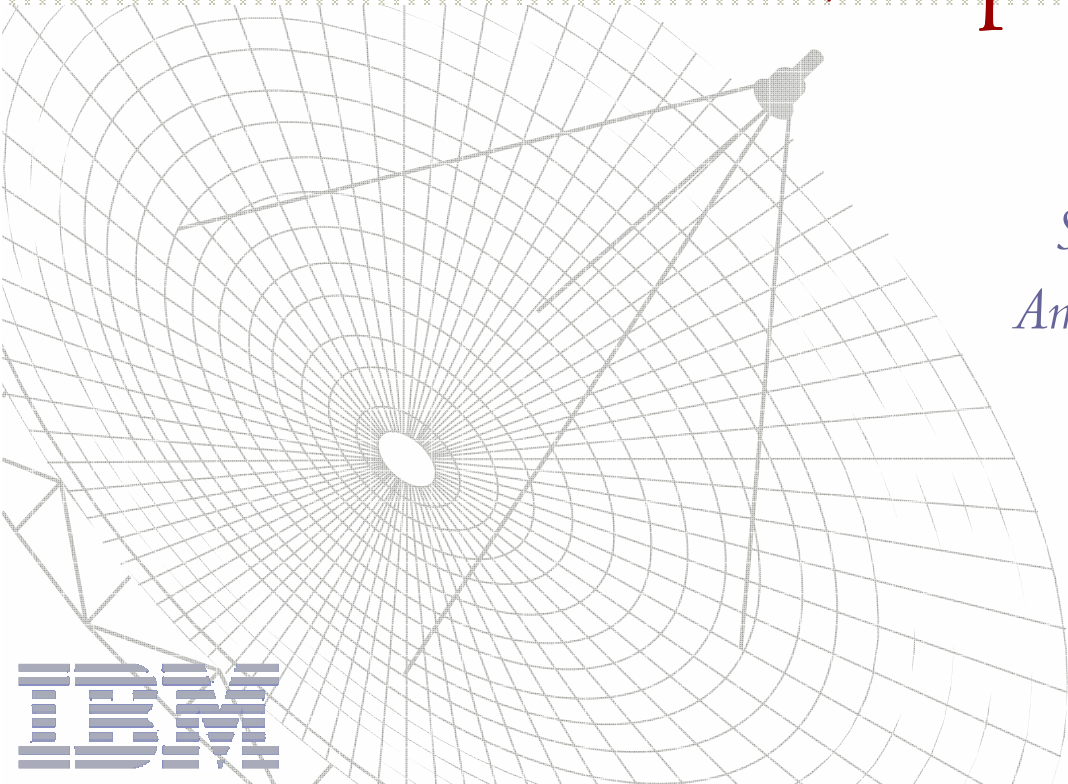




*VoiKiosk*: Increasing Reachability of  
Kiosks in Developing Regions



*Sheetal K Agarwal, Arun Kumar  
Amit A. Nanavati, and Nitendra Rajput*

*IBM India Research Lab*

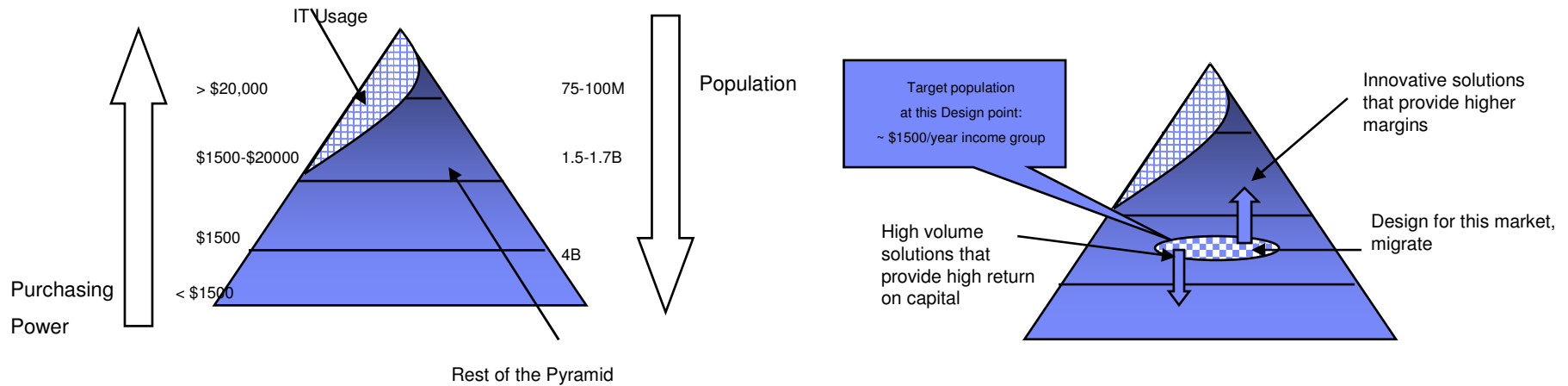
**IBM**

# Outline

- ★ Background and Motivation
- ★ Introducing VoiceSites
- ★ Our Vision: *The World Wide Telecom Web*
- ★ Report from the field



# Rest of the Pyramid: Design Point



Adapted from *The Fortune At The Bottom Of The Pyramid* by C.K. Prahalad.

