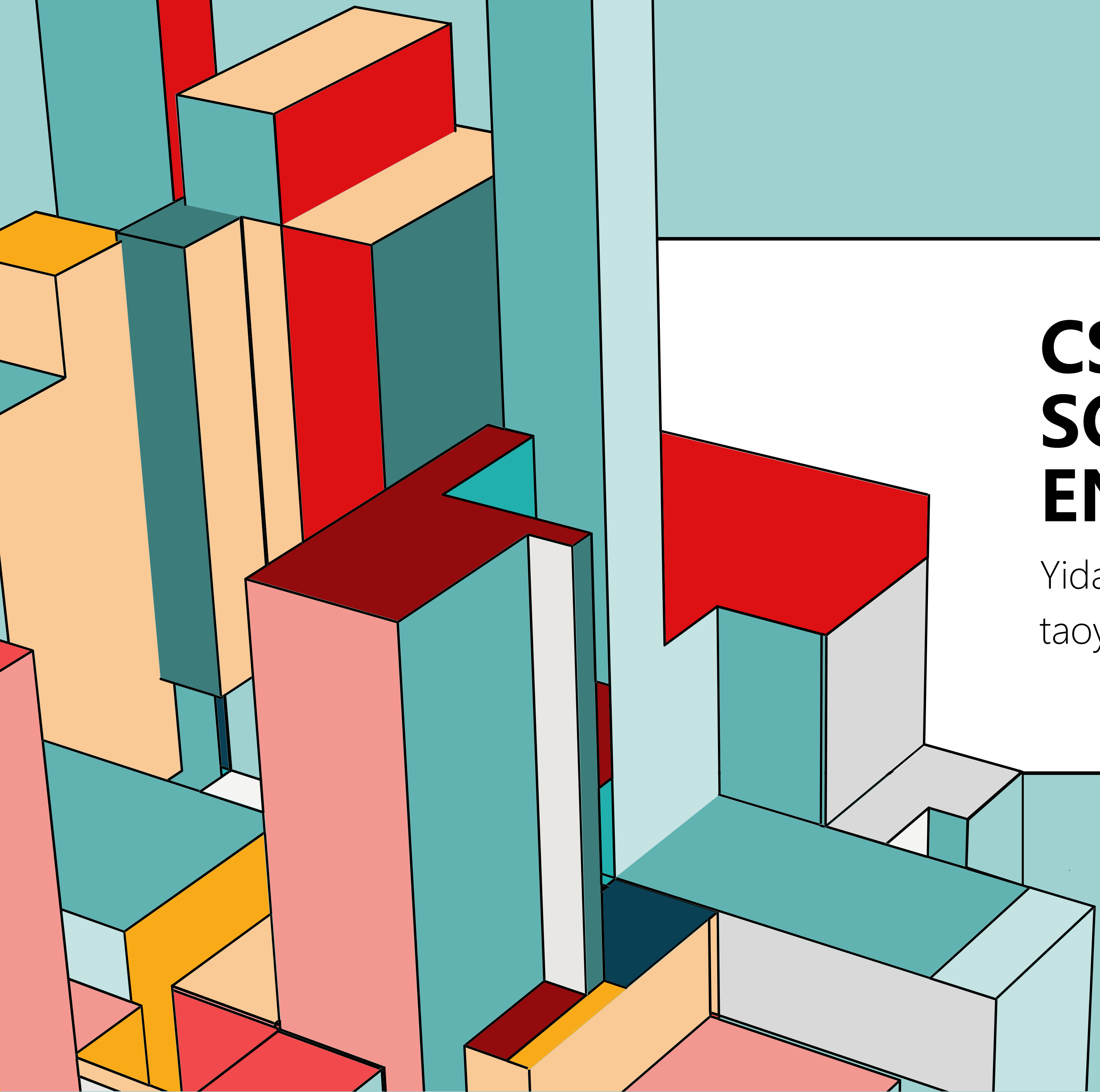


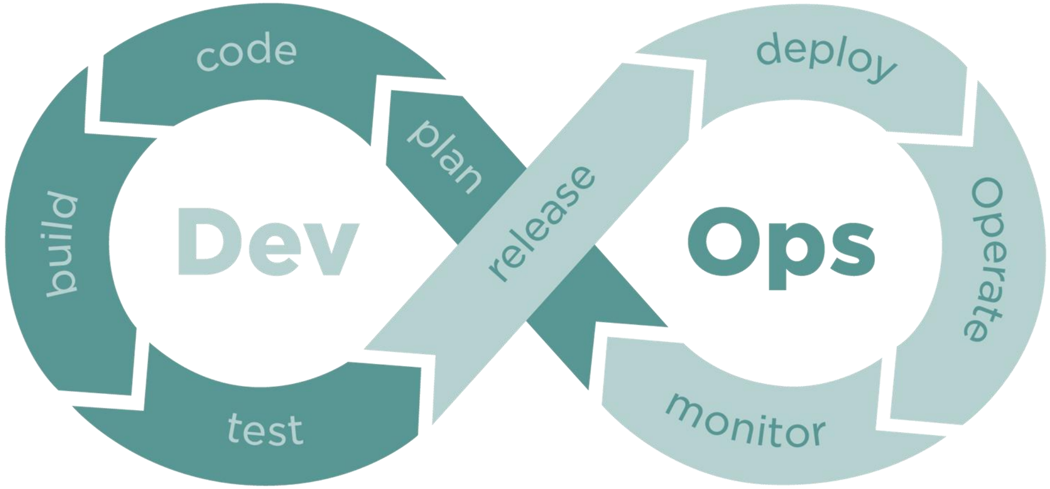
南方科技大學
SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

CS304 SOFTWARE ENGINEERING

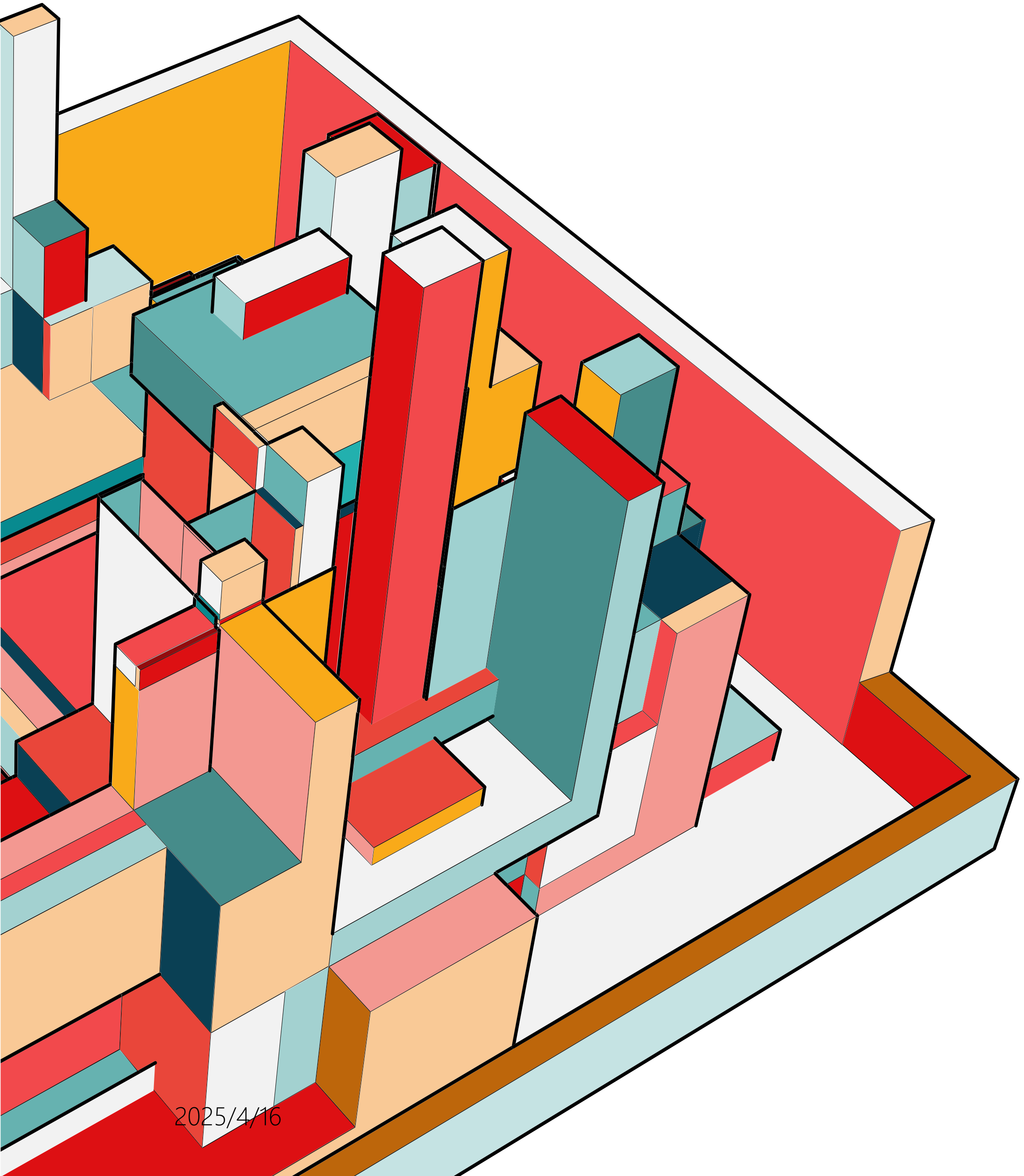
Yida Tao

taoyd@sustech.edu.cn

WHERE ARE WE NOW?



One missing piece before release……

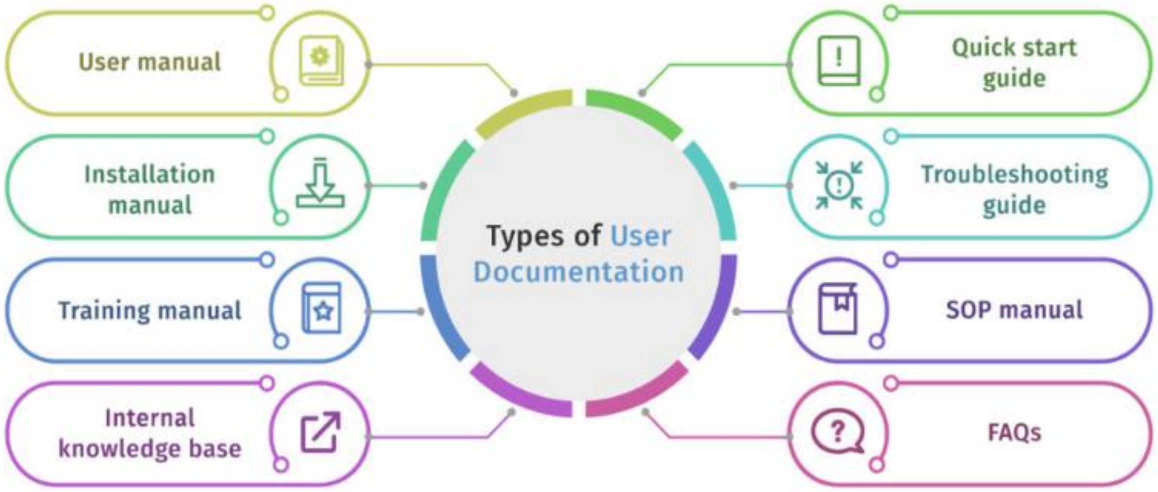


LECTURE 10

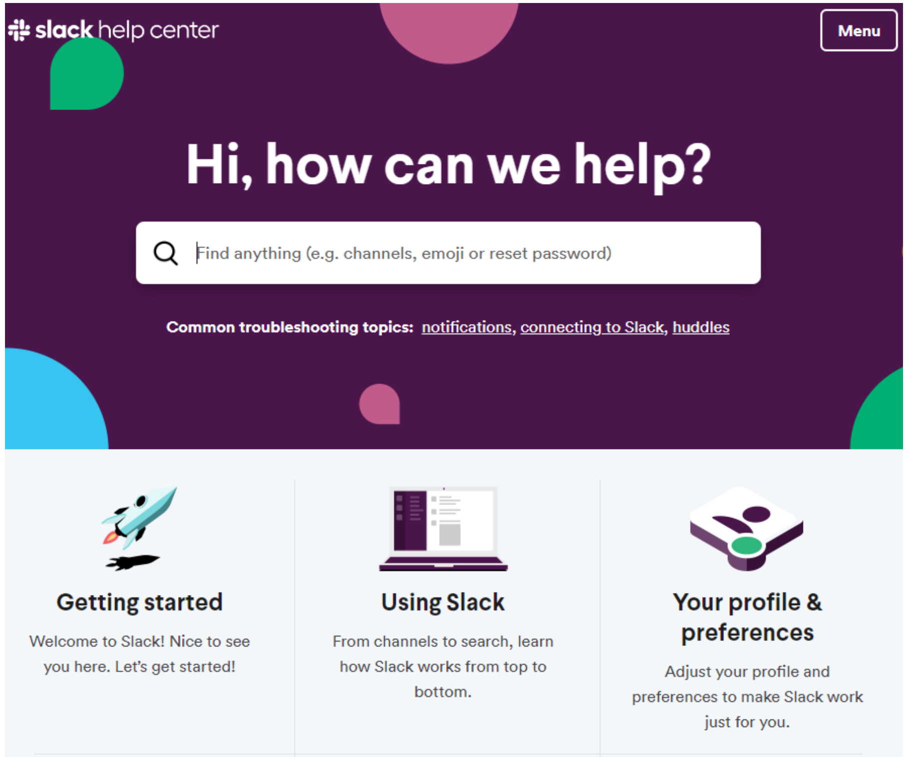
- Software documentation
  - Types
  - Good Practices
  - Tools
- Documentation as Code

EXTERNAL SOFTWARE DOCUMENTATION

- **End-user documentation**: gives end users basic instructions on how to use, install and troubleshoot the software (e.g., user guides, tutorials).
- **Just-in-time documentation**: provides end users with support documentation at the exact time they will need it (e.g., FAQ pages, how-to documents)



EXTERNAL SOFTWARE DOCUMENTATION



Hi, how can we help?

Common troubleshooting topics: notifications, connecting to Slack, huddles

Getting started

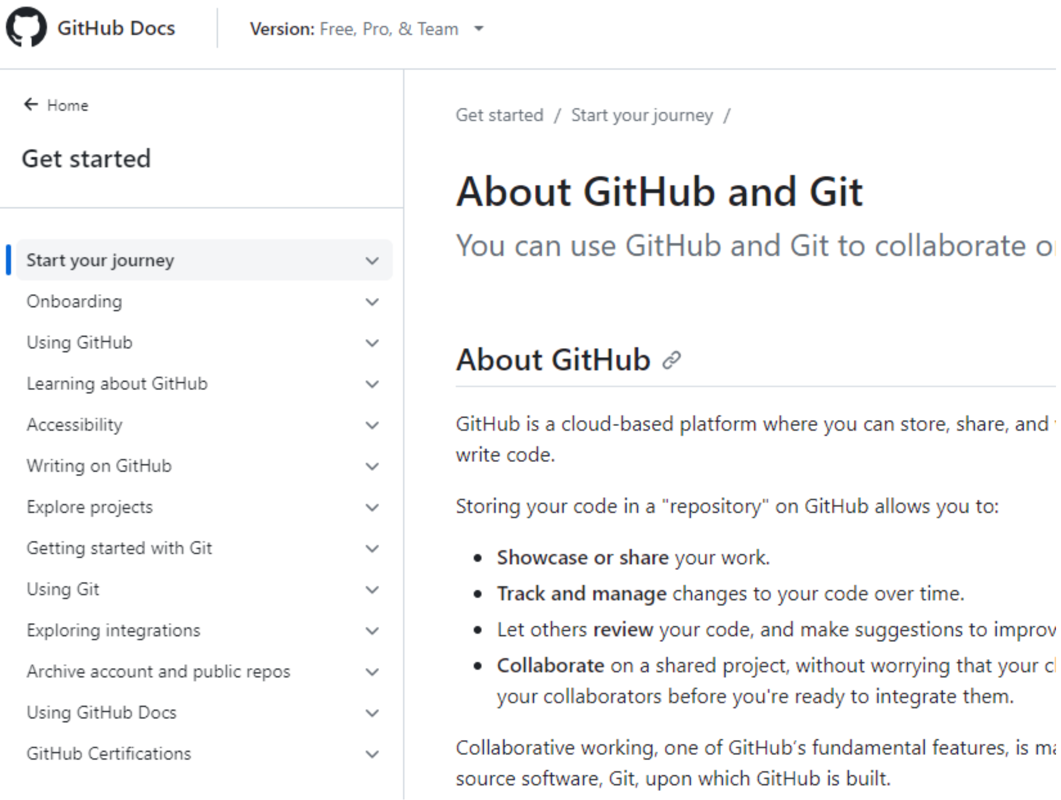
Welcome to Slack! Nice to see you here. Let's get started!

Using Slack

From channels to search, learn how Slack works from top to bottom.

Your profile & preferences

Adjust your profile and preferences to make Slack work just for you.



About GitHub and Git

You can use GitHub and Git to collaborate o

About GitHub

GitHub is a cloud-based platform where you can store, share, and write code.

Storing your code in a "repository" on GitHub allows you to:

- **Showcase or share** your work.
- **Track and manage** changes to your code over time.
- Let others **review** your code, and make suggestions to improv
- **Collaborate** on a shared project, without worrying that your c your collaborators before you're ready to integrate them.

