

Phonon and NMM

M. Kretz B. Fuchshumer M. Lohse M.
Repplinger

LinuxTag 2006



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The people in front of you are...

- ▶ **Matthias Kretz**
 - ▶ studies physics and computer science in Heidelberg
 - ▶ started as KView Maintainer in 2000
 - ▶ continued with contributions to multimedia projects, esp. aRts
 - ▶ two years ago started to focus on aRts replacement
- ▶ **Michael Repplinger**
 - ▶ PhD student at Saarland University
 - ▶ developer for the NMM project since 2000

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KDEMM

remember last year?

- ▶ talk about KDEMM last year at LinuxTag
- ▶ KDE Multimedia API for KDE 4
- ▶ renamed to Phonon at the beginning of this year

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- ▶ **task-oriented design**
- ▶ 80/20
- ▶ easy multimedia development
- ▶ no “competition” for GStreamer/NMM like media frameworks
- ▶ already in KDE SVN: trunk/KDE/kdelibs/phonon

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the user's perspective

- ▶ A user should be able to playback any media without configuration steps
- ▶ “power users” want great flexibility
- ▶ additional multimedia hardware should be available to all applications without any further steps
- ▶ users need to decide what device to use for what purpose/program
- ▶ KDE should not get in the way of “media producers”

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the developer's perspective

- ▶ **Qt/KDE style API**
- ▶ developers need APIs that are straightforward, easy to use and understand
- ▶ applications need a multimedia API that works on UNIX systems (including OS X) and Windows
- ▶ ABI changes should not hinder KDE from using the newest version of some media framework

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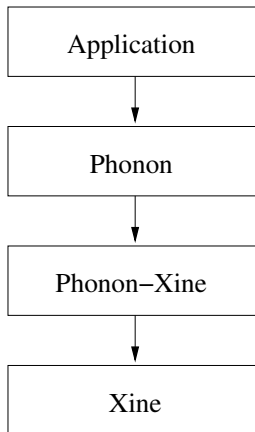
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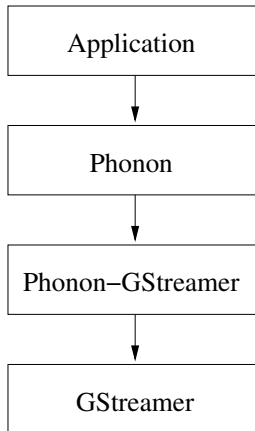
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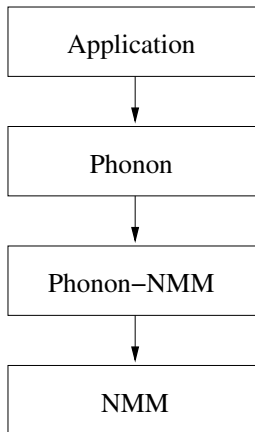
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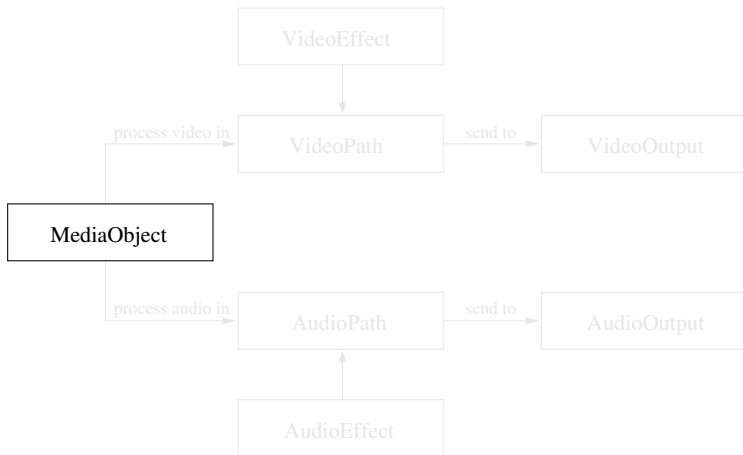
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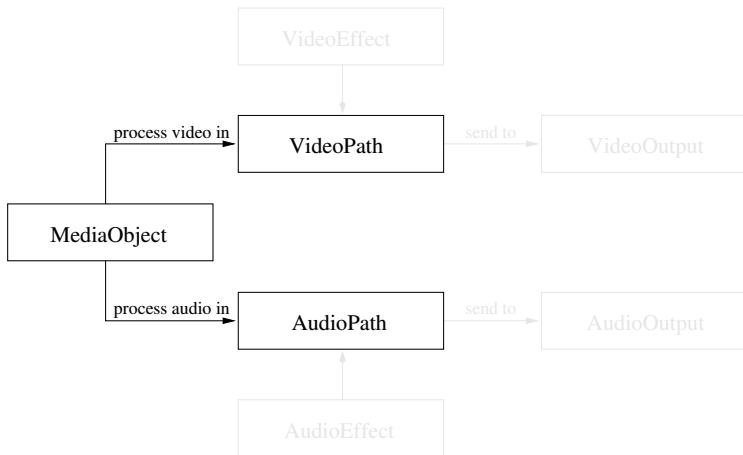
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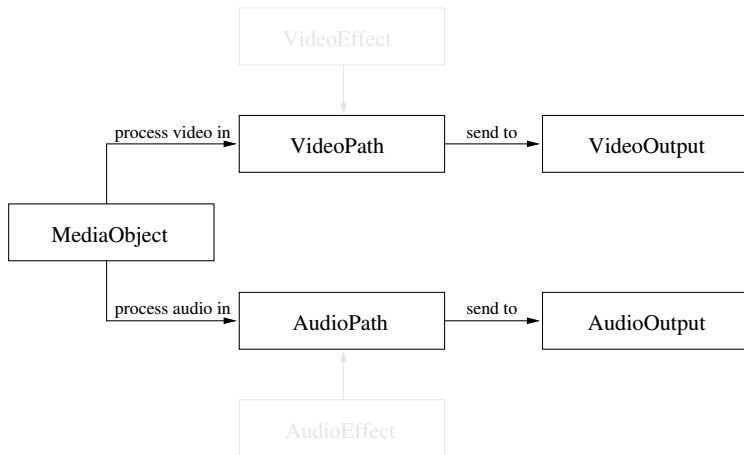
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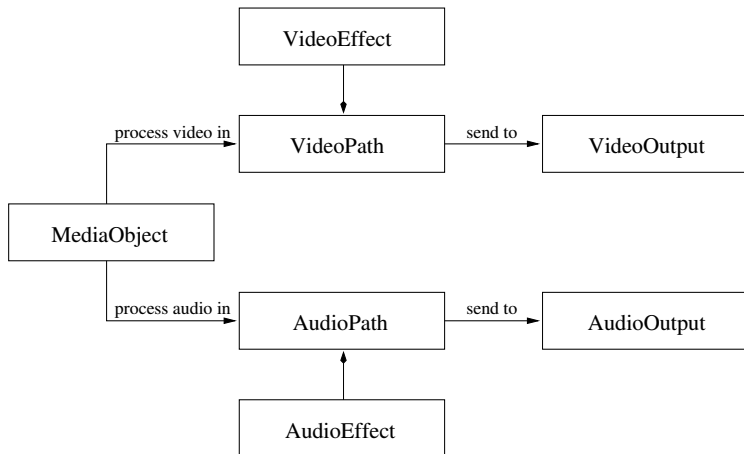
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- ▶ AvCapture

