

Incubating Next Generation Telecom Intellectual Property

Telecom Centers of
Excellence Initiative-
Indian IPR in 4G

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Telecom Centres of Excellence

A Public Private Partnership Initiative

- Capacity building to sustain the telecom growth
- Help build an environment for innovation by creating synergies among premier academic institutions, telecom companies and the Government of India

Centres across India

<p>IIMA Idea Telecom Centre of Excellence (IITCOE) at IIM Ahmedabad</p>	
<p>Vodafone Essar IIT Centre of Excellence in Telecommunications (VEICET) at IIT Kharagpur</p>	
<p>Aircel IISc Centre of Excellence in Telecommunications (AIIScCET) at IISc Bangalore</p>	
<p>Airtel IIT Delhi Centre of Excellence in Telecommunications (AICET) at IIT Delhi</p>	
<p>BSNL IITK Telecom Centre of Excellence (BITCOE) at IIT Kanpur</p>	
<p>Tata TeleServices IIT Bombay Centre of Excellence in Telecommunications (TICET) at IIT Bombay</p>	
<p>Reliance IITM Centre of Excellence in Telecommunications (RITCOE) at IIT Madras</p>	

TCOE – Main Areas

4G Standardization

Networks and Infrastructure

Devices

Applications and Services

4G Standardization

Impact on Cellular Standards

IEEE 802.16m

RITCOE IIT Madras & CeWiT

CeWiT - Supported by Govt of India and an industry consortium

Open-loop Rank 1 and CDR regions, collision free interlaced pilots, relays

TICET- IIT Bombay

Bandwidth Reservations and Quality of Service

Relay ARQ, seamless relay handover

Co-Located Coexistence of WiMax & Wi-Fi

IEEE 802.11

TICET-IIT Bombay

Mobile backhaul- segment protection

4G Standardization

Patents

We are making contributions to the following standards body

4G Standardization

- RAN-2/RAN-3 WG of LTE
- IMT-A Evaluation.]
- IEEE 802.16m standards

Research Areas

- Cooperative communication and Relay Networks
- QoS for Broadband Wireless

➤ Prateek Kapadia, B Srinadh, Abhay Karandikar and Harshad Maral, *“Differentiating Wireless Uplink Bandwidth Request by Connection Priority”*, India Filing 09/07/09 and US Filing 19/08/10

➤ Abhay Karandikar, Prateek Kapadia, Animesh Kumar, Sanjay Kumar, Somya Sharma and Dhanshree Deval – Parakh, *“Method for facilitating and analyzing social interactions and context for targeted recommendations in a telecom service provider’s network”*, India Filing 25/02/2010 and US Filing 25/10/2010

➤ Siddharth Shetty, Punit Rathod and Abhay Karandikar, *“An approach for enabling coexistence for Radio Technologies”*, India Filing 09/07/2010 and US Filing 26/10/2010



Significant Contributions

- ❑ Prateek Kapadia, B. Srinadh and Abhay Karandikar, “*Differentiating Bandwidth Request based on Service Class and Re-try Attempts*”, July 2009, IEEE C802.16m-09/1321r5
- ❑ Prateek Kapadia, Abhay Karandikar, Gauri Joshi, Nirbhay Rane, Srinadh B, Muthaiah Venkatachalam, Xiangying Yang, Shantidev Mohanty, Jerry Sydir, Kanchei(Ken) Loa, Chun-Yen Hsu, Youn-Tai Lee, YihShen Chen, Paul Cheng, Jungshin Park, Hyunjeong Kang, JungJe Son, Rakesh Taori, Yuqin Chen, Mary Chion and Yang Liu, “*Data path operation for 16m relays(16.6)*”, December 2009, IEEE C802.16m-09/3038r2
- ❑ Siddharth Shetty, Punit Rathod, Abhay Karandikar, Prateek Kapadia, Zhu Jing, Shantidev Mohanty, Ming-Hung Tao and Kelvin Chou, “*Proposal for change in Co-located Coexistence (CLC) message attribute (Section 16.2.3.17)*”, July 2010, IEEE C80216m-10_0937r4
- ❑ Anurag Nishad, Prateek Kapadia and Abhay Karandikar, “*Inclusion of Bandwidth Request parameters in MAC management messages (Section 16.2.3, 16.2.11.1)*”, July 2010, IEEE C802.16m-10_0907r1
- ❑ A list of full contributions can be seen at <http://ticet.iitb.ac.in/ticet/publications/publications.htm>

