



Building Scalable and Distributed Voice Forums in the Developing World

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Joint work with **Bill Thies**

Microsoft®
Research
india

Voice Remains Primary Interface for Mobile Subscribers in India

- Most subscribers lack smart phones

Smart Phone: < 5%

Feature Phone: 50-70%
(e.g., music player)

Basic Phone: 30-50%



- Text interfaces hindered by:
 - Low literacy (33% of adults in India are non-literate)
 - Language diversity (font support for tribal language?)

Interactive Voice Response in India

- Interactive Voice Response (IVR) allows humans to interact with computers by placing a voice call
- In 2010: \$750M from value-added IVR services
 - Expected to grow to \$3 billion by 2020
- Examples:
 - Ringtones, music, jokes, astrology
 - Booking movie tickets, travel, mobile commerce
 - TATA's *Behtar Zindagi* program: information for farmers with over 10,000 voice prompts
 - Screening for *Kaun Banega Crorepati*

Voice Forums for “Development”

Citizen News Journalism

Mudliar et al. **ICTD 2012**

Community Radio

Koradia et al. **ICTD 2012**

Viral Entertainment Platform

Raza et al. **ICTD 2012**

Feedback on School Meals

Grover et al. **DEV 2012**

Content Creation and Dissemination by Rural users

Agarwal et al. **ICTD 2009**

Avaaj Otalo: Agriculture Discussion Forum

Patel et al. **CHI 2010**

Community driven Intelligent Maps

Kumar et al. **ICTD 2009**

(Phone Broadcasting System for Sex Workers)

Sambasivan et al. **CHI 2011**

(Healthline: Access to Health Information)

Sherwani et al. **ICTD 2007**

Example: CGNet Swara

A Voice Forum for Citizen Journalism

- Anyone can report news, issues, etc. in local language
- Submissions are reviewed by moderators over the Web
- Appropriate submissions are published:
 - For playback on audio channel
 - For browsing on Web
 - Some submissions seed stories for posting on CGNet site + list



How to Build a Voice Forum?

- Option 1: Leverage a hosting provider



– Limited availability; can be expensive

- Option 2: Build and host it yourself



How to Build a Voice Forum?



Limitations of Existing Tools (Freedom Fone, FreeSWITCH, Asterisk)

Host your own website for content moderation and distribution

Runs on Linux

Ad-hoc implementation, tied to single infrastructure

Centralized server implies long-distance calls

A new open-source system that combines other free and commercial tools into an integrated platform to facilitate creation of **Distributed and Scalable** voice forums.

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Utilize YouTube for hosting and content moderation

Runs on Windows

Standardized code (VoiceXML), portable across infrastructures

Distributed servers enable local calls

IVR Junction offers **easier setup** and **cost-effective, distributed access points**

