

# **Web-enabling an Integrated Health Informatics System**



**Angel Petrovski and John Grundy**

Department of Computer Science

University of Auckland

New Zealand

# Outline



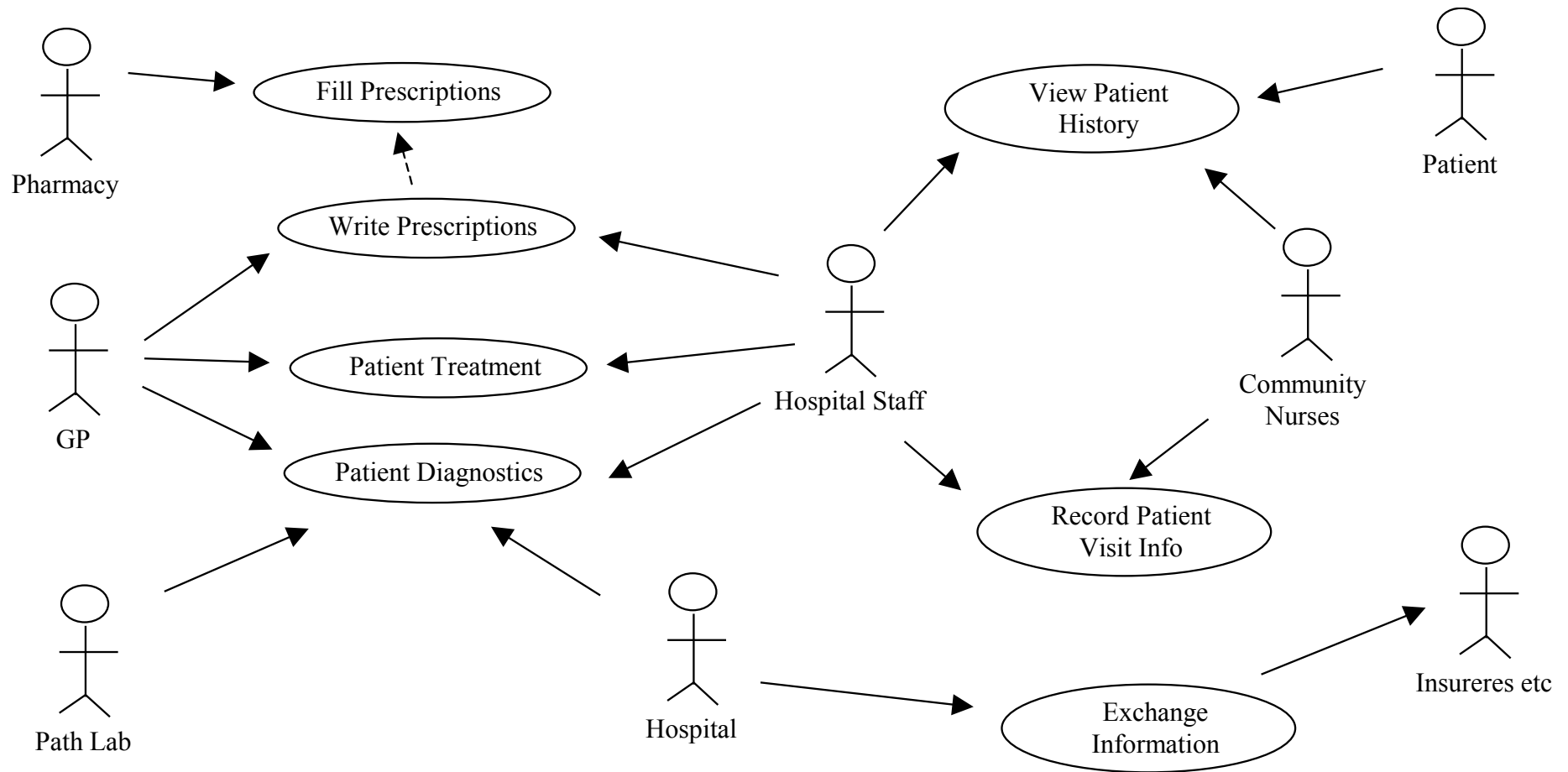
- ❑ Motivation for this work
- ❑ Our distributed Health IS Architecture
- ❑ OO Designs: EJBs; CORBA/XML; JSPs; Jini
- ❑ Examples of user interfaces (desktop; HTML; WML; mobile device Applets)
- ❑ Evaluation
- ❑ Conclusions

