

IDOL PCI Package

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Technical Note



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Introduction

The IDOL PCI Package contains tools that allow you to locate Payment Card Industry (PCI) in your data, to ensure compliance with financial regulations.

The IDOL PCI Package uses [IDOL Eduction Grammars](#) (.ecr files).

IDOL Eduction is a tool for finding entities (small pieces of information such as names and phone numbers) in text. Eduction grammars contain descriptions of the entities. In some cases, this might be a list of fixed values (such as names), and in others it might be pattern matching tools that find data of a particular type (such as a set of digits that make up a phone number). The Eduction grammars included in the IDOL PCI Package describe different kinds of personally identifiable information, so that you can find these in your data.

Data Sources

The IDOL PCI Package contains a variety of different kinds of entities to describe payment card information that is protected by payment card industry regulations. The following sections provide some information about how this information is compiled.

For all of these types of information, as much test data is acquired as possible to test the recall metric of the algorithms. Many millions of examples are run through the grammars to ensure that all patterns in usage are covered.

Names

An international database containing over 100 million individuals is analyzed to identify the structure and characteristics of names in each country. In doing so, extensive lists of the frequencies of occurrence of given names and family names are used to generate strong identification grammars for names.

In addition, rules are included to handle linguistic information, such as transliteration (for example, from the Cyrillic or Greek alphabets), or the use or removal of diacritic marks.

Dates

A large corpus of documents from public sources is processed to analyze the occurrence and format of dates. In this way, coverage of all common and less-common formats is built up, while enabling a *likelihood* measure to indicate the confidence that the characters identified are a payment card date, rather than an unrelated date or other alphanumeric string.

PCI Numbers

The formats of the PCI numbers entities are sourced from the PCI Security Standards Council, and other public sources where appropriate.

Country and Language Support

The IDOL PCI Package contains grammars that apply to data from many countries and languages.

Country Codes

For data that corresponds to a particular country, the Education grammars identify each country by using the ISO 3166-1 alpha-2 country codes. The following countries are supported:

Country Code	Country
at	Austria
au	Australia
be	Belgium
bg	Bulgaria
br	Brazil
ca	Canada
ch	Switzerland
cy	Cyprus
cz	Czech Republic
de	Germany
dk	Denmark
ee	Estonia
es	Spain
fi	Finland
fr	France
gb	United Kingdom (England, Wales, Scotland, and Northern Ireland)
gr	Greece
hr	Croatia
hu	Hungary

Country Code	Country
ie	Ireland
is	Iceland
it	Italy
li	Liechtenstein
lt	Lithuania
lu	Luxembourg
lv	Latvia
mt	Malta
nl	Netherlands
no	Norway
nz	New Zealand
pl	Poland
pt	Portugal
ro	Romania
se	Sweden
si	Slovenia
sk	Slovakia
tr	Turkey
us	United States of America

Languages

For data that corresponds to a particular language, the Education grammars identify each language by using the ISO 639-2/B language codes. The following languages are supported:

Language Code	Language
eng	English

IDOL Education Grammars

The following section describes the Education grammars available in the IDOL PCI Package.

You can use these grammars with IDOL Education, by using Education Server, the `edktool` command-line utility, or the Education SDK. For more information, refer to the *IDOL Education User Guide* and the *Education SDK Programming Guide*.

IMPORTANT: To use the Education grammars in the IDOL PCI Package, you must have a license that enables them. To obtain a license, contact Micro Focus Support.

Configure Post Processing

When you use the IDOL PCI Package Education grammars it is essential to configure a Lua post-processing task to run the script `pci_postprocessing.lua`. This script contains post-processing to improve results for various entities, such as stop list filtering, and checksum validation (see [Validated ID Numbers, on page 13](#)).

IMPORTANT: If you do not run this script, you might encounter unexpected behavior.

Add a post-processing task to your Education configuration. For example:

```
[PostProcessingTasks]
NumTasks=1
Task0=MyPostProcessingSection

[MyPostProcessingSection]
Type=Lua
Script=scripts/pci_postprocessing.lua
Entities=pci/*
```

For more information about configuring post-processing tasks, refer to the *Education User and Programming Guide*.

Entity Context

Some of the entities are available in two versions, with and without context. The context-based entities match the entity when it occurs in an easily identifiable location in text. For example, it might match a telephone number that occurs next to the prefix **Phone**:

The entities that do not have context attempt to match the entity wherever it occurs. This version might over-match significantly (that is, it is likely to return values that are similar to the entity patterns, such a number that is not a telephone number). However, it also reduces the number of false negatives (that is, it misses fewer matches).

