

**LAPORAN PRAKTIKUM 6 ABSTRACT DAN INTERFACE**  
**UJIAN TENGAH SEMESTER**



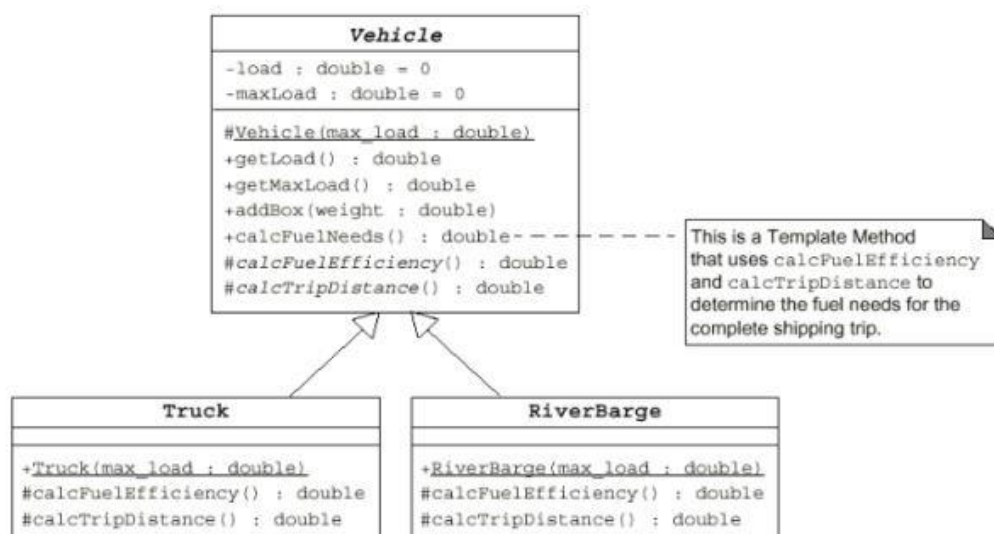
**Oleh:**

Fisma Meividianugraha Subani

21091397017

**D4 MANAJEMEN INFORMATIKA**  
**FAKULTAS VOKASI**  
**UNIVERSITAS NEGERI SURABAYA**  
**TAHUN AJARAN 2022/2023**

1. Buat program berdasarkan UML berikut!



a) Source Code Index PHP (No 1)

```

C:\xampp\htdocs\PRO\Praktikum 6\No 1\017_fisma_praktikum6_indexno1.php - Sublime Text (UNREGISTERED)
File Edit Selection Find View Goto Tools Project Preferences Help

017_fisma_praktikum6_indexno1.php x 017_fisma_praktikum6_no1.php x 017_fisma_praktikum6_abstractno1.php x
1 <!-- Nama : Fisma Mevidianugraha Subani
2 NIM : 21091397017 -->
3
4 <?php
5 require_once '017_fisma_praktikum6_no1.php';
6 >
7 <DOCTYPE html>
8 <html lang="id">
9
10 <head>
11 <!-- Bootstrap CSS -->
12 <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/css/bootstrap.min.css" rel="stylesheet"
13 integrity="sha384-1Bne4K8B8781VHf1dvKuhfTAU6Au58t194wRhftJ0brCEXSU10Boqy12Qv26]M3" crossorigin="anonymous">
14
15 <title>Praktikum 6</title>
16 </head>
17
18 <body>
19
20 <div class="container">
21 <div>
22 <div class="row">
23 <div class="col-5 mx-auto border p-3 mt-2">
24 <div class="text-center"><strong><u>Soal No.1</u></strong></div>
25 <br><br>
26 <div><?=$truck->getMaxLoad() . ' kg'; >> <br></div>
27 <br>
28 <div><?=$truck->addBox(5000) . ' kg'; >> <br>
29 <div><?=$truck->addBox(5000) . ' kg'; >> <br>
30 <div><?=$truck->addBox(5000) . ' kg'; >> <br>
31
32 <?php
33 echo "Jadi, Butuh Bahan Bakar sebanyak " . $truck->calcFuelNeeds() . ' Liter'. '<br>';
34 >
35 <br>
36 <div>
37 <div>
38 <div><?=$riverBarge->getMaxLoad() . ' kg'; >> <br></div>
39 <br>
40 <div><?=$riverBarge->addBox(7000) . ' kg'; >> <br>
41 <div><?=$riverBarge->addBox(8000) . ' kg'; >> <br>
42 <div><?=$riverBarge->addBox(10000) . ' kg'; >> <br>
43
44 <?php
45 echo "Jadi, Butuh Bahan Bakar sebanyak " . $riverBarge->calcFuelNeeds() . ' Liter';
46 >
47 </div>
48 </div>
49 </body>
50
51 </html>
52

```

## b) Source Code PHP

```
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017_fisma_praktikum6_indexno1.php x 017_fisma_praktikum6_no1.php x 017_fisma_praktikum6_abstractno1.php x

1 <!-- Nama : Fisma Meividianugraha Subani
2 NIM : 21091397017 -->
3
4 <?php
5 require_once '017_fisma_praktikum6_abstractno1.php';
6
7
8 class Truck extends Vehicle {
9     public function __construct($maxLoad, $name)
10     {
11         $this->maxLoad = $maxLoad;
12         $this->name = $name;
13     }
14
15     public function calcFuelNeeds()
16     {
17         $fuel = $this->calcFuelEfficiency();
18         $strip = $this->calcTripDistance();
19
20         return ceil($fuel / $strip);
21     }
22 }
23
24 class RiverBarge extends Vehicle {
25     public function __construct($maxLoad, $name)
26     {
27         $this->maxLoad = $maxLoad;
28         $this->name = $name;
29     }
30
31     public function calcFuelNeeds()
32     {
33         $fuel = $this->calcFuelEfficiency();
34         $strip = $this->calcTripDistance();
35
36         return ceil($fuel / $strip);
37     }
38 }
39 $truck = new Truck(20000, 'Truk');
40 $riverBarge = new RiverBarge(25000, 'Tongkang Sungai');
```

