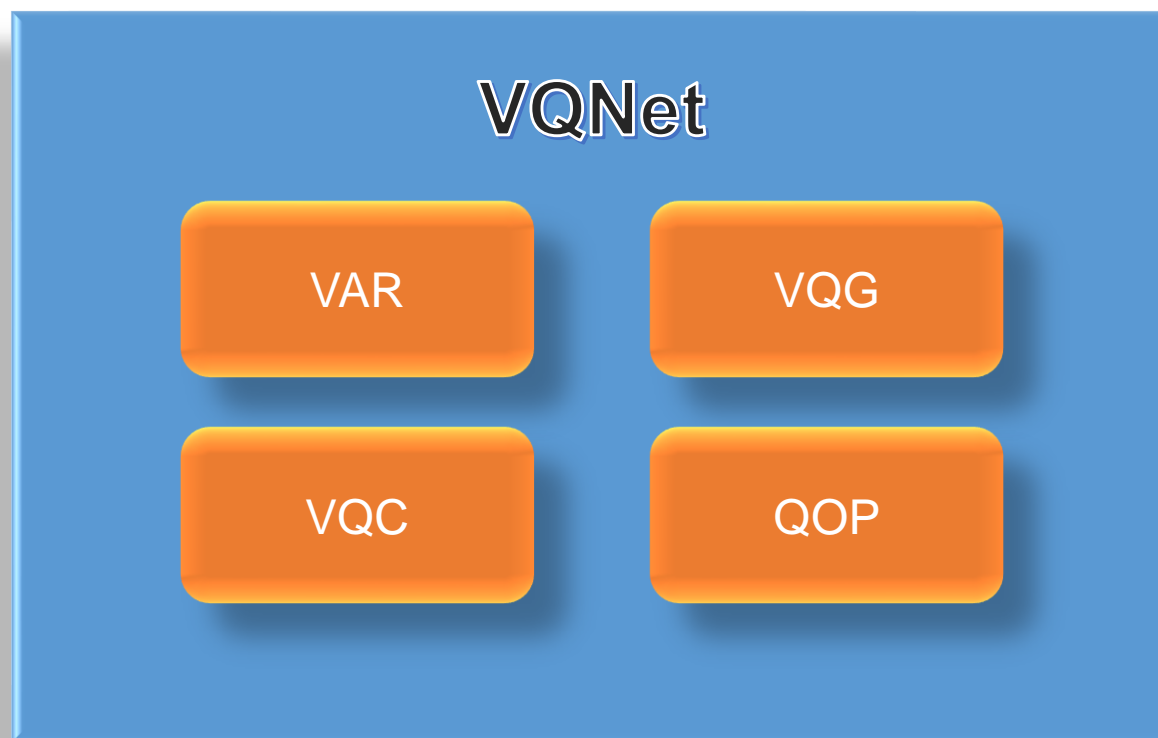
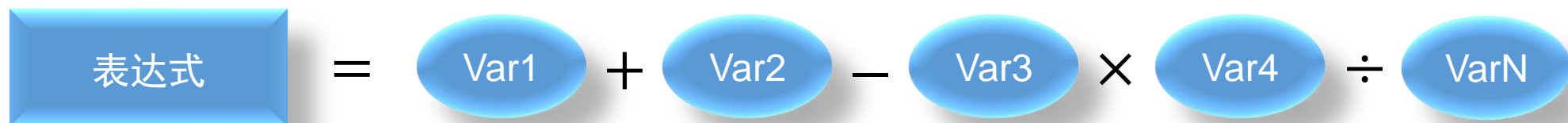


课程五：综合示例

- QAOA | VQNet简介



• QAOA | 变量类(Var)



```
from pyqpanda import *

if __name__=="__main__":
    v1 = p.var(10)
    v2 = p.var(5)

    add = v1 + v2
    minus = v1 - v2
    multiply = v1 * v2
    divide = v1 / v2

    print("add: ", p.eval(add))
    print("minus: ", p.eval(minus))
    print("multiply: ", p.eval(multiply))
    print("divide: ", p.eval(divide))
```

