

```
1 C:\Users\kanis\.jdk\openjdk-16.0.2\bin\java.exe "-
  javaagent:C:\Program Files\JetBrains\IntelliJ IDEA
  2021.2.1\lib\idea_rt.jar=64068:C:\Program Files\
  JetBrains\IntelliJ IDEA 2021.2.1\bin" -Dfile.encoding
  =UTF-8 -classpath C:\Users\kanis\IdeaProjects\
  DistributedSystes\Project3\Project3Task1\target\
  classes;C:\Users\kanis\.m2\repository\org\json\json\
  20190722\json-20190722.jar blockchaintask.
  BlockchainClient
2
3 0. View basic blockchain status
4 1. Add a transaction to blockchain.
5 2. Verify the blockchain.
6 3. View the blockchain.
7 4. Corrupt the chain.
8 5. Hide the corruption by repairing the chain
9 6. Exit
10 0
11 Current size of the chain: 1
12 Difficulty of the most recent block: 2
13 Total difficulty for all blocks: 2
14 Approximate hashes per second on this machine:
  2958579
15 Expected total hashes required for the whole chain:
  256.0
16 Nonce for the most recent block: 649
17 Chain hash:
  007B359631B3DD848EF2D652B8B3E6FDFF18871367AB68270C53D
  FC62A1C8AFB
18
19 0. View basic blockchain status
20 1. Add a transaction to blockchain.
21 2. Verify the blockchain.
22 3. View the blockchain.
23 4. Corrupt the chain.
24 5. Hide the corruption by repairing the chain
25 6. Exit
26 1
27 Enter difficulty > 0
28 3
29 Enter transaction
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30 Kanishka pays Bob 100 dscoin
31 Total execution time to add this block was 0
   milliseconds
32
33 0. View basic blockchain status
34 1. Add a transaction to blockchain.
35 2. Verify the blockchain.
36 3. View the blockchain.
37 4. Corrupt the chain.
38 5. Hide the corruption by repairing the chain
39 6. Exit
40 1
41 Enter difficulty > 0
42 3
43 Enter transaction
44 Bob pays Kanishka 20 dscoin
45 Total execution time to add this block was 48
   milliseconds
46
47 0. View basic blockchain status
48 1. Add a transaction to blockchain.
49 2. Verify the blockchain.
50 3. View the blockchain.
51 4. Corrupt the chain.
52 5. Hide the corruption by repairing the chain
53 6. Exit
54 1
55 Enter difficulty > 0
56 4
57 Enter transaction
58 Kanishka pays Carol 23 dscoin
59 Total execution time to add this block was 16
   milliseconds
60
61 0. View basic blockchain status
62 1. Add a transaction to blockchain.
63 2. Verify the blockchain.
64 3. View the blockchain.
65 4. Corrupt the chain.
66 5. Hide the corruption by repairing the chain
67 6. Exit
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68 1
69 Enter difficulty > 0
70 5
71 Enter transaction
72 Donna pays Kanishka 34 dscoin
73 Total execution time to add this block was 1267
  milliseconds
74
75 0. View basic blockchain status
76 1. Add a transaction to blockchain.
77 2. Verify the blockchain.
78 3. View the blockchain.
79 4. Corrupt the chain.
80 5. Hide the corruption by repairing the chain
81 6. Exit
82 3
83 {"ds_chain{" : [ {"index" : "0","time stamp" : "2021
  -10-23 15:38:58.645", "Tx" : "Genesis", "PrevHash
  " : "", "nonce" : "649", "difficulty" : "2"}
84 {"index" : "1","time stamp" : "2021-10-23 15:39:20.
  962", "Tx" : "Kanishka pays Bob 100 dscoin", "
  PrevHash" : "
  007B359631B3DD848EF2D652B8B3E6FDFF18871367AB68270C53
  DFC62A1C8AFB", "nonce" : "26", "difficulty" : "3"}
85 {"index" : "2","time stamp" : "2021-10-23 15:39:33.
