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$FriendStatus ::= Confirmed \mid RequestSent \mid RequestSent$   
 $ParcelStatus ::=$   
 $Uninitiated \mid RendezvousRequested \mid RendezvousAccepted \mid WithCourier \mid Completed$   
 $Bool ::= True \mid False$   
 $[Char]$   
 $[User]$   
 $[Parcel]$   
 $String == seqChar$

*UserManager*

$UserId : User \mapsto \mathbb{N}$   
 $UserName : User \mapsto String$   
 $UserParcels : User \mapsto \mathbb{P} Parcel$   
 $UserFriends : User \mapsto \mathbb{P} User$   
 $UserFriendStatus : \{User, User\} \mapsto FriendStatus$   
 $UserCourier : User \mapsto Bool$   
 $UserLat : User \mapsto \mathbb{R}$   
 $UserLng : User \mapsto \mathbb{R}$   
 $UserRating : User \mapsto \mathbb{Z}$   
 $UserRatable : User \mapsto \text{bag } User$   
 $UserDistance : \{User, User, User\} \mapsto \mathbb{R}$

*ParcelManager*

$ParcelId : Parcel \mapsto \mathbb{N}$   
 $ParcelDescription : Parcel \mapsto String$   
 $ParcelStatus : Parcel \mapsto ParcelStatus$   
 $ParcelDestination : Parcel \mapsto User$   
 $ParcelSource : Parcel \mapsto User$   
 $ParcelCarrier : Parcel \mapsto User$   
 $ParcelLat : User \mapsto \mathbb{R}$   
 $ParcelLng : User \mapsto \mathbb{R}$   
 $ParcelTime : User \mapsto \mathbb{N}$

*Server*

$Users : \mathbb{P} User$   
 $Parcels : \mathbb{P} Parcel$   
 $UserParcels : User \mapsto \mathbb{P} Parcel$

<p><i>RequestFriend</i></p> <hr/> <p><math>\Delta UserManager</math>  <math>s? : User</math>  <math>r? : User</math></p> <hr/> <p><math>r? \notin UserFriends\ s?</math>  <math>UserFriendStatus' = UserFriendStatus \cup \{s?, r?\} \mapsto RequestSent</math>  <math>UserFriendStatus' = UserFriendStatus \cup \{r?, s?\} \mapsto RequestReceived</math>  <math>UserFriends'\ s? = UserFriends\ s? \cup \{r?\}</math>  <math>UserFriends'\ r? = UserFriends\ s? \cup \{s?\}</math></p> <hr/>
<p><i>FriendResponse</i></p> <hr/> <p><math>\Delta UserManager</math>  <math>s? : User</math>  <math>r? : User</math>  <math>response? : Bool</math></p> <hr/> <p><math>UserFriendStatus\{r?, s?\} = RequestReceived</math>  <math>(response? = True \wedge</math>  <math>\quad UserFriendStatus'\{r?, s?\} \mapsto confirmed \wedge</math>  <math>\quad UserFriendStatus'\{r?, s?\} \mapsto confirmed)</math>  <math>\vee (UserFriendStatus'\{r?, s?\} \mapsto \emptyset \wedge</math>  <math>\quad UserFriendStatus'\{r?, s?\} \mapsto \emptyset \wedge</math>  <math>\quad UserFriends'\ s? = UserFriends\ s? \setminus \{r?\} \wedge</math>  <math>\quad UserFriends'\ r? = UserFriends\ r? \setminus \{s?\})</math></p> <hr/>
<p><i>RequestRendezvous</i></p> <hr/> <p><math>\Delta UserManager</math>  <math>\Delta ParcelManager</math>  <math>s? : User</math>  <math>r? : User</math>  <math>p? : Parcel</math></p> <hr/> <p><math>UserFriendStatus\{r?, s?\} = Confirmed</math>  <math>p? \in UserParcels\ s?</math>  <math>ParcelStatus\ p? = Uninitiated \vee ParcelStatus\ p? = WithCourier</math>  <math>ParcelStatus'\ p? = RendezvousRequested</math></p> <hr/>

