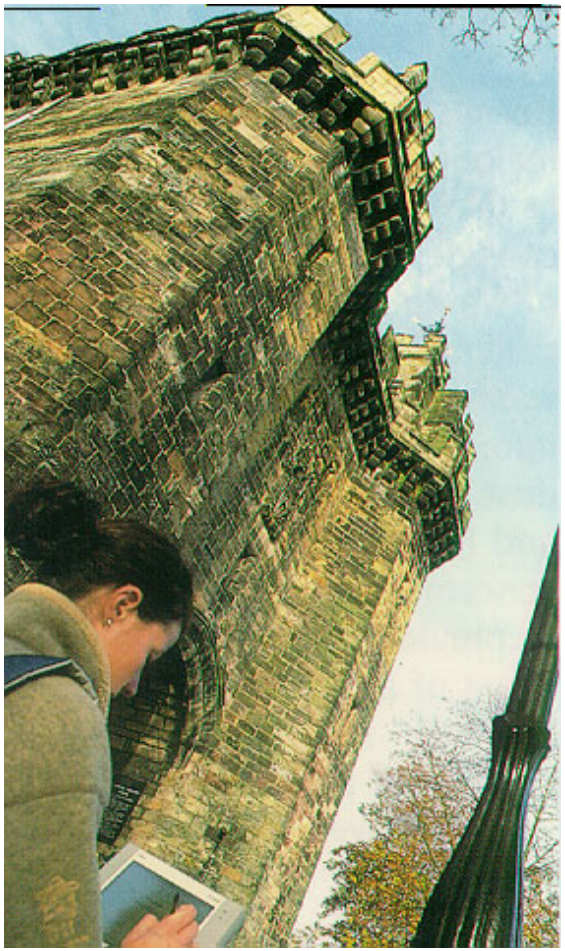
Experiences in Developing and Deploying the Archetypal Context-Aware Computing Application

Nigel Davies

Computing Department, Lancaster University
Lancaster, England
&
Computer Science Department, University of Arizona
Tucson, AZ

The GUIDE Project



- Project aims:
  - to develop context-sensitive guides for visitors to the city of Lancaster.
  - to provide location dependent tourist information.
  - to offer interactive services.
- To evaluate the GUIDE system through a series of user field trials.

The City of Lancaster

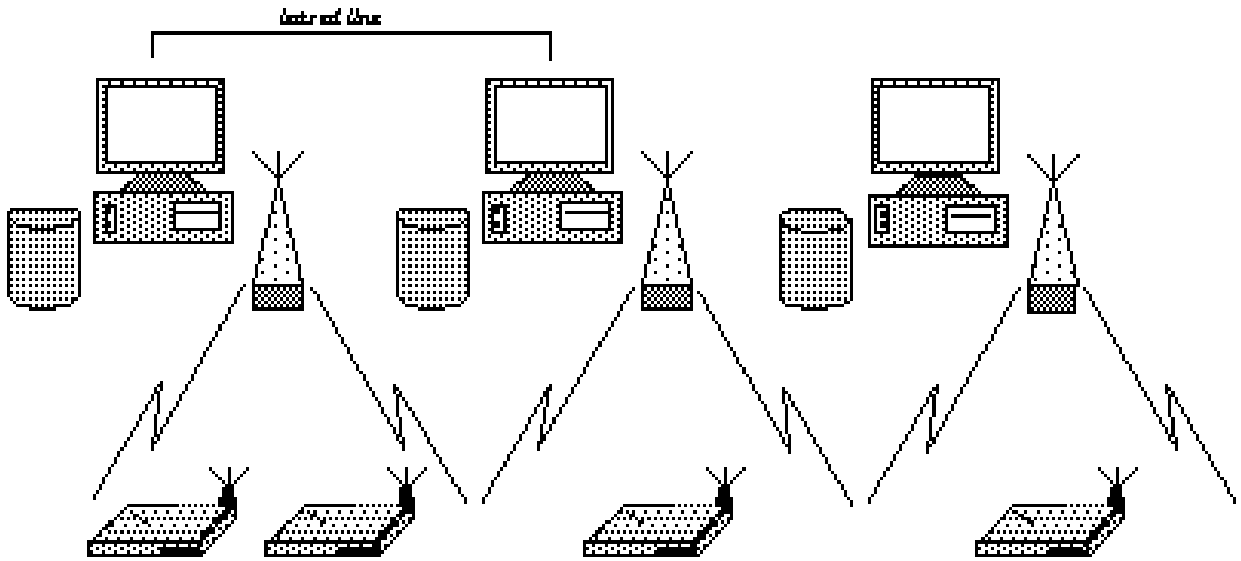
- The city is compact and all major tourist locations are within a radius of two kilometres.

