PERCONA
LIVEONLINE

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Voovio Technologies

Boosting MySQL Performance

October 21
1:00 AM
New York

October 21
1:00 PM
Singapore

October 21
6:00 PM
London

This is not a DB optimization talk

It’s a talk about how doing things in a specific way leads to getting way better results by default

"We should forget about small efficiencies, say about 97% of the time: **premature optimization is the root of all evil**"

-- Donald Knuth

Preoptimization

Don’t denormalize

Maintenance prevails over performance

Use InnoDB

Preoptimization

Don’t denormalize

by default

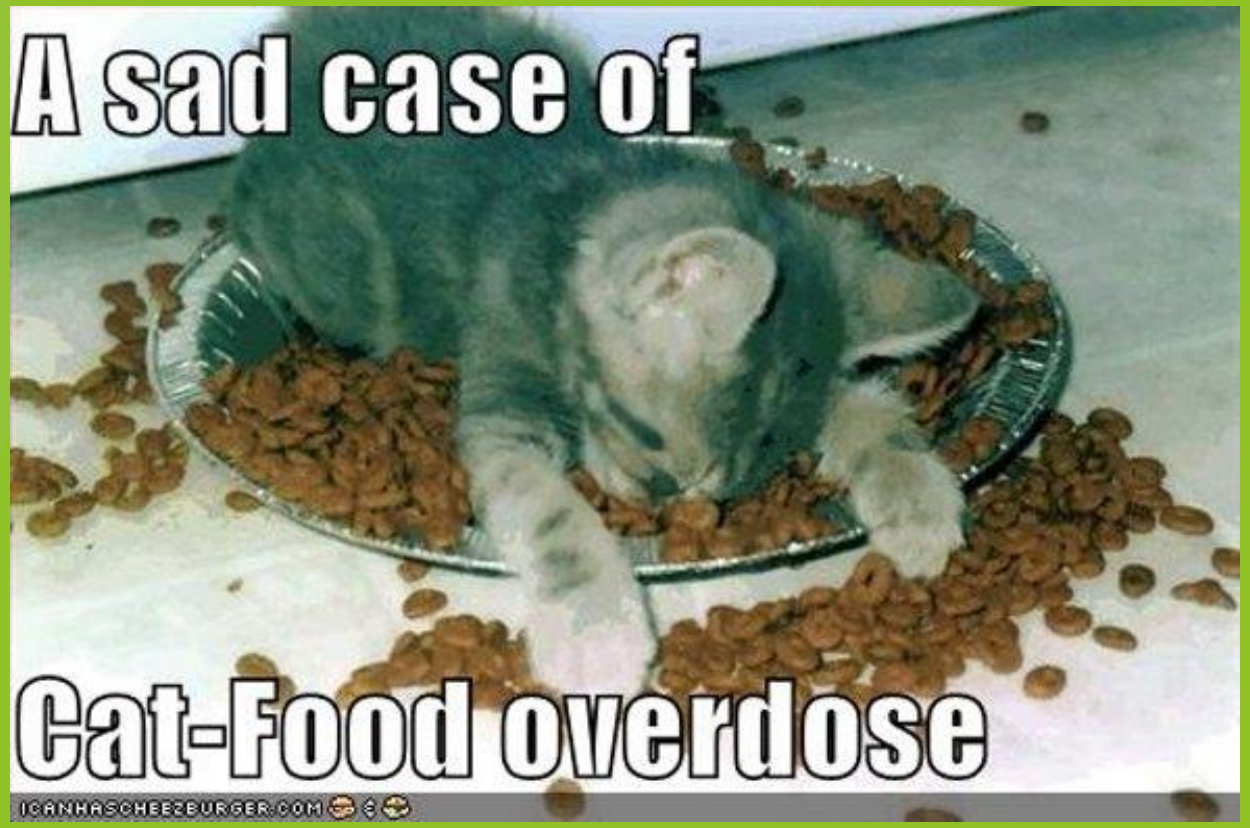
Maintenance prevails over performance

by default

Use InnoDB

by default

Preoptimization



Tuning MySQL Parameters

MySQL Parameter Tuning

Will get you out of SOME trouble

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But not a good default strategy, specially if the base is flawed

MySQL Parameter Tuning

Will get you out of SOME trouble

But not a good default solution, specially if the base is flawed

Please do tune MySQLs defaults

Not the theme for this talk

Start with your schema

Start with your Schema

- Your schema is probably the root cause of your “My DB doesn’t scale” problems
  - The solution is not “have a loose/no schema”
- How to fake a DB Design (Curtis Ovid Poe)
  - https://www.youtube.com/watch?v=y1tcbhWLiUM

Care for your datatypes

Data types: how (not) to bloat your DB

SELECTING DATA TYPES WITH A BIT OF CARE IS VERY PRODUCTIVE

IT MAKES MORE DATA FIT IN LESS SPACE

OPTIMIZES USE OF INNODB BUFFER POOL, MYISAM KEY BUFFER, JOIN BUFFER, SORT BUFFER, SMALLER INDEXES

- Integers

Type	Bytes	Unsigned	Signed
INT	4	4000M	-2000M to 2000M

INT(1) == INT(10) == 4 bytes

Same range!

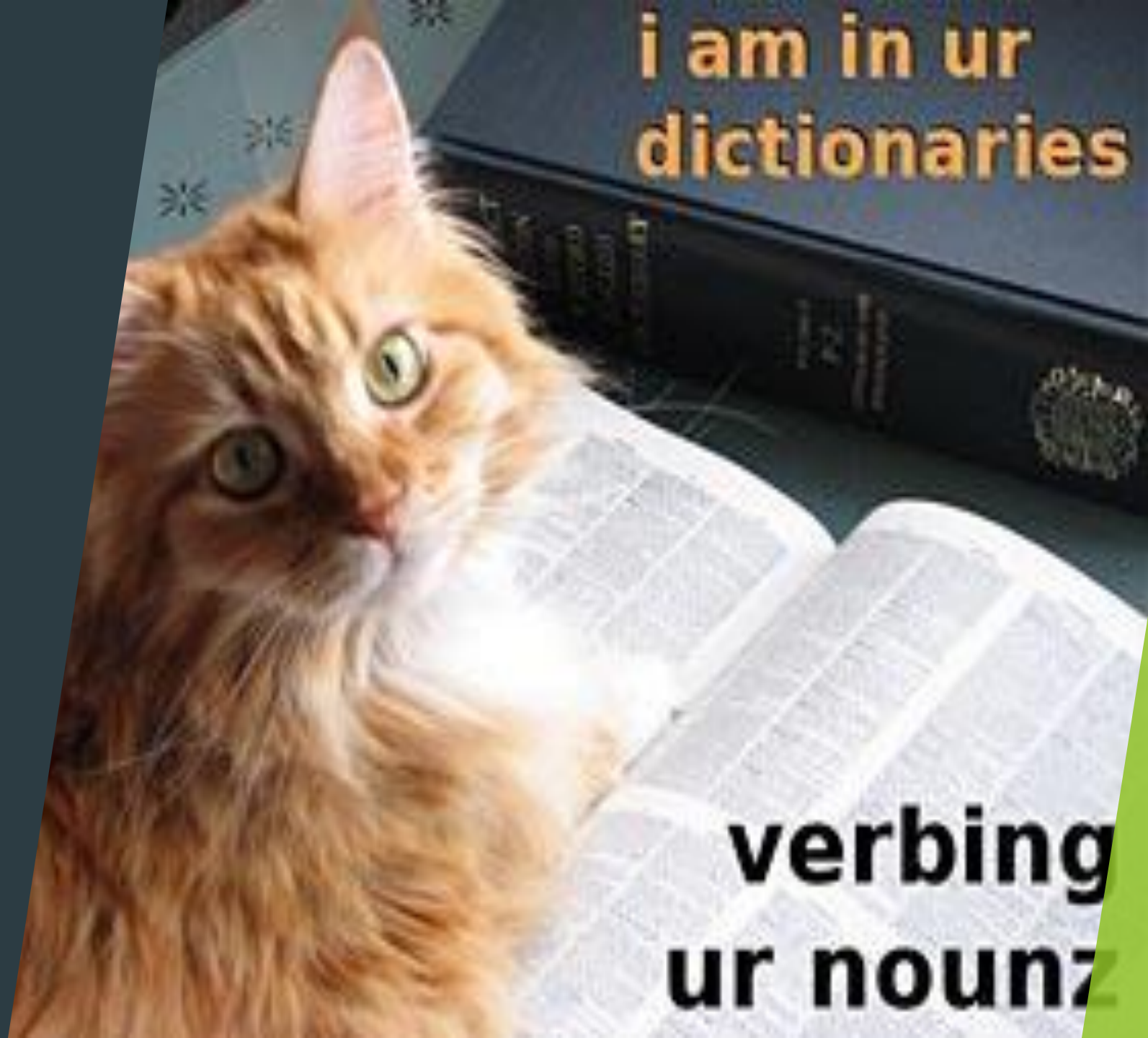
Type	Bytes	Unsigned	Signed
INT	4	4000M	-2000M to 2000M

