An Empirical Study on Factors Impacting Bug Fixing Time

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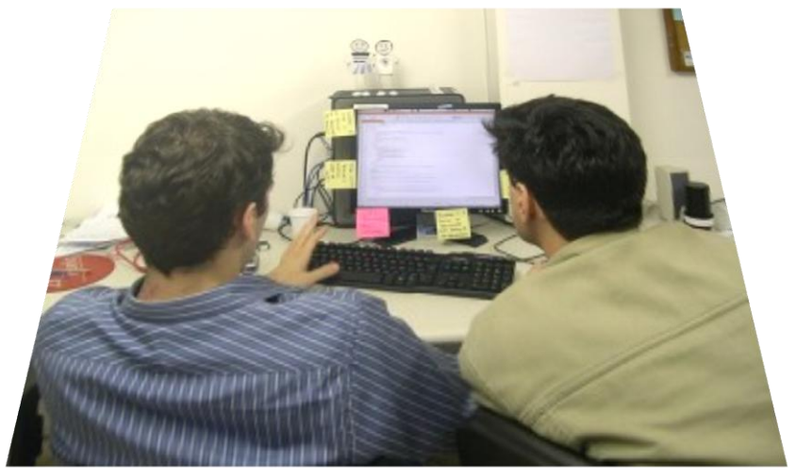
A Typical Process of Bug Fixing

New ⟶ Assign ⟶ Bug Fixing ⟶ Verified ⟶ Resolved



Bug Fixing Time

Example: delay before change

Who	When	What	Added
mik.kersten	2006-10-23 17:57:16 EDT	Assignee	mik.kersten
		Priority	P2
steffen.pingel	2011-05-21 14:19:36 EDT	Status	RESOLVED
		Resolution	FIXED
		Assignee	steffen.pingel

almost
5 years

Reported & Assigned
Oct-2006

Fixing started & Resolved:
Mar-2011

Example: delay after change

eclipse BUGS

Bugzilla – Activity log for bug 246547: [Tests] Failure in testImport

Home | New | Browse | Search | Search [?]

~~Back to bug 246547~~

Who	When	What	Added
tzarna	2008-09-08 06:29:34 EDT	Status	ASSIGNED
		Target Milestone	3.5 M2
tzarna	2011-02-24 04:27:07 EST	Status	RESOLVED
		Resolution	FIXED