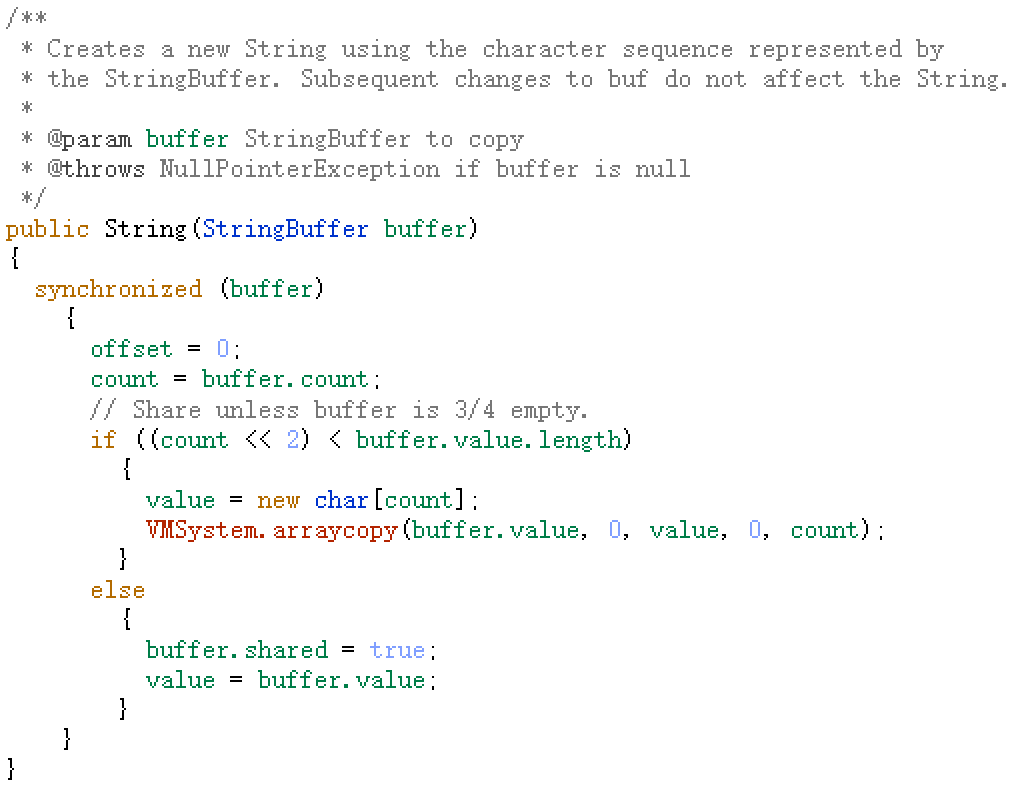
Collaborative working, one of GitHub's fundamental features, is m source software, Git, upon which GitHub is built.

INTERNAL SOFTWARE DOCUMENTATION

- **Administrative documentation**: the high-level administrative guidelines, roadmaps and product requirements for the software development team and project managers working on the software (e.g., status reports, meeting notes).

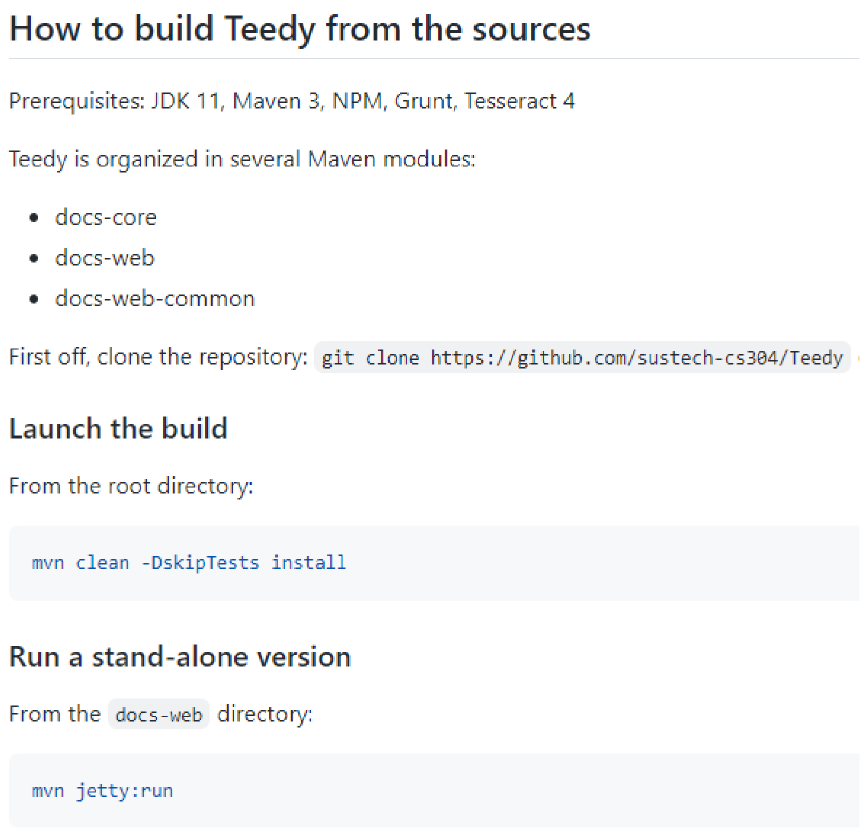
- **Developer documentation**: provides instructions to developers for building & extending the software and guides them through the development process.
  - Requirements documentation
  - Architecture & design documentation
  - Code Comments
  - API documentation
  - Readme, release notes, etc.

INTERNAL SOFTWARE DOCUMENTATION



```
/**
 * Creates a new String using the character sequence represented by
 * the StringBuffer. Subsequent changes to buf do not affect the String.
 *
 * @param buffer StringBuffer to copy
 * @throws NullPointerException if buffer is null
 */
public String(StringBuffer buffer)
{
  synchronized (buffer)
    {
      offset = 0;
      count = buffer.count;
      // Share unless buffer is 3/4 empty.
      if ((count << 2) < buffer.value.length)
        {
          value = new char[count];
          VMSystem.arraycopy(buffer.value, 0, value, 0, count);
        }
      else
        {
          buffer.shared = true;
          value = buffer.value;
        }
    }
}
```

java.io.String



How to build Teedy from the sources

Prerequisites: JDK 11, Maven 3, NPM, Grunt, Tesseract 4

Teedy is organized in several Maven modules:

- docs-core
- docs-web
- docs-web-common

First off, clone the repository: `git clone https://github.com/sustech-cs304/Teedy`

Launch the build

From the root directory:

```
mvn clean -DskipTests install
```

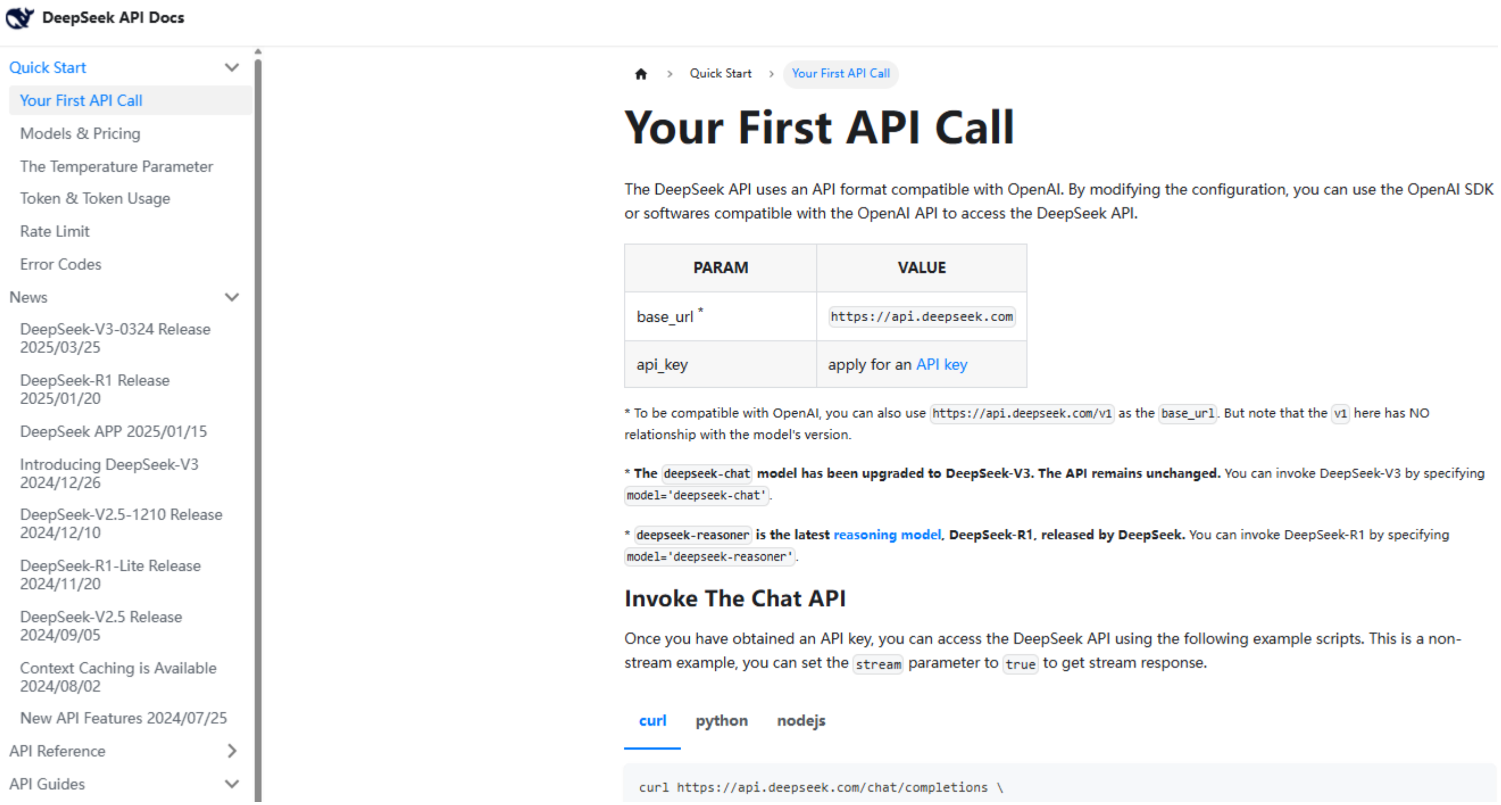
Run a stand-alone version

From the `docs-web` directory:

```
mvn jetty:run
```

Teedy readme

INTERNAL SOFTWARE DOCUMENTATION


DeepSeek API Docs
Quick Start
Your First API Call
Models & Pricing
The Temperature Parameter
Token & Token Usage
Rate Limit
Error Codes
News
DeepSeek-V3-0324 Release 2025/03/25
DeepSeek-R1 Release 2025/01/20
DeepSeek APP 2025/01/15
Introducing DeepSeek-V3 2024/12/26
DeepSeek-V2.5-1210 Release 2024/12/10
DeepSeek-R1-Lite Release 2024/11/20
DeepSeek-V2.5 Release 2024/09/05
Context Caching is Available 2024/08/02
New API Features 2024/07/25
API Reference
API Guides
Quick Start
Your First API Call

Your First API Call

The DeepSeek API uses an API format compatible with OpenAI. By modifying the configuration, you can use the OpenAI SDK or softwares compatible with the OpenAI API to access the DeepSeek API.

PARAM	VALUE
base_url *	`https://api.deepseek.com`
api_key	apply for an API key

* To be compatible with OpenAI, you can also use `https://api.deepseek.com/v1` as the `base_url`. But note that the `v1` here has NO relationship with the model's version.

* **The `deepseek-chat` model has been upgraded to DeepSeek-V3. The API remains unchanged.** You can invoke DeepSeek-V3 by specifying `model='deepseek-chat'`.

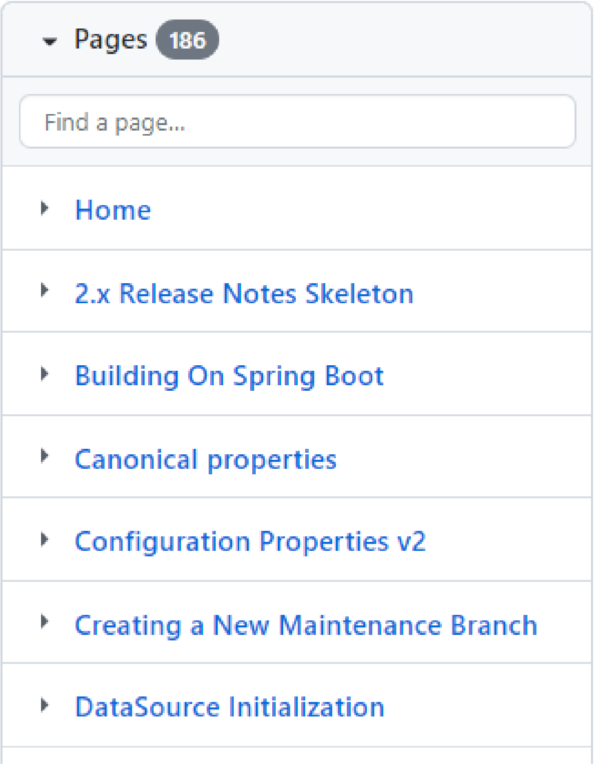
* **`deepseek-reasoner` is the latest reasoning model, DeepSeek-R1, released by DeepSeek.** You can invoke DeepSeek-R1 by specifying `model='deepseek-reasoner'`.

Invoke The Chat API

Once you have obtained an API key, you can access the DeepSeek API using the following example scripts. This is a non-stream example, you can set the `stream` parameter to `true` to get stream response.

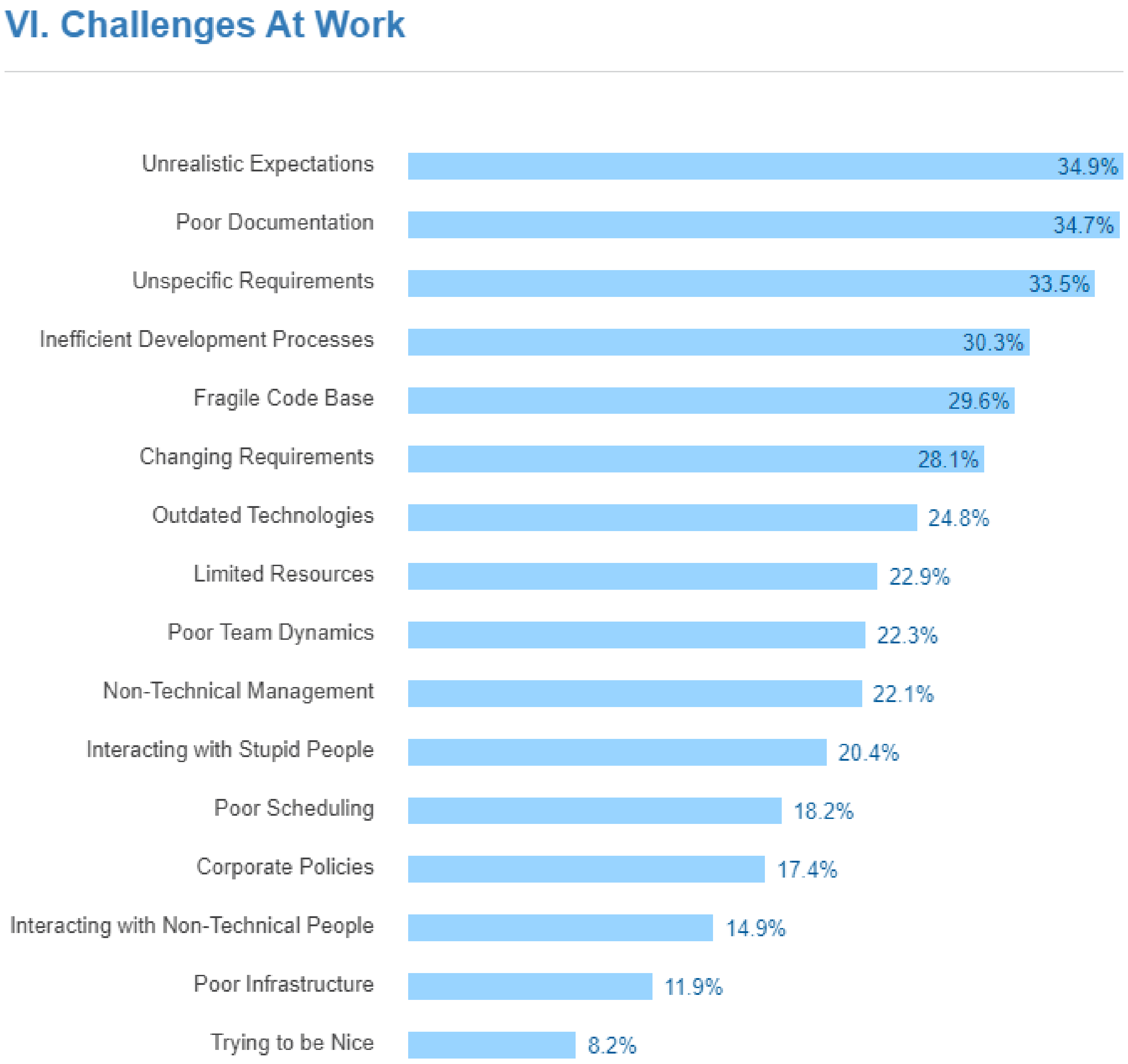
```
curl https://api.deepseek.com/chat/completions \
```

