Entity- Relationship Model

Group Q&A

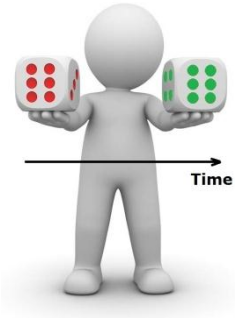
Introduction

Question2Answer

More than ER model

Problems

What should we do to the real world?



ERM fundamentals

Video time

ERM fundamentals

- Entity and entity set
- Relationship and relationship set
- Attribute and keys
- Mapping cardinality

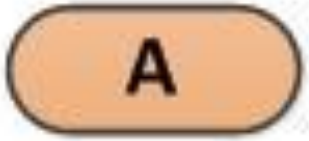
ERM fundamentals

Abstraction

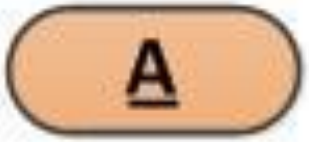
ERD Process: Symbols

Entity

Relationship



Attribute

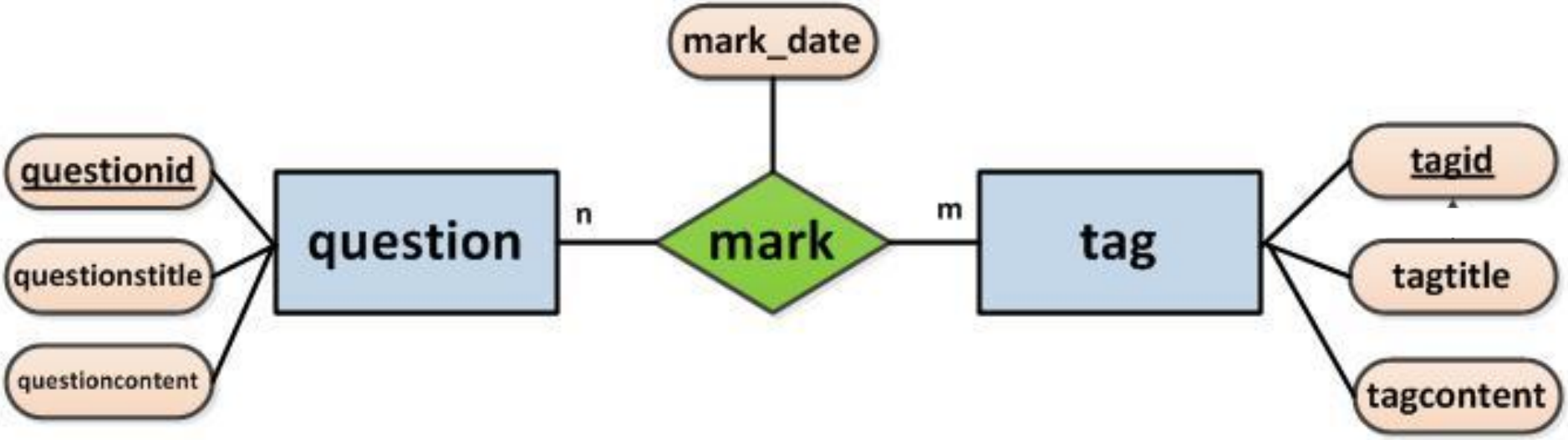


Primary key

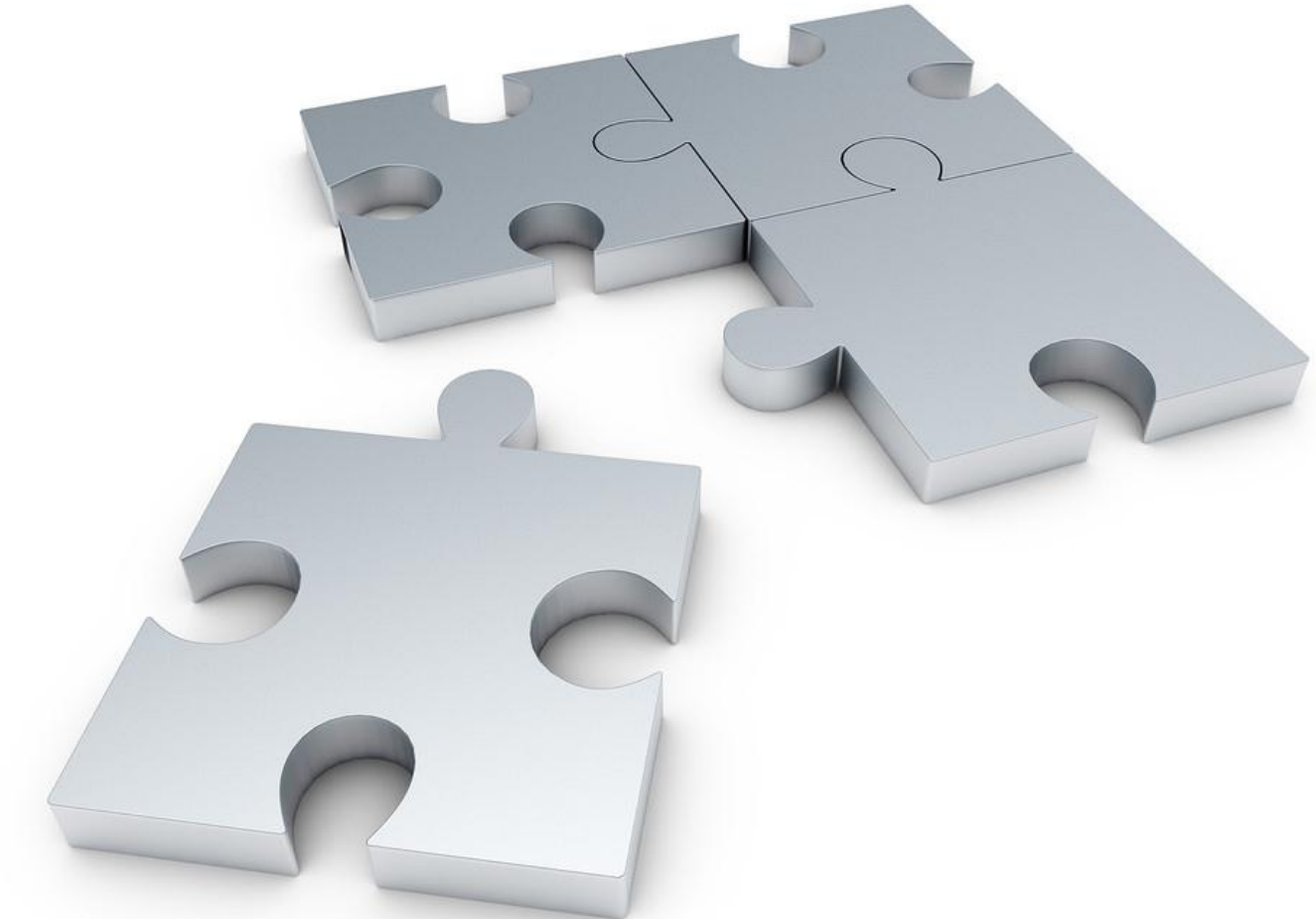
ERD Process: Reason

- **Why E-R diagram?**

  Display real world in similar way with human beings.

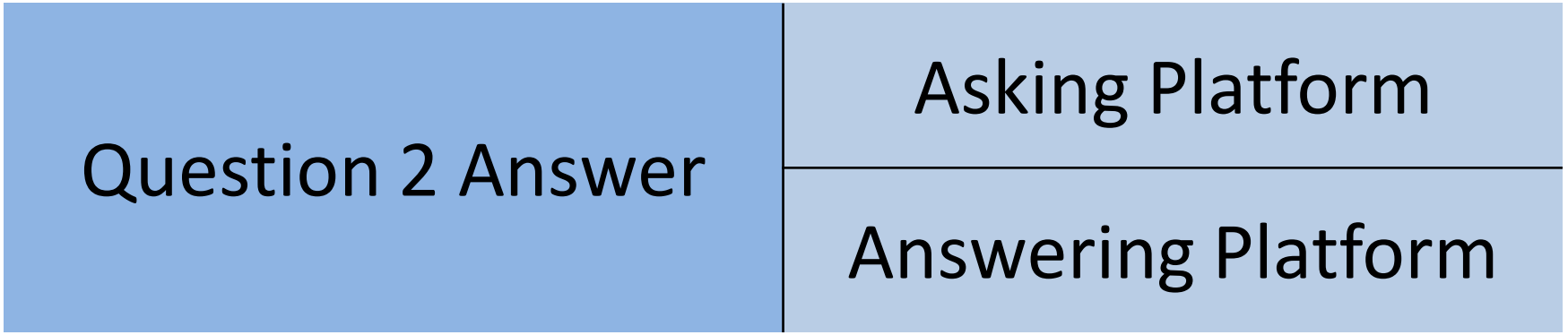


ERD Process: Design Instance



ERD Process: Design Instance

Determine range of local structure



ERD Process: Design Instance

Define Entity

Asking Platform	requester, question, tag
Answering Platform	responder, answer, question

ERD Process: Design Instance

Define Relationship

Asking Platform	requester to question	ask	1 : n
	tag to question	mark	n : m
	requester to tag	define	1 : n
Answering Platform	responder to answer	post	1 : n
	answer to question	belong	n : 1

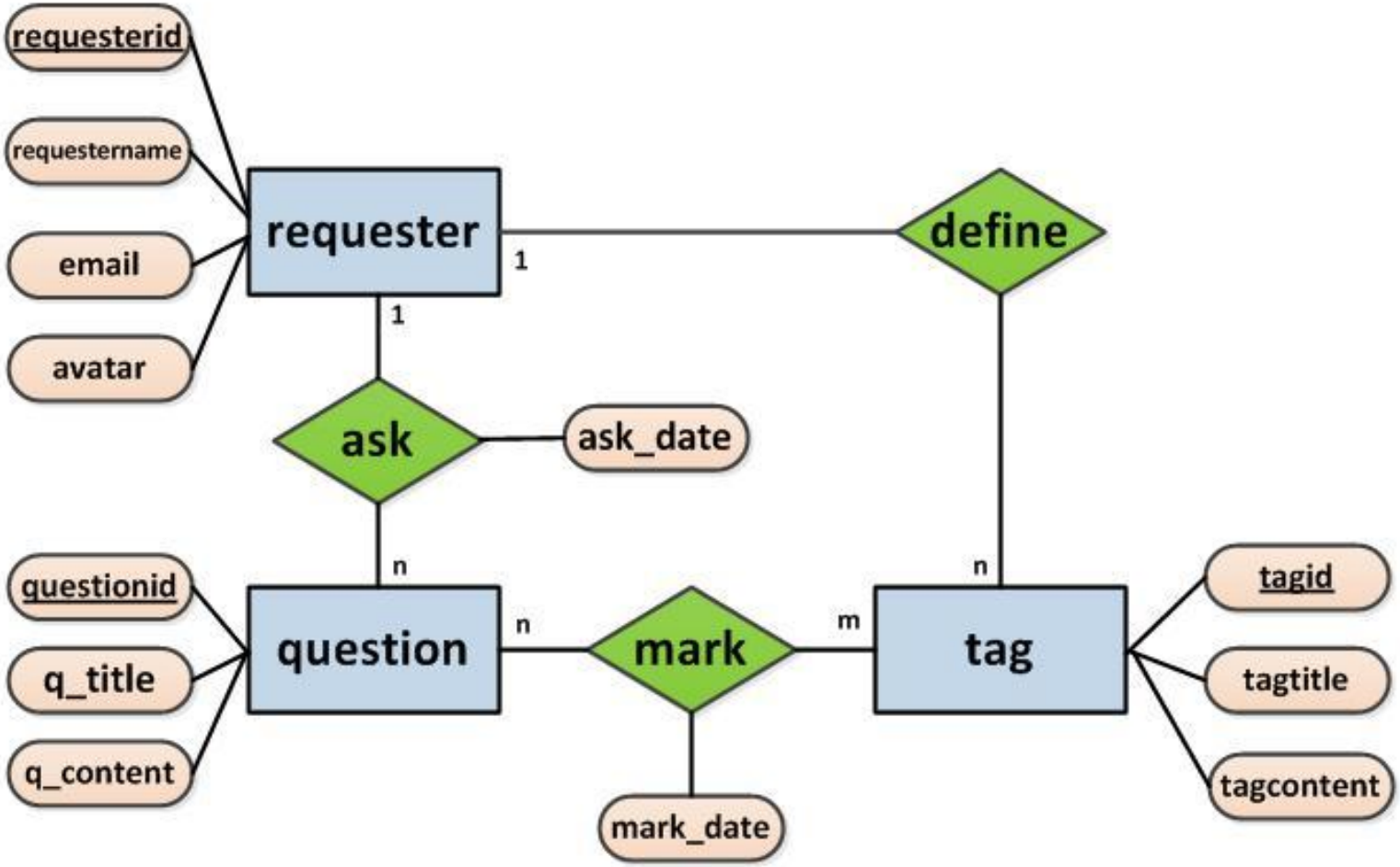
ERD Process: Design Instance

Allocate Attributes

Asking Platform	requester	requesterid, requestername, email, avatar
	question	questionid, q_title, q_content
	tag	tagid, tagtitle, tagcontent
	ask	ask_date
	mark	mark_date
Answering Platform	responder	responderid, respondername, email, avatar
	answer	answerid, a_title, a_content
	question	questionid, q_title, q_content
	post	post_date

