CAN YOU KEEP A SECRET?

@AARONBASSETT

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AARON BASSETT

DEVELOPER ADVOCATE

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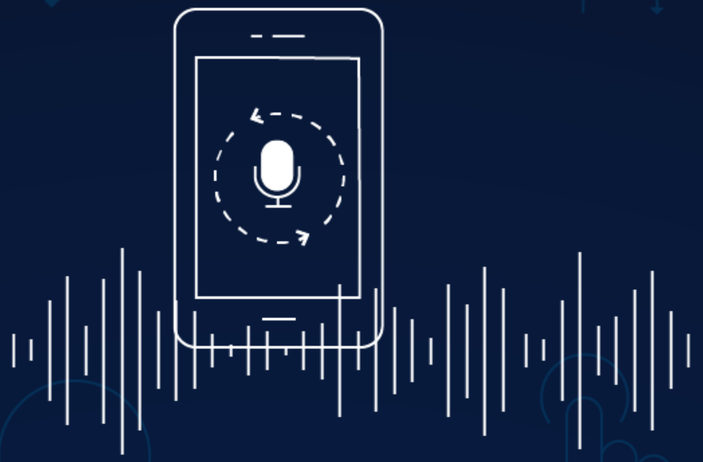

```
import nexmo

client = nexmo.Client(
    key="a925db1ar392", secret="01nd637fn29oe31mc721"
)
client.send_message({
    "from": "Python",
    "to": "447700900981",
    "text": "Hello world"
})
```

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```python
import nexmo

NEXMO_KEY = "a925db1ar392"
NEXMO_SECRET = "01nd637fn29oe31mc721"
MY_NUMBER = "447700900981"

client = nexmo.Client(key=NEXMO_KEY, secret=NEXMO_SECRET)
client.send_message({
    "from": "Python",
    "to": MY_NUMBER,
    "text": "Hello world"
})
```

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import nexmo

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client.send_message({
    "from": "Python",
    "to": MY_NUMBER,
    "text": "Hello world"
})
```

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```
git add .
git commit -m “wip”
git push
```

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"THE MEDIAN TIME TO DISCOVERY WAS 20 SECONDS, WITH TIMES RANGING FROM HALF A SECOND TO OVER 4 MINUTES"

– How Bad Can It Git? Characterizing Secret Leakage in Public GitHub Repositories

NOT SAFE, BUT VERY EASY

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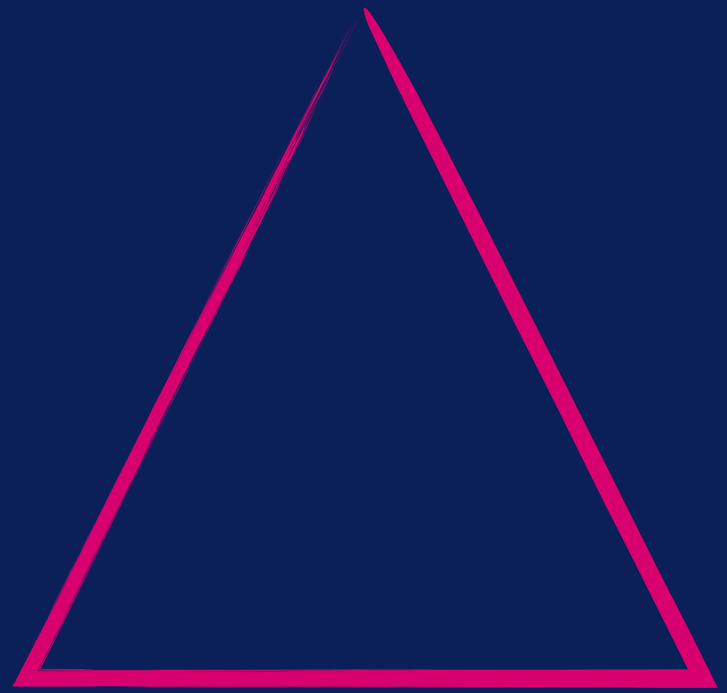
FUNCTIONALITY



SECURITY

USABILITY

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LOW FRICTION

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EASY TO IMPLEMENT

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12 FACTOR APPS

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I. CODEBASE

II. DEPENDENCIES

III. CONFIG

IV. BACKING SERVICES

V. BUILD, RELEASE, RUN

VI. PROCESSES

VII. PORT BINDING

VIII. CONCURRENCY

IX. DISPOSABILITY

X. DEV/PROD PARITY

XI. LOGS

XII. ADMIN PROCESSES

III. CONFIG

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"A litmus test for whether an app has all config correctly factored out of the code is whether the codebase could be made open source at any moment, without compromising any credentials."

—The twelve-factor app

ENVIRONMENT VARIABLES

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```python
import os
import nexmo

client = nexmo.Client(
    key=os.environ["NEXMO_KEY"], secret=os.environ["NEXMO_SECRET"]
)

client.send_message({
    "from": "Python",
    "to": os.environ["MY_NUMBER"],
    "text": "Hello world"
})
```

