DB와 ORM에 관한 7가지 고민

김찬우

Internal Products Developer, ***Toss***

Dev Django Korea 2018

DB와 ORM에 관한 ≠ 6가지 고민 🤷‍♀️

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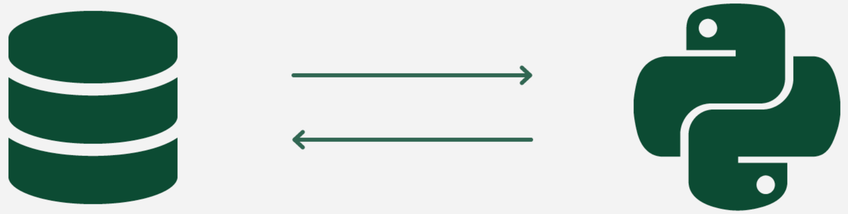
Dev Django Korea 2018



Notes

1️⃣ 슬라이드 주소 : bit.ly/devdjango-2018-ed

2️⃣ 특별한 언급이 없는 한, MySQL 환경을 기준으로 합니다.

Django at ***Toss***

Django at **Toss**

Toss

Django at *Toss*

Toss

Viva Manager

toss internal

Django at *Toss*

Toss

Viva Manager

toss internal

자주 묻는 질문 | 송금 | 이용방법 | 보안 | 거래내역 조회 | 신용등급 조회 | 카드조회서비스
비대면 계좌 개설 | 부동산 소액투자 | P2P 분산투자 | 펀드 소액투자 | 해외 주식투자 | 기타

입금확인증은 어디에서 발급 받을 수 있나요?

은행의 자동이체 알림 메시지를 받았어요

토스 송금/결제 한도는 어떻게 되나요?

1. 송금
   - 일반 회원 : 일 50만원
   - 토스 신한금융투자 계좌, 토스 KEB하나은행 계좌 개설 회원 : 일 200만원
   - 미성년자 회원 : 일 30만원, 월 최대 100만원

   채우기/옮기기와 송금 한도는 별도로 계산됩니다. 옮기기 횟수는 1일 30회까지 입니다.
2. 결제
   - 일반 회원 : 일 200만원
   - 미성년자 회원 : 일 30만원, 월 최대 100만원

   단, 일부 가맹점은 더 낮은 한도가 적용됩니다. 자세한 사항은 가맹점 홈페이지에서 확인하세요.
3. 1999년생 출생자의 경우, **생일이 지난 다음달 1일에 '일반 회원'의 한도로 변경**됩니다. (2018년 기준)
4. **미성년자의 출금 한도는 송금액과 결제액이 합하여 계산됩니다.**
   예를 들어 이번 달에 30만원 송금하고 토스 가맹점에서 50만원 결제했다면, 다음 달이 되기 전엔 20만원이 넘는 송금이나 결제를 할 수 없습니다.

타인 명의 휴대폰으로도 토스를 사용할 수 있나요?

토스머니 대사 운영

BankingHistory2 - toss_fb_main 매칭 현황을 관리합니다.

지난 3일 간 이상 상황이 없습니다.

조회 시작 일시*
2018-08-15

조회 종료 일시*
2018-09-15

조회하기

9월 15일 (토) 법인계좌 잔여 0건 / 펌뱅킹 잔여 0건 ▼

9월 14일 (금) 법인계좌 잔여 0건 / 펌뱅킹 잔여 0건 ▼

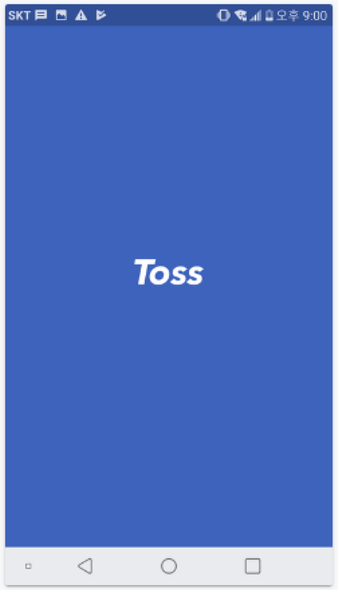
9월 13일 (목) 법인계좌 잔여 5건 / 펌뱅킹 잔여 1건 ▼

9월 12일 (수) 법인계좌 잔여 3건 / 펌뱅킹 잔여 1건 ▼

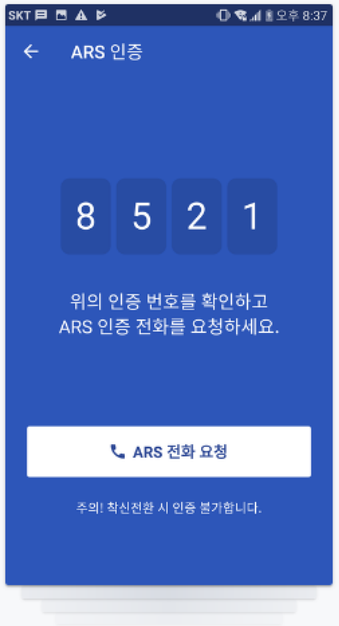
← 14 screens for 인트로

인트로 영역에서 필터 조건에 해당하는 스크린 14개가 검색되었습니다.