# Motivation

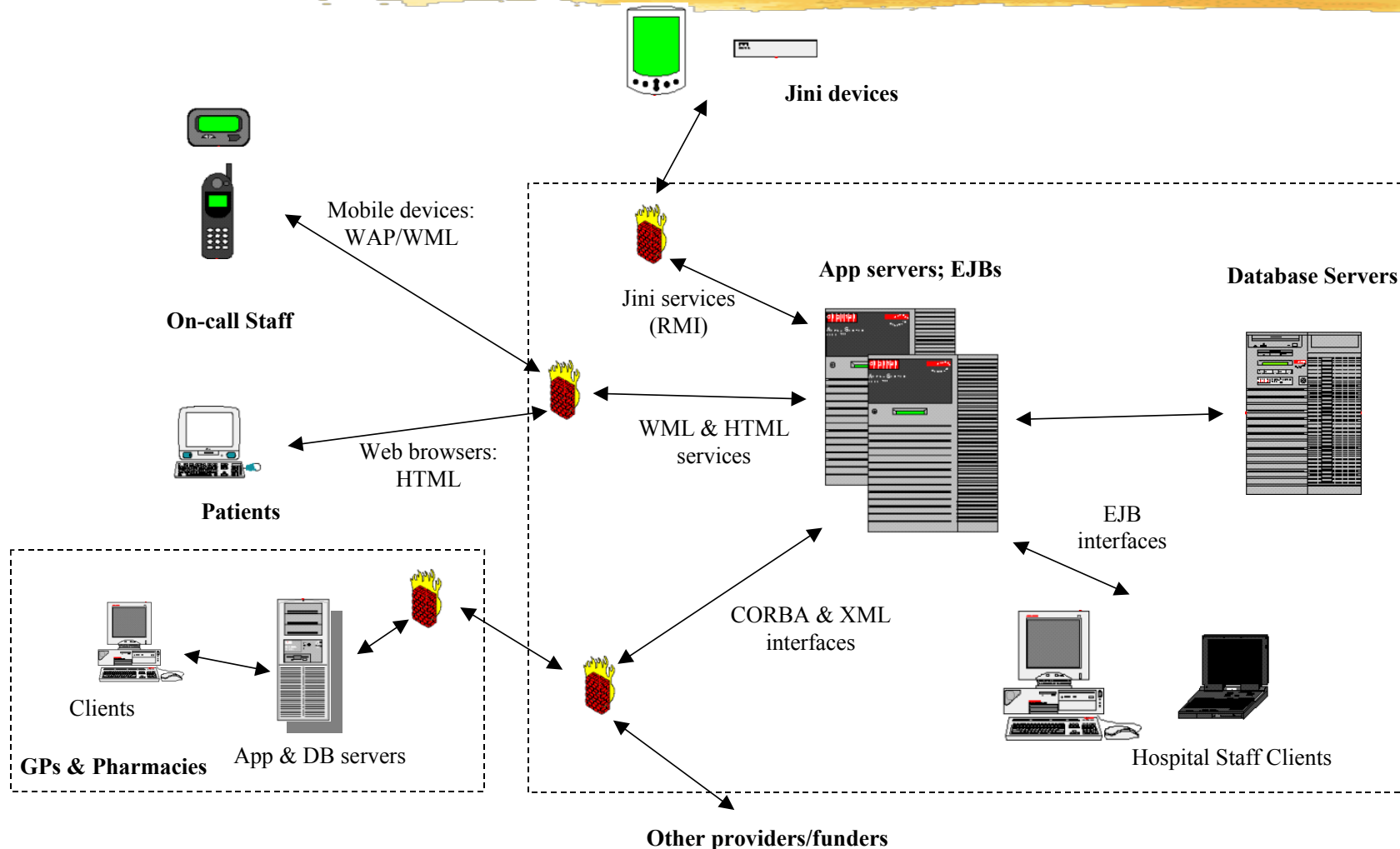


- ❑ Healthcare data used by many people
- ❑ Want to ensure timely, accurate, secure but widely accessible data; good UIs
- ❑ Want to enable intra- and inter-organisational data utilisation
- ❑ Want to support myriad of UI devices e.g. web (HTML), mobile (WAP), Applets plus external system information exchange

