

*turning knowledge into practice*

# Zambia Electronic Perinatal Record System (ZEPRS)

Improving health care through information & communication technology

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*RTI International is a trade name of Research Triangle Institute*

# Objectives

- Improved health of patients
  - Improved access to patient records
  - Improved patient record quality
  - Improved patient follow-up & drug adherence
  - Improved information for research and analyzing interventions
  - Useful information for Zambian health administrators



*Patient files at UTH*

# Perinatal EMR System

ZEPRS	Staff demo	Patient Jones, Jane	NRC Number 123456/78/9	District ID 5040-123456	EGA (calc) n/a	Time 15:11:16	referral   webmail   training																																																												
<a href="#">Home</a> <a href="#">Demographics</a> <a href="#">Chart</a> <a href="#">Problem List</a> <a href="#">History</a> <a href="#">Problem/ Antepartum Visit</a> <a href="#">Problem/ Labor Visit</a> <a href="#">Delivery Summary/ Postnatal</a> <a href="#">NICU</a> <a href="#">UTH Admissions</a> <a href="#">Ultrasound</a> <a href="#">Labs</a> <a href="#">Admin</a>	<b>Chart Summary   <a href="#">Most Recent Form</a></b> <table border="1"> <thead> <tr> <th>Date</th> <th>Est. Gest. Age (EGA):</th> <th>Fundal Height:</th> <th>Urinalysis Acetone:</th> <th>Urinalysis Albumin:</th> <th>Urinalysis Glucose:</th> </tr> </thead> <tbody> <tr> <td>21 Sep 04</td> <td>9 3/7</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>30 Nov 04</td> <td></td> <td>25</td> <td>1+</td> <td>1+</td> <td>1+</td> </tr> <tr> <td>09 Jan 05</td> <td></td> <td>25</td> <td></td> <td></td> <td></td> </tr> <tr> <td>09 Jan 05</td> <td>0 2/7</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>09 Jan 05</td> <td>0 1/7</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>09 Jan 05</td> <td>0</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					Date	Est. Gest. Age (EGA):	Fundal Height:	Urinalysis Acetone:	Urinalysis Albumin:	Urinalysis Glucose:	21 Sep 04	9 3/7					30 Nov 04		25	1+	1+	1+	09 Jan 05		25				09 Jan 05	0 2/7					09 Jan 05	0 1/7					09 Jan 05	0					<b>Problem List   <a href="#">Create Problem</a></b> <table border="1"> <thead> <tr> <th colspan="2">Active Problems</th> </tr> <tr> <th>Problem</th> <th>Date Created</th> </tr> </thead> <tbody> <tr> <td>Referral Request: If small stature (<math>\leq 150</math> cm), then refer to UTH</td> <td>09 Jan 05</td> </tr> <tr> <td>Referral Request: Referral selected in form</td> <td>01 Dec 04</td> </tr> <tr> <td>test</td> <td>30 Nov 04</td> </tr> <tr> <td>test</td> <td>30 Nov 04</td> </tr> <tr> <td>ijij</td> <td>30 Nov 04</td> </tr> <tr> <td>test</td> <td>30 Nov 04</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Inactive Problems</th> </tr> </thead> <tbody> <tr> <td>No inactive problems</td> </tr> </tbody> </table>		Active Problems		Problem	Date Created	Referral Request: If small stature ( $\leq 150$ cm), then refer to UTH	09 Jan 05	Referral Request: Referral selected in form	01 Dec 04	test	30 Nov 04	test	30 Nov 04	ijij	30 Nov 04	test	30 Nov 04	Inactive Problems	No inactive problems
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# Assessment

## *Clinics*

- Dusty, congested
- Only 7 phones, VHF only option

## *Personnel*

- No computer literacy
- Very stressed, high medical staff turn-over

## *Telecommunications*

- Weak landline infrastructure
- Congested 2.4GHz wireless segment

## *Electrical*

- Inadequate electrical systems, no backup power, No lightening protection
- Poorly regulated grid (Frequent power outages)



*Chawama clinic MCH waiting room*

# Solution

- 5.8GHz Wireless backbone network / 2.4GHz Wireless in facilities
- Web-based applications
- Mixed Open Source/proprietary platform
- Data center hosted by CIDRZ (NGO)
- Standard PCs on mobile carts

