AirSIMS

Visuals Draft Presentation

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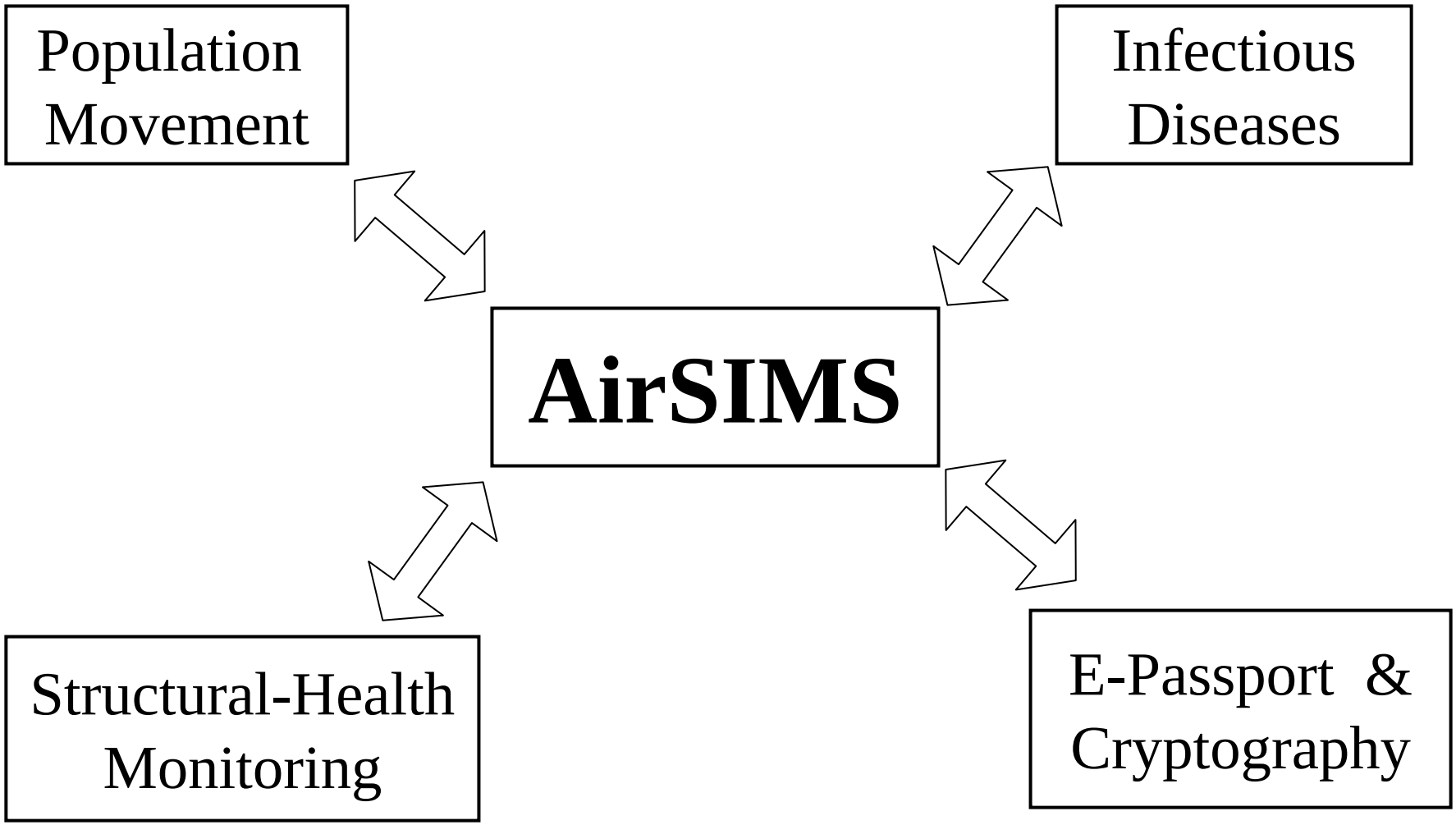
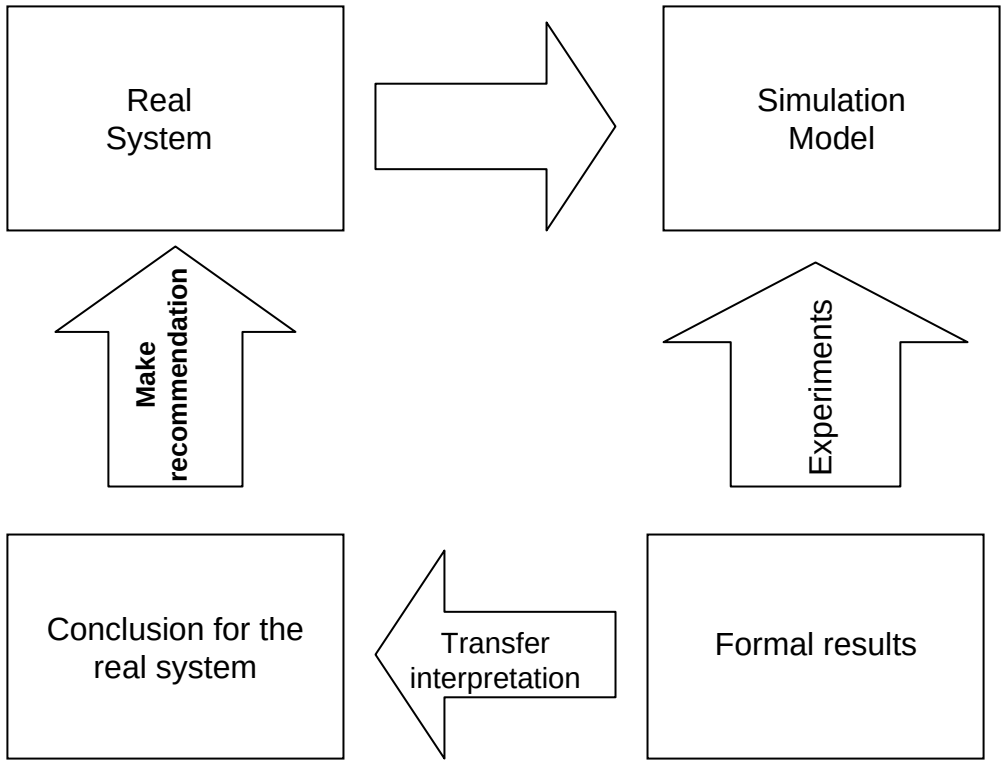
A System of Systems

