



| Does Computer Science need Computing?

Anyone for Tennis?

| The science behind IBM Wimbledon

| Matt Roberts – IBM Hursley Labs

10 March 2004

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Agenda

- **Introduction**
- **What's IT all about?**
- **The Real World**
- **IT Architecture the easy way**
- **Tell me your secrets?**

IBM Wimbledon

- **The first Wimbledon Championship was in 1877.**
- **IBM has been the “Official Supplier of Information Technology and Consultancy” since 1990.**
- **IBM’s handles all information and IT systems on the grounds of the Wimbledon club – not just the website!**

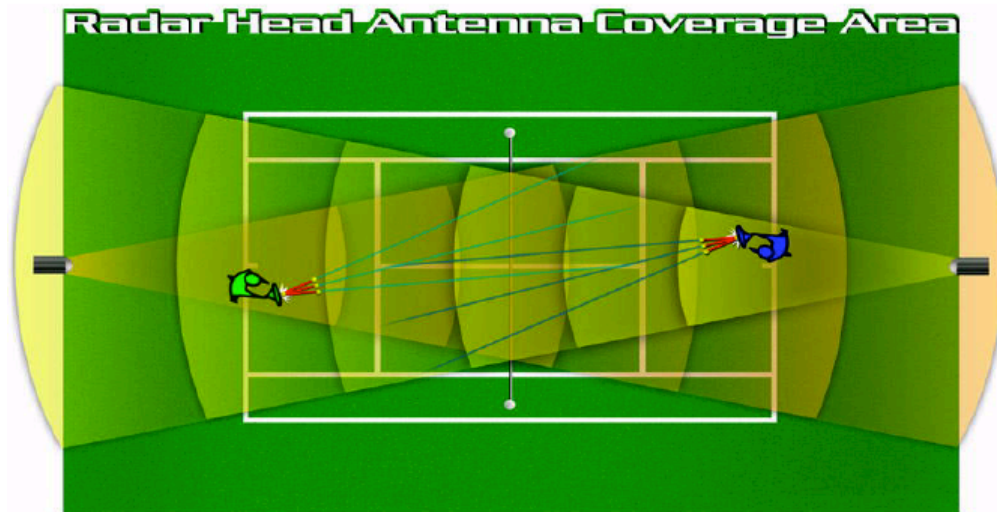
What's IT all about?

- **Information Technology is about problem solving.**
- **There are many different types of job in the IT industry.**
- **What skills do you need?**

Joining physical and non-physical worlds

- **An important part of any IT system is where the information comes from.**
- **Inserting information into an IT system**
- **Retrieving information from an IT system**

