# personal digital assistants (PDAs) for development

use of handheld mobile and complementary technologies in low resource settings

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SATELLIFE

# research questions

- Is handheld computing a viable cost effective option for health information management and provider education in low resource areas?
- What are the barriers to adoption of this technology?
- Can it impact provider practices or decision making to improve health outcomes?

# research settings

- Field data collection - surveys
- Routine program performance monitoring
- pharmaceutical inspection at PoE
- Routine registration of blood donors
- Service area mapping
- Routine health information management
- Clinical level distance education
- Voter registration list management

# technology - handheld

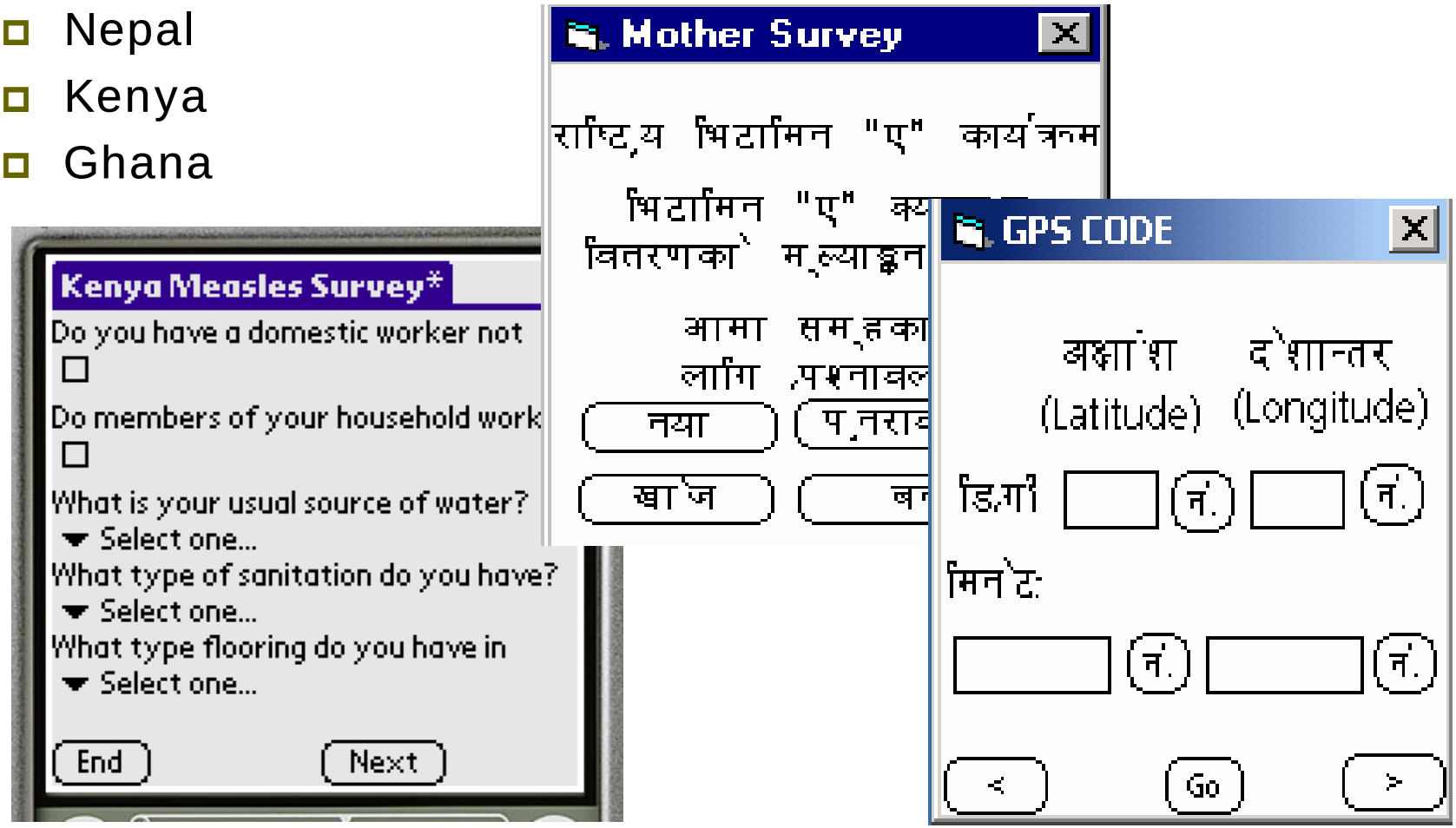
| | |
|---|---|
| Low end Palm OS handheld | $105 |
| Secure Digital (SD) expansion card | 18 |
| SD back up card | 34 |
| Travel power charger | 16 |
| Solar charger | 65 |
| Car adaptor/charger | 15 |
| GPS device | 99 |
| GPS cable | 65 |

# software applications

- Forms / data collection
- Browser /html text reader
- PDF reader
- Word file reader
- “Up-loader”
- Other free / shareware programs
- Commercial e-book application