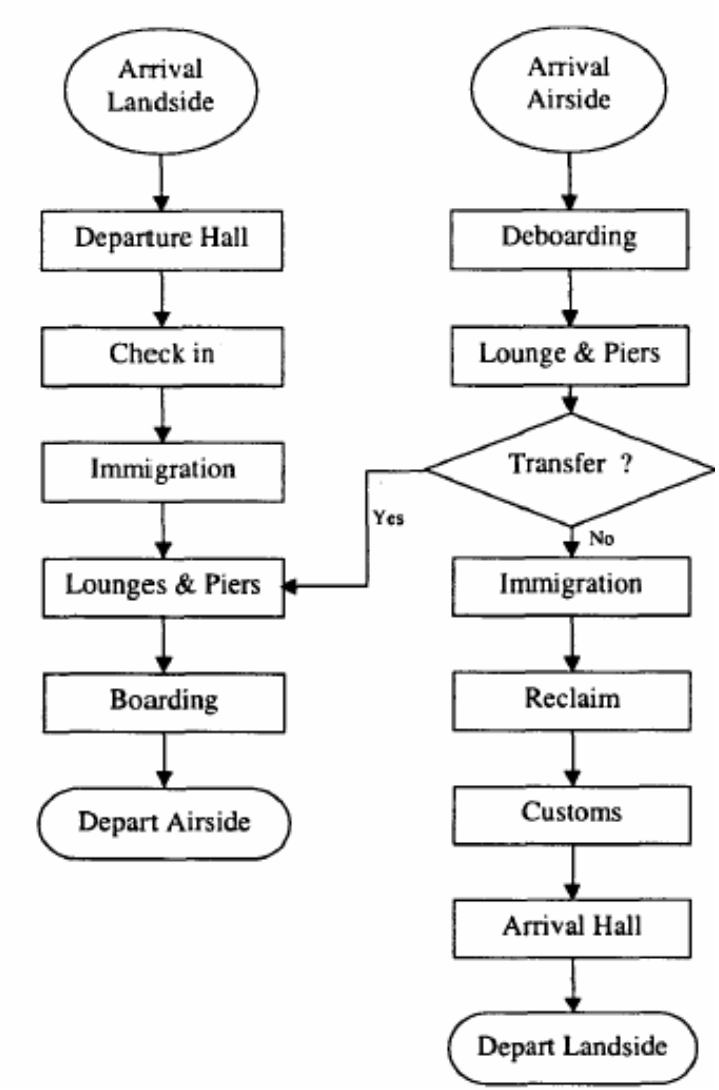


Population Movement



Simulation Model Flow Chart

Population Movement



Passenger Handling