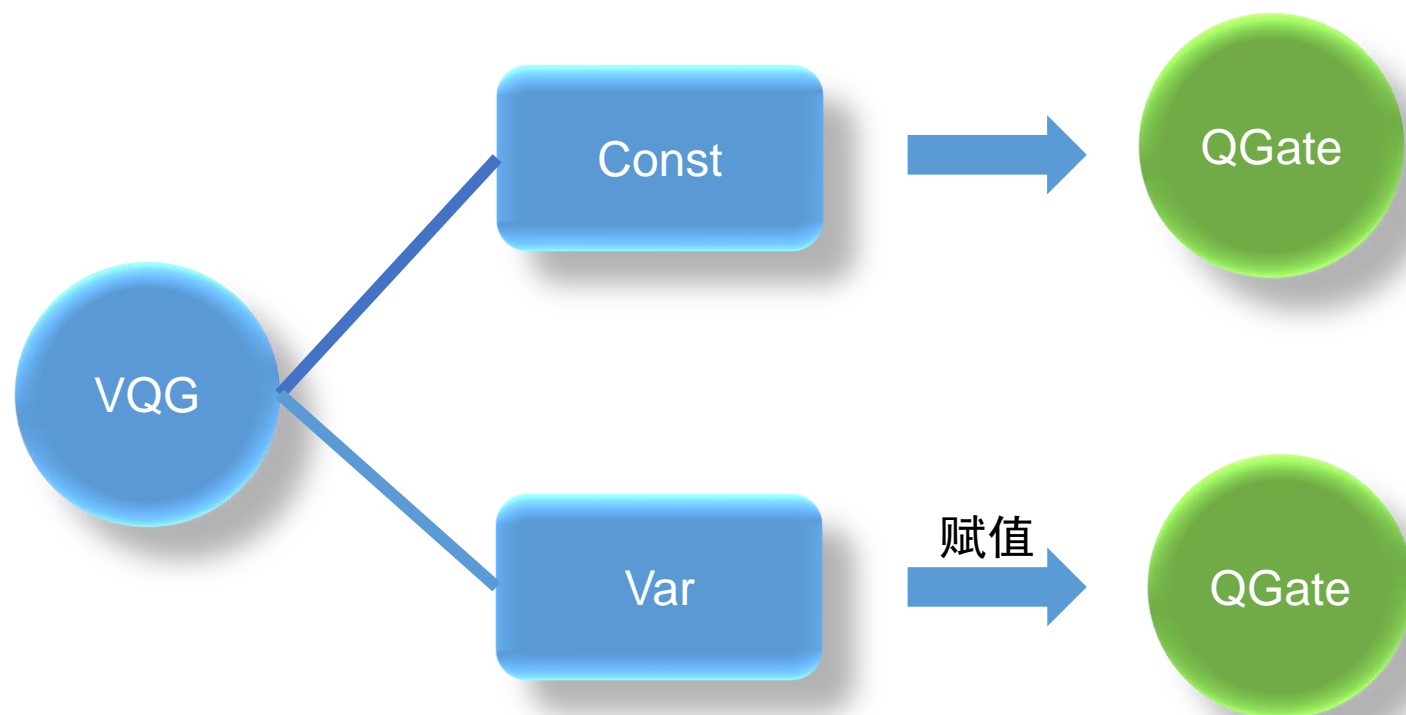
```
add: [[15.]]
minus: [[5.]]
multiply: [[50.]]
divide: [[2.]]
```

```
v1.set_value([[20]])

print("add: ", p.eval(add))
print("minus: ", p.eval(minus))
print("multiply: ", p.eval(multiply))
print("divide: ", p.eval(divide))
```

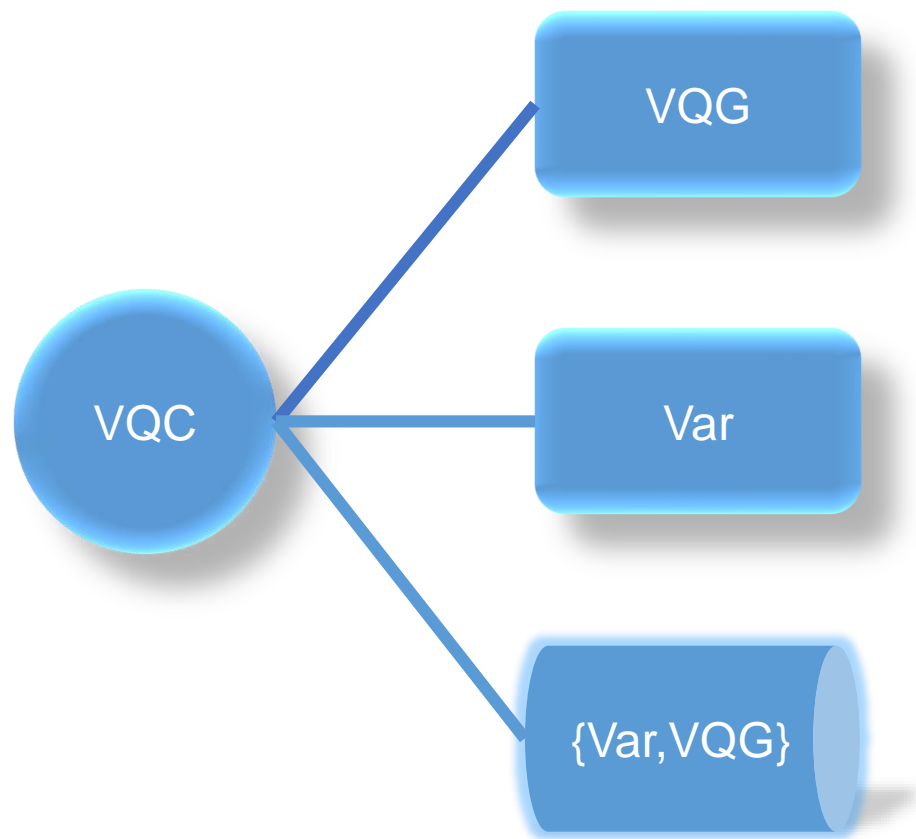
```
add: [[25.]]
minus: [[15.]]
multiply: [[100.]]
divide: [[4.]]
```

