# IETF Participation

## Experiences and Contributions

**Awareness Program on Internet Protocols and Standards**
**College of Engineering, Thiruvananthapuram**

**11th August 2018**

**Centre for Development of Advanced Computing (C-DAC), Thiruvananthapuram**
A Scientific Society of Ministry of Communications and Information Technology
**Government of India**

# Overview

- Introduction
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- IETF Activities - WIPSeN Project
  - Aim & Objectives
  - Participation in IETF Draft proposals
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  - Participation in IETF meetings
  - 6TiSCH Testbed Activities
  - National Workshops
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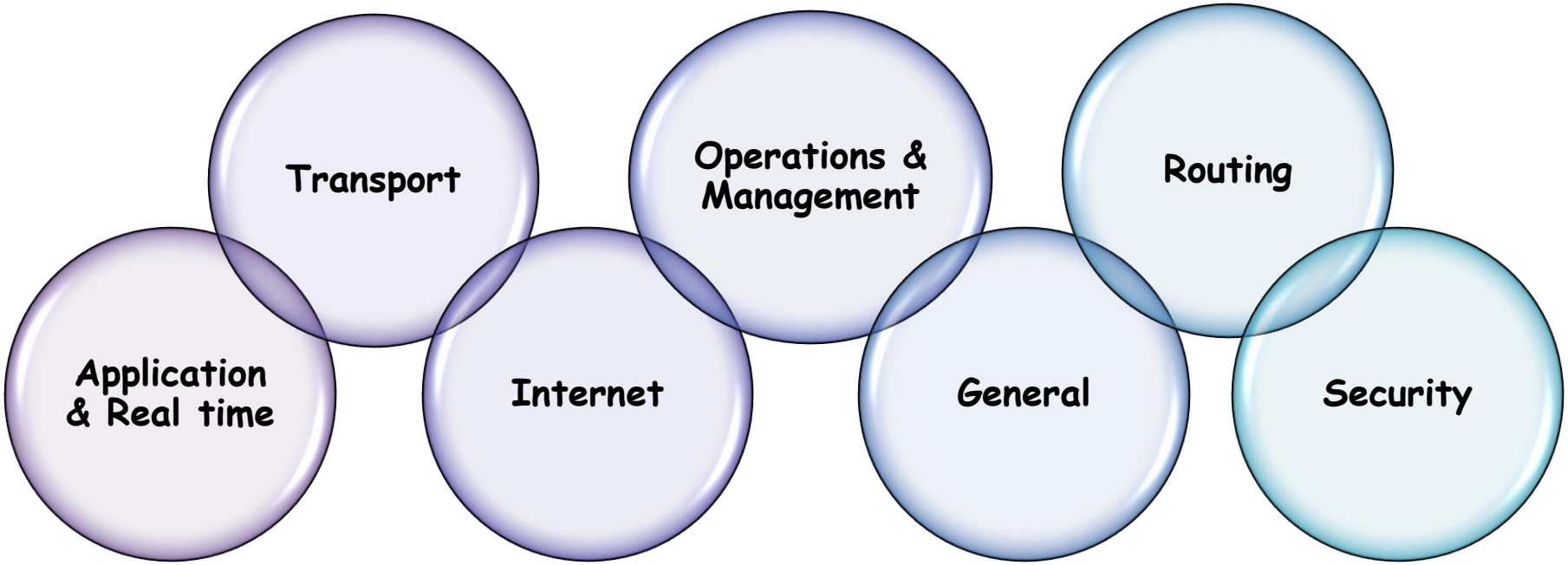
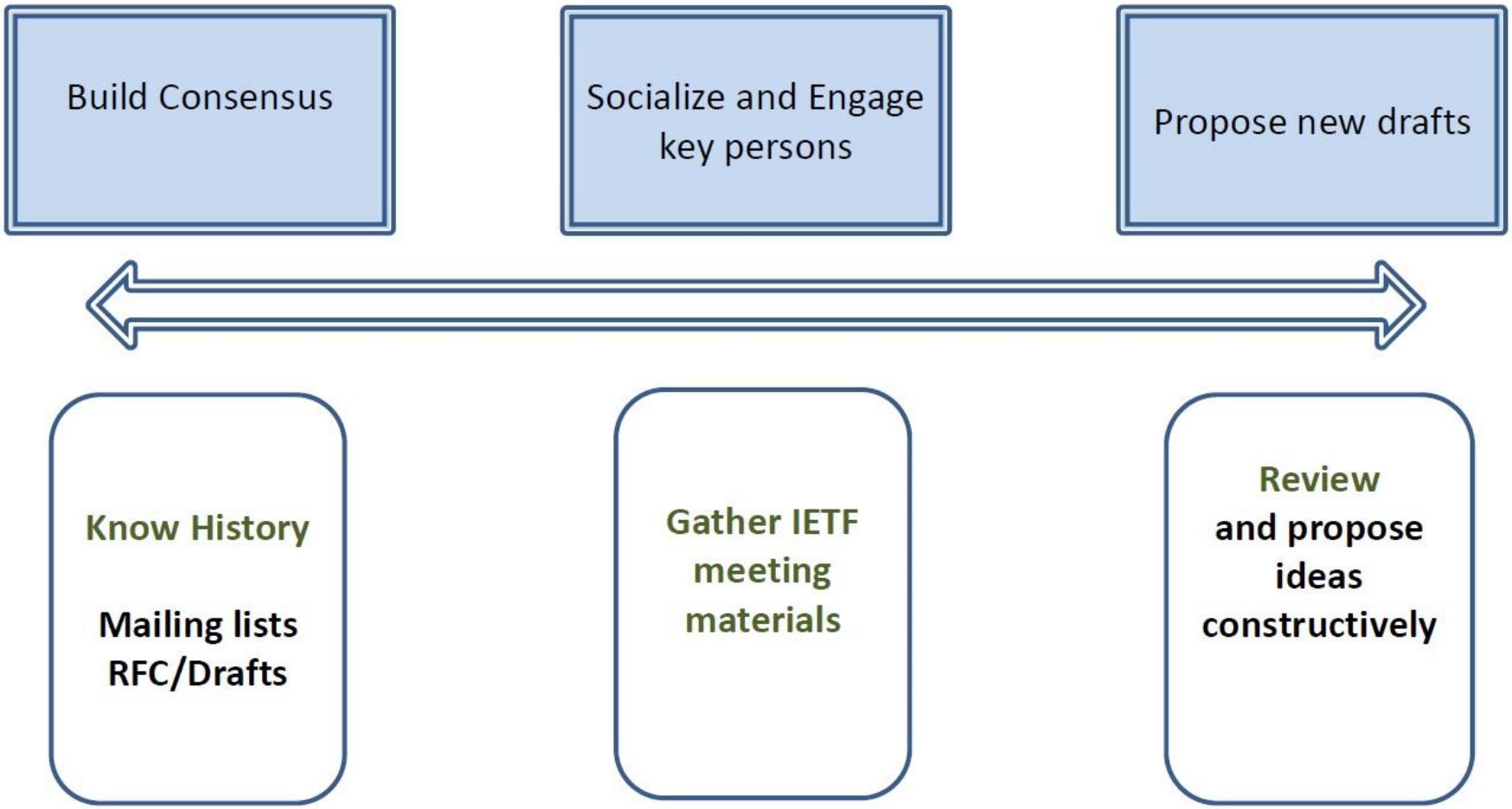
# Introduction