The Integer family

Type	Bytes	Unsigned	Signed
TINYINT	1	255	-128 to 127
SMALLINT	2	65K	-32K to 32K
MEDIUMINT	3	16M	-8M to 8M
INT	4	4000M	-2000M to 2000M
BIGINT	8	$1.8x10^{19}$	$-9x10^{18}$ to $9x10^{18}$

https://dev.mysql.com/doc/refman/8.0/en/integer-types.html

Strings



Strings are sequences of bytes with a charset and a collation

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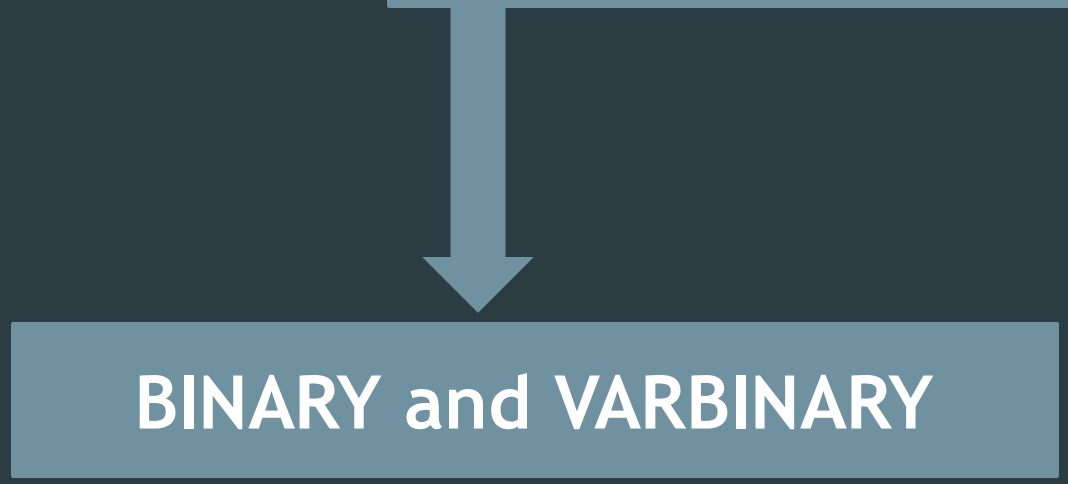

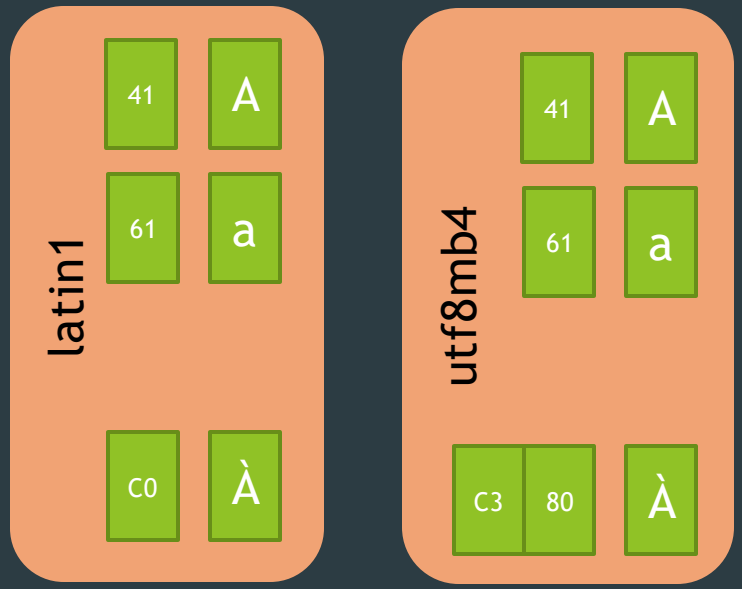

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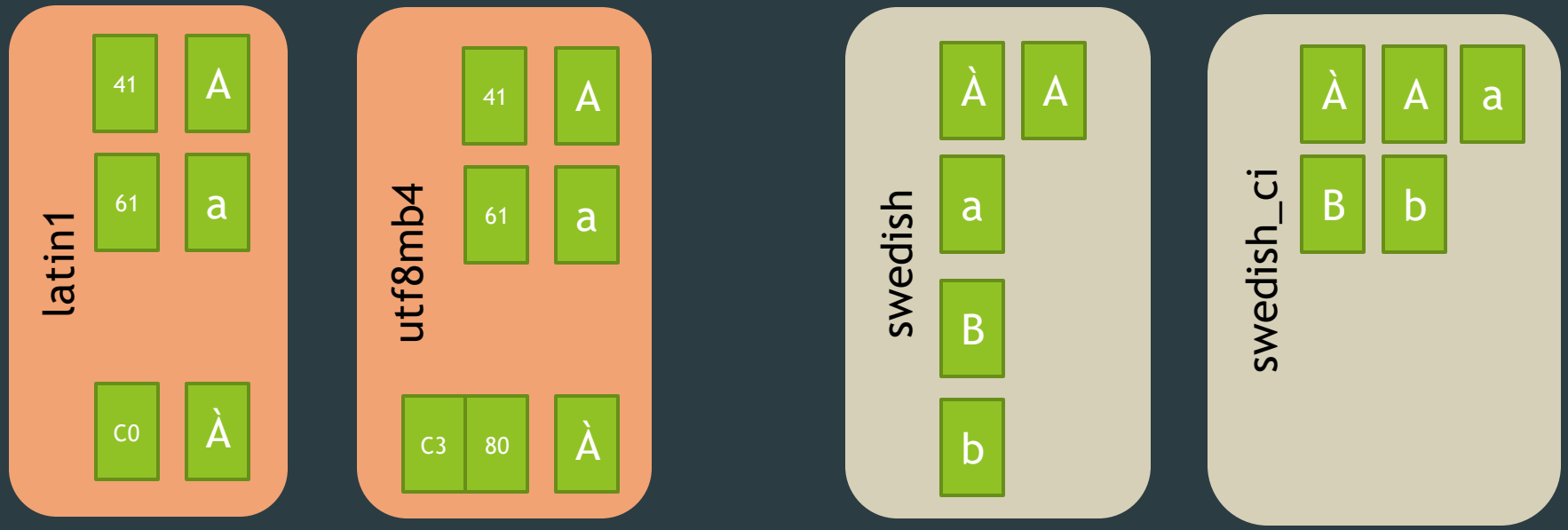