Population Movement

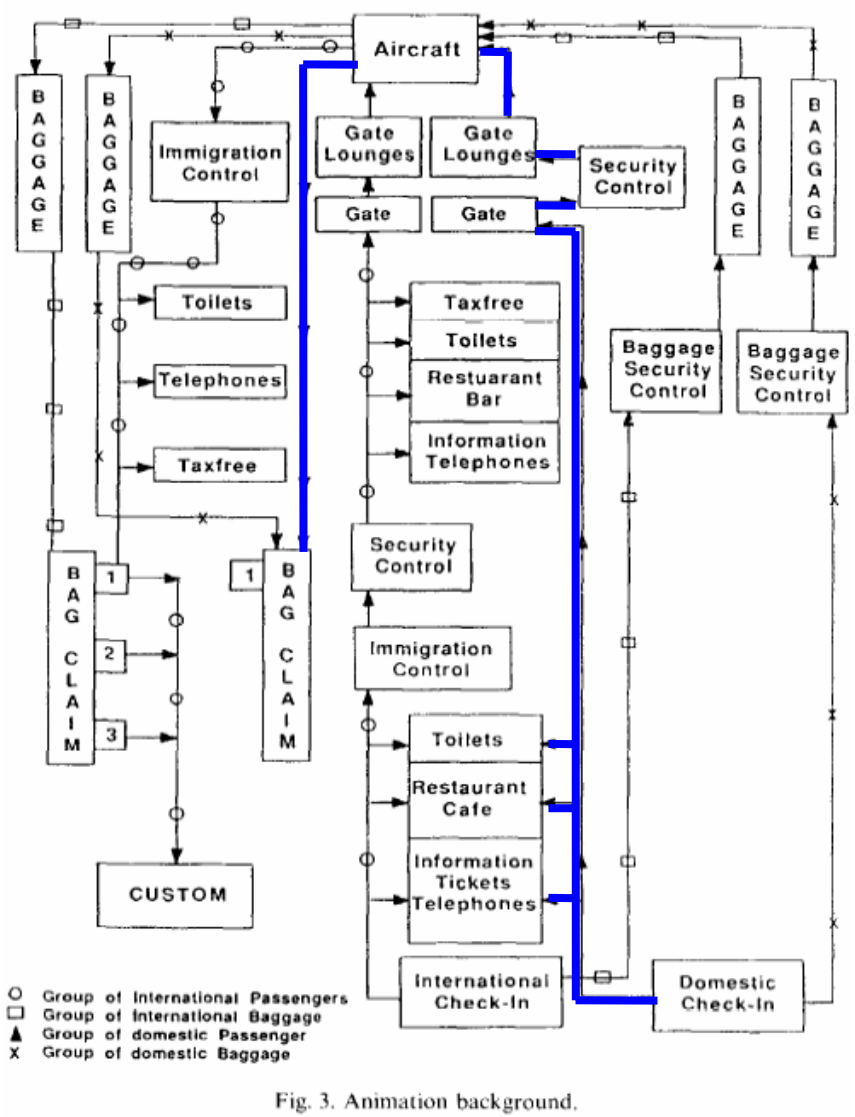
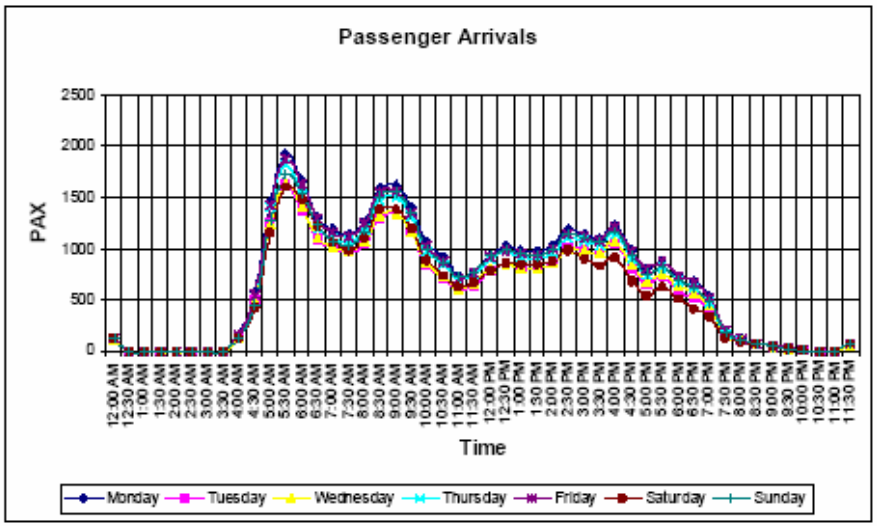


Fig. 3. Animation background.

