

ChangeMacroRecorder

Recording Fine-Grained Textual Changes of Source Code

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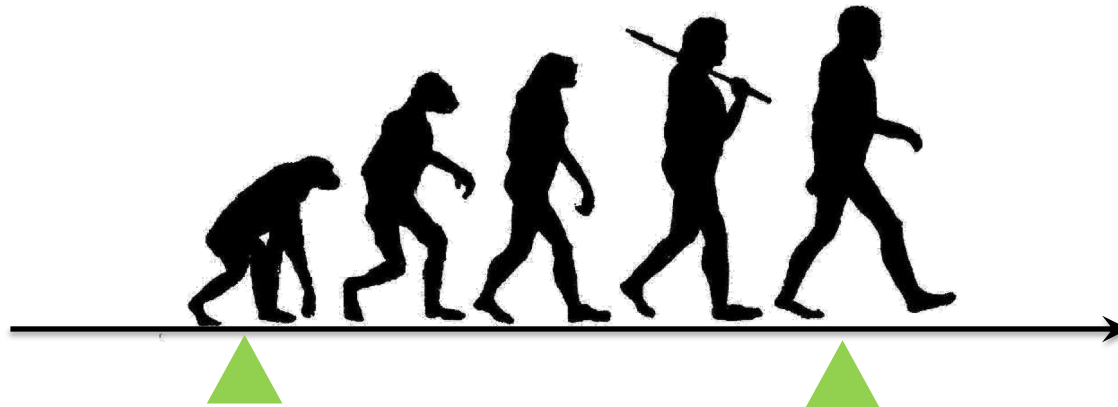
Tokyo Institute of Technology, Japan



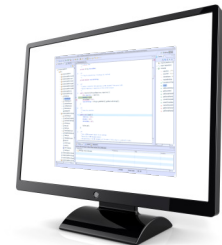
Change Recording



Commit-based
(coarse-grained)



Edit-based
(fine-grained)



Change Event Recorders

Mylyn

*Kersten & Murphy
AOSD 2005*

SpyWare

*Robbes & Lanza
ENTCS, 2007*

ChEOPS

*Ebraert et al.
ICDL 2007*

Syde

*Hattori & Lanza
ICSE 2007*

OperationRecorder

*Omori & Maruyama
MSR 2008*

Fluorite

*Yoon & Myers
PLATEAU 2011*

ChEOPSJ

*Soetens & Demeyer
CSMR 2012*

PLOG

*Kobayashi et al.
RSSE 2012*

CodingTracker

*Negara et al.
ECOOP 2012*

DFLOW

*Minelli et al.
ICPC 2015*

FeedBaG++

*Proksch et al.
SANER 2017*

COPE

*Dig et al.
ICSE 2017*

Yet Another Change Recorder

ChangeMacroRecorder

Eclipse plug-in to capture changes

- **On-the-fly production of change events**
 - Child CMR plug-ins can monitor change events
- **Keeping change consistency**
 - Handles edits in not-opened files
 - Handles edits happened outside of the IDE
- **Providing different levels of change events**
 - Low-level (raw) events
 - Aggregated/filtered events representing changes clearer

