

# Internet of Things *for* Health & Safety

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# IoT for Health and Safety

- Healthcare is accessible to only few residents in a city; it is either overburdened or not affordable for others
- Adequate preventive healthcare, specialized health advice and individual health monitoring facilities for weaker or essential section
- A fitting emergency response system that assists ambulance services by connecting the needy, authorities and relevant citizens
- Foresee/track likely potential diseases and respond with a preventive system

(source: adopted from CDAC Mohali/Open domain)

# IoT for Health and Safety ...

- One of the top ten killer in the world
- Kills one out of three hundred people
- Kills over 50,000 people every year in US alone and 10 times more world wide
- Goes unnoticed in India at times ...



# IoT for Health and Safety ...

- Preventable Medical Error
- Not new – Decades ago technology changed the health-care system
- Monitoring improves results
- No doubt – healthcare has improved drastically
- Errors/Gaps Persist !

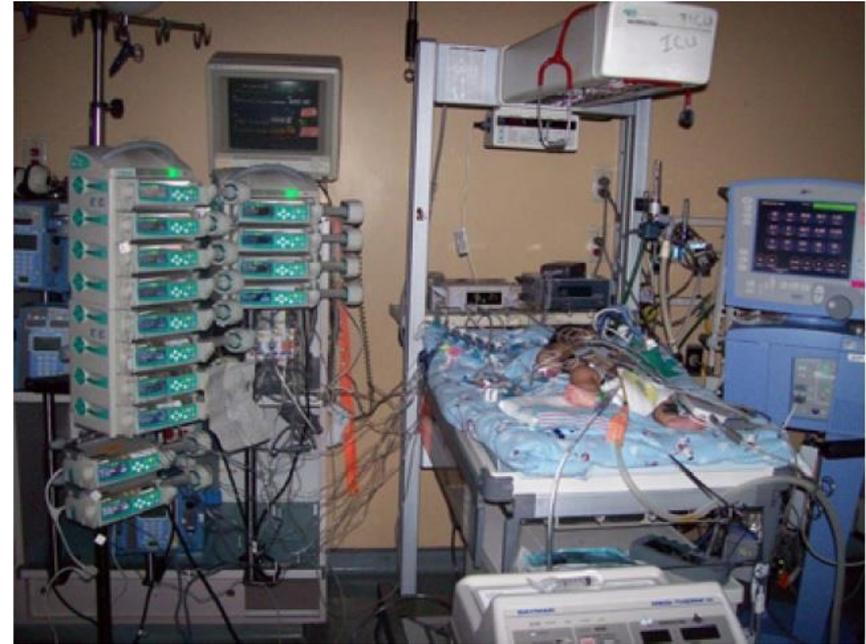


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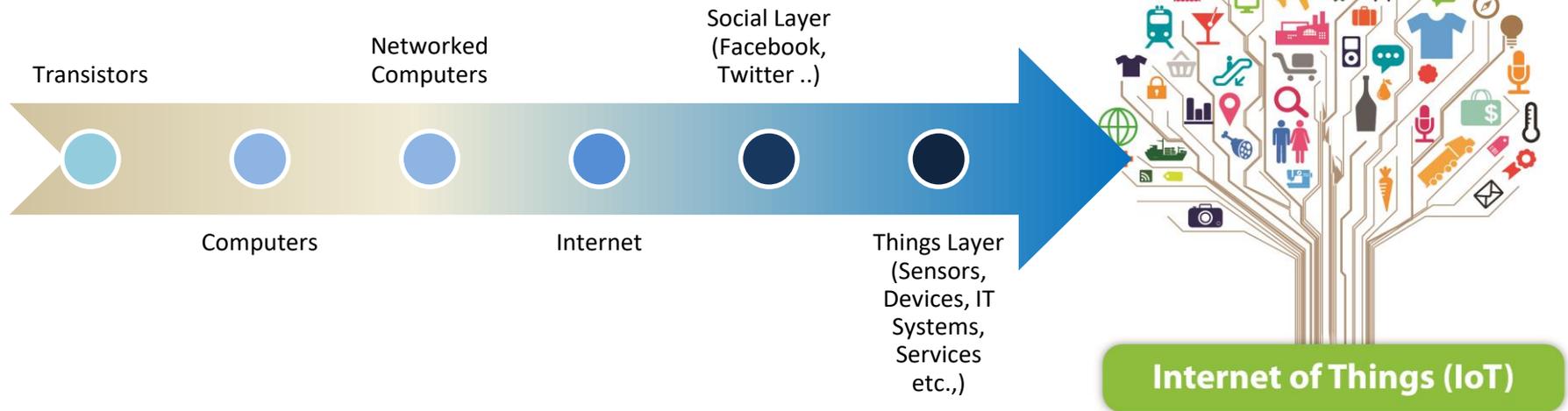
# IoT for Health and Safety ...

