**OCL Constraints- Case Study 1**

**1. context** Branch:: nameIsKey() : Boolean

**post:**

result=Branch.allInstances()-> **select**(b|b.name=self.name)->size()=1

**2. context** BranchType:: nameIsKey() : Boolean

**post:**

result=BranchType.allInstances()-> **select**(b|b.name=self.name)->size()=1

**3. context** Country:: nameIsKey() : Boolean

**post:**

result=Country.allInstances-> **select**(b|b.name=self.name)->size()=1

**4. context** PerformanceIndicator:: nameIsKey() : Boolean

**post**:

result=PerformanceIndicator.allInstances()-> **select**(b|b.name=self.name)->size()=1

**5. context** ServiceDepot:: nameIsKey() : Boolean

**post:**

result=ServiceDepot.allInstances()-> **select**(s|s.name=self.name)->size()=1

**6. context** CarModel:: nameIsKey() : Boolean

**post:**

result=CarModel.allInstances-> **select**(b|b.name=self.name)->size()=1

**7. context** CarGroup:: nameIsKey() : Boolean

**post:**

result=CarGroup.allInstances()-> **select**(b|b.name=self.name)->size()=1

**8. context** RentalDuration:: nameIsKey() : Boolean

**post:**

result=RentalDuration.allInstances()-> **select**(b|b.name=self.name)->size()=1

**9. context** Discount:: nameIsKey() : Boolean

**post:**

result=Discount.allInstances()-> **select**(b|b.name=self.name)->size()=1

**10. context** MakeRental:: pickUpBranch() : Branch

**post:**

**let** branches:Set(Branch) = Branch.allInstances() -> **select**(name=self.pickUpId)

in

branches->size()=1 implies result=branches->**any()**

**11. context** MakeRental:: dropOffBranch() : Branch

**post:**

**let** branches:Set(Branch) = Branch.allInstances()-> **select**(name=self.dropOffId)

in

branches->size()=1 implies result=branches->**any()**

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**12. context** PendantCarOrder:: idIsKey() : Boolean

**post:**

result=PendantCarOrder.allInstances()-> select(b|b.id=self.id)->size()=1

**13. context** EU\_RentPerson:: idIsKey() : Boolean

**post:**

result=EU\_RentPerson.allInstances() ->select(p|p.id=self.id)->size()=1

**14. context** DemandXModel:: demand() : Integer

**post:**

**let** pendantRes:Reservation= Reservation.allInstances()->

**select**(r|r.beginning.date()=tomorrow())-> **select**(r| r.pickUpBranch=self.branch and r.car-> isEmpty())

in

result=pendantRes.requestedModel-> **select**(m|m=d.carModel)->size()

**15. context** DemandXGroup:: demand() : Integer

**post:**

**let** pendantRes:Reservation= Reservation.allInstances()->

**select**(r|r.beginning.date()=tomorrow())-> **select**(r|

r.pickUpBranch=self.branch and r.car-> **isEmpty()**)

in

result=pendantRes.requestedGroup-> **select**(m|m=d.carGroup)->size()

**16. context** DemandXModel:: demand() : Integer

**post:**

**let** pendantRes:Reservation= Reservation.allInstances()->

**select**(r|r.beginning.date()=tomorrow())-> **select**(r| r.pickUpBranch=self.branch and r.car-> isEmpty())

in

result=pendantRes.requestedModel-> **select**(m|m=d.BikeModel)->size()

**17. context** DemandXGroup:: demand() : Integer

**post:**

**let** pendantRes:Reservation= Reservation.allInstances()->

**select**(r|r.beginning.date()=tomorrow())-> **select**(r |

r.pickUpBranch=self.branch and r.car-> **isEmpty()**)

in

result=pendantRes.requestedGroup-> **select**(m|m=d.BikeGroup)->size()

