



# THE INTERNET WEATHER IN ASEAN COUNTRIES

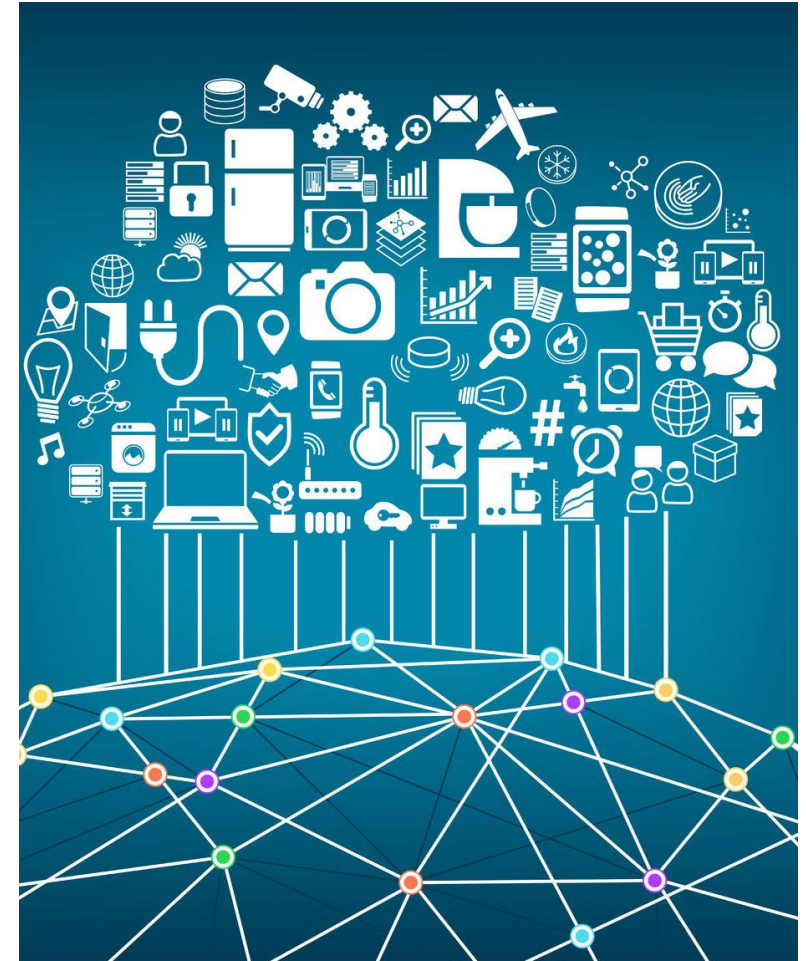
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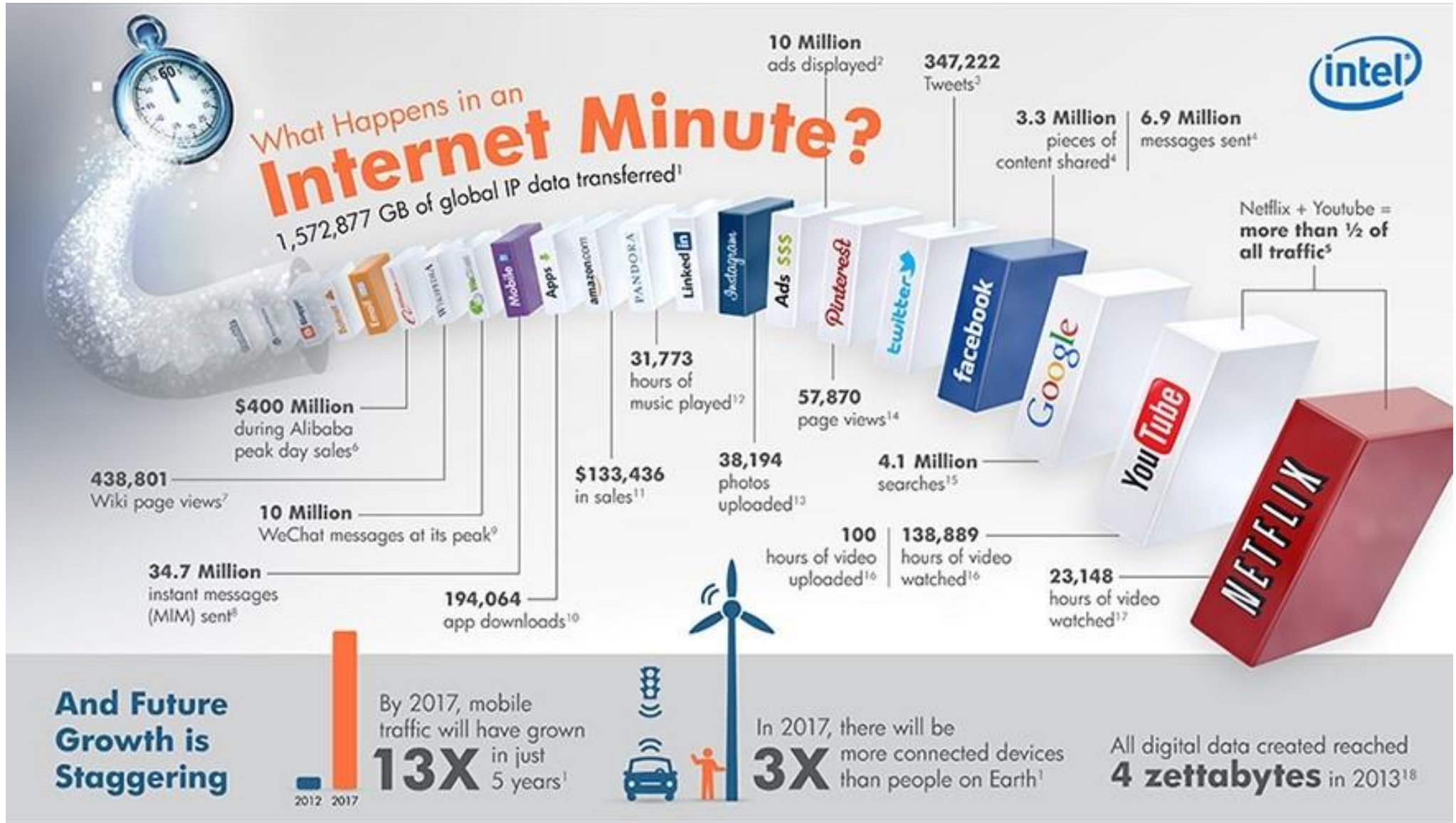
**Chiangmai, Thailand  
14 - 17 December 2016**