Requirements Analysis: Some Observations

- Users reqs. very varied (more than you'd think!).
- Significant overhead supporting a wide range of languages.
- Significant number of repeat visitors during a single day.
- Strong requirement for interactive services:
  - changing attraction availability
  - bookings for accommodation etc.
  - requests which require human intervention
- Support for 'group tourists'.

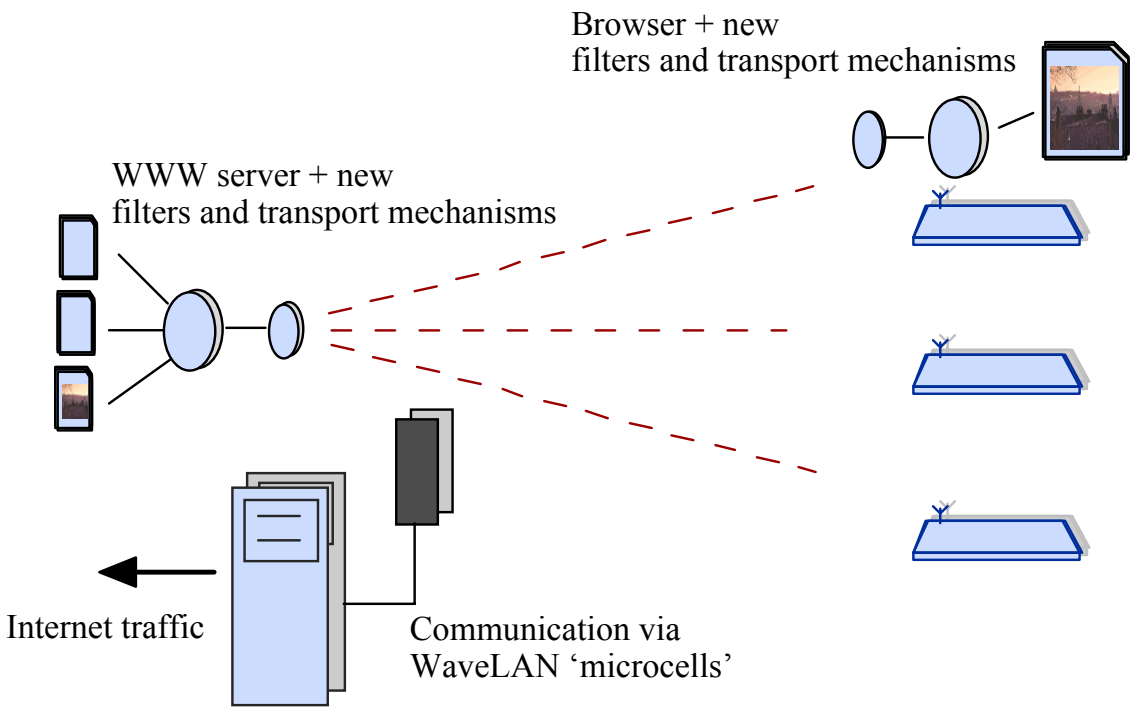
Fundamental Design Decision

- From the outset we decided to download information dynamically rather than rely on local storage:
  - should (might) make end-systems cheaper
  - should make end-systems more general purpose
  - more interesting