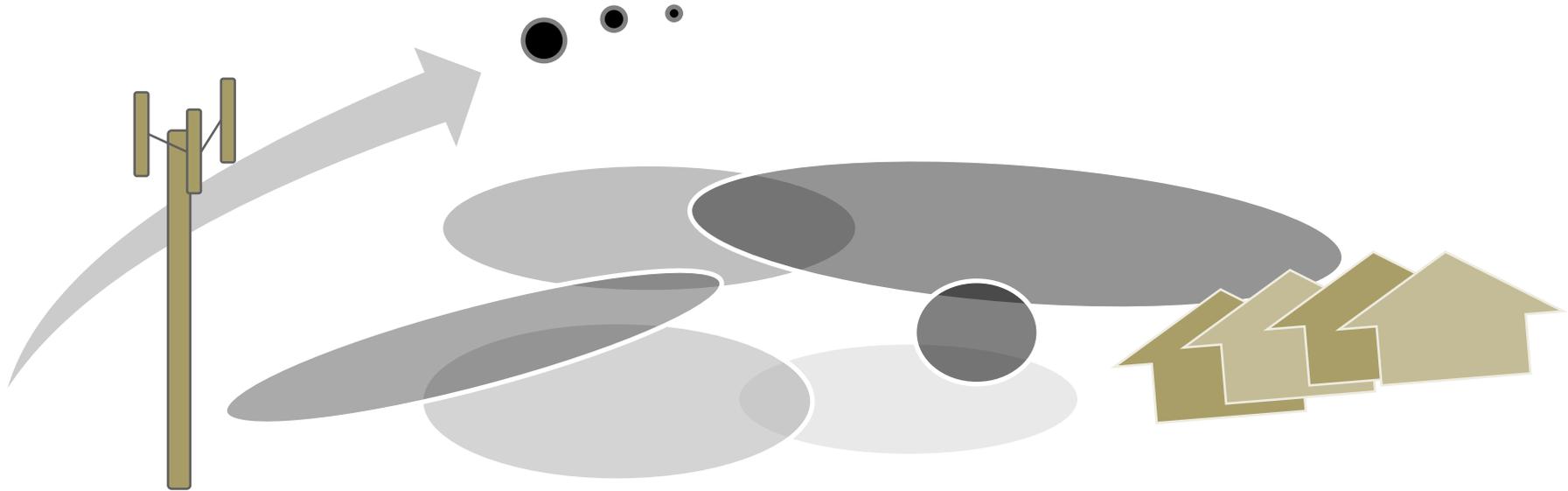


Networks and Infrastructure

TICET-IIT Bombay

CeBRA

Cellular Backhaul for Rural Access

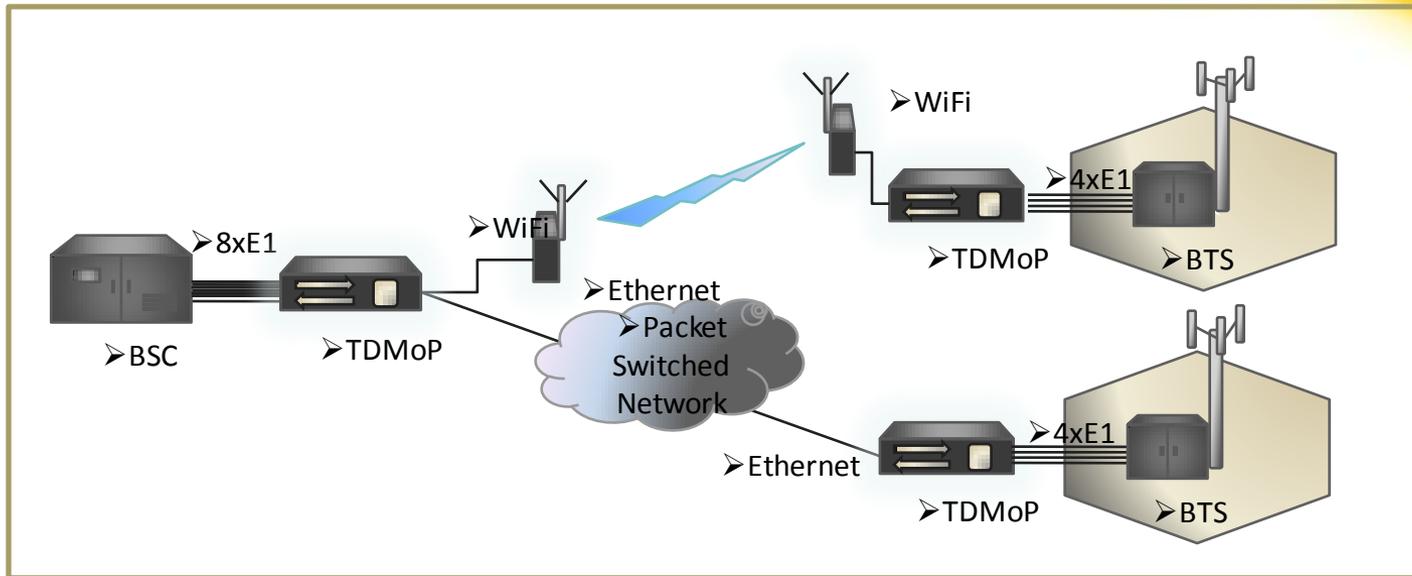


CeBRA solves the problem of Cellular deployment in Rural areas by:

- *Extending reach of the E1 to beyond the twisted pair limitation*
- *Using modified and efficient Wi-Fi (TDMA based)*
- *Circuit Emulation over optimized TDMA Wi-Fi*
- *Enabling reach to rural areas, 10s of kilometers supporting multi-hop*



CeBRA ...



TDM Interface

- Supports up to 8 E1s
- Supports both long-haul and short-haul applications

Ethernet Interface

- 2 10/100 Ethernet ports
- 2 100Base-FX / 100Base-TX **combo mode**
- Packets up-to 2000 bytes
- VLAN support for 802.1, 802.1Q and stacking (Q-in-Q)
- 1 Port with PoE support

Circuit Emulation

- Full support for: CESoPSN, TDMoIP
- Ethernet, IPv4/IPv6 and MPLS encapsulation
- Clock recovery handles packet loss, constant delay changes, frequency changes and other impairments
- Enough jitter buffer to avoid packet delay variation
- High resilience to adverse traffic conditions

Configuration interface

- CLI, SNMP and Web UI support for easy set-up and maintenance
- Display of alarms, counters and status