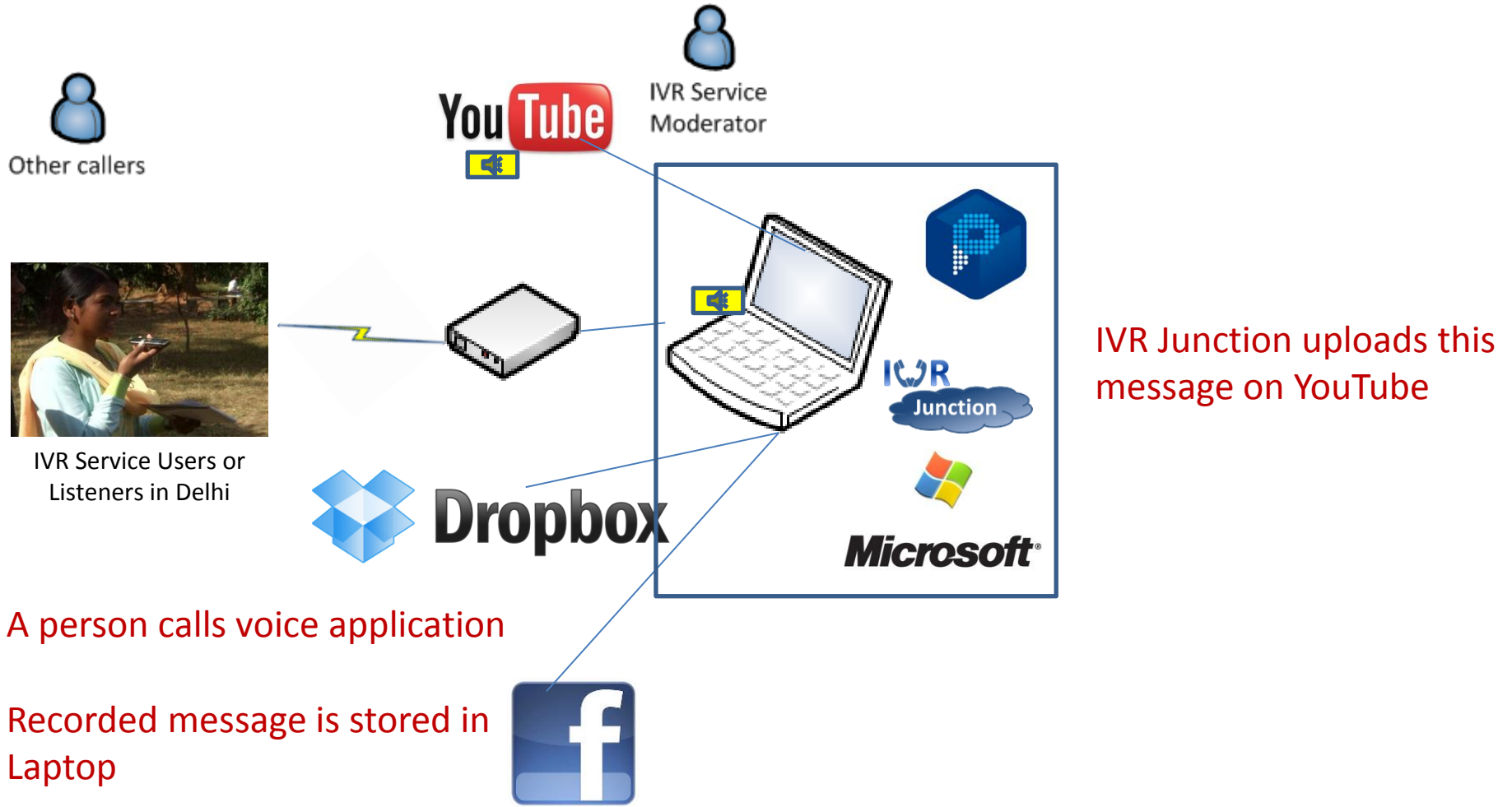
How Works



A person calls voice application

Recorded message is stored in Laptop

How Works