over
2 years

Reported & Assigned
Fixing started & ended:
September-2008

Resolved:
February-2011

Intervals during Bug Fixing

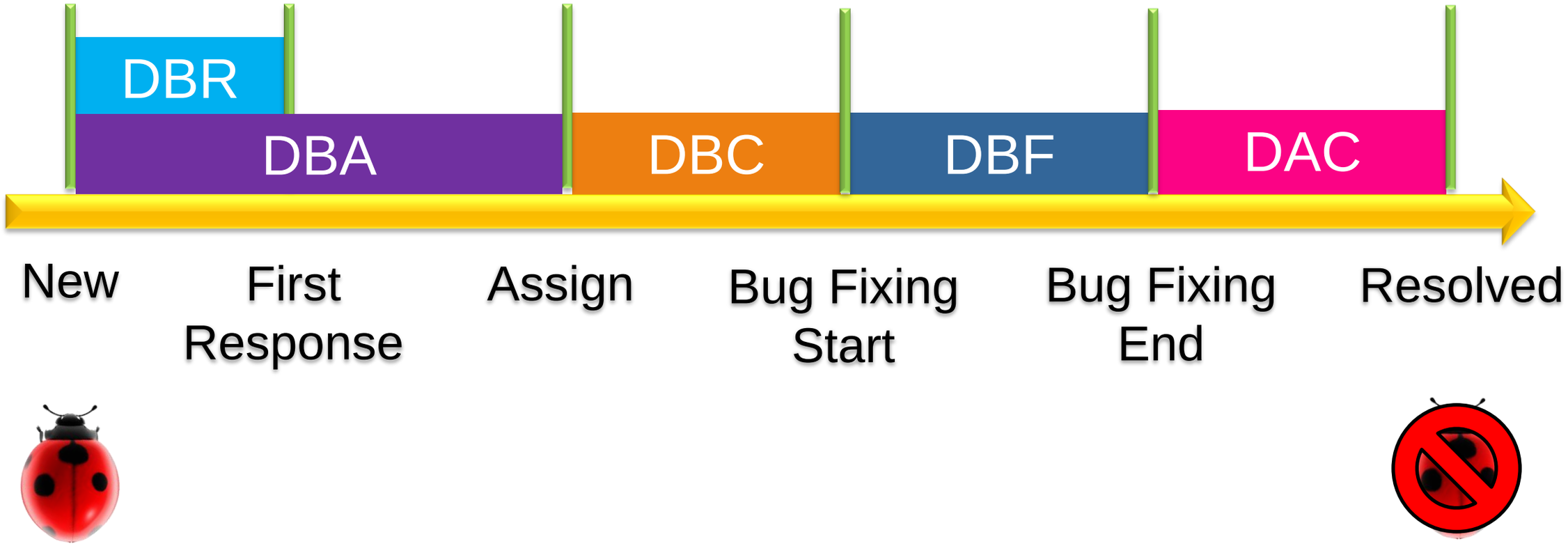
DBR Delay Before Response

DBA Delay Before Assigned

DBC Delay Before Change

DBF Duration of Bug Fixing

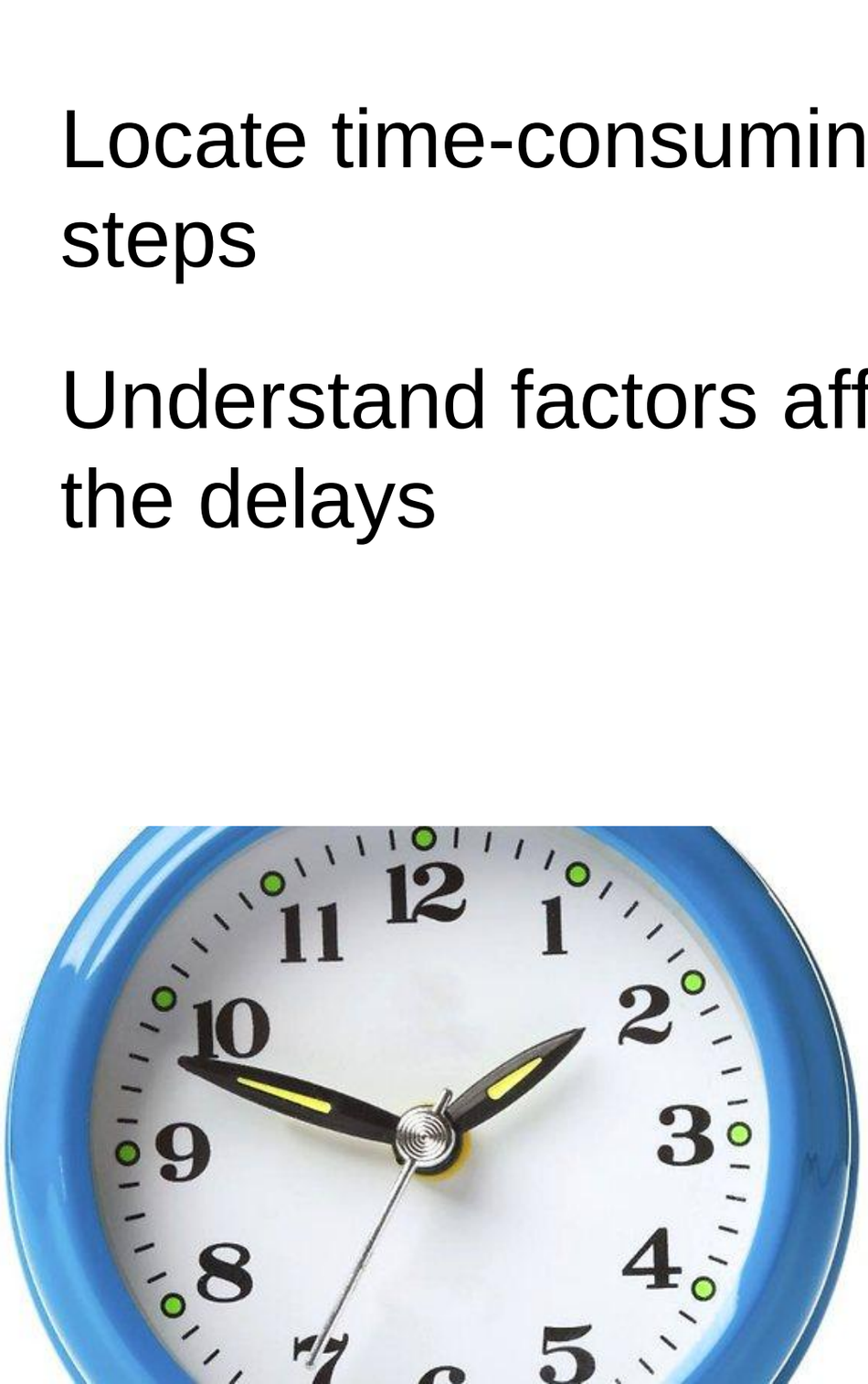