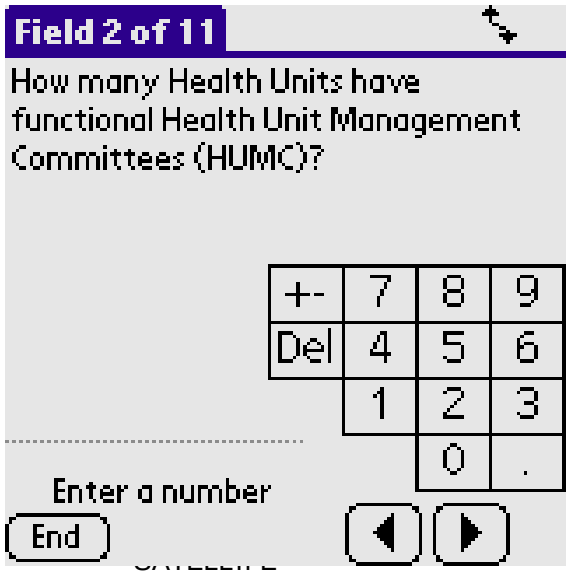
# field level data collection

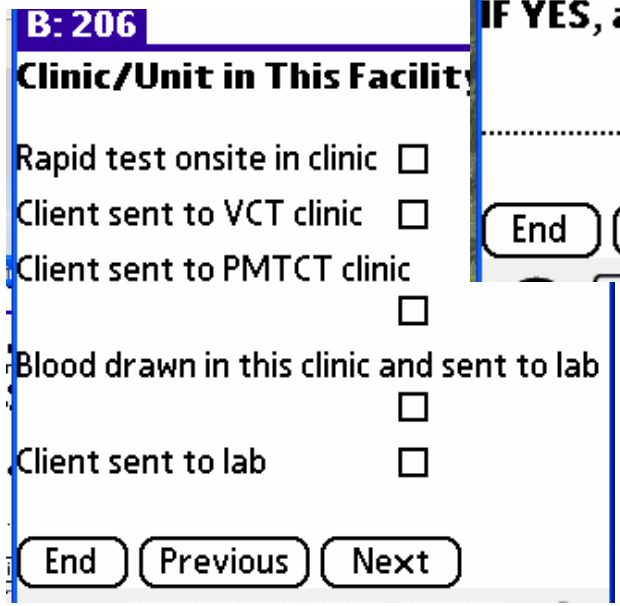
- Nepal
- Kenya
- Ghana

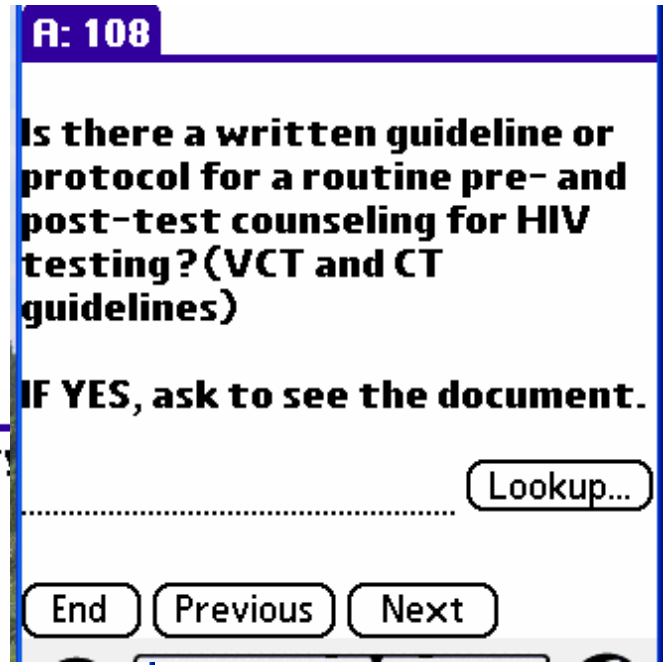