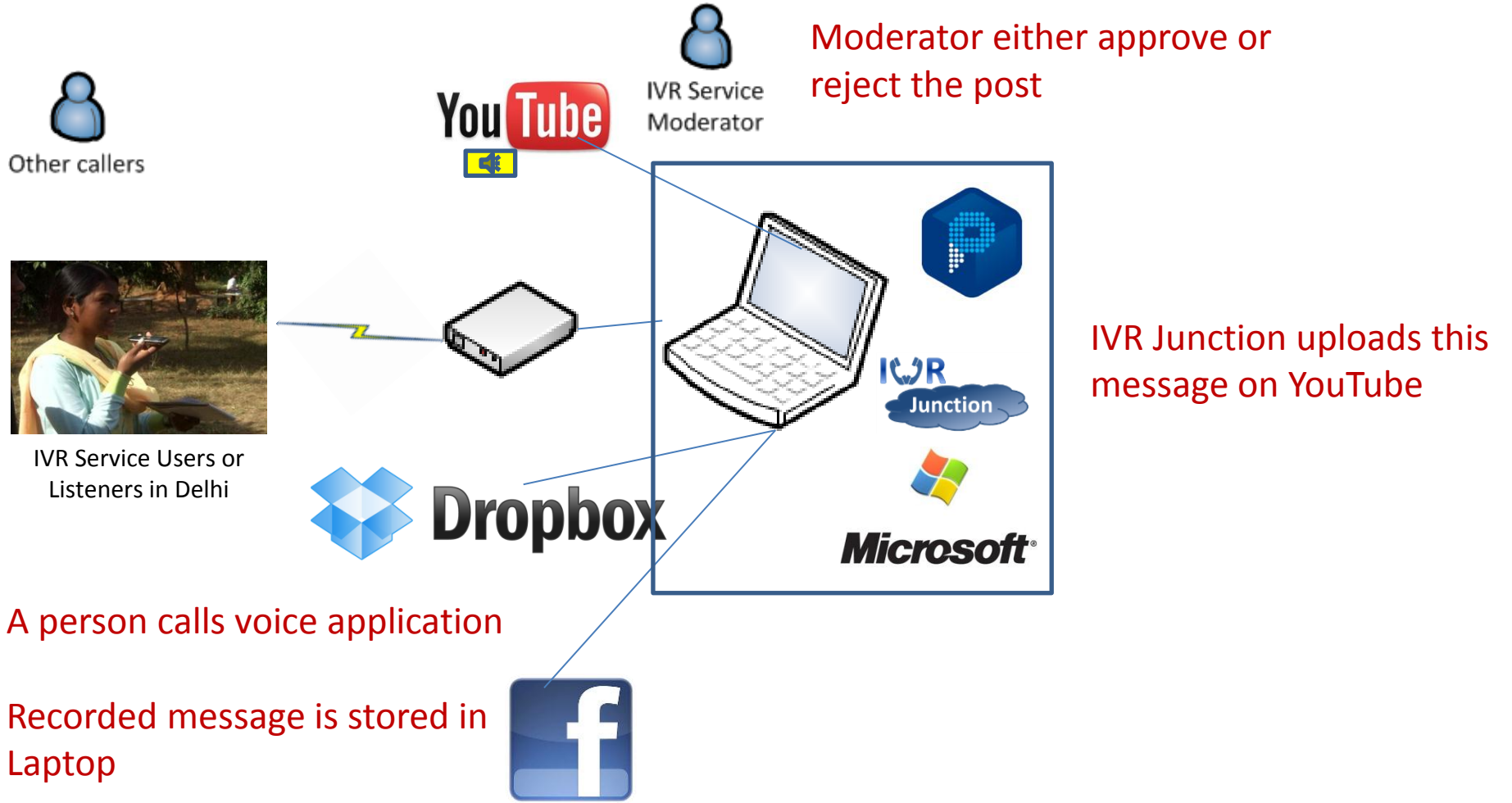


IVR Junction uploads this message on YouTube

A person calls voice application