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- ▶ AudioDataOutput

▶ AbstractVideoOutput

- ▶ VideoWidget
- ▶ VideoDataOutput

▶ AudioPath

▶ VideoPath

▶ AudioEffect

- ▶ VolumeFaderEffect

▶ VideoEffect

▶ NameDescriptionTuple

- ▶ AudioOutputDevice
- ▶ AudioCaptureDevice
- ▶ VideoOutputDevice
- ▶ VideoCaptureDevice
- ▶ AudioEffectDescription
- ▶ VideoEffectDescription

▶ Ui::VideoWidget

▶ Ui::SeekBar

▶ Ui::VolumeSlider

▶ Ui::MediaControls

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Audio Playback

the simplest case

SimplePlayer

```
SimplePlayer* player = new SimplePlayer;  
player->play( "file:///home/user/song.ogg" );
```

seek/pause/stop

```
player->seek( milliseconds );  
player->pause();  
player->stop();
```

volume

```
float volume = player->volume();  
volume *= 0.5;  
player->setVolume( volume );
```



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Audio Playback

with more control

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define the output

```
output = new AudioOutput;  
output->setCategory( Phonon::MusicCategory );  
path1 = new AudioPath;  
path1->addOutput( output );
```



simple MediaObject use

```
medial = new MediaObject;  
medial->addAudioPath( path1 );  
medial->setUrl( "file:///home/user/song.ogg" );  
medial->play();
```

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simple MediaObject use

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medial = new MediaObject;  
medial->addAudioPath( path1 );  
medial->setUrl( "file:///home/user/song.ogg" );  
medial->play();
```

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Audio Playback

adding a Fader

Phonon and NMM

Kretz,
Fuchshumer,
Lohse, Repplinger

recall the AudioPath

```
path1 = new AudioPath;
```



insert the Fader

```
fader1 = new VolumeFaderEffect;  
fader1->setVolume( 1.0 );  
path1->insertEffect( fader1 );
```

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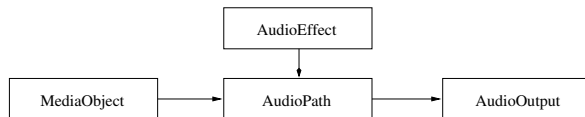
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prepare next MediaObject for Crossfade

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```
path2 = new AudioPath;  
path2->addOutput( output );  
media2 = new MediaObject;  
media2->addAudioPath( path2 );  
media2->setUrl( "file:///home/user/moremusic.  
ogg" );  
fader2 = new VolumeFaderEffect;  
fader2->setVolume( 0.0 );  
path2->insertEffect( fader2 );
```



