

# Impact of Triage: a Study of Mozilla and Gnome

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# What is Bug Triage in OSS?

- Issue-tracking Systems (ITS) is a key part of software project
- Developer teams are overwhelmed by the massive inflow of low quality issues
  - > 50K/year new bug reports in Gnome and Mozilla
  - Bulk of them are rejected
- Triage: to filter and improve the quality of user-reported issues
  - check the relevance, accuracy, reproducibility, non-duplication and completeness



# Non-developer Triager

- We found that many non-developers do triage
- However, non-developer triagers may feel unappreciated because the value of their contributions may be underestimated.
- We found no authoritative information on:
  - What are the triage tasks in practice?
  - How many issues non-developers they triage?
  - What is the non-developer triage quality?

# Primary objectives

- To help FLOSS understand the value of non-developers
  - Show how to leverage their strength to improve the project
- 
- What are triage activities in Mozilla and Gnome?  
Do they differ?
  - What activities do triagers benefit the most?

# Method

- Understand ITS practices related to triage
  - E-mail exchanges with 4 key contributors in Gnome and Mozilla
- Quantify Issue-tracking System (ITS) data
  - Gnome Bugzilla - 2001 to 2010
  - Mozilla Bugzilla - 2001 to 2009
- Triage task
  - A modification to issue report attribute
- Non-developer contribution:
  - Number of tasks
  - Accuracy of tasks

# What Are Triage Tasks?

- Issue resolution workflow depends on issue attributes
- Attributes that may be modified during triage are:
  - Status, Resolution, Severity, Priority, Product, Version and Operating System (OS)
- We consider triage tasks to involve:
  - Modification to these attributes between states UNCONFIRMED and RESOLVED/NEW
  - Confirmation: the change of state to NEW or RESOLVED-FIXED)

# Triage Tasks: Example

- Issue's life



The triage tasks in this issue contain

Timeline

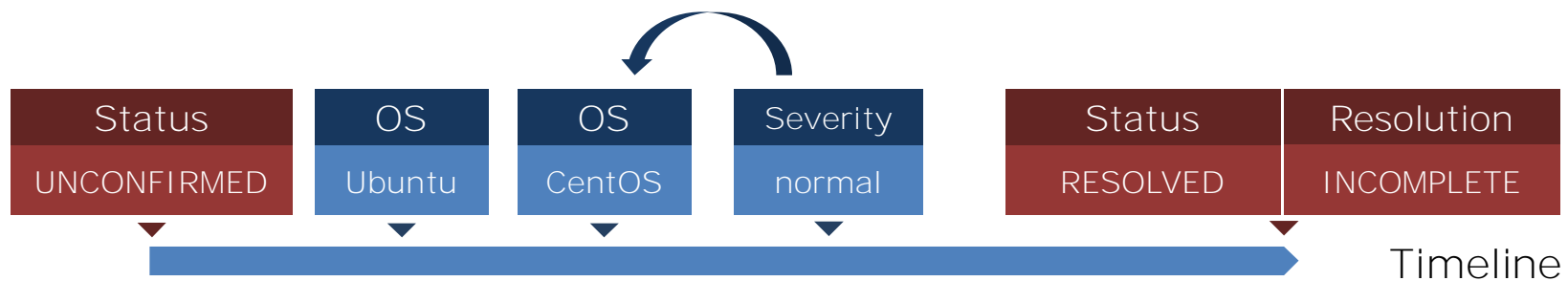
- Modification
  - Change OS to Ubuntu
  - Change Severity to normal
- Confirmation
  - Confirm this issue
  - Confirm OS as Ubuntu
  - Confirm Severity as normal
- We analyze:
  - 1M triage tasks in Gnome and
  - 1.5M triage tasks in Mozilla

# Identify the Roles

- Why:
  - Developer and reporter may also conduct triage activities in ITS
  - We want non-developer triager's contribution
- Developers: by matching logins/names of code committers in Version Control System (VCS)
- Triagers: have modified issues reported by others
- Reporters: only modify their own reported issues