# Presentation Outline

- 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

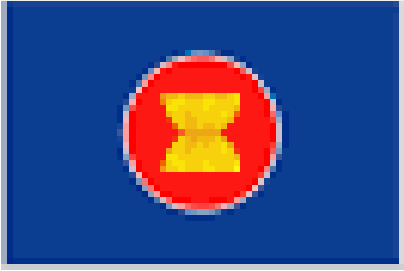
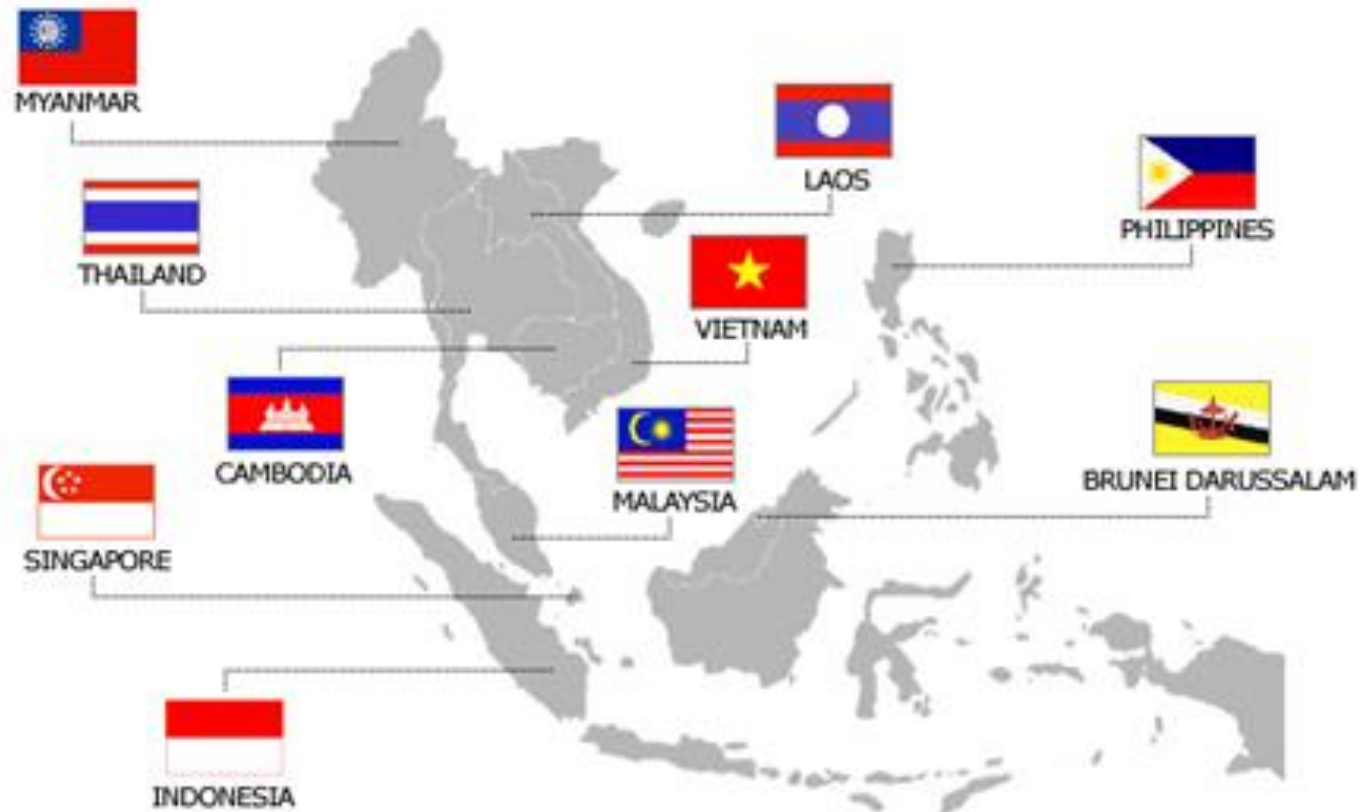