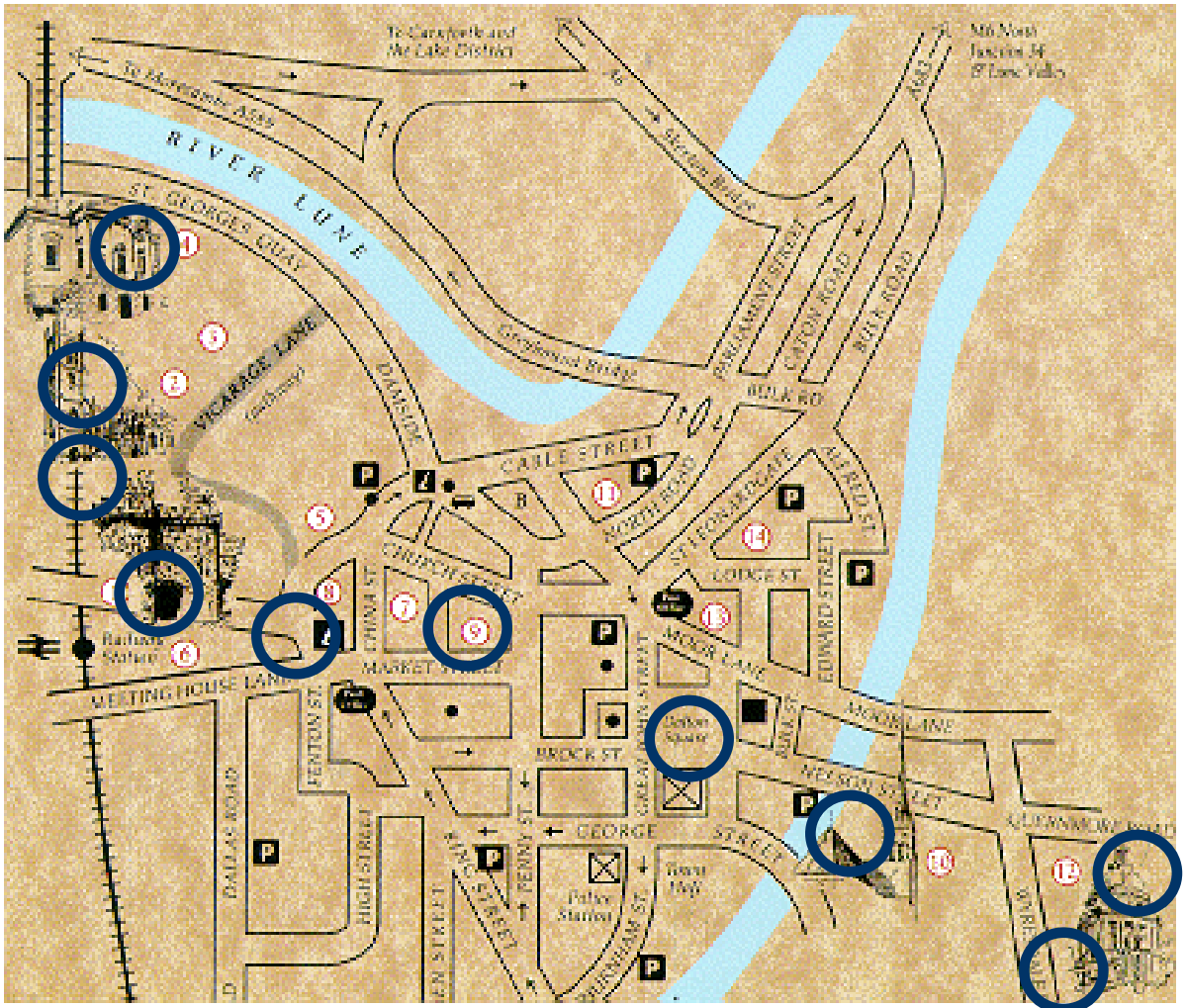


System Architecture

- WaveLAN used to create microcells which support information download.
- New transport mechanisms and filters optimised for multicast delivery.



