TIM 50 - Business Information Systems

Lecture 17

Instructor: Terry Allen
UC Santa Cruz
11/21/2011

Outline

- Announcements
- Databases (cont'd)
- Algorithms and Protocols
- Student Presentations
- Akamai

Announcements I

- Database Assignment due 12/2 (submit electronically)
- Business paper – due 12/2 (last day of instruction)

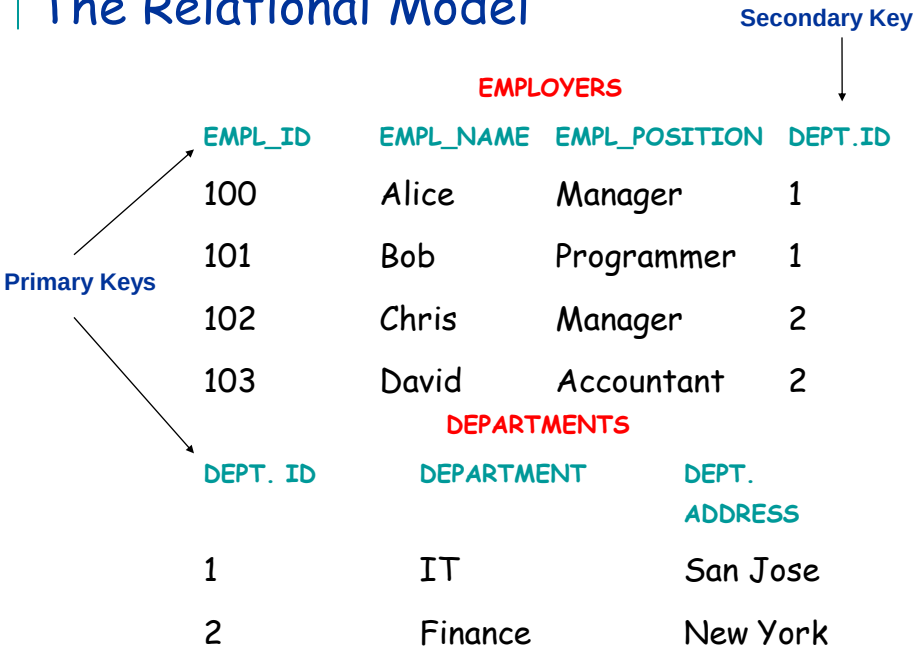
Announcements II

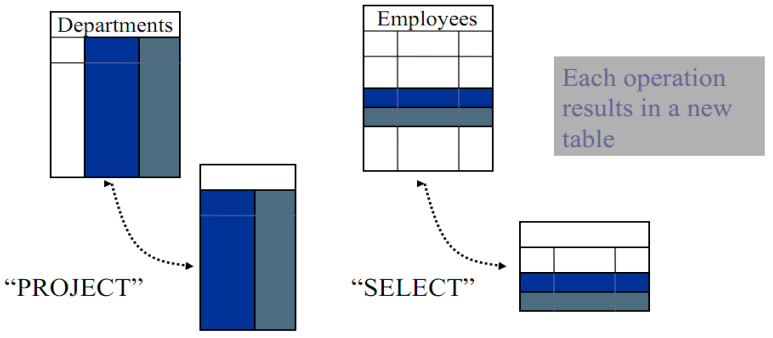
- Student Presentations next week?
  - ??
- Reading:
  - Chapter 10 of Messerschmitt (Reader 1)
  - American Airline Case Study (Reader 2)
  - Chapter 1 on Networking
- 2nd Database tutorial
  - Friday, Dec. 2, 3:00 p.m., BE109

Student Presentations

- Rachel Karagianes – Artificial Skin
- Eleonor Concepción – Galaxy Hotel System

The Relational Model





Database Operations

EMPLOYERS

EMPL_ID	EMPL_NAME	EMPL_POSITION	DEPT. ID
100	Alice	Manager	1
101	Bob	Programmer	1
102	Chris	Manager	2
103	David	Accountant	2

