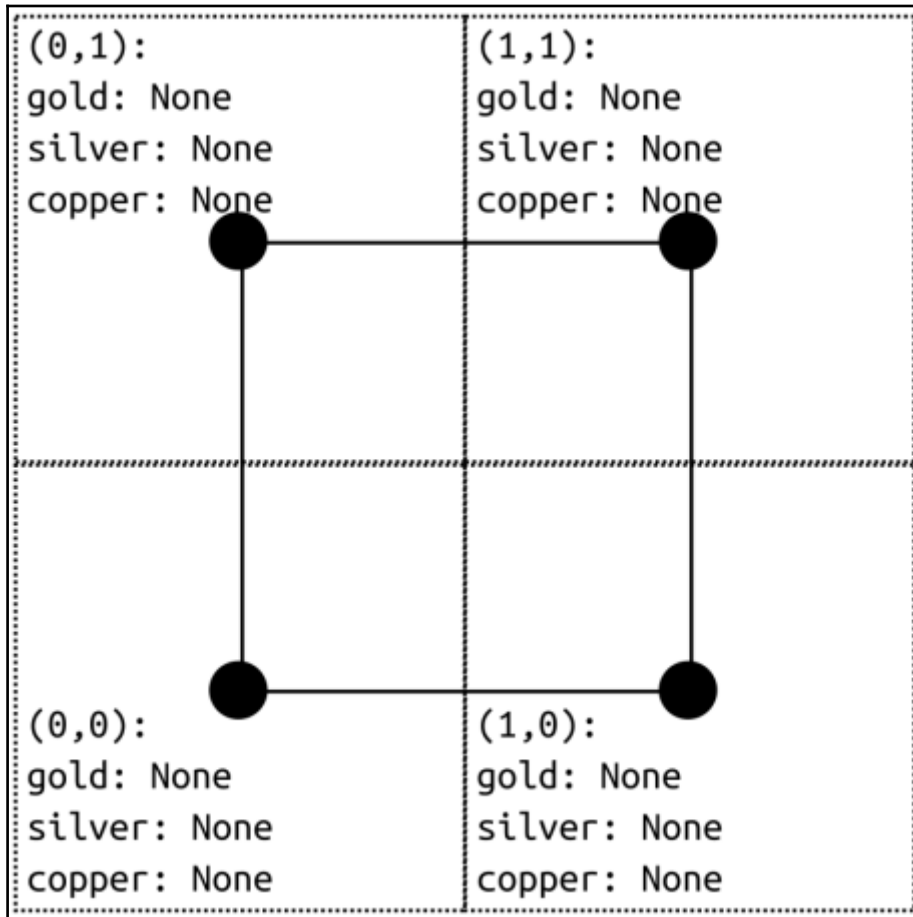
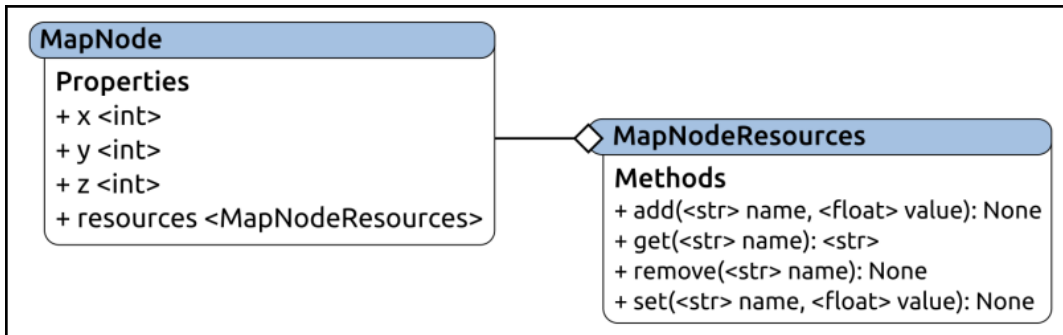


# Chapter 1: Programming versus Software Engineering





```

<MapNode (0,0) {'silver': None, 'gold': 0.25, 'copper': None}>
<MapNode (0,0) {'silver': 0.25, 'gold': 0.25, 'copper': None}>
<MapNode (0,0) {'silver': 0.25, 'gold': 0.25, 'copper': 0.25}>
  
```

```

Traceback (most recent call last):
  SetNodeResource(0,6,None,'gold',0.25)
  
```

```
# stripped for brevity ...
```

```
map_nodes.NonExistantNodeError
```

```

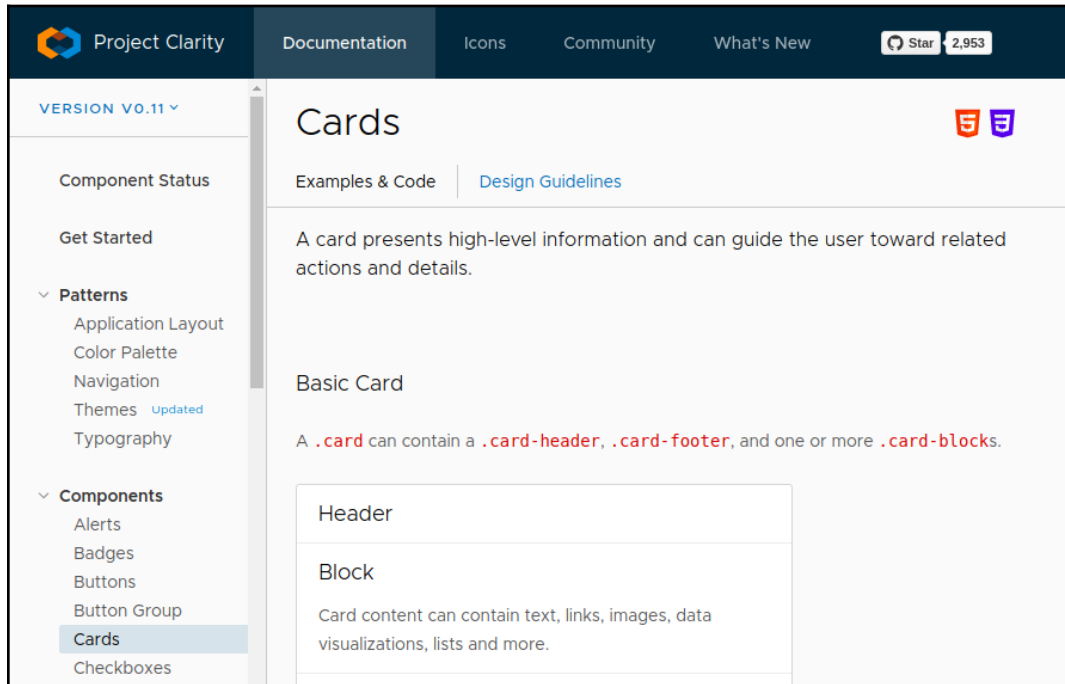
ValueError: set_node_resource expects a float value from
0.0-1.0, or a value that can be converted to one, for
resource_value: 2.0 (float) is not valid
  
```

```

ValueError: tin is not a tracked resource
(gold,silver,copper)
  
```

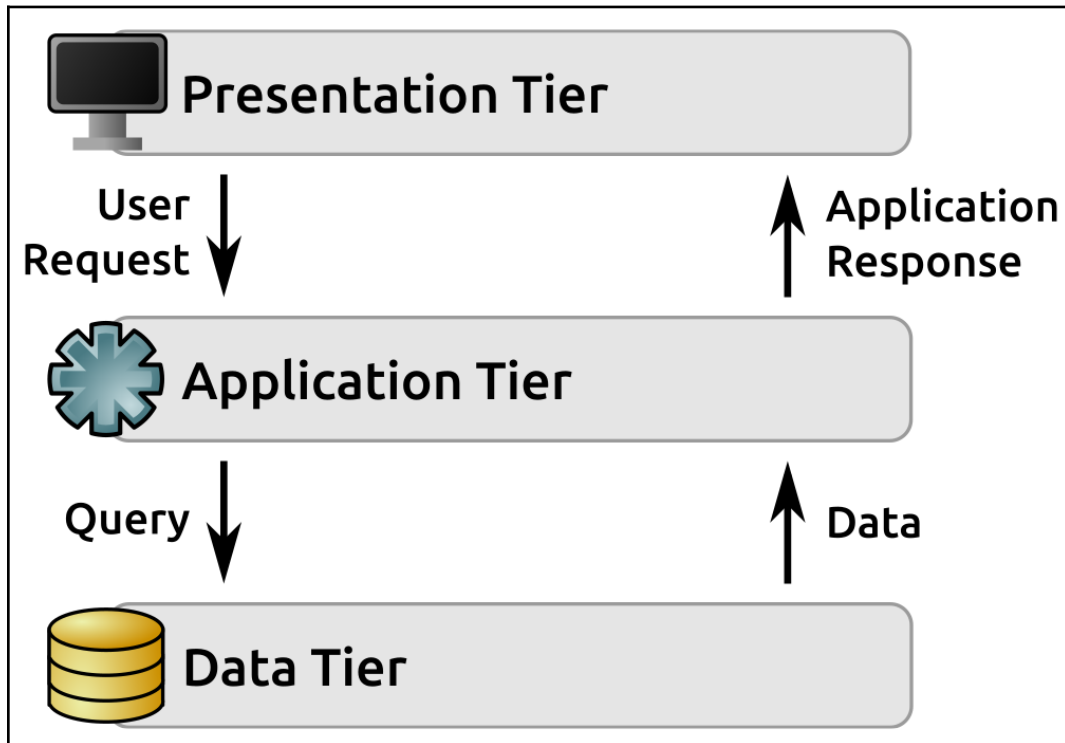
---

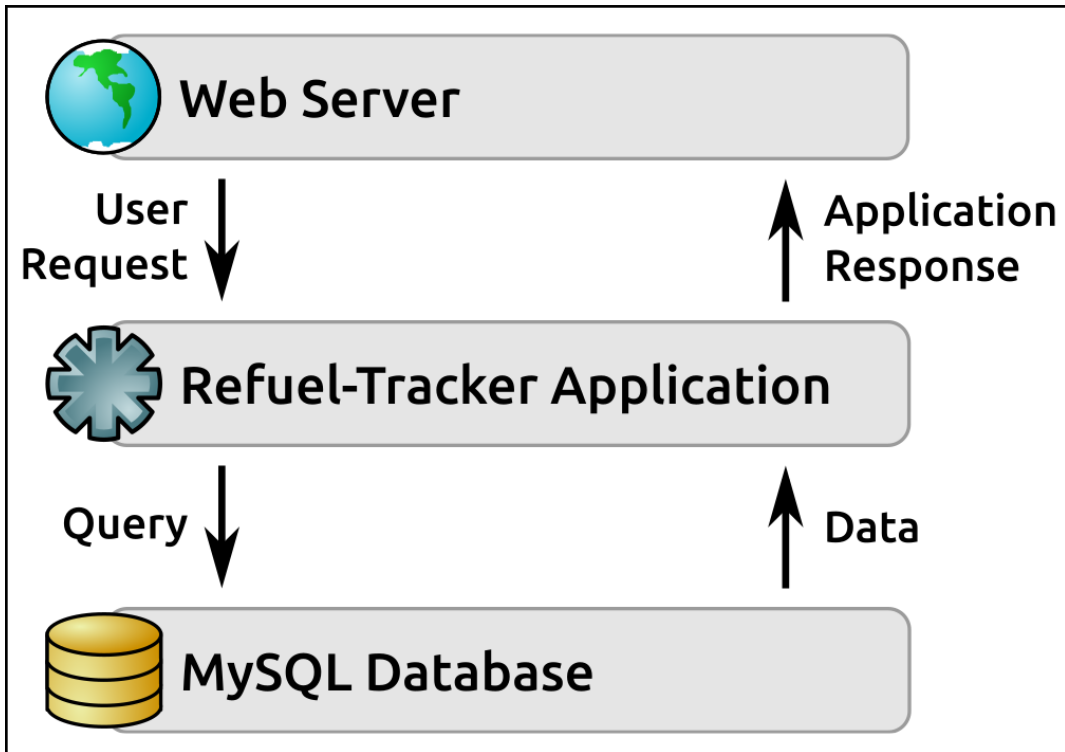
# Chapter 2: The Software Development Life Cycle

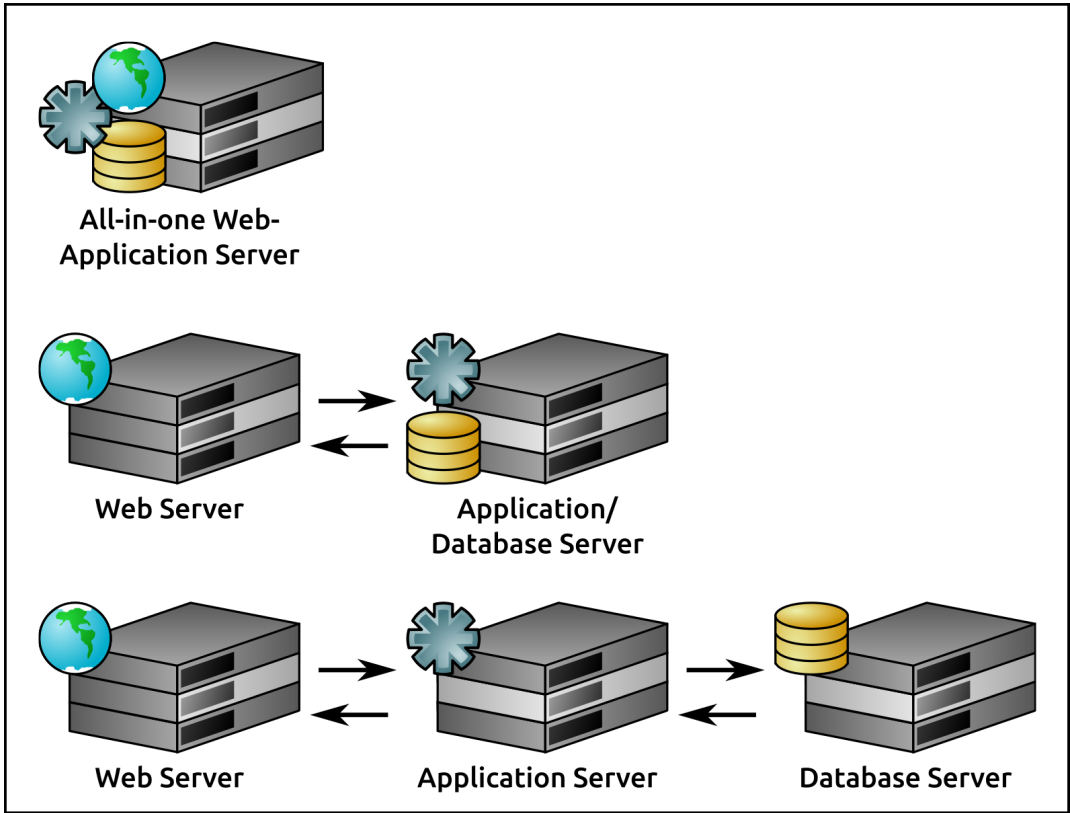


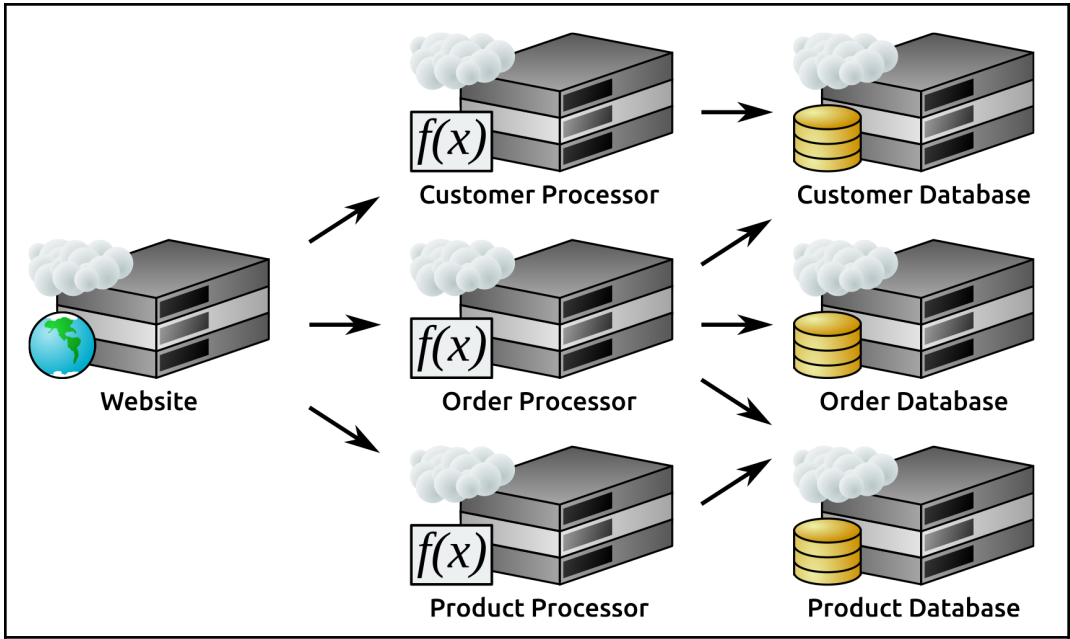
---

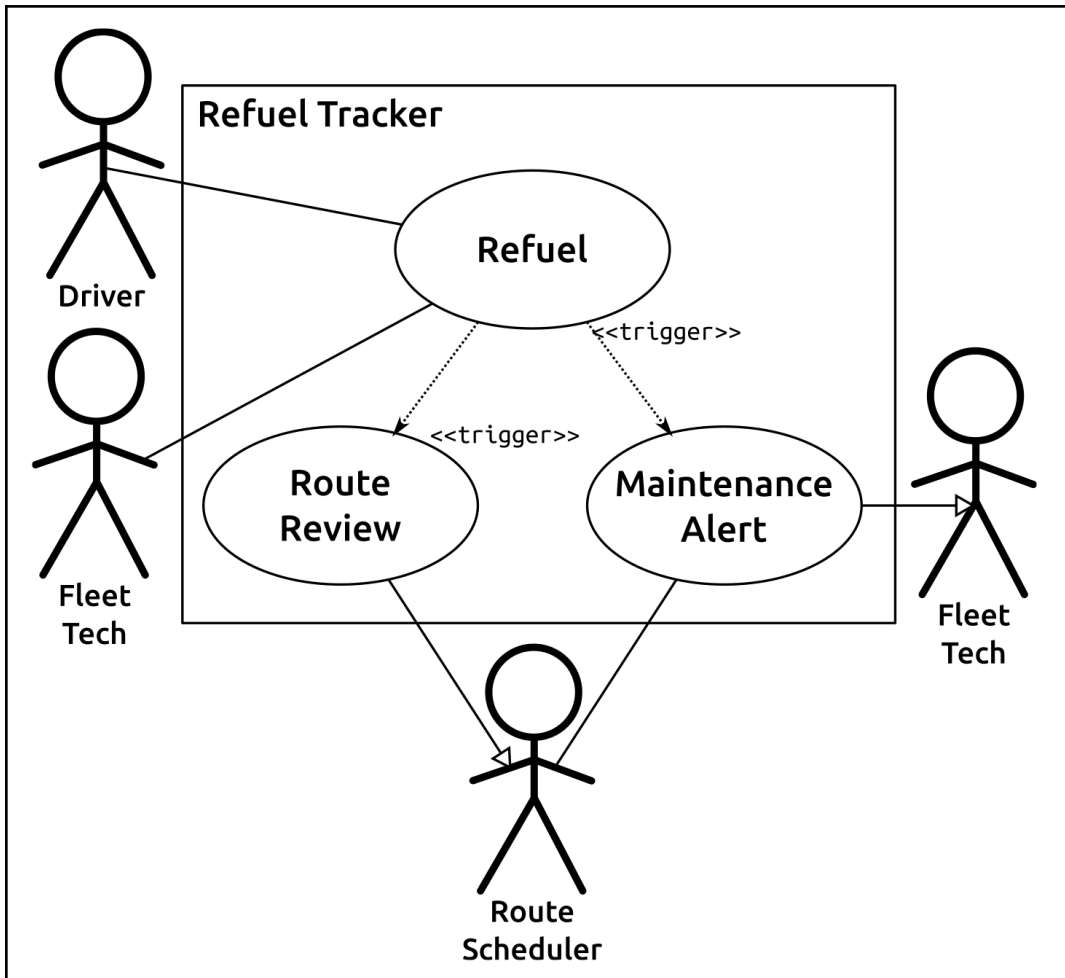
## Chapter 3: System Modeling



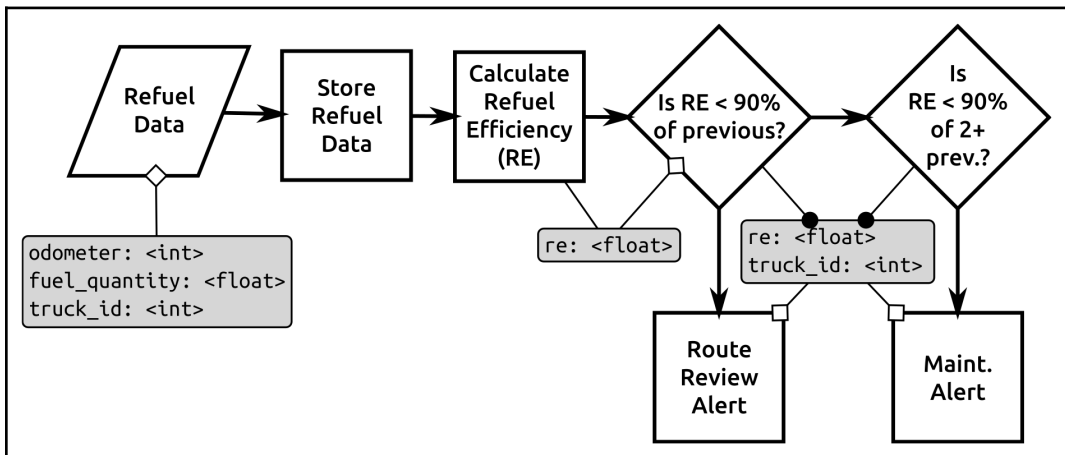
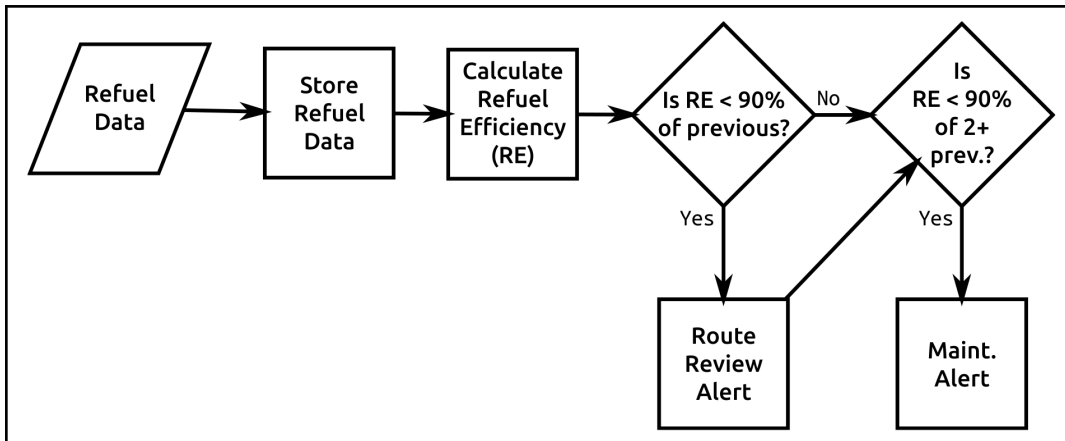