- The Internet Engineering Task Force (IETF) is a global community of network designers, operators, vendors, and researchers that develops Internet protocols
- GOAL : To make the Internet work better
- Technical work of the IETF is carried out in Working Groups (WGs)
  - WGs are the primary mechanism for the development of IETF specifications and guidelines, many of which are intended to be standards or recommendations
  - Work Groups(WGs) will be chartered with one or more deliverables
- Most of the work happens online over WG mailing lists
  - In-person interactions take place during IETF meetings
  - Virtual meetings can happen often

# IETF Working Areas

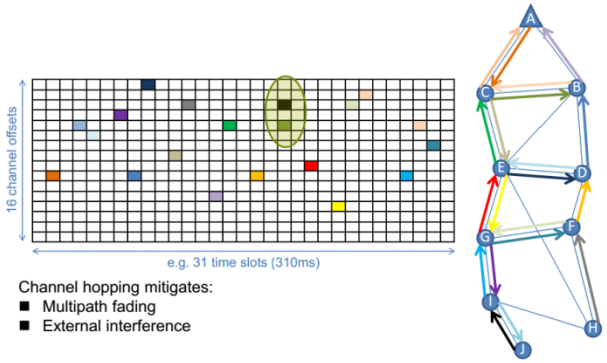


# IETF Culture and Proceedings



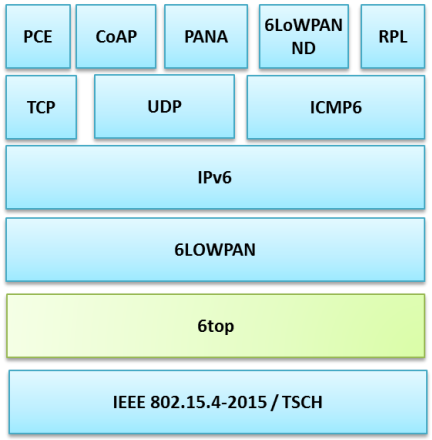
# IETF 6TiSCH WG

- **6TiSCH** WG focuses on enabling **IPv6 over the TSCH** mode of the **IEEE 802.15.4-2015 standard**

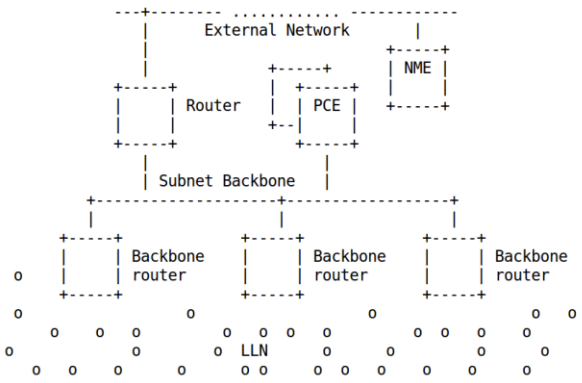



## Current Charter Highlights

- Propose Minimalistic Operation to setup a IPv6 network over 6TiSCH network
- Distributed routing over a static schedule using RPL
- Dynamic allocation of cells between peer nodes
- Joining Securely
- Creating Deterministic Tracks
- 6TiSCH Architecture
- 6top Sublayer
- 6top Scheduling Function




*6TiSCH protocol stack*




*6TiSCH Network*

# WIPSeN Project

**Wireless Internet Protocol enabled Time slotted and Channel hopping Sensor Network**

# WIPSeN

## ❑ Aim

- Active participation in the IETF draft proposals
- Participation in the IETF discussion groups
- 6TiSCH testbed for evaluating the proposed architecture and IETF drafts and provide valuable feedback to IETF community
- Propose new IETF draft proposals
- Conduct National Workshops to create awareness

## ❑ Funding Agency

- Ministry of Electronics and Information Technology, Government of India

# IETF WG's of Interest

| | |
|---|---|
| 6TiSCH | IPv6 over the TSCH mode of IEEE 802.15.4e |
| ROLL | Routing Over Low power and Lossy networks |
| DetNet | Deterministic Networking |
| 6Lo | IPv6 over Networks of Resource-constrained Nodes |

# Active Participation in the IETF draft proposals

## ❑ WG mailing list discussions

Actively participated in the 6tisch, roll, detnet and 6lo WG mailing list discussions where we proposed valuable suggestions and provided feedback to the existing drafts.

