

XpertSMS – Introducing Automated MTB/RIF Reporting into running projects

Interactive Research and Development

Electronic recording and reporting systems for Xpert MTB/RIF
GLI Meeting
Annecy, April 17th 2013

Electronic Result Reporting

- Labs are often at a significant distance from the treatment site
- Getting results to treatment providers quickly results in shorter time to treatment
- GeneXpert has reduced the time to obtain a result
- Results are still often manually reported

Xpert SMS - Automated GeneXpert Reporting

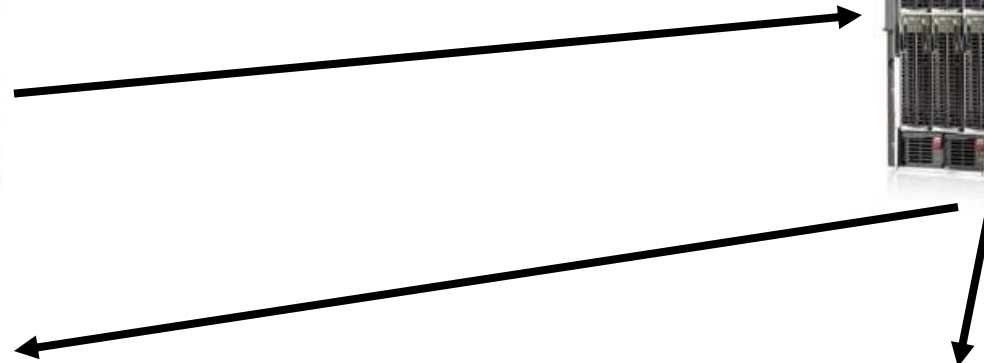
1. GeneXpert test results automatically relayed to a server over Internet/SMS