https://api-docs.deepseek.com/

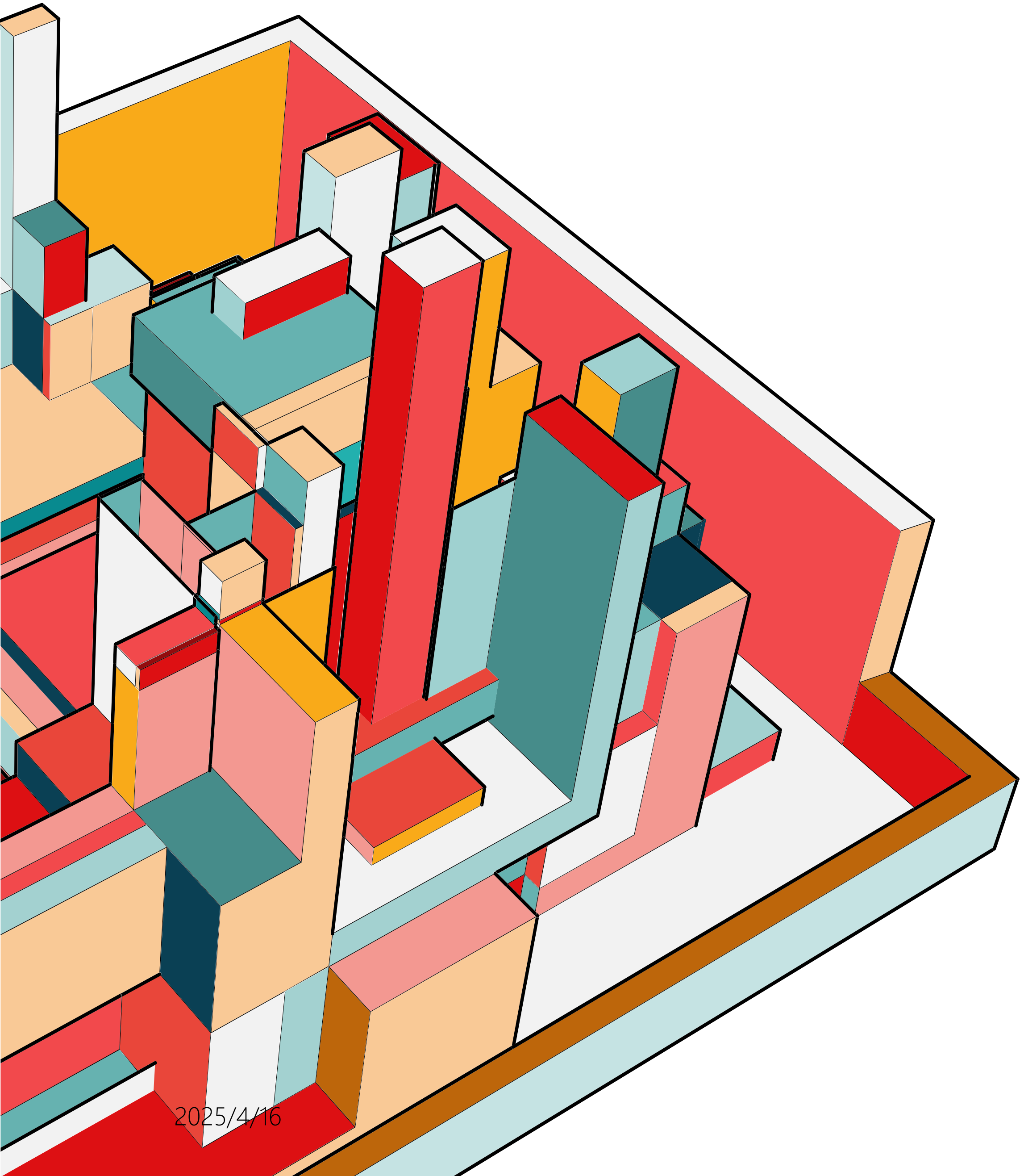

Pages 186
Find a page...
Home
2.x Release Notes Skeleton
Building On Spring Boot
Canonical properties
Configuration Properties v2
Creating a New Maintenance Branch
DataSource Initialization

https://github.com/spring-projects/spring-boot/wiki

POOR DOCUMENTATION IS EVERYWHERE



Source: Stack Overflow Developer Survey 2016



WRITING GOOD DOCUMENTATION

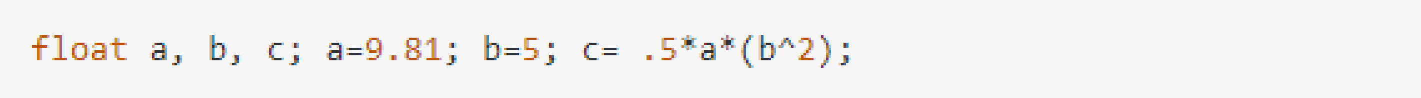
GOOD PRACTICES

SELF-DOCUMENTING CODE

- Self-documenting (or self-describing) code follow naming conventions and structured programming conventions that enable use and understanding of the system without prior specific knowledge
  - Meaningful directory structure
  - Meaningful file/class/method/variable names

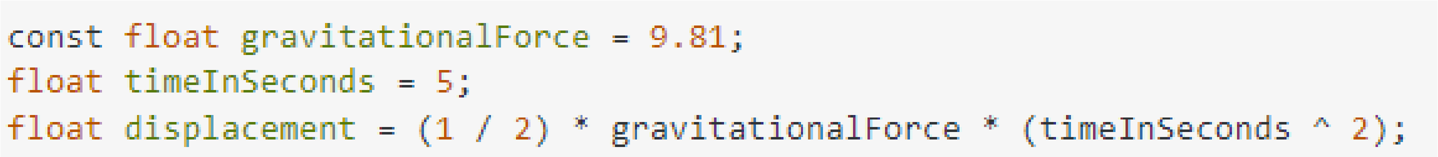
- Main goal: allowing developers to understand code at a glance

SELF-DOCUMENTING CODE



```
float a, b, c; a=9.81; b=5; c= .5*a*(b^2);
```

VS



```
const float gravitationalForce = 9.81;
float timeInSeconds = 5;
float displacement = (1 / 2) * gravitationalForce * (timeInSeconds ^ 2);
```

Good code doesn’t need documentation. It’s self-explaining

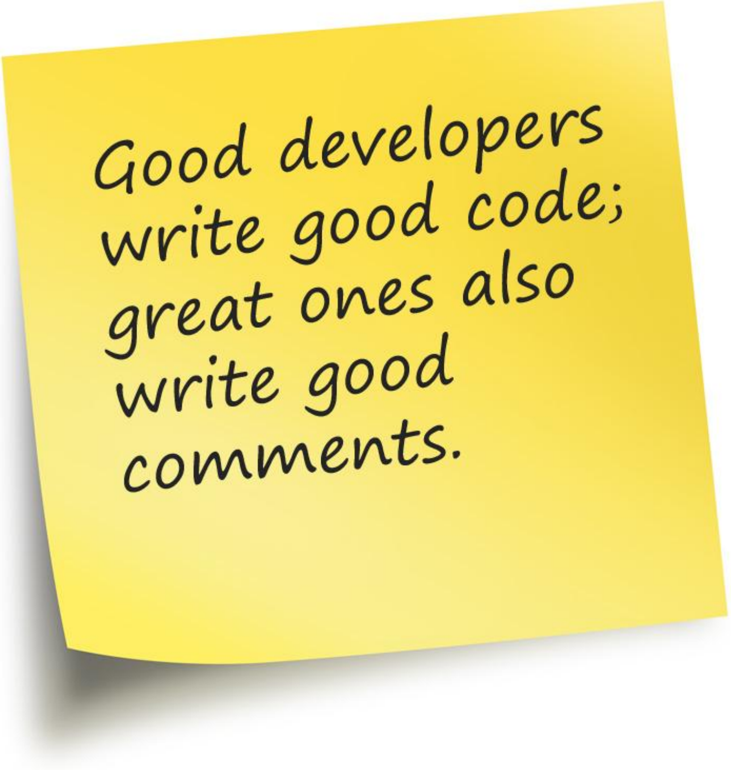
https://stackoverflow.com/questions/209015/what-is-self-documenting-code-and-can-it-replace-well-documented-code

CODE COMMENTS （注释）

- Sometimes when the code alone can’t provide context or clarify intent, the developer may write extra descriptions, i.e., code comments.

- Code comments enhance readability. They facilitate code reviews, refactoring, and maintenance.

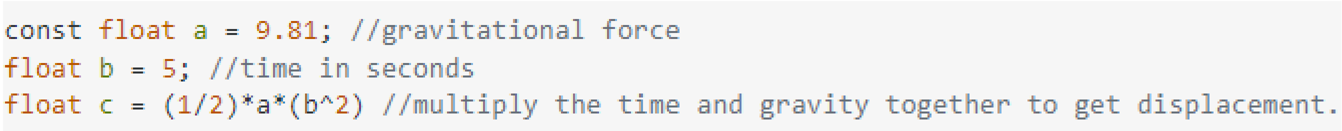
- Code comments are ignored by compilers and interpreters when producing the final executable. Thus, they incur no runtime performance overhead. However, too many or unnecessary comments reduce readability.



Good developers write good code; great ones also write good comments.

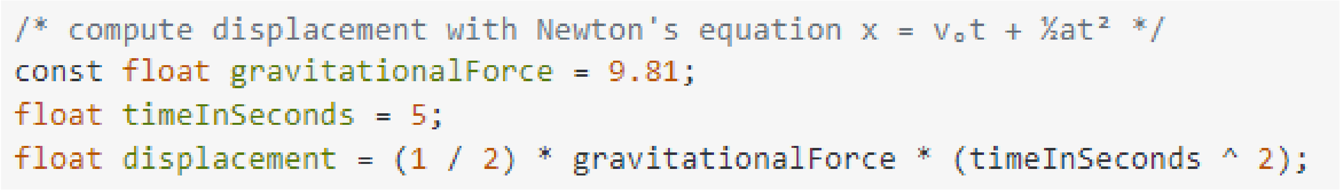
WRITING GOOD COMMENTS

- Comments should be used only to explain the **intent** behind code that cannot be refactored to explain itself
- Mostly used for providing **additional context**, instead of simply repeating the code
- Should answer **WHY**, instead of WHAT



```
const float a = 9.81; //gravitational force
float b = 5; //time in seconds
float c = (1/2)*a*(b^2) //multiply the time and gravity together to get displacement.
```

VS



```
/* compute displacement with Newton's equation x = v₀t + ½at² */
const float gravitationalForce = 9.81;
float timeInSeconds = 5;
float displacement = (1 / 2) * gravitationalForce * (timeInSeconds ^ 2);
```

https://stackoverflow.com/questions/209015/what-is-self-documenting-code-and-can-it-replace-well-documented-code

WRITING GOOD COMMENTS

```
while (! finished) {
    try {
        Thread.sleep(10); // so that program gets time to handle xxx logics
    }
    catch (InterruptedException e) {
        ……
    }
}
```

Meaningful code comment complements / explains the intention of the code

WRITING GOOD COMMENTS

```
//WARNING: This test case requires ~15 minutes to execute, don’t run it during daily integration.
@Ignore
@Test
public void testHighThroughput() {
//模拟十万个线程同时进行访问
}
```

Meaningful code comment gives necessary warnings

WRITING GOOD COMMENTS

```
//Notice： should be read from external config files
String driver = "com.mysql.jdbc.Driver";
String url = "jdbc:mysql://localhost:3306/sqltestdb";
String user = "root";
String password = "123456";
Class.forName(driver);
con = DriverManager.getConnection(url,user,password);
```

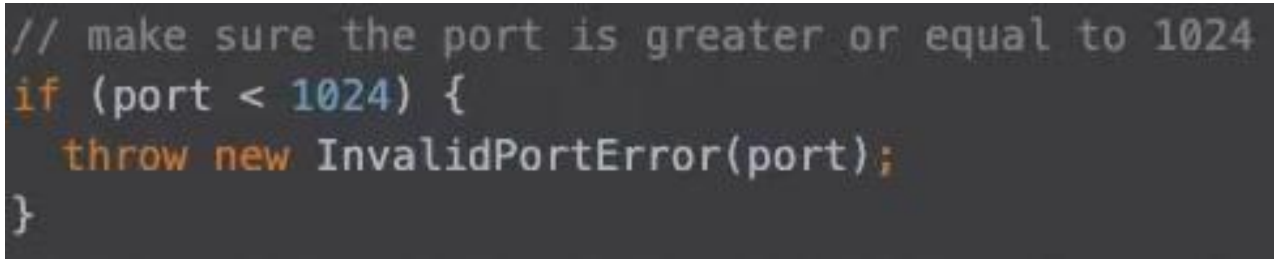
Meaningful code comment reminds about self-admitted technical debt (自承认技术债): developers consciously perform the hack (suboptimal solution) due to time constraints or technical limitations

WRITING GOOD COMMENTS

```
public int[] sortNumbers() {
    //TODO: the sorting code here
    return new int[]{1,2,3,4,5};
}
```

Meaningful code comment helps developers locate incomplete/unfinished implementations (//TODO cannot exist in delivered code)

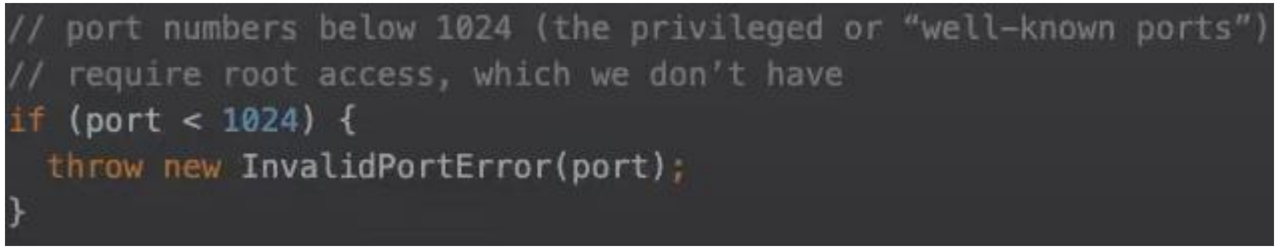
COMMENTS - EXAMPLES



```
// make sure the port is greater or equal to 1024
if (port < 1024) {
  throw new InvalidPortError(port);
}
```

Bad

- No additional information
- WHAT



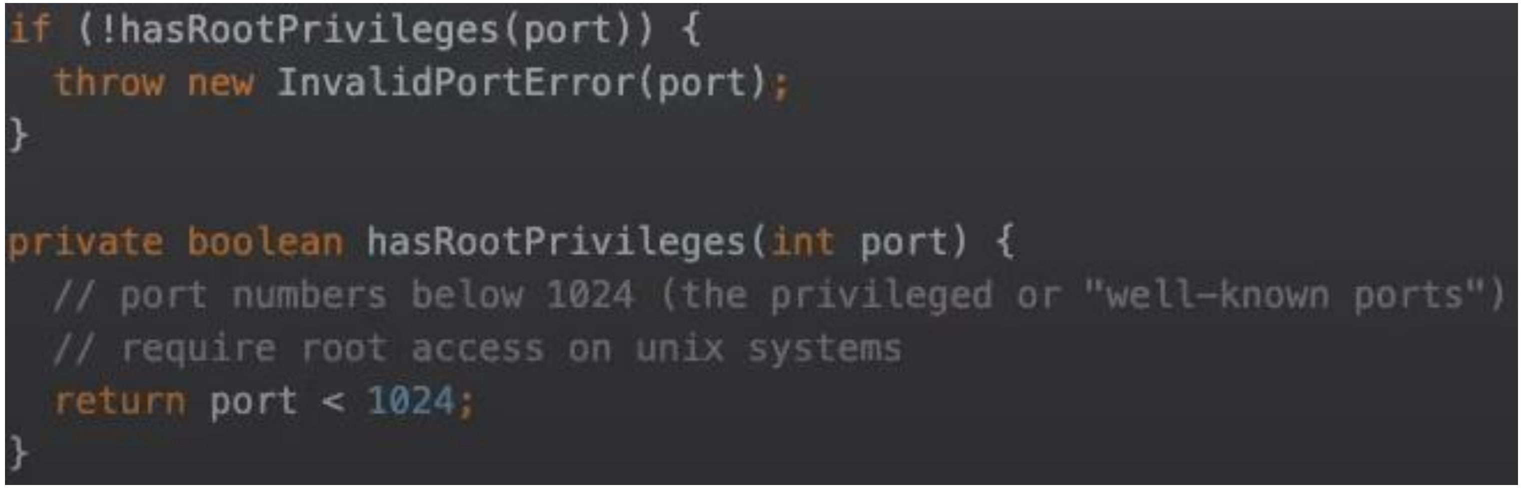
```
// port numbers below 1024 (the privileged or “well-known ports”)
// require root access, which we don’t have
if (port < 1024) {
  throw new InvalidPortError(port);
}
```

Okay

- Additional information
- WHY

Examples from https://www.youtube.com/watch?v=uPMxUnBjGG8

COMMENTS - EXAMPLES

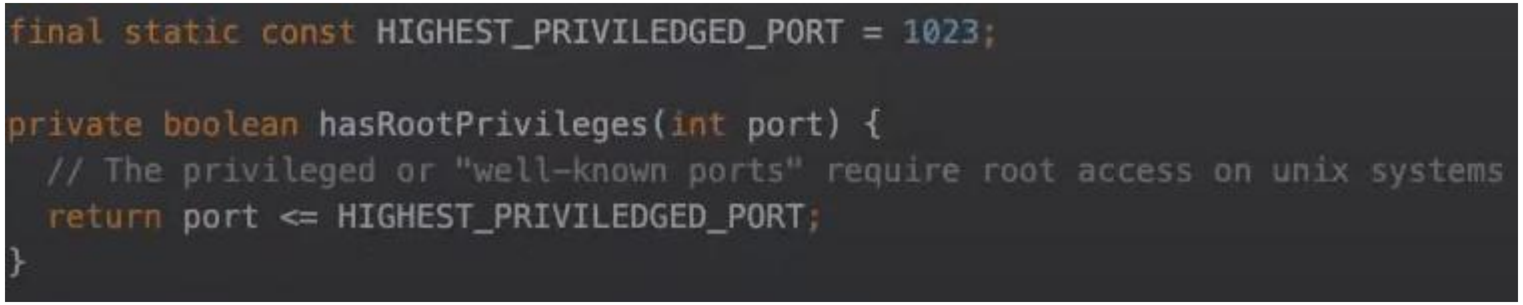


```
if (!hasRootPrivileges(port)) {
  throw new InvalidPortError(port);
}

private boolean hasRootPrivileges(int port) {
  // port numbers below 1024 (the privileged or "well-known ports")
  // require root access on unix systems
  return port < 1024;
}
```

Better

- Refactored with meaningful name (`hasRootPrivileges`)



```
final static const HIGHEST_PRIVILEDGED_PORT = 1023;

private boolean hasRootPrivileges(int port) {
  // The privileged or "well-known ports" require root access on unix systems
  return port <= HIGHEST_PRIVILEDGED_PORT;
}
```

Even better

- Turn **magic number** into a constant with meaningful name
- Comment might no longer be needed