- Devices in Silos/Island
- Combined information from various devices to know patient status
- False Alarms
- Misconfiguration Unnoticed
- Critical Conditions Unaddressed



ICU - Drug Administration using infusion pumps

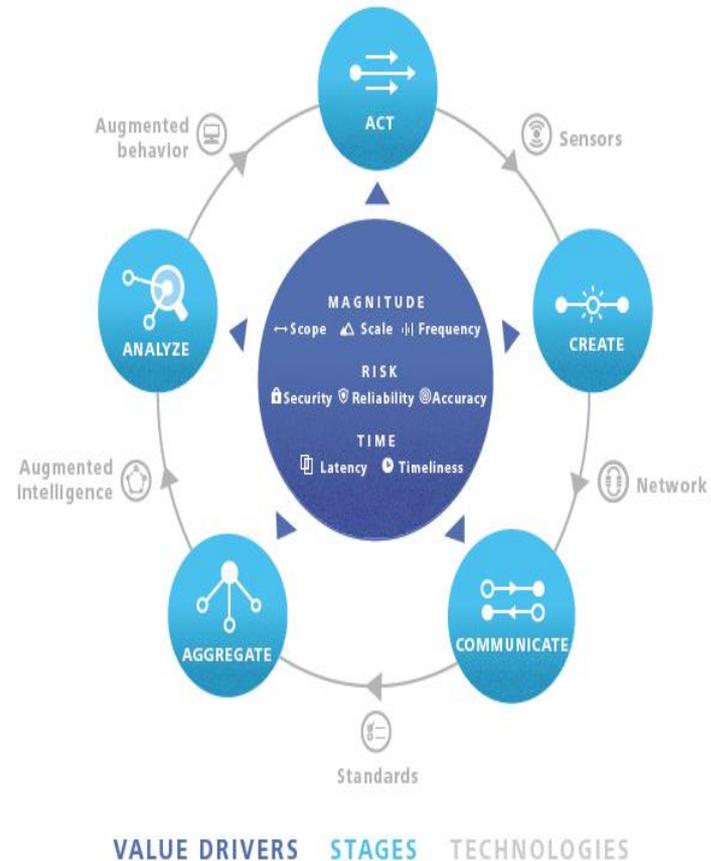
# Value Creation - Need of the hour



**Connected Things ; 'Things Layer' is making the difference**

# Value Creation - Need of the hour

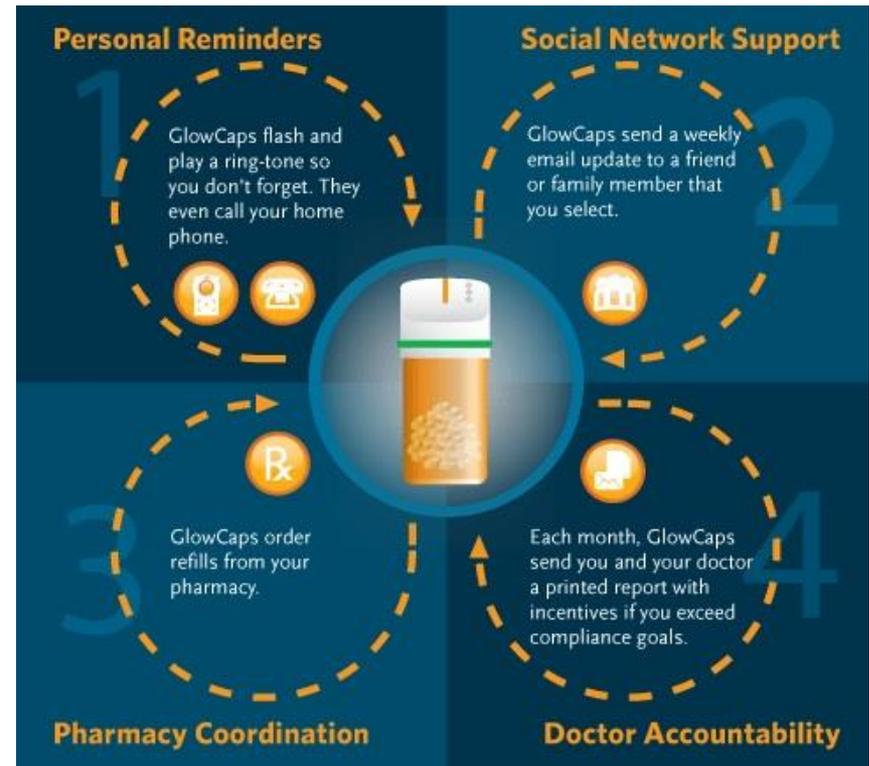
- Technologies; Stages; Value drivers
- Tennis player no longer values tennis racquet alone (frame, string tension, weight)