**18. context** CarGroup:: totalOrder() : Boolean

**post:**

**let** isWorse (w,b:CarGroup):Boolean= b.worse=w **or**

isWorse(w,b.worse)

**let** isBetter (b,w:CarGroup):Boolean= w.better=b **or**

isBetter(b,w.better)

in

result = CarGroup.allInstances()->**one** (cg|cg.worse->isEmpty())

**and** CarGroup.allInstances()->**one** (cg|cg.better->isEmpty()) **and**

CarGroup.allInstances()->**forall** (cg1,cg2| isWorse(cg1,cg2)

implies not isBetter (cg1,cg2) **and** isBetter (cg1,cg2) implies

not isWorse (cg1,cg2))

**19. context** RentalDuration:: totalOrder() : Boolean

**post:**

**let** isShorter(s,l:RentalDuration):Boolean= l.shorter=s **or**

isShorter(s,l.shorter)

**let** isLonger(l,s:RentalDuration):Boolean= s.longer=l **or**

isLonger(l,s.longer)

in

result = RentalDuration.allInstances()->**one** (rd| rd.shorter-> isEmpty())

**and** RentalDuration.allInstances() -> **one** (rd|rd.longer->isEmpty()) **and** RentalDuration.allInstances()-> **forAll** (rd1,rd2| isShorter (rd1,rd2)

implies not isLonger (rd1,rd2) **and** isLonger (rd1,rd2) implies not isShorter (rd1,rd2))

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**20. context** ExistingRentalDuration:: duration() : RentalDuration

**post:**

let rentDuration:Set (RentalDuration)= RentalDuration. allInstances()->

**select**(rd| rd.name=self.durationName)

in

rentDuration->notEmpty() implies result= rentDuration-> **any()**

**and** self. perf= durationLimit

**21. context** ExistingPerformanceIndicator:: perfInd() : PerformanceIndicator

**post:**

let perf: Set(PerformanceIndicator)= PerformanceIndicator. allInstances()-> **select**(pi|pi.name=self.name)

in

perf->notEmpty() implies result=perf-> **any()**

**and** self. perf= performanceLevel

**22. context** ExistingCar:: car() : Car

**post:**

**let** carI: Set(Car)=Car.allInstances()-> **select**(c|c.registrationNumber=self.regNumber)

in

carI->**notEmpty()** implies result=carI->**any()**

**23. context** ExistingCarGroup:: carG() : CarGroup

**post:**

**let** carGr:Set(CarGroup)= carGroup.allInstances()-> **select**(cG| cG.name=self.carGroup)

in

carGr->notEmpty() implies result=carGr-> **any()**

**24. context** ExistingCarModel:: carM() : CarModel

**post:**

**let** carMod: Set(CarModel)=CarModel.allInstances()-> **select**(cM| cM.name=self.carModel)

in

carMod->notEmpty() implies result=carMod-> **any()**

**25. context** ExistingDiscount:: discount() : Discount

**post:**

**let** dis: Set(Discount)= Discount.allInstances()-> **select**(d|d.name=self.discountName)

in

dis->notEmpty() implies result= dis-> **any()**

**26. context** ExistingRentalDuration:: duration() : RentalDuration

**post:**

**let** rentDuration:Set (RentalDuration)=RentalDuration. allInstances()->**select** (rd| rd.name= self.durationName)

in

rentDuration->notEmpty() implies result= rentDuration-> **any()**

**27. context** ExistingPerformanceIndicator:: perfInd() :PerformanceIndicator

**post:**

**let** perf: Set(PerformanceIndicator)= PerformanceIndicator. allInstances()-> **select**(pi|pi.name=self.name)

in

perf->notEmpty() implies result=perf-> **any()**

**28. context** NewCarGroupDurationPrice:: apply() : CarGroup

**post:**

cgdp.oclIsNew() **and** cgdp.oclIsTypeOf(CarGroupDurationPrice)

