

Z Specifications for RealOffice

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February 2017

Contents

1	State-space Schema	2
2	Operation Schemas	3
3	Query Schemas	5
4	Error State Definitions	5
5	Full Schemas	7
6	References	7

1 State-space Schema

[DATETIME, VENUE, PERSON, REQUIREMENT, REMINDER]

RealOffice

Known_meetings : *P String*

Meeting_venues : *String* \leftrightarrow *VENUE*

Meeting_stimes : *String* \leftrightarrow *DATETIME*

Meeting_etimes : *String* \leftrightarrow *DATETIME*

Meeting_participants : *String* \leftrightarrow *P PERSON*

Meeting_requirements : *String* \leftrightarrow *P REQUIREMENT*

Meeting_reminders : *String* \leftrightarrow *P REMINDER*

Meeting_organizers : *String* \leftrightarrow *PERSON*

Known_users : *P PERSON*

Known_admins : *P PERSON*

Note that here the *Known_meetings* and other meeting fields contain information from both sources - meetings scheduled via the *RealOffice* platform as well as the meetings pulled via the CSE department meetings database.

2 Operation Schemas

Add_meeting _____

$\Delta RealOffice$

meeting? : *String*

meeting_venue? : *VENUE*

meeting_stime? : *DATETIME*

meeting_etime? : *DATETIME*

meeting_participants? : *P PERSON*

meeting_requirements? : *P REQUIREMENT*

meeting_reminders? : *P REMINDER*

meeting_organizer? : *PERSON*

meeting? \notin *Known_meetings*

meeting_stime? \leq *meeting_etime?*

\forall *scheduled_meeting* : *Known_meetings* •

$((\text{Meeting_stimes } \text{scheduled_meeting}) \geq \text{meeting_etime?}) \vee$

$((\text{Meeting_etimes } \text{scheduled_meeting}) \leq \text{meeting_stime?}))$

Known_meetings' = *Known_meetings* \cup *meeting?*

Meeting_venues' = *Meeting_venues* \cup {*meeting?* \rightarrow *meeting_venue?*}

Meeting_stimes' = *Meeting_stimes* \cup {*meeting?* \rightarrow *meeting_stime?*}

Meeting_etimes' = *Meeting_etimes* \cup {*meeting?* \rightarrow *meeting_etimes?*}

Meeting_participants' = *Meeting_participants* \cup {*meeting?* \rightarrow *meeting_participants?*}

Meeting_requirements' = *Meeting_requirements* \cup {*meeting?* \rightarrow *meeting_requirements?*}

Meeting_reminders' = *Meeting_reminders* \cup {*meeting?* \rightarrow *meeting_reminders?*}

Meeting_organizers' = *Meeting_organizers* \cup {*meeting?* \rightarrow *meeting_organizer?*}

Delete_meeting _____

$\Delta RealOffice$

meeting? : *String*

meeting? \in *Known_meetings*

Known_meetings' = *Known_meetings* $-$ {*meeting?*}

Reschedule_meeting

$\Delta RealOffice$

meeting? : *String*

meeting_venue? : *VENUE*

meeting_stime? : *DATETIME*

meeting_etime? : *DATETIME*

meeting? \in *Known_meetings*

meeting_stime? \leq *meeting_etime?*

$\forall \text{ scheduled_meeting} : (\text{Known_meetings} - \{\text{meeting?}\}) \bullet$
 $((\text{Meeting_stimes scheduled_meeting}) \geq \text{meeting_etime?}) \vee$
 $((\text{Meeting_etimes scheduled_meeting}) \leq \text{meeting_stime?})$

Meeting_venues' = *Meeting_venues* \cup $\{\text{meeting?} \rightarrow \text{meeting_venue?}\}$

Meeting_stimes' = *Meeting_stimes* \cup $\{\text{meeting?} \rightarrow \text{meeting_stime?}\}$

Meeting_etimes' = *Meeting_etimes* \cup $\{\text{meeting?} \rightarrow \text{meeting_etimes?}\}$

Add_user

$\Delta RealOffice$

new_user? : *String*

curr_user? : *String*

curr_user? \in *Known_admins*

new_user? \notin *Known_users*

Known_users' = *Known_users* \cup *new_user?*

Delete_user

$\Delta RealOffice$

del_user? : *String*

curr_user? : *String*

curr_user? \in *Known_admins*

del_user? \in *Known_users*

Known_users' = *Known_users* $- \{\text{del_user?}\}$

<i>Add_requirements</i>	_____
$\Delta RealOffice$	
<i>meeting?</i> : <i>String</i>	
<i>meeting_requirements?</i> : <i>P REQUIREMENTS</i>	
<i>meeting?</i> \in <i>Known_meetings</i>	
$Meeting_requirements' = Meeting_requirements$ $\cup \{meeting? \rightarrow ((Meeting_requirements\ meeting?) \cup meeting_requirements?)\}$	