2. Data transferred to remote server and integrated into patient medical records



3. Data accessible to patient, clinicians, and program teams remotely via SMS alerts, mobile phones, and a web interface

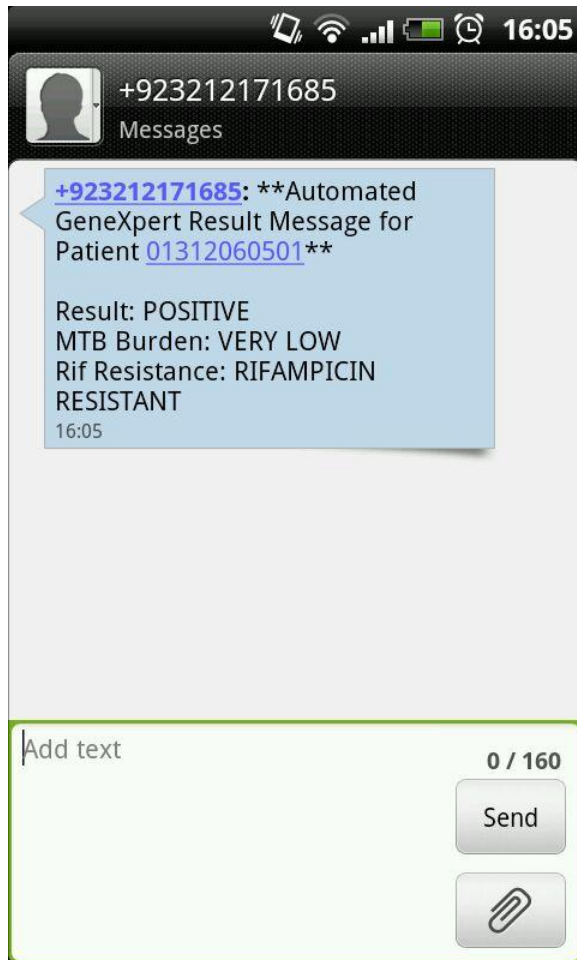


XpertSMS

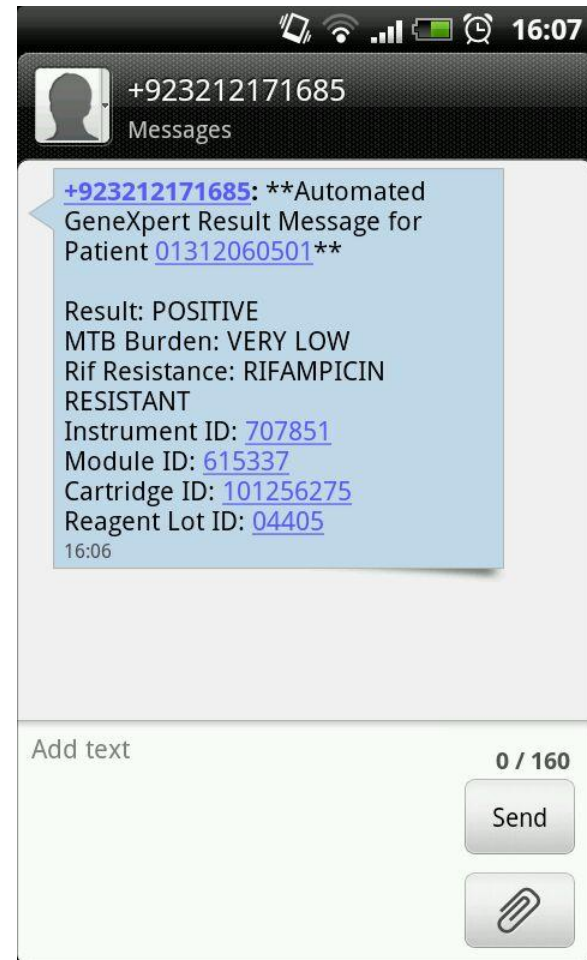
- Reduces time to TB/MDR-TB treatment
- Gives access to cleaner, faster data
- Improves patient level and aggregate reporting
 - Inventory control through reporting cartridge data
 - Monitoring through module data and error reports
 - Better analysis through probe results
 - Reports available as PDF and CSV

