THE INTERNET WEATHER IN ASEAN COUNTRIES

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• Internet and our Life
• PingER project
• Internet performance in ASEAN countries
  – Throughput
  – Losses
  – Delay (Round Trip Time)
• How does the Internet assist development?
• What is next?
Internet and our Life

What Happens in an Internet Minute?

1,572,877 GB of global IP data transferred¹

- 10 Million ads displayed²
- 347,222 Tweets³
- 3.3 Million pieces of content shared⁴
- 6.9 Million messages sent⁵

Netflix + Youtube = more than ½ of all traffic⁶

And Future Growth is Staggering

By 2017, mobile traffic will have grown 13X in just 5 years¹

In 2017, there will be 3X more connected devices than people on Earth¹

All digital data created reached 4 zettabytes in 2013¹⁸

Source: Cisco VNI 2015
Internet and our Life
Internet and our Life

The Association of Southeast Asian Nations (ASEAN)
PingER Project

Monitor Host

Repositories

Once a Day

ping remote-host

10 ping request packets each 30 mins

Ping response packets

Internet

Remote Host (typically web server)

Measure Round Trip Time & Loss
PingER Project

- Monitors ~60 in 23 countries
- Beacons monitored by most monitors (~100)
- Remote sites monitored by some monitors (~750)
ASEAN Countries
- Singapore
- Thailand, Malaysia and The Philippines
- Lowest performance: Laos & Myanmar

Derived throughput $\sim 8 \times 1460 \div (\text{RTT} \times \sqrt{\text{loss}})$

Mathis et. al

Source: The PingER project
ASEAN Countries
- Lowest: Singapore, The Philippines
- Highest: Thailand, Laos, and Myanmar

Minimum RTT seen from SLAC to ASEAN countries

Source: The PingER project
Low losses are good.
Losses are mainly at the edge, so distance independent
Losses are improving (decreasing exponentially)

- Best <0.1%: Singapore
- 0.1%-<1%: Malaysia, Thailand
- Worst> 1%: Laos

Source: The PingER project
Internet Performance

Top 4
Europe, N. America, East Asia & Australasia

Behind Europe
5-6 yrs: Russia, L America, M East

9 yrs: SE Asia

12-14 yrs: India, C. Asia

18 yrs: Africa

Source: The PingER project
Internet Performance

Top 4
Europe, N. America, East Asia & Australasia

Behind Europe

5-9 Yrs: Russia, Latin America, Middle East, Southeast Asia

12-14 Yrs: So+Central Asia

16 Years: Africa

In 10 years: Russia and Latin America may catch up with top 4.
Africa was falling farther behind; new cables made a difference since 2010; now slowing down once again, catchup in 2013 was 2030, now 2040.
S.E. Asia are catching up slowly
Mean Opinion Score (MOS)

- ITU metric, based on quality of a conversation
  - Originally people listen and give quality 1-5

- $\geq 4$ is good,
- 3-4 is fair,
- 2-3 is poor.

Important for VoIP
How does the Internet assist development?

- Investment in information technology plays the role of a "facilitator"
- World Bank / IFC report: for every 10% increase in high-speed Internet connections there is an increase in economic growth of 1.3 percentage points.
- A study reported by Akamai showed that 80 new jobs are created for every 1,000 new broadband connections
The Internet assists development in several ways:

- **ITU GDP:**
  - Well-being, living standards, and the growth of the economy.
  - Distinguishes whether a country is developed, developing, or underdeveloped.
  - Indicates the impact of economic policies on the quality of life.

A clear correlation between the GDP per capita and the throughput is evident from the graph. The equation $y = 0.0176x + 571.99$ with $R^2 = 0.5681$ shows a statistically significant relationship.

![Graph showing normalized throughput versus GDP per capita for various countries, including Brunei, Indonesia, Myanmar, Laos, Malaysia, Philippines, Singapore, Thailand, and Vietnam.](image-url)
How does the Internet assist development?

**UNDP HDI:**

- **A long and healthy life,** as measured by life expectancy at birth
- **Knowledge** as measured by the adult literacy rate (with 2/3 weight) and the combined primary, secondary and tertiary growth enrollment ratio (with 1/3 weight)
- **A decent standard of living**, as measured by GDP per capita

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**A Clear Correlation Between the UNDP HDI and the Throughput**

\[ y = 2411.4x - 898.5 \]

\[ R^2 = 0.5191 \]
How does the Internet assist development?

ITU IDI:

- IDI = ICT readiness + usage + skills

**Readiness (infrastructure access)**
- phone (cell & fixed)
- subscriptions, international BW, %households with computers, and % households with Internet access

**Usage (intensity of current usage)**
- % population are Internet users, %mobile, and fixed broadband users

**Skills (capability)**
- Literacy, secondary & tertiary education

- Top right = Good

Positive Correlation Between the IDI and the Throughput

\[
y = 197.78x - 113.27 \\
R^2 = 0.7185
\]
**Fertility Rates:**
- Children born by a woman in a given country
- The world's population will increase from today's 7.3 billion people to 9.7 billion in 2050 and 11.2 billion at century's end.
- Achieving significant fertility declines requires education and easy access to information
- Internet a major enabler

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How does the Internet assist development?

**Normalized Throughput 2016 Versus Fertility Rate**

![Graph showing negative correlation between fertility rate and throughput](image)

The graph illustrates the negative correlation between the fertility rate and the throughput, with a regression line given by:

\[ y = -428.86x + 1713.4 \]

The coefficient of determination, \( R^2 = 0.4109 \), indicates a moderate level of explained variation in the dependent variable.
How does the Internet assist development?

**HPI:**
- new index of human wellbeing and environmental impact
- how well nations are doing at achieving long, happy, sustainable lives

**Normalized Throughput 2016 Versus Happy Planet Index**

A weak negative Correlation BTW HPI and the Throughput.
Facebook & Google believe they have a real shot at connecting the 57% of the world's population still offline.

The Google balloon project being developed with the mission of providing Internet access to rural and remote areas.

Facebook's Connectivity Lab is building drones, satellites and lasers to deliver the Internet to everyone.

The higher performance of the Facebook laser transmitting drones may eventually supersede the wireless transmissions of the Google balloons.
What Is Next

- Join PingER team and let’s work together to study Internet performance in ASEAN countries:
  - Identifying last mile problems
    - Noisy (jitter & loss)
    - Very indirect connections
  - Discovering poor routing
  - Identified and quantified rates of improvement for countries /regions
  - Evaluating the impact of:
    - Major cable cuts,
    - Earthquakes, tsunamis
    - Upgrades (GEOS to terrestrial)
What does the Internet weather look like in ASEAN countries?
Thank You
ขอขอบคุณ
Khop khun khap
PingER Project

HTTP

Ping

SLAC

Archive

Reports & Data

Archive

Monitoring

Remote Host