# Internet and our Life



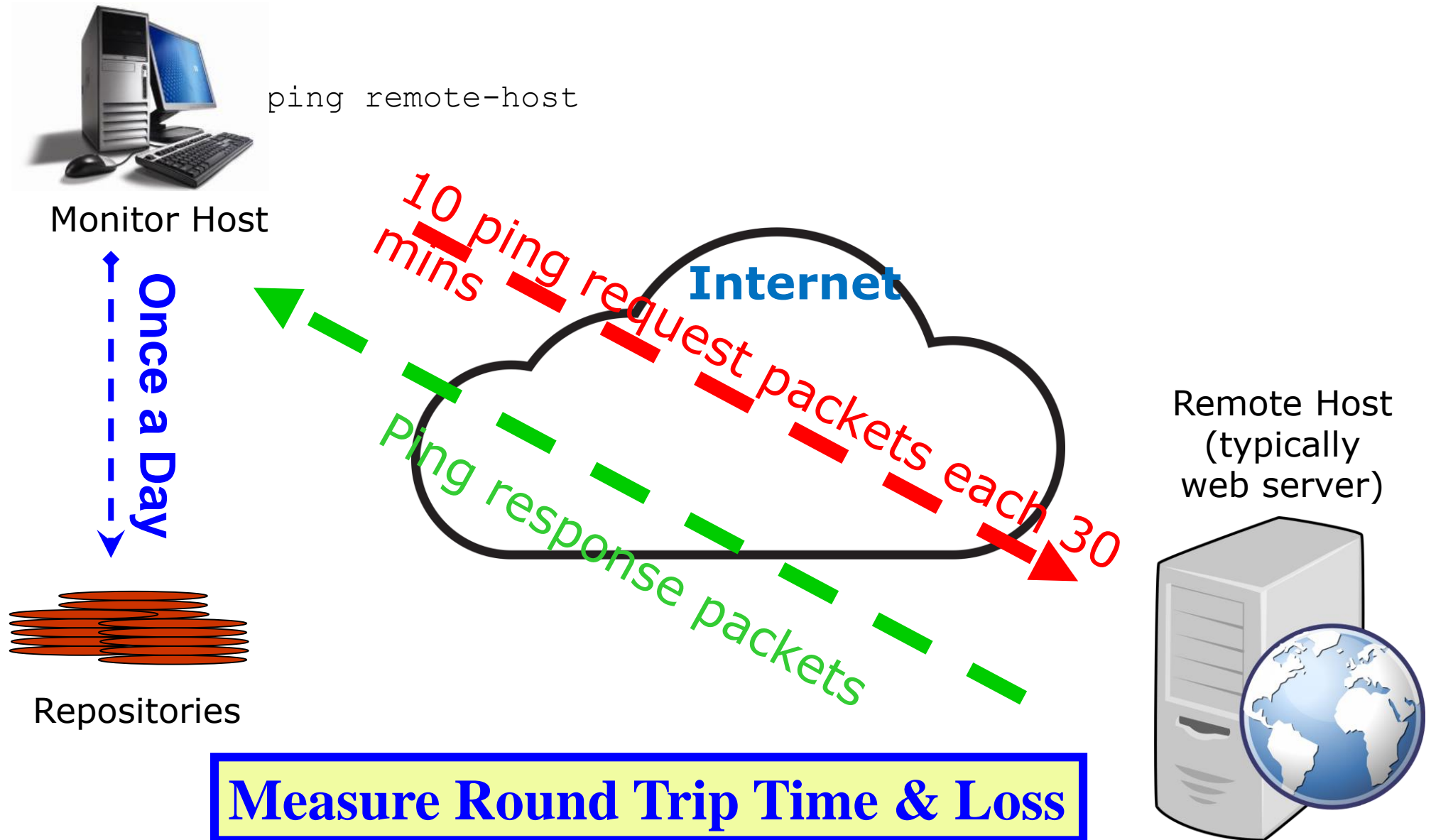


# Internet and our Life



The Association of Southeast Asian Nations (ASEAN)

# PingER Project



# PingER Project

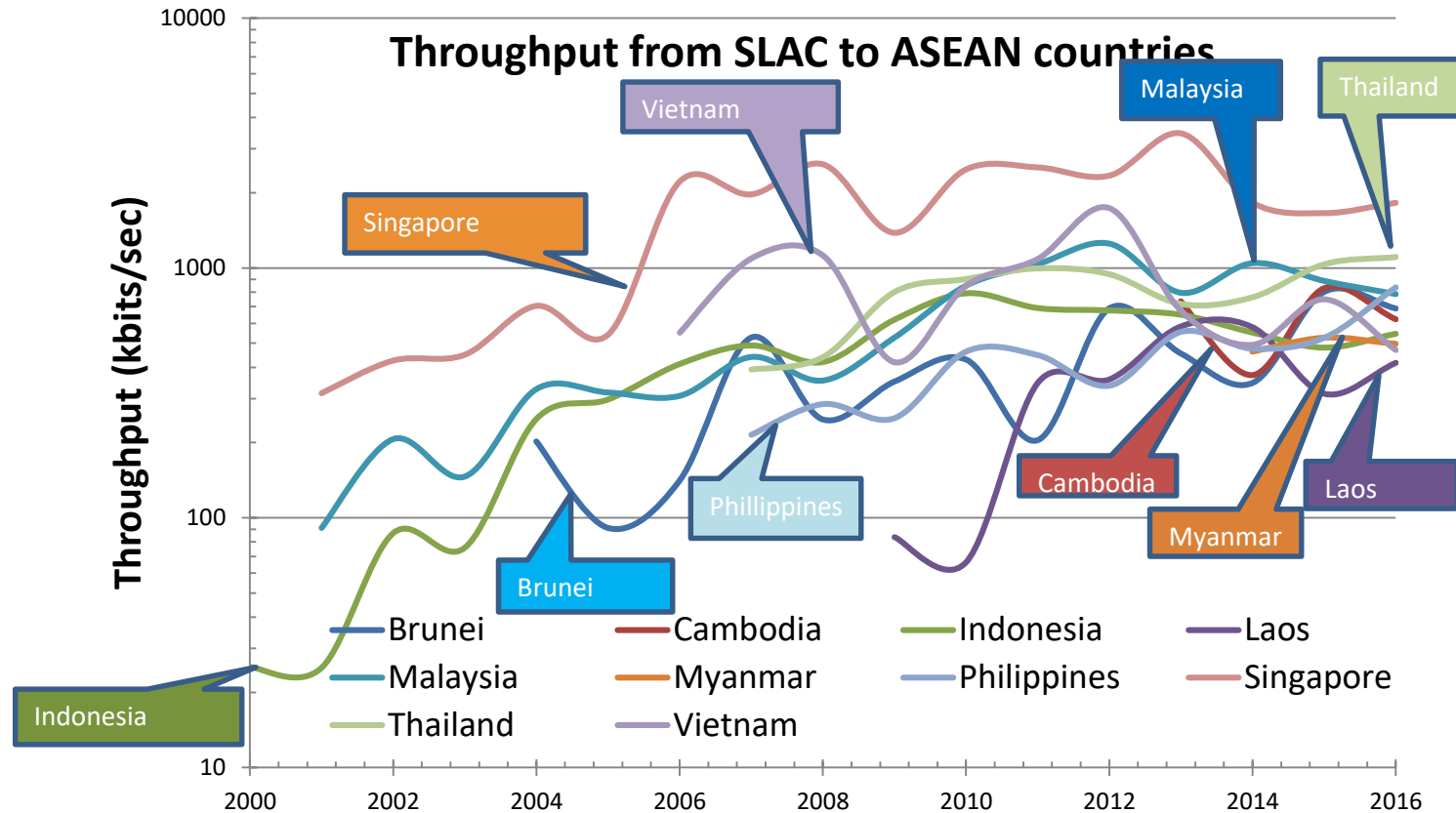
- Monitors ~60 in 23 countries
- Beacons monitored by most monitors (~100)
- Remote sites monitored by some monitors (~750)



# Internet Performance

## ASEAN Countries

- Singapore
- Thailand, Malaysia and The Philippines
- Lowest performance: Laos & Myanmar