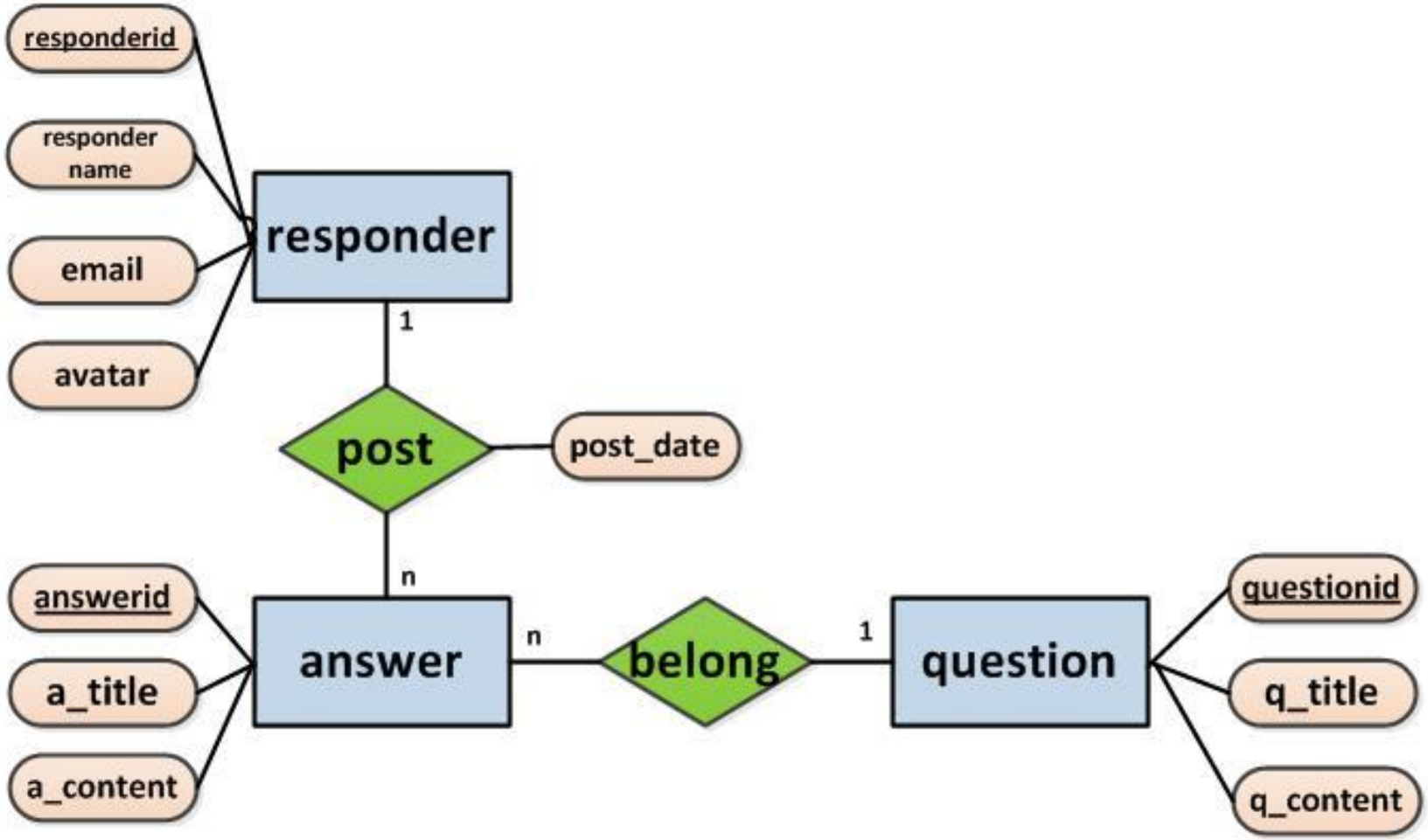
ERD Process: Design Instance

Local ERM Diagram – Asking Platform

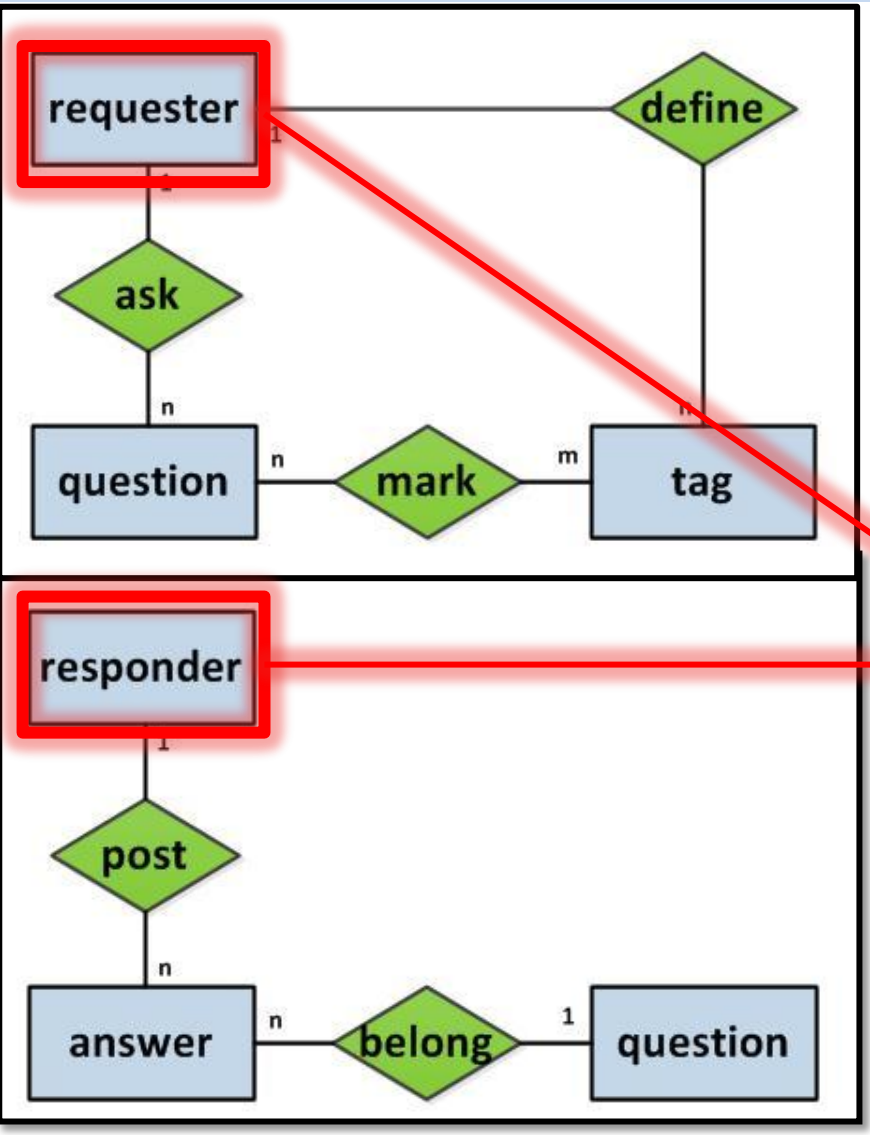


ERD Process: Design Instance

Local ERM Diagram – Answering Platform



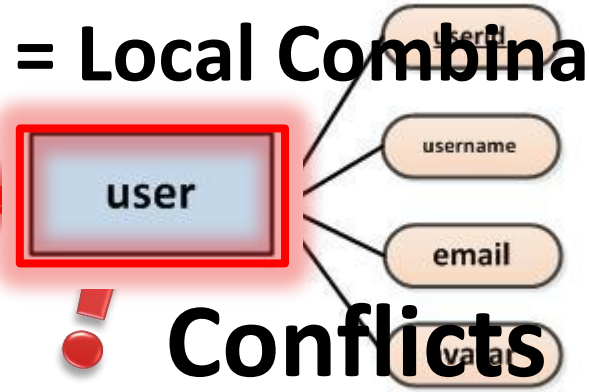
ERD Process: Design Instance



Global ERM Design

- name conflict
- attribute conflict

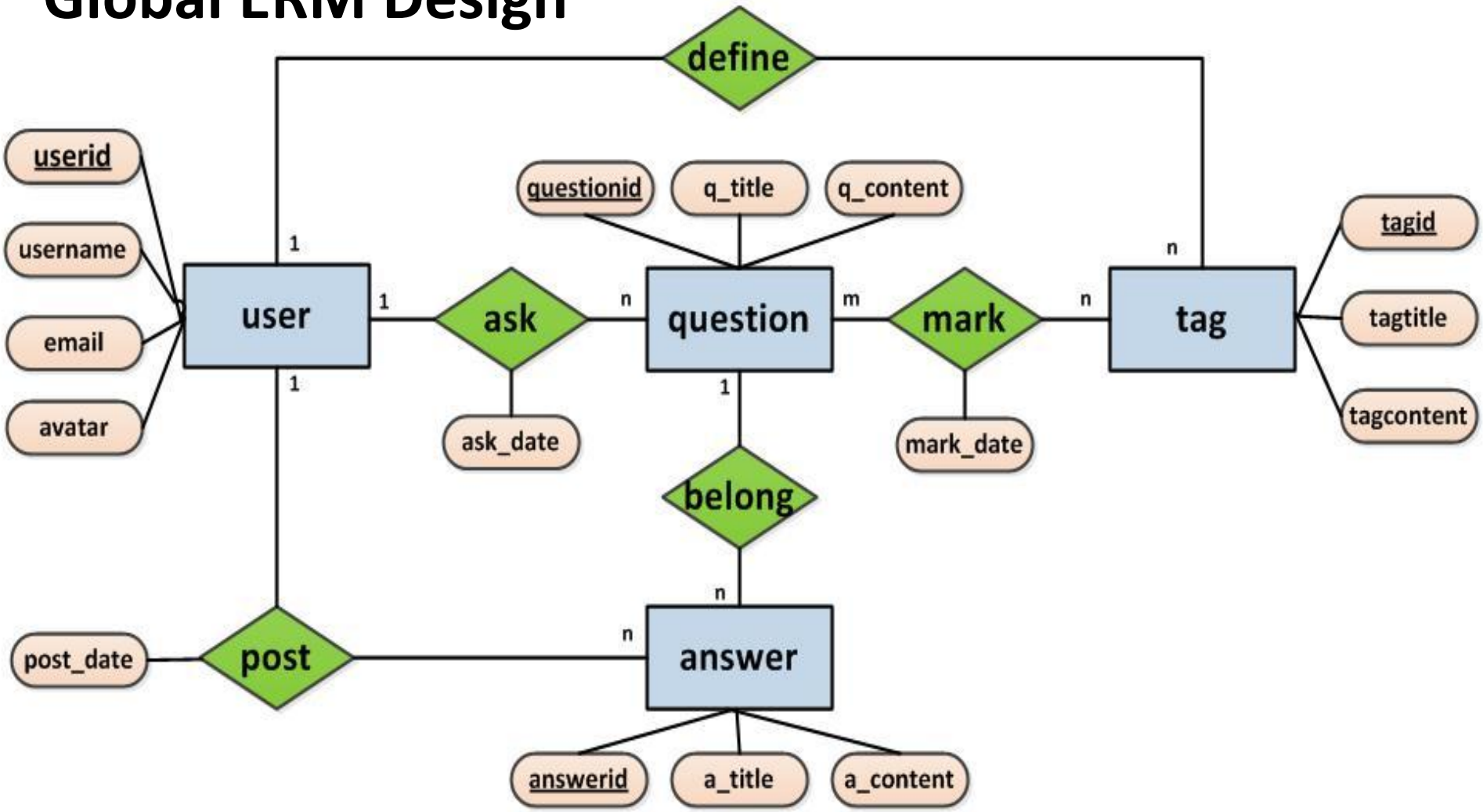
= Local Combination