You can configure Education to use both versions of an entity; matches located with context are given a higher score in the results.

Balance Precision and Recall

In many cases, Education is able to locate entities that are ambiguous, such as a postal code which is simply a five-digit number. In some situations it is desirable to match as many entities as possible ("high recall") and in others only entities with a high likelihood of being a useful match ("high precision"). Each match is given a score value so that you can filter the results.

As described in [Entity Context, on the previous page](#), matches located by an entity that requires context are assigned higher scores than matches located by the corresponding entity without context. Most matches extracted without context have a score of 0.4. For example, a context-free date ("January 18, 1998") might be returned by a Date Of Birth entity with a score of 0.4. But with context to suggest that it is indeed a date of birth ("DOB: January 18, 1998"), the score should be above 0.5.

The PCI post-processing script (see [Configure Post Processing, on the previous page](#)) includes a step to validate matches (for example, it can validate some ID numbers by calculating a checksum). The script increases the score of matches that have valid checksums, because this is an indication that the match is more likely to be genuine. Any match that has an invalid checksum is immediately discarded because it cannot be genuine.

When you configure Education, use the parameters `MinScore` and `PostProcessThreshold` to achieve the desired balance between precision and recall. Education discards any match with a score lower than `MinScore`. Matches with scores that meet or exceed `MinScore` are then processed by post-processing tasks. After post-processing has finished, Education discards any match with a score lower than `PostProcessThreshold`.

In the example configuration that is included with the IDOL PCI Package, `MinScore` is set to 0.4 and `PostProcessThreshold` is set to 0.5. These values have been chosen to return results only if they have a relatively high likelihood of being a useful match. Any match that is located without context can proceed to post-processing, but, unless its score is increased through successful validation, it is then discarded. If you prefer to maximize recall rather than precision, you can reduce or remove these thresholds.

For more information about Education configuration parameters, refer to the *Education User and Programming Guide*.

Configure Tangible Characters

`TangibleCharacters` is a configuration parameter that you can set when using the Education SDK, the Education Server, or the Education command-line utility (`edktool`). It specifies a list of characters to treat as part of a word, rather than as word boundaries.

Some of the entities in the IDOL PCI Package Education Grammars require tangible characters to be set in order to perform correctly (see the descriptions of the entities in [Education Grammar Reference, on the next page](#)).

When you use Education to search for matches, `TangibleCharacters` applies across all of your chosen entities. If you use multiple entities that have different recommended tangible character sets, you might need to take some extra steps. For example:

- If you are using the Education SDK, create a separate EDK engine for each distinct set of tangible characters, and configure the tangible characters for the engine using the appropriate API call:

C	<code>EdkSetTangibleCharacters</code>
Java	<code>EDKEngine.setTangibleCharacters</code>

After configuring an engine with the correct tangible characters, you can add the relevant entities. You will need to create a session from each engine to process your input text.

- If you are using an Education Server, send a separate action (`EduceFromText` or `EduceFromFile`) for each distinct set of tangible characters. In each action, set the `TangibleCharacters` and `Entities` action parameters to specify which set of tangible characters and which entities to use.
- If you are using the command line `edktool`, create a separate configuration file for each distinct set of tangible characters and associated entities, and process your input text once with each configuration file.

For more information about the `TangibleCharacters` configuration parameter, refer to the *Education User Guide*.

Customize Stop Lists

The IDOL PCI Package post-processing script (see [Configure Post Processing, on page 8](#)) uses stop lists to discard matches that are likely to be false positives. You can add entries to the stop lists, or remove entries, by modifying the following files.

- `scripts/names_stoplist.lua` contains two stop lists to discard names. In the first stop list, each component is plausible but the entire match is likely to be a false positive, for example "Christian Church" or "Norman Conquest". The second stop list contains common words that are likely to indicate a false positive when returned as either the `FORENAME` or `SURNAME` component of a name match. The stop lists in this file can be customized such that a name can be considered a false positive in one country but not another.

Education Grammar Reference

The following tables describe the grammar files that are available in the IDOL PCI Package, and the entities that each provides.

In the entity names, the abbreviation `CC` refers to a two-letter country code. For a list of available country codes, see [Country Codes, on page 6](#).