Microcell Deployment Map



Modelling A Context-Sensitive City

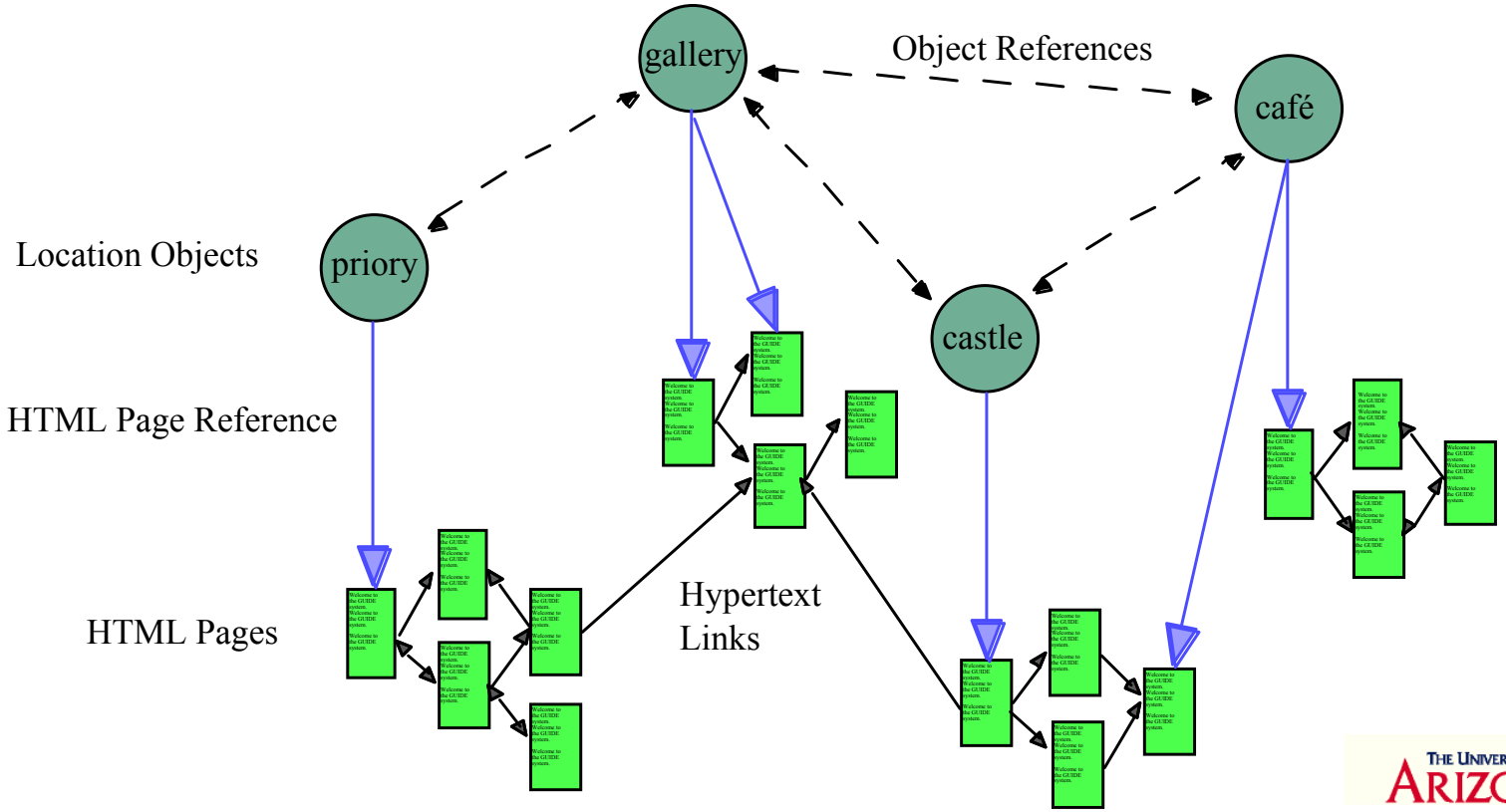
- Many factors affect the information to be displayed.

Additional Requirements

- Route guidance:
  - links which represent physical and virtual routes through information space
- Active entities which can respond to events:
  - e.g. changes in availability
- Virtual and physical tours:
  - users who wish to ‘visit’ a city before visiting the city !
- Information Persistence
  - you would like the system to have information about users which persists across multiple visits

The GUIDE Approach

- Currently adopted a hybrid approach with two distinct models.



The GUIDE Approach

- Pages contain tags which allow for simple tailoring

```
<GUIDETAG history>
      some historical information
</GUIDETAG>

<GUIDETAG if visits != 0>
      welcome back
</GUIDETAG>
```

Allow standard page creation tools to be used.

The Application

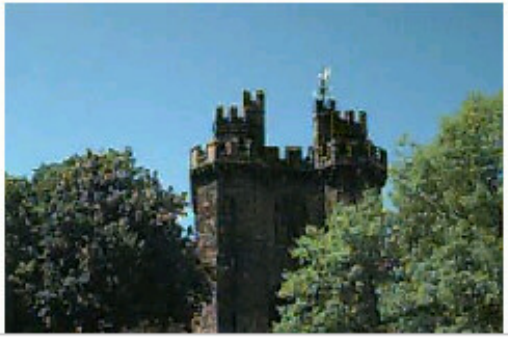
GUIDE - April 1999

Application

Info | Map | Locator | Help | Hold | Back | Stop | Refresh | Forward

Information

You are in an area of town known as Castle Hill now Nigel.



The imposing gateway to the prison is known as the John of Gaunt Gateway and is named after John of Gaunt, Duke of Lancaster. A full-length statue of John of Gaunt stands above the gateway, which was erected in 1826.

It's quite a steep climb up to the gatehouse but the Castle's entrance was deliberately placed so that anyone approaching it should arrive out of breath - just in case!