# routine site performance monitoring

- Nepal
- Bangladesh
- Bolivia
- Kenya

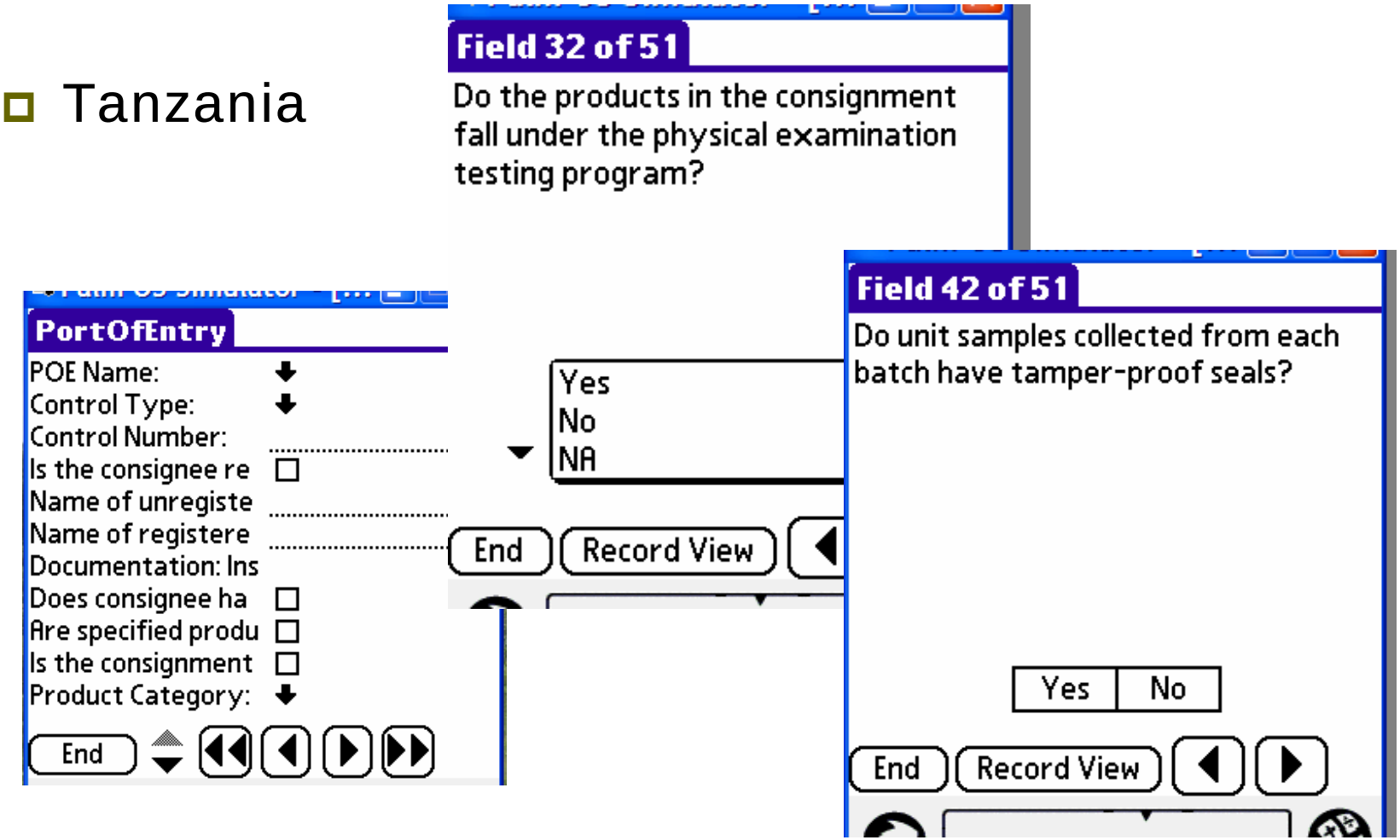


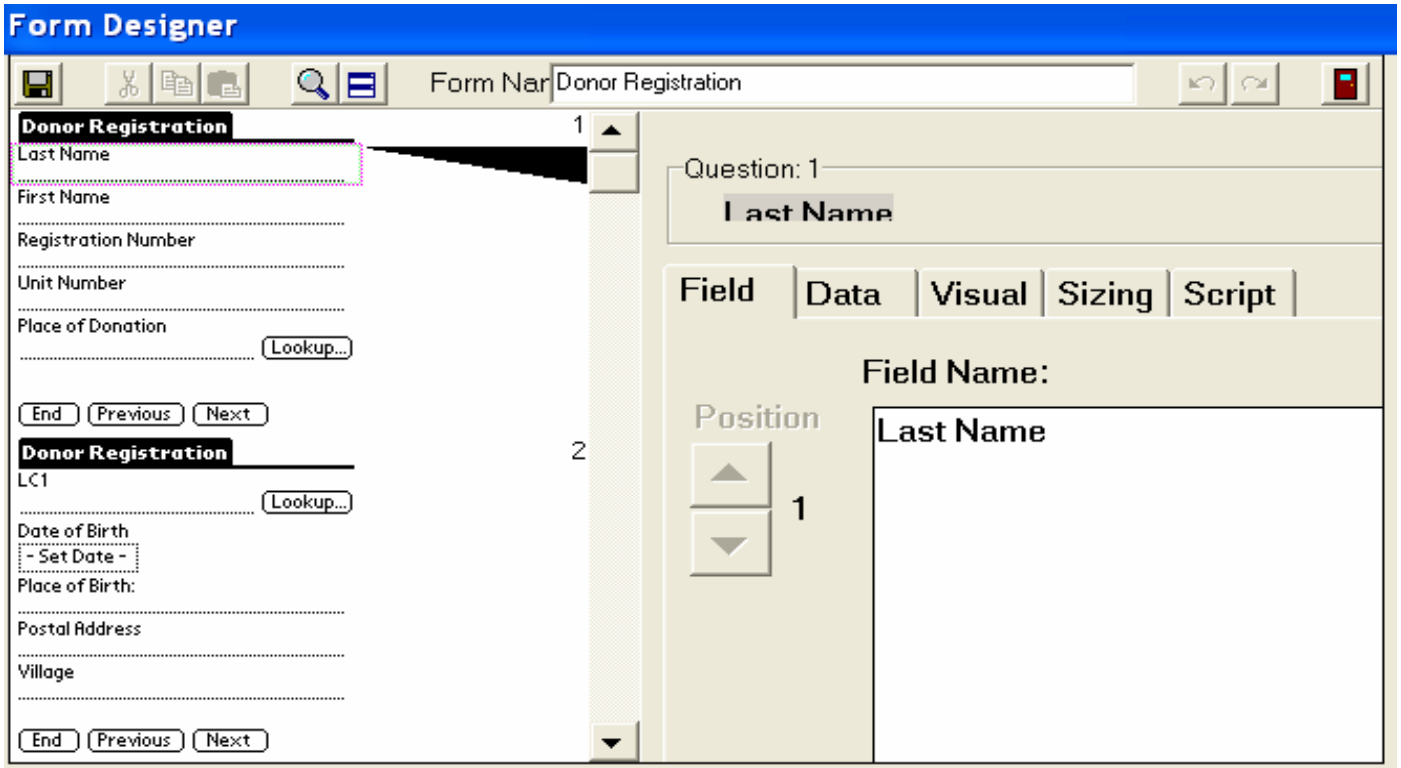
# pharmaceutical inspection at point of entry