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How Works



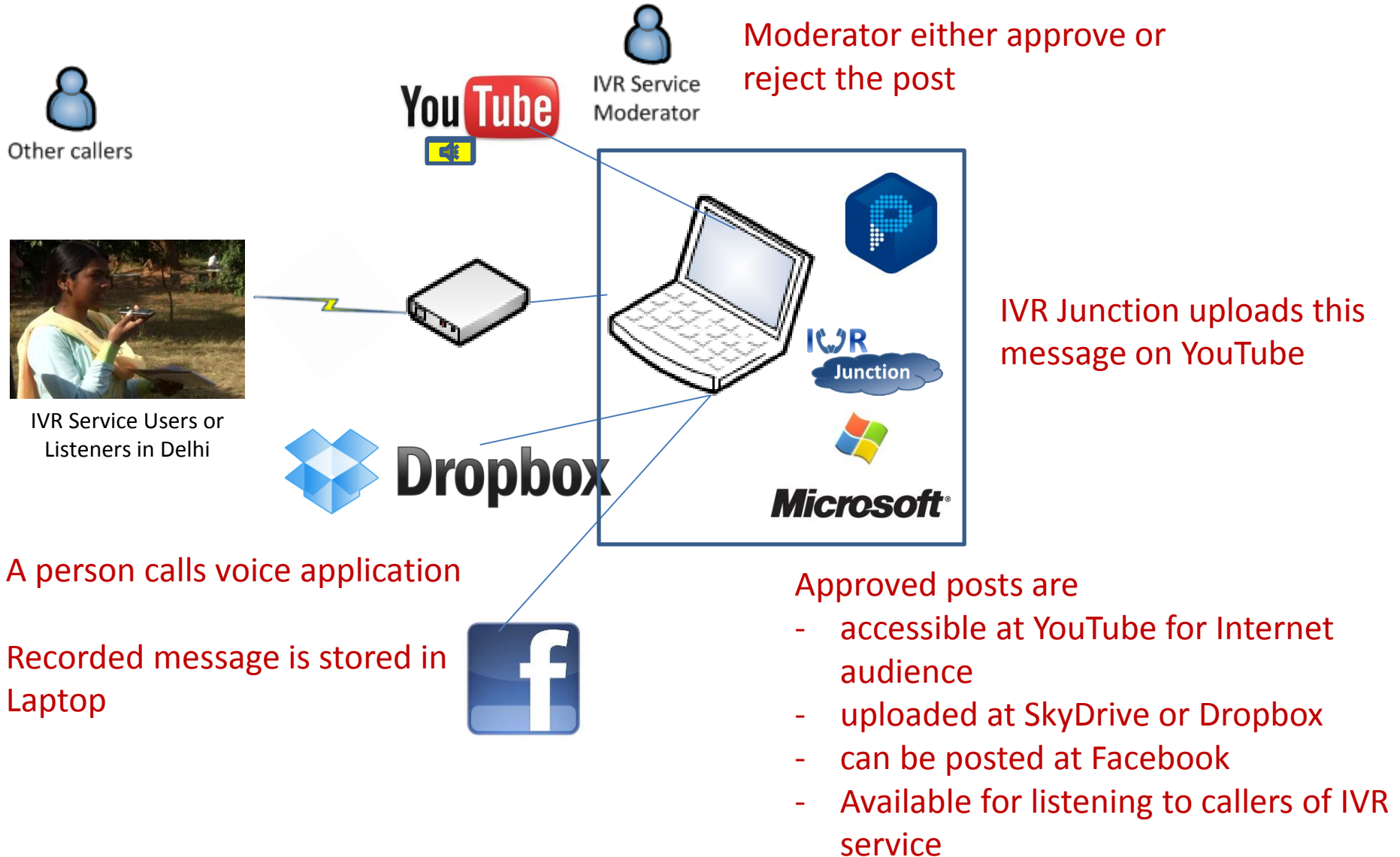
Moderator either approve or reject the post