DEPARTMENTS

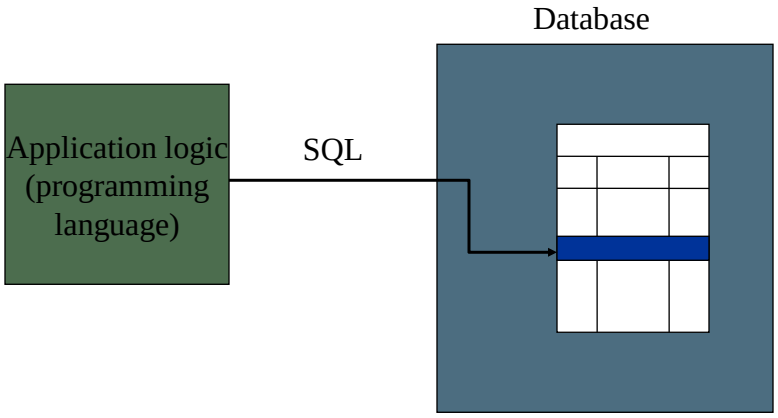
DEPT. ID	DEPARTMENT	DEPT. ADDRESS
1	IT	San Jose
2	Finance	New York

JOIN

EMPL_DEPT

EMPL_ID	EMPL_NAME	EMPL_POSITION	DEPT.	ADDRESS
100	Alice	Manager	IT	San Jose
101	Bob	Programmer	IT	San Jose
102	Chris	Manager	Finance	New York
103	David	Accountant	Finance	New York

