

# World Wide Telecom Web

*providing an ocean for voice search ...*

*Arun Kumar,  
Sheetal Agarwal,  
Amit A. Nanavati,  
Sougata Mukherjea,  
Nitendra Rajput,  
([rnitendra@in.ibm.com](mailto:rnitendra@in.ibm.com))*

*IBM India Research Lab*

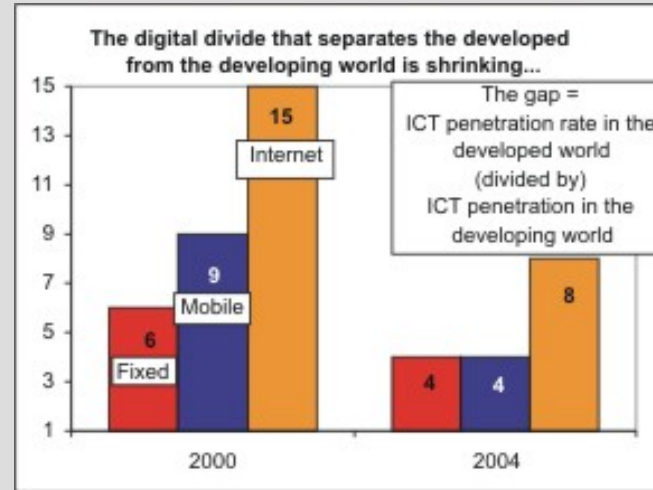
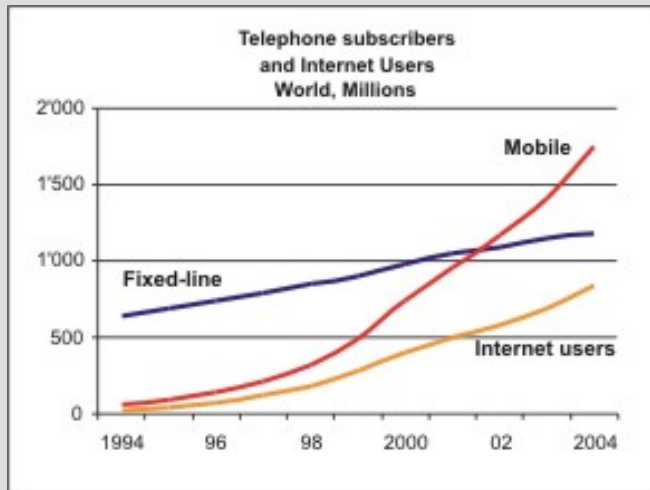
# Talk Overview

- Why World Wide Telecom Web
  - T-Web
- What is the T-Web
- How to enable T-Web
  - *Create*: VoiceSite Composer
  - *Link*:Hyperspeech Transfer Protocol
  - *Browse*: T-Web Browser
- The future with T-Web
- Search and T-Web
- Questions !



⇒ Why ?  
What ?  
How ?

# Why T-Web ? *The infrastructure problem*



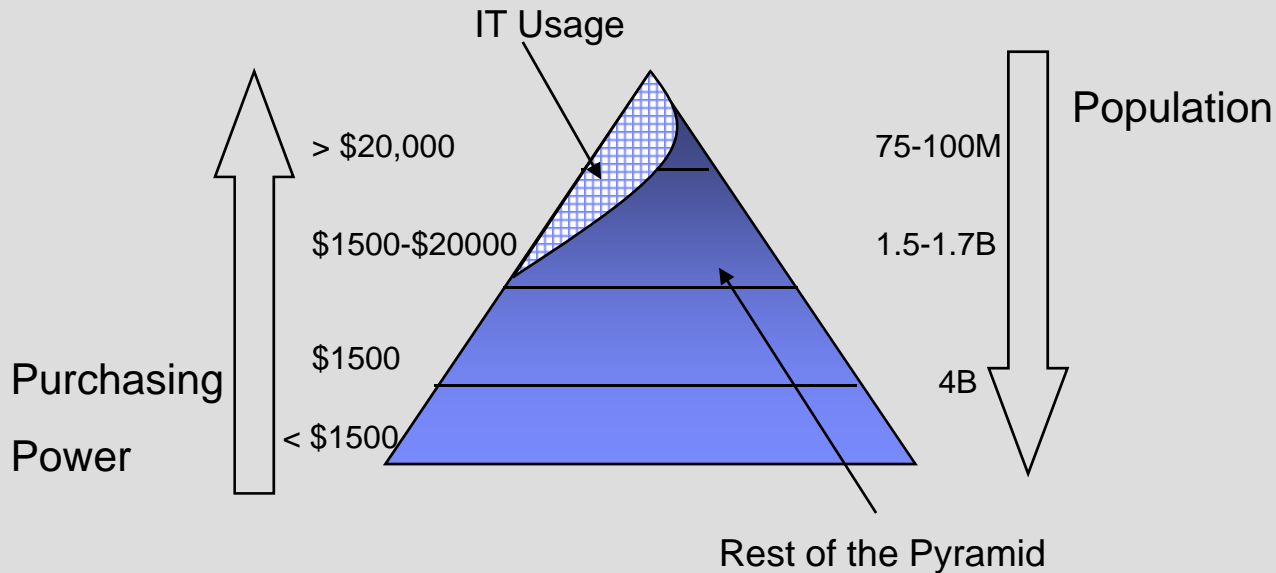
Source: International Telecommunications Union