- Tanzania



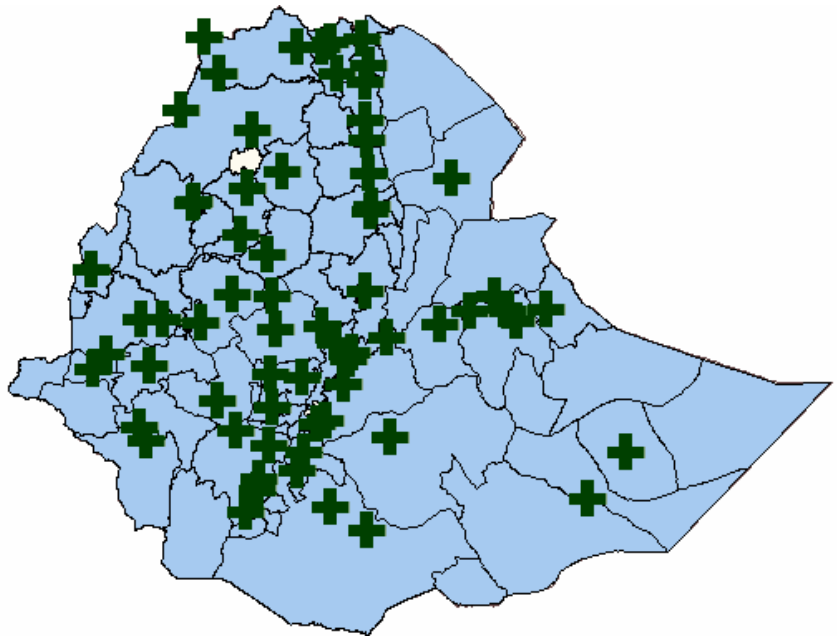
# registration of blood donors

- Uganda



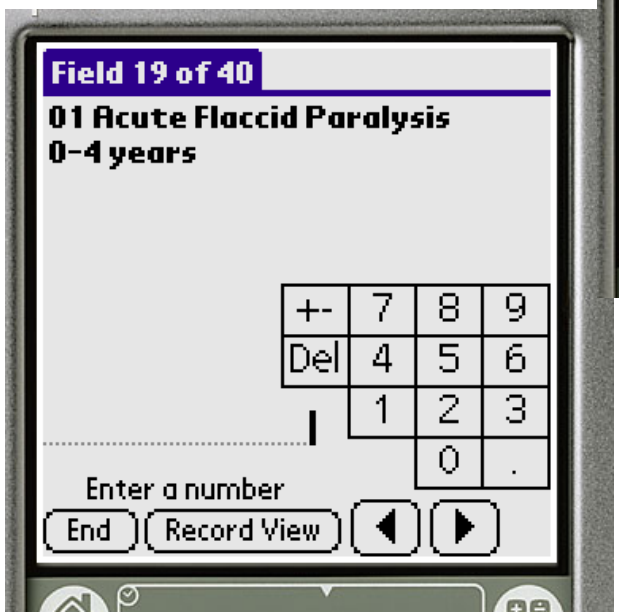
# service area mapping

- WHO SAM
  - Ethiopia
  - Nigeria
  - Uganda
  - Tanzania
  - WHO Afro
  - WHO SEAsia



