

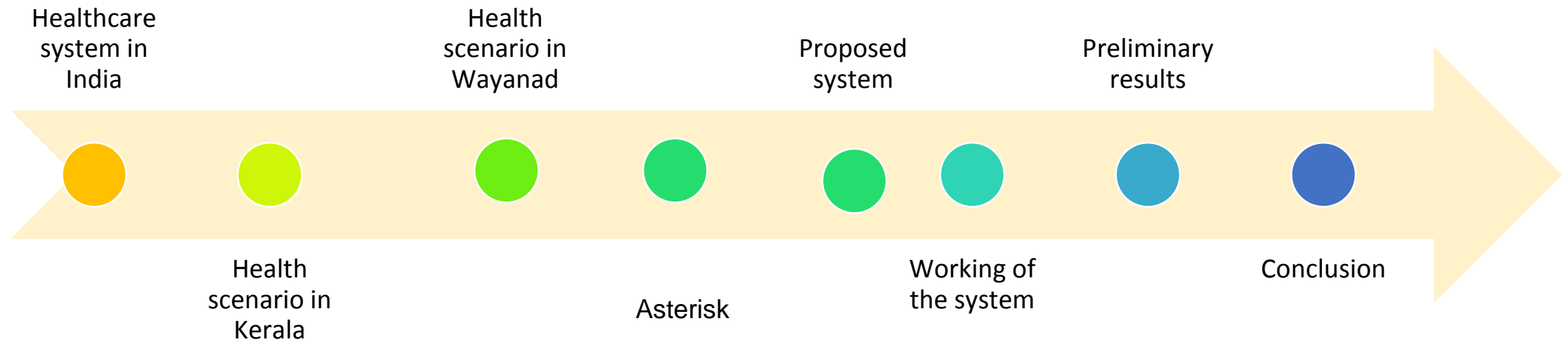
The Role of open source Asterisk-IP PBX in providing timely healthcare consultation for Tribal Community in India