- Value: Insights about the players tennis stroke, speed, direction, timing and likewise
- Scope and areas of improvement
- Not just the product/service; but the information around it creates the value



Source: Article DUPress.com by MICHAEL E. RAYNOR AND MARK J. COTTELEER

# Value Creation - Need of the hour

- **Glowcap** : David Rose – MIT Media Lab
- US Dept. of Health and Human Services estimates systematic cost – Non-adherence ~ \$105 Bn/year
- Value Creation: Patient-Health-Insurance-Hospitals-Governance



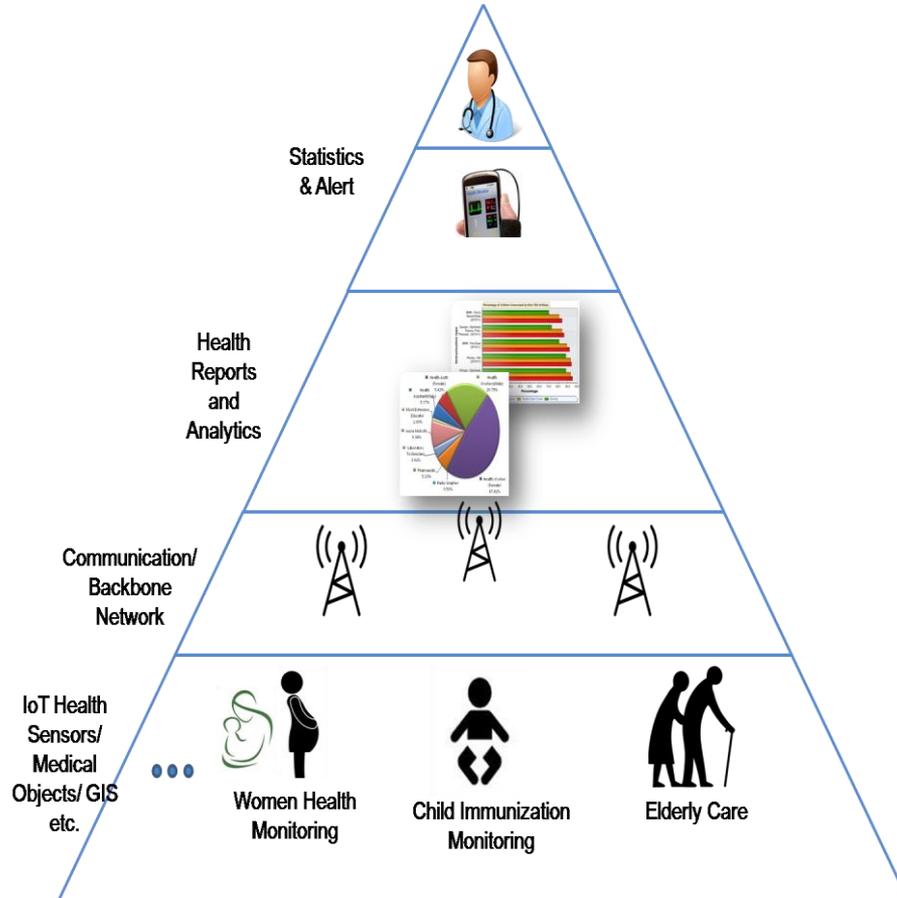
Source:<http://www.stephensonstrategies.com>