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    "text": "Hello world"
})
```

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```python
import os
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client = nexmo.Client(
    key=os.environ.get("NEXMO_KEY"),
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)

client.send_message({
    "from": "Python",
    "to": os.environ.get("MY_NUMBER"),
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)
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    key=os.getenv("NEXMO_KEY"),
    secret=os.getenv("NEXMO_SECRET"),
)
client.send_message(
    {
        "from": "Python",
        "to": os.getenv("MY_NUMBER"),
        "text": "Hello world",
    }
)
```

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CREATING ENVIRONMENT VARIABLES

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```
# This file must be used with "source bin/activate" *from bash*
# you cannot run it directly

deactivate () {
    ...

    # Unset variables
    unset NEXMO_KEY
    unset NEXMO_SECRET
    unset MY_NUMBER
}

...

export NEXMO_KEY="a925db1ar392"
export NEXMO_SECRET="01nd637fn29oe31mc721"
export MY_NUMBER="447700900981"
```

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```
# This file must be used with "source bin/activate" *from bash*
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deactivate () {
    ...

    # Unset variables
    unset NEXMO_KEY
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}

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export NEXMO_KEY="a925db1ar392"
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```
# This file must be used with "source bin/activate" *from bash*
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deactivate () {
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    unset NEXMO_KEY
    unset NEXMO_SECRET
    unset MY_NUMBER
}

...

export NEXMO_KEY="a925db1ar392"
export NEXMO_SECRET="01nd637fn29oe31mc721"
export MY_NUMBER="447700900981"
```

"direnv is an extension for your shell. It augments existing shells with a new feature that can load and unload environment variables depending on the current directory."

– direnv.net

```
$ echo export NEXMO_KEY=a925db1ar392 > .envrc
```

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```
$ echo export NEXMO_KEY=a925db1ar392 > .envrc
.envrc is not allowed
```

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```
$ echo export NEXMO_KEY=a925db1ar392 > .envrc
.envrc is not allowed
$ direnv allow .
```

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```
$ echo export NEXMO_KEY=a925db1ar392 > .envrc
.envrc is not allowed
$ direnv allow .
direnv: reloading
direnv: loading .envrc
direnv export: +NEXMO_KEY
```

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```
$ echo export NEXMO_KEY=a925db1ar392 > .envrc
.envrc is not allowed
$ direnv allow .
direnv: reloading
direnv: loading .envrc
direnv export: +NEXMO_KEY
$ cd ..
```

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```
$ echo export NEXMO_KEY=a925db1ar392 > .envrc
.envrc is not allowed
$ direnv allow .
direnv: reloading
direnv: loading .envrc
direnv export: +NEXMO_KEY
$ cd ..
direnv: unloading
```

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IGNORE .ENVRC

```
echo .envrc > ~/.gitignore
git config --global core.excludesfile ~/.gitignore
```

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EXAMPLE .ENVRC

```
grep -ohr "^export .*=" .envrc > .envrc.example
```

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SHARING VALUES & FILES

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```python
import os
import nexmo


client = nexmo.Client(
    application_id=os.getenv("NEXMO_APPLICATION_ID"),
    private_key=os.getenv("NEXMO_PRIVATE_KEY", "./private.key"),
)

response = client.create_call(
    {
        "to": [{"type": "phone", "number": os.getenv("TO_NUMBER")}],
        "from": {"type": "phone", "number": os.getenv("NEXMO_NUMBER")},
        "answer_url": [f"{os.getenv('VAPI_URL')}/answer"],
    }
)
```