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Agenda

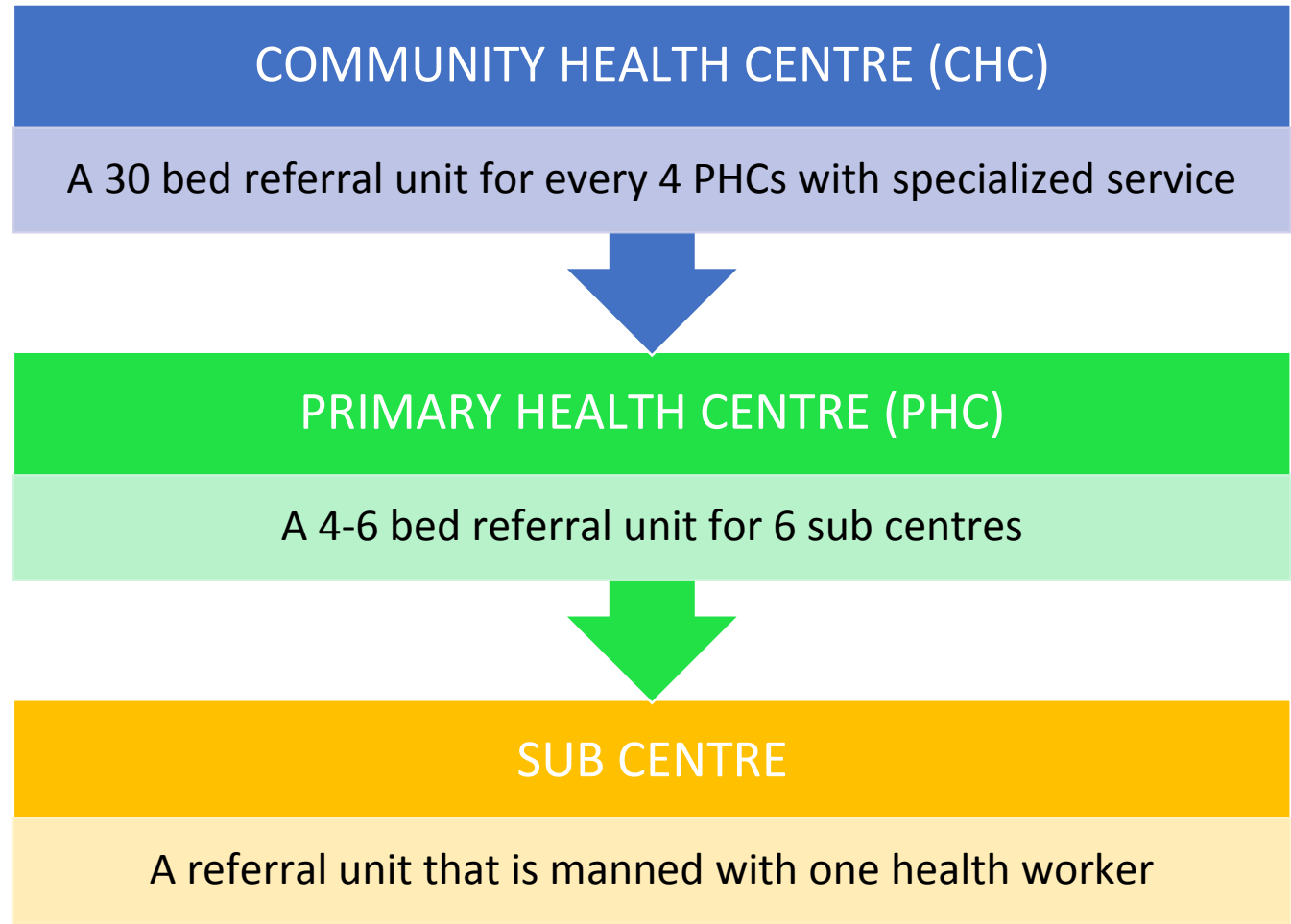


Healthcare system in India

- Three-tier rural infrastructure

March 2011 statistics

- 148,124 Sub Centers
- 23,887 PHCs
- 4,809 CHCs



Healthcare system in India (contd...)

60% of India's population – do not have access to basic medicines and medical facilities

- 8% of the PHCs - no doctors or medical staff
- 39% of the PHCs - no lab technicians
- 18% of the PHCs - not even a pharmacist

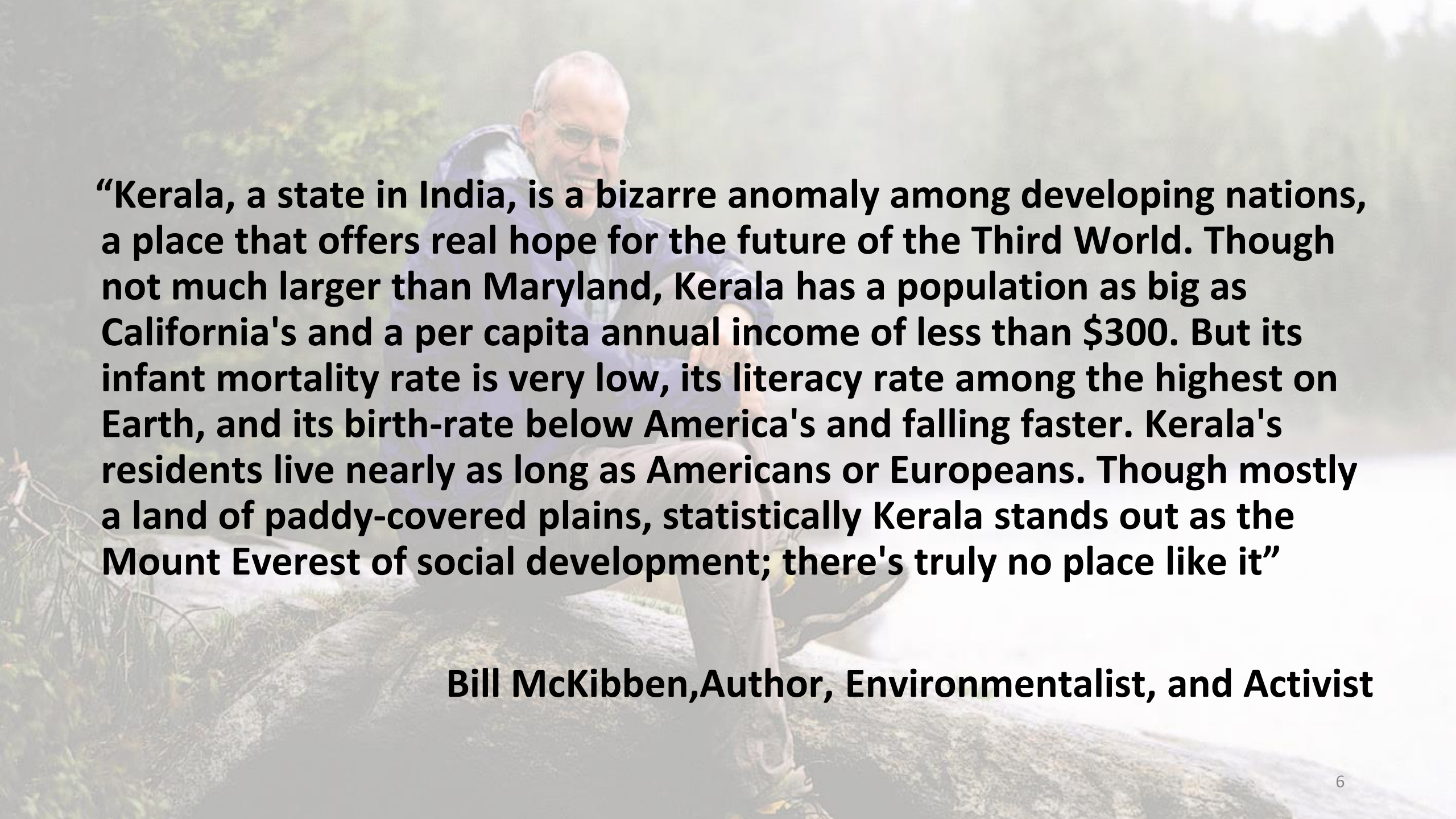
31% of population needs to travel more than 30 km for health facility

