
paxb

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paxb is a library that provides an API for mapping between XML documents and Python objects.

paxb library implements the following functionality:

- *Deserialize* XML documents to Python objects
- Validate deserialized fields
- Access and update Python object fields
- *Serialize* Python objects to XML documents

paxb provides an efficient way of mapping between an XML document and a Python object. Using paxb developers can write less boilerplate code emphasizing on application domain logic.

Since paxb is based on [attrs](#) library paxb and attrs API can be *mixed* together.

CHAPTER 1

Requirements

- attrs

2.1 Installation

This part of the documentation covers the installation of *paxb* library.

2.1.1 Installation using pip

To install *paxb*, run:

```
$ pip install paxb
```

2.1.2 Installation from source code

You can clone the repository:

```
$ git clone git@github.com:dapper91/paxb.git
```

Then install it:

```
$ cd paxb  
$ pip install .
```

2.2 Quick start

Suppose you have an xml document `user.xml`:

```

<?xml version="1.0" encoding="utf-8"?>
<doc:envelope xmlns="http://www.test.org"
  xmlns:doc="http://www.test1.org">
  <doc:user name="Alex" surname="Ivanov" age="26">

    <doc:birthdate year="1992" month="06" day="14"/>

    <doc:contacts>
      <doc:phone>+79204563539</doc:phone>
      <doc:email>alex@gmail.com</doc:email>
      <doc:email>alex@mail.ru</doc:email>
    </doc:contacts>

    <doc:documents>
      <doc:passport series="3127" number="836815"/>
    </doc:documents>

    <data:occupations xmlns:data="http://www.test2.org">
      <data:occupation title="yandex">
        <data:address>Moscow</data:address>
        <data:employees>8854</data:employees>
      </data:occupation>
      <data:occupation title="skbkontur">
        <data:address>Yekaterinburg</data:address>
        <data:employees>7742</data:employees>
      </data:occupation>
    </data:occupations>

  </doc:user>
</doc:envelope>

```

To deserialize the document you could use `xml` python standard library api to parse the document and then set the corresponding class fields. Such an imperative code has a lot of boilerplate manipulations. Instead you can use `paxb` api to write declarative style code. All you need to describe field mappings and types, `paxb` will serialize and deserialize data for you:

```

import json
import re
from datetime import date

import attr
import paxb as pb

@pb.model(name='occupation', ns='data', ns_map={'data': 'http://www.test2.org'})
class Occupation:
    title = pb.attr()
    address = pb.field()
    employees = pb.field(converter=int)

@pb.model(name='user', ns='doc', ns_map={'doc': 'http://www.test1.org'})
class User:
    name = pb.attr()
    surname = pb.attr()
    age = pb.attr(converter=int)

```

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```

birth_year = pb.wrap('birthdate', pb.attr('year', converter=int))
birth_month = pb.wrap('birthdate', pb.attr('month', converter=int))
birth_day = pb.wrap('birthdate', pb.attr('day', converter=int))

@property
def birthdate(self):
    return date(year=self.birth_year, month=self.birth_month, day=self.birth_day)

@birthdate.setter
def birthdate(self, value):
    self.birth_year = value.year
    self.birth_month = value.month
    self.birth_day = value.day

phone = pb.wrap('contacts', pb.field())
emails = pb.wrap('contacts', pb.as_list(pb.field(name='email')))

passport_series = pb.wrap('documents/passport', pb.attr('series'))
passport_number = pb.wrap('documents/passport', pb.attr('number'))

occupations = pb.wrap(
    'occupations', pb.lst(pb.nested(Occupation), ns='data', ns_map={'data':
↪ 'http://www.test2.org'})
)

citizenship = pb.field(default='RU')

@phone.validator
def check(self, attribute, value):
    if not re.match(r'\+\d{11,13}', value):
        raise ValueError("phone number is incorrect")

with open('user.xml') as file:
    xml = file.read()

```

Then the deserialized object can be modified and serialized back to xml document or converted to json format:

```

try:
    user = pb.from_xml(User, xml, envelope='doc:envelope', ns_map={'doc': 'http://www.
↪test1.org'})
    user.birthdate = user.birthdate.replace(year=1993)

    with open('user.json') as file:
        json.dump(attr.asdict(user), file)

except (pb.exc.DeserializationError, ValueError) as e:
    print(f"deserialization error: {e}")

```

user.json:

```

{
  "age": 26,
  "birth_day": 14,
  "birth_month": 6,
  "birth_year": 1993,
  "citizenship": "RU",

```

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```

"emails": ["alex@gmail.com", "alex@mail.ru"],
"name": "Alexey",
"occupations": [
  {
    "address": "Moscow",
    "employees": 8854,
    "title": "yandex"
  },
  {
    "address": "Yekaterinburg",
    "employees": 7742,
    "title": "skbkontur"
  }
],
"passport_number": "836815",
"passport_series": "3127",
"phone": "+79204563539",
"surname": "Ivanov"
}

```

2.3 XML binding

2.3.1 model

The `paxb.model()` decorator is used to describe a mapping of a python class to an xml element. All encountered class fields are mapped to xml subelements. In the following example `User` class attributes `name` and `surname` are mapped to the corresponding xml elements. The model:

```

import paxb as pb

@pb.model
class User:
    name = pb.field()
    surname = pb.field()

```

has a complete mapping description for the document

```

<User>
  <name>Alex</name>
  <surname>Ivanov</surname>
</User>

```

By default class name is used as an xml tag name for a mapping. The default behavior can be altered using decorator `name` argument. The `User` class can be rewritten as follows:

```

import paxb as pb

@pb.model(name='user')
class User:
    name = pb.field()
    surname = pb.field()

```

```
<user>
  <name>Alex</name>
  <surname>Ivanov</surname>
</user>
```

2.3.2 field

The `paxb.field()` function describes a mapping of a python class field to an xml subelement. In the following example fields `name` and `surname` are mapped to the corresponding xml subelements. The name of the fields is used as an xml tag name for a mapping.

```
import paxb as pb

@pb.model
class User:
    name = pb.field()
    surname = pb.field()
```

```
<User>
  <name>Alex</name>
  <surname>Ivanov</surname>
</User>
```

Similarly to the `paxb.model()` decorator the default behavior can be altered using `name` argument.

```
import paxb as pb

@pb.model
class User:
    name = pb.field(name="Name")
    surname = pb.field(name="Surname")
```

```
<User>
  <Name>Alex</Name>
  <Surname>Ivanov</Surname>
</User>
```

2.3.3 attribute

The `paxb.attr()` function describes a mapping of a python class field to an xml element attribute. In the following example fields `name` and `surname` are mapped to the corresponding `User` element attributes. The name of the fields is used as an xml tag name for a mapping.

```
import paxb as pb

@pb.model
class User:
    name = pb.attr()
    surname = pb.attr()
```

```
<User name="Alex" surname="Ivanov"/>
```

Similarly to the `paxb.field()` function the default behavior can be altered using `name` argument.

```
import paxb as pb

@pb.model
class User:
    name = pb.attribute(name="Name")
    surname = pb.attribute(name="Surname")
```

```
<User Name="Alex" Surname="Ivanov"/>
```

2.3.4 nested

The `paxb.nested()` function is used to describe a mapping of a python class to an xml element. It is similar to the `paxb.model()` decorator, but declares a nested one. Beyond that it acts the same. The following example illustrates using nested classes:

```
import paxb as pb

@pb.model
class Passport:
    series = pb.attribute()
    number = pb.attribute()

@pb.model
class User:
    name = pb.attribute()
    surname = pb.attribute()
    passport = pb.nested(Passport)
```

```
<User name="Alex" surname="Ivanov">
  <Passport series="4581" number="451672"/>
</User>
```