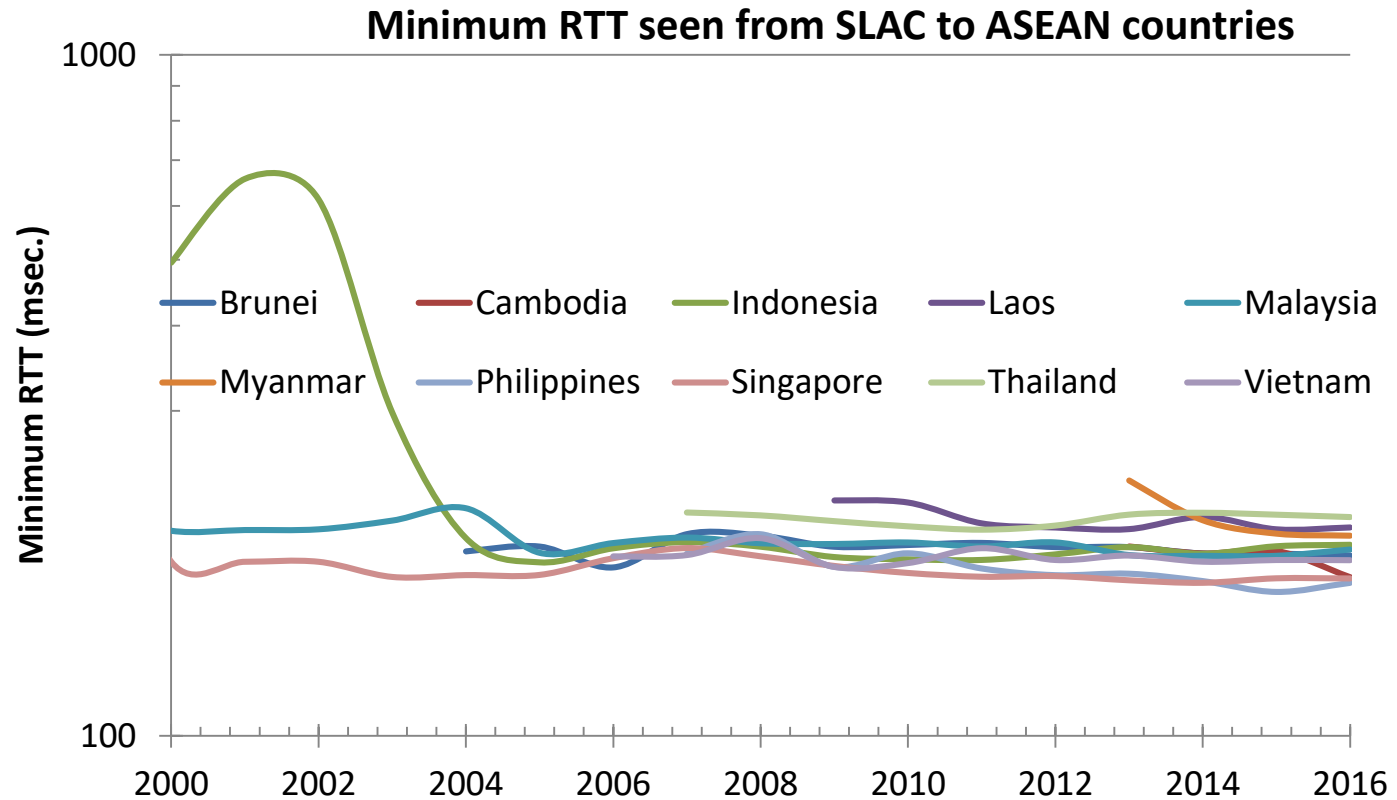
Derived throughput  $\sim 8 * 1460 / (RTT * \text{sqrt}(\text{loss}))$   
Mathis et. al



# Internet Performance

## ASEAN Countries

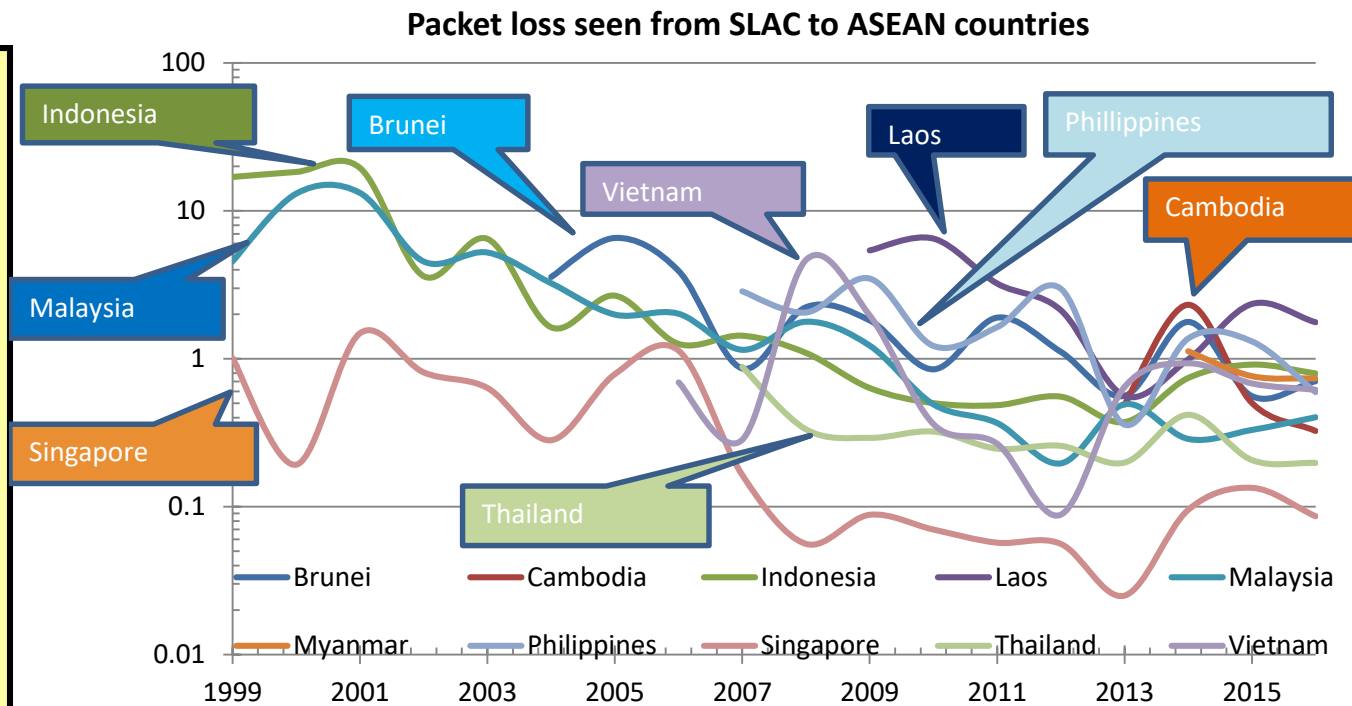
- **Lowest: Singapore, The Philippines**
- **Highest: Thailand, Laos, and Myanmar**