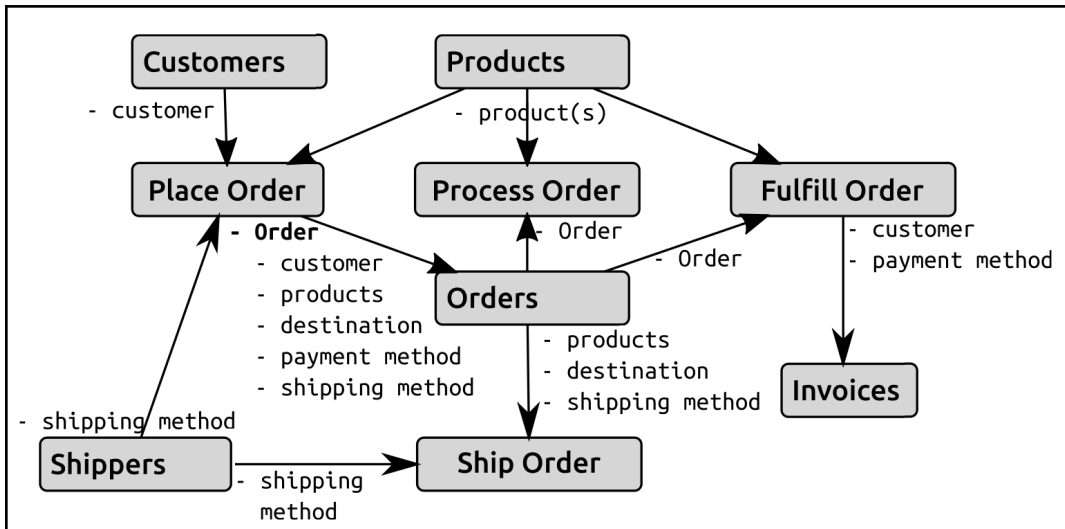


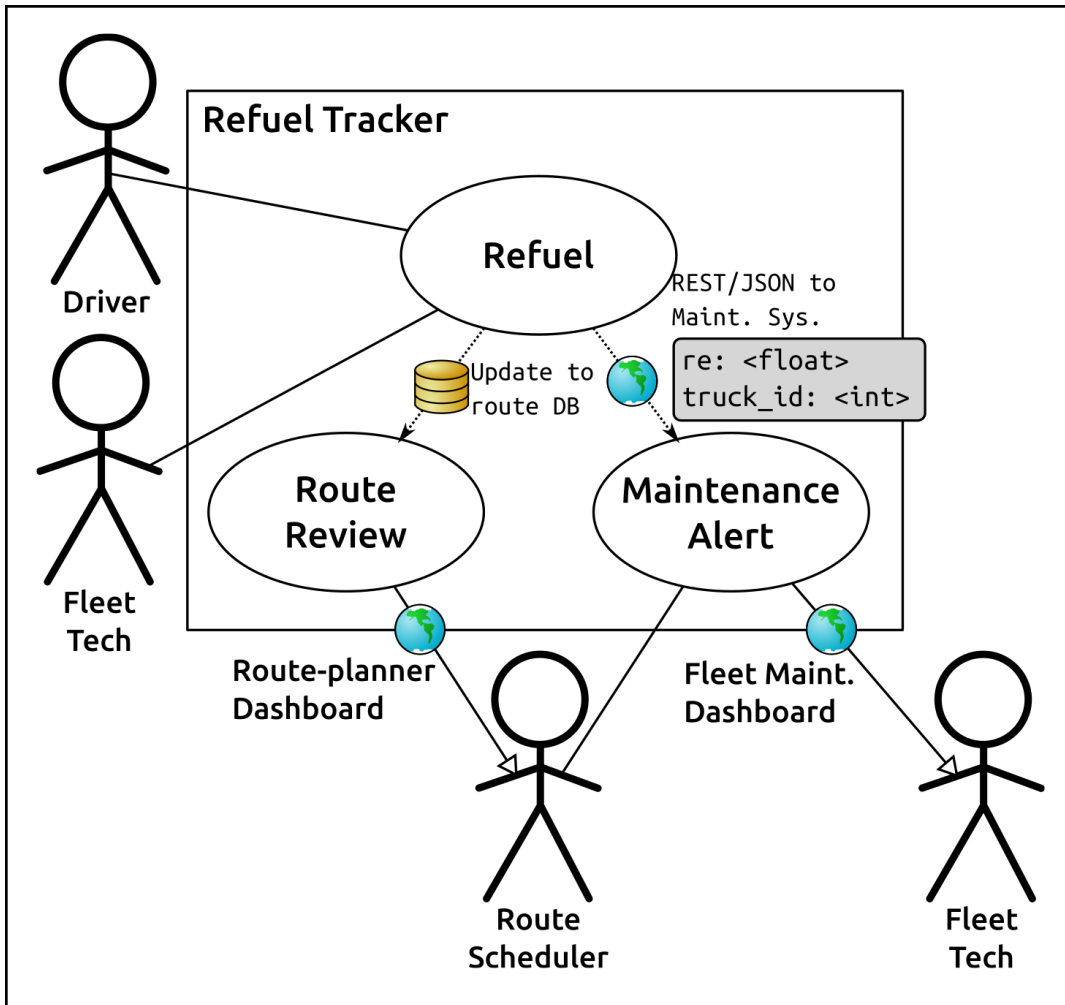


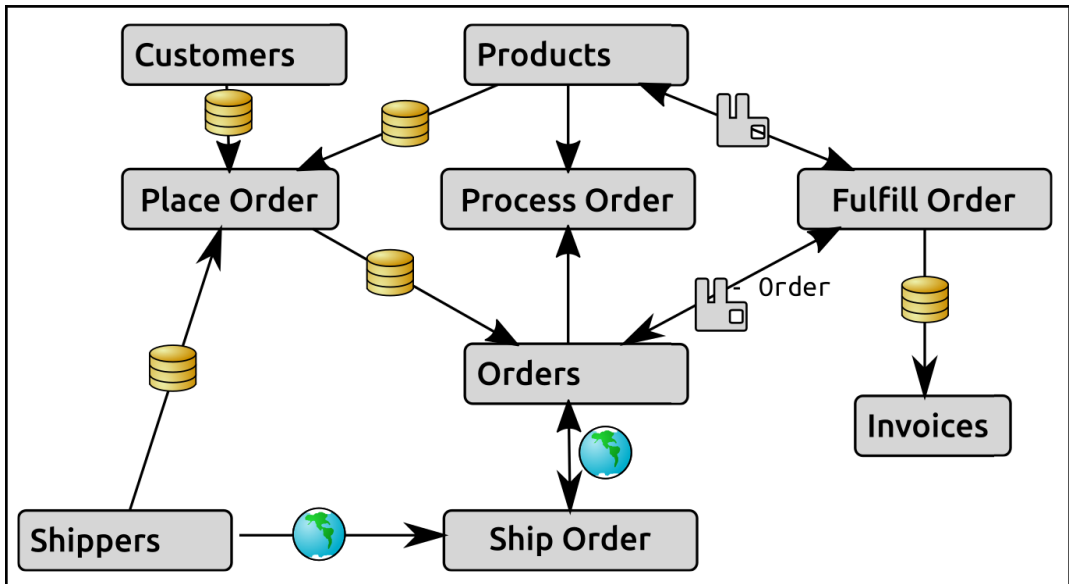






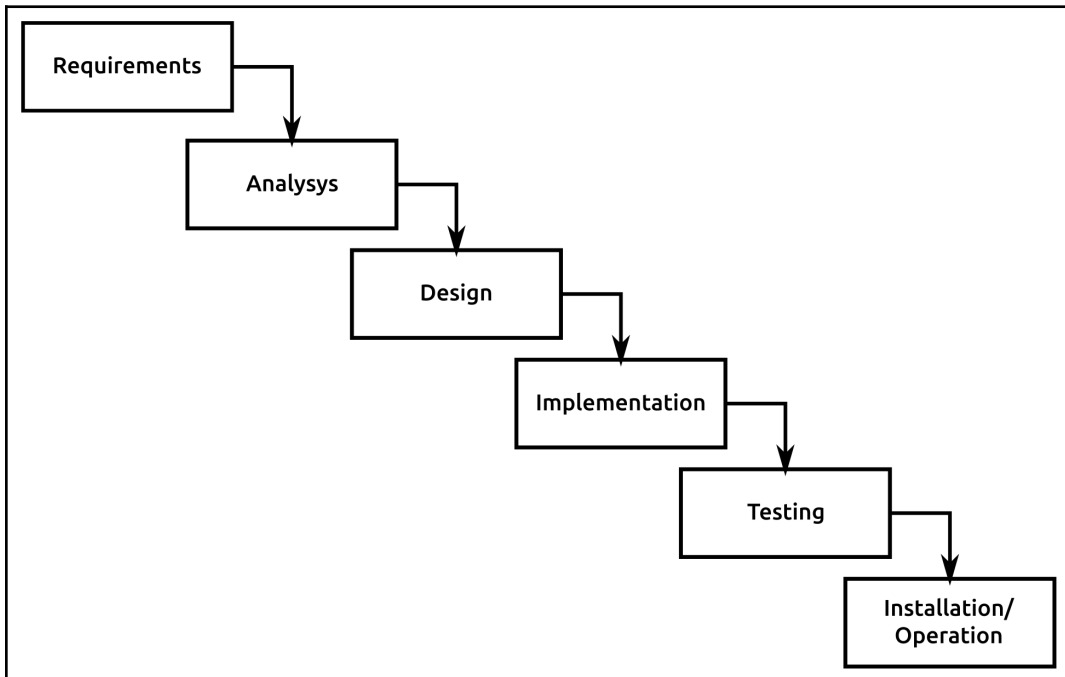
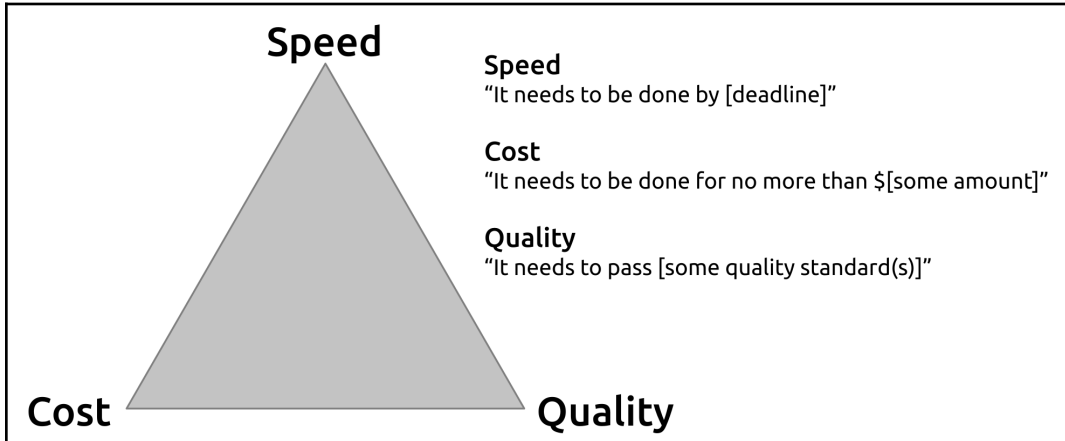


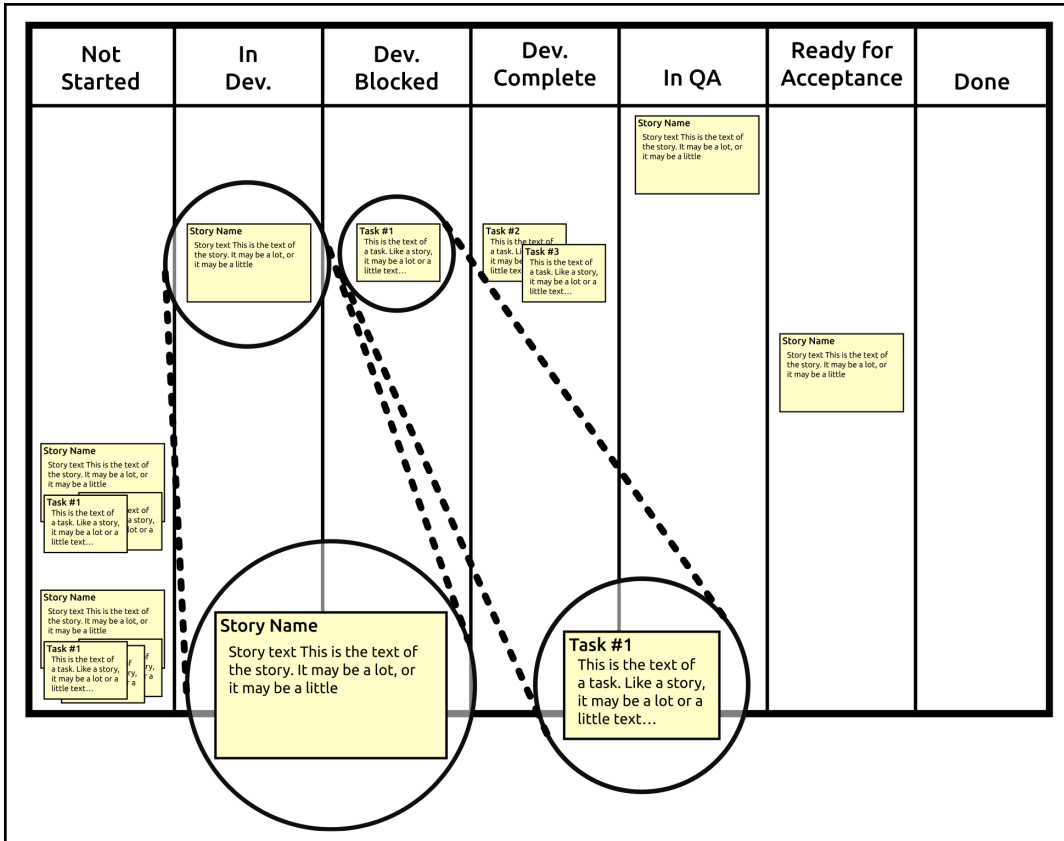




---

# Chapter 4: Methodologies, Paradigms, and Practices





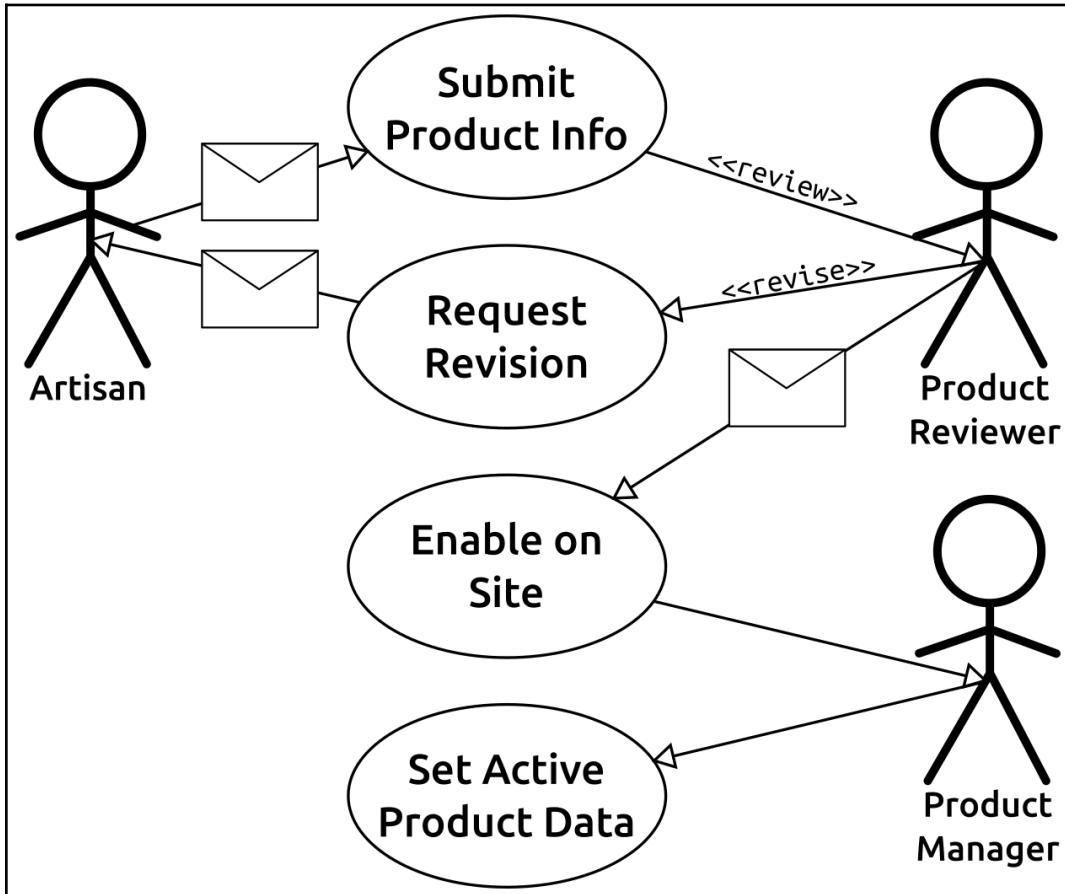
```

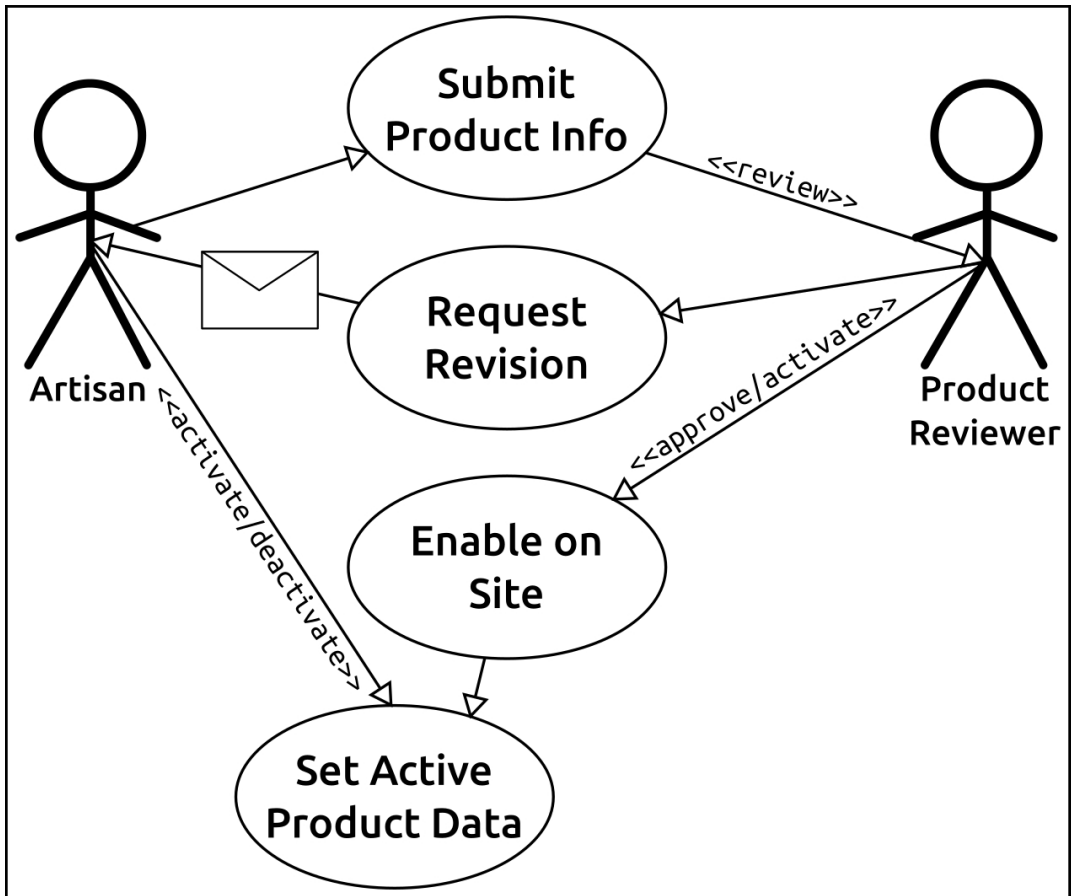
URL ..... http://python.org
Page data length ... 48892
URL ..... http://www.google.com
Page data length ... 12467