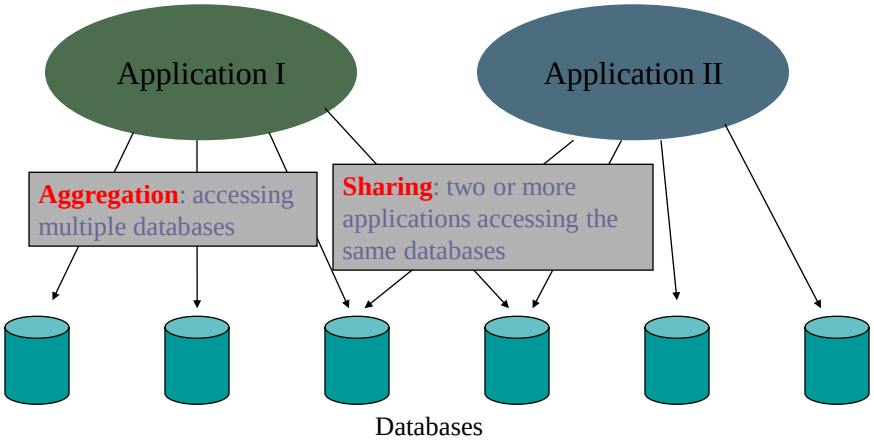
Application Logic and Tables



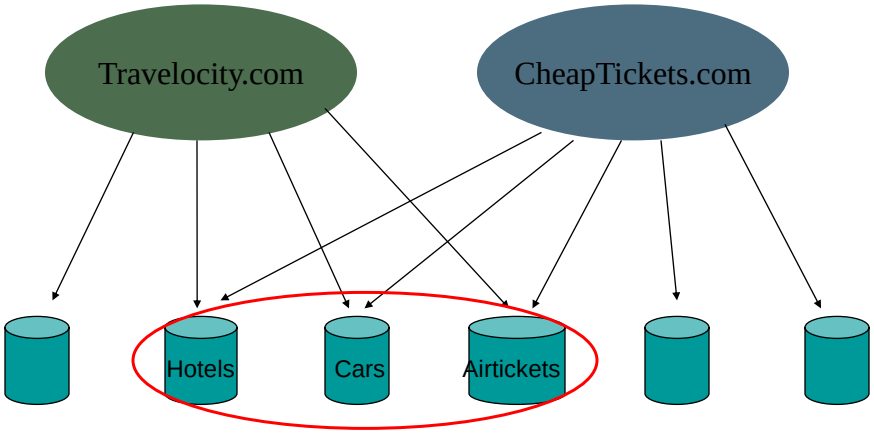
Databases & OLTP

- Click to add text

Recall - Two capabilities

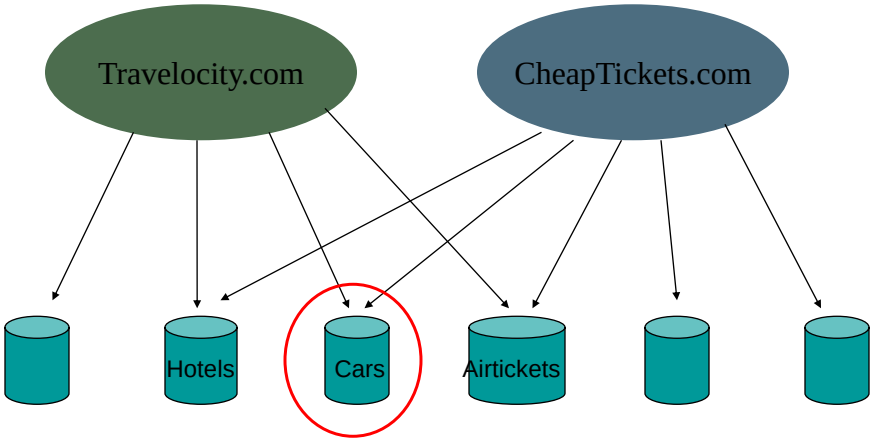


Example - Travel Agency



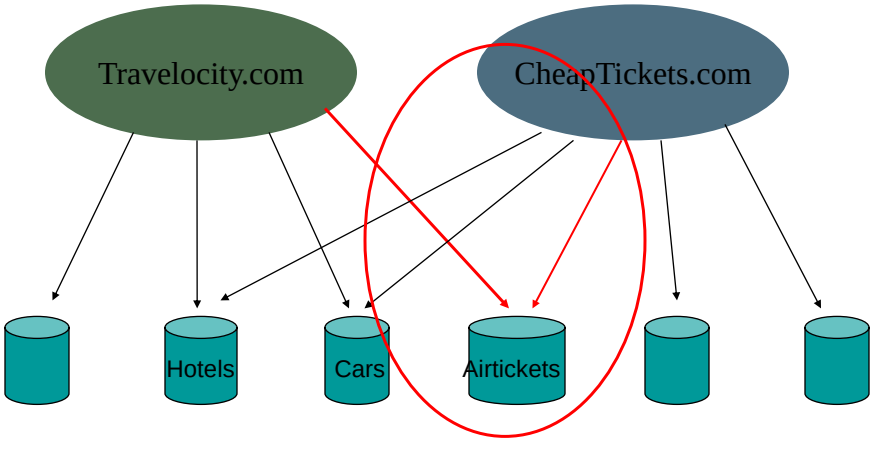
What can go wrong?