Type of Recorded Macros

DocumentMacro for storing inserted/deleted texts

CancelMacro for expressing undo execution

CopyMacro for storing a copied text

CommandMacro for command execution

CodeCompletionMacro for code completion

RefactoringMacro for refactoring actions

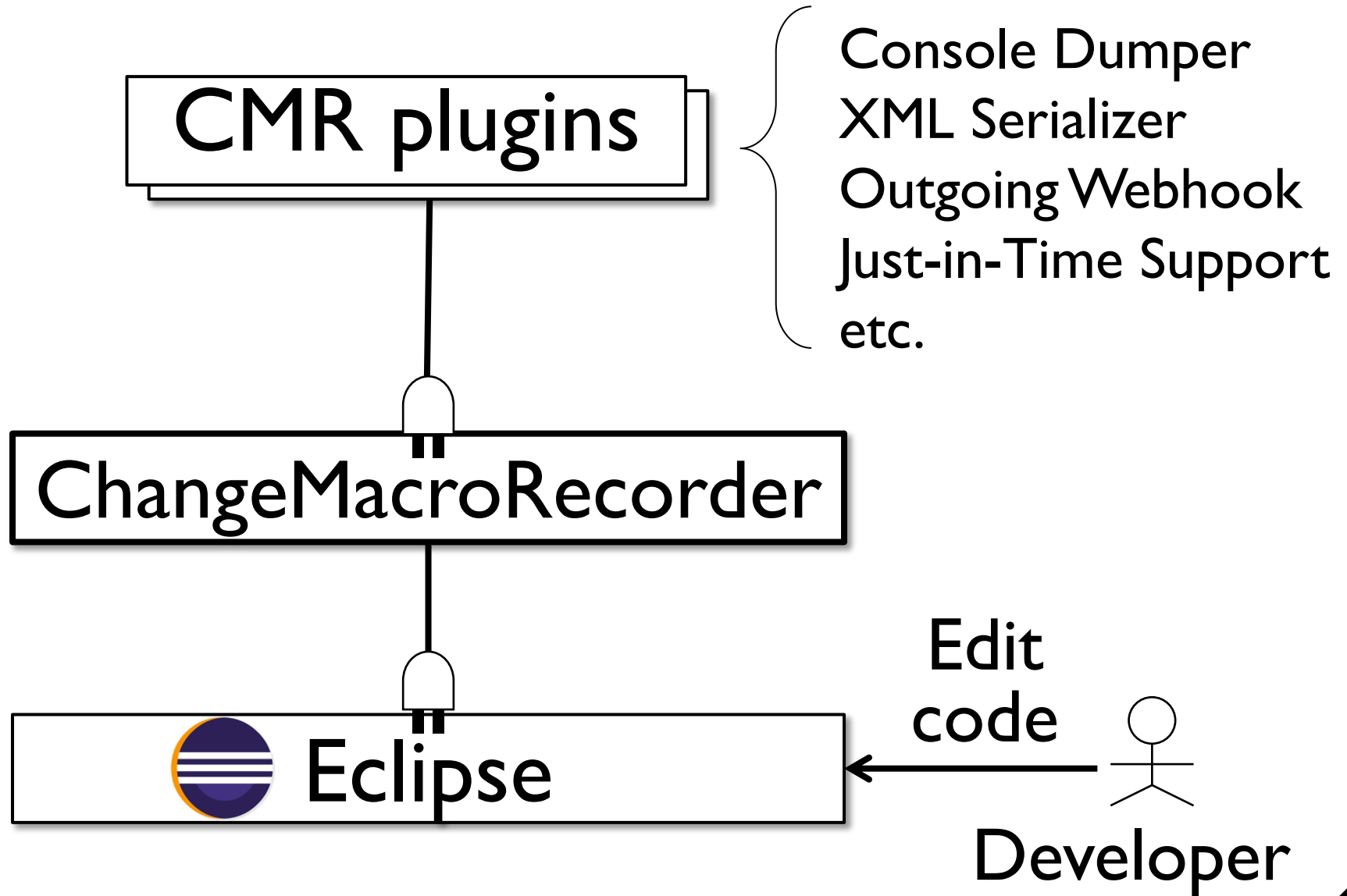
GitMacro for Git actions

ResourceMacro for property changes of resources

FileMacro for file changes

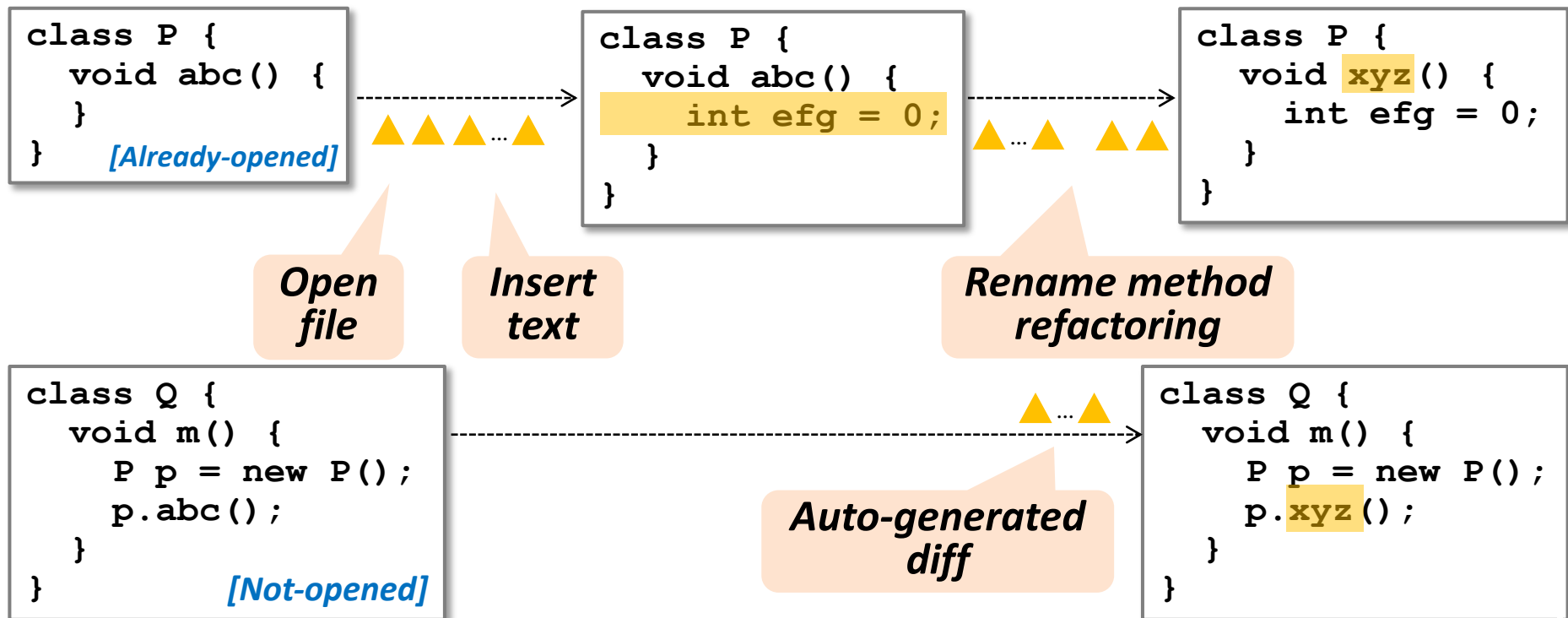
TriggerMacro for indicating the timing of events

Plugin Mechanism



Keeping Consistency

- Generates diff-based edits automatically when an inconsistency happens
 - Handles edits in not-opened files / outside of the IDE



Change Aggregation

Low level

```
{File} OPENED: P.java
{File} ACTIVATED: P.java
{Trigger} CURSOR_CHANGE: P.java timing=[INSTANT]
{{Trigger} CURSOR_CDDocument} EDIT: P.java offset=39 ins=[~ ] del=[]
{Document} EDIT: P.java offset=42 ins=[i] del=[]
{Document} EDIT: P.java offset=43 ins=[n] del=[]
{Document} EDIT: P.java offset=44 ins=[t] del=[]