  61", "Tx" : "Bob pays Kanishka 20 dscoin", "PrevHash
  " : "
  0008088409F83872BE1DC83EDDB158D61567C016EE2EBD820D9C
  377359E8DB35", "nonce" : "11845", "difficulty" : "3
  "}
86 {"index" : "3","time stamp" : "2021-10-23 15:39:46.
  412", "Tx" : "Kanishka pays Carol 23 dscoin", "
  PrevHash" : "
  0005869905F8BB8305CF90B7EC686EAF520C826514702B52200C
  318AE3DDE667", "nonce" : "13011", "difficulty" : "4
  "}
87 {"index" : "4","time stamp" : "2021-10-23 15:40:02.
  041", "Tx" : "Donna pays Kanishka 34 dscoin", "
  PrevHash" : "
  00004111A2F975C575636BD1E25EFA0E73C357CDA5806E6B7F76
  E79D2CC4A628", "nonce" : "962195", "difficulty" : "5

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87  "}"
88  ],"chainHash":
    000002C72FE12FC4BF8BFD4A5A6D356E17D9888C375608B0F886
    C8A494F50F76"}
89
90  0. View basic blockchain status
91  1. Add a transaction to blockchain.
92  2. Verify the blockchain.
93  3. View the blockchain.
94  4. Corrupt the chain.
95  5. Hide the corruption by repairing the chain
96  6. Exit
97  1
98  Enter difficulty > 0
99  2
100 Enter transaction
101 Carol pays Donna 1 dscoin
102 Total execution time to add this block was 0
    milliseconds
103
104 0. View basic blockchain status
105 1. Add a transaction to blockchain.
106 2. Verify the blockchain.
107 3. View the blockchain.
108 4. Corrupt the chain.
109 5. Hide the corruption by repairing the chain
110 6. Exit
111 3
112 {"ds_chain{" : [ {"index" : "0","time stamp" : "2021
    -10-23 15:38:58.645", "Tx" : "Genesis", "PrevHash
    " : "", "nonce" : "649", "difficulty" : "2"}
113 {"index" : "1","time stamp" : "2021-10-23 15:39:20.
    962", "Tx" : "Kanishka pays Bob 100 dscoin", "
    PrevHash" : "
    007B359631B3DD848EF2D652B8B3E6FDFF18871367AB68270C53
    DFC62A1C8AFB", "nonce" : "26", "difficulty" : "3"}
114 {"index" : "2","time stamp" : "2021-10-23 15:39:33.
    61", "Tx" : "Bob pays Kanishka 20 dscoin", "PrevHash
    " : "
    0008088409F83872BE1DC83EDDB158D61567C016EE2EBD820D9C
    377359E8DB35", "nonce" : "11845", "difficulty" : "3

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114 {}
115 {"index" : "3","time stamp" : "2021-10-23 15:39:46.
    412", "Tx" : "Kanishka pays Carol 23 dscoin", "
    PrevHash" : "
    0005869905F8BB8305CF90B7EC686EAF520C826514702B52200C
    318AE3DDE667", "nonce" : "13011", "difficulty" : "4
    "}
116 {"index" : "4","time stamp" : "2021-10-23 15:40:02.
    041", "Tx" : "Donna pays Kanishka 34 dscoin", "
    PrevHash" : "
    00004111A2F975C575636BD1E25EFA0E73C357CDA5806E6B7F76
    E79D2CC4A628", "nonce" : "962195", "difficulty" : "5
    "}
117 {"index" : "5","time stamp" : "2021-10-23 15:40:22.
    322", "Tx" : "Carol pays Donna 1 dscoin", "PrevHash
    " : "
    000002C72FE12FC4BF8BFD4A5A6D356E17D9888C375608B0F886
    C8A494F50F76", "nonce" : "40", "difficulty" : "2"}
118 ],"chainHash":
    00918B22252F665C4D5DE79611FE9254A021F170CF7E7FA5B2A0
    B29B42B55C69"}
119
120 0. View basic blockchain status
121 1. Add a transaction to blockchain.