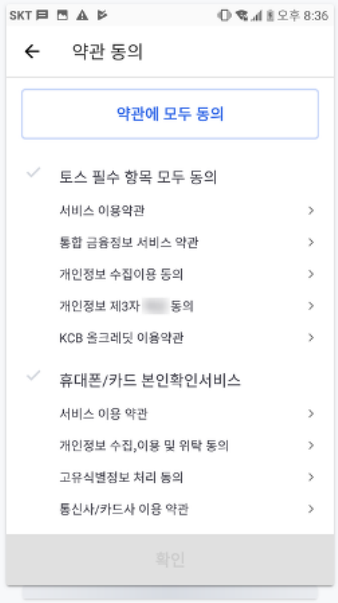
splash



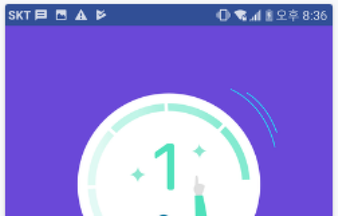
auth_ars 6



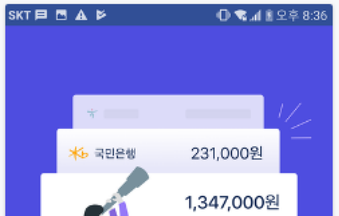
init_guide_4 2



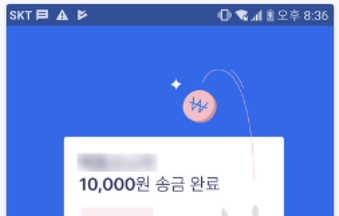
init_guide_3



init_guide_2



init_guide_1



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Why do we use ORM in the first place?

#ORM #왜쓸까

1. Why do we use ORM in the first place?

??? : “SQL 몰라도 된다고 하는 사람과는 일 안 한다”

1. Why do we use ORM in the first place?

??? : “SQL 몰라도 된다고 하는 사람과는 일 안 한다”

SQL queries from 1 connection

DO

1183.69 ms (12 queries)

Query	Timeline	Time (ms)	Action
SELECT @@SQL_AUTO_IS_NULL		20.71	
SELECT VERSION()		21.33	
SELECT • • • FROM `T0` INNER JOIN `T1` ON (`T0`.`account_no` = `T1`.`no`) WHERE (`T0`.`target_date` <= '2018-10-06' AND `T0`.`target_date` >= '2018-09-06' AND `T1`.`toss_money` = 1) GROUP BY `T0`.`target_date`, `T0`.`category_id` ORDER BY NULL		302.85	Sel Expl
SELECT • • • FROM `T2` INNER JOIN `T1` ON (`T2`.`account_no` = `T1`.`no`) WHERE (`T2`.`target_date` <= '2018-10-06' AND `T2`.`target_date` >= '2018-09-06' AND `T1`.`toss_money` = 1) GROUP BY `T2`.`target_date` ORDER BY NULL		71.67	Sel Expl
SELECT • • • FROM `T0` INNER JOIN `T1` ON (`T0`.`account_no` = `T1`.`no`) WHERE (`T0`.`target_date` <= '2018-10-06' AND `T0`.`target_date` >= '2018-09-06' AND `T1`.`toss_money` = 1)		522.04	Sel Expl
SELECT • • • FROM `T3` LEFT OUTER JOIN `T3` A ON (`T3`.`parent_id` = A.`id`) LEFT OUTER JOIN `T3` AA ON (A.`parent_id` = AA.`id`) LEFT OUTER JOIN `T3` AAA ON (AA.`parent_id` = AAA.`id`) WHERE `T3`.`id` IN (0, 257, 155, 307, 317, 407, 435, 271, 273, 167, 147, 149, 151, 409, 431, 285, 287, 289, 197, 419, 293, 423, 171, 159, 173, 157, 177, 179, 415, 437, 417, 183, 283, 185, 187, 411, 189, 309, 279, 175, 267, 325, 327, 329, 331, 319, 305, 433, 291, 215, 217, 221, 315, 351, 227, 195, 401, 233, NULL, 235, 237, 239, 241, 339, 349, 247, 343, 249, 251, 281, 277) ORDER BY `T3`.`ordering` ASC, `T3`.`codename` ASC		36.98	Sel Expl
SELECT • • • FROM `T1` INNER JOIN `T4` ON (`T1`.`bank_no` = `T4`.`no`)		62.87	Sel Expl
SELECT • • • FROM `T3` WHERE `T3`.`parent_id` IS NULL ORDER BY `T3`.`ordering` ASC, `T3`.`codename` ASC		24.64	Sel Expl
