

5 Composition

Introduction

Object inheritance is a core aspect of object oriented programming. It's used inside the Python runtime by every object except for the root type named `object`. Object composition is another aspect of object oriented programming. Composition consists of accessing the functionality from other object types through attributes. Where inherited objects have an **is a** relationship, composite objects are more of a **has a** relationship.

The code in this lab step demonstrates composition by modeling a rudimentary company. The model is composed of the following classes: `Employee`, `Department`, and `Company`. The `Company` class is composed from the other two classes.

Instructions

1. Open and review the `playground/composite.py` file.

The below `Employee` class is composed of the built-in `str` type and itself. The `manager` attribute is a reference to another instance of `Employee`.

2. Add the following base class to the top of the `playground/composite.py` file.

```
1 class Employee:
2     def __init__(self, name: str, manager=None):
3         self.name = name
4         self.manager = manager
5
6     def __str__(self):
7         if self.manager:
8             return f'{self.name}: managed by: {self.manager}'
9         return f'{self.name}.'
10
11     def __repr__(self):
12         return str(self)
```

< Back

Start check



The below `Department` class is composed of built-in types and `Employee` objects.

3. Add the following code below the `Employee` class.

```
1 class Department:
2     def __init__(self, name: str, head: Employee=None):
3         self.name = name
4         self.head = head
5         self.team = []
6
7     def with_team(self, *members):
8         self.team += members
9         return self
10
11    def with_head(self, head):
12        self.head = head
13        return self
14
15    def __str__(self):
16        return f'{self.name}: headed by: {self.head}. Team:
17
18    def __repr__(self):
19        return str(self)
20
21
```

The `Company` class is composed of the `Employee` and `Department` classes.

4. Add the following code below the `Department` class.

```
1 class Company:
2     def __init__(self):
3         self.c_suite = []
```

< Back

Start check ↻





4. Add the following code below the `Department` class.

```
1 class Company:
2     def __init__(self):
3         self.c_suite = [
4             Employee('Q Q'),
5             Employee('R R'),
6             Employee('S S'),
7         ]
8
9         self.departments = [
10            Department('HR').with_team(
11                Employee('A A'),
12                Employee('B B'),
13            ).with_head(
14                Employee('Y Y')
15            ),
16            Department('DEV').with_team(
17                Employee('C C'),
18                Employee('D D'),
19            ).with_head(
20                Employee('Z Z')
21            ),
22        ]
23
24     def __str__(self):
25         return f'C Suite: {self.c_suite} Departments: {self.departments}'
26
27     def __repr__(self):
28         return str(self)
29
30 if __name__ == '__main__':
31     company = Company()
32     print(company)
33
```

< Back

Start check ↻





```

1  #!/usr/bin/perl

2  use strict; use warnings;

3  my $name = "perl";
4  my $version = "5.10.0";

5  sub get_version {
6      my ($name) = @_;
7      my $version = $ENV{"$name_VERSION"};
8      return $version;
9  }

10 sub get_name {
11     my ($name) = @_;
12     return $name;
13 }

14 sub get_version {
15     my ($name) = @_;
16     my $version = $ENV{"$name_VERSION"};
17     return $version;
18 }

19 sub get_name {
20     my ($name) = @_;
21     return $name;
22 }

23 sub get_version {
24     my ($name) = @_;
25     my $version = $ENV{"$name_VERSION"};
26     return $version;
27 }

28 sub get_name {
29     my ($name) = @_;
30     return $name;
31 }

32 sub get_version {
33     my ($name) = @_;
34     my $version = $ENV{"$name_VERSION"};
35     return $version;
36 }

37 sub get_name {
38     my ($name) = @_;
39     return $name;
40 }

41 sub get_version {
42     my ($name) = @_;
43     my $version = $ENV{"$name_VERSION"};
44     return $version;
45 }

46 sub get_name {
47     my ($name) = @_;
48     return $name;
49 }

50 sub get_version {
51     my ($name) = @_;
52     my $version = $ENV{"$name_VERSION"};
53     return $version;
54 }

55 sub get_name {
56     my ($name) = @_;
57     return $name;
58 }

59 sub get_version {
60     my ($name) = @_;
61     my $version = $ENV{"$name_VERSION"};
62     return $version;
63 }

64 sub get_name {
65     my ($name) = @_;
66     return $name;
67 }

68 sub get_version {
69     my ($name) = @_;
70     my $version = $ENV{"$name_VERSION"};
71     return $version;
72 }

73 sub get_name {
74     my ($name) = @_;
75     return $name;
76 }

77 sub get_version {
78     my ($name) = @_;
79     my $version = $ENV{"$name_VERSION"};
80     return $version;
81 }

82 sub get_name {
83     my ($name) = @_;
84     return $name;
85 }

86 sub get_version {
87     my ($name) = @_;
88     my $version = $ENV{"$name_VERSION"};
89     return $version;
90 }

91 sub get_name {
92     my ($name) = @_;
93     return $name;
94 }

95 sub get_version {
96     my ($name) = @_;
97     my $version = $ENV{"$name_VERSION"};
98     return $version;
99 }

100 sub get_name {
101     my ($name) = @_;
102     return $name;
103 }

104 sub get_version {
105     my ($name) = @_;
106     my $version = $ENV{"$name_VERSION"};
107     return $version;
108 }

109 sub get_name {
110     my ($name) = @_;
111     return $name;
112 }

113 sub get_version {
114     my ($name) = @_;
115     my $version = $ENV{"$name_VERSION"};
116     return $version;
117 }

118 sub get_name {
119     my ($name) = @_;
120     return $name;
121 }

122 sub get_version {
123     my ($name) = @_;
124     my $version = $ENV{"$name_VERSION"};
125     return $version;
126 }

127 sub get_name {
128     my ($name) = @_;
129     return $name;
130 }

131 sub get_version {
132     my ($name) = @_;
133     my $version = $ENV{"$name_VERSION"};
134     return $version;
135 }

136 sub get_name {
137     my ($name) = @_;
138     return $name;
139 }

140 sub get_version {
141     my ($name) = @_;
142     my $version = $ENV{"$name_VERSION"};
143     return $version;
144 }

145 sub get_name {
146     my ($name) = @_;
147     return $name;
148 }

149 sub get_version {
150     my ($name) = @_;
151     my $version = $ENV{"$name_VERSION"};
152     return $version;
153 }

154 sub get_name {
155     my ($name) = @_;
156     return $name;
157 }

158 sub get_version {
159     my ($name) = @_;
160     my $version = $ENV{"$name_VERSION"};
161     return $version;
162 }

163 sub get_name {
164     my ($name) = @_;
165     return $name;
166 }

167 sub get_version {
168     my ($name) = @_;
169     my $version = $ENV{"$name_VERSION"};
170     return $version;
171 }

172 sub get_name {
173     my ($name) = @_;
174     return $name;
175 }

176 sub get_version {
177     my ($name) = @_;
178     my $version = $ENV{"$name_VERSION"};
179     return $version;
180 }

181 sub get_name {
182     my ($name) = @_;
183     return $name;
184 }

185 sub get_version {
186     my ($name) = @_;
187     my $version = $ENV{"$name_VERSION"};
188     return $version;
189 }

190 sub get_name {
191     my ($name) = @_;
192     return $name;
193 }

194 sub get_version {
195     my ($name) = @_;
196     my $version = $ENV{"$name_VERSION"};
197     return $version;
198 }

199 sub get_name {
200     my ($name) = @_;
201     return $name;
202 }

203 sub get_version {
204     my ($name) = @_;
205     my $version = $ENV{"$name_VERSION"};
206     return $version;
207 }

208 sub get_name {
209     my ($name) = @_;
210     return $name;
211 }

212 sub get_version {
213     my ($name) = @_;
214     my $version = $ENV{"$name_VERSION"};
215     return $version;
216 }

217 sub get_name {
218     my ($name) = @_;
219     return $name;
220 }

221 sub get_version {
222     my ($name) = @_;
223     my $version = $ENV{"$name_VERSION"};
224     return $version;
225 }

226 sub get_name {
227     my ($name) = @_;
228     return $name;
229 }

230 sub get_version {
231     my ($name) = @_;
232     my $version = $ENV{"$name_VERSION"};
233     return $version;
234 }

235 sub get_name {
236     my ($name) = @_;
237     return $name;
238 }

239 sub get_version {
240     my ($name) = @_;
241     my $version = $ENV{"$name_VERSION"};
242     return $version;
243 }

244 sub get_name {
245     my ($name) = @_;
246     return $name;
247 }

248 sub get_version {
249     my ($name) = @_;
250     my $version = $ENV{"$name_VERSION"};
251     return $version;
252 }

253 sub get_name {
254     my ($name) = @_;
255     return $name;
256 }

257 sub get_version {
258     my ($name) = @_;
259     my $version = $ENV{"$name_VERSION"};
260     return $version;
261 }

262 sub get_name {
263     my ($name) = @_;
264     return $name;
265 }

266 sub get_version {
267     my ($name) = @_;
268     my $version = $ENV{"$name_VERSION"};
269     return $version;
270 }

271 sub get_name {
272     my ($name) = @_;
273     return $name;
274 }

275 sub get_version {
276     my ($name) = @_;
277     my $version = $ENV{"$name_VERSION"};
278     return $version;
279 }

280 sub get_name {
281     my ($name) = @_;
282     return $name;
283 }

284 sub get_version {
285     my ($name) = @_;
286     my $version = $ENV{"$name_VERSION"};
287     return $version;
288 }

289 sub get_name {
290     my ($name) = @_;
291     return $name;
292 }

293 sub get_version {
294     my ($name) = @_;
295     my $version = $ENV{"$name_VERSION"};
296     return $version;
297 }

298 sub get_name {
299     my ($name) = @_;
300     return $name;
301 }

302 sub get_version {
303     my ($name) = @_;
304     my $version = $ENV{"$name_VERSION"};
305     return $version;
306 }

307 sub get_name {
308     my ($name) = @_;
309     return $name;
310 }

311 sub get_version {
312     my ($name) = @_;
313     my $version = $ENV{"$name_VERSION"};
314     return $version;
315 }

316 sub get_name {
317     my ($name) = @_;
318     return $name;
319 }

320 sub get_version {
321     my ($name) = @_;
322     my $version = $ENV{"$name_VERSION"};
323     return $version;
324 }

325 sub get_name {
326     my ($name) = @_;
327     return $name;
328 }

329 sub get_version {
330     my ($name) = @_;
331     my $version = $ENV{"$name_VERSION"};
332     return $version;
333 }

334 sub get_name {
335     my ($name) = @_;
336     return $name;
337 }

338 sub get_version {
339     my ($name) = @_;
340     my $version = $ENV{"$name_VERSION"};
341     return $version;
342 }

343 sub get_name {
344     my ($name) = @_;
345     return $name;
346 }

347 sub get_version {
348     my ($name) = @_;
349     my $version = $ENV{"$name_VERSION"};
350     return $version;
351 }

352 sub get_name {
353     my ($name) = @_;
354     return $name;
355 }

356 sub get_version {
357     my ($name) = @_;
358     my $version = $ENV{"$name_VERSION"};
359     return $version;
360 }

361 sub get_name {
362     my ($name) = @_;
363     return $name;
364 }

365 sub get_version {
366     my ($name) = @_;
367     my $version = $ENV{"$name_VERSION"};
368     return $version;
369 }

370 sub get_name {
371     my ($name) = @_;
372     return $name;
373 }

374 sub get_version {
375     my ($name) = @_;
376     my $version = $ENV{"$name_VERSION"};
377     return $version;
378 }

379 sub get_name {
380     my ($name) = @_;
381     return $name;
382 }

383 sub get_version {
384     my ($name) = @_;
385     my $version = $ENV{"$name_VERSION"};
386     return $version;
387 }

388 sub get_name {
389     my ($name) = @_;
390     return $name;
391 }

392 sub get_version {
393     my ($name) = @_;
394     my $version = $ENV{"$name_VERSION"};
395     return $version;
396 }

397 sub get_name {
398     my ($name) = @_;
399     return $name;
400 }

401 sub get_version {
402     my ($name) = @_;
403     my $version = $ENV{"$name_VERSION"};
404     return $version;
405 }

406 sub get_name {
407     my ($name) = @_;
408     return $name;
409 }

410 sub get_version {
411     my ($name) = @_;
412     my $version = $ENV{"$name_VERSION"};
413     return $version;
414 }

415 sub get_name {
416     my ($name) = @_;
417     return $name;
418 }

419 sub get_version {
420     my ($name) = @_;
421     my $version = $ENV{"$name_VERSION"};
422     return $version;
423 }

424 sub get_name {
425     my ($name) = @_;
426     return $name;
427 }

428 sub get_version {
429     my ($name) = @_;
430     my $version = $ENV{"$name_VERSION"};
431     return $version;
432 }

433 sub get_name {
434     my ($name) = @_;
435     return $name;
436 }

437 sub get_version {
438     my ($name) = @_;
439     my $version = $ENV{"$name_VERSION"};
440     return $version;
441 }

442 sub get_name {
443     my ($name) = @
```

5. Run the code to observe the result.

```
python3 playground/composite.py
```

C Suite: [Q Q., R R., S S.] Departments: [HR: headed by: Y Y., Team: [A A., B B.], DEV: headed by: Z Z., Team: [C C., D D.]]

Composition consists of interacting with other object types through attributes. Composite classes leverage the functionality of the classes without augmentation. Unlike inherited classes which allow derived classes to augment the functionality of the base class.

★ Proceed to the next step ★

✓ Validations

○ Composition: On-Track

1. Ensure that you're on-track.

Python

[← Back](#)

Start check ↻