EGRBAC AND PDR-EGRBAC POLICIES FOR A SMART HOME

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Presented use case aims to make a representation of a smart home environment in which users’ accesses are granted to parts of functionalities of given devices, a.k.a. device roles.

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ROLES:

Parent: someone who can access all the devices in the smart house. The role parent can be associated to the homeowner to whom all functionalities of smart home are available.

Kid: someone who can access a subset of functionalities of the devices. Parents want children to have access only to the kids\_friendly\_content on entertainment devices (TV, DVD, and PlayStation). It should not be possible for kids to access to some functionalities of devices, which should be specifically controlled by an adult, for example turn the oven on/off.

Adult: has access to the adult controlled devices such as turning on/off the oven, unlocking the door, and using the thermostat.

Babysitter: has scheduled access to subset of functionalities of the smart house. We want babysitter to access the required adult-controlled functionalities, such as turning the oven/thermostat on/off and lock/unlock the front door. However, we do not want to grant an unnecessary access to babysitter, e.g., modifying the thermostat schedule. If a delivery person rings the doorbell while the babysitter is home, the babysitter should be allowed to handle the event. We also want him/her to be able to control children’s devices.

Guest: can be a friend, a relative or a visitor to whom we want to give limited access to the devices in the house. He can control the lights or the entertainment devices.

Neighbor: we described the people representing the relationship *neighbor* as “good people, which includes friendly small talk, and occasional dinner invitations.”[[1]](#footnote-1)

One typical response for when a capability should be accessible to neighbors is *“Perhaps when I’m on vacation and I ask them to watch my home”.* If there is an emergency when the family is on vacation, their neighbor can see who is at the door from their smartphone.

Maid: responsible for cleaning, they must complete tasks like vacuuming, sweeping, emptying trash cans, dusting shelves, cleaning windows, and mopping floors. Some Housekeepers change linens, wash dishes, and do light ironing and laundry. They have access to the cleaning devices.

Teenager: (presented as 16 years old) they are familiar with all Smart devices in the home and enjoy using them. They know how to use these devices very well. A 16-year-old teenager was regarded as a young adult and is more widely trusted to use capabilities responsibly.

Authorities: to handle emergency situations we have defined this role which includes allowing the police, firefighters, or doctors to use the devices like door lock, windows, and surveillance cameras only when an emergency arises.

Chef: has access to all the devices in the kitchen (oven, fridge, cooktop, food processor, coffee machine)

Manager: is the super user

//forse aggiungere il gardener

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EGRBAC policy

Users (U), Roles (R) are familiar sets in RBAC systems. A user is a human being who interacts with smart home devices as authorized. In context of smart homes, a role specifically represents the relationship between the user and the family, which encompasses parents, kids, neighbors, and such. The many-to-many UA relation specifies the assignment of users to roles.

**U** = {angela, giuseppe, alessio, gianluigi, jonathan, gaia, daria, catia, mario, roberta, anna, bob}

**R** = {kid, parent, babysitter, guest, neighbor, maid, teenager, authorities, adult, manager, chef}

**UA** = {(jonathan, kid), (angela, parent), (giuseppe, parent), (gaia, babysitter), (daria, guest), (gianluigi, neighbour), (catia, maid), (alessio, teenager), (mario, authorities), (roberta, adult), (anna, manager), (bob, chef)}

A Device (D) is a smart home device such as a smart TV. Operations (OP) represent actions on devices as specified by device manufacturers. A permission is an approval to perform an operation on one device, i.e., it is a device, operation pair. The set of permissions P is a subset of D×OP.

**D** = {DoorLock, TV, DVD, PlayStation, Oven, Fridge, DishWasher, Washer, SmartToy, Windows, BurglarAlarm, Thermostat, Alexa, Lights, SurveillanceCameras, SmokeAlarm, Safe, Computer, SmartClock, TempoStudio (fitness device), BluetoothSpeaker, GarageDoor, SmartRobot Vacuum Cleaner, SmartCoffee Machine, Smartwatch, SmartCookware&Cooktop, Kitchen FoodProcessor, IceMaker}

**OP** = {Lock, Unlock, On, Off, PG, R, OnOven, OffOven, OnFridge, OffFridge, DisplayFood,

SetTemperature, OnDishwasher, OffDishwasher, OnWasher, OffWasher, RecordVoice, PlaySound, OnW, OffW, Activate, Deactivate, OnThermostat, OffThermostat, SheduleThermostat, ActivateAlexa, OnLight, OffLight, StartRecording, StopRecording, DeactivateSmokeAlarm, OpenSafe, CloseSafe, Onc, Offc, Connect, VolumeUp, VolumeDown, DisplayTime, MicrophoneMuteSwitch, OnTempoStudio, OffTempoStudio, OnBS, OffBS, ManageAudio, OnGarage, OffGarage, OnRobot, OffRobot, Setting, BrewCoffee, MonitorHeartRate, OnCooktop, OffCooktop, Pulse, Off, High, Low, Clean, Power}

Device Roles (DR) are means of categorizing permissions of different devices. The many-to-many PDRA relation specifies this assignment.

**DR** = {Entertainment\_Devices, Adult\_Controlled, Owner\_Controlled, Kids\_Friendly\_Content, Lighting\_Devices, Cleaning\_Devices, Teenager\_Controlled, Door\_Device, Thermostat\_Device, Fridge\_Device, Oven\_Device, PlayStation\_Device, Safe\_Device, Computer\_Device, Clock\_Device, Fitness\_Devices, Windows\_Devices, Garage\_Device, Kitchen\_Devices}