SELECT • • • FROM `T3` WHERE (`T3`.`id` IN (257, 299, 321, 307, 279, 349, 435, 271, 273, 147, 277, 151, 327, 409, 155, 157, 287, 289, 283, 293, 325, 167, 169, 227, 171, 159, 173, 175, 177, 179, 437, 183, 185, 415, 411, 317, 319, 193, 343, 195, 407, 197, 417, 329, 339, 331, 305, 269, 285, 433, 255, 291, 213, 303, 215, 267, 217, 309, 219, 221, 351, 225, 419, 315, 165, 401, 259, 233, 431, 423, 237, 239, 241, 275, 235, 187, 189, 247, 153, 249, 251, 281, 149) AND `T3`.`parent_id` IN (299, 303)) ORDER BY `T3`.`ordering` ASC, `T3`.`codename` AS		28.77	Sel Expl
SELECT • • • FROM `T3` WHERE (`T3`.`id` IN (257, 299, 321, 307, 279, 349, 435, 271, 273, 147, 277, 151, 327, 409, 155, 157, 287, 283, 293, 325, 167, 169, 227, 171, 159, 173, 175, 177, 179, 183, 185, 415, 411, 317, 319, 193, 343, 195, 407, 197, 417, 329, 339, 331, 305, 269, 285, 433, 255, 291, 213, 303, 215, 267, 217, 309, 219, 221, 225, 165, 259, 235, 187, 189, 247, 153, 249, 251, 281, 149) AND `T3`.`parent_id` IN (259, 321, 269, 147, 149, 153, 409, 411, 287, 289, 165, 169, 173, 431, 213, 247, ER BY `T3`.`ordering` ASC, `T3`.`codename` ASC		30.48	Sel Expl
SELECT • • • FROM `T3` WHERE (`T3`.`id` IN (257, 299, 321, 307, 279, 349, 435, 271, 273, 147, 277, 151, 327, 409, 155, 157, 287, 289, 283, 293, 325, 167, 169, 227, 171, 159, 173, 175, 177, 179, 437, 183, 185, 415, 411, 317, 319, 193, 343, 195, 407, 197, 417, 329, 339, 331, 305, 269, 285, 433, 255, 291, 213, 303, 215, 267, 217, 309, 219, 221, 351, 225, 419, 315, 165, 401, 259, 233, 431, 423, 237, 239, 241, 275, 235, 187, 189, 247, 153, 249, 251, 281, 149) AND `T3`.`parent_id` IN (257, 279, 175, 271, 273, 277, 151, 283, 157, 415, 417, 419, 293, 167, 291, 171, 285, 177, 307, 155, 437, 183, 185, 423, 187, 317, 435, 195, 407, 197, 327, 331, 339, 215, 267, 217, 221, 351, 227, 233, 235, 237, 189, 241, 349, 249, 251)) ORDER BY `T3`.`ordering` ASC, `T3`.`codename` ASC		35.57	Sel Expl
SELECT • • • FROM `T3` WHERE (`T3`.`id` IN (257, 299, 321, 307, 279, 349, 435, 271, 273, 147, 277, 151, 327, 409, 155, 157, 287, 289, 283, 293, 325, 167, 169, 227, 171, 159, 173, 175, 177, 179, 437, 183, 185, 415, 411, 317, 319, 193, 343, 195, 407, 197, 417, 329, 339, 331, 305, 269, 285, 433, 255, 291, 213, 303, 215, 267, 217, 309, 219, 221, 351, 225, 419, 315, 165, 401, 259, 233, 431, 423, 237, 239, 241, 275, 235, 187, 189, 247, 153, 249, 251, 281, 149) AND `T3`.`parent_id` IN (305, 239, 401, 309, 343, 281, 315, 159)) ORDER BY `T3`.`ordering` ASC, `T3`.`codename` ASC		25.77	Sel Expl