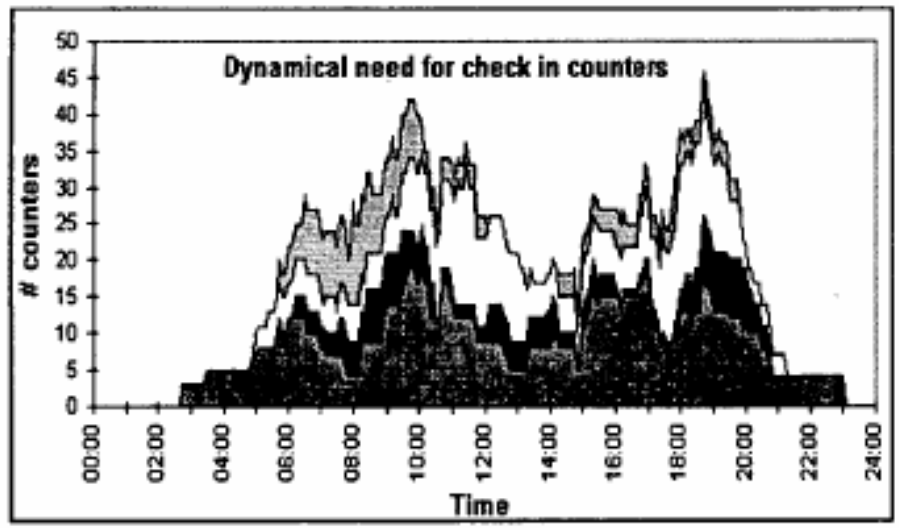
Passenger Travel Path

Population Movement

Passenger Movement Simulations



Passenger Arrival Pattern for 7 Days for a Large International Airport

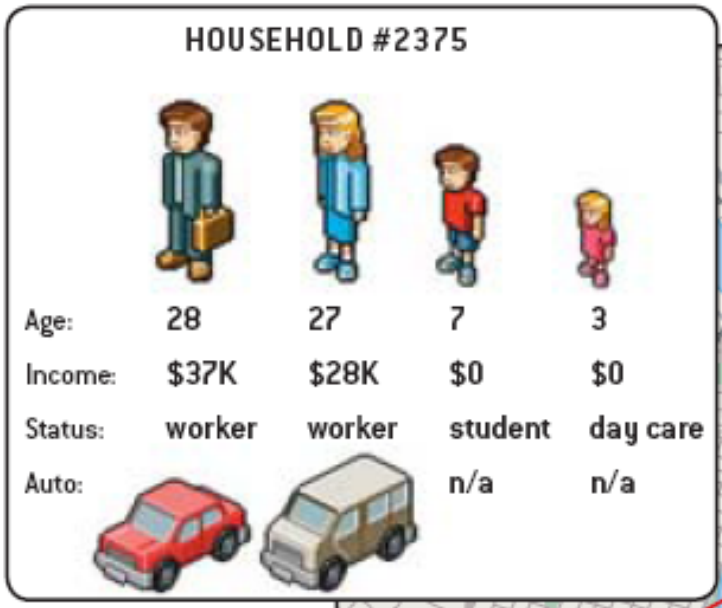


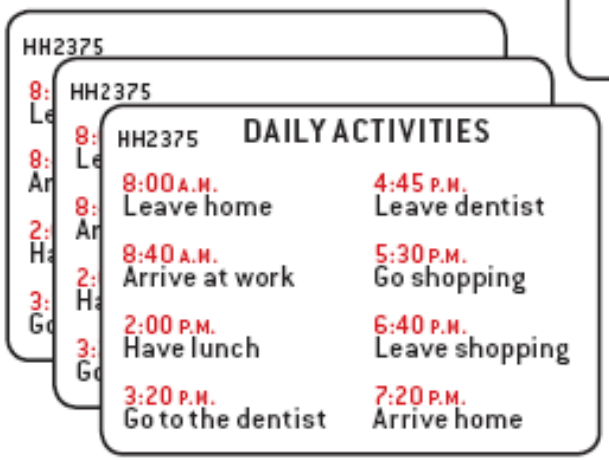
Check in Counter Usage

The original EpiSims model was based on Portland, Ore., but gathering sufficiently detailed information about 1.6 million real people and their activities would have been difficult and intrusive. A synthetic population, statistically indistinguishable from the real one, could nonetheless be constructed and given realistic daily lives using publicly available data.