# IoT for Health and Safety ...



- Genuinity of life saving medicine/drugs
- Expired drug racket: Drugs past the sell by date; Repackaged with new expiry dates - Resold in the market
- CDAC has come-up (deployment in the process) with an simple IoT system to track the genuineness of the medicines

# IoT for Health and Safety ...



## Connected Medi-Assist:

- Remote health monitoring
- Pregnant women and elderly people (fall detection) monitoring
- Child Immunization Tracking and Monitoring System
- U-Sehat (Wireless Body Area Network), MOTHER

# Medical devices and SDK's

- **SDKs (DICOM/HL7):** C-DAC Medical Informatics SDK is a suite of API libraries/toolkit that provides medical standards compliance to the implementing applications/medical devices
- SDK for DICOM is licensed under Apache License v2.0 (Open Source License) – Free for both personal and commercial use
- **Wireless Digital Stethoscope:** Data can be stored for monitoring progress and/or transmitted for remote diagnosis in tele-care settings



Wireless Digital Stethoscope CDAC-Mohali

# Medical devices and SDK's ...

- **TARANG** is a programmable intelligent hearing aid
- **MoSQuIT** is an advanced mobile base surveillance tool for surveying Malar prone areas in order to track and monitor the status of malaria prevalence
- **MOTHER** is a Push method based personalized advice based on the health parameters of pregnant women and mothers for child care and reminders
- **Smart-Bed** senses heart rate and other vital parameters to identify early stage sleeping disorders
- **Sajeevan** (Help on wheels) last-mile connectivity to healthcare



