Instantiable service composition in the home environment

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Home environment

- A lot of devices
  - TV, DVD players
  - HiFi systems, MP3 players
  - Digital cameras, camera enabled phones
  - ...

- Collaboration of devices
  - Starting a slide show from my camera on the TV
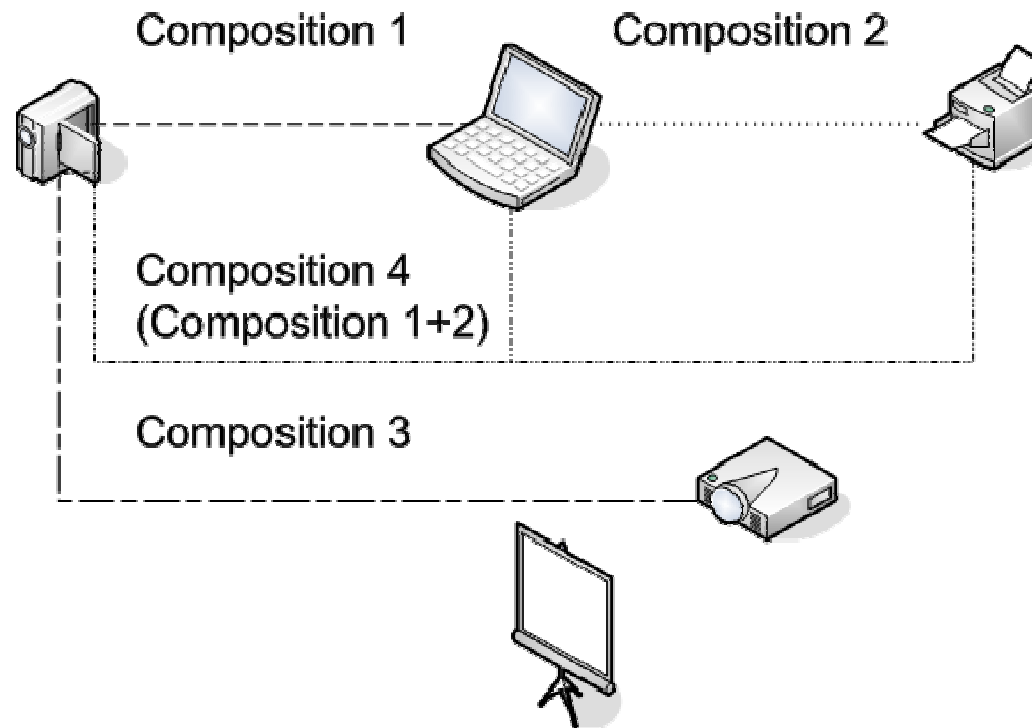 - Listening my MP3 file on the HiFi

Collaboration of devices

- ○ **Difficult setup**
  - Need human intervention
  - Connecting / disconnecting devices
  - Configuring devices

- ○ **Objective**
  - Easy connection of devices to better exploit the potential of the home environment

Approach

- Rely on service composition
- Propose the user available composed services

Instantiable service composition (ISC)

- ○ Service composition
  - Involved services and devices
  - Service connection
  - Composition control

- ○ Instantiable composition
  - Devices / services belong to class
    - ○ Cameras, monitors, MP3 players
  - Do not associate a composition to specific devices
  - Associate composition to class of devices
  - Instantiate composition at runtime

ISC content

- Purpose of the composition
- Classes of the required devices
- Description of the in / out / control ports
  - Sufficiently detailed to be meaningful
  - Broad enough to not exclude similar services
- Connection of ports
  - out camera => in monitor
- Code to control the composition
- Interaction point with the user