- Internet penetration is far less than the mobile penetration
  - 3.5 Billion Mobile phone users in 2007
  - Growth every minute
    - 388 users in Asia Pacific
    - 94 users in Africa
    - 46 users in North America
- 1.3 Billion Internet users in 2007
- No electricity in lots of remote areas
- Hardware operational and maintenance issues while operating in harsh conditions



# Why T-Web ? *The affordability problem*

Why ?  
What ?  
How ?



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

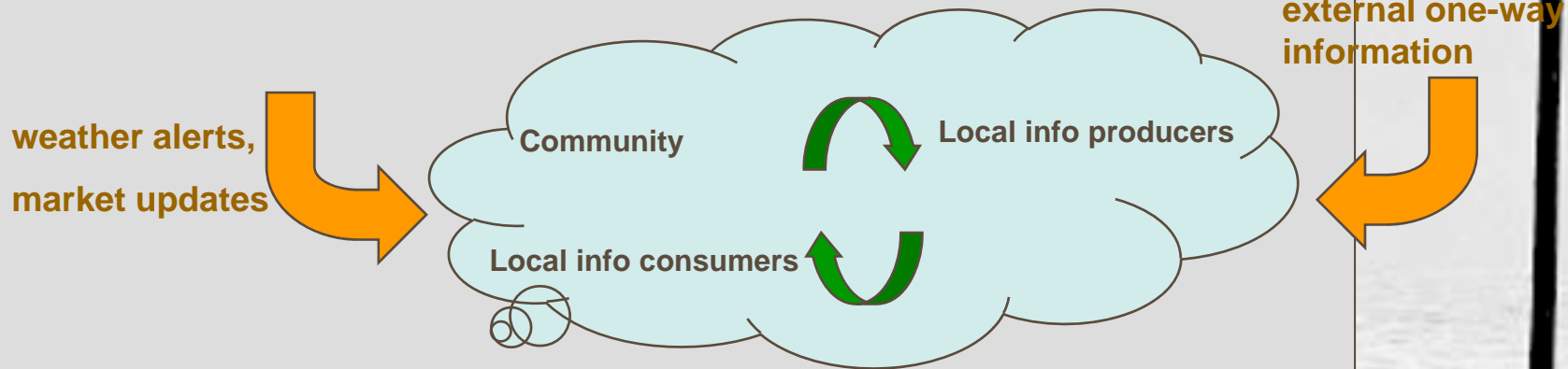
- 53% of the world population lives below USD 2 per day
- Current IT systems cater to people at the top of the economic pyramid



Why ?  
What ?  
How ?

# Why T-Web ? *The information problem*

- An average person on the street does not need a PC, but needs access to information
  - 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



- Such locally relevant information is not available for the majority of world population
- Computer literacy is not enough
  - Know what to look for
  - Know how to access it
  - Know how to use it



# Talk Overview

⇒ Why ?  
What ?  
How ?

- Why World Wide Telecom Web
  - T-Web
- What is the T-Web
- How to enable T-Web
  - *Create*: VoiceSite Composer
  - *Link*: Hyperspeech Transfer Protocol
  - *Browse*: T-Web Browser
- The future with T-Web
- Search and T-Web
- Questions !

IBM  
India Research Lab



Voice Search  
Conference 2008

# What is the Telecom Web?

⇒ Why ?  
What ?  
How ?

The Telecom Web is a world wide web in the *telecom network*, where people can host and browse **VoiceSites**, traverse **VoiLinks**, even conduct business transactions, all just by *talking* over the existing telephone network.

- The T-Web will interoperate with the existing WWW.
- The T-Web will interoperate with Next Generation Networks too.

IBM  
India Research Lab



Voice Search  
Conference 2008

# Introducing VoiceSites

⇒ Why ?  
What ?  
How ?

