How to logging

2022-09 @Guzhongren

Agenda

- Why log?
- What is logging?
- What’s your expectation about logging?
- Some good practices of logging
- Tools recommendation
- Tips
- Q&A

Why log?

What's the importance of logging?

Why log?

- Troubleshooting
- Alerting
- Business Data Visualization
- ...

Why log?
Troubleshooting

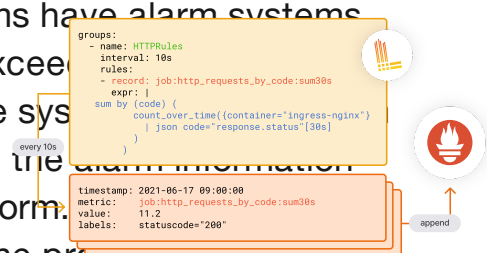
- Imagine that the system you are responsible for developing and maintaining is found to be faulty. you should do? Chec information to verify printed on the server information. As programmers, logs are the most familiar tool for solving problems.

- `Restore the crime scene`

Why log?

Alerting

Logging can be used as an important data source for our business system monitoring; mature product systems have alarm systems. If there is a problem exceeding the defined indicator in the system, the system will automatically send the alarm information to the notification platform. Developers can locate and solve the problem according to the alarm information.



Why log?

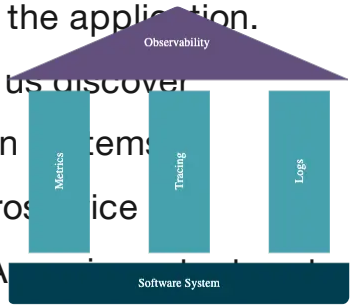
Business Data Visualization

Many companies can use the logs of the production environment stored in their own databases to visualize l
combination with the co
such as Grafana and Su

What is logging?

What is logging?

- Logging is `structured` or `unstructured` text information generated by the system during operation. Usually, it can be regarded as a `record of an event` by the applic tion. Logging can often help us discover `unexpected behaviors` in tems, especially in some micros ice architecture systems. A of `Observability`, Logging plays an irreplaceable role in our system development and maintenance.



What’s your expectation about logging?

What’s your expectation about logging?

`#Troubleshooting` `#Sensitive Data` `#Timestamp` `#Log level` `#Log tool` `#Env` `#Formatting` `#Store` `#Alert` `#Visualization` `#Hostname` `#Method` `#Number of line` `#Message` `#Filter` `#PII` `#PCI` `#Law` `#Error` `#Error stack` ...

Some good practices of logging


Log Format
Basic Template
Basic
Timestamp
Log Level
Message
Advanced Template
Single Node
Timestamp
Log Level
Thread
Method
Class
Line
Message
Multiple Node
Timestamp
Log Level
Hostname
Thread
Method
Class
Line
Message
Demo
Single Node Format
Timestamp
[Log Level]
[Thread]
Method
(Class:
Line)
- Message
Multiple Node Format
Timestamp
[Log Level]
[Hostname]
[Thread]
Method
(Class:
Line)
- Message
Parameter message Format
- Customized Message
_Parameter Key1:Parameter_value1
, Parameter Key2:Parameter_value2.....
Error message Format
- Customized Message
_error:
error stack
Message Demo