SYNTHETIC HOUSEHOLDS

The U.S. Census Bureau provided demographic information, such as age, household composition and income, for the entire city as well as 5 percent of its complete records for smaller study areas of a few square blocks. Through a statistical technique called iterative proportional fitting, these two data sets were combined to create households and individuals with statistically correct demographics and geographic distribution.





ACTIVITIES

Most metropolitan planning offices conduct detailed traveler activity surveys for small population samples of a few thousand. These logs track the movements of each household member over the course of one or more days, noting the time of each activity. By matching the demographics of survey respondents to the entire synthetic population, realistic daily activities can be generated for

LOCATIONS

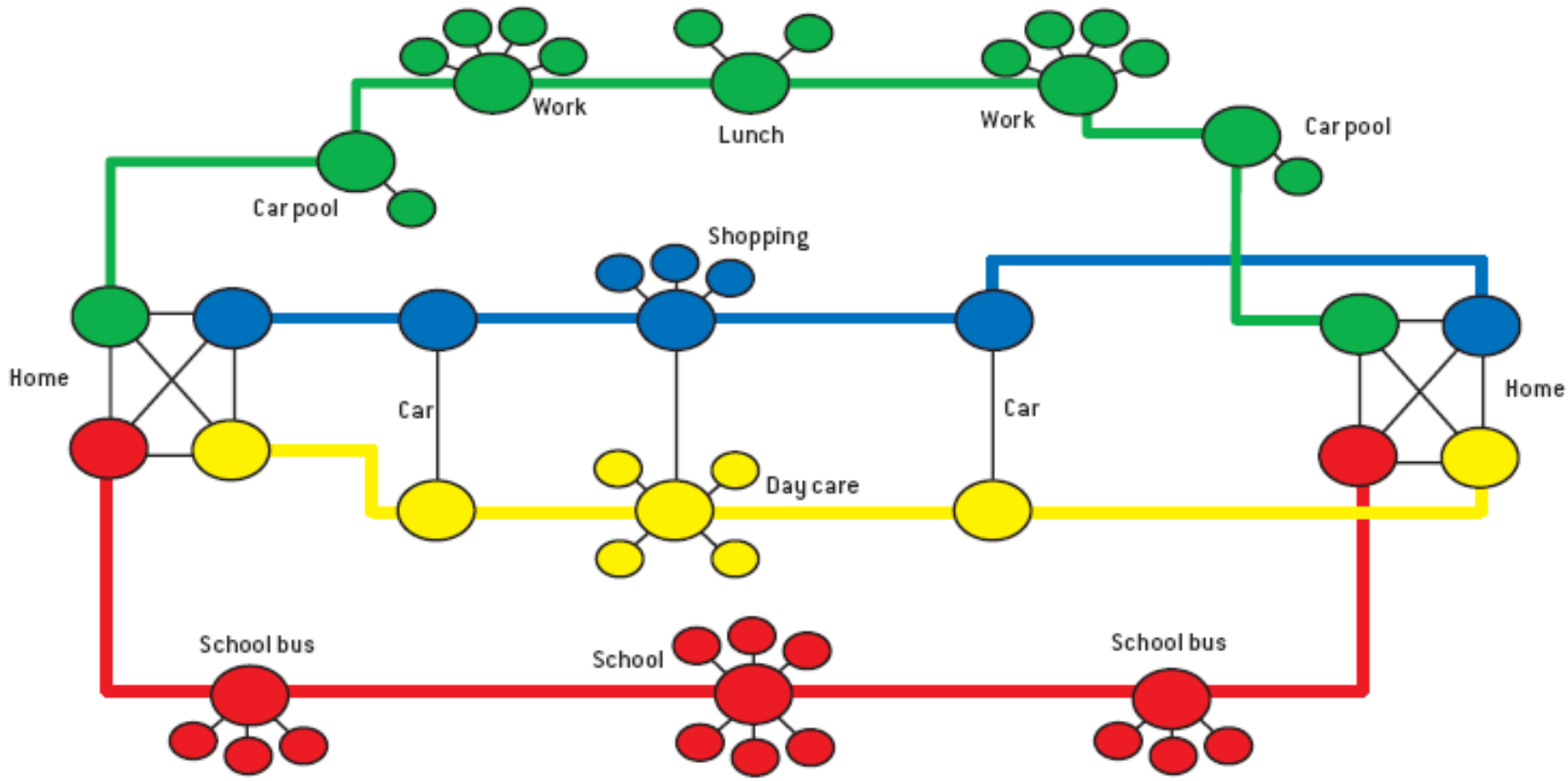
Setting the population in motion requires assigning locations to every household's activities. Land-use data for buildings, parking lots, parks and other places were associated with 180,000 locations in the model, providing estimates of the number of people performing various types of activities there. Activities were anchored to individuals' work or school locations, and then places were chosen for additional activities, such as grocery shopping or recreation, taking

