



# **ΔALERT**

**Collaboration in open source software  
development: the ALERT approach**

**Ljiljana Stojanovic, Jun Ma, Sinan Sen**

# BPM & Collaboration



- **Business process management (BPM)** is a systematic approach to making an organization's workflow more effective, more efficient and more capable of adapting to an ever-changing environment
- There are **two kinds of business processes**:
  - **Mechanistic business processes** are on the most part implemented by machines and human involvement is limited to key decision and data entry points
    - They are routinized and often semi- or fully automated
  - **Human-driven processes**, differ from this in that they are fundamentally **collaborative**, dynamic and innovative
    - These processes depend on interaction and are dynamically shaped by the participants

# Agenda



- **Introduction**
- Our approach
- Conceptual architecture
- Conclusion

# Introduction



- Large scale software development is an inherently collaborative, team based process, and hence requires **coordination** and control in order to make it successful
- The use of **communication** technologies (e.g., e-mails) alleviates problems caused by separation of workers in time and space, studies have often found them to be not as effective as publicized
- The main problem is that, in order to enhance coordination, communication must be **efficient** (i.e. timely and clear) and **effective** (i.e. targeted)

# Introduction



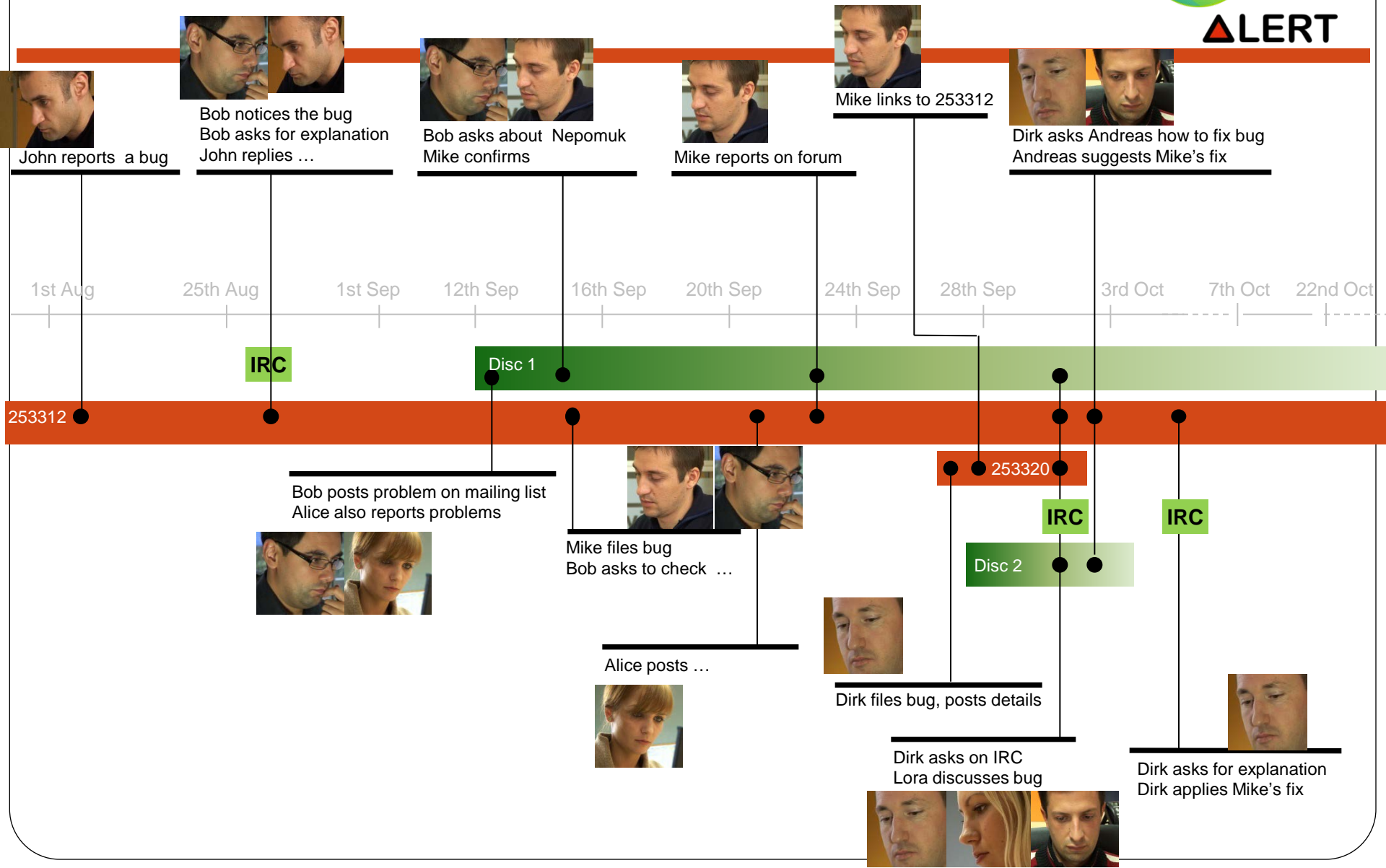
- FLOSS communities use a **variety** of communication tools . This makes the information pull very **heterogeneous, distributed and not well-linked** on the basis of its content
  - mailing lists for technical discussions, a BTS for monitoring and fixing bugs, a CVS code repository for storing a common version of the code, etc.
- FLOSS communities are very **communication-intensive**, which causes a kind of **information overload**
  - The KDE Bugzilla contains 18000/15500 open bugs/ feature. During the last year 38000 Bugzilla entries were opened
  - There are about 100 active KDE mailing lists which accumulate about 1400 messages a day
- FLOSS developers are said to **autonomously** decide how and when to contribute to project development. This makes the **awareness** about the work and need of others very vague