3 Query Schemas

<i>Generate_report</i>	_____
$\Xi RealOffice$	
<i>stime?</i> : <i>DATETIME</i>	
<i>etime?</i> : <i>DATETIME</i>	
<i>meetings_report!</i> = <i>P String</i>	
<i>stime?</i> \leq <i>etime?</i>	
$meetings_report! = \{meeting : Known_meetings \mid ((Meeting_stimes\ meeting) > stime?) \wedge ((Meeting_etimes\ meeting) < etime?)\}$	

4 Error State Definitions

REPORT ::= *ok* | *meeting_not_exist* | *meeting_exists* | *meeting_clash* | *not_admin*
| *user_exists* | *user_not_exist* | *date_range_invalid*

<i>Success</i>	_____
<i>report!</i> : <i>REPORT</i>	
<i>report!</i> = <i>ok</i>	
<i>Meeting_not_exist</i>	_____
$\Xi RealOffice$	
<i>meeting?</i> : <i>String</i>	
<i>report!</i> : <i>REPORT</i>	
<i>meeting?</i> \notin <i>Known_meetings</i> <i>report!</i> = <i>meeting_not_exist</i>	

<i>Meeting_exists</i> $\exists \text{RealOffice}$
<i>meeting?</i> : <i>String</i> <i>report!</i> : <i>REPORT</i>
<i>meeting?</i> \in <i>Known_meetings</i> <i>report!</i> = <i>meeting_exist</i>

<i>Not_admin</i> $\exists \text{RealOffice}$
<i>curr_user?</i> : <i>PERSON</i> <i>report!</i> : <i>REPORT</i>
<i>curr_user?</i> \notin <i>Known_admins</i> <i>report!</i> = <i>not_admin</i>

<i>User_exists</i> $\exists \text{RealOffice}$
<i>new_user?</i> : <i>PERSON</i> <i>report!</i> : <i>REPORT</i>
<i>new_user?</i> \in <i>Known_users</i> <i>report!</i> = <i>user_exists</i>

<i>User_not_exist</i> $\exists \text{RealOffice}$
<i>del_user?</i> : <i>PERSON</i> <i>report!</i> : <i>REPORT</i>
<i>del_user?</i> \notin <i>Known_users</i> <i>report!</i> = <i>user_not_exist</i>

<i>Date_range_invalid</i> $\exists \text{RealOffice}$
<i>stime?</i> : <i>DATETIME</i> <i>etime?</i> : <i>DATETIME</i> <i>report!</i> : <i>REPORT</i>
<i>etime?</i> > <i>stime?</i> <i>report!</i> = <i>date_range_invalid</i>

$Meeting_clash$ $\exists RealOffice$ $meeting_stime? : DATETIME$ $meeting_etime? : DATETIME$ $report! : REPORT$
$\neg (\forall scheduled_meeting : Known_meetings \bullet$ $((Meeting_stimes\ scheduled_meeting) \geq meeting_etime?) \vee$ $((Meeting_etimes\ scheduled_meeting) \leq meeting_stime?)))$ $report! = meeting_clash$

5 Full Schemas

$Full_Add_meeting \hat{=} (Add_meeting \wedge Success) \vee Meeting_exists \vee Meeting_clash \vee$
 $Date_range_invalid$

$Full_Delete_meeting \hat{=} (Delete_meeting \wedge Success) \vee Meeting_not_exist$

$Full_Reschedule_meeting \hat{=} (Reschedule_meeting \wedge Success) \vee Meeting_not_exist \vee$
 $Meeting_clash \vee Date_range_invalid$

$Full_Add_user \hat{=} (Add_user \wedge Success) \vee Not_admin \vee User_exists$

$Full_Delete_user \hat{=} (Delete_user \wedge Success) \vee Not_admin \vee User_not_exist$

$Full_Add_requirements \hat{=} (Add_requirements \wedge Success) \vee Meeting_not_exist$

$Full_Generate_report \hat{=} (Generte_report \wedge Success) \vee Date_range_invalid$

6 References

<http://www.cs.nott.ac.uk/~pszrq/files/4FSPnotation.pdf>