# Accuracy of Triage

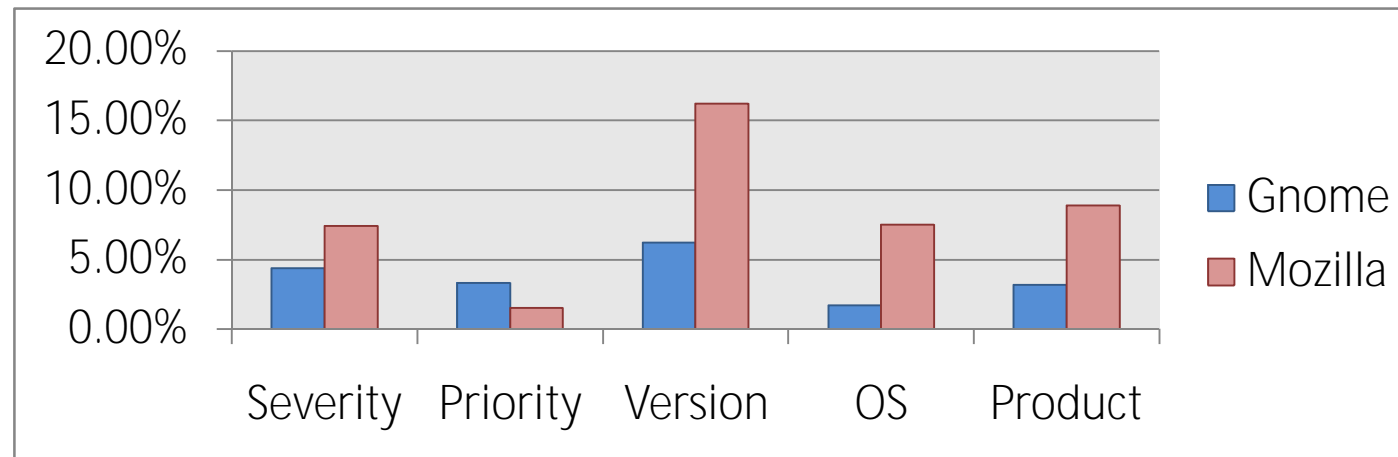
- Is the value of modified attribute correct?
  - No “gold standard”
  - Infer the “right answer” by subsequent actions on the attribute



- OS as CentOS is confirmed by subsequent modification of Severity:
  - Task modifying OS to Ubuntu is **incorrect**
- No subsequent change to Severity and severity of incomplete bugs is of no concern:
  - Accuracy of task setting Severity in this issue is **not measured**
  - If, however, the issue was confirmed, then Severity task would have been **correct**

# Filtering, completing, locating

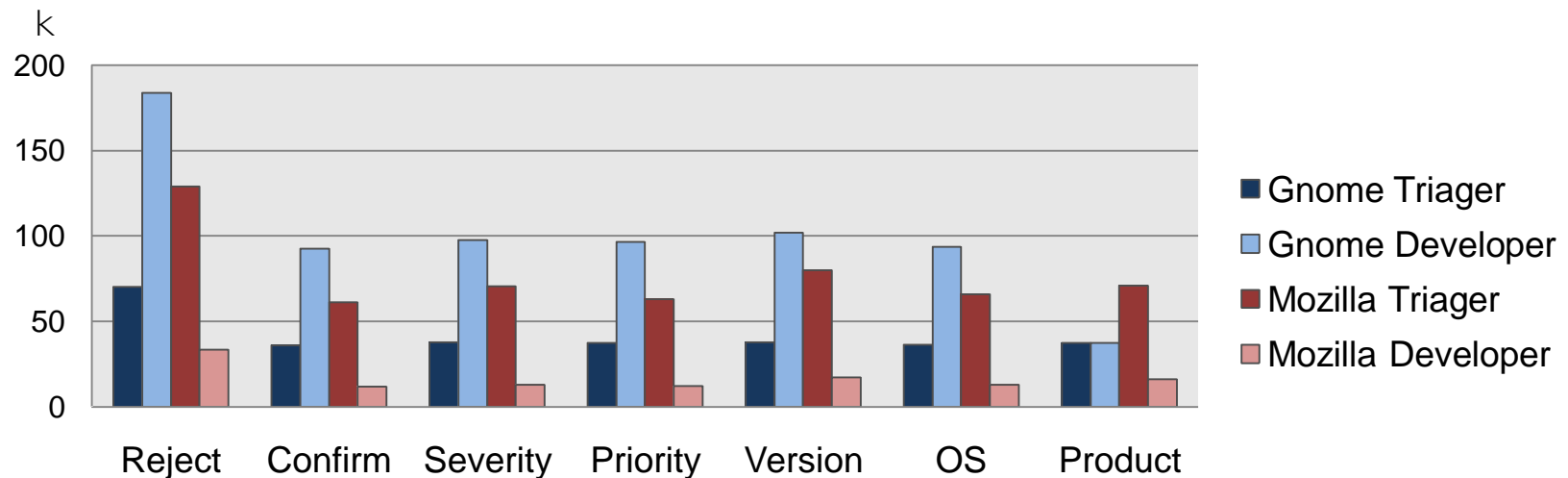
- Triage activities in Mozilla and Gnome
  - Filtering
    - check the relevance and reject the irrelevant reports
  - Completing information
    - complete the attributes like Severity, Priority, Version and OS
  - Determine the location
    - assign the report to product