IVR Junction uploads this message on YouTube

A person calls voice application

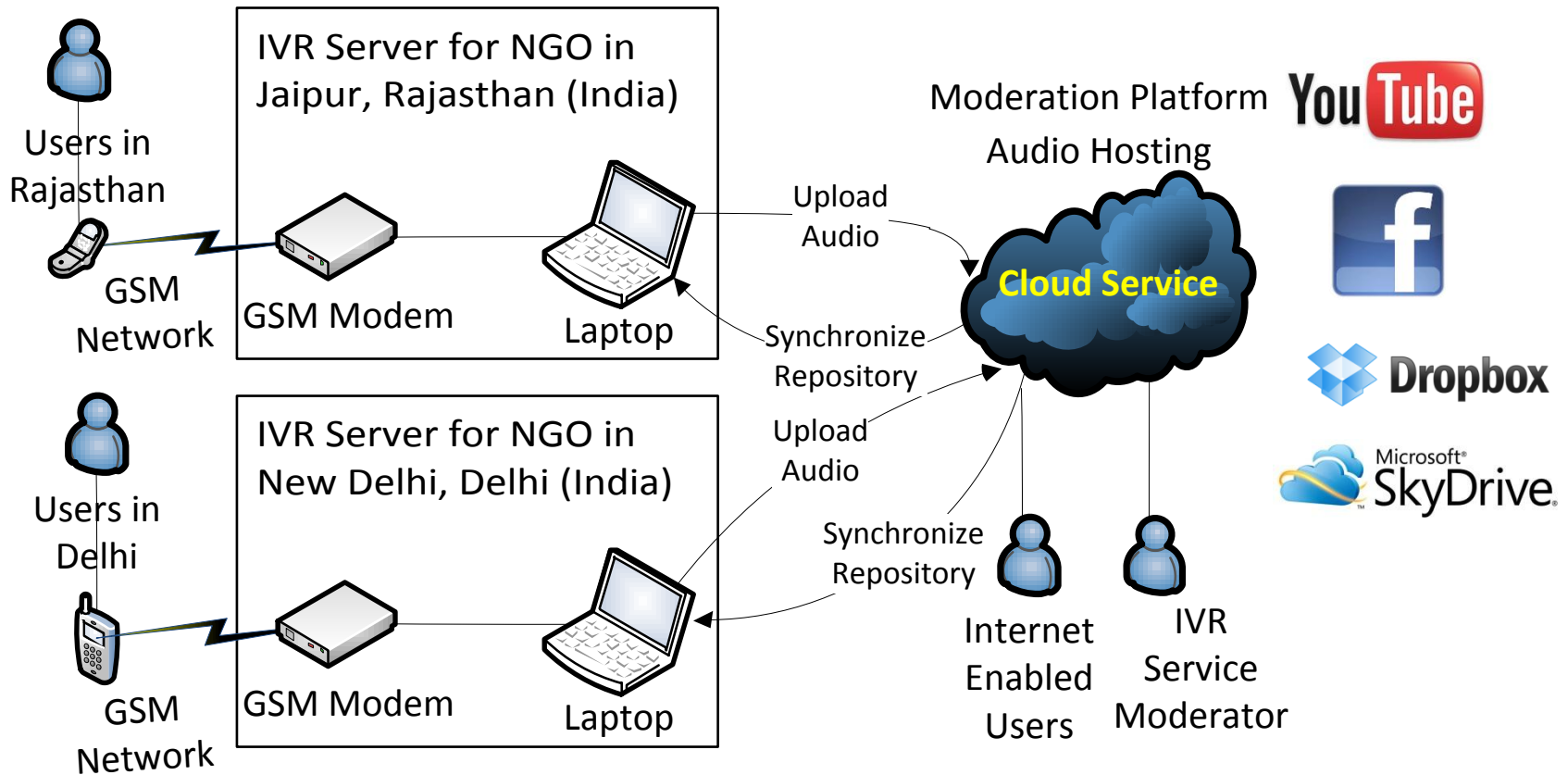
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How Works





