

# PROJECT COMPLETION REPORT- TRIPURA VISION CENTRE

## PHASE-II- 10 CENTER'S

### DISTRICT- WEST TRIPURA



**Department of Health, Government of Tripura**

**DATE OF SUBMISSION- 29-SEPT-2008**

**Submitted  
by**



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## Tripura Vision Centre Project:

The Vision Centre project completed for the State of Tripura will form a base for effectively utilizing the benefits of Information and Communication Technologies to perform the outreach program. It aims at improving access to quality health care in rural areas of Tripura by adopting emerging developments in technology and medical advancements.

The Project aims at providing quality eye care services to rural patients in 4 districts in the State of Tripura in an integrated manner where by every case is accounted for, classified and closed with a solution. The project will approximately cater to a population of 34, 32,000 (*Estimated as of 2007 by the State*) spread across 40 blocks of 4 districts in the State. A total of 40 vision centers are planned for the state which will render Tele-ophthalmology service to the above said population.

This project completion report enumerates various modules, physical, medical, ICT infrastructure and associated components which were established for commissioning the Vision centre project for the State of Tripura in phase –II in 10 locations (West District). **The report is being submitted after the trial run period of 30 working days from the date of commissioning of all 10 locations.**

## Project deployment in three phases:

### Phase- I:

One Pilot Vision centre was set up in the Melaghar block on April' 07 and is operational till date. The centre has screened more than 4800 patients and has made significant impact in the local community in avoiding needless visual impairment in the community. Based on the progress made in Melaghar and significant insight learnt on the local demographics, the project was scaled in phase-II.



**Pilot Vision Centre –Melaghar Block**

### Patient Screening Report Phase-I:

Number of Patients from 07.04.08 to 30.09.08

Vision Centre Name	Total Patient		Total Glass Prescribed		Total Refraction	Ref. to IGM Hospital	Ref to M.S.D Hospital	
	Total	New	Old	Male				Female
Melaghar VC	5798	4962	836	877	838	2483	343	315

## Phase- II:

Phase- II comprised of scaling the vision centre network to 10 blocks in West Tripura District covering a population size of approximately 15, 32,982 citizens. Phase-II also comprised of the utility of digital patient medical records in the Vision Centers using database management solution called VCMS- Vision Center Management System and setting up of an independent wireless network with bandwidth of 256 kbps bustable up to 2Mbps. The 10 Vision center locations commissioned on Aug & Sept' 08, are screening 7 to 8 patients per day on an average.

Apart from setting up Vision center infrastructure on the ground in 10 locations, the project also included setting up of a core mini data centre for maintaining electronic medical records and a connectivity NOC at IGM with an ICT enabled real time doctor consultation, facility at the Ophthalmology –OPD counter at IGM.



**New center's at Kathalia & Mandhai**

## Patient Screening Report Phase-II:

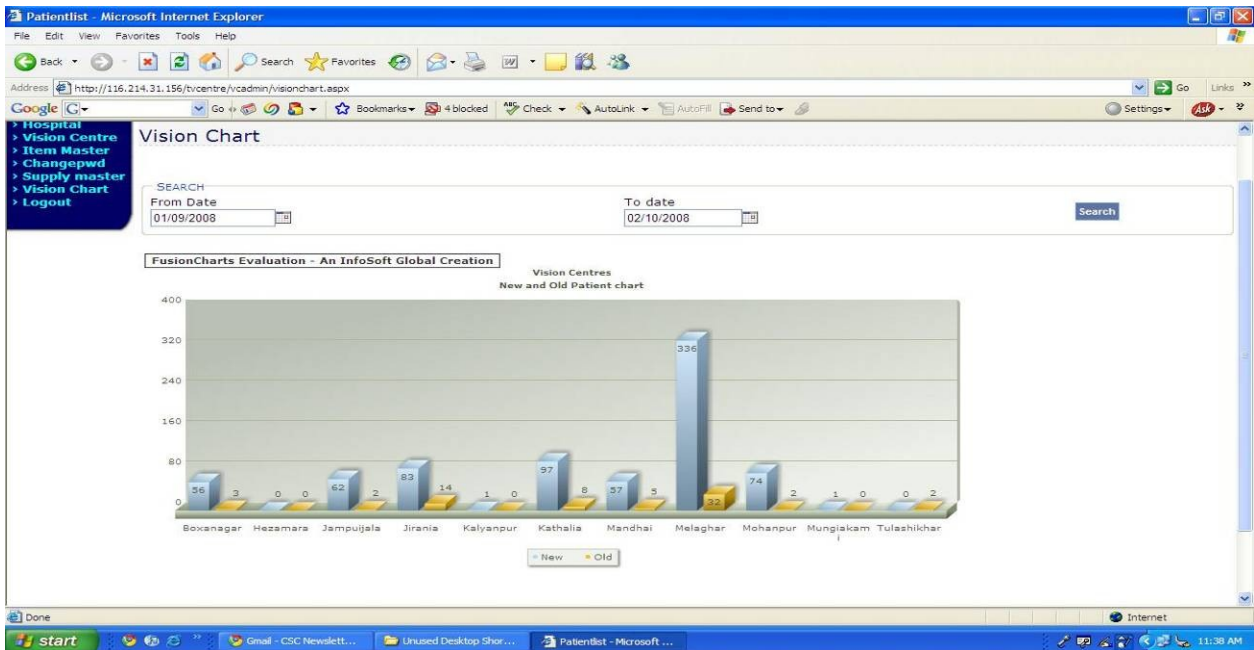
Number of patients from 05.07.08 to 30.09.08