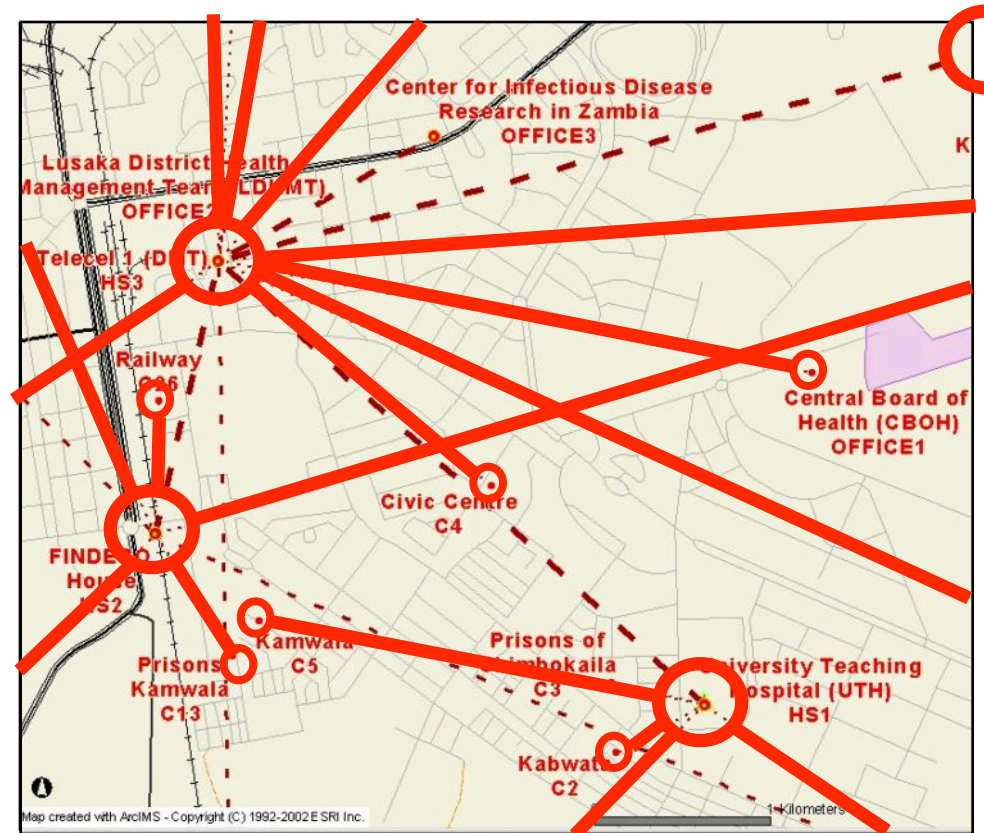


*Cellular telephone tower with  
ZEPRS co-located equipment*



# Wireless WAN

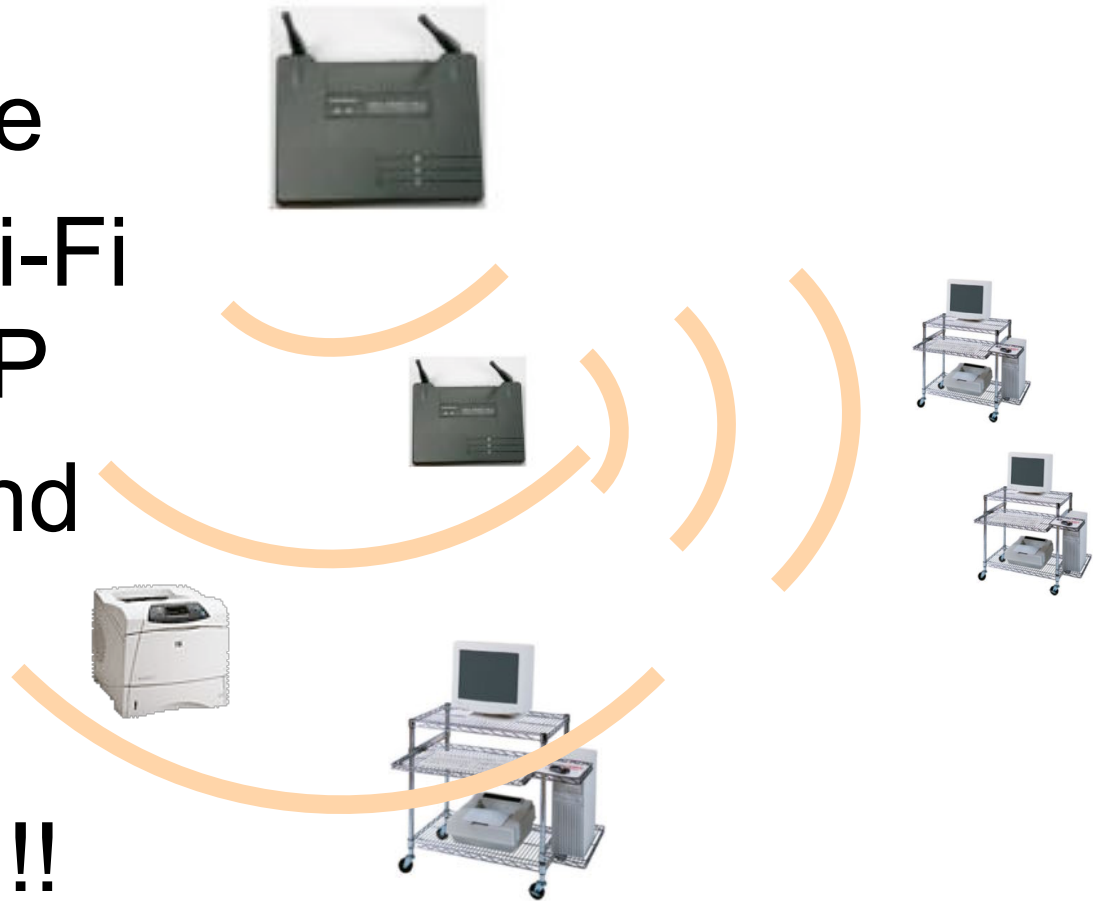
- Co-located equipment and new towers
- 4 “hub” sites
- WAN: 45, 20, 10 Mbps BBone
- LANs: Mostly wireless, some fiber + wireless.