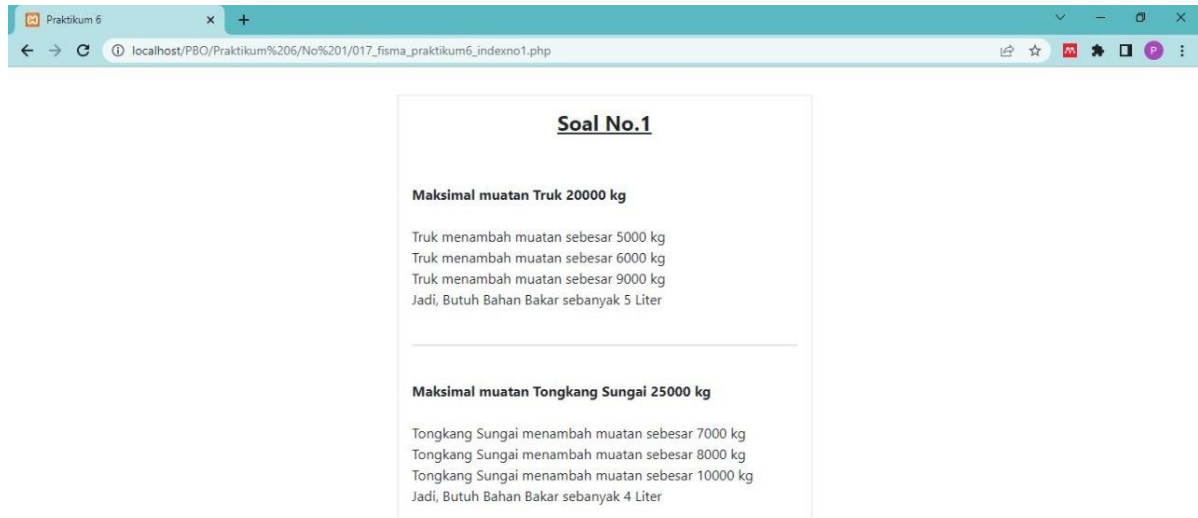
## c) Source Code Abstract PHP (No 1)

```
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017_fisma_praktikum6_indexno1.php x 017_fisma_praktikum6_no1.php x 017_fisma_praktikum6_abstractno1.php x

1 <!-- Nama : Fisma Meividianugraha Subani
2 NIM : 21091397017 -->
3
4 <?php
5
6 abstract class Vehicle {
7     private $load = 0;
8     protected $maxLoad = 0, $name;
9
10     protected function __construct($maxLoad, $name) {
11         $this->$maxLoad = $maxLoad;
12         $this->$name = $name;
13     }
14
15     public function getLoad() {
16         return $this->load;
17     }
18
19     public function getMaxLoad() {
20         echo "Maksimal muatan ' . $this->name . ' ";
21         return $this->maxLoad;
22     }
23
24     public function addBox($weight) {
25         if ($this->load >= $this->maxLoad) {
26             echo "$this->name menambah muatan sebesar $weight <br>";
27             echo "Muatan telah penuh tidak bisa menambah lagi";
28         } else {
29             $this->load += $weight;
30             echo "$this->name menambah muatan sebesar $weight";
31         }
32     }
33
34     abstract public function calcFuelNeeds();
35
36     protected function calcFuelEfficiency() {
37         $range = 50000000;
38         $range /= $this->load;
39         return $range;
40     }
41
42     protected function calcTripDistance() {
43         return 500;
44     }
45 }
```

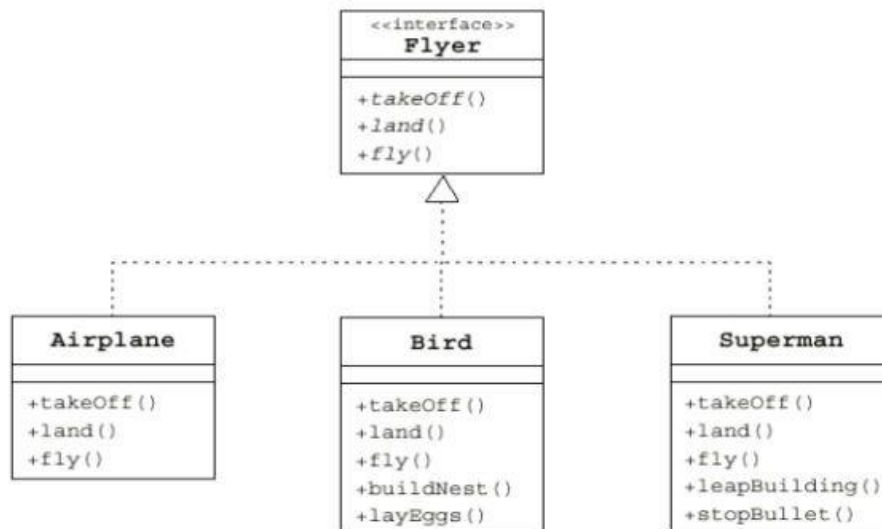
d) Output yang dihasilkan



e) Analisis

Implementasi dari abstract class pada class Vehicle, method calcFuelNeeds digunakan untuk menghitung bahan bakar yang digunakan. Abstract method di letakkan pada class Vehicle sebagai parent class dan diakses oleh child classnya yaitu class Truk, dan class RiverBarge yang akan mengembalikan nilai yang dihasilkan dari pembagian 2 method yaitu calcFuelEfficiency dan calcTripDistance.