TIP: You can use the Education parameter `EntityN` to specify which entities you want to extract. This parameter accepts wildcards, so you can extract entities of a specific type for all supported countries or languages. For example, to match names for all countries specify a value of

pci/name/??.

date.ecr

Entity	Description
pci/date/nocontext/eng	A calendar date, written numerically or using words, without context. For example "01.03.1918", or "01/01/2020".
pci/date/paymentcard/context/eng	A card date, with context. For example "Expires end: 01/20".
pci/date/paymentcard/nocontext/eng	A card date without context. For example "01/20".
pci/date/paymentcard/landmark/eng	A card date landmark. For example "Expires end".

name.ecr

Entity	Description
pci/name/CC	A full personal name, in title case or upper case. This entity returns the names in a normalized format, in the form <i>GIVEN NAME SURNAME</i> , for example JOHN SMITH.
pci/name/given_name/context/CC	A given name, with context. For example "Forename: John".
pci/name/given_name_landmark/CC	A given name landmark. For example "Forename".
pci/name/surname/context/CC	A surname with context. For example "Surname: Smith".
pci/name/surname/landmark/CC	A surname landmark. For example "Surname".

pci_numbers.ecr

Entity	Description
pci/magstripe/context/magstripe	Magnetic stripe data with context. For example "Magstripe: %B5641821234567890122^SMITH/JOHN A. ^20111260000000000000000000000000?c". NOTE: To ensure that the entities in this grammar perform correctly, set your <code>TangibleCharacters</code> configuration to include the following characters: %;. For more information, see Configure Tangible Characters, on page 9 .
pci/magstripe/nocontext/magstripe	Magnetic stripe data without context. For example

Entity	Description
	"%B5641821234567890122^SMITH/JOHN A. ^20111260000000000000000000000000?c". NOTE: To ensure that the entities in this grammar perform correctly, set your <code>TangibleCharacters</code> configuration to include the following characters: %;. For more information, see Configure Tangible Characters, on page 9 .
pci/magstripe/landmark/magstripe	A magnetic stripe landmark. For example "Magstripe".
pci/pan/context/pan	A Primary Account Number with context. For example "PAN: 4485221211756505".
pci/pan/nocontext/pan	A Primary Account Number without context. For example "4485 2212 1175 6505".
pci/pan/landmark/pan	A Primary Account Number landmark. For example "PAN".
pci/pin/context	A card Personal Identification Number with context. For example "PIN: 1234".
pci/pin/nocontext	A card Personal Identification Number without context. For example "1234".
pci/pin/landmark	A card Personal Identification Number landmark. For example "PIN".
pci/pin_block/context	An encrypted or unencrypted PIN block with context (either base-64, base-16 or base-2). For example "PIN block: BABCDEFGHIJ=".
pci/pin_block/nocontext	An encrypted or unencrypted PIN block without context (either base-64, base-16 or base-2). For example "BABCDEFGHIJ=".
pci/pin_block/landmark	A PIN block landmark. For example "PIN block".
pci/printed_security_code/context/cav2	A CAV2 security code with context. For example "CAV2: 123".
pci/printed_security_code/landmark/cav2	A CAV2 security code landmark. For example "CAV2".
pci/printed_security_code/context/cid	A CID security code with context. For example "CID: 1234".
pci/printed_security_code/landmark/cid	A CID security code landmark. For example "CID".
pci/printed_security_code/context/cvc2	A CVC2 security code with context. For example "CVC2: 123".

Entity	Description
pci/printed_security_code/landmark/cvc2	A CVC2 security code landmark. For example "CVC2".
pci/printed_security_code/context/cvv2	A CVV2 security code with context. For example "CVV2: 123".
pci/printed_security_code/landmark/cvv2	A CVV2 security code landmark. For example "CVV".
pci/printed_security_code/nocontext	Any of CAV2, CID, CVC2 or CVV2 security code without landmark. For example "123".
pci/service_code/context	A service code with context. For example "Service code: 123".
pci/service_code/nocontext	A service code without context. For example "123".
pci/service_code/landmark	A Service code landmark. For example "Service code".

Validated ID Numbers

The script `pci_postprocessing.lua` (see [Configure Post Processing, on page 8](#)) includes steps to validate ID numbers that are found by Education. This improves accuracy by discarding results that match the pattern for a valid ID number, but cannot be genuine because they have an invalid checksum. The script increases the score for matches that have a valid checksum, because this is an indication that the match is more likely to be genuine.

The following tables list the entities that are validated.

Magnetic Stripe Data (<code>magstripe.ecr</code>)		
pci/magstripe/context/magstripe	pci/magstripe/nocontext/magstripe	Validation implicitly validates the Primary Account Number (PAN) that is included in the magstripe data.

Primary Account Numbers (<code>pan.ecr</code>)	
pci/pan/context/pan	pci/pan/nocontext/pan

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