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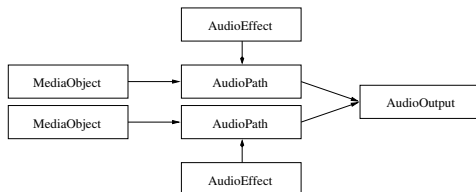
Audio Playback

prepare next MediaObject for Crossfade

Phonon and NMM

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media2 = new MediaObject;  
media2->addAudioPath( path2 );  
media2->setUrl( "file:///home/user/moremusic.  
ogg" );  
fader2 = new VolumeFaderEffect;  
fader2->setVolume( 0.0 );  
path2->insertEffect( fader2 );
```



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Crossfade 2s before the first song ends

```
media1->setAboutToFinishTime( 2000 );  
connect( media1, SIGNAL( aboutToFinish( long )  
        ), SLOT( crossfade( long ) ) );
```

```
void MyPlayer::crossfade( long remaining )
```

```
fader1->fadeOut( remaining );  
fader2->fadeIn( remaining );  
media2->play();
```

Phonon and NMM

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- ▶ Every `AudioOutput` has a volume control
- ▶ Volume can be read and written using IPC
- ▶ Central “desktop-mixer” can then control the volume of all Phonon applications
- ▶ To not let the number of volume controls explode they are be combined into the categories Notifications, Music, Movies, Games and Communication

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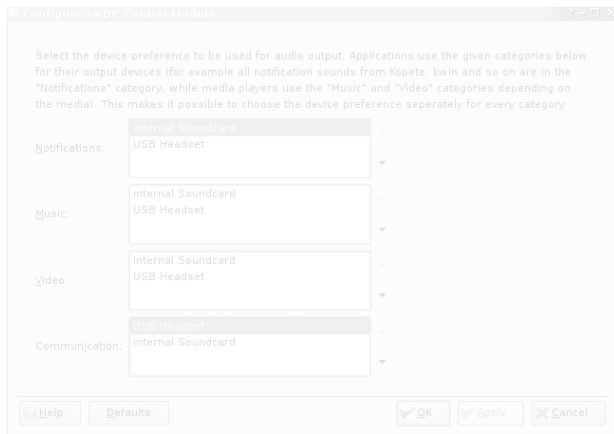
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- ▶ central place for device selection
- ▶ select device per category
- ▶ applications can override the selection