BITCOE – IIT Kanpur

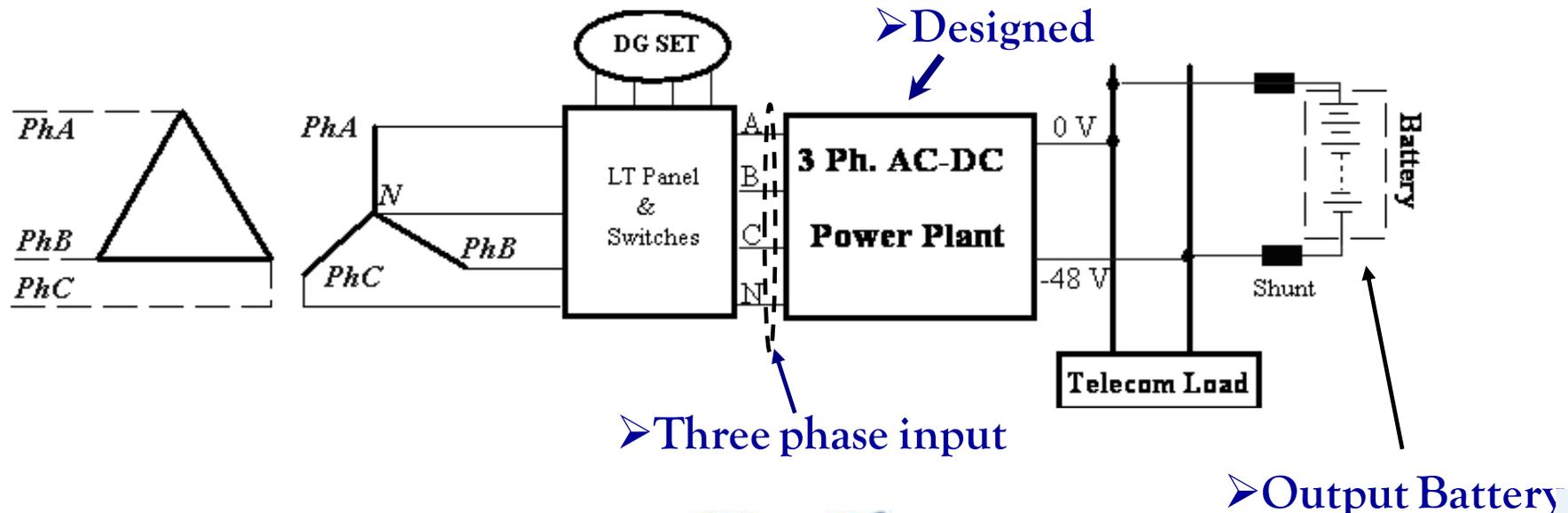
Power Plant Architecture for Rural Telecom Application

➤ Current Problems with the Rural Power Plants

- Power plant doesn't work when 2 or 1-phase is available.

➤ Proposed Solution

- New Power Plant Architecture is proposed which works with 1-2, or 3 phases
- Supplies a regulated output with input voltage range between 90 V (during single phase) to 480 V (during three phase)
- The output is manually variable between -48 VDC and -56 VDC
- The output should be floating to accommodate battery interface



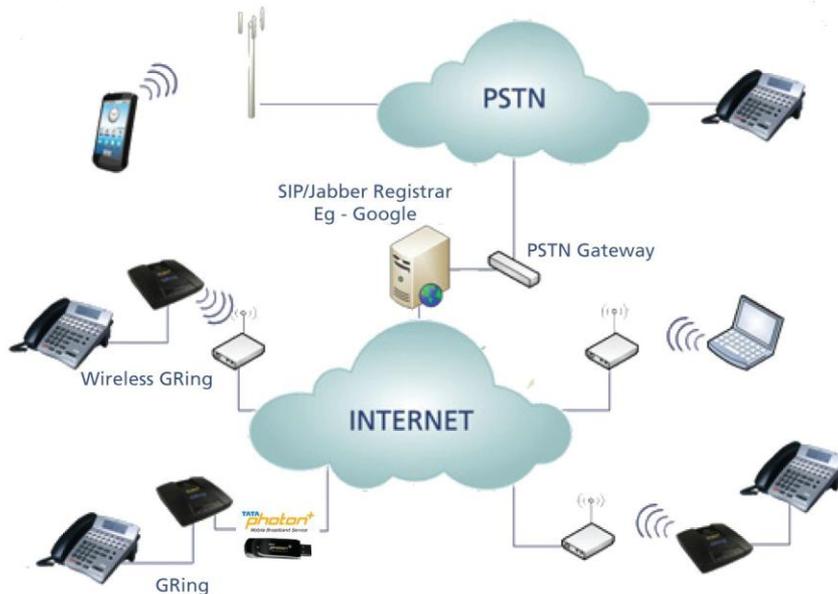
Network - Devices

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GRing

Features

- Use Google Talk with Conventional Telephone handset
- Integrated Wi-Fi AP + Ethernet Router
- Internet access via USB Modem or Ethernet
- Make calls to Google Buddy without PC or Mobile Phone
- Intuitively designed UI and keypad management