Distributed Architecture





Implementation

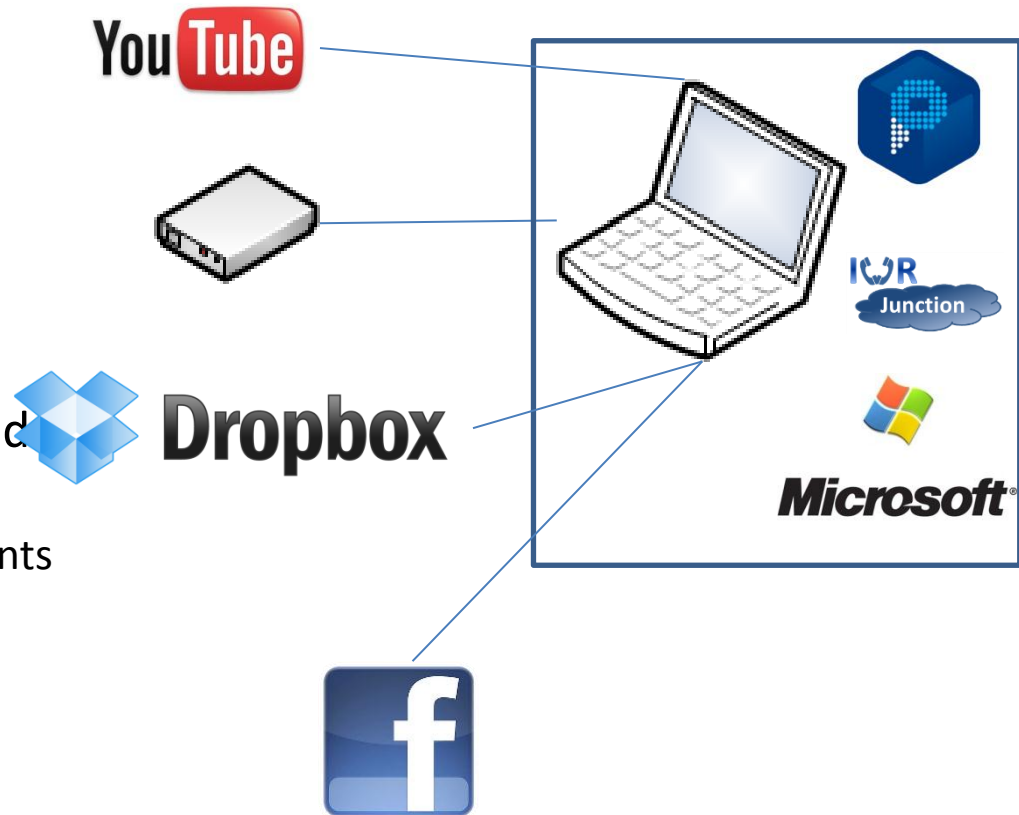
- Key functionality: Synchronize content across different platforms and to present a unified interface to the user

| Feature | LOC |
|-------------------------------------|---------------------------------|
| Caller Interface | 700 of ASP.NET, VoiceXML and C# |
| Admin Interface | 1500 of ASP.NET |
| Synchronization with Moderators | 3100 of C# |
| Synchronization with other branches | 1300 of C# |

- Implemented
- Various deployments are in progress
- Expected to be released this summer


Setting Up “Your” Voice Service

- Laptop
- GSM or Fixed line modem
- SIP and VXML interpreter software
 - Voxeo Prophecy 11
- IVR Junction and Application code
 - Free and Open source
 - Utilizes free Microsoft components like IIS Express, MS SQL Server Express, .NET framework 4 etc.
- YouTube account (free)
- SkyDrive or Dropbox account (free)
- Facebook page





is Easy to Set Up



IVR Junction

Configuration Page - Requires Internet

IVR Toolkit Configuration Options

Choose the moderation channel


Offline Online

Do you want to configure synchronization among s

Yes No

Do you want to configure your audio files to be p

Yes No



IVR Junction

Configuration Page - Requires Internet

Branch Configuration

Branch Name *Specify the unique Branch Name for the NGO*

IVR Folder Location Configuration

IVR Folder Location *Specify the IVR folder location where Configuration data would be stored*

DropBox Configuration

Using OAuth 2.0 Using DropBox Local Folder

DropBox Folder Location *Specify the Path of Configured DropBox Folder*

YouTube Channel Information

Developer Key *Specify the Developer Key corresponding to your application* [Get YouTube Developer Key](#)