- Transmit Power Control proposal in the 6top layer was well received. Invited to write proposal for IEEE 802.15.4

  http://www.ietf.org/mail-archive/web/6tisch/current/msg03969.html

- Participated in more than 8 IETF draft proposals and received positive response from authors and working group members

## ❑ WebEx meetings

Actively participated in bi-weekly WebEx meetings

https://bitbucket.org/6tisch/meetings/wiki/170623_webex

# Participation in IETF Meetings

- **IETF 96**

  Team members attended the **IETF96** meeting held at **Berlin, Germany**

- **IETF 97**
  - All the 3 drafts co-authored by us were presented during this meeting
  - AODV-RPL draft has been adopted by ROLL WG
- **IETF 98**

  A team member attended the **IETF98** meeting held at **Chicago, USA**

- **IETF 99**
  - Version-4 of our packet expiration time draft was presented in 6lo WG
  - Remotely presented the draft and OpenWSN work to 6TiSCH WG
  - New version of AODV-RPL was presented
- **IETF100**

  Our team member got Internet Society (ISOC) fellowship and attended the **IETF100** meeting held at **Singapore**

# New IETF Drafts

## 3 IETF drafts proposed

- **Packet Delivery Deadline time in 6LoWPAN Routing Header**

  Working Group Name: IPv6 over Networks of Resource-constrained Nodes (6lo)

  Area: Internet Area (int)

- **Asymmetric AODV-P2P-RPL in Low-Power and Lossy Networks (LLNs)**

  Working Group Name: Routing Over Low power and Lossy networks (roll)

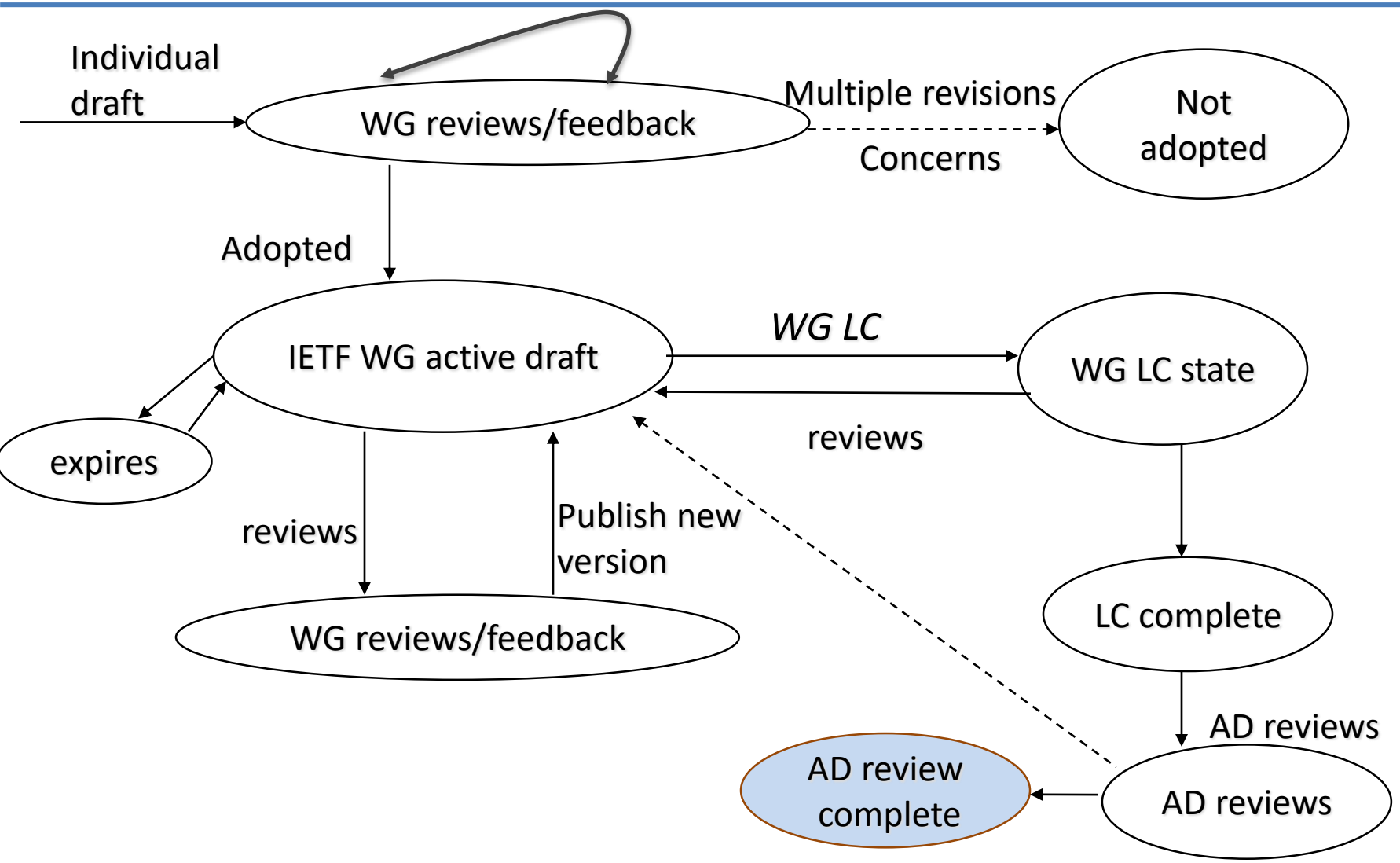
  Area: Routing Area (rtg)