- A VoiceSite is:
  - A voice driven application **hosted** in the network and **created by subscribers** themselves
  - Consists of a set of interconnected **VoicePages** (eg *VoiceXML 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



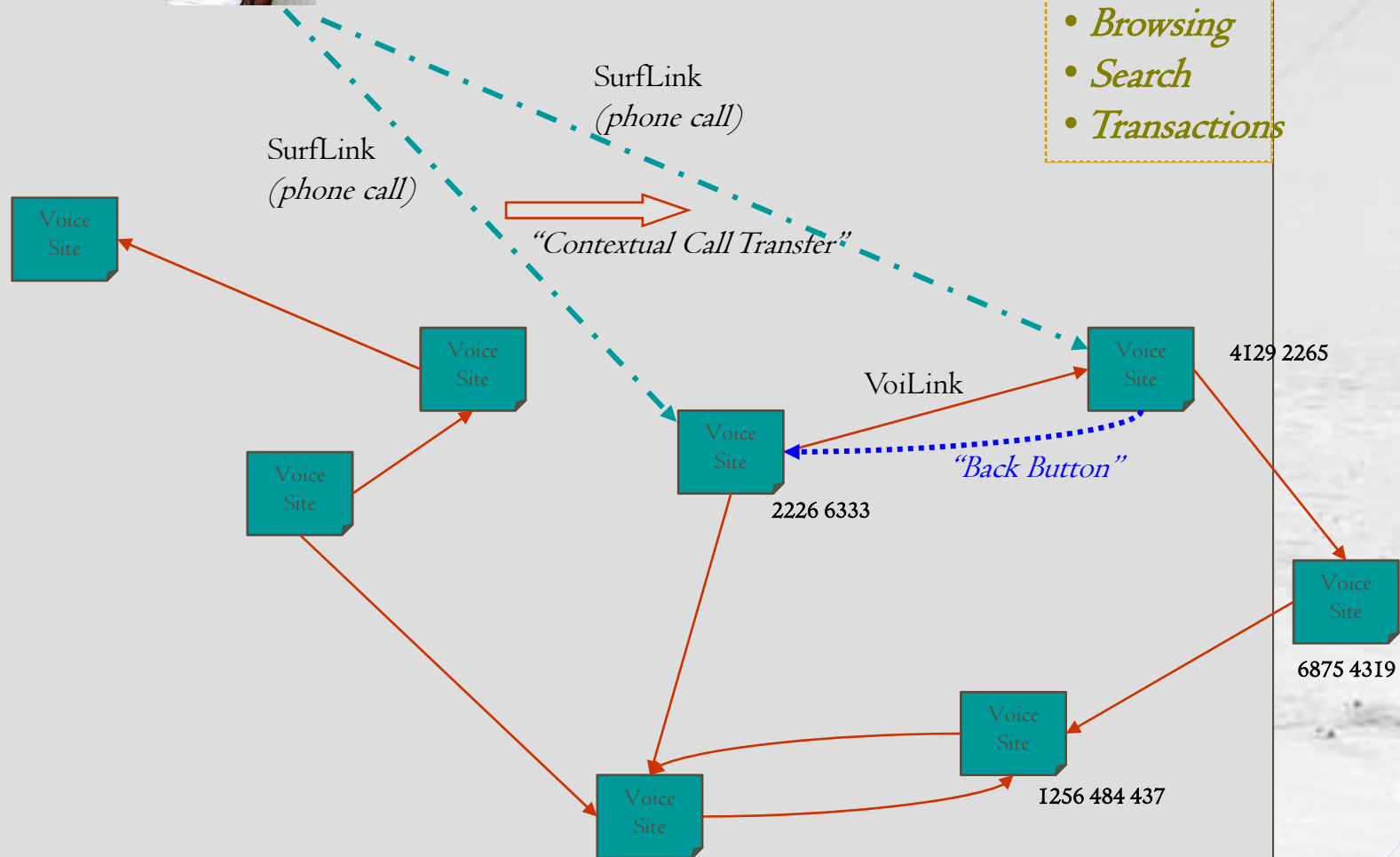


# What is the Telecom Web?

Why ?  
What ?  
How ?



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



# Talk Overview

⇒ Why ?  
What ?  
How ?

- Why World Wide Telecom Web
  - T-Web
- What is the T-Web
- How to enable T-Web
  - *Create*: VoiceSite Composer
  - *Link*: Hyperspeech Transfer Protocol
  - *Browse*: T-Web Browser
- The future with T-Web
- Search and T-Web
- Questions !

IBM  
India Research Lab

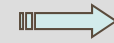


Voice Search  
Conference 2008

# How to enable the T-Web

- Need a *simple* mechanism to create VoiceSites
  - Creation of VoiceSites should be possible through a mobile device
  - Should not have literacy requirements
- Need a mechanism to connect the VoiceSites to form a Web of VoiceSites
- Need a mechanism to browse these VoiceSites
- Need a mechanism to search the T-Web

Why ?  
What ?  
How ?