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```python
import os
import nexmo


client = nexmo.Client(
    application_id=os.getenv("NEXMO_APPLICATION_ID"),
    private_key=os.getenv("NEXMO_PRIVATE_KEY", "./private.key"),
)

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    {
        "to": [{"type": "phone", "number": os.getenv("TO_NUMBER")}],
        "from": {"type": "phone", "number": os.getenv("NEXMO_NUMBER")},
        "answer_url": [f"{os.getenv('VAPI_URL')}/answer"],
    }
)
```

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)

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    {
        "to": [{"type": "phone", "number": os.getenv("TO_NUMBER")}],
        "from": {"type": "phone", "number": os.getenv("NEXMO_NUMBER")},
        "answer_url": [f"{os.getenv('VAPI_URL')}/answer"],
    }
)
```

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git-secret

GIT-SECRET.IO

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"git-secret encrypts files and stores them inside the git repository. So you will have all the changes for every commit."

—git-secret.io

SAFE & EASY

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SAFE & EASY-ISH

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PGP

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```
$ git secret init
git-secret: init created: '/myproject/.gitsecret/'
```

```
$ git secret tell me@aaronbassett.com
gpg: marginals needed: 3  completes needed: 1  trust model: pgp
gpg: depth: 0  valid:   1  signed:   0  trust: 0-, 0q, 0n, 0m, 0f, 1u
gpg: next trustdb check due at 2021-09-30
gpg: keybox '/myproject/.gitsecret/keys/pubring.kbx' created
gpg: /myproject/.gitsecret/keys/trustdb.gpg: trustdb created
git-secret: done. me@aaronbassett.com added as user(s) who know the secret.
```

```
$ git secret add private.key
git-secret: these files are not in .gitignore: private.key
git-secret: auto adding them to .gitignore
git-secret: 1 item(s) added.
```

```
$ cat .gitignore
.gitsecret/keys/random_seed
!*.secret
private.key
```

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```
$ ls
.git
.gitignore
.gitsecret
private.key
```

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```
$ git secret hide
git-secret: done. 1 of 1 files are hidden.
```

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```
$ ls
.git
.gitignore
.gitsecret
private.key
private.key.secret
```

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```
$ git secret reveal
File '/myproject/private.key' exists. Overwrite? (y/N) y
git-secret: done. 1 of 1 files are revealed.
```

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```
$ git secret whoknows
me@aaronbassett.com

$ git secret list
private.key
```

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```
$ git secret killperson me@aaronbassett.com
git-secret: removed keys.
git-secret: now [me@aaronbassett.com] do not have an access to the repository.
git-secret: make sure to hide the existing secrets again.

$ git secret reveal
git-secret: abort: no public keys for users found. run 'git secret tell email@address.
```

GIT SECRETS

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"git-secrets scans commits, commit messages, and --no-ff merges to prevent adding secrets into your git repositories. If a commit, commit message, or any commit in a --no-ff merge history matches one of your configured prohibited regular expression patterns, then the commit is rejected."

– awslabs/git-secrets

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```
$ git secrets --register-aws --global
OK

$ git secrets --install ~/.git-templates/git-secrets
√ Installed commit-msg hook to /Users/aaronbassett/.git-templates/git-
secrets/hooks/commit-msg
√ Installed pre-commit hook to /Users/aaronbassett/.git-templates/git-
secrets/hooks/pre-commit
√ Installed prepare-commit-msg hook to /Users/aaronbassett/.git-templates/
git-secrets/hooks/prepare-commit-msg

$ git config --global init.templateDir ~/.git-templates/git-secrets
```

```
$ git secrets --register-aws --global
OK

$ git secrets --install ~/.git-templates/git-secrets
✓ Installed commit-msg hook to /Users/aaronbassett/.git-templates/git-
secrets/hooks/commit-msg
✓ Installed pre-commit hook to /Users/aaronbassett/.git-templates/git-
secrets/hooks/pre-commit
✓ Installed prepare-commit-msg hook to /Users/aaronbassett/.git-templates/
git-secrets/hooks/prepare-commit-msg

$ git config --global init.templateDir ~/.git-templates/git-secrets
```

```
$ git secrets --register-aws --global
OK

$ git secrets --install ~/.git-templates/git-secrets
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secrets/hooks/commit-msg
√ Installed pre-commit hook to /Users/aaronbassett/.git-templates/git-
secrets/hooks/pre-commit
√ Installed prepare-commit-msg hook to /Users/aaronbassett/.git-templates/
git-secrets/hooks/prepare-commit-msg

$ git config --global init.templateDir ~/.git-templates/git-secrets
```

```
$ git secrets --register-aws --global
OK

$ git secrets --install ~/.git-templates/git-secrets
√ Installed commit-msg hook to /Users/aaronbassett/.git-templates/git-
secrets/hooks/commit-msg
√ Installed pre-commit hook to /Users/aaronbassett/.git-templates/git-
secrets/hooks/pre-commit
√ Installed prepare-commit-msg hook to /Users/aaronbassett/.git-templates/
git-secrets/hooks/prepare-commit-msg

$ git config --global init.templateDir ~/.git-templates/git-secrets
```