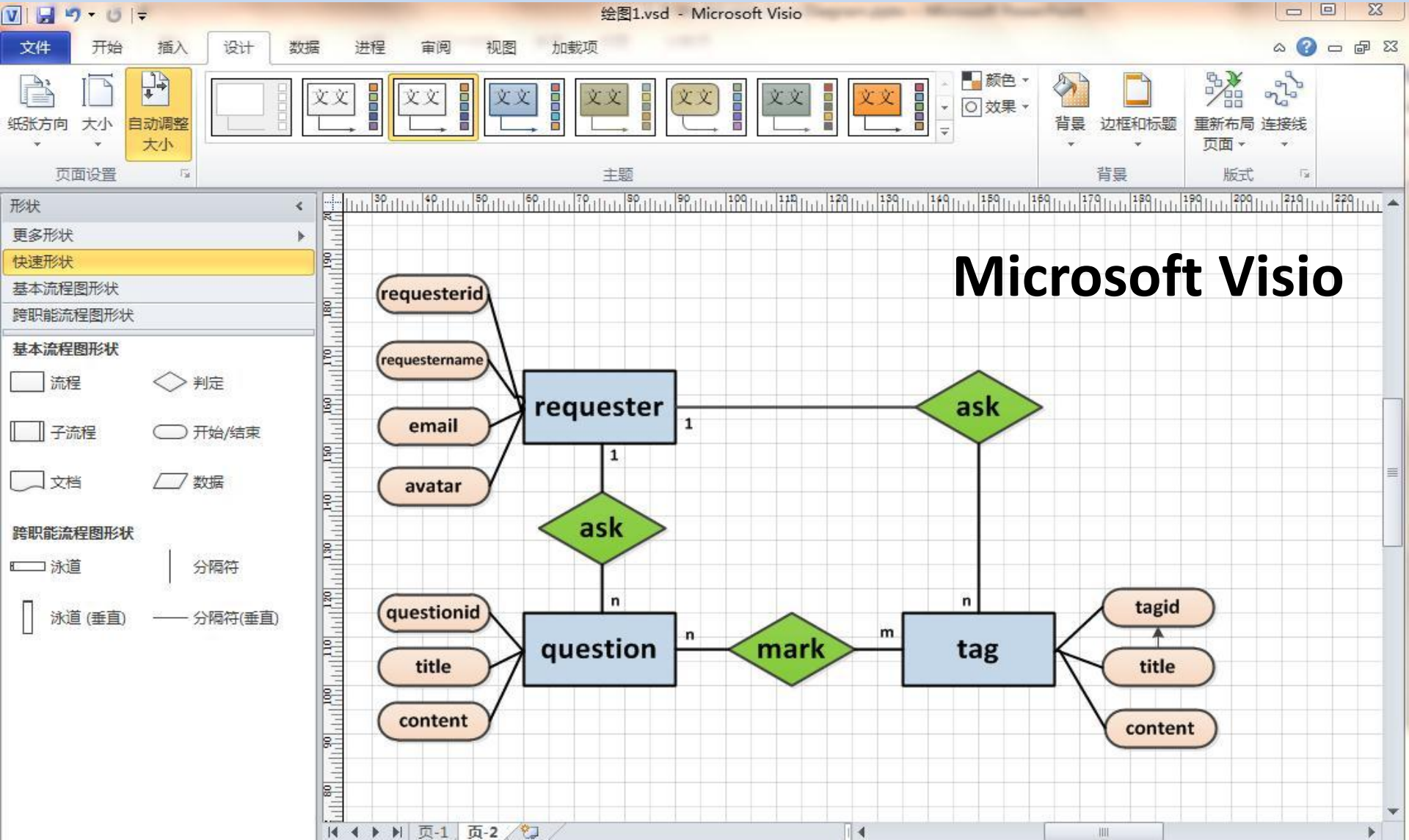
Conflicts

ERD Process: Design Instance

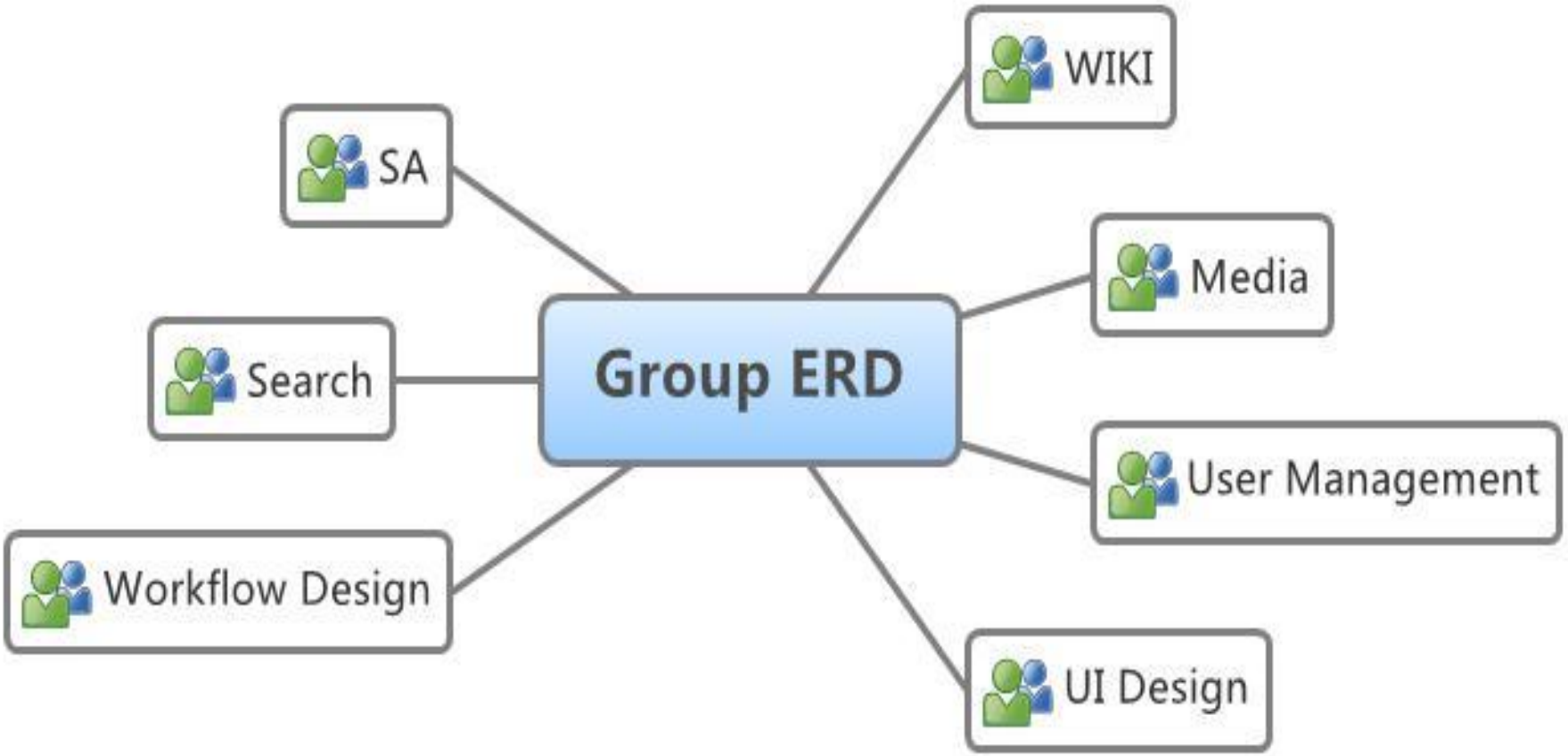
Global ERM Design



ERD Process: Design Instance



ERD Process: Design Instance

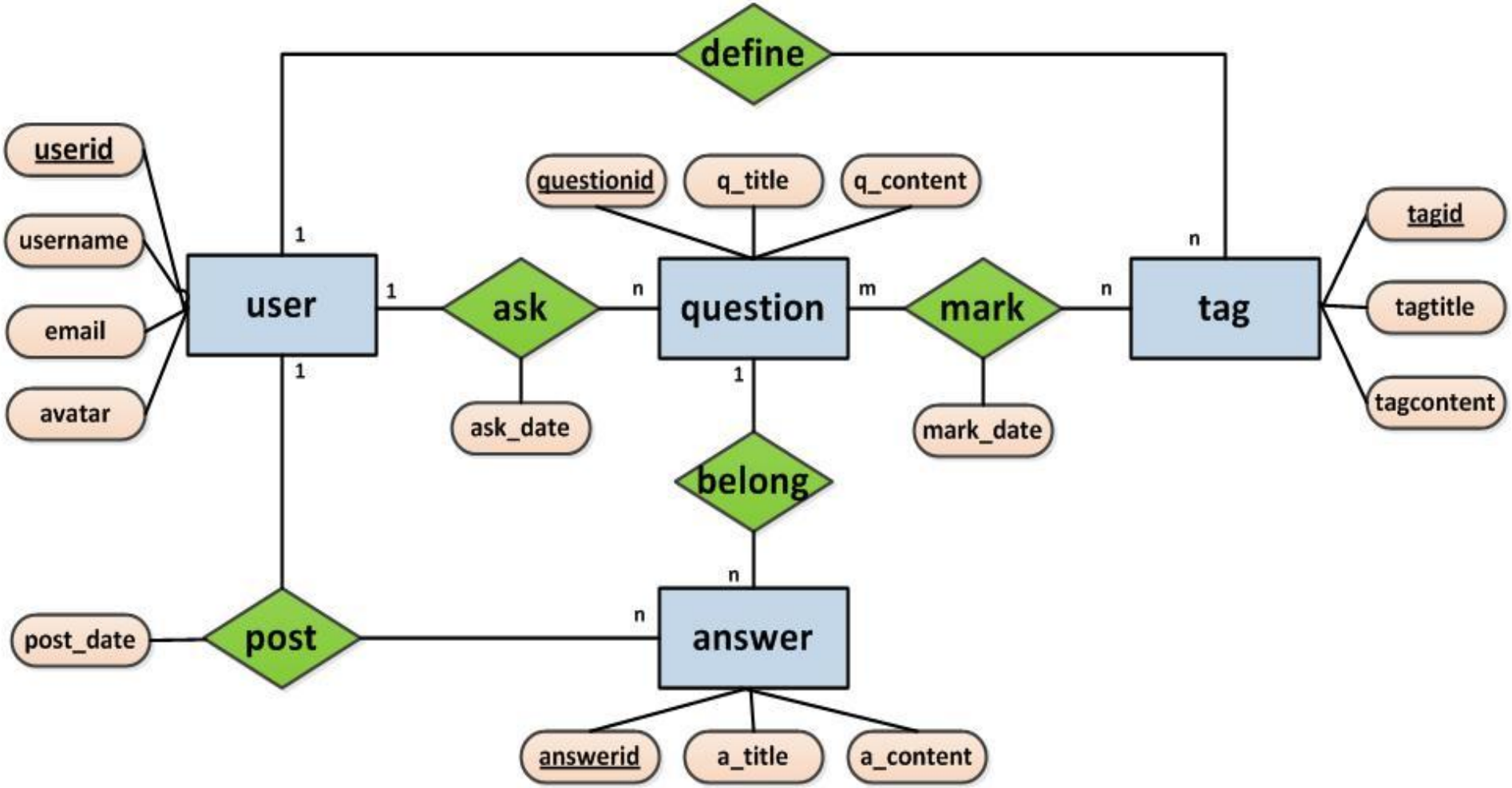


ERD Process: Conversion

Difference

Relational Model	Entity-Relational Model
Foreign key	Relationship set
Abstract	Human logic
Ambiguity	Clarity