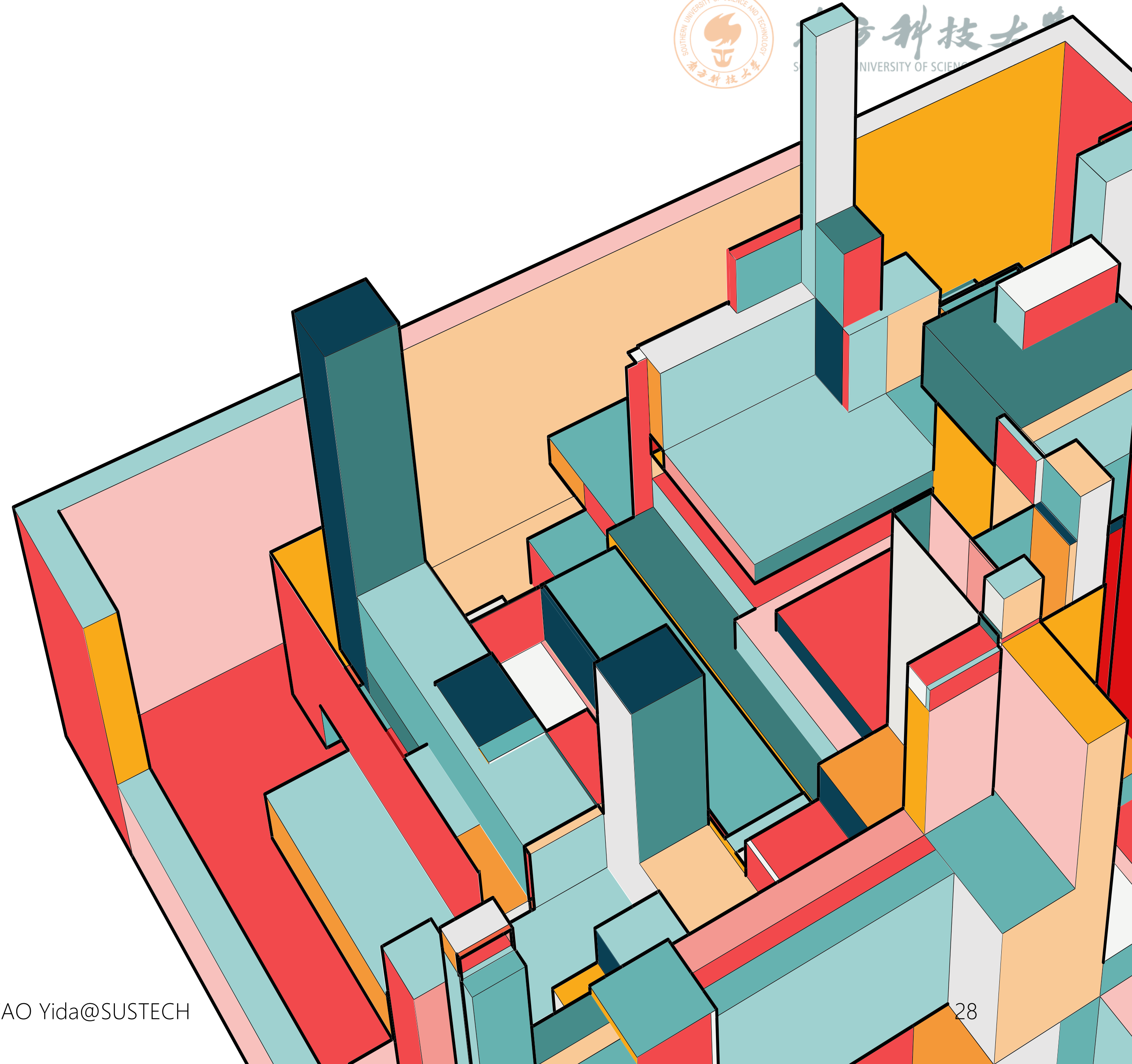
Examples from https://www.youtube.com/watch?v=uPMxUnBjGG8

COMMENTING PRINCIPLES

- The best documentation is the code itself
- Make the code self-explainable and self-documenting
- Do not document bad code, refactor or rewrite it!
- WHY (rationales), not WHAT (implementations)

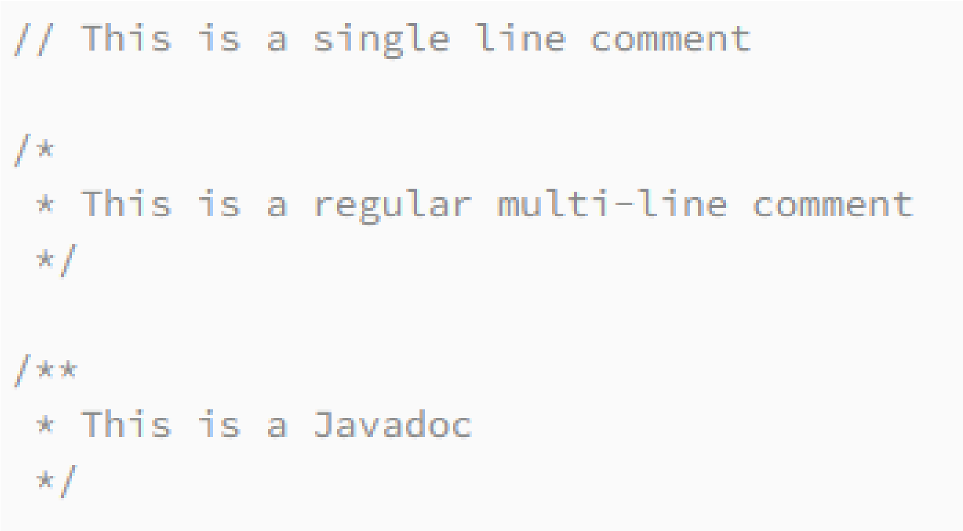
JAVADOC

Javadoc (included in JDK) automatically generates API documentation from comments present in the Java source code.



JAVADOC COMMENT SYNTAX

- Javadoc comments structure look very similar to a regular multi-line comment, but the key difference is the extra asterisk at the beginning
- Javadoc style comments may contain HTML tags as well.



```
// This is a single line comment

/*
 * This is a regular multi-line comment
 */

/**
 * This is a Javadoc
 */
```

https://www.baeldung.com/javadoc

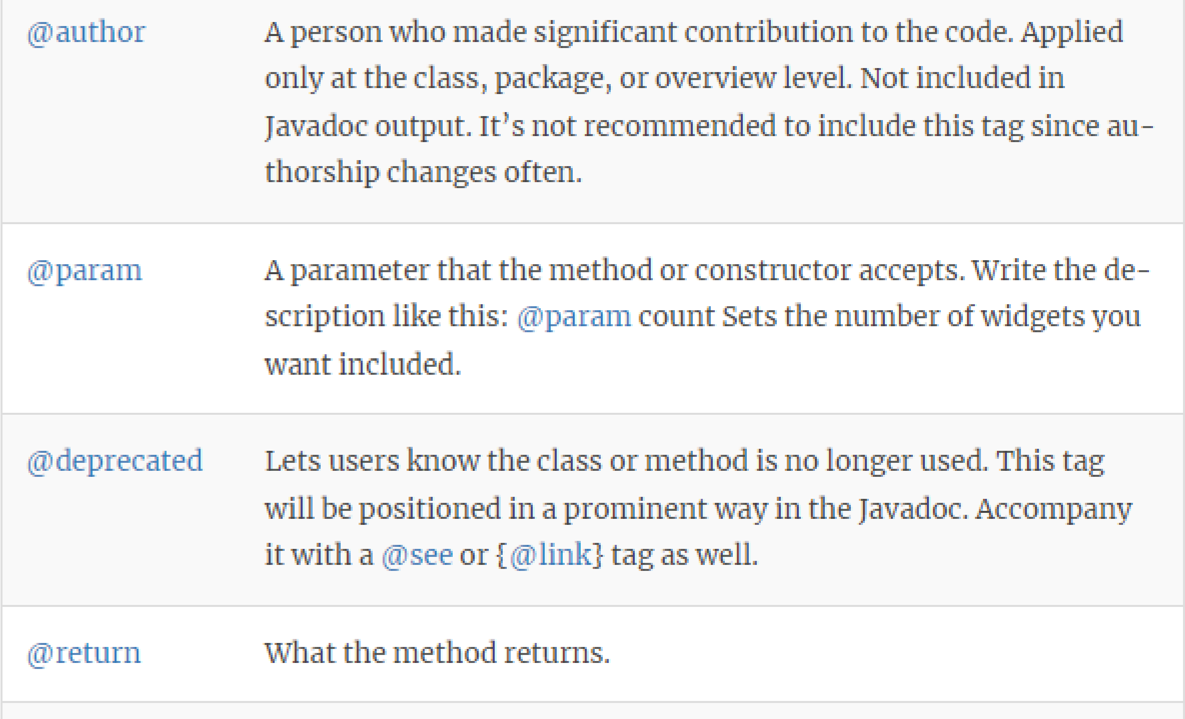
JAVADOC COMMENT SYNTAX

- Javadoc comments may be placed above any class, method, or field which we want to document.

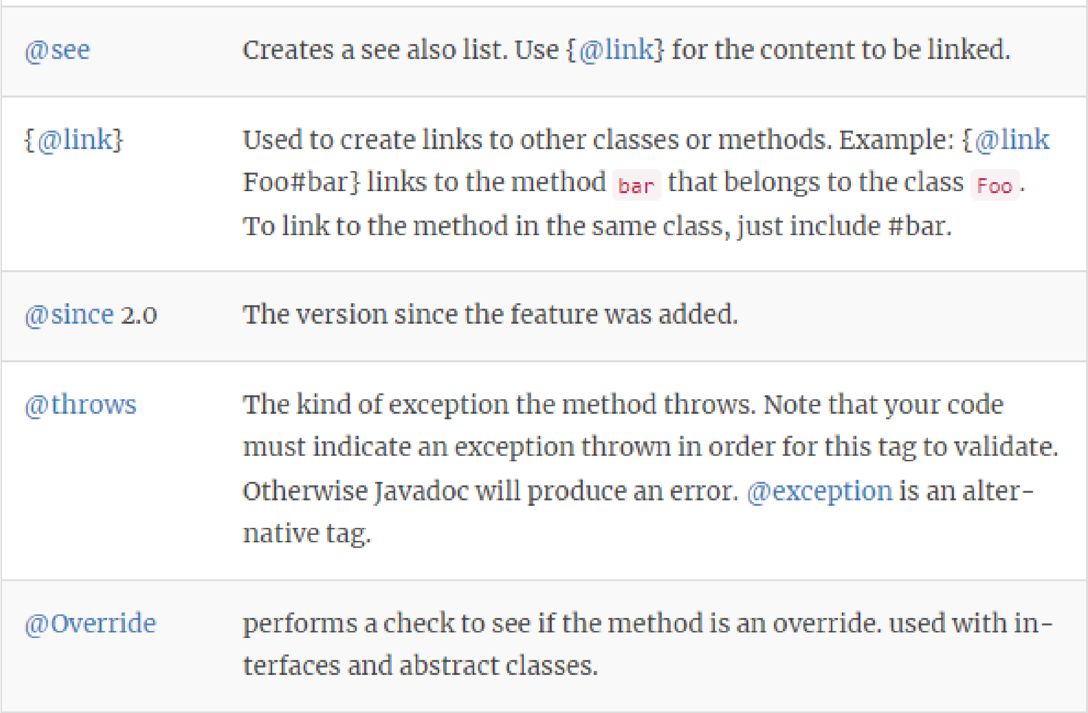
- These comments are commonly made up of two sections:
  - The description of what we're commenting on
  - The standalone block tags (marked with the “@” symbol) which describe specific meta-data

https://www.baeldung.com/javadoc

JAVADOC TAGS



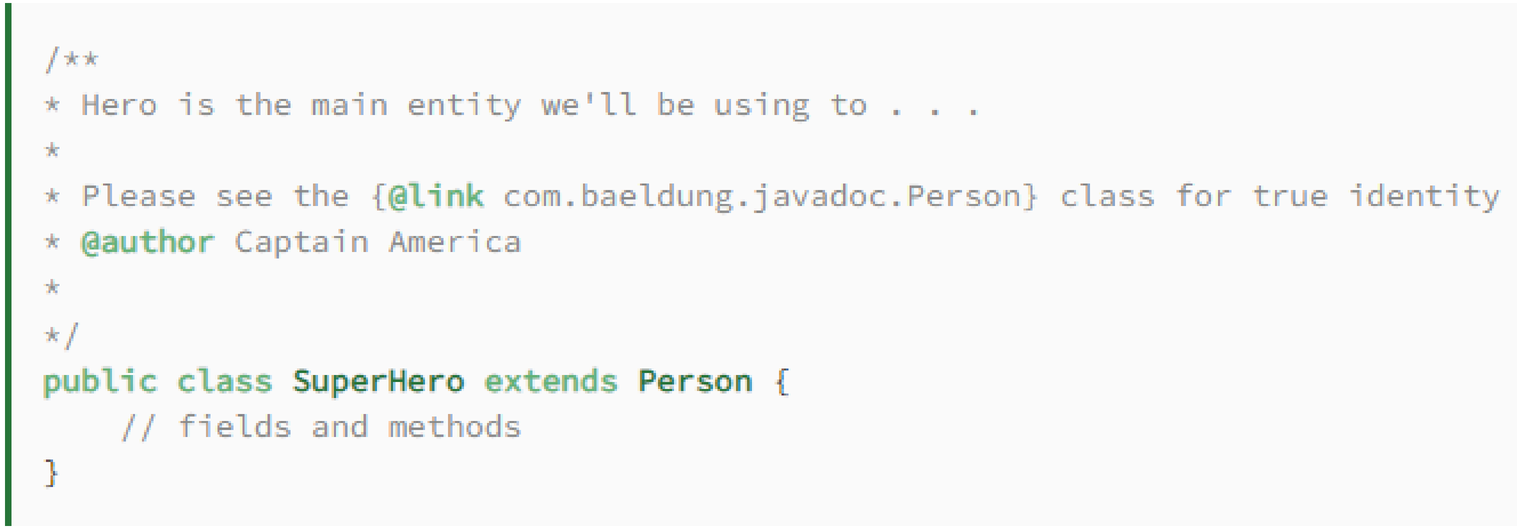
@author	A person who made significant contribution to the code. Applied only at the class, package, or overview level. Not included in Javadoc output. It's not recommended to include this tag since authorship changes often.
@param	A parameter that the method or constructor accepts. Write the description like this: @param count Sets the number of widgets you want included.
@deprecated	Lets users know the class or method is no longer used. This tag will be positioned in a prominent way in the Javadoc. Accompany it with a @see or {@link} tag as well.
@return	What the method returns.



@see	Creates a see also list. Use {@link} for the content to be linked.
{@link}	Used to create links to other classes or methods. Example: {@link Foo#bar} links to the method `bar` that belongs to the class `Foo`. To link to the method in the same class, just include #bar.
@since 2.0	The version since the feature was added.
@throws	The kind of exception the method throws. Note that your code must indicate an exception thrown in order for this tag to validate. Otherwise Javadoc will produce an error. @exception is an alternative tag.
@Override	performs a check to see if the method is an override. used with interfaces and abstract classes.

https://idratherbewriting.com/java-javadoc-tags/

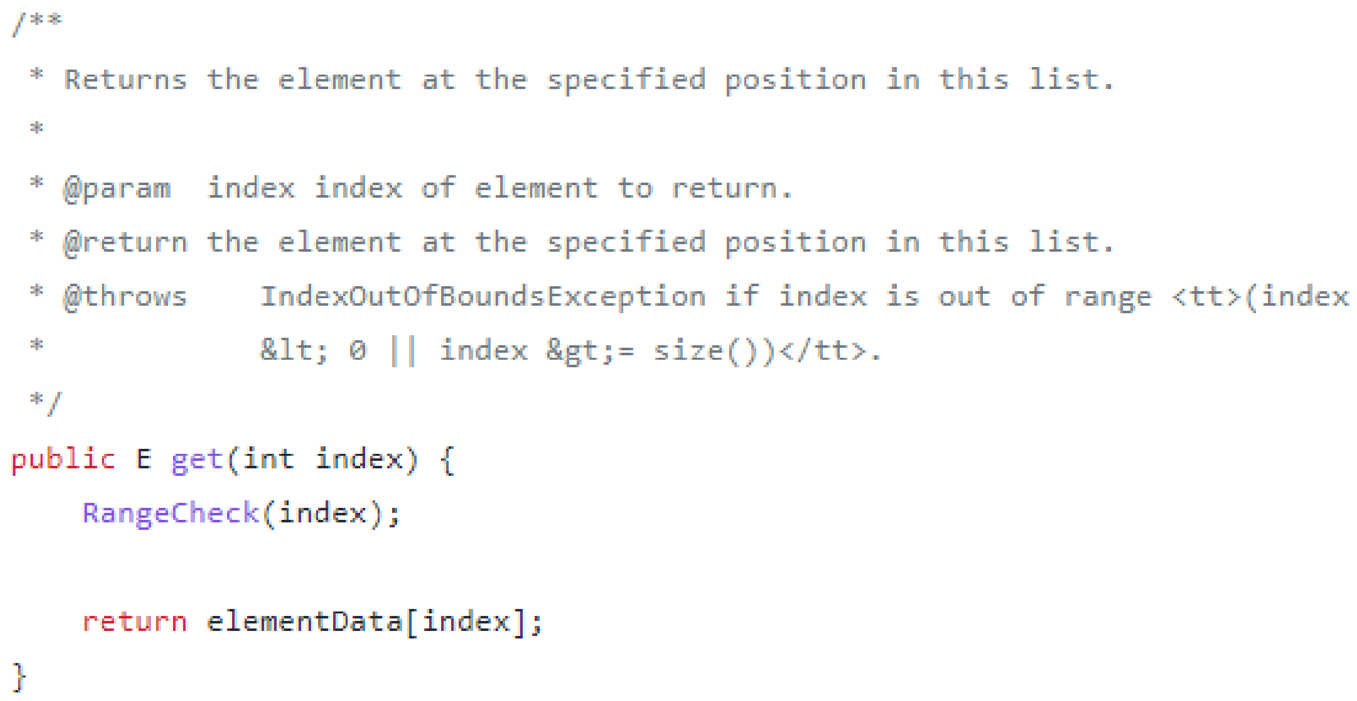
JAVADOC AT CLASS LEVEL



```java
/**
* Hero is the main entity we'll be using to . . .
*
* Please see the {@link com.baeldung.javadoc.Person} class for true identity
* @author Captain America
*
*/
public class SuperHero extends Person {
    // fields and methods
}
```