"Innovations in BOP markets can reverse the flow of concepts, ideas, and methods. Therefore, for an MNC that aims to stay ahead of the curve, experimenting in BOP markets is increasingly critical. It is no longer an option", C.K. Prahalad, *The Fortune At The Bottom Of The Pyramid*

- ★ Urban *micro* businessmen

- ✦ Shopkeepers, taxi-walas, autorickshaws, kirana stores, Insurance agents, Plumbers, Electricians, Carpenters

- ★ Small rural businessmen

- ✦ Fisherman, Farmers, Brokers, Money lenders, Rental equipment suppliers

- ★ Consumers

- ✦ Middle class income group

# Background

- ★ Impact of WWW is restricted
  - ✦ to a small percentage of human population
  - ✦ barely 17% of world's population has access to Internet [IWS]
  
- ★ Causes
  - ✦ Affordability
    - ▲ Of the other 83%, about 53% of the population lives below USD 2 per day [WPDS]
  - ✦ Literacy
    - ▲ a significant portion of the remaining 30% is semi-literate or illiterate
  - ✦ Relevance
    - ▲ Information and services on WWW are not very relevant for this section of the population
  
- ★ Focus of Existing Work: bringing PCs with Internet to the masses

# Observation and Approach

- ★ Is providing access to PC and Internet sufficient ?
- ★ An average person does not need access to PC/Internet
  - ✦ Access to PC with Internet
    - ▲ delivers globally relevant information since local content for developing regions does not exist in WWW
    - ▲ interaction is typically through an intermediary (such as kiosk operator or a literate person in the family) which is restrictive in nature
    - ▲ complex interface
    - ▲ high upfront cost
  - ✦ *Information Literacy* rather than *Computer Literacy*
    - ▲ Fisherman needs weather info before heading out to sea
    - ▲ Farmer needs to look up commodity prices
    - ▲ Milkman needs to know if the homeowner is in town
- ★ Can Information Literacy be made into a basic facility such as railroad, electricity ?
- ★ Some India Specific Observations
  - ✦ **Phone penetration has been phenomenal**
    - ▲ Internet penetration = 3.5 % , Phone penetration = 20 %
  - ✦ **Voice as an interface is more acceptable than keyboard on mobiles/PCs**
    - ▲ Many people are unable to use phone features such as address book, SMS etc.
    - ▲ SMS volume is one third of the call volume even in major cities

# Outline

- ★ Introduction and Background
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# Introducing VoiceSites

- ★ A VoiceSite is:
  - ✦ A voice driven application *hosted* in the network and *created by subscribers* themselves
  - ✦ Consists of a set of interconnected *VoicePages* (eg *vxml files*)
  - ✦ Accessed by calling up the associated phone number and interacting with its underlying application flow through a telephony interface
  - ✦ Analogous to WebSites in the World Wide Web

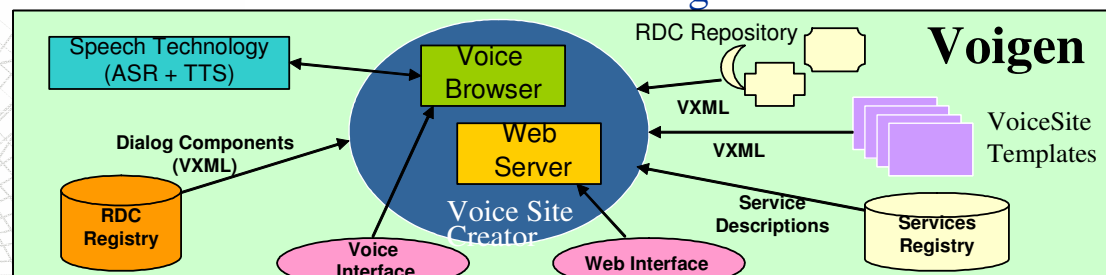


# VoiGen: VoiceSite creation made easy

- ★ What an Homepage creator is to Websites, VoiGen is to the VoiceSites.
- ★ VoiGen
  - ✦ is a voice driven generator of voice driven applications
  - ✦ enables individual phone subscribers to create, deploy and offer their own customized voice driven data services.

Just by talking with *VoiGen*, a user can create his own personalised *VoiceSite*

- ✦ Gateway to shared data/voice services
  - ▲ Local Databases
  - ▲ Web Services
  - ▲ Next Generation Services delivered through IMS



**Home Phone Subscribers**  
(hosting personal Voice-site)



India Research Lab



**Small Business Subscribers**  
(offering business Voice sites  
with data services)



# VoiceSite Creation

e.g. a Plumber Voice Site

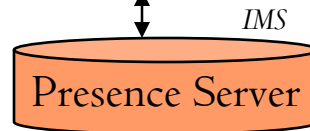
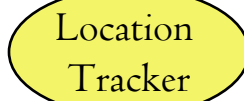
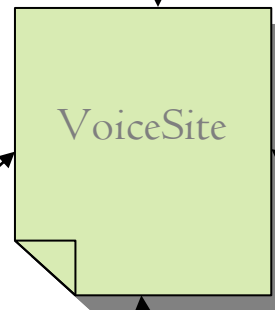


Call VoiGen to create VoiceSite



VoiGen: Please say your name

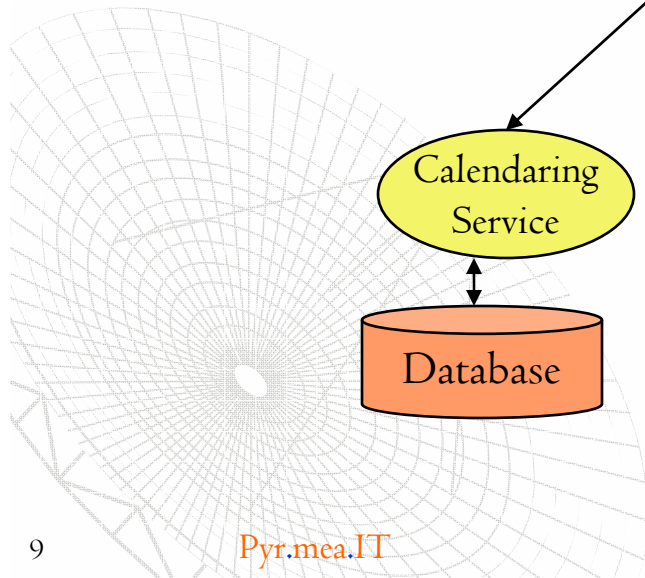
Caller: Hi my name is Sam, and I am a plumber. Please find information regarding my services on my VoiceSite.