```

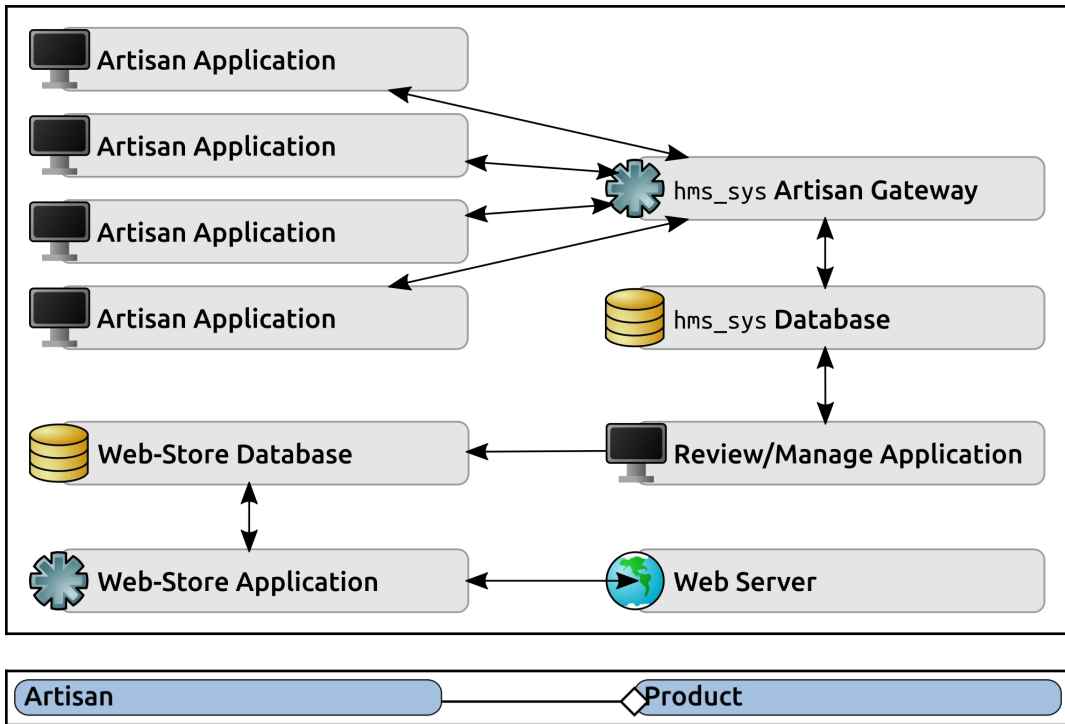
---

## Chapter 5: The hms\_sys System Project

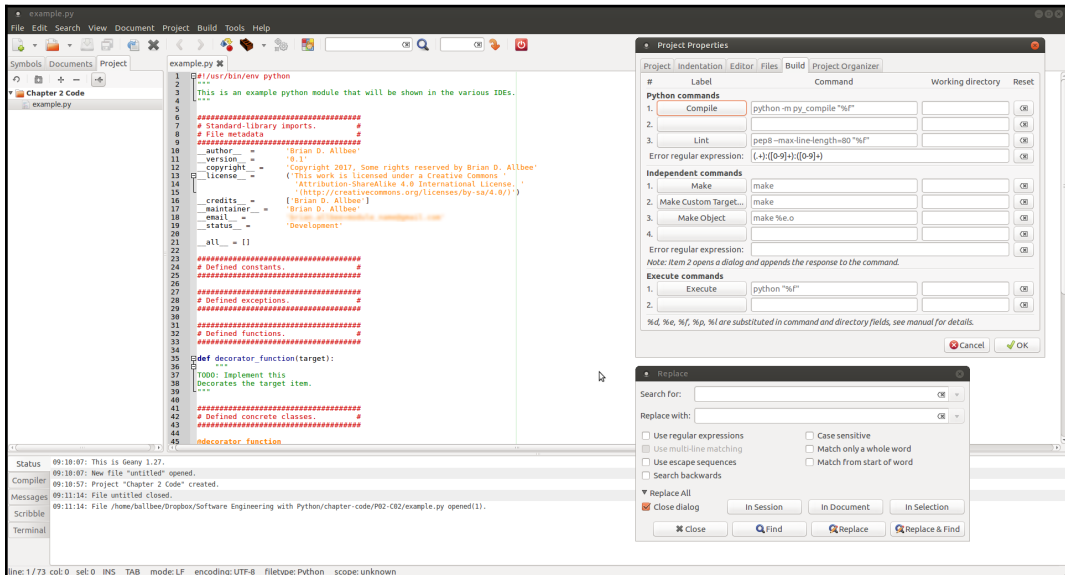
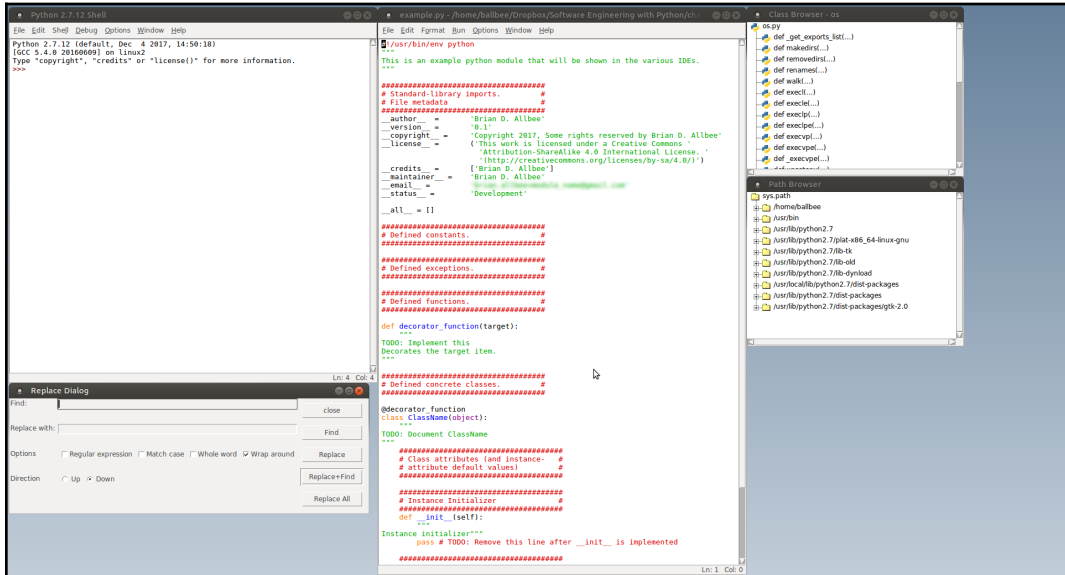


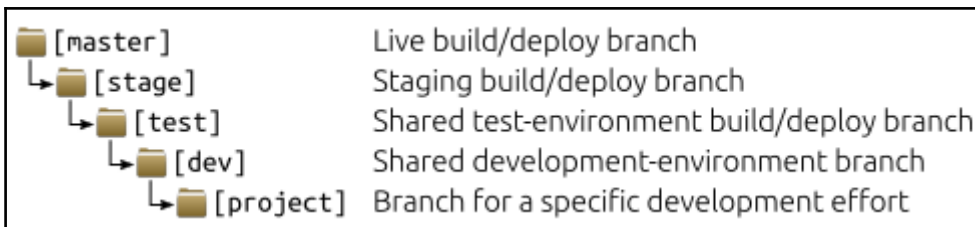
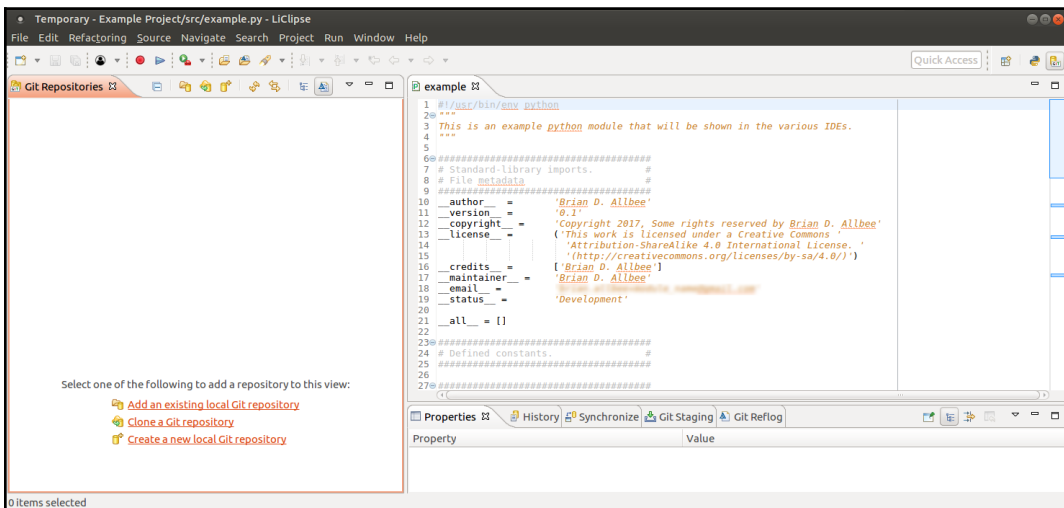
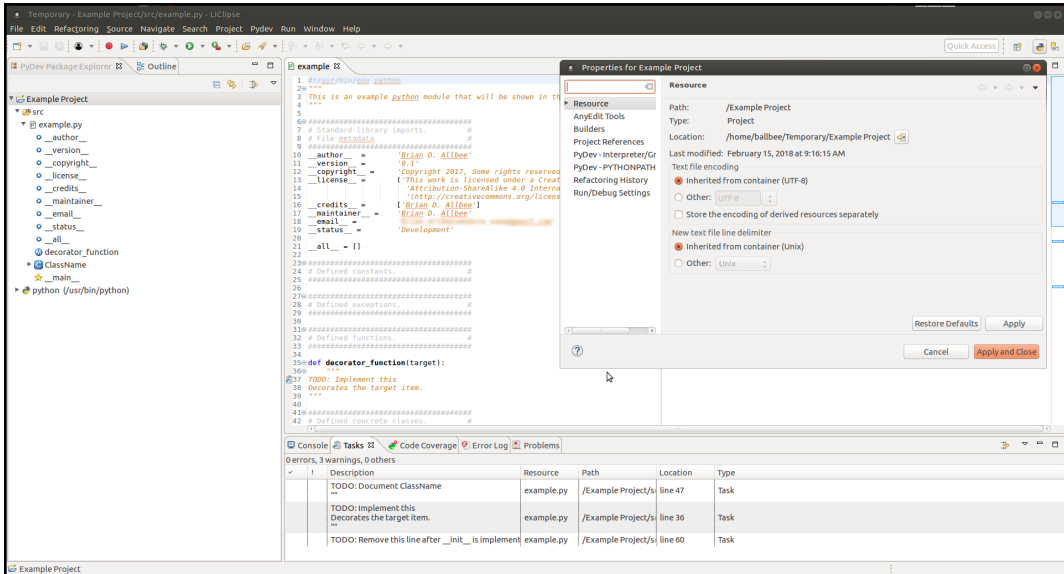


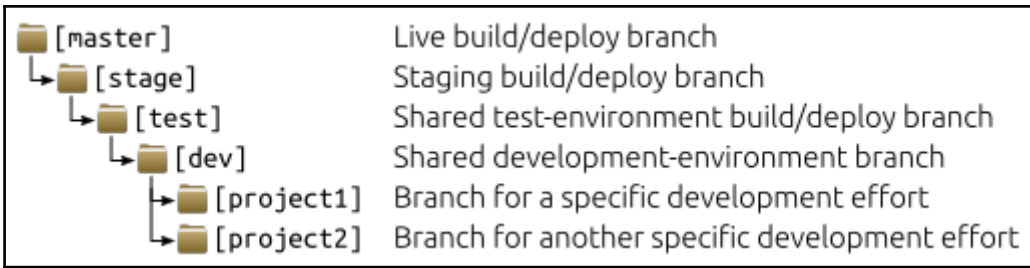




# Chapter 6: Development Tools and Best Practices

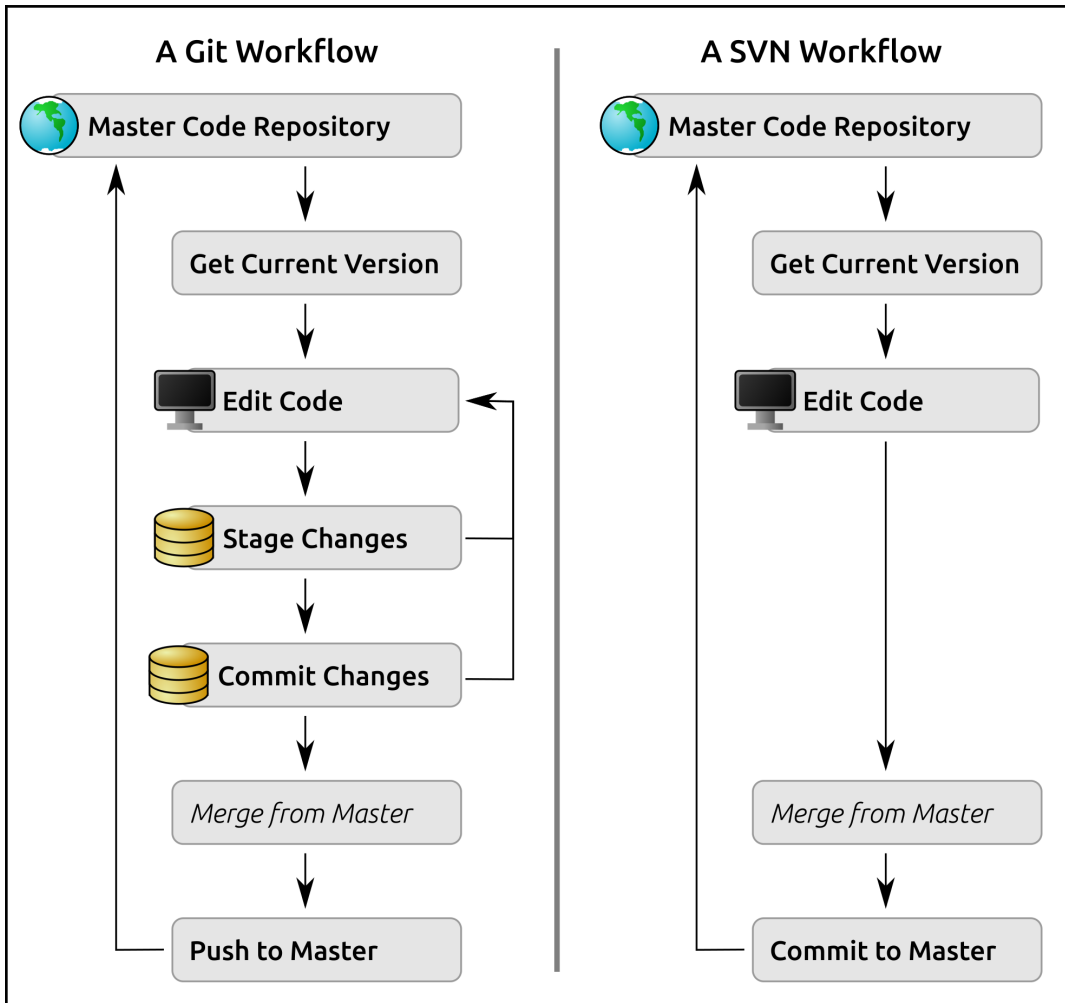






If that doesn't fix it, git.txt contains the phone number of a friend of mine who understands git. Just wait through a few minutes of 'It's really pretty simple, just think of branches as...' and eventually you'll learn the commands that will fix everything.

<https://xkcd.com/1597>



---

```
name ..... Product #1
description ... Description of the product
price ..... 12.95
```

```
name ..... Product #2
description ... None
price ..... 10.00
```

```
name ..... Product #1
description ... Description of the product
price ..... 12.95
```

```
name ..... Product #2
description ... None
price ..... 10.00
```

```
{
  'return': <class 'str'>, 'description': (<class 'str'>, None),
  'price': (<class 'float'>, <class 'int'>), 'name': <class 'str'>
}
```

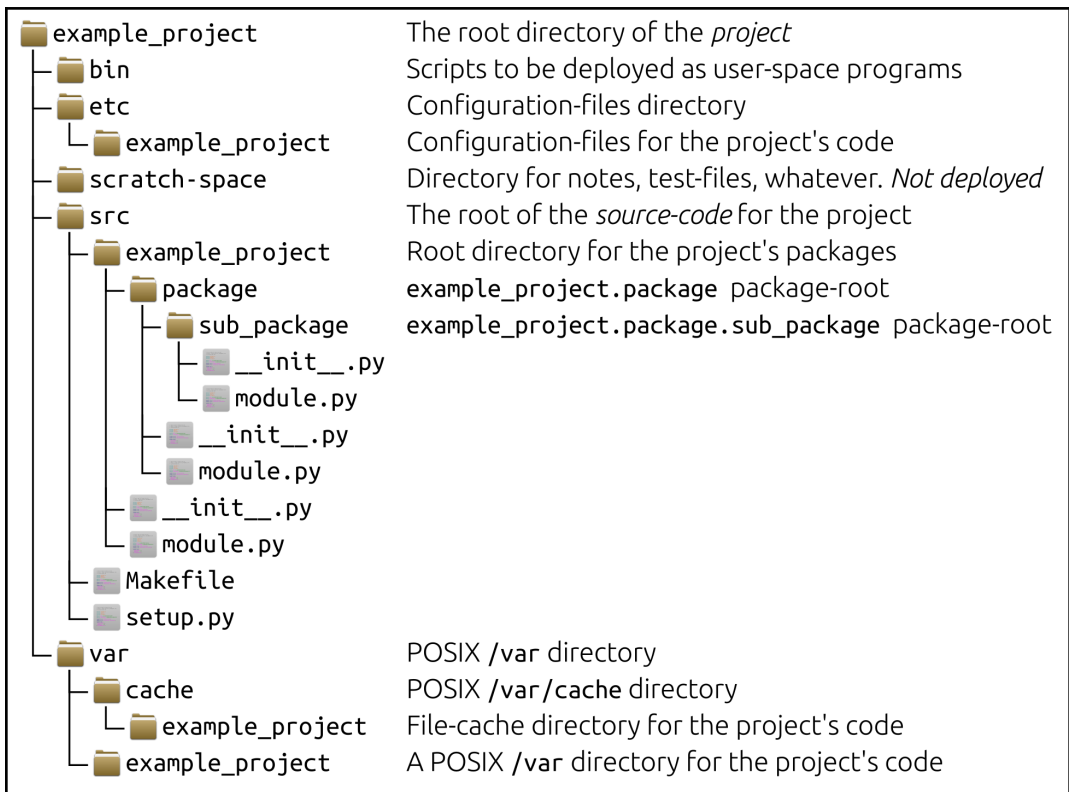
```
All 90 tests passed
```

```
RuntimeError raised calling my_function(None, 0, None)
RuntimeError raised calling my_function(-1, 0, None)
RuntimeError raised calling my_function(-1.0, 0, None)
RuntimeError raised calling my_function(True, 0, None)
RuntimeError raised calling my_function(False, 0, None)
RuntimeError raised calling my_function(<object object at 0x7f61840d30a0>, 0, None)
```

---

```
RuntimeError raised calling my_function(None, 0, None)
RuntimeError raised calling my_function(-1, 0, None)
RuntimeError raised calling my_function(-1.0, 0, None)
RuntimeError raised calling my_function(True, 0, None)
RuntimeError raised calling my_function(False, 0, None)
RuntimeError raised calling my_function(<object object at 0x7f1dd9fe90a0>, 0, None)
RuntimeError raised calling my_function(Product, -1, None)
RuntimeError raised calling my_function(Product, -1.0, None)
RuntimeError raised calling my_function(Product, -12.95, None)
RuntimeError raised calling my_function(Product, -13, None)
RuntimeError raised calling my_function(Product, 0, -1)
RuntimeError raised calling my_function(Product, 0, -1.0)
RuntimeError raised calling my_function(Product, 0, True)
RuntimeError raised calling my_function(Product, 0, False)
RuntimeError raised calling my_function(Product, 0, <object object at 0x7f1dd9fe90b0>)
```

```
$ make
# Executes the unit-tests for the package, allowing the build-
# process to die and stop the build if a test fails
# Calls the main setup.py to build a source-distribution
# python setup.py sdist
# Doesn't (yet) do anything other than running the test and
# setup targets
$
$ make test
# Executes the unit-tests for the package, allowing the build-
# process to die and stop the build if a test fails
$
$ make setup
# Calls the main setup.py to build a source-distribution
# python setup.py sdist
$
```



```

$ python3 -m venv ~/py_envs/example_ve
$ source ~/py_envs/example_ve/bin/activate
(example_ve) ~$ python
Python 3.5.2 (default, Nov 23 2017, 16:37:01)
[GCC 5.4.0 20160609] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
(example_ve) ~$ deactivate
$ python
Python 2.7.12 (default, Dec 4 2017, 14:50:18)
[GCC 5.4.0 20160609] on linux2
Type "help", "copyright", "credits" or "license" for more information.
>>>

```



```
$ source ~/py_envs/example_ve/bin/activate
(example_ve)~$ pip freeze
pkg-resources==0.0.0
You are using pip version 8.1.1, however version 9.0.1 is available.
You should consider upgrading via the 'pip install --upgrade pip' command.
(example_ve)~$ pip install --upgrade pip
Collecting pip
  Using cached pip-9.0.1-py2.py3-none-any.whl
Installing collected packages: pip
  Found existing installation: pip 8.1.1
  Uninstalling pip-8.1.1:
    Successfully uninstalled pip-8.1.1
Successfully installed pip-9.0.1
(example_ve)~$ pip freeze
pkg-resources==0.0.0
(example_ve)~$ pip install pillow
Collecting pillow
  Downloading Pillow-5.0.0-cp35-cp35m-manylinux1_x86_64.whl (5.9MB)
    100% |████████████████████████████████████████| 5.9MB 183kB/s
Installing collected packages: pillow
Successfully installed pillow-5.0.0
(example_ve)~$ pip freeze
Pillow==5.0.0
pkg-resources==0.0.0
(example_ve)~$ pip uninstall pillow
Uninstalling Pillow-5.0.0:


# ... Shows a long list of files to be removed if the uninstall is approved

Proceed (y/n)? y
  Successfully uninstalled Pillow-5.0.0
```

---

## Chapter 7: Setting Up Projects and Processes

### Create a new repository [Import repository](#)

Owner  ▼

Repository name\*

Access level  This is a private repository

Include a README?  ▼

Version control system  Git  Mercurial

▼ **Advanced settings**

Description

Forking  ▼

Project management  Issue tracking  Wiki

Language  × ▼

Integrations  Enable Hipchat notifications



com / hms\_sys

## Overview

HTTPS ▾

https://@bitbucket.org/

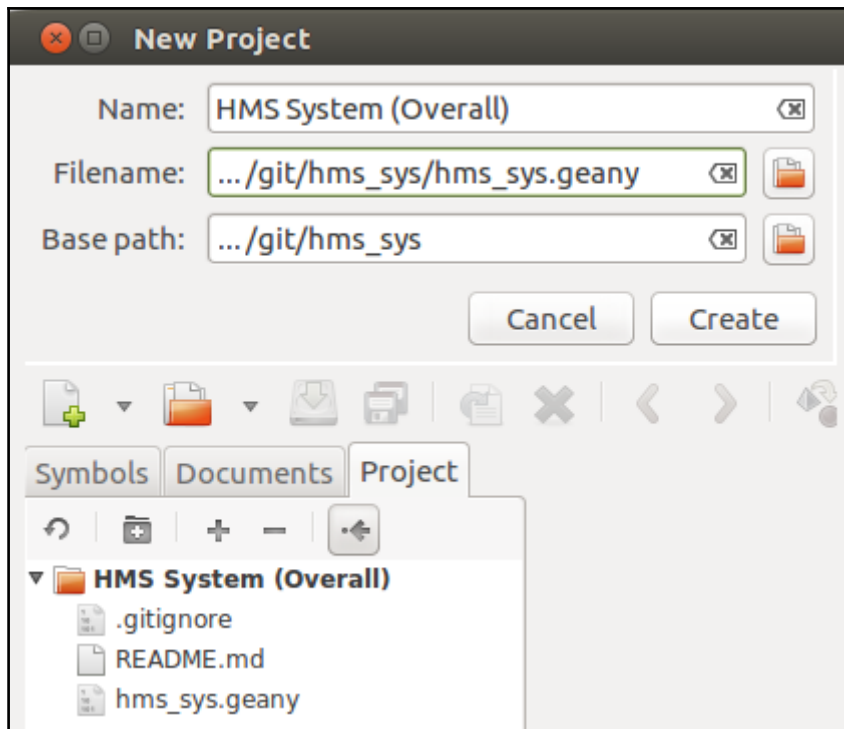
Last updated	54 seconds ago	0	1
Language	Python	Open PRs	Watcher
Access level	Admin	1	0
		Branch	Forks

 [Edit README](#)

## hms\_sys

















The system-level repository for the hms\_sys project, from [Hands On Software Engineering with Python](#), published by Packt

Name	Size	Type
hms_sys	1 item	Folder
README.md	140 bytes	Text



The screenshot shows a web interface for a Git repository named 'hms\_sys'. On the left is a navigation sidebar with options: Overview, Source (selected), Commits, Branches, Pull requests, Pipelines, Downloads, Boards, and Settings. The main content area is titled 'Source' and shows the current branch as 'master'. Two files are listed: '.gitignore' and 'README.md', both of which are enclosed in a red rectangular box. Below the file list, there is a section for the repository 'hms\_sys' with a description: 'The system-level repository for the'. Underneath, there is a heading 'Geany Project Set-up' followed by the text: 'Geany project-files (\*.geany) are were moved from one developer's'.