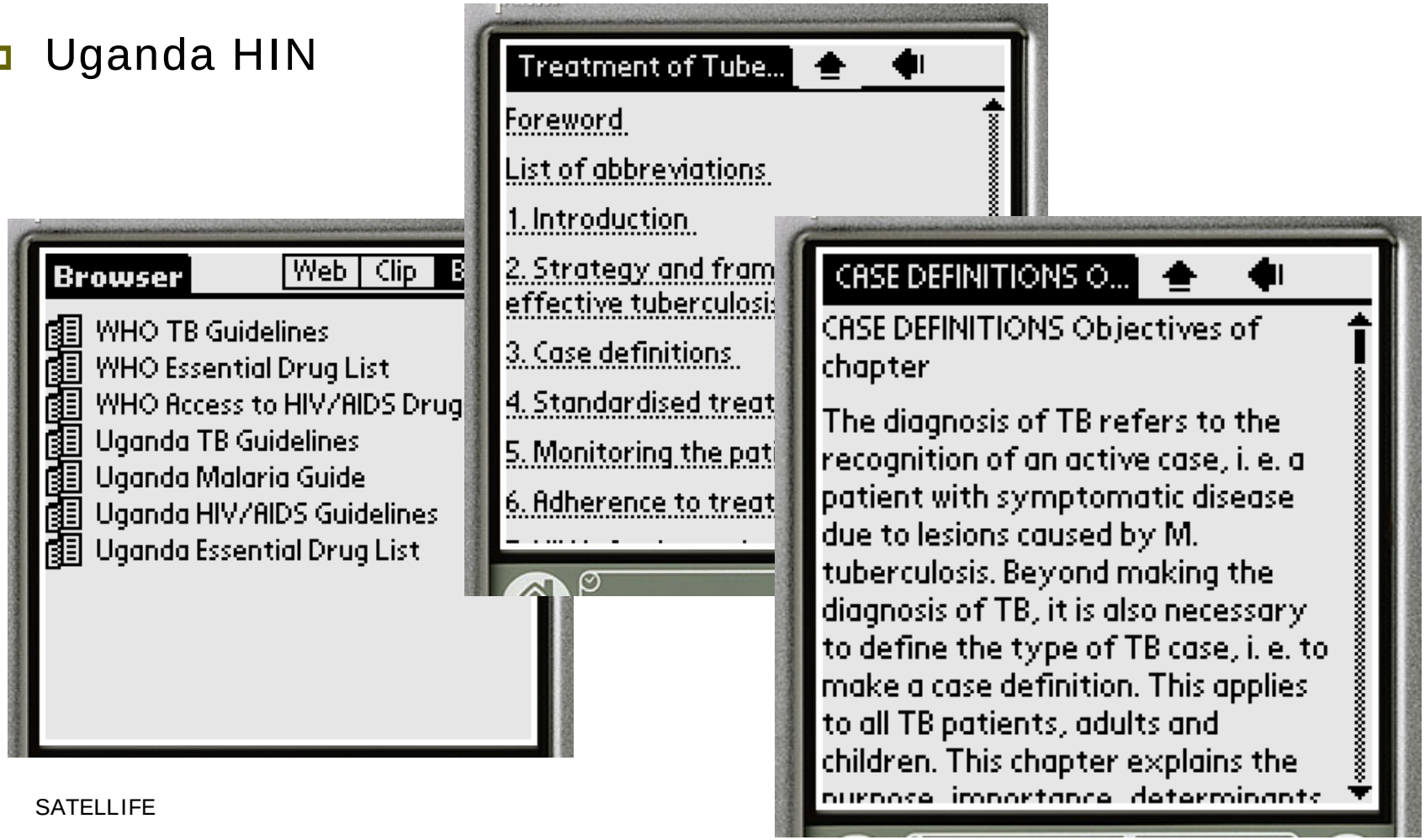
# routine health information management

- Uganda HIN
  - Rakai
  - Mbale
  - Manafawa

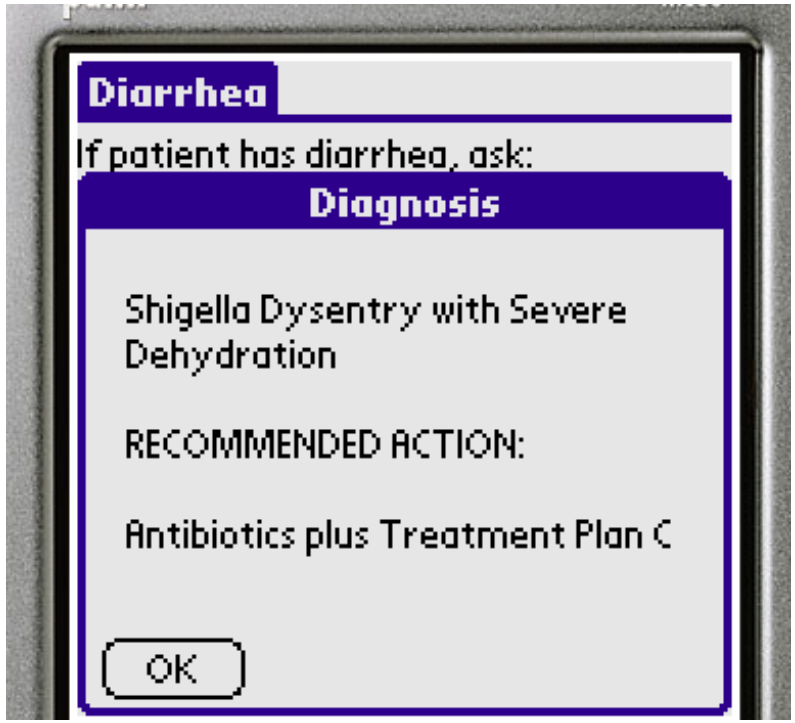



# health center level provider education

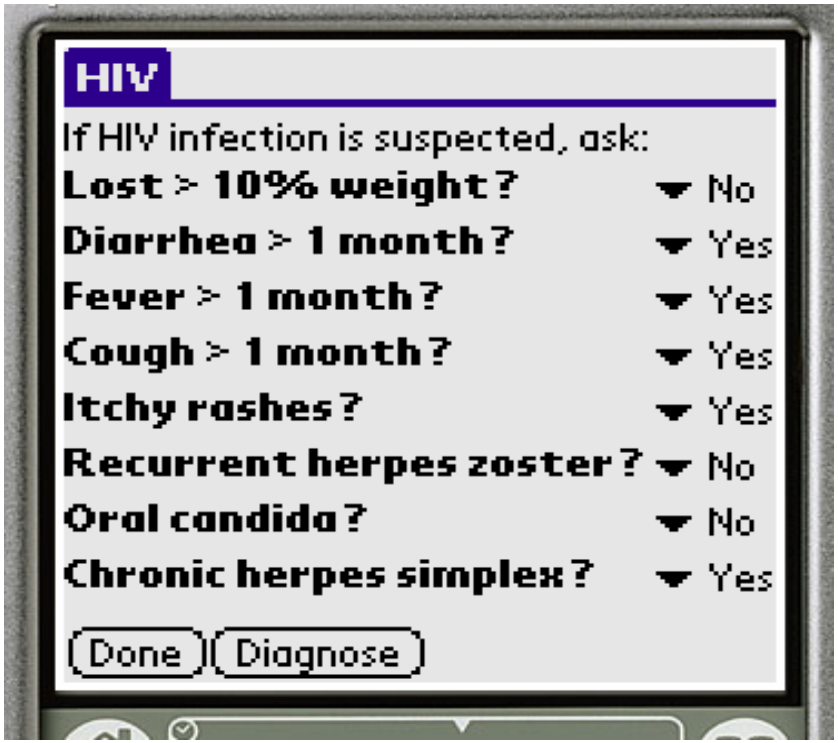
- Uganda HIN

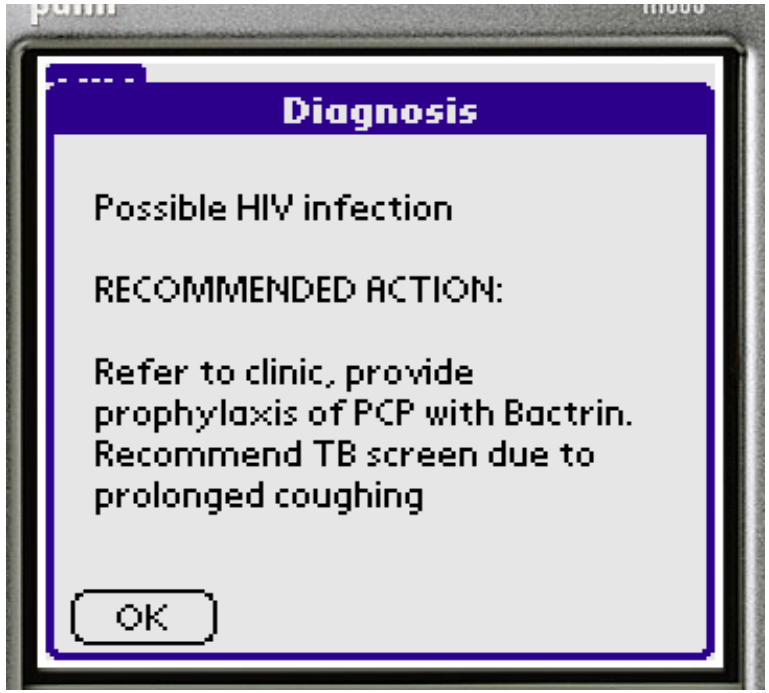


# provider education

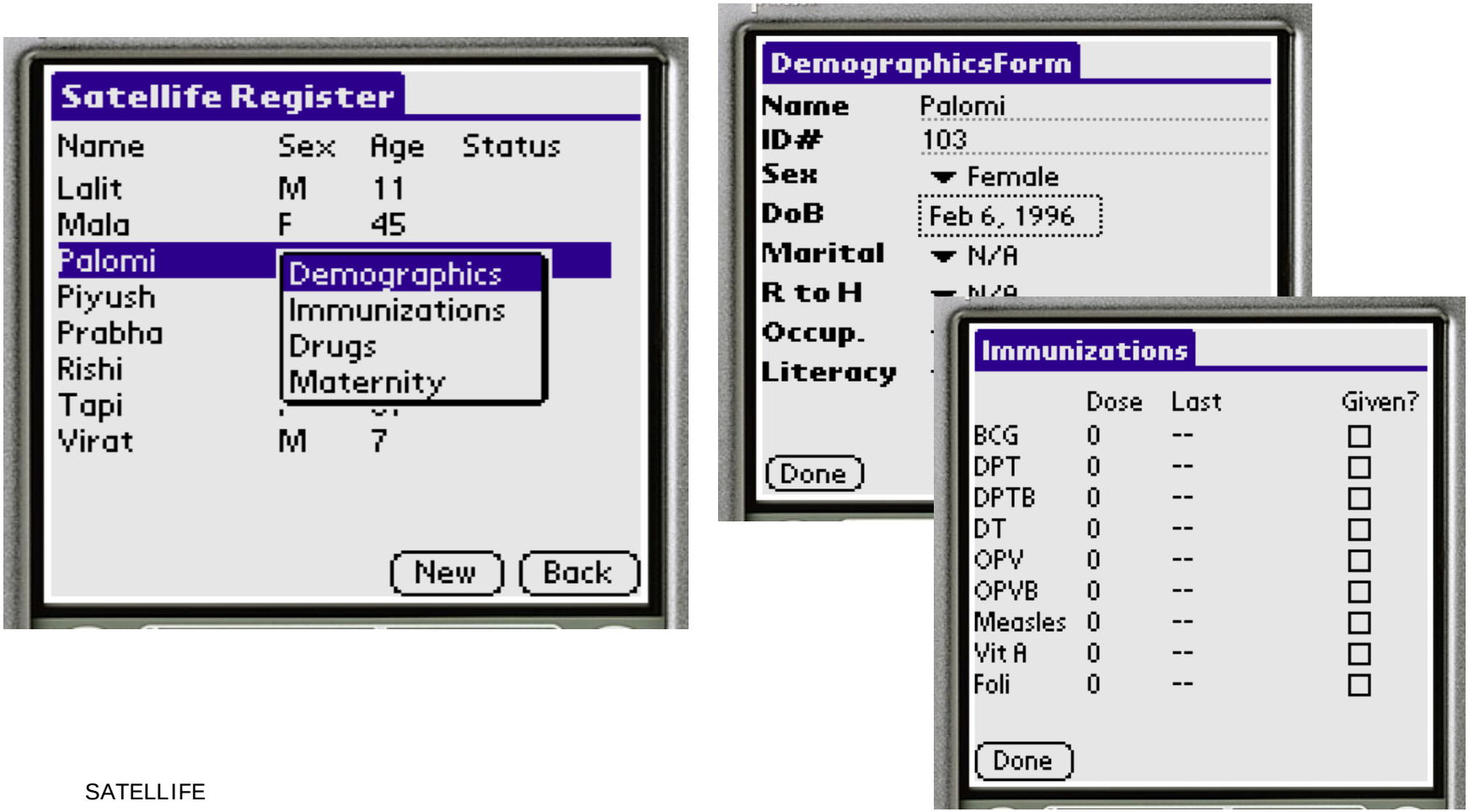