ERD Process: Conversion



ERD Process: Conversion

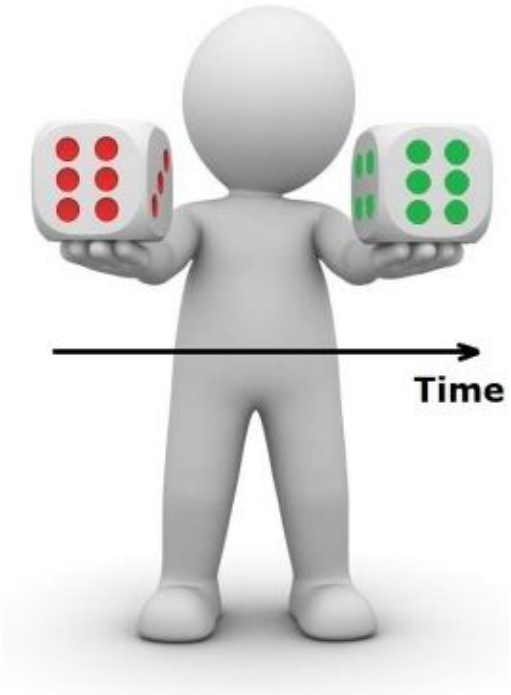
Relational tables in Q2A

#	名字	类型	整理	属性	空	默认	额外	操作
1	postid	int(10)		UNSIGNED	否	无		修改 删除
2	title	varchar(40)	utf8_general_ci		否	无		修改 删除
3	content	varchar(8000)	utf8_general_ci		否	无		修改 删除

#	名字	类型	整理	属性	空	默认	额外	操作
1	tag	varchar(80)	utf8_general_ci		否	无		修改
2	title	varchar(40)	utf8_general_ci		否	无		修改
3	content	varchar(8000)	utf8_general_ci		否	无		修改

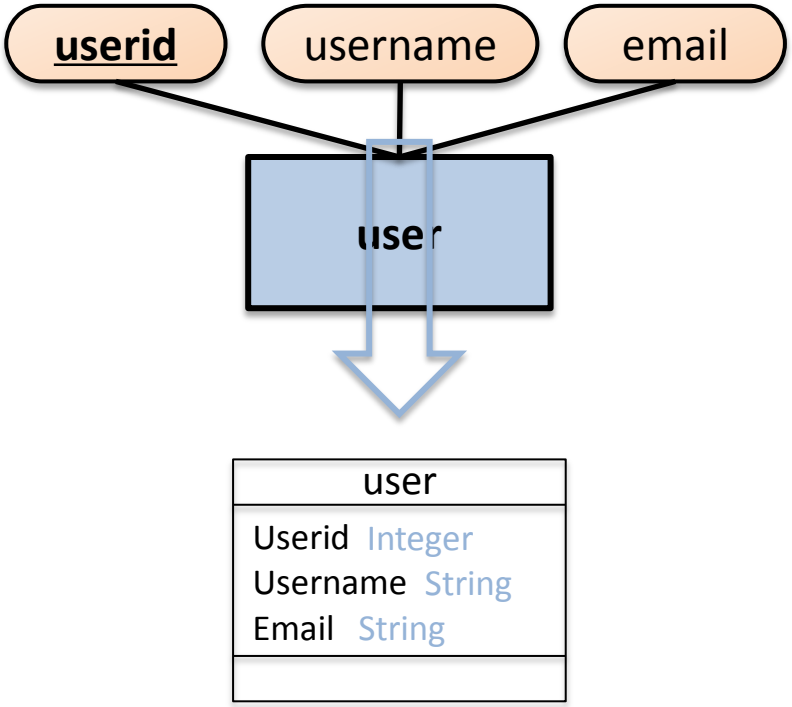
	userid	created	createip	email	handle	avatarblobid	avatarwidth	avatarheight	passsalt	passcheck
编辑 复制 删除	1	2012-10-06 11:35:40	0	zhengrx9266@gmail.com	zrx10	NULL	NULL	NULL	2018pord5k71cfto	edcfa9affe3329

Problems

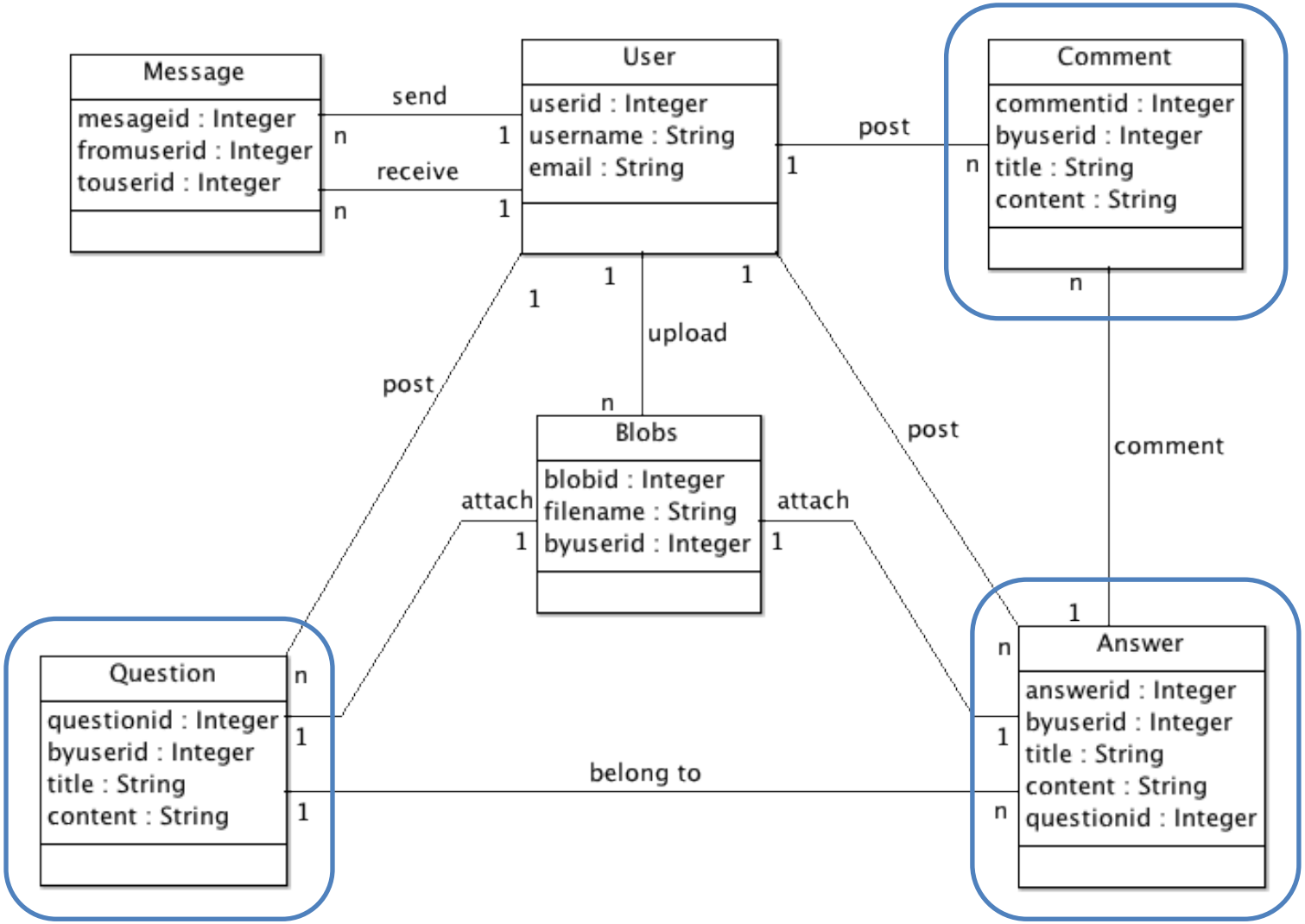


What if data change
at different moments?