IBM  
India Research Lab



Why ?  
What ?  
How ?

# VoiGen: Easy VoiceSite creation

- What an HTML editor is to WWW, VoiGen is to the T-Web
- A voice driven generator of voice driven applications
- A user can just talk to the VoiGen system to create his personal *VoiceSite*.
  - The personalised VoiceSite can contain any personal content, including music.
- Enable individual phone subscribers to create and offer their own customized voice driven data services.

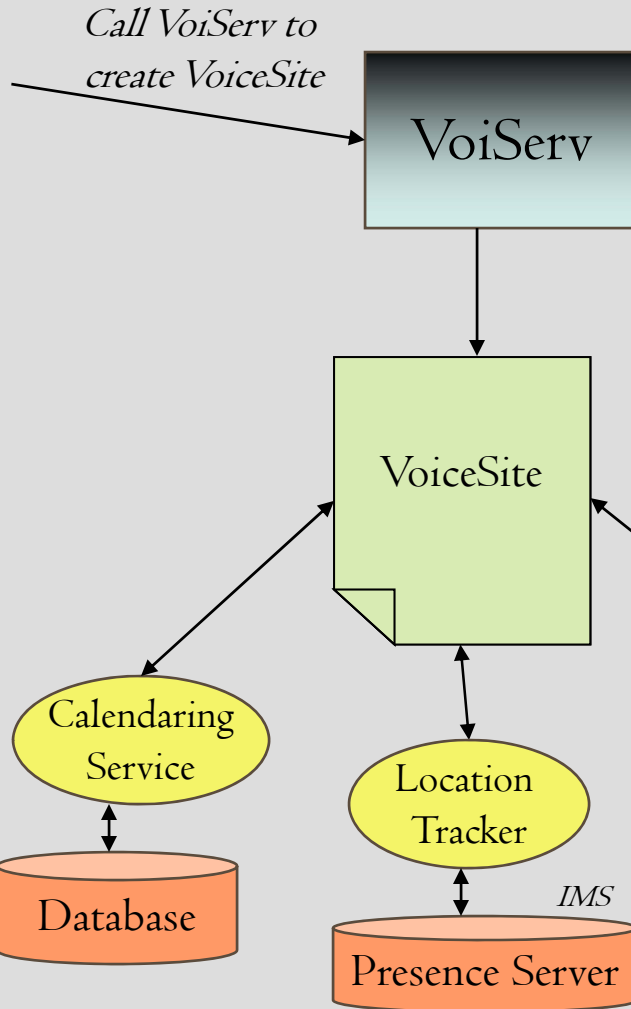
IBM  
India Research Lab



Voice Search  
Conference 2008

# VoiGen

Why ?  
What ?  
How ?



VoiServ: Would you like to offer appointment scheduling services?