IMS

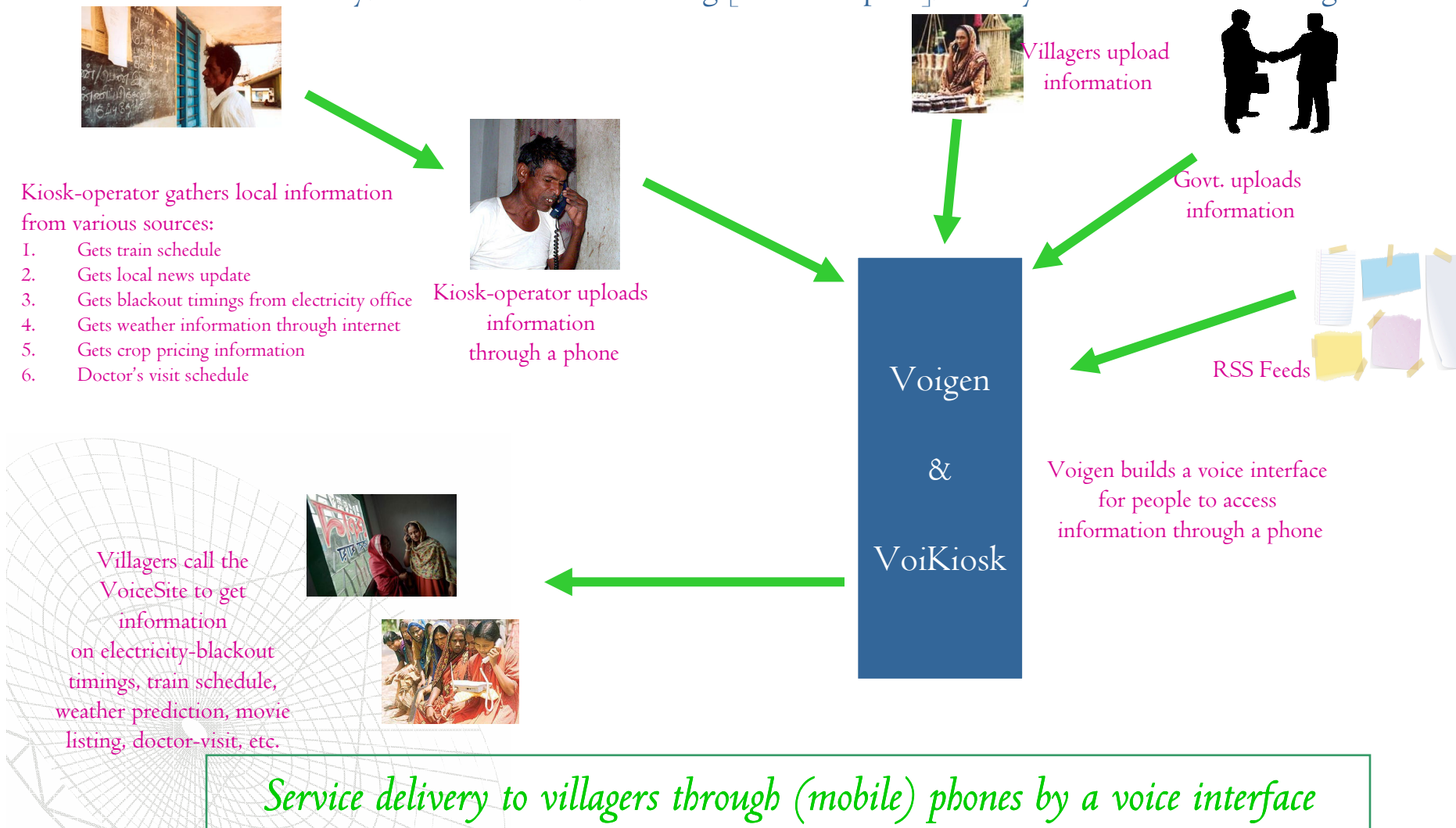


WWW

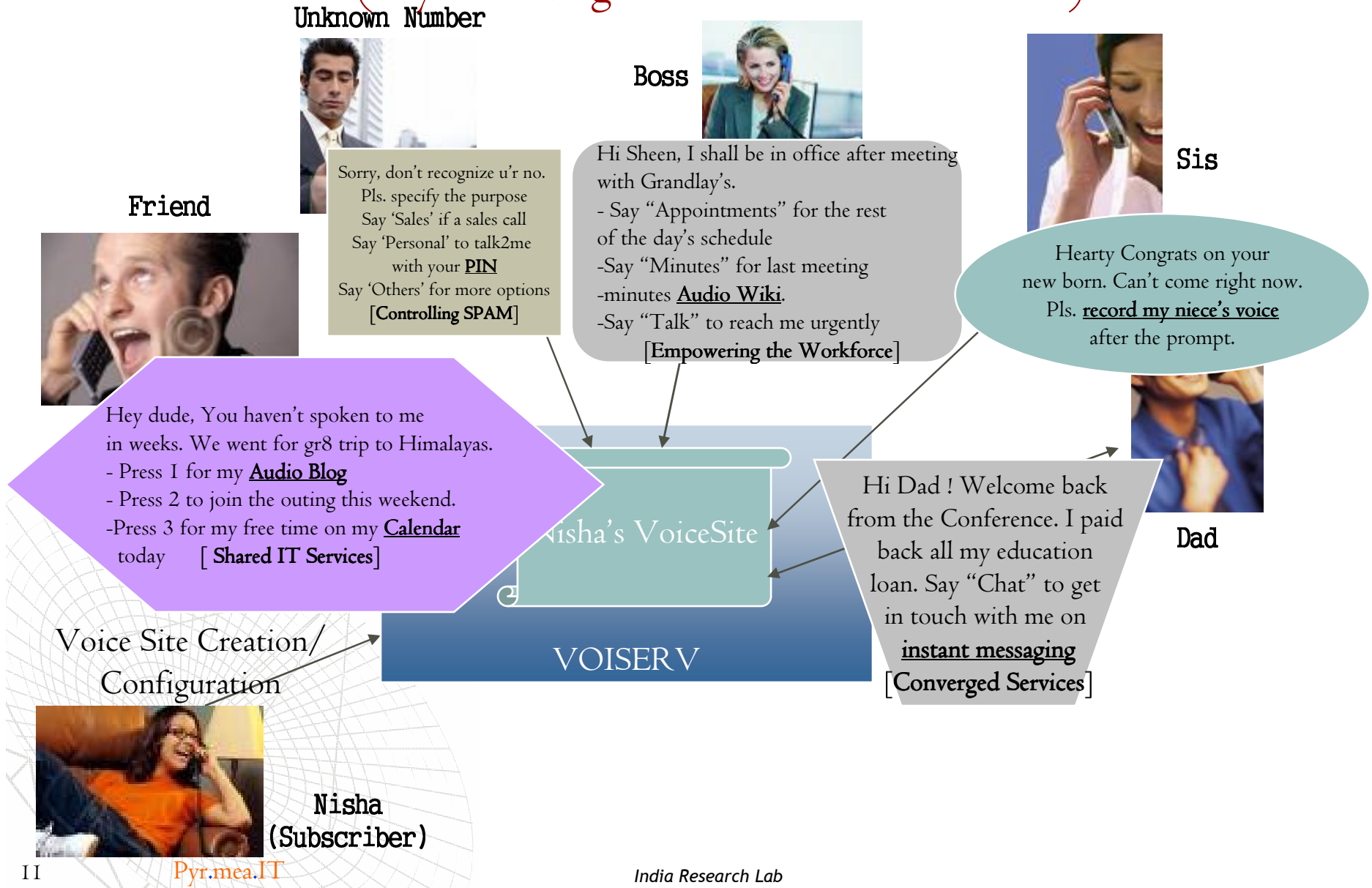


# VoiKiosk: A VoiceSite for Rural Population

- Issues with PC/Internet Kiosks
  - Density, User Interface, Branding [MSR Report], locally relevant info. missing



# Next Gen Personalization (beyond Ring Tones and Hello Tunes)



# Outline

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# Our Vision : The Telecom Web

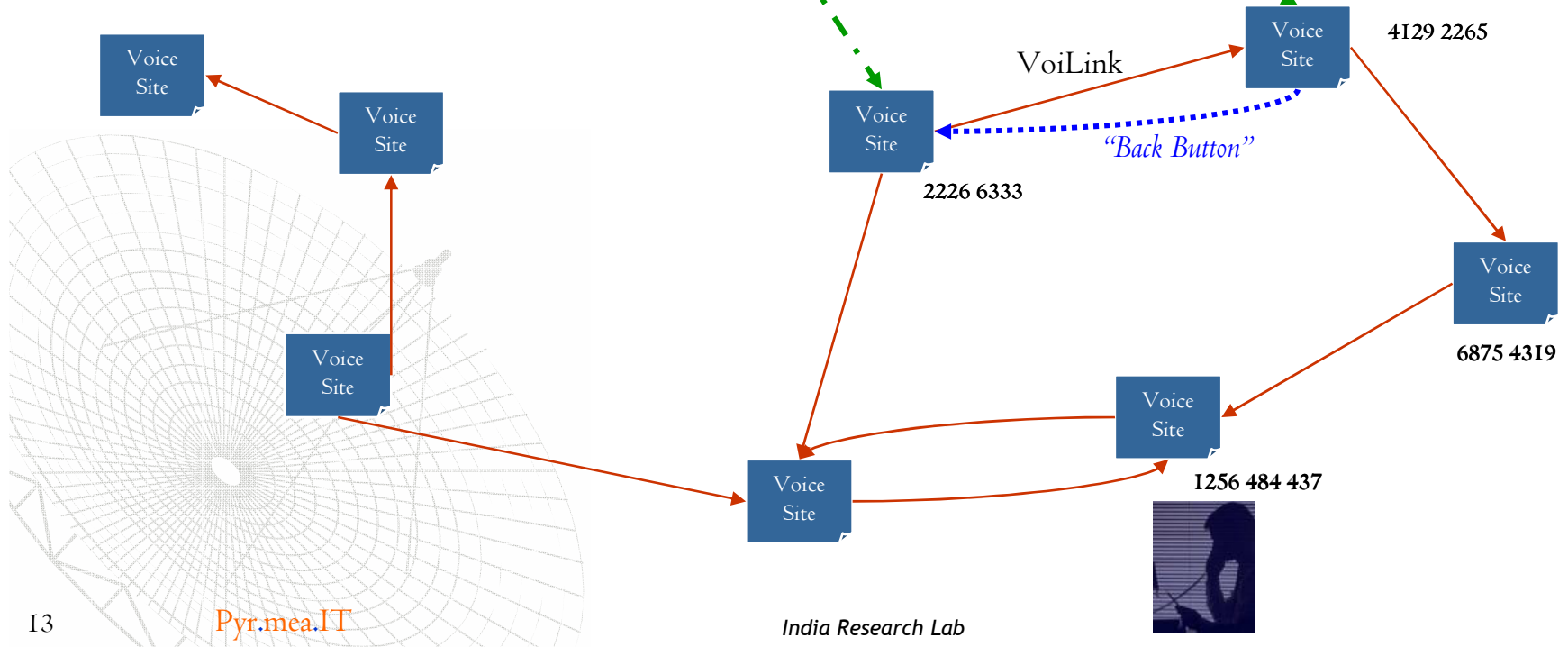


SurfLink  
(phone call)

SurfLink  
(phone call)

“Contextual Call Transfer”

- Key Concepts*
- *VoiceSites*
  - *VoiLinks*
  - *SurfLinks*
  - *Browsing*
  - *Search*
  - *Transactions*



# What is the Telecom Web?

- ★ The Telecom Web is a world wide web in the *telecom network*
  - ✦ Enables the individual subscribers to *create, host and offer* information and services *produced by themselves*
  - ✦ people can *browse* VoiceSites, *traverse* hyper VoiLinks, even conduct *business transactions*, all just by talking over the existing telephone network
  - ✦ provides simple and affordable means to *access IT services and applications* currently available to WWW users
- ★ The T-Web can coexist and interoperate with the existing WWW.
- ★ The T-Web will interoperate with Next Generation Networks too.