{Document} EDIT: P.java offset=45 ins=[ ] del=[]
...
{Document} EDIT: P.java offset=52 ins=[0] del=[]
{Document} EDIT: P.java offset=53 ins=[,] del=[]
HANGE: P.java timing=[INSTANT]
{Trigger} CURSOR_CHANGE: P.java timing=[INSTANT]
{Command} EXECUTION: P.java cmd=[rename.element]
{Trigger} REFACTORING: P.java timing=[BEGIN]
{Document} EDIT: P.java offset=32 ins=[x] del=[abc]
{Document} EDIT: P.java offset=33 ins=[y] del=[]
{Document} EDIT: P.java offset=34 ins=[z] del=[]
{Cancel} UNDO: P.java offset=33 ins=[] del=[yz]
{Cancel} UNDO: P.java offset=32 ins=[abc] del=[x]
{Refactoring} ABOUT_TO_PERFORM: P.java name=[rename.method] range=[32-34]
{Trigger} REFACTORING: P.java timing=[BEGIN]
{Document} EDIT: P.java offset=32 ins=[xyz] del=[abc]
{Resource} CHANGED: Q.java target=[FILE]
{File} CONTENT_CHANGED: Q.java
{Document} DIFF: Q.java offset=59 ins=[xyz] del=[abc]
{File} REFACTORED: Q.java
{Trigger} REFACTORING: P.java timing=[END]
{Refactoring} PERFORMED: P.java name=[rename.method]
```