https://www.baeldung.com/javadoc

JAVADOC AT METHOD LEVEL



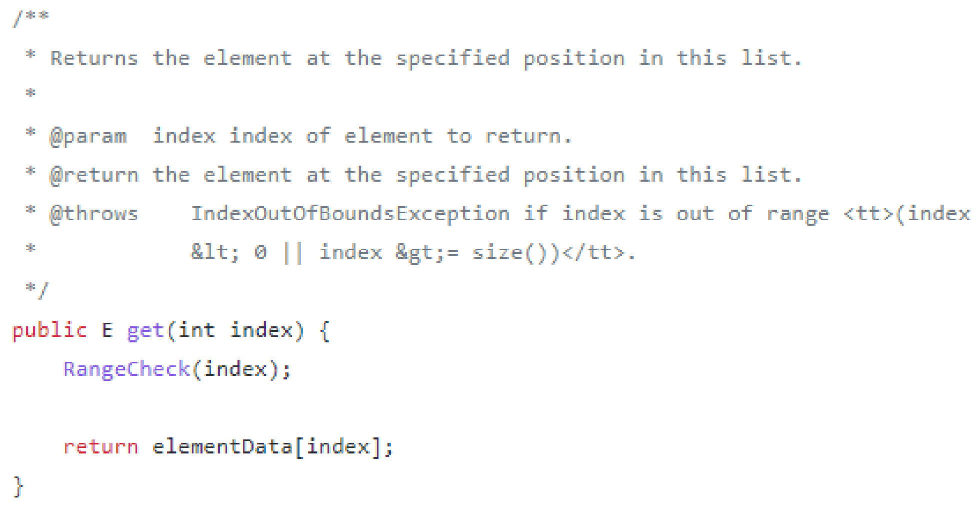
```
/**
 * Returns the element at the specified position in this list.
 *
 * @param  index index of element to return.
 * @return the element at the specified position in this list.
 * @throws    IndexOutOfBoundsException if index is out of range <tt>(index
 *            &lt; 0 || index &gt;= size())</tt>.
 */
public E get(int index) {
    RangeCheck(index);

    return elementData[index];
}
```

java.util.ArrayList

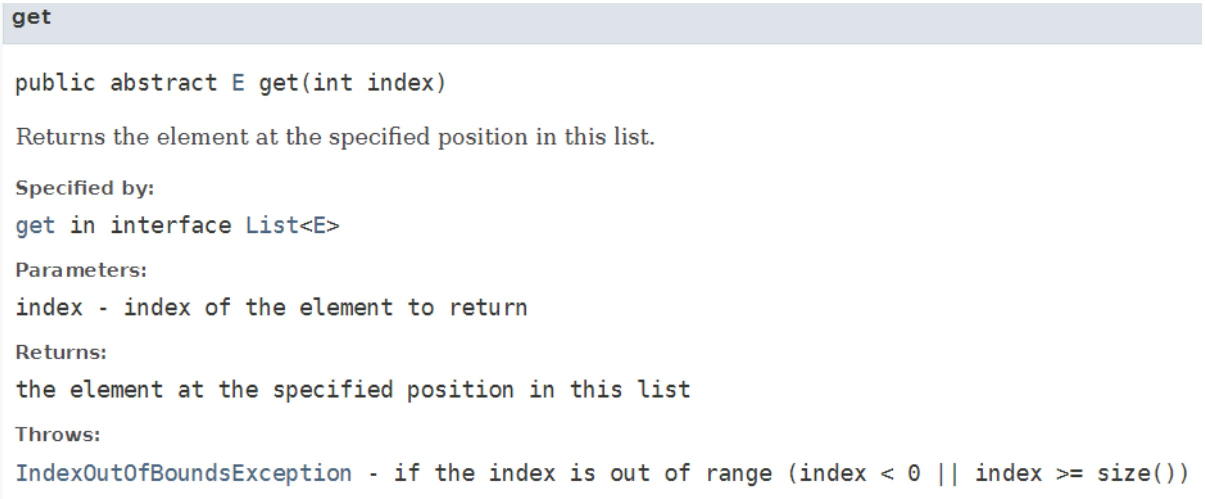
JAVADOC GENERATION

```
C:> javadoc -d C:\home\html -sourcepath C:\home\src java.my.package
```



```
/**
 * Returns the element at the specified position in this list.
 *
 * @param  index index of element to return.
 * @return the element at the specified position in this list.
 * @throws    IndexOutOfBoundsException if index is out of range <tt>(index
 *            &lt; 0 || index &gt;= size())</tt>.
 */
public E get(int index) {
    RangeCheck(index);

    return elementData[index];
}
```



get

`public abstract E get(int index)`

Returns the element at the specified position in this list.

Specified by:

`get` in interface `List<E>`

Parameters:

`index` - index of the element to return

Returns:

the element at the specified position in this list

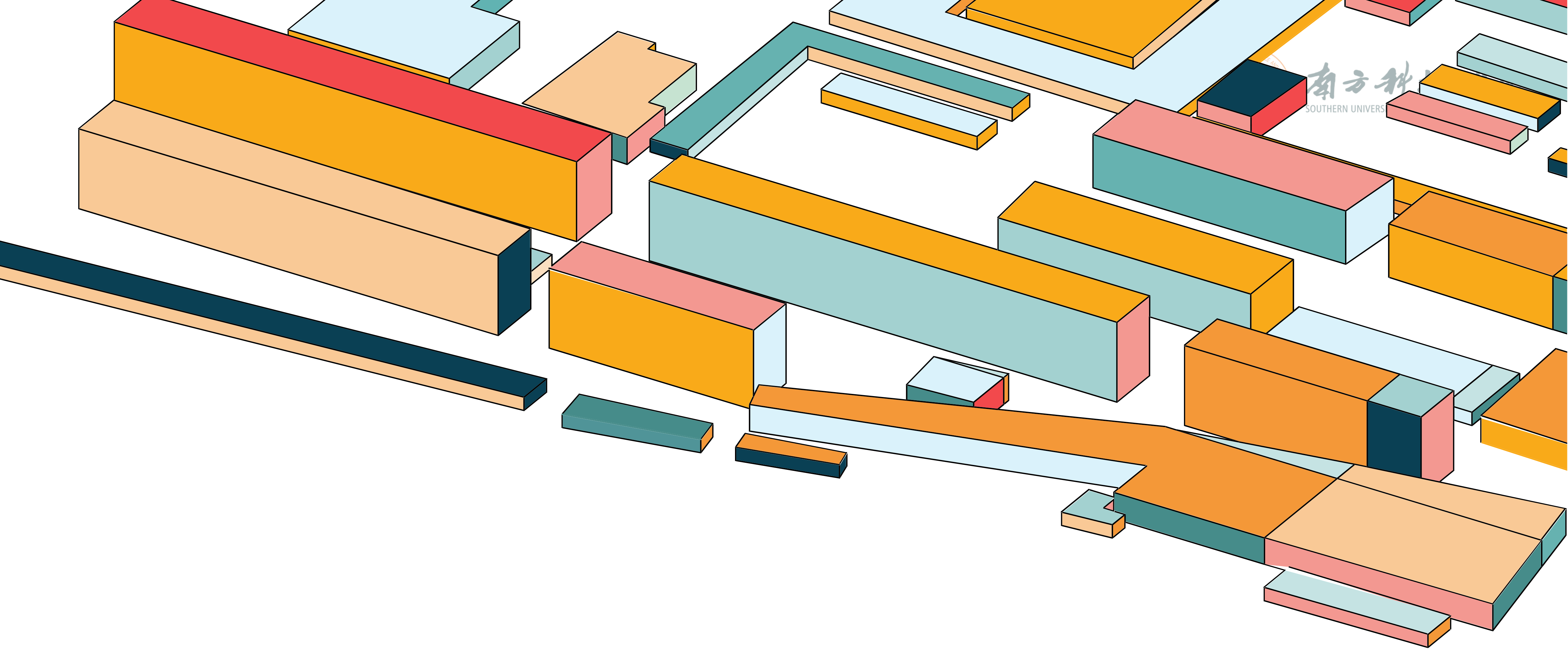
Throws:

`IndexOutOfBoundsException` - if the index is out of range (index < 0 || index >= size())

DOCUMENTATION TOOLS & FRAMEWORKS

- Sphinx: a documentation generator. https://www.sphinx-doc.org/en/master/
- Swagger: a popular framework for documenting REST APIs. https://swagger.io/docs/
- GitBook: a modern documentation platform where teams can document everything from products to internal knowledge bases and APIs. https://www.gitbook.com/

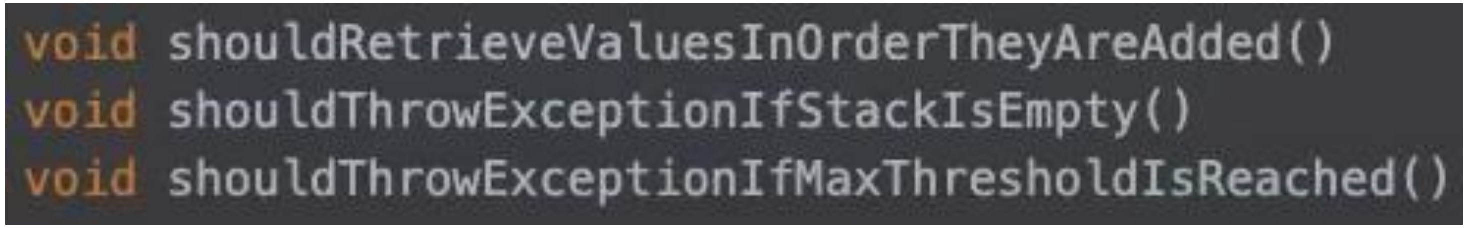
https://www.baeldung.com/javadoc



LESS RECOGNIZED DOCUMENTATION

TESTS

- Tests could be used to “document” how the code should behave
- Tests provide examples of how to use an API, with assertions
- Tests also give examples of edge case scenarios

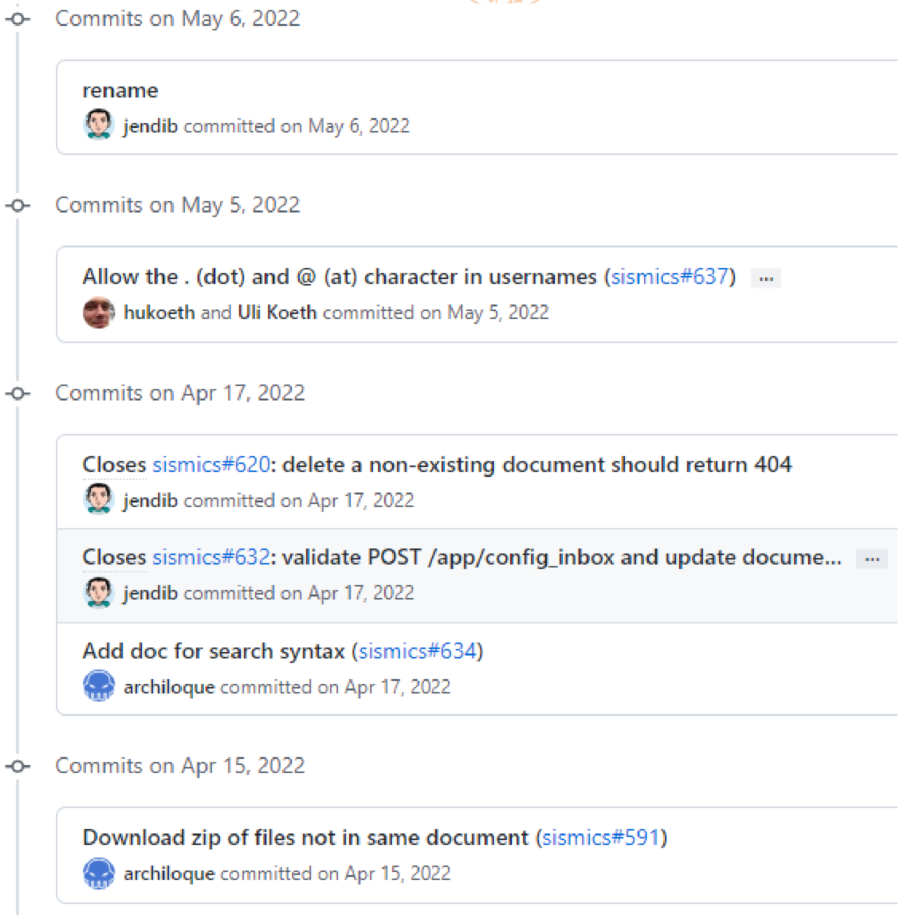


```
void shouldRetrieveValuesInOrderTheyAreAdded()
void shouldThrowExceptionIfStackIsEmpty()
void shouldThrowExceptionIfMaxThresholdIsReached()
```

Sample tests for Stack

GIT COMMIT MESSAGES

- Gives context of the change
- Explain "why this change is needed?" kinds of questions
- Commit messages live with the code with no clutter
- Always up-to-date w.r.t. the code changes



Commits on May 6, 2022

rename
jendib committed on May 6, 2022

Commits on May 5, 2022

Allow the . (dot) and @ (at) character in usernames (sismics#637) ...
hukoeth and Uli Koeth committed on May 5, 2022

Commits on Apr 17, 2022

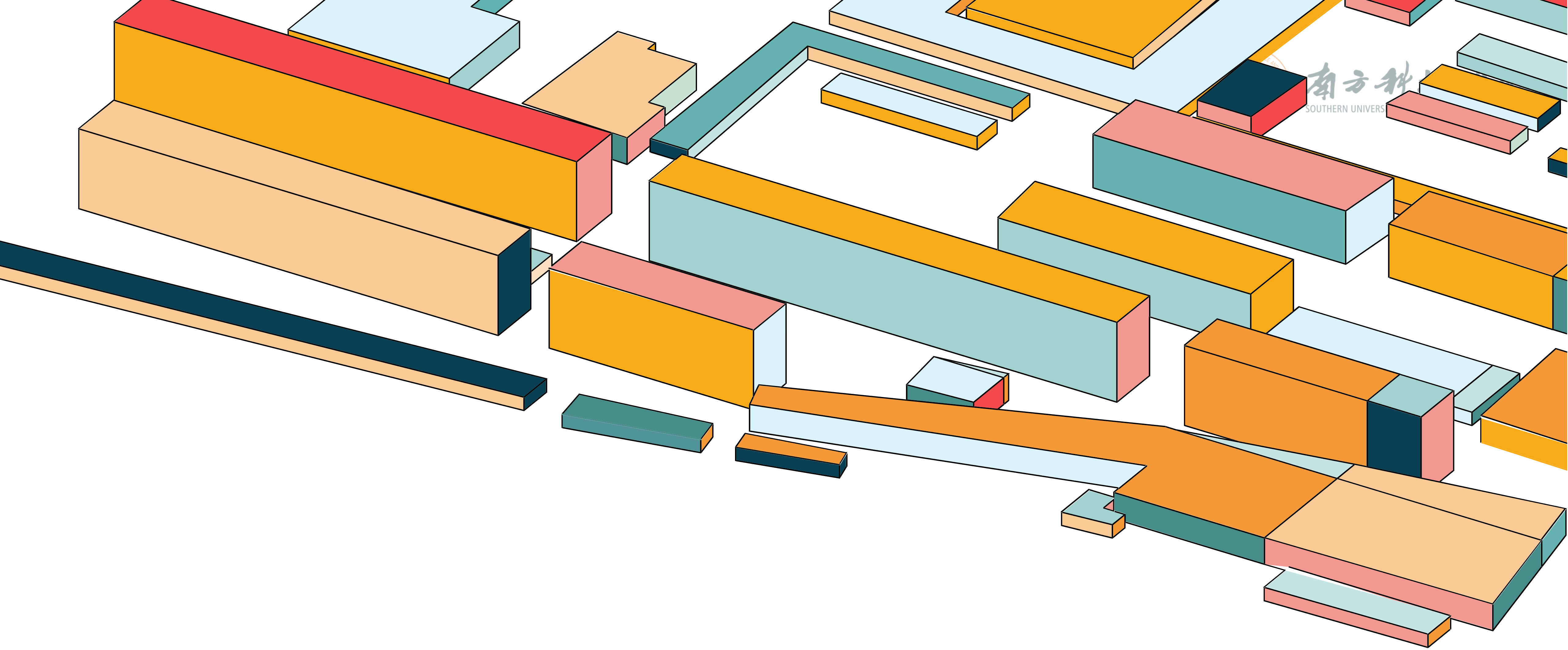
Closes sismics#620: delete a non-existing document should return 404
jendib committed on Apr 17, 2022

Closes sismics#632: validate POST /app/config_inbox and update docume... ...
jendib committed on Apr 17, 2022

Add doc for search syntax (sismics#634)
archiloque committed on Apr 17, 2022

Commits on Apr 15, 2022

Download zip of files not in same document (sismics#591)
archiloque committed on Apr 15, 2022



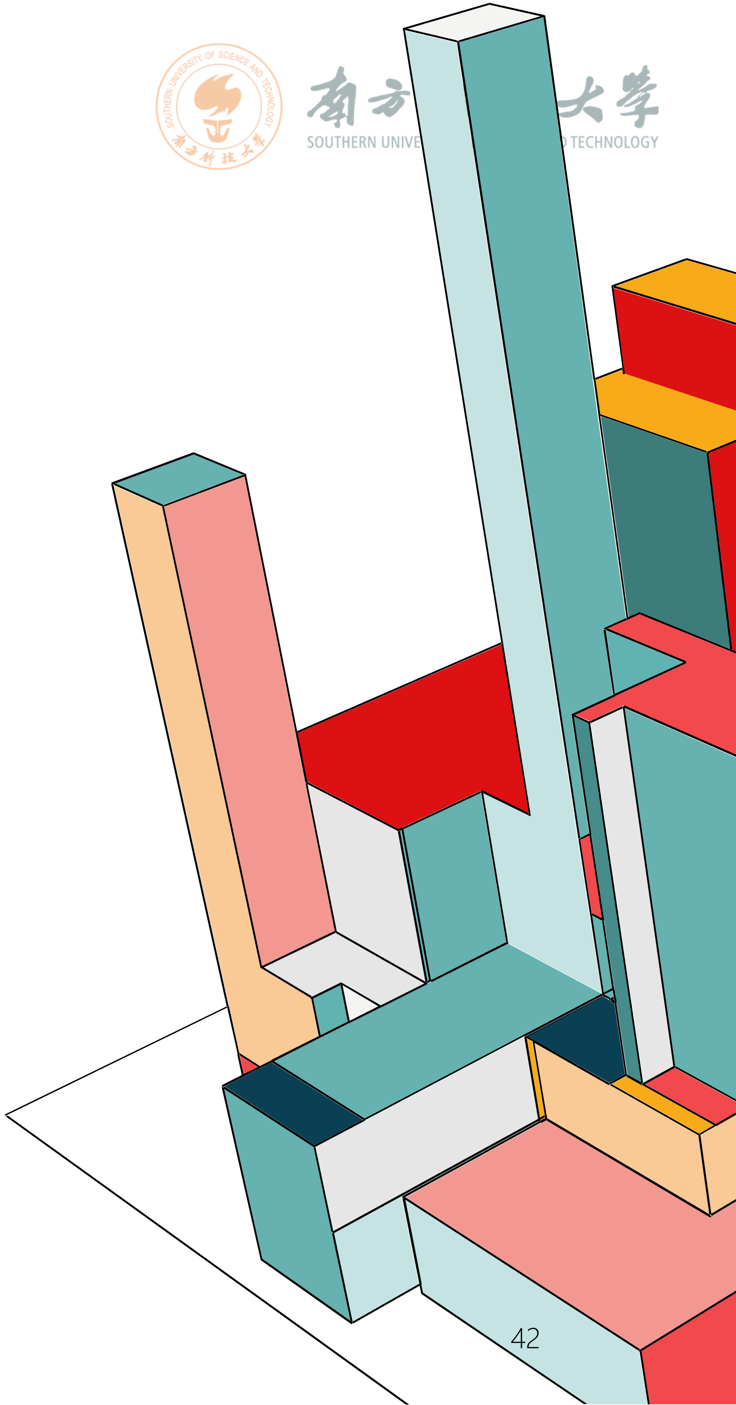
DOCUMENTATION AS CODE

Case study @ Google

ONCE UPON A TIME . . .