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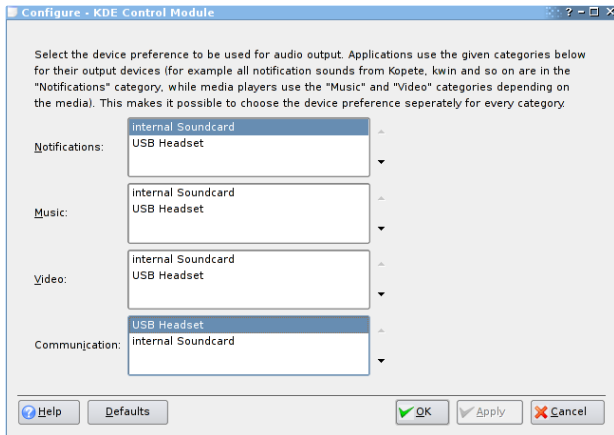
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- ▶ hotplugging a device will change outputs to the new device if it is preferred
- ▶ consider VoIP
 - ▶ call comes in
 - ▶ you answer the call using the internal soundcard
 - ▶ plug in the USB headset
 - ▶ notification shows that the device has been switched
 - ▶ you can use your headset for the conversation now

Configuration

or: Hiding tedious configuration work from the user

- ▶ applications should not need to configure the sound system, selecting the device to use is enough
- ▶ one central place for configuration
- ▶ configuration options include
 - ▶ default video output device
 - ▶ default capture devices
 - ▶ whether to use a soundserver (the soundserver will then be started by KDE and made available as a device)
 - ▶ backend specific options
- ▶ For system wide integration a shared configuration is needed for the cases where hardware mixing or ALSA dmix is unavailable

Phonon and NMM

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Network and Special Routing

or: How to integrate NMM

- ▶ NMM provides for a high degree of network transparency
- ▶ Out of scope for the Phonon API
- ▶ IPC hooks in the NMM backend
- ▶ NMM-Phonon control application

Phonon and NMM

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Where do I Start?