2.3.5 as_list

The `paxb.as_list()` function describes a mapping of a python class field to xml subelements. The corresponding subelements will be deserialized to a list. An element of a list can be field, nested class or wrapper (will be described later). Look at the example:

```
import paxb as pb

@pb.model
class User:
    emails = pb.as_list(pb.field(name="Email"))
```

```
<User>
  <Email>alex@mail.ru</Email>
  <Email>alex@gmail.com</Email>
  <Email>alex@yandex.ru</Email>
</User>
```

2.3.6 wrapper

It is common when a mapped element is placed in a subelement but declaring a nested class is redundant. Here the `paxb.wrapper()` function comes forward. Let's look at the example:

```
import paxb as pb

@pb.model
class User:
    email = pb.wrapper('contacts', pb.field())
```

```
<User>
  <contacts>
    <email>alex@gmail.com</email>
  </contacts>
</User>
```

Here `email` is a direct field of the `User` class but in the xml tree it is placed in `contacts` subelement.

One `paxb.wrapper()` can be wrapped by another:

```
import paxb as pb

@pb.model
class User:
    email = pb.wrapper('info', pb.wrapper('contacts', pb.field()))
    ...
```

```
<User>
  <info>
    <contacts>
      <email>alex@gmail.com</email>
    </contacts>
  </info>
</User>
```

A path can be used instead of a tag name. The following model is equivalent to the former one:

```
import paxb as pb

@pb.model
class User:
    email = pb.wrapper('info/contacts', pb.field())
```

2.3.7 let's put it all together

All the functions can be mixed together. Look at the more advanced example:

```
<envelope>
  <user name="Alexey" surname="Ivanov" age="26">
    <birthdate year="1992" month="06" day="14"/>
    <contacts>
      <phone>+79204563539</phone>
```

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```

        <email>alex@gmail.com</email>
        <email>alex@mail.ru</email>
    </contacts>

    <documents>
        <passport series="3127" number="836815"/>
    </documents>

    <occupations>
        <occupation title="yandex">
            <address>Moscow</address>
            <employees>8854</employees>
        </occupation>
        <occupation title="skbkontur">
            <address>Yekaterinburg</address>
            <employees>7742</employees>
        </occupation>
    </occupations>

</user>
</envelope>

```

```

import paxb as pb

@pb.model(name='occupation')
class Occupation:
    title = pb.attribute()
    address = pb.field()
    employees = pb.field()

@pb.model(name='user')
class User:
    name = pb.attribute()
    surname = pb.attribute()
    age = pb.attribute()

    phone = pb.wrap('contacts', pb.field())
    emails = pb.wrap('contacts', pb.as_list(pb.field(name='email')))

    passport_series = pb.wrap('documents/passport', pb.attribute('series'))
    passport_number = pb.wrap('documents/passport', pb.attribute('number'))

    occupations = pb.wrap('occupations', pb.lst(pb.nested(Occupation)))

```

2.4 Serialization

paxb implements an API for serializing a python object to an xml string. To serialize an object just pass it to a `paxb.to_xml()` method:

```

>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     name = pb.attribute()

```

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```

...     surname = pb.attribute()
...     email = pb.field()
...     phone = pb.field()
...
>>> obj = User(name='Alex', surname='Ivanov', email='alex@gmail.com', phone=
↳ '+79123457323')
>>>
>>> xml_string = pb.to_xml(obj)
>>> print(xml_string)
b'<User name="Alex" surname="Ivanov"><email>alex@gmail.com</email><phone>+79123457323
↳ </phone></User>'