Current Location

Lancaster Castle - John O'Gaunt Gateway

Tour Guide / Route Guidance

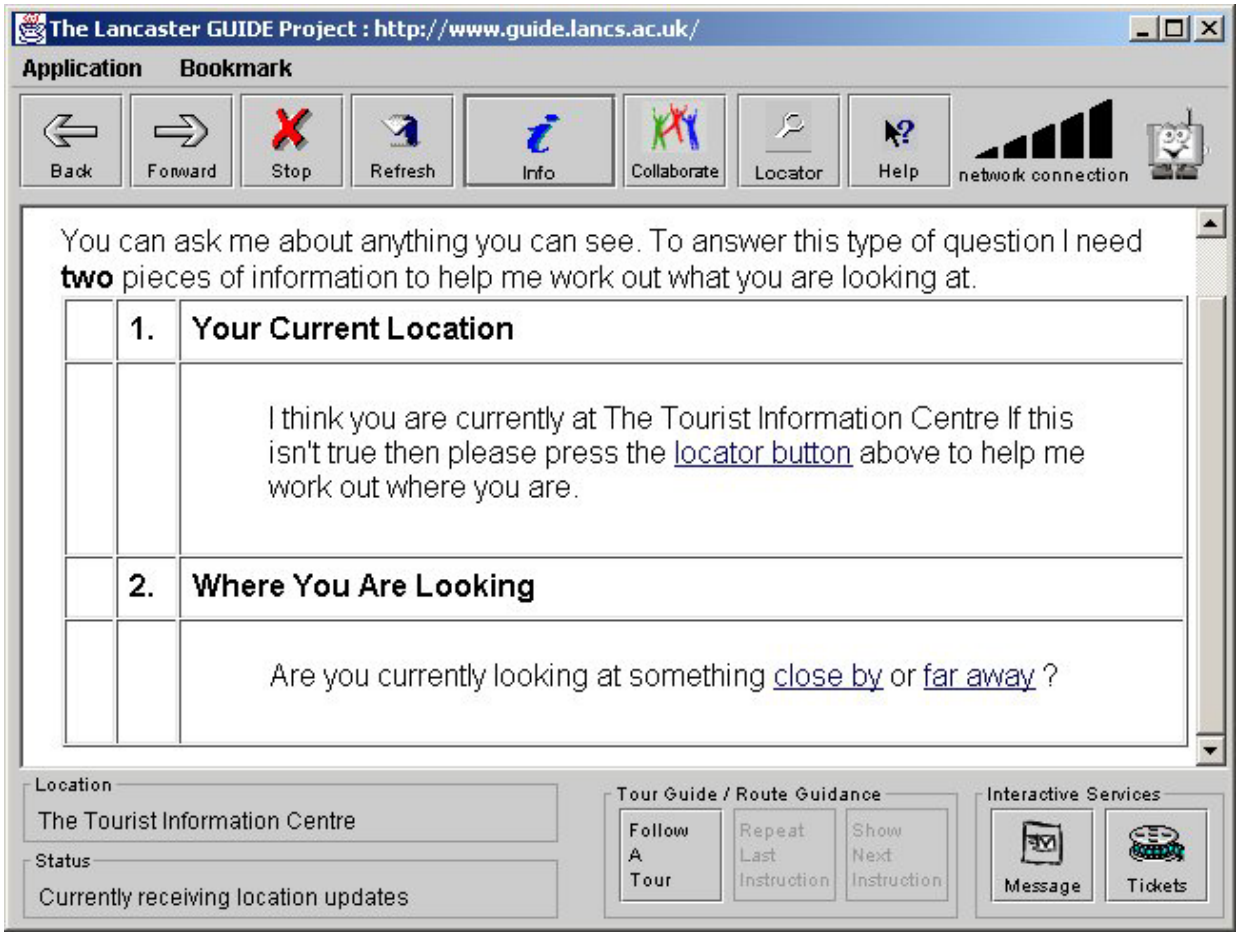
Tour | Repeat | Next

Interactive Services

Message | Tickets

The System in Use

Answering the $1,000,000 Question



Evaluation

- Ascertain quality of experience
- Determine the implications of our approach
  - Would users trust the system?
  - Granularity of location information?
  - What about the role of connectivity?
- Expert walkthrough & Field Trial
  - 60 visitors tried the system
  - Usage period between 10 mins and 1 hour

Key findings ….

- Visitors appreciated location-aware navigation and granularity of positioning was sufficient
- Visitors trust of the system was dynamic
- Visitors in 10-20 age group revelled in technology
  - Explored twice as many links per minute
- 45/60 accepted the portable end-system
- Connection based services very popular

Future Work

- GUIDE specific work:
  - educational and entertainment applications.
  - more context sharing experiments.
  - migration to a new end-system.
  - evaluation techniques for context-aware applications.
- Infrastructure activities:
  - IPv6 Testbed with Cisco, Microsoft and Orange
  - new interactive applications aimed at city residents
  - public access points
  - “Traditional services” gateway
  - New location service

Concluding Remarks

- The GUIDE project is developing and deploy context-sensitive tour guides for visitors to the city of Lancaster.
- Guide provided us with a starting point for further experiments in ubiquitous wireless communications.
- The project was unique because of both the technical approach being adopted and the focus on user requirements and field trials.