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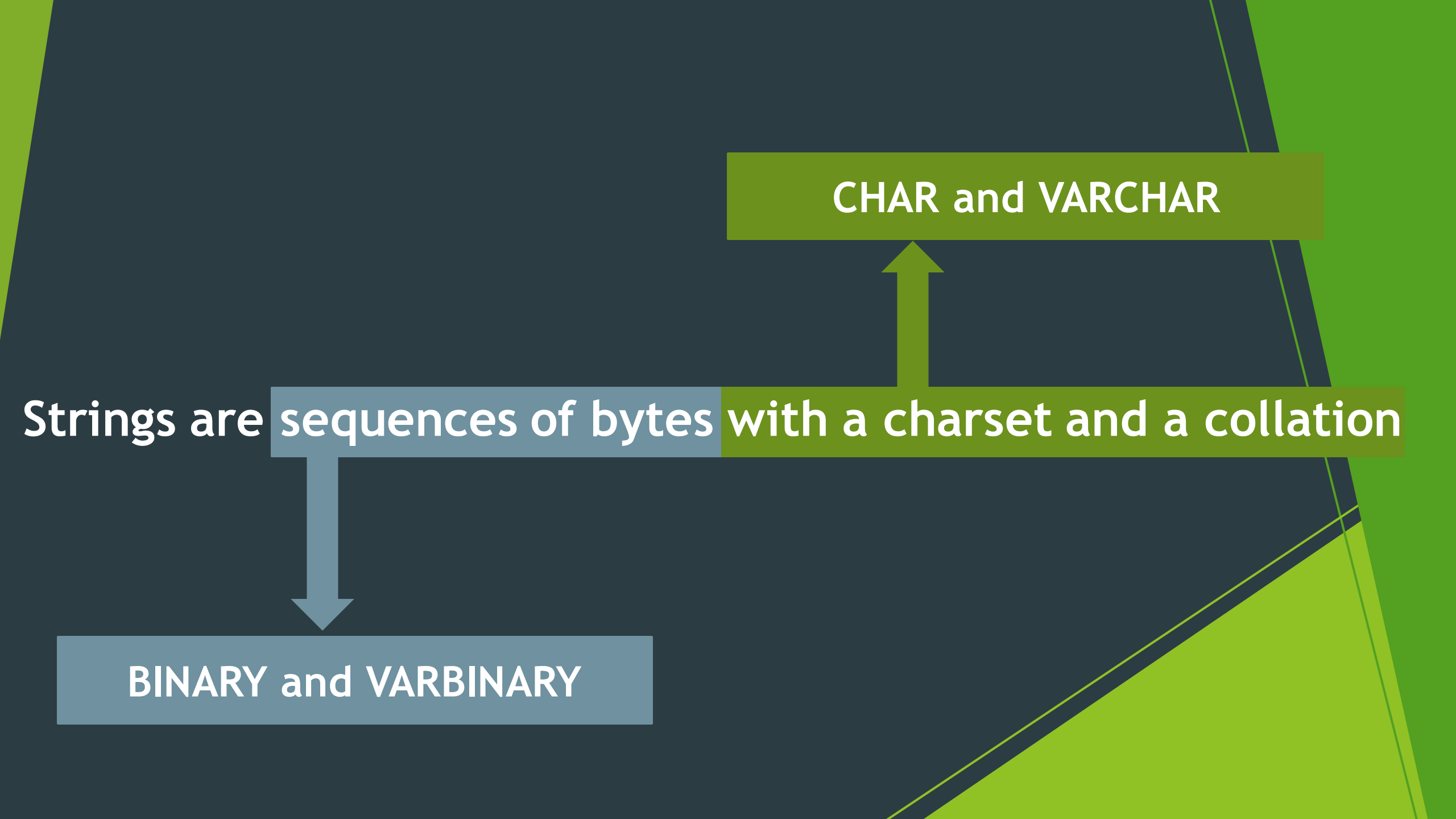
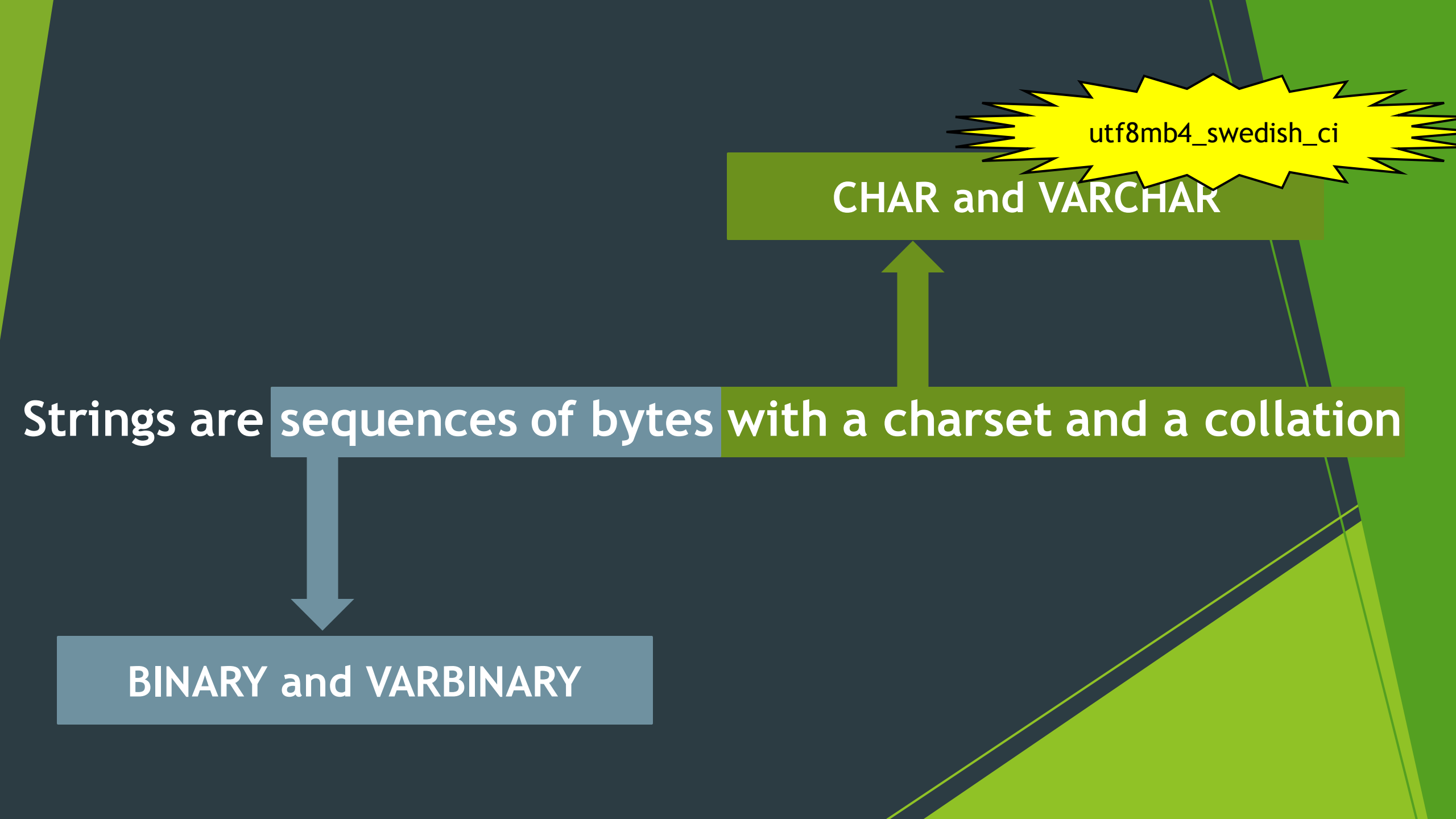

CHAR and VARCHAR
Strings are sequences of bytes with a charset and a collation
BINARY and VARBINARY


utf8mb4_swedish_ci
CHAR and VARCHAR
Strings are sequences of bytes with a charset and a collation
BINARY and VARBINARY

BINARY and CHAR: Fixed length

BINARY(10)

CHAR(10) LATIN1

???