# Internet Performance

- 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



# Internet Performance

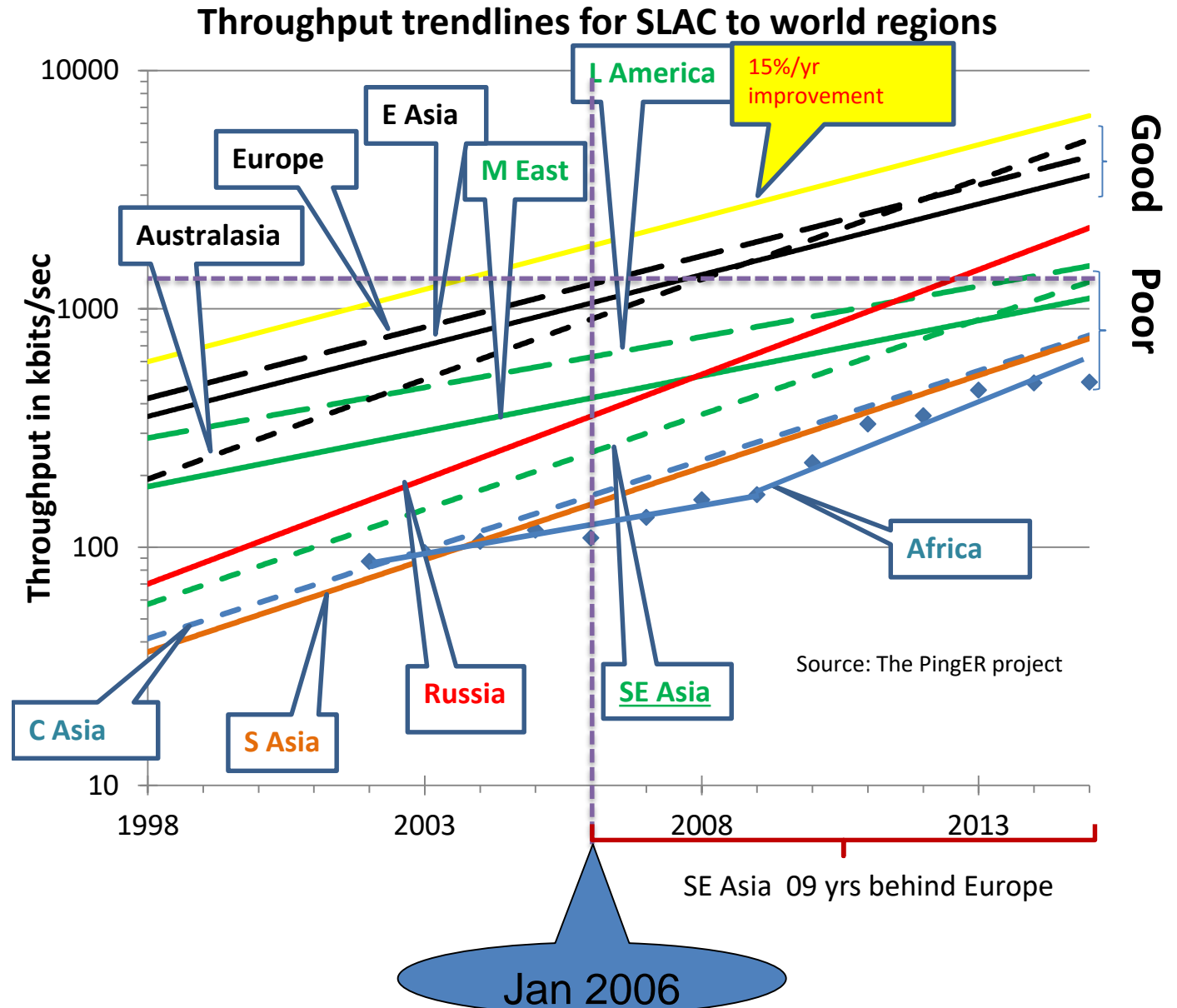
**Top 4**  
 Europe, N. America,  
 East Asia & Australasia

