



THE INTERNET IS FOR EVERYONE

Join us to keep the Internet open, thriving,
and benefitting people around the globe.

IXP Workshop & Technical Training

Islamabad, Pakistan

18-22 April 2016



What is the Internet Society?

The Internet Society (ISOC) is a cause-based organization that works with governments, industries, and others to ensure the technologies and policies that helped develop and evolve the Internet will continue into the future.

Our programs cultivate an Internet that is open to everyone, everywhere and aim to ensure that it will continue to be a tool for creativity, innovation, and economic growth.

MISSION: To promote the open development, evolution, and use of the Internet for the benefit of all people throughout the world.

VISION: The Internet is for everyone

Global Presence



NORTH AMERICA

EUROPE

AFRICA

THE MIDDLE EAST

ASIA

LATIN AMERICA &
CARIBBEAN

118+

Chapters
Worldwide

80,000+

Members and
Supporters

143+

Organization
Members


5 (6)

Regional
Bureaus

21/38

Countries where
ISOC Staff Work
& Languages

ISOC | Who and What



Home | Connect Login | Become a Member | Find a Chapter | Blog | News | العربية | 简体中文 | English | Français | Русский | Español

Who We Are | What We Do | Events | Publications | The Internet | Get Involved | Donate

Why It Matters

Is enough to have Internet access, or must we also ensure that the access is open and unrestricted?

Join us at RightsCon

Deployment of W4C in Nepal in earthquake affected area of Gorkha District (Location of epicentre).

10 Villages connected, including 2 health centres and multiple schools.



Above: Rainesh Singh and Babu Ram Aryal
Below: ISOC sponsored Wi-Fi Area





I E T F®

Search



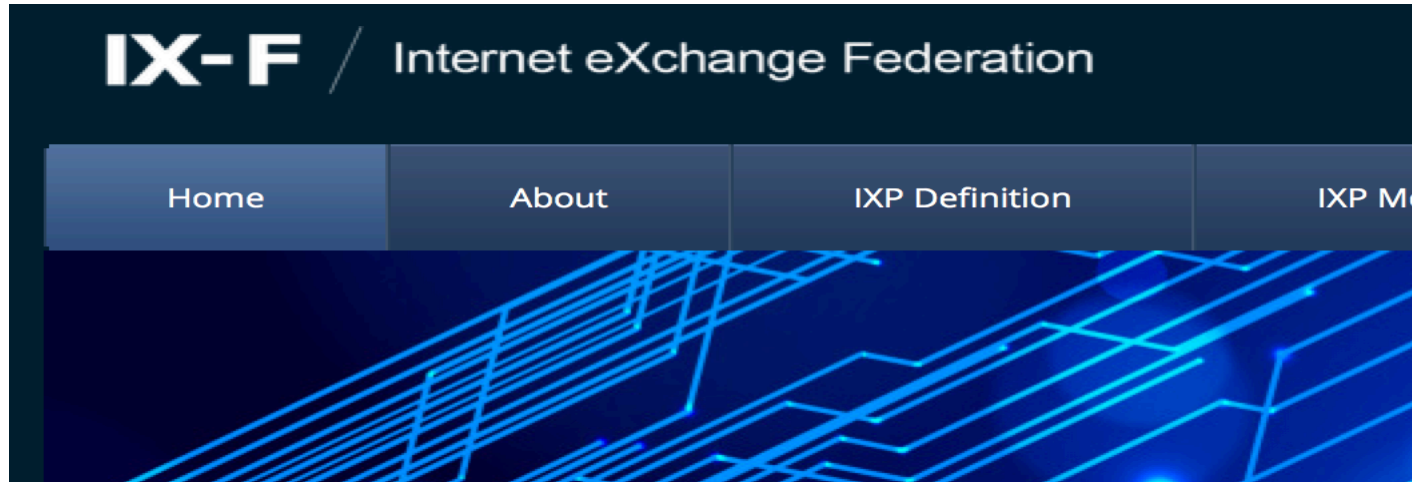
Chat Live with the IETF Community

Kenya IXP Project II



International IXP Development | Associations & Forums

An Internet Exchange Point (IXP) is a network facility that enables the interconnection of more than two independent Autonomous Systems, primarily for the purpose of facilitating the exchange of Internet traffic