48%

Google engineers citing documentations as productivity issue (Googlegeist 2014)

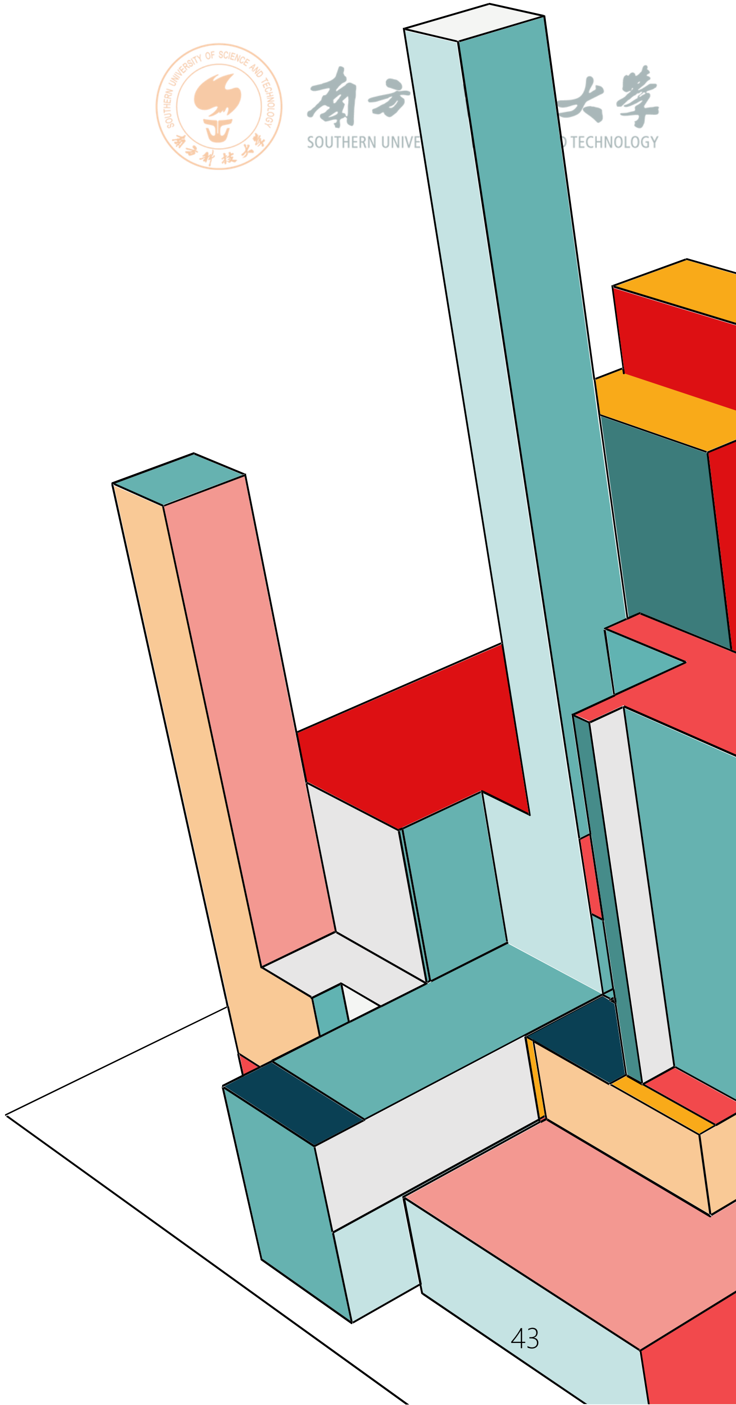


Case study @ Google

ONCE UPON A TIME . . .

50%+

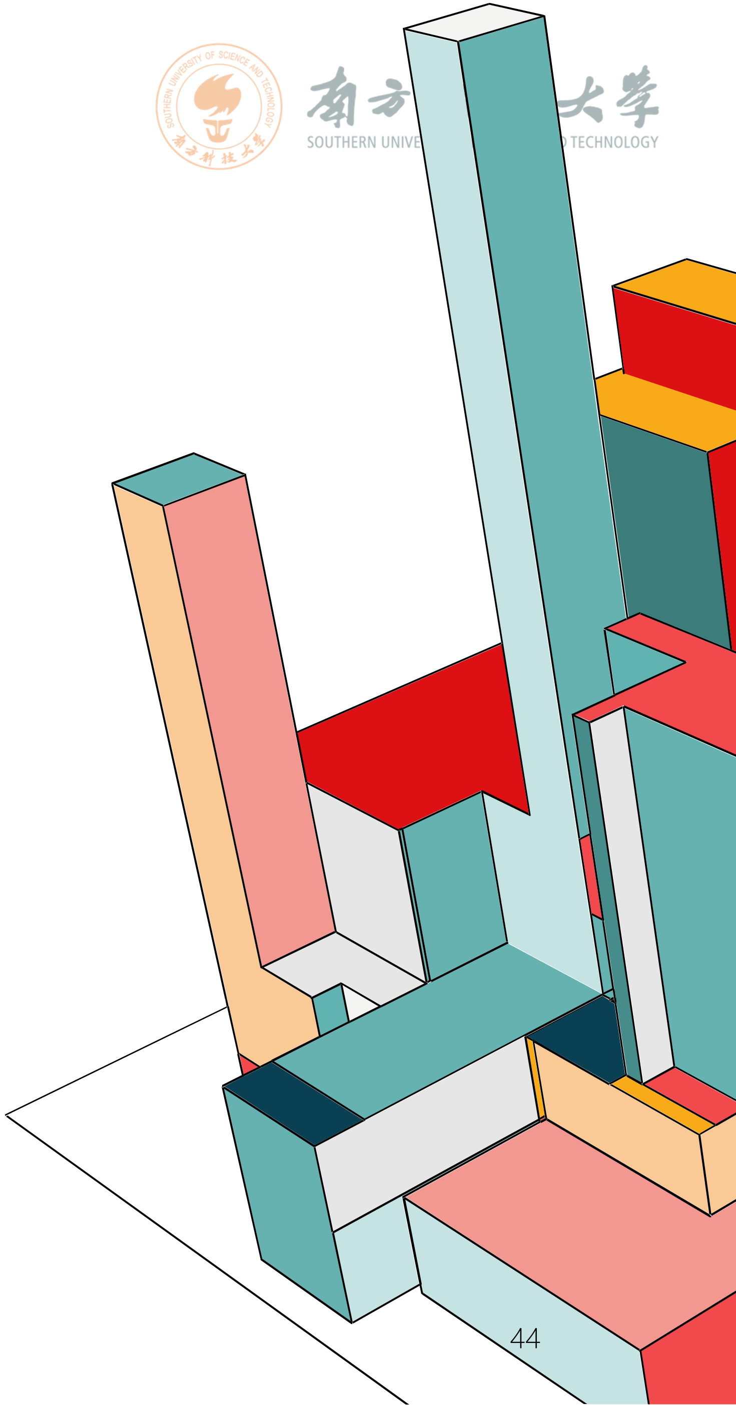
Google SRE issues cited problems with documentation (Googlegeist 2014)



ONCE UPON A TIME ...

Troubles with docs

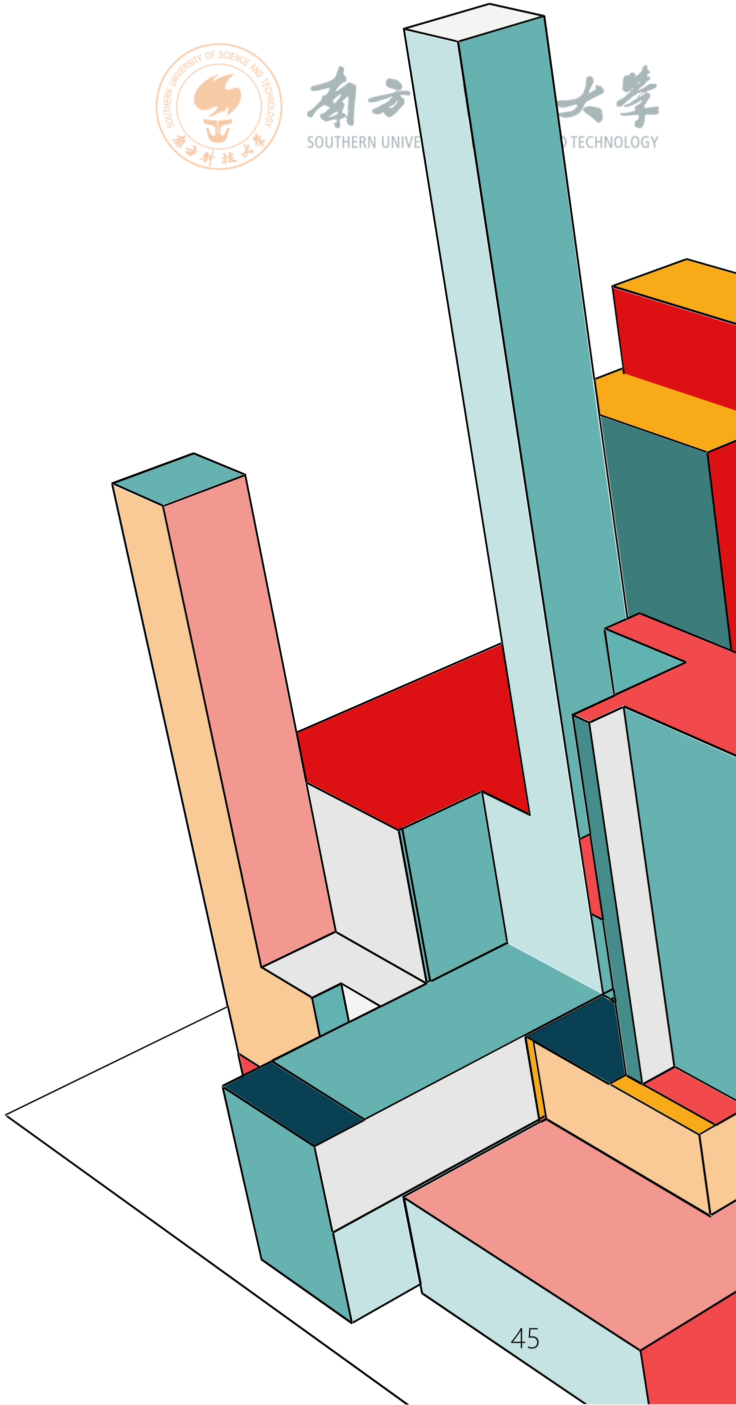
- They “don’t exist”
- They are “impossible to find”
- They are “wrong”



ONCE UPON A TIME . . .

Troubles with writing docs

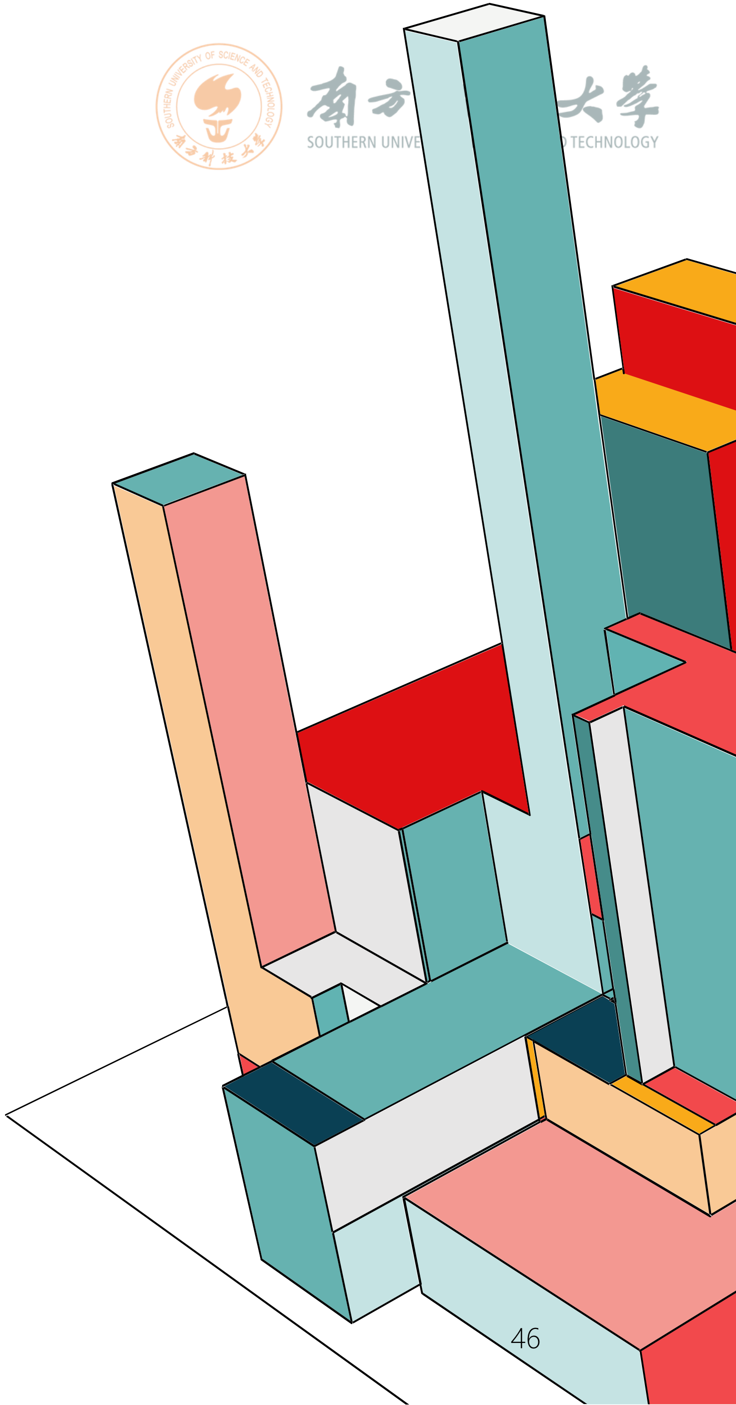
- “No time”
- “No incentive”



Case study @ Google

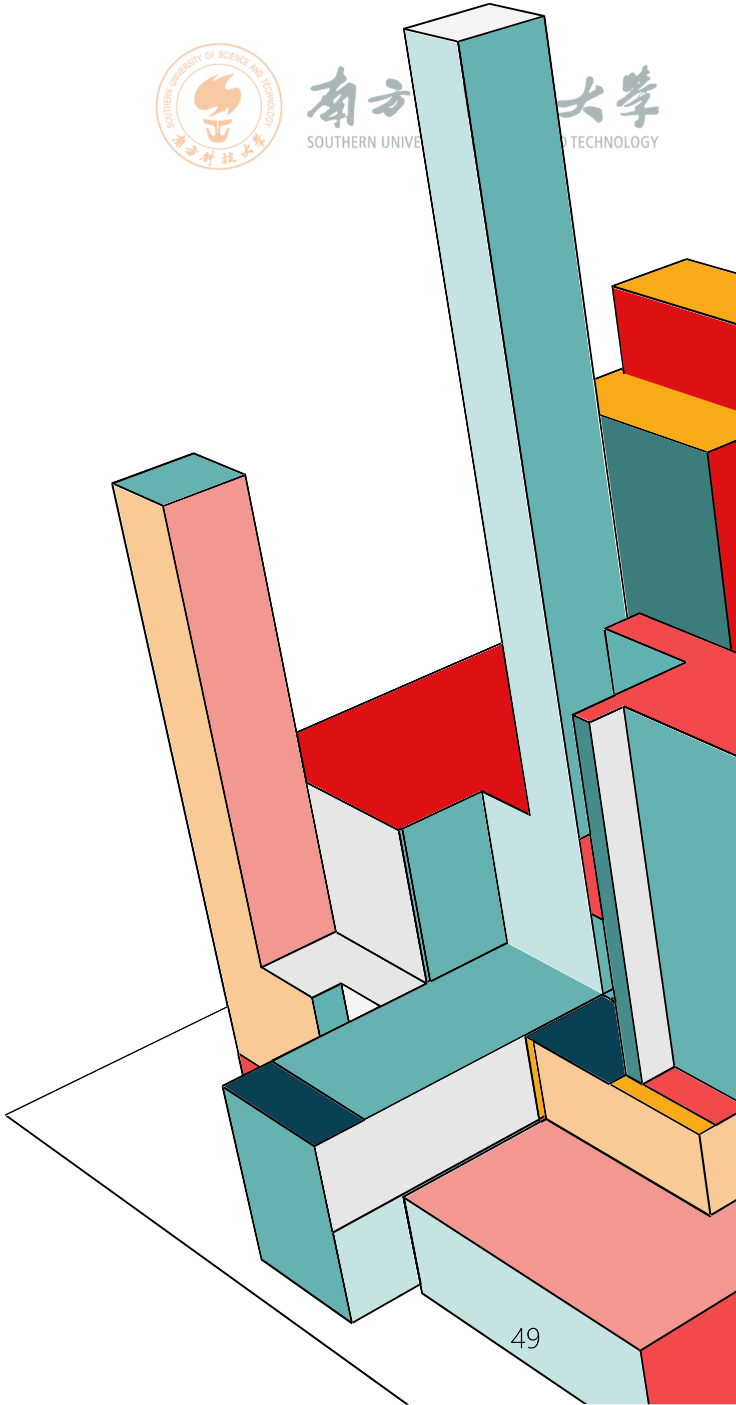
NO DOC CULTURE

Docs: Everybody’s problem, nobody’s jobs



LESSONS LEARNED

Documentation will never be part of the engineering culture until it is integrated into the codebase and workflow