PROVIDERS

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```
^[5KL][1-9A-HJ-NP-Za-km-z]{50,51}$
(xox[p|b|o|a]-[0-9]{12}-[0-9]{12}-[0-9]{12}-[a-z0-9]{32})
https://hooks.slack.com/services/T[a-zA-Z0-9_]{8}/B[a-zA-Z0-9_]{8}/[a-zA-Z0-9_]{24}
EAACEdEose0cBA[0-9A-Za-z]+
[t|T][w|W][i|I][t|T][t|T][e|E][r|R].*[1-9][0-9]+-[0-9a-zA-Z]{40}
[t|T][w|W][i|I][t|T][t|T][e|E][r|R].*['|\"][0-9a-zA-Z]{35,44}['|\"]
AIza[0-9A-Za-z\\-_]{35}
[0-9]+-[0-9A-Za-z_]{32}\\.apps\\.googleusercontent\\.com
ya29\\.[0-9A-Za-z\\-_]+
[h|H][e|E][r|R][o|O][k|K][u|U].*[0-9A-F]{8}-[0-9A-F]{4}-[0-9A-F]{4}-[0-9A-F]{4}-[0-9A-F]{12}
(-----(BEGIN|END) PRIVATE KEY-----)
(-----(BEGIN|END) RSA PRIVATE KEY-----)
```

```
$ git secrets --add-provider -- cat /secret/file/patterns
```

```
(-----(BEGIN|END) RSA PRIVATE KEY-----)
```

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```
ya29\\.[0-9A-Za-z\\-_]+
```

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```
EAACEdEose0cBA[0-9A-Za-z]+
```

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```
$ cd /secret/file/patterns
$ ls
crypto
keys
vendors
```

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```
# Slack
(xox[p|b|o|a]-[0-9]{12}-[0-9]{12}-[0-9]{12}-[a-z0-9]{32})
https://hooks.slack.com/services/T[a-zA-Z0-9_]{8}/B[a-zA-Z0-9_]{8}/[a-zA-Z0-9_]{24}

# Facebook
EAACEdEose0cBA[0-9A-Za-z]+

# Twitter
[t|T][w|W][i|I][t|T][t|T][e|E][r|R].*[1-9][0-9]+-[0-9a-zA-Z]{40}
[t|T][w|W][i|I][t|T][t|T][e|E][r|R].*['|\"][0-9a-zA-Z]{35,44}['|\"]