2. Buat program berdasarkan UML berikut!



a) Source Code Index PHP (No 2)

C:\xampp\htdocs\PBO\Praktikum 6\No 2\017\_fisma\_praktikum6\_indexno2.php - Sublime Text (UNREGISTERED)

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017\_fisma\_praktikum6\_indexno2.php x 017\_fisma\_praktikum6\_no2.php x 017\_fisma\_praktikum6\_interfaceresno2.php x

```

1 <!-- Nama : Fisma Meividianugraha Subani
2 NIM : 21091397017 -->
3
4 <?php
5 require_once '017_fisma_praktikum6_no2.php';
6 >?
7
8 <!DOCTYPE html>
9 <html lang="en">
10
11 <head>
12 <!-- Bootstrap CSS -->
13 <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/css/bootstrap.min.css" rel="stylesheet"
14 integrity="sha384-1lmf4kkm878lYh1d6lvKUHfTAu6AU8t59HfjDbrEXJSU10Boqy12QvZ6Jl33" crossorigin="anonymous">
15
16 <title>Praktikum 6</title>
17 </head>
18
19 <body>
20 <div class="container">
21 <br>
22 <div class="row">
23 <div class="col-5 mx-auto border p-3 mt-2">
24 <h4 class="text-center"><strong><u>Soal 2</u></strong></h4>
25 <br><br>
26 <b><?php
27 echo "Superman";
28 ></b><br>
29 <?= $superman->land(); >> <br>
30 <?= $superman->takeOff(); >> <br>
31 <?= $superman->fly(); >> <br>
32 <?= $superman->leapBuilding(); >> <br>
33 <?= $superman->stopBullet(); >> <br>
34 <br>
35 <b><?php
36 echo "Bird";
37 ></b><br>
38 <?= $bird->buildNest(); >> <br>
39 <?= $bird->takeOff(); >> <br>
40 <?= $bird->fly(); >> <br>
41 <?= $bird->land(); >> <br>
42 <?= $bird->layEgg(); >> <br>
43 <br>
44 <b><?php
45 echo "Airplane";
46 ></b><br>
47 <?= $airplane->takeOff(); >> <br>
48 <?= $airplane->fly(); >> <br>
49 <?= $airplane->land(); >> <br>
50 </div>
51 </div>
52 </div>
53 </body>
54 </html>

```

## b) Source Code PHP

```
C:\xampp\htdocs\PBO\Praktikum 6\No 2\017_fisma_praktikum6_no2.php - Sublime Text (UNREGISTERED)
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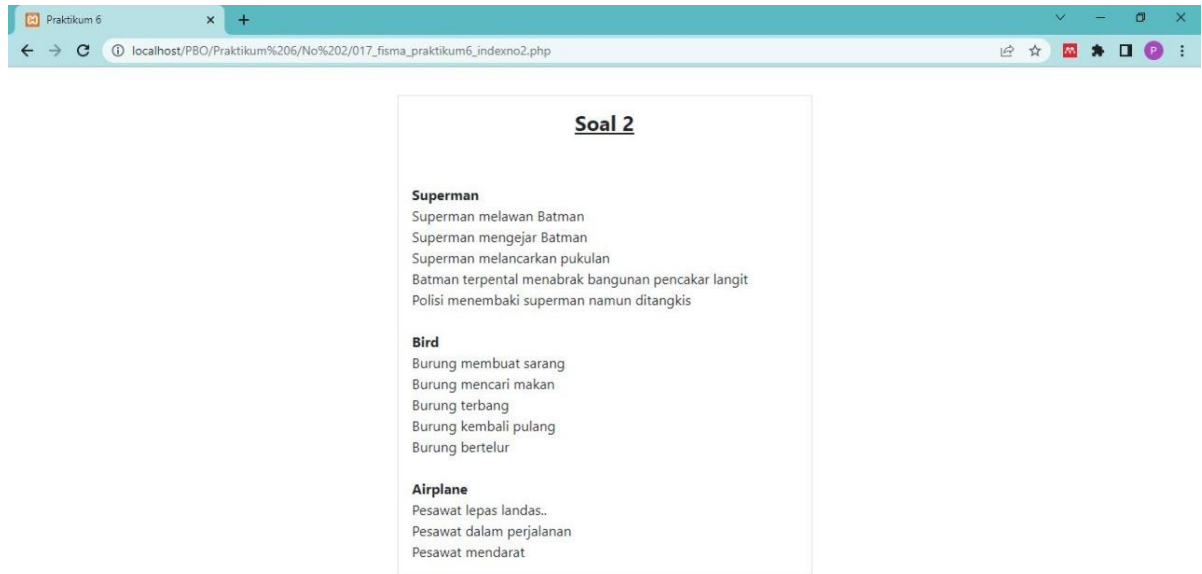
017_fisma_praktikum6_indexno2.php x 017_fisma_praktikum6_no2.php x 017_fisma_praktikum6_interfaceno2.php x
1 <!-- Nama : Fisma Meividianugraha Subani
2     NIM : 21091397017 -->
3
4 <?php
5
6 require_once '017_fisma_praktikum6_interfaceno2.php';
7
8 class Airplane implements Flyer {
9     public function takeOff() {
10         return 'Pesawat lepas landas..';
11     }
12
13     public function land() {
14         return 'Pesawat mendarat';
15     }
16
17     public function fly() {
18         return 'Pesawat dalam perjalanan';
19     }
20 }
21
22 class Bird implements Flyer {
23     public function takeOff() {
24         return 'Burung mencari makan';
25     }
26
27     public function land() {
28         return 'Burung kembali pulang';
29     }
30
31     public function fly() {
32         return 'Burung terbang';
33     }
34
35     public function buildNest() {
36         return 'Burung membuat sarang';
37     }
38
39     public function layEgg() {
40         return 'Burung bertelur';
41     }
42 }
43
44 class Superman implements Flyer {
45     public function takeOff() {
46         return 'Superman mengejar Batman';
47     }
48
49     public function land() {
50         return 'Superman melawan Batman';
51     }
52
53     public function fly() {
54         return 'Superman melancarkan pukulan';
55     }
56
57     public function leapBuilding() {
58         return 'Batman terpelantai menabrak bangunan pencakar langit';
59     }
60
61     public function stopBullet() {
62         return 'Polisi menembaki superman namun ditangkis';
63     }
64 }
65
66 $airplane = new Airplane;
67 $bird = new Bird;
68 $superman = new Superman;
```