Vision Centre Name	Total Patient			Total Glass Prescribed		Total Refraction		Ref. to IGM Hospital	
	Total	Male	Female	Male	Female	Male	Female	Male	Female
Mungiakami VC	127	96	31	11	4	51	26	17	8
Mohanpur VC	112	72	40	27	16	47	27	7	3
Mandhai VC	90	60	30	21	8	35	9	3	3
Jirania VC	174	86	88	40	46	61	70	7	5
Jampuijala VC	85	68	17	30	7	50	14	4	1
Boxanagar VC	103	67	36	18	10	44	22	4	4
Kathalia VC	170	117	53	50	16	81	34	6	3
Kalyanpur VC	135	76	59	40	35	40	35	9	8
Hezamara VC	41	37	4	7	0	10	2	1	0
<b>Total</b>	<b>1037</b>	<b>679</b>	<b>358</b>	<b>244</b>	<b>142</b>	<b>419</b>	<b>239</b>	<b>58</b>	<b>35</b>

**List of 10 +1 Locations completed in Phase II with commissioning dates:**

District	Block	Population	Date of Commissioning	VC-Status
West Tripura	Bishalghar	156410		Not Included
	Boxanagar	44064	7-Aug-08	Phase-II
	Dukli	95857		Not Included
	Hezamara	32895	7-Aug-08	Phase-II
	Jampuijala	43969	14-Aug-08	Phase-II
	Jirania	128196	7-Aug-08	Phase-II
	Kalyanpur	42972	14-Sep-08	Phase-II
	Kathalia	54347	7-Aug-08	Phase-II
	Khowai	62144		Not Included
	Mandai	43876	7-Aug-08	Phase-II
	Melaghar	108018	7-Aug-07	PilotSite-Phase-I
	Mohanpur	158974	7-Aug-08	Phase-II
	Padmabil	27417		Not Included
	Teliamura	78736		Not Included
Mungiakami		14-Sep-08	Phase-II	
Tulashikhar	45039	14-Sep-08	Phase-II	

**Online MIS through VCMS- for tracking real time patient details from VC**



## **Details of Vision Centre Infrastructure in 11 locations:**

### **i. Site Preparation at each Vision Centre:**

In all the sites completed at the above mentioned locations, approximately 250 sq ft to 800 Sq ft of covered premises where allocated by the Block Development Officer on the request of the Health department, Government of Tripura. On take over of the sites at the above mentioned block locations in West Tripura by IL&FS-ETS, the following activities where carried out and completed prior to installation of medical and ICT infrastructure at the site.

- a. **Site Assessment:** Sites were assessed for power availability with required input voltage, power stability, earthing for the building and mean sea level for planning and establishing wireless network in all the 10+1 locations were carried out and completed.
- b. **Earthing Pit:** A seperate earthing pit with an insulated Copper flexible cable was constructed at every location. This was connected to the changeover switch for Mains and DG. The earthing resistance was set at less than than 5 Ohms. The Earth to Neutral voltage was set not to exceed 1.0V (0.75V recommended). The Neutral is shorted to this earthing connection in the changeover switch. The Mains earthing is terminated at the Mains DB and need not be connected with the dedicated earth for IT equipment to avoid any circulating currents. Earthing resistance and the Earth to Neutral voltage is to be measured every 3 months to ensure that they are within allowed limits. Necessary action like putting water in earth pit should be ensured from time to time to maintain proper bonding to earth.
- c. **Separate Electricity Board (EB) connection for the site:** In order to have sustainable operations it was agreed with Nodal officer that separate single phase EB connection for power was enabled at every site and the same was applied for every location.
- d. **Basic site preparation:** All sites where given basic painting and required internal wiring, lighting and other electrical fixtures with power source.