39 million Indians are pushed to poverty because of ill-health every year

Need of the hour: LOW-COST HEALTHCARE ACCESS IN REMOTE AREAS

Healthcare Scenario in Kerala

- Health care developments in Kerala generally come under the “Kerala Model of Development”
- Gained attention due to the presence of the paradox of high indicators of social development and comparatively low economic growth
- Policy of health as a right
- 2,700 government medical institutions in the state, with 330 beds per 100,000 population, the highest in the country
- Its adult literacy rate is 94.59 per cent compared to India's 65 and the US's 99
- Life expectancy at birth in Kerala is 75 years compared to 64 years in India and 77 years in the US
- Female life expectancy in Kerala exceeds that of the male, just as it does in the developed world
- Kerala's maternal mortality rate is :Total: .6 deaths/1,000 live births (2012), lowest in India

A man with glasses and a blue jacket is sitting on a large, mossy rock by a river. He is smiling and looking towards the camera. The background is a lush, green forest with a river flowing in the foreground.

“Kerala, a state in India, is a bizarre anomaly among developing nations, a place that offers real hope for the future of the Third World. Though not much larger than Maryland, Kerala has a population as big as California's and a per capita annual income of less than \$300. But its infant mortality rate is very low, its literacy rate among the highest on Earth, and its birth-rate below America's and falling faster. Kerala's residents live nearly as long as Americans or Europeans. Though mostly a land of paddy-covered plains, statistically Kerala stands out as the Mount Everest of social development; there's truly no place like it”