TARANG Body Worn (TBW100) Digital Programmable Hearing Aid



**MOTHER**

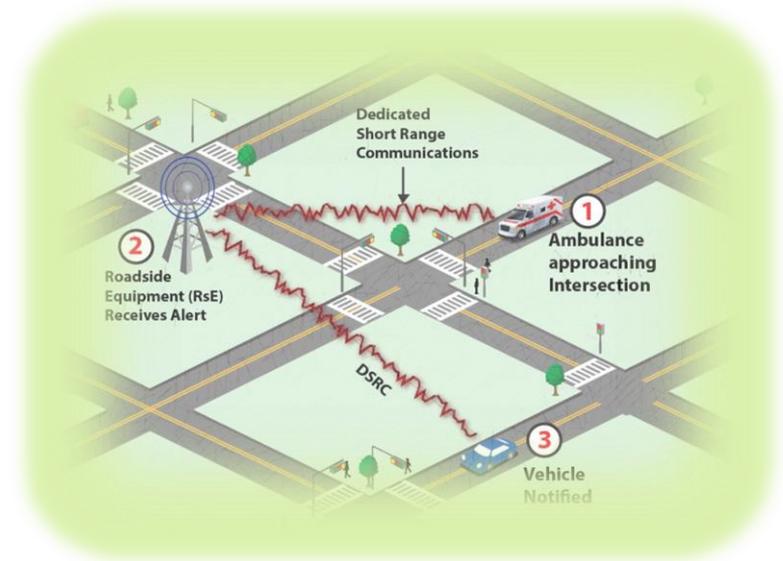


TARANG Behind-the-Ear (TBE105) Digital Programmable Hearing Aid



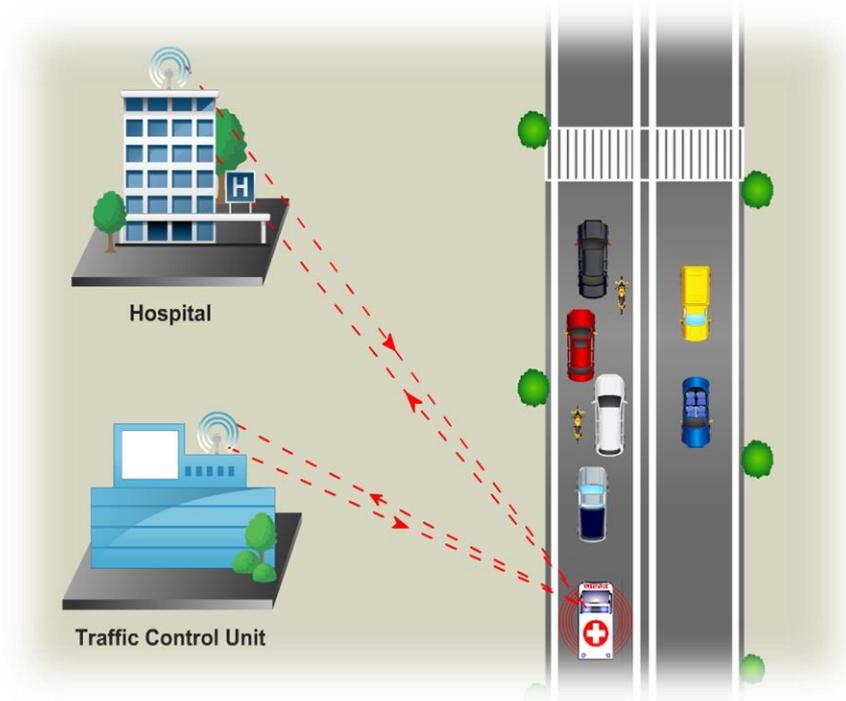
# Green Corridor for Ambulance

- Healthcare – Traffic – Police – People (At present Ad-hoc & Manual)
- C-DAC has developed a technology/platform to track the position of the emergency vehicles and to establish communication amongst authorities/officials from various departments

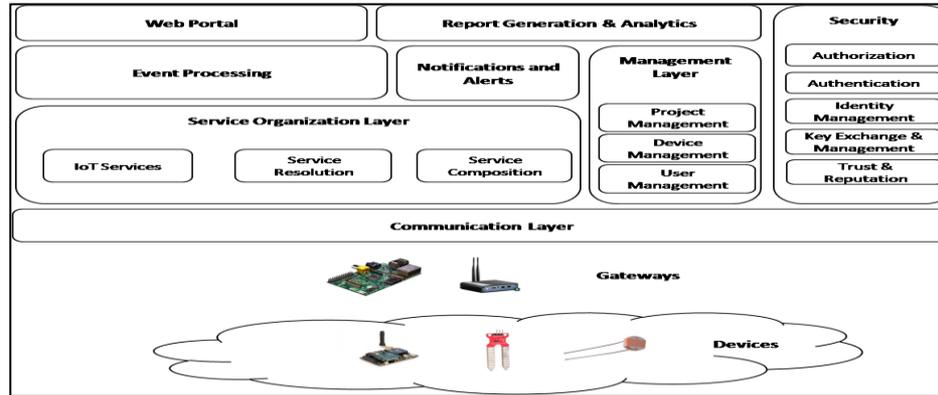


## Green Corridor for Ambulance ...

- Percolation of messages to corresponding officials responsible for delivering emergency services like green corridor for ambulance etc.
- Individual or a group of vehicles can be easily monitored and handled



# IoT Framework



DDS, GSN,  
MQTT, SOAP,  
REST,  
WebIOPi

Skynet.im  
APIs  
Node-RED

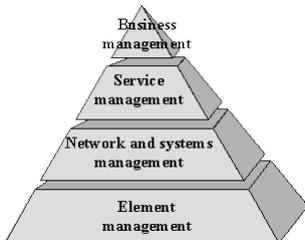
Data  
Visualization  
& Analysis



Device  
Abstraction  
Legacy APIs

Web-based  
IoT  
framework  
(Node.js/  
REST)