Proportion of Issues with a Modified Attribute

# The number of triage tasks

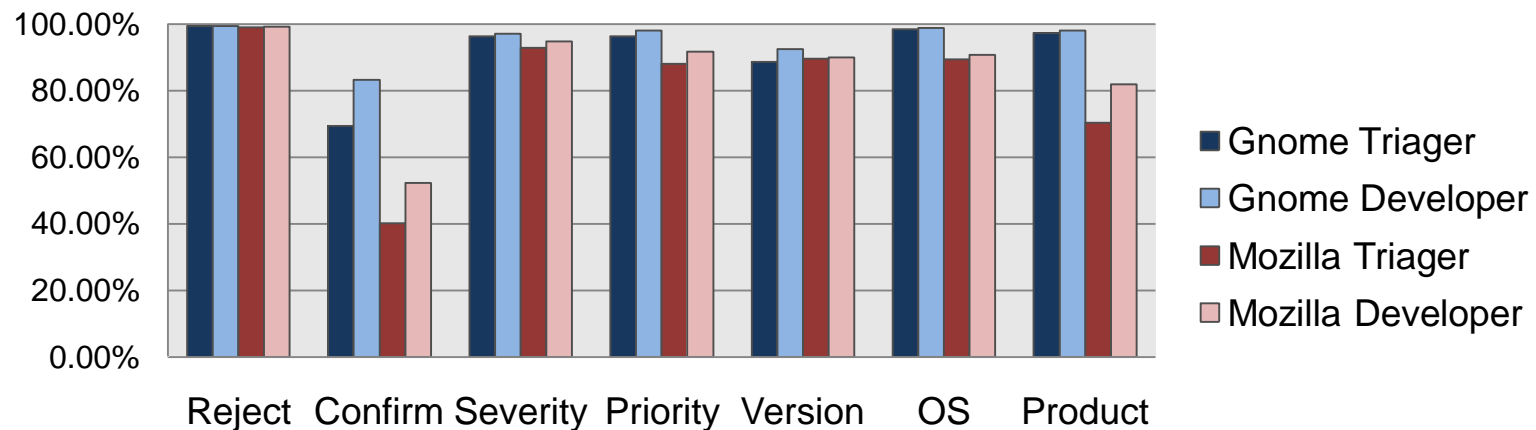
- Non-developer triagers' largest contributions
  - Reject irrelevant issues
  - Complete information



Number of Issues by Triage Task and Role

# Accuracy

- Non-developer triagers' contributions
  - Good at rejecting and completing information
  - Confirming and Product Assigning are more difficult



Accuracy of Issues by Triage Task and Role

# Conclusions

- Three critical triage goals:
  - Filtering incoming reports,
  - Completing information and
  - Assigning reports to products
- Non-developer triagers make a substantial contributions by:
  - Filtering non-fixable issues and by
  - Filling basic information
- Confirming issues and assigning products appear is a challenge for triagers

# Future Work

- Investigate the reasons for the difficulties in product assignment and in confirming issues
- Develop tools to support improve triage quality

# Thanks

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