• QAOA | 可变量子逻辑门(VQG)



```
from pyqpanda import *  
  
if __name__=="__main__":  
    ...  
    x = p.var(1)  
    y = p.var(2)  
  
    g1 = p.VariationalQuantumGate_H(q[0])  
    g2 = p.VariationalQuantumGate_RX(q[0], x)  
    g3 = p.VariationalQuantumGate_RY(q[0], y)  
    g4 = p.VariationalQuantumGate_RZ(q[0], 0.12)  
    g5 = p.VariationalQuantumGate_CZ(q[0], q[1])  
    g6 = p.VariationalQuantumGate_CNOT(q[0], q[1])  
  
    ...
```

• QAOA | 可变量子线路(VQC)



```
from pyqpanda import *

if __name__=="__main__":

    machine=p.init_quantum_machine()
    q = machine.qAlloc_many(2)
    x = p.var(1)
    y = p.var(2)

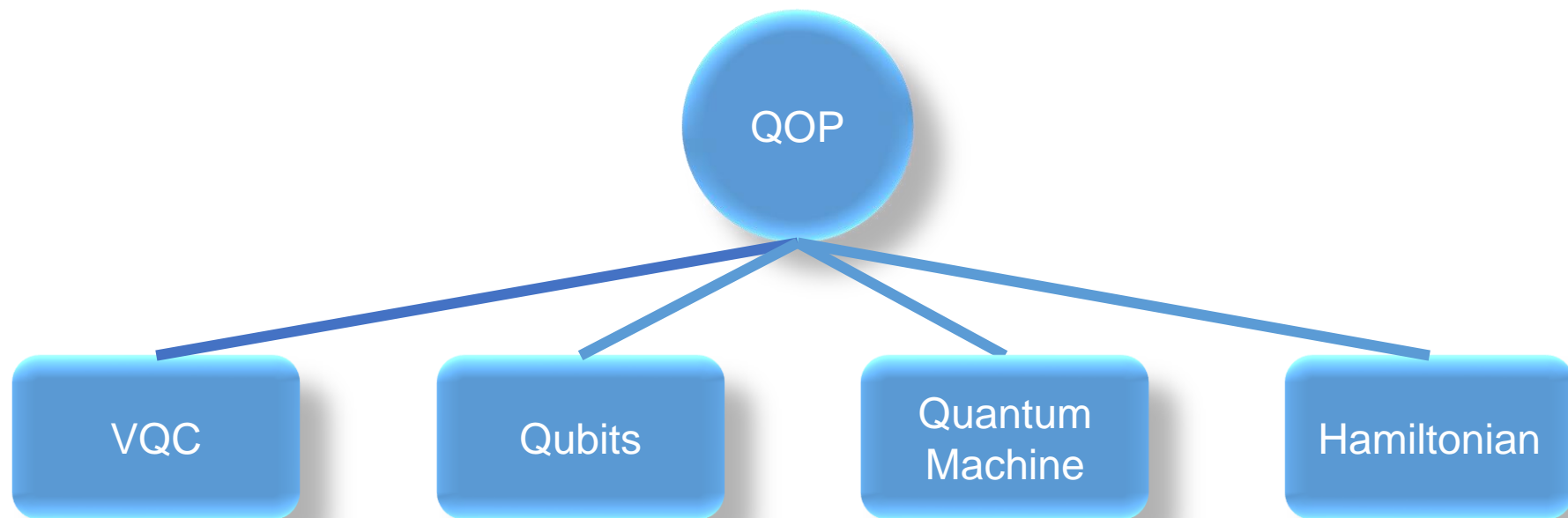
    vqc = p.VariationalQuantumCircuit()
    vqc.insert(p.VariationalQuantumGate_H(q[0]))