Example - Travel Agency



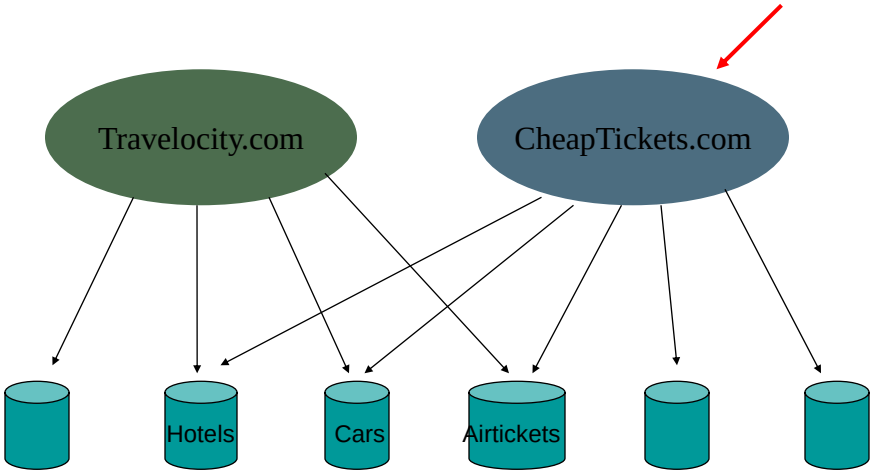
A resource might be unavailable

Example - Travel Agency



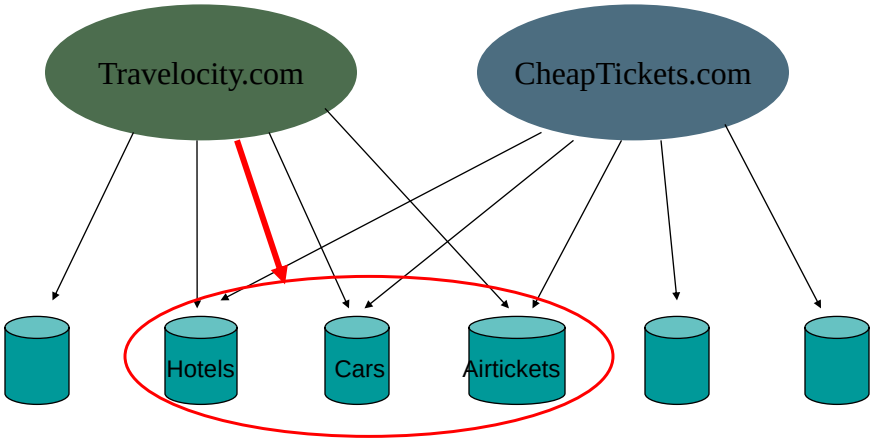
Two applications might try to access & update the same resource concurrently

Example - Travel Agency



An application or a host might crash before the completion of the transaction

Example - Travel Agency



A customer's transaction should be completed in its entirety, or aborted

Transaction Processing

- "The coordination of multiple resources and the shared access to common resources in a systematic and consistent way"
- Examples?
  - Financial applications (stock market, ATMs)
  - Reservations (travel, theatre)
  - Manufacturing (inventory, purchasing, billing)
  - Etc…

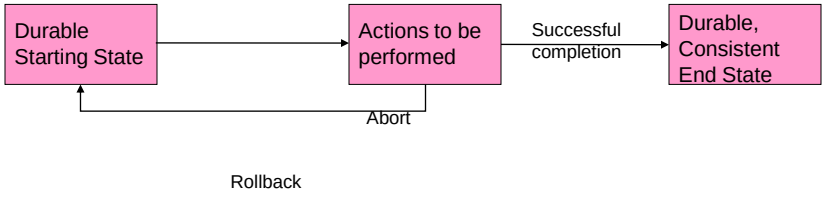
Online Transaction Processing (OLTP)

- Transaction Processing for networked applications
- 4 Important Properties of transactions: **ACID**
  - **A**tomicity
  - **C**onsistency
  - **I**solation
  - **D**urability

The ACID properties

- Atomicity
  - All transaction components should either complete together (commit) or abort
  - E.g. All reservations (airline, hotel, car) should be grouped as a single transaction that either commits, or aborts
- Consistency
  - A transaction must leave the system in a consistent state at the end of the transaction, or else abort
  - E.g. Either a consistent set of reservations has been made, or none
- Isolation
  - Concurrent transactions are allowed only if they don't interfere with each other
  - Two travel agents can concurrently access the same database if the reservations are for different dates/places
- Durability
  - A transaction leaves the resources in a permanent state after it commits