# Agenda

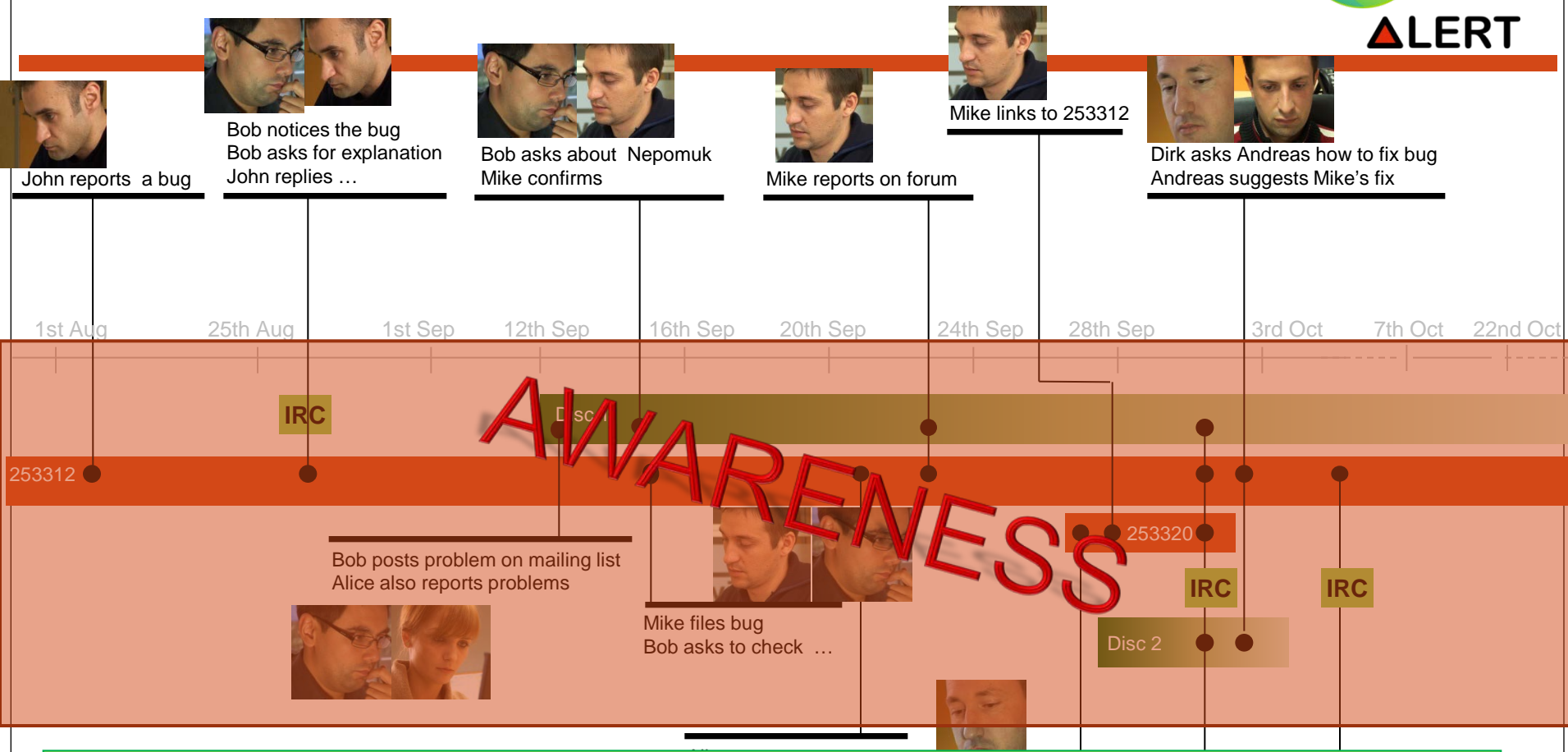


- Introduction
- **Our approach**
- Conceptual architecture
- Conclusion

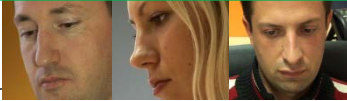
# Research challenges



# Research challenges



- How to coordinate and maintain awareness of community activities?  
The information and interactions relating to the bug were located in multiple artefacts with no links. Thus, a duplicate bug was filed.





INTERPRETATION

Senden | Optionen... | Hilfe

An...: kde-faq@mail.kde.org

Cc...:

Bcc...:

Betreff: AW: Dolphin crashes suddenly when opening a folder.

Anlagen:

Normal | Times New Roman | 12

A B K U

**Von:** [Boban.Mitrovic@cimcollege.rs](mailto:Boban.Mitrovic@cimcollege.rs)  
**Gesendet:** Do 07.10.2010 14:04  
**An:** Alice; [kde-faq@mail.kde.org](mailto:kde-faq@mail.kde.org)  
**Cc:** Sebastian; Peter  
**Betreff:** AW: Dolphin crashes suddenly when opening a folder.

Hi again,

@Sebastian and Peter: just to check, could this issue be related with Neomuk integration? (so far this Qt-dbus crash only affected Dolphin, and I don't recall about other component which could use dbus...)

Regards,

BM

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**Von:** Alice  
**Gesendet:** Do 07.10.2010 14:04  
**An:** [Boban.Mitrovic@cimcollege.rs](mailto:Boban.Mitrovic@cimcollege.rs); [kde-faq@mail.kde.org](mailto:kde-faq@mail.kde.org)  
**Betreff:** AW: Dolphin crashes suddenly when opening a folder.

Hi,

KDE version 4.3.1 release 169

As i upgraded to kde4.3 dolphin makes trouble. It always crash when i try to change the directory, in moment as i click on a folder-icon. Have the same trouble in various programs, for example changing the download folder in Firefox etc.

Best regards,

Alice

Re



John repo

1st Aug

253312

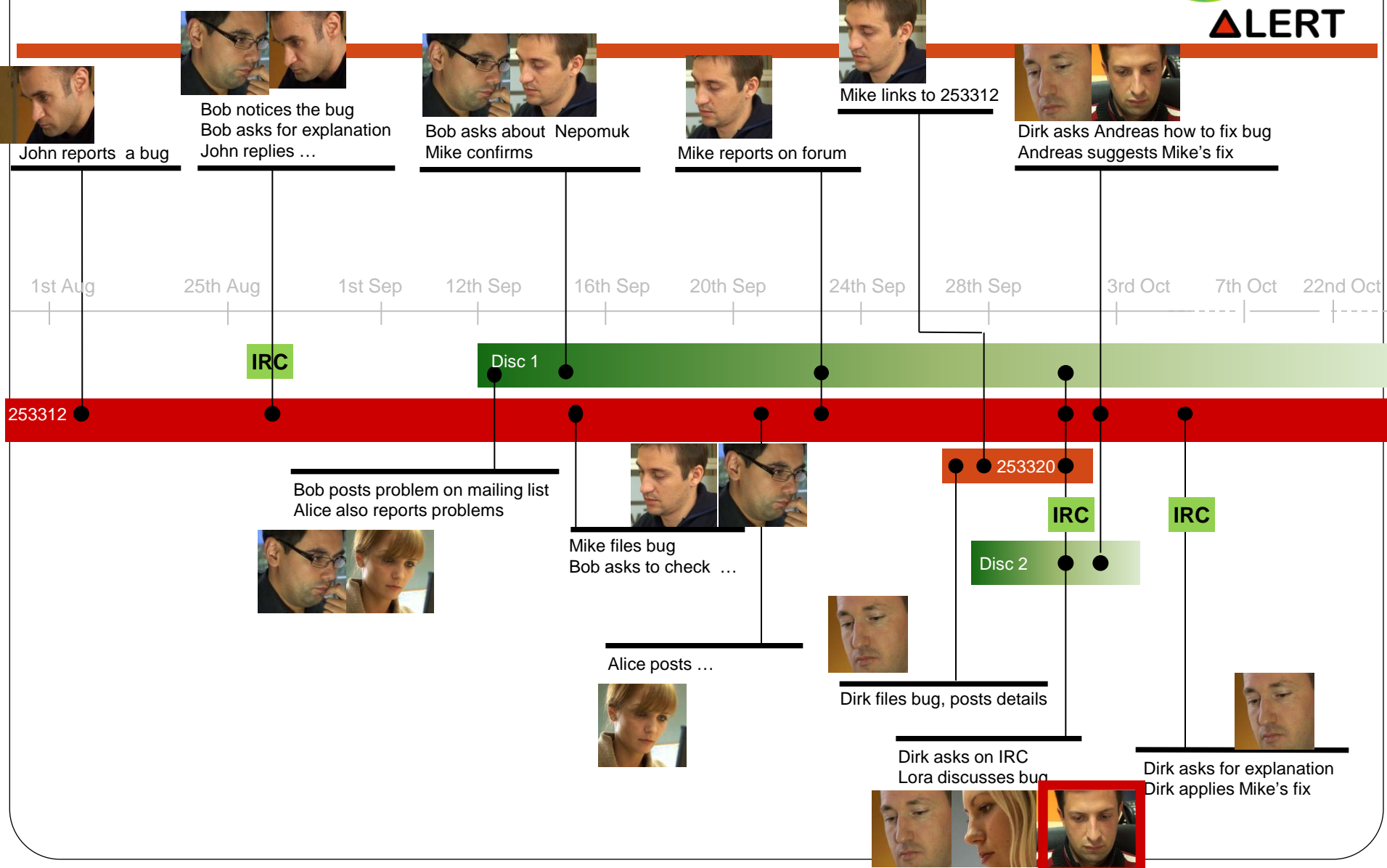
- Ho  
 Ther  
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RT

22nd Oct

m

# Research challenges



John reports a bug



Bob notices the bug  
Bob asks for explanation  
John replies ...