BINARY and CHAR: Fixed length

BINARY(10)

CHAR(10) LATIN1

BINARY and CHAR: Fixed length

BINARY(10)

CHAR(10) LATIN1

CHAR(10) utf8

BINARY and CHAR: Fixed length

BINARY(10)

CHAR(10) LATIN1

CHAR(10) utf8 + InnoDB

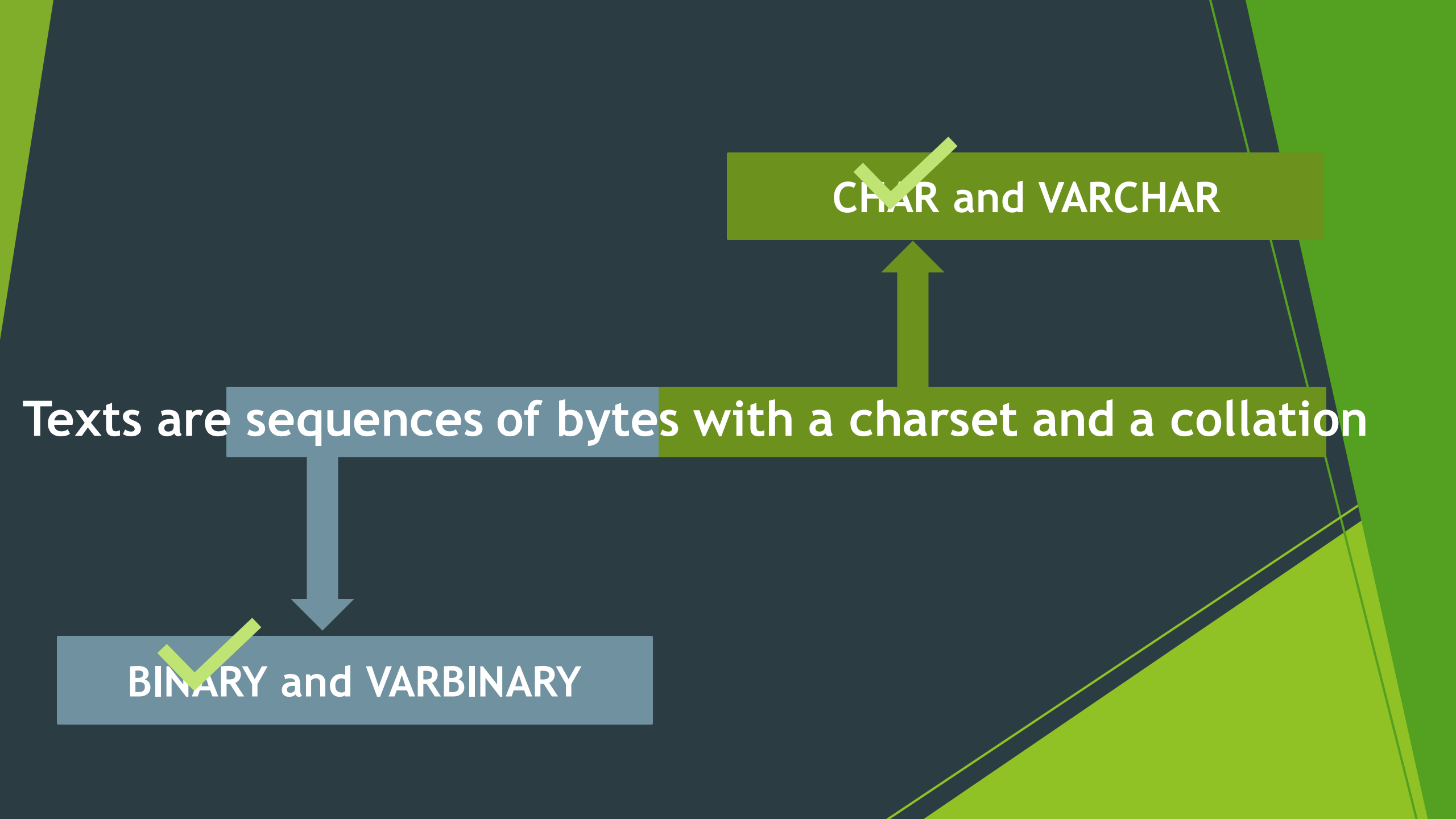
Use uft8mb4 by default

Don't use utf8 (alias for utf8mb3)

CHAR and VARCHAR

Texts are sequences of bytes with a charset and a collation

BINARY and VARBINARY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Texts are sequences of bytes with a charset and a collation
BINARY and VARBINARY

VARBINARY and VARCHAR

VARBINARY(10)

7	P	E	R	C	O	N	A

VARCHAR(10) LATIN1

6	O	N	L	I	N	E

VARCHAR(10) utf8mb4

20	2	0	2	0		☆	☆	☆	☆	☆

4	2	0	2	0

VARBINARY and VARCHAR

VARBINARY(10)

7	P	E	R	C	O	N	A

1 to 11 bytes

VARCHAR(10) L

6	O	N	L	I	N	E

VARCHAR(10) utf8mb4

20	2	0	2	0	☆	☆	☆	☆

1 to 41 bytes

4	2	0	2	0

VARBINARY(65535) and VARCHAR(65535)

VARCHAR(560) latin1

500	L	o	r	e	m							e	u	.
4	2	0	2	0										

MySQL Max row size: 65K

I’ll just go for VARCHAR(255) on all text columns

I’ll just go for VARCHAR(255) on all text columns

“After all… I’ll just consume the number of bytes + 1

All your VARCHAR(255) are now CHAR(255) in memory temp tables

That’s 255 bytes binary/latin-1. Or 1K utf8mb4 O_o

Big texts

The Blob family

Text	Blob	Bytes Max
TEXT	BLOB	65K

https://dev.mysql.com/doc/refman/8.0/en/blob.html

The Blob family

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TINYTEXT	TINYBLOB	255
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MEDIUMTEXT	MEDIUMBLOB	16M
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Don´t use

FS / Object Store

https://dev.mysql.com/doc/refman/8.0/en/blob.html

IF a SELECT references a BLOB/TEXT column

Temporary tables go DIRECTLY to DISK


MemeCenter.com

Small sets

ENUM

One value out of a set of possibilities (‘big’, ‘small’)

1 or 2 bytes

Looks like a string to the client

SET

Choose a set of non-exclusive
possible values (‘pool’,’terrace’,’fence’,’guard’)

SETS are NOT good for finding stuff

FIND_IN_SET is a function. No indexes

Model by default to a separate table + relation

Date and Time

The Date and Time Family

Text	Bytes
YEAR	1
DATE	3
TIME	3 + ...
DATETIME	8 + ...
TIMESTAMP	4 + ...