The screenshot displays an application management interface. It features three main application cards. The first card, 'Artisan Application', includes buttons for 'Artisan', 'Product', and 'Order', and a separate row with 'Customer' and 'Address' buttons. The second card, 'hms\_sys Artisan Gateway', includes buttons for 'Artisan', 'Product', and 'Order'. The third card, 'Review/Manage Application', includes a 'Product' button.

Name	▲	Size	Type
▼  bin		0 items	Folder
(Empty)			
▼  etc		1 item	Folder
▼  hms		1 item	Folder
 hms_core.conf		49 bytes	Text
▼  src		1 item	Folder
▼  hms_core		1 item	Folder
 __init__.py		2.7 kB	Text
▼  var		1 item	Folder
▼  cache		1 item	Folder
▼  hms		2 items	Folder
▼  core		1 item	Folder
 placeholder.txt		35 bytes	Text
 placeholder.txt		56 bytes	Text
 Makefile		359 bytes	Text
 README.md		409 bytes	Text
 setup.py		649 bytes	Text

---

```
~/git/hms_sys/hms-core$ python3 setup.py sdist
running sdist
running egg_info
```

```
[Removed for brevity]
```

```
creating dist
Creating tar archive
removing 'HMS-Core-0.1.dev0' (and everything under it)
```

```
~/git/hms_sys/hms-core$ pip3 install dist/HMS-Core-0.1.dev0.tar.gz
Processing ./dist/HMS-Core-0.1.dev0.tar.gz
Building wheels for collected packages: HMS-Core
```

```
[Removed for brevity]
```

```
Installing collected packages: HMS-Core
Successfully installed HMS-Core
```

```
~/git/hms_sys/hms-core$ python
Python 3.5.2 (default, Nov 23 2017, 16:37:01)
[GCC 5.4.0 20160609] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import hms_core
>>> dir()
['__builtins__', '__doc__', ..., 'hms_core']
>>> dir(hms_core)
['__all__', '__author__', '__copyright__', '__doc__', '__status__', ...]
>>> print(hms_core.__doc__)
```

```
TODO: Document the package.
Package-header for the hms_core namespace.
Provides classes and functionality for SOME_PURPOSE
```

```
>>>
```

---

```
ExampleParent.public_method called:
+- arg ..... example public
+- args ..... (1, 2, 3)
+- kwargs ... {'key': 'value'}
ExampleParent._protected_method called:
+- arg ..... example "protected"
+- args ..... (1, 2, 3)
+- kwargs ... {'key': 'value'}
ExampleParent.__private_method called:
+- arg ..... example "private"
+- args ..... (1, 2, 3)
+- kwargs ... {'key': 'value'}
```



---

```
ExampleChild.public_method called:
+- arg ..... example public
+- args ..... (1, 2, 3)
+- kwargs ... {'key': 'value'}
ExampleChild._protected_method called:
+- arg ..... example "protected"
+- args ..... (1, 2, 3)
+- kwargs ... {'key': 'value'}
ExampleChild.__private_method called:
+- arg ..... example "private"
+- args ..... (1, 2, 3)
+- kwargs ... {'key': 'value'}
```

```
Parent.arg [public] ..... parent
Parent.arg [protected] ..... parent
Parent.arg [private] ..... parent
Child.arg [public] ..... child
Child.arg [protected] ..... child
Child.arg [private] ..... child
ChildOverride.arg [PUBLIC] ..... child-override
ChildOverride.arg [PROTECTED] ... child-override
ChildOverride.arg [private] ..... child-override
```

---

```
### Testing Parent.__private
.### Testing Parent._protected
.### Testing Parent.public
```

```
.
```

```
-----
Ran 3 tests in 0.000s
```





```
OK
```

```
...
```

```
-----
Ran 3 tests in 0.001s
```

```
OK
```

---

Name	▲	Size	Type
▶ bin		0 items	Folder
▶ dist		1 item	Folder
▶ etc		1 item	Folder
▶ src		1 item	Folder
▼ tests		2 items	Folder
▶ test_hms_core		1 item	Folder
 run_tests.py		1.1 kB	Text
▶ var		1 item	Folder
 Makefile		359 bytes	Text
 README.md		409 bytes	Text
 setup.py		642 bytes	Text

Test-policies require test-case classes to be created for each class in the codebase. The following have not been created:

- \* testShowable
- \* testChildOverride
- \* testChild
- \* testParent

---

```
.F
```

```
=====
FAIL: testCodeCoverage (__main__.testmeCodeCoverage)
-----
```

```
[Removed for brevity]
```

```
Unit-testing policies require test-cases for all classes and functions
in the me module, but the following have not been defined:
```

```
(testChild, testChildOverride, testParent, testShowable)
```

```
-----
Ran 2 tests in 0.002s
```

```
...F.FF...
```

```
=====
FAIL: testMethodCoverage (__main__.testChildOverride)
-----
```

```
Unit-testing policy requires test-methods to be created for all public and protected
methods, but testChildOverride is missing the following test-methods:
```

```
['test_protected', 'testpublic']
```

```
=====
FAIL: testMethodCoverage (__main__.testParent)
-----
```

```
Unit-testing policy requires test-methods to be created for all public and protected
methods, but testParent is missing the following test-methods:
```

```
['test__init__', 'test_protected', 'testpublic', 'testshow']
```

```
=====
FAIL: testPropertyCoverage (__main__.testParent)
-----
```

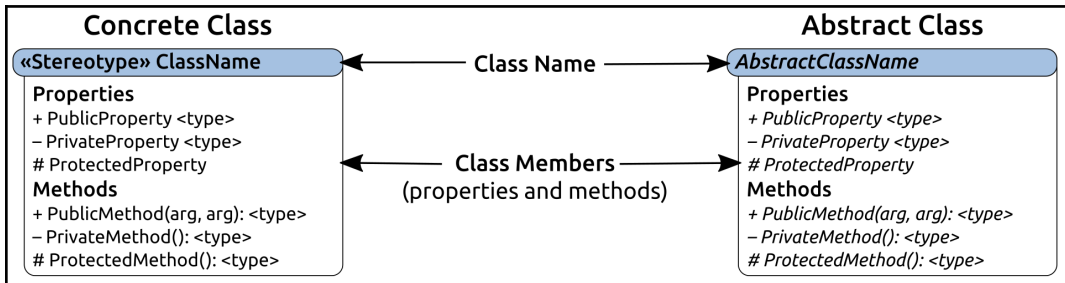
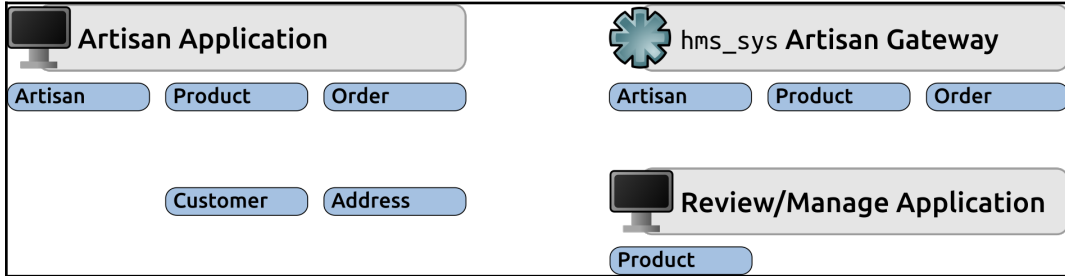
```
Unit-testing policy requires test-methods to be created for all public properties,
but testParent is missing the following test-methods:
```

```
['testprop']
```

```
-----
Ran 10 tests in 0.004s
```

```
FAILED (failures=3)
```

# Chapter 8: Creating Business Objects



## Address

### Properties

- + street\_address <str>
- + building\_address <str>
- + city <str>
- + region <str>
- + postal\_code <str>
- + country <str>

## BaseArtisan

### Properties

- + contact\_name <str>
- + contact\_email <str>
- + company\_name <str>
- + address <Address>
- + website <str>
- + products <BaseProduct>\*

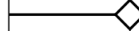
### Methods

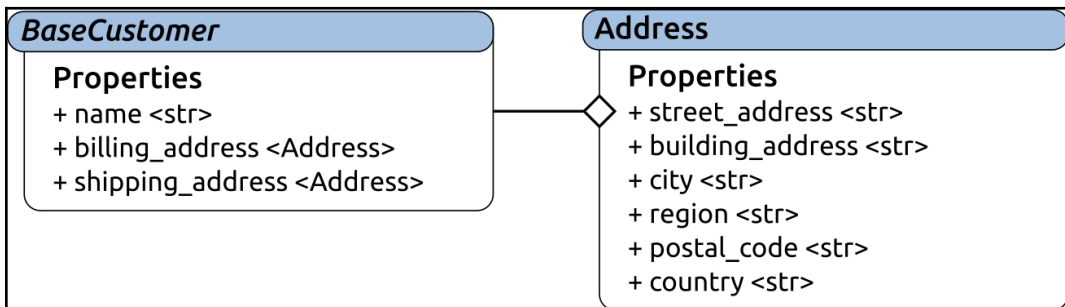
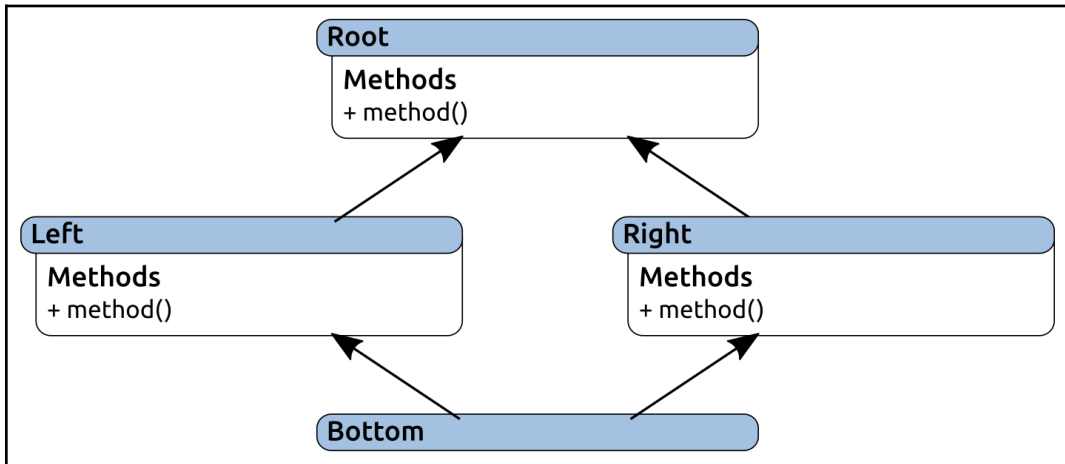
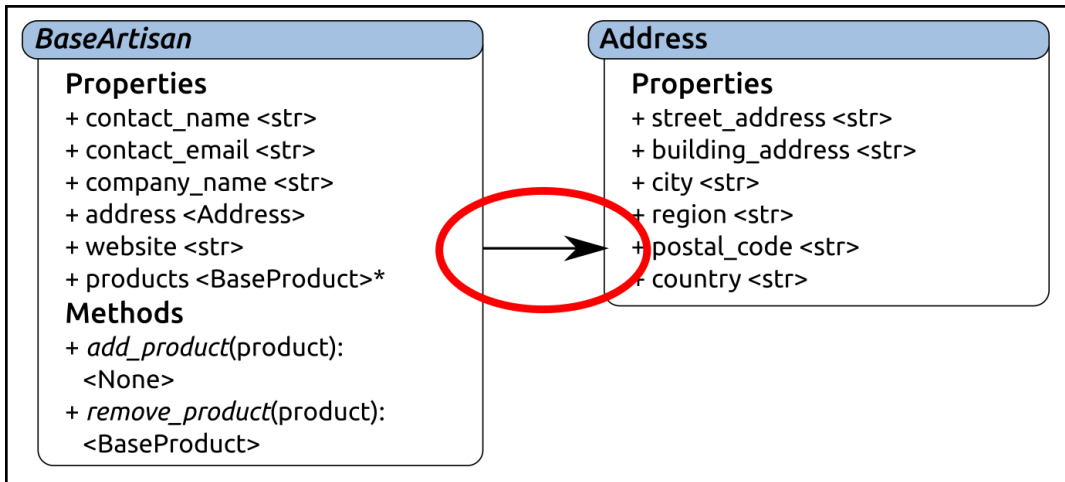
- + *add\_product*(product):  
<None>
- + *remove\_product*(product):  
<BaseProduct>

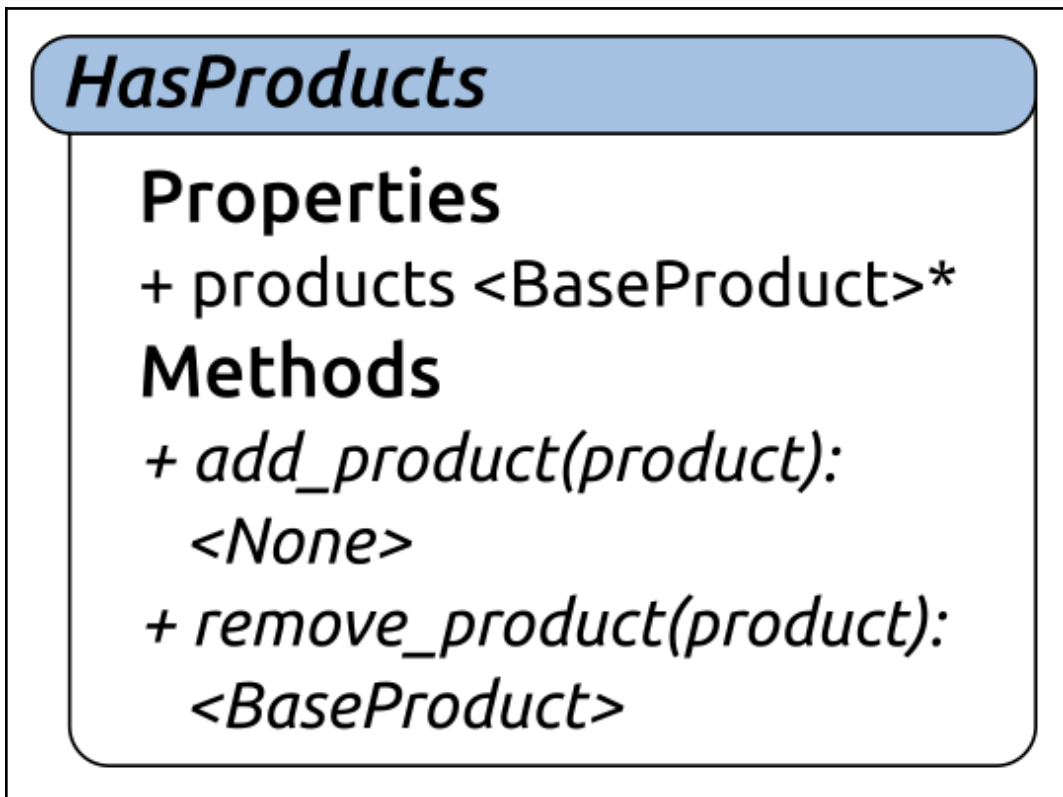
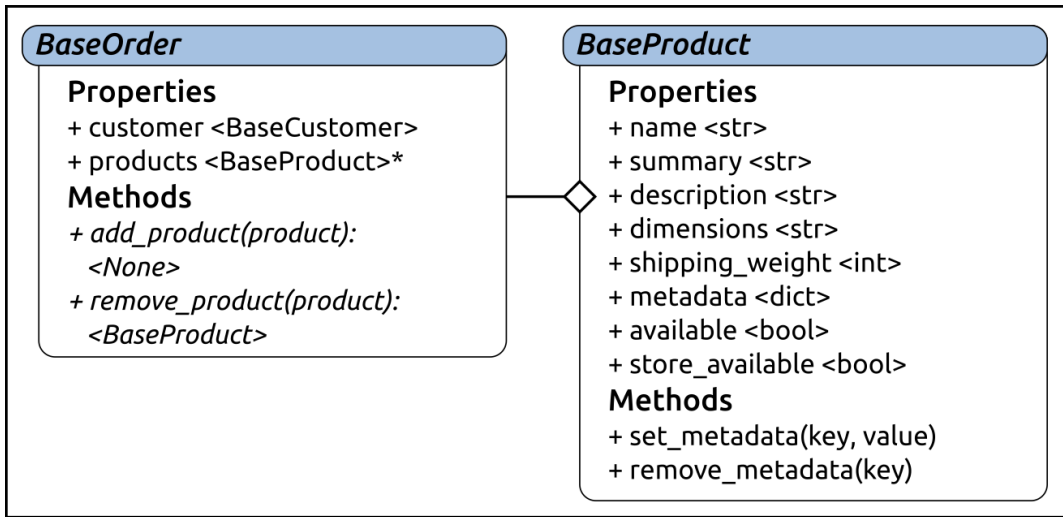
## Address

### Properties

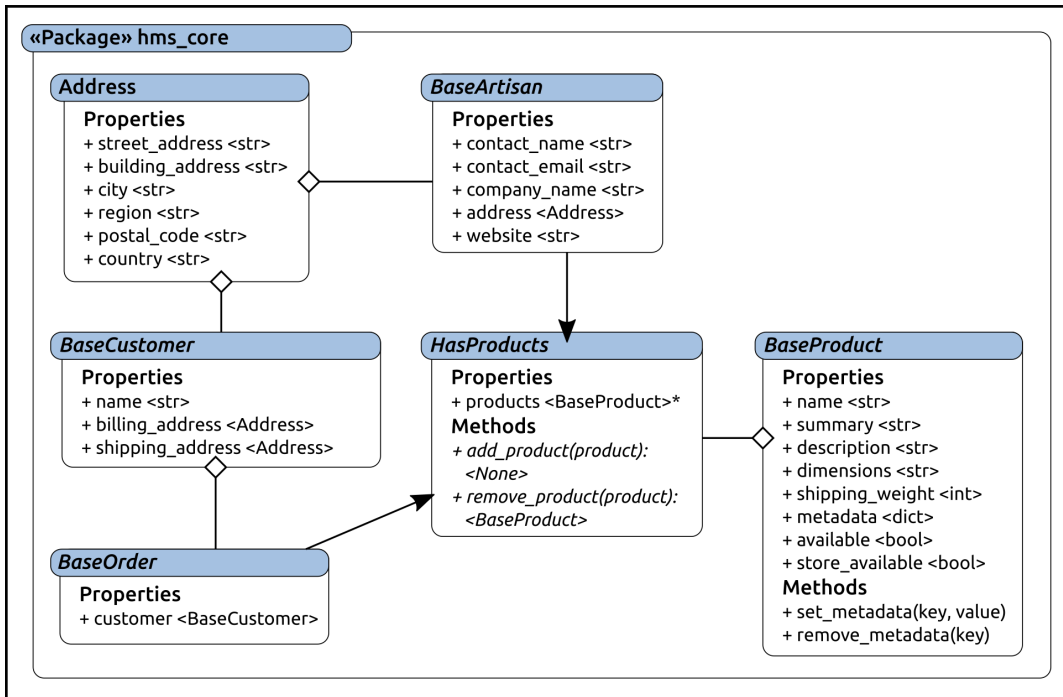
- + street\_address <str>
- + building\_address <str>
- + city <str>
- + region <str>
- + postal\_code <str>
- + country <str>