Bill McKibben, Author, Environmentalist, and Activist

Wayanad, Kerala

3.79% urbanized

Population in 2011: 816,558 people

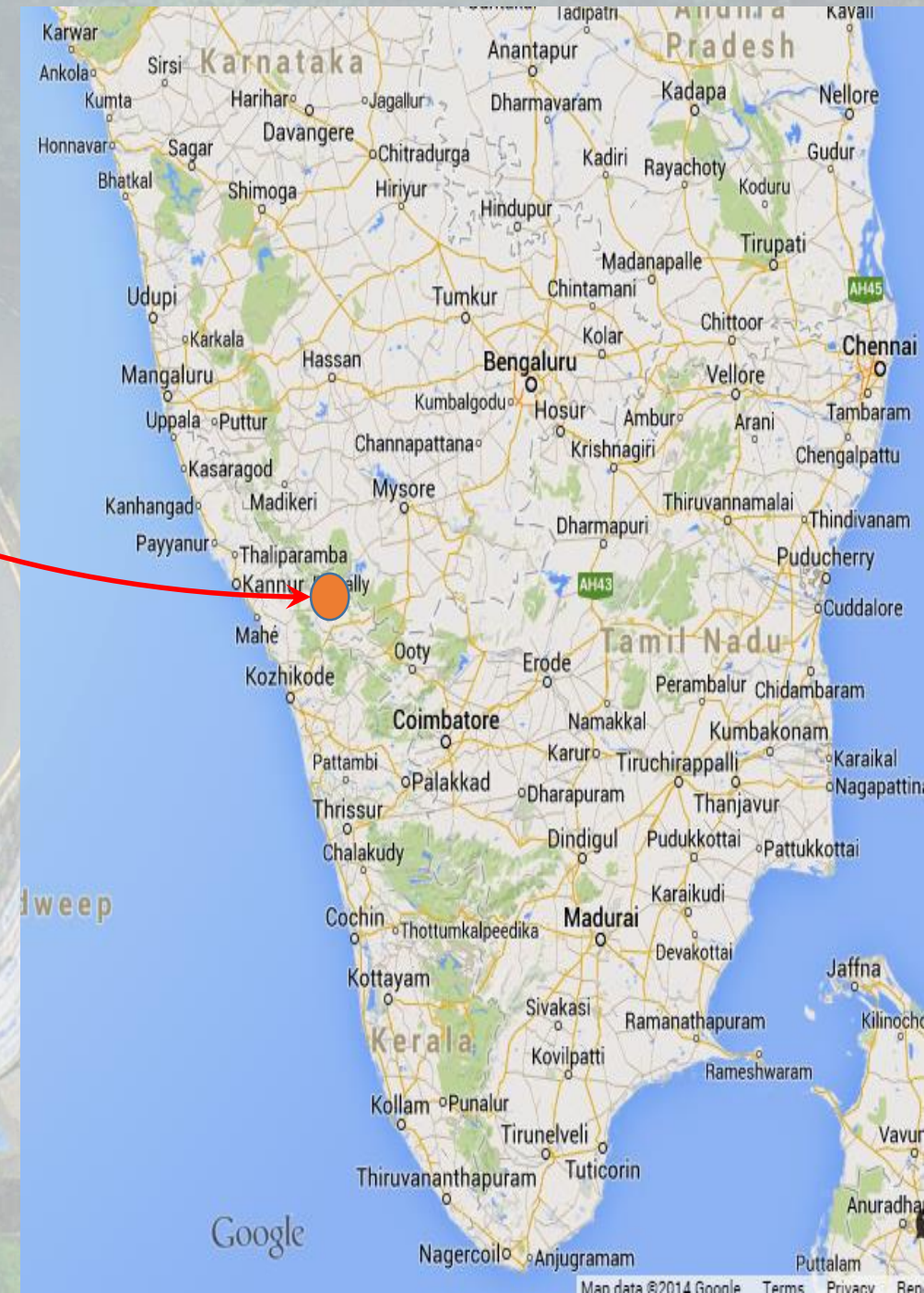
Altitude - 700 to 2100 m

One among 90 backward districts in India

17.4% tribal population

Dependent of agriculture and forestry

Mostly inaccessible – poor infrastructure



Responsible Tourism theme in Kerala for World Tourism Day

keralabiznews.com › Tourism ▼

2 days ago - "As the world leader in **sustainable tourism**, our State will celebrate ... of Kerala Tourism has spread to three more destinations – **Wayanad**, Thekkady and Kovalam. ... Kochi set to host **Kerala Travel Mart 2014** on Sept 17-20.

Latest Kerala Tourism news in Kerala: Rediff Localnews

localnews.rediff.com/location#!kerala-tourism-location-kerala-india ▼

1 day ago - T3 News Network, Sep 26, 2014 Kerala Tourism has made a successful ... community participation in **sustainable tourism** development to a higher level. ...

Wayanad, the fastest growing tourism destination in Kerala, made a splash at ... The KTM, the largest annual tourism marketing fair in the State jointly ...

KTM 2014: Kerala beckons the World - Tourism India Official ...

www.tourismindiaonline.com/detail/index.php?cnws=174&crnpg... ▼

The eighth edition of **Kerala Travel Mart (KTM)**, which is one of the biggest B2B **tourism** ... Kumarakam, Kovalam, **Wayanad** and Thekkadi are identified as village for **tourism** in the development agenda Free media as vital to **sustainable** ...