Speed of serve machine



Radar head located at each end of the court



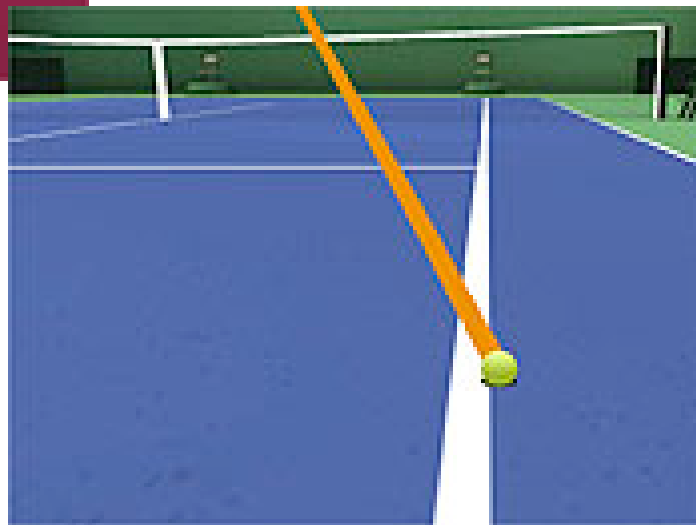
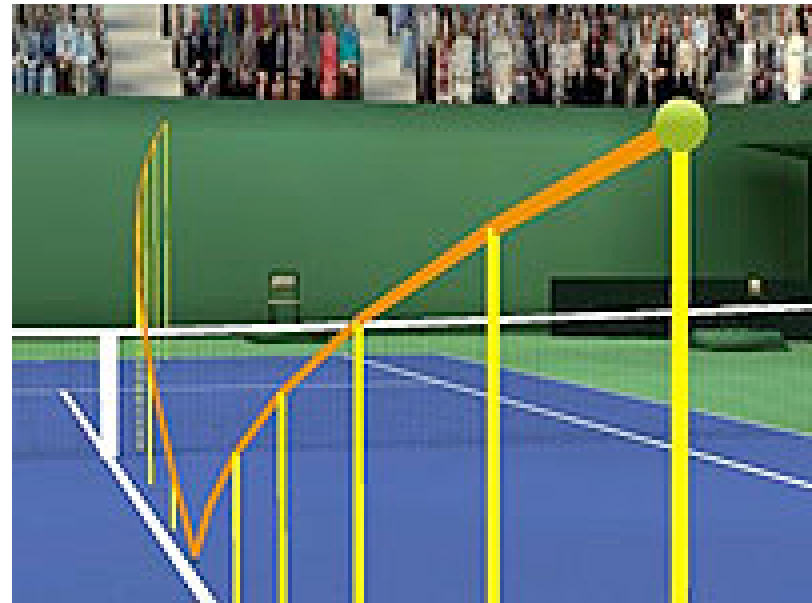
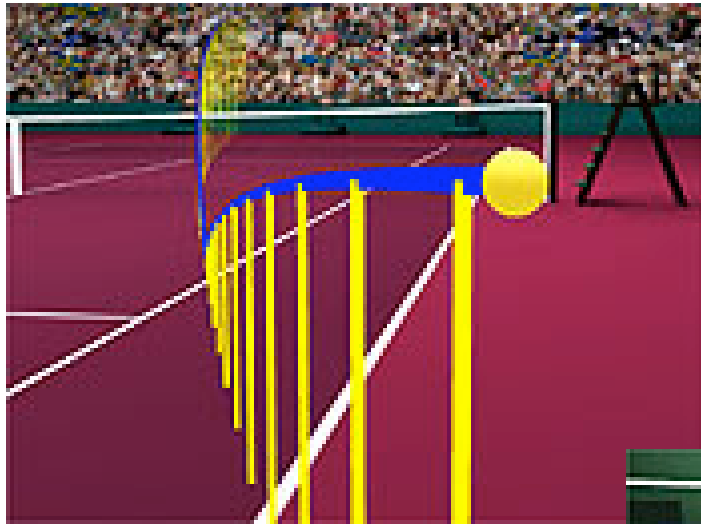
On court displays



TV Graphics



HawkEye



www.wimbledon.org

THE WIMBLEDON SHOP
Official Wimbledon Merchandise

Item	Price (GBP)	Price (USD)
Embroidered Guest Towel - Green	£ 8.00	\$ 11.28 US
Crazy About Tennis - Hand Towel	£ 13.00	\$ 18.33 US
2004 Men's Championship Towel	£ 24.00	\$ 33.84 US

Ah, Mr. Jones – we have been expecting you...

- **How many customers do you expect to use your website?**
- **When do you expect them to use it?**
- **When are the peaks going to be?**
- **How can you make sure your business can cope with the peaks?**

Response times

- **How long would you wait for a webpage to load?**
- **What happens if a customer gets bored of waiting for your site to load?**
- **Is the time you are willing to wait dependent on what you're waiting for?**
- **What could you do to improve the time your website pages take to load?**

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IT Architecture from First Principles