122 2. Verify the blockchain.
123 3. View the blockchain.
124 4. Corrupt the chain.
125 5. Hide the corruption by repairing the chain
126 6. Exit
127 4
128 Corrupt the Blockchain
129 Enter the block ID of block to corrupt
130 0
131 Enter new data for block 2
132 Carol pays Kanishka 1000 dscoin
133 Block 0 now holds Carol pays Kanishka 1000 dscoin
134
135 0. View basic blockchain status
136 1. Add a transaction to blockchain.
137 2. Verify the blockchain.
138 3. View the blockchain.

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139 4. Corrupt the chain.
140 5. Hide the corruption by repairing the chain
141 6. Exit
142 3
143 {"ds_chain{" : [ {"index" : "0","time stamp" : "2021
    -10-23 15:38:58.645", "Tx" : "Carol pays Kanishka
    1000 dscoin", "PrevHash" : "", "nonce" : "649", "
    difficulty" : "2"}
144 {"index" : "1","time stamp" : "2021-10-23 15:39:20.
    962", "Tx" : "Kanishka pays Bob 100 dscoin", "
    PrevHash" : "
    007B359631B3DD848EF2D652B8B3E6FDF18871367AB68270C53
    DFC62A1C8AFB", "nonce" : "26", "difficulty" : "3"}
145 {"index" : "2","time stamp" : "2021-10-23 15:39:33.
    61", "Tx" : "Bob pays Kanishka 20 dscoin", "PrevHash
    " : "
    0008088409F83872BE1DC83EDDB158D61567C016EE2EBD820D9C
    377359E8DB35", "nonce" : "11845", "difficulty" : "3
    "}
146 {"index" : "3","time stamp" : "2021-10-23 15:39:46.
    412", "Tx" : "Kanishka pays Carol 23 dscoin", "
    PrevHash" : "
    0005869905F8BB8305CF90B7EC686EAF520C826514702B52200C
    318AE3DDE667", "nonce" : "13011", "difficulty" : "4
    "}
147 {"index" : "4","time stamp" : "2021-10-23 15:40:02.
    041", "Tx" : "Donna pays Kanishka 34 dscoin", "
    PrevHash" : "
    00004111A2F975C575636BD1E25EFA0E73C357CDA5806E6B7F76
    E79D2CC4A628", "nonce" : "962195", "difficulty" : "5
    "}
148 {"index" : "5","time stamp" : "2021-10-23 15:40:22.
    322", "Tx" : "Carol pays Donna 1 dscoin", "PrevHash
    " : "
    000002C72FE12FC4BF8BFD4A5A6D356E17D9888C375608B0F886
    C8A494F50F76", "nonce" : "40", "difficulty" : "2"}
149 ],"chainHash": "
    00918B22252F665C4D5DE79611FE9254A021F170CF7E7FA5B2A0
    B29B42B55C69"}
150
151 0. View basic blockchain status

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152 1. Add a transaction to blockchain.
153 2. Verify the blockchain.
154 3. View the blockchain.
155 4. Corrupt the chain.
156 5. Hide the corruption by repairing the chain
157 6. Exit
158 5
159 Repairing the entire chain
160 Total execution time required to repair the chain
    was 168 milliseconds
161
162 0. View basic blockchain status
163 1. Add a transaction to blockchain.
164 2. Verify the blockchain.
165 3. View the blockchain.
166 4. Corrupt the chain.
167 5. Hide the corruption by repairing the chain
168 6. Exit
169 3
170 {"ds_chain{" : [ {"index" : "0","time stamp" : "2021
    -10-23 15:38:58.645", "Tx" : "Carol pays Kanishka
    1000 dscoin", "PrevHash" : "", "nonce" : "71", "
    difficulty" : "2"}
171 {"index" : "1","time stamp" : "2021-10-23 15:39:20.