GRing Use Cases

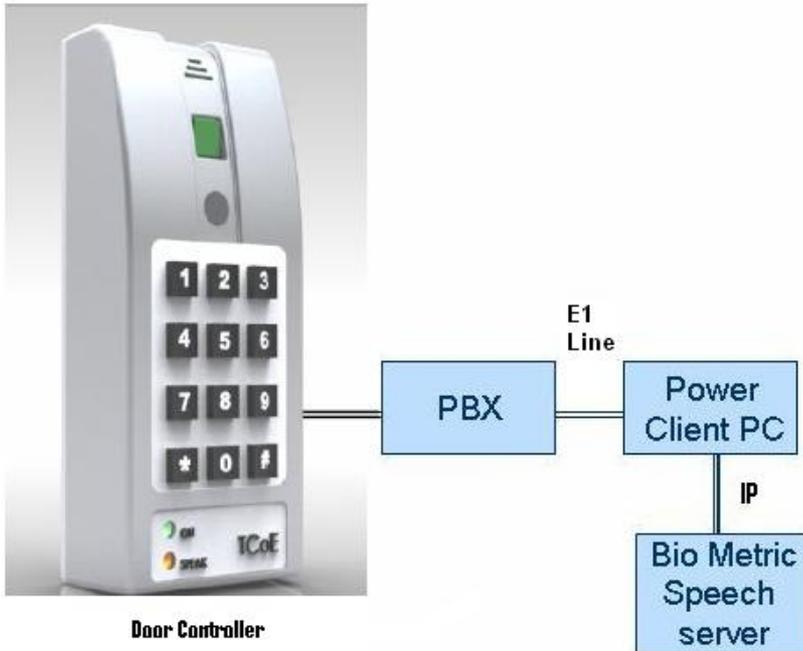
Sampling Now



RITCOE – IIT Madras

Voice Activated Door Lock (VADOL)

VADOL controls access to a door/premise. The access is controlled by authentication of the authorized user voice by an Voice Authentication Server.



Door Controller

Features

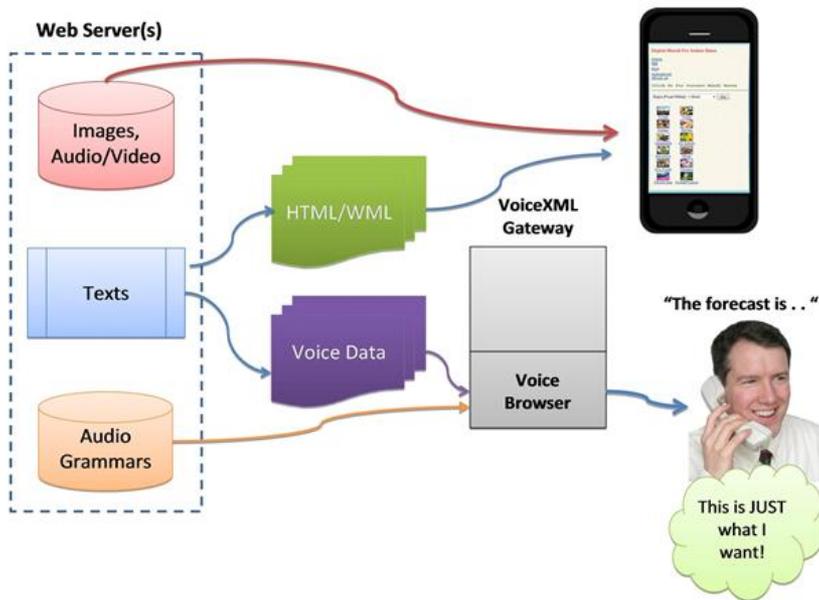
- Secured door lock system.
- Bio - metric server will provide authentication only for original voice.
- Authentication response from the server is encrypted
- Easy registration and user friendly authentication
- Automatic door opening system in case of fire alarm signal detection
- Keypad used for User PIN entry & authentication in case of PABX failure
- Battery backup
- Fail safe operation
- Low cost solution

Network – Applications & Services

BITCOE – IIT Kanpur

Digital Mandi for the Indian Kisan

Digital Mandi for the Indian Kisan presents a unique web and cell phone based multi-modal agriculture commodity pricing retrieval system.