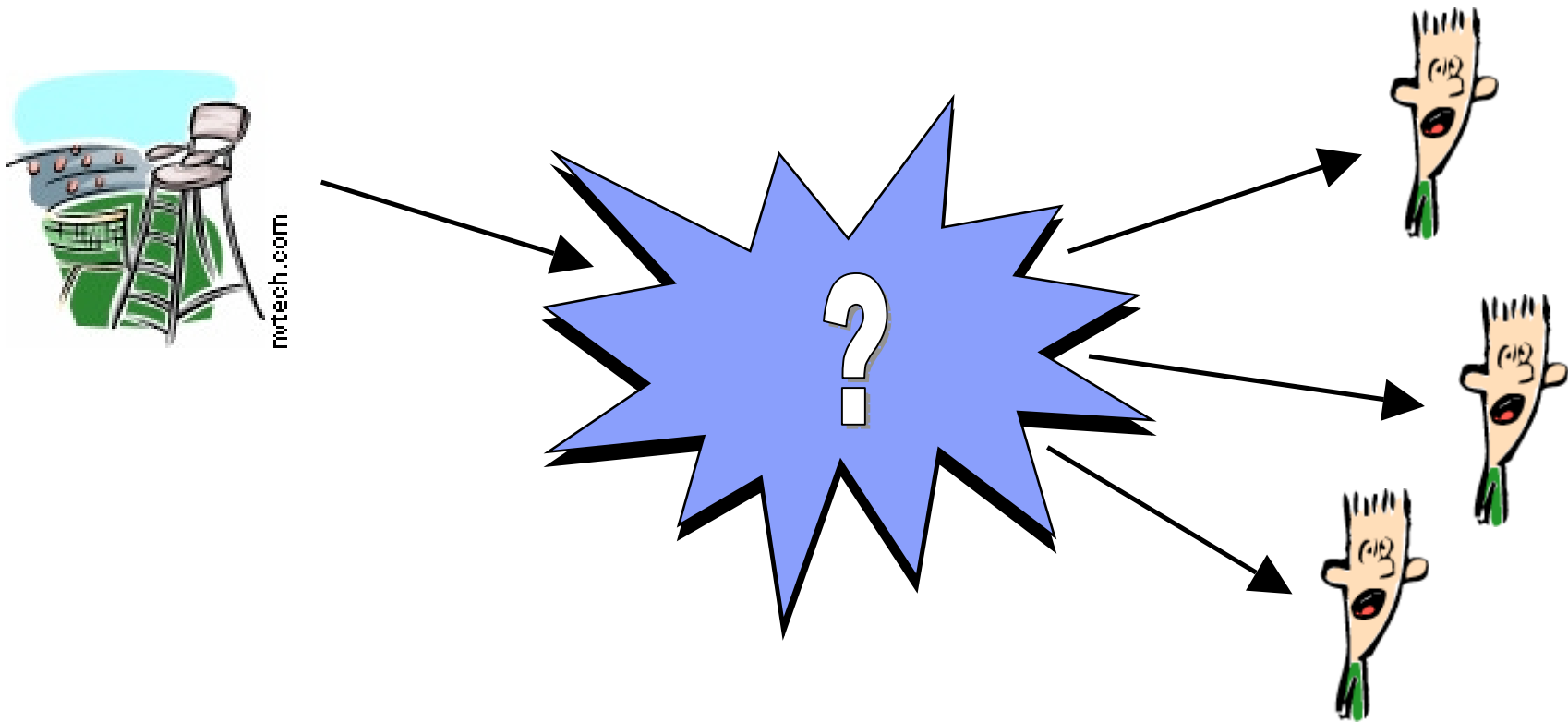
What problem are you trying to solve?

We want to provide Wimbledon fans around the world the ability to get scores from the tennis matches updated as soon as it happens on a point by point basis to encourage them to feel part of the action even if they aren't courtside...

Step 1: Gather requirements

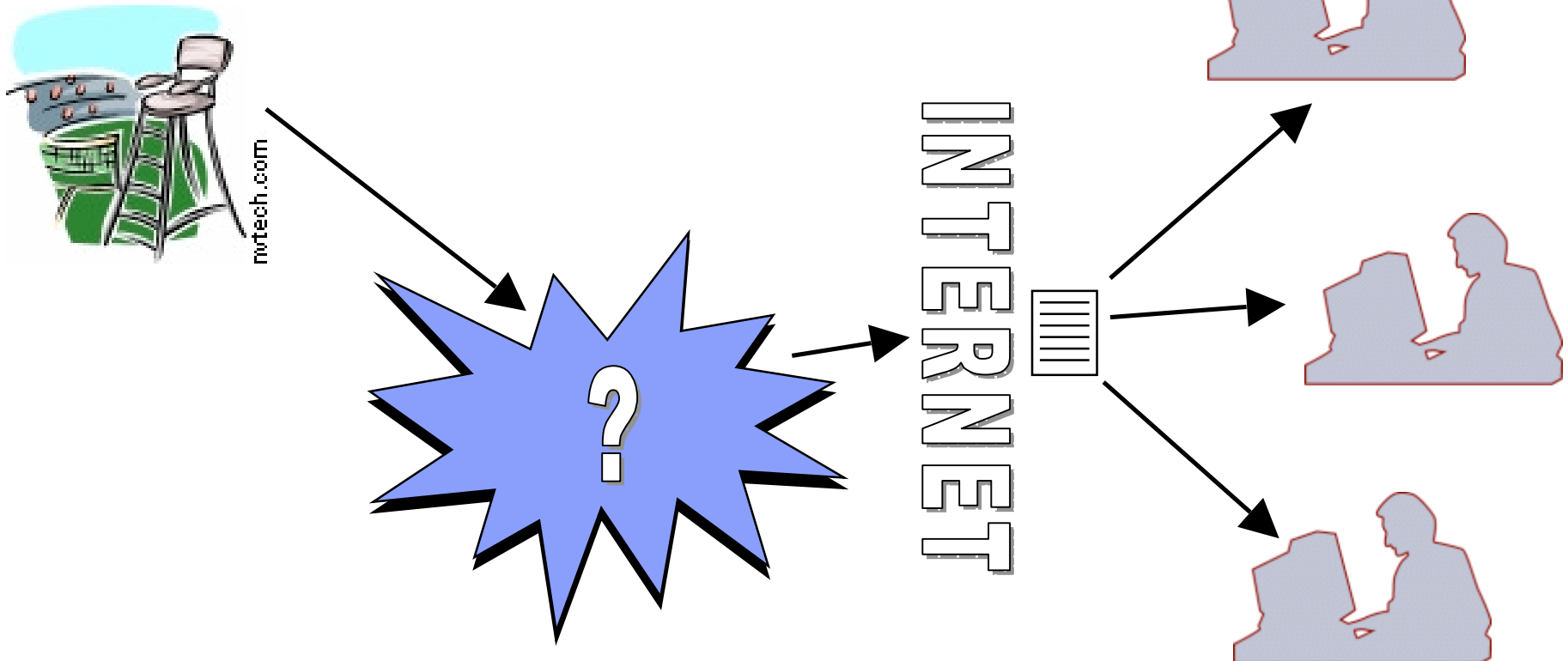
- **Who are the target audience?**
- **How many of them are there?**
- **What information do they want?**
- **What does “as soon as it happens” mean?**