DAC Delay After Change



Benefits of Studying Delays

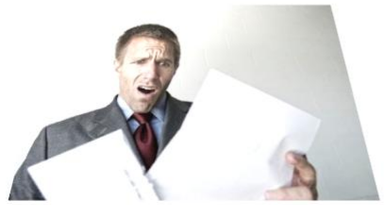
Locate time-consuming steps

Understand factors affecting the delays



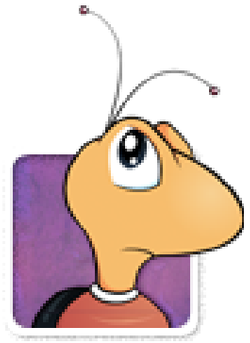
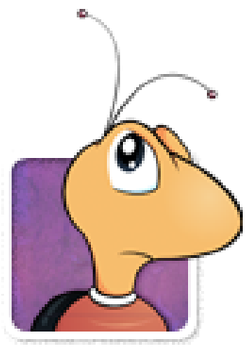
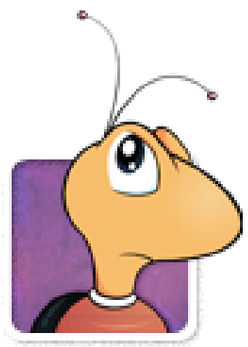
A Typical Process of Bug Fixing