Features

- Multi modal query and Access System.
- Query Agro commodity Prices using a GPRS enabled cell phone.
- Image, Text and Voice based data retrieval.
- Outbound Calling for Farmers.
- Receive calls for crop prices queried in case you need it via voice.
- Combination of image, text, and voice make the system truly multimodal.
- Robust to speech recognition errors.
- Can be accessed with inexpensive GPRS (2G or 3G) enabled cell phones.
- IVRS based system, call 0512-391-5353 to access the test deployment.
- Speech recognition based access system under development, call 0512-391-5354 to access the test deployment.

TICET-IIT Bombay

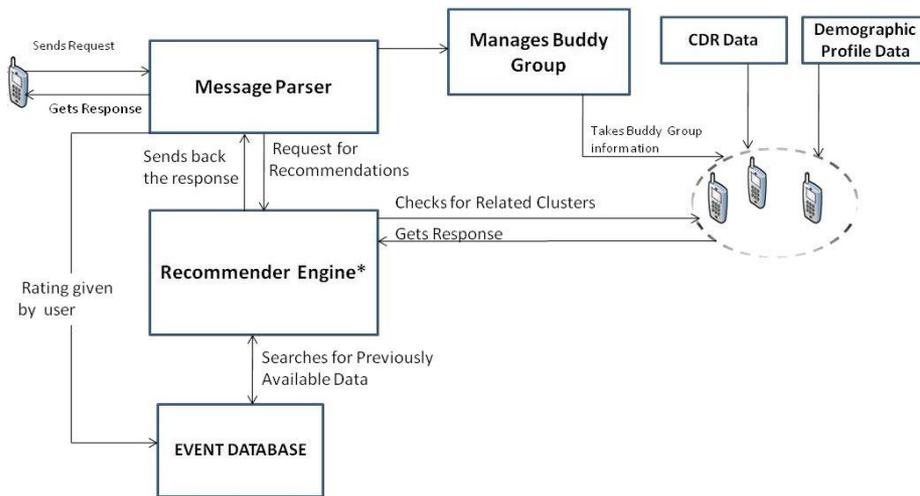
MSNP

USING SOCIAL INTERACTIONS IN SMS APPLICATIONS

➤ A unique patented platform for telecom service providers that exploits user's social interactions to increase overall network intelligence

Features

- ❑ Novel clustering algorithm
- ❑ Consideration for CDR, buddy list and previous history of user's likes and dislikes to form groups of users with similar interests.
- ❑ Effective resource usage
- ❑ Increased network intelligence for better application development, such as personalized tariff plan recommendation
- ❑ Optimized searching facility for caller tunes/ringtones via SMS
- ❑ Modular Architecture so that many socially benefiting applications such as User Driven Health Care in rural areas can be plugged into this platform.



RECOMMENDER SYSTEM



RITOCCE – IIT Madras

Mobile Interface to Enterprise Database (MINED)

Provides an ideal solution for multimedia information aggregation to an enterprise database using a mobile phone.



Applications:

- Efficient Field Surveys
- Sales/Order Fulfillment
- Mobile Phone based Personalized Knowledge Validation and Evaluation

Features

- Easily configurable web interface for form creation
- Multilingual user friendly interface for the end user
- Supports uploading of forms input data, images and voice captured from the mobile phone from any remote location
- Every user could be assigned a specific data collection task with access privileges for uploading data
- Uploaded data is time stamped along with details of the sender when captured in the enterprise database.
- Data is uploaded whenever the mobile phone can establish a GPRS connection to the enterprise database. In the absence of a GPRS connection, data gathering and validation can still be done locally on the mobile. This stored data is later uploaded whenever the GPRS connection becomes available
- Report Generation Facility