# Key Technology Enablers for this ecosystem

## ★ Creation and Hosting

- ✦ *VoiGen* – voice driven creator of voice driven applications
- ✦ *VoiHost* – for VoiceSite Hosting

## ★ Browsing and Transactions through Hyperlinks

- ✦ *Hyperspeech Transfer Protocol (HSTP)* – a protocol equivalent to HTTP for cross organizational transactions
- ✦ *World Wide Telecom Web Browser* – a voice application to enable browsing of network of VoiceSites in Telecom Web.

## ★ Search

- ✦ *BizFinder* – for enabling Search with location and near real-time updates

## ★ User Interface

- ✦ *Conspeakuous* – for incorporating rich context to enhance user experience

# HSTP: Hyperspeech Transfer Protocol

## ★ Hyperspeech

- ✦ a voice fragment in a voice app that is a hyperlink to another voice fragment in another voice application

## ★ HSTP

- ✦ a protocol to seamlessly connect telephony voice applications

## ★ HSTP can be used for

- ✦ developing *cross-enterprise workflows*
- ✦ browsing across voice applications by navigating the Hyperspeech content

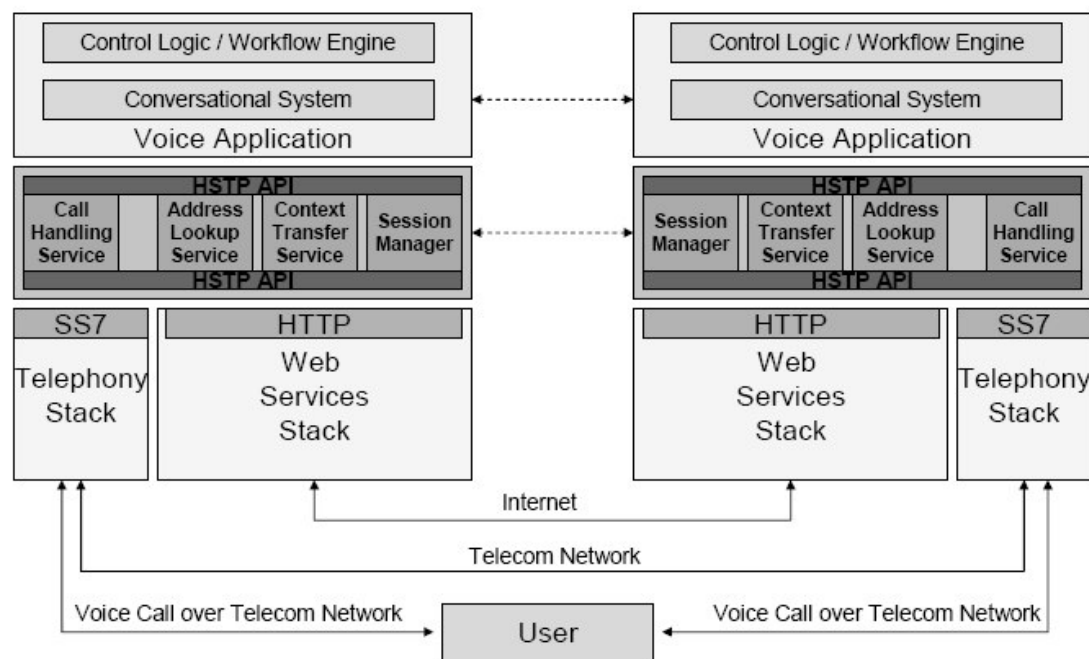


Figure 1: HYPERSPEECH Protocol Stack

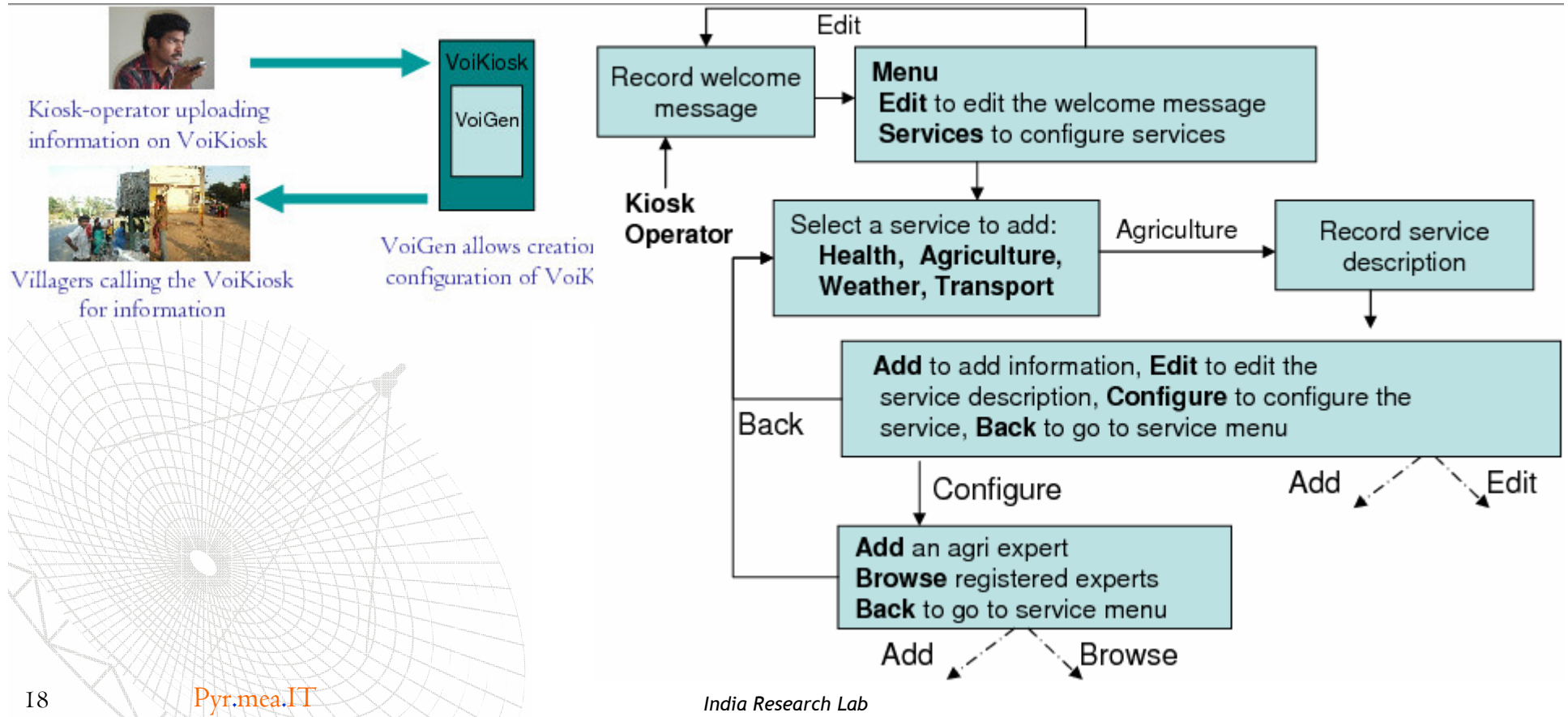
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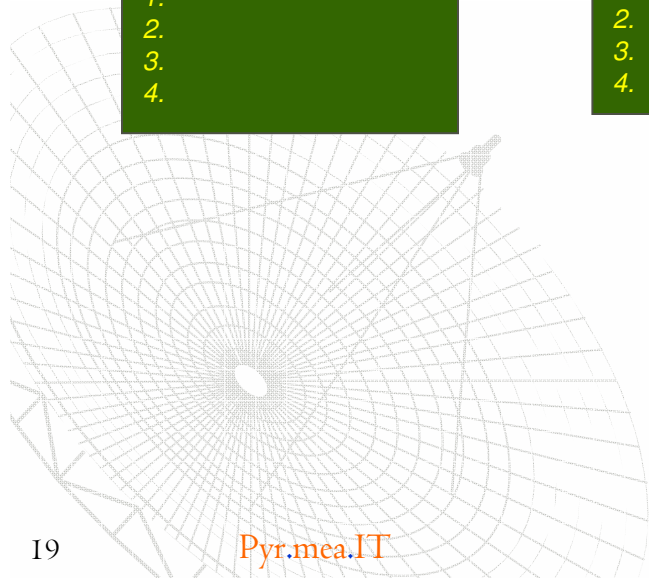
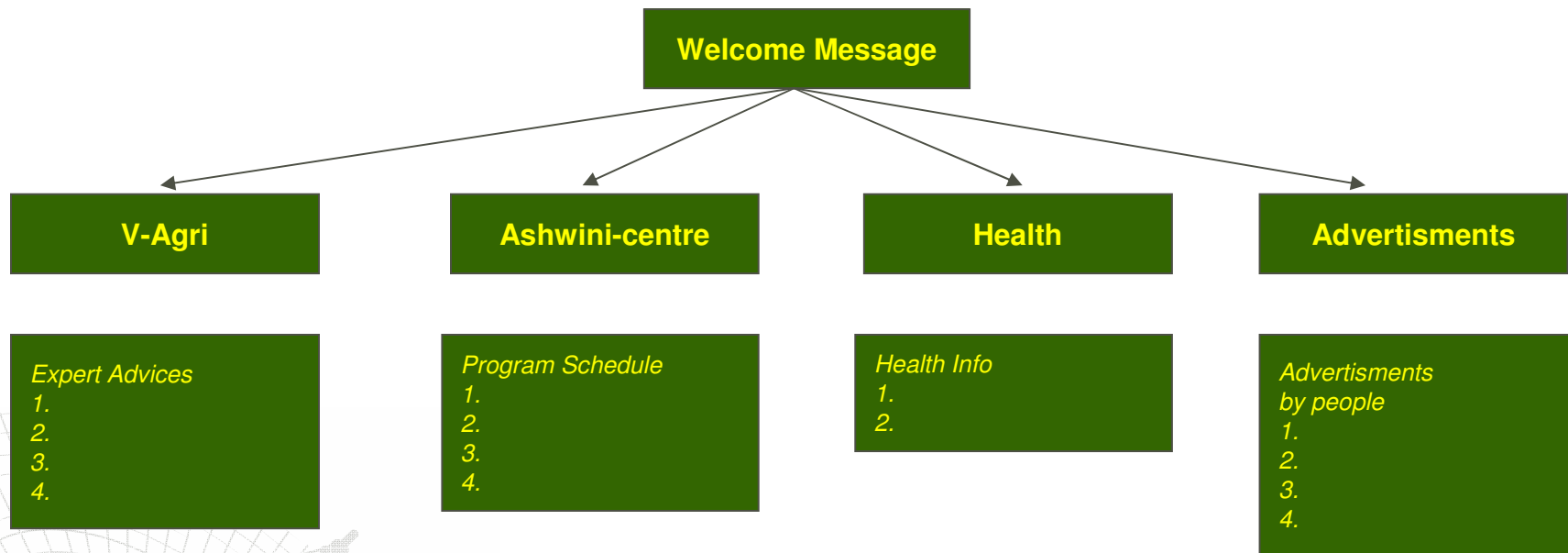


# VoiKiosk: Information and Service Delivery over a phone

(Village Kiosk Deployed in Andhra Pradesh)