<i>RendezvousResponse</i>	
$\Delta UserManager$	
$\Delta ParcelManager$	
$s? : User$	
$r? : User$	
$p? : Parcel$	
$response? : Bool$	
$UserFriendStatus\{r?, s?\} \mapsto confirmed$	
$p? \in UserParcels\ s?$	
$p? \in UserParcels\ r?$	
$(response? = True \wedge ParcelStatus'\ p? = RendezvousAccepted) \vee$	
$((ParcelCarrier\ p? = ParcelSource\ p? \wedge ParcelStatus'\ p? = Uninitiated) \vee$	
$(ParcelStatus'\ p? = WithCourier))$	

<i>FinalizeExchange</i>	
$\Delta UserManager$	
$\Delta ParcelManager$	
$s? : User$	
$r? : User$	
$p? : Parcel$	
$UserFriendStatus\{r?, s?\} \mapsto confirmed$	
$p? \in UserParcels\ s?$	
$UserParcels'\ s? = UserParcels\ s? \setminus \{p?\}$	
$UserParcels'\ r? = UserParcels\ r? \cup \{p?\}$	
$(ParcelDestination\ p? = r?$	
$\wedge ParcelStatus'\ p? \mapsto completed)$	
$\vee ParcelStatus'\ p \mapsto WithCourier$	

<i>InitiateCourier</i>
$\Delta UserManager$
$\Delta ParcelManager$
$s? : User$
$r? : User$
$p? : Parcel$
$!courier : User$
$UserFriendStatus\{r?, s?\} \mapsto confirmed$ $\exists c : User \in (UserFriends\ s? \cap UserFriends\ r? \wedge$ $\quad UserFriendStatus\{r?, c?\} = confirmed \wedge UserFriendStatus\{s?, c?\} = confirmed \wedge$ $\quad UserCourier\ c? = True)$ $p? \in UserParcels\ s?$ $ParcelStatus\ p? \mapsto uninitiated$ $UserParcels'\ r? = UserParcels'\ r? \cup \{p?\}$ $!courier = u1 : User \in (UserFriends\ s? \cap UserFriends\ r?) \wedge$ $\quad UserCourier\ u1 = True \wedge UserFriendStatus\{r?, u1\} = confirmed \wedge$ $\quad UserFriendStatus\{s?, u1\} = confirmed \wedge$ $\quad (\forall u2 : User \in (UserFriends\ s? \cap UserFriends\ r?) \wedge$ $\quad \quad UserCourier\ u2 = True \wedge UserFriendStatus\{r?, u2\} = confirmed \wedge$ $\quad \quad UserFriendStatus\{s?, u2\} = confirmed \wedge$ $\quad \quad UserDistance\{s?, u1, r?\} \leq UserDistance\{s?, u2, r?\})$

<i>IsFriendWith</i>
$\Delta UserManager$
$s? : User$
$r? : User$
$res! : Bool$
$res! = UserFriendStatus\{r?, s?\} \mapsto confirmed$

<i>IsRatable</i>
$\Delta UserManager$
$s? : User$
$r? : User$
$res! : Bool$
$res! = (UserFriendStatus\{r?, s?\} \mapsto confirmed \wedge$ $\quad r? \text{ in } UserRatable\ s?)$

<i>Rate</i>	
$\Delta UserManager$	
$s? : User$	
$r? : User$	
$up? : Bool$	
$UserFriendStatus\{r?, s?\} \mapsto confirmed$	
$r? \text{ in } UserRatable\ s?$	
$(up? = True \wedge UserRating'\ r? = UserRating\ r? + 1) \vee$	
$(UserRating'\ r? = UserRating\ r? - 1)$	
$UserRatable'\ s? = UserRatable'\ s? \cup \llbracket r? \rrbracket$	