- ▶ many classes to implement
- ▶ starting point: `Backend` class
 - ▶ `mediaframework` initialization
 - ▶ works as factory for all other classes
- ▶ then implement `MediaObject`, `AudioPath` and `AudioOutput`: enough for audio playback

Phonon and NMM

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Main Audio Playback Classes

MediaObject

- ▶ read and decode mediafile
- ▶ play, pause, stop, seek, tick
- ▶ takes multiple `Audio-` and `VideoPaths`

AudioPath

- ▶ defines routing (and signal processing)
- ▶ takes multiple `AudioOutputs`

AudioOutput

- ▶ defines audio sink
- ▶ software volume control

Phonon and NMM

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- ▶ 1:1
 - ▶ Phonon objects create and hold objects of the media framework
 - ▶ good when there's a 1:1 mapping between Phonon classes and media framework classes
- ▶ Phonon objects as description
 - ▶ Phonon objects describe what the application wants
 - ▶ Backend object(s) look at what the user wants and wire media framework objects accordingly

using Multimedia functionality in KDE 4 will be easier for

- ▶ developers
- ▶ users

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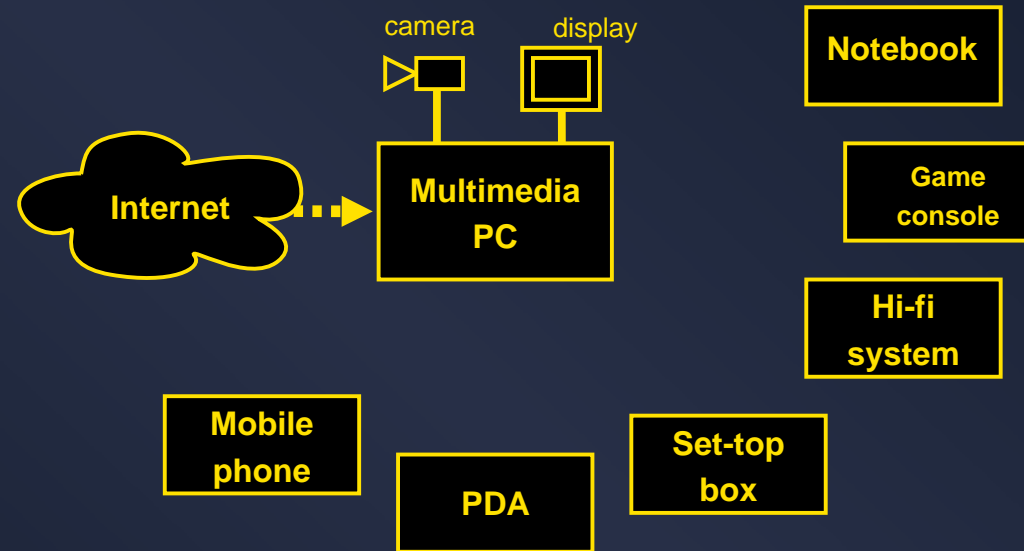
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Q&A

Outlook

- ▶ network interfaces, DVD-/TV-Support, OSD
- ▶ **backend development**
- ▶ review
- ▶ more tests
- ▶ backend “certification” tests

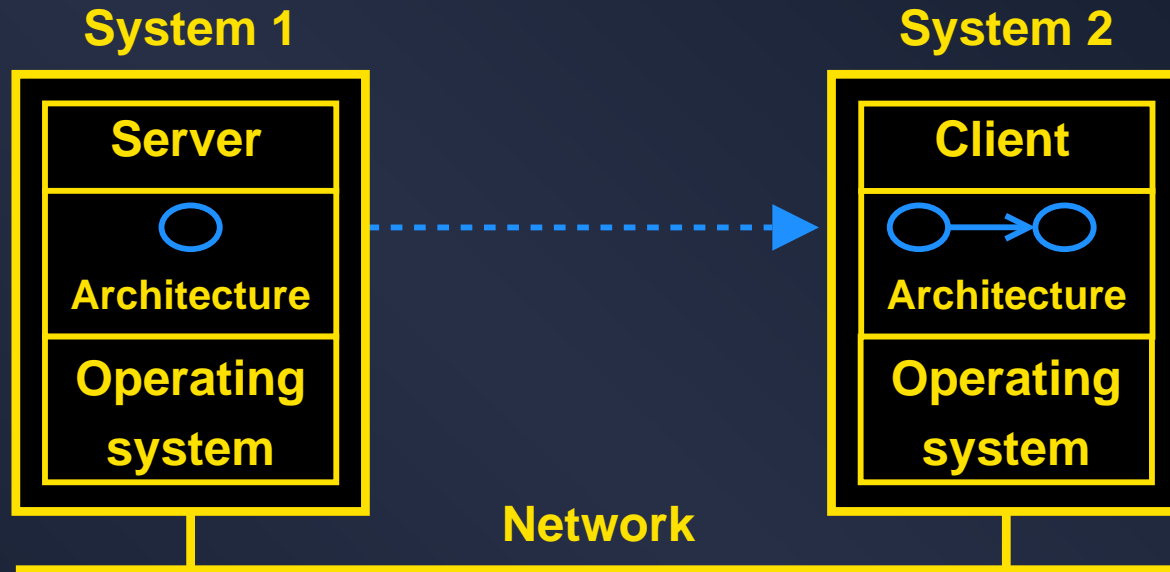