퍼포먼스 병목의 요인

DB I/O

1.

Joins, Aggregation, Indexes... 쿼리셋으로 돌아돌아 공부하면
장님 코끼리 만지는 느낌을 벗어날 수 없다.

1. Why do we use ORM in the first place?

2.

데이터 엔지니어와 소통하기
다른 스택 개발자들과 소통하기

1. Why do we use ORM in the first place?

쉽게 해 준다고 해서 애초에 고민해야 하는 전통적인 질문들이 사라지지는 않는다.

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오히려...

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오히려...

DRY, object-oriented code ✅

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오히려...

DRY, object-oriented code ✅

SQL injection ✅

1. Why do we use ORM in the first place?

결론: SQL 중요하다.

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Is the ORM-generated schema good enough?

#ORM #스키마 #괜찮을까

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2. Is the ORM-generated schema good enough?

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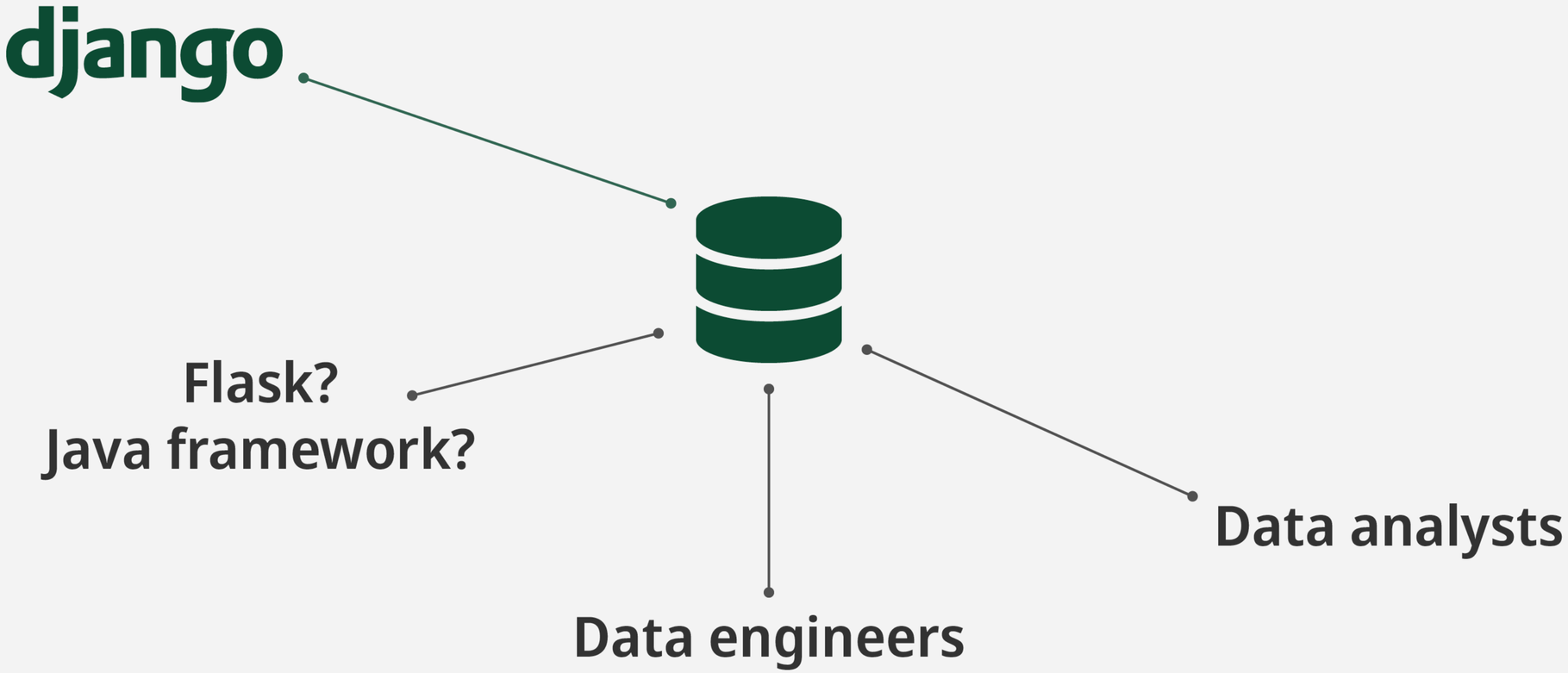
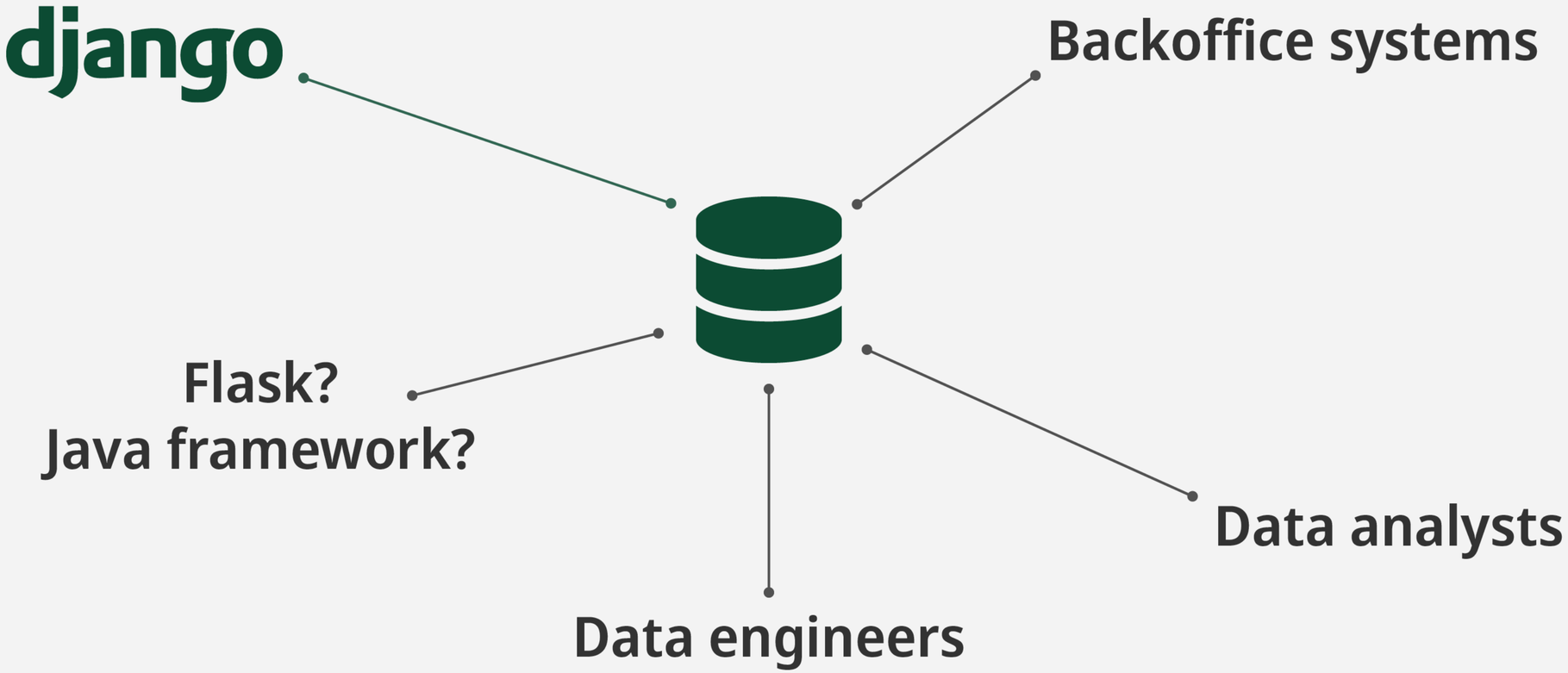


2. Is the ORM-generated schema good enough?



2. Is the ORM-generated schema good enough?

DB는 영원히 장고만의 것이 아니다.