---

## Chapter 9: Testing Business Objects

```
#####
Tests were successful ..... False
Number of tests run ..... 1
+ Tests ran in ..... 0.00 seconds
Number of errors ..... 0
Number of failures ..... 1
Number of tests skipped ... 0
#####
FAILURES
#-----#
testCodeCoverage (__main__.testhms_coreCodeCoverage)

[lines removed for brevity]

Unit-testing policies require test-cases for all classes and functions in the
hms_core module, but the following have not been defined:
    (testAddress, testBaseArtisan, testBaseCustomer, testBaseOrder,
     testBaseProduct, testHasProducts)
#####
Unit-test results
#####
Tests were successful ..... False
Number of tests run ..... 1
+ Tests ran in ..... 0.00 seconds
Number of errors ..... 0
Number of failures ..... 1
Number of tests skipped ... 0
#####
```

```

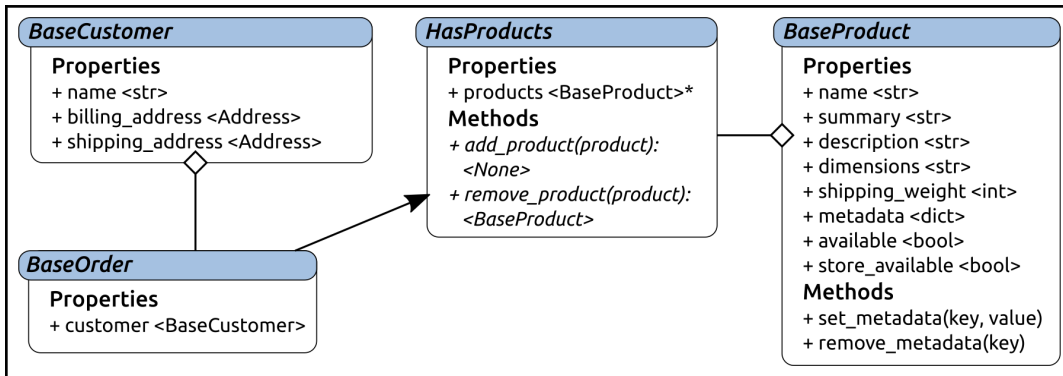
#####
FAILURES
testMethodCoverage (__main__.testAddress)
# ...
Unit-testing policy requires test-methods to be created for all public and
protected methods, but testAddress is missing the following test-methods:
  ['test__init__', 'test_del_building_address', 'test_del_city',
   'test_del_country', 'test_del_postal_code', 'test_del_region',
   'test_del_street_address', 'test_get_building_address',
   'test_get_city', 'test_get_country', 'test_get_postal_code',
   'test_get_region', 'test_get_street_address',
   'test_set_building_address', 'test_set_city', 'test_set_country',
   'test_set_postal_code', 'test_set_region', 'test_set_street_address',
   'teststandard_address']
#-----#
testPropertyCoverage (__main__.testAddress)
# ...
Unit-testing policy requires test-methods to be created for all public
properties, but testAddress is missing the following test-methods:
  ['testbuilding_address', 'testcity', 'testcountry', 'testpostal_code',
   'testregion', 'teststreet_address']
#-----#
testMethodCoverage (__main__.testBaseArtisan)
# ... There are similar results for each test-case class,
#   removed for brevity
#-----#
testMethodCoverage (__main__.testHasProducts)
# ...
Unit-testing policy requires test-methods to be created for all public and
protected methods, but testHasProducts is missing the following test-methods:
  ['test__init__', 'test_del_products', 'test_get_products', 'test_set_products']
#-----#
testPropertyCoverage (__main__.testHasProducts)
# ...
Unit-testing policy requires test-methods to be created for all public
properties, but testHasProducts is missing the following test-methods:
  ['testproducts']
#####
Unit-test results
#####
Tests were successful ..... False
Number of tests run ..... 13
Number of failures ..... 12

```

```
#####
Unit-test results
#####
Tests were successful ..... False
Number of tests run ..... 29
+ Tests ran in ..... 0.00 seconds
Number of errors ..... 0
Number of failures ..... 9
Number of tests skipped ... 0
#####
```

```
#####
Unit-test results
#####
Tests were successful ..... False
Number of tests run ..... 29
+ Tests ran in ..... 0.00 seconds
Number of errors ..... 0
Number of failures ..... 3
Number of tests skipped ... 0
#####
```

```
#####
FAILURES
#-----#
testCodeCoverage (__main__.testhms_coreCodeCoverage)
Unit-testing policies require test-cases for all classes and functions in the
hms_core module, but the following have not been defined:
    (testBaseArtisan, testBaseCustomer, testBaseOrder, testBaseProduct,
     testHasProducts)
#####
Unit-test results
#####
Tests were successful ..... False
Number of tests run ..... 29
+ Tests ran in ..... 0.84 seconds
Number of errors ..... 0
Number of failures ..... 1
Number of tests skipped ... 0
#####
```



```

#####
Unit-test results
#####
Tests were successful ..... True
Number of tests run ..... 118
+ Tests ran in ..... 0.85 seconds
Number of errors ..... 0
Number of failures ..... 0
Number of tests skipped ... 0
#####
  
```

---

```
python setup.py test
running test
running egg_info
writing top-level names to src/HMS_Core.egg-info/top_level.txt
writing src/HMS_Core.egg-info/PKG-INFO
writing dependency_links to src/HMS_Core.egg-info/dependency_links.txt
reading manifest file 'src/HMS_Core.egg-info/SOURCES.txt'
writing manifest file 'src/HMS_Core.egg-info/SOURCES.txt'
running build_ext
testCodeCoverage (idic.unit_testing.ModuleCoverageTest) ... ok
testMethodCoverage (tests.test_hms_core.testAddress) ... ok
testPropertyCoverage (tests.test_hms_core.testAddress) ... ok

# ... There are a LOT of other tests in this output ...
# ... removed for brevity

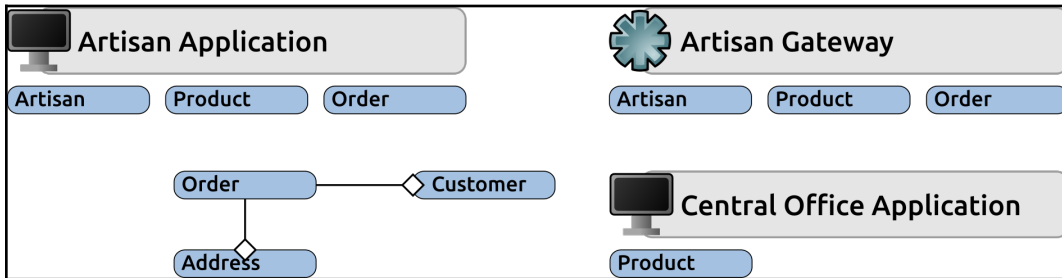
testproducts (tests.test_hms_core.testHasProducts) ... ok
testCodeCoverage (tests.test_hms_core.testhms_coreCodeCoverage) ... ok

-----
Ran 119 tests in 0.843s

OK
```

```
$ python
Python 3.5.2 (default, Nov 23 2017, 16:37:01)
[GCC 5.4.0 20160609] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import hms_core
>>> dir(hms_core)
[
  'Address', 'BaseArtisan', 'BaseCustomer', 'BaseOrder', 'BaseProduct',
  'EMAIL_CHECK', 'HasProducts', 'URL_CHECK', '__all__', '__author__',
  '__builtins__', '__cached__', '__copyright__', '__doc__', '__file__',
  '__loader__', '__name__', '__package__', '__path__', '__spec__', '__status__',
  'abc', 'parseaddr', 're'
]
>>>
```

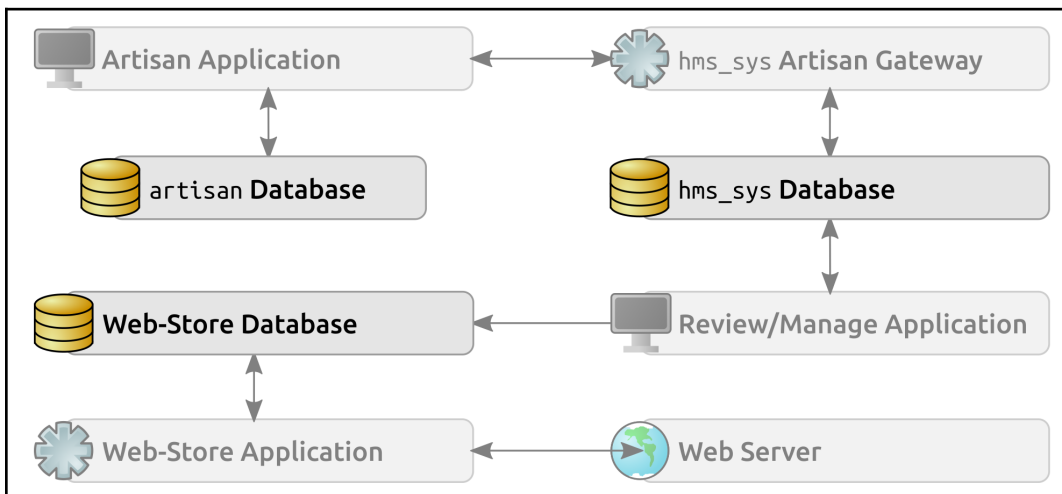
# Chapter 10: Thinking About Business Object Data Persistence

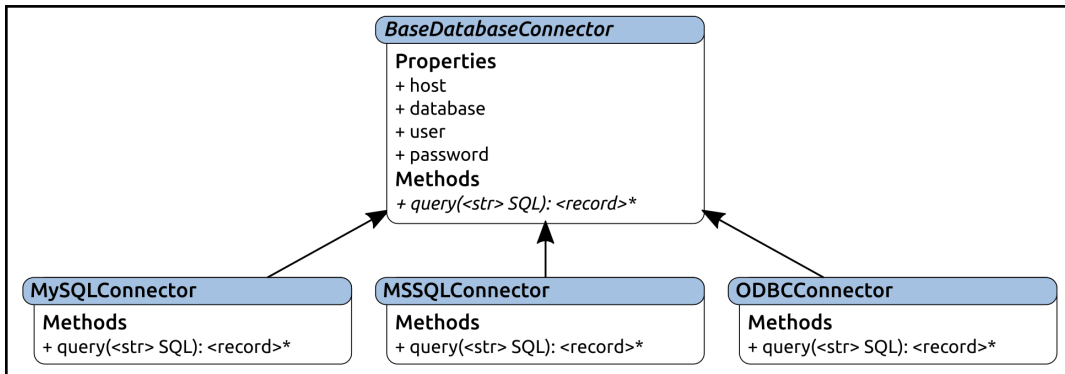


*Primary Key field*

Fields or Columns

	<i>Primary Key field</i>	Fields or Columns	Fields or Columns	Fields or Columns
	<b>user_id</b>	<b>first_name</b>	<b>last_name</b>	<b>email_address</b>
<b>Records or Rows</b> →	1	Joe	Smith	jsmith@somewhere.com
→	2	John	Doe	john.doe@somewhere-else.com
→	...	...	...	...
→	1011	Christine	Aragones	caragones@company.es







---

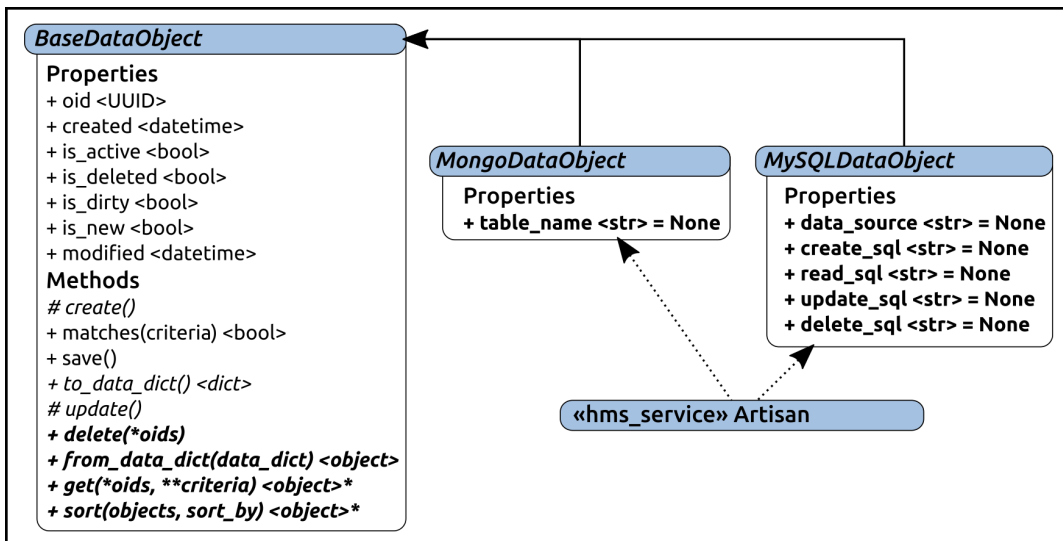
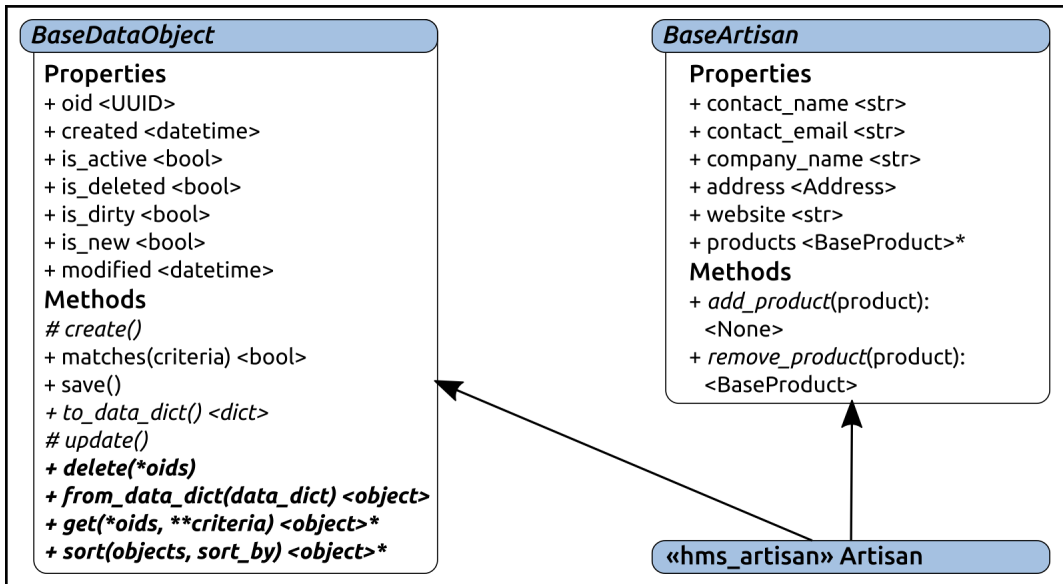
## *BaseDataObject*

### **Properties**

+ oid <UUID>  
+ created <datetime>  
+ is\_active <bool>  
+ is\_deleted <bool>  
+ is\_dirty <bool>  
+ is\_new <bool>  
+ modified <datetime>

### **Methods**

*# create()*  
+ matches(criteria) <bool>  
+ save()  
+ to\_data\_dict() <dict>  
*# update()*  
**+ delete(\*oids)**  
**+ from\_data\_dict(data\_dict) <object>**  
**+ get(\*oids, \*\*criteria) <object>\***  
**+ sort(objects, sort\_by) <object>\***



---

## Chapter 11: Data Persistence and BaseDataObject

### *BaseDataObject*

#### **Properties**

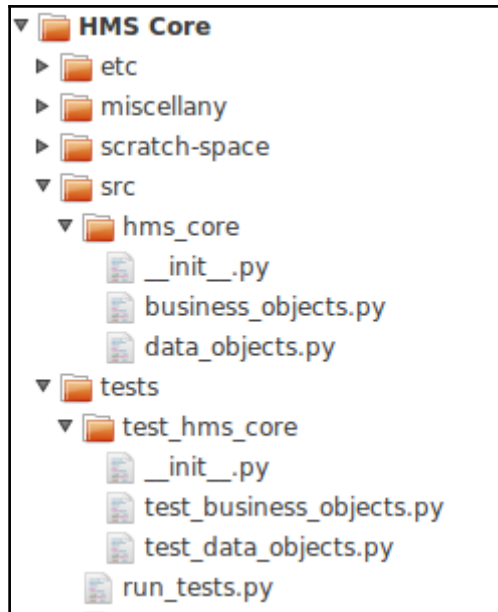
+ oid <UUID>  
+ created <datetime>  
+ is\_active <bool>  
+ is\_deleted <bool>  
+ is\_dirty <bool>  
+ is\_new <bool>  
+ modified <datetime>

#### **Methods**

# *create()*  
+ matches(criteria) <bool>  
+ save()  
+ to\_data\_dict() <dict>  
# *update()*  
**+ delete(\*oids)**  
**+ from\_data\_dict(data\_dict) <object>**  
**+ get(\*oids, \*\*criteria) <object>\***  
**+ sort(objects, sort\_by) <object>\***

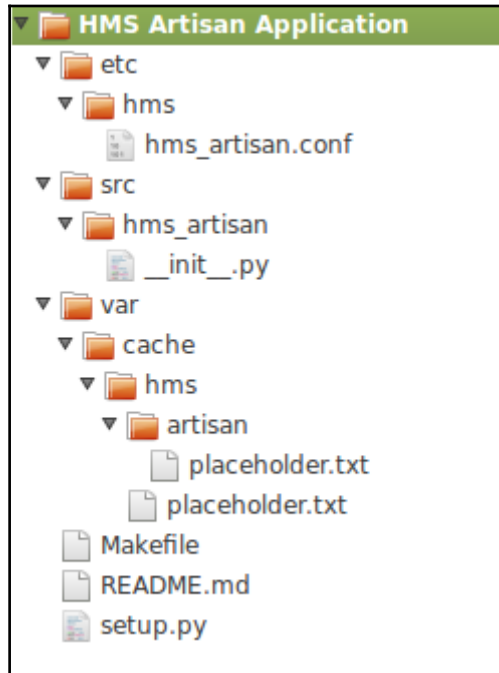
```
#####
FAILURES
#-----#
testCodeCoverage (test_data_objects.testdata_objectsCodeCoverage)
Unit-testing policies require test-cases for all classes and functions in the
hms_core.data_objects module, but the following have not been defined:
    (testBaseDataObject)
#####
Unit-test results
#####
Tests were successful .... False
Number of tests run ..... 119
+ Tests ran in ..... 0.87 seconds
Number of errors ..... 0
Number of failures ..... 1
Number of tests skipped ... 0
#####
```

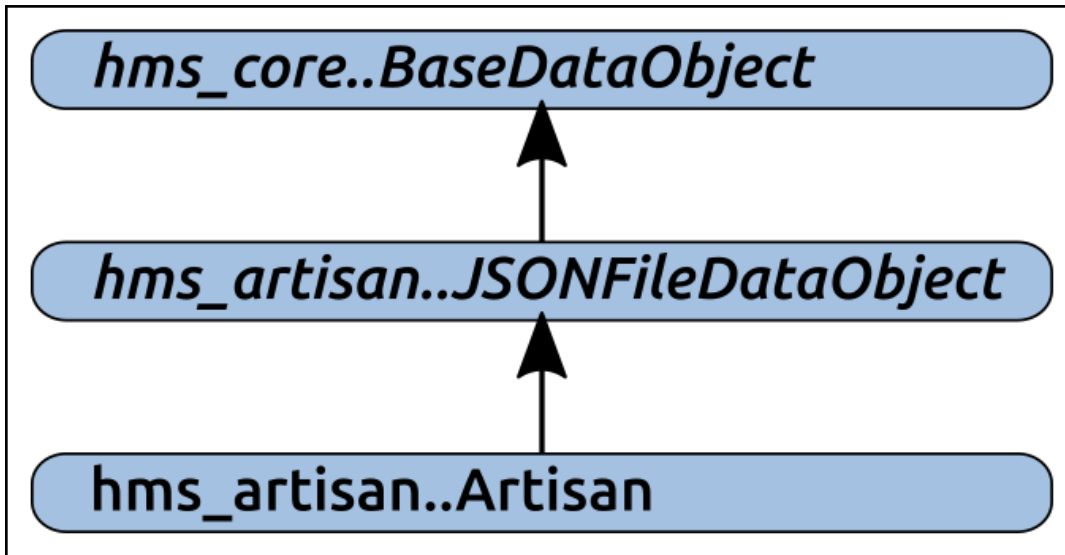
```
#####
FAILURES
#-----#
Unit-testing policies require test-cases for all classes and functions in the
hms_core.data_objects module, but the following have not been defined:
    (testBaseDataObject)
#####
Unit-test results
#####
Tests were successful .... False
Number of tests run ..... 1
+ Tests ran in ..... 0.00 seconds
Number of errors ..... 0
Number of failures ..... 1
Number of tests skipped ... 0
#####
```