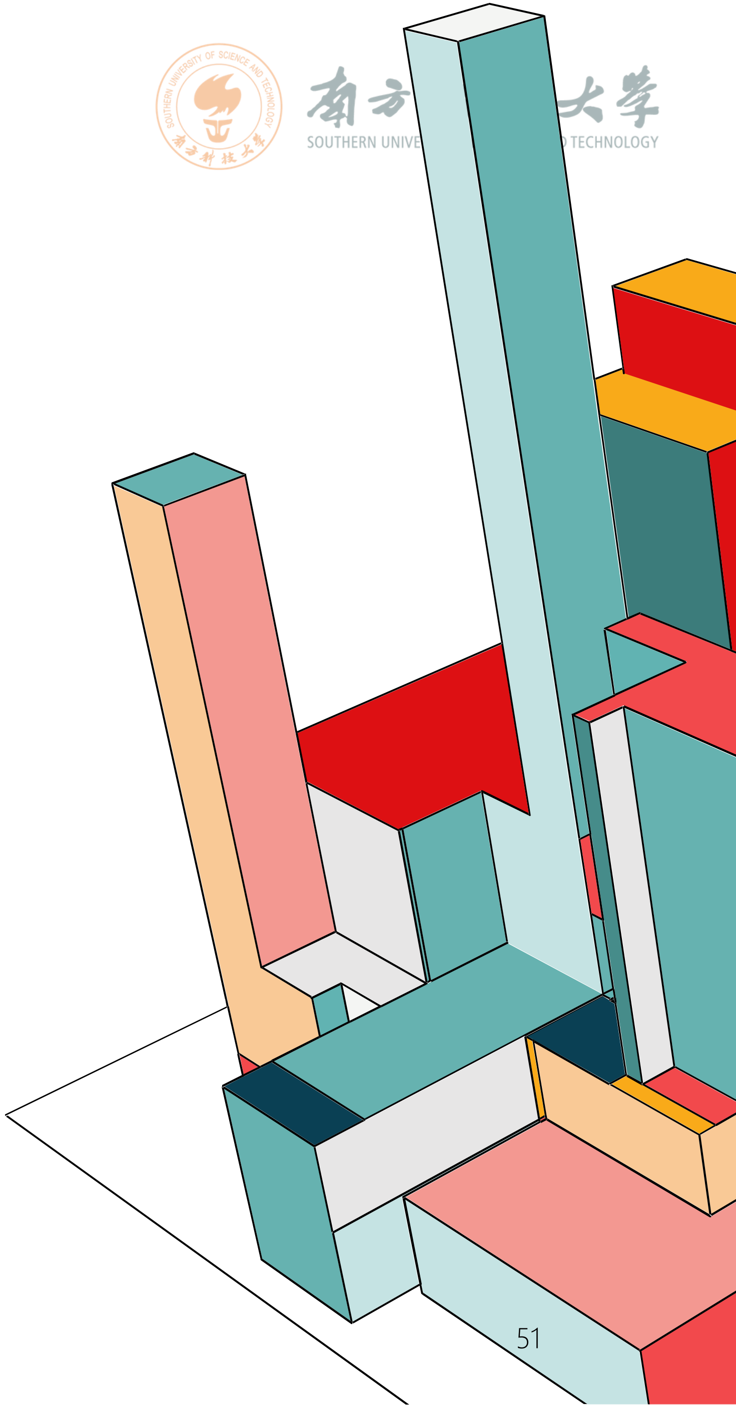


Case study @ Google

g3doc

Engineers find, create, and maintain docs using their regular workflow and developers tools

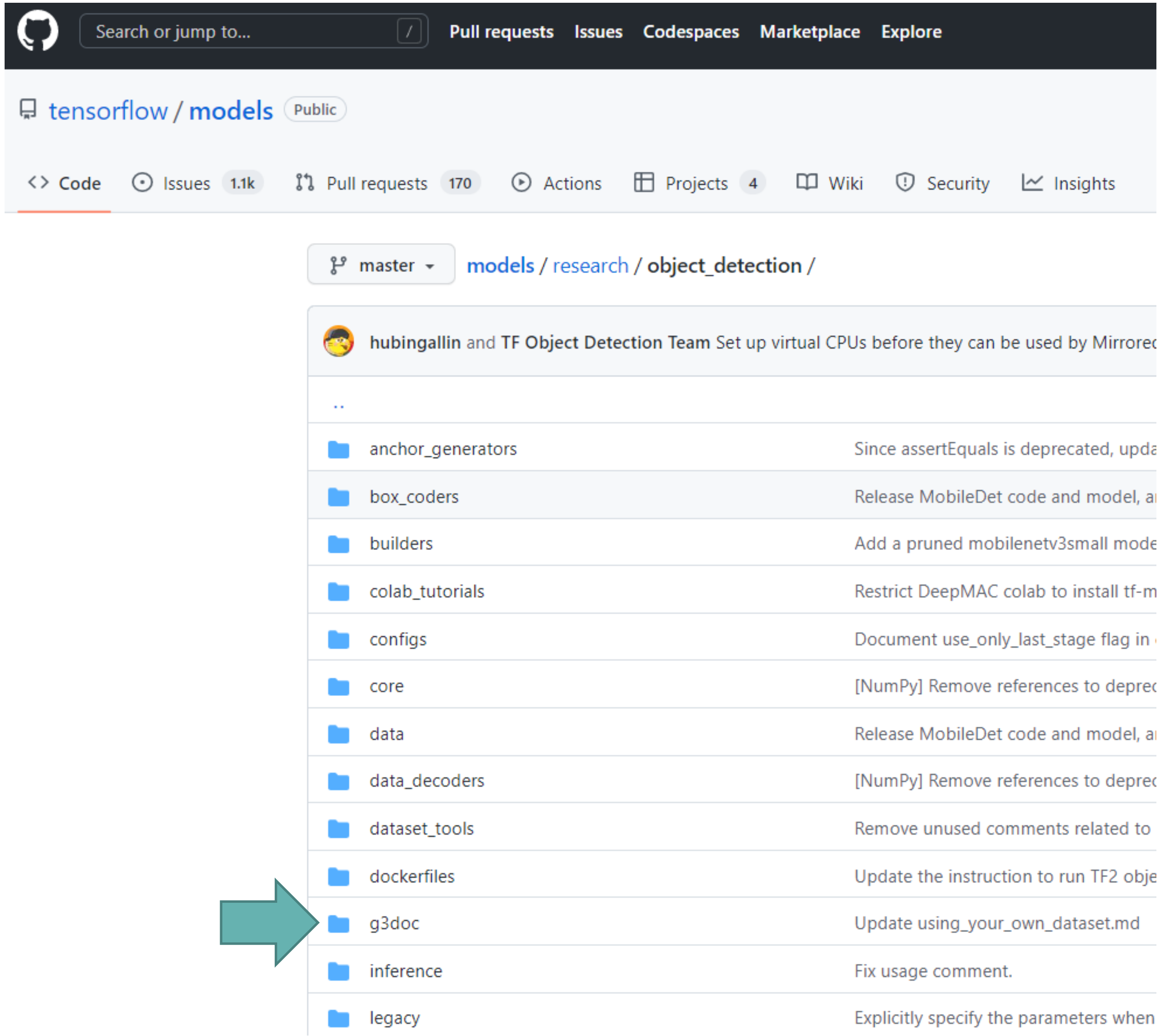
Documentation is treated as code



Case study @ Google

DESIGN 1: DOCS LIVES WITH CODE

Docs are stored side-by-side with the source code in the codebase



Search or jump to... /

Pull requests Issues Codespaces Marketplace Explore

tensorflow / models Public

Code | Issues 1.1k | Pull requests 170 | Actions | Projects 4 | Wiki | Security | Insights

master

models / research / object_detection /

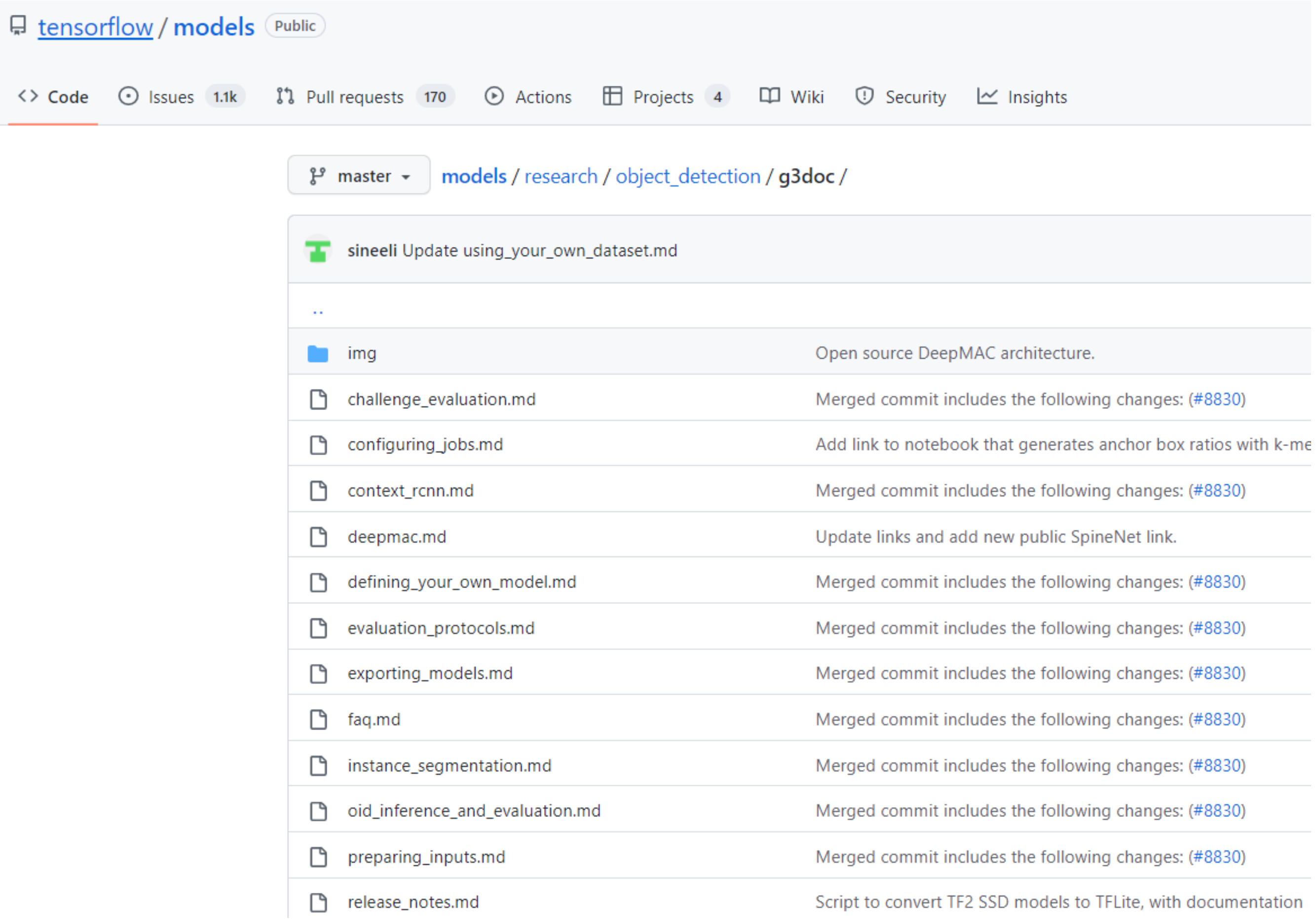
hubingallin and TF Object Detection Team Set up virtual CPUs before they can be used by Mirrored

..

anchor_generators	Since assertEquals is deprecated, upda
box_coders	Release MobileDet code and model, a
builders	Add a pruned mobilenetv3small mode
colab_tutorials	Restrict DeepMAC colab to install tf-m
configs	Document use_only_last_stage flag in
core	[NumPy] Remove references to deprec
data	Release MobileDet code and model, a
data_decoders	[NumPy] Remove references to deprec
dataset_tools	Remove unused comments related to
dockerfiles	Update the instruction to run TF2 obje
g3doc	Update using_your_own_dataset.md
inference	Fix usage comment.
legacy	Explicitly specify the parameters when

DESIGN 2: USE MARKDOWN

Docs are written in markdown format (.md)



models / research / object_detection / g3doc /

sineeli Update using_your_own_dataset.md

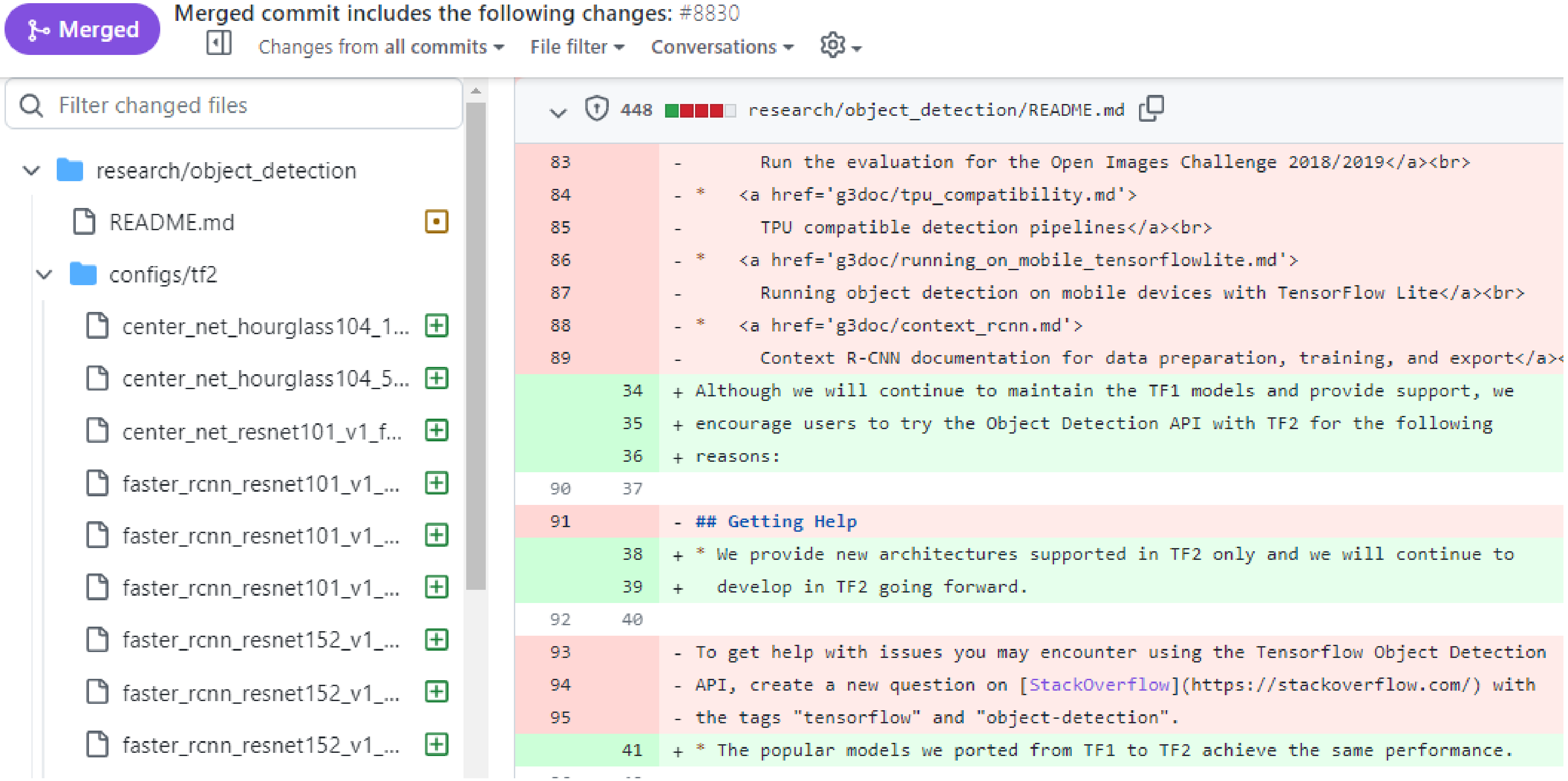
..

img	Open source DeepMAC architecture.
challenge_evaluation.md	Merged commit includes the following changes: (#8830)
configuring_jobs.md	Add link to notebook that generates anchor box ratios with k-me
context_rcnn.md	Merged commit includes the following changes: (#8830)
deepmac.md	Update links and add new public SpineNet link.
defining_your_own_model.md	Merged commit includes the following changes: (#8830)
evaluation_protocols.md	Merged commit includes the following changes: (#8830)
exporting_models.md	Merged commit includes the following changes: (#8830)
faq.md	Merged commit includes the following changes: (#8830)
instance_segmentation.md	Merged commit includes the following changes: (#8830)
oid_inference_and_evaluation.md	Merged commit includes the following changes: (#8830)
preparing_inputs.md	Merged commit includes the following changes: (#8830)
release_notes.md	Script to convert TF2 SSD models to TFLite, with documentation

Case study @ Google

BENEFITS

- Docs are under version control like code
- Allow code review, diff, blame, fixes, and issue tracking



Merged commit includes the following changes: #8830

- research/object_detection
  - README.md
  - configs/tf2
    - center_net_hourglass104_1...
    - center_net_hourglass104_5...
    - center_net_resnet101_v1_f...
    - faster_rcnn_resnet101_v1_...
    - faster_rcnn_resnet101_v1_...
    - faster_rcnn_resnet101_v1_...
    - faster_rcnn_resnet152_v1_...
    - faster_rcnn_resnet152_v1_...
    - faster_rcnn_resnet152_v1_...