BUILDING SOCIAL NETWORKS

TYPICAL HOUSEHOLD'S CONTACTS

Constructing a social network for a household of two adults and two children starts by identifying their contacts with other people throughout a typical day.

This diagram shows where the household members go and what they do all day but reveals little about how their individual contacts might be interconnected or connected to others.



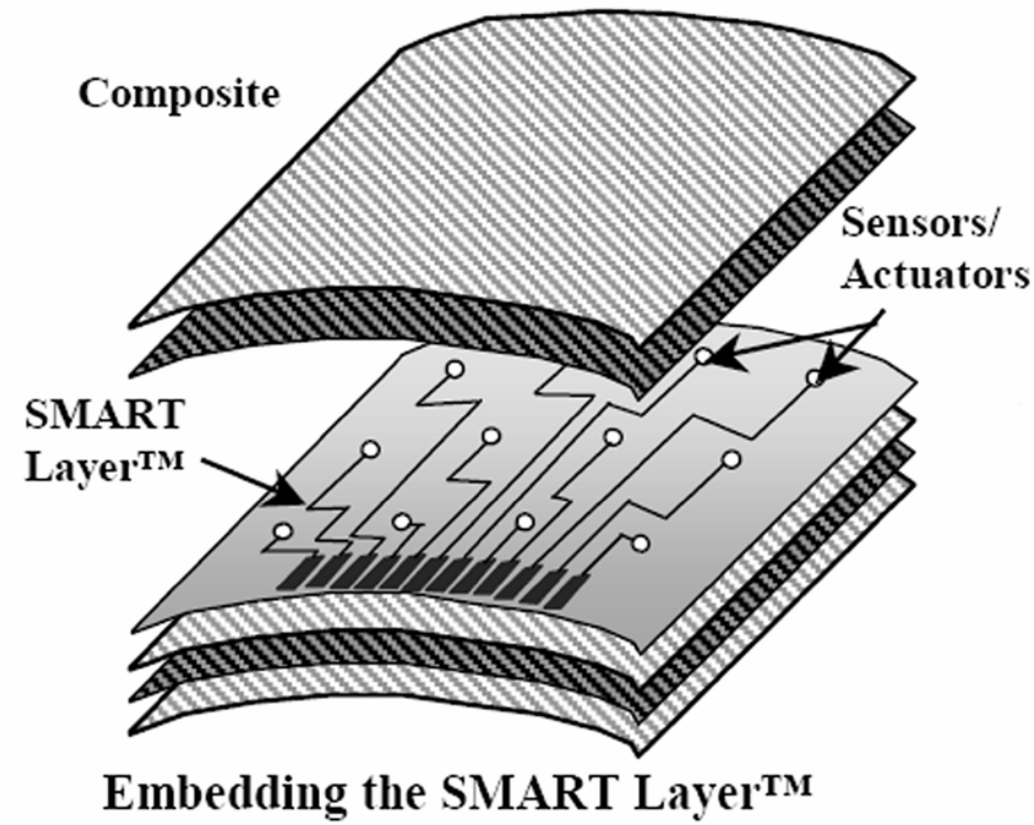
person	location	arrival time	departure time
1	A	8:00	17:00
2	A	8:00	12:00
2	B	12:00	16:00
3	C	8:00	14:00
3	B	14:00	17:00

Table 1: A hypothetical set of activities for 3 people visiting 3 locations.