**P1** = {TV, DVD} × {On, Off, PG}

**P2**= {TV, DVD, PlayStation} × {On, Off, PG}

**P3**= {Oven} × {OnOven, OffOven}

**P4** = {Fridge} × {OnFridge, OffFridge,DisplayFood, SetTemperature}

**P5**= {DoorLock} × {Lock, Unlock}

**P6**= {DishWasher, CleaningMachine} × {Onwasher, OffWasher, OnDishwasher, OffDishwasher}

**P7** = {Light} × {OnLight, OffLight}

**P8**= {SurveillanceCameras} × {StartRecording, StopRecording}

**P9** = {Thermostat} × {OnThermostat, OffThermostat, ScheduleThermostat}

**P10** = {Thermostat} × {OnThermostat, OffThermostat}

**P11** = {SmokeAlarm} × {DeactiveSmokeAlarm}

**P12** = {BurglarAlarm} × {Activate, Deactivate}

**P13**= {Alexa} x {ActivateAlexa}

**P14**= {Safe} x {OpenSafe, CloseSafe}

**P15** = {Computer} x {Onc, Offc}

**P16** = {PlayStation} x {R}

**P17** = {SmartClock} x {Connect, VolumeUp, VolumeDown, DisplayTime,

MicrophoneMuteSwitch}

**P18** = {TempoStudio} x {OnTempoStudio, OffTempoStudio}

**P19** = {BluetoothSpeaker}x {OnBS, OffBS, ManageAudio}

**P20** = {Windows} x {OnW, OffW}

**P21** = {GarageDoor} x {OnGarage, OffGarage}

**P22** ={SmartToy}x{RecordVoice, PlaySound}

**P23** ={SmartRobot Vacuum Cleaner}x{OnRobot, OffRobot, Setting}

**P24** ={SmartCoffee Machine}x{BrewCoffee}

**P25** ={Smartwatch}x{MonitorHeartRate}

**P26** ={SmartCookware&Cooktop}x{OnCooktop, OffCooktop}

**P27** ={Kitchen FoodProcessor}x{Start, Off}

**P28** ={IceMaker}x{Clean, Power}

**P29** ={SmartRobot Vacuum Cleaner}x{OnRobot, OffRobot}

P =

**PDRA** = {{P1 U P16} × Entertainment\_Devices} U {P16 × PlayStation\_Device}

U {{P2 U P22} × Kids\_Friendly\_Content} U {{P3 U P4 U P5 U P10 U P11 UP20} × Adult\_Controlled} U {{P8 U P9 U P12 U P14 U P23 U P25} × Owner\_Controlled} U

{P7 × Lighting\_Devices} U {{P6 UP29}× Cleaning\_Devices} U {P13 U P19 × Teenager\_Controlled} U {P5 × Door\_Device} U {P3 × Oven\_Device} U {P4 × Fridge\_Device} U {P9 × Thermostat\_Device} U {P14 × Safe\_Device} U {P15 × Computer\_Device} U {P17 × Clock\_Device} U {{P18 U P25} × Fitness\_Devices} U {P20 × Windows\_Devices} U {P21 x Garage\_Device} U {{P3 U P4 U P24 U P26 U P27 U P28} × Kitchen\_Devices}

Environment Roles (ER) are a GRBAC innovation representing environmental contexts, such as daytime/nighttime, and winter/summer. Environment roles are turned on/off (i.e., triggered) by Environment Conditions (EC) such as daylight, or weather. EA maps each environment role to a subset of EC.

**EC** = {weekends, evenings, vacation, TRUE, emergency, certain day, at\_home}

**ER** = {Entertainment\_Time, Not\_At\_Home, Any\_Time, At\_Home, Emergency\_Time, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday}

**EA** = {({weekends, evenings}, Entertainment\_Time), ({vacation}, Not\_At\_Home), ({TRUE}, Any\_Time), ({emergency}, Emergency\_Time), ({at home}, At\_Home),

({certain day}, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday)}

We can assume to have two different babysitters, one who comes on Friday and one who comes on Wednesday, so we distinguish permissions based on the environment role.

Each role pair is a combination of a role and currently active environment roles. A role pair rp has a role part rp.r that is the single role associated with rp, and an environment role part rp.ER.

**RP** = {(kid,{Entertainment\_Time}), (kid,{At\_Home}), (parent,{Any\_Time}), (parent,{Not\_At\_Home}), (chef,{At\_Home}), (babySitter,{Wednesday}), (babySitter,{Friday}), (maid,{At\_Home}), (neighbor,{At\_Home}), (guest,{At\_Home}), (manager,{Any\_Time}), (adult,{Any\_Time}), (teenager,{Any\_Time}), (teenager,{Entertainment\_Time}), (authorities,{Emergency\_Time})}

NOTE: the roles maidAtHome, guestAtHome and neighborAtHome will be activated only when connected to wifi.

RPDRA brings all these components together by assigning device roles to role pairs.

**RPDRA** = {((parent,{Any\_Time}),Adult\_Controlled), ((parent,{Any\_Time}),Owner\_Controlled), ((parent,{Any\_Time}),Entertainment\_Devices), ((parent,{Any\_Time}),Cleaning\_Devices), ((parent,{Any\_Time}),Lighting\_Devices), ((parent,{Any\_Time}),Door\_Device), ((parent,{Any\_Time}),Fridge\_Device), ((parent,{Any\_Time}),Oven\_Device), ((parent,{Any\_Time}),Thermostat\_Device),

((parent,{Any\_Time}),Kids\_Friendly\_Content), ((parent,{Any\_Time}),PlayStation\_Device), ((parent,{Any\_Time}),Safe\_Device), ((parent,{Any\_Time}),Computer\_Device), ((parent,{Any\_Time}),Clock\_Device) , ((parent,{Any\_Time}),Fitness\_Device), ((parent,{Any\_Time}),Windows\_Devices), ((parent,{Any\_Time}),Garage\_Device), ((babysitter,{Friday}),Door\_Device),

((babysitter,{Wednesday}),Door\_Device), ((kid,{At\_Home}),Lighting\_Devices),

((kid,{Entertainment\_Time}),Kids\_Friendly\_Content), ((maid,{At\_Home}),Door\_Device), ((teenager,{Any\_Time}),Lighting\_Devices), ((maid,{At\_Home}),Cleaning\_Devices), ((teenager,{Any\_Time}),Teenager\_Controlled), ((teenager,{Entertainment\_Time}),Entertainment\_Devices)}

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PDR-AEGRBAC policy

Administrator Users (AUser) are a subset of regular users, with administrative authorizations. Administrator users would be recognized by their assignment to Administrative Roles (AR).