## c) Source Code Interface PHP (No 2)

```
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017_fisma_praktikum6_indexno2.php x 017_fisma_praktikum6_no2.php x 017_fisma_praktikum6_interfaceno2.php x
1 <!-- Nama : Fisma Meividianugraha Subani
2     NIM : 21091397017 -->
3
4 <?php
5
6 interface Flyer {
7     public function takeOff();
8     public function land();
9     public function fly();
10 }
11
12 interface Sailer {
13     public function dock();
14     public function cruise();
15 }
```

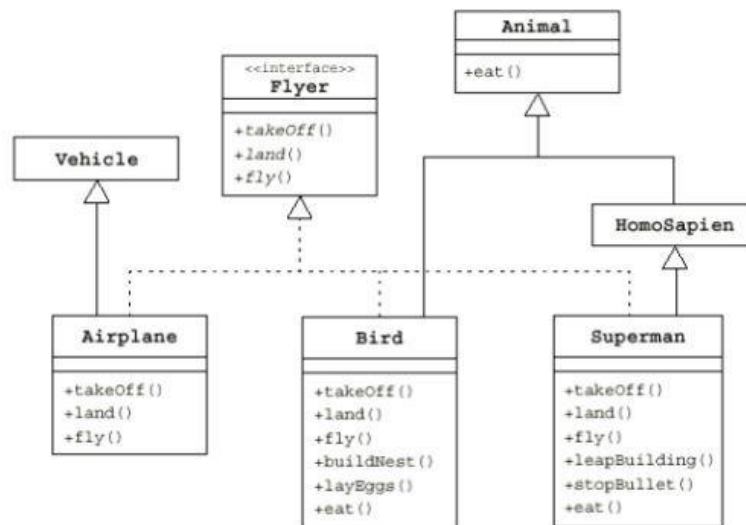
d) Output yang dihasilkan



e) Analisis

Implementasi Polymorphism dengan penggunaan Interface Flyer sehingga semua class yang Implements dari interface Flyer harus memiliki method takeoff, land, dan fly.

3. Buat program berdasarkan UML berikut!



a) Source Code Index PHP (No 3)

```

C:\xampp\htdocs\PO\Praktikum 6\No 3\017_fisma_praktikum6_indexno3.php - Sublime Text (UNREGISTERED)
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017_fisma_praktikum6_indexno3.php x 017_fisma_praktikum6_no3.php x 017_fisma_praktikum6_abstractno3.php x 017_fisma_praktikum6_interfaceno3.php x
1 <!-- Nama : Fisma Meividianugraha Subani
2 NIM : 21091397017 -->
3
4 <?php
5     require_once '017_fisma_praktikum6_no3.php';
6 >
7
8 <!DOCTYPE html>
9 <html lang="id">
10
11 <head>
12 <!-- Bootstrap CSS -->
13 <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/css/bootstrap.min.css" rel="stylesheet"
14     integrity="sha384-1Bt4kq87B1YHf1dvkuhFTAU6au8BT194MhHf3J0brCEXSU10Boq12QvZ6J1M3" crossorigin="anonymous">
15
16 <title>Praktikum 6</title>
17 </head>
18 <body>
19     <div class="container">
20         <div class="row">
21             <div class="col-5 mx-auto border p-3 mt-2">
22                 <h4 class="text-center"><strong><u>Soal 3</u></strong></h4>
23                 <br><br>
24                 <?=> $burung->eat(); ?> <br>
25                 <?=> $manusia->eat(); ?> <br>
26                 <br>
27                 <?=> $airplane2->getMaxLoad() . ' kg'; ?> <br></b>
28                 <?=> $airplane2->addBox(5000) . ' kg'; ?> <br>
29                 <?=> $airplane2->addBox(4000) . ' kg'; ?> <br>
30                 <?=> $airplane2->addBox(8000) . ' kg'; ?> <br>
31                 <?=> $airplane2->addBox(3000) . ' kg'; ?> <br>
32                 <?=> $airplane2->takeOff(); ?> <br>
33                 <?=> $airplane2->fly(); ?> <br>
34                 <?=> $airplane2->land(); ?> <br>
35                 <br>
36                 <?php
37                     echo "Jadi, Butuh Bahan Bakar sebanyak " . $airplane2->calcFuelNeeds() . ' Liter'. "<br>";
38                 >
39                 <br>
40                 <?=> $superman2->eat(); ?> <br>
41                 <?=> $superman2->land(); ?> <br>
42                 <?=> $superman2->takeOff(); ?> <br>
43                 <?=> $superman2->fly(); ?> <br>
44                 <?=> $superman2->leapBuilding(); ?> <br>
45                 <?=> $superman2->stopBullet(); ?> <br>
46             </div>
47         </div>
48     </div>
49 </body>
50 </html>
51
52 </html>