Sample XpertSMS messages

Treatment Provider

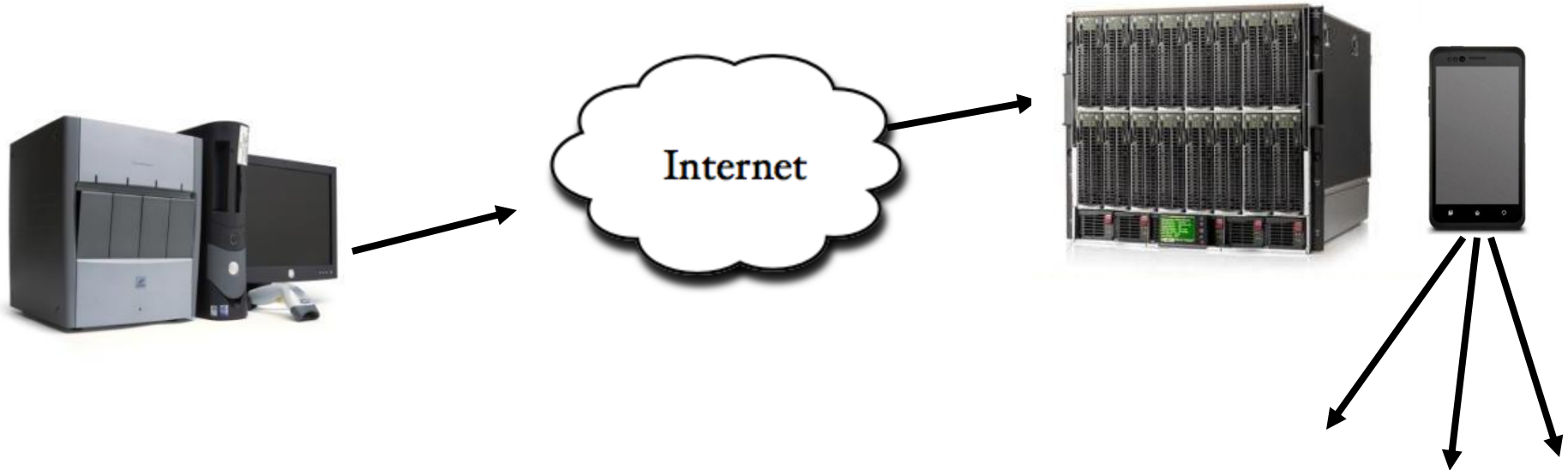


Program



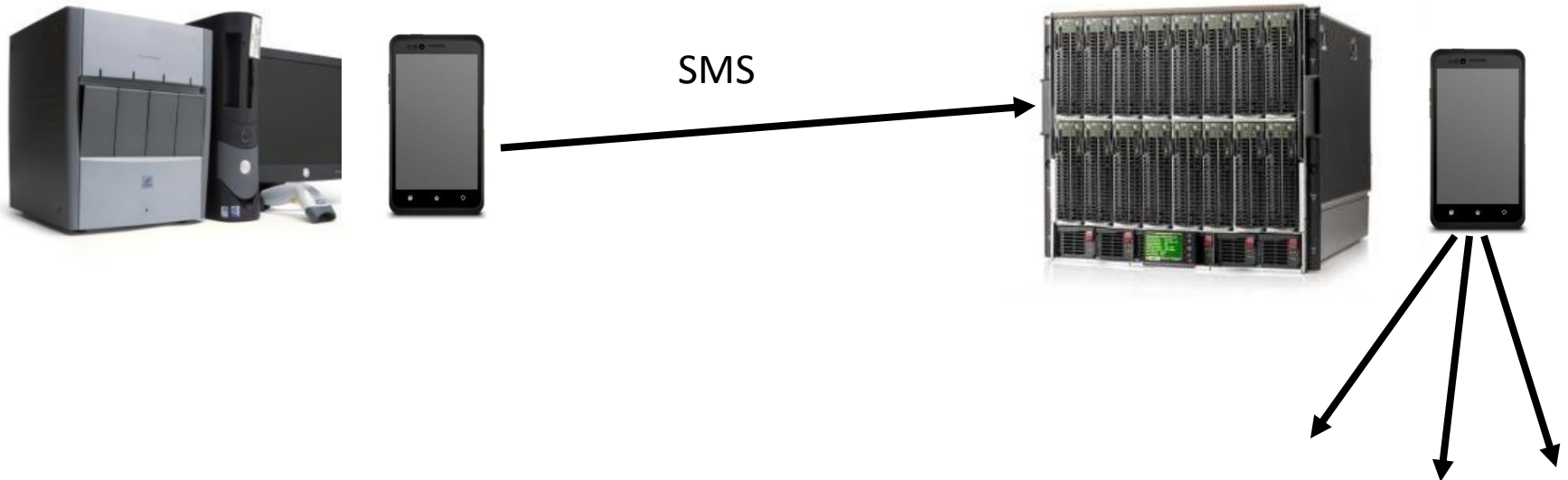
Data Transfer over Internet

- Central Server
 - In-country or on the cloud
- Single Android phone to act as a modem



Data Transfer over SMS

- Central Server
 - In-country or on the cloud
- Android phone at server
- Android phone at each GeneXpert site





My Computer



GeneXpert Dx



Help and Support



Recycle Bin

XpertSMS

TB REACH XpertSMS

MTB code:

RIF code:

QC code:

Local port:

Send Method:

Server URL:

Server Port:

Server SMS Number:

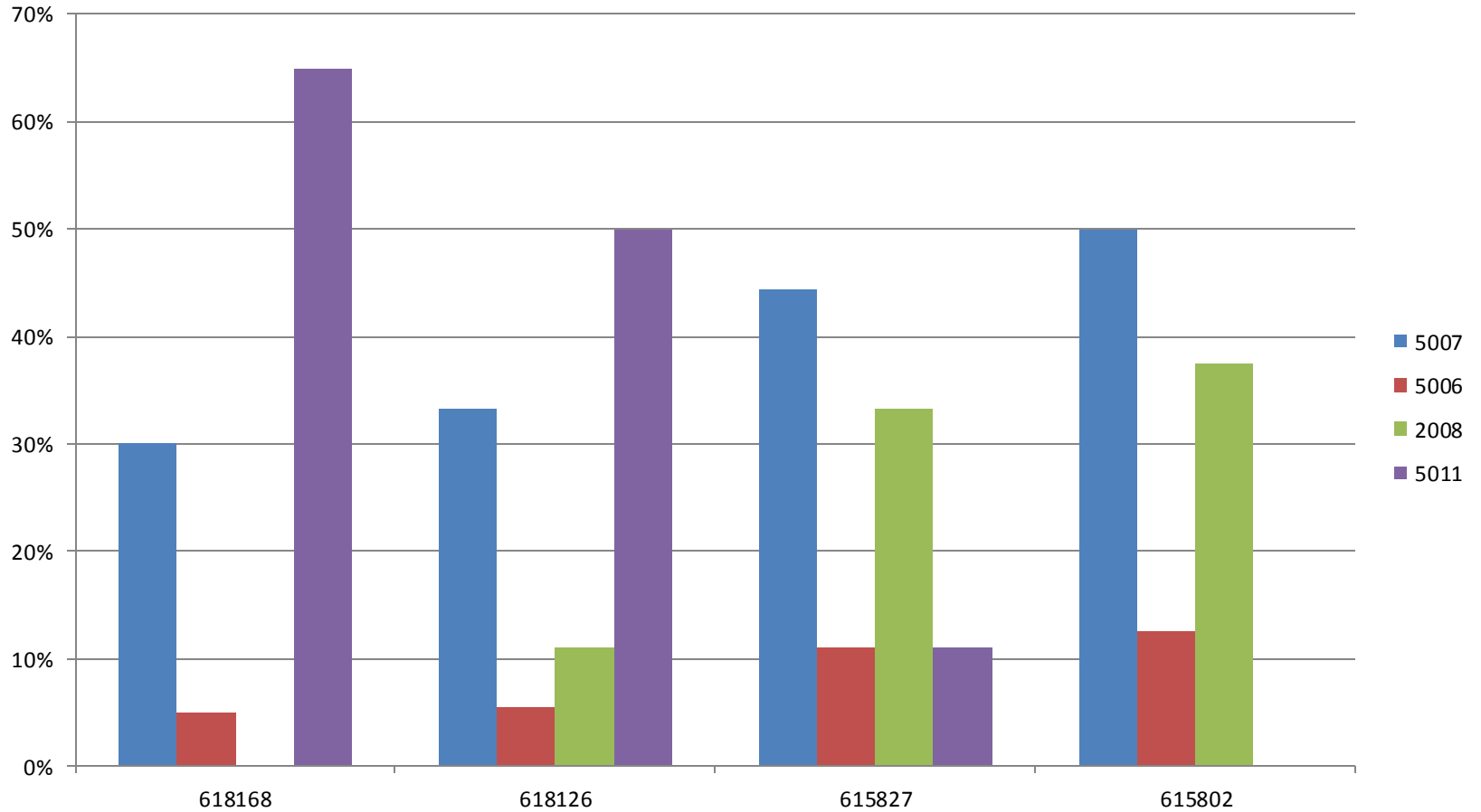
Export Probe Data

Retrying Sample ID 00071! Attempts = 1
 Result for Sample ID 00043 transmitted successfully
 Retrying Sample ID 00088! Attempts = 1
 Retrying Sample ID 00098! Attempts = 1
 Result for Sample ID 00049 transmitted successfully
 Retrying Sample ID 00103! Attempts = 1
 Retrying Sample ID 00109! Attempts = 1
 Result for Sample ID 000498 transmitted successfully
 Result for Sample ID 00059 transmitted successfully
 Result for Sample ID 00063 transmitted successfully
 Result for Sample ID 00070 transmitted successfully
 Result for Sample ID 00071 transmitted successfully