그 자체로 완결성 있어야 한다.

2. Is the ORM-generated schema good enough?

DDL

이름 짓기.

2. Is the ORM-generated schema good enough?

```python
# banking/models.py

class BankingHistoryCategorizationManualLogEntry(models.Model):
    ...
```

```sql
-- SQL

CREATE TABLE banking_bankinghistorycategorizationmanuallogentry (
    ...
```

2. Is the ORM-generated schema good enough?

```python
# banking/models.py

class BankingHistoryCategorizationManualLogEntry(models.Model):
    ...
```

```sql
-- SQL 🤔

CREATE TABLE banking_bankinghistorycategorizationmanuallogentry (
    ...
```

2. Is the ORM-generated schema good enough?

```python
# banking/models.py

action_time = models.DateTimeField(db_index=True)
slug = models.SlugField(unique=True)
```

```sql
-- SQL

ALTER TABLE banking_bankinghistorycategorizatonmanuallogentry
  ADD INDEX banking_bankinghistorycateg_action_time_fe6002e8 (action_time);
ALTER TABLE banking_bankinghistorycategorizatonmanuallogentry
  ADD CONSTRAINT banking_bankinghistoryca_slug_b6ea4771_uniq UNIQUE (slug);
```

2. Is the ORM-generated schema good enough?

```python
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action_time = models.DateTimeField(db_index=True)
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```

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-- SQL 🤔

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  ADD INDEX banking_bankinghistorycateg_action_time_fe6002e8 (action_time);
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  ADD CONSTRAINT banking_bankinghistoryca_slug_b6ea4771_uniq UNIQUE (slug);
```

2. Is the ORM-generated schema good enough?

```python
# banking/models.py

action_type = models.CharField(max_length=30, choices=ACTION_TYPE_CHOICES)
reason = models.CharField(max_length=255)
```

```sql
-- SQL

ALTER TABLE banking_bankinghistorycategorizatonmanuallogentry
  ADD COLUMN action_type varchar(30) NOT NULL;
ALTER TABLE banking_bankinghistorycategorizatonmanuallogentry
  ADD COLUMN reason varchar(255) NOT NULL;
```

2. Is the ORM-generated schema good enough?

```python
# banking/models.py

action_type = models.CharField(max_length=30, choices=ACTION_TYPE_CHOICES)
reason = models.CharField(max_length=255)
```

```sql
-- SQL 🤔

ALTER TABLE banking_bankinghistorycategorizatonmanuallogentry
  ADD COLUMN action_type varchar(30) CHARACTER SET utf8 NOT NULL;
ALTER TABLE banking_bankinghistorycategorizatonmanuallogentry
  ADD COLUMN reason varchar(255) CHARACTER SET utf8 NOT NULL;
```

2. Is the ORM-generated schema good enough?

```
# banking/models.py

category = models.ForeignKey('BankingHistoryCategory', models.CASCADE)
```

```
-- SQL

ALTER TABLE banking_bankinghistorycategorizatonmanuallogentry
  ADD COLUMN category_id varchar(30) NOT NULL;
ALTER TABLE banking_bankinghistorycategorizatonmanuallogentry
  ADD CONSTRAINT banking_bankinghisto_category_id_ec0fe47a_fk_banking_b
  FOREIGN KEY (category_id) REFERENCES banking_bankinghistorycategory (slug);
```

2. Is the ORM-generated schema good enough?

```python
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category = models.ForeignKey('BankingHistoryCategory', models.CASCADE)
```

```sql
-- SQL 🤔

ALTER TABLE banking_bankinghistorycategorizatonmanuallogentry
  ADD COLUMN category_id varchar(30) NOT NULL;
ALTER TABLE banking_bankinghistorycategorizatonmanuallogentry
  ADD CONSTRAINT banking_bankinghisto_category_id_ec0fe47a_fk_banking_b
  FOREIGN KEY (category_id) REFERENCES banking_bankinghistorycategory (slug);
```

2. Is the ORM-generated schema good enough?

```
# banking/models.py

categories = models.ManyToManyField('BankingHistoryCategory')
```

```
-- SQL 😌

CREATE TABLE banking_bankinghistorycategorizatonmanuallogentry_categories (
  id int(11) AUTO_INCREMENT NOT NULL PRIMARY KEY,
  bankinghistorycategorizatonmanuallogentry_id int(11) NOT NULL,
  bankinghistorycategory_id varchar(30) NOT NULL);
ALTER TABLE banking_bankinghistorycategorizatonmanuallogentry_categories
  ADD CONSTRAINT banking_bankinghistoryca_bankinghistorycategoriza_773edd06_uniq
  UNIQUE (bankinghistorycategorizatonmanuallogentry_id, bankinghistorycategory_id);
ALTER TABLE ...
```

2. Is the ORM-generated schema good enough?

✅ **항상** 테이블 & 인덱스 이름 지정하기

✅ **항상** M2M 중간 테이블 지정하기

✅ 스트링 인코딩, 테이블 & 칼럼 코멘트, ...

2. Is the ORM-generated schema good enough?

+) 진지하게 오래 가는 DB를 만들 거면 migration은 끄자.

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What really is a ForeignKey?