Network-Integrated Multimedia Middleware (NMM)



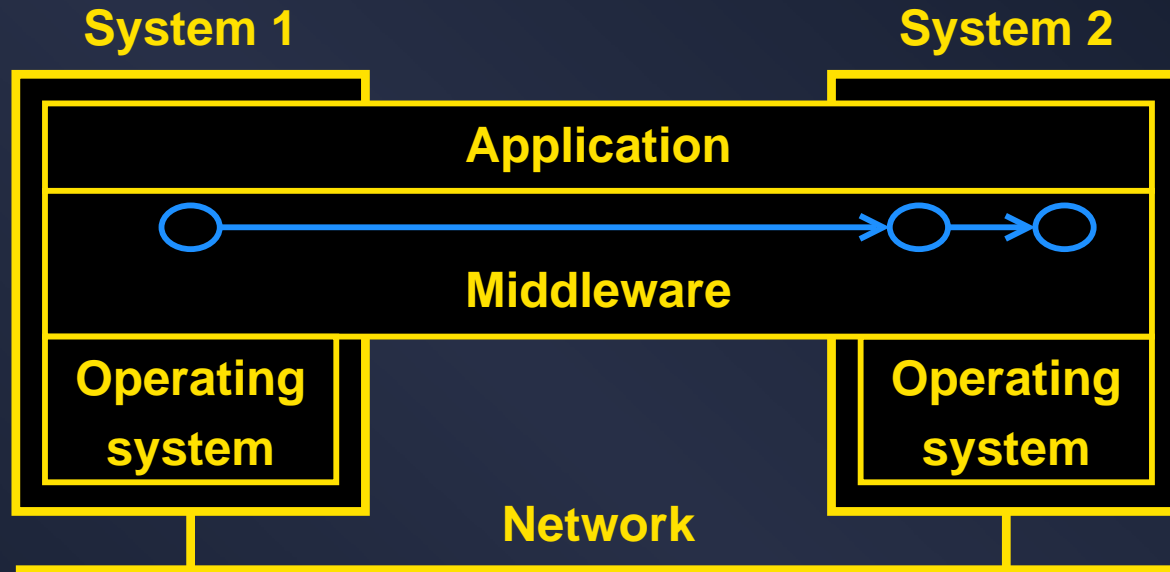
- Growing number of multimedia devices
- Fully programmable
- One or more networking interfaces

⇒ Unexploited networking capabilities: Why?

Client/Server Streaming



- Network: Client/server streaming \Rightarrow Black-box
 - Control?
 - Extensibility?
 - Complex application scenarios?



- Distributed software layer
 - Transparency: Access, control, and connect distributed devices and software components
- ⇒ Eases development of networked applications

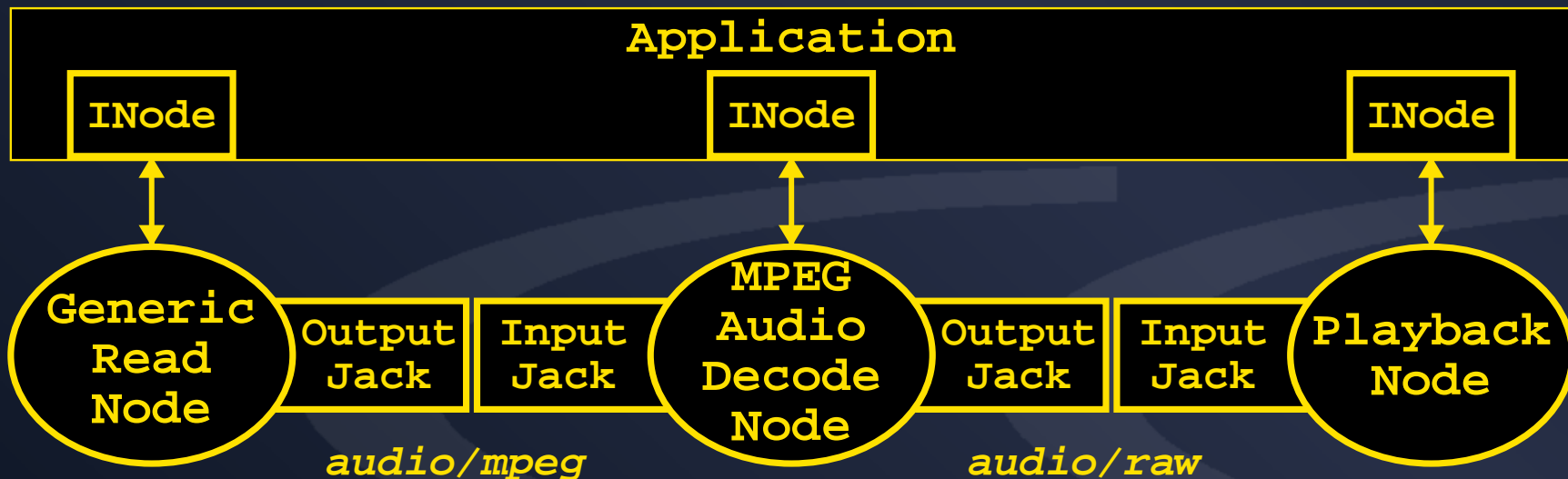
- Each application has ...
 - Full access to all resources within the network: devices and processing power
- Example: A simple mobile device ...
 - Includes TV receiver of remote system
 - Access to processing power for media conversion (transcoding)
 - High-quality audio output using nearby hi-fi system
 - “Remote control” for all other devices

- Nodes as smallest processing unit
- Jacks to connect nodes
- Formats to type connections
- Interfaces to control objects
- Messages to forward media data or control information

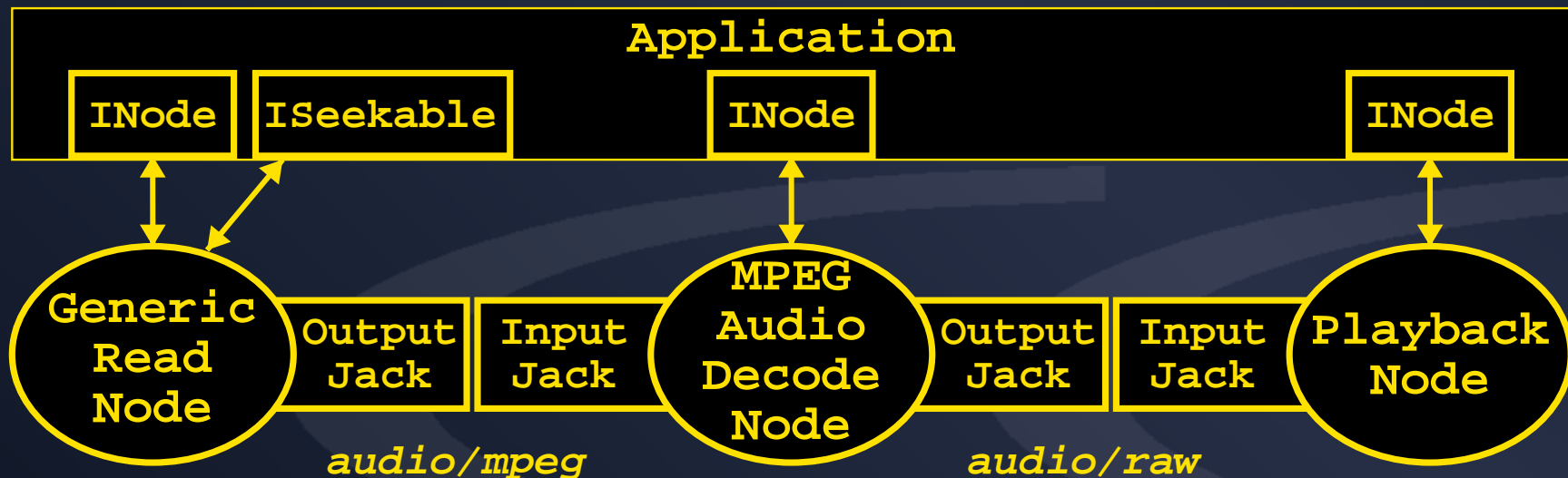
Application



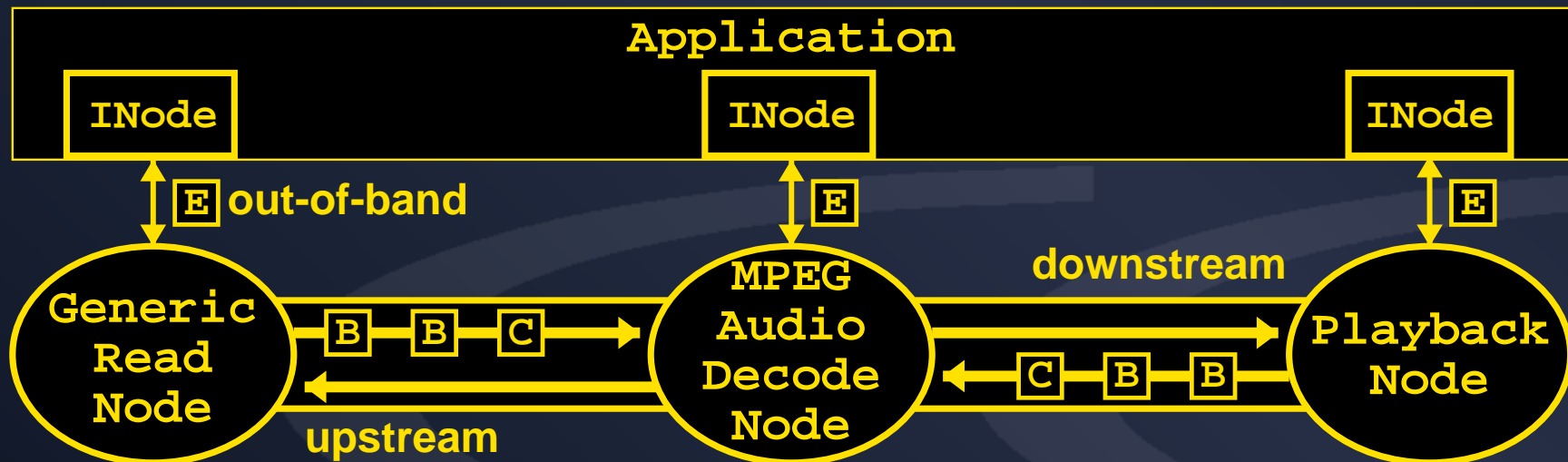
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- Source
 - CDDA, DVD/menus, WinTV PVR, KFIR, DVB, Firewire, VISCA cameras, audio devices, WAV, AVI
- Encoder/decoder/converter/filter
 - MPEG audio, MPEG video, DivX, Ogg/Vorbis, SPU, PNG, JPEG, RTJPEG