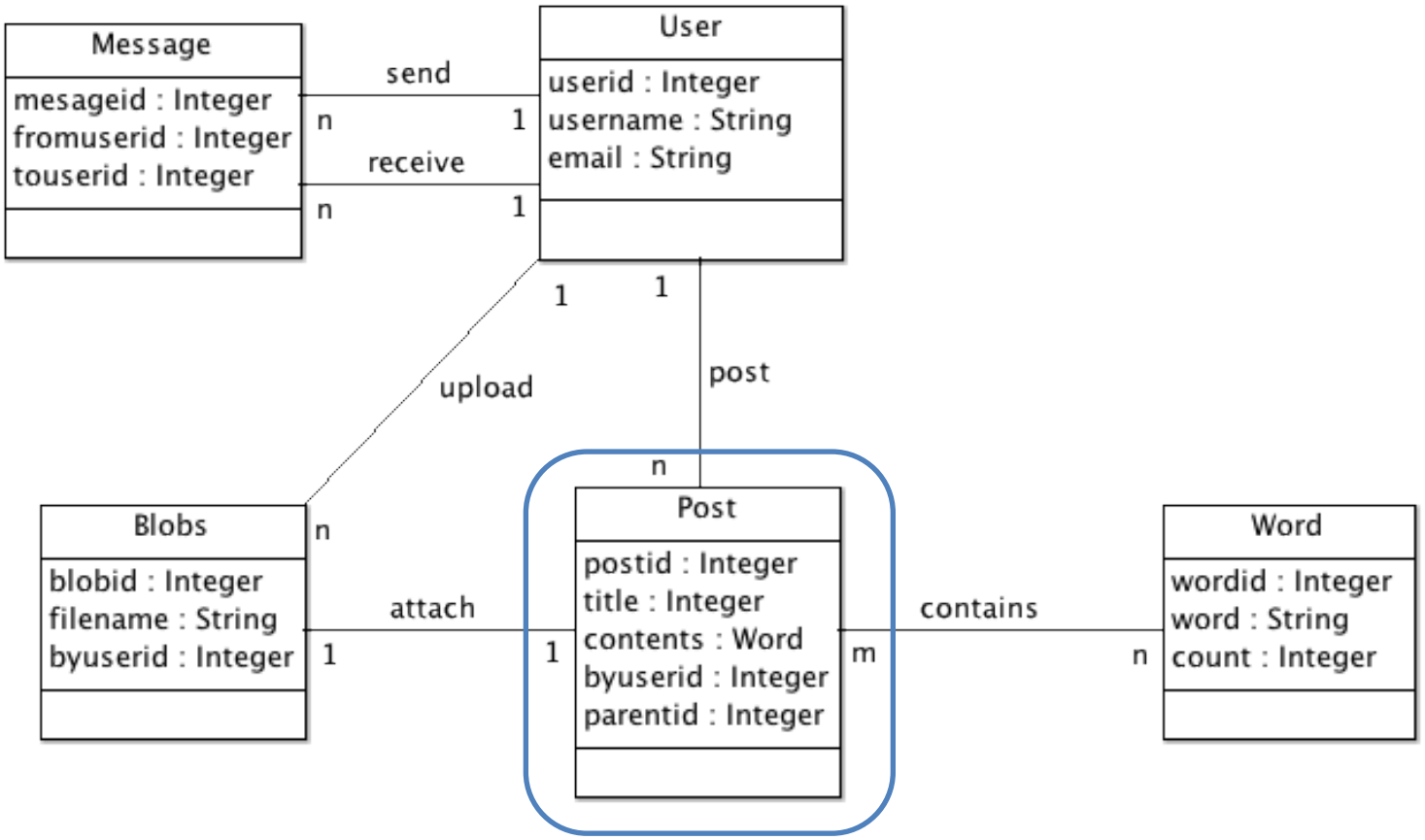
ER Model


userid
username
email
user
user
Userid Integer
Username String
Email String

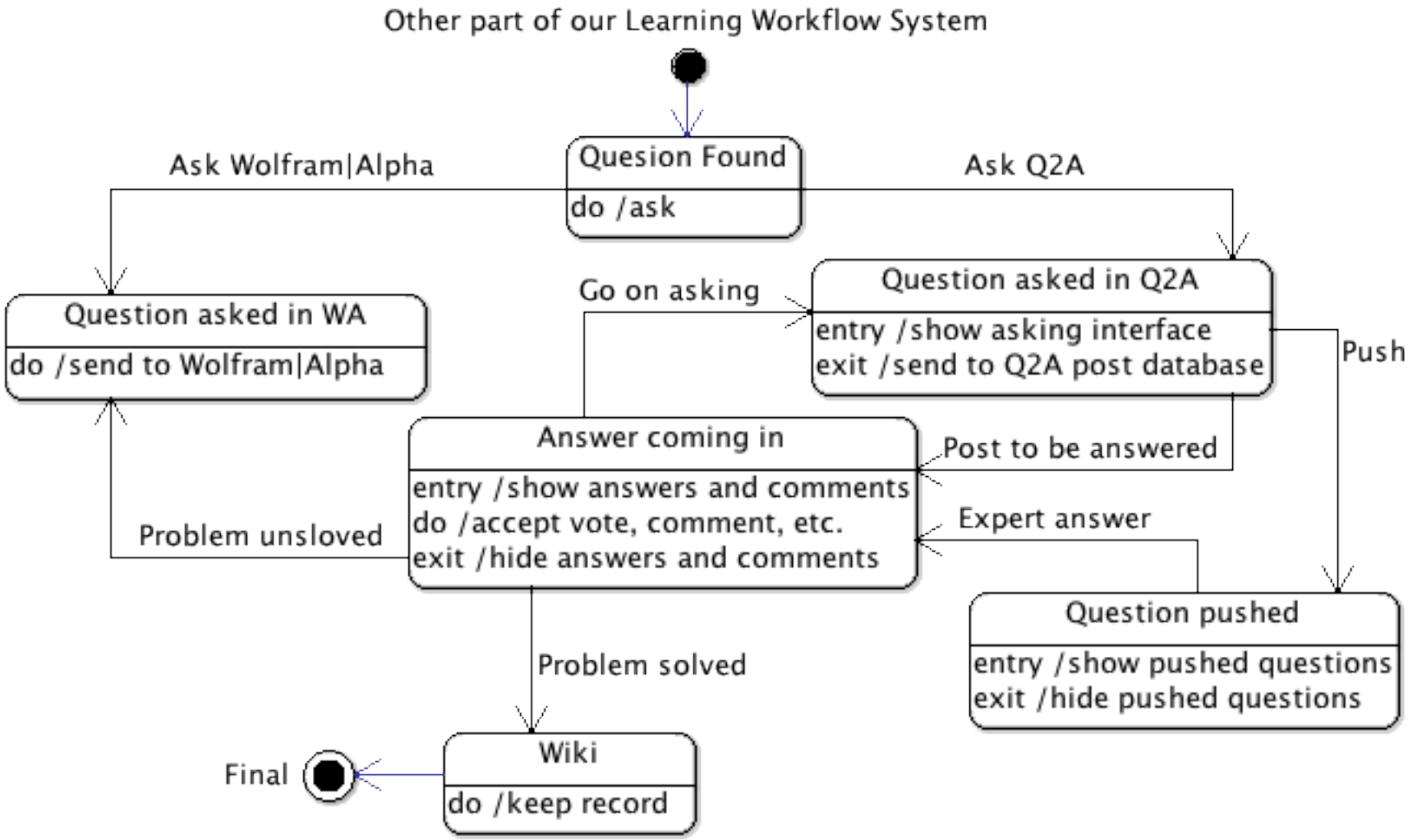
Object Model



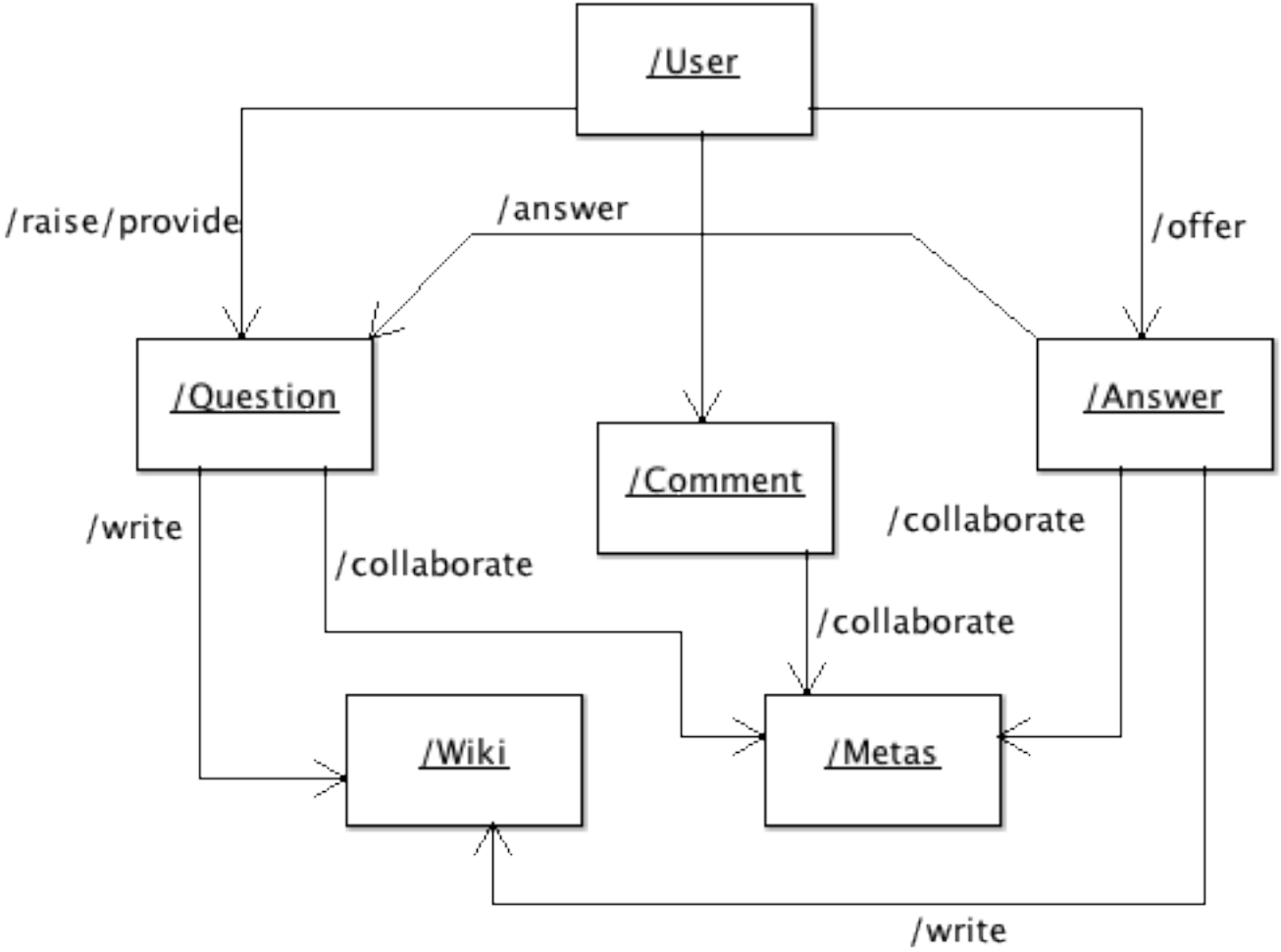
Object Model(mended)



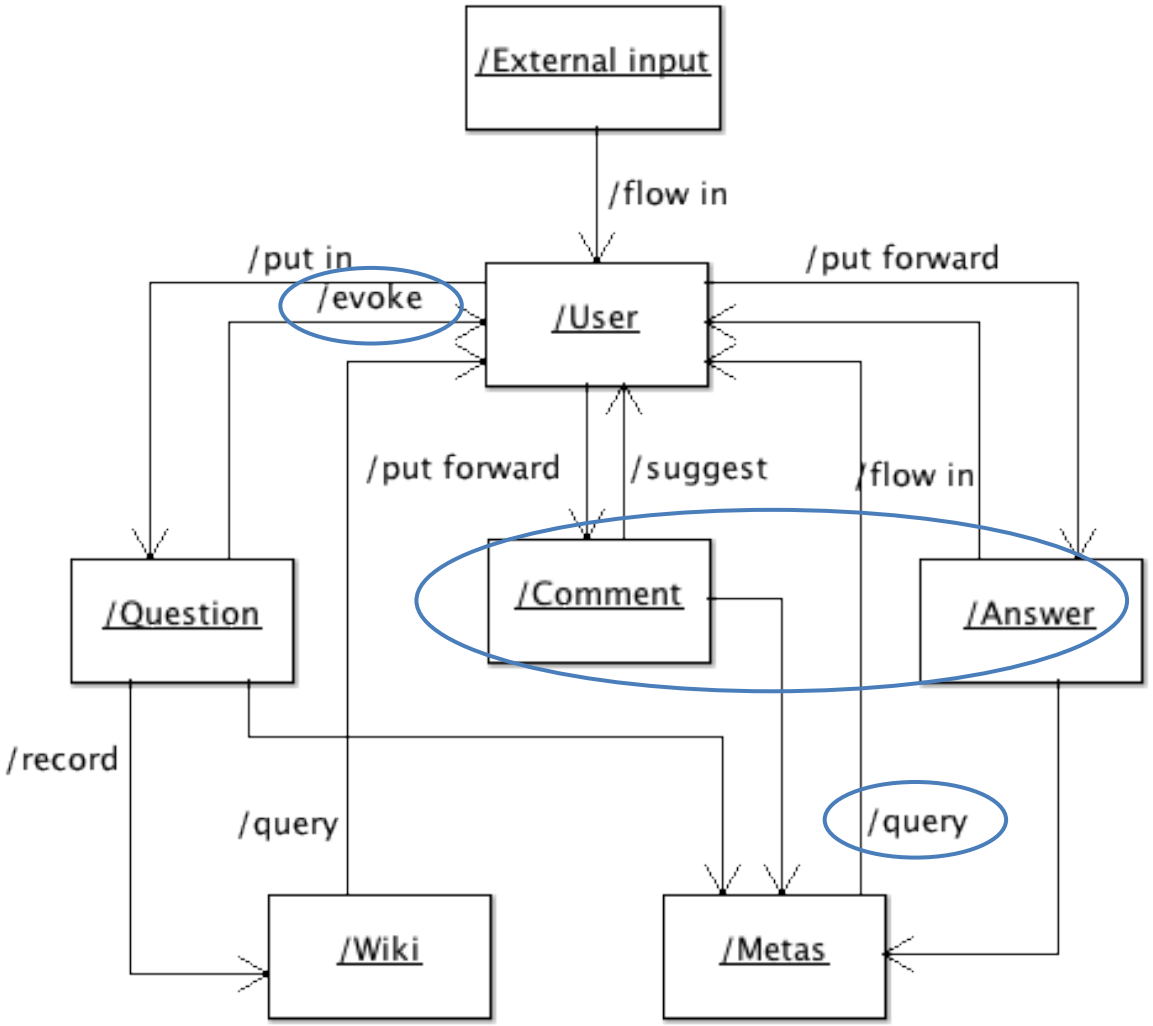
State Model


Other part of our Learning Workflow System
Quesion Found
do /ask
Ask Wolfram|Alpha
Ask Q2A
Question asked in WA
do /send to Wolfram|Alpha
Question asked in Q2A
entry /show asking interface
exit /send to Q2A post database
Go on asking
Push
Answer coming in
entry /show answers and comments
do /accept vote, comment, etc.
exit /hide answers and comments
Post to be answered
Problem unsloved
Expert answer
Question pushed
entry /show pushed questions
exit /hide pushed questions
Problem solved
Wiki
do /keep record
Final