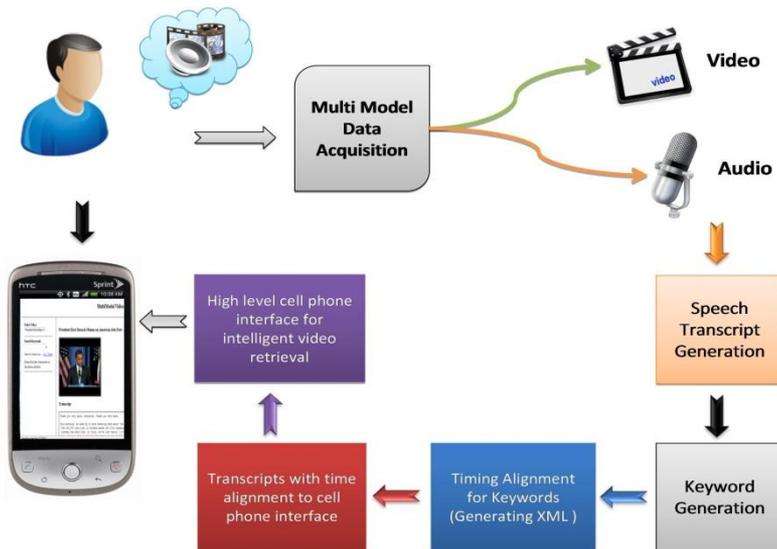
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Intelligent Video Retrieval (IVR)

Features

IVR Retrieving video data for the time interval of interest finds applications in numerous fields including education, news, and entertainment.

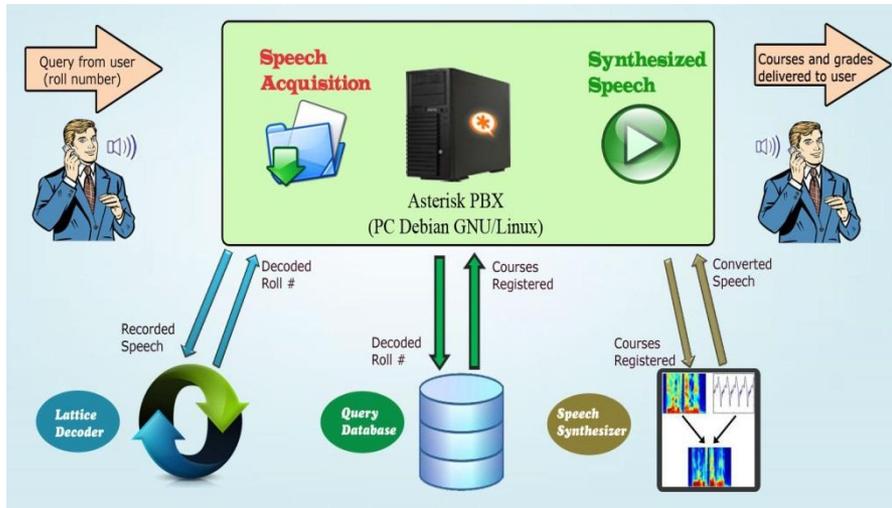
- ❑ Speech Recognition tools are used to extract a time aligned transcript from the video
- ❑ Important keywords are recognized from the transcript
- ❑ These keywords and time of their occurrence is then indexed by the information retrieval system
- ❑ Video can be searched by the keywords and viewed from where these keywords occur



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Speech based Grade Enquiry System

The grade enquiry system currently receives digit inputs from the users cell phone in the form of voice and the voice recognition is done at the server.



Features

- ❑ Open source tools like Sphinx and HTK have been used to build digit recognition systems.
- ❑ A combination of letters and digits is also allowed to enable roll numbers with letters at the beginning.
- ❑ A call flow is designed for this specific purpose which intuitive and easy to use.
- ❑ Voice prompts guide the user through the process of grade retrieval.
- ❑ The system currently receives digit inputs from the users cell phone in the form of voice.
- ❑ Call +91-512-3915399 to access the system.

Thank You!