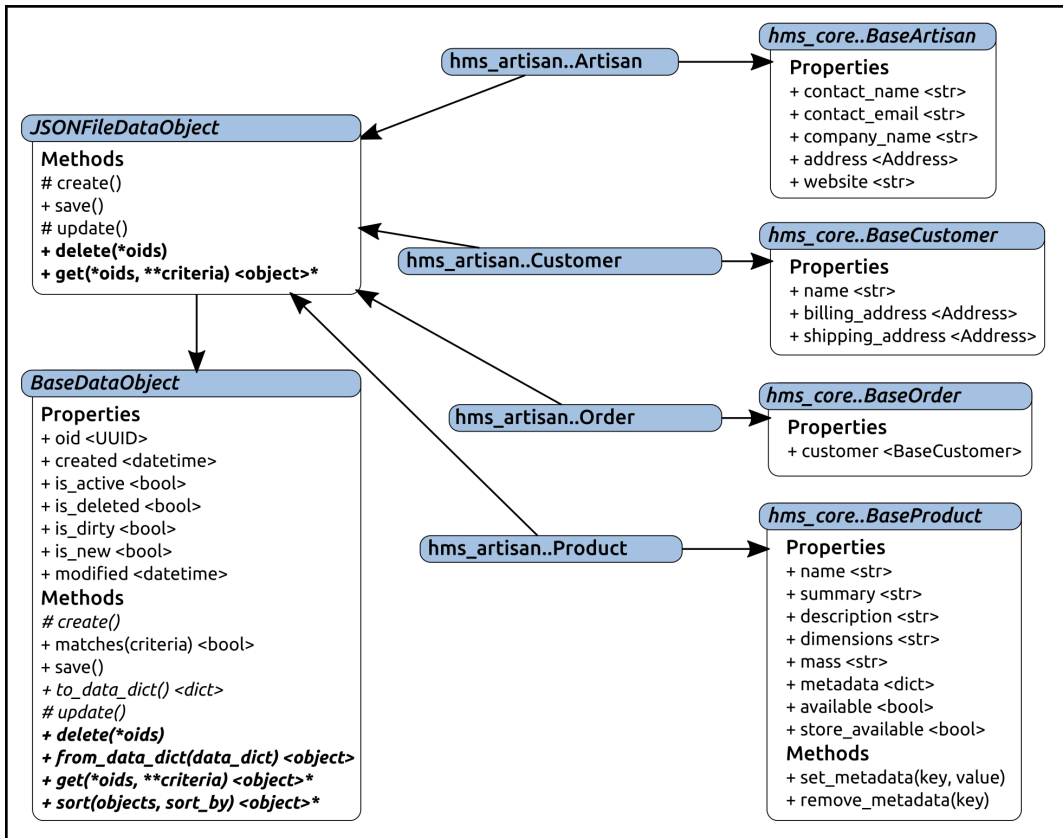


---

# Chapter 12: Persisting Object Data to Files







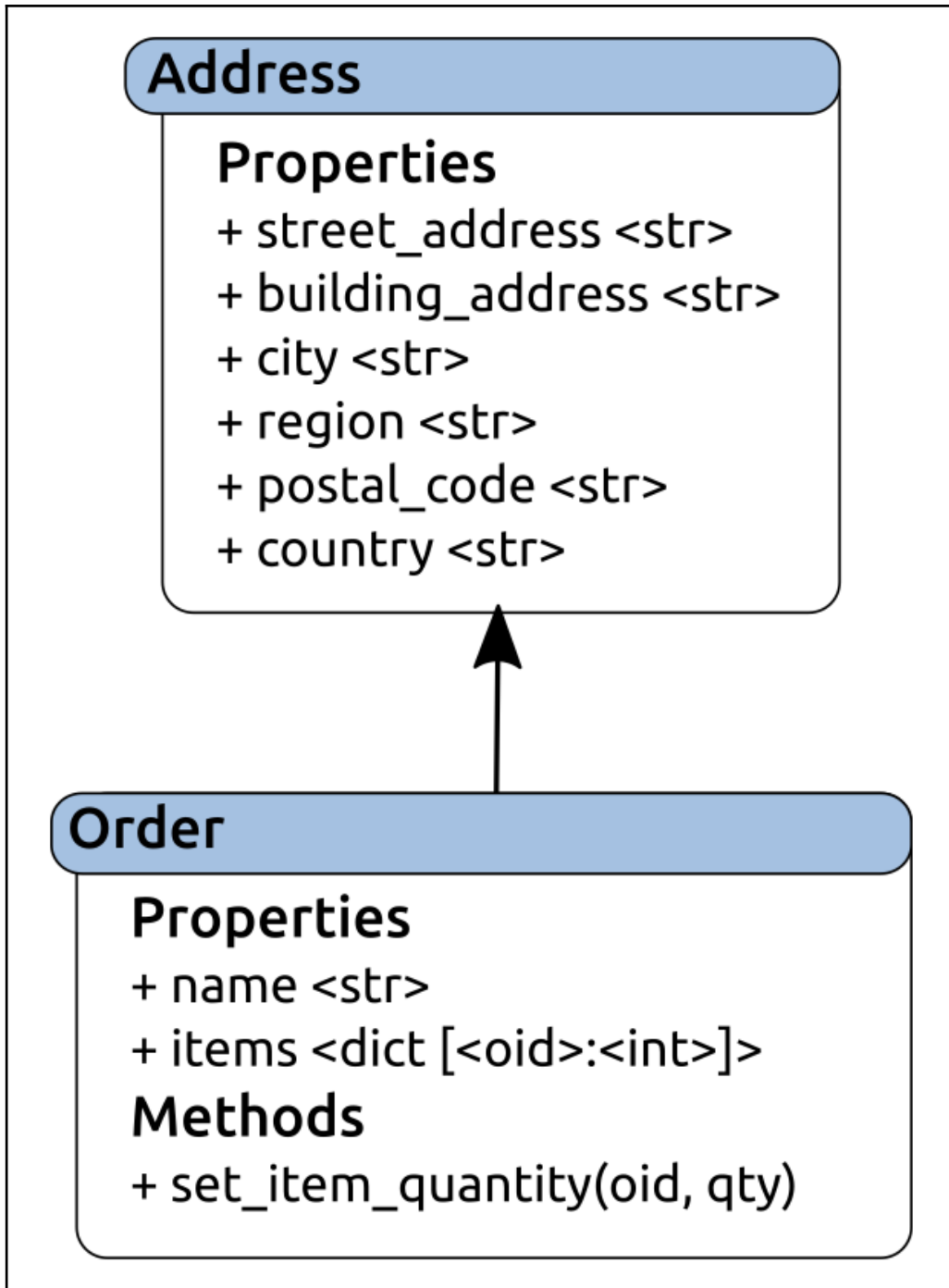


---

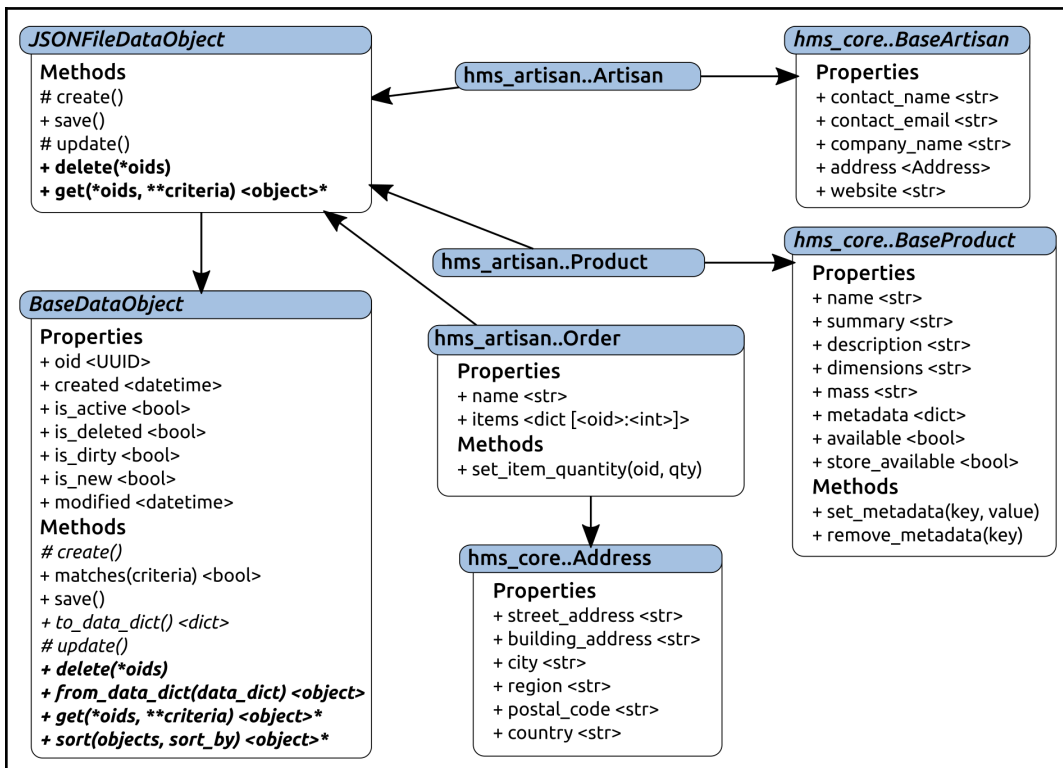
```
{
  "website": null,
  "is_active": true,
  "contact_email": "j@smith.com",
  "address": {
    "region": null,
    "postal_code": null,
    "building_address": null,
    "street_address": "12345 Main Street",
    "country": null,
    "city": "City Name"
  },
  "modified": "2018-05-20 09:21:48",
  "contact_name": "John Smith",
  "created": "2018-05-20 09:21:48",
  "oid": "52267e19-8668-4f9e-b8b7-53d650682a46",
  "company_name": null,
  "is_deleted": false
}
```

---

```
{
  "available": true,
  "created": "2018-05-20 09:40:10",
  "description": null,
  "dimensions": null,
  "is_active": true,
  "is_deleted": false,
  "metadata": {},
  "modified": "2018-05-20 09:40:10",
  "name": "name",
  "oid": "1b4f226a-8616-4141-be6f-a69cdccf6572",
  "shipping_weight": 0,
  "store_available": true,
  "summary": "summary"
}
```

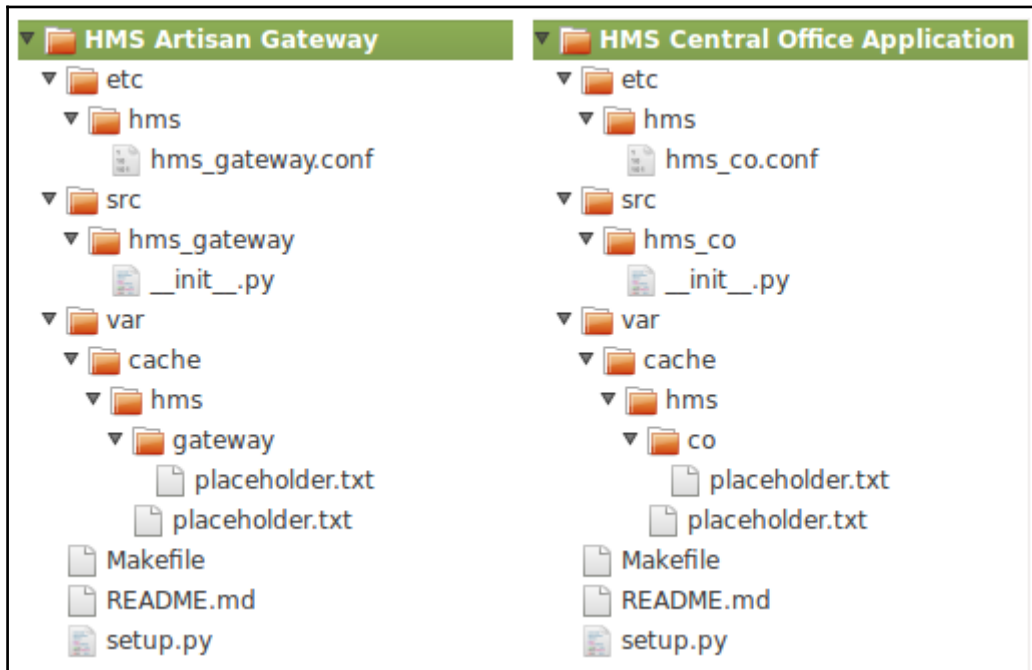


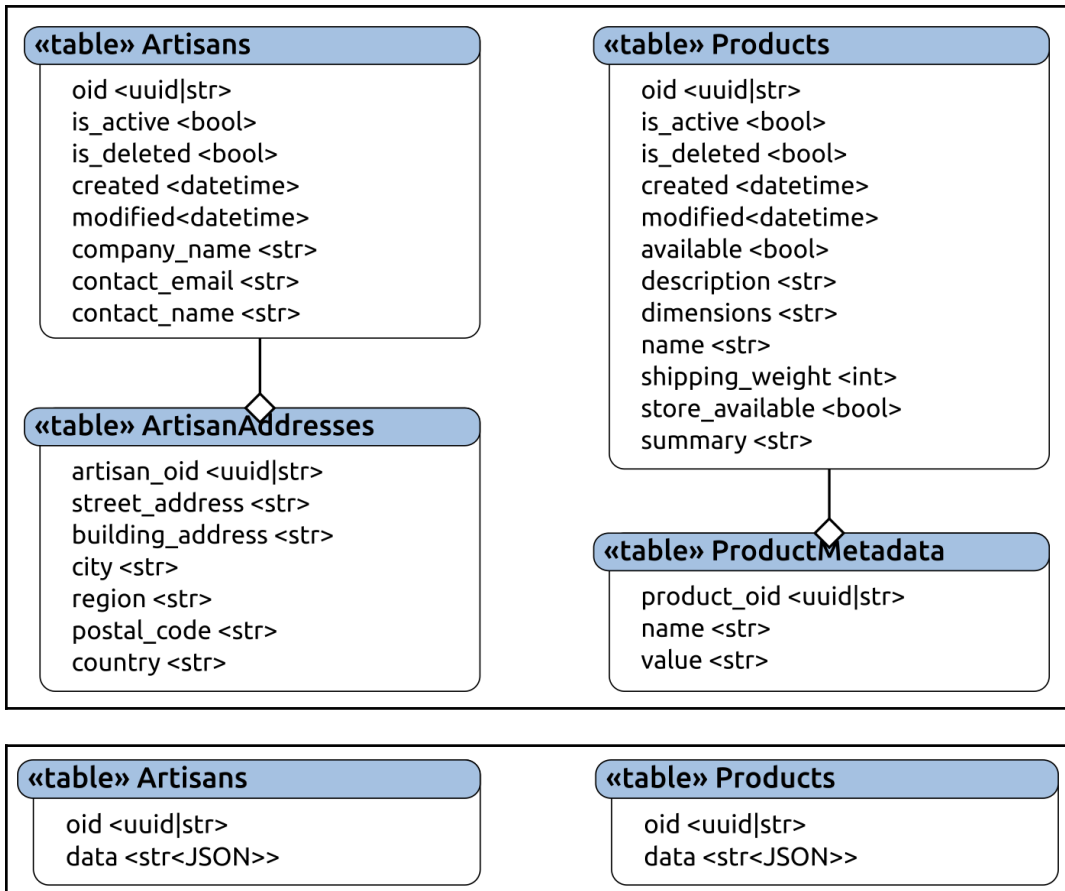
Name	Size
Artisan-data	1 item
df19a3e7-0a53-4461-9291-54...	506 bytes
Order-data	1 item
0f80749c-8dc4-4643-9f43-de...	371 bytes
Product-data	1 item
a577dd5c-03bf-4445-accd-e6...	371 bytes

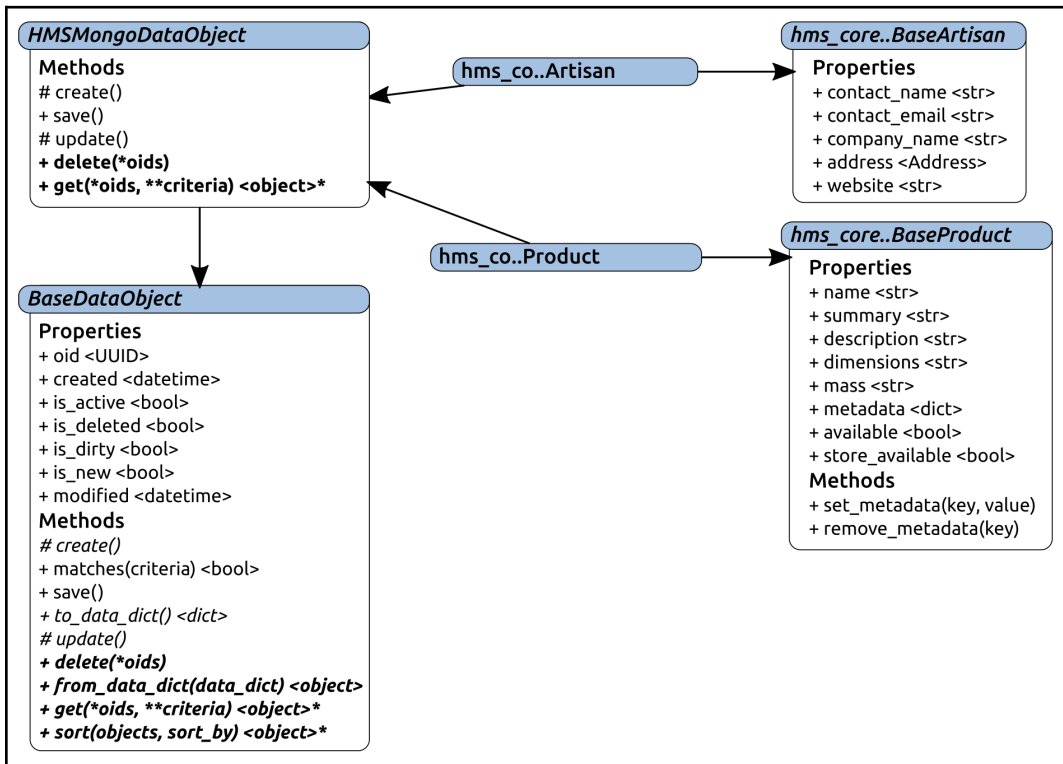
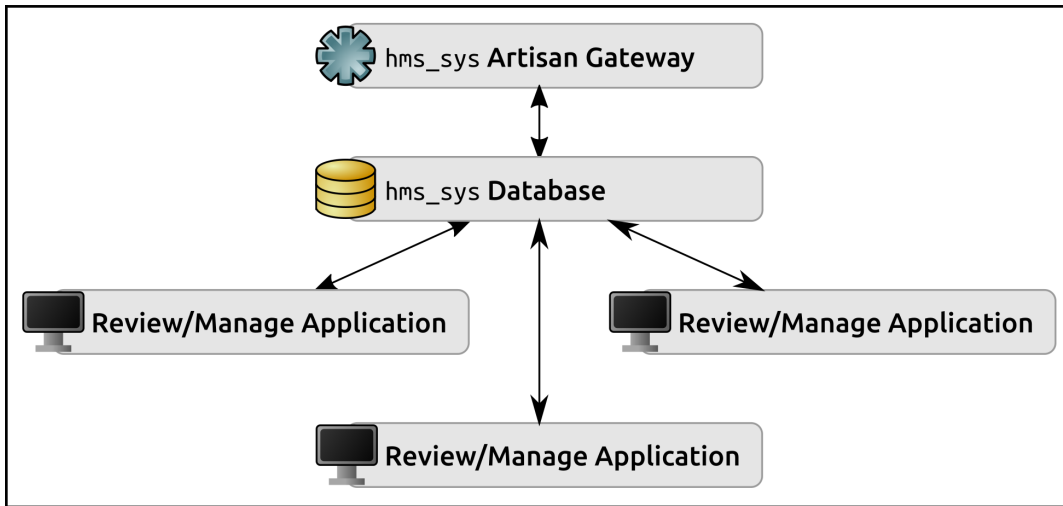


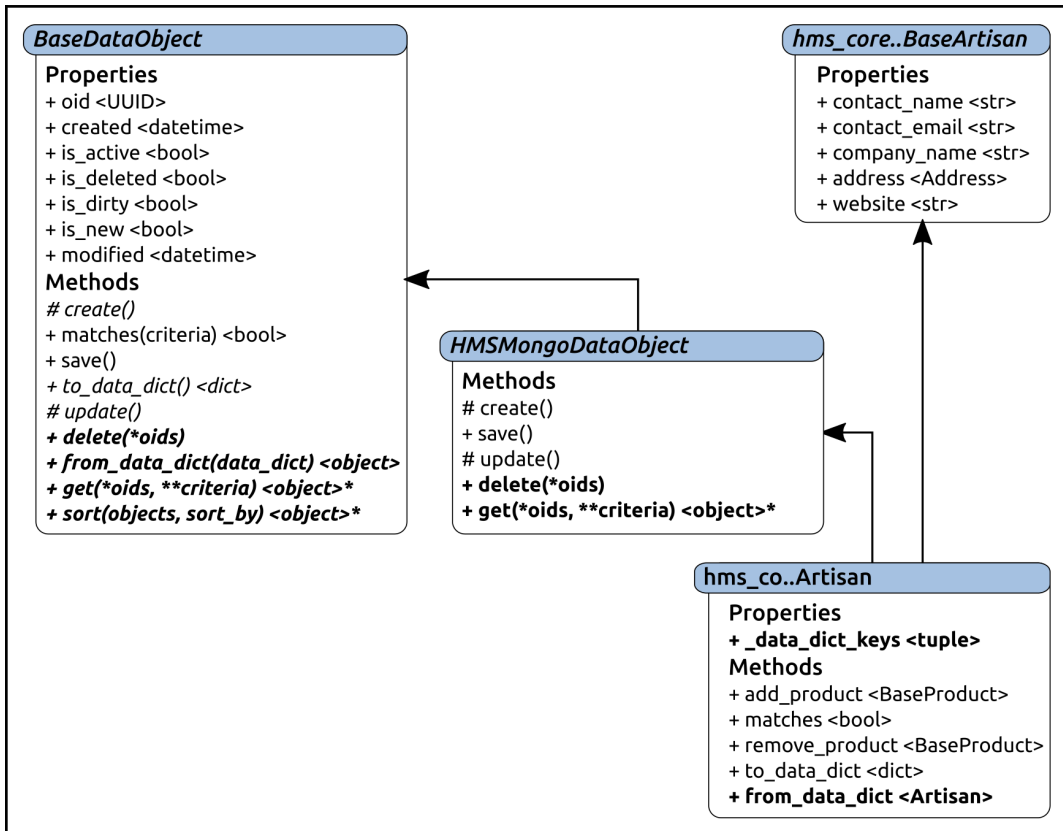
---

## Chapter 13: Persisting Data to a Database











---

```
[
  {
    "available": true,
    "created": "2018-06-02 06:23:38",
    "description": null,
    "dimensions": null,
    "is_active": true,
    "is_deleted": false,
    "metadata": {
      "gemstone": "Sapphire",
      "metal": "Silver"
    },
    "modified": "2018-06-02 06:23:38",
    "name": "Necklace #4",
    "oid": "c886c6d9-98f3-4f03-b326-0c9bad613f89",
    "shipping_weight": 0,
    "store_available": true,
    "summary": "Showing some Product.get aspects"
  }
]
```