Some good practices of logging

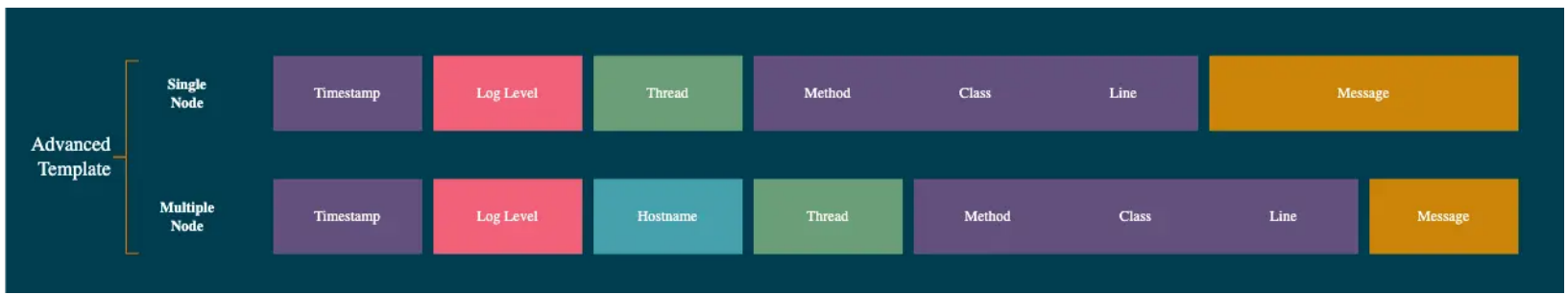
Basic template

- At minimum, qualified logs should have the following information: `Timestamp`, `Log Level`, and `Message`

Some good practices of logging

Advanced template - Graph

- Advanced Template Adds `Thread`, `Hostname`, `Method` name, `Class` name, and the `Number of lines` corresponding to the method