#ForeignKey #대체뭘까

3. What really is a ForeignKey?

```
class User(models.Model):
    id = models.IntegerField(
        primary_key=True,
    )

class Post(models.Model):
    id = models.IntegerField(
        primary_key=True,
    )
    user = models.ForeignKey(
        User,
        on_delete=models.CASCADE,
    )
```

3. What really is a ForeignKey?

```python
class User(models.Model):
    id = models.IntegerField(
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    id = models.IntegerField(
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    )
    user = models.ForeignKey(
        User,
        on_delete=models.CASCADE,
    )
```

```
>>> post.user
<User: User object (1)>
```

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```python
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    )
```

```
>>> post.user
<User: User object (1)>

>>> post.user_id
1
```

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    )
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        User,
        on_delete=models.CASCADE,
    )
```

```
>>> post.user
<User: User object (1)>

>>> post.user_id
1

>>> user.post_set
<django.db.models.fields.related_descriptors.
create_reverse_many_to_one_manager.<locals>.
RelatedManager object at 0x10e082a90>
```

3. What really is a ForeignKey?

```python
class User(models.Model):
    id = models.IntegerField(
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    )

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    id = models.IntegerField(
        primary_key=True,
    )
    user = models.ForeignKey(
        User,
        on_delete=models.CASCADE,
    )
```

```sql
CREATE TABLE user (
  id int(11) NOT NULL,
  PRIMARY KEY (id)
);

CREATE TABLE post (
  id int(11) NOT NULL,
  user_id int(11) NOT NULL,
  PRIMARY KEY (id),
  KEY c564eba6 (user_id),
  CONSTRAINT c564eba6 FOREIGN KEY (user_id)
    REFERENCES user (id)
);
```

3. What really is a ForeignKey?

```python
class User(models.Model):
    id = models.IntegerField(
        primary_key=True,
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        db_index=True,
    )
    user = models.ForeignObject(
        User,
        on_delete=models.CASCADE,
        from_fields=['user_id'],
        to_fields=['id'],
    )
```

```sql
CREATE TABLE user (
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);

CREATE TABLE post (
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  user_id int(11) NOT NULL,
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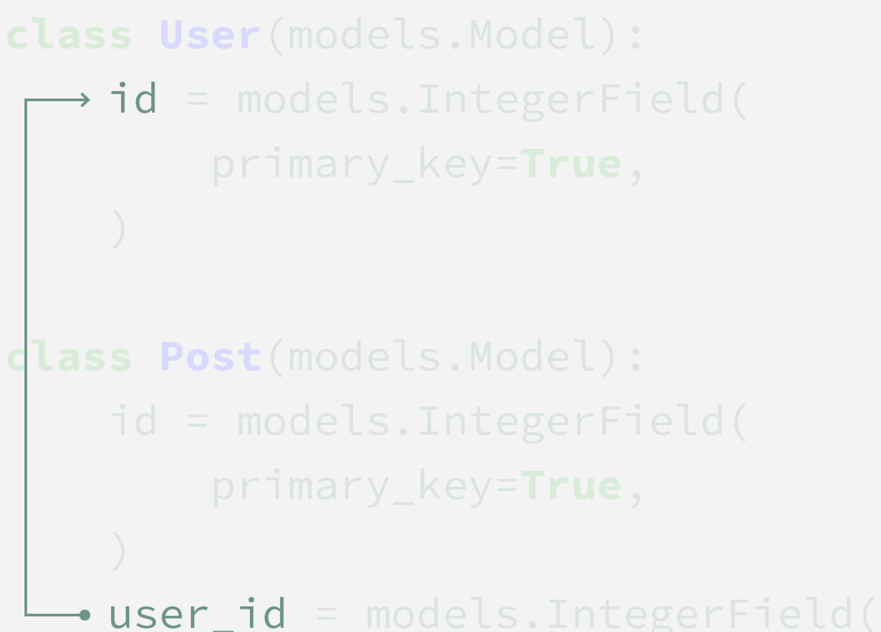

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    post_set =
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class Post(models.Model):
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```

```
>>> post.user
<User: User object (1)>
```

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        db_index=True,
    )
    user =
    (ForwardManyToOneDescriptor instance)
```

```
>>> post.user
<User: User object (1)>

>>> user.post_set
<django.db.models.fields.related_descriptors.
create_reverse_many_to_one_manager.<locals>.
RelatedManager object at 0x10e082a90>
```

Descriptors

https://docs.python.org/3/howto/descriptor.html

https://dev.to/dawranliou/writing-descriptors-in-python-36

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Referential integrity: how should we enforce it?

#참조무결성 #어떻게할까

4. Referential integrity: how should we enforce it?

REFERENTIAL INTEGRITY

4. Referential integrity: how should we enforce it?

> [...] This is because of referential integrity. In order to maintain a relationship between two objects, Django needs to know that the primary key of the related object is valid.
>
> [...] Controls whether or not a constraint should be created in the database for this foreign key. The default is True, and that's almost certainly what you want; setting this to False can be very bad for data integrity.

Multiple databases & Model field reference | Django documentation

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Multiple databases & Model field reference | Django documentation

Referential integrity

From Wikipedia, the free encyclopedia

Referential integrity is a property of data stating references within it are valid. In the context of relational databases, it requires every value of one column of a table to exist as a value of another column in a different (or the same) table.