- **Scheduling Function One(SF1) for hop-by-hop Scheduling in 6tisch Networks**

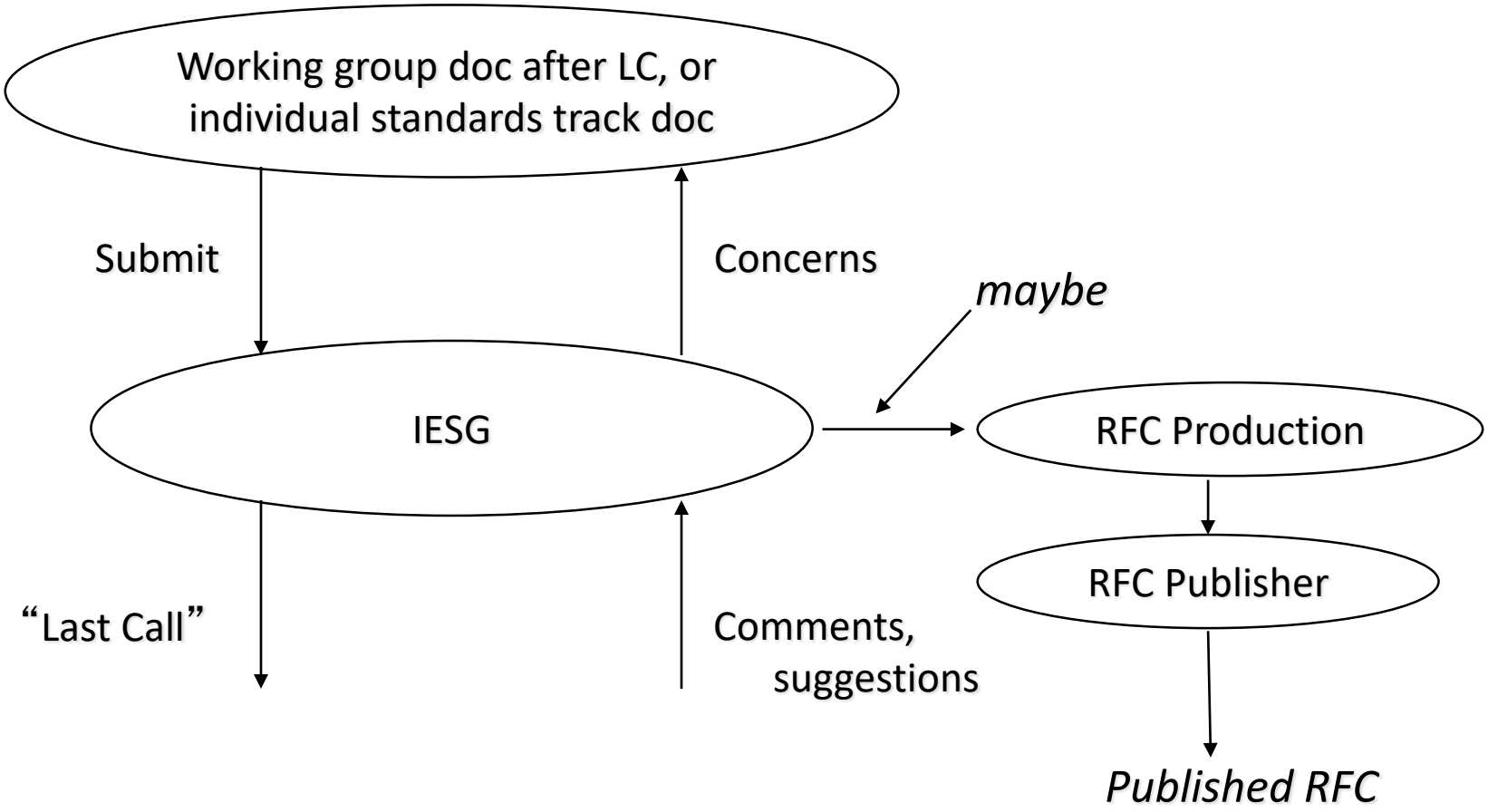
  Working Group Name: IPv6 over the TSCH mode of IEEE 802.15.4e (6tisch)

  Area: Internet Area (int)

# Life Cycle of a draft in WG



# Life Cycle of a draft after LC



# IETF draft 1 - Packet Delivery Deadline time in 6LoWPAN Routing Header

- **Draft proposed in 6Lo Working Group**
- **Link : https://datatracker.ietf.org/doc/draft-ietf-6lo-deadline-time/**
- **Draft revisions were presented in IETF97, IETF98, IETF99 meetings**
- **Implemented the draft in OpenWSN which has been integrated with the OpenWSN main distribution and is available for free download**


6lo
Internet-Draft
Intended status: Standards Track
Expires: September 5, 2018

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March 4, 2018


Packet Delivery Deadline time in 6LoWPAN Routing Header
draft-ietf-6lo-deadline-time-01


Abstract

This document specifies a new type for the 6LoWPAN routing header containing the delivery deadline time for data packets. The deadline time enables forwarding and scheduling decisions for time critical IoT M2M applications that need deterministic delay guarantees over constrained networks and operate within time-synchronized networks.

# IETF draft 2 - Asymmetric AODV-P2P-RPL in Low-Power and Lossy Networks (LLNs)

- **Draft proposed in ROLL Working Group**
- **Link : https://datatracker.ietf.org/doc/draft-ietf-roll-aodv-rpl/**
- **Draft revisions presented in IETF 96,97,98,99 meetings**
- **Implemented the draft in Contiki OS**


ROLL
Internet-Draft
Intended status: Standards Track
Expires: September 6, 2018

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Asymmetric AODV-P2P-RPL in Low-Power and Lossy Networks (LLNs)
draft-ietf-roll-aodv-rpl-03


Abstract

Route discovery for symmetric and asymmetric Point-to-Point (P2P) traffic flows is a desirable feature in Low power and Lossy Networks (LLNs). For that purpose, this document specifies a reactive P2P route discovery mechanism for both hop-by-hop routing and source routing: Ad Hoc On-demand Distance Vector Routing (AODV) based RPL protocol. Paired Instances are used to construct directional paths, in case some of the links between source and target node are asymmetric.