Step 2: The Big Picture (System overview)



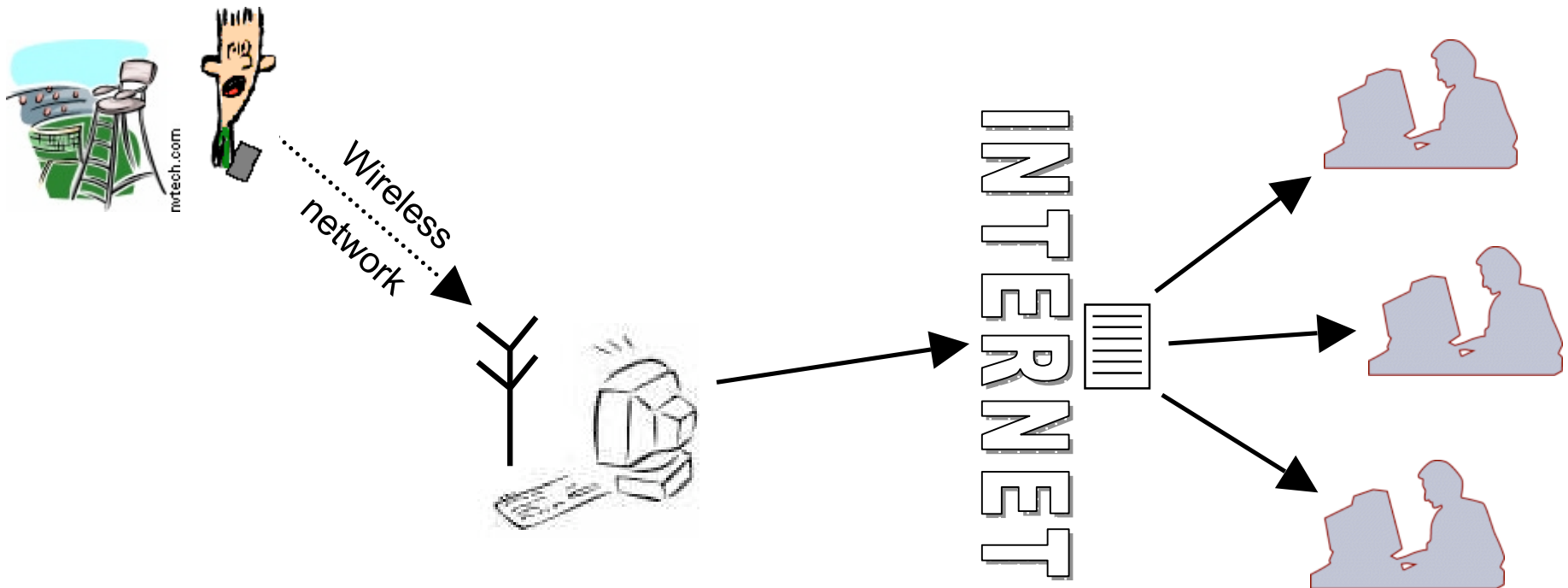
- How are users going to obtain the information?