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

**9 yrs: SE Asia**

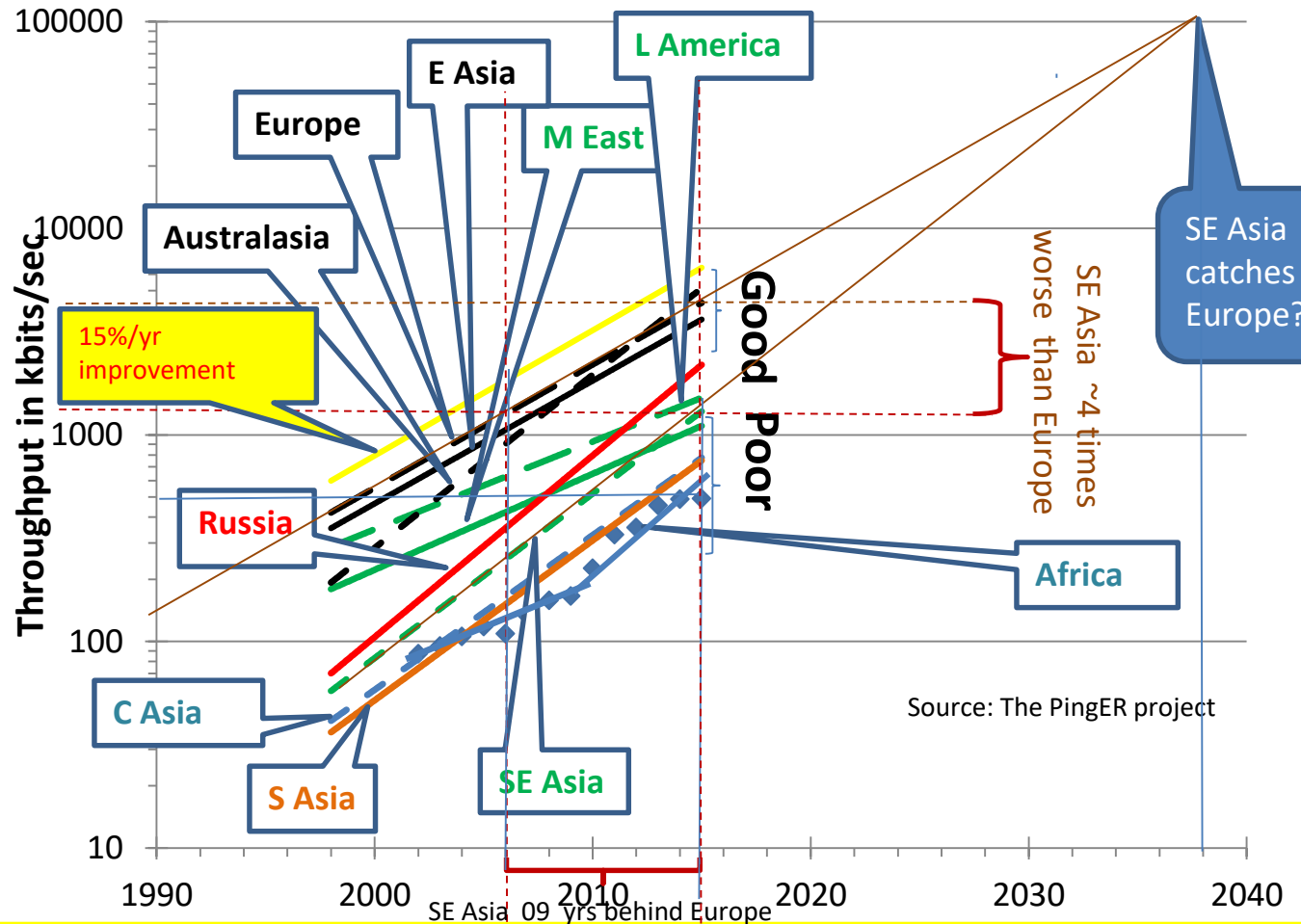
12-14 yrs: India, C. Asia

18 yrs: Africa



# Internet Performance

Throughput trendlines for SLAC to world regions



## 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**

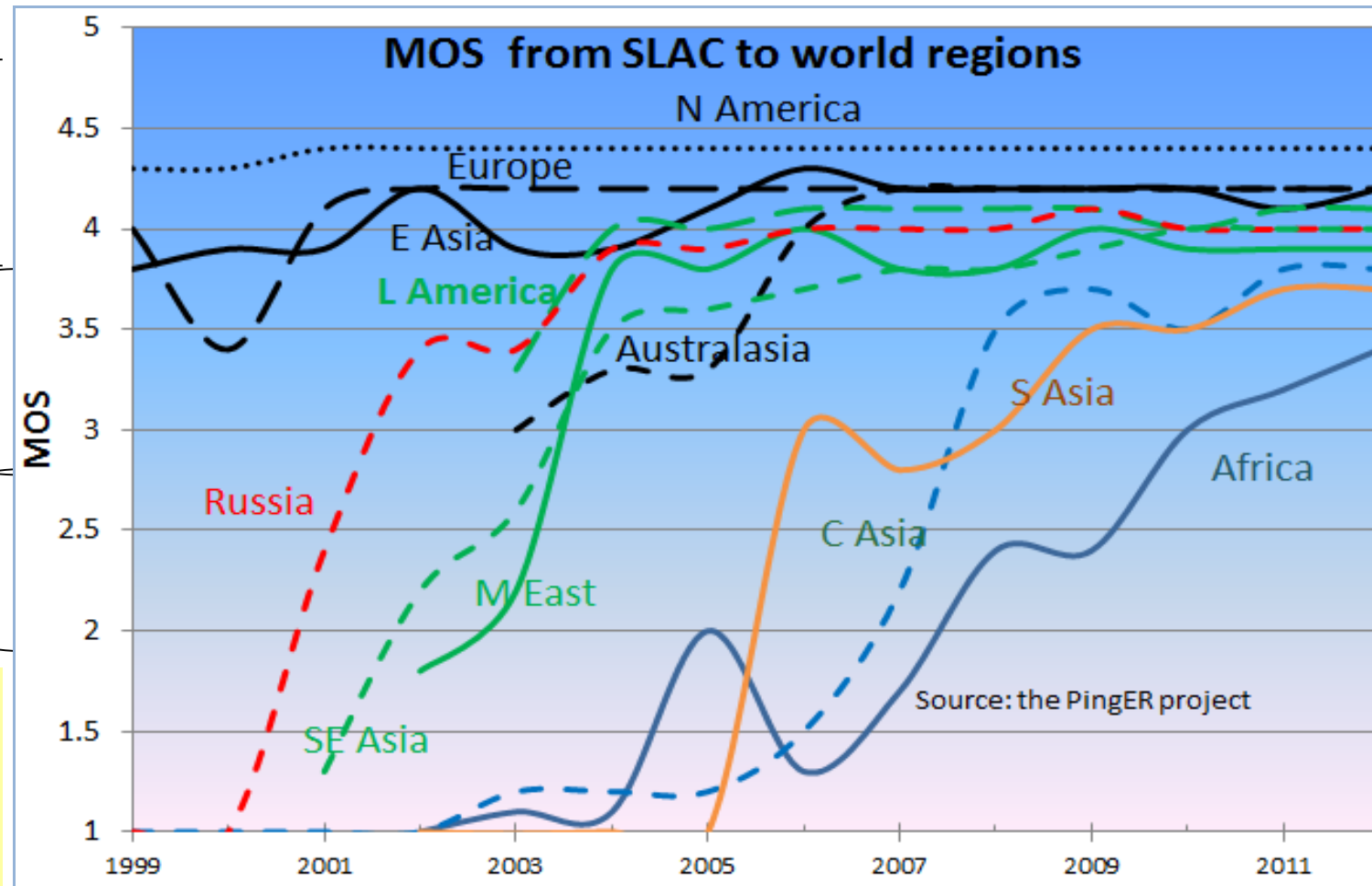


# Mean Opinion Score (MOS)

- 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.