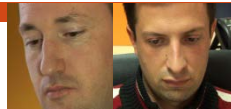
Bob asks about Nepomuk  
Mike confirms



Mike reports on forum



Mike links to 253312



Dirk asks Andreas how to fix bug  
Andreas suggests Mike's fix

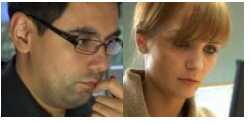
1st Aug    25th Aug    1st Sep    12th Sep    16th Sep    20th Sep    24th Sep    28th Sep    3rd Oct    7th Oct    22nd Oct

IRC

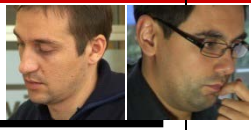
Disc 1

253312

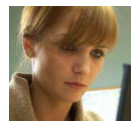
Bob posts problem on mailing list  
Alice also reports problems



Mike files bug  
Bob asks to check ...



Alice posts ...

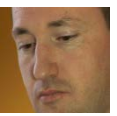


Disc 2

IRC

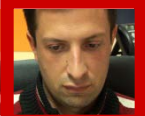
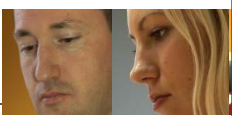
IRC

253320

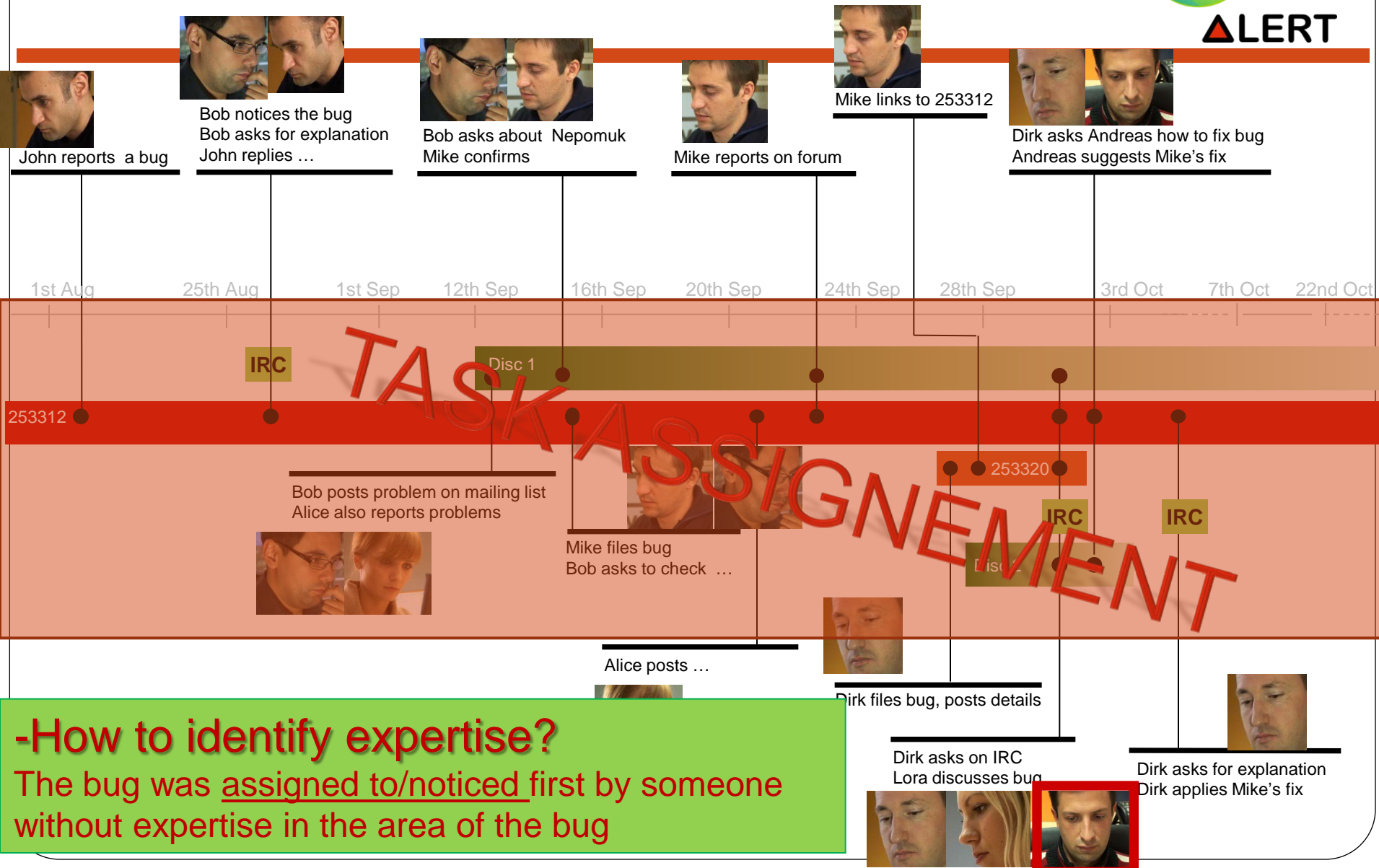


Dirk files bug, posts details

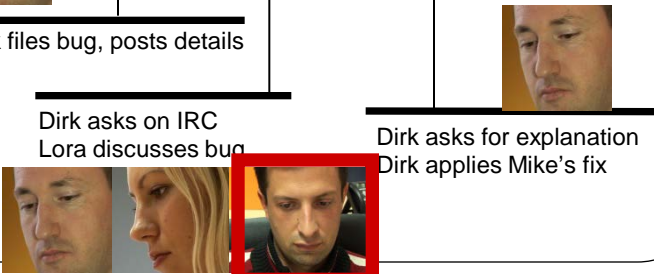
Dirk asks on IRC  
Lora discusses bug



# Research challenges



**-How to identify expertise?**  
 The bug was assigned to/noticed first by someone without expertise in the area of the bug



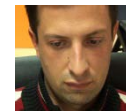
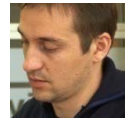
# How will the ALERT system address the identified challenges?



INTERPRETATION

AWARENESS

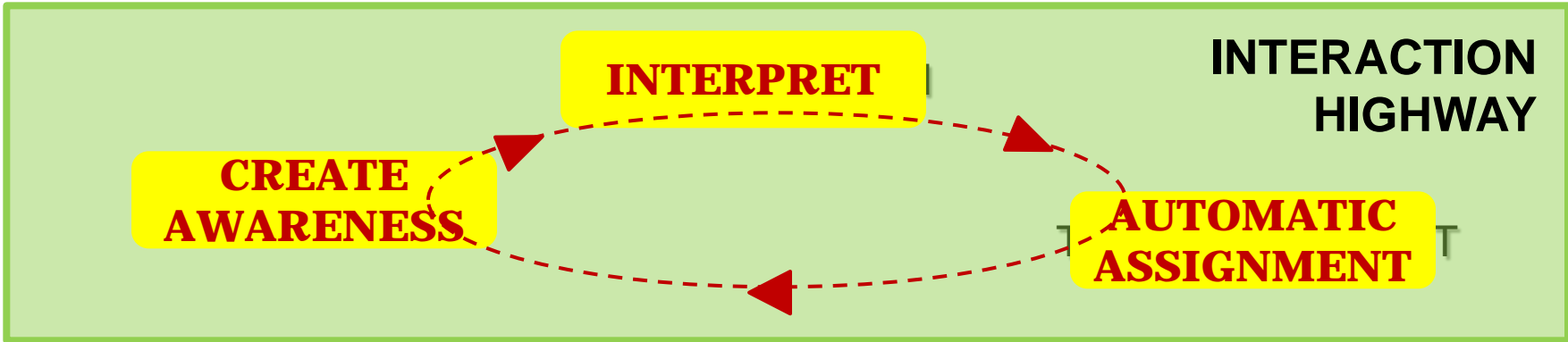
TASK ASSIGNMENT



# How will the ALERT system address the identified challenges?



A collage of various screenshots from bug reports and forum discussions. Visible text includes "Bug 210063 - dolphin crashes suddenly", "Crash of Dolphin with Nepomuk", "KDE 4.5.0 is available!", "Bug 253320 - Dolphin Qt-dbus random crashes", and "Bug 253312". The images show technical details, user comments, and system messages.