Careful with ranges. Consult the manual frequently
https://dev.mysql.com/doc/refman/8.0/en/date-and-time-types.html

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Text	Bytes
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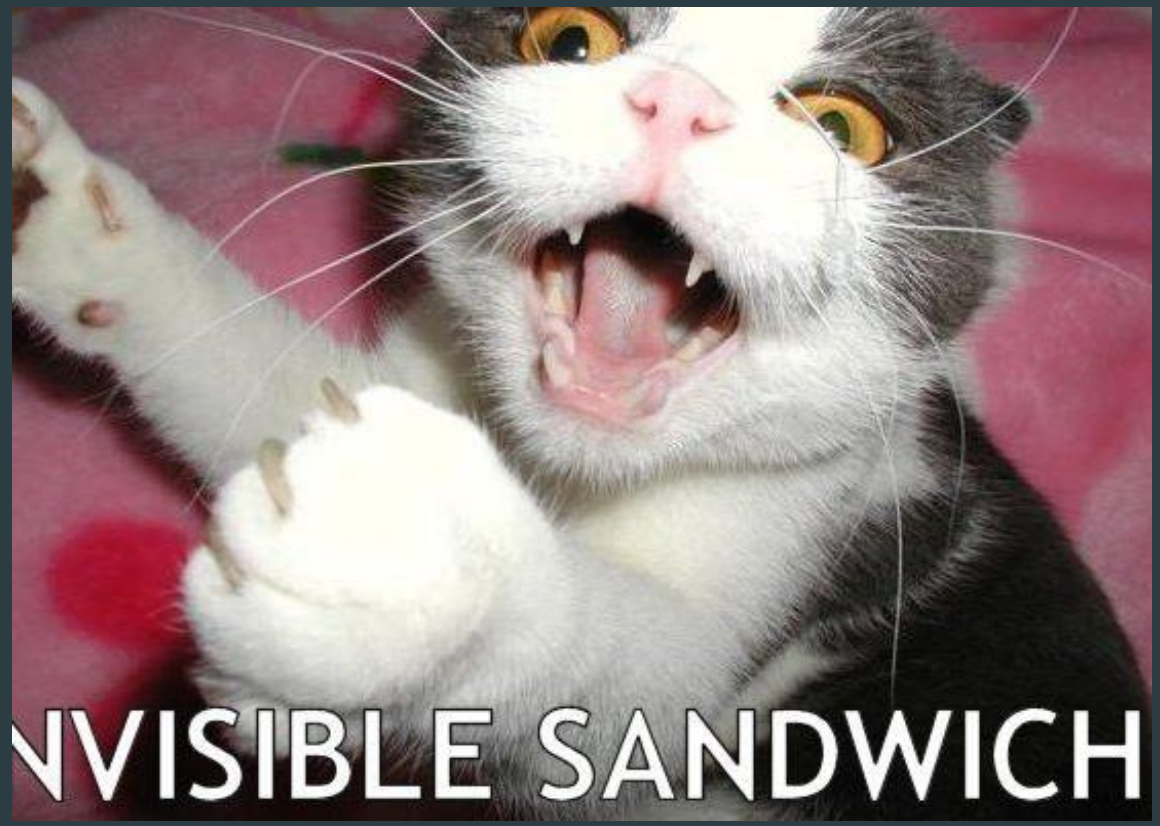
NULL vs NOT NULL



Gives the DB hints

Set NULL where ever it makes sense

Masked Data


By day, she was Hello Kitty
By night, she dropped the "o"
ICANHASCHEEZBURGER.COM

Choose type for

An IP Address

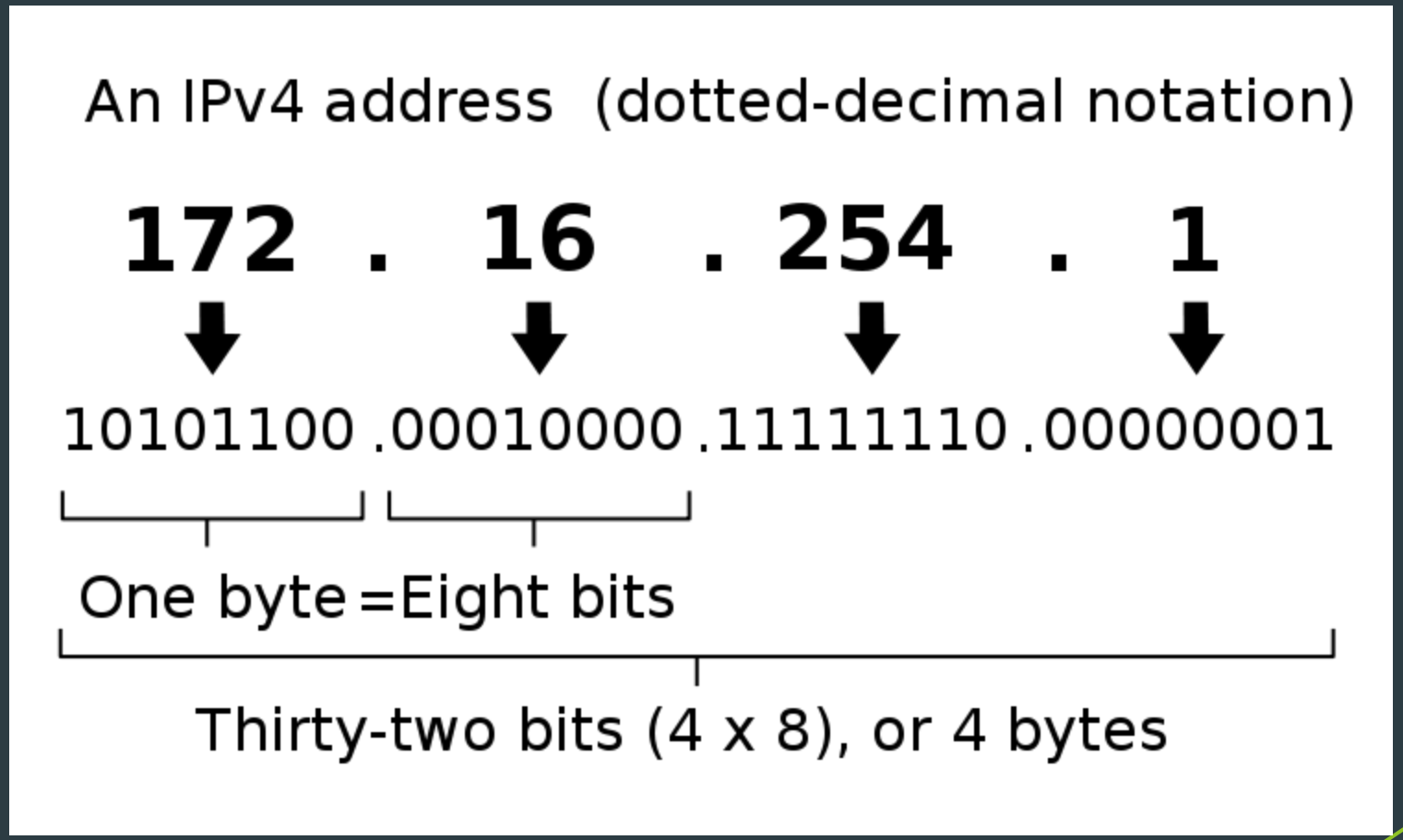
234.34.123.92

Choose type for

An IP Address

234.34.123.92

CHAR(15)? VARCHAR(15)?