# The Village Portal





Villagers  
can access  
the  
voicesite  
from  
a public  
phone







Bike and Auto Mechanic uploading his advertisement on the VoiceSite





An Appey owner uploading his advertisement on the VoiceSite

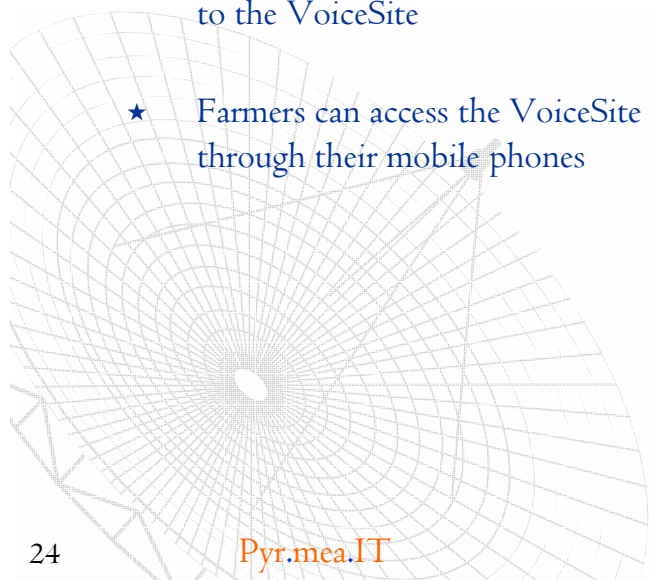




The VoiceSite  
administrator uploading  
his advertisement

# V-Agri service on VoiceSite

- ★ The field coordinator collects water sample from the pond
- ★ This sample is tested right at the pond-side while the water retains its characteristics
- ★ Previously, test results were uploaded through the Ashwini computer center. Now, this can be done by calling the VoiceSite.
- ★ Experts get the results and then upload advice to the VoiceSite
- ★ Farmers can access the VoiceSite at their farms through their mobile phones





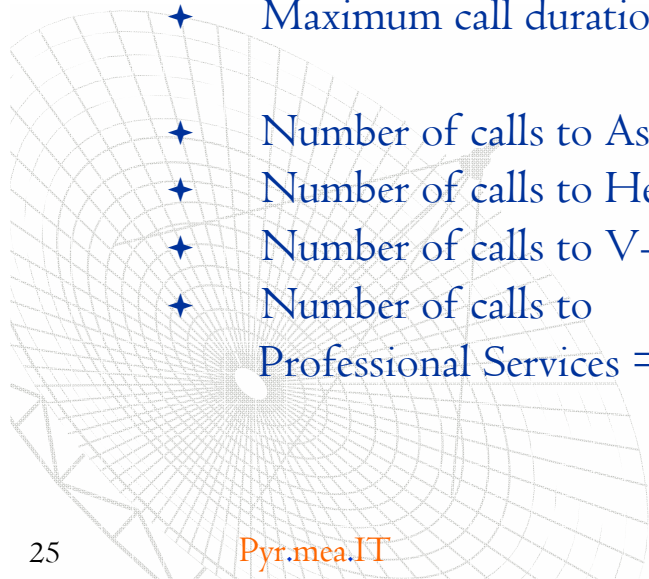
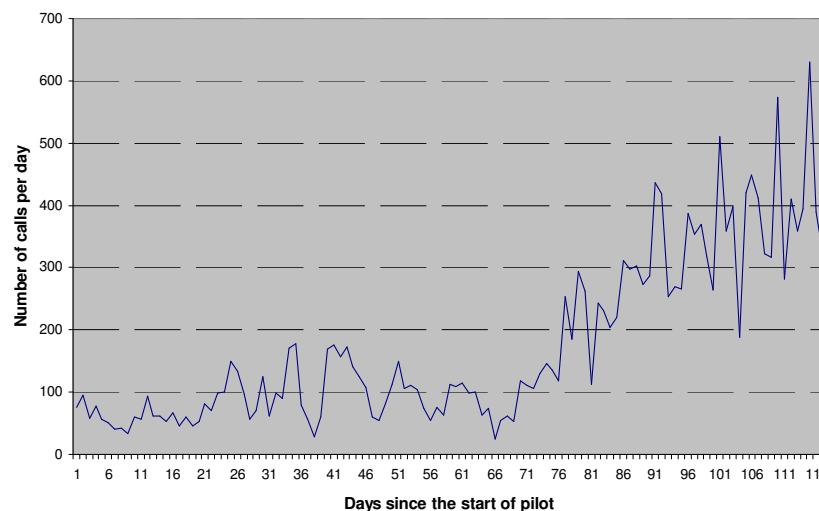
# Byrraju Pilot Statistics

**Matrimonial Ads**

**Social Space**

**Election Speech**

- ★ Pilot Launch: May 23, 2008
- ★ Report Summary (as of October 20, 2008)
  - ✦ Total number of calls received = 34812
  - ✦ Number of unique callers = 1555
  - ✦ Total time spent = 761 hours
  - ✦ Average call time spent = 1 min, and 18 seconds.
  - ✦ Maximum call duration = 49 min
  - ✦ Number of calls to Ashwini Center = 2836
  - ✦ Number of calls to Health Center = 4130
  - ✦ Number of calls to V-Agri = 3405
  - ✦ Number of calls to Professional Services = 10984



# Thank You !

## ★ Questions ?

## ★ Contact

### ✦ Email

✦ [kkarun@in.ibm.com](mailto:kkarun@in.ibm.com)

### ✦ Web

✦ Google: “World Wide Telecom Web” or “Pyr.me.IT”

✦ [http://domino.research.ibm.com/comm/research\\_people.nsf/pages/arun\\_kumar.WWTW.html](http://domino.research.ibm.com/comm/research_people.nsf/pages/arun_kumar.WWTW.html)