❖ **IX-Federation | <http://www.ix-f.net/>**

IXP Best Practices and Best Current Operational Practices

<https://www.euro-ix.net/ixps/set-up-ixp/ixp-bcops/>

IGF IXP Best Practices | <http://ow.ly/YYTFZ>

IXP Tech Infrastructure & Impact

- ❖ IXPs need not be expensive to be effective.
- ❖ LINX, now one of the largest IXPs in the world, started with 5 members and a donated switch.
- ❖ Bottom-up Community Development
- ❖ Technical Capacity Building
- ❖ Local traffic cheaper, latency decreases, quality better



<https://www.youtube.com/watch?v=QuBde4Sn3f0>



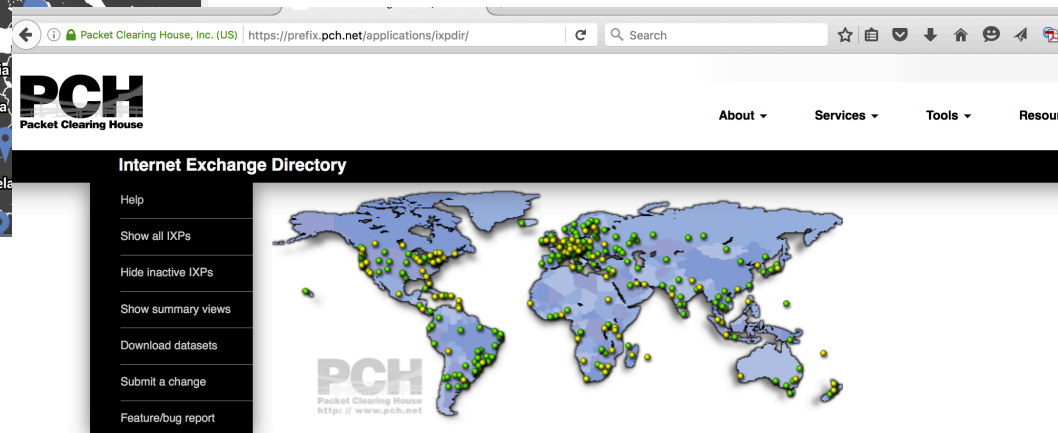
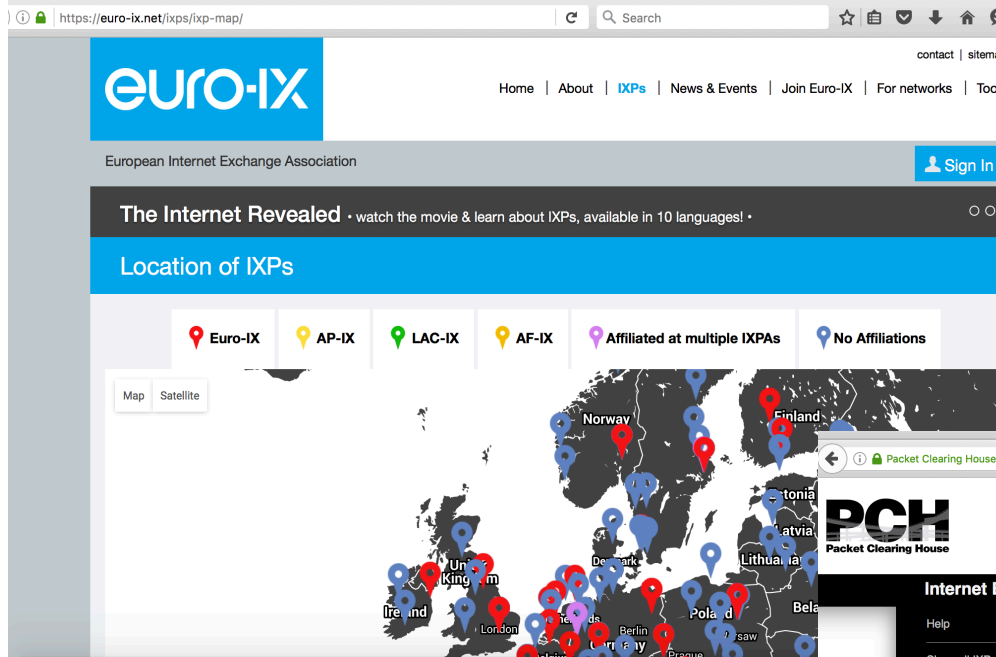
<https://www.youtube.com/watch?v=5oliP-p4zJM>