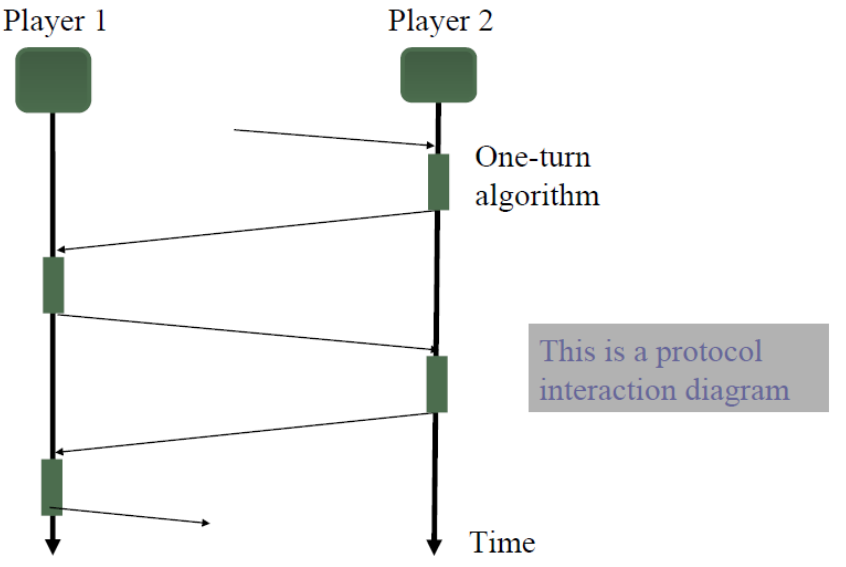
Structure of a Transaction



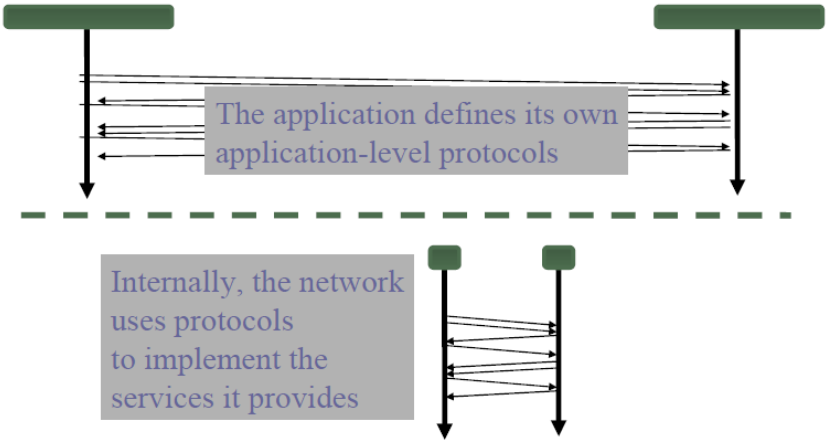
OLTP

- Simplifies application development
- Ensables protection and integrity of mission-critical data in a transparent way
  - for the end user
  - for the application developer