# provider education



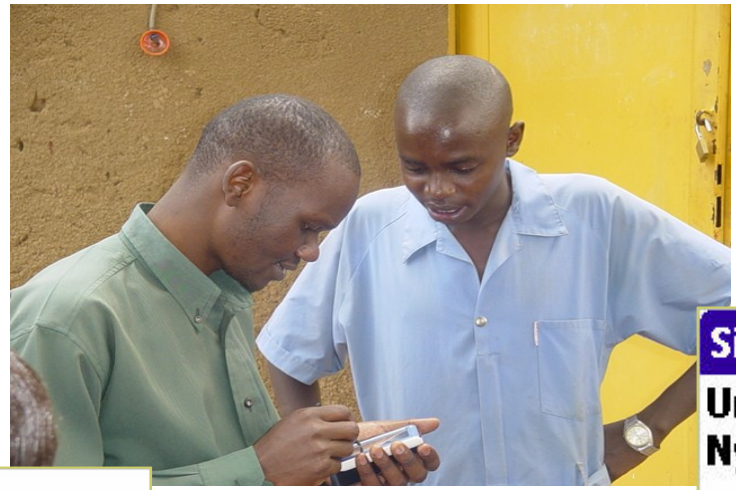



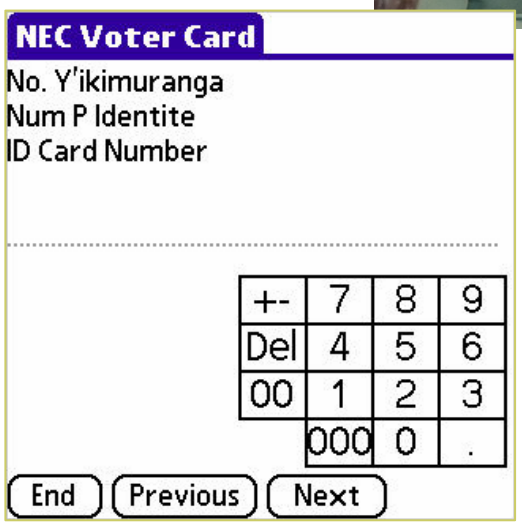
# community health – patient tracking



# voter registration list management

- Rwanda






# data transfer options

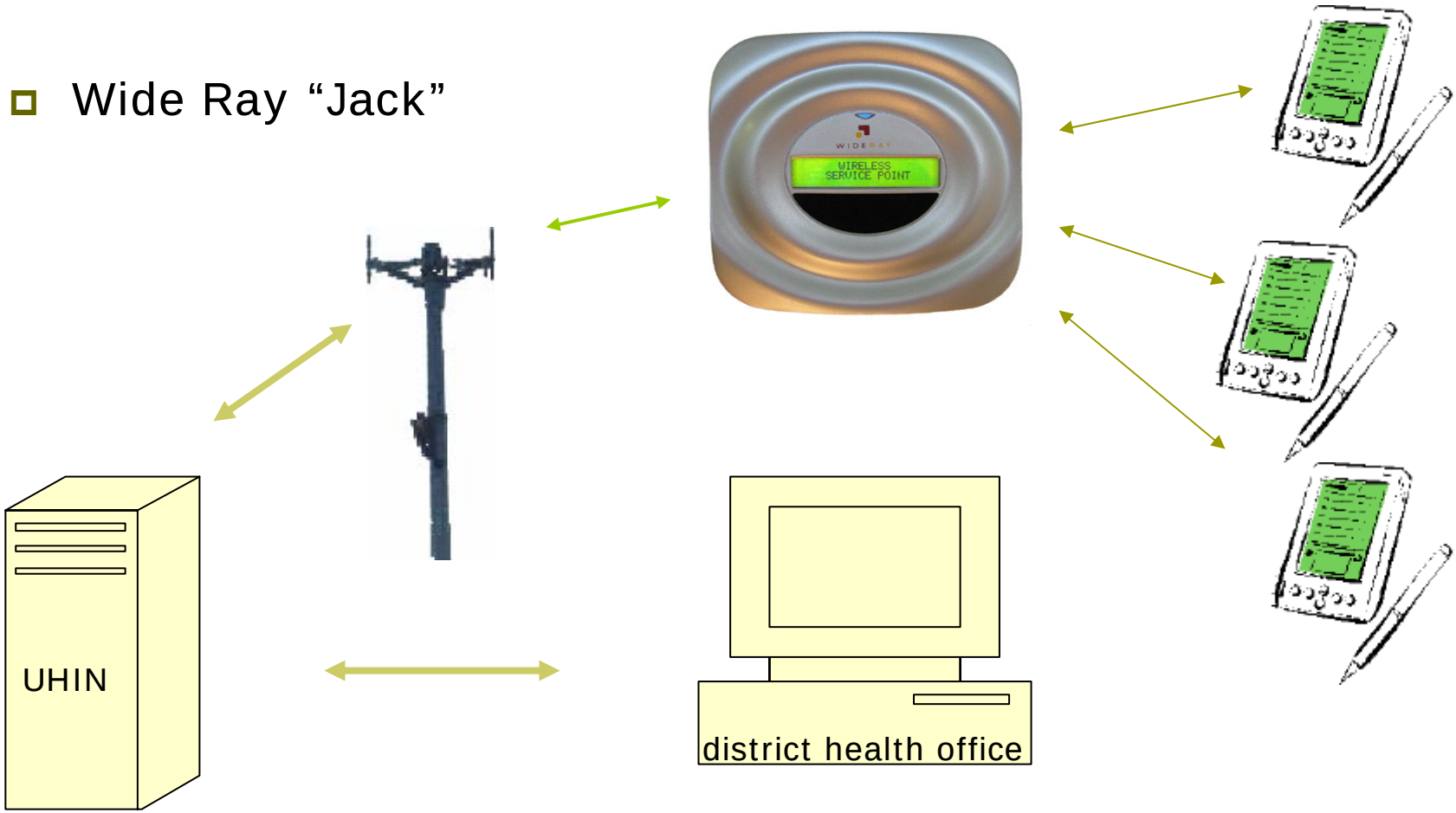
- by hand
  - turn over PDA
  - turn over SD card
- unit to unit
  - “beam” data between units
- unit to local host
  - field “hot sync”
- unit to remote host
  - dial up hot sync or data transfer
  - wifi or other wireless data transfer

# program design specifications for routine electronic data transfer

- use existing infrastructure where possible
- stand alone appliance
- little or no user maintenance
- little or no skill to operate
- remote management
- power smart - solar battery
- support multiple users
- low operating cost
- secure

# current technology

- Wide Ray “Jack”