448 research/object_detection/README.md

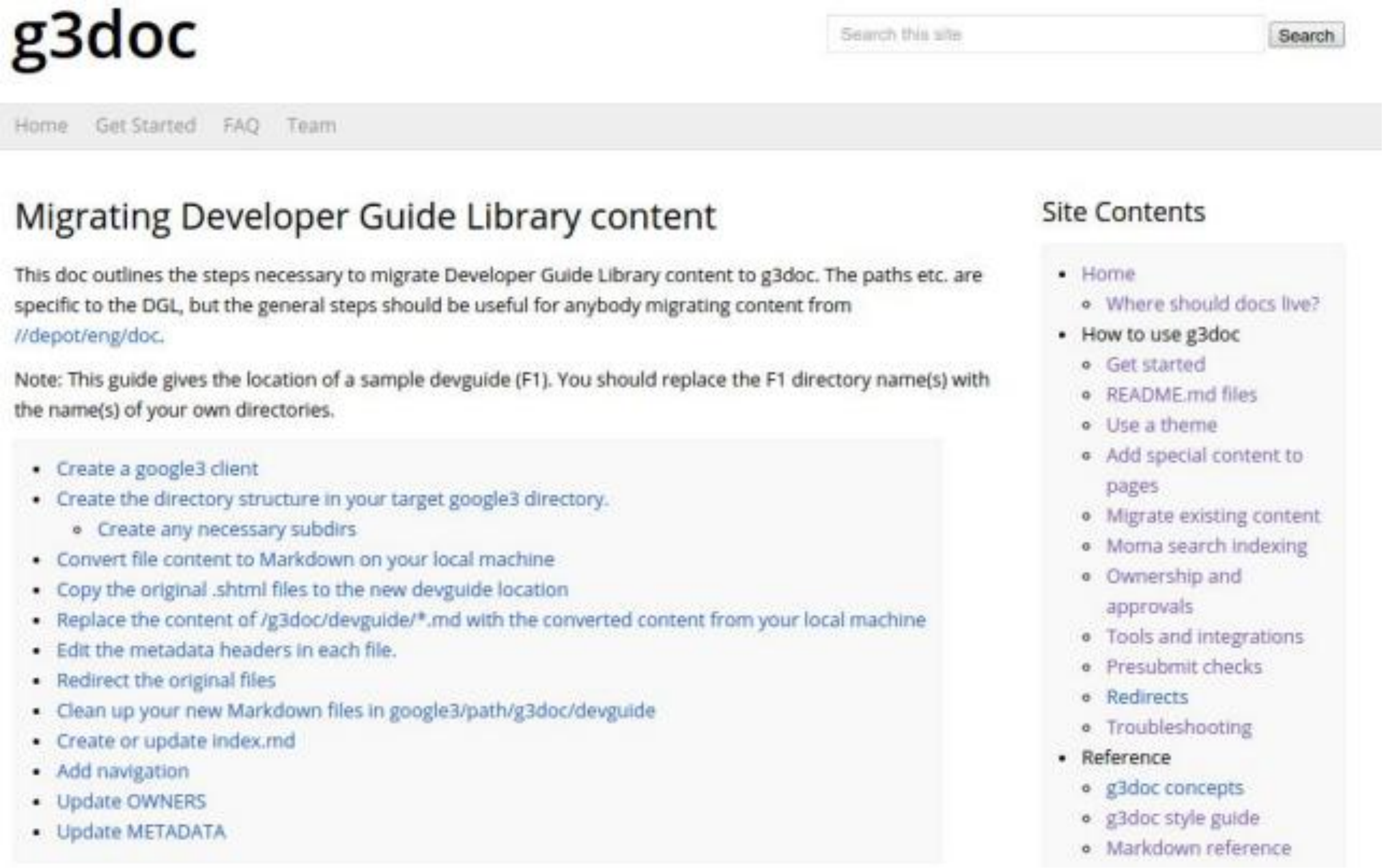
```
-      Run the evaluation for the Open Images Challenge 2018/2019</a><br>
- *    <a href='g3doc/tpu_compatibility.md'>
-      TPU compatible detection pipelines</a><br>
- *    <a href='g3doc/running_on_mobile_tensorflowlite.md'>
-      Running object detection on mobile devices with TensorFlow Lite</a><br>
- *    <a href='g3doc/context_rcnn.md'>
-      Context R-CNN documentation for data preparation, training, and export</a><
+ Although we will continue to maintain the TF1 models and provide support, we
+ encourage users to try the Object Detection API with TF2 for the following
+ reasons:

- ## Getting Help
+ * We provide new architectures supported in TF2 only and we will continue to
+   develop in TF2 going forward.

- To get help with issues you may encounter using the Tensorflow Object Detection
- API, create a new question on [StackOverflow](https://stackoverflow.com/) with
- the tags "tensorflow" and "object-detection".
+ * The popular models we ported from TF1 to TF2 achieve the same performance.
```

BENEFITS

- g3doc renders beautiful html based on .md files
- Developers focus on the contents, instead of the presentation



Migrating Developer Guide Library content

This doc outlines the steps necessary to migrate Developer Guide Library content to g3doc. The paths etc. are specific to the DGL, but the general steps should be useful for anybody migrating content from //depot/eng/doc.

Note: This guide gives the location of a sample devguide (F1). You should replace the F1 directory name(s) with the name(s) of your own directories.

- Create a google3 client
- Create the directory structure in your target google3 directory.
  - Create any necessary subdirs
- Convert file content to Markdown on your local machine
- Copy the original .shtml files to the new devguide location
- Replace the content of /g3doc/devguide/*.md with the converted content from your local machine
- Edit the metadata headers in each file.
- Redirect the original files
- Clean up your new Markdown files in google3/path/g3doc/devguide
- Create or update index.md
- Add navigation
- Update OWNERS
- Update METADATA

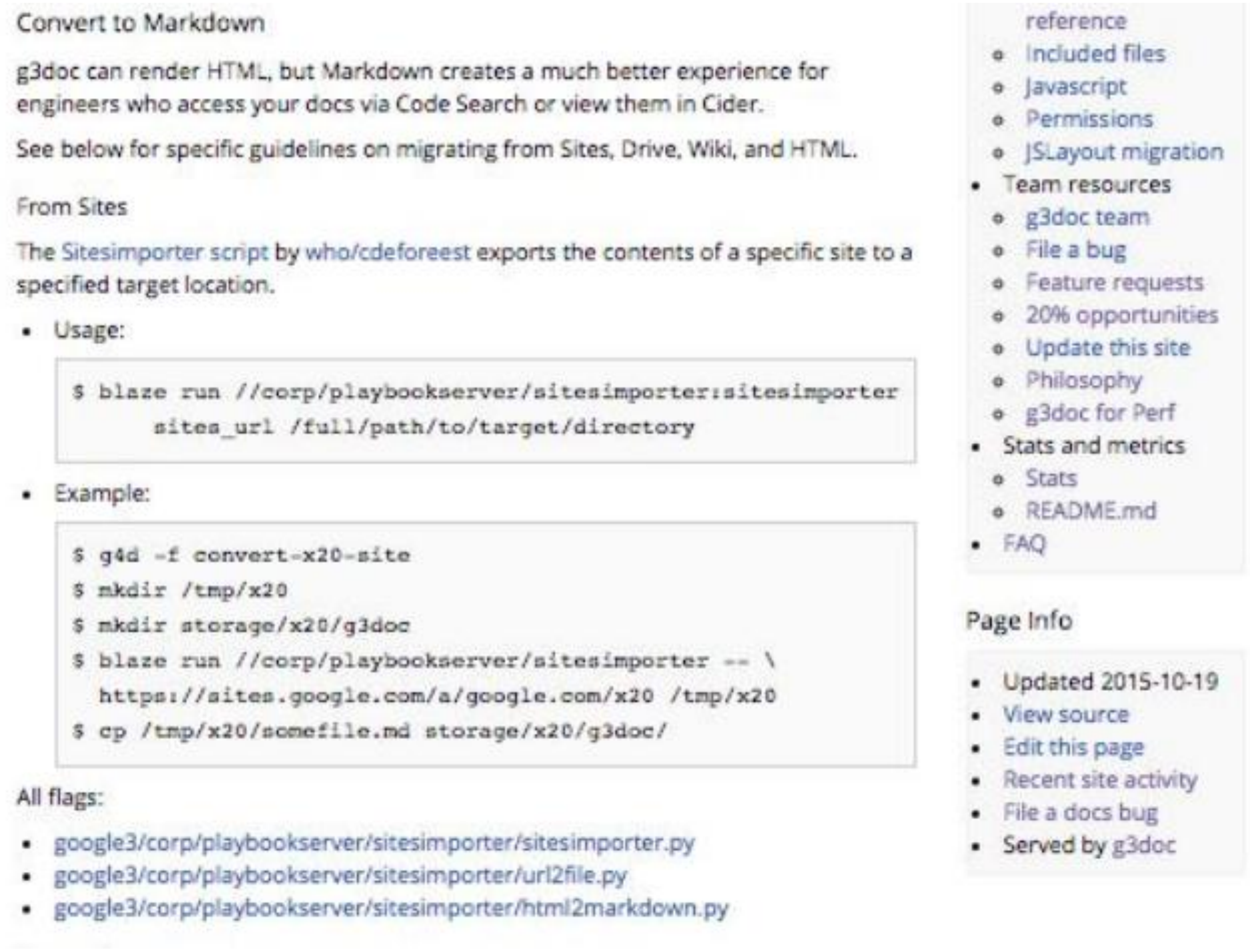
Site Contents

- Home
  - Where should docs live?
- How to use g3doc
  - Get started
  - README.md files
  - Use a theme
  - Add special content to pages
  - Migrate existing content
  - Moma search indexing
  - Ownership and approvals
  - Tools and integrations
  - Presubmit checks
  - Redirects
  - Troubleshooting
- Reference
  - g3doc concepts
  - g3doc style guide
  - Markdown reference

Case study @ Google

BENEFITS

- Docs have rich links to source code
- Easy for code search



Convert to Markdown

g3doc can render HTML, but Markdown creates a much better experience for engineers who access your docs via Code Search or view them in Cider.

See below for specific guidelines on migrating from Sites, Drive, Wiki, and HTML.

From Sites

The Sitesimporter script by who/cdeforeest exports the contents of a specific site to a specified target location.

- Usage:

```
$ blaze run //corp/playbookserver/sitesimporter:sitesimporter
     sites_url /full/path/to/target/directory
```

- Example:

```
$ g4d -f convert-x20-site
$ mkdir /tmp/x20
$ mkdir storage/x20/g3doc
$ blaze run //corp/playbookserver/sitesimporter -- \
  https://sites.google.com/a/google.com/x20 /tmp/x20
$ cp /tmp/x20/somefile.md storage/x20/g3doc/
```

All flags:

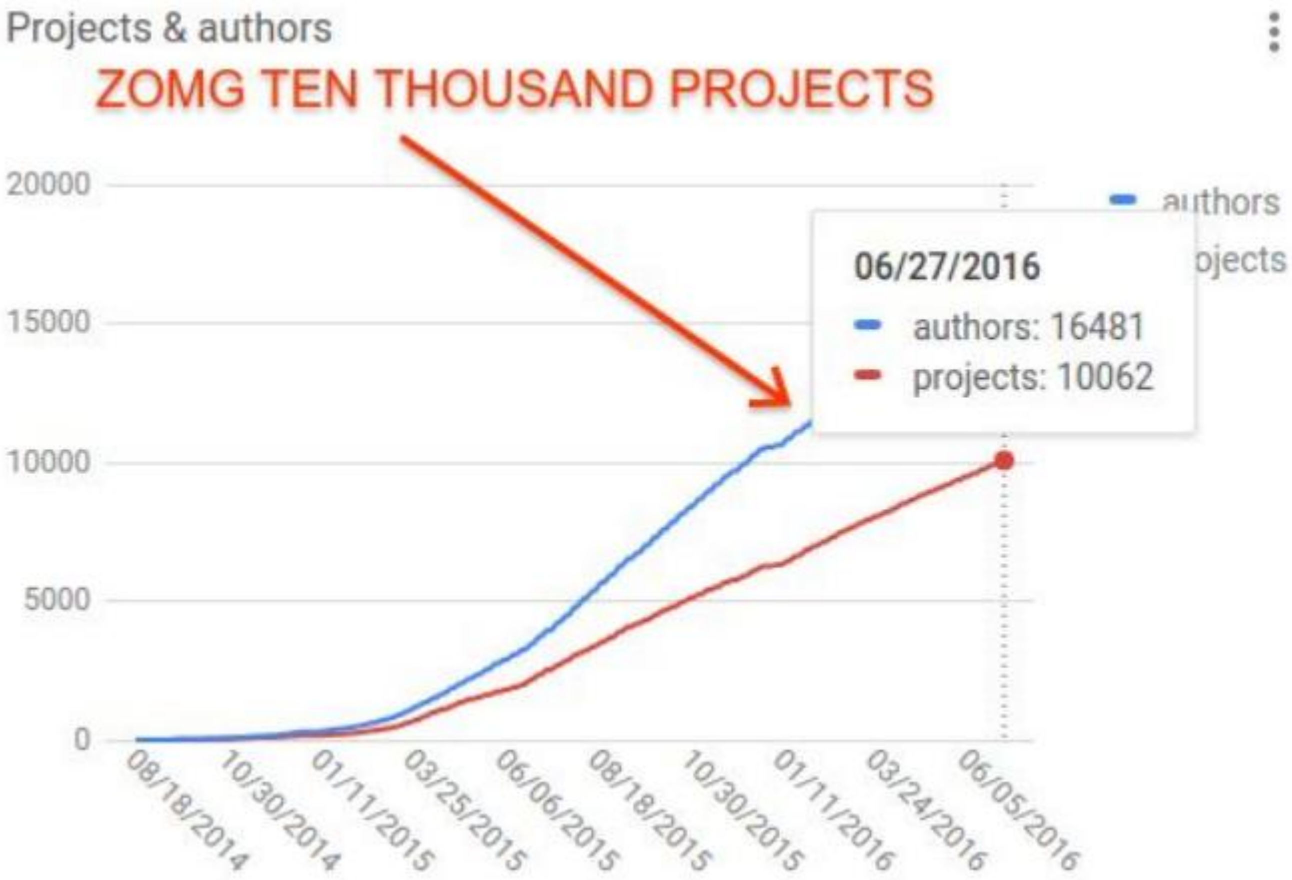
- google3/corp/playbookserver/sitesimporter/sitesimporter.py
- google3/corp/playbookserver/sitesimporter/url2file.py
- google3/corp/playbookserver/sitesimporter/html2markdown.py

reference
- Included files
- Javascript
- Permissions
- JSLayout migration
- Team resources
  - g3doc team
  - File a bug
  - Feature requests
  - 20% opportunities
  - Update this site
  - Philosophy
  - g3doc for Perf
- Stats and metrics
  - Stats
  - README.md
- FAQ

Page Info

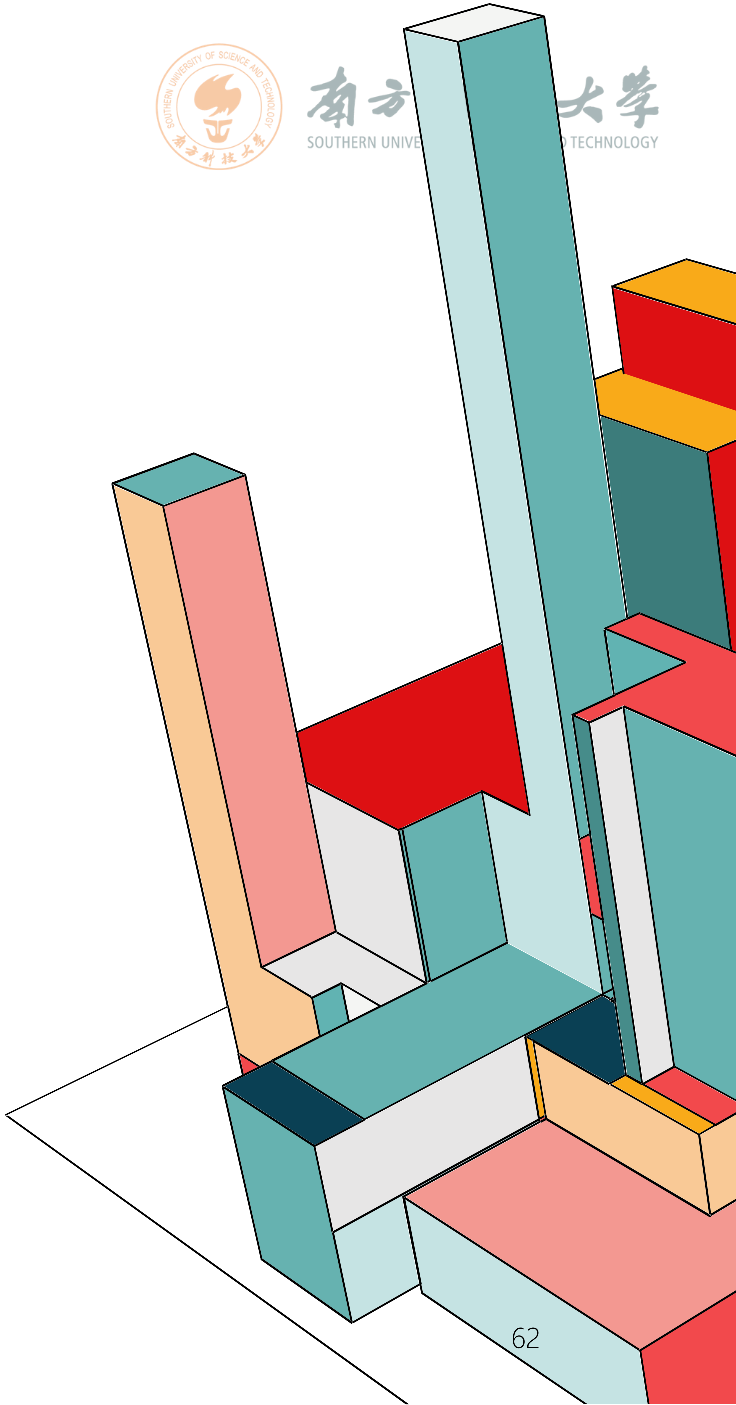
- Updated 2015-10-19
- View source
- Edit this page
- Recent site activity
- File a docs bug
- Served by g3doc

GROWTH OF G3DOC



READINGS

- Chapter 10. Documentation. Software Engineering at Google by Titus Winters, et al.
- 第4.2章 代码风格. 现代软件工程基础 by 彭鑫 et al.



NEXT

- Continuous Integration