 - Color space, video scaler, on-screen menus, deinterlacer
- Multiplexer/demultiplexer
 - AVI, MPEG, OGM
- Sink
 - Video output via X or OpenGL, audio devices, WAV, AVI

- clic – command line interaction and configuration
 - Quick prototyping of distributed flow graphs from textual descriptions
- Multimedia-Box (Saarland University)
 - “All-in one” solution for TV, DVD, CD, ...
 - Test-bed for new application scenarios
- External Open Source projects
 - Playback engine for amarok
 - Underlying framework for upcoming KDE 4 MM architecture

- Unique features
 - Open micro-core architecture: Integration of arbitrary streaming/control protocols, networking technology, and multimedia components
 - Transparently distributed data flow graphs including distributed synchronization
 - Advanced middleware services for networked home entertainment

⇒ Enabling technology for distributed multimedia

⇒ Only full-featured multimedia middleware available

⇒ <http://www.networkmultimedia.org>

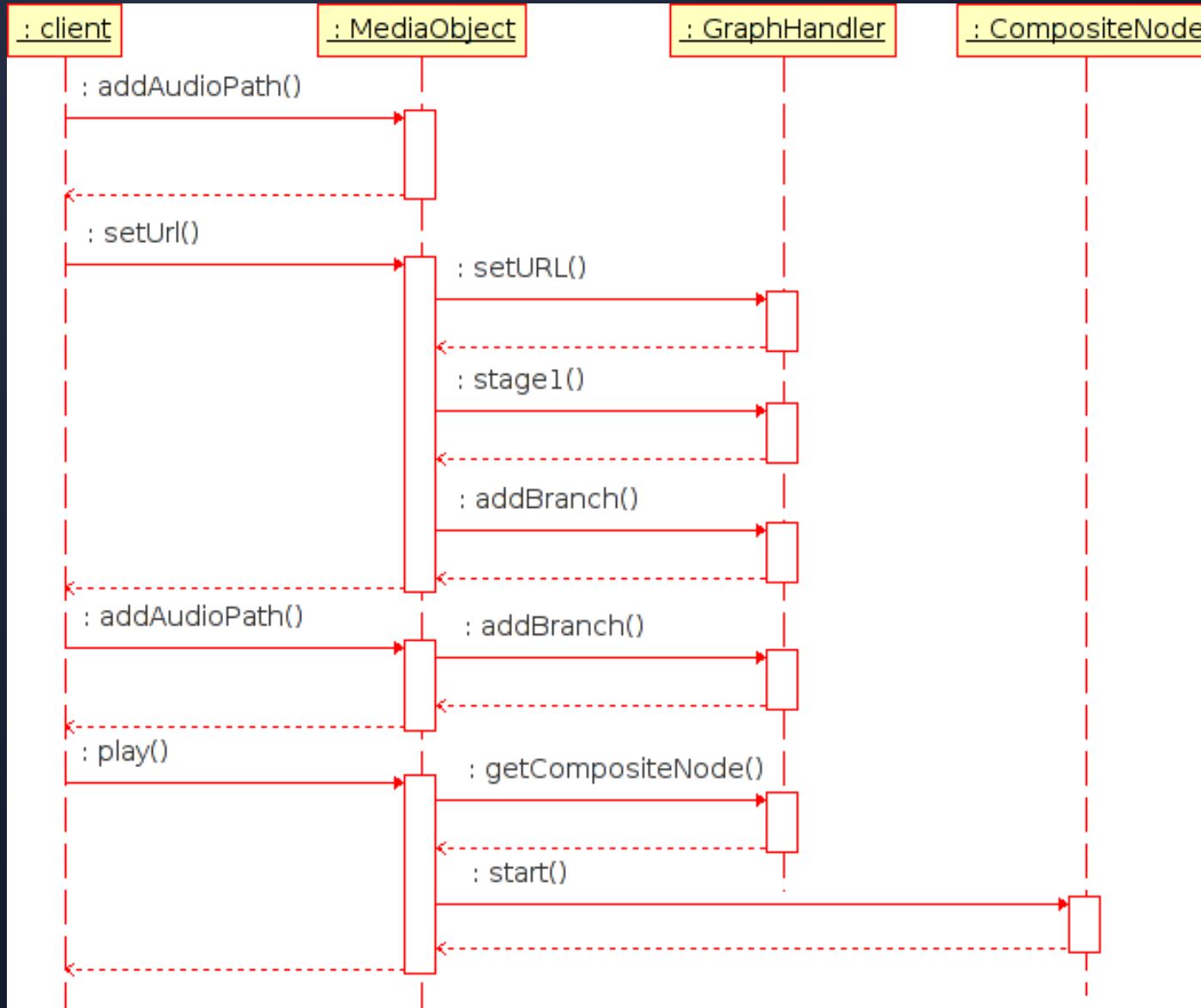


Phonon-NMM Backend

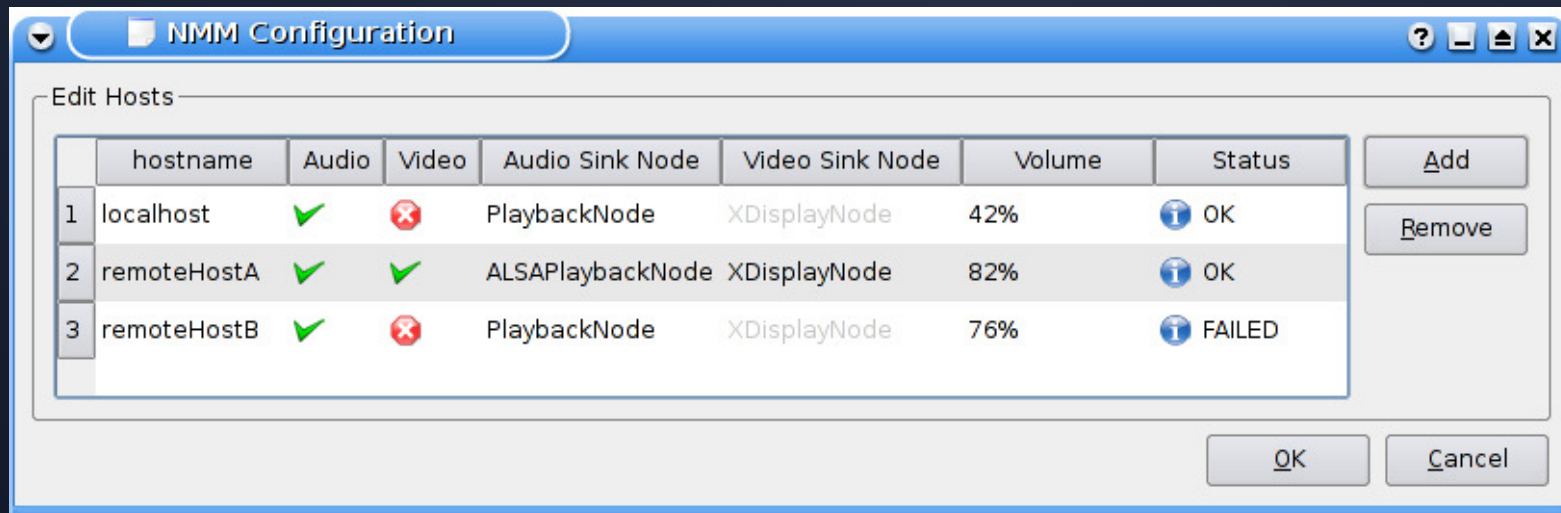
- GraphHandler
 - Provides all functionality required by Phonon
 - Automatically setup flow graphs from a URL
 - Information about media content can be queried
 - Allows to add an arbitrary number of local and remote audio and video sinks
 - New local and remote sinks can also be added during playback
 - Adds additional converter components automatically

- Phonon-NMM MediaObjects
 - Use GraphHandler to read the URL and setup the flow graph
 - Get information about the media from GraphHandler
 - Forward control information to GraphHandler
- Phonon-NMM MediaPathes
 - Use GraphHandler to add new local and remote sources
 - MediaPath can also be added during playback

Phonon Integration (2)



- Separate configuration application
 - Support for playback on multiple audio and video sinks (locally and remote)
 - Multiple users simultaneously enjoy the same content
 - Transparent control of remote components



- Smaller tasks
 - Implement volume control
 - Improve usage of configuration application
 - Use and test the Phonon-NMM backend
- Bigger tasks
 - Implement audio and video effects for Phonon
 - Implement a/v capturing for Phonon
 - Implement elements for user interaction (e.g. video widget)
 - Implement future extensions of Phonon

Google Summer of Code



- Improve and extend the implementation of the Phonon backend using NMM

- Phonon - New media framework for KDE4
 - Provides unified interface for multimedia functionality
 - Uses backends to integrate multimedia platforms
- Network-Integrated Multimedia Middleware (NMM)
 - Transparently distributed flow graphs
 - Provides services for networked multimedia
- Phonon-NMM Backend
 - First working backend for Phonon
 - Provides new and unique features to the KDE4 user

Demonstrations

Discussion