# Key Use Cases

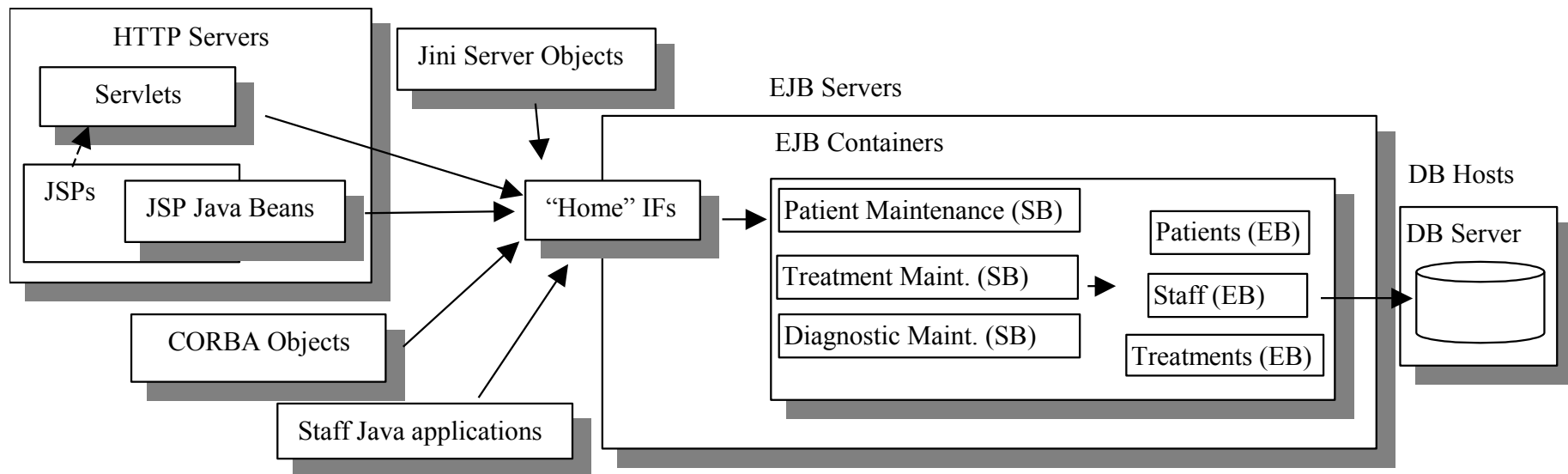


# Architecture

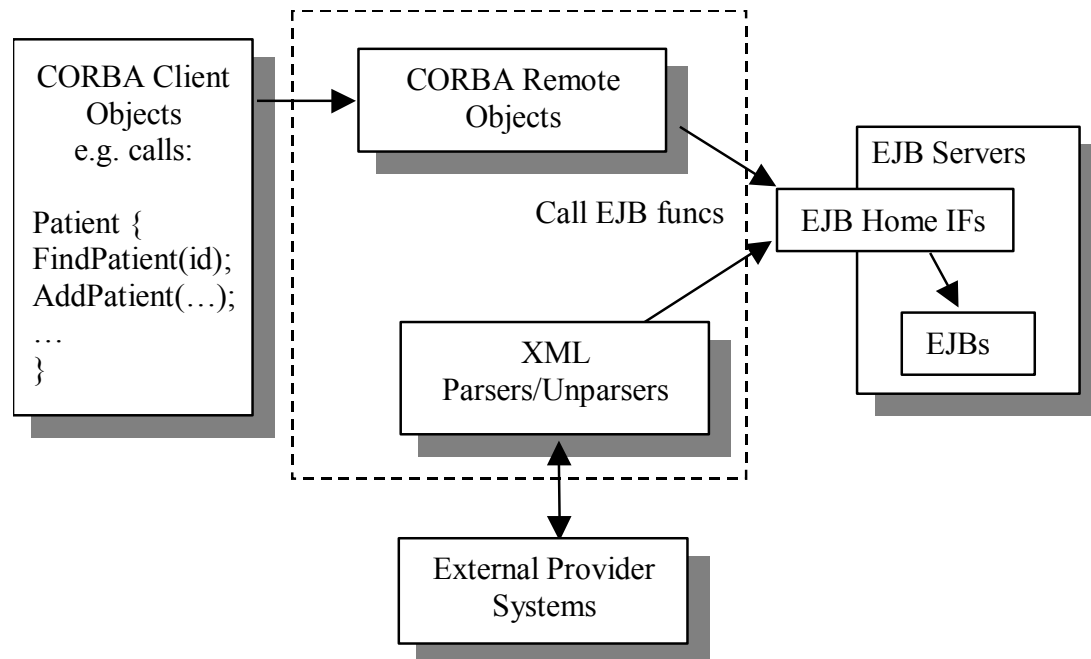


# Database and Application Server Organisation

- Enterprise JavaBeans
- Session Beans = server-side processing
- Entity Beans = data management/DB interface