S.No	Electrical Fixures	Discription
1	Electrical Connection	sepeare electrical connecxtion with a meter box connecting all equipments through the UPS
2	Fan	
3	Tubelights, bulbs	compulsory tubelight above the computer table, also bulbs inside the wall mounted lamp etc
4	Electrical points	as per design
5	Earthing	proper separate earthing for the Vision center power points
6	Lan cabling	as per design

S.No	Furniture	Discription
1	Computer table	4 X 1.5 ft computer table with keyboard draw
2	Screening table	3 X 1.5 ft table with lockable storage space
3	Grinding table	4 X 2 ft table with a cupboard model storage space
4	Rotable chair	with back support without arms
5	Patient chairs - 2	S type chair without arms and rotatable stool
6	Patient waiting bench - 2	6 X 1 ft benches
7	Floor carpeting and mattresses	pastable plastic flooring, door mattress
8	Partition Screens and interior work	screen cloth partitions for windows and door, and room interior plywood partitions as per design diagram
9	Miscellaneous (working shoes, bucket, mug )	dust bin, bucket
10	Drinking water facility	water filter with a wooder stool
11	Stationary	paper, files, threads, rechargeable batteries
12	Signboard	4 X 3 signboard with metal standing support
13	plastic trolley - 2	three rack neelkamal plastic trolley with wheels

## ii. Medical Equipments Installed:

The list of medical equipments and the vendors for supplying the same was decided in conjunction with Aravind Eye Care system, based on the field trials conducted by Aravind at their Vision centers in Madurai district- Tamil Nadu. The equipments where are also further evaluated based on their performance at the Melaghar Vision Centre in Tripura (West district) pilot project over a period of six months. All 11 locations inclusive of the pilot have been installed and commissioned with the below given list of Ophthalmic equipments to conduct basic screening and to support capture of data for remote diagnostics and prescription from the doctor.

S No	Medical Equipments	Description/ Configuration
1	Slit lamp	Topcon basic slitlamp model
2	Applanation Tonometer	
3	Streak Retinoscope	
4	Direct Ophthalmoscope	
5	Trial sets	
6	Schiotz tonometer	
7	Basic sterilizer	
8	78 D lens	
9	IPD Scale	
10	JCC	
11	Mirror (Refraction)	
12	Snellen's chart drum	Mechanised vision drum with joystick
13	Near Vision Chart	
14	Grinding, edging kit and machine	
15	Thermometer	
16	BP apparatus	
17	Stethoscope	
18	Torch Light	
19	Height Chart	
20	Needle Sterilizer	
21	Glucometer	
22	Weighing Machine	
23	Syringing set	x
24	Remedi Kit	Telemedicine kit which works as a remote diagnosis tool in synch with a software that stores and transmits patient analysis data digitally

## iii. ICT Infrastructure Installed at Vision Centre:

To enable capturing of patient records at source through the online VCMS-Module and to conduct seamless real time consultation with patients using the communicate@work (Video conferencing tool) from the 11 vision centers across the West district of Tripura, the following ICT infrastructure as been installed and commissioned in all 10+1 locations.

S.No	IT Equipments	Description/ Configuration
1	Computer	DELL-AO-330dt-Dell OptiPlex 330 Desktop ( XP)1.6 GHz, 1MB L2 Cache,800 MHz FSB PC with monitor,CPU, Keyboard, OS, Office suite
2	Web camera	D link web camera
3	Speakers with microphone	D link speakers with microphone
3	Digital Camera with clamp	Cannon camera 8 mpxl fabricated clamp to fix 78D lens to capture fundus images
4	Printer	Cannon printer
5	UPS	1.2 KVA online numeric UPS with 2 hours back up option
6	Battery charger	1 unit of - 4 battery charger equipment

