Communication Patterns in the IETF

Matthew Russell Barnes, Mladen Karan, Stephen McQuistin, Colin Perkins, Gareth Tyson, Ignacio Castro, Richard Clegg - 10/2023
• Social **graph** of **mailing list** interactions

• **Person IDs** collating similar **email addresses** together

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**Basic Statistics**

- 10,319 nodes
- 557,236 edges
- 21/06/2012 - 17/04/2021

**Active Nodes in Last Year**

![Graph showing the number of active nodes over years](image-url)

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The Web We Weave: Untangling the Social Graph of the IETF, Proc. ICWSM, P. Khare et al. (2022)
Hierarchical Structure

Area Director (AD)

Working Group Chair (WGC)

Regular Participant (RP)

Working Groups

21/06/2012 - 17/04/2021
How does the hierarchy affect the communication patterns of the IETF?

Key Concepts

• Degree
  - Amount of activity of an individual

• Average Neighbour Degree
  - Average amount of activity of an individual’s connections

• Time Window
  - Collation of the activity of individuals between two times
• **Positive** Correlation (*Philanthrope*)
  - Active individuals *help* neighbourhood discussion
  - Inactive individuals *dissuade* discussion

• **Negative** Correlation (*Prima Donna*)
  - Neighbourhoods are *stifled* by active individuals
  - Neighbourhoods *thrive* with inactive individuals
• **Positive** Correlation (*Communitarian*)
  - **Active** neighbourhoods **help** individual discussion
  - **Inactive** neighbourhoods **dissuade** discussion

• **Negative** Correlation (*Individualist*)
  - Individuals are **stifled** by an **active** neighbourhood
  - Individuals **thrive** in an **inactive** neighbourhood
How do people higher in the organisation hierarchy impact their most direct contacts?

- Increased effect on and from neighbours’ degree
- Especially for Community
- Suggests a “facilitator” role for WGCs
Working group chairs - good facilitators?

- They are affected **positively** by neighbours’ activity
- And **neighbours** are affected **positively** by them

**BUT**

- No account is taken of communication direction
- Do **directed communication motifs** show a **difference**?

How do different **hierarchy levels** communicate with the wider organisation?
Temporal Three-Edge Motifs

Outward Star
- Announcements
- Dissemination of Information

Inward Star
- Questions
- Condensing of Information

Mixed Star
- Discussion
- Facilitation of Conversation
Organisation wide hierarchy level communication patterns

- Higher hierarchy levels experience a **larger** proportion of **incoming** and **mixed** email motifs than lower levels
- All levels have a **similar** proportion of **outgoing** email motifs

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For each level:
- **Inward Star**
  - Motif Proportion
  - Regular Participant: Blue
  - Working Group Chair: Orange
  - Area Director: Green

- **Outward Star**
  - Motif Proportion
  - Regular Participant: Blue
  - Working Group Chair: Orange
  - Area Director: Green

- **Mixed Star**
  - Motif Proportion
  - Regular Participant: Blue
  - Working Group Chair: Orange
  - Area Director: Green

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**Legend**
- Regular Participant
- Working Group Chair
- Area Director
Conclusions

- Working group chairs are facilitators of discussion
- In working group discussion, regular participants send out more than they receive in
- And, area directors and working group chairs are condensers of discussion

Any suggestions / questions?
Thank you
RQ1: How does the hierarchy evolve over time?

- More working group chairs - about +35%
RQ1: How does the hierarchy evolve over time?

- Little change in ADs since 2012
RQ1: How does the hierarchy evolve over time?

- WGCs are about 25-35% of the total IETF activity
- ADs are 5% of activity
RQ4: How do people at different levels communicate, does information flow "up" or "down" the hierarchy?

- Grid of communication

<table>
<thead>
<tr>
<th>AD</th>
<th>WGC</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example:

- Sum of all weighted edges from AD->WGC divided by the sum of all weighted edges from WGC->AD
RQ4: How do people at different levels communicate, does information flow "up" or "down" the hierarchy?

- Ratio of communications inbound/outbound between strata

![Graph showing communication ratios between strata AD, WGC, and RP over years 2014 to 2021]

Legend:
- AD
- WGC
- RP

Graph labels:
- Upwards
- Downwards

Percent of outdegree for lower strata

Year:
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
- 2021
RQ2: How does organisation hierarchy impact communication patterns?

- Indegree vs outdegree
- Number of emails per month

TODO
- For WGC vs Not
- Before and after becoming WGC