- VoIP capability in all facilities
- Data center at CIDRZ
- Automated network monitoring



*High sites and connected facilities in central Lusaka*

# Wireless LANs

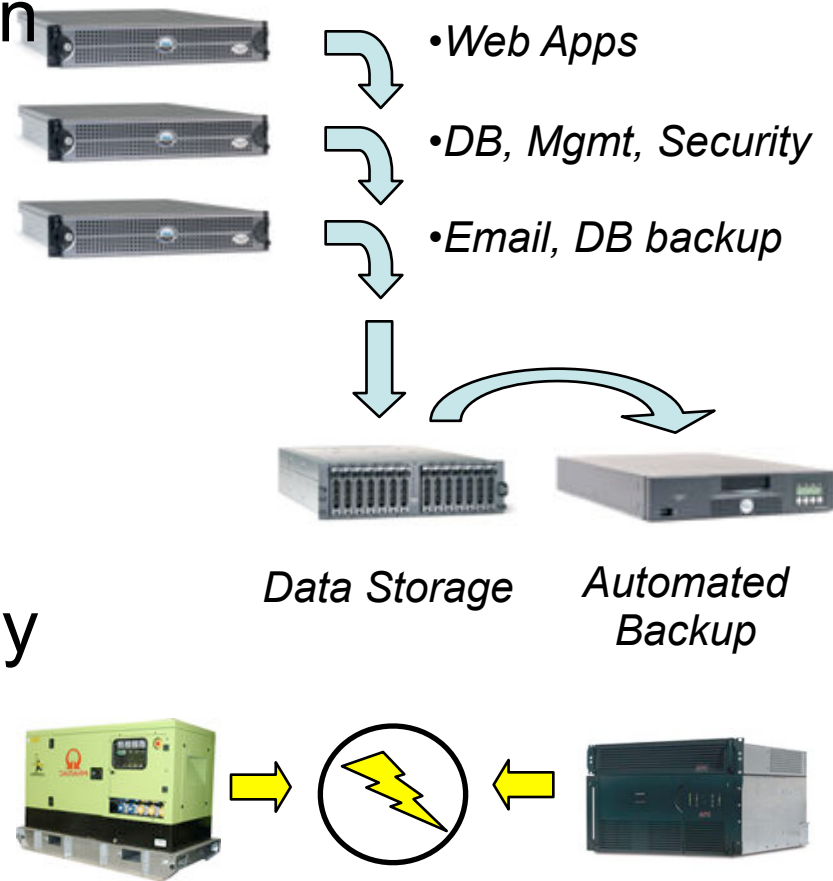
- Full coverage
- Roaming, Wi-Fi  
Printing, VoIP
- Monitored and  
remotely  
manageable
- Standardized!!!