Account Name *Specify the Account Name of your YouTube Channel*

Username *Specify your YouTube Username*

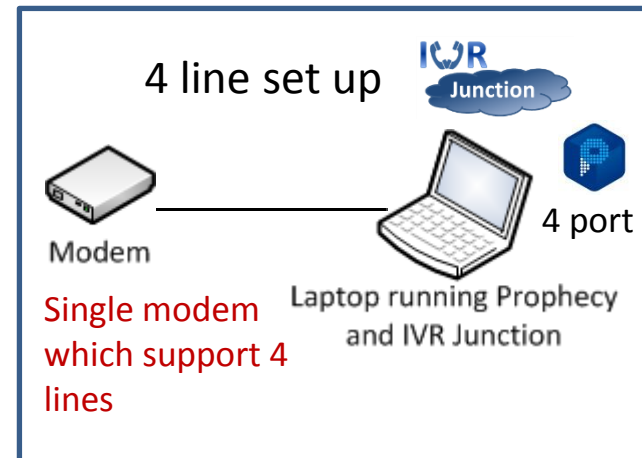
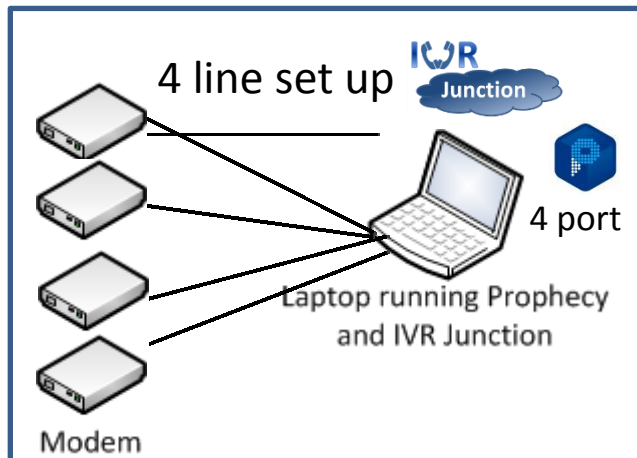
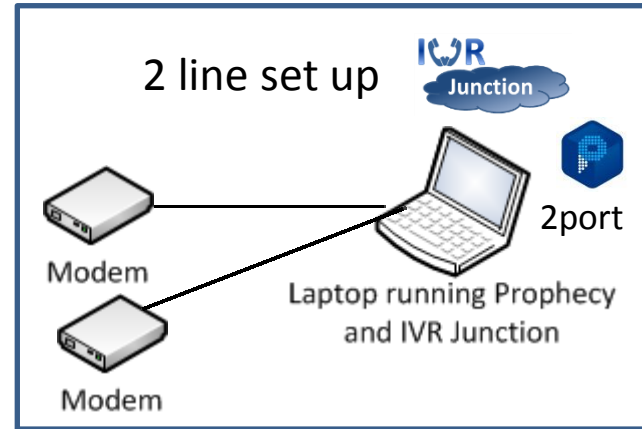
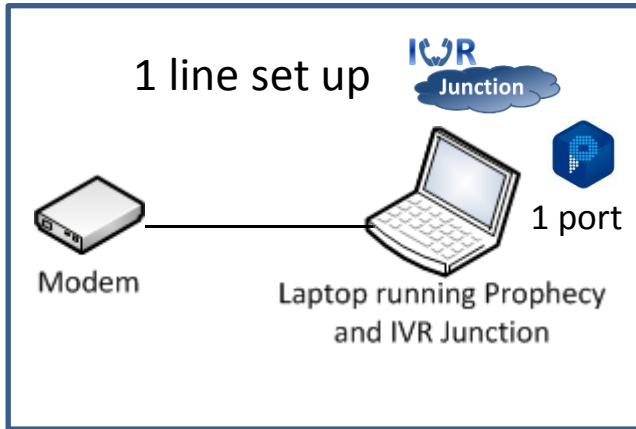
Password *Specify your YouTube Password*