ISC example

Parameter			Value
Description			Show an image from <service1> on <service2>
Purpose			<usersensation::visual><action::show><object::image>
Class of required devices			service1:<image provider:fipa.profiles.device.camera> service2:<image display:fipa.profiles.device.monitor>
IN/OUT/ CONTR des- cription	service1	IN OUT CONTR	in1:<storage><object::image> out1:<object::image> contr1:<service1::in1:service1::out1>
	service2	IN OUT CONTR	in1:<object::stream> in2:<object::image> out1:<usersensation::visual><action::show> contr1:<service2::in1,2:service2::out1>
Connection			<service1::out1,service2::in1,2>
External IN/OUT/ CONTR		IN OUT	service1::in1 service2:out1
Synchronization			NA
Interaction point			service2::out1

Service description

Parameter			Value
Purpose			<action::server><object::image>
Device class			<image provider:fipa.profiles.device.camera>
IN/OUT/ CONTR des- cription	*camera: Sony Cyber Shot P92,43- 26-48- 2s*	IN OUT CONTR	in1:*<storage><object::image:: JPG,RAW-Sony >* out1:*<object::image::JPG,RAW-Sony>* contr1:*<camera::in1:camera::out1 >*

Parameter			Value
Purpose			<action::show><object::image,stream>
Device class			<image provider:fipa.profiles.device.monitor>
IN/OUT/ CONTR des- cription	*monitor: Dell TKJ 21.43.79*	IN OUT CONTR	in1:*<object::stream::ASF>* in2:*<object::image::JPG,PNG>* out1:<usersensation::visual><action::show> contr1:<monitor::in1,monitor::out1>

Device description

○ Rely on the FIPA ontology

Profile	fipa.profiles.device.camera			
Ontology	Fipa-Device			
Parameter				**Value**
info-description		name		Sony CyberShot
		vendor		Sony Corp
		version		P-92
type				photo camera
agent-compliancy				true
hw-desc	connection-description	info-description	name	Bluetooth
			version	x.x
	connection-description	info-description	name	S-Video
			version	y.y
	ui-description	screen-description	size	1,5
			unit	inch
		audio-input		false
		audio-output		false
	memory-description	memory-type-description	unit	MB
			usage-type	storage
			amount	256
sw-desc	info-description	name		Sony
		vendor		x.x
		version		x.x
	agent-platform	name		true
		dynamic		true

Instantiation

- ○ User experience
  - List of possible compositions
  - Selection of one composition
  - Instantiation of the composition
  - Presentation of the GUI of the composition

Instantiation

- System point of view
  - Monitor available devices and services
  - Determine possible compositions
  - Instantiate selected composition
    - Connect ports of services
    - Configure devices
    - Present user interface

Instantiation

Parameter			Value
Description			Show an image from *<camera>* on *<monitor>*
Purpose			<usersensation::visual><action::show> <object::image>
Class of required devices			service1: <image provider:fipa.profiles.device.camera> service2: <image display:fipa.profiles.device.monitor>
IN/OUT/ CONTR des- cription	*camera: Sony Cyber Shot P92,43- 26-48- 2s*	IN OUT CONT R	in1:*<storage><object::image:: JPG,RAW-Sony >* out1:*<object::image::JPG >* contr1:<camera::in1:camera::out1>
	monitor: Dell TKJ 21.43.79	IN OUT CONT R	in1:*<object::image::JPG>* out1:<usersensation::visual><action::show> contr1:<monitor::in1,monitor::out1>
Connection			<camera::out1,monitor::in1,2>
External IN/OUT/ CONTR		IN OUT CONTR	camera::in1 monitor:out1 NA
Synchronization			NA
Interaction point			monitor::out1

Related works

- ○ Bluetooth
  - Only static association between devices

- ○ Amigo
  - Dynamic composition of services
  - Rely on a centralized middleware

Conclusion

- Underused potential in the home environment
  - Difficult coordination of device
- Proposition
  - Instantiable service composition
  - Monitor available services
  - Propose to the user possible composition

Future works

- Implementation
  - Rely on our context-aware middleware
  - Need an additional service discovery layer
  - Represent services as components
  - Connect services via component connection
- Reuse Amigo results where possible
- Composition of ISC
- What about Web services ?
  - Connection of a Web service to an ISC

Thank you for listening!

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