	Real-Network	CL	FastGen-1	FastGen-2
number of locations	181230	178746 (98.63%)	181230 (100%)	178668 (98.59%)
size of giant(locations)	181192	178571	181088	178611
number of people	1615860	1507234 (93.28%)	1507291 (93.28%)	1615860 (100%)
size of giant(people)	1615813	1507054	1507148	1615803
number of edges	6060679	6065637 (100.08%)	6060679 (100%)	6060679 (100%)
average degree (people)	3.7507	4.0227	4.0209	3.7507
time for generating a graph		>10 hours	<40 seconds	<30 seconds

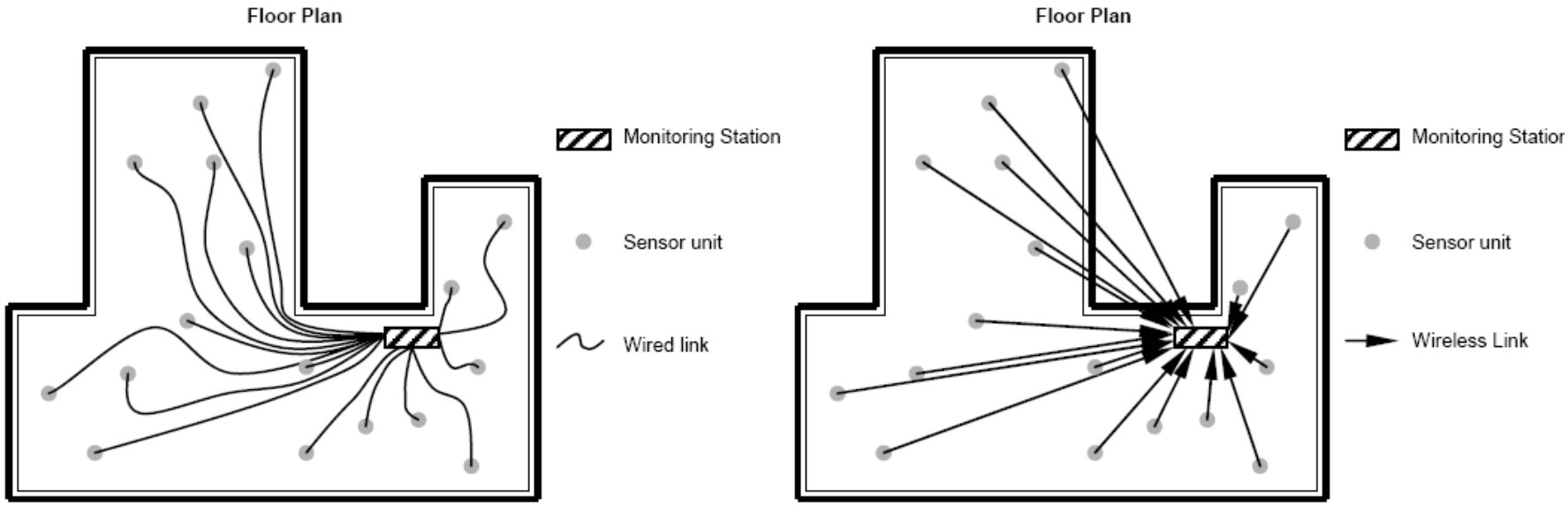
Table 1: Comparing the basic graph theoretic parameters for the Real-Network and randomly generated graphs. The last row compares the time it requires to generate such graphs.