Caller: Yes

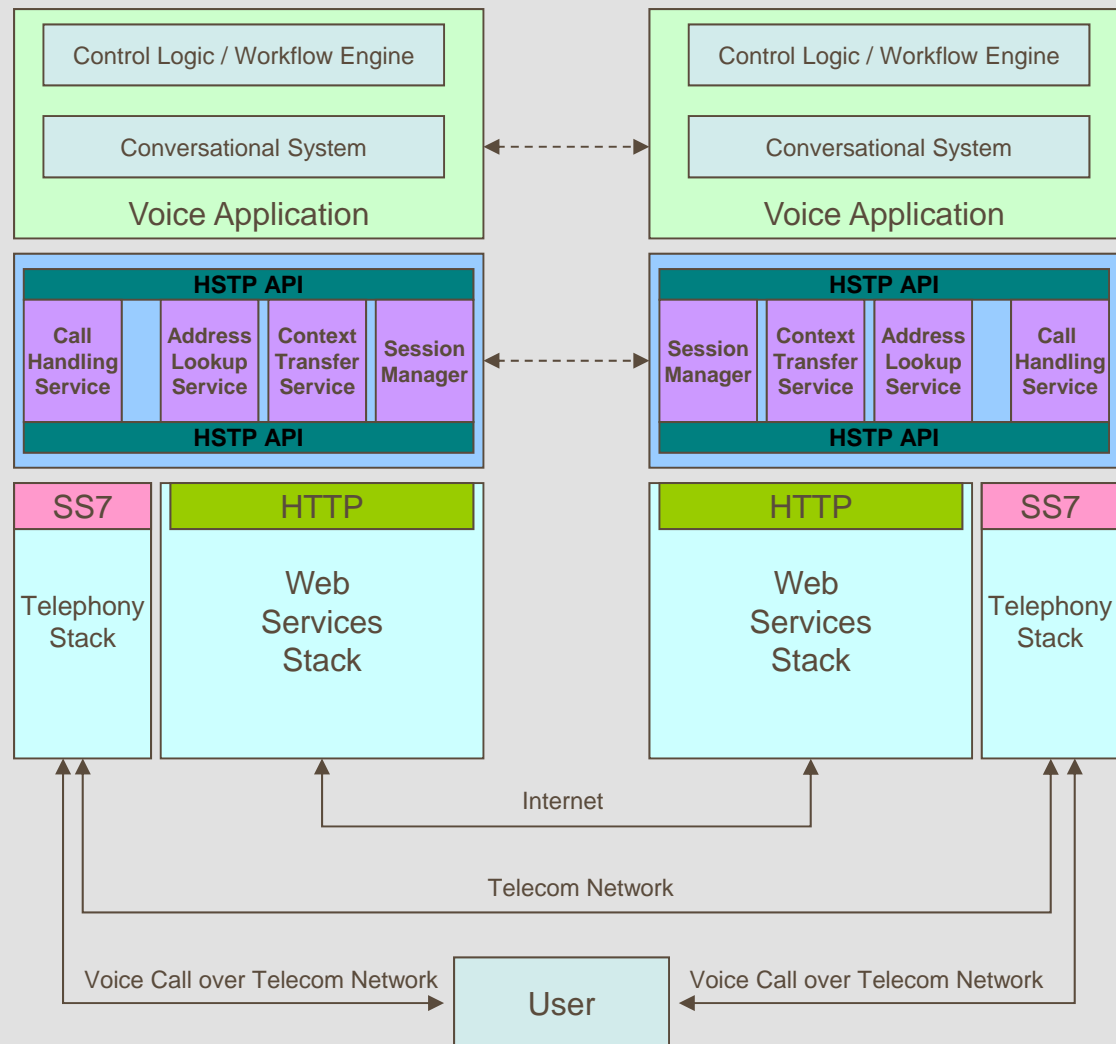


# HSTP: Connecting VoiceSites

Why ?  
What ?  
How ?