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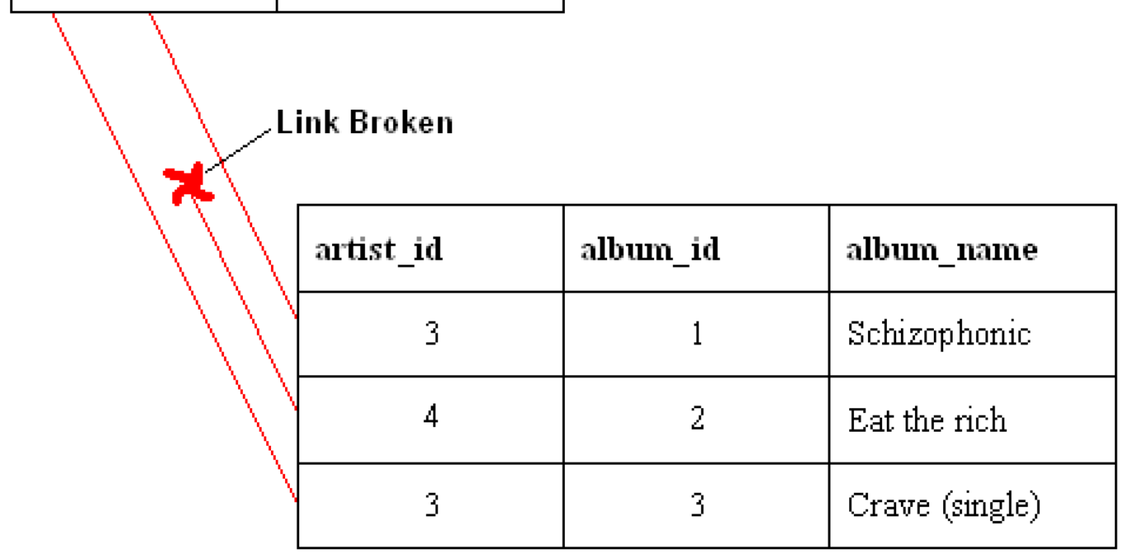
artist_id	artist_name
1	Bono
2	Cher
3	Nuno Bettencourt



artist_id	album_id	album_name
3	1	Schizophonic
4	2	Eat the rich
3	3	Crave (single)

4. Referential integrity: how should we enforce it?

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참조 무결성이 지켜지지 않을 이유

1. Hard deletions.

참조 무결성이 지켜지지 않을 이유

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- Cascade operations

  참조하는 행이 100만 개라면?

참조 무결성이 지켜지지 않을 이유

1. Hard deletions.

- Cascade operations

  참조하는 행이 100만 개라면?

- Null vs. invalid value

  로그, 장부... 존재하지 않는 pk 값도 의미 있다

참조 무결성이 지켜지지 않을 이유

2. Cross-database relations. Partitioning.

참조 무결성이 지켜지지 않을 이유

2. Cross-database relations. Partitioning.

- Cross-database relations

  DB가 물리적으로 분리되면 정책 일관성이 깨진다

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- Cross-database relations

  DB가 물리적으로 분리되면 정책 일관성이 깨진다

- Partitioning

  테이블이 샤딩 내지 파티셔닝되는 경우의 어려움

How are join types determined?

#JOIN #INNER #OUTER

5. How are join types determined?

`select_related()`을 하니 인스턴스가 사라진다?

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```
>>> Post.objects.count()
100
```

select_related()을 하니 인스턴스가 사라진다?

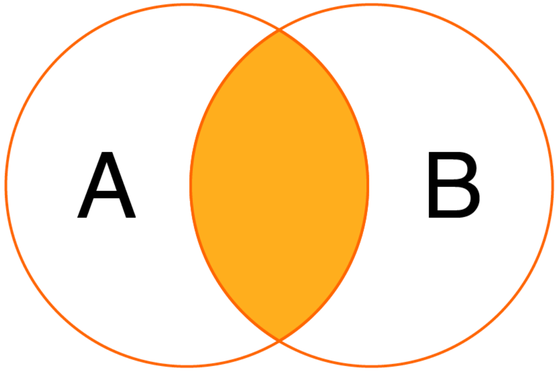
```
>>> Post.objects.count()
100

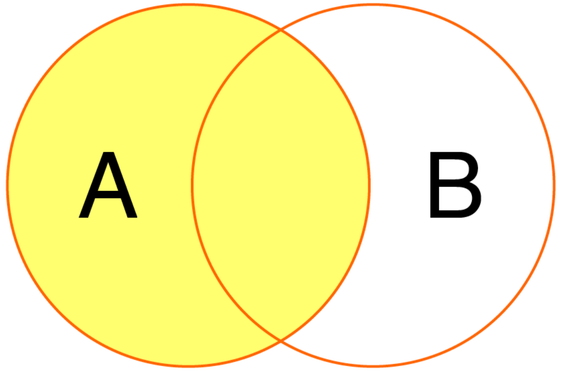
>>> Post.objects.select_related('user').count()
92
```

5. How are join types determined?