Inserting "int"

Refactoring configuration

Refactoring edits to the target file

Subsequent edits to another file

Rename Method refactoring

Timeline

Change Aggregation

Low level

Aggregated level

{File} OPENED: P.java
{File} ACTIVATED: P.java
{Trigger} CURSOR_CHANGE: P.java timing=[INSTANT]
{Document} EDIT: P.java offset=39 ins=[~] del=[]
{Document} EDIT: P.java offset=42 ins=[i] del=[]
{Document} EDIT: P.java offset=43 ins=[n] del=[]
{Document} EDIT: P.java offset=44 ins=[t] del=[]
{Document} EDIT: P.java offset=45 ins=[] del=[]
...
{Document} EDIT: P.java offset=52 ins=[0] del=[]
{Document} EDIT: P.java offset=53 ins=[;] del=[]
{Trigger} CURSOR_CHANGE: P.java timing=[INSTANT]
{Trigger} CURSOR_CHANGE: P.java timing=[INSTANT]
{Command} EXECUTION: P.java cmd=[rename.element]
{Trigger} REFACTORING: P.java timing=[BEGIN]
{Document} EDIT: P.java offset=32 ins=[x] del=[abc]
{Document} EDIT: P.java offset=33 ins=[y] del=[]
{Document} EDIT: P.java offset=34 ins=[z] del=[]
{Cancel} UNDO: P.java offset=33 ins=[] del=[yz]
{Cancel} UNDO: P.java offset=32 ins=[abc] del=[x]
{Refactoring} ABOUT_TO_PERFORM: P.java name=[rename.
{Trigger} REFACTORING: P.java timing=[BEGIN]
{Document} EDIT: P.java offset=32 ins=[xyz] del=[abc]
{Resource} CHANGED: Q.java target=[FILE]
{File} CONTENT_CHANGED: Q.java
{Document} DIFF: Q.java offset=59 ins=[xyz] del=[abc]
{File} REFACTORED: Q.java
{Trigger} REFACTORING: P.java timing=[END]
{Refactoring} PERFORMED: P.java name=[rename.method]

{File} OPENED: P.java
{File} ACTIVATED: P.java

{Document} EDIT: P.java offset=39 ins=[~] del=[]
{Document} EDIT: P.java offset=42 ins=[int] del=[]
Compressed