Health Scenario in Wayanad, Kerala

Lags behind national average on socio-economic indicators like drinking water

Tobacco and alcohol consumption high in tribal communities (even children are addicted to it)

33% of the villages do not have access to a health facility

- National Rural Health Mission (NRHM) – 8 locations as difficult to reach
- Chekadi – focus of this study – one among the 8 locations

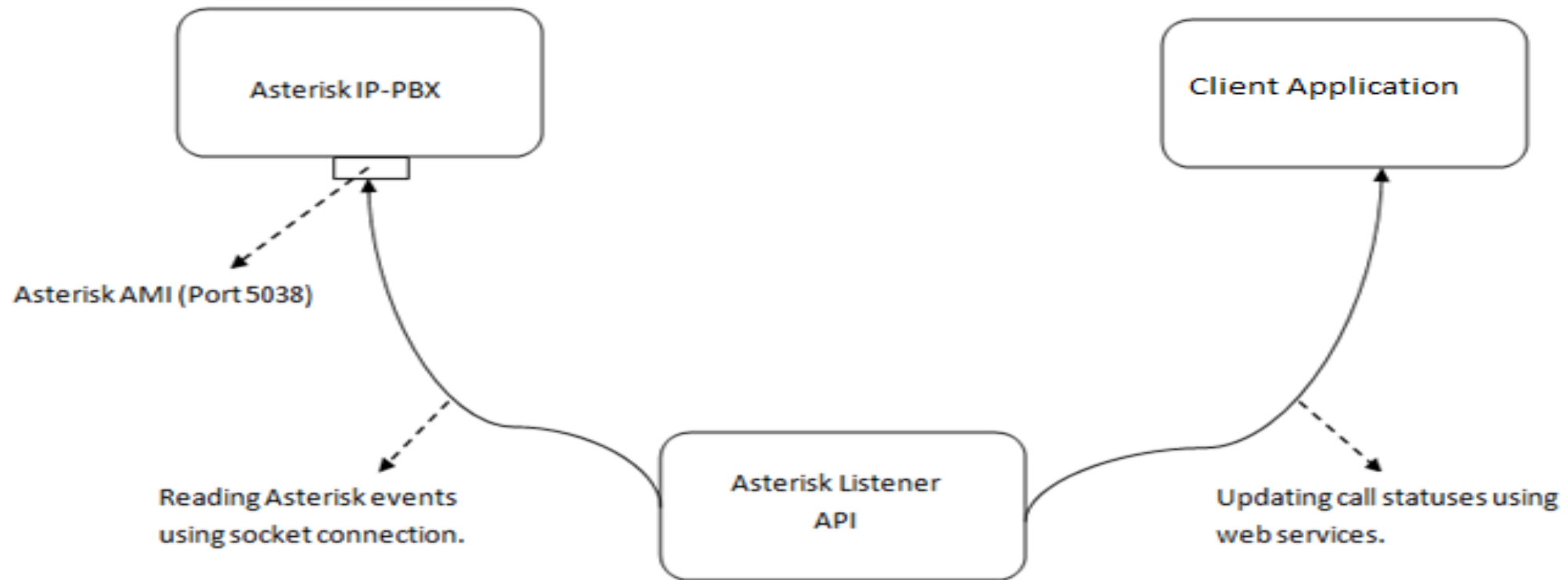


What is Asterisk?

- A Complete PBX in software, designed to reproduce the features of standard office phone systems
- Asterisk is h/w independent and runs on Linux, BSD, MACOSX
- Developed by Mark Spencer in 1999
- Realized once a call is inside a PC, anything can be done with it-Hence the name asterisk
- Asterisk is maintained by an active community supported by Digium, founded by spencer.



Asterisk Manager Interface(AMI)