New → Assign → Bug Fixing → Verified → Resolved

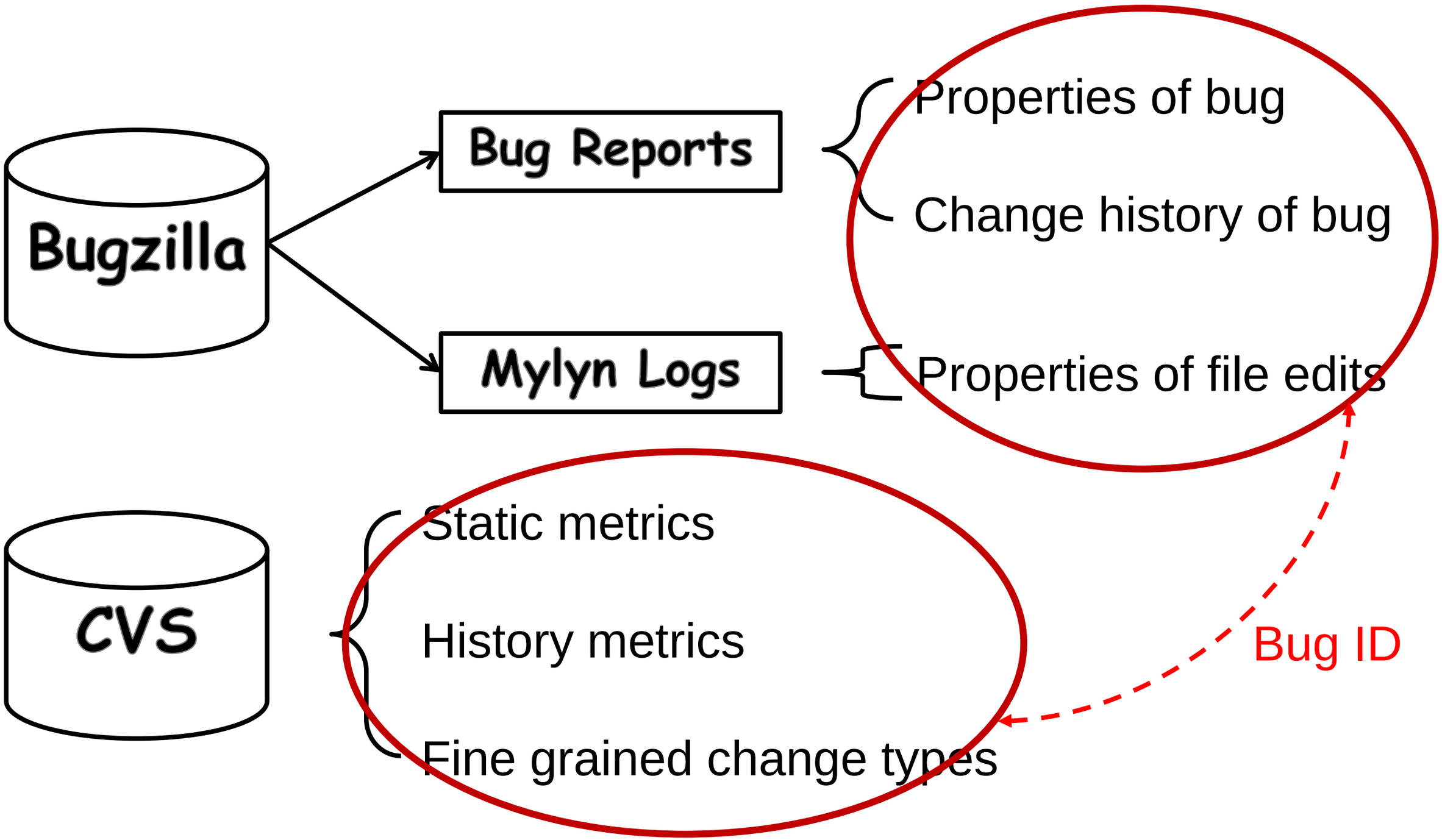


Improve the process of bug fixing

Subject Systems

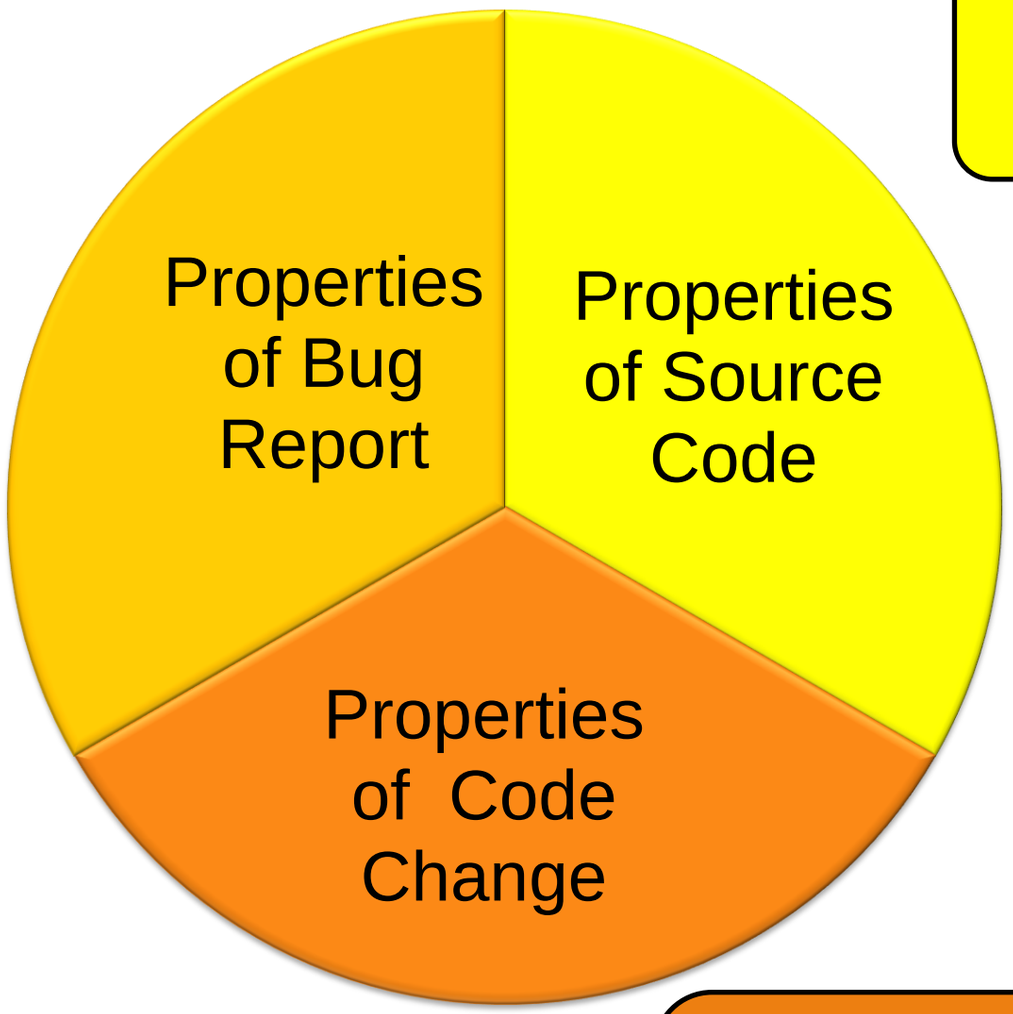
Mylyn	2,722 bugs			3,883 logs 
Eclipse Platform	606 bugs			793 logs 
PDE	524 bugs			638 logs 

Data Sources



Metrics from three Dimensions

Title
Summary
Severity of Bug
Operating System
Comments



Size (LOC, NOM)
Complexity (WMC)