Usable



Important for  
VoIP

# How does the Internet assist development?

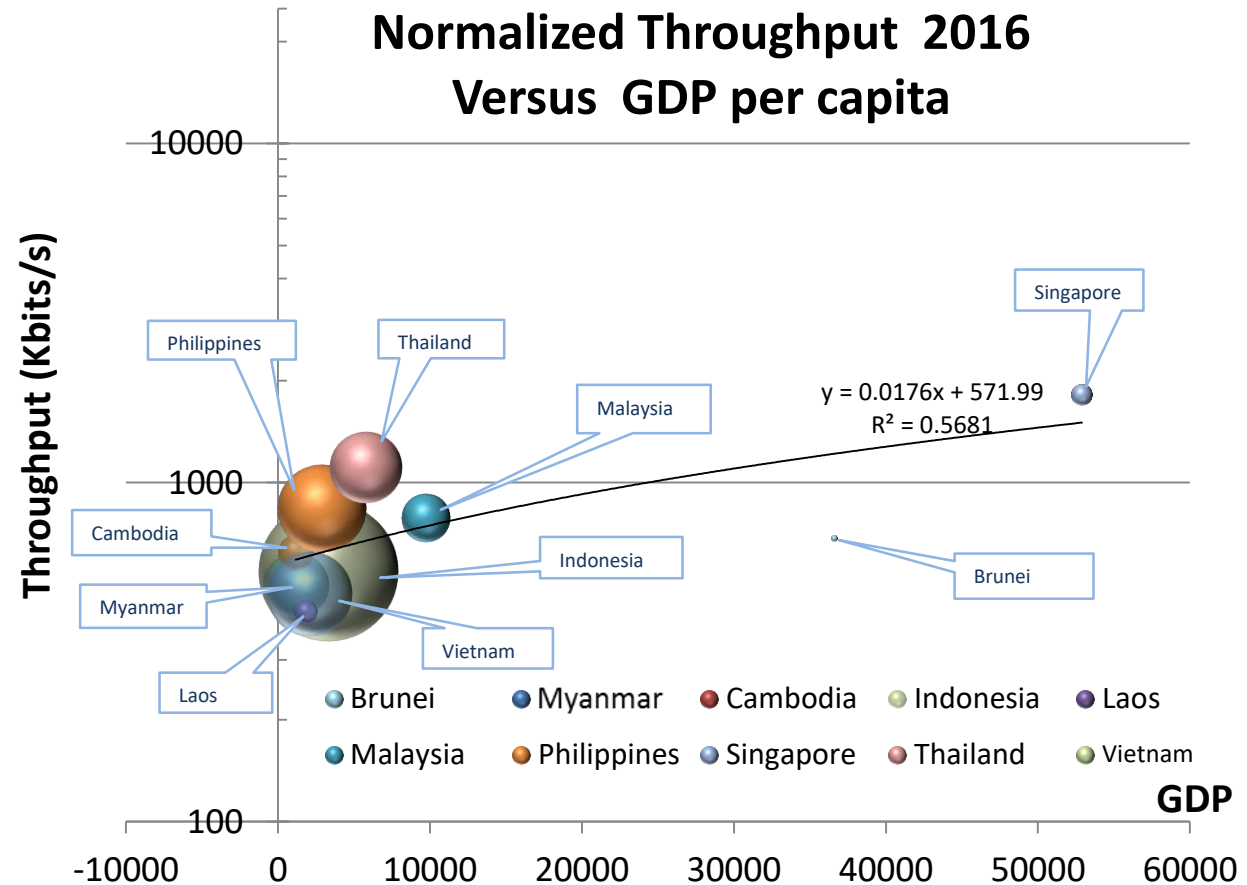
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- Investment in information technology plays the role of a **"facilitator"**
- World Bank / IFC report: for every **10% increase in high-speed Internet connections** there is an increase in economic growth of **1.3 percentage points**.
- A study reported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

# How does the Internet assist development?

## ITU GDP:

- ◆ well-being, living standards and the growth of the economy
- ◆ distinguish whether a country is developed, developing, or under developed
- ◆ indicate the impact of economic policies on the quality of life