An IPv4 address (dotted-decimal notation)
172 . 16 . 254 . 1
10101100 .00010000 .11111110 .00000001
One byte =Eight bits
Thirty-two bits (4 x 8), or 4 bytes

INT

```
INSERT INTO table (col) VALUES (INET_ATON('10.10.10.10'));

SELECT INET_NTOA(col) FROM table;
```

Choose type for

MD5("The quick brown fox jumps over the lazy cat")

"71bd588d5ad9b6abe87b831b45f8fa95"

Choose type for

MD5("The quick brown fox jumps over the lazy cat")

"71bd588d5ad9b6abe87b831b45f8fa95"

CHAR(32)?

MD5

From Wikipedia, the free encyclopedia

The **MD5 message-digest algorithm** is a widely used cryptographic hash function producing a 128-bit (16-byte) hash value, typically expressed in text format as a 32 digit hexadecimal number. MD5 has been utilized in a wide variety of cryptographic applications, and is also commonly used to verify data integrity.

BINARY(16)

Others

UUIDs

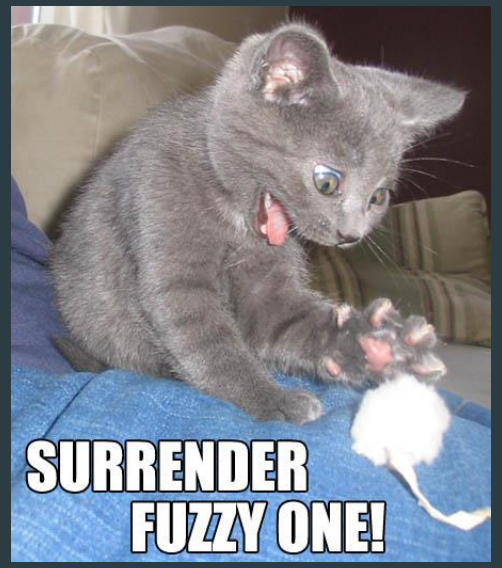
HASH functions

Network masks

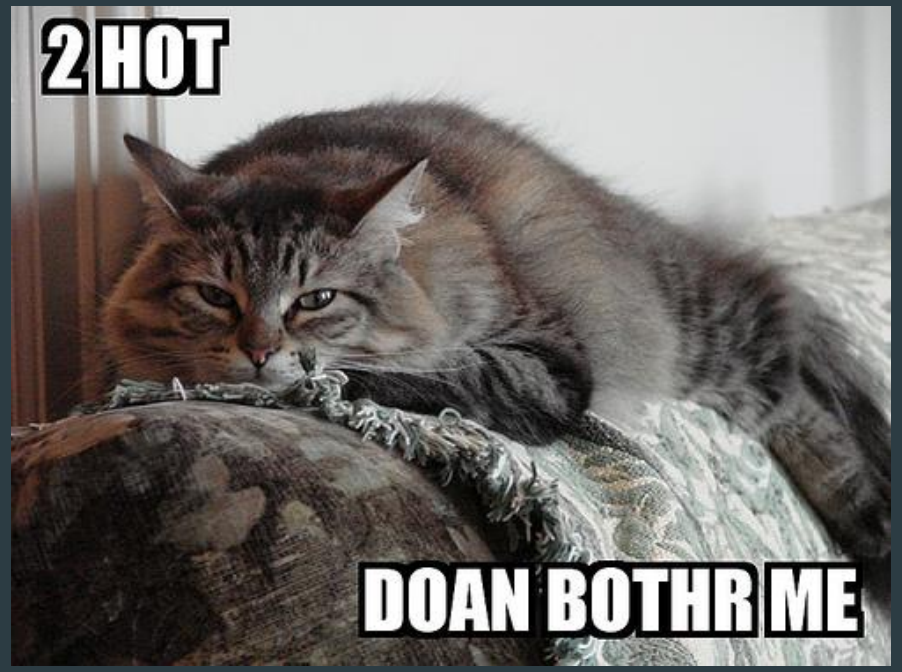
Your new best friend

- https://dev.mysql.com/doc/refman/5.7/en/storage-requirements.html
- https://dev.mysql.com/doc/refman/8.0/en/storage-requirements.html

Smaller is better



VS



Indexes

Datatype for keys

Default to an Integer for your PK

AUTONUMERIC UNSIGNED INT by default. Think if it can be smaller.
  TINY, SMALL, MEDIUM. Always UNSIGNED!

UNIQUE INDEX your "natural keys"
  This is called a surrogate key

InnoDB stores whole PK on every index.
The DB bloats with “big keys”

Do you really need an UNSIGNED BIGINT?

The magnitude comparison trick

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Epochs in Unix have 4 bytes (like an UNSIGNED INT)

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Will run out in 2038

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The magnitude comparison trick

Epochs in Unix have 4 bytes (like an UNSIGNED INT)

The epoch has been counting every second since 1970

Will run out in 2038

An INT can identify ONE THING HAPPENING EVERY SECOND for 68 YEARS!

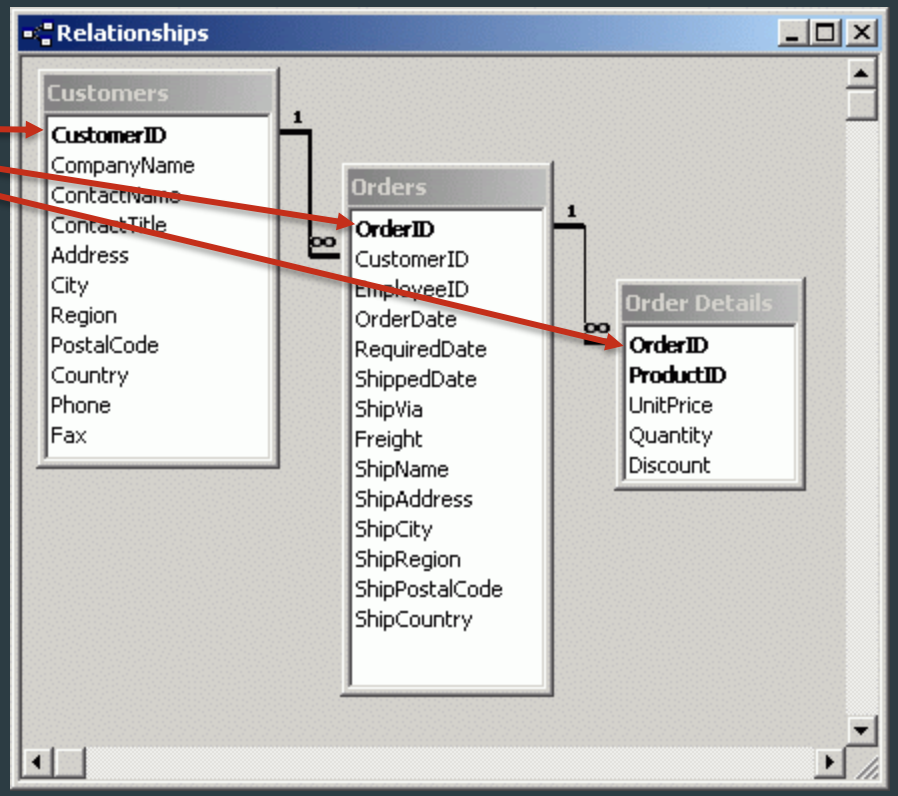
Do you STILL need a BIGINT?