```



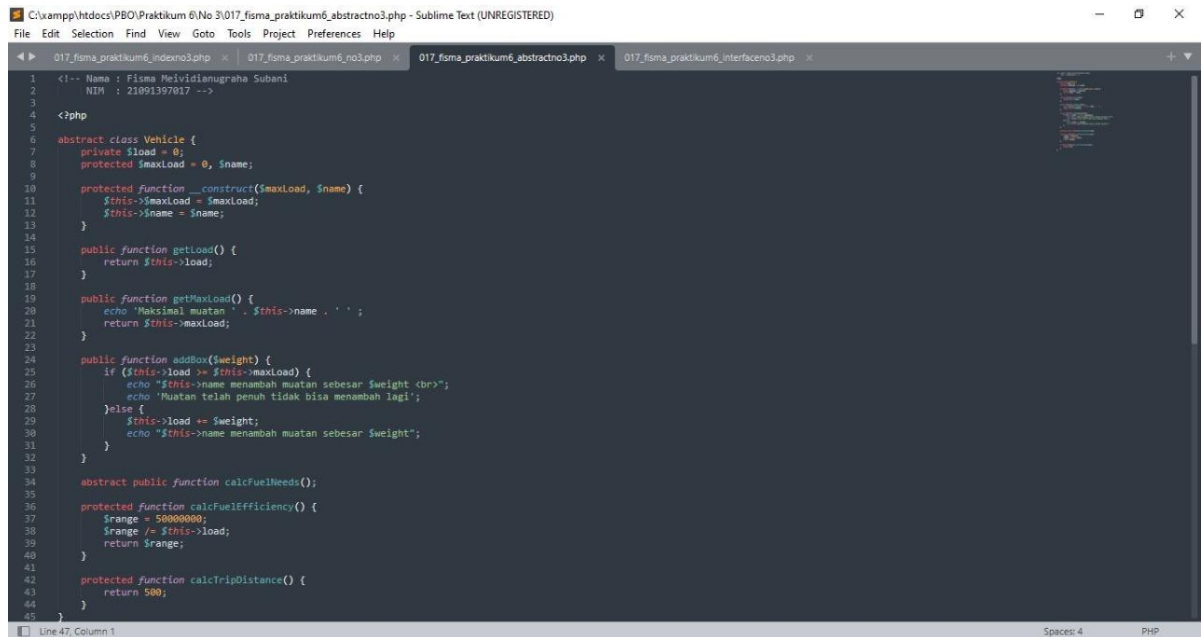
## b) Source Code PHP

```
C:\xampp\htdocs\PBO\Praktikum 6\No 3\017_fisma_praktikum6_no3.php - Sublime Text (UNREGISTERED)
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017_fisma_praktikum6_indexno3.php 017_fisma_praktikum6_no3.php 017_fisma_praktikum6_abstractno3.php 017_fisma_praktikum6_interfaceno3.php

1 <!-- Nama : Fisma Meividianugraha Subani
2 NIM : 21091397017 -->
3
4 <?php
5 require_once '017_fisma_praktikum6_abstractno3.php';
6 require_once '017_fisma_praktikum6_interfaceno3.php';
7
8 class Animal
9 {
10     protected $name;
11     public function __construct($name)
12     {
13         $this->name = $name;
14     }
15     public function eat()
16     {
17         return $this->name . ' sedang makan';
18     }
19 }
20
21 class Homosapiens extends Animal {}
22
23 class Airplane2 extends Vehicle implements Flyer
24 {
25     public function __construct($maxLoad, $name)
26     {
27         $this->maxLoad = $maxLoad;
28         $this->name = $name;
29     }
30     public function takeOff()
31     {
32         return $this->name lepas landas;
33     }
34     public function land()
35     {
36         return $this->name mendarat;
37     }
38     public function fly()
39     {
40         return $this->name dalam perjalanan;
41     }
42     public function calcFuelNeeds()
43     {
44         $fuel = $this->calcFuelEfficiency();
45         $trip = $this->calcTripDistance();
46         return ceil($fuel / $trip);
47     }
48 }
49
50 class Superman2 extends Homosapiens implements Flyer
51 {
52     public function takeOff()
53     {
54         return $this->name mengejar Batman;
55     }
56     public function land()
57     {
58         return $this->name melawan Batman;
59     }
60     public function fly()
61     {
62         return $this->name melancarkan pukulan;
63     }
64     public function leapBuilding()
65     {
66         return "Batman terpengal menabrak bangunan pencakar langit";
67     }
68     public function stopBullet()
69     {
70         return "Polisi menembaki $this->name namun ditangkis";
71     }
72 }
73
74 $burung = new Animal('Burung');
75 $manusia = new Homosapiens('Bryan Bramasta');
76 $airplane2 = new Airplane2(20000, 'Garuda Indonesia');
77 $superman2 = new Superman2('Superman');
```

