particular session.

Location: Case_State_Instructions

Presence: multiple, optional

Attributes: var [type: string; single, mandatory], value [type: string; single, mandatory]

Unset_Var

Nullifies value of "var" used in this session.

Location: Case_State_Instructions

Presence: multiple, optional

Attributes: var [type: string; single, mandatory]

Toggle_Var

Toggle value of "var" attribute in state of particular session. Set the specified state if the state is unset, otherwise unsets the state if the state is set.

Location: Case_State_Instructions
Presence: multiple, optional
Attributes: var [type: string; single, mandatory], value [type: string; single, mandatory]

3.

Security Considerations

This Internet Draft describes the CIDSS format for storing information about IDS signatures. The applications of this standard can raise security concerns, but there is no security concerns related strictly to the document format.

It is RECOMMENDED that a system for storing CIDSS data SHOULD be protected against unauthorized access and unauthorized use. The means for achieving this protection are outside the scope of this document.

Appendix A

XML CIDSS Document Example

Here we present a sample signature in CIDSS format. Elements of this signature have been used as examples in the previous sections. (This [appendix](#) MAY NOT be compatible with Internet Draft formatting).

```
<?xml version="1.0" encoding="utf-8" ?>
<Signatures xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="cidss.xsd">
  <Signature SID="1">
    <Enabled>true</Enabled>
    <Sig_Source>snort</Sig_Source>
    <Action>alert</Action>
    <Description>NETBIOS SMB-DS DCERPC Remote Activation bind attempt;
sid=2252</Description>
    <Message>NETBIOS SMB-DS DCERPC Remote Activation bind
attempt</Message>
    <Comment>reference: cve,CAN-2003-0528</Comment>
    <Comment>reference: cve,CAN-2003-0605</Comment>
    <Comment>reference: cve,CAN-2003-0715</Comment>
```

```

    <Comment>reference:
url,www.microsoft.com/technet/security/bulletin/MS03-
039.aspx</Comment>
    <Sources ID="1">
        <Source Src_ID="1">
            <Source_IP neg="false" mask="0">any</Source_IP>
            <Source_Port>any</Source_Port>
        </Source>
        <Source Src_ID="2">
            <Source_IP neg="true" mask="8">10.0.0.0</Source_IP>
            <Source_Port>any</Source_Port>
        </Source>
        <Source Src_ID="3">
            <Source_IP neg="true" mask="24">192.168.1.0</Source_IP>
            <Source_Port>any</Source_Port>
        </Source>
        <Src_Logic>1 AND 2 AND 3</Src_Logic>
    </Sources>
    <Destinations ID="2">
        <Destination Dst_ID="1">
            <Destination_IP neg="false" mask="0">any</Destination_IP>
            <Destination_Port>445</Destination_Port>
        </Destination>
        <Destination Dst_ID="2">
            <Destination_IP neg="true"
mask="24">192.168.1.0</Destination_IP>
            <Destination_Port>445</Destination_Port>
        </Destination>

```

```

        <Destination Dst_ID="3">
            <Destination_IP neg="true"
mask="8">10.0.0.0</Destination_IP>
            <Destination_Port>445</Destination_Port>
        </Destination>
        <Dst_Logic>1 AND 2 AND 3</Dst_Logic>
    </Destinations>
    <Protocols ID="3">
        <Protocol Proto_ID="1" Type="tcp">
            <TCP_State>established</TCP_State>
        </Protocol>
        <Proto_Logic>1</Proto_Logic>
    </Protocols>
    <Patterns ID="4">

```

```

    <Pattern Pat_ID="1">
      <Pattern_Type>string</Pattern_Type>
      <Pattern_Content
CaseSensitive="false"><![CDATA[|FF|SMB%]]></Pattern_Content>
      <Pattern_Depth>5</Pattern_Depth>
      <Pattern_Offset>4</Pattern_Offset>
    </Pattern>
    <Pattern Pat_ID="2">
      <Pattern_Type>string</Pattern_Type>
      <Pattern_Content
CaseSensitive="true"><![CDATA[&|00|]]></Pattern_Content>
      <Pattern_Within>2</Pattern_Within>
      <Pattern_Distance>56</Pattern_Distance>
    </Pattern>
    <Pattern Pat_ID="3">
      <Pattern_Type>string</Pattern_Type>
      <Pattern_Content CaseSensitive="false">|5C
00|P|00|I|00|P|00|E|00 5C 00|</Pattern_Content>
      <Pattern_Within>12</Pattern_Within>
      <Pattern_Distance>5</Pattern_Distance>
    </Pattern>
    <Pattern Pat_ID="4">
      <Pattern_Type>hex</Pattern_Type>
      <Pattern_Content CaseSensitive="true">05</Pattern_Content>
      <Pattern_Within>1</Pattern_Within>
    </Pattern>
    <Pattern Pat_ID="5">
      <Pattern_Type>hex</Pattern_Type>
      <Pattern_Content CaseSensitive="true">0B</Pattern_Content>
      <Pattern_Within>1</Pattern_Within>
      <Pattern_Distance>1</Pattern_Distance>
    </Pattern>
    <Pattern Pat_ID="6">
      <Pattern_Type>string</Pattern_Type>
      <Pattern_Content CaseSensitive="true">|B8|J|9F|M|1C|}|CF 11
86 1E 00| |AF|n|7C|W</Pattern_Content>
      <Pattern_Within>16</Pattern_Within>
      <Pattern_Distance>29</Pattern_Distance>

```

```

    </Pattern>
    <Pat_Logic>1 AND 2 AND 3 AND 4 AND 5 AND 6</Pat_Logic>
  </Patterns>
  <Session>
    <Session_Filter>(SRC_1 AND SRC_2 AND SRC_3) AND (DST_1 AND

```

```
DST_2 AND DST_3) AND PROTO_1 AND (PAT_1 AND PAT_2 AND PAT_3 AND PAT_4
AND PAT_5 AND PAT_6)</Session_Filter>
  <Session_End>
    <Session_Pckt_Count>5</Session_Pckt_Count>
  </Session_End>
</Session>
</Signature>
</Signatures>
```

Appendix B

The schema of CIDSS - cidss.xsd

Available at <http://translator.b59.net/docs/cidss.xsd>

References

Normative references

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- [SHOKIug] Shoki, "Shoki User's Guide", Release 0.3.0,
<http://shoki.sourceforge.net/>
- [XML10] Extensible Markup Language (XML) 1.0, Third Edition,
<http://www.w3.org/TR/2004/REC-xml-20040204/>
- [XSD] XML Schema - Specifications and Development,
<http://www.w3.org/XML/Schema#dev>
- [ISSdoc] ISS - Internet Security Systems, Documentation,
<http://www.iss.net/support/documentation/>
- [CISCOdoc] Cisco - NetRanger, Documentation,
<http://www.cisco.com/univercd/cc/td/doc/product/iaabu/\nnetrangr/>
- [PCRE] PCRE - Perl Compatible Regular Expressions,
<http://www.pcre.org/>

Informative references

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- [ARACH] arachNIDS - Whitehats Network Security Resource, <http://whitehats.com/ids/>

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