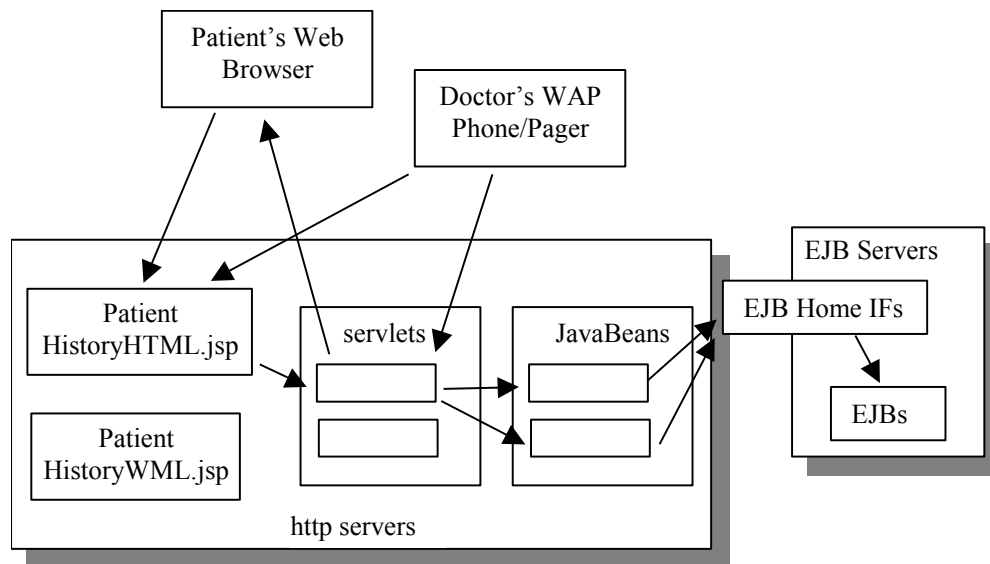


# External System Interfaces



- ❑ Remote object/XML architecture
- ❑ CORBA Remote objects
- ❑ Delphi and Java clients
- ❑ Remote object access when require data
- ❑ CORBA objects -> EJBs
- ❑ XML encoded data for e.g. insurers, other health providers