# How will the ALERT system address the identified challenges?



Information source 1

Information source 2

I.s. 3

I.s. n

continuous push of changes

INTERPRET

INTERACTION  
HIGHWAY

CREATE  
AWARENESS

AUTOMATIC  
ASSIGNMENT

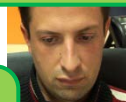
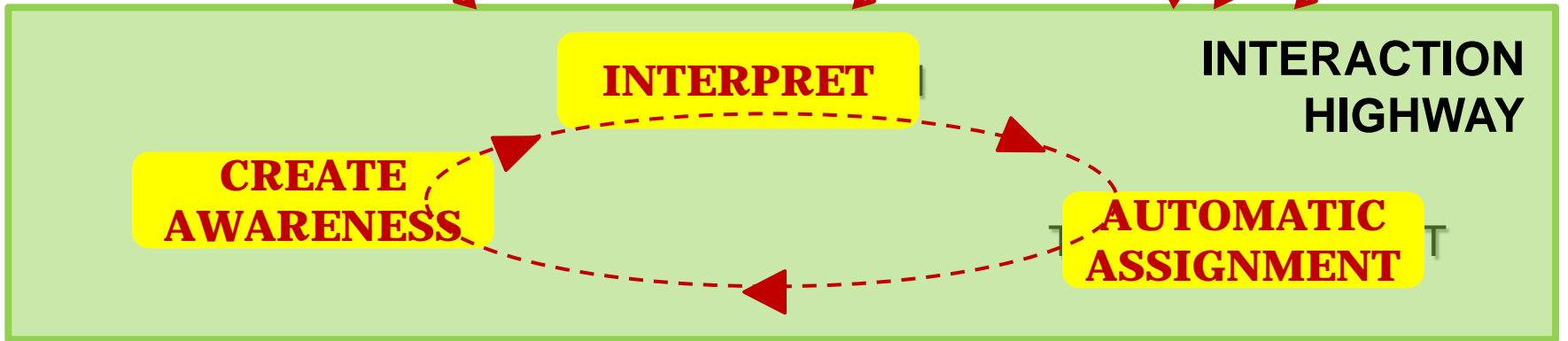
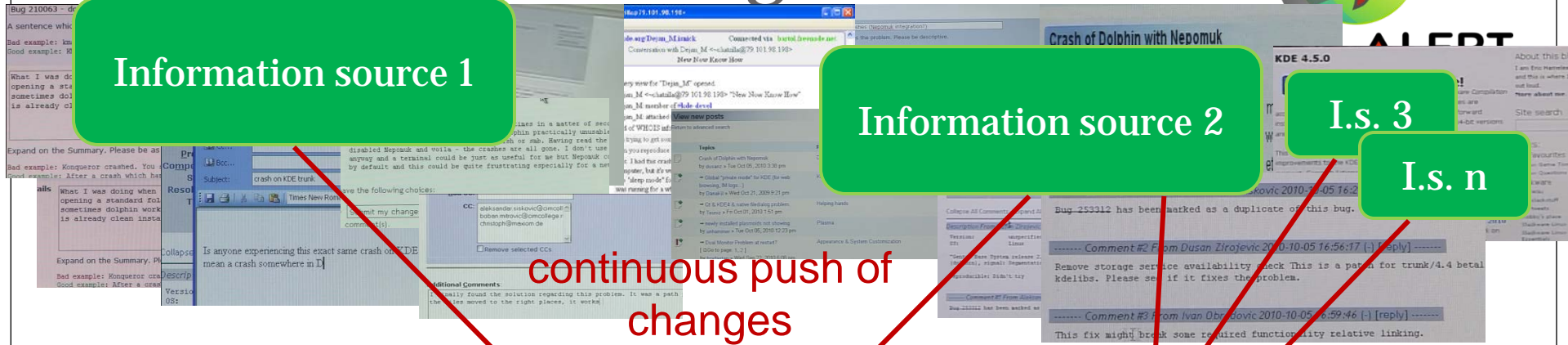
complex  
subscriptions

preferred  
information

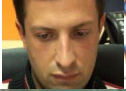
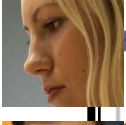
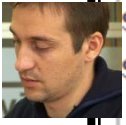
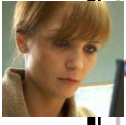
Developer 1

Developer 2

Developer m



# ALERT SYSTEM



Summary: **Dolphin Qt-dbus random crashes (Nepomuk integration?)**

Product: **dolphin** Reporter: **Dusan Zirojevic**  
 <dusan.zirojevic@cimcollege.rs>

Component: **general** Assignee: **Peter Penz**  
 <peter.penz19@gmail.com>

Status: **UNCONFIRMED**

Severity: **normal** CC: **aleksandar.siskovic@cimcollege.rs**  
**ivan.obradovic@cimcollege.rs**

Priority: **NOR**

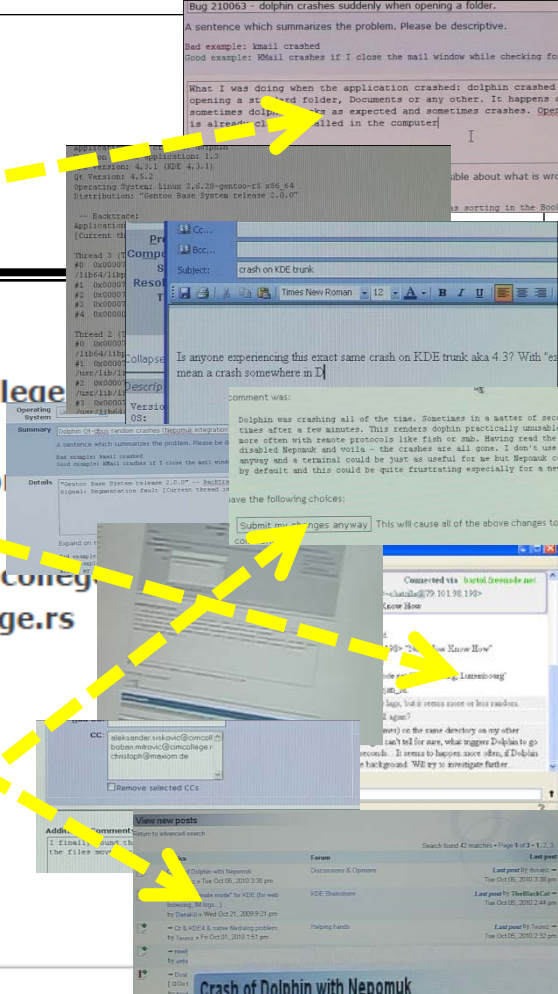
Version: **unspecified**

Target Milestone: **---**

Hardware: **Unlisted Binaries**

OS: **Linux**

Version Fixed In:



Comment #1 From Dusan Zirojevic 2010-10-05 16:20:18

unspecified (using KDE 4.3.1)  
Linux

Base System release 2.0.0 -- Backtrace: Application: Dolphin

bin), signal: Segmentation fault [Current thread is 0 (LWP 8630)

executable: Didn't try

## Crash of Dolphin with Nepomuk

2010-10-05 2010 3:38 pm  
I can confirm that Nepomuk is sort of running on my machine. I wonder if there anything I can get that's particularly useful when I experience this.

**KDE 4.5.0**

**KDE 4.5.0 is available!**  
 and I can offer you packages for KDE Software Compilation 4.5.0 for Slackware-current. The 4.5.0 packages are accompanied by a README which explains the straightforward installation/upgrade steps. As always, both 32-bit and 64-bit versions are available.

Comment #1 From Aleksandar Siskovic 2010-10-05 16:24:27 (reply)

Bug 233112 has been marked as a duplicate of this bug.