Structural-Health Monitoring



Acellent Technologies SMART Layer™
from Lin *et al*

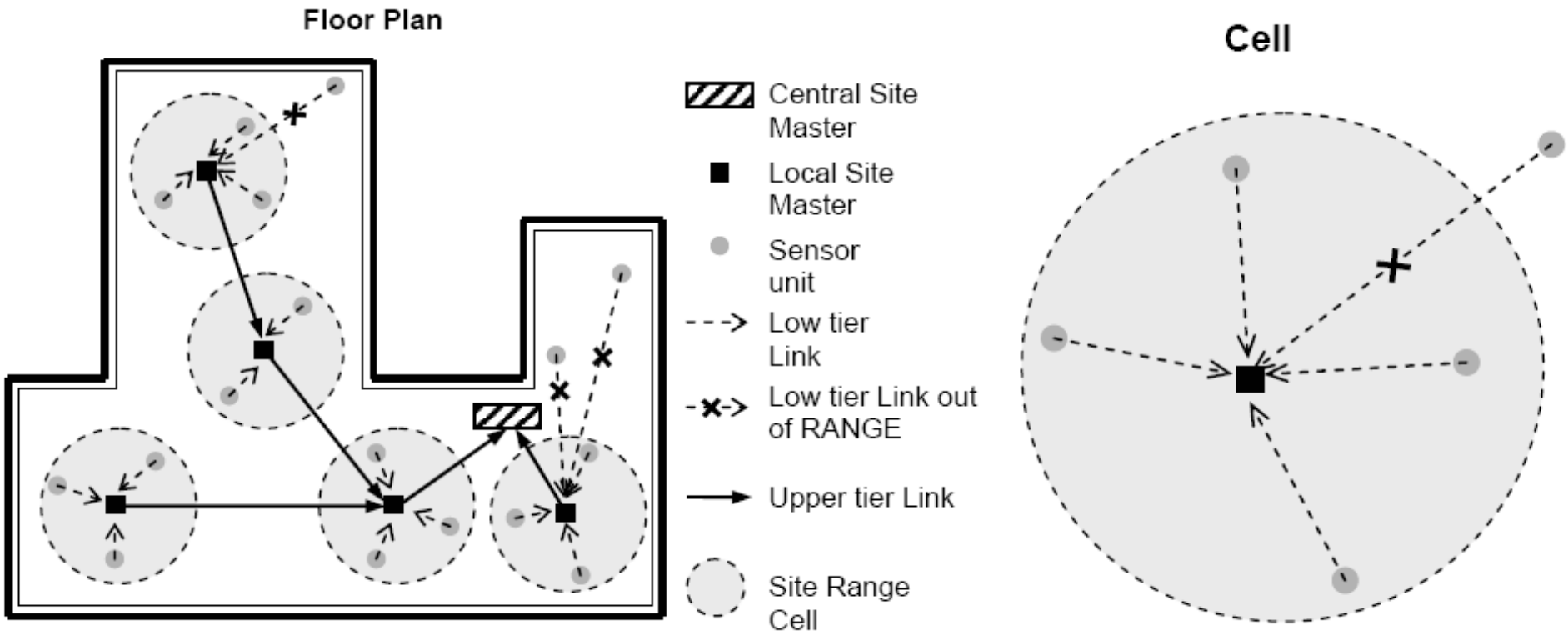
Structural-Health Monitoring



Basic Wired and Wireless Sensor Network Architecture

from Kottapalli, *et al*, revised by Mastroleon *et al*

Structural-Health Monitoring



Two-Tier Wireless Network Architecture

from Kottapalli, *et al*, revised by Mastroleon *et al*

How Cryptography Could Improve National Security

Outline

- Problem with Conventional Passport
- E-Passport
- How E-Passport works

Conventional Passport

- It could be falsified easily
  - There is no technological difficulties
- The only security feature is a photograph of the holder
  - The photograph could be 10 years old
- Fake passports can’t be identified easily

How to Make a Fake Passport?

- The easiest way – steal one from some one, cut the photo out and replace it with your own
- You can buy one from who makes fake passports
- There are other ways too, just ask some criminal and terrorist

In summary:

Current passports could be faked easily due to the lack of advance security features; therefore, continuing to use them may pose a danger to national security

A Feasible Solution

- E-Passport could be used instead
- Similar things are already in wide use by places like government agencies and national labs

What is E-Passport?

- It is the next generation passport
- It contains all the information current passports have
- It contains new security features for protection, including biometrics, smart card, digital signature, and so on
- To use E-Passport, information about each individual holder must be collected and stored in some database system

Why use E-Passport?

- The best reason: it is extremely secure, it can’t be falsified
  - not easily anyways like the current version (unless you are willing to pay Wai a ton of money)

New Features in E-Passport

- Smart Card
  - It is basically a computer chip integrated into a conventional passport
  - It can store data in digital form
  - Data stored will be encrypted
  - Nearly impossible to hack into

New Feature in E-Passport (Cont)

- Biometrics
  - It refers to information that could (potentially) uniquely identify a person
  - It includes, but not limited to, facial recognition, fingerprint, DNA
  - E-Passport will use fingerprint because it is the simplest information to collect and store in the smart card

New Features in E-Passport (cont)

- Digital Signature
  - It is basically a piece of encrypted information
  - It is useful for checking if someone is really who say they are
  - The digital signature will be stored in the smart card

How do these new features work?

In summary, digital signature and biometric information will be stored inside the smart card. To identify anyone who holds such a passport, his or her fingerprint sample will be taken at the airport; then the fingerprint sample will in turn unlock the digital signature stored in the chip if there is a match. Finally, decryption will be done to the extracted digital signature to generate a message, which will be compared to a known correct message stored in a database system. If everything in this process matches, then we could be sure that the person is really who he or she says is.

How well does it work?

- E-Passport is as secure as it could get compare to the current version and other ideas
- Japan has tested a primitive prototype, and it was of great success

Summary

- Current passports are NOT secure
- E-passport would be a feasible option for replacement
- New security features in E-passport
- How E-passport works
- E-passport is secure and proven to work