- Asterisk Manager Interface (AMI) allows a client program to connect to an Asterisk instance (port:5038)
- Issue commands or read events over a TCP/IP stream
- Action: *<action type><CRLF>*
<Key 1>: <Value 1><CRLF>
<Key 2>: <Value 2><CRLF>
...
Variable: *<Variable 1>=<Value 1><CRLF>*
Variable: *<Variable 2>=<Value 2><CRLF>*
<CRLF>
- Before issuing commands to Asterisk, Need to establish a manager session (/etc/asterisk/manager.conf)
- Packets may be transmitted in either direction at any time after authentication.
- The first line of a packet will have a key of "Action" when sent from the client to Asterisk, but "Event" or "Response" when sent from Asterisk to the client.
- The order of lines within a packet is insignificant, so you may use your favorite programming language's native unordered dictionary type to efficiently store a single packet.
- CR/LF is used to delimit each line and a blank line (two CR/LF in a row) indicates the end of the command which Asterisk is now expected to process.

```
root@crm:~
root@bhea-sys-dpc-032: /home/bhea
# --- mysql_checked_query
19-08-2013 10:22:20! --- Event -----
!           Event --> Dial
!           Privilege --> call,all
!           SubEvent --> Begin
!           Channel --> SIP/2506-00001180
!           Destination --> DAHDI/i1/9686605333-70e
!           CallerIDNum --> 6756666
!           CallerIDName --> <unknown>
!           ConnectedLineNum --> <unknown>
!           ConnectedLineName --> <unknown>
!           UniqueID --> 1376888222.12585
!           DestUniqueID --> 1376888222.12586
!           Dialstring --> g0/9686605333
! -----
! Dial Event src=SIP/2506-00001180 dest=DAHDI/i1/9686605333-70e
! Successfully created CALL record with id=dd968161-c5fa-cc7c-791e-5211a48a1547
2537621,27 96%
```

Field study

A background image showing a group of people, including children and adults, in a traditional woven boat on a river. One person is using a long wooden paddle. The scene is set in a natural, possibly forested, environment.

Chekadi tribal mission - 12 kms inside the forest from Pulpally

Access to the tribal mission – through Kabani river which lacks proper water transportation facility

Working with an evangelist at a Church that supports the tribal mission

- Other activities of the Church - Social work, de-addiction, tuition centers, health camps

Concerns raised during interviews with stakeholders

- Poor transportation, presence of fake doctors, high alcohol and drug consumption

Proposed system

Remote health centre equipped with diagnostic tools for monitoring temperature, blood, blood pressure, and urine.