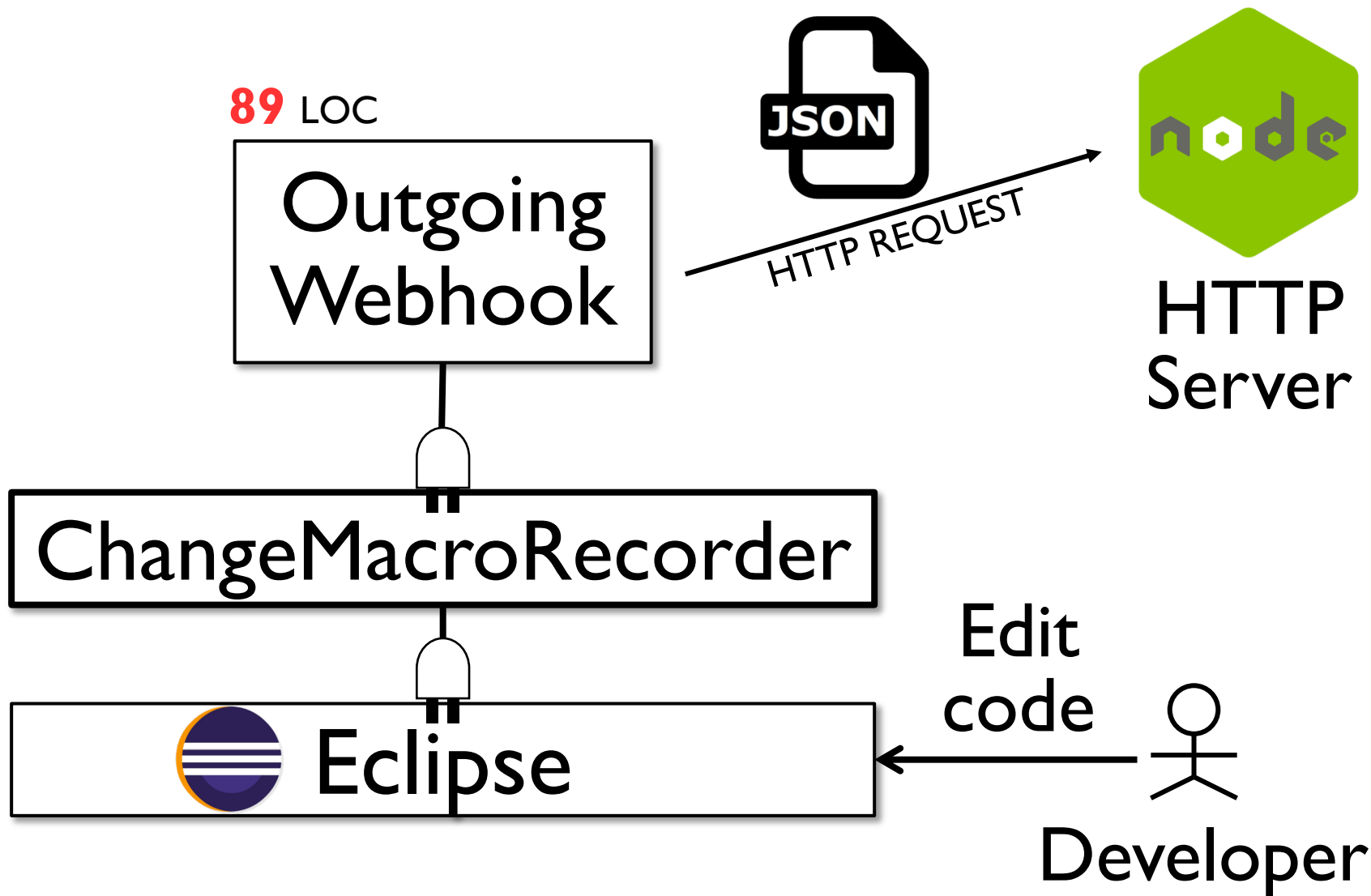
{Document} EDIT: P.java offset=45 ins=[] del=[]
...
{Document} EDIT: P.java offset=52 ins=[0] del=[]
{Document} EDIT: P.java offset=53 ins=[;] del=[]

{Command} EXECUTION: P.java cmd=[rename.element]
{Compound} REFACTORING cmd=[rename.element]
Compounded

!{Refactoring} ABOUT_TO_PERFORM: P.java name=[rena
!{Document} EDIT: P.java offset=32 ins=[xyz] del=[abc]
!{Resource} CHANGED: P.java target=[FILE]
!{File} CONTENT_CHANGED: P.java
!{Document} AUTO_DIFF: P.java offset=59 ins=[xyz] del:
!{File} REFACTORED: P.java

{Refactoring} PERFORMED: P.java name=[rename.meth

Developing Plugin is Easy





[https://github.com/
katsuhisamaruyama/
ChangeMacroRecorder](https://github.com/katsuhisamaruyama/ChangeMacroRecorder)
(<https://git.io/vxZs3>)



[http://katsuhisamaruyama.github.io/
ChangeMacroRecorder/
org.jtool.macrorecorder.site/
site.xml](http://katsuhisamaruyama.github.io/ChangeMacroRecorder/org.jtool.macrorecorder.site/site.xml)

Credit

- **Chronology**

- <http://www.flickr.com/photos/elsie/4607687530/>