Integration  
of Semantic  
Web

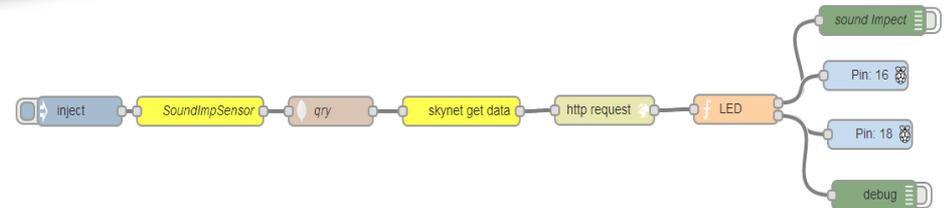
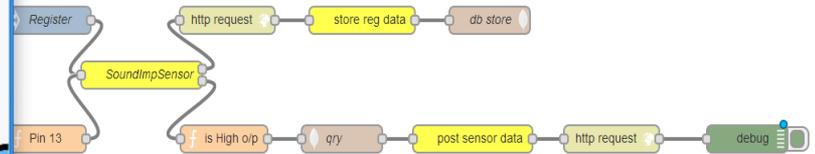


Source: <http://www.tml.tkk.fi>

# IoT Framework ...

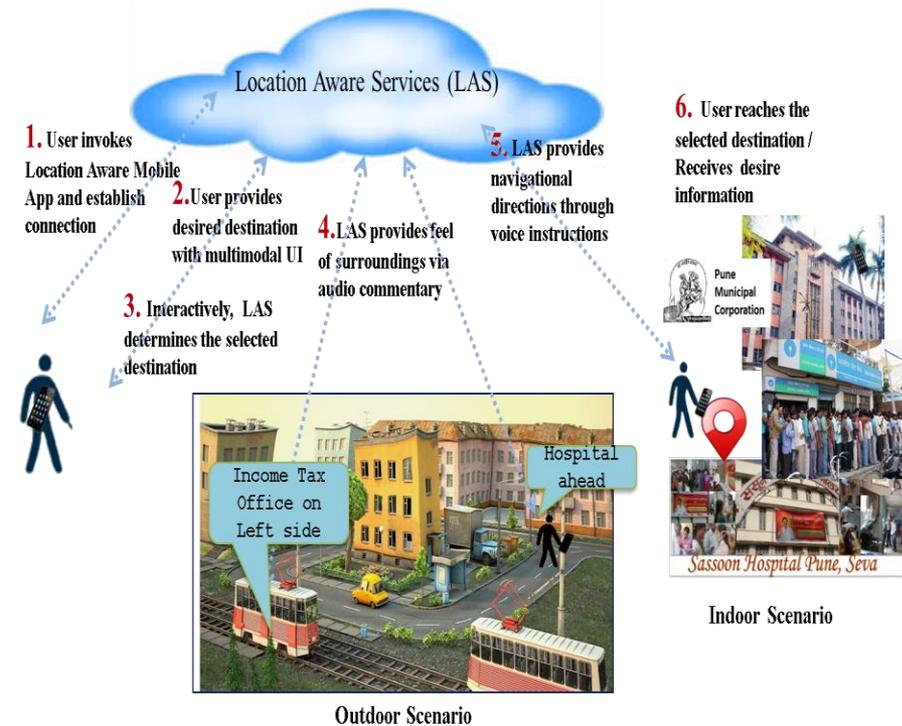


SkyNet  
as a private cloud on  
Linux Server



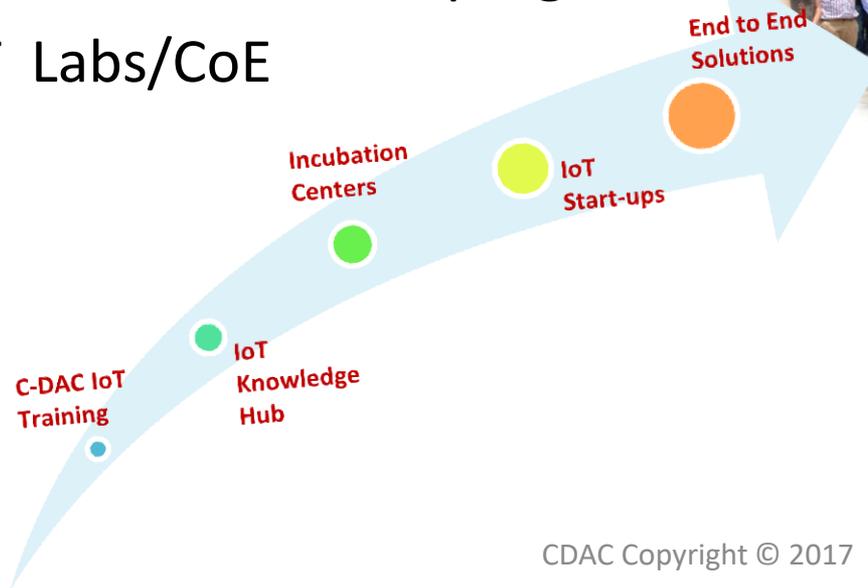
# IoT Framework ...

- Truly justifiable smartness cares differently-abled, senior citizens and like
- Targeted assistive/IoT solution encourages social participation, independency and quality of life

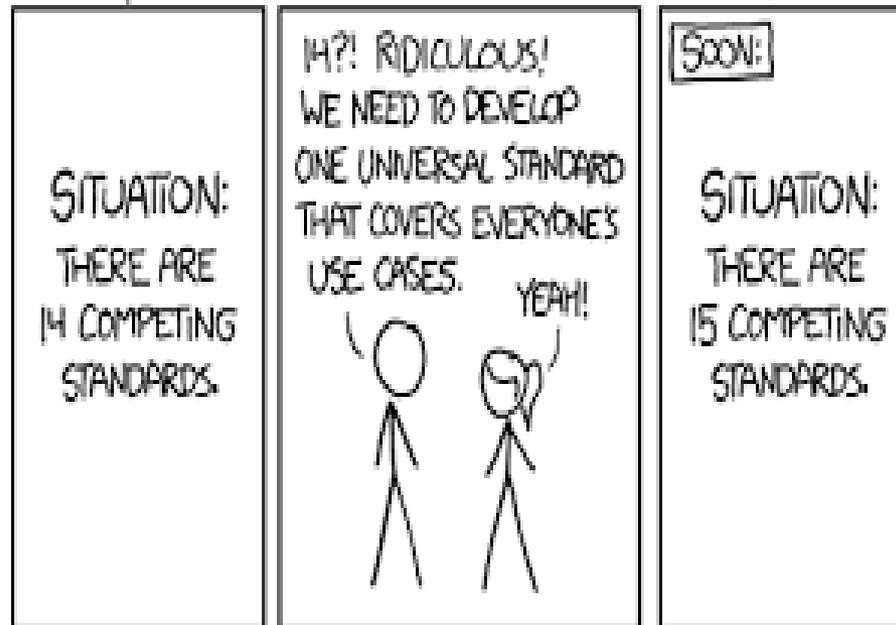


# IoT Framework ...

- Northeast Focus: To create technical manpower and promote IoT technologies to cater to the domestic and international market
- Basic and advanced program
- IoT Labs/CoE



HOW STANDARDS PROLIFERATE:  
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)



Source: <https://xkcd.com/927/>

# Summary

- Electronic Health Record (EHR); People, Policy and Technology need to join hands to address Security/Privacy concerns in Healthcare
- Rural Healthcare still a major concern in India and there is a great need. Mission hospital Vs Government Vs Private players ; Affordability to standards compliance
- Telecom service providers coming-up with managed IoT/healthcare services - Regulatory concerns

# Summary

- Adhoc solutions may perhaps meet the immediate and local requirements. At large, non-compliance will have its own impact and challenge the very vision of IoT
- Need for retrofitting, greenfield/brownfield; slowly hurry-up approach
- OneM2M can possibly be the game changer; the ecosystem will evolve
- IoT task force opens a channel (testbed) for the industry partners to join hands in implementing an open, transparent, standard compliant and India specific solutions

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Thank  
you