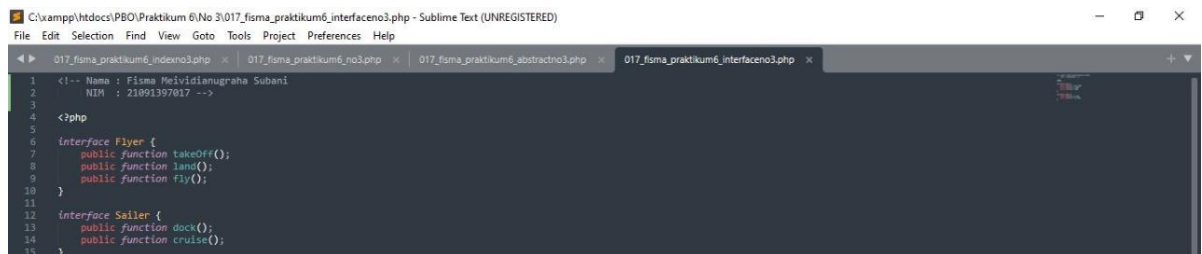
### c) Source Code Abstract PHP (No 3)



The screenshot shows a Sublime Text editor window with the file path `C:\xampp\htdocs\PBO\Praktikum 6\No 3\017_fisma_praktikum6_abstractno3.php`. The code defines an abstract class `Vehicle` with the following methods and properties:

```
1 <!-- Nama : Fisma Meividianugraha Subani
2 NIM : 21091397017 -->
3
4 <?php
5
6 abstract class Vehicle {
7     private $load = 0;
8     protected $maxLoad = 0, $name;
9
10     protected function __construct($maxLoad, $name) {
11         $this->$maxLoad = $maxLoad;
12         $this->$name = $name;
13     }
14
15     public function getLoad() {
16         return $this->$load;
17     }
18
19     public function getMaxLoad() {
20         echo "Maksimal muatan ' . $this->$name . ' ";
21         return $this->$maxLoad;
22     }
23
24     public function addBox($weight) {
25         if ($this->$load >= $this->$maxLoad) {
26             echo "$this->$name menambah muatan sebesar $weight <br>";
27             echo "Muatan telah penuh tidak bisa menambah lagi";
28         } else {
29             $this->$load += $weight;
30             echo "$this->$name menambah muatan sebesar $weight";
31         }
32     }
33
34     abstract public function calcFuelNeeds();
35
36     protected function calcFuelEfficiency() {
37         $range = 500000000;
38         $range /= $this->$load;
39         return $range;
40     }
41
42     protected function calcTripDistance() {
43         return 500;
44     }
45 }
```

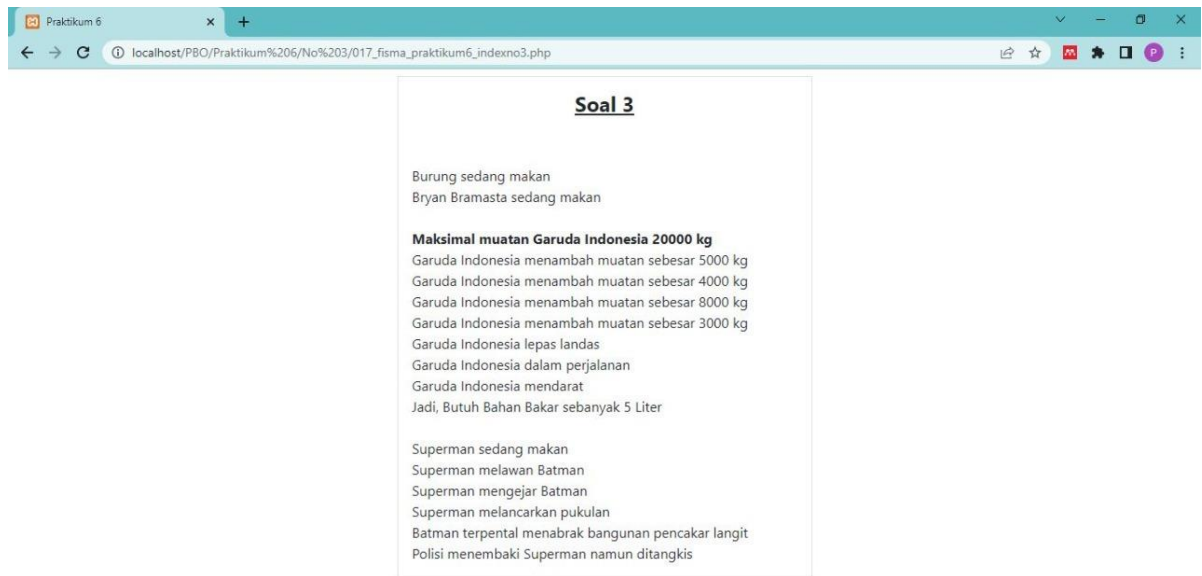
### d) Source Code Interface PHP (No 3)



The screenshot shows a Sublime Text editor window with the file path `C:\xampp\htdocs\PBO\Praktikum 6\No 3\017_fisma_praktikum6_interfaceno3.php`. The code defines two interfaces:

```
1 <!-- Nama : Fisma Meividianugraha Subani
2 NIM : 21091397017 -->
3
4 <?php
5
6 interface Flyer {
7     public function takeOff();
8     public function land();
9     public function fly();
10 }
11
12 interface Sailer {
13     public function dock();
14     public function cruise();
15 }
```

