**Case 1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Obligation Group(timestamp)** | **Obligations** | **Actions** | **Obligation Sequences with Race Condition** |
| CreatePDS(1) | CreatePDS | grant(PI,{add-copi},PDSWhole) | N/A |
| DeleteCoPI(1) | DeleteCoPI1 | delete association(CoPI,{read},PDSWhole) | None |
| DeleteCoPI2 | delete association(CoPI,{edit},PDSWhole) |
| AddCoPI(2) | AddCoPI1 | grant(CoPI,{edit},PDSWhole) | {AddCoPI1, AddCoPI2, AddCoPI3} -> association(CoPI,{edit,delete},PDSWhole)  {AddCoPI2, AddCoPI1, AddCoPI3} -> association(CoPI,{edit},PDSWhole) |
| AddCoPI2 | grant(CoPI,{edit,delete},PDSWhole) |
| AddCoPI3 | grant(CoPI,{read},PDSWhole)  grant(PI,{add-copi},PDSWhole) |

**Case 2**

|  |  |  |  |
| --- | --- | --- | --- |
| **Obligation Group(timestamp)** | **Obligation** | **Action/Condition** | **Obligation Sequences with Race Condition -> conflicting postcondition** |
| CreatePDS(1) | CreatePDS | grant(PI,{add-copi},PDSWhole) | N/A |
| DeleteCoPI(1) | DeleteCoPI1 | delete association(CoPI,{read},PDSWhole) | None |
| DeleteCoPI2 | delete association(CoPI,{edit},PDSWhole) |
| AddCoPI(2) | AddCoPI1 | assign(Alice,CoPI) | {AddCoPI1, AddCoPI2, AddCoPI3} -> assignment(Bob,CoPI)  {AddCoPI2, AddCoPI1, AddCoPI3} -> ¬assignment(Bob,CoPI) |
| AddCoPI2 | assign(Bob,CoPI)/contains(Alice,CoPI) |
| AddCoPI3 | assign(Alice,CoPI) |

**Case 3**

|  |  |  |  |
| --- | --- | --- | --- |
| **Obligation Group(timestamp)** | **Obligations** | **Actions** | **Obligation Sequences with Race Condition** |
| CreatePDS(1) | CreatePDS | grant(PI,{add-copi},PDSWhole) | N/A |
| DeleteCoPI(1) | DeleteCoPI1 | delete association(CoPI,{read},PDSWhole) | None |
| DeleteCoPI2 | delete association(CoPI,{edit},PDSWhole) |
| AddCoPI(2) | AddCoPI1 | grant(CoPI,{edit},PDSWhole)  grant(CoPI,{edit,delete},PDSWhole) | None |
| AddCoPI2 | grant(CoPI,{edit,delete},PDSWhole) |
| AddCoPI3 | grant(CoPI,{read},PDSWhole)  grant(PI,{add-copi},PDSWhole) |

**Case 4**

|  |  |  |  |
| --- | --- | --- | --- |
| **Obligation Group(timestamp)** | **Obligation** | **Action/Condition** | **Obligation Sequences with Race Condition -> conflicting postcondition** |
| CreatePDS(1) | CreatePDS | grant(PI,{add-copi},PDSWhole) | N/A |
| DeleteCoPI(1) | DeleteCoPI1 | delete association(CoPI,{read},PDSWhole) | None |
| DeleteCoPI2 | delete association(CoPI,{edit},PDSWhole) |
| AddCoPI(2) | AddCoPI1 | assign(Alice,CoPI)  assign(Bob,CoPI) | None |
| AddCoPI2 | assign(Bob,CoPI)/contains(Alice,CoPI) |
| AddCoPI3 | assign(Alice,CoPI) |

**Case 5**

|  |  |  |  |
| --- | --- | --- | --- |
| **Obligation Group(timestamp)** | **Obligation** | **Action/Condition** | **Obligation Sequences with Race Condition -> conflicting postcondition** |
| CreatePDS(1) | CreatePDS | grant(PI,{add-copi},PDSWhole) | N/A |
| DeleteCoPI(1) | DeleteCoPI1 | delete association(CoPI,{read},PDSWhole) | None |
| DeleteCoPI2 | delete association(CoPI,{edit},PDSWhole) |
| AddCoPI(2) | AddCoPI1 | assign(Bob,CoPI)  delete assign(Alice,CoPI) | None |
| AddCoPI2 | assign(Bob,CoPI)/contains(Alice,CoPI) |
| AddCoPI3 | assign(Alice,CoPI) |

**Case 6**

|  |  |  |  |
| --- | --- | --- | --- |
| **Obligation Group(timestamp)** | **Obligation** | **Action/Condition** | **Obligation Sequences with Race Condition -> conflicting postcondition** |
| CreatePDS(1) | CreatePDS | grant(PI,{add-copi},PDSWhole) | N/A |
| DeleteCoPI(1) | DeleteCoPI1 | delete association(CoPI,{read},PDSWhole) | None |
| DeleteCoPI2 | delete association(CoPI,{edit},PDSWhole) |
| AddCoPI(2) | AddCoPI1 | delete assign(Alice,CoPI)/contains(James,CoPI) | {AddCoPI1, AddCoPI2, AddCoPI3} -> assignment(Alice,CoPI)  {AddCoPI2, AddCoPI1, AddCoPI3} -> ¬assignment(Alice,CoPI) |
| AddCoPI2 | assign(James,CoPI)/contains(Alice,CoPI) |
| AddCoPI3 | assign(Bob,CoPI) |