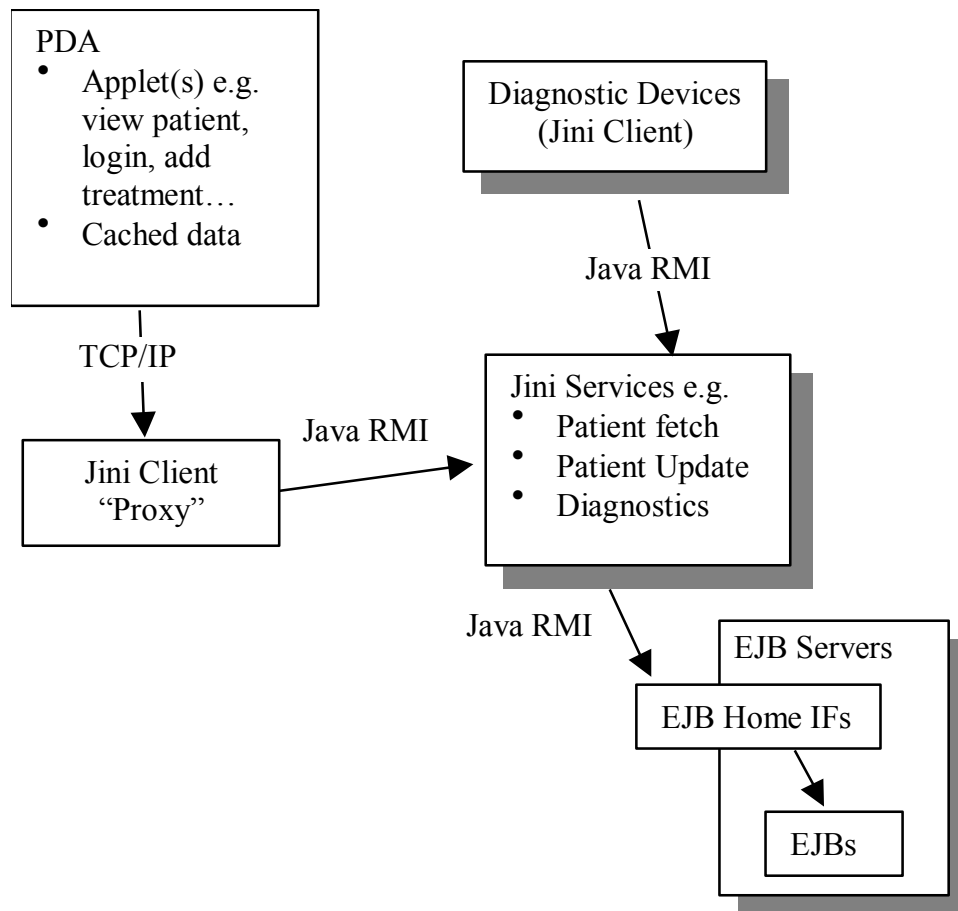
# Patient/Doctor Interfaces



- ❑ Need HTML and WML interfaces e.g. web browser, WAP phone
- ❑ JSPs used to provide wide-area access
- ❑ JSPs -> Servlets -> EJB access
- ❑ Device/OS independent
- ❑ SSL/HTTPS for security



# PDA Interfaces/Devices



- ❑ PDAs run Applets
- ❑ Connect via Java Jini
- ❑ Devices (ECGs etc) via Jini
- ❑ Multiple Jini services possible
- ❑ Applets = more flexible e.g. off-line, caching vs WML interfaces
- ❑ Need "proxy" for KVM...

# Example Interfaces

Doctor Interface  
Robert Lee  
Friday, 11 August 2000

Patient	Time	Taken By	Pay Status	Type of payment
1 Jane Harison	10:00	Ann	not paid	n/a
2 Jack Berich	11:00	Ann	not paid	n/a
3 Raechel Coll	12:00	Ann	not paid	n/a
4 Rob Veldov	13:00	Ann	not paid	n/a
5 Jack Berich	14:00	Ann	not paid	n/a
6 Jane Harison	15:00	Ann	not paid	n/a
7 Rob Veldov	16:00	Ann	not paid	n/a

Checkup Details | Patient Details | Prescription Details

Name: Jack Berich ID: jack005 DOB: 24/05/1959

**Home Details**  
Address: 146 Market St  
Suburb: Remuera Town: Auckland  
Phone: (09) 5298874

**Work Details**  
Address: 12 Gray St  
Suburb: Remuera Town: Auckland  
Phone: n/a

Email: jack@hotmail.com

Allergic Details: Fish Oil

Insurance Details: Southern Cross

Update Record Exit

GP (Delphi/CORBA)

http://delcpi8100/process.jsp - Microsoft Internet Explorer  
Address: http://delcpi8100/process.jsp

**Patient Information**

User Name: apet027

First Name: Angel

Family Name: Petrovski

Address Home: 14 Merton Road

Suburb Home: St Johns

Town Home: St Johns

Done

http://delcpi8100/login.html - Microsoft Internet Explorer  
Address: http://delcpi8100/login.html