# IETF draft 3 - Scheduling Function One (SF1) for hop-by-hop Scheduling in 6tisch Networks

- **Draft proposed in 6TiSCH Working Group**
- **Link : https://datatracker.ietf.org/doc/draft-satish-6tisch-6top-sf1/**
- **Draft reviewed in IETF 96, 97 meetings**


6tisch
Internet-Draft
Intended status: Standards Track
Expires: April 30, 2018

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October 27, 2017

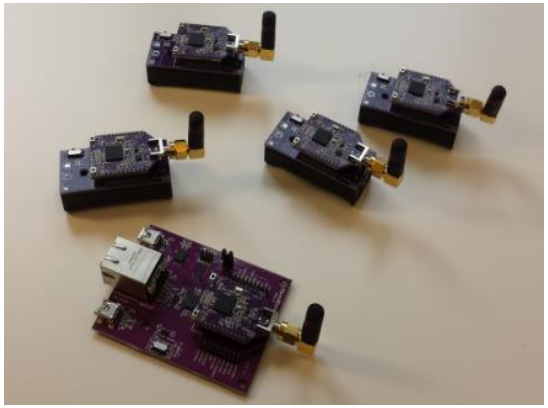

Scheduling Function One (SF1): hop-by-hop Scheduling with RSVP-TE in 6tisch Networks
draft-satish-6tisch-6top-sf1-04

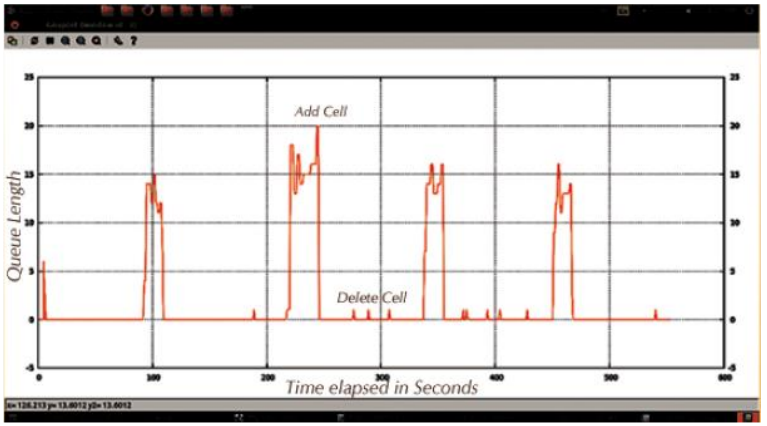

Abstract

This document defines a 6top Scheduling Function called "Scheduling Function One" (SF1) to reserve, label and schedule the end-to-end resources hop-by-hop through the Resource ReserVation Protocol - Traffic Engineering (RSVP-TE). SF1 uses the 6P signaling messages with a global TrackID to add or delete the cells in L2-bundles of

# 6TiSCH Testbed Activities

- **Hardware**
  - OpenMote
  - WiSMote
  - Telosb
- **Software**
  - ContikiOS
  - OpenWSN
- **Simulation Environment**
  - Cooja
  - Python Simulator