IXPs Global Landscape



IXPs | Global

Internet Exchange Point (IXP) Maps



Region	Country	City	Internet Exchange Name	Participants	Traffic	Prefixed	Established	URL
Asia-Pacific	Afghanistan	Kabul	National Internet Exchange of Afghanistan				May 2011	
Europe	Albania	Tirana	Albania IX	8			2011	
Africa	Algeria	Algiers	Algeria Internet Exchange				2013	
Angola (2)	Luanda		ANGONIX	16	2.6G	294	9 Mar 2015	
			Angola Internet Exchange	10	600M		17 Mar 2006	
			Ponto de Intercambio Internet Angola					

IXPs | Global

https://euro-ix.net/ixps/list-ixps/ Search

euro-IX

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Home | About | **IXPs** | News & Events | Join Euro-IX | For networks | Tools

European Internet Exchange Association

Sign In

The Internet Revealed • watch the movie & learn about IXPs, available in 10 languages!

List of IXPs

525 IXPs Worldwide

120 Countries
350 Cities

218 IXPs in Europe

49 Countries
154 Cities

Filter Name, City or Country

M Member **S** Sub-Member **A** Associate **R** Remote

All [Euro-IX](#) [APIX](#) [AF-IX](#) [LAC-IX](#) [North America](#)

NAME	CITY	COUNTRY	COUNTRY CODE	AFFILIATION
AMPATH - Florida International University/CIARA	▼ Miami	United States of America	US	
Academia Sinica Internet Exchange 6	▼ Taipei	Taiwan	TW	

IXPs | IXP Associations & Peering DB

Af-ix.net

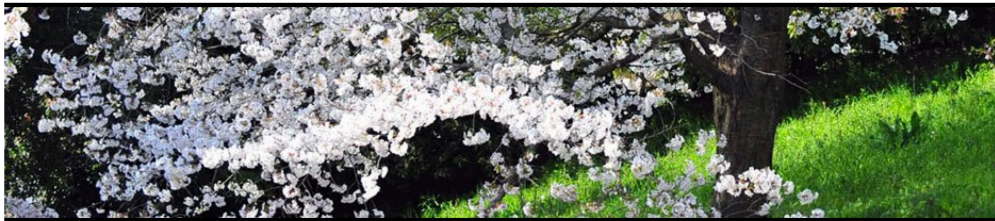
Ap-ix.net

Euro-ix.net

Lax-ix.org

Asia Pacific Internet Exchange Association (APIX)

Association of Internet Exchange Points
in Asia Pacific Region



Home APIX Members Meetings Contact

Steering Committee members 2016

Posted on February 26, 2016 by toyama

In our General Meeting on Sunday 21 February 2016, we had election for two Steering Committee members.

After this election, the current APIX Steering

Search

Archives

- February 2016
- February 2012

Meta

https://www.peeringdb.com



PeeringDB

Search here for a network, IX, or facility.

Register or

Login

Advanced Search

PeeringDB facilitates the exchange of information related to Peering.

Specifically, we are a database of networks that are peering, where they are peering, and if they are likely to peer with you. If you don't know what peering is, and/or you don't currently engage in peering, this probably won't have any meaning for you.

You are currently viewing a read-only view of the data contained here. If you are a peering network who would like to create an account, [you may register for one here](#). Please register ONLY if you are a peering network.

Still have questions? [Read our FAQ](#)

MOST RECENT NETWORK UPDATES

[Air Advantage LLC](#) (27216)

1 hours ago

[CoreSite-Any2Easy \(Route Server\)](#) (19996)

3 hours ago

[CoreSite IP](#) (2734)

3 hours ago

[DuPont Fabros Technology](#) (11011)

3 hours ago

[Z.U.H. ELEKTRON s.c.](#) (50333)

6 hours ago

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Resources

[Documentation](#)
[API Documentation](#)