```

By default `paxb.to_xml()` method serializes an object to a root element in an xml tree, class name is used as the element name, the element namespace is empty. The default behaviour can be altered using `paxb.to_xml()` argument. Look at the example:

```

>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     name = pb.attribute()
...     surname = pb.attribute()
...     email = pb.field()
...     phone = pb.field()
...
>>> obj = User(name='Alex', surname='Ivanov', email='alex@gmail.com', phone=
↳ '+79123457323')
>>>
>>> xml_string = pb.to_xml(obj, envelope='root', name='user', ns='test', ns_map={'test
↳ ': 'http://www.test.org'}, encoding='unicode')
>>> print(xml_string)
<root xmlns:test="http://www.test.org"><test:user name="Alex" surname="Ivanov">
↳ <test:email>alex@gmail.com</test:email><test:phone>+79123457323</test:phone></
↳ test:user></root>

```

The encoding argument is an additional argument passed to `xml.etree.ElementTree.tostring()` method.

2.4.1 Encoder

By default an object fields serialized using the following rules:

- `str` field is serialized as it is.
- `bytes` field serialized using base64 encoding.
- `datetime.datetime` field serialized as iso formatted string.
- `datetime.date` field serialized as iso formatted string.
- other types serialized using `__str__()`.

The default behaviour can be altered using `encoder` argument. Encoder must be a callable object that accepts an encoded value and returns its `str` representation.

Since `paxb` is based on `attr` library, `attr.asdict()` function can be used to serialize an object to a json string:

```

>>> import attr
>>> import json
>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     name = pb.attribute()
...     surname = pb.attr()
...     email = pb.field()
...     phone = pb.field()
...
>>> obj = User(name='Alex', surname='Ivanov', email='alex@gmail.com', phone=
↳'+79123457323')
>>>
>>> obj_dict = attr.asdict(obj)
>>> json.dumps(obj_dict)
'{"name": "Alex", "surname": "Ivanov", "email": "alex@gmail.com", "phone":
↳"+79123457323"}'

```

2.5 Deserialization

paxb implements an API for deserializing an xml string to a python object. To serialize an object just pass a class and an xml string to a `paxb.from_xml()` method:

```

>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     name = pb.attribute()
...     surname = pb.attribute()
...     email = pb.field()
...     phone = pb.field()
...
>>> xml_str = '<User name="Alex" surname="Ivanov"><email>alex@gmail.com</email><phone>
↳+79123457323</phone></User>'
>>> pb.from_xml(User, xml_str)
User(name='Alex', surname='Ivanov', email='alex@gmail.com', phone='+79123457323')

```

By default `paxb.from_xml()` method deserializes an object from a root element in an xml tree, class name is used as an element name, the element namespace is empty. The default behaviour can be altered using `paxb.from_xml()` additional arguments. Look at the example:

```

>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     name = pb.attribute()
...     surname = pb.attribute()
...     email = pb.field()
...     phone = pb.field()
...
>>> xml_str = '<root xmlns:test="http://www.test.org"><test:user name="Alex" surname=
↳"Ivanov"><test:email>alex@gmail.com</test:email><test:phone>+79123457323</
↳test:phone></test:user></root>'
>>> pb.from_xml(User, xml_str, envelope='root', name='user', ns='test', ns_map={'test
↳': 'http://www.test.org'}, required=True)

```

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```
User(name='Alex', surname='Ivanov', email='alex@gmail.com', phone='+79123457323')
```

The required argument tells the deserializer to raise an exception if the element not found in the xml tree, otherwise None will be returned (see *Errors*).

By default all fields deserialized as `str` types. The default behaviour can be altered using a `converter` parameter. See `attr.ib()`.