Comment #2 From Dusan Zirojevic 2010-10-05 14:56:17 (reply)

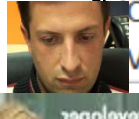
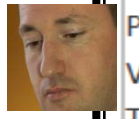
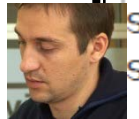
Remove storage service availability check This is a patch for trunk/4.4 beta0 kdelibs. Please see if it fixes the problem.

Comment #3 From Ivan Obradovic 2010-10-05 14:59:46 (reply)

This fix might break some required functionality relative linking.



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**Product:** dolphin **Reporter:** Dusan Zirojevic  
<dusan.zirojevic@cimcollege.rs>  
**Component:** general **Assignee:** Peter Penz  
<peter.penz19@gmail.com>  
**Status:** UNCONFIRMED  
**Severity:** normal **CC:** aleksandar.siskovic@cimcollege.rs  
ivan.gradovic@cimcollege.rs  
**Priority:** NOR  
**Version:** unspecified  
**Target Milestone:** ---  
**Hardware:** Unlisted  
Binaries  
**OS:** Linux  
**Version Fixed In:**

The collage includes:

- A bug report snippet: "Bug 210663 - dolphin crashes suddenly when opening a folder. A sentence which summarizes the problem. Please be descriptive. Bad example: kmail crashed Good example: KMail crashes if I close the mail window while checking for mail." and "What I was doing when the application crashed: dolphin crashed when opening a saved folder, document or any other. It happens sometimes dolphin behaves as expected and sometimes crashes. Gzip is already installed on the computer".
- A KDE trunk crash report: "crash on KDE trunk" with a backtrace showing application crashes.
- A forum post: "Is anyone experiencing this exact same crash on KDE trunk aka 4.3? With 'es' mean a crash somewhere in I".
- A KDE 4.3.1 release announcement: "KDE 4.3.1 is available!".
- A KDE 4.5.0 announcement: "KDE 4.5.0 is available! and I can offer you packages for KDE Software Compilation 4.5.0 for Slackware-current. The 4.5.0 packages are accompanied by a README which explains the straight-forward installation/upgrade steps. As always, both 32-bit and 64-bit versions are available."
- A forum thread titled "Crash of Dolphin with Nepomuk" with a post: "I can confirm that Nepomuk is sort of running on my machine. I wonder if there anything I can get that's particularly useful when I experience anything like this".



on From Dusan Zirojevic 2010-10-05 16:20:18

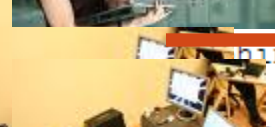
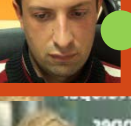
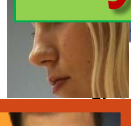
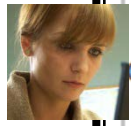
unspecified (using KDE 4.3.1)  
Linux

Base System release 2.0.0 -- Backtrace: Application: Dolphin  
bin), signal: Segmentation fault [Current thread is 0 (LWP 8630)]

Real-time knowledge extraction & integration



# ALERT SYSTEM



Summary: **Dolphin Qt-dbus random crashes (Nepomuk integration?)**  
Product: **dolphin** Reporter: **Dusan Zirojevic**  
Component: **general** Assignee: **Peter Penz**  
Status: **UNCONFIRMED**  
Severity: **normal** CC: **aleksandar.siskovic@cimcollege.rs**  
**ivan.obradovic@cimcollege.rs**

**Dynamic profiling**

Hardware: **Unlisted**  
Binaries  
OS: **Linux**  
Version Fixed In:

on From *Dusan Zirojevic* 2010-10-05 16:20:18

unspecified (using KDE 4.3.1)  
Linux

Base System release 2.0.0" -- Backtrace: Application: **Dolphin**  
**dolphin**, signal: **Segmentation fault** [Current thread is 0 (LWP 8630)

ible: Didn't try

Application: dolphin  
KDE Version: 4.3.1 (KDE 4.3.1)  
OS: Linux 2.6.28-entoo-13\_x86\_64  
Distribution: "Gentoo Base System release 2.0.0"

Backtrace:  
Application: dolphin  
Current: 0  
#0 0x00000000  
#1 0x00000000  
#2 0x00000000  
#3 0x00000000  
#4 0x00000000

Thread 2 (LWP 8630):  
#0 0x00000000  
#1 0x00000000  
#2 0x00000000  
#3 0x00000000  
#4 0x00000000

Operating System: Linux 2.6.28-entoo-13\_x86\_64  
Distribution: "Gentoo Base System release 2.0.0"

Additional Comment:  
I finally found the files moved to

Crash of Dolphin with Nepomuk  
Tue Oct 05, 2010 3:38 pm

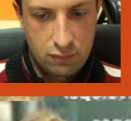
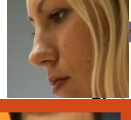
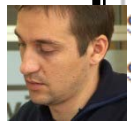
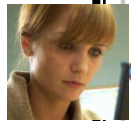
KDE 4.5.0 is available!  
I can offer you packages for KDE Software Compilation 4.5.0 for Slackware-current. The 4.5.0 packages are accompanied by a README which explains the straight-forward installation/upgrade steps. As always, both 32-bit and 64-bit versions are available.

Comment #1 From Aleksandar Siskovic 2010-10-05 16:24:27 (reply)  
Bug-233112 has been marked as a duplicate of this bug.

Comment #2 From Dusan Zirojevic 2010-10-05 14:58:17 (reply)  
Remove storage service availability check This is a patch for trunk/4.4 beta1 kdelibs. Please see if it fixes the problem.

Comment #3 From Ivan Obradovic 2010-10-05 16:59:46 (reply)  
This fix might break some required functionality relative linking.

# ALERT SYSTEM



Summary: **Dolphin Qt-dbus random crashes (Nepomuk integration?)**  
Product: **dolphin** Reporter: **Dusan Zirojevic**  
Component: **general** Assignee: **Peter Penz**

Status: [Hide recs](#)  
Severity: **People: lars pind dave bauer**

Priority: **Code: bootstrap.tcl**  
Version: **gpl.html**

Target Milestone: **Bug reports: Parsing error when a user doesnot insert proper HTML tags (1833)**  
Hardware: **return\_url in entry-edit should be "" not "." (382)**

OS: **Forums: ad\_page\_contract blocking less than symbol in form data (165028)**  
Version Fixed In: **multi var validation (89072)**

unspecified (using KDE 4.3.1)  
Linux

Base System release 2.0.0" -- Backtrace: Application: **Dolphin**  
**dolphin**, signal: **Segmentation fault** [Current thread is 0 (LWP 8630)]