# Google
AIza[0-9A-Za-z\\-_]{35}
[0-9]+-[0-9A-Za-z_]{32}\\.apps\\.googleusercontent\\.com
ya29\\.[0-9A-Za-z\\-_]+

# Heroku
[h|H][e|E][r|R][o|O][k|K][u|U].*[0-9A-F]{8}-[0-9A-F]{4}-[0-9A-F]{4}-[0-9A-F]{4}-[0-9A-F]{12}
```

```
git secrets --add-provider -- egrep -rhv "(^#|^$)" /secret/file/patterns
```

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```
^[5KL][1-9A-HJ-NP-Za-km-z]{50,51}$
(xox[p|b|o|a]-[0-9]{12}-[0-9]{12}-[0-9]{12}-[a-z0-9]{32})
https://hooks.slack.com/services/T[a-zA-Z0-9_]{8}/B[a-zA-Z0-9_]{8}/[a-zA-Z0-9_]{24}
EAACEdEose0cBA[0-9A-Za-z]+
[t|T][w|W][i|I][t|T][t|T][e|E][r|R].*[1-9][0-9]+-[0-9a-zA-Z]{40}
[t|T][w|W][i|I][t|T][t|T][e|E][r|R].*['|\"][0-9a-zA-Z]{35,44}['|\"]
AIza[0-9A-Za-z\\-_]{35}
[0-9]+-[0-9A-Za-z_]{32}\\.apps\\.googleusercontent\\.com
ya29\\.[0-9A-Za-z\\-_]+
[h|H][e|E][r|R][o|O][k|K][u|U].*[0-9A-F]{8}-[0-9A-F]{4}-[0-9A-F]{4}-[0-9A-F]{4}-[0-9A-F]{12}
(-----(BEGIN|END) PRIVATE KEY-----)
(-----(BEGIN|END) RSA PRIVATE KEY-----)
```

```
$ git add ‘private.key’
$ git commit -m "Adding some files I shouldn't"
private.key:1:-----BEGIN PRIVATE KEY-----

[ERROR] Matched one or more prohibited patterns

Possible mitigations:
- Mark false positives as allowed using: git config --add secrets.allowed ...
- Mark false positives as allowed by adding regular expressions to .gitallowed at repository's root directory
- List your configured patterns: git config --get-all secrets.patterns
- List your configured allowed patterns: git config --get-all secrets.allowed
- List your configured allowed patterns in .gitallowed at repository's root directory
- Use --no-verify if this is a one-time false positive
```

GITLEAKS

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"AUDIT GIT REPOS FOR SECRETS. GITLEAKS PROVIDES A WAY FOR YOU TO FIND UNENCRYPTED SECRETS AND OTHER UNWANTED DATA TYPES IN GIT SOURCE CODE REPOSITORIES"

— Zri cEthEZaV/9I tLEaKS

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I. A GIT REPO

II. GITHUB USER

III. GITHUB ORGANIZATION

IV. GITHUB PR

V. GITLAB USER

VI. GITLAB GROUP

```
{
    "line": "-----BEGIN PRIVATE KEY-----",
    "commit": "37f19780583f12fd2fb687f2d7d3840880e79c76",
    "offender": "-----BEGIN PRIVATE KEY-----",
    "rule": "PKCS8",
    "info": "-----BEGIN PRIVATE KEY----- regex match",
    "commitMsg": "wip backup ",
    "author": "Joe Bloggs",
    "email": "jbloggs@example.com",
    "file": "app/private.key",
    "repo": "my-awesome-app",
    "date": "2019-09-14T12:26:10+08:00",
    "tags": "key, PKCS8",
    "severity": ""
  }
```

```
gitleaks —github-org=MyOrg > /dev/null
if [ $? -eq 0 ]; then
    echo "No Leaks"
else
    nexmo sms 447700900235 Git is leaking --confirm
fi
```

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```
gitleaks —github-org=MyOrg > /dev/null
if [ $? -eq 0 ]; then
    echo "No Leaks"
else
    nexmo sms 447700900235 Git is leaking --confirm
fi
```

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```
gitleaks —github-org=MyOrg > /dev/null
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    nexmo sms 447700900235 Git is leaking --confirm
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```

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```
gitleaks —github-org=MyOrg > /dev/null
if [ $? -eq 0 ]; then
    echo "No Leaks"
else
    nexmo sms 447700900235 Git is leaking --confirm
fi
```

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1. KEEP SECRETS AND CODE SEPARATE

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2. IF YOU NEED TO SHARE SECRETS ENCRYPT THEM FIRST

PGP IS A PITA, USE TOOLS TO MAKE IT EASIER

3. AUTOMATE, AUTOMATE, AUTOMATE

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4. LATE IS BETTER THAN NEVER

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@AARONBASSETT
NOTI.ST/AARONBASSETT

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