# Data Center

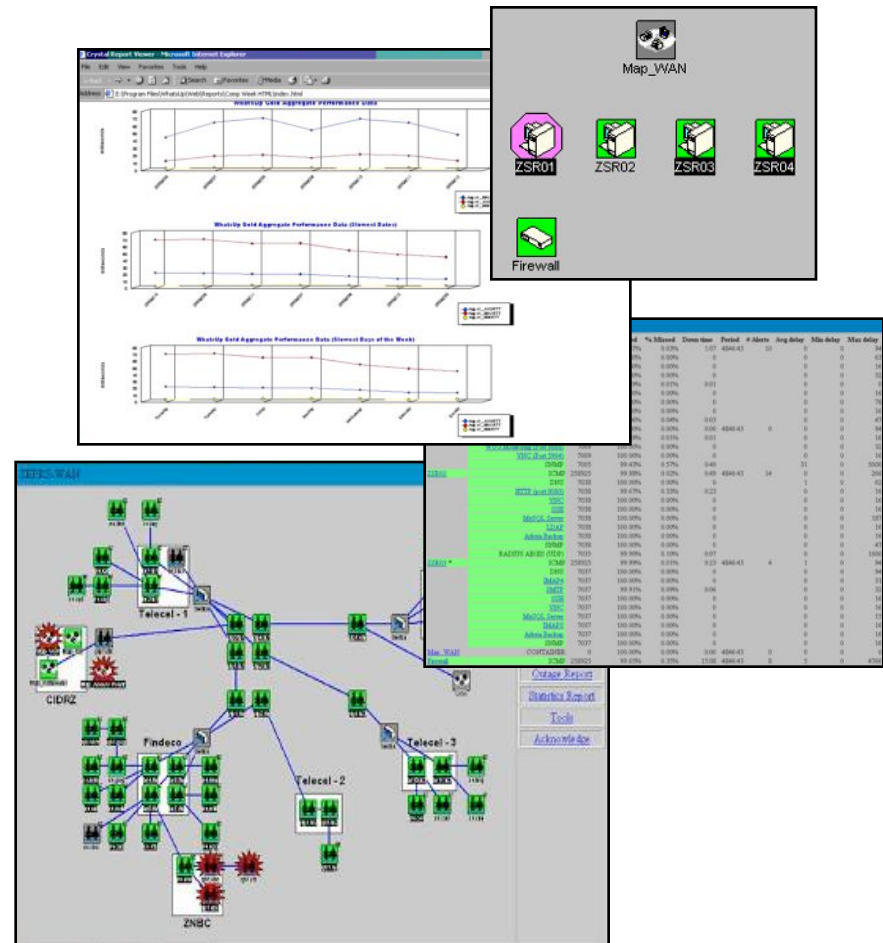
- Secured Internet connection
- Centralized wireless authentication
- Web-based e-mail server
- Web application server
- Database server
- External RAID storage array
- Tape backup autoloader
- UPS & diesel generator





# Network Monitoring

- Monitoring in Zambia and from abroad
- Automated e-mail & SMS alerts of equipment failure
- Automated performance & availability report generation



# Software Platform

Platform Component	Selected Solution
Operating System	Red Hat Enterprise (Srv) / Windows XP (Client)
Server Backup	Arkeia Backup 5.2
Wireless Authentication	AEGIS RADIUS Server 1.1.4
Relational Database	MySQL 3.23 (4.1 now)
Web Application Server	Tomcat 5 with Apache 2
E-mail	Cyrus IMAP, Sendmail, SpamAssassin
E-mail Web Interface	Squirrel Mail
Firewall	SonicWALL (PIX now)
Client Anti-virus	McAfee
E-mail Server Anti-virus	AMaVIS

# Status

- ü Network fully functional, PCs installed in all clinics
- ü Support staff trained
- ü Network monitoring and alert system in place
- ü Four training centers established (two clinics, two at UTH); More than 800 medical personnel trained
- ü Detailed medical record developed, approved and ready for beta deploy (March 14, 2005)
- ü Referral application component operational in all clinics and at UTH
- ü ART patient management operational in 8 clinics and UTH



# Lessons Learned



**A, B, C ...**

# Q & A