Functional Model

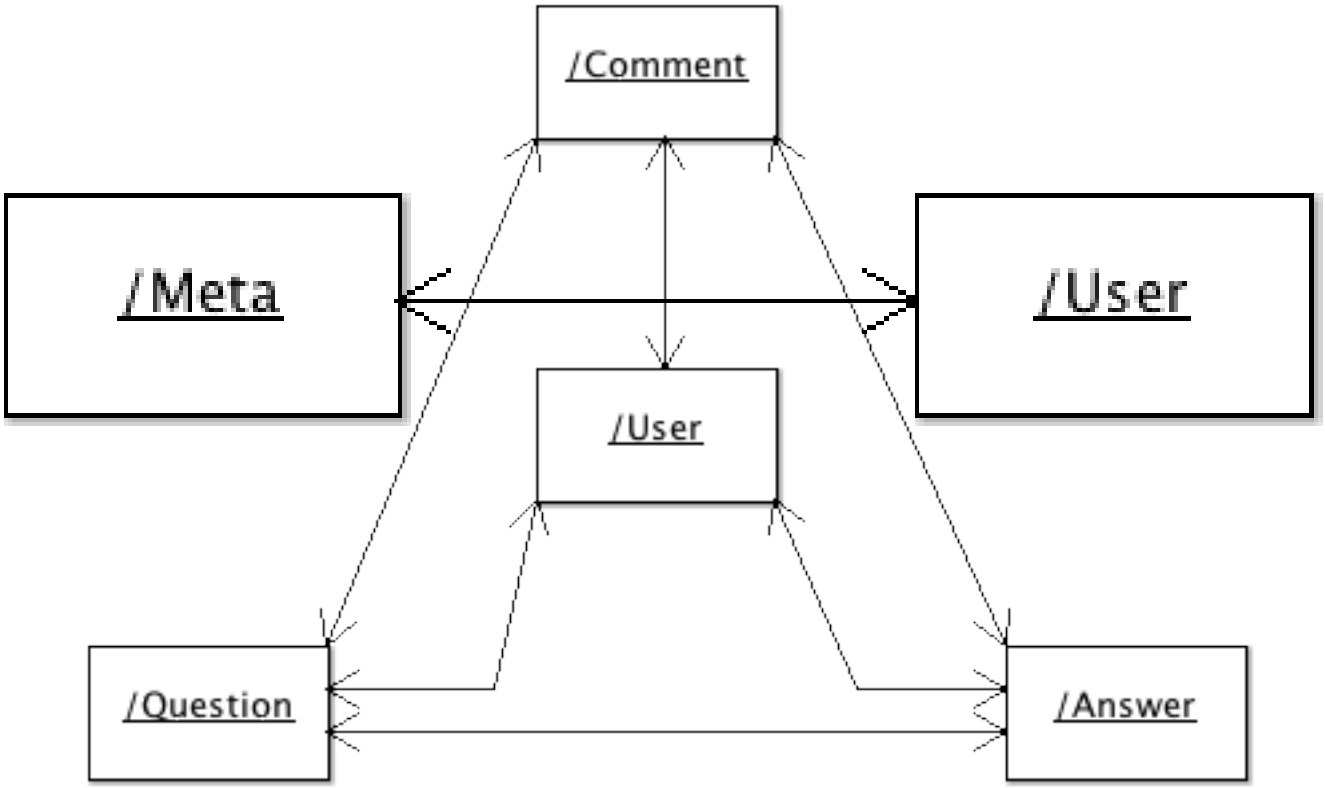


Data Flow



evoke
communicate
query

Knowledge Flow



Object-Oriented Modeling

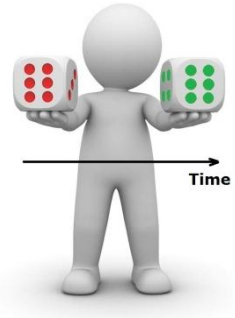
- What is Object Orientation
- What is Object-Oriented Modeling
- 3 levels of OOM
  - Object model -who
  - State model -when
  - Functional model -what

Object Orientation

- Basic Point
- Main features
  - Encapsulation
  - Inheritance
  - Polymorphism

Problems

How can we create a better database?



Hybrid modeling: Reasons

- **Multimedia Storage**

Hybrid modeling: Reasons

- **Automatic Detection**

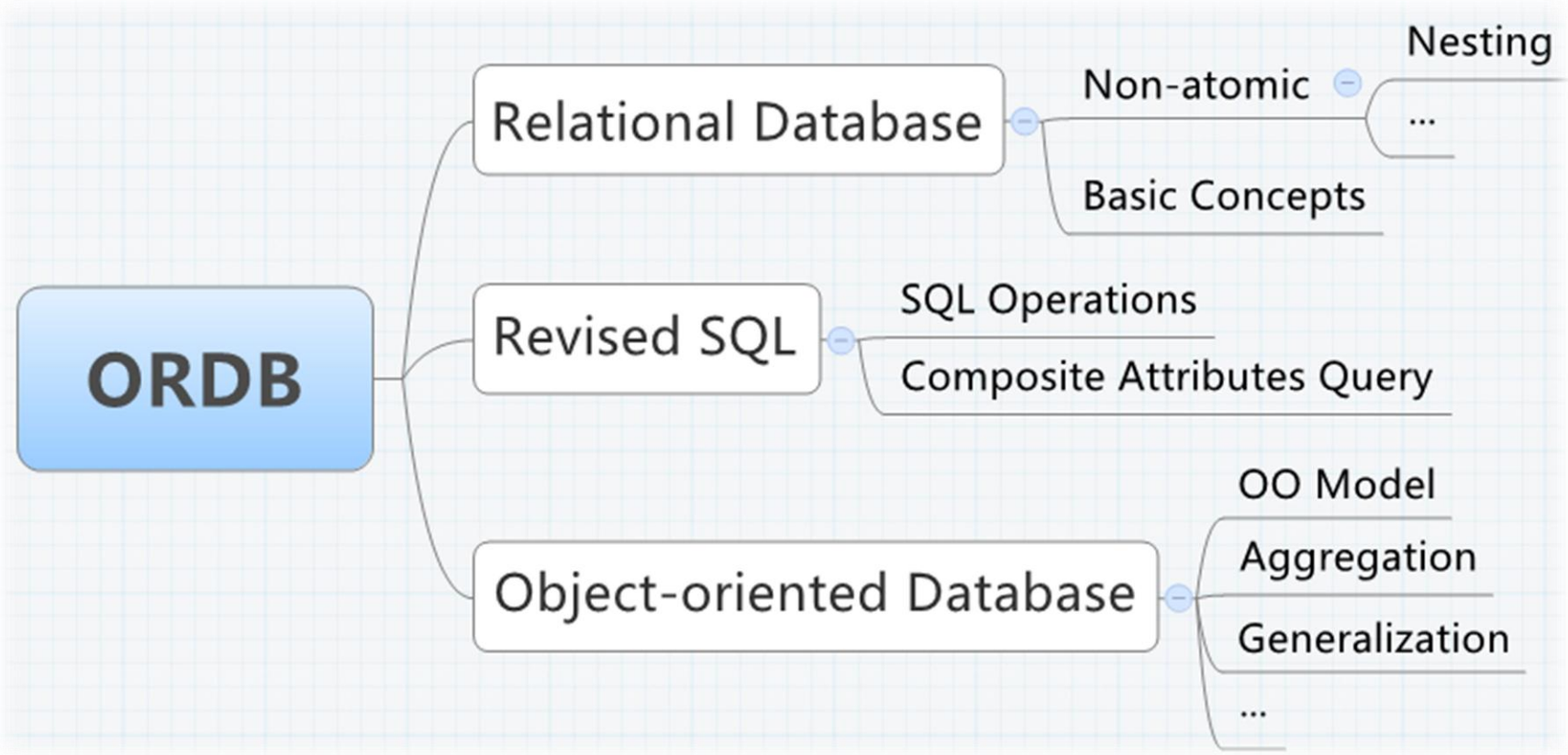
Hybrid modeling: Reasons

- **Code Compression**

Hybrid modeling: Methodology

- **ORDB**
- **ORM**

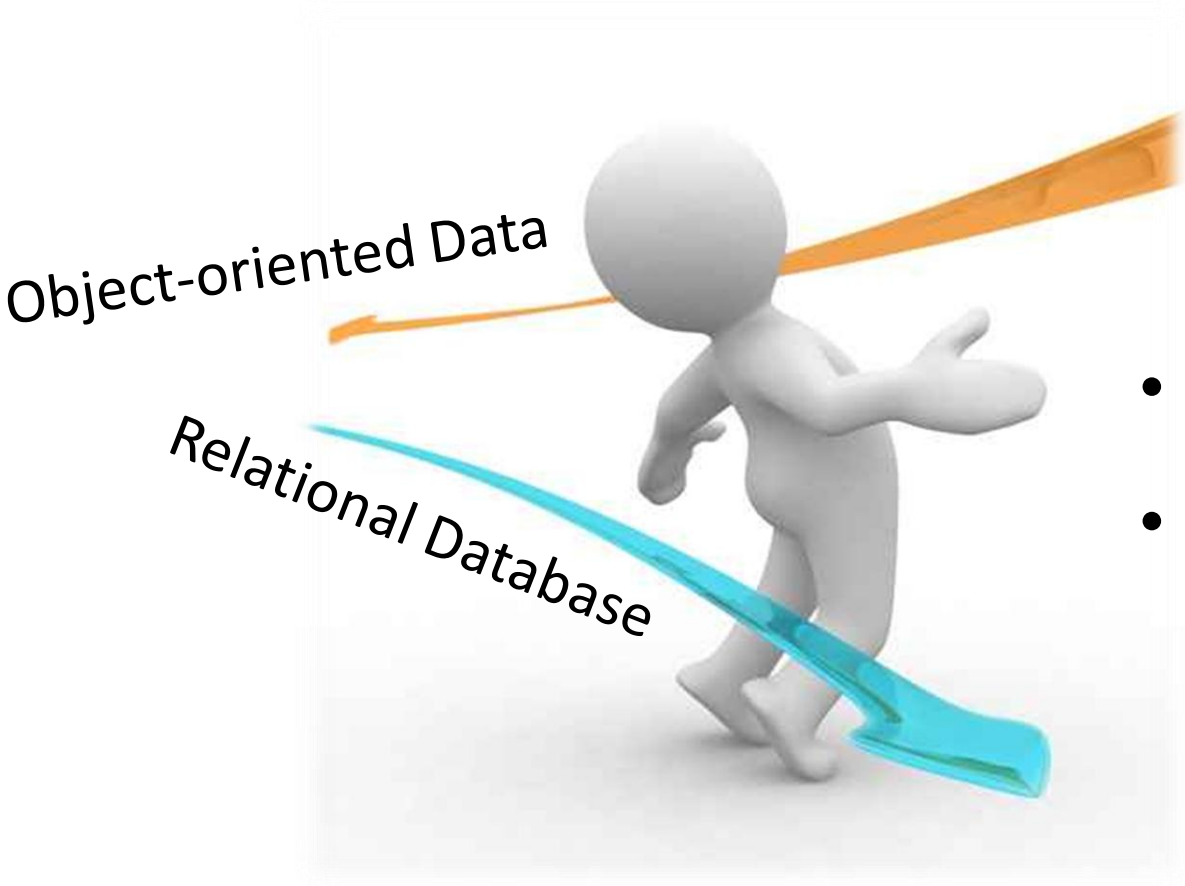
Hybrid modeling: Methodology



Hybrid modeling: Methodology

```
class qa_event_notify {
function process_event($event, $userid, $handle, $cookieid,
    $params)
        {
                switch ($event) {
                        case 'q_post':…
                        case 'a_post':…
                        case 'c_post':…
                                …
                                …
                                …
```

Hybrid modeling: Methodology



ORM

- **Impedance Mismatch**
- **Object CRUD**

Hybrid modeling: Methodology

//Create a new post in the database and return its ID

function qa_db_post_create($type, $parentid, $userid, $cookieid, $ip, $title, $content, $format, $tagstring, $notify, $categoryid=null)

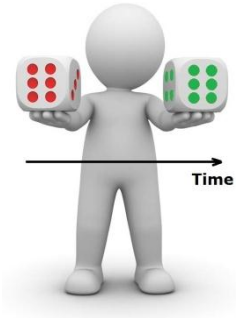
function qa_db_**post_acount_update**($questionid)

function qa_db_**category_path_qcount_update**($path)