#### iv. Connectivity Infrastructure Installed:

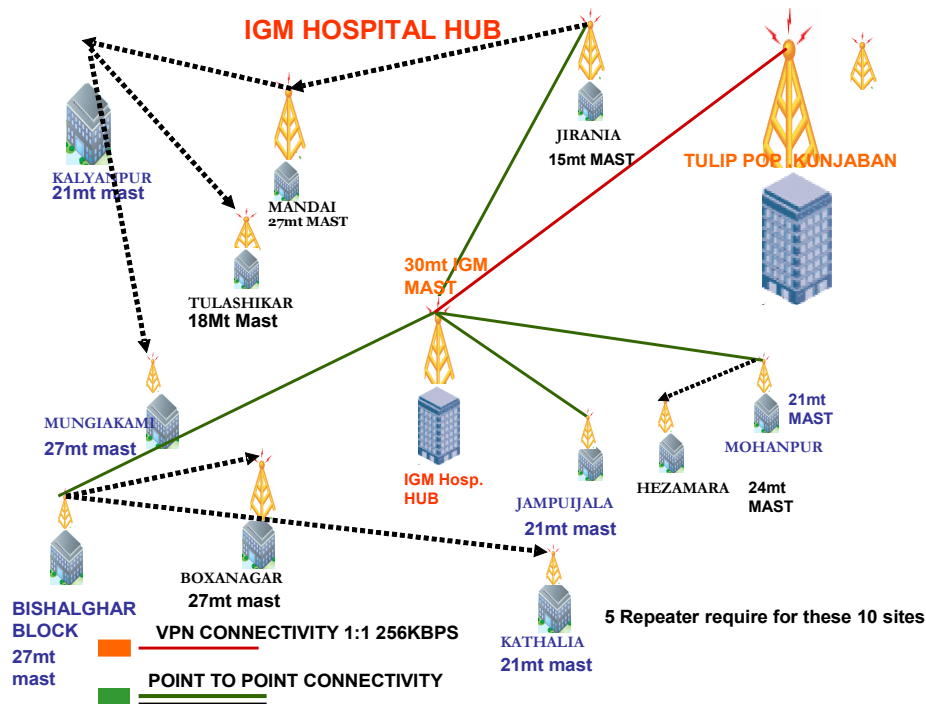
The connectivity network built for the vision centre includes a number of base stations that are installed on top of POP's in every cluster covered by the network. The wireless network is deployed to operate with Near Line of Sight (LoS) in most areas and Non Line of Sight in some areas. This enables to connect Vision centers by mounting the Customer Premises Equipment (CPE) on a less than 30 mtrs tower, hence in all locations less than 30 mtr towers have been erected to connect to the NOC and the Data centre at IGM-Agartala.

The MPLS VPN Network supports both Layer 3 and Layer 2 tunneling methods such as IPSec and MPLS for creation of VPNs. IPSec tunnels are CPE based, and the tunnels originate at one customer site, and are terminated at the other end. MPLS is a network based tunneling method that labels, categorizes and monitors each packet as it traverses the network. Because MPLS is an overlay protocol it can operate on top of the IP protocol in the same network without interference.

**MPLS VPNs:** When a customer packet comes to the edge router (Label Edge Router) on MPLS enabled network, the packet is encapsulated and tagged with a label (also called MPLS shim header, and is 32 bits long), which is removed only when the packet exits the network. As the packet travels through network, the routers in the core (Label Switch Routers) switch, rather than route the packets, there by greatly reducing latency in the network. The path between the Label Edge Router (LER) and a Label Switch Router (LSR) is called a Label Switch Path (LSP). MPLS allows for the creation of LSPs, which are predetermined paths (not necessarily lowest cost paths) through the network. The key benefit to customers is an ability to place their critical traffic on pre- defined LSPs, while letting their less critical traffic traverses the network using regular IP routes. From a Vision centre perspective, MPLS VPNs enable network routing to be simplified. For

example, rather than having to manage routing over a complex virtual backbone composed of many PVCs (Permanent Virtual Connections), an MPLS VPN user can generally employ backbone as the default route in communicating with all of the other VPN sites. The use of MPLS for VPNs provides an attractive alternative to both Frame Relay /ATM PVC- based of VPNs and IP sec tunneling to interconnect routers at customer sites. The MPLS VPN model supports "any-to-any" communication between VPN sites without requiring a full mesh.