```
# django/db/models/sql/constants.py

INNER = 'INNER JOIN'
LOUTER = 'LEFT OUTER JOIN'
```





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INNER  LOUTER

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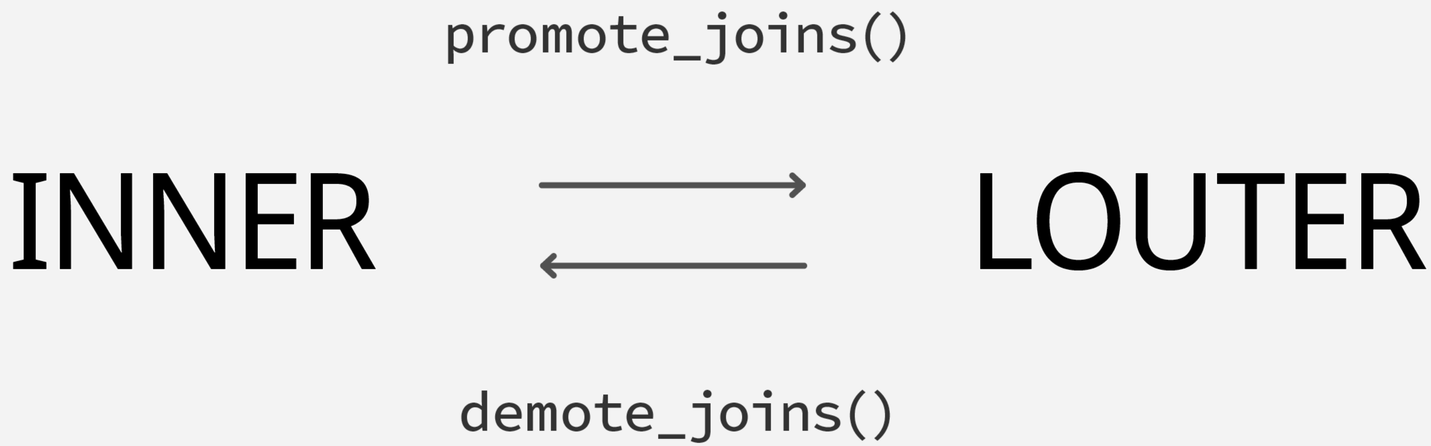

5. How are join types determined?

```
# django/db/models/sql/query.py

class Query:

    def promote_joins(self, aliases):
        aliases = list(aliases)
        while aliases:
            alias = aliases.pop(0)
            if self.alias_map[alias].join_type is None:
                continue
            parent_alias = self.alias_map[alias].parent_alias
            parent_louter = parent_alias and self.alias_map[parent_alias].join_type == LOUTER
            already_louter = self.alias_map[alias].join_type == LOUTER
            if ((
                self.alias_map[alias].nullable or
                parent_louter
            ) and not already_louter):
                self.alias_map[alias] = self.alias_map[alias].promote()
                aliases.extend(
                    join for join in self.alias_map
                    if self.alias_map[join].parent_alias == alias and join not in aliases
                )
```

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Can we handle cross-database relations?

#다중DB #참조

6. Can we handle cross-database relations?

Django doesn't currently provide any support for foreign key or many-to-many relationships spanning multiple databases. If you have used a router to partition models to different databases, any foreign key and many-to-many relationships defined by those models must be internal to a single database.

6. Can we handle cross-database relations?

1️⃣ 데이터베이스 라우팅 문제

2️⃣ 조인 실패 문제

6. Can we handle cross-database relations?

1️⃣ **데이터베이스 라우팅 문제**

2️⃣ 조인 실패 문제

6. Can we handle cross-database relations?

```python
# routers.py

class ExampleAuthRouter:

    def db_for_read(self, model, **hints):
        if model._meta.app_label == 'auth':
            return 'default'

    def db_for_write(self, model, **hints):
        if model._meta.app_label == 'auth':
            return 'default'


# settings.py

DATABASE_ROUTERS = [
    'routers.ExampleAuthRouter',
    ...
]
```

6. Can we handle cross-database relations?

The hints received by the database router can be used to decide which database should receive a given request.
[...] Django tries each router in turn until a database suggestion can be found. If no suggestion can be found, it tries the current `_state.db` of the hint instance.

Multiple databases | Django documentation

6. Can we handle cross-database relations?

```python
# django/db/utils.py

class ConnectionRouter:

    def db_for_read(self, model, **hints):
        chosen_db = None
        for router in self.routers:
            try:
                method = getattr(router, 'db_for_read')
            except AttributeError:
                pass
            else:
                chosen_db = method(model, **hints)
                if chosen_db:
                    return chosen_db
        instance = hints.get('instance')
        if instance is not None and instance._state.db:
            return instance._state.db
        return 'default'
```

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            else:
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                if chosen_db:
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        instance = hints.get('instance')
        if instance is not None and instance._state.db: 👈
            return instance._state.db
        return 'default'
```

6. Can we handle cross-database relations?

✅

`ConnectionRouter()`에서 **`instance`** 힌트를 사용하지 못하도록

- 모든 모델이 커스텀 라우터에서 라우팅되도록 하거나,
- related descriptor에서 라우터에 힌트를 넘겨주는 부분을 모두 제거한다.

6. Can we handle cross-database relations?

1️⃣ 데이터베이스 라우팅 문제

2️⃣ **조인 실패 문제**

6. Can we handle cross-database relations?

✅

1. **`Query.promote_joins()`** 로직을 패치한다. (슬라이드 84)

2. **`select_related()`** 대신 **`prefetch_related()`**를 사용한다.

감사합니다.

발표 자료 repo

bit.ly/devdjango-2018-ed

edcwkim

edcwkim@gmail.com