Next-Gen Django Background Workers

— Django Meetup Vol. 56 —

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A Common Problem

Run long running tasks outside the request-response lifecycle.

Current Landscape

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Solution: Install a third-party solution

- Celery
- Django Q or Django Q2
- Huey
- …

Third-Party Solutions

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The Problem

- Yet another dependency
- No common interface
- Hard to migrate from one to another

🙄

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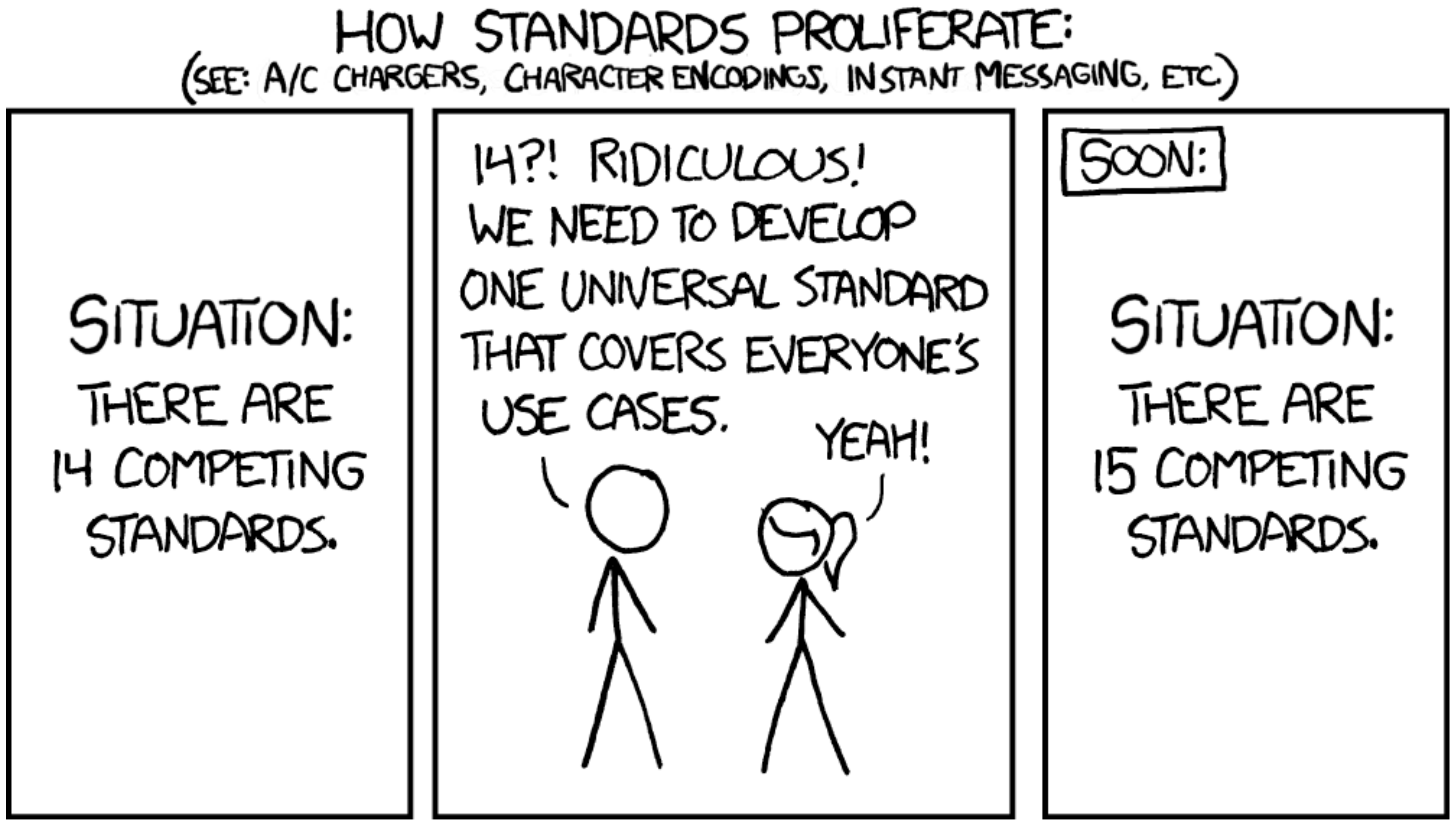
DEP 0014

Yet Another Background Worker?


HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)
SITUATION: THERE ARE 14 COMPETING STANDARDS.
14?! RIDICULOUS! WE NEED TO DEVELOP ONE UNIVERSAL STANDARD THAT COVERS EVERYONE'S USE CASES.
YEAH!
SOON:
SITUATION: THERE ARE 15 COMPETING STANDARDS.

Source XKCD: https://xkcd.com/927

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Why another one?

A competing standard or a solution?

Project Goal

Interface and **base** implementation for long-running background tasks **shipped with** Django.

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Project Goal

- Common Interface
  - "task backend" interface specification
  - For Third-Party Libraries & Your Code
- Base Implementation
  - ImmediateBackend — Run tasks immediately
  - DatabaseBackend — Django ORM to store tasks
  - DummyBackend — Don't execute, store in memory

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Backend Interface

- Task backends must inherit from `BaseTaskBackend`
- Common interface between Django and the task runner
- Functions to determine if a backend can run a task
  - e.g. if async is not supported
  - Throws InvalidTaskError exception
- Project can have multiple backends and queues

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Task Interface

- Generic `Task` class
- Actions the task runners execute
- No need to subclass
- Tasks are immutable
  - Create a (reconfigured) copy of a task with "using"

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Task Interface

```
from django.tasks import task

@task()
def calculate_meaning_of_life():
    return 42
```

- Can be function or coroutine
- Decorator parameters can overwrite defaults
- Task arguments must be JSON serializable

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Tasks are normal functions

```
from django.tasks import task

@task()
def do_a_task(*args, **kwargs):
    pass

# Calls `do_a_task` as if it weren't a task
do_a_task()
```

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Queueing Tasks

```python
from django.tasks import task

@task()
def add(a: int, b: int):
    return a + b

result = add.enqueue(31, b=11)
```

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Queueing Tasks

```python
from django.tasks import task

@task(priority=100, backend='other-backend', queue_name='high-load')
def calculate_meaning_of_life():
    return 42
```

- Manage multiple queues
- Select different backend
- Set priorities

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Overwrite Defaults

```
from django.tasks import task

@task()
def calculate_meaning_of_life():
    return 42

calculate_meaning_of_life.using(
    priority=100,
    backend='other-backend',
    queue_name='high-load'
).enqueue()
```

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Deferring Tasks

```
from django.tasks import task

@task()
def do_a_task():
    pass

do_a_task.using(run_after=timedelta(minutes=5)).enqueue()
```

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Task Results

- Queueing a task returns a `TaskResult` object
- Caches the task's result (once available)
- Stores status of task

NEW	The task has been created, but hasn't started running yet
RUNNING	The task is currently running
FAILED	The task failed
COMPLETE	The task is complete, and the result is accessible

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Database Background Worker

- Start worker with: `python manage.py db_worker`
- Executes queued tasks
- Can be configured to only execute specific queues

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Out of Scope (for now)

- Completion hooks
- Bulk queuing
- Automated task retrying
- Generic task runner execution
  - Custom backends need to implement their own runners
- Task Queue monitoring and reporting
- Cron-based scheduling
- Task timeouts

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Disclaimer

- Work in Progress
- Not yet part of Django
  - Reference implementation django-tasks is an early demo
- Breaking changes likely
- A lot of missing features
  - See DEP for more infos

Demo

— Django Tasks in Action —

Django Tasks

Packages & Resources

- **Django Enhancement Proposal 14: Background Workers**
- **Django Tasks**
  - Reference Implementation by Jake Howard

Slides

andreas.earth/s/djmc-56