**AUser** = {anna, angela, giuseppe, alessio, roberta, catia, bob}

**AR** = {Manager, Home\_Owner, Teenager\_Devices\_Manager, Adult\_Manager,

Entertainment\_Manager, Cleaning\_Manager, Kitchen\_Manager, Kids\_Manager}

**AUA** = {(angela, Home\_Owner), (giuseppe, Home\_Owner), (roberta, Adult\_Manager),

(angela, Adult\_Manager), (giuseppe, Entertainment\_Manager), (anna, Manager), (catia, Cleaning\_Manager), (alessio, Teenager\_Devices\_Manager), (bob, Kitchen\_Manager), (gaia, Kids\_Manager)}

Administrative User Assignment (AUA) is a relation which assigns administrator users to administrative roles. Administrative Unit (AU) is an abstraction to represent a unit of administration, which contains the scope of management of its contained AR. Each Administrative Unit (AU) includes two components, a uniquely associated AR, and a subset of possible authorization assignments, namely Administrative Tasks (AT). Any AR included in an AU is permitted to manage any of the possible authorization assignments included in its corresponding AT.

**AU** = {Admin\_Control, Ownership\_Control, Teenager\_Devices\_Control, Adult\_Management, Entertainment\_Management, Cleaning\_Management, Kitchen\_Management, Kids\_Control}

Prohibited assignments indicate denial of access instead of conferring it.

For instance, babysitter does not need and should not be granted access to the owner devices.

**ProhibitedAssignment** = {((kid,{Entertainment\_Time}), Entertainment\_Devices),

((babySitter,{Friday}), Cleaning\_Devices), ((guest,{At\_Home}), Owner\_Controlled), ((babySitter,{Wednedsay}), Safe\_Device),

((maid,{At\_Home}), Owner\_Controlled), (babySitter,{Wednesday}), Owner\_Controlled), (babySitter,{Friday}), Owner\_Controlled),

((babySitter,{Friday}), Safe\_Device), (guest,{At\_Home}),Safe\_Device),

((kid,{At\_Home}), Adult\_Controlled), ((kid,{At\_Home}), Cleaning\_Devices), ((kid,{At\_Home}), Owner\_Controlled), ((chef,{At\_Home}), Owner\_Controlled), ((adult,{At\_Home}), Owner\_Controlled), ((neighbor,{At\_Home}), Owner\_Controlled), (neighbor,{At\_Home}), Safe\_Device), (chef,{At\_Home}), Safe\_Device), (adult,{At\_Home}), Safe\_Device), (maid,{At\_Home}), Safe\_Device)}}

**AT** = {at0, at1, at2, at3, at4, at5, at6, at7}

**at0** = {(kid,{Entertainment\_Time}), (kid,{At\_Home}), (parent,{Any\_Time}), (guest,{At\_Home}), (parent,{Not\_At\_Home}), (chef,{At\_Home}), (babysitter,{Friday}), (babySitter,{Wednesday}), (maid,{At\_Home}), (neighbor,{At\_Home}), (adult,{Any\_Time}), (teenager,{Any\_Time}), (teenager,{Entertainment\_Time}), (authorities,{Emergency\_Time})} x {Entertainment\_Devices, Adult\_Controlled, Owner\_Controlled, Kids\_Friendly\_Content, Lightning\_Devices, Cleaning\_Devices,

Teenager\_Controlled, Door\_Device, Thermostat\_Device, Fridge\_Device, Oven\_Device, PlayStation\_Device, Safe\_Device, Computer\_Device, Clock\_Device, Fitness\_Devices, Windows\_Devices, Garage\_Device, Kitchen\_Devices} \ {ProhibitedAssignment}

**at1** = {(parent,{Any\_Time}), (guest,{At\_Home}), (babysitter,{Friday}), (babysitter,{Wednesday}), (kid,{Entertainment\_Time}), (adult,{Any\_Time}), (teenager,{Entertainment\_Time})} x {Entertainment\_Devices, Kids\_Friendly\_Content­, PlayStation\_Device} \ {ProhibitedAssignment}

**at2** = {(parent,{Any\_Time}), (authorities,{Emergency\_Time})} x {Owner\_Controlled, Safe\_Device} \ {ProhibitedAssignment}

**at3** = {(parent,{Any\_Time}), (guest,{At\_Home}), (maid,{At\_Home}), (kid,{At\_Home}),

(babySitter,{Friday}), (babySitter,{Wednesday}), (neighbor{At\_Home}), (authorities,{Emergency\_Time})} x {Adult\_Controlled, Lighting\_Devices, Cleaning\_Devices, Oven\_Device, Fridge\_Device, Thermostat\_Device, Door\_Device, Computer\_Device, Clock\_Device, Fitness\_Devices, Windows\_Devices, Garage\_Device} \ {ProhibitedAssignment}

**at4** = {(teenager,{Any\_Time}), (guest,{At\_Home})} x {Teenager\_Controlled, PlayStation\_Device} \{ProhibitedAssignment}

**at5** = {(maid,{At\_Home})} x {Garage\_Device, Cleaning\_Devices, Lighting\_Devices, Windows\_Devices} \ {ProhibitedAssignment}

**at6** = {(chef,{At\_Home})} x {Kitchen\_Devices, Lighting\_Devices} \ {ProhibitedAssignment}

**at7** = {(babysitter,{Wednesday}), (babysitter,{Friday}} x {Kids\_Friendly\_Content} \ {ProhibitedAssignment}

ARATA is Administrative Role to Administrative Task assignment, which is a one-to-one relation, which means only one AR could be authorized to activate authorizations included in corresponding AT. ARAUA is Administrative Role to Administrative Unit Assignment, which is a one-to-one relation, that means no more than one AR can be assigned to an AU.

**ARATA** = {(Admin,at0), (Entertainment\_Manager,at1), (Home\_Owner,at2), (Adult\_Manager,at3), (Teenager\_Devices\_Manager,at4), (Cleaning\_Manager,at5), (Kitchen\_Manager,at6), (Kids\_Manager,at7)}

**ARAUA** = {(Home\_owner, Ownership\_Control), (Adult\_Manager, Adult\_Management),

(Entertainment\_Manager, Entertainment\_Management), (Admin, Admin\_Control), (Cleaning\_Manager, Cleaning\_Management), (Kitchen\_Manager, Kitchen\_Management),

(Teenager\_Devices\_Manager, Teenager\_Devices\_Control), (Kids\_Control, Kids\_Manager)}

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Function assignRPDR(𝑎𝑢𝑠𝑒𝑟 ∈ 𝐴𝑈𝑠𝑒𝑟,𝑎𝑟 ∈ 𝐴𝑅,𝑟𝑝 ∈ 𝑅𝑃,𝑑𝑟 ∈ 𝐷𝑅) enables a user *auser* with *ar* role to add the (𝑟𝑝,𝑑𝑟) to the set of RPDRA of operational model. This means the device role *dr* would be assigned to the role pair *rp*, which consequently adds a new rule to the set of policies of EGRBAC.