```
>>> import datetime
>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     age = pb.attribute(converter=int)
...     birthdate = pb.field(converter=datetime.date.fromisoformat)
...
>>> xml_str = '<User age="26"><birthdate>1993-08-21</birthdate></User>'
>>> pb.from_xml(User, xml_str)
User(age=26, birthdate=datetime.date(1993, 8, 21))
```

To deserialize an object from a json document use python `json` package:

```
>>> import json
>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     name = pb.attribute()
...     surname = pb.attribute()
...     email = pb.field()
...     phone = pb.field()
...
>>> json_str = '{"name": "Alex", "surname": "Ivanov", "email": "alex@gmail.com",
↳ "phone": "+79123457323"}'
>>> User(**json.loads(json_str))
User(name='Alex', surname='Ivanov', email='alex@gmail.com', phone='+79123457323')
```

2.6 Namespaces

2.6.1 Namespace inheritance

The default namespace of any element is an empty namespace. Functions `paxb.field()`, `paxb.model()`, `paxb.wrapper()` and `paxb.nested()` has a `ns` argument which alters the default (empty) namespace by a passed one. Compare two examples:

```
>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     name = pb.field()
...     surname = pb.field()
...
>>> user = User(name='Alex', surname='Ivanov')
```

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```
>>>
>>> pb.to_xml(user)
b'<User><name>Alex</name><surname>Ivanov</surname></User>'
```

```
>>> import paxb as pb
>>>
>>> @pb.model(ns='test1')
... class User:
...     name = pb.field(ns='test2')
...     surname = pb.field(ns='test3')
...
>>> user = User(name='Alex', surname='Ivanov')
>>>
>>> pb.to_xml(user, ns_map={
...     'test1': 'http://test1.org',
...     'test2': 'http://test2.org',
...     'test3': 'http://test3.org',
... })
b'<test1:User xmlns:test1="http://test1.org" xmlns:test2="http://test2.org"
↳xmlns:test3="http://test3.org"><test2:name>Alex</test2:name><test3:surname>Ivanov</
↳test3:surname></test1:User>'
```

The `ns_map` argument describes a mapping from a namespace prefix to a full name that will be used during serialization and deserializaion.

The namespace of `paxb.field()`, `paxb.wrapper()` and `paxb.nested()` is inherited from the containing model if it is not declared explicitly. Look at the example:

```
from xml.dom.minidom import parseString
import paxb as pb

@pb.model
class Passport: # implicit namespace, will be inherited from a
↳containing model
    series = pb.field() # implicit namespace, the same as of Passport
↳model
    number = pb.field(ns='test3') # explicit namespace 'test3'

@pb.model(ns='test2') # namespace 'test2' explicitly set for
↳DrivingLicence and implicitly set for all contained elements
class DrivingLicence: # explicit namespace 'test2'
    number = pb.field() # implicit namespace 'test2'

@pb.model(ns='test1') # namespace 'test1' explicitly set for User and
↳implicitly set for all contained elements
class User: # explicit namespace 'test1'
    name = pb.field() # implicit namespace 'test1'
    surname = pb.field(ns='test2') # explicit namespace 'test2'

    passport = pb.nested(Passport) # default namespace for the
↳contained model Passport will be set to 'test1'
    driving_licence = pb.nested(DrivingLicence) # default namespace for the
↳contained model DrivingLicence will be set to 'test1'

passport = Passport(series="5425", number="541125")
licence = DrivingLicence(number="673457")
```

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```

user = User(name='Alex', surname='Ivanov', passport=passport, driving_licence=licence)

xml = pb.to_xml(user, ns_map={
    'test1': 'http://test1.org',
    'test2': 'http://test2.org',
    'test3': 'http://test3.org',
}, encoding='unicode')
print(parseString(xml).toprettyxml(indent=' ' * 4), end='')

```

Output:

```

<?xml version="1.0" ?>
<test1:User xmlns:test1="http://test1.org" xmlns:test2="http://test2.org" xmlns:test3=
↳"http://test3.org">
  <test1:name>Alex</test1:name>
  <test2:surname>Ivanov</test2:surname>
  <test1:Passport>
    <test1:series>5425</test1:series>
    <test3:number>541125</test3:number>
  </test1:Passport>
  <test2:DrivingLicence>
    <test2:number>673457</test2:number>
  </test2:DrivingLicence>
</test1:User>

```

2.7 Errors

The package has two main exceptions: `paxb.exceptions.SerializationError` and `paxb.exceptions.DeserializationError`.

`paxb.exceptions.DeserializationError` is raised when any deserialization error occurs. The most common case it is raised is a required element is not found in an xml tree. Look at the example:

```

>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     name = pb.attribute()
...
>>> xml_str = '<User/>'
>>> pb.from_xml(User, xml_str)
Traceback (most recent call last):
...
paxb.exceptions.DeserializationError: required attribute '/User[1]/name' not found

```

This error is raised when either of `paxb.field()`, `paxb.attr()`, `paxb.nested()` or `paxb.wrapper()` element not found. This behaviour can be altered by passing a default value to an element:

```

>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     name = pb.attr(default='Alex')
...

```

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```
>>> xml_str = '<User/>'
>>> pb.from_xml(User, xml_str)
User(name='Alex')
```

The same applies to `paxb.field()`, `paxb.nested()` and `paxb.wrapper()`.

`paxb.exceptions.SerializationError` is raised when any serialization error occurs. The most common case it is raised is a required element is not set. Look at the example:

```
>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     name = pb.attr()
...
>>> obj = User(name=None)
>>> pb.to_xml(obj)
Traceback (most recent call last):
...
paxb.exceptions.SerializationError: required attribute 'name' is not set
```

This error is raised when either of `paxb.field()`, `paxb.attr()`, `paxb.nested()` or `paxb.wrapper()` element is not set. This behaviour can be altered by passing a default value to an element:

```
>>> import paxb as pb
>>>
>>> @pb.model
... class User:
...     name = pb.attr(default='Alex')
...
>>> obj = User()
>>> pb.to_xml(obj)
b'<User name="Alex" />'
```

2.8 attrs library integration

Since `paxb` is based on `attrs` library `paxb` and `attrs` APIs can be mixed together.

Decorator `paxb.model()` accepts `attr.s()` function arguments as `**kwargs` and internally passes them to it. For example you can pass `str=True` argument to ask `attrs` library to generate `__str__` method for a class.

Functions `paxb.attr()`, `paxb.field()` and `paxb.nested()` accept `attr.ib()` function arguments as `**kwargs` and internally passes them to it. For example you can pass `default` or `factory` argument to set a default value for a class field or `converter` argument to convert a value to an appropriate type. Look at the example:

```
>>> import paxb as pb
>>>
>>> @pb.model
... class Model:
...     field = pb.field(default='1', converter=int)
...
>>> Model()
Model(field=1)
```

paxb in conjunction with `attrs` library can be used as a flexible xml-to-json converter and vice versa. All you need is just to declare a model, fields and field types, the rest is up to paxb.

Suppose you have an xml document `user.xml`:

```
<?xml version="1.0" encoding="utf-8"?>
<doc:envelope xmlns:doc="http://www.test1.org">
  <doc:user name="Alex" surname="Ivanov" age="26">

    <doc:contacts>
      <doc:phone>+79204563539</doc:phone>
      <doc:email>alex@gmail.com</doc:email>
      <doc:email>alex@mail.ru</doc:email>
    </doc:contacts>

    <data:occupations xmlns:data="http://www.test2.org">
      <data:occupation title="yandex">
        <data:address>Moscow</data:address>
        <data:employees>8854</data:employees>
      </data:occupation>
      <data:occupation title="skbkontur">
        <data:address>Yekaterinburg</data:address>
        <data:employees>7742</data:employees>
      </data:occupation>
    </data:occupations>

  </doc:user>
</doc:envelope>
```