The Big Picture (take 2)



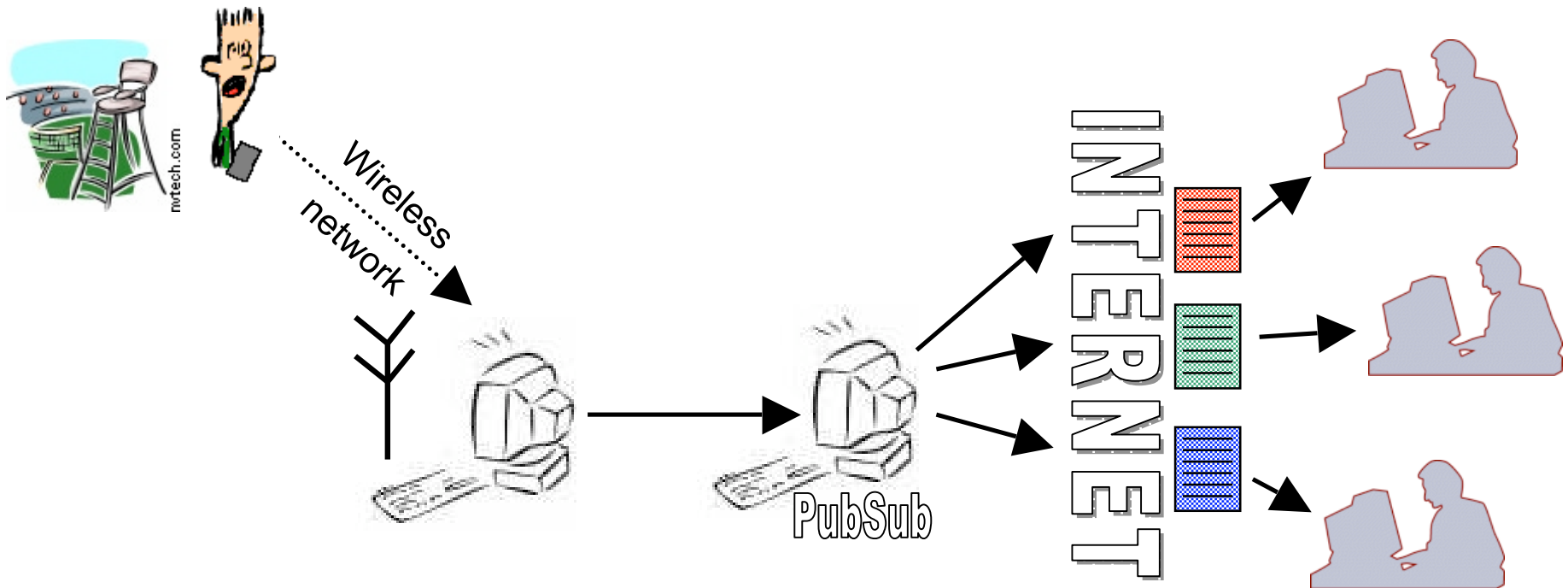
- How does the information get onto a computer?

The Big Picture (take 3)



- How can we give the service a personal touch?

The Big Picture (take 4)



- What will the information look like to the user?