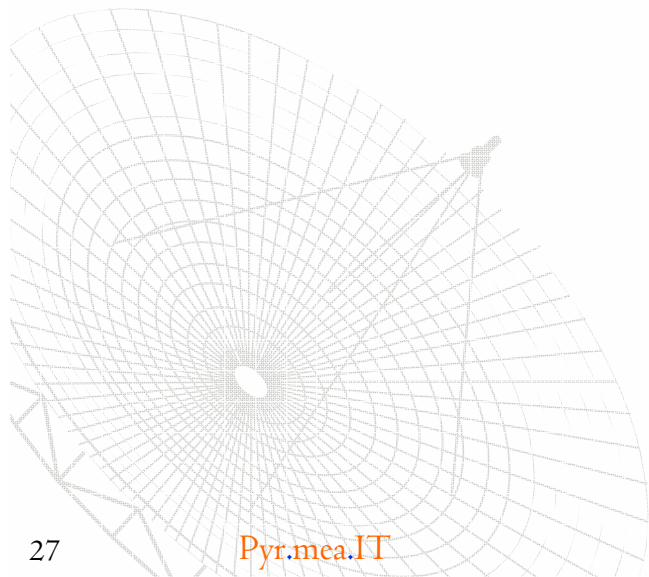
✦ [http://domino.research.ibm.com/comm/research\\_projects.nsf/pages/pyrmeait.index.html](http://domino.research.ibm.com/comm/research_projects.nsf/pages/pyrmeait.index.html)

### ✦ VoiceSite

✦ Under development ;-)

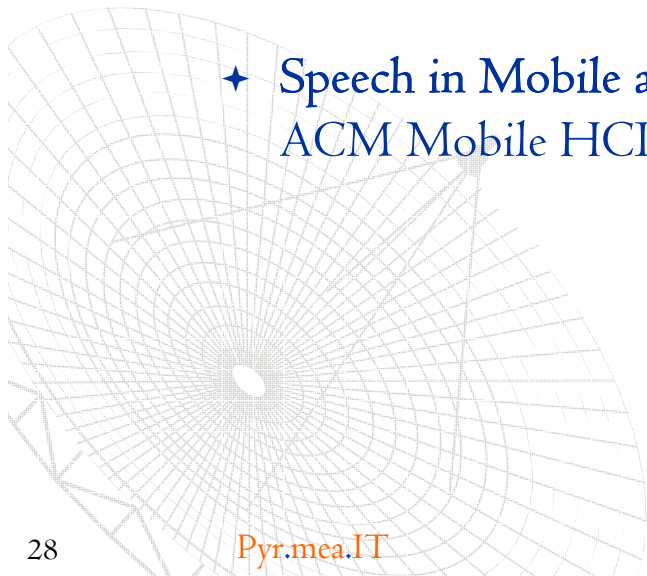


# Backup



# Academic Activities - Workshops

- ✦ IUI4DR: Intelligent User Interfaces for Developing Regions at ACM IUI, Canary Islands, Spain, Jan 13th, 2008
  - ▲ Michelle X. Zhou, Shimei Pan, IBM
  - ▲ Michael Best, Georgia Tech
  - ▲ Pearl Pu, EPFL
  - ▲ Mary Czerwinski, Microsoft Research
  - ▲ John Canny, Berkeley
  
- ✦ Speech in Mobile and Pervasive Environments for Developing Regions  
ACM Mobile HCI Workshop, Amsterdam, August, 2008



# Academic Activities - Panels

- ★ “Information Uptrieval: Exploring Models for Content Assimilation and Aggregation for Developing Regions”

WWW 2008 Panel, **Beijing, China**, April 23<sup>rd</sup>, 2008

- ✦ Shadi Abou-Zahra (W3C Web Accessibility Initiative, International Program Office Activity Lead)
- ✦ Stéphane Boyera (W3C Mobile Web Initiative)
- ✦ Richard J. Gowen (President, IEEE Foundation)
- ✦ Lakshminarayanan Subramanian (NYU, USA)

- ★ **Web Delivery Models for Developing Regions**

WWW 2007 Panel, **Banff, Canada**, May 9<sup>th</sup>, 2007

- ✦ Saman Amarasinghe (MIT, USA)
- ✦ Ken Banks (kiwanja.net, UK)
- ✦ Krithi Ramamritham (IIT Bombay, India)
- ✦ Umar Saif (MIT, USA and LUMS, Pakistan)
- ✦ Kentaro Toyama (Microsoft Research, India)

- ★ **Building self-sustainable communities while delivering IT to masses: Learning from experiences**

HoIT 200 Panel, **Chennai, India**, August 24<sup>th</sup>, 2007

- ✦ Dr. Timothy A. Gonzalves, Professor, IIT Madras
- ✦ Dr. Krithi Ramamritham: Professor, IIT Bombay
- ✦ T. Dinesh, Janastu, India

# Publications

- ✦ **Organizing the Unorganized - Employing IT to Empower the Under-privileged**  
Arun Kumar, Nitendra Rajput, Sheetal K Agarwal, Dipanjan Chakraborty, Amit A Nanavati  
In International World Wide Web Conference (WWW), **Beijing, China, April 2008**
- ✦ **Raising a Billion Voices !**  
Sheetal K. Agarwal, Arun Kumar, Sougata Mukherjea, Amit A. Nanavati, Nitendra Rajput  
In ACM Interactions, March 2008
- ✦ **Pyr.me.IT: Permeating IT Towards the Base of the Pyramid**  
Sheetal K Agarwal, Dipanjan Chakraborty, Swati Challa, Nanda Kambhatla, Arun Kumar, Sougata Mukherjea, Amit A Nanavati, and Nitendra Rajput,  
In ACM SIGOPS Operating Systems Review, Special Issue on System Projects at IBM Research, Jan 2008.
- ✦ **The World-Wide Telecom Web**  
Arun Kumar, Nitendra Rajput Dipanjan Chakraborty, Sheetal K. Agarwal, Amit A. Nanavati  
ACM SIGCOMM Workshop on Networked Systems for Developing Regions (NSDR), **Kyoto, Japan, August, 2007**
- ✦ **HSTP : Hyperspeech Transfer Protocol**  
Sheetal K. Agarwal, Dipanjan Chakraborty, Arun Kumar, Amit A. Nanavati, Nitendra Rajput  
ACM Conference on Hypertext and HyperMedia, **Manchester, UK, Sept. 2007**
- ✦ **VoiServ: Creation and Delivery of Converged Services through Voice for Emerging Economies**  
Sheetal Agarwal, Dipanjan Chakraborty, Arun Kumar, Amit A. Nanavati, Nitendra Rajput  
IEEE WoWMoM Industry Track, **Helsinki, Finland, April 2007**