---

## Chapter 14: Testing Data Persistence

```
#####
Unit-test results
#####
Tests were successful ..... False
Number of tests run ..... 92
+ Tests ran in ..... 0.01 seconds
Number of errors ..... 0
Number of failures ..... 74
Number of tests skipped ... 0
#####
```

```
#####
Unit-test results
#####
Tests were successful ..... True
Number of tests run ..... 113
+ Tests ran in ..... 0.25 seconds
Number of errors ..... 0
Number of failures ..... 0
Number of tests skipped ... 7
#####
SKIPPED
#-----#
testsort (test_artisan_objects.testArtisan)
testsort (test_artisan_objects.testOrder)
testsort (test_artisan_objects.testProduct)
- Sort will be implemented once there's a need for it, and tested as part of
  that implementation
test_load_objects (test_data_storage.testJSONFileDataObject)
testdelete (test_data_storage.testJSONFileDataObject)
testget (test_data_storage.testJSONFileDataObject)
testsave (test_data_storage.testJSONFileDataObject)
- Since the file-load process provided by _load_objects is used by many of
  the CRUD operations, it is tested as part of testCRUDOperations
#####
```

---

```
#####  
Unit-test results  
#####  
Tests were successful ..... False  
Number of tests run ..... 16  
+ Tests ran in ..... 0.00 seconds  
Number of errors ..... 0  
Number of failures ..... 11  
Number of tests skipped ... 0  
#####
```

```
#####  
Unit-test results  
#####  
Tests were successful ..... False  
Number of tests run ..... 47  
+ Tests ran in ..... 0.01 seconds  
Number of errors ..... 0  
Number of failures ..... 33  
Number of tests skipped ... 0  
#####
```

```
#####
Unit-test results
#####
Tests were successful ..... True
Number of tests run ..... 47
+ Tests ran in ..... 0.41 seconds
Number of errors ..... 0
Number of failures ..... 0
Number of tests skipped ... 5
#####
SKIPPED
#-----#
test_del_collection (__main__.testHMSMongoDataObject)
- Tested in test_get_collection
test_del_connection (__main__.testHMSMongoDataObject)
- Tested in test_get_connection
test_del_database (__main__.testHMSMongoDataObject)
- Tested in test_get_database
test_get_configuration (__main__.testHMSMongoDataObject)
- The fact that the configuration works in setUp is sufficient
testconfigure (__main__.testHMSMongoDataObject)
- The fact that the configuration works in setUp is sufficient
#####
```

---

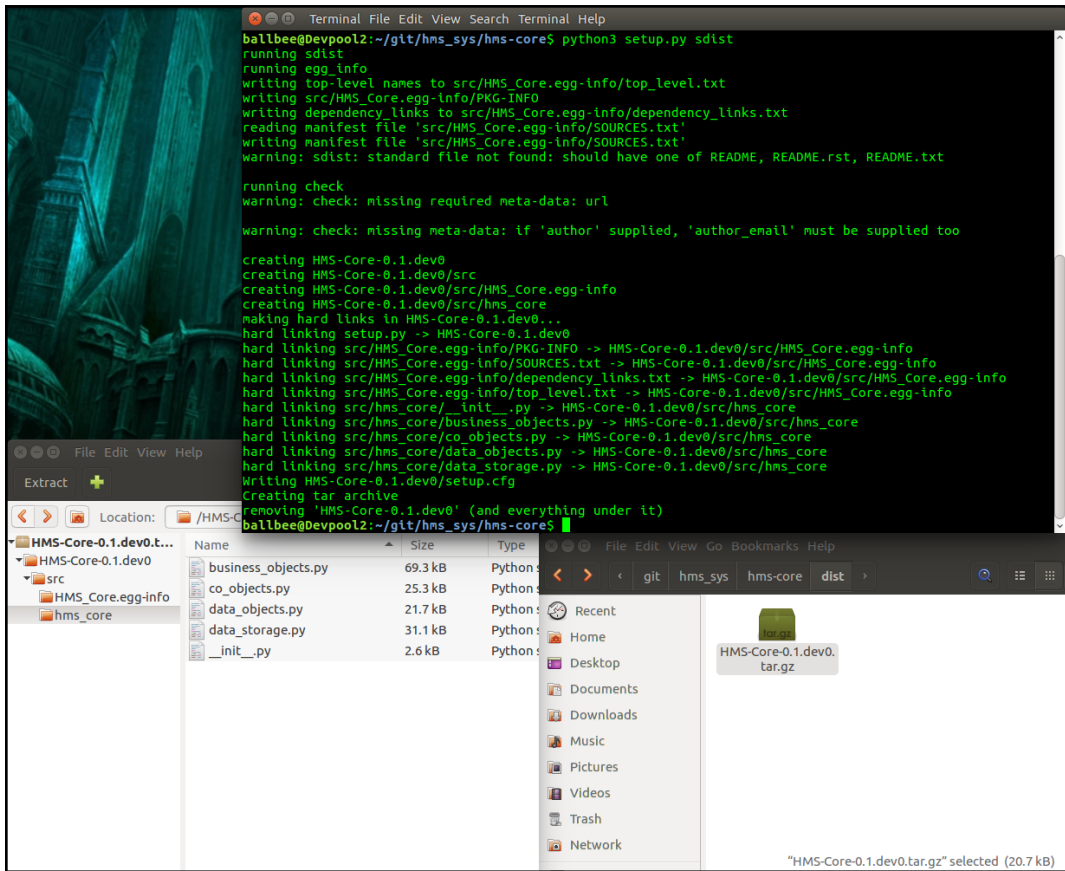
```
python setup.py test
running test
running egg_info
writing dependency_links to src/HMS_Core.egg-info/dependency_links.txt
writing top-level names to src/HMS_Core.egg-info/top_level.txt
writing src/HMS_Core.egg-info/PKG-INFO
reading manifest file 'src/HMS_Core.egg-info/SOURCES.txt'
writing manifest file 'src/HMS_Core.egg-info/SOURCES.txt'
running build_ext
testCodeCoverage (idic.unit_testing.ModuleCoverageTest) ... ok
testCodeCoverage (tests.test_hms_core.testhms_coreCodeCoverage) ... ok
testCodeCoverage (idic.unit_testing.ModuleCoverageTest) ... ok

...

testsort (tests.test_hms_core.test_co_objects.testProduct) ... skipped
"Sort will be implemented once there's a need for it, and tested
as part of that implementation"
teststore_available (tests.test_hms_core.test_co_objects.testProduct) ... ok
testsummary (tests.test_hms_core.test_co_objects.testProduct) ... ok
testto_data_dict (tests.test_hms_core.test_co_objects.testProduct) ... ok
testCodeCoverage (tests.test_hms_core.test_co_objects.testco_objectsCodeCoverage) ... ok

-----
Ran 261 tests in 1.324s

OK (skipped=9)
```



local demo (3)

- System
- demo\_data
  - Collections (2)
    - System
    - ExampleObject
  - Functions
  - Users

db.getCollection('Exam... x

local demo localhost:27017 demo\_data

```
db.getCollection('ExampleObject').find({})
```

ExampleObject 0.001 sec. 0 50

Key	Value	Type
(4) LUUID("7f709fd8-7892-41b5-9fc3-8ff35fc4...")	{ 9 fields }	Object
(5) LUUID("3568a0d5-7dbd-45ef-ac59-fb6e7b2...")	{ 9 fields }	Object
(6) LUUID("663f1a07-7a03-4726-9766-cc041e4...")	{ 9 fields }	Object
_id	LUUID("663f1a07-7a03-4726-9766-cc041e474031")	Legacy UUID
description	Description	String
oid	663f1a07-7a03-4726-9766-cc041e474031	String
is_deleted	false	Boolean
cost	3	Int32
created	2018-06-09 12:36:28	String
is_active	true	Boolean
name	Alice	String
modified	2018-06-09 12:36:28	String
(7) LUUID("cc98709a-ec2b-45fe-80c9-0d2b7be...")	{ 9 fields }	Object
(8) LUUID("12f9ab71-211e-45fb-ac25-d7bf6b4...")	{ 9 fields }	Object
(9) LUUID("a06b4989-286f-409c-b08d-39c352...")	{ 9 fields }	Object
(10) LUUID("06914179-0798-431a-a0d4-cfcd...")	{ 9 fields }	Object
(11) LUUID("ae1df13f-a2f3-4955-8496-edaa9e...")	{ 9 fields }	Object
(12) LUUID("d387fcae-5061-407d-9a0f-a07623...")	{ 9 fields }	Object
(13) LUUID("87b6986c-5de7-4d65-a1c2-37214...")	{ 9 fields }	Object
_id	LUUID("87b6986c-5de7-4d65-a1c2-37214d26cc9f")	Legacy UUID
description	null	Null
oid	87b6986c-5de7-4d65-a1c2-37214d26cc9f	String
is_deleted	false	Boolean
cost	1	Int32
created	2018-06-09 12:36:28	String
is_active	true	Boolean
name	Carl	String
modified	2018-06-09 12:36:28	String
(14) LUUID("22e56fb3-8303-43ab-b22f-a343bb...")	{ 9 fields }	Object
(15) LUUID("a11d8aaf-c0a2-4afc-a4da-08a0d4...")	{ 9 fields }	Object

Logs

---

## Chapter 15: Anatomy of a Service

```
$ tail -f /var/log/syslog | grep ".*py_daemon_func\.py"
py_daemon_func.py: Starting py_daemon_func.py
py_daemon_func.py: Event Loop (0)
py_daemon_func.py: Event Loop (1)
py_daemon_func.py: Event Loop (2)
py_daemon_func.py: Event Loop (3)
py_daemon_func.py: Event Loop (4)
py_daemon_func.py: Event Loop (5)
```

```
-- DEFAULT -----
+ log_level ..... (str) INFO
+ queue_type ..... (str) rabbit
+ queue_check ..... (str) 5
-- console_log -----
+ capture ..... (str) INFO, WARNING
+ log_level ..... (str) INFO
+ queue_type ..... (str) rabbit
+ queue_check ..... (str) 5
-- file_log -----
+ log_file ..... (str) /var/log/myservice/activity.log
+ log_level ..... (str) INFO
+ queue_type ..... (str) rabbit
+ queue_check ..... (str) 5
-- rabbit_config -----
+ server ..... (str) 10.1.10.1
+ port ..... (str) 5672
+ queue_name ..... (str) my-queue
+ user ..... (str) username
+ password ..... (str) password
+ log_level ..... (str) INFO
+ queue_type ..... (str) rabbit
+ queue_check ..... (str) 5
```

```
2018-07-08 10:21:30,215 - logging-example - CRITICAL - This is a CRITICAL-level message
2018-07-08 10:21:30,215 - logging-example - DEBUG - This is a DEBUG-level message
2018-07-08 10:21:30,216 - logging-example - ERROR - This is an ERROR-level message
2018-07-08 10:21:30,216 - logging-example - INFO - This is an INFO-level message
2018-07-08 10:21:30,216 - logging-example - WARNING - This is a WARNING-level message
```

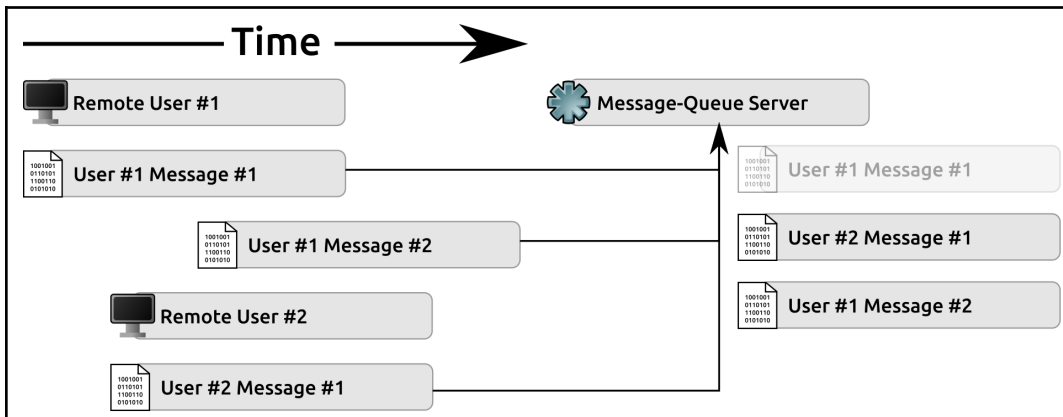


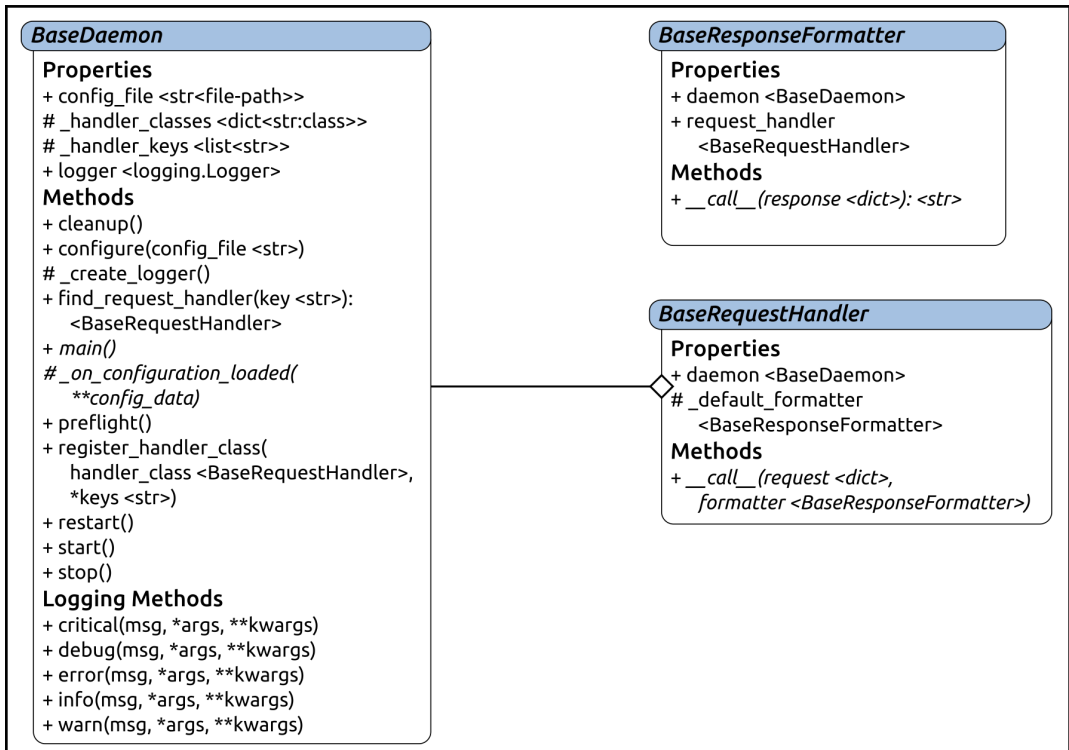
```

# Results with logging set to logging.DEBUG on a local dev-environment:
-----
2018-07-08 11:00:49,791 - logging-example - INFO - Calling with no arguments
2018-07-08 11:00:49,791 - logging-example - INFO - some_function((), {}) called
2018-07-08 11:00:49,791 - logging-example - WARNING - some_function was called with
no arguments
2018-07-08 11:00:49,791 - logging-example - INFO - some_function complete
2018-07-08 11:00:49,791 - logging-example - INFO - Calling with x and y values
2018-07-08 11:00:49,791 - logging-example - INFO - some_function((1, 2), {}) called
2018-07-08 11:00:49,791 - logging-example - DEBUG - *args exists: (1, 2)
2018-07-08 11:00:49,792 - logging-example - DEBUG - x = 1, y = 2
2018-07-08 11:00:49,792 - logging-example - INFO - Calling with a bad y-value
2018-07-08 11:00:49,792 - logging-example - INFO - some_function((1, 0), {}) called
2018-07-08 11:00:49,792 - logging-example - DEBUG - *args exists: (1, 0)
2018-07-08 11:00:49,792 - logging-example - DEBUG - x = 1, y = 0
2018-07-08 11:00:49,792 - logging-example - ERROR - ZeroDivisionError in
some_function: division by zero
2018-07-08 11:00:49,792 - logging-example - INFO - some_function complete

# Results with logging set to logging.ERROR on a production environment:
-----
2018-07-08 11:00:49,792 - logging-example - ERROR - ZeroDivisionError in
some_function: division by zero

```





```

$ python testdaemon.py;tail -f /tmp/daemon-name.log

DEBUG    - testdaemon.config_file set to example-config.yaml
INFO     - Loading configuration for testdaemon
INFO     - testdaemon configuration has been loaded:

{timestamp} - daemon-name - INFO - Logging started. Other messages may have been \
        output to stdout/terminal prior to now
{timestamp} - daemon-name - DEBUG - SIGINT and SIGTERM handlers for testdaemon \
        created
{timestamp} - daemon-name - INFO - testdaemon.daemonize called
{timestamp} - daemon-name - DEBUG - +- Initial fork completed
{timestamp} - daemon-name - DEBUG - +- Decoupling from parent environment complete
{timestamp} - daemon-name - DEBUG - +- Second fork completed
{timestamp} - daemon-name - DEBUG - +- PID (18194) written to /tmp/testdaemon.pid
{timestamp} - daemon-name - INFO - testdaemon.daemonize complete
{timestamp} - daemon-name - INFO - testdaemon.preflight called
{timestamp} - daemon-name - INFO - testdaemon.preflight complete
{timestamp} - daemon-name - INFO - Starting testdaemon.main
{timestamp} - daemon-name - INFO - Starting main daemon event-loop
{timestamp} - daemon-name - INFO - Iteration 1
{timestamp} - daemon-name - INFO - Iteration 2

pkill -f testdaemon.py;tail -f /tmp/daemon-name.log

{timestamp} - daemon-name - INFO - Iteration 5
{timestamp} - daemon-name - INFO - Stopping testdaemon
{timestamp} - daemon-name - DEBUG - +- signal_num ... 15
{timestamp} - daemon-name - DEBUG - +- frame ..... <frame object at 0x7fab9a44f210>
{timestamp} - daemon-name - INFO - testdaemon main loop terminated
{timestamp} - daemon-name - INFO - testdaemon.cleanup called

```

```

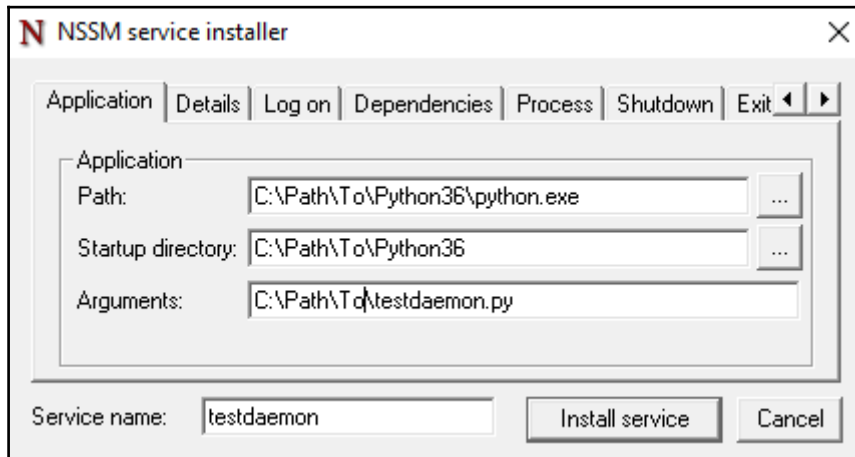
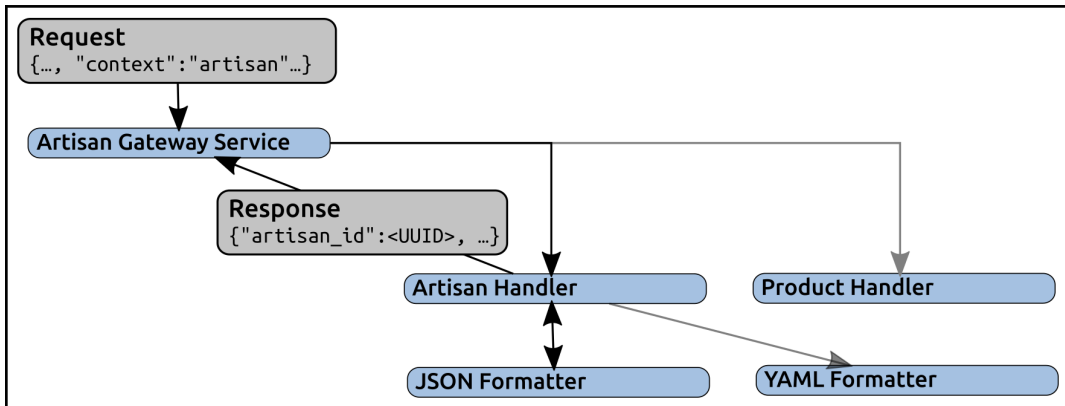
callable_class("calling instance 1") called:
+- self._some_arg ..... instance 1
+- self._some_other_arg ... other arg

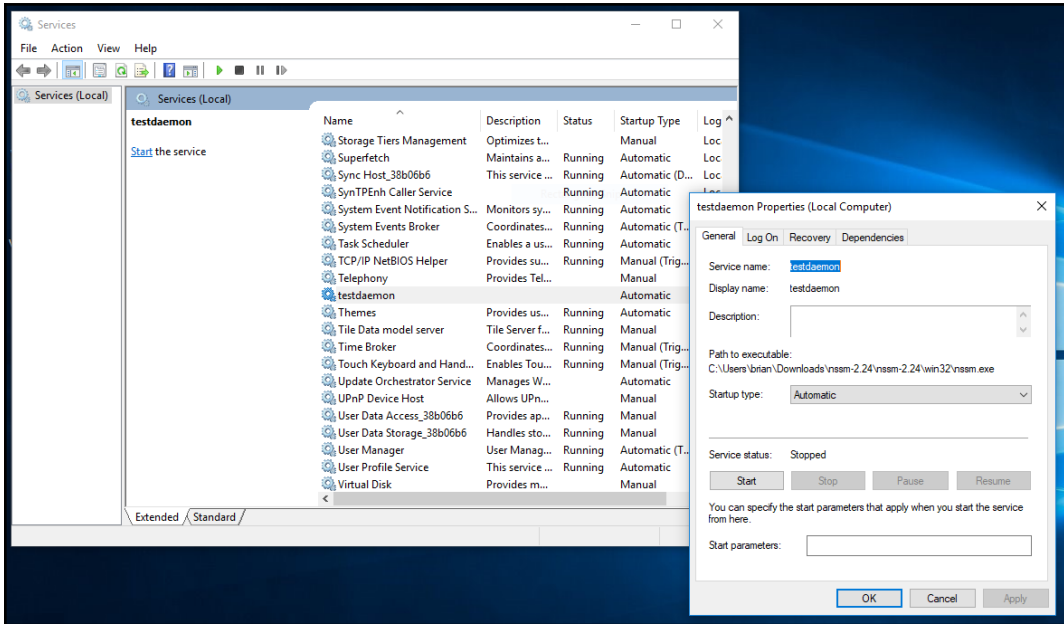
```

```

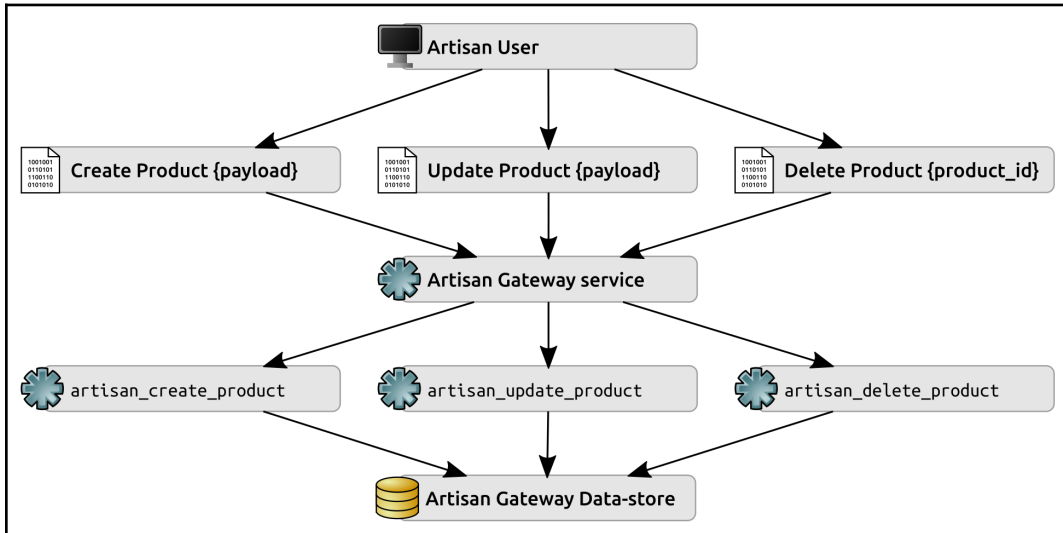
callable_class("calling instance 2") called:
+- self._some_arg ..... <__main__.callable_class object at 0x7f5d9d375550>
+- self._some_other_arg ... True