Junction

Supports Parallel Lines

You can have as many parallel lines you want





Power Applications

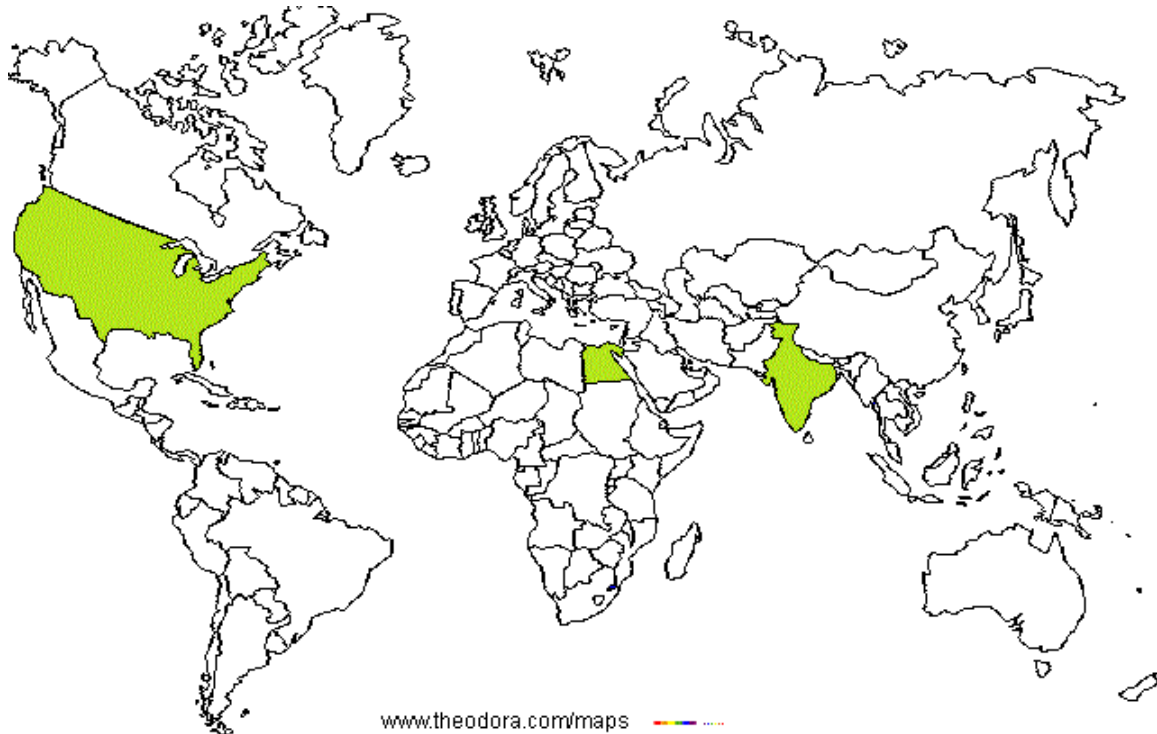
- Voice forums similar to CGNet Swara and Avaaj Otalo
- Phone Broadcasting System utilizing distributed architecture for lower outgoing call rates
- Any voice forum connecting users in different countries





Power Applications

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Future of Scalable Voice Forums

- Moderating content at scale
- Managing call costs at scale

Moderating Content at Scale

- Run a call center of content moderators
 - Like Just Dial
 - Challenge: difficult to maintain consistent judgment, quality and accountability across all moderators
- Community Moderation
 - Analogous to reddit, Digg, Slashdot, Quora, Stackoverflow
 - Easy to penalize those who try to game the system as phone number is unique identity
 - Challenge: taxing to listen to long voice posts
 - Hybrid model: transcribe audio posts on web using crowdsourcing. Moderators can moderate a voice forum by reading text rather than by listening to posts
 - Challenge: how to protect anonymity of participants of a sensitive voice forum before community moderation
 - Voice anonymizer can be used to distort the recording enough to prevent recognition of speaker

Managing Call Cost at Scale



- Use Distributed Architecture
- Deliver audio over data rather than voice
 - Streaming download from Web
 - Use “content caching” mobile application
 - Can also offer meta-data, search, that reduces traffic
 - Limitation: require users to have access to and familiarity with feature or smart phone
- Leveraging offline, peer to peer dissemination
 - Limitation: applicable only for those voice applications whose users are motivated to share the content with peers, have Bluetooth enabled cell phones and knowledge to send files via Bluetooth

Conclusion

- IVR systems can provide innovative information services to mobile subscribers in the developing world
- Complexity in setting up IVR systems, and challenges in moderating content and managing call costs limits impact
- IVR Junction
 - is a new and open-source system built on Windows platform
 - simplifies installation and configuration
 - enables interplay between Internet users and phone users
 - utilizes a distributed architecture for affordable sharing of audio content across different locations
- There are further opportunities to manage content and call costs at scale

Thanks!

Seeking Users!

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