PDR-EGRBAC POLICY: assignRPDR

In this set of assign functions, a manager gives parents permission to control all devices in the house

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Adult\_Controlled}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Owner\_Controlled}))

assignRPDR(anna,Manager,({(parent,{Not\_At\_Home}),Owner\_Controlled}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Door\_Device}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Frigde\_Device}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Oven\_Device}))

assignRPDR(anna,Manager,{(parent,{Any\_Time}),Entertainment\_Devices}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Windows\_Devices}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Safe\_Device}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Kids\_Friendly\_Content}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Lighting\_Devices}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Cleaning\_Devices}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),PlayStation\_Device}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Fitness\_Devices}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Thermostat\_Device}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Computer\_Device}))

assignRPDR(anna,Manager,({(parent,{Any\_Time}),Clock\_Device}))

A teenager can control the entertainment devices during its entertainment time, and he must be able to control lights and fitness devices. We also take into consideration the possibility of assigning adult devices to him.

assignRPDR(anna,Manager,({(teenager,{Entertainment\_Time}),Entertainment\_Devices}))

assignRPDR(anna,Manager,({(teenager,{Entertainment\_Time}),PlayStation\_Device}))

assignRPDR(anna,Manager,({(teenager,{Any\_Time}),Teenager\_Controlled}))

assignRPDR(anna,Manager,({(teenager,{Any\_Time}),Adult\_Controlled}))

assignRPDR(anna,Manager,({(teenager,{Any\_Time}),Lighting\_Devices }))

assignRPDR(anna,Manager,({(teenager,{Any\_Time}),Fitness\_Devices }))

Here a manager allows an adult to control the adult devices assignRPDR(anna,Manager,({(adult,{Any\_Time}),Adult\_Controlled}))

Here a manager allows the chef to use Kitchen devices and lighting devices after gaining access to the door

assignRPDR(anna,Manager,({(chef,{At\_Home}),Door\_Device,Kitchen\_Devices}))

assignRPDR(anna,Manager,({(chef,{At\_Home}),Door\_Device}))

assignRPDR(anna,Manager,({(chef,{At\_Home}),Door\_Device,Lighting\_Devices}))

A child can control the lights and only the devices with content suitable for him, here we have the actions performed by a manager.

assignRPDR(anna,Manager,({(kid,{Entertainment\_Time}),¬Entertainment\_Devices, Kids\_Friendly\_Content }))

assignRPDR(anna,Manager,({(kid,{At\_Home}),Lighting\_Devices }))

A Manager can assign the babysitter on Friday or Wednesday the access to the door, windows, and lighting devices. She must be able to control children's devices to better interact with them.

assignRPDR(anna,Manager,({(babysitter,{Friday}),¬Adult\_Controlled,Door\_Device}))

assignRPDR(anna,Manager,({(babysitter,{Friday}),Door\_Device,Lighting\_Devices }))

assignRPDR(anna,Manager,({(babysitter,{Friday}),Lighting\_Devices,¬Adult\_Controlled,Windows\_Devices}))

assignRPDR(anna,Manager,({(babysitter,{Friday}),Lighting\_Devices,¬Adult\_Controlled,Thermostat\_Device}))

assignRPDR(anna,Manager,({(babysitter,{Friday}),Door\_Device∧Windows\_Devices∧Thermostat\_Device,Adult\_Controlled }))

assignRPDR(anna,Manager,({(babysitter,{Friday}),Lighting\_Devices,Kids\_Friendly\_Content}))

assignRPDR(anna,Manager,({(babysitter,{Wednesday}),¬Adult\_Controlled,Door\_Device }))

assignRPDR(anna,Manager,({(babysitter,{Wednesday}),Door\_Device,Lighting\_Devices}))

assignRPDR(anna,Manager,({(babysitter,{Wednesday}),Lighting\_Devices,¬Adult\_Controlled,Windows\_Devices}))

assignRPDR(anna,Manager,({(babysitter,{Wednesday}),Lighting\_Devices,¬Adult\_Controlled,Thermostat\_Device}))

assignRPDR(anna,Manager,({(babysitter,{Wednesday}),Lighting\_Devices,

Kids\_Friendly\_Content}))

A manager gives the maid permission to control the cleaning devices in the house after gaining access to the door. We can give her access to the fridge or the garage if she has to clean them.

assignRPDR(anna,Manager,({(maid,{At\_Home}),Door\_Device}))

assignRPDR(anna,Manager,({(maid,{At\_Home}),Windows\_Devices}))

assignRPDR(anna,Manager,({(maid,{At\_Home}),Door\_Device,Lighting\_Devices}))

assignRPDR(anna,Manager,({(maid,{At\_Home}),Door\_Device∧Lighting\_Devices,Cleaning\_Devices}))

assignRPDR(anna,Manager,({(maid,{At\_Home}),Cleaning\_Devices,Fridge\_Device}))

assignRPDR(anna,Manager,({(maid,{At\_Home}),Door\_Device∧Lighting\_Devices,Thermostat\_Device}))

assignRPDR(anna,Manager,({(maid,{At\_Home}),Cleaning\_Devices,Garage\_Device}))

A guest can also be a friend, so we consider the possibility of assigning him permission to control the lights and the entertainment devices.

assignRPDR(anna,Manager,({guest,{At\_Home}),Door\_Device}))

assignRPDR(anna,Manager,({(guest,{At\_Home}),Door\_Device,Lighting\_Devices}))

assignRPDR(anna,Manager,({(guest,{At\_Home}),Lighting\_Devices,Entertainment\_Devices}))

assignRPDR(anna,Manager,({(guest,{At\_Home}),Door\_Device,PlayStation\_Device}))

A manager gives the neighbor the permission to control lights when at home.