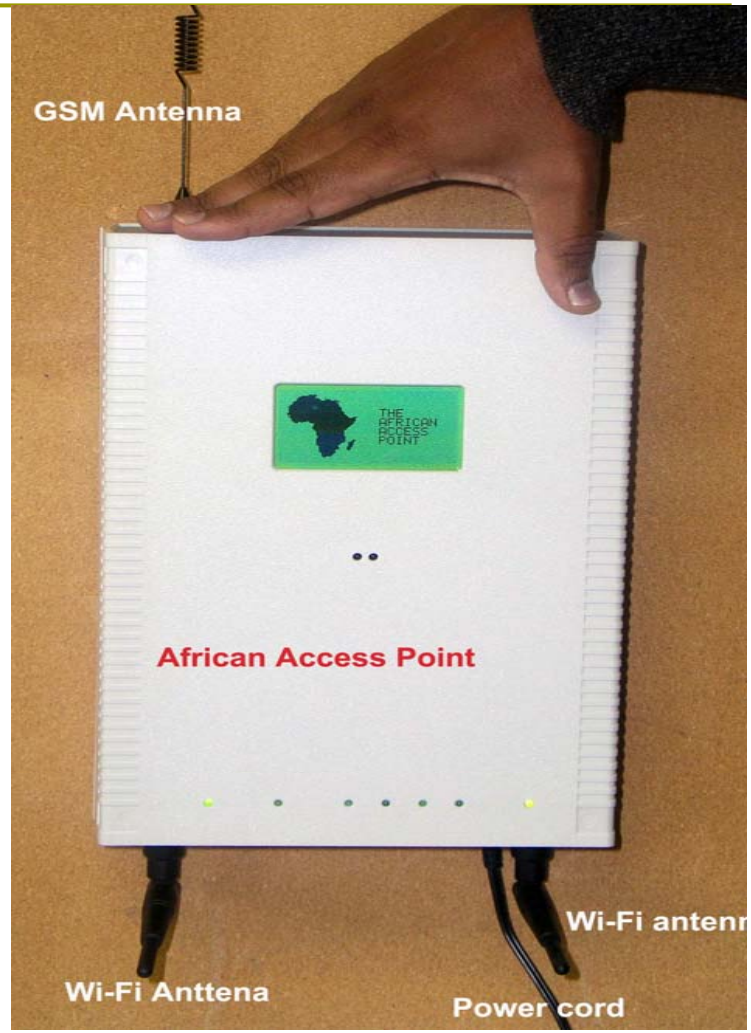
# “jack” specs

- **Hardware**
  - Size and Weight:  6.5" x 5.5" x 2", 23 oz.
  - IR Transmission Range: Up to 15 feet
  - IR Transmission Rate:  Up to 115,200 bps
  - Number of Simultaneous Users: Up to 1,000
  - Wireless Network:  GPRS and GSM Worldwide Wireless Network
  - Storage Capacity:  32 MB
- **Software**
  - Operating System: Linux (ARM)

# “jack” -- secure, but available for all - Rakai district health office

# new technology

- “Africa Access Point”

# AAP specs

- **Hardware:**
  - **Power Supply:** 15V AC-DC power converter is its main power supply. Feeding into the Regulator/Charging circuit, 12V is used to power the AAP while a higher voltage is needed to charge the backup battery.
  - **Real Time Clock (RTC):** Using the GPIO lines a RTC is placed on a Custom Interface board and uses a lithium battery to ensure it is kept operational at all times.
  - **Secure Digital (SD) Card Reader:** To give the AAP the ability to expand its memory capacity a SD card reader will be placed on the GPIO lines. This will allow for SD cards to be added to the AAP as required.
  - **LCD Module:** LCD module is attached to the GPIO lines via interface circuitry.

# APP specs (continued)

- **GSM Module:** The GSM module, attached to one of the two available serial interfaces, provides cellular capabilities of the AAP. A SIM card socket allows the addition of SIM cards which provide the identification of the AAP for cellular communications.
- **Analogue Modem Module:** Placed on the same serial interface as the GSM module and accessible via electronic switch circuitry the modem provides an alternate communications medium to the GSM module.
- **Bluetooth Module:** The Bluetooth module provides wireless connections to Bluetooth compatible devices. It is placed on the other available serial interface.
- **Infra-red Module:** Attached to the same serial interface as the Bluetooth module and also using electronic switch circuitry the Infra-red module provides Infra-red connections to compatible devices.

# APP specs (continued)

- **Wi-Fi and Ethernet**: Wi-Fi and Ethernet connectivity are provided as the default communication mediums of Linksys WRT54GS.

- Software
  - Operating System: OpenWRT GNU/Linux
  - Web Server: LightTPD
  - Mail Server: Mini-Sendmail (SMTP) & popa3d (POP3)
  - FTP Server: Atftpd
  - Scripting Language: PHP
  - Programming Language: C

# data transfer technology compared

Jack

- $2400 retail per unit (our price $1800)
- requires proprietary backend
- additional price for wifi or bluetooth

AAP

- $580 per unit expected price
- open source
- larger cache
- email option
- includes wifi & ethernet
- gsm & analogue phone
- expandable memory

# research findings to date

- Is handheld computing a viable, cost effective option for health information management and provider education in low resource areas?
  - reduces cost of data collection and data entry
  - easy to use by all levels of health professional
  - increased accuracy, timeliness and completeness of data collection
  - improvements sustained over time
  - user demand for additional, practical educational content
  - not good for lengthy text entry

# research finings to date (continued)

- What are the barriers to adoption of this technology? – what we expected:
  - Fear of new technologies
  - Unwillingness to learn new skill not related to reward
  - Continuing user support required from program
  - Continuing user training required from program
  - Unit Loss, breakage
  - Language difficulty
  - Power needs deter use
  - Lack of understanding sufficient to solve user problems
  - Security of “Jacks”

# research findings to date (continued)

- **What we found:**
  - Near 100% use over year
  - Improved timeliness and completeness of reports
  - Requests for additional programs/applications and email
  - Requests for additional practical CME material
  - Sharing device with community
  - Loss or breakage equal to US
  - Jacks 99% un-tampered with
  - Regular Use of solar chargers
  - Request for programs in Luganda
  - Local take over of training and user support functions
  - ***NEED MORE JACKS***

# research findings to date (continued)

- Can it impact provider practices or decision making to improve health outcomes?

*Preliminary outcomes of study due March 28 – 29th UHIN Stakeholders Meeting – Kampala Uganda.*

# next steps?

- patient management – electronic medical record
- scale-up (Uganda CPD)
- back-end database design and management
- additional “appliances”

# references

- www.bridges.org/satellife
- www.healthnet.org/pdaprojects.php
- PDA toolkit – *coming soon*

- *Technical reports and user surveys from Uganda project available upon request*

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