**and** cgdp.price=self.price **and** cgdp.carGroup=self.carG **and** cgdp.rentalDuration=duration

**29. context** NewCGDPForNewDuration:: apply()

**post:**

cgdp.oclIsNew() **and** cgdp.oclIsTypeOf(CarGroupDurationPrice)

**and** cgdp.price=self.price **and** cgdp.carGroup=self.carG **and** cgdp.rentalDuration=duration

**30. context** ExtendedCarAllocationDefinitions:: 2upgradePossible(): Boolean

**post:**

result= **if** self.2upgradeGroup->isNotEmpty()

**then**(self.curBranch.nextDayR.car-> **collect**(carGroup)-> **includes**

(upgradeGroup) or self.groupAvail(self.upgradeGroup)) **and**

self.groupAvail(self.2upgradeGroup)->isNotEmpty **and**

self.groupAvail(self.2upgradeGroup).quantity@pre -

self.demXGroup->select(d|d.carGroup=self.2upgradeGroup).

demand@pre >0.1\*self.groupQuota(self.curBranch,

self.2upgradeGroup)

else

False

**31. context** ExtendedCarAllocationDefinitions::downgradePossible():Boolean

**post:**

result= **if** self.downgradeGroup->isNotEmpty()

**then** self.groupAvail(self.downgradeGroup)->isNotEmpty **and**

self.groupAvail(self.downgradeGroup).quantity@pre -

self.demXGroup->select(d|d.carGroup=self.downgradeGroup).

demand@pre >0.1\*self.groupQuota(self.curBranch,

self.downgradeGroup)

else

False

**32. context** WithSurplus:: allInstances() : Boolean

**post:**

CalculateOwnCars.allInstances()-> **select**(c|c.answerSurplus)

**33. context** WithLack:: allInstances() : Boolean

**post:**

CalculateOwnCars.allInstances()-> **select**(c|c.answerLack)

**34. context** CarAllocationDefinitions:: demXModel() : DemandXModel

**post:**

result=self.reservation.pickUpBranch.demandXModel

**35. context** CarAllocationDefinitions:: demXGroup() : DemandXGroup

**post:**

result=self.reservation.pickUpBranch.demandXGroup

**36. context** RequestTransfer:: apply() : Boolean

**post:**

self.**oclIsTypeOf**(MoveCars).^apply() **and** self.otherBranch.

carsAvailable@pre->intersection(self.otherBranch.car->

**select**(c|c.**oclIsKindOf**(BeingTransferredCar) **and**

c.**oclIsTypeOf**(BeingTransferredCar).destination=self.askingBranch))-> size()=movedCars

**37. context** DoTransfer:: apply() : Boolean

**post:**

self.**oclIsTypeOf**(MoveCars).^apply() **and** self.askingBranch.

carsAvailable@pre->intersection(self.askingBranch.car->

**select**(c|c.**oclIsKindOf**(BeingTransferredCar) **and**

c.**oclIsTypeOf**(BeingTransferredCar).destination=self.otherBranch))->size()=movedCars

**38. context** EndOfMaintenance:: carWasBeingMaintained() : Boolean

**post:**

result=self.car.**oclIsTypeOf**(MaintenanceScheduled) **and**

self.car.**oclAsType**(MaintenanceScheduled).beginningDate<now())

**39. context** EndOfRepairs:: carWasBeingRepaired() : Boolean

**post:**

result=self.car.**oclIsTypeOf**(RepairsScheduled) **and**

self.car.**oclAsType**(RepairsScheduled).beginningDate< now())

**40. context** RequestTransfer:: apply() : Boolean

**post:**

self.**oclAsType**(MoveCars).^apply() **and** self.otherBranch.

carsAvailable@pre ->intersection (self.otherBranch.car -> **select**(c|c.**oclIsKindOf**(BeingTransferredCar) **and**

c.oclAsType(BeingTransferredCar).destination= self.askingBranch))->size()=movedCars