assignRPDR(anna,Manager,({(neighbor,{At\_Home}),Door\_Device}))

assignRPDR(anna,Manager,({(neighbor,{At\_Home}∧ Door\_Device,Lighting\_Devices}))

As we mentioned before, authorities must be able to access the door and windows in an emergency, so a manager assigns those permissions to them.

assignRPDR(anna,Manager,({(authorities{Emergency\_Time}),Door\_Device}))

assignRPDR(anna,Manager,({(authorities{Emergency\_Time}),Windows\_Devices}))

assignRPDR(anna,Manager,({(authorities{Emergency\_Time}),Door\_Device∧Windows\_Devices,Owner\_Controlled}))

the homeowner gives parents control of devices such as the safe even when not at home; in this case study the homeowner is the parent.

assignRPDR(giusppe,Home\_Owner,({(parent,{Any\_Time}),Owner\_Controlled}))

assignRPDR(giusppe,Home\_Owner,({(parent,{Not\_At\_Home}),Owner\_Controlled}))

assignRPDR(giusppe,Home\_Owner,({(parent,{Any\_Time}),Safe\_Device}))

The adult manager allows parents to control all the devices that fall within his administrative unit. These are like the ones above, but the action is performed by the Adult Manager.

assignRPDR(angela,Adult\_Manager,({(parent,{Any\_Time}),Adult\_Controlled}))

assignRPDR(angela,Adult\_Manager,({(parent,{Any\_Time}),Door\_Device}))

assignRPDR(angela,Adult\_Manager,({(parent,{Any\_Time}),Fridge\_Device}))

assignRPDR(angela,Adult\_Manager,({(parent,{Any\_Time}),Oven\_Device}))

assignRPDR(roberta,Adult\_Manager,({(parent,{Any\_Time}),Windows\_Devices}))

assignRPDR(angela,Adult\_Manager,({(parent,{Any\_Time}),Lighting\_Devices }))

assignRPDR(angela,Adult\_Manager,({(parent,{Any\_Time}),Cleaning\_Devices }))

assignRPDR(roberta,Adult\_Manager,({(parent,{Any\_Time}),Fitness\_Devices}))

assignRPDR(roberta,Adult\_Manager,({(parent,{Any\_Time}),Thermostat\_Device}))

assignRPDR(roberta,Adult\_Manager,({(parent,{Any\_Time}),Computer\_Device}))

assignRPDR(roberta,Adult\_Manager,({(parent,{Any\_Time}),Clock\_Device}))

An adult manager allows the chef to use lighting devices after gaining access to the door.

assignRPDR(roberta,Adult\_Manager,({(chef,{At\_Home}),Door\_Device}))

assignRPDR(roberta,Adult\_Manager,({(chef,{At\_Home}),Door\_Device,Lighting\_Devices }))

assignRPDR(roberta,Adult\_Manager,({(kid,{At\_Home}),Lighting\_Devices}))

Here we have permissions assigned to the babysitter as described before, but the action is performed by an adult manager

assignRPDR(angela,Adult\_Manager,({(babysitter,{Friday}),¬Adult\_Controlled,Door\_Device}))

assignRPDR(angela,Adult\_Manager,({(babysitter,{Friday}),Door\_Device,Lighting\_Devices}))

assignRPDR(angela,Adult\_Manager,({(babysitter,{Wednesday}),¬Adult\_Controlled, Door\_Device}))

assignRPDR(roberta,Adult\_Manager,({(babysitter,{Wednesday}),Door\_Device, Lighting\_Devices}))

assignRPDR(roberta,Adult\_Manager({(babysitter,{Friday}),Lighting\_Devices ∧ ¬Adult\_Controlled,Windows\_Devices}))

assignRPDR(roberta,Adult\_Manager,({(babysitter,{Wednesday}),Lighting\_Devices ∧ ¬Adult\_Controlled,Windows\_Devices}))

assignRPDR(roberta,Adult\_Manager,({(babysitter,{Friday}),Lighting\_Devices ∧ ¬Adult\_Controlled,Thermostat\_Device}))

assignRPDR(roberta,Adult\_Manager,({(babysitter,{Wednesday}),Lighting\_Devices ∧ ¬Adult\_Controlled,Thermostat\_Device}))

assignRPDR(roberta,Adult\_Manager,({(babysitter,{Friday}),Door\_Device ∧ Windows\_Devices ∧ Thermostat\_Device,Adult\_Controlled}))

An adult manager gives the maid permission to control the cleaning devices in the house after gaining access to the door. We can give her access to the fridge or the garage if she has to clean them.

assignRPDR(angela,Adult\_Manager,({(maid,{At\_Home}),Door\_Device}))

assignRPDR(angela,Adult\_Manager,({(maid,{At\_Home}),Windows\_Devices}))

assignRPDR(angela,Adult\_Manager,({(maid,{At\_Home}),Door\_Device,Lighting\_Devices}))

assignRPDR(angela,Adult\_Manager,({(maid,{At\_Home}),Door\_Device ∧ Lighting\_Devices, Cleaning\_Devices}))

assignRPDR(angela,Adult\_Manager,({(maid,{At\_Home}),Cleaning\_Devices,Fridge\_Device}))

assignRPDR(roberta,Adult\_Manager,({(maid,{At\_Home}),Door\_Device ∧ Lighting\_Devices, Thermostat\_Device}))

assignRPDR(roberta,Adult\_Manager,({(maid,{At\_Home}),Cleaning\_Devices,Garage\_Device}))

An adult manager gives the guest the permission to control lights when at home.

assignRPDR(angela,Adult\_Manager,({guest,{At\_Home}),Door\_Device}))

assignRPDR(angela,Adult\_Manager,({(guest,{At\_Home}),Door\_Device,Lighting\_Devices}))

An adult manager gives the neighbor the permission to control lights when at home

assignRPDR(angela,Adult\_Manager,({(neighbor,{At\_Home}),Door\_Device}))

assignRPDR(angela,Adult\_Manager,({(neighbor,{At\_Home})∧ Door\_Device, Lighting\_Devices}))

Here we have a set of rules defined as above, but they can also be performed by an adult manager.