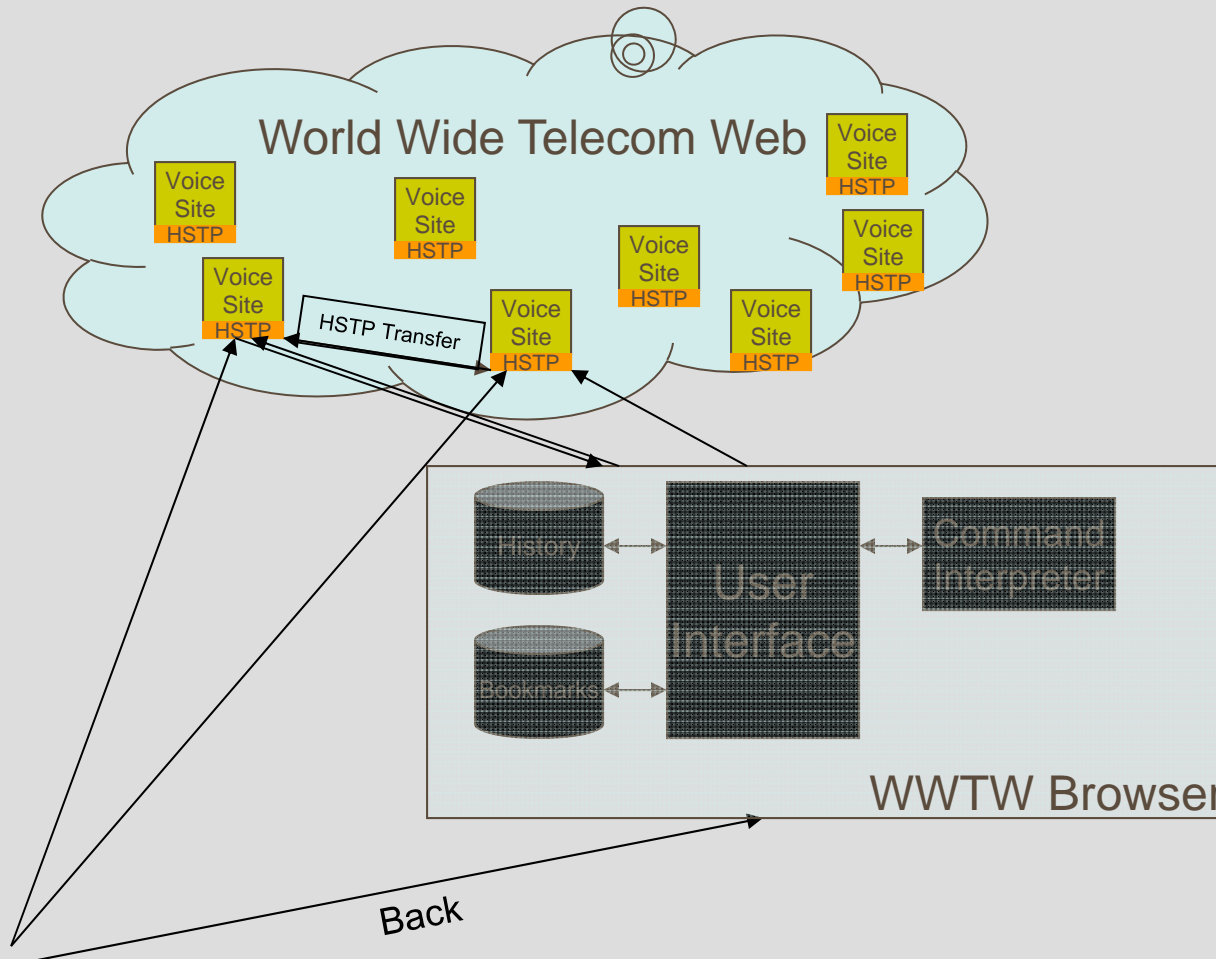
IBM  
India Research Lab

- A protocol to seamlessly connect telephony voice applications
- HSTP enables the users to browse across voice applications by navigating the Hyperspeech content in a voice application.
- HSTP can also be used for developing cross-enterprise applications that allow a user to transact across two or more voice applications.



# The T-Web Browser

Why ?  
What ?  
How ?



- User calls the T-WEB Browser to access a VoiceSite
- T-Web Browser transfers the call to the VoiceSite through HSTP
- When the user browses to the other VoiceSite, HSTP passes information to the WWTW Browser



End users

# Talk Overview

- Why World Wide Telecom Web
  - T-Web
- What is the T-Web
- How to enable T-Web
  - *Create*: VoiceSite Composer
  - *Link*: Hyperspeech Transfer Protocol
  - *Browse*: T-Web Browser
- The future with T-Web
- Search and T-Web
- Questions !

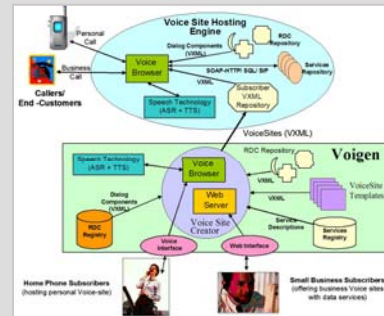




# T-Web for the Workforce

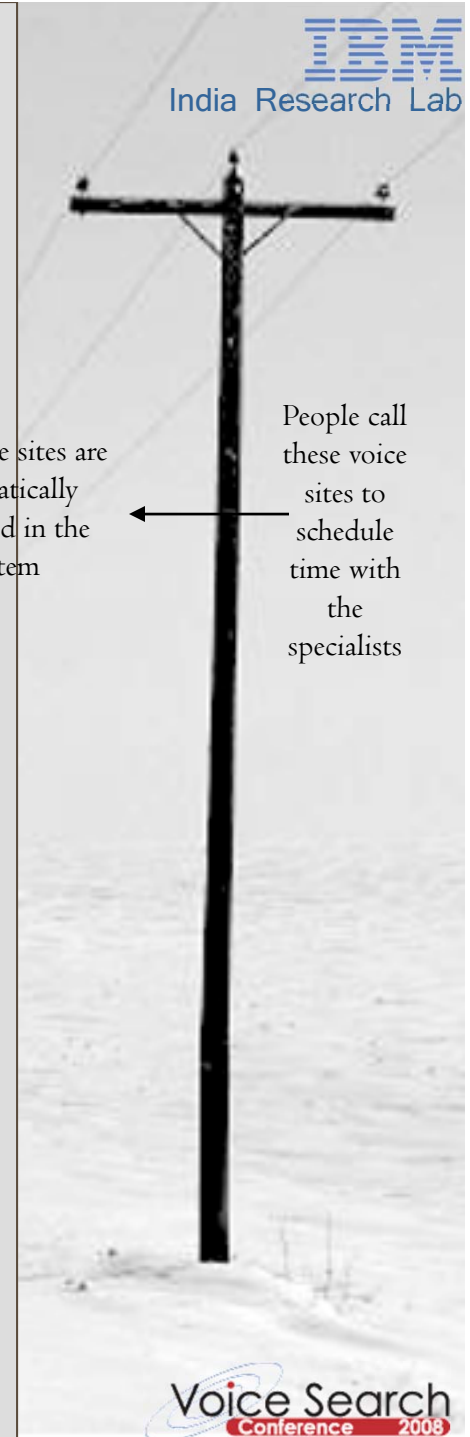


Carpenters/  
Electricians  
make a call to  
VoiGen to  
generate their  
voice sites