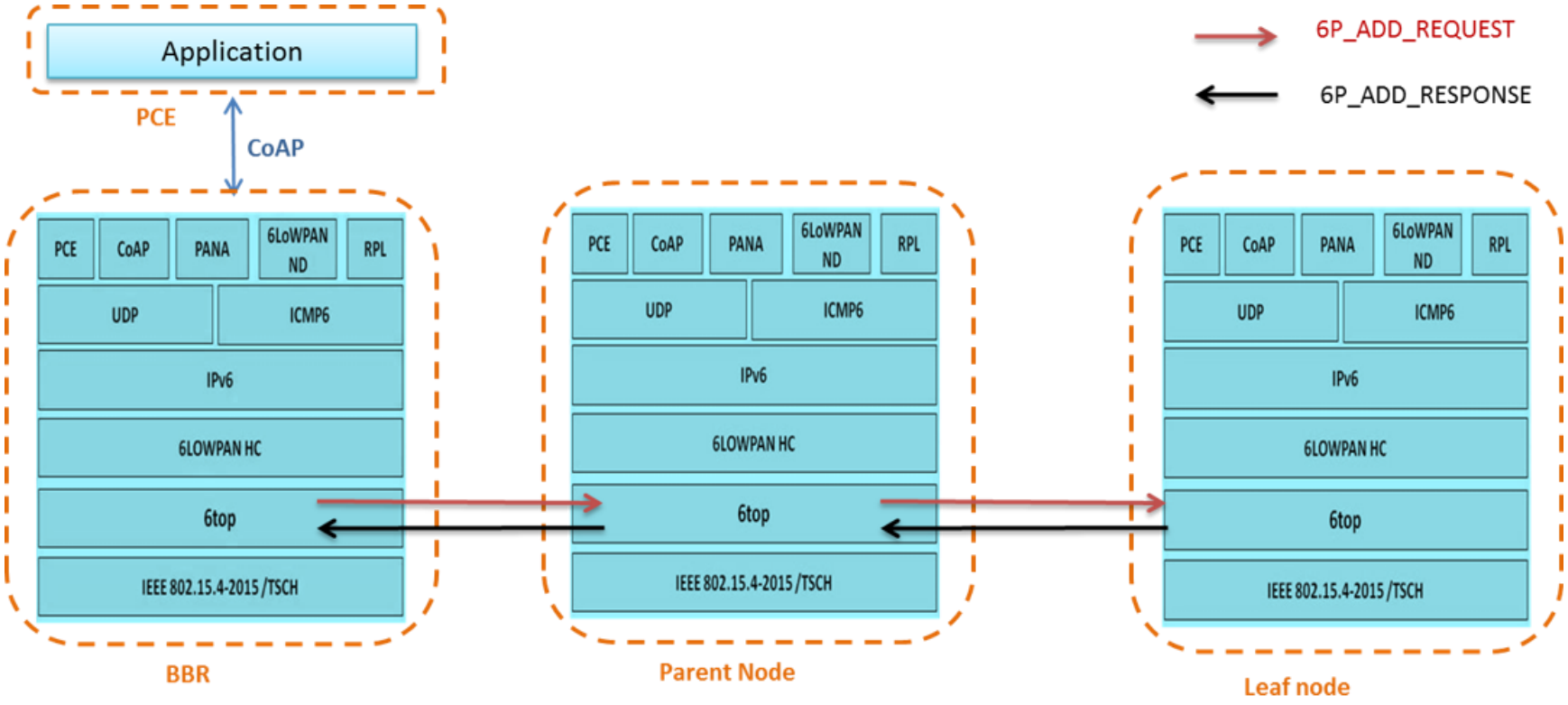




# 6TiSCH Testbed Activities

## ❑ 6top layer implementation on Contiki OS

- Designed and implemented the 6top layer on Contiki OS and validated the same using OpenMote Hardware and Cooja simulator
- Contributed the 6top layer code to Contiki OS



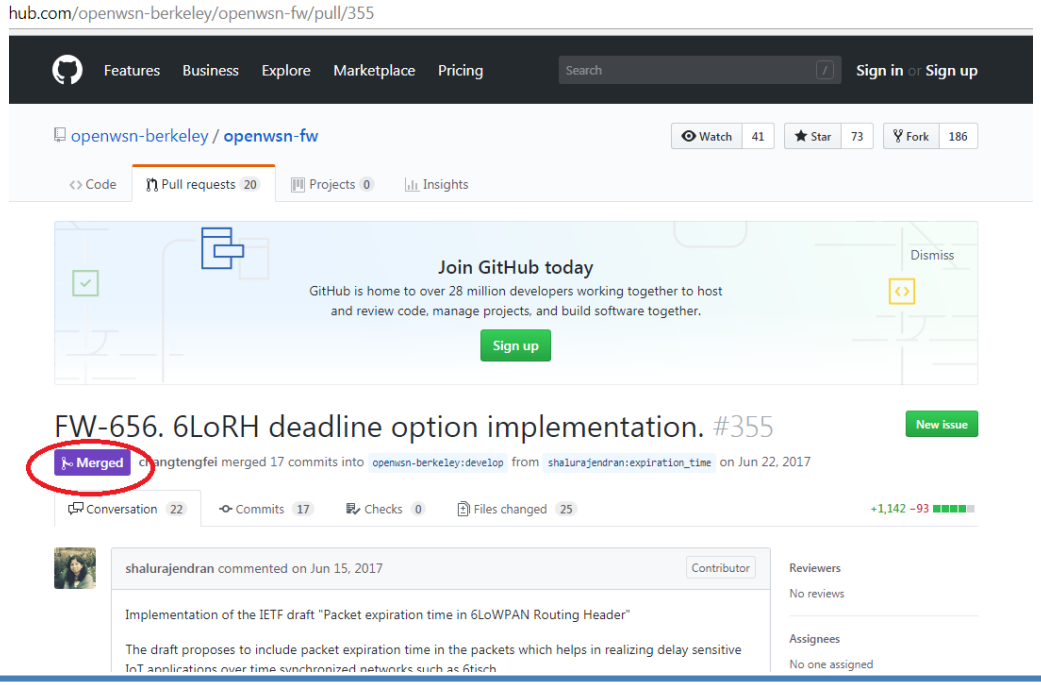
# 6TiSCH Testbed Activities

- **6Lo packet expiration draft implementation on OpenWSN**

  https://github.com/openwsn-berkeley/openwsn-fw/pull/355

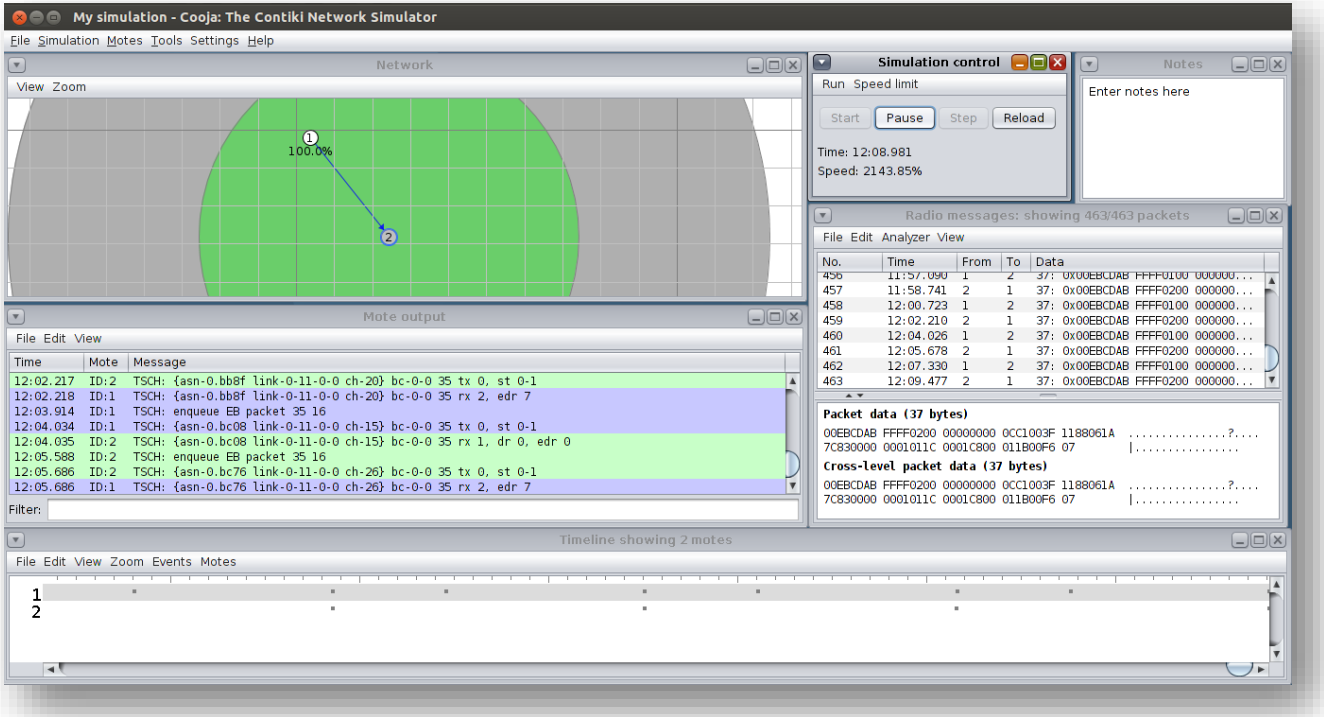
  https://github.com/openwsn-berkeley/openwsn-sw/pull/150