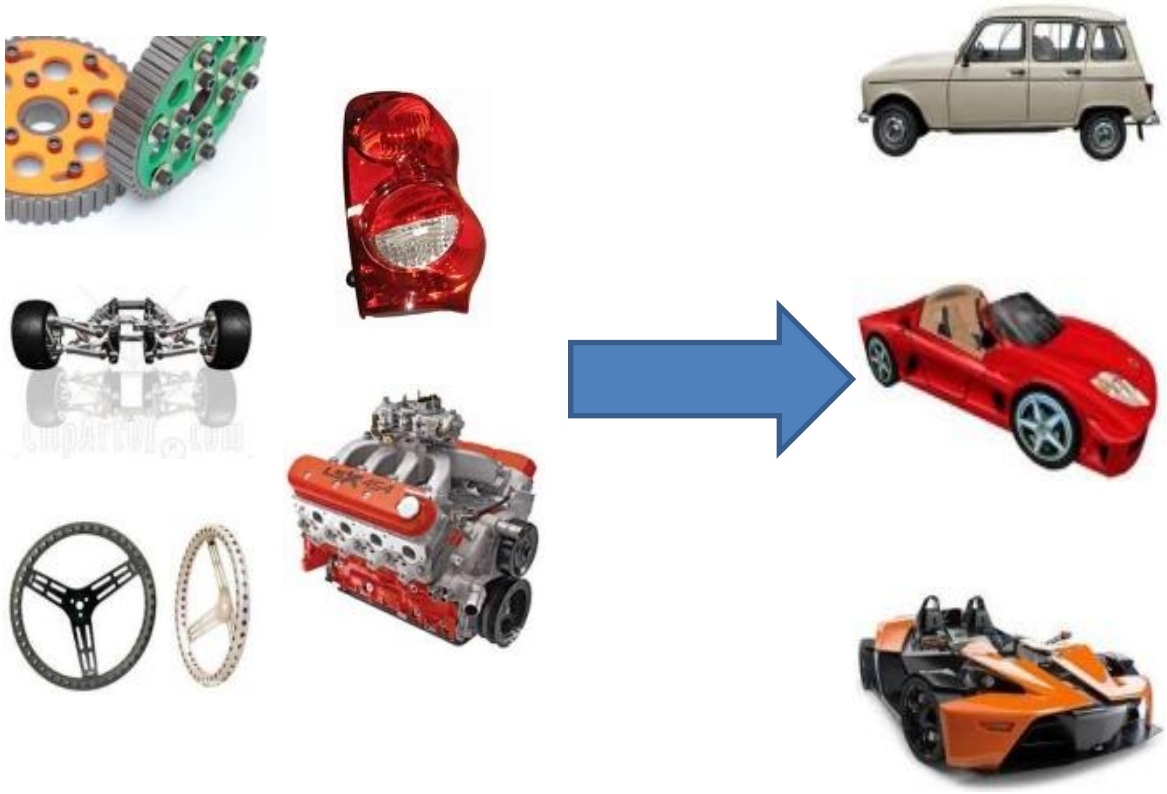
function qa_db_**ifcategory_qcount_update**($categoryid)

Problems

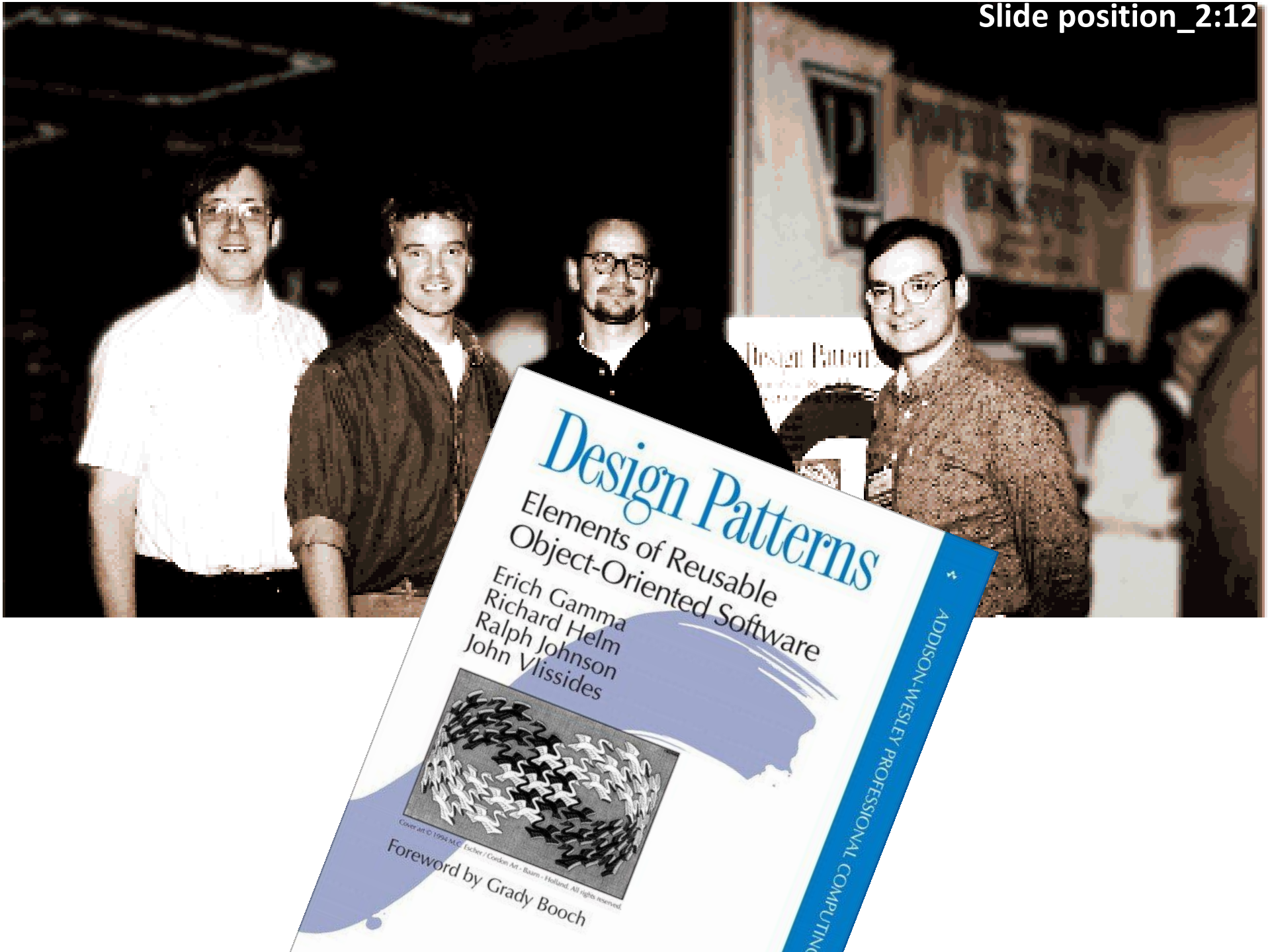
How can we cooperate with the entire LWS?



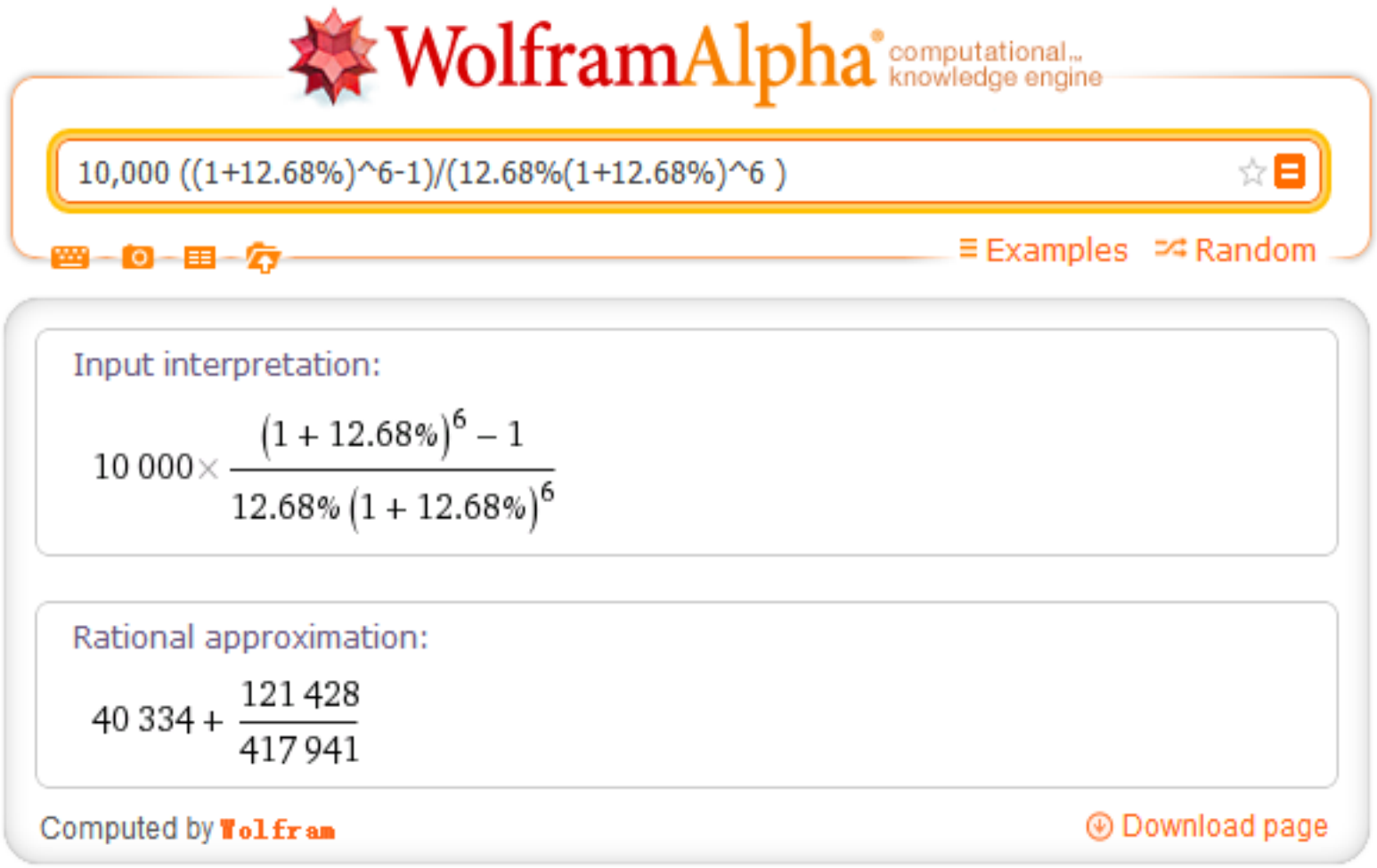
Design patterns



- Standardized design for common problem


Design Patterns
Elements of Reusable
Object-Oriented Software
Erich Gamma
Richard Helm
Ralph Johnson
John Vlissides
Foreword by Grady Booch
ADDISON-WESLEY PROFESSIONAL COMPUTING

Design patterns example: Interpreter



Base of design patterns: OOD

Basic Ideas:

- Object oriented
- Re-usable
- Variable with minimal effort
- Extendable without change

OOD: Principles

- **S** = Single Responsibility Principle
- **O** = Opened Closed Principle
- **L** = Liskov's Substitution Principle
- **I** = Interface Segregation Principle
- **D** = Dependency Inversion Principle