The voice sites are  
automatically  
deployed in the  
system

People call  
these voice  
sites to  
schedule  
time with  
the  
specialists



- Methodology for survey
  - Electricians/Plumbers/Carpenters make a call to VoiGen and create their voice sites
  - We ask the subjects about the usability of the VoiGen system
- 12 subjects surveyed for technology validation
  - 10 were able to create the voice site successfully (within 4 minutes)
  - There were usability issues with respect to conversation flow, speech recognition accuracy
  - Everyone realised that this technology can have tremendous impact
  - Since this technology does not require the end-user to own any costs in terms of devices, it has a low acceptance barrier

# T-Web for the rural population

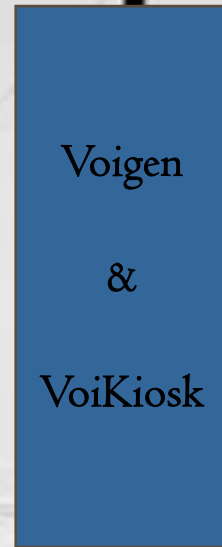


Kiosk-operator gathers local information from various sources:

1. Makes phone calls to get train schedule
2. Gets movie list for today
3. Gets blackout timings from electricity office
4. Gets weather information through internet
5. Gets visitor list (doctors, etc.) by officials from panchayat



Kiosk-operator uploads information through a phone

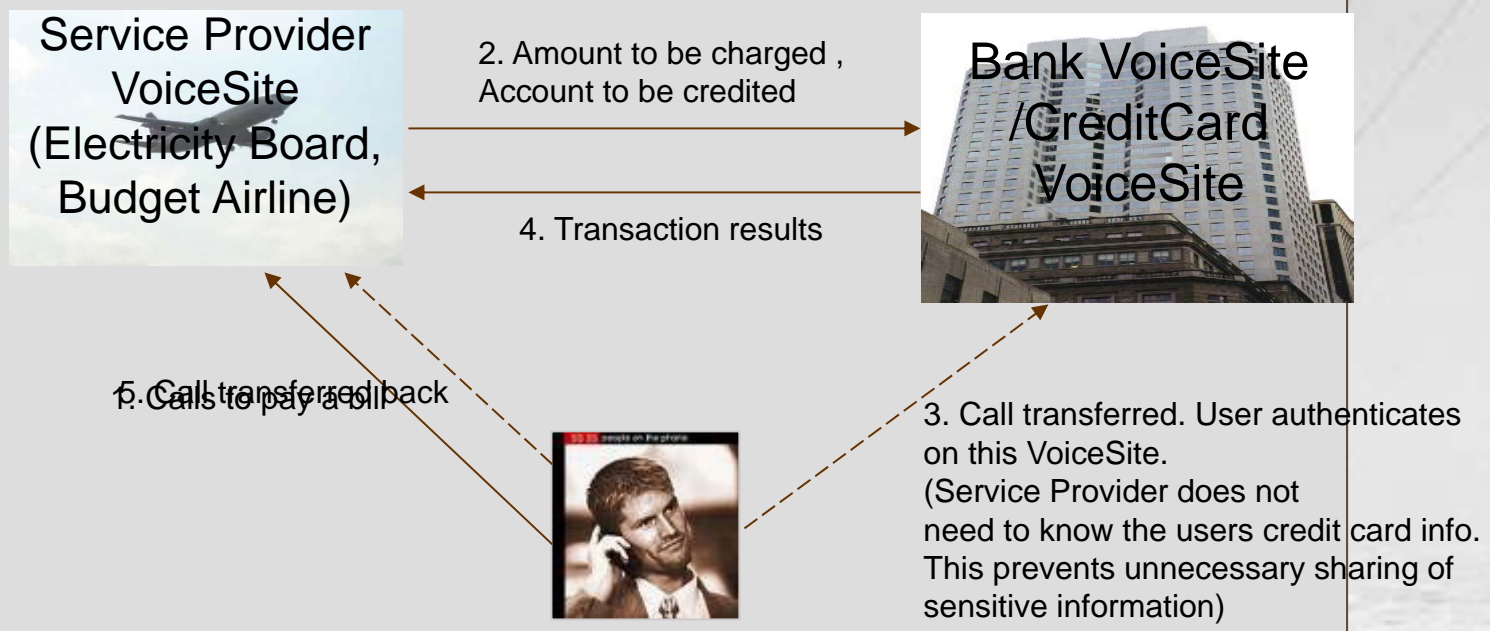


Villagers call the VoiceSite to get information on electricity-blackout timings, train schedule, weather prediction, movie listing, doctor-visit, etc.