First you need to describe models. Then deserialize the document to an object and call `attr.asdict()` `attrs` library API method:

```
import json
import attr
import paxb as pb

xml = '''<?xml version="1.0" encoding="utf-8"?>
<doc:envelope xmlns:doc="http://www.test1.org">
  <doc:user name="Alex" surname="Ivanov" age="26">

    <doc:contacts>
      <doc:phone>+79204563539</doc:phone>
      <doc:email>alex@gmail.com</doc:email>
      <doc:email>alex@mail.ru</doc:email>
    </doc:contacts>

    <data:occupations xmlns:data="http://www.test2.org">
      <data:occupation title="yandex">
        <data:address>Moscow</data:address>
        <data:employees>8854</data:employees>
      </data:occupation>
      <data:occupation title="skbkontur">
        <data:address>Yekaterinburg</data:address>
        <data:employees>7742</data:employees>
      </data:occupation>
    </data:occupations>

  </doc:user>
```

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```
</doc:envelope>
'''

@pb.model(name="occupation")
class Occupation:
    title = pb.attribute()
    address = pb.field()
    employees = pb.field(converter=int)

@pb.model(name="user", ns="doc")
class User:
    name = pb.attribute()
    surname = pb.attribute()
    age = pb.attribute(converter=int)

    phone = pb.wrap("contacts", pb.field())
    emails = pb.wrap("contacts", pb.as_list(pb.field(name="email")))

    occupations = pb.wrap("occupations", pb.lst(pb.nested(Occupation)), ns="data")

user = pb.from_xml(User, xml, envelope="doc:envelope", ns_map={
    "doc": "http://www.test1.org",
    "data": "http://www.test2.org",
})

print(json.dumps(attr.asdict(user), indent=4))
```

Output:

