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1 example1 Theory

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Parent Theories: acIDrules

1.1 Datatypes

commands = go | nogo | launch | abort

staff = Alice | Bob | Carol | Dan

1.2 Theorems

[example1Theorem]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice controls prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat prop go}$

[example1TheoremA]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice controls prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat prop go}$

[example1TheoremB]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice controls prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat prop go}$

[example2Theorem]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice speaks_for Name Bob} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Bob controls prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat prop go}$

[example2TheoremA]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice speaks_for Name Bob} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Bob controls prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat prop go}$

[example2TheoremB]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice speaks_for Name Bob} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Bob controls prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat prop go}$

[example3Theorem]

$\vdash (M, Oi, Os) \text{ sat prop go impf prop launch} \Rightarrow$
 $(M, Oi, Os) \text{ sat prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Carol says prop launch}$

[example3TheoremA]

$\vdash (M, Oi, Os) \text{ sat prop go impf prop launch} \Rightarrow$
 $(M, Oi, Os) \text{ sat prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Carol says prop launch}$

[Mono_Reps_Theorem]

$\vdash (M, Oi, Os) \text{ sat } Q \text{ controls } f \Rightarrow$
 $(M, Oi, Os) \text{ sat reps } P \ Q \ f \Rightarrow$
 $(M, Oi, Os) \text{ sat } P' \text{ quoting } Q' \text{ says } f \Rightarrow$
 $(M, Oi, Os) \text{ sat } P' \text{ speaks_for } P \Rightarrow$
 $(M, Oi, Os) \text{ sat } Q' \text{ speaks_for } Q \Rightarrow$
 $(M, Oi, Os) \text{ sat } f$

2 conops0Solution Theory

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Parent Theories: aclDrules

2.1 Datatypes

commands = go | nogo | launch | abort | activate | stand_down

keyPrinc = Staff people | Role roles | Ap num

people = Alice | Bob

principals = PR keyPrinc | Key keyPrinc

roles = Commander | Operator | CA

2.2 Theorems

[ApRuleActivate_thm]

```

⊢ (M, Oi, Os) sat
  Name (PR (Role Operator)) controls prop launch ⇒
  (M, Oi, Os) sat
  reps (Name (PR (Staff Bob))) (Name (PR (Role Operator)))
    (prop launch) ⇒
  (M, Oi, Os) sat
  Name (Key (Staff Bob)) quoting Name (PR (Role Operator)) says
  prop launch ⇒
  (M, Oi, Os) sat prop launch impf prop activate ⇒
  (M, Oi, Os) sat
  Name (Key (Role CA)) speaks_for Name (PR (Role CA)) ⇒
  (M, Oi, Os) sat
  Name (Key (Role CA)) says
  Name (Key (Staff Bob)) speaks_for Name (PR (Staff Bob)) ⇒
  (M, Oi, Os) sat
  Name (PR (Role CA)) controls
  Name (Key (Staff Bob)) speaks_for Name (PR (Staff Bob)) ⇒
  (M, Oi, Os) sat prop activate

```

[ApRuleStandDown_thm]

```

⊢ (M, Oi, Os) sat Name (PR (Role Operator)) controls prop abort ⇒
  (M, Oi, Os) sat
  reps (Name (PR (Staff Bob))) (Name (PR (Role Operator)))
    (prop abort) ⇒
  (M, Oi, Os) sat
  Name (Key (Staff Bob)) quoting Name (PR (Role Operator)) says
  prop abort ⇒
  (M, Oi, Os) sat prop abort impf prop stand_down ⇒
  (M, Oi, Os) sat
  Name (Key (Role CA)) speaks_for Name (PR (Role CA)) ⇒
  (M, Oi, Os) sat
  Name (Key (Role CA)) says
  Name (Key (Staff Bob)) speaks_for Name (PR (Staff Bob)) ⇒
  (M, Oi, Os) sat
  Name (PR (Role CA)) controls
  Name (Key (Staff Bob)) speaks_for Name (PR (Staff Bob)) ⇒
  (M, Oi, Os) sat prop stand_down

```

[OpRuleAbort_thm]

```

⊢ (M, Oi, Os) sat Name (PR (Role Commander)) controls prop nogo ⇒
  (M, Oi, Os) sat

```

```

reps (Name (PR (Staff Alice))) (Name (PR (Role Commander)))
  (prop nogo) ⇒
(M, Oi, Os) sat
Name (Key (Staff Alice)) quoting
Name (PR (Role Commander)) says prop nogo ⇒
(M, Oi, Os) sat prop nogo impf prop abort ⇒
(M, Oi, Os) sat
Name (Key (Role CA)) speaks_for Name (PR (Role CA)) ⇒
(M, Oi, Os) sat
Name (Key (Role CA)) says
Name (Key (Staff Alice)) speaks_for Name (PR (Staff Alice)) ⇒
(M, Oi, Os) sat
Name (PR (Role CA)) controls
Name (Key (Staff Alice)) speaks_for Name (PR (Staff Alice)) ⇒
(M, Oi, Os) sat
Name (Key (Staff Bob)) quoting Name (PR (Role Operator)) says
prop abort

```

[OpRuleLaunch_thm]

```

⊢ (M, Oi, Os) sat Name (PR (Role Commander)) controls prop go ⇒
(M, Oi, Os) sat
reps (Name (PR (Staff Alice))) (Name (PR (Role Commander)))
  (prop go) ⇒
(M, Oi, Os) sat
Name (Key (Staff Alice)) quoting
Name (PR (Role Commander)) says prop go ⇒
(M, Oi, Os) sat prop go impf prop launch ⇒
(M, Oi, Os) sat
Name (Key (Role CA)) speaks_for Name (PR (Role CA)) ⇒
(M, Oi, Os) sat
Name (Key (Role CA)) says
Name (Key (Staff Alice)) speaks_for Name (PR (Staff Alice)) ⇒
(M, Oi, Os) sat
Name (PR (Role CA)) controls
Name (Key (Staff Alice)) speaks_for Name (PR (Staff Alice)) ⇒
(M, Oi, Os) sat
Name (Key (Staff Bob)) quoting Name (PR (Role Operator)) says
prop launch

```

3 solutions1 Theory

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Parent Theories: example1

3.1 Theorems

[aclExercise1]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Bob says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice meet Name Bob says prop go}$

[aclExercise1A]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Bob says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice meet Name Bob says prop go}$

[aclExercise1B]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Bob says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice meet Name Bob says prop go}$

[aclExercise2]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice controls prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat prop go impf prop launch} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Bob says prop launch}$

[aclExercise2A]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice controls prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat prop go impf prop launch} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Bob says prop launch}$

[aclExercise2B]

$\vdash (M, Oi, Os) \text{ sat Name Alice says prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Alice controls prop go} \Rightarrow$
 $(M, Oi, Os) \text{ sat prop go impf prop launch} \Rightarrow$
 $(M, Oi, Os) \text{ sat Name Bob says prop launch}$

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