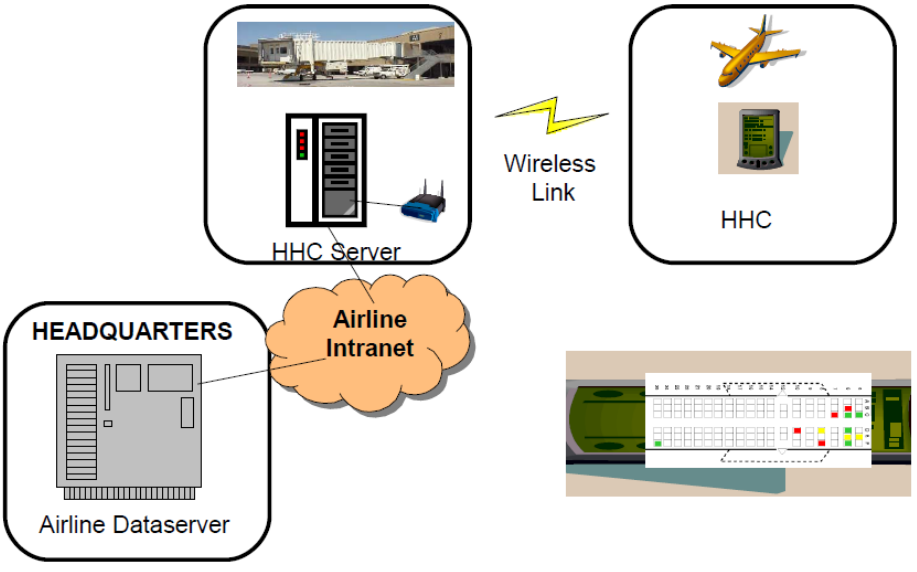
Monopoly players protocol



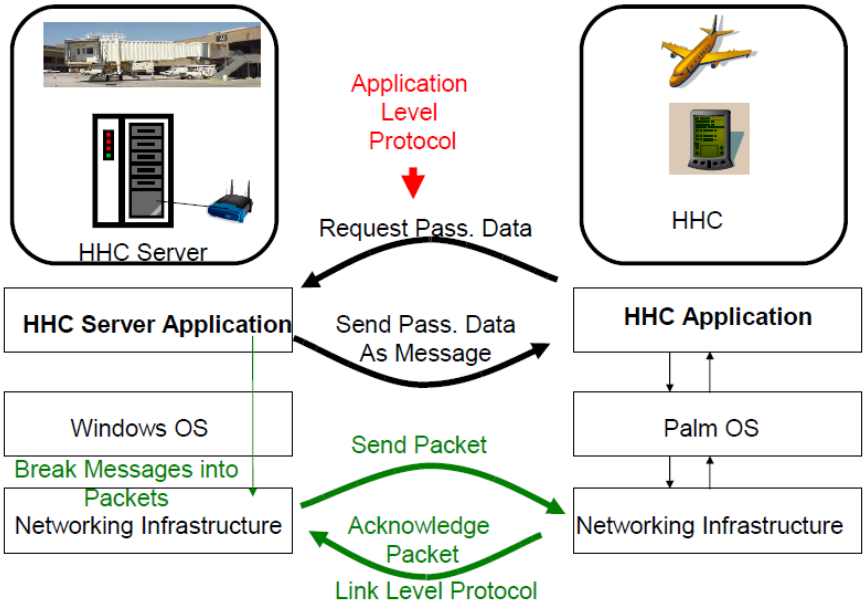
Application and infrastructure



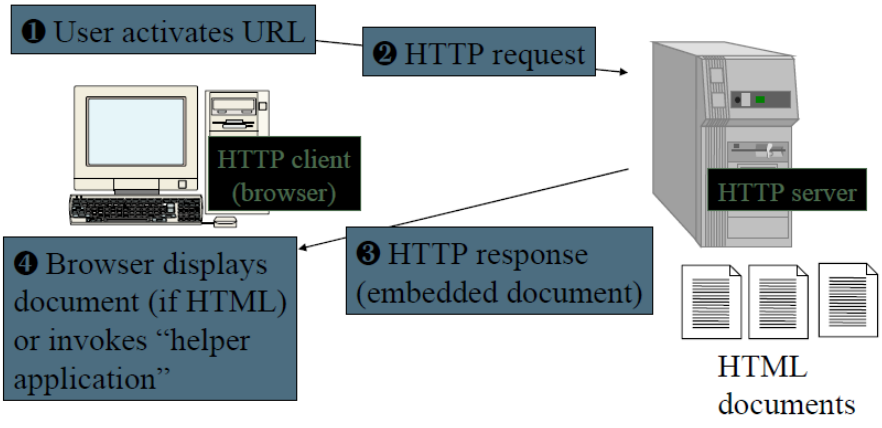
Example:



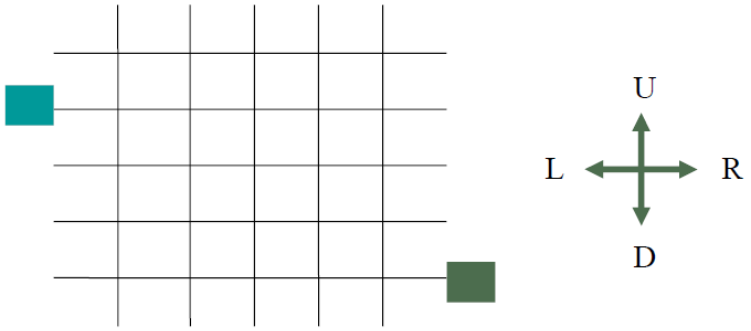
Layered Protocols Example



Example: HTTP (Hyper Text Transfer Protocol)



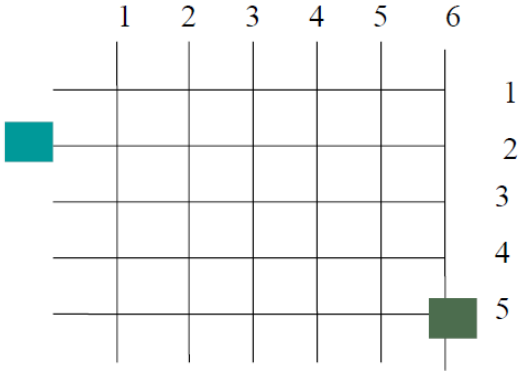
Example



Path from ■ to ■ is (R,D,D,D,R,R,R,R)

Is (R,D,D,D,R,R,R,R) an address?
No! -- not an address, because it depends on starting point

Example



Address of ■ is (6,5)

Route from ■ can be inferred

Program

Program

- Precise description of an algorithm in a formal language that is called programming language
- Actions are applied to data

Formulation in a language

- Natural language
  - No strict syntactic rules
  - Great density and semantic capability
- Formal language
  - Strict syntax and semantics
- Programming language
  - Formal language in which computations can be described
  - Executable by an electronic computer

Can we solve all problems?

Collatz Conjecture (Ulam):

while x!=1 do

if (x is even) then x=x/2

else x=3*x+1

Example:

$$7 \to 22 \to 11 \to 34 \to 17 \to 52 \to 26 \to 13 \to 40 \to 20 \to 10 \to 5 \to 16 \to 8 \to 4 \to 2 \to 1$$

Given *any* arbitrary number x, will the program terminate?

Open problem!

Translation of programs

Source Code

(in a programming language)