Voigen builds a voice interface for people to access information through a phone

*Service delivery to villagers through (mobile) phones by a voice interface*

# T-Web and Transactions



- Transactions across multiple voice applications.
  - control is and the user is transferred
- Other scenarios include
  - Tele-railway reservation system, Tele-online payments, *Bank-on-a-phone*

# Search on the T-Web

- Due to the unique structure of the VoiceSites, the search techniques from the WWW domain can not be used in the WWTW world
  - T-Web Search is a combination of VoiceSearch and the Web Search
- We need a method for indexing and searching voice sites from the following sources in a voice site
  - The text prompts
  - The audio prompts
  - Expected voice-site-user response through speech recognition grammars
  - Meta information available in the presentation layer (i.e. at the VoiceXML level)



# Search on the T-Web

A Typical VoiceSite authored in VoiceXML:

```

<vxml version="1.0">
  <var name="covigo_confirm_form_id" />
  <form id="welcome">
    <field name="currency">
      <grammar src="http://localhost:8080/currency/names.grxml/">
      <prompt bargein="false">
        Welcome to the currency rates voice site.
        We can provide you the exchange rates for any currency. The rates are almost real-time.
        What currency are you interested in?
      </prompt>
    </block>
    <catch event="help" >
      <prompt bargein="false">
        <audio src="http://cc.covigo.net/prompts/help_general.wav" />
      </prompt>
      <goto next="#welcome" />
    </catch>
    <block>
      <var name="JServSessionIdroot" />
      <assign name="JServSessionIdroot" expr="&apos;rlbglulu5I&apos;"/>
      <submit expr="&apos;/cc/app/StartModel/Start/I&apos;" method="get"
      namelist="JServSessionIdroot " />
    </field>
  </form>
</vxml>

```

Search Items:

Grammar contains what users can say in response to this VoiceSite

Text prompts that describe what the voice site is about

Audio prompts that describe what the voice site is about

Meta information available in VoiceXML



# Get involved. *Search!*

- How to crawl VoiceSites ?
  - *A new requirement*
  - *Crawling is following links from a set of seed pages*
    - *Identifying links in HTML pages is easy*
    - *How to identify links?*
      - *How to answer prompts automatically ?*
  - *How will maintain directories of voicesites?*
    - *Telco operator ? Third party ?*
- Voice Search 🕒 T-Web Search
- How to rank a VoiceSite ?
  - *Based on the location/profile of the person calling?*
    - *The telco has a lot of information about the caller – unlike that of a surfer*
  - *Based on the location/profile of the voicesite too!*
    - *Location of the mobile (voicesite) gives the location of the human service provider*
- *Language problem*
  - *For the common man, by the common man*
  - *Speech-to-speech translation ?*
  - *Real time !?*



# References

- Arun Kumar, Nitendra Rajput, Dipanjan Chakraborty, Sheetal K. Agarwal, Amit Anil Nanavati, “*WWTW: The World Wide Telecom Web*,” NSDR 2007 (SIGCOMM workshop), Kyoto, Japan, 27 August, 2007.
- Arun Kumar, Nitendra Rajput, Dipanjan Chakraborty, Sheetal K. Agarwal, Amit Anil Nanavati, “*VOISERV: Creation and Delivery of Converged Services through Voice for Emerging Economies*,” IEEE WoWMoM, Helsinki, Finland, June 2007.
- Sheetal K. Agarwal, Dipanjan Chakraborty, Arun Kumar, Amit Anil Nanavati, Nitendra Rajput, “*HSTP: Hyperspeech Transfer Protocol*,” ACM Hypertext 2007, Manchester, UK, 10-12 September 2007.
- Arun Kumar, Nitendra Rajput, Dipanjan Chakraborty, Sheetal K. Agarwal, Amit Anil Nanavati, “*Organizing the Unorganized – Employing IT to Empower the Underprivileged*,” WWW 2008 (to appear).



**Thank you !**

*Search the T-Web ...*

*Get involved !*

*Create your VoiceSite today*

*Search "World Wide Telecom Web" &*

*"Pyr.me.IT"*

*Arun Kumar,*

*Sheetal Agarwal,*

*Amit A. Nanavati,*

*Sougata Mukherjea,*

*Nitendra Rajput,*

*([rnitendra@in.ibm.com](mailto:rnitendra@in.ibm.com))*