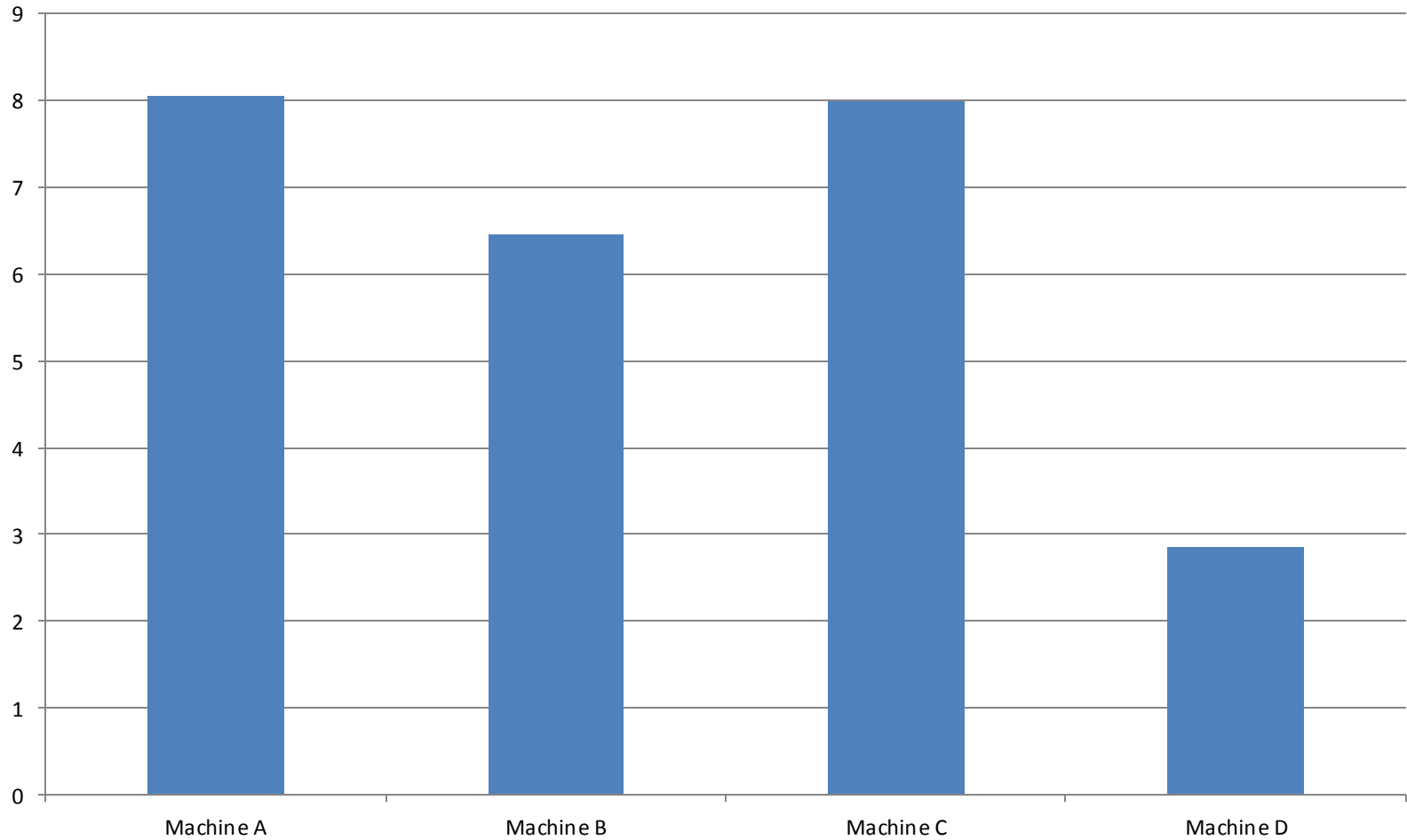
GeneXpert Probes

PatientID	Sample ID	MTB Result	Rif Resistance	Probe A	Ct A	End Pt A	Probe B	Ct B	End Pt B	Probe C	Ct C	End Pt C	Probe D	Ct D	End Pt D	Probe E	Ct E	End Pt E	Probe SPC	Ct SPC	End Pt SPC
1420505003	01039	MTB NOT DETECTED		NEG	0.0	0.0	NEG	0.0	3.0	NEG	0.0	2.0	NEG	0.0	0.0	NEG	0.0	-2.0	PASS	28.2	244.0
1420307003	01040	MTB NOT DETECTED		NEG	0.0	0.0	NEG	0.0	3.0	NEG	0.0	1.0	NEG	0.0	1.0	NEG	0.0	-2.0	PASS	28.1	238.0
1420307002	01044	MTB NOT DETECTED		NEG	0.0	1.0	NEG	0.0	3.0	NEG	0.0	1.0	NEG	0.0	2.0	NEG	0.0	-3.0	PASS	29.1	261.0
1420208001	01050	MTB NOT DETECTED		NEG	0.0	0.0	NEG	0.0	4.0	NEG	0.0	1.0	NEG	0.0	1.0	NEG	0.0	-2.0	PASS	30.8	243.0
1420907001	01052	MTB DETECTED	NOT DETECTED	POS	33.1	68.0	POS	33.1	75.0	POS	33.0	89.0	POS	34.1	66.0	POS	35.3	59.0	NA	30.2	252.0
1411209005	01054	MTB NOT DETECTED		NEG	0.0	-1.0	NEG	0.0	-4.0	NEG	0.0	-1.0	NEG	0.0	-1.0	NEG	0.0	-5.0	PASS	35.4	215.0
1420307005	01080	MTB NOT DETECTED		NEG	0.0	2.0	NEG	0.0	4.0	NEG	0.0	0.0	NEG	0.0	1.0	NEG	0.0	-4.0	PASS	28.2	275.0
1420608001	01139	MTB NOT DETECTED		NEG	0.0	1.0	NEG	0.0	2.0	NEG	0.0	1.0	NEG	0.0	0.0	NEG	0.0	-3.0	PASS	25.5	259.0
1420709003	01187	MTB NOT DETECTED		NEG	0.0	-1.0	NEG	0.0	2.0	NEG	0.0	1.0	NEG	0.0	0.0	NEG	0.0	-3.0	PASS	27.2	238.0
1420508004	01171	MTB NOT DETECTED		NEG	0.0	1.0	NEG	0.0	4.0	NEG	0.0	3.0	NEG	0.0	2.0	NEG	0.0	-2.0	PASS	25.7	267.0
1420709005	01233	MTB NOT DETECTED		NEG	0.0	0.0	NEG	0.0	-1.0	NEG	0.0	-2.0	NEG	0.0	-2.0	NEG	0.0	-1.0	PASS	37.0	102.0
1420208002	01328	MTB NOT DETECTED		NEG	0.0	1.0	NEG	0.0	5.0	NEG	0.0	0.0	NEG	0.0	2.0	NEG	0.0	-3.0	PASS	25.4	233.0
1420510001	01344	MTB NOT DETECTED		NEG	0.0	1.0	NEG	0.0	3.0	NEG	0.0	1.0	NEG	0.0	2.0	NEG	0.0	-3.0	PASS	27.0	257.0
1420509006	01350	MTB NOT DETECTED		NEG	0.0	-1.0	NEG	0.0	4.0	NEG	0.0	3.0	NEG	0.0	2.0	NEG	0.0	-2.0	PASS	25.4	289.0