  - Implemented our 6lo draft "draft-lijo-6lo-expiration-time-04" in OpenWSN
  - Contributed to the OpenWSN open source distribution
  - Implemented Earliest Deadline First scheduling algorithm



# 6TiSCH Testbed Activities

- Implementation of AODV-RPL on Contiki OS
- For supporting delay sensitive IoT applications, a basic debt-based scheduling algorithm was designed and implemented on 6TiSCH simulator




*6tisch network simulation on Cooja simulator (Contiki OS)*

*Testbed setup @ CDAC*

# Workshops

- First National workshop on "**IETF Participation and Emerging Industrial Networking Technologies**" was held at IISc, Bangalore on 21st April, 2016.

- Second National Workshop on "**Realising Anything as a Service in IoT : Technologies and Standards**", was held at C-DAC, Thiruvananthapuram on 3rd March, 2017.

# Publications & Awards

- **6TiSCH Operation Sublayer (6top) implementation on Contiki OS**
  - Published a paper in COMSNETS 2017
  - Available at **IEEE Xplore**

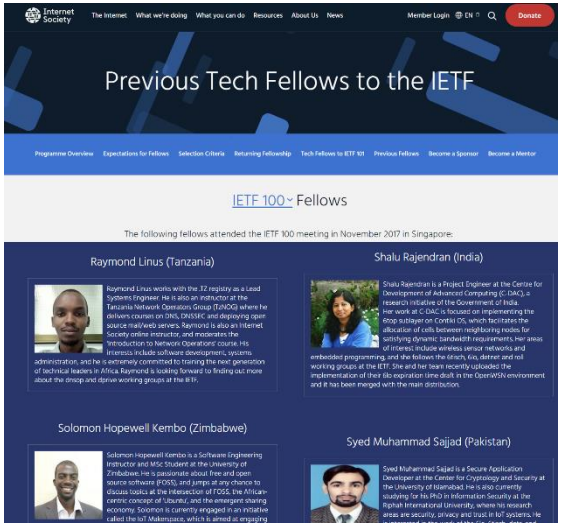
  http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7945424


- **Received 3 IIREF Fellowships funded by MeitY to attend IETF 96, 98 meetings at Germany & USA**