```
{
  "name": "Alex",
  "surname": "Ivanov",
  "age": 26,
  "phone": "+79204563539",
  "emails": [
    "alex@gmail.com",
    "alex@mail.ru"
  ],
  "occupations": [
    {
      "title": "yandex",
      "address": "Moscow",
      "employees": 8854
    },
    {
      "title": "skbkontur",
      "address": "Yekaterinburg",
      "employees": 7742
    }
  ]
}
```


3.1 Developer Interface

`paxb` is a library that provides an API for mapping between XML documents and Python objects.

`paxb` library implements the following functionality:

- Deserialize XML documents to Python objects
- Validate deserialized data
- Access and update Python object fields
- Serialize Python objects to XML documents

`paxb` provides an efficient way of mapping between an XML document and a Python object. Using `paxb` developers can write less boilerplate code emphasizing on application business logic.

Since `paxb` based on `attrs` library `paxb` and `attrs` API can be mixed together.

3.1.1 Binding

`paxb.attribute` (*name=None*, ***kwargs*)

The Function maps a class field to an XML attribute. The field name is used as a default attribute name. The default name can be altered using the *name* argument.

Parameters

- **name** (*str*) – attribute name. If *None* field name will be used
- **kwargs** – arguments that will be passed to `attr.ib()`

`paxb.field` (*name=None*, *ns=None*, *ns_map=None*, *idx=None*, ***kwargs*)

The Function maps a class field to an XML element. The field name is used as a default element name. The default name can be altered using *name* argument. The *ns* argument defines the namespace of the element.

Internally the decorator adds some metainformation to `attr.ib.metadata`.

Parameters

- **name** (*str*) – element name. If *None* field name will be used
- **ns** (*str*) – element namespace. If *None* the namespace is inherited from the containing model
- **ns_map** (*dict*) – mapping from a namespace prefix to a full name.
- **idx** (*int*) – element index in the xml document. If *None* 1 is used
- **kwargs** – arguments that will be passed to `attr.ib()`

`paxb.nested` (*cls, name=None, ns=None, ns_map=None, idx=None, **kwargs*)

The Function maps a class to an XML element. *nested* is used when a `paxb.model()` decorated class contains another one as a field.

Parameters

- **cls** – nested object class. *cls* must be an instance of `paxb.model()` decorated class
- **name** (*str*) – element name. If *None* model decorator *name* attribute will be used
- **ns** (*str*) – element namespace. If *None* model decorator *ns* attribute will be used
- **ns_map** (*dict*) – mapping from a namespace prefix to a full name. It is applied to the current model and it's elements and all nested models
- **idx** (*int*) – element index in the xml document. If *None* 1 is used
- **kwargs** – arguments that will be passed to `attr.ib()`

`paxb.as_list` (*wrapped*)

The Function maps a class list field to an XML element list. Wrapped element can be field or nested model.

Parameters **wrapped** – list element type

`paxb.wrapper` (*path, wrapped, ns=None, ns_map=None, idx=None*)

The Function is used to map a class field to an XML element that is contained by a subelement.

Parameters

- **path** (*str*) – full path to the *wrapped* element. Element names are separated by slashes
- **wrapped** – a wrapped element
- **ns** (*str*) – element namespace. If *None* the namespace is inherited from the containing model
- **ns_map** (*dict*) – mapping from a namespace prefix to a full name. It is applied to the current model and it's elements and all nested models
- **idx** (*int*) – element index in the xml document. If *None* 1 is used

`paxb.attr`

Alias for `paxb.attribute()`

`paxb.wrap`

Alias for `paxb.wrapper()`

`paxb.lst`

Alias for `paxb.as_list()`

3.1.2 Serialization/Deserialization

`paxb.from_xml` (*cls*, *xml*, *envelope=None*, *name=None*, *ns=None*, *ns_map=None*, *required=True*)

Deserializes xml string to object of *cls* type. *cls* must be a `paxb.model()` decorated class.

Parameters

- **cls** – class the deserialized object is instance of
- **xml** (*str* or `xml.etree.ElementTree.ElementTree`) – xml string or xml tree to deserialize the object from
- **envelope** (*str*) – root tag where the serializing object will be looked for
- **name** (*str*) – name of the serialized object element. If *None* model decorator *name* argument will be used
- **ns** (*str*) – namespace of the serialized object element. If *None* model decorator *ns* argument will be used
- **ns_map** (*dict*) – mapping from a namespace prefix to a full name
- **required** (*bool*) – is the serialized object element required. If element not found and *required* is *True* `paxb.exceptions.DeserializationError` will be raised otherwise *None* is returned

Returns deserialized object

`paxb.to_xml` (*obj*, *envelope=None*, *name=None*, *ns=None*, *ns_map=None*, *encoder=default_encoder*, ***kwargs*)

Serializes a `paxb` model object to an xml string. Object must be an instance of a `paxb.model()` decorated class.

Parameters

- **obj** – object to be serialized
- **envelope** (*str*) – root tag name the serialized object element will be added inside. If *None* object element will be a root
- **name** (*str*) – name of the serialized object element. If *None* model decorator *name* argument will be used
- **ns** (*str*) – namespace of the serialized object element. If *None* model decorator *ns* argument will be used
- **ns_map** (*dict*) – mapping from a namespace prefix to a full name.
- **encoder** – value encoder. If *None* `paxb.encoder.encode()` is used
- **kwargs** – arguments that will be passed to `xml.etree.ElementTree.tostring()` method

Returns serialized object xml string

Return type `bytes` or `str`

`paxb.encoder.encode` (*value*)

Default `paxb` value encoder. Encodes attributes or element text data during serialization. Supports `str`, `bytes`, `datetime.date` and `datetime.datetime` types.

Parameters **value** – value to be encoded

Returns encoded value string

Return type `str`

3.1.3 Exceptions

Package errors.

exception `paxb.exceptions.BaseError`

Base package exception. All package exception are inherited from it.

exception `paxb.exceptions.DeserializationError`

Deserialization error. Raised when any deserialization error occurs.

exception `paxb.exceptions.SerializationError`

Serialization error. Raised when any serialization error occurs.

4.1 Development

Install pre-commit hooks:

```
$ pre-commit install
```

For more information see [pre-commit](#)

You can run code check manually:

```
$ pre-commit run --all-file
```


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