Slide position_6:12

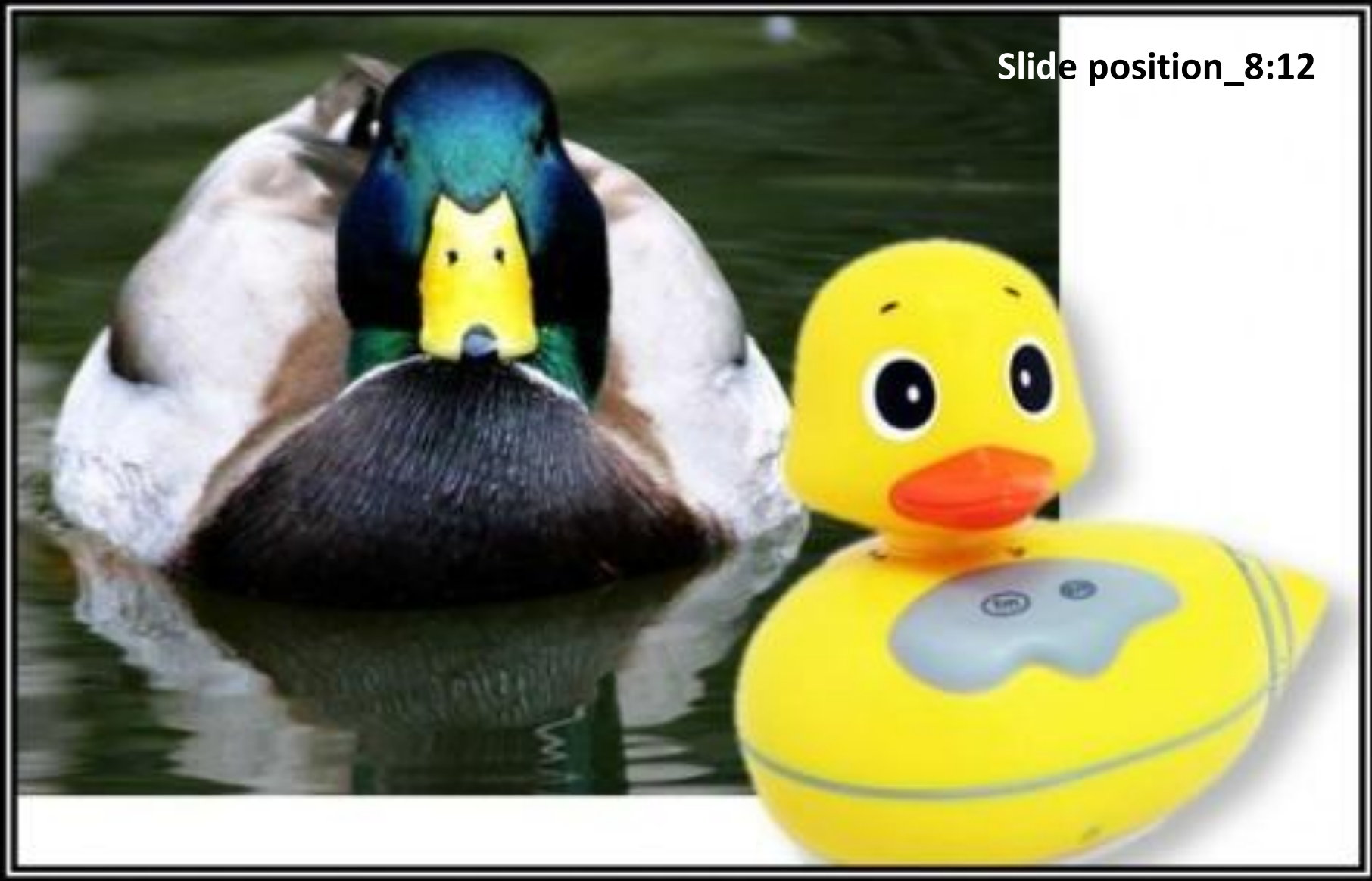
SINGLE RESPONSIBILITY PRINCIPLE

Just Because You Can, Doesn't Mean You Should

OPEN CLOSED PRINCIPLE

Open Chest Surgery Is Not Needed When Putting On A Coat

Slide position_8:12



LISKOV SUBSTITUTION PRINCIPLE

If It Looks Like A Duck, Quacks Like A Duck, But Needs Batteries - You Probably Have The Wrong Abstraction

Slide position_9:12

INTERFACE SEGREGATION PRINCIPLE

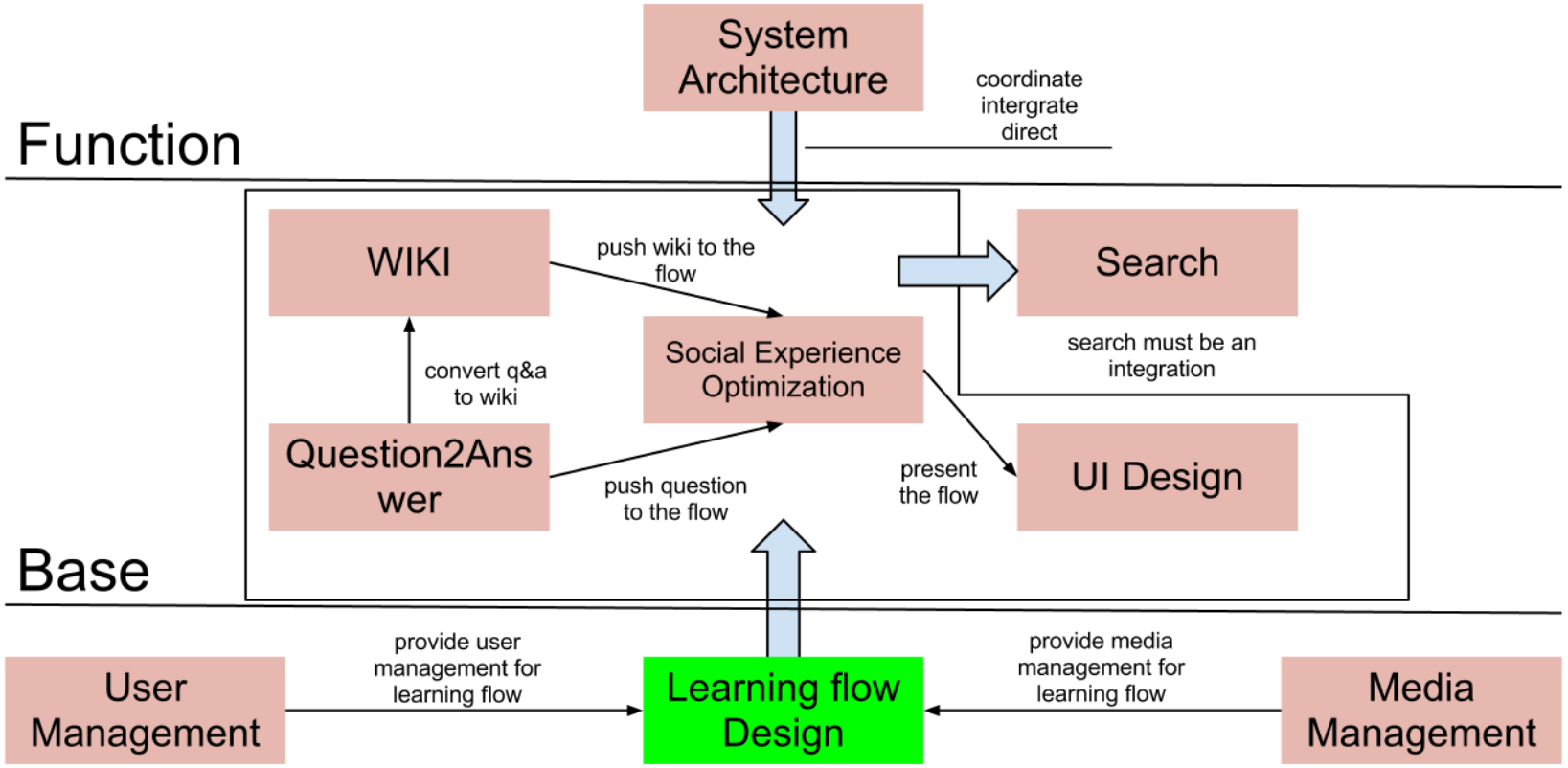
You Want Me To Plug This In, Where?

Slide position_10:12

DEPENDENCY INVERSION PRINCIPLE

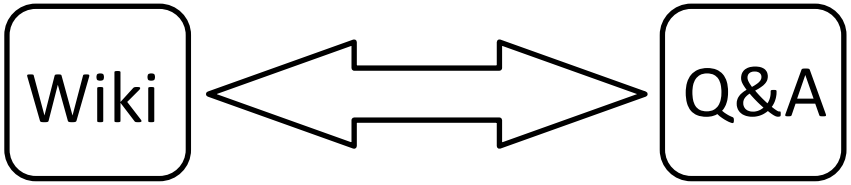
Would You Solder A Lamp Directly To The Electrical Wiring In A Wall?

Design by Contract



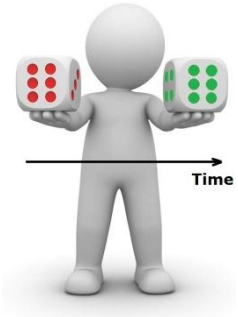
Design by Contract

- Pre-condition
- Post-condition
- Class invariant



Problems

How to deal with worldwide users?



Accumulative data

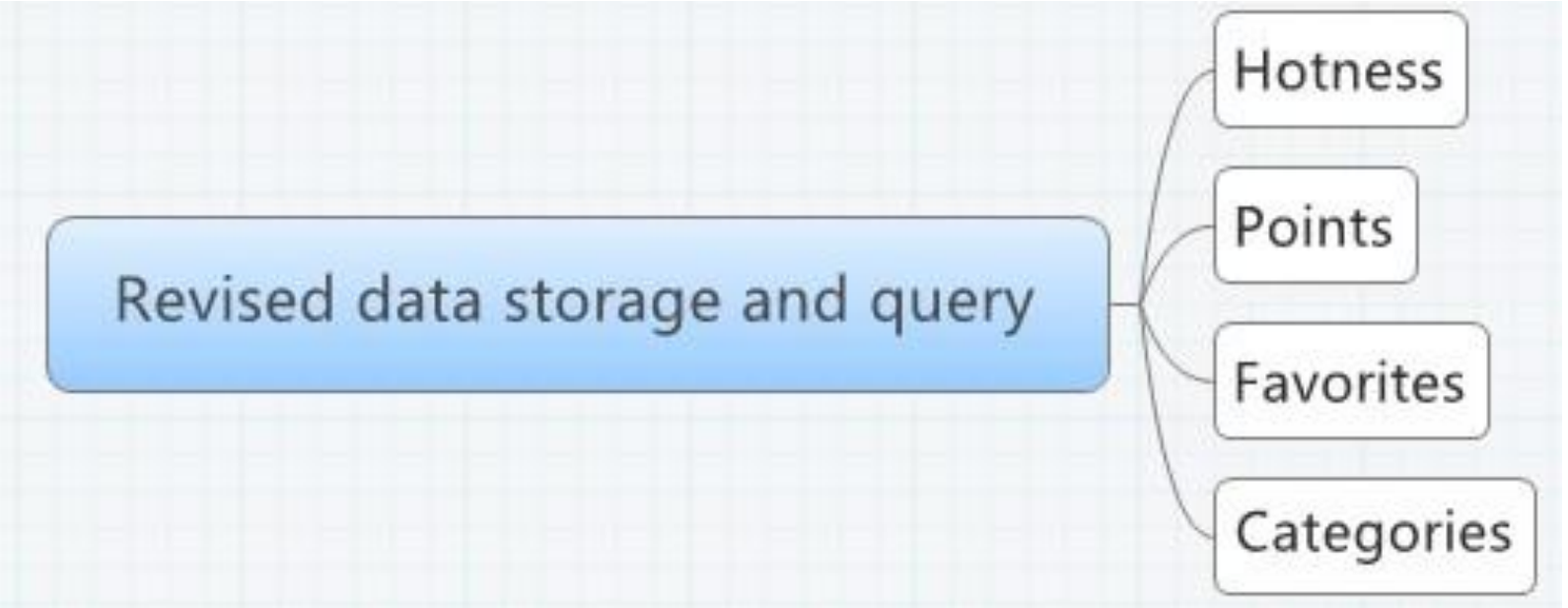
Ask Question

3,852,617

questions

Accumulative data

Accumulative data



Accumulative data

- **Generate a user's updates**

Shared event stream	User-specific event stream
Each event happening	Each event happening
Same event happening	Nothing stored

Data mining in our daily life

Mass-data processing: Data mining

The process that attempts to discover patterns in large data sets (Wikipedia)

Step1: data preparation
Step2: modeling & data mining
Step3: results validation

Data mining: In business

WAL★MART

Data mining: In our website

帅大牛

You might be interested

- Database
- Operations Research
- Human Factors

You might be interested

- High-school Physics
- Plane Geometry
- C language

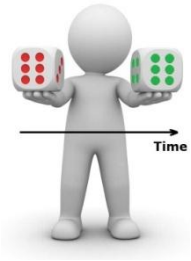
小细腿

Review

Building up Question & Answer platform

ER model theory

ER design process



Object orientation

Knowledge flow

Hybrid modeling

Methodology

Review

Building up Learning Workflow System

Object-oriented design

Design patterns

Design by Contract

Accumulative data storage

Data mining

Thesis

ER model

OO model

Information world

Real world

Abstraction

Question&Answer

Design patterns

Relational model

KNOWLEDGE FLOW

Reference

- *Data modeling essentials*, Graeme. C. Simson
- *Entity relationship model-toward a unified view of data*, Peter Chen
- *A relational model of data for large shared data banks,* E. F. Codd
- *Complexity, networks and knowledge flow*, Olav Sorenson, Jan W.Rivkin
- *Code compression*, Fang Yu
- *The relational model for database management*, Dr. Edgar F. Codd
- *How I explained OOD to my wife, Al-Farooque Shubho*
- 运用实体联系模型数据建模，胡松林，王一凡
- 面向对象的实体关系模型，杜晓明，于永利
- 一种实体联系模型到面向对象模型的持久化映射，徐长梅
- 数据挖掘中用户兴趣模型设计，周晓兰
- 实体关系模型的面向对象实现，徐宝祥，王玉红
- Wikipedia and other online sources
- Lecture Slides, Group UAM

Acknowledgements

- Prof. Benjamin Koo
- Jonathan Burke
- Yeong Liqian
- Hu Yanglin
- Wang Haoyu
- Pan Tao

All listeners

Thank you

Group Q&A