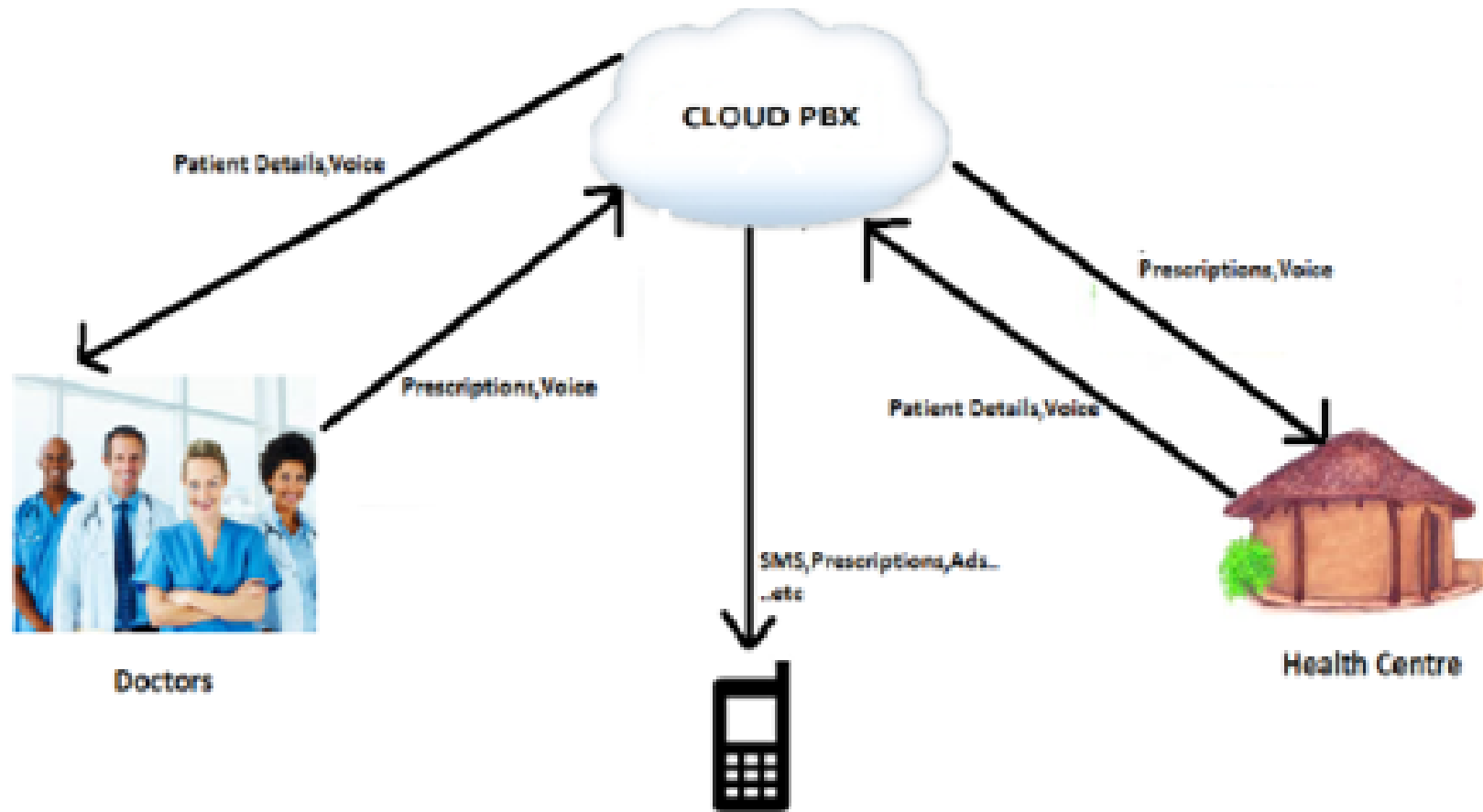
Electronic medical record system

Mobile network coverage available

2G internet erratic during rainy season – so dual-mode system (SMS and MMS))

Value added service like SMS alerts – still in the planning stage

System architecture




Working of the system

Health agent gets basic patients details and loads it in software interface, patient ID created



Patient directed to audio conference room, call routed through a cloud PBX (Private Branch Exchange)



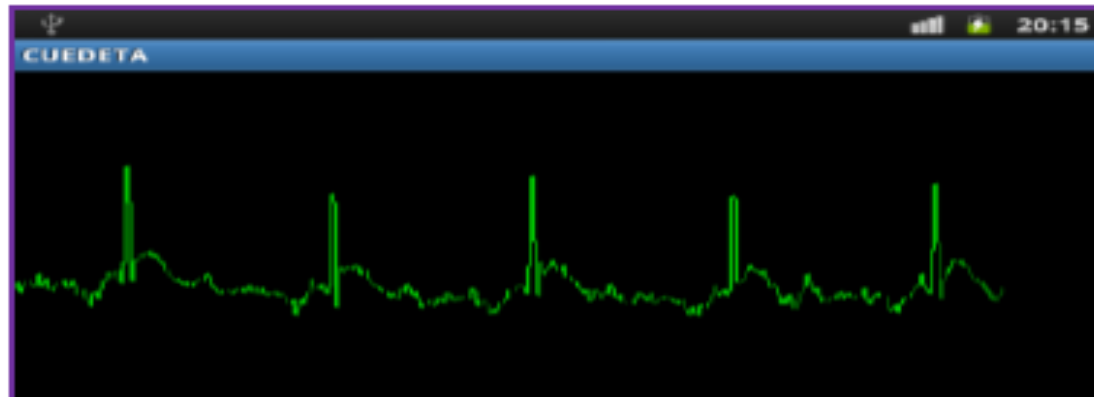
Remote doctor has access to patient details on laptop/SMS. Diagnosis and Advice offered.



Audio conversation and patient details stored as electronic medical record for future use

Preliminary results

ECG monitoring – using real-time heart monitoring Android app CUEDETA



Issac, Roshan & Ajaynath, M.S. CUEDETA: A Real Time Heart Monitoring System Using Android OS, ,IEEE India Council Annual Conference (INDICON) 2012. ISBN:978-1-4673-2272-0

Preliminary results (contd...)

One touch Ultra 2 glucometer - Blood glucose

A&D UA-76 PBT blood pressure meter – BP, blood oxygen level

Oximeter - pulse rate

Name	Pressure (Sys/Dia)	Blood Glucose Level(mg/dL)	SpO2 %	Pulse (bpm)	Te mp (°F)
Roshan	120/70	110	98	80	98
Jibu	140/90	140	97	68	100
Cyril	110/70	100	99	90	99
Ajay	150/90	170	98	75	98

Conclusion

Step towards improving health care facilities in remote rural areas and can be replicated to other parts of India

Full scale implementation with video conferencing – tie-up with medical college hospital

Immense possibilities of big data analytics in future


Looking for funding and collaboration

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Thank You!

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