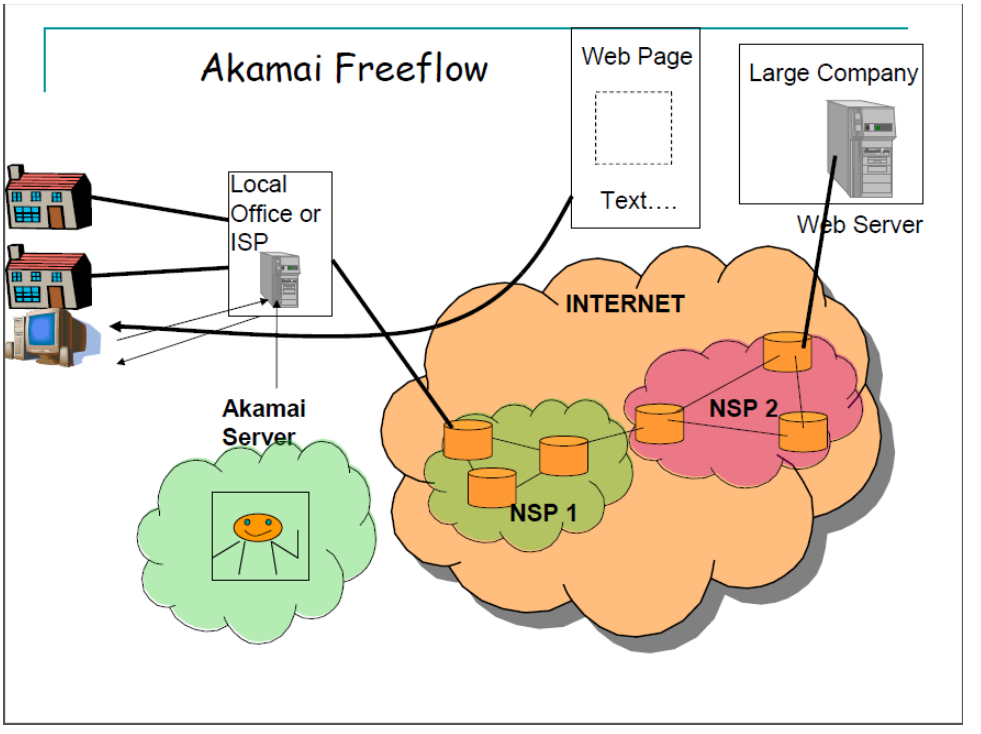
⇓

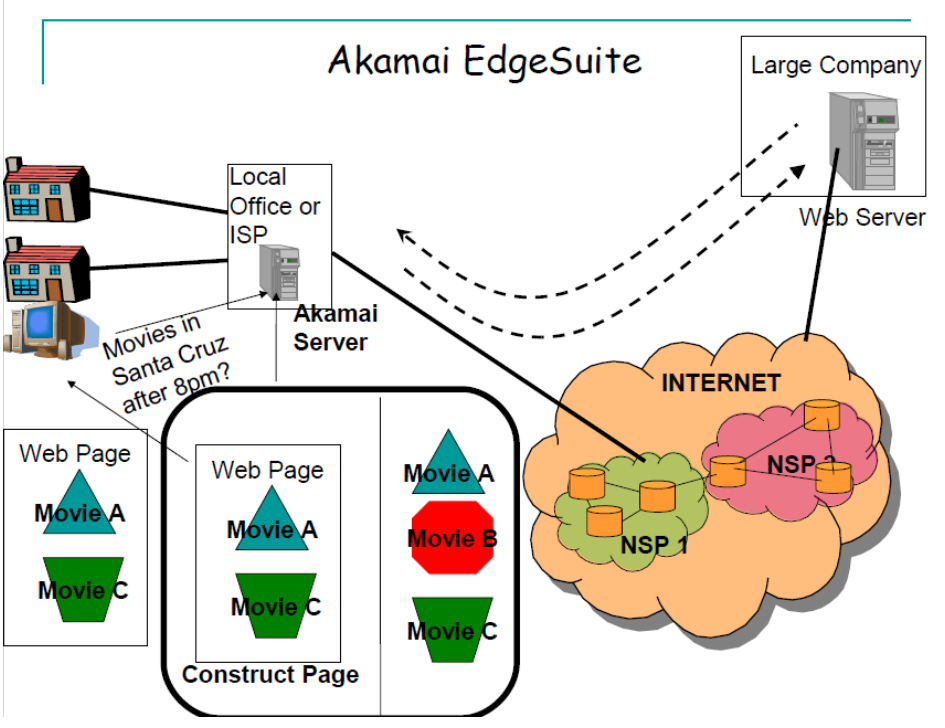
Compiler

⇓

Input → Executable program → **Output**

(machine language)


Akamai Freeflow
Web Page
Text….
Large Company
Web Server
Local Office or ISP
INTERNET
Akamai Server
NSP 2
NSP 1


Akamai EdgeSuite
Large Company
Web Server
Local Office or ISP
Akamai Server
Movies in Santa Cruz after 8pm?
INTERNET
NSP 1
Web Page
Movie A
Movie C
Web Page
Movie A
Movie C
Construct Page
Movie A
Movie B
Movie C

Quiz 4 *(total 10 pts)*

- What is SQL?
- How long (in bits) is an IP address?
- Akamai is famous for what?