**Indicative network diagram of the commissioned Vision Centers**



**V. Outpatient –Real time consulting at OPD facility, IGM:**

In order to facilitate seamless online consultation with the patients from the Vision centers across the 11 locations. A real time consultation facility was established in the Out patient doctor consultation room at IGM-Hospital with required video conferencing software and access to VCMS module for doctor validation and sending the signed prescription online.



S.No	IT Equipments	Description/ Configuration
1	Computer	DELL-AO-330dt-Dell OptiPlex 330 Desktop ( XP)1.6 GHz, 1MB L2 Cache,800 MHz FSB PC with monitor,CPU, Keyboard, OS, Office suite
2	Web camera	D link web camera
3	Speakers with microphone	D link speakers with microphone
4	Printer	Cannon printer
5	UPS	1.2 KVA online numeric UPS with 2 hours back up option

#### VI. Datacenter at IGM:

The Vision Center database server is located in the Indra Gandhi Memorial Hospital premise at Agartala, the state capital. The server will serve as the NOC for the entire state which will translate to 40 vision Centers in the block levels. Apart from the required furniture, fixture and other accessories required for the data centre please find below enumerated ICT infrastructure technical specifications:

S No	Data Centre Equipments
1	UPS Online 1KVA 90 minutes Backup with 1 year total warranty (2 number)
2	Comprehensive AMC for 2nd and 3rd year (Includes maintenance, servicing and replacement of the UPS hardware, excluding battery@6%)
3	9U RACK for Switch, Patch Panel, Router etc.
4	Computer table
5	Rotable chair
6	Ordinary chair Plastic (3 Nos).
7	Floor carpeting and mattresses
8	Miscellaneous (working shoes, Dust Bin etc )
9	Electrical Connection and work (Fan, Tube light, bulbs, Electrical points with 2.5 multi wire cable Havels )
10	AC 1.5 Tone Split LG/ Carrer One Year Warranty )
11	Surge Protector 3KV
12	Earthing
13	D-Link 8 Port Switch Managed
14	LAN cabling CAT 6 D-link
15	Office Table

### **Server Machine:**

The server machine is required to be continuously operational and the video conferencing tool and the Vision Center application will be run from the server.

Technical specification - Hardware: the Vision Center database is of the following configuration:

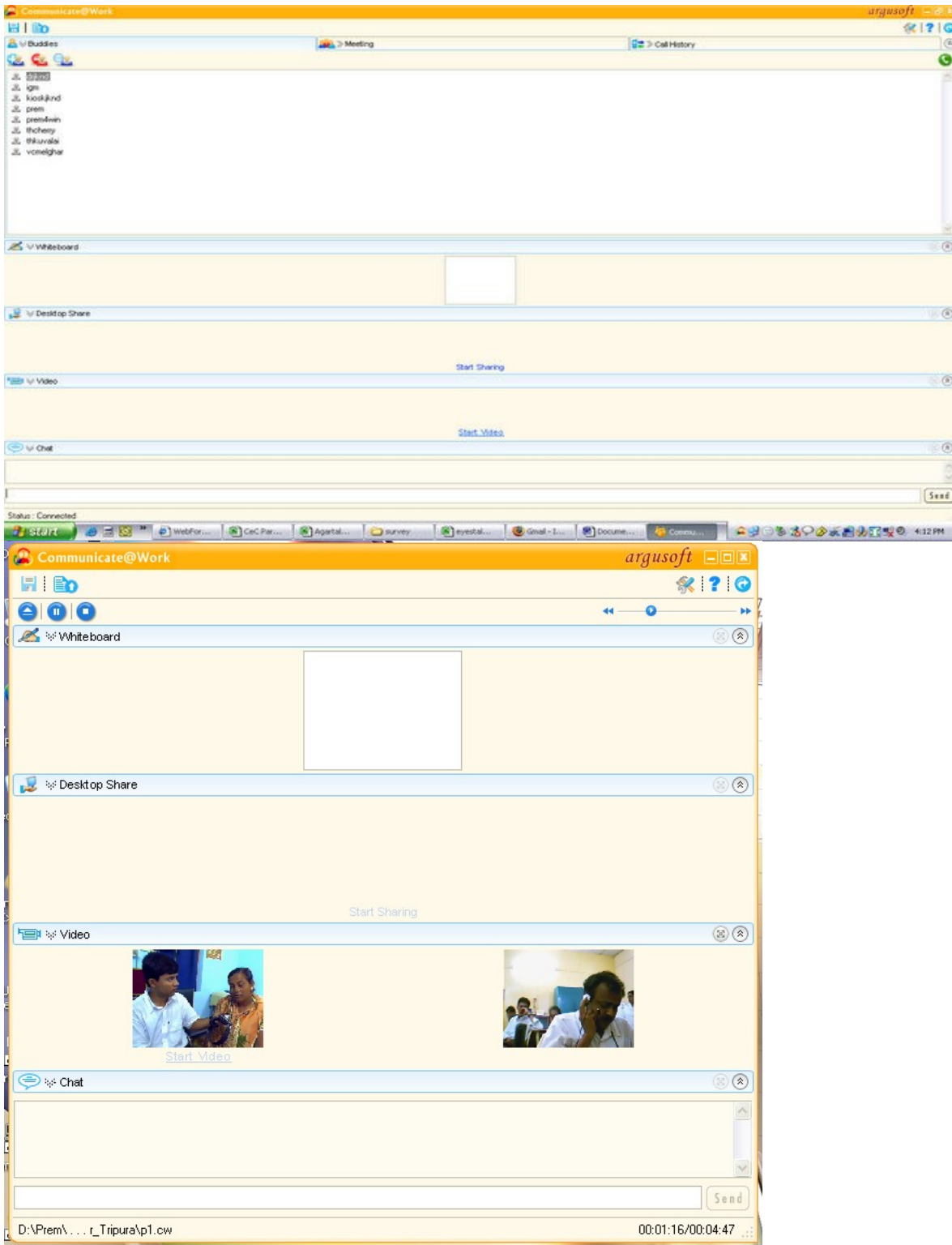
AS-PE840 AS-PE840 - Dell(TM) PowerEdge(TM) 840 Server  
XM678 -PowerEdge(TM) 840, Quad Core Xeon Pro X3210, 2x4M 2  
B Cache, 2.13GHz, 1066MHZ FSB  
BNW-S029 -Integrated Single Gigabit Ethernet Controller 2  
BVC-S015 -Embedded ATI RN50 with 16MB Memory 2  
BSA-S004 -Integrated SATA (4 Channels) 2  
BPT-S003 -Integrated USB 2.0 (2 ports) 2  
2K159 -Mod Specs Info (India) 2  
NH976 -C8: Raid 5 (Add-in SAS/SATA RAID Card with HotPlug2  
g HDD, 3 to 4 HDD), PERC 5i  
JJ313 -Chassis with Hotplug HDD Cage 2  
YD558 -PERC5/i Controller Card 2  
WF102 -Document & User Guide for PERC5i & PERC5E Card (E 2  
nglish)  
XU772 -Fan Bracket for PERC5i or PERC5E 2

Two such server machines have been made operational where one will act as the back up server for the other.

**Argusoft's – Communicate@work** Audi/Video Chat service will be run out this server. The video conferencing tool will require the server for authentication purpose and then will establish a peer to peer link between the respective machines. Though the application provides the option to record the real time sessions between the doctor & the patient, the model currently does not require the sessions to be stored as archives.

### **Communicate@work:**

The Communicate@work application is installed in the server machine and the client – Communicate@work is installed in the users' desktop. The clients will need authentication to log in. For the profile of the software, please visit [www.argusoft.com](http://www.argusoft.com). The snapshot of the Communicate@work videoconferencing client is given below. The application is built using "C programs"



The Vision Center application is a customized application designed and developed by Aravind Eye Care –Madurai. This web enabled module allows the paramedic to capture all the information relevant to the eye screening of the patient (may include pictures of the eye in some cases). The patient case history

can be seamlessly escalated between the secondary care and tertiary care hospital as when required.

**Technical Specification - Software:** The following are the software components that are part of the server system.

Windows 2003 server - standard edition

Sql-server – free personal edition

internet Application Server (IAS) - free edition

Dot net framework version 1.1

The snapshot of the Vision Center module is given below.

The screenshot shows a web-based form for a vision center. It includes sections for patient history (Diabetic, Hypertensive), vision details (Presenting Vision, Best Corrected), physical details (Height, Weight), and a detailed list of complaints and ocular exam findings. The form uses a combination of text boxes, dropdown menus, and radio buttons for data entry.