FIND THE CAT
kappit.com


FIND THE CAT
kappit.com

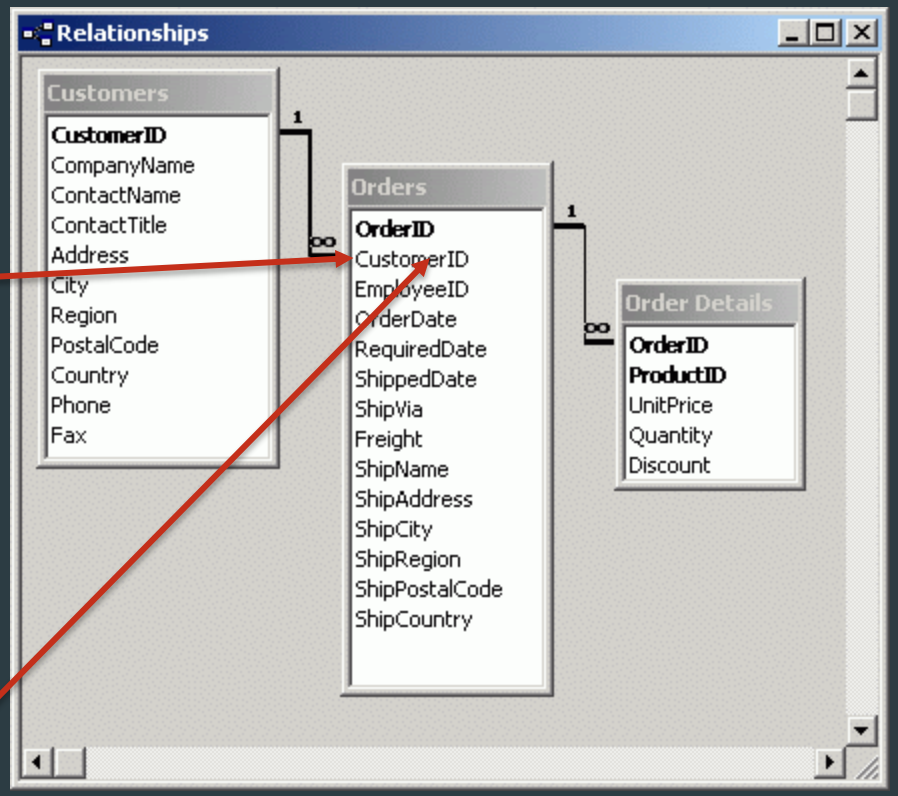
Index the two sides of relations

PK



Index the two sides of relations

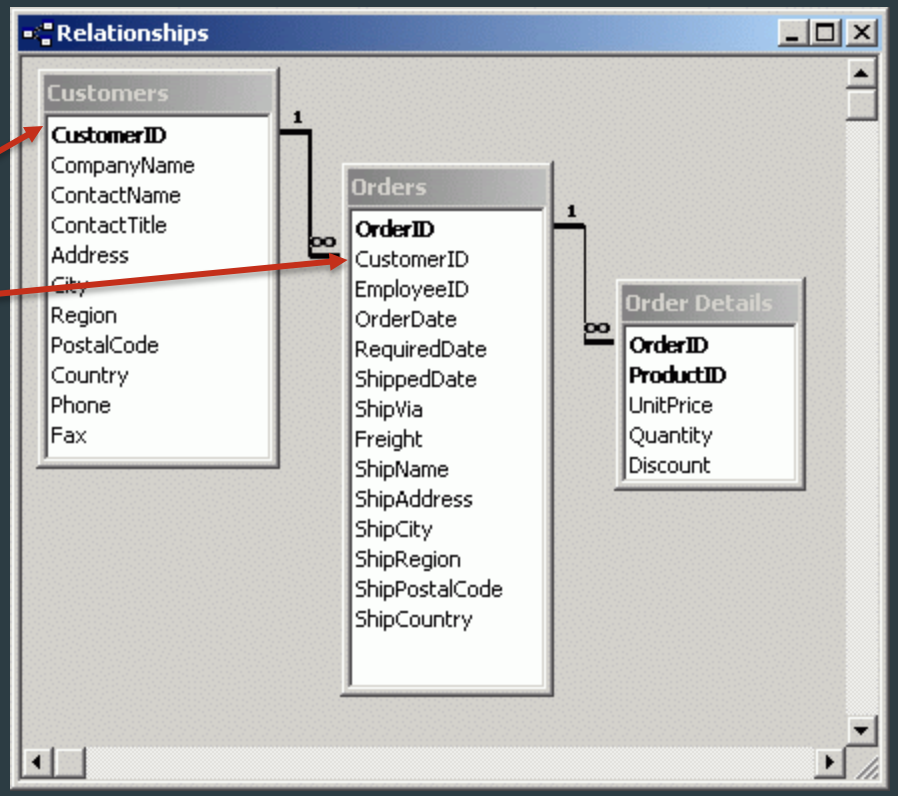
Non-Unique index



Use REFERENCES Customers.CustomerID

Index the two sides of relations

Same Data Type



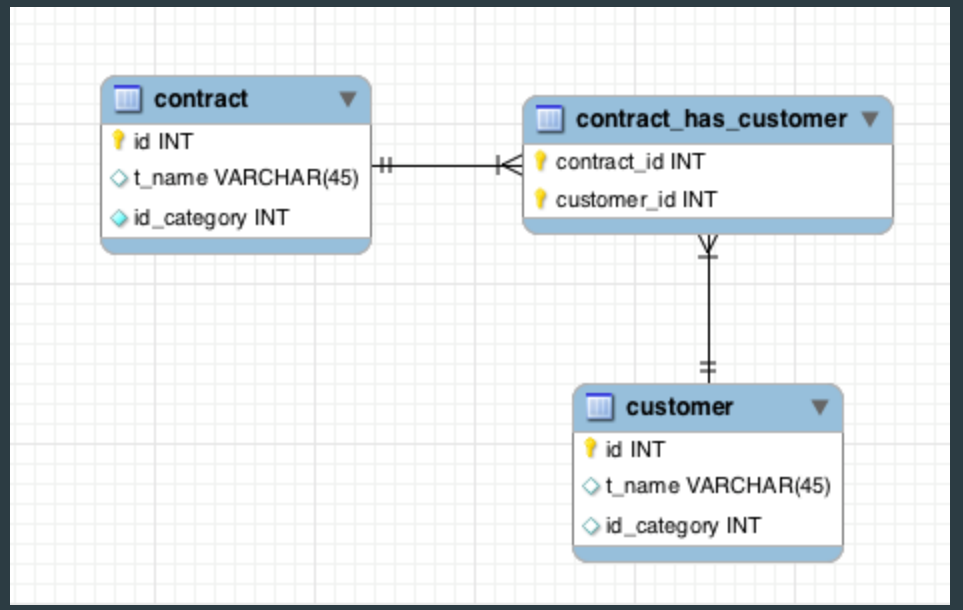

FIND THE CAT
kappit.com

N-M relation: Junction tables

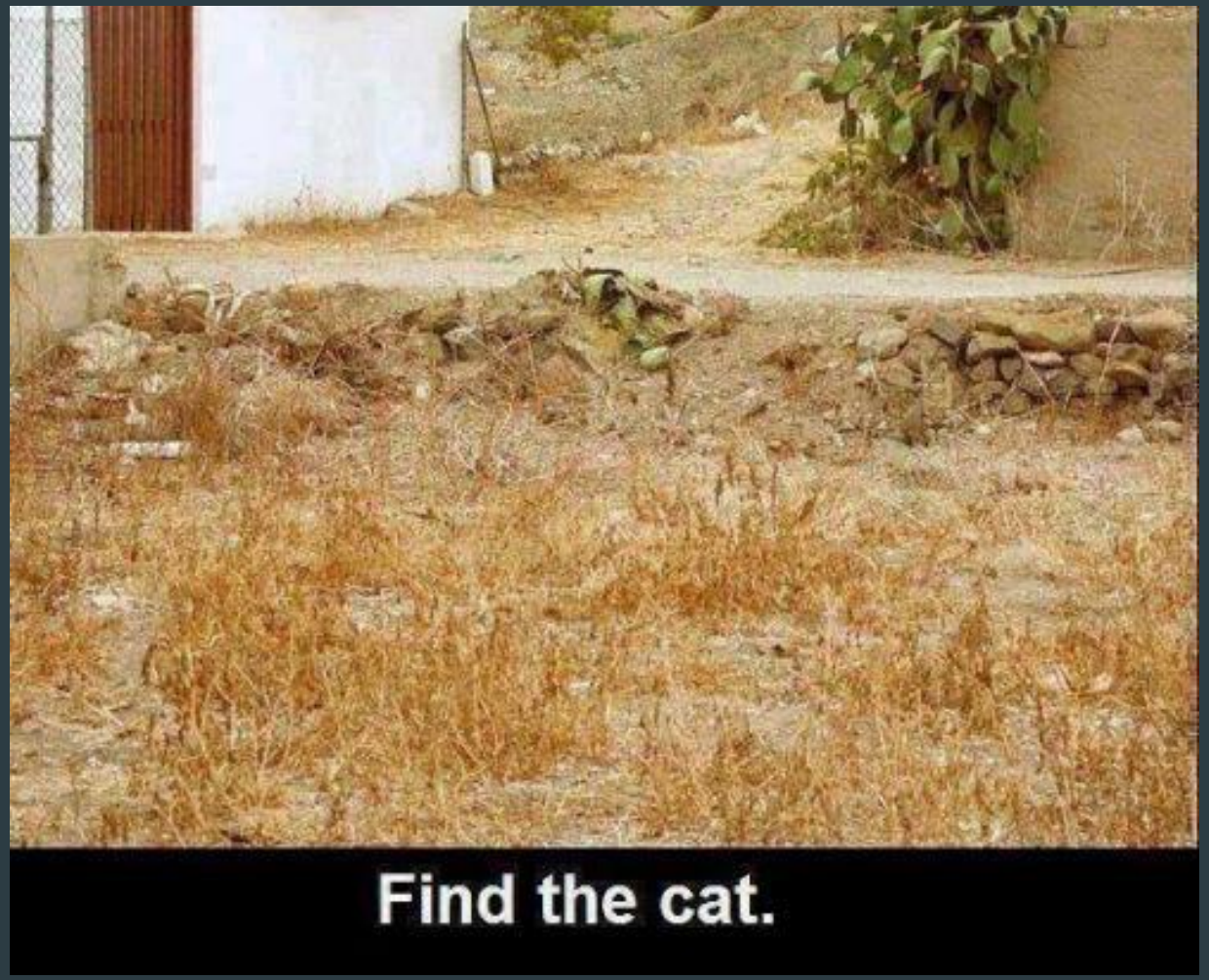
PK is (contract_id, customer_id)

(Implied uniqueness)

Index “both ways”:
(customer_id, contract_id)



InnoDB optimization: Don’t index the full (customer_id, contract_id). The index ALREADY HAS customer_id in it’s leafs. So just index (customer_id)


Find the cat.


Find the cat.

Don’t operate on fields

- Because they can’t use indexes

- WHERE column = ‘x’
  WHERE column > 2000
  WHERE column LIKE ‘prefix%’

- WHERE column + 2000 > 2013
  WHERE FIND_IN_SET(column)
  WHERE CONCAT(f1,f2) = “xxxx.com”
  WHERE YEAR(date) = 2015
  WHERE column LIKE ‘%.com’

Polish your maths: Algebra

- Doesn’t use index

WHERE column + 2000 > 2013

WHERE FIND_IN_SET(‘pool’,column)