Code Churn
Number of Changed Files
Fine Grained Change Types

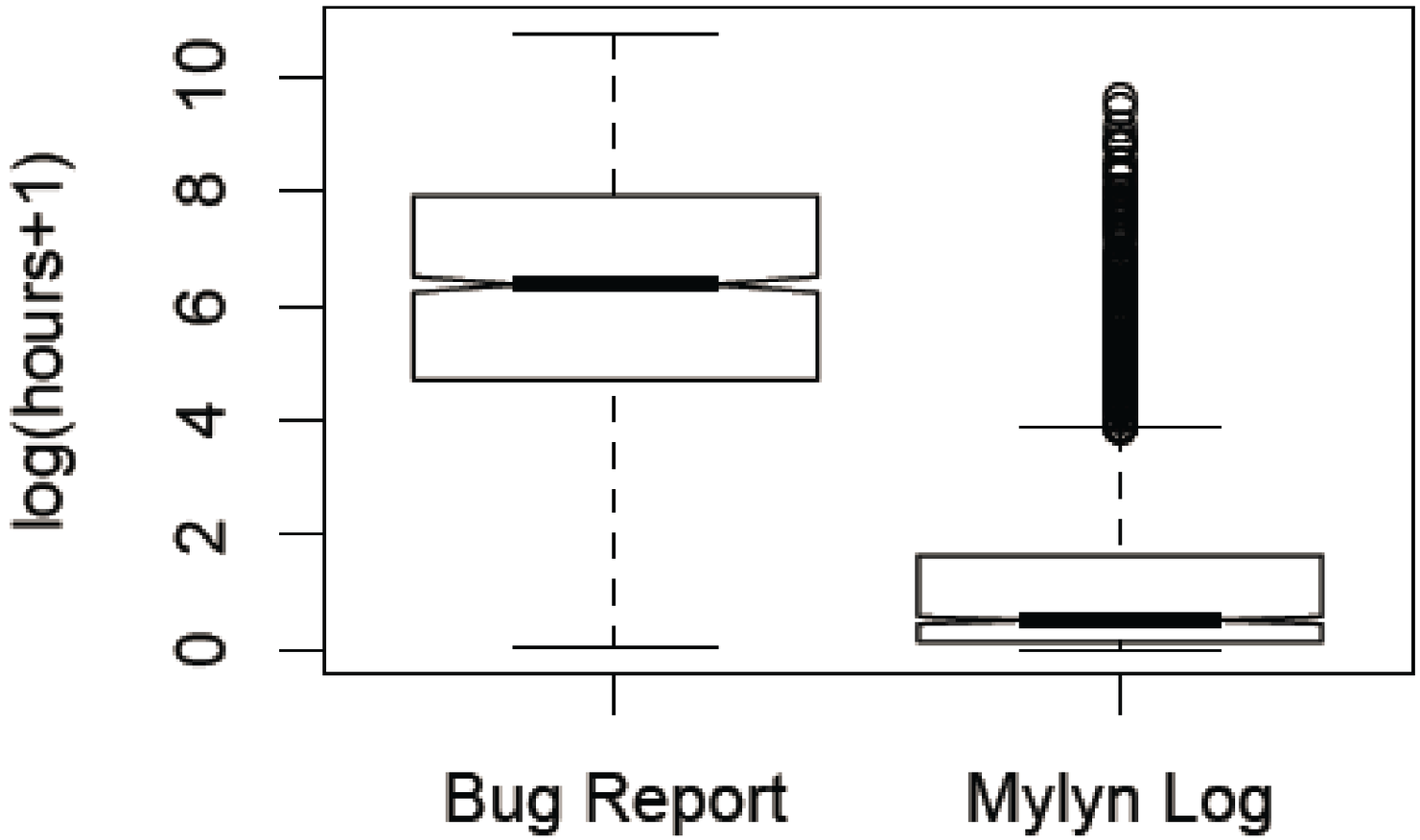
Research Questions

RQ1: Do delays by developers exist during bug fixing process?

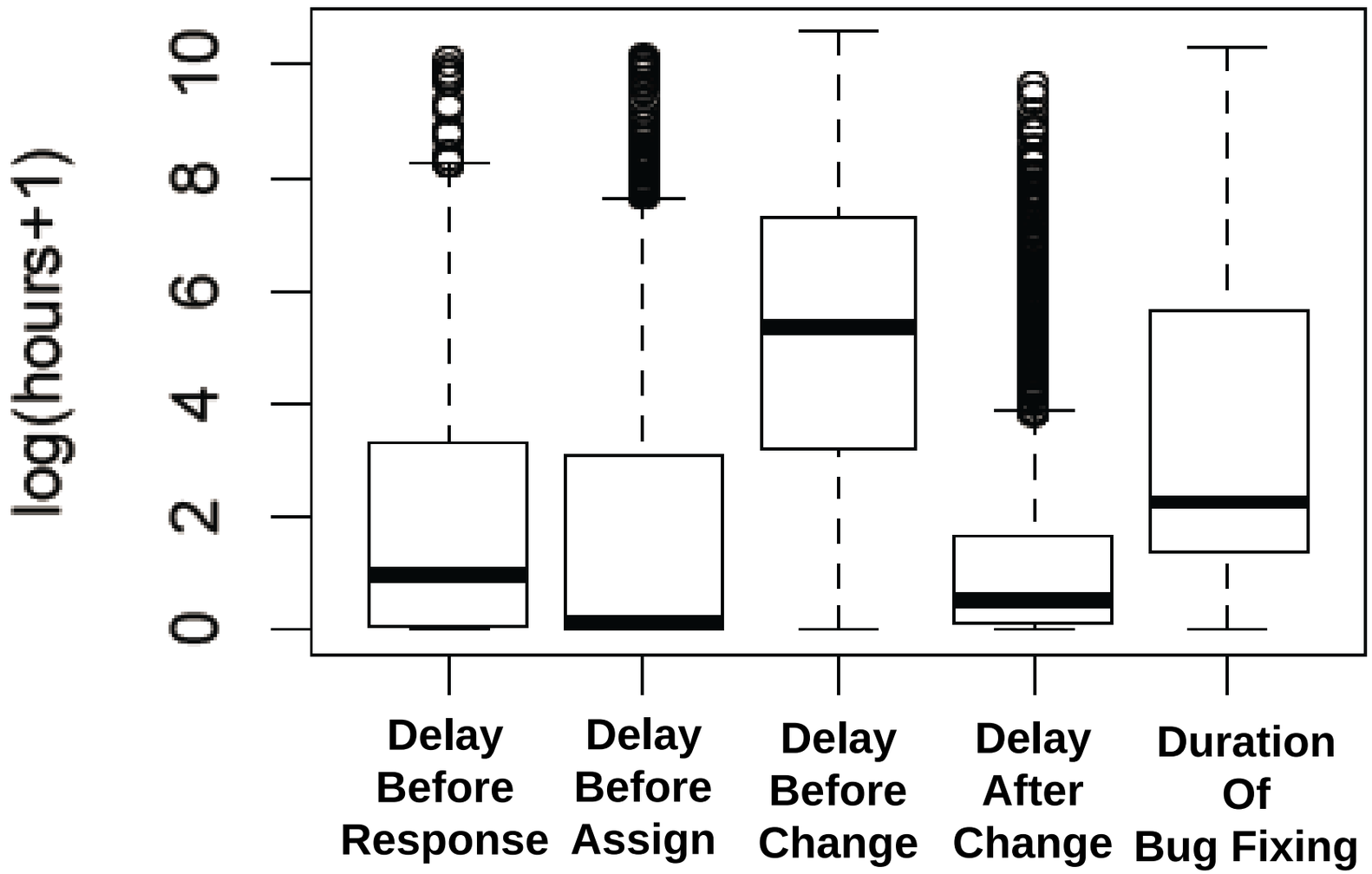
RQ2: Can we characterize delays incurred by developers before and after fixing bugs?