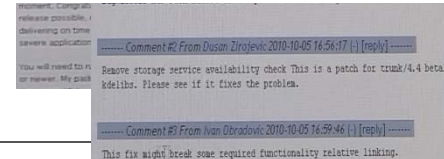
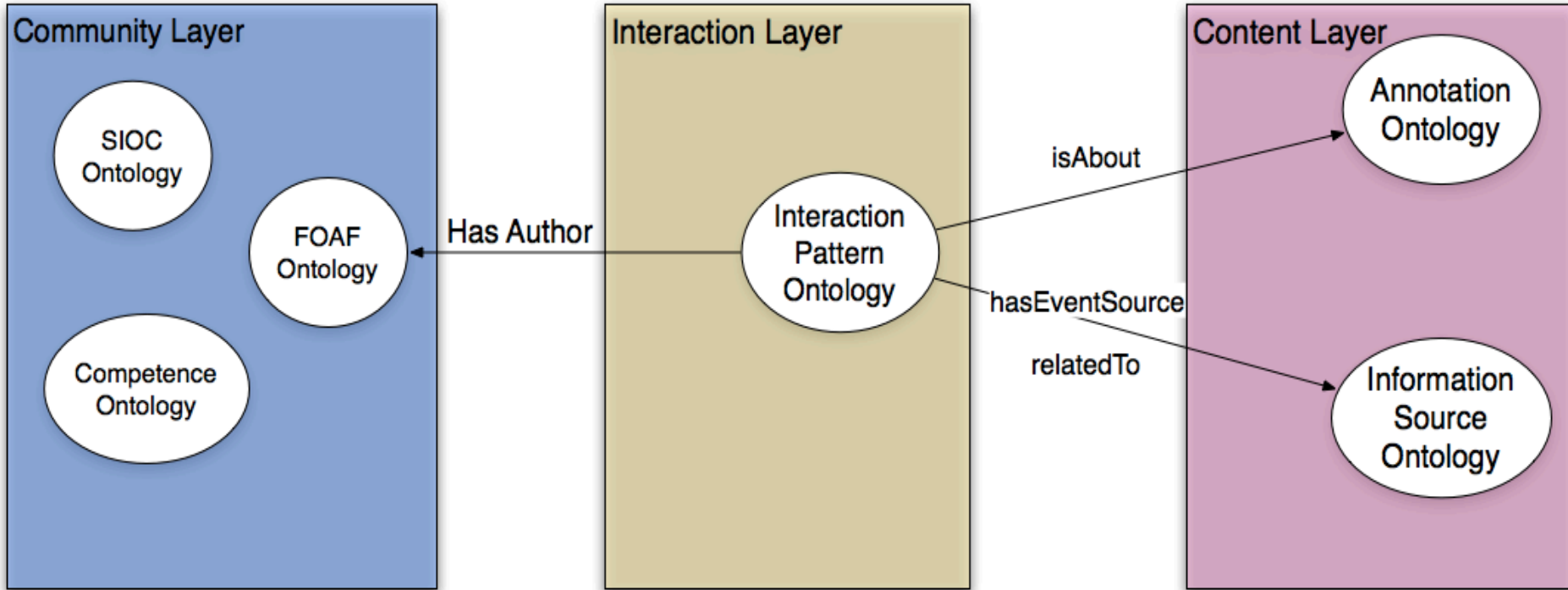
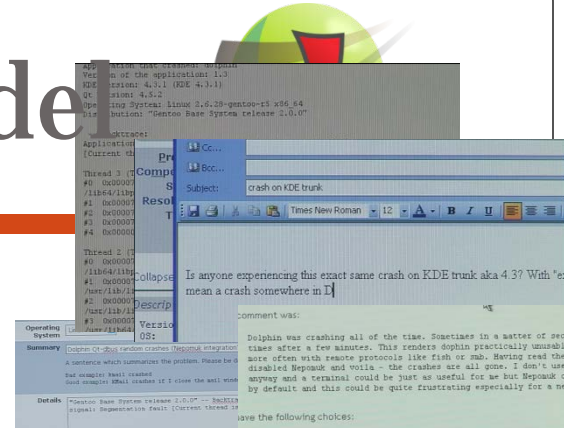
executable: Didn't try

## Intelligent services

The collage contains several screenshots:

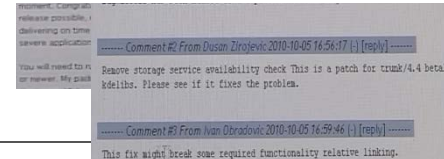
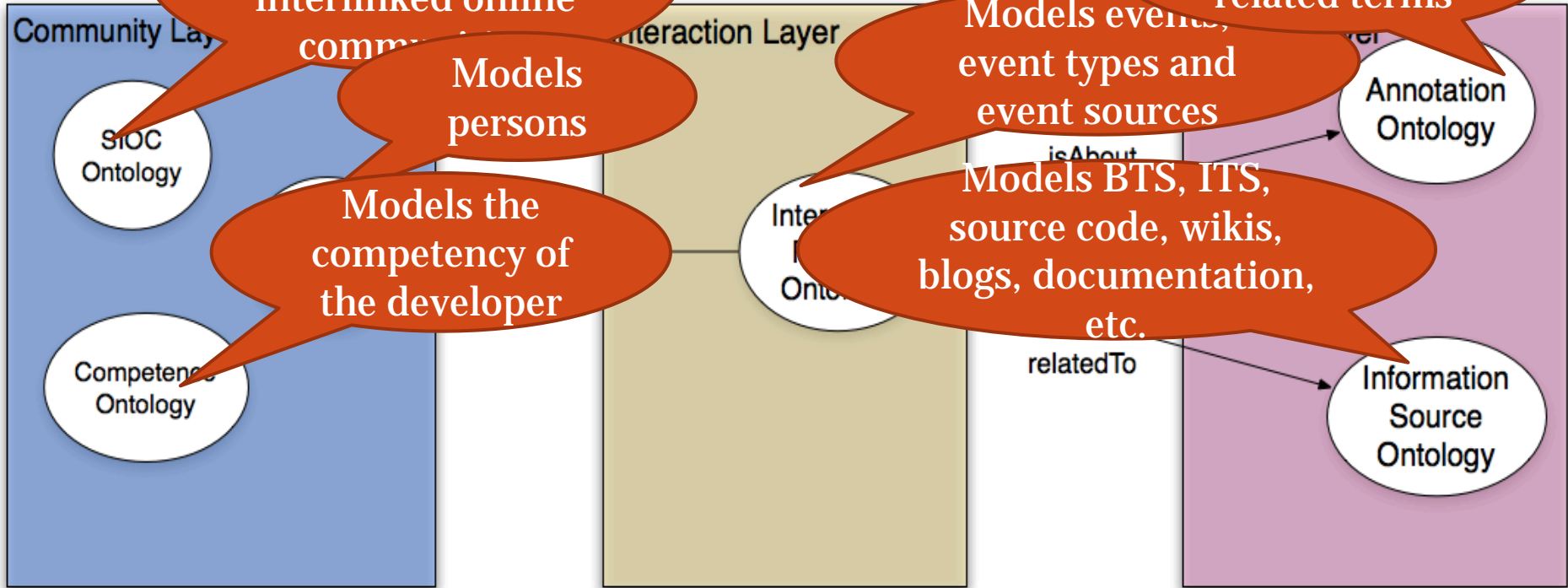
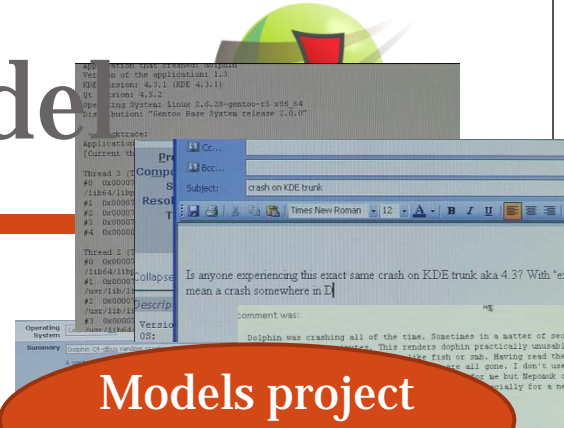
- A KDE bug report titled "Bug 210063 - dolphin crashes suddenly when opening a folder...".
- A KDE bug report titled "crash on KDE trunk".
- A KDE bug report titled "Dolphin was crashing all of the time".
- A KDE bug report titled "Parsing error when a user doesnot insert proper HTML tags (1833)".
- A KDE bug report titled "return\_url in entry-edit should be "" not "." (382)".
- A KDE bug report titled "ad\_page\_contract blocking less than symbol in form data (165028)".
- A KDE bug report titled "multi var validation (89072)".
- A KDE bug report titled "unspecified (using KDE 4.3.1) Linux".
- A KDE bug report titled "Base System release 2.0.0" -- Backtrace: Application: Dolphin dolphin, signal: Segmentation fault [Current thread is 0 (LWP 8630)]".
- A KDE bug report titled "executable: Didn't try".
- A KDE 4.5.0 announcement titled "KDE 4.5.0 is available!".
- A forum discussion titled "Nepomuk".
- A forum discussion titled "I can confirm that Nepomuk is sort of running on my machine. I wonder if there anything I can get that's particularly useful when I experience anything".
- A forum discussion titled "Comment #1 From Aleksandar Siskovic 2010-10-05 16:24:27".
- A forum discussion titled "Comment #2 From Dusan Zirojevic 2010-10-05 14:58:17".
- A forum discussion titled "Comment #3 From Ivan Obradovic 2010-10-05 16:59:46".