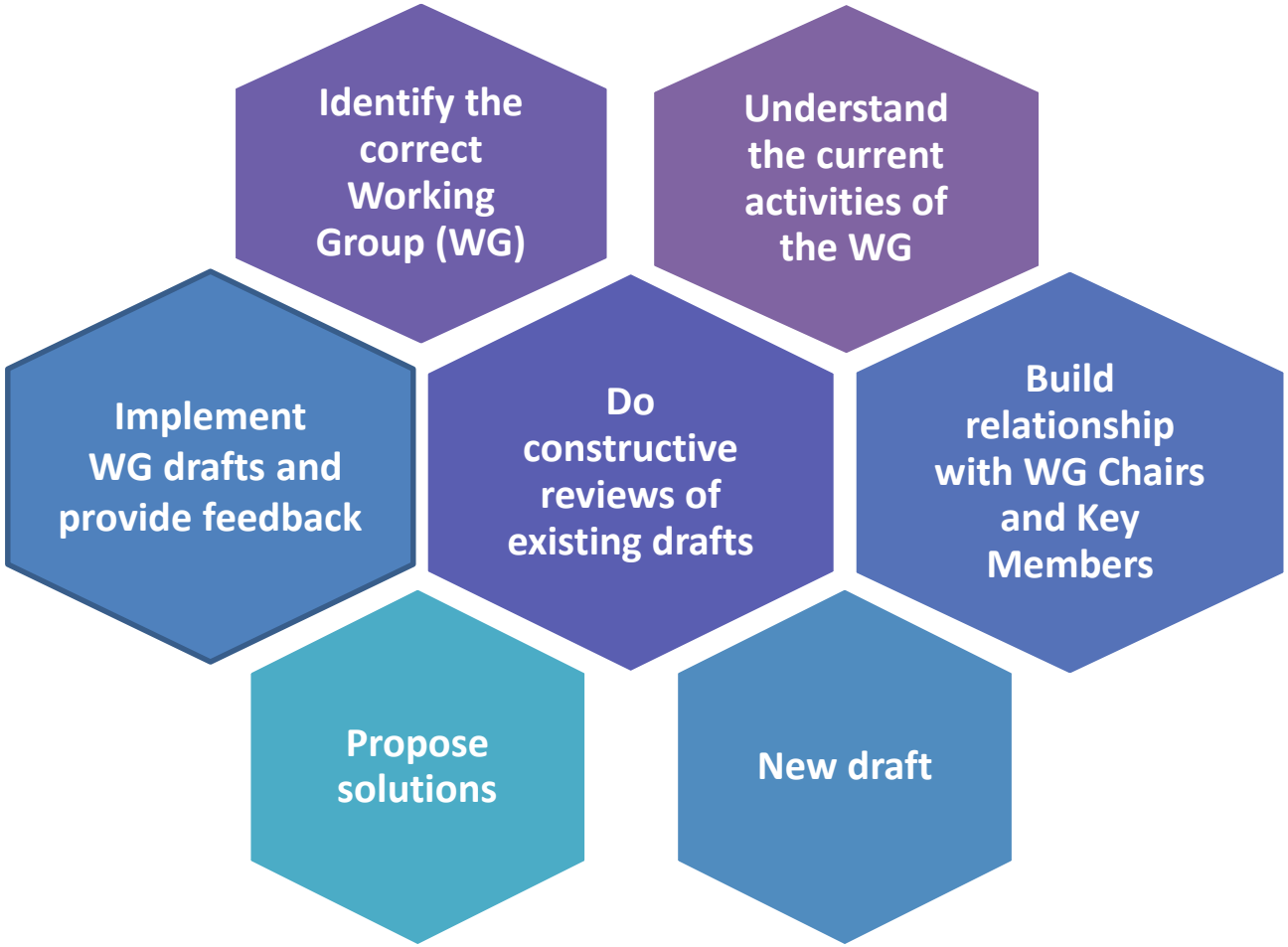
  https://iiref.in/result

- **Received 1 ISOC Fellowship funded by Internet Society to attend IETF 100 meeting at Singapore**

  https://www.internetsociety.org/leadership/fellowship-to-ietf/fellows/100/



# Contribute to IETF ?



# IETF Fellowships

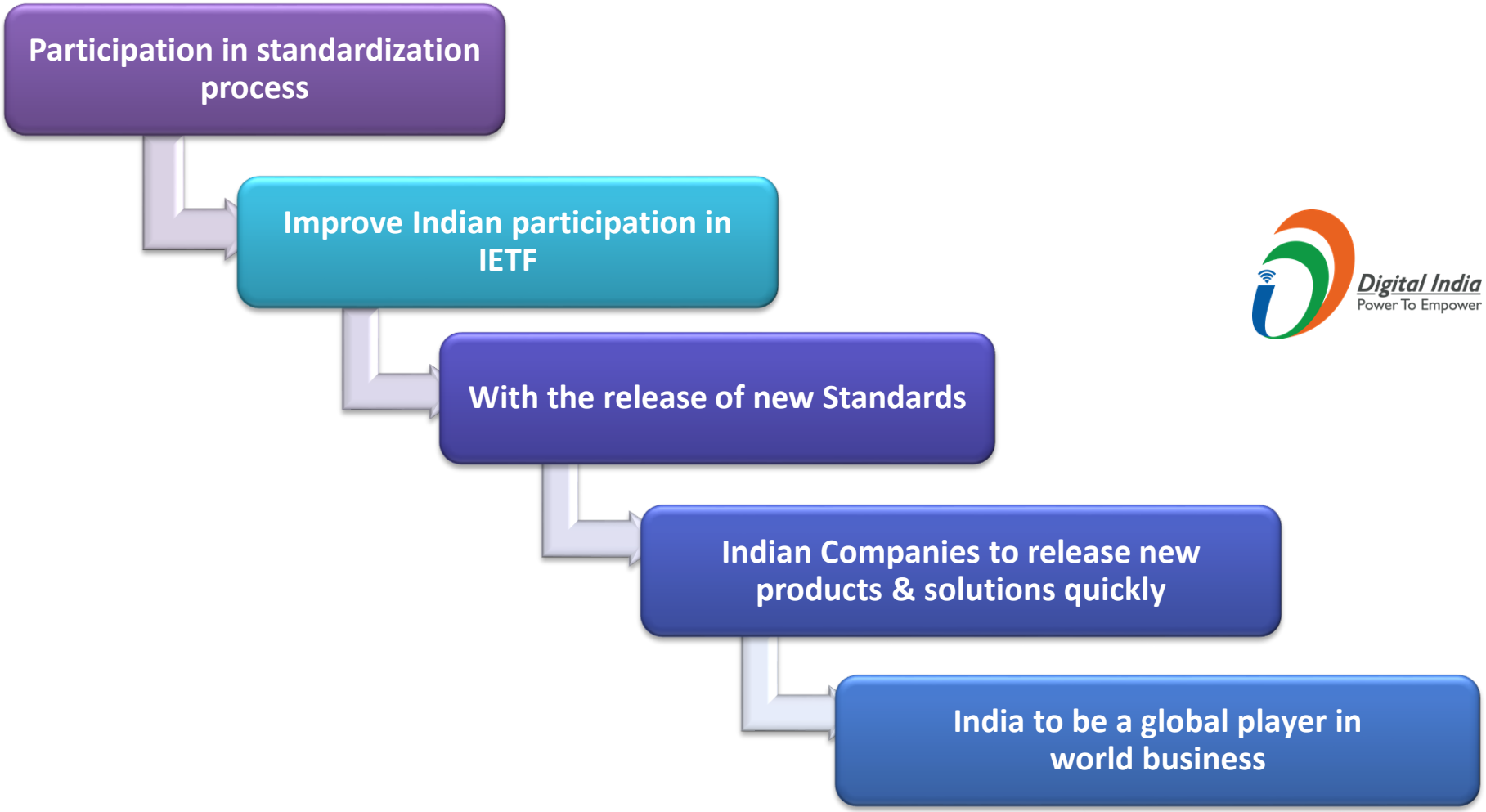
**IIREF**

- Indian Internet Research and Engineering Forum
- https://iiref.in/fellowship

**ISOC**

- Internet Society Fellowship
- https://www.internetsociety.org/

# Conclusion


Participation in standardization process
Improve Indian participation in IETF
With the release of new Standards
Indian Companies to release new products & solutions quickly
India to be a global player in world business

# Thank You

Lijo Thomas
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