assignRPDR(angela,Adult\_Manager,({(teenager,{Any\_Time}),Adult\_Controlled}))

assignRPDR(roberta,Adult\_Manager,({(teenager,{Any\_Time}),Lighting\_Devices }))

assignRPDR(roberta,Adult\_Manager,({(teenager,{Any\_Time}),Fitness\_Devices }))

assignRPDR(angela,Adult\_Manager,({(authorities{Emergency\_Time}),Door\_Device}))

assignRPDR(angela,Adult\_Manager,({(authorities{Emergency\_Time}),Windows\_Devices}))

assignRPDR(angela,Adult\_Manager,({(authorities{Emergency\_Time}),Door\_Device ∧ Windows\_Devices,Owner\_Controlled}))

An entertainment manager gives parents access to entertainment devices.

assignRPDR(giuseppe,Entertainment\_Manager,({(parent,{Any\_Time}),Entertainment\_Devices}))

assignRPDR(giuseppe,Entertainment\_Manager,({(parent,{Any\_Time}),Kids\_Friendly\_Content}))

assignRPDR(giuseppe,Entertainment\_Manager,({(parent,{Any\_Time}),PlayStation\_Device}))

We don’t want to grant access to Entertainment Devices to the kids during their entertainment time but only to the content suitable for them (defined in Kids Friendly Content device role).

assignRPDR(giuseppe,Entertainment\_Manager,({(kid,{Entertainment\_Time}),¬Entertainment\_Devices,Kids\_Friendly\_Content}))

The babysitter after putting the baby to bed could use the entertainment devices, so we assign her this permission.

assignRPDR(giuseppe,Entertainment\_Manager,({(babysitter,{Friday}),Lighting\_Devices,Entertainment\_Devices}))

assignRPDR(giuseppe,Entertainment\_Manager,({(babysitter,{Wednesday}),Lighting\_Devices,Entertainment\_Devices}))

A teenager can control the entertainment devices during its entertainment time.

A guest can be a friend of the teenager so we give him access to entertainment devices too.

assignRPDR(giuseppe,Entertainment\_Manager,({(guest,{At\_Home}),Lighting\_Devices,

Entertainment\_Devices}))

assignRPDR(giuseppe,Entertainment\_Manager,({(teenager,{Entertainment\_Time}),Entertainment\_Devices}))

assignRPDR(giuseppe,Entertainment\_Manager,({(teenager,{EntertainmentTime}),PlayStation\_Device}))

A teenager can also be the manager of an administrative unit and control his own devices. He can also allow a guest to control the PlayStation.

assignRPDR(alessio,Teenager\_Devices\_Manager,({(teenager,{Any\_Time}),Teenager\_Controlled}))

assignRPDR(alessio,Teenager\_Devices\_Manager,({(teenager,{Entertainment\_Time}),

PlayStation\_Device}))

assignRPDR(alessio,Teenager\_Devices\_Manager,({(guest,{At\_Home}),Door\_Device,

PlayStation\_Device}))

We consider an administrative unit managed by the maid so that, when needed, she can give herself control of the garage or windows to clean them.

assignRPDR(catia,Cleaning\_Manager,({(maid,{At\_Home}),Door\_Device ∧ Lighting\_Devices,Cleaning\_Devices }))

assignRPDR(catia,Cleaning\_Manager,({(maid,{At\_Home}),Cleaning\_Devices,Garage\_Device}))

assignRPDR(catia,Cleaning\_Manager,({(maid,{At\_Home}),Cleaning\_Devices,Windows\_Devices}))

A chef can be in charge of an administrative unit and can assign himself access to appliances in the kitchen and the use of lights. assignRPDR(bob,Kitchen\_Manager,({(chef,{At\_Home}),Door\_Device,Kitchen\_Devices}))

assignRPDR(bob,Kitchen\_Manager,({(chef,{At\_Home}),Lighting\_Devices}))

The Kids Manager gives babysitters permission to control kids-friendly content devices.

assignRPDR(gaia,Kids\_Manager,({(babysitter,{Friday}),Lighting\_Devices,

Kids\_Friendly\_Content}))

assignRPDR(gaia,Kids\_Manager,({(babysitter,{Wednesday}),Lighting\_Devices,

Kids\_Friendly\_Content}))

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PDR-EGRBAC POLICY: revokeRPDR

Function revokeRPDR(𝑎𝑢𝑠𝑒𝑟 ∈ 𝐴𝑈𝑠𝑒𝑟,𝑎𝑟 ∈ 𝐴𝑅,𝑟𝑝 ∈ 𝑅𝑃,𝑑𝑟 ∈ 𝐷𝑅) would authorize an administrator user auser with ar role to revoke a device role from a role pair.

For each rule assignRPDR, there is a corresponding rule revokeRPDR so we won’t provide a further explanation.

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Adult\_Controlled}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Owner\_Controlled}))

revokeRPDR(anna, Manager, ({(parent,{Not\_At\_Home}),Owner\_Controlled}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Door\_Device}))

revokePDR(anna, Manager, ({(parent,{Any\_Time}),Frigde\_Device}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Oven\_Device}))

revokeRPDR(anna,Manager, ({(parent,{Any\_Time}),Entertainment\_Devices}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Windows\_Devices}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Safe\_Device}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Kids\_Friendly\_Content}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Lighting\_Devices}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Cleaning\_Devices}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),PlayStation\_Device}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Fitness\_Devices}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Thermostat\_Device}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Computer\_Device}))

revokeRPDR(anna, Manager, ({(parent,{Any\_Time}),Clock\_Device}))

revokeRPDR(anna, Manager, ({(teenager,{Any\_Time}),Teenager\_Controlled}))

revokeRPDR(anna, Manager, ({(teenager,{Entertainment\_Time}),

Entertainment\_Devices}))

revokeRPDR(anna,Manager, ({(teenager,{Entertainment\_Time}), PlayStation\_Device}))

revokeRPDR(anna,Manager, ({(teenager,{Any\_Time}),Adult\_Controlled}))

revokeRPDR(anna,Manager, ({(teenager,{Any\_Time}),Lighting\_Devices }))

revokeRPDR(anna, Manager, ({(teenager,{Any\_Time}),Fitness\_Devices }))

revokeRPDR(anna, Manager, ({(adult,{Any\_Time}),Adult\_Controlled}))