```





## Chapter 16: The Artisan Gateway Service



```
root# rabbitmqctl list_queues
Listing queues ...
hello 1
```

```
root# rabbitmqctl list_queues
Listing queues ...
hello 2
```

---

```
root# rabbitmqctl list_queues
Listing queues ...
hello 2
queue_name 1
```

```
Listening for messages:
=====
Handling a message:
+- ch (channel) ... (BlockingChannel) <BlockingChannel>
+- method ..... (Deliver) <Basic.Deliver>
+- properties .... (BasicProperties) <BasicProperties>
+- message ..... (DaemonMessage) <hms_core.daemons.DaemonMessage object>
  +- operation ... (str) 'response'
  +- signature ... (str) '59237... (a lot more hex-digits) ... 904'
  +- data ..... (dict)
-- Message-data -----
{'hello': 'Hello from rabbitmq-sender.py', 'random_number': 3}
=====
Handling a message:
+- ch (channel) ... (BlockingChannel) <BlockingChannel>
+- method ..... (Deliver) <Basic.Deliver>
+- properties .... (BasicProperties) <BasicProperties>
+- message ..... (DaemonMessage) <hms_core.daemons.DaemonMessage object>
  +- operation ... (str) 'response'
  +- signature ... (str) '59237... (a lot more hex-digits) ... 904'
  +- data ..... (dict)
-- Message-data -----
{'hello': 'Hello from rabbitmq-sender.py', 'random_number': 3}
=====
```

```
=====
Handling a message:
+- ch (channel) ... (BlockingChannel) <BlockingChannel>
+- method ..... (Deliver) <Basic.Deliver>
+- properties .... (BasicProperties) <BasicProperties>
InvalidMessageError: The message
  {'hello': 'Hello from rabbitmq-bad-sender.py'},
  with a signature of "036e8... (a lot more hex-digits) ... 4cc" did not match
  the expected signature. Message DENIED
```

```
# Start-up of daemon
```

```
{date/time} - hms_ag - INFO - Logging started. Other ... (truncated) ... prior to now
{date/time} - hms_ag - INFO - ArtisanGatewayDaemon.preflight called
{date/time} - hms_ag - INFO - Starting ArtisanGatewayDaemon.main
{date/time} - hms_ag - INFO - Starting main daemon event-loop
```

```
# Sending the first valid message
```

```
{date/time} - hms_ag - INFO - ArtisanGatewayDaemon._handle_message called:
{date/time} - hms_ag - INFO - <hms_core.daemons.DaemonMessage object at 0x7fb4b11371d0>
```

```
# Sending an invalid message (signature failure)
```

```
{date/time} - hms_ag - ERROR - InvalidMessageError:
  The message {'hello': 'Hello from rabbitmq-bad-sender.py'},
  with a signature of "036e8... (a lot more hex-digits) ... 4cc"
  did not match the expected signature.
  Message DENIED
```

```
# Sending a second copy of the good message
```

```
{date/time} - hms_ag - INFO - ArtisanGatewayDaemon._handle_message called:
{date/time} - hms_ag - INFO - <hms_core.daemons.DaemonMessage object at 0x7fb4b11372b0>
```

```
# Shutting the daemon down
```

```
{date/time} - hms_ag - INFO - Stopping ArtisanGatewayDaemon
{date/time} - hms_ag - INFO - ArtisanGatewayDaemon main loop terminated
{date/time} - hms_ag - INFO - ArtisanGatewayDaemon.cleanup called
```



```
raw_key (bytes)
b'\x95|\xcea\xdd\r\xa1\xd6^U\xa9)\xe5\xbc\xbc\x9c<S\x13\xc6\xe2\xf7\x12W'

serialized (str)
957cce61dd0da1d65e55a929e5bcbc9c3c5313c6e2f71257

unserialized (bytes)
b'\x95|\xcea\xdd\r\xa1\xd6^U\xa9)\xe5\xbc\xbc\x9c<S\x13\xc6\xe2\xf7\x12W'

unserialized == raw_key: True
```

```
Content-Type: multipart/form-data; boundary=-----{field-separator}
Content-Length: {content-length}

-----{field-separator}
Content-Disposition: form-data; name="{field-name}"

{field-value}
-----{field-separator}
Content-Disposition: form-data; name="{field-name}"; filename="{file-name}"
Content-Type: {MIME-type}

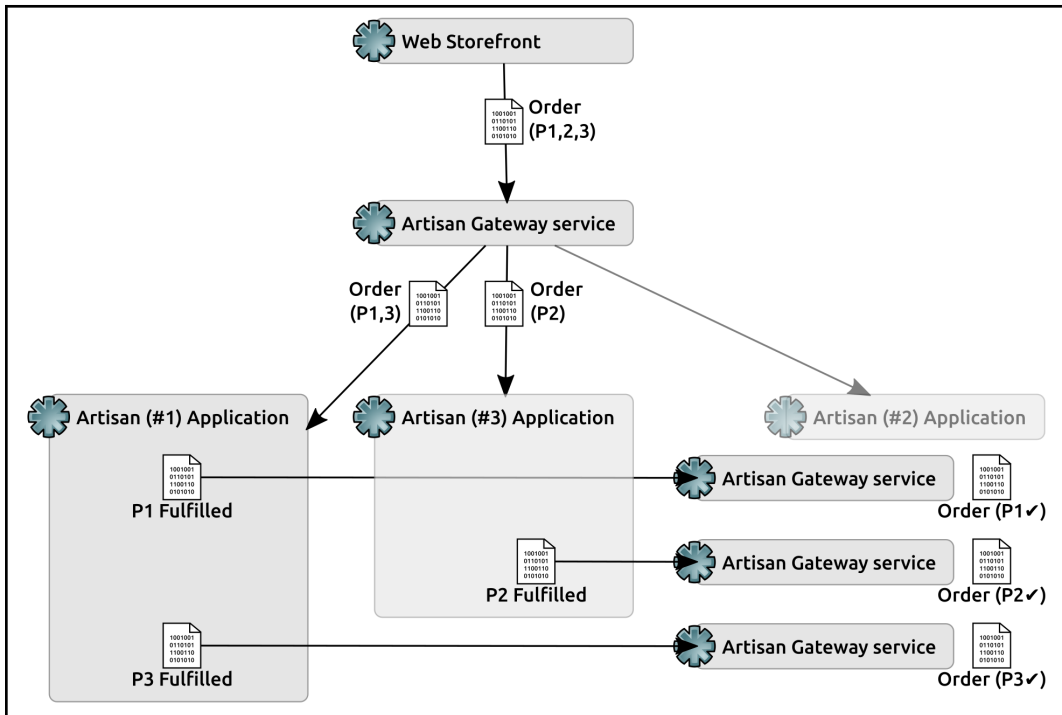
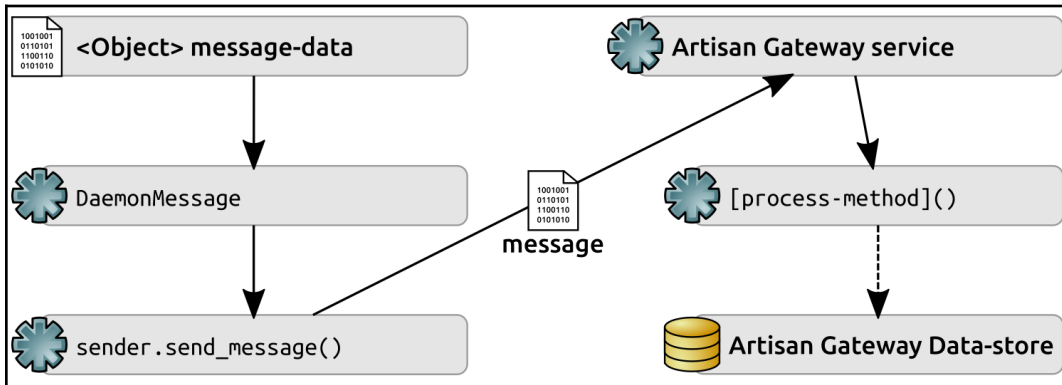
{file-data}

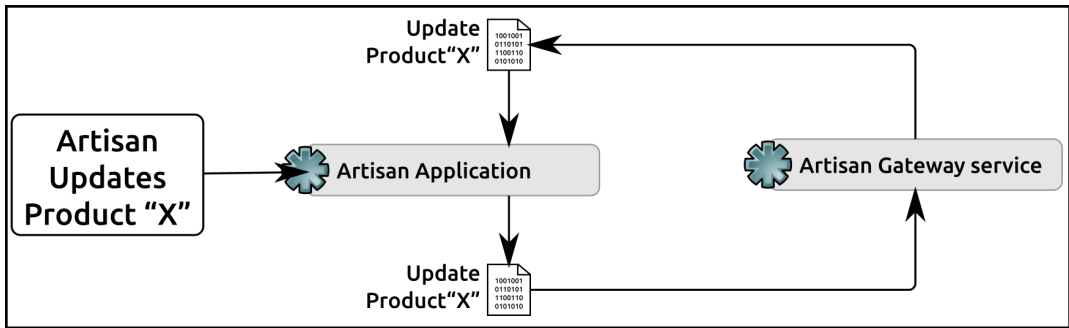
-----{field-separator}
Content-Disposition: form-data; name="{field-name}"; filename="{file-name}"
Content-Type: {MIME-type}

{file-data}

-----{field-separator}--
```

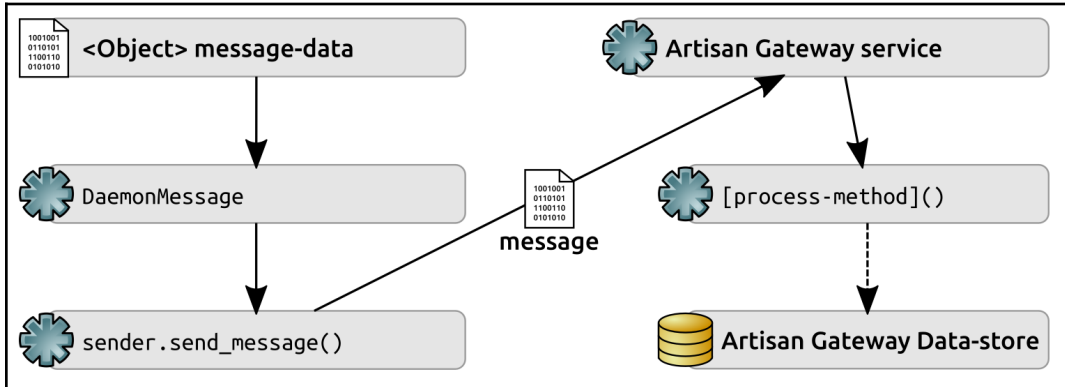
# Chapter 17: Handling Service Transactions





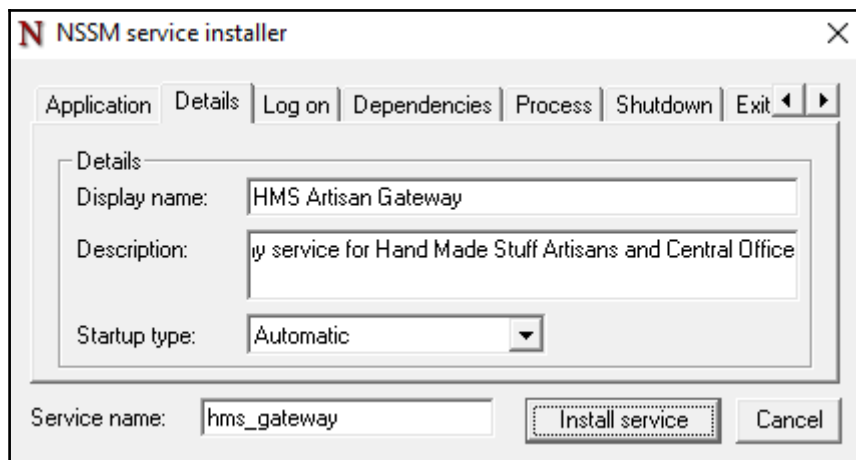
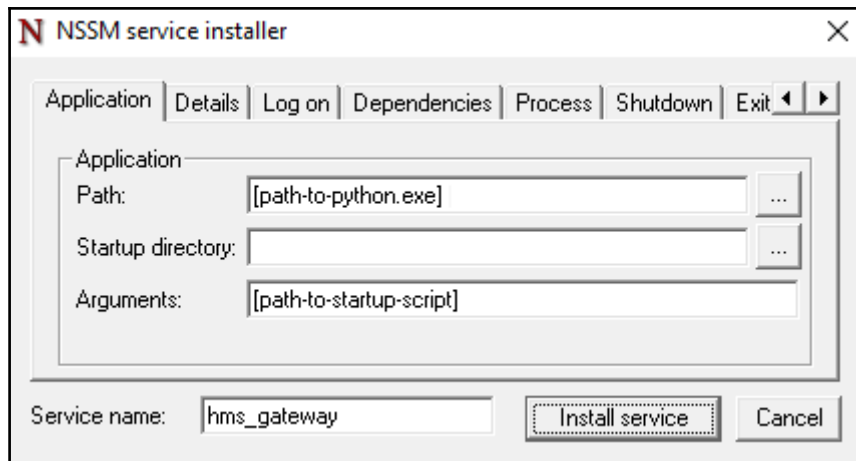
---

# Chapter 18: Testing and Deploying Services



```
==== Central Office Creating Artisan =====+
| Initial state:
| +- address ..... {'country': None, 'building_address': None, 'city': '
| +- company_name ..... None
| +- contact_email ..... no-one@me.co
| +- contact_name ..... contact-name
| +- created ..... 2018-09-29 10:13:33
| +- is_active ..... True
| +- is_deleted ..... False
| +- modified ..... 2018-09-29 10:13:33
| +- oid ..... b9bd49e0-d11b-4ba6-9cf5-bc019cb64776
| +- queue_id ..... bogus-queue-id
| +- signing_key ..... 42ac3040780c20df0e96bda01a0a899cbae4a53fc6ca4ae49a1f8
| +- website ..... None
+-----+
| Saved state:
| +- address ..... {'country': None, 'building_address': None, 'city': '
| +- company_name ..... None
| +- contact_email ..... no-one@me.co
| +- contact_name ..... contact-name
| +- created ..... 2018-09-29 10:13:33
| +- is_active ..... True
| +- is_deleted ..... False
| +- modified ..... 2018-09-29 10:13:33
| +- oid ..... b9bd49e0-d11b-4ba6-9cf5-bc019cb64776
| +- queue_id ..... bogus-queue-id
| +- signing_key ..... 42ac3040780c20df0e96bda01a0a899cbae4a53fc6ca4ae49a1f8
| +- website ..... None
+-----+

[Enter] to continue
```



---

# Chapter 19: Multiprocessing and HPC in Python

```
# Execution of serial_baseline.py, using all of 1 CPU's capacity
=====

1000 iterations executed in 422.351294 seconds
Average time per iteration was 0.422351 seconds
```

```
# Execution of multiprocessing_baseline.py, using all available CPU capacity (4)
=====

1000 iterations executed in 236.325325 seconds
Average time per iteration was 0.236325 seconds
```

```

# Execution of multiprocessing_tests.py, using all available CPU capacity (4)
=====

==> [20:47:47.268985] factors_of(11) called
==> [20:47:47.270272] factors_of(101) called
==> [20:47:47.270984] factors_of(102) called

*** [20:47:47.271755] Joining factors_of-11 process

==> [20:47:47.272125] factors_of(1000000001) called
==> [20:47:47.272729] factors_of(16) called
==> [20:47:47.273174] factors_of(1000001) called
==> [20:47:47.274394] factors_of(1001) called

<== [20:47:57.273740] factors_of(11) complete

*** [20:47:57.276896] Joining factors_of-1000001 process

<== [20:47:57.279912] factors_of(101) complete
<== [20:47:57.280497] factors_of(102) complete
<== [20:47:57.281377] factors_of(16) complete
<== [20:47:57.285299] factors_of(1001) complete
<== [20:47:57.356765] factors_of(1000001) complete

*** [20:47:57.357743] Joining factors_of-101 process
*** [20:47:57.357819] Joining factors_of-102 process
*** [20:47:57.357852] Joining factors_of-1000000001 process

<== [20:48:40.374990] factors_of(1000000001) complete

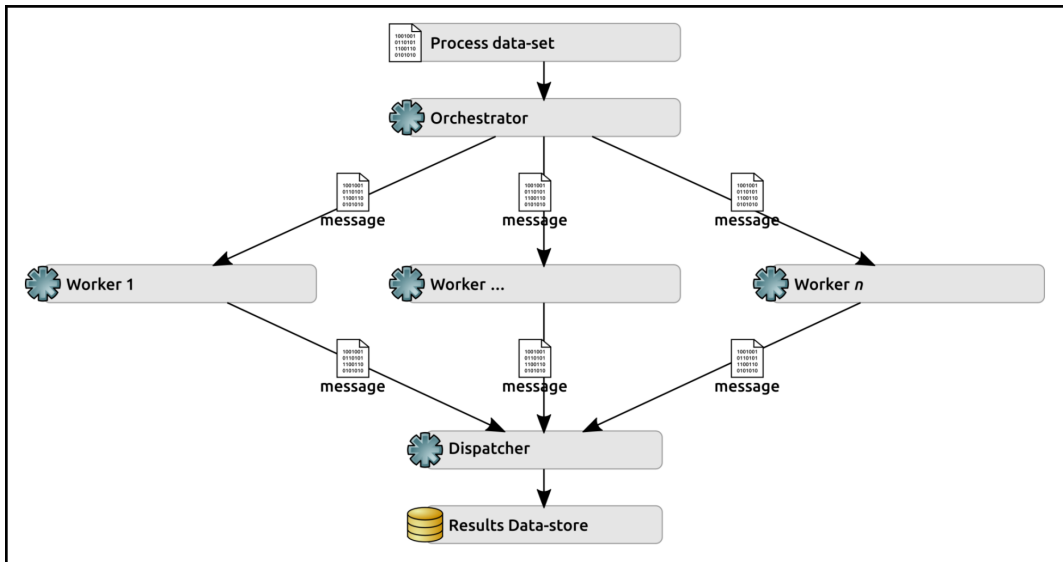
*** [20:48:40.376157] Joining factors_of-16 process
*** [20:48:40.376216] Joining factors_of-1001 process
=====

7 factor_of iterations executed in 53.109640 seconds
Average time per iteration was 7.587091 seconds
=====

results:
(11, [])
(101, [])
(16, [2, 4, 8])
(102, [2, 3, 6, 17, 34, 51])
(1001, [7, 11, 13, 77, 91, 143])
(1000001, [101, 9901])
(1000000001, [7, 11, <truncated for brevity> , 90909091, 142857143])

```





```

> echo "4 8 15 16 23 42" | python factors_stdin.py
4:[2]
8:[2, 4]
15:[3, 5]
16:[2, 4, 8]
23:[ ]
42:[2, 3, 6, 7, 14, 21]
  
```

```

> cat hugos_numbers.txt | python factors_stdin.py
4:[2]
8:[2, 4]
15:[3, 5]
16:[2, 4, 8]
23:[ ]
42:[2, 3, 6, 7, 14, 21]
  
```

---

```
> python factors_cli.py 4 8 15 16 23 42
4:[2]
8:[2, 4]
15:[3, 5]
16:[2, 4, 8]
23:[]
42:[2, 3, 6, 7, 14, 21]
```