RQ3: What factors contribute to the delays most?

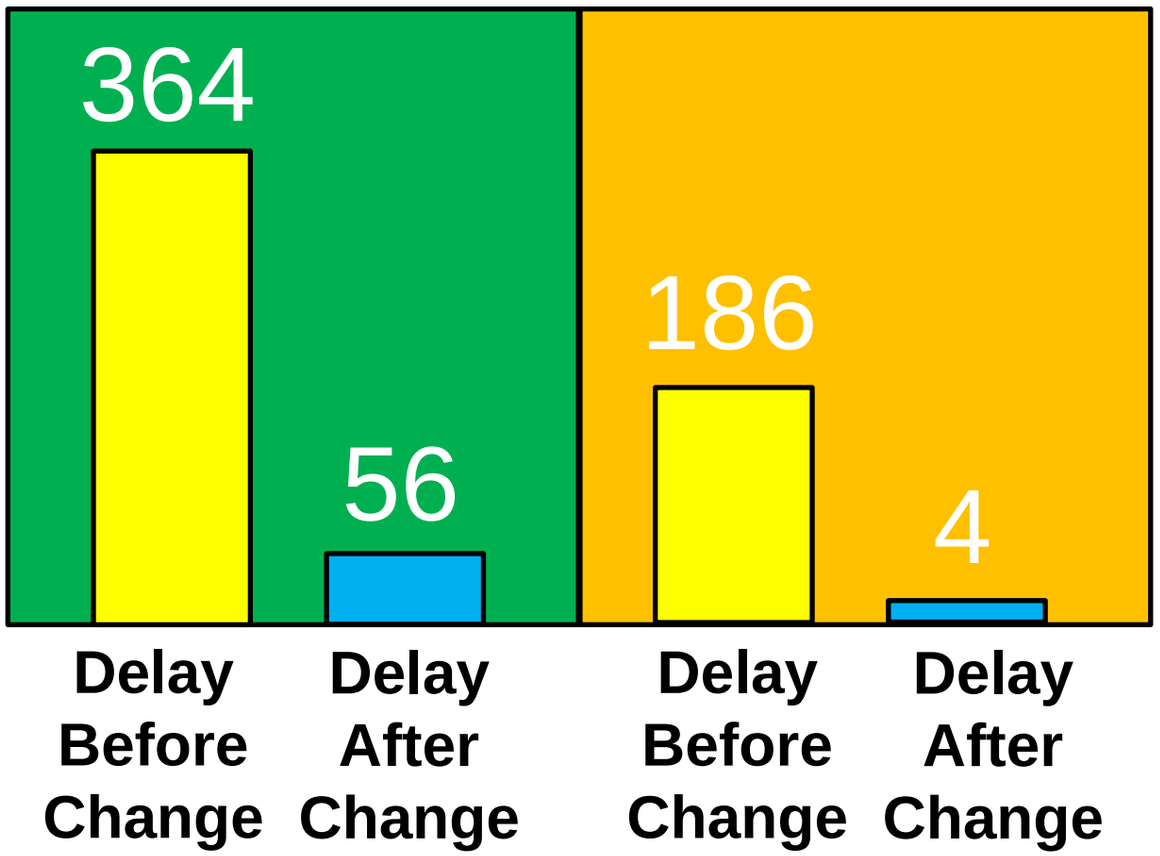
RQ1: Bug fixing time extracted from two data sources