IBM Realtime Scoreboard



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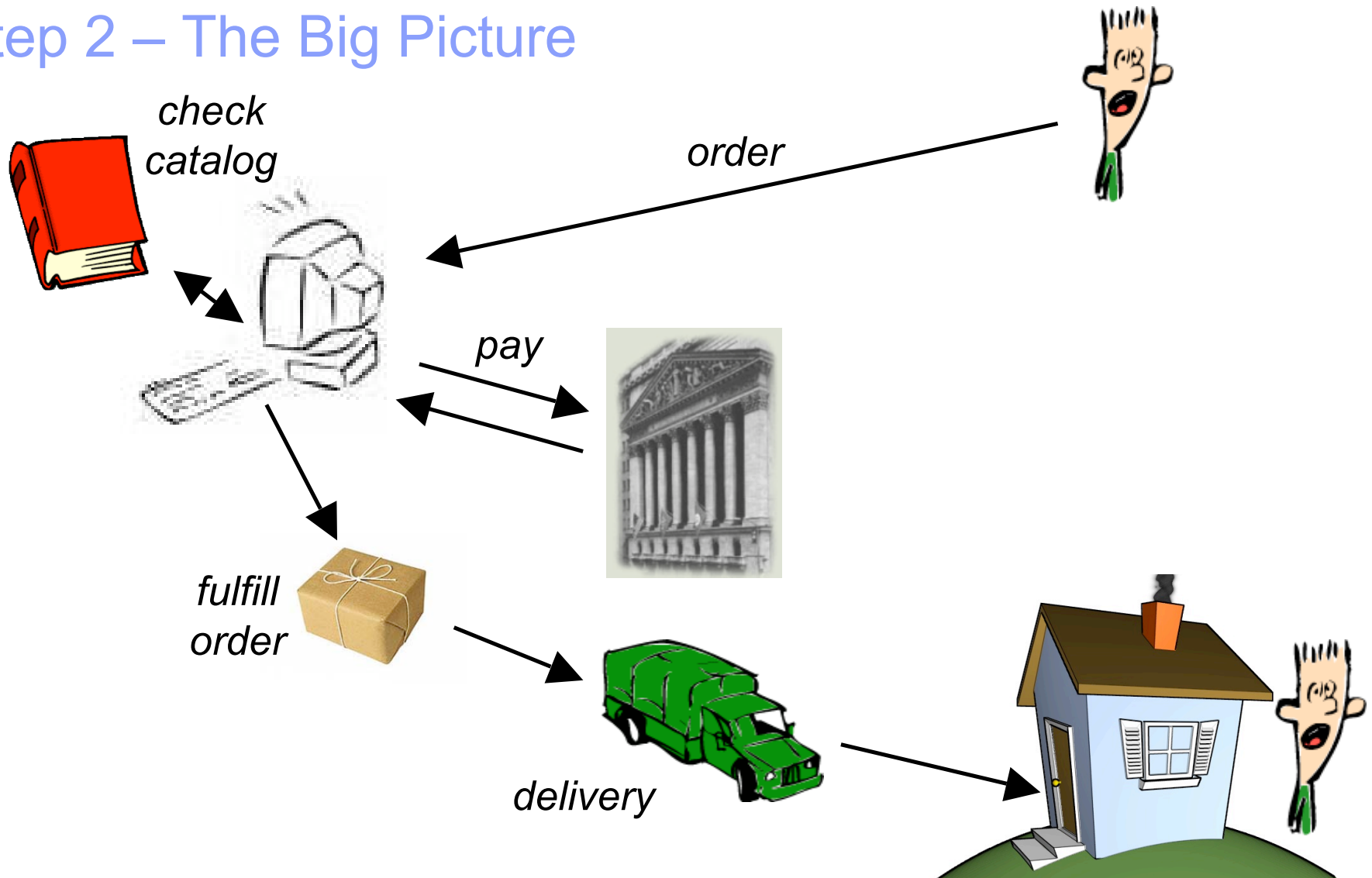
Online selling from First Principles

We want to put our souvenir shop online so that people around the world can order items from us 24/7.

Step 1 – Gather requirements

- **What is in the product catalog?**
- **Where are the customers? How many?**
- **What is the expected usage pattern?**
- **What does 24/7 mean?**

Step 2 – The Big Picture



Security in an online world

How can I give my pay for things over the Internet without my credit card number being found out by criminals as it is transferred between me and the website?

Take 1 – send it as normal



Take 2 – how to encrypt a message

- Think of a mathematical function that converts one number to another...

$$X = f(x, n) = 7(2nx + 75)$$

- x is the number you want to encode, and n is a special number that you need to know to decrypt it.

$$x = 1234, n = 17$$

$$X = 294217$$

- To decrypt the message, work out the inverse of the function and insert your personal number again.

$$x = f^{-1}(X, n) = \frac{1}{2n} \left(\frac{X}{7} - 75 \right)$$

Take 2 – sending the message



Take 3

- **What if there was a way of encoding information that did not require you to have the same key to decode it?**



Public Key Cryptography

- Although it is very easy to describe the analogy for how this works, it is difficult to find a mathematical function with the same properties.

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Summary

- **Connecting the physical world to computer systems**
- **Behind the scenes on a global website**
- **Designing IT systems (it's not big, and it's not clever)**
- **Sending sensitive information over the Internet**

- **What skills do you need to work in IT?**



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Questions?

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References

For further information on the topics covered, try the following references, or send me an email!

The Wimbledon Tennis Championships

<http://www.wimbledon.org>

<http://www.ibm.com/wimbledon>

<http://www.hawkeyeinnovations.co.uk>

Public Key Cryptography

The Code Book, by Simon Singh – ISBN 1-85702-879-1