revokeRPDR(anna, Manager, ({(chef,{At\_Home}),Kitchen\_Devices}))

revokeRPDR(anna, Manager, ({(chef,{At\_Home}),Door\_Device }))

revokeRPDR(anna, Manager, ({(chef,{At\_Home}),Lighting\_Devices }))

revokeRPDR(anna,Manager, ({(kid,{Entertainment\_Time}), Kids\_Friendly\_Content }))

revokeRPDR(anna, Manager, ({(kid,{At\_Home}),Lighting\_Devices }))

revokeRPDR(anna, Manager, ({(babysitter,{Friday}),Door\_Device }))

revokeRPDR(anna, Manager, ({(babysitter,{Friday}),Lighting\_Devices }))

revokeRPDR(anna, Manager, ({(babysitter,{Friday}), Windows\_Devices }))

revokeRPDR(anna, Manager, ({(babysitter,{Friday}), Thermostat\_Device }))

revokeRPDR(anna, Manager, ({(babysitter,{Friday}),Adult\_Controlled }))

revokeRPDR(anna, Manager, ({(babysitter,{Friday}), Kids\_Friendly\_Content }))

revokeRPDR(anna, Manager, ({(babysitter,{Wednesday}), Thermostat\_Device }))

revokeRPDR(anna, Manager, ({(babysitter,{Wednesday}), Kids\_Friendly\_Content }))

revokeRPDR(anna,Manager, ({(babysitter,{Wednesday}),Door\_Device }))

revokeRPDR(anna, Manager, ({(babysitter,{Wednesday}), Lighting\_Devices}))

revokeRPDR(anna, Manager, ({(babysitter,{Wednesday}),Windows\_Devices }))

revokeRPDR(anna,Manager, ({(maid,{At\_Home}),Door\_Device}))

revokeRPDR(anna,Manager, ({(maid,{At\_Home}),Windows\_Devices}))

revokeRPDR(anna,Manager, ({(maid,{At\_Home}),Lighting\_Devices}))

revokeRPDR(anna,Manager, ({(maid,{At\_Home}),Cleaning\_Devices}))

revokeRPDR(anna,Manager, ({(maid,{At\_Home}),Fridge\_Device}))

revokeRPDR(anna,Manager, ({(maid,{At\_Home}),Thermostat\_Device}))

revokeRPDR(anna,Manager, ({(maid, {At\_Home}),Garage\_Device}))

revokeRPDR(anna,Manager, ({guest,{At\_Home}),Door\_Device}))

revokeRPDR(anna,Manager, ({(guest,{At\_Home}),Lighting\_Devices}))

revokeRPDR(anna,Manager, ({(guest,{At\_Home}), Entertainment\_Devices}))

revokeRPDR(anna, Manager, ({(guest,{At\_Home}),PlayStation\_Device}))

revokeRPDR(anna,Manager, ({(neighbor,{At\_Home}),Door\_Device}))

revokeRPDR(anna,Manager, ({(neighbor,{At\_Home},Lighting\_Devices}))

revokeRPDR(anna,Manager, ({(authorities{Emergency\_Time}),Door\_Device}))

revokeRPDR(anna,Manager, ({(authorities{Emergency\_Time}),Windows\_Devices}))

revokeRPDR(anna,Manager, ({(authorities{Emergency\_Time}),Owner\_Controlled}))

revokeRPDR(giusppe, Home\_Owner, ({(parent,{Any\_Time}),Owner\_Controlled}))

revokeRPDR(giusppe, Home\_Owner, ({(parent,{Not\_At\_Home}),Owner\_Controlled}))

revokeRPDR(giusppe, Home\_Owner, ({(parent,{Any\_Time}),Safe\_Device}))

revokeRPDR(angela, Adult\_Manager, ({(parent,{Any\_Time}),Adult\_Controlled}))

revokeRPDR(angela,Adult\_Manager, ({(parent,{Any\_Time}),Door\_Device}))

revokeRPDR(angela,Adult\_Manager, ({(parent,{Any\_Time}),Fridge\_Device}))

revokeRPDR(angela, Adult\_Manager, ({(parent,{Any\_Time}),Oven\_Device }))

revokeRPDR(roberta, Adult\_Manager, ({(parent,{Any\_Time}),Windows\_Devices }))

revokeRPDR(angela, Adult\_Manager, ({(parent,{Any\_Time}),Lighting\_Devices }))

revokeRPDR(angela, Adult\_Manager, ({(parent,{Any\_Time}),Cleaning\_Devices }))

revokeRPDR(roberta, Adult\_Manager, ({(parent,{Any\_Time}),Fitness\_Devices }))

revokeRPDR(roberta, Adult\_Manager, ({(parent,{Any\_Time}),Thermostat\_Device }))

revokeRPDR(roberta, Adult\_Manager, ({(parent,{Any\_Time}), Computer\_Device }))

revokeRPDR(roberta, Adult\_Manager, ({(parent,{Any\_Time}),Clock\_Device }))

revokeRPDR(roberta, Adult\_Manager, ({(chef,{At\_Home}),Door\_Device }))

revokeRPDR(roberta, Adult\_Manager, ({(chef,{At\_Home}),Lighting\_Devices }))

revokeRPDR(roberta, Adult\_Manager, ({(kid,{At\_Home}),Lighting\_Devices }))

revokeRPDR(angela, Adult\_Manager, ({(babysitter,{Friday}),Door\_Device }))

revokeRPDR(angela, Adult\_Manager, ({(babysitter,{Friday}),Lighting\_Devices }))

revokeRPDR(angela, Adult\_Manager, ({(babysitter,{Wednesday}),Door\_Device }))

revokeRPDR(roberta, Adult\_Manager,({(babysitter,{Wednesday}),Lighting\_Devices}))

revokeRPDR(roberta, Adult\_Manager, ({(babysitter,{Friday}),Windows\_Devices }))

revokeRPDR(roberta, Adult\_Manager,({(babysitter,{Wednesday}),Windows\_Devices }))

revokeRPDR(roberta, Adult\_Manager,({(babysitter,{Friday}), Thermostat\_Device }))

revokeRPDR(roberta,Adult\_Manager,({(babysitter,{Wednesday}),Thermostat\_Device}))

revokeRPDR(roberta, Adult\_Manager, ({(babysitter,{Friday}), Adult\_Controlled }))