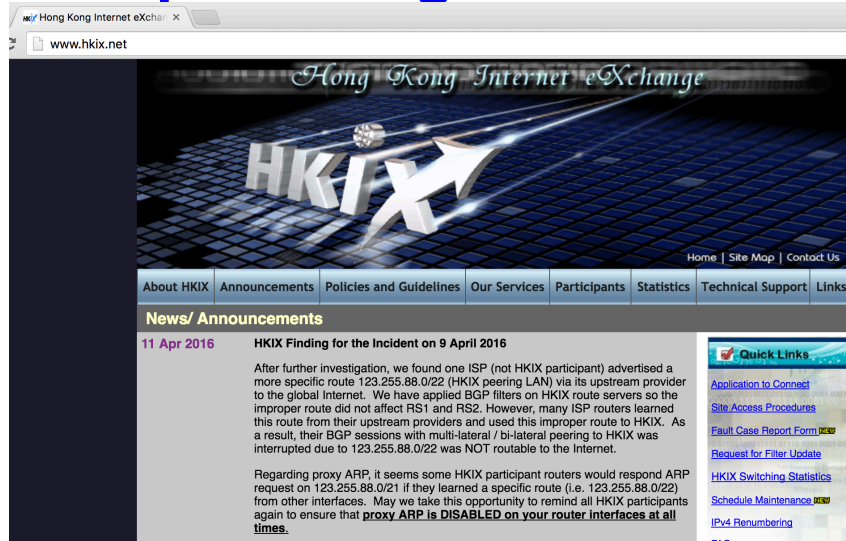
Contact Us

support@peeringdb.com

Global System Statistics

6113 Peering Networks
631 Public Exchange Points
16187 Unique Public Exchange Presences
2040 Private Facilities
15025 Private Facility Presences

IXP Development | Peering Events & Network Operator Group Meetings



Internet Ecosystem – Impact | IXPs

- **Internet Community Multiplier Effect**
- **Internet & Fibre Infrastructure Development**
- **Local technical community development & strengthening**
- **Train the trainer**
- **Network Operator Group (NOG) Development**
- **Mentoring Opportunities**
- **Economic Development & Investment | Additional Sustainable Infrastructure Projects**
- **Bottom-up Governance & Amplifier Across Local Ecosystem**

IXPs Best Practices & Regional



Challenges - IXPs

Collaboration and building trust. The establishment of an IXP requires the collaboration of many actors, many of whom are competitors that will be exchanging traffic at the IXP. **Neutral location and management.**

Best practices have shown that IXP location and management should be as neutral as possible and agreed upon by all IXP participants. Ideally, the location of an IXP and an IXP manager/operator should be independent of outside commercial or governmental influences. Unfortunately, some incumbents and/or governments want to control all aspects of an IXP. When this happens, the IXP often fails, as confidence and trust in its management and operations is lost.

Enabling environment. IXPs are sensitive to local constraints associated with the lack of an enabling Internet-connectivity environment, including investment and tax constraints, the high cost of local terrestrial fibre, and complicated rules for network deployment.

Best Practices - IXPs

Guiding Principles

Government actors can play an active and critical role in championing the development of IXPs and removing roadblocks to their growth and success. Guiding principles for policy makers and regulators include:

- **Support IXPs** and speed their development with information and communications technology (ICT) policy objectives that promote an enabling environment for interconnection via policy and regulatory frameworks.
- **Provide as much policy and regulatory transparency** as possible to encourage regional and international entities to participate in the local interconnection and peering environment.
- **Encourage competitive access to wired and wireless connections**, which will help lower the costs associated with connecting to an IXP.

Best Practices - IXPs

Guiding Principles

- **Promote local investment opportunities** via tax holidays, and reduced duties on the equipment needed to build IXPs and operator networks (e.g., switches, routers, and servers). Provide clear guidance about local business rules and practices.
- **Foster relationships with IXPs to learn more** about local interconnection environments and the sustainability and technical management of an IXP.
- **Work with existing IXPs and expert organizations to avoid the mistakes** that other IXPs have made, obtain start-up assistance and equipment donations, and learn more about training and human-capacity development opportunities.
- **Refer to the Internet Society online Interconnection information for a general set of guiding principles** that enhance overall network interconnectivity (<http://www.internetsociety.org>) and our report on *Lifting barriers to Internet development in Africa: suggestions for improving connectivity*:
<http://www.internetsociety.org/doc/lifting-barriers-internet-development-africa-suggestions-improving-connectivity/>

Best Practices - IXPs

Below are best practices from some of the practical work we have done with partners around the world:

- **Local Champion(s):** A champion is needed to help develop the IXP and build a community.
- **Neutrality:** As noted above, a neutral location and management of the IXP is critical to sustainability. All organizations at the IXP should agree on location and IXP management.
- **Simple Management Structure:** Many very large IXPs have been established on a basis of a simple management structure, a governing board made up largely of customers, and a volunteer staff, with customer fees set to just cover costs ('not-for-profit').
- **Equal Partners:** All peers at an IXP should be treated equally. Founding partners should not vote in or out members or have a weighted vote.
- **Establish Operating Principles:** Establish operating principles and publish them.
- **Website:** It is critical to have a web-site that includes, at a minimum, basic location and contact information, peering policies, traffic statistics, peers at the IXP.

Best Practices - IXPs

Below are best practices from some of the practical work we have done with partners around the world:

Redundant Power Supply: Always have a redundant power supply and test switching over to it frequently.

Fibre to the IXP: Allow operators to bring their fibre to the IXP

Redundant POP: Establish a redundant Point of Presence (POP).

Numbering Resources: Work with your regional Internet registry (RIR) to obtain IP addresses for peering and IXP management, and obtain an ASN from the RIR.

Host Value-added Services: Host value-added services to increase the value of the IXP for peers (i.e., time servers, root server instances, CDN caches).

Staffing: Some IXPs function with volunteers. Others have part-time or permanent staff. Take a look at models that may work for you, recognizing your staffing may shift as the IXP grows.

Diverse players: Allow diversity at your IXP -- banks, regional and international operators, content delivery networks, research and education networks, cloud-service providers (gaming, social media), and government networks.

IXPs : Cost, Legal & Dispute Resolution



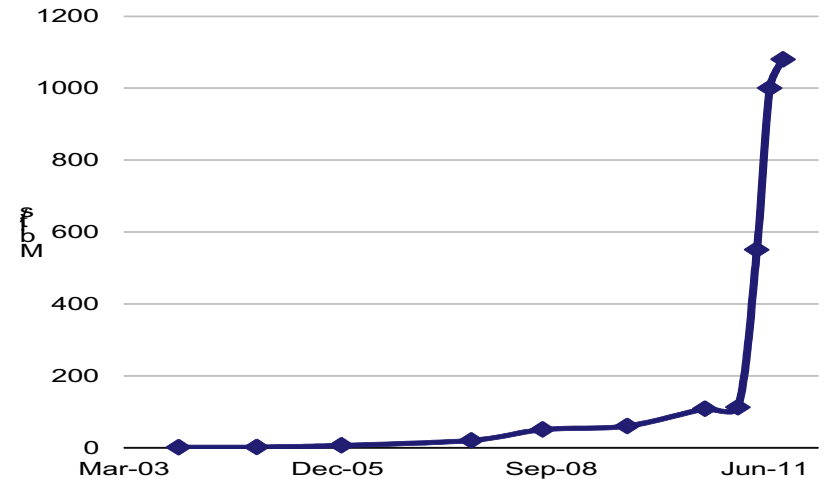
Measuring the Benefits and Impacts of IXPs: Kenya and Nigeria Case Study

<i>Benefit</i>	<i>KIXP</i>	<i>IXPN</i>	<i>Summary</i>
Latency	Reduced from 200-600 ms to 2-10 ms	Reduced from 200-400 ms to 2-10 ms	Noticeable increase in performance for end users
Local traffic exchange	1 Gbit/s peak	300 Mbit/s peak	Savings on international transit of over \$1 million per year in each country
Content	Google network present locally, along with rehomeing of domestic content	Same as in Kenya	Increase in usage and corresponding revenues for mobile data traffic
E-government	Kenya Revenue Authority gathers taxes online	Usage by education and research networks	Social benefits from e-government access to IXPs
Other benefits	An increasing amount of regional traffic exchanged at KIXP	Financial platforms hosted locally	Further economic benefits resulting from IXPs

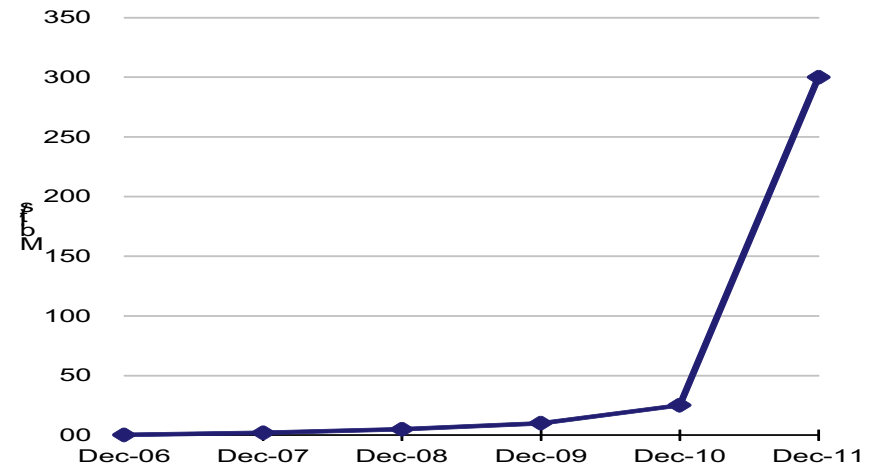
- Reduced latency increasing performance and driving demand -- Especially for data-heavy applications, including video
- Direct savings on international transit (\$1.5M p.a. Kenya, \$1M Nigeria)
- Benefits facilitating e-government and education services -- e.g. Kenya Revenue Authority, West African Examination Council
- Catalyzing local hosting and content industry -- Repatriation of financial platforms in Nigeria, Data center investment in Kenya
- Increased mobile data market by an estimated \$6 million in Kenya; KIXP is attracting regional traffic

CDN Caches: Localizing International Content

- In addition to creating local hosting, local caching of Content Delivery Network content is a key opportunity.
- Implementation of Google/Akamai and other Caches and pops has had an impact on local traffic growth
- Localized CDN traffic represents more than 50% of traffic exchanged at KIXP and IXPN
- CDNs report that the existence of a robust IXP is a key decision factor in decision making on cache/pop locations



KIXP



IXPN

Cost, Legal & Dispute Resolution

- **Start-up Costs: Covered by Philip**
- **Donated equipment, racks, space**

Legal

- **Clear with PTA and Other Agencies: local, international**

Dispute Resolution

- **Take care not to impose heavy pre-regulation on IXP**
- **Potential “foundational document”**

Thank you for your attention!

Jane Coffin
coffin@isoc.org

Philip Smith, NSRC
philip@nsrc.org

Naveed Haq
Haq@isoc.org

The Internet Society | www.internetsociety.org

Annex: Additional Background

IXP Workshop April 5-6, Tunis, Tunisia

The Internet Society | www.internetsociety.org

Resources | Studies & Surveys

- **ASEAN: Unleashing the Internet in SouthEast Asia**
<http://www.internetsociety.org/doc/unleashing-potential-internet-asean-economies>
- **Asia Pacific: Mobile Internet Survey** | <http://www.internetsociety.org/doc/mobile-internet-usage-trends-asia-pacific>
- **LAC IXP Study** | “Connectivity In Latin America and the Caribbean: The Role of Internet Exchange Points” <http://ow.ly/Jiw8s>
- **Bolivia IXP Study** | “Do Internet Exchange Points Really Matter? Evidence from Bolivia” <http://ow.ly/Jiw5X>
- **IXP Toolkit** | <http://www.internetsociety.org/ixptoolkitguide>
- **Africa IXP Study** | “Assessment of the Impact of Internet Exchange Points (IXPs) – Empirical Study of Kenya and Nigeria” <http://www.internetsociety.org/ixpimpact>
- **Lifting Barriers to Internet Development in Africa** | Suggestions for Improving Connectivity <http://ow.ly/Jiwhx>
- **Rwanda Content Study** | “Promoting Local Content Hosting to Develop the Internet Ecosystem” <http://ow.ly/JiwAE>

Resources | Videos

- IXP: Africa | AfPIF - Peering & IXPs: It Starts with a Handshake - <https://www.youtube.com/watch?v=5oliP-p4zJM>
- IXP Toolkit | Videos from Africa & Canada – IXP Development - <http://ixptoolkit.org/content/ixp-videos-0>
- W4C: Mexico | Guerrero – Building the Internet in Guerrero - <https://www.youtube.com/watch?v=RNOjPQoxSCQ>
- W4C: India | Digital Empowerment Foundation – Building the Internet through Community Wireless Networks – Ocean in a Drop - <https://vimeo.com/147451465>