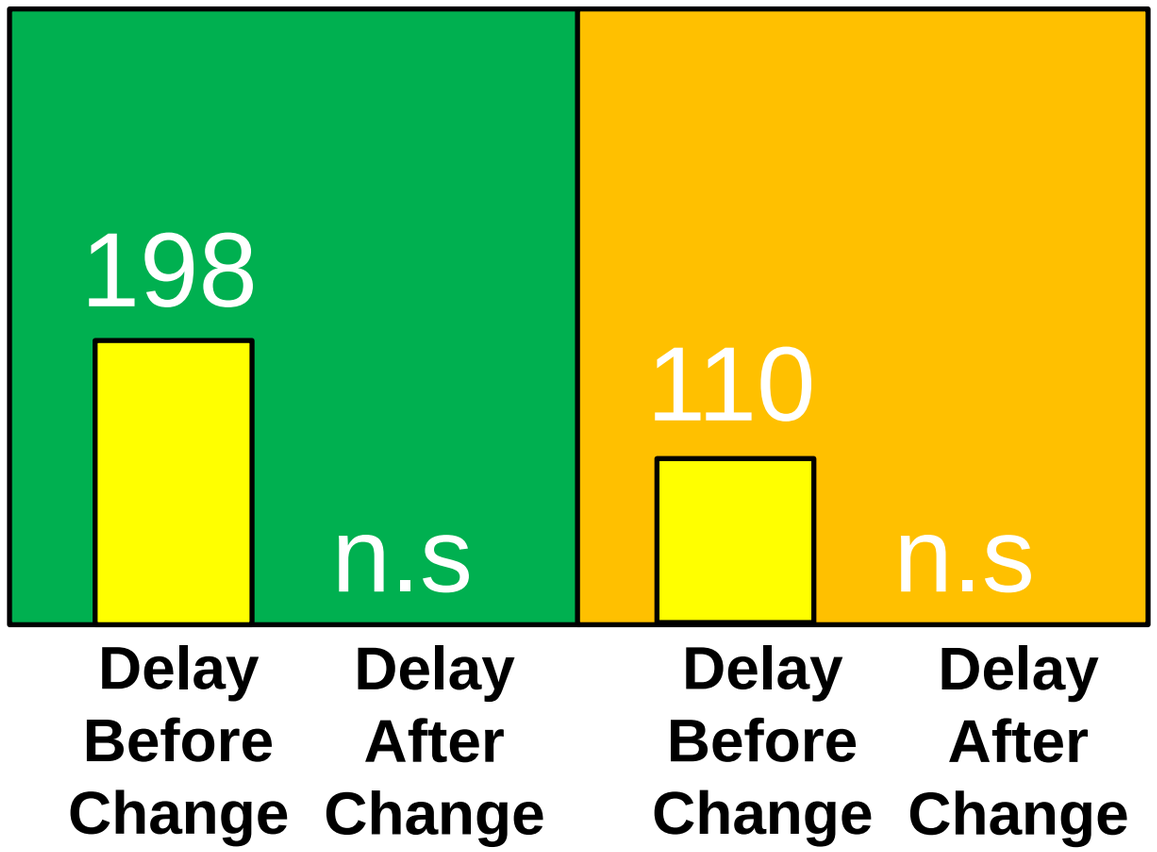


RQ1: Intervals during bug fixing process



RQ2: Properties of Bug Report





RQ2: Properties of Bug Report (cont')

Length of comment ↑

delay before change ↑

delay after change ↑

RQ2: Properties of Source Code

Size of Source Code 

delay before change (sum) 

delay after change (avg/sum/max) 

Complexity of Source Code 

delay before change (sum) 

delay after change (sum/max) 

RQ2: Properties of Code Change

Code Churn ⬆

delay before change (avg/sum/max) ⬆

delay after change (avg/sum/max) ⬆

Fine Grained Change Types ⬆

delay before change ⬆

delay after change ⬆

RQ3: What factors contribute to the delays most?

Analysis Method: (Logistic Regression Model)

Predict the probability of an event's occurrence.

Combines different factors.

Interpretation by Coefficient:

magnitude describes importance

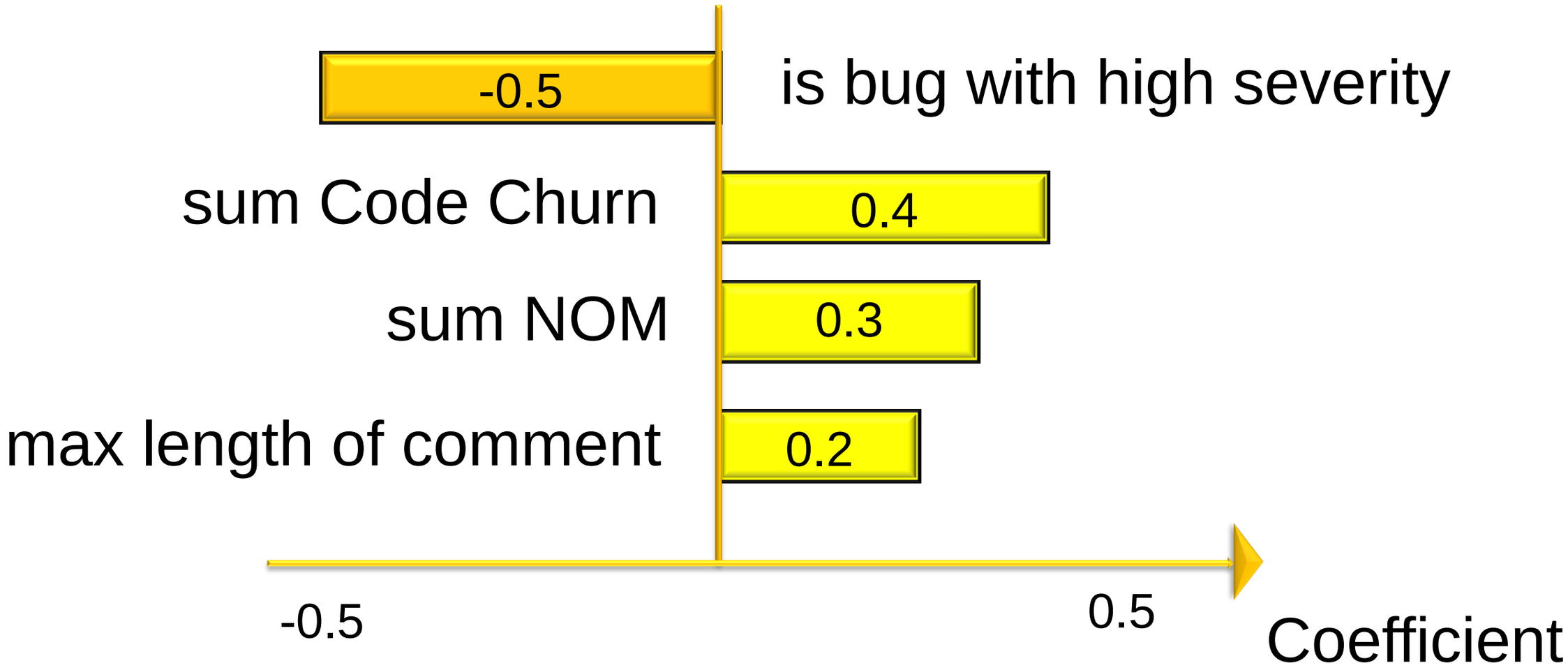
sign describes direction

Events:

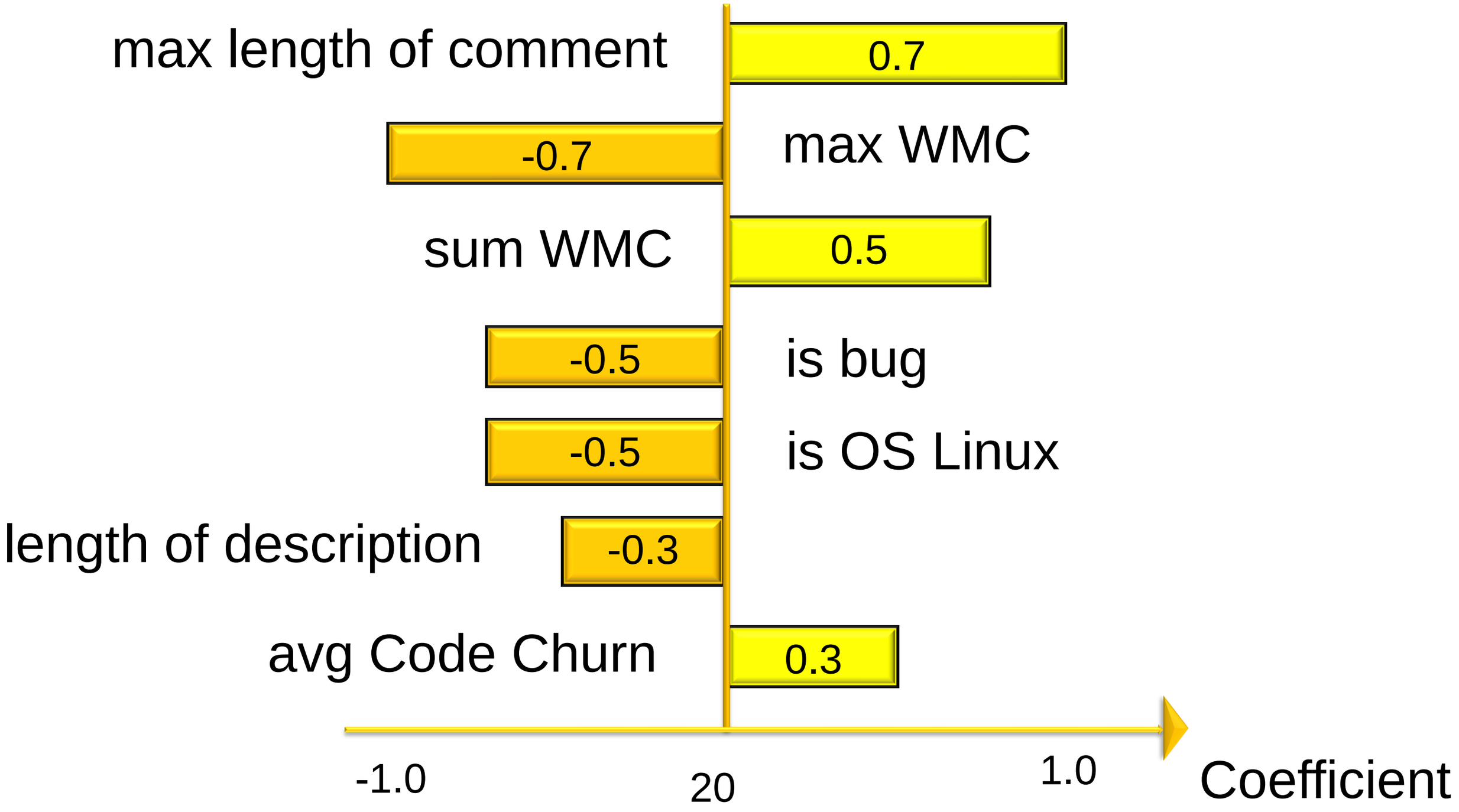
Long DBC : greater than median

Long DAC : greater than median

RQ3: Factors Impacting Delays Before Change



RQ3: Factors Impacting Delays After Change



Conclusions

Top Two Intervals in Bug Fixing Process

delay before and after change

Delay Before Change

level of severity, code churn (most influential factors)

Delay After Change

comments, complexity (most influential factors)