**USER LOGIN**  
\* Required Fields

User Name\*  
apet027

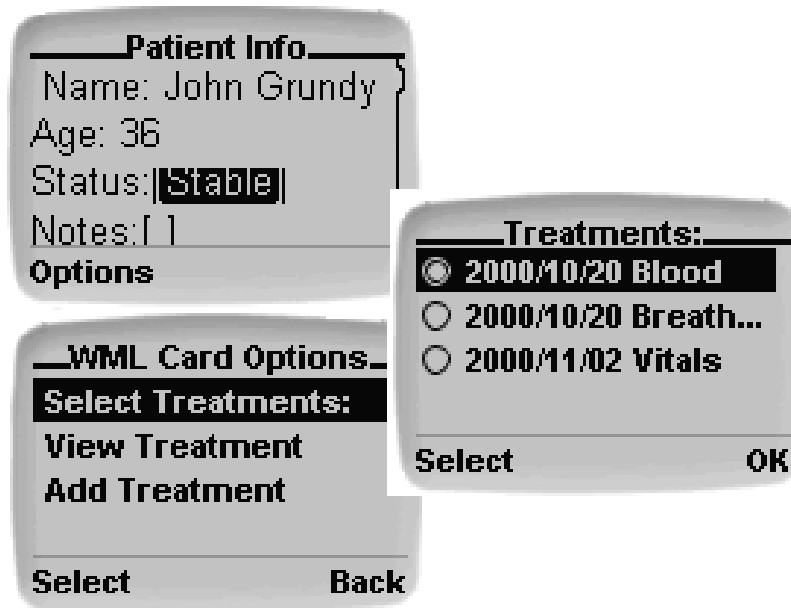
Password\*  
\*\*\*\*\*

Submit Reset

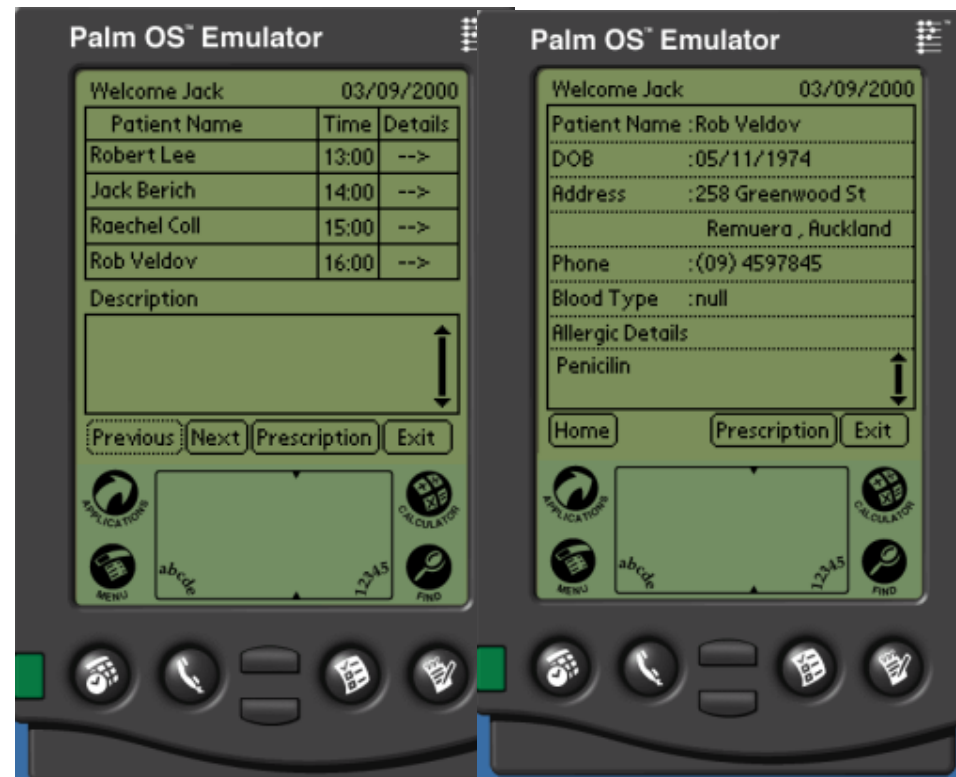
Done Local intranet

Patient (JSP/HTTP)

# Mobile Interfaces



Doctor (WML/WAP)



Nurse (PDA/Jini)

# Experiences



- ❑ EJBs – scalable application server tier components; a lot of effort to reuse; J2EE SDK tools lacking (at present)
- ❑ CORBA/XML – isolate technologies well; effort to program; data translation issues
- ❑ JSPs/WML – relatively easy to build; inflexible; must be on-line services
- ❑ Jini/PDA Applets – flexible; cached data; very buggy virtual machine; Jini service location issues

# Evaluations



## □ Usability:

- Delphi, Java applications – good
- JSPs – generally good; some inflexibility
- PDAs – limitations of current KVM implementation

## □ Performance:

- EJBs – large number of clients => need multiple servers; still often bound by database performance
- CORBA/XML – moderate volume of data supported
- JSPs – large number of users – OK response
- Jini – moderate number clients (15-20) = 1-2 second response times

# Conclusions



- ❑ Prototype integrated, web-enabled health information system feasible
- ❑ Current technologies generally good
- ❑ Choices of EJBs vs DCOM; JSPs vs ASPs vs CGIs; HTTP vs WAP; WML vs Applet
- ❑ Attention to USABILITY of UIs essential
- ❑ Working with current Health industry IT provider on further mobile interfaces...