1420813001	01414	MTB DETECTED	NOT DETECTED	POS	32.7	74.0	POS	33.1	81.0	POS	32.9	99.0	POS	34.2	69.0	POS	34.9	64.0	NA	29.9	243.0
1420110002	01433	MTB DETECTED	NOT DETECTED	POS	27.6	97.0	POS	30.4	54.0	POS	28.9	112.0	POS	30.0	87.0	POS	28.8	100.0	NA	29.8	223.0

Error Percentage by Module



Tests/day per GeneXpert Machine



Current Deployments



Initial Improvements

- Application made more robust
 - Able to handle connectivity problems
 - Able to recover from interruptions
- Added support for CSV dumps of data to the local machine
- Optimized software to reduce CPU and memory footprint

Key Hurdles

- Unique patient identifiers not being entered in the GeneXpert DX software
 - Patient ID's are missing
 - Sample ID's are not unique
 - Impossible to match a result to a patient
 - System can still be used to generate aggregate data
- Several GeneXpert machines were down pending calibration
 - This made testing at those sites impossible

Parallel Systems

- Most projects have some existing means of recording and reporting results
 - Excel sheets
 - Paper registers
 - Access databases
- These are phased out or impacted when XpertSMS is introduced
 - Change to project workflow needs to be thought through
 - Import of legacy data is possible

Security

- Identifiable information not transferred at any point
 - Patient name and demographics entered separately in the EMR
 - Patient ID and Sample ID are transferred. Cannot be used to identify a patient without access to the EMR
 - Privacy regulations may vary from country to country and restrict applicability
- EMR access is role-based and only through username and password

Next Steps

- Integration with OpenMRS
 - To be done for the TBXpert PPM projects in Pakistan, Bangladesh, and Indonesia
- Pursue integration with other EMR systems
 - Support for HL7
- Allow customization of message content
- Allow flexibility of SMS modem options
 - USB modems
- Deployments in Kenya, Uganda, Malawi