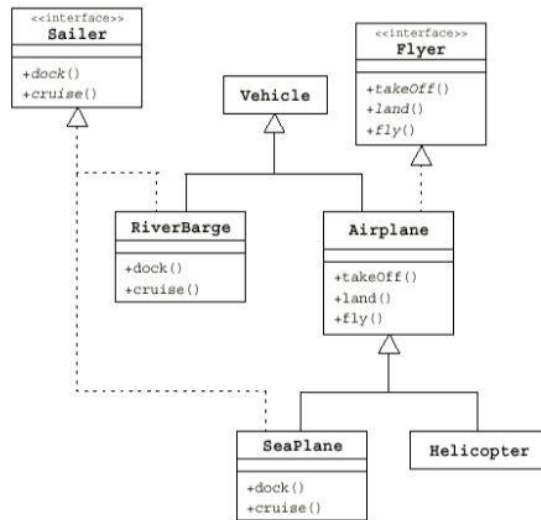
e) Output yang dihasilkan



f) Analisis

Terdapat interface Flyer dan abstract class Vehicle. Class airplane implementasi dari interface Flyer dan turunan dari Vehicle sehingga class Airplane harus memiliki method calcFuelNeeds, takeoff, land, dan fly. Class Bird implementasi dari Flyer dan turunan dari Animal sehingga memiliki method takeoff, land, fly, dan eat. Class Superman turunan dari homosapiens yang juga turunan dari Animal, serta implementasi dari interface Flyer. Maka class Superman memiliki method eat, takeoff, land, fly.

4. Buat program berdasarkan UML berikut!



a) Source Code Index PHP (No 4)

```

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017_fisma_praktikum6_indexno4.php x 017_fisma_praktikum6_abstrackno4.php x 017_fisma_praktikum6_interfackno4.php x
1 <!-- Nama : Fisma Medividianugraha Subani
2 NIM : 21091397017 -->
3
4 <?php
5     require_once '017_fisma_praktikum6_no4.php';
6 >?
7
8 <!DOCTYPE html>
9 <html lang="en">
10
11 <head>
12     <!-- Bootstrap CSS -->
13     <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/css/bootstrap.min.css" rel="stylesheet"
14         integrity="sha384-1hm4k4b781Yh14vKuhTIAU6au0t54eHnftjDorCEX5J08oqy12qVz6jH3" crossorigin="anonymous">
15
16     <title>Praktikum 6</title>
17 </head>
18 <body>
19     <div class="container">
20     <div class="row">
21     <h4 class="text-center"><strong><u>Soal No.4</u></strong></h4>
22     <br><br>
23     <div class="col-4 mx-auto border p-2 mt-2">
24         <b><?=$riverBarge2->getMaxLoad() . ' kg'; >> <br></b>
25         <?=$riverBarge2->addBox(17000) . ' kg'; >> <br>
26         <?=$riverBarge2->addBox(12000) . ' kg'; >> <br>
27         <?=$riverBarge2->addBox(10000) . ' kg'; >> <br>
28         <?=$riverBarge2->addBox(5000) . ' kg'; >> <br>
29         <?=$riverBarge2->dock(); >> <br>
30         <?=$riverBarge2->cruise(); >> <br>
31     </div>
32     <?php
33         <echo "Jadi, Butuh Bahan Bakar sebanyak " . $riverBarge2->calcFuelNeeds() . ' Liter'. '<br>';
34     >?
35     </div>
36     <div class="col-4 mx-auto border p-2 mt-2">
37         <b><?=$seaPlane->getMaxLoad() . ' kg'; >> <br></b>
38         <?=$seaPlane->addBox(17000) . ' kg'; >> <br>
39         <?=$seaPlane->addBox(12000) . ' kg'; >> <br>
40         <?=$seaPlane->dock(); >> <br>
41         <?=$seaPlane->cruise(); >> <br>
42         <?=$seaPlane->takeOff(); >> <br>
43         <?=$seaPlane->fly(); >> <br>
44         <?=$seaPlane->land(); >> <br>
45     </div>
46     <?php
47         <echo "Jadi, Butuh Bahan Bakar sebanyak " . $seaPlane->calcFuelNeeds() . ' Liter'. '<br>';
48     >?
49     </div>
50     <div class="col mx-auto border p-2 mt-2">
51         <b><?=$shellcopter->getMaxLoad() . ' kg'; >> <br></b>
52         <?=$shellcopter->addBox(6000) . ' kg'; >> <br>
53         <?=$shellcopter->addBox(8000) . ' kg'; >> <br>
54         <?=$shellcopter->takeOff(); >> <br>
55         <?=$shellcopter->fly(); >> <br>
56         <?=$shellcopter->land(); >> <br>
57     </div>
58     <?php
59         <echo "Jadi, Butuh Bahan Bakar sebanyak " . $shellcopter->calcFuelNeeds() . ' Liter'. '<br>';
60     >?
61 </div>
62 </body>
63 </html>

```

## b) Source Code PHP

```
C:\xampp\htdocs\PO\Praktikum 6\No 4\017_fisma_praktikum6_no4.php - Sublime Text (UNREGISTERED)
File Edit Selection Find View Goto Tools Project Preferences Help

017_fisma_praktikum6_indexno4.php x 017_fisma_praktikum6_no4.php x 017_fisma_praktikum6_abstractno4.php x 017_fisma_praktikum6_interfaceno4.php x

1 <!-- Nama : Fisma Melvidianugraha Subani
2 NIM : 21091397017 -->
3
4 <?php
5
6 require_once '017_fisma_praktikum6_abstractno4.php';
7 require_once '017_fisma_praktikum6_interfaceno4.php';
8
9 class RiverBarge2 extends Vehicle implements Soiler {
10     public function __construct($maxload, $name) {
11         $this->maxload = $maxload;
12         $this->name = $name;
13     }
14
15     public function calcFuelNeeds() {
16         $fuel = $this->calcFuelEfficiency();
17         $strip = $this->calcTripDistance();
18
19         return ceil($fuel / $strip);
20     }
21
22     public function dock() {
23         return $this->name . ' berada di dermaga';
24     }
25
26     public function cruise() {
27         return $this->name . ' sedang berlayar';
28     }
29 }
30
31 class Airplane2 implements Flyer {
32     public function takeOff() {
33         return 'Pesawat lepas landas';
34     }
35     public function land() {
36         return 'Pesawat mendarat';
37     }
38     public function fly() {
39         return 'Pesawat dalam perjalanan';
40     }
41 }
42
43 class SeaPlane extends Vehicle implements Soiler {
44     public function __construct($maxload, $name) {
45         $this->maxload = $maxload;
46         $this->name = $name;
47     }
48
49     public function calcFuelNeeds() {
50         $fuel = $this->calcFuelEfficiency();
51         $strip = $this->calcTripDistance();
52
53         return ceil($fuel / $strip);
54     }
55
56     public function dock() {
57         return $this->name . ' berada di dermaga';
58     }
59
60     public function cruise() {
61         return $this->name . ' sedang berlayar';
62     }
63
64     public function takeOff() {
65         return $this->name . ' lepas landas';
66     }
67
68     public function land() {
69         return $this->name . ' mendarat';
70     }
71
72     public function fly() {
73         return $this->name . ' dalam perjalanan';
74     }
75 }
76
77 class Helicopter extends Vehicle {
78     public function __construct($maxload, $name) {
79         $this->maxload = $maxload;
80         $this->name = $name;
81     }
82
83     public function calcFuelNeeds() {
84         $fuel = $this->calcFuelEfficiency();
85         $strip = $this->calcTripDistance();
86
87         return ceil($fuel / $strip);
88     }
89     public function takeOff() {
90         return $this->name . ' lepas landas';
91     }
92
93     public function land() {
94         return $this->name . ' mendarat';
95     }
96
97     public function fly() {
98         return $this->name . ' dalam perjalanan';
99     }
100 }
101
102 $riverBarge2 = new RiverBarge2(45000, 'Atomic');
103 $seaPlane = new SeaPlane(30000, 'Titanic');
104 $helicopter = new Helicopter(15000, 'Brooklyn');
```

### c) Source Code Abstract PHP (No 4)

```

1 <!-- Nama : Fisma Meividianugraha Subani
2 NIM : 21091397047 -->
3
4 <?php
5
6 abstract class Vehicle {
7     private $load = 0;
8     protected $maxLoad = 0, $name;
9
10     protected function __construct($maxLoad, $name) {
11         $this->$maxLoad = $maxLoad;
12         $this->$name = $name;
13     }
14
15     public function getLoad() {
16         return $this->$load;
17     }
18
19     public function getMaxLoad() {
20         echo "Maksimal muatan" . $this->$name . " : ";
21         return $this->$maxLoad;
22     }
23
24     public function addBox($weight) {
25         if ($this->$load >= $this->$maxLoad) {
26             echo "Nama menambah muatan sebesar $weight <br>";
27             echo "Muatan telah penuh tidak bisa menambah lagi";
28         } else {
29             $this->$load += $weight;
30             echo "Nama menambah muatan sebesar $weight";
31         }
32     }
33
34     abstract public function calcFuelNeeds();
35
36     protected function calcFuelEfficiency() {
37         $range = 50000000;
38         $range /= $this->$load;
39         return $range;
40     }
41
42     protected function calcTripDistance() {
43         return 500;
44     }
45 }

```

### d) Source Code Interface PHP (No 4)

```

1 <!-- Nama : Fisma Meividianugraha Subani
2 NIM : 21091397017 -->
3
4 <?php
5
6 interface Flyer {
7     public function takeOff();
8     public function land();
9     public function fly();
10 }
11
12 interface Sailer {
13     public function dock();
14     public function cruise();
15 }

```

### e) Output yang dihasilkan

Soal No.4		
<b>Maksimal muatan Atomic 45000 kg</b> Atomic menambah muatan sebesar 17000 kg Atomic menambah muatan sebesar 12000 kg Atomic menambah muatan sebesar 10000 kg Atomic menambah muatan sebesar 5000 kg Atomic berada di dermaga Atomic sedang berlayar Jadi, Butuh Bahan Bakar sebanyak 3 Liter	<b>Maksimal muatan Titanic 30000 kg</b> Titanic menambah muatan sebesar 17000 kg Titanic menambah muatan sebesar 12000 kg Titanic berada di dermaga Titanic sedang berlayar Titanic lepas landas Titanic dalam perjalanan Titanic mendarat Jadi, Butuh Bahan Bakar sebanyak 4 Liter	<b>Maksimal muatan Brooklyn 15000 kg</b> Brooklyn menambah muatan sebesar 6000 kg Brooklyn menambah muatan sebesar 8000 kg Brooklyn lepas landas Brooklyn dalam perjalanan Brooklyn mendarat Jadi, Butuh Bahan Bakar sebanyak 8 Liter

f) Analisis

Implementasi polymorphism dengan interface dan abstract class ditunjukkan pada class SeaPlane yang implements interface Sailer, turunan dari class Airplane yang implements Flyer dan child dari Vehicle sehingga class SeaPlane memiliki method dock, cruise, takeoff, land, fly, dan calcFuelNeeds.