revokeRPDR(angela,Adult\_Manager, ({(maid,{At\_Home}),Door\_Device}))

revokeRPDR(angela,Adult\_Manager, ({(maid,{At\_Home}),Windows\_Devices}))

revokeRPDR(angela,Adult\_Manager, ({(maid,{At\_Home}),Lighting\_Devices}))

revokeRPDR(angela,Adult\_Manager, ({(maid,{At\_Home}), Cleaning\_Devices}))

revokeRPDR(angela,Adult\_Manager, ({(maid,{At\_Home}),Fridge\_Device}))

revokeRPDR(roberta,Adult\_Manager, ({(maid,{At\_Home}),Thermostat\_Device}))

revokeRPDR(angela,Adult\_Manager, ({(maid,{At\_Home}),Garage\_Device}))

revokeRPDR(angela,Adult\_Manager, ({guest,{At\_Home}),Door\_Device}))

revokeRPDR(angela,Adult\_Manager, ({(guest,{At\_Home}),Lighting\_Devices}))

revokeRPDR(angela,Adult\_Manager, ({(neighbor,{At\_Home}),Door\_Device}))

revokeRPDR(angela,Adult\_Manager, ({(neighbor,{At\_Home}),Lighting\_Devices}))

revokeRPDR(angela,Adult\_Manager, ({(teenager,{Any\_Time}),Adult\_Controlled}))

revokeRPDR(roberta, Adult\_Manager, ({(teenager,{Any\_Time}),Lighting\_Devices }))

revokeRPDR(roberta, Adult\_Manager, ({(teenager,{Any\_Time}),Fitness\_Devices }))

revokeRPDR(angela,Adult\_Manager, ({(authorities{Emergency\_Time}),Door\_Device}))

revokeRPDR(angela,Adult\_Manager,({(authorities{Emergency\_Time}),Windows\_Devices}))

revokeRPDR(angela,Adult\_Manager,({(authorities{Emergency\_Time}),Owner\_Controlled}))

revokeRPDR(giuseppe,Entertainment\_Manager,({(parent,{Any\_Time}),Entertainment\_Devices }))

revokeRPDR(giuseppe,Entertainment\_Manager,({(parent,{Any\_Time}), Kids\_Friendly\_Content }))

revokeRPDR(giuseppe,Entertainment\_Manager,({(parent,{Any\_Time}),PlayStation\_Device}))

revokeRPDR(giuseppe, Entertainment\_Manager, ({(kid,{Entertainment\_Time}),

Kids\_Friendly\_Content }))

revokeRPDR(giuseppe, Entertainment\_Manager, ({(babysitter,{Friday}), Entertainment\_Devices }))

revokeRPDR(giuseppe,Entertainment\_Manager,({(babysitter,{Wednesday}),Entertainment\_Devices }))

revokeRPDR(giuseppe,Entertainment\_Manager,({(guest,{At\_Home}),

Entertainment\_Devices}))

revokeRPDR(giuseppe,Entertainment\_Manager,({(teenager,{Entertainment\_Time}),Entertainment\_Devices}))

revokeRPDR(giuseppe,Entertainment\_Manager,({(teenager,{EntertainmentTime}),PlayStation\_Device}))

revokeRPDR(alessio,Teenager\_Devices\_Manager,({(teenager,{Any\_Time}),Teenager\_Controlled}))

revokeRPDR(alessio, Teenager\_Devices\_Manager, ({(teenager,{Entertainment\_Time}),

PlayStation\_Device}))

revokeRPDR(alessio,Teenager\_Devices\_Manager,({(guest,{At\_Home}), PlayStation\_Device}))

revokeRPDR(catia, Cleaning\_Manager, ({(maid, {At\_Home}), Cleaning\_Devices }))

revokeRPDR(catia, Cleaning\_Manager, ({(maid, {At\_Home}), Garage\_Device}))

revokeRPDR(catia, Cleaning\_Manager, ({(maid, {At\_Home}), Windows\_Devices }))

revokeRPDR(bob, Kitchen\_Manager, ({(chef,{At\_Home}),Kitchen\_Devices}))

revokeRPDR(bob, Kitchen\_Manager, ({(chef,{At\_Home}),Lighting\_Devices}))

revokeRPDR(gaia,Kids\_Manager,({(babysitter,{Friday}), Kids\_Friendly\_Content }))

revokeRPDR(gaia, Kids\_Manager,({(babysitter,{Wednesday}),Kids\_Friendly\_Content }))

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SAMPLE ANALYSIS QUESTIONS

1. (reachability) Can the babysitter of Friday control the clock device?

She could change the date and get the same privileges as the babysitter of Wednesday

In base alle regole della politica, la babysitter non ha accesso all’orologio

1. (escalation of privileges) Can a guest get the same privileges as the home (parent) and control Owner Controlled devices?

In base alle regole della politica, un ospite non ha accesso ai dispositivi del proprietario

1. (availability) Can a maid clean a room and use the cleaning devices if she doesn’t have access to the room she has to clean?

Se ci sono le regole per assegnare luci e porta, la domestica può avere accesso ai cleaning devices. No altrimenti

1. (reachability) Can a kid control the adult devices?

No, l’analisi ha richiesto più tempo ma sempre nel giro di secondi

1. (reachability) Can a user control the smart toy?

This is problematic because he could spy on or interact with the child playing with the toy

La babysitter può controllare i dispositivi per bambini, ad un ospite viene invece negato l’accesso in base alle regole della politica

1. (reachability) Can the maid control the robot vacuum cleaner? Vacuum cleaner is in the role Cleaning Devices so the query will be in the form:

<Admin, R\_maidAtHome&CleaningDevices, target>

This is another possible threat since the user could steal information like the home’s layout or even monitor residents’ activities

La domanda a questa risposta sarà yes perché lei può controllare i cleaning devices in cui è contenuto il robot ma non potrà accedere alle impostazioni in quanto ha solo la possibilità di accenderlo e spegnerlo (ha solo il permesso P29)

1. He, Weijia, et al. "Rethinking Access Control and Authentication for the Home Internet of Things ({IoT})." *27th USENIX Security Symposium (USENIX Security 18)*. 2018. [↑](#footnote-ref-1)