WHERE CONCAT(f1,’.’,f2) = “xxxx.com”

WHERE YEAR(date) = 2015

WHERE column LIKE ‘%.com’

- Uses index

WHERE column > 13

?

WHERE f1 = ‘xxxx’ AND f2 = ‘com’

WHERE date BETWEEN ’01-01-2015’ and ’31-12-2015’

?

The old switcheroo…

- Doesn’t use index

```
WHERE column + 2000 > 2013

WHERE FIND_IN_SET(‘pool’,column)

WHERE CONCAT(f1,’.’,f2) =
“xxxx.com”

WHERE YEAR(date) = 2015

WHERE column LIKE ‘%.com’
```

- Uses index

```
WHERE has_pool = 1

WHERE column_rev LIKE ‘moc.%’
```

The old switcheroo…

- Doesn’t use index

```
WHERE column + 2000 > 2013

WHERE FIND_IN_SET(‘pool’,column)

WHERE CONCAT(f1,’.’,f2) =
“xxxx.com”

WHERE YEAR(date) = 2015

WHERE column LIKE ‘%.com’
```

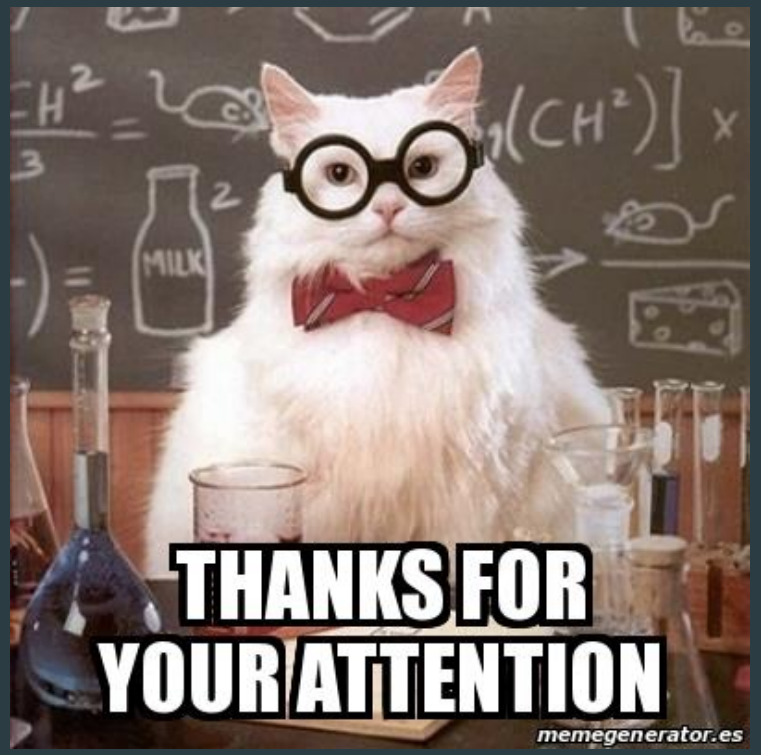
- Uses index

```
WHERE has_pool = 1

UPDATE t SET has_pool =
FIND_IN_SET(‘pool’,column);

WHERE column_rev LIKE ‘moc.%’

UPDATE t SET
column_rev=REVERSE(column)
```


CAT IS HERE

Wrap up

- Data Types
  - How to select them
  - Masked types
- Indexes
  - Surrogate keys
  - Indexing relations
  - Using indexes



pplu_io

https://www.linkedin.com/in/joseluismartineztorres/