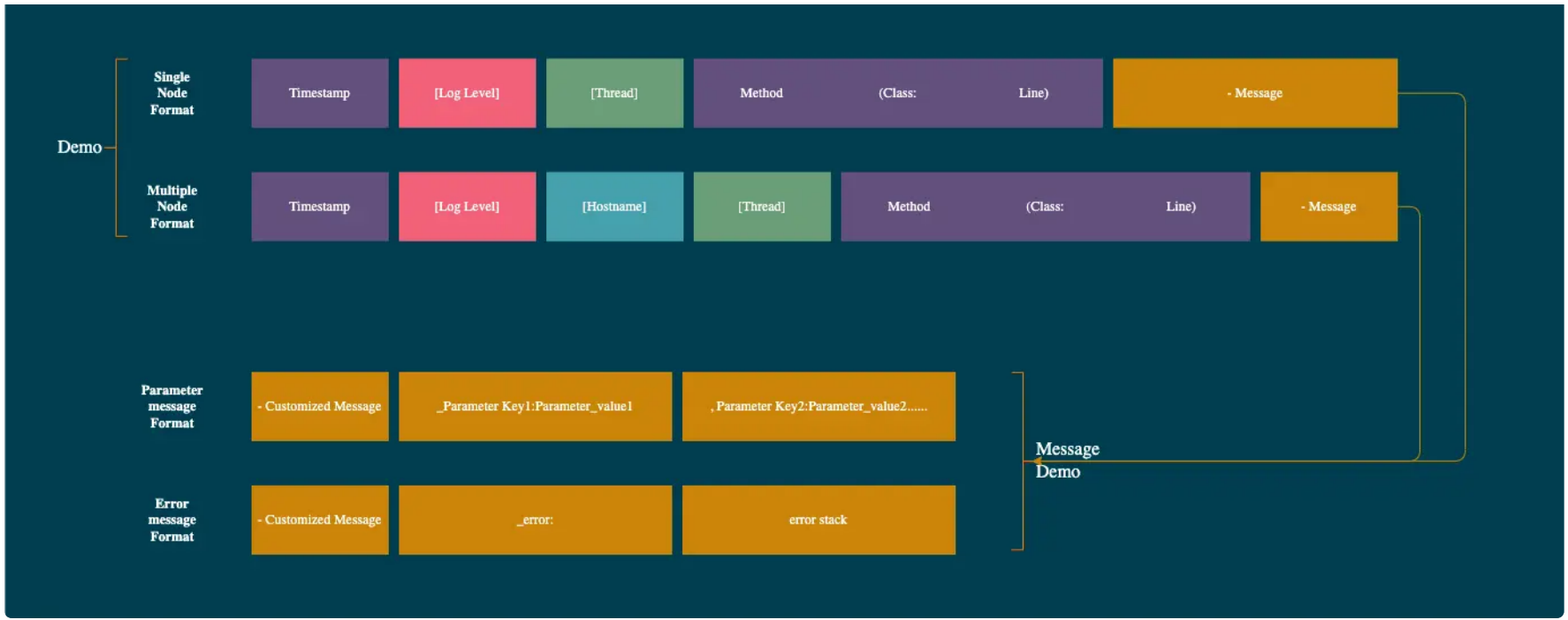
Some good practices of logging

Advanced template - Explanation

- `Thread`: Most applications don’t have a single user. For a single-instance service, many users accessing the same interface will execute the application in different threads. So using the thread name is best to differentiate the business process of corresponding users.
- `Hostname`: Most current applications are deployed in the cloud with multiple instances, so on the basis of a single node, the logging needs to be distinguished at the instance level on multiple instances, and the hostname is the best way to differentiate.
- `Method` Name: A convenient way to differentiate the source within the same log.
- `Class` Name: A convenient way to quickly locate the business process.
- `Number of line`: A quick way to find the specific location of the log.

Some good practices of logging

Formatting - Graph



Some good practices of logging

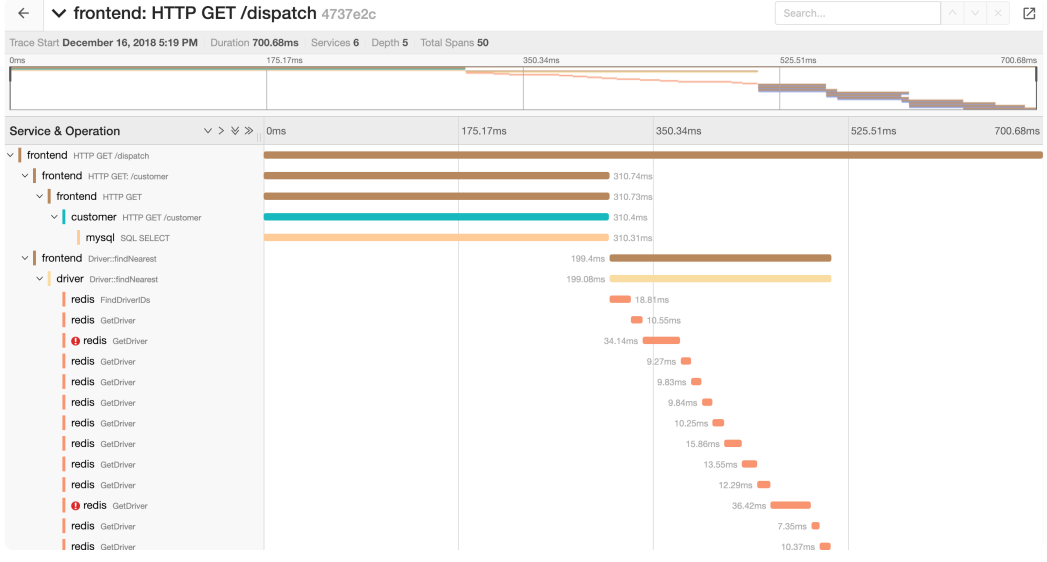
Formatting - Explanation

- Put `square brackets` around the log level, host name, and thread name;
- Add `parentheses` to the class name and line number where the method name is located, and separate the class name and line number with a colon;
- Add a `horizontal line` between the line number and log information; Specific formatting is also possible for log information:
- For regular requests, response or other business logs, you can separate custom information and parameters with an `underscore`; multiple parameters are separated by `commas`;
- For error message formatting, you can use `Key:Value`.

Some good practices of logging

Chain-Tracking

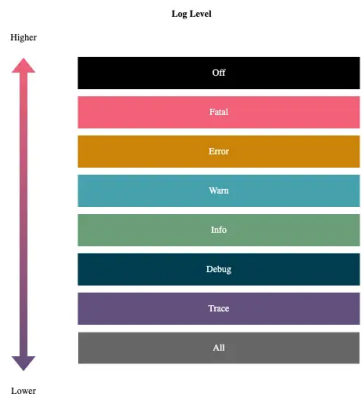
If the recorded log is just a simple text description line by line, it'll be hard to read. In a complex system or a system with frequent business operations, there will be multiple logs and we'll have to spend time filtering out the relevant logs. The best way to solve this problem is through chain tracking of logs: putting one or more unique IDs in the business system that are added to each log, so that when locating business problems, we can quickly filter out the relevant logs through these unique IDs and Other criteria (e.g. time).