    962", "Tx" : "Kanishka pays Bob 100 dscoin", "
    PrevHash" : "
    008E55AC62F4A9441622104EACC5EFAD04468C3FCE28A952F586
    80094632AFD3", "nonce" : "11344", "difficulty" : "3
    "}
172 {"index" : "2","time stamp" : "2021-10-23 15:39:33.
    61", "Tx" : "Bob pays Kanishka 20 dscoin", "PrevHash
    " : "
    00049B7B15B6857EAA263704DF98628AE775F693FDFC753AC28D
    8364D2B20AB6", "nonce" : "5678", "difficulty" : "3"}
173 {"index" : "3","time stamp" : "2021-10-23 15:39:46.
    412", "Tx" : "Kanishka pays Carol 23 dscoin", "
    PrevHash" : "
    000D70DB72009755C06596525A52588C6A9C634BA4FF10E9D5D1
    47061CC13AA7", "nonce" : "76284", "difficulty" : "4
    "}
174 {"index" : "4","time stamp" : "2021-10-23 15:40:02.

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174 041", "Tx" : "Donna pays Kanishka 34 dscoin", "
    PrevHash" : "
    00007698FC8C9B2AD374A41035A8DFCE4E23479ACB4000F33DC7
    2F6193346BE7", "nonce" : "45039", "difficulty" : "5
    "}
175 {"index" : "5","time stamp" : "2021-10-23 15:40:22.
    322", "Tx" : "Carol pays Donna 1 dscoin", "PrevHash
    " : "
    00000634C741C47A369DD4A9F0E32A5109D0395B5AA64ECEF146
    982E74B57563", "nonce" : "159", "difficulty" : "2"}
176 ],"chainHash": "
    0055ECB9F581BB4AF7648C4E7CA8E842D88E8905DE9B826D14B0
    933607D6F994"}
177
178 0. View basic blockchain status
179 1. Add a transaction to blockchain.
180 2. Verify the blockchain.
181 3. View the blockchain.
182 4. Corrupt the chain.
183 5. Hide the corruption by repairing the chain
184 6. Exit
185 1
186 Enter difficulty > 0
187 4
188 Enter transaction
189 Edward pays Kanishka 34 dscoin
190 Total execution time to add this block was 279
    milliseconds
191
192 0. View basic blockchain status
193 1. Add a transaction to blockchain.
194 2. Verify the blockchain.
195 3. View the blockchain.
196 4. Corrupt the chain.
197 5. Hide the corruption by repairing the chain
198 6. Exit
199 2
200 Verifying the entire chain
201 Chain verification: true
202 Total execution time to verify the chain was 0
    milliseconds
```



```
203
204 0. View basic blockchain status
205 1. Add a transaction to blockchain.
206 2. Verify the blockchain.
207 3. View the blockchain.
208 4. Corrupt the chain.
209 5. Hide the corruption by repairing the chain
210 6. Exit
211 4
212 Corrupt the Blockchain
213 Enter the block ID of block to corrupt
214 2
215 Enter new data for block 2
216 Frank pays Kanishka 3 dscoin
217 Block 2 now holds Frank pays Kanishka 3 dscoin
218
219 0. View basic blockchain status
220 1. Add a transaction to blockchain.
221 2. Verify the blockchain.
222 3. View the blockchain.
223 4. Corrupt the chain.
224 5. Hide the corruption by repairing the chain
225 6. Exit
226 2
227 Verifying the entire chain
228 Chain verification: false
229 ..Improper hash at node2.Does not begin with 000
230 Total execution time to verify the chain was 0
    milliseconds
231
232 0. View basic blockchain status
233 1. Add a transaction to blockchain.
234 2. Verify the blockchain.
235 3. View the blockchain.
236 4. Corrupt the chain.
237 5. Hide the corruption by repairing the chain
238 6. Exit
239 5
240 Repairing the entire chain
241 Total execution time required to repair the chain
    was 2712 milliseconds
```

```

242
243 0. View basic blockchain status
244 1. Add a transaction to blockchain.
245 2. Verify the blockchain.
246 3. View the blockchain.
247 4. Corrupt the chain.