### **Remedi Telemedicine Kit:**

In due course of time, the Vision centers will be equipped to provide treatment for issues other than Eye care. The treatment for general medical issues will be provided by through a telemedicine model where the doctors will be connected through the same network. The Remedi diagnostic tool will be used to capture the following patient details at source.

- 12-channel ECG, NiBP, Auscultation Sounds
  - Temperature and Heart rate
- ☐ Measurements  
(Stethoscope),

The Remedi kit will be connected to the software which will capture the information digitally from the remedi kit

The Remedi kit is a product of a telemedicine company called Neurosynaptics.

For further information visit  
[http://www.neurosynaptic.com/products\\_ReMeDi\\_MDAU.htm](http://www.neurosynaptic.com/products_ReMeDi_MDAU.htm)

Acrobat Reader - [ReMeDi.pdf]

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Neurosynaptic intends to bridge this gap by creating an affordable solution that will provide access to basic healthcare facilities to rural population. Towards this end, a patent pending ReMeDi™ Telemedicine Solution has been developed in collaboration with the IITM group of Indian Institute of Technology, Madras. ReMeDi™ Data Acquisition Unit and ReMeDi™ Software can measure basic physiological parameters and provide vital information about the patient to the doctor for a preliminary diagnosis. Video conferencing has been integrated into this solution, which works even at a bandwidth as low as 28.8 Kbps. With both the capital and operational expenses reduced, it is an extremely cost-effective solution for telemedicine applications. System can be used by anybody who is familiar with the usage of computers, after a minimal amount of training.

ReMeDi™ solution facilitates the basic diagnosis of a patient remotely by a doctor by measurement of patient's temperature and blood pressure, and listening to chest sounds using the electronic stethoscope. A preliminary diagnosis of cardiac problems can be carried out using Stethoscope, ECG and Blood Pressure measurement. Using high-resolution images, doctors can provide Eye care, Dermatology and ENT services.

Advantages of ReMeDi™

- Low bandwidth requirement
- Does not require huge infrastructure cost, hence extremely cost-effective and scalable
- Not necessarily a center in doctor's consultancy, although may be used for a specialist or super specialist opinion at a time.

Telemedicine facilitates the provision of medical aid from a distance. Video consultation from a remote area to a doctor can alleviate prohibitive travel and associated costs for the patients and reduce cost of medical care for those in remote areas.

Many telemedicine solutions have been implemented but the solution and telecommunication technology are both inappropriate in most cases. Many rural areas either do not have cable using or even if the regular telephone lines are available, they do not supply adequate bandwidth for most telemedicine applications. Other kinds of high bandwidth telecommunication services required for sophisticated use may be available but they all come at a prohibitive cost. This has hampered the viability of the solution. As a result, those

used by anybody who is familiar with the usage of computers, after a minimal amount of training.

ReMeDi™ solution facilitates the basic diagnosis of a patient remotely by a doctor by measurement of patient's temperature and blood pressure, and listening to chest sounds using the electronic stethoscope. A preliminary diagnosis of cardiac problems can be carried out using Stethoscope, ECG and Blood Pressure measurement. Using high-resolution images, doctors can provide Eye care, Dermatology and ENT services.

System Features

- Plugged design for rural conditions
- Integrated solution with video and audio conferencing facility between the doctor and patient
- Low bandwidth requirement (as low as 28.8 Kbps) for real-time audio, video and medical data transfer
- Stable for any kind of connectivity (Dial-up, LAN, cable, ISDN and VSAT)
- Supports both real-time and store-and-forward modes of data transfer
- Comprehensive Medical Record Management System with storage, query retrieval, display and printing of medical records
- Complete control with the doctor during measurement
- Easy-to-use software and hardware with minimal amount of training, does not require a doctor or a technician at the patient end
- 200W AC power supply required only for re-charging purpose, not required while in operation
- Connects to the computer using wireless communication
- Continuous battery based operation for twenty hours after charging for only four hours
- Low battery indicator

ReMeDi™ Kit Contents

- ReMeDi™ Data Acquisition Unit
- Electrodes and probes for ECG, Temperature, Blood Pressure and Electronic Stethoscope sound capture
- Wireless dongle with a serial interface
- ReMeDi™ software (including video conferencing) in an installable form on a Compact Disc
- User Manual

Other Specifications

- Electrodes and Probes cable length: 2.5 meter maximum
- Wireless Communication distance: 1 meter
- Serial cable length: upto 1 meter




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