Some good practices of logging

Logging on demand - Log level

The output of the log is divided into levels.Different scenarios need to print different levels of logs.



- Debug: Record technica
  to help understand the
- Info: Record business ir
- Warn: Acceptable error
  manageable and not ur
- Error: Unexpected error
  behavior, usually caused by system bugs or environmental problems.

Some good practices of logging

Logging on demand - Log level

Environment	Log Leave
Dev	Debug
Test	Debug
UAT	Info
Prod	Info

Some good practices of logging

Logging on demand - Logging position

The location of the log print also needs to be made clear.

- When other systems call their own systems, they need to print the log once each when they receive a request and when the request is completed;
- The log is printed once before the self-hosted system calls the interface of the third-party system and after receiving the response;
- The log needs to be printed in any abnormal place in the system.

Some good practices of logging

Emotional statement

Give the user a clear state of application

KEY WORDS

`Start to ....`, `Successfully finish ....`, `Failed to ...`

EXAMPLE

```
2022-11-01T21:30:05.687 [INFO] [10-171-200-68] [71605]  get(uid.ts:10)
  -Start to generate uid
2022-11-01T21:30:05.691 [INFO] [10-171-200-68] [71605]  getUid(UidService.ts:13)
  -Start to get UUID from https://www.uuidtools.com/api/generate/v4
2022-11-01T21:30:10.700 [INFO] [10-171-200-68] [71605]  getUid(UidService.ts:19)
  -Successfully get the result from https://www.uuidtools.com/api/generate/v4, the respo
2022-11-01T21:30:10.700 [INFO] [10-171-200-68] [71605]  get(uid.ts:19)
  -Successfully get the result from https://www.uuidtools.com/api/generate/v4, the respo
2022-11-01T21:35:09.478 [ERROR] [10-171-200-68] [72228]  getUid(UidService.ts:19)
  -Failed to request uuid_error: AxiosError: timeout of 1ms exceeded
```

Tools recommendation

Tools Recommendation

- Log4j
- Pino

Tools recommendation

Log4j

Different programming languages have different logging tools;

- The most famous is `Apache's Log4j`, which is highly `configurable` and can be configured via external files at runtime. It is based on **`logging priority` **and provides `mechanisms` to


information to many des
database, file, console, UNIX system log, etc.;

- Log4j has been ported to other programming languages, such as `logging` in Python, `log4js` in NodeJS, `log4rs` in Rust.

Tools recommendation

Pino

Very low overhead Node.js logger.

- Intergrate with many popular NodeJS web framework
- Many plugins
- Support `Asynchronous Logging`

Tips

Tips

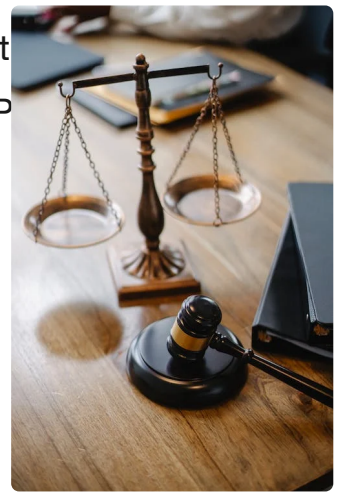
Should not print any PII, PCI

- PII - Personally identifiable information
- PCI - Payment Card Industry

Tips

Should obey local laws and regulations

- PILI - Personal Informat
- GDPR - General Data P Regulation



Q & A

Refs

- Some Good Practices of Logging
- Apache Log4j™ 2
- logging
- log4js
- log4rs
- Audit Logging Overview

Thank you!