248 5. Hide the corruption by repairing the chain
249 6. Exit
250 3
251 {"ds_chain{" : [ {"index" : "0","time stamp" : "2021
    -10-23 15:38:58.645", "Tx" : "Carol pays Kanishka
    1000 dscoin", "PrevHash" : "", "nonce" : "71", "
    difficulty" : "2"}
252 {"index" : "1","time stamp" : "2021-10-23 15:39:20.
    962", "Tx" : "Kanishka pays Bob 100 dscoin", "
    PrevHash" : "
    008E55AC62F4A9441622104EACC5EFAD04468C3FCE28A952F586
    80094632AFD3", "nonce" : "11344", "difficulty" : "3
    "}
253 {"index" : "2","time stamp" : "2021-10-23 15:39:33.
    61", "Tx" : "Frank pays Kanishka 3 dscoin", "
    PrevHash" : "
    00049B7B15B6857EAA263704DF98628AE775F693FDFC753AC28D
    8364D2B20AB6", "nonce" : "7285", "difficulty" : "3"}
254 {"index" : "3","time stamp" : "2021-10-23 15:39:46.
    412", "Tx" : "Kanishka pays Carol 23 dscoin", "
    PrevHash" : "
    0000EB4557E9BAB0BC569DA7A31D1DB97B2664A3D94FE448D62A
    5CFF410BBEC5", "nonce" : "2456", "difficulty" : "4"}
255 {"index" : "4","time stamp" : "2021-10-23 15:40:02.
    041", "Tx" : "Donna pays Kanishka 34 dscoin", "
    PrevHash" : "
    0000813AF2FF526ACFB395CE5748E69FD2C5050D6DABA4FC4557
    A0B80BCAAFB", "nonce" : "2123455", "difficulty" : "
    5"}
256 {"index" : "5","time stamp" : "2021-10-23 15:40:22.
    322", "Tx" : "Carol pays Donna 1 dscoin", "PrevHash
    " : "
    00000E08912AE327BDF2D674AF0279BCAC9A65DACBA3F59DB787
    DE70DAEB9443", "nonce" : "394", "difficulty" : "2"}
257 {"index" : "6","time stamp" : "2021-10-23 15:41:19.

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```
257 034", "Tx" : "Edward pays Kanishka 34 dscoin", "
    PrevHash" : "
    000847C9B2F3285BF3DC6EC98023930C6FD11C80F3EA78BE3ED2
    98FEF78FFE23", "nonce" : "47600", "difficulty" : "4
    "}
258 ],"chainHash":"
    0000E540167C91E8FDE3150CF99E9A39D8797230F42135922702
    818557507753"}
259
260 0. View basic blockchain status
261 1. Add a transaction to blockchain.
262 2. Verify the blockchain.
263 3. View the blockchain.
264 4. Corrupt the chain.
265 5. Hide the corruption by repairing the chain
266 6. Exit
267 2
268 Verifying the entire chain
269 Chain verification: true
270 Total execution time to verify the chain was 0
    milliseconds
271
272 0. View basic blockchain status
273 1. Add a transaction to blockchain.
274 2. Verify the blockchain.
275 3. View the blockchain.
276 4. Corrupt the chain.
277 5. Hide the corruption by repairing the chain
278 6. Exit
279 0
280 Current size of the chain: 7
281 Difficulty of the most recent block: 4
282 Total difficulty for all blocks: 23
283 Approximate hashes per second on this machine:
    2958579
284 Expected total hashes required for the whole chain:
    1188352.0
285 Nonce for the most recent block: 47600
286 Chain hash:
    0000E540167C91E8FDE3150CF99E9A39D8797230F42135922702
    818557507753
```

```
287
288 0. View basic blockchain status
289 1. Add a transaction to blockchain.
290 2. Verify the blockchain.
291 3. View the blockchain.
292 4. Corrupt the chain.
293 5. Hide the corruption by repairing the chain
294 6. Exit
295 6
296
297 Process finished with exit code 0
298
```