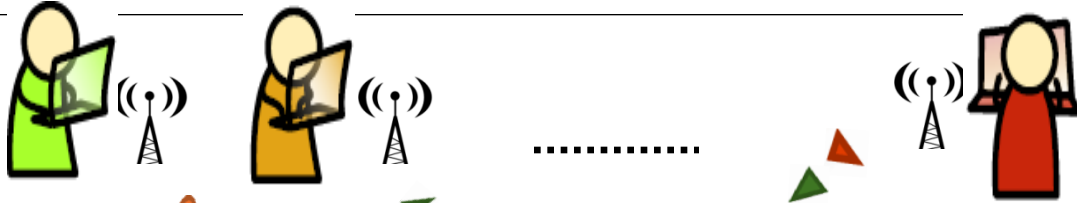
# Ontologies as a data mode





# Ontologies as a data mode

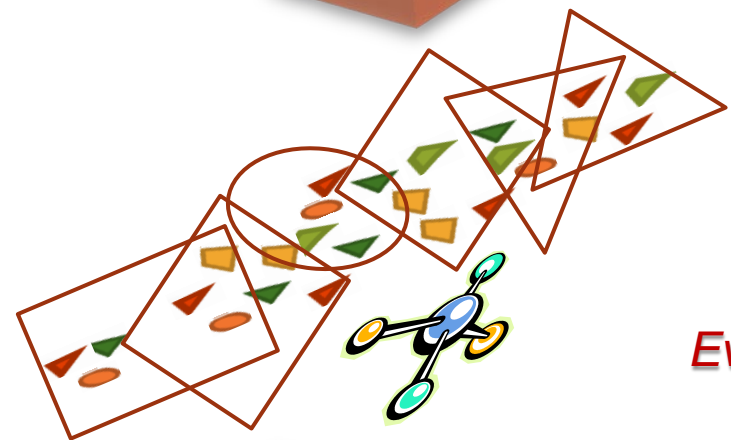




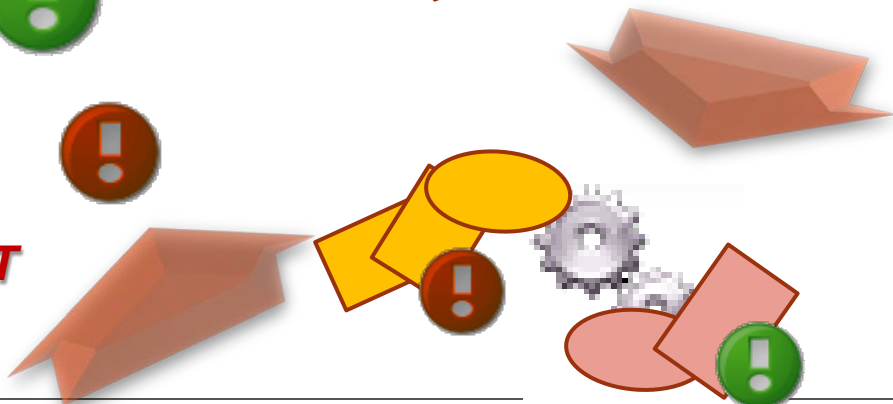
**ALERT**



**OBSERVE**  
Event capturing  
Interaction ontology



**ORIENT**  
Event interpretation  
Content and  
Community ontologies



**DECIDE**  
Complex event processing  
Interaction patterns

**ACT**

# Interaction patterns



- An interaction pattern is the description of the situation which should be detected and reported in real-time (immediately after it has appeared)
  - Interaction patterns represent knowledge about the reactive behavior of the system (when a system should react on – from any reason)
  - Main features:
    - Real-time: Get the information immediately
    - Personalized: Get only the relevant information
- Example: Inform me whenever there is a new bug followed by an intensive discussion in the forum (e.g. intensive = more than 10 posts in five hours)

# Interaction patterns



- There are different complexity tiers of interaction patterns that can be detected. They correspond to the complexity of the situations they describe:
  - **Tier1** *low complexity*: interaction patterns can describe a situation that a property value is above/below a specific threshold, or that a specific event occurred
  - **Tier2** *medium complexity*: Interaction patterns can describe a situation that extends **Tier1** with the capability of combining multiple events from different event sources
  - **Tier3** *high complexity*: Interaction patterns can describe a situation that extends **Tier2** with the capability of windows (temporal, spatial, count) and aggregations

# Examples of interaction patterns



## Tier1

If there is a new bug with certain [properties]

If there is a new bug from [user]

If there is a new bug containing [words]

## Tier2

If there is a commit and the bug in the package is not closed in BTS

If there is a new release and a bug related to this release is not closed in BTS

If there is a new [email],[wikiPage],[post] related to [method],[class],[package],[bug]

If there is a bug and there is a discussion about this bug that the bug has been fixed (because of a release) and bug status in BTS is not marked as fixed

## Tier3

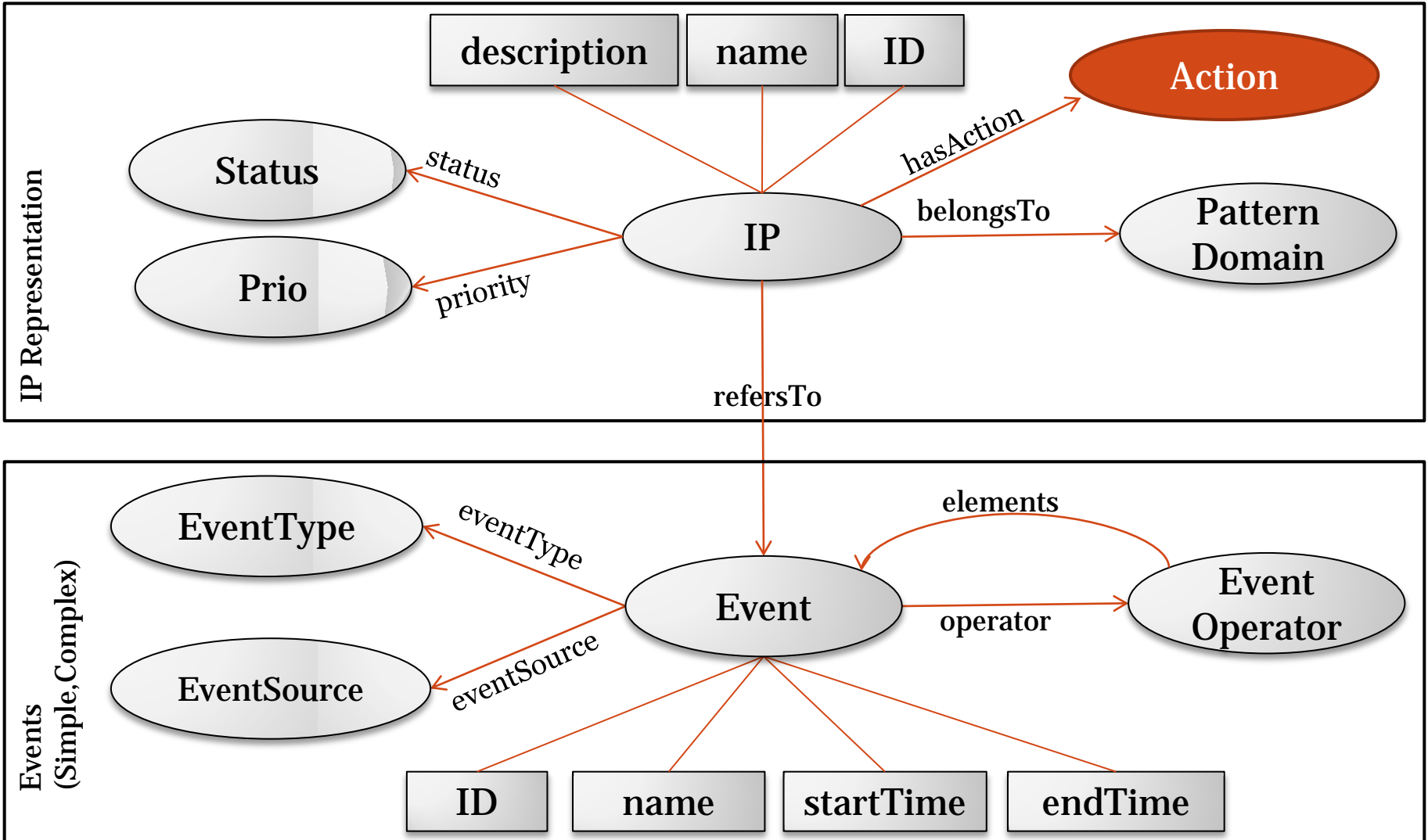
If there is new bug and nothing else happens related to this bug in all sources within a time period [T]