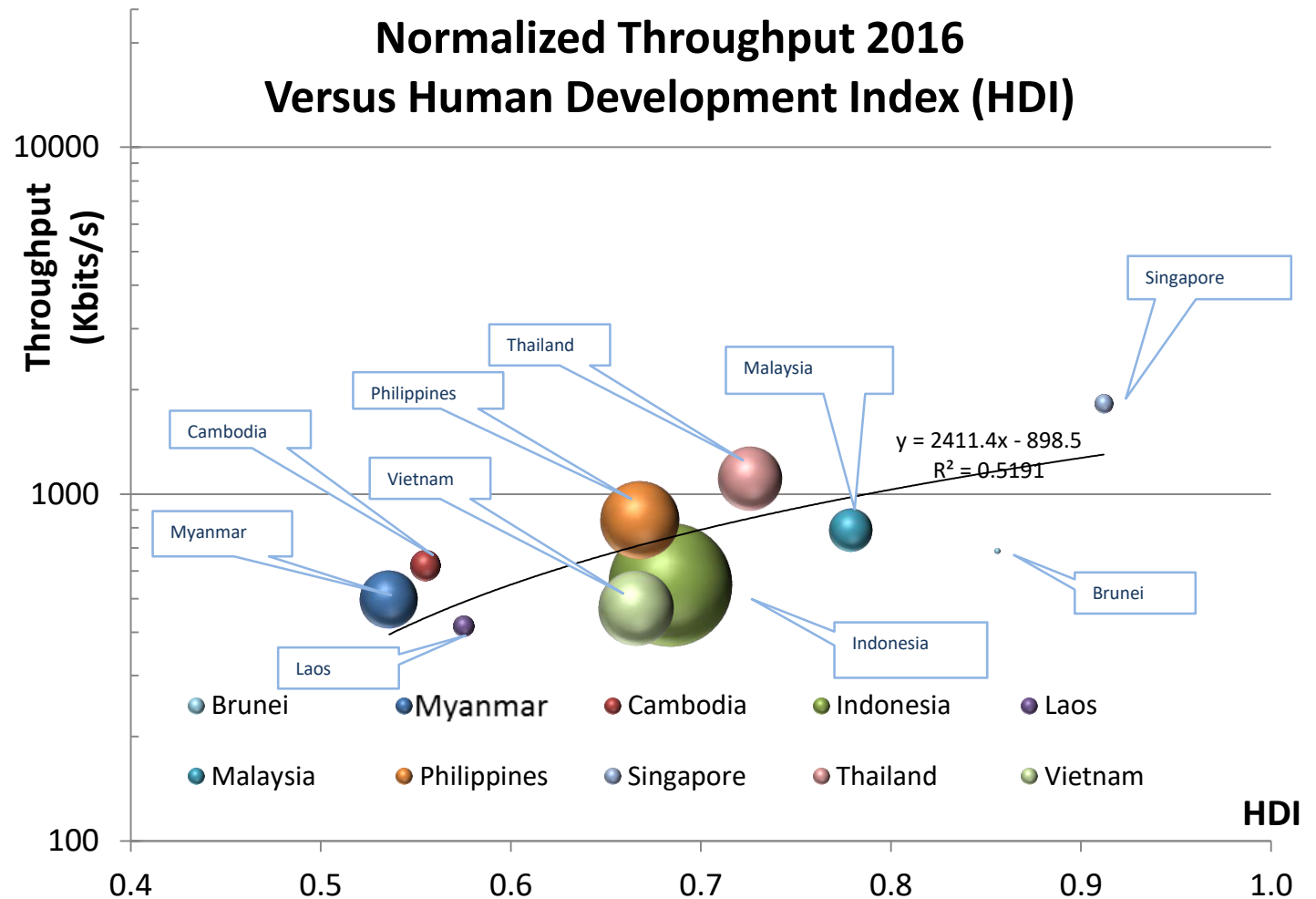


A Clear Correlation Between the GDP per capita and the Throughput

# 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



A Clear Correlation Between the UNDP HDI and the Throughput



# How does the Internet assist development?

## ITU IDI:

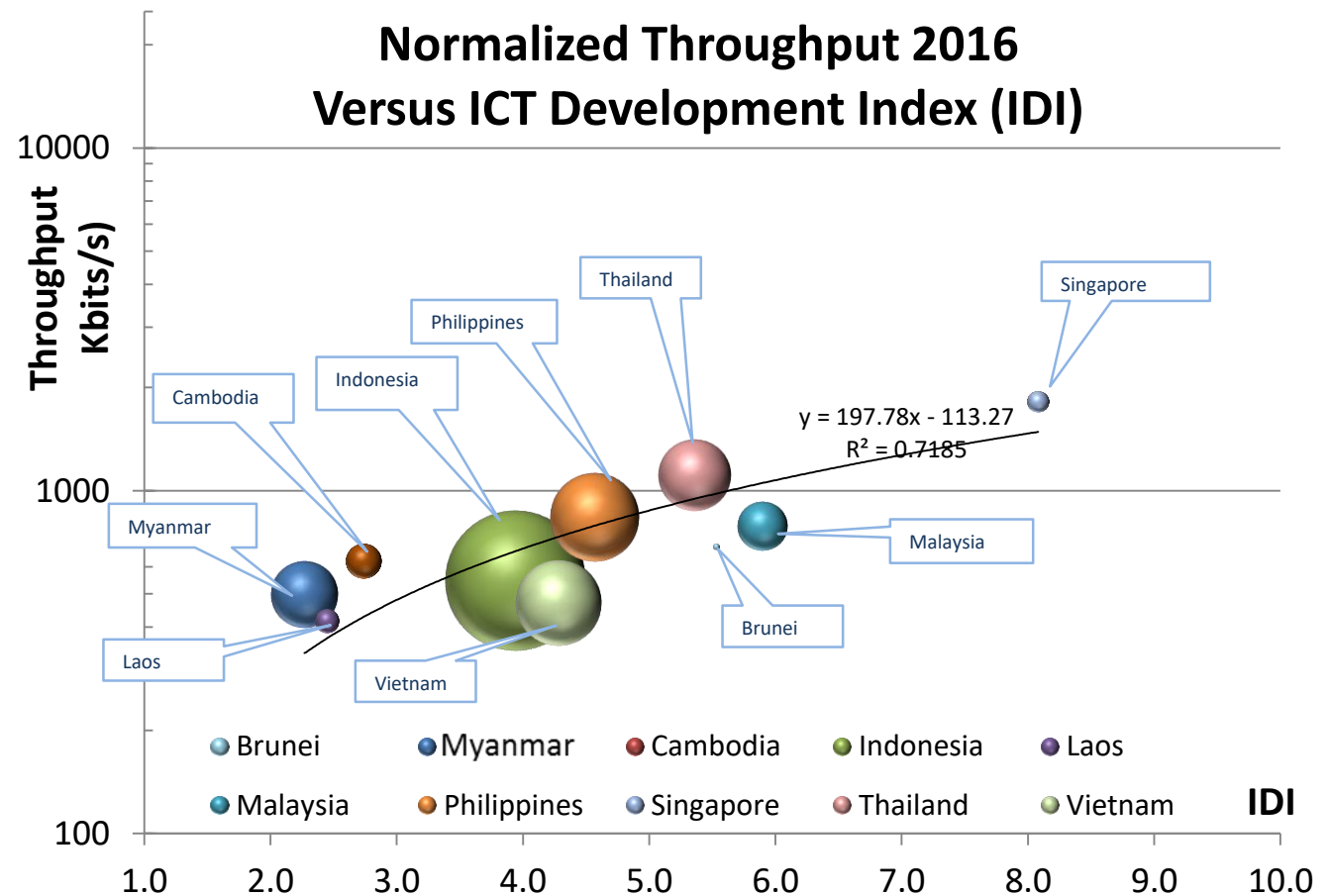
◆ IDI = ICT readiness + usage + skills

**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