    vqc.insert(p.VariationalQuantumGate_RX(q[0], x))
    vqc.insert(p.VariationalQuantumGate_RY(q[1], y))

    circuit = vqc.feed()
    prog = p.QProg()
    prog.insert(circuit)
    print(p.qRunesProg(prog))

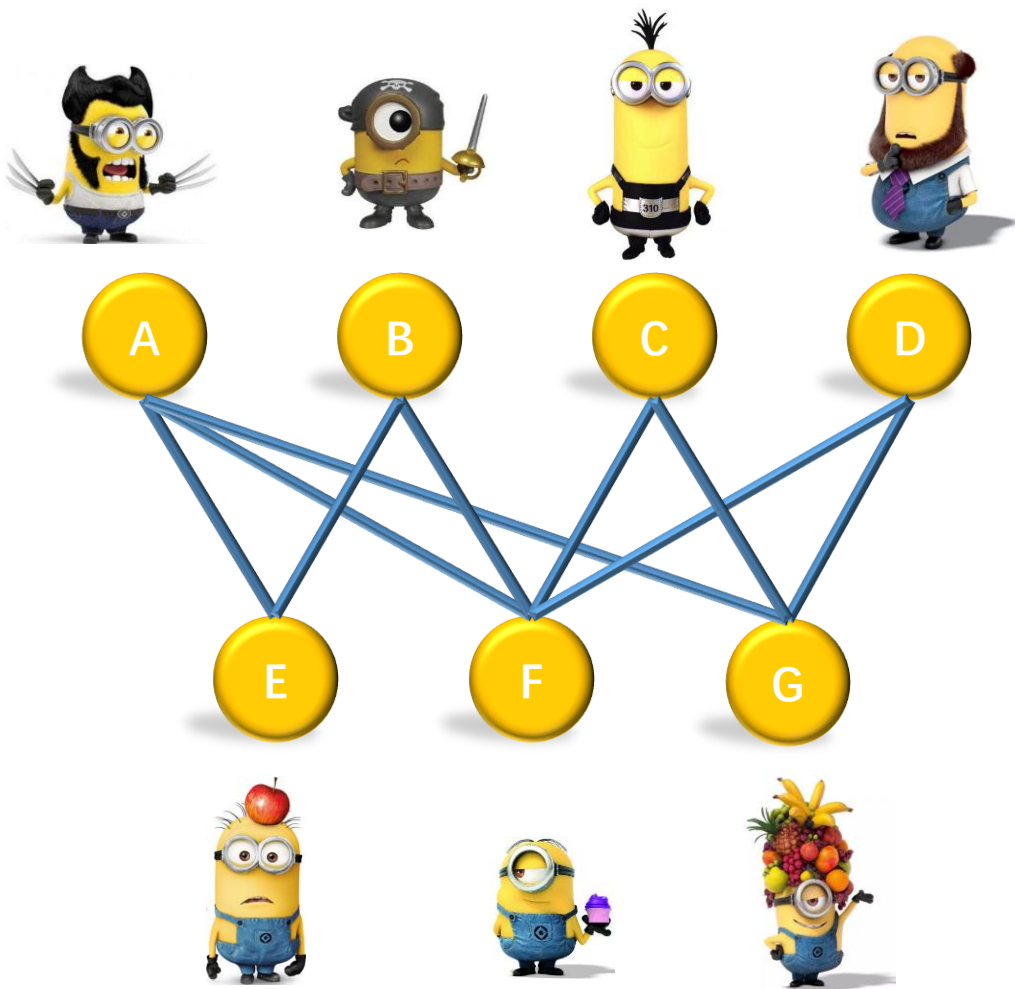
    x.set_value([[4]])
    circuit2 = vqc.feed()
    prog2 = p.QProg()
    prog2.insert(circuit2)
    print(p.qRunesProg(prog2))
```

```
QINIT 2
CREG 0
H 0
RX 0,"1.000000"
RY 1,"2.000000"
QINIT 2
CREG 0
H 0
RX 0,"4.000000"
RY 1,"2.000000"
```

- **QAOA** | 量子操作(QOP)



• QAOA | 最大切割问题



		矛盾值			矛盾值
A	E	0.73	C	F	0.88
A	F	0.33	C	G	0.58
A	G	0.5	D	F	0.67
B	E	0.69	D	G	0.43
B	F	0.36			

• QAOA | 代码演示



追本溯源 高掌远跖

支持与交流

<https://github.com/OriginQ/QPanda-2>

<https://www.originqc.com.cn>