If there is a new bug and nothing else happens with this bug in BTS and there is a hot conversation in [blog],[wiki],[email],[forum] within a certain time period [X]

If there is a new bug without description followed by a [post],[wiki] containing a description for this bug



# Model

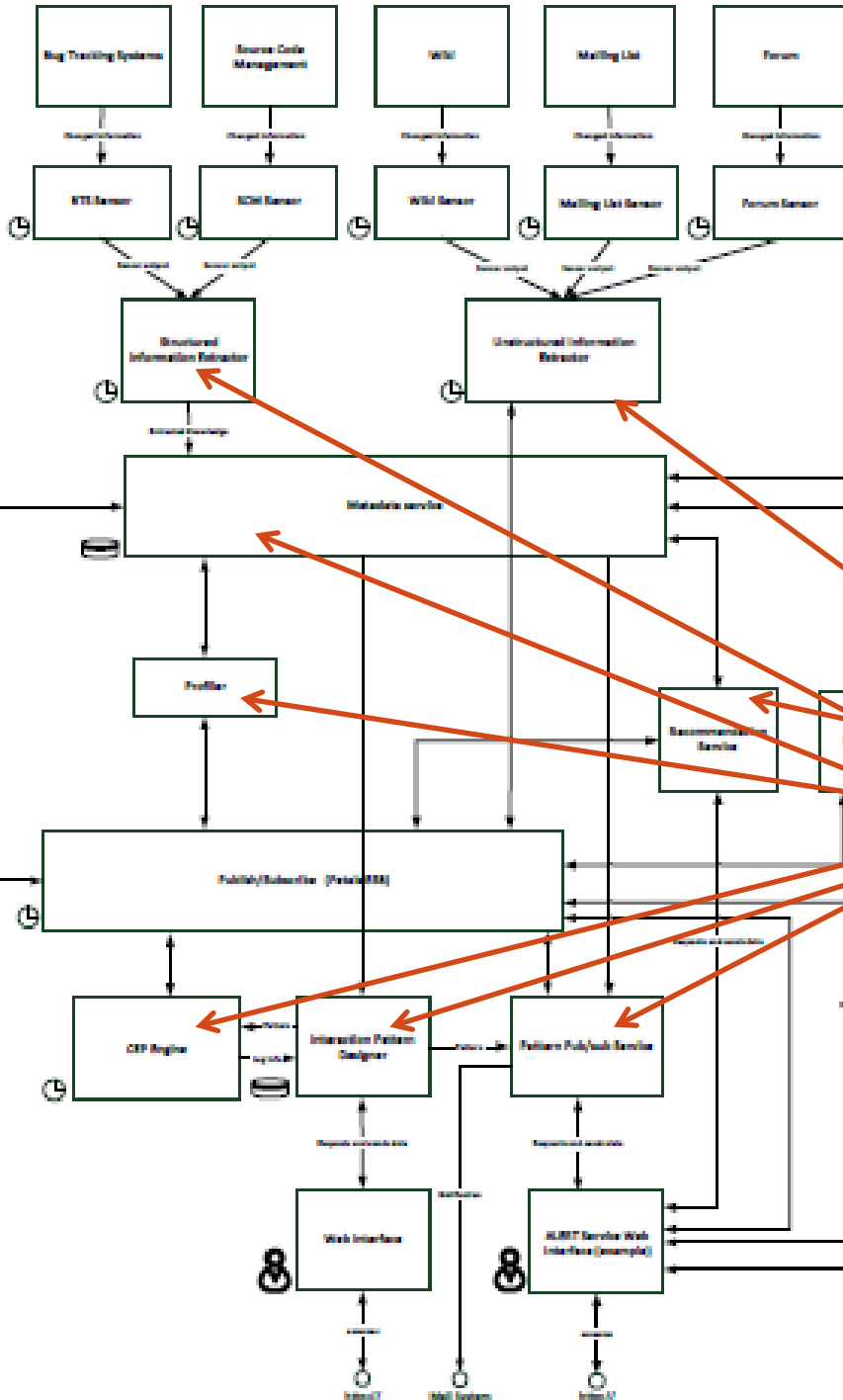


# Agenda



- Introduction
- Our approach
- **Conceptual architecture**
- Conclusion

# Conceptual architecture



- Using single and multiple criteria recommendation methods:
- \* Recommend most competent developer to resolve an issue
- \* Recommend a set of issues that are most suited to the developer's competence

patterns

# Events



```
- <event xmlns="http://alert-project.com/" xmlns:onto="http://alert-project.com/ontologie">
  <!-- common information about an event -->
  - <head>
    <!-- string value -->
    <timestamp />
    <!-- by which alert component -->
    <sentby />
  </head>
  <!-- put the related information into the payload section -->
  - <payload>
    - <meta>
      <onto:property name="hasTime" value="2009-09-30" typeOf="http://www.w3.org/TR/xmlschema-2/#string" />
      - <onto:property name="doneBy" typeOf="http://#Person">
        - <class value="http://personX">
          <onto:property name="hasName" value="Zsombor" typeOf="http://www.w3.org/TR/xmlschema-2/#string" />
        </class>
      </onto:property>
    </meta>
    - <eventType name="NewBugEvent" typeOf="http://icep.fzi.de/eventrepresentation1.0/icepEventScheme#NewBugEvent">
      - <onto:property name="isRelatedTo" typeOf="http://www.w3.org/1999/02/22-rdf-syntax-ns#Bug">
        - <class value="http://Bug1">
          <onto:property name="hasID" value="1234" typeOf="String" />
          - <onto:property name="hasStatus" typeOf="http://#BTSStatus">
            - <class value="http://status1">
              <onto:property name="hasDescription" value="RESOLVED" typeOf="http://www.w3.org/TR/xmlschema-2/#string" />
            </class>
          </onto:property>
          - <onto:property name="isAbout" typeOf="http://#Integration">
            - <class value="http://TopicQ">
              <onto:property name="hasImportance" value="2" typeOf="http://www.w3.org/TR/xmlschema-2/#integer" />
              <onto:property name="hasDescription" value="Nepomuk" typeOf="http://www.w3.org/TR/xmlschema-2/#string" />
            </class>
          </onto:property>
          - <onto:property name="isRelatedSourceCode" typeOf="http://#Method">
```

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# Conclusion



- ALERT system will improve **FLOSS coordination by maintaining awareness of community activities through real-time, personalized, context-aware notification**
- The ALERT system will act as an **active collaboration platform, i.e. a virtual actor will**
  - **interact with other** developers,
  - process and recognize various kinds of interactions,
  - suggest actions on the basis of these and remember and
  - bring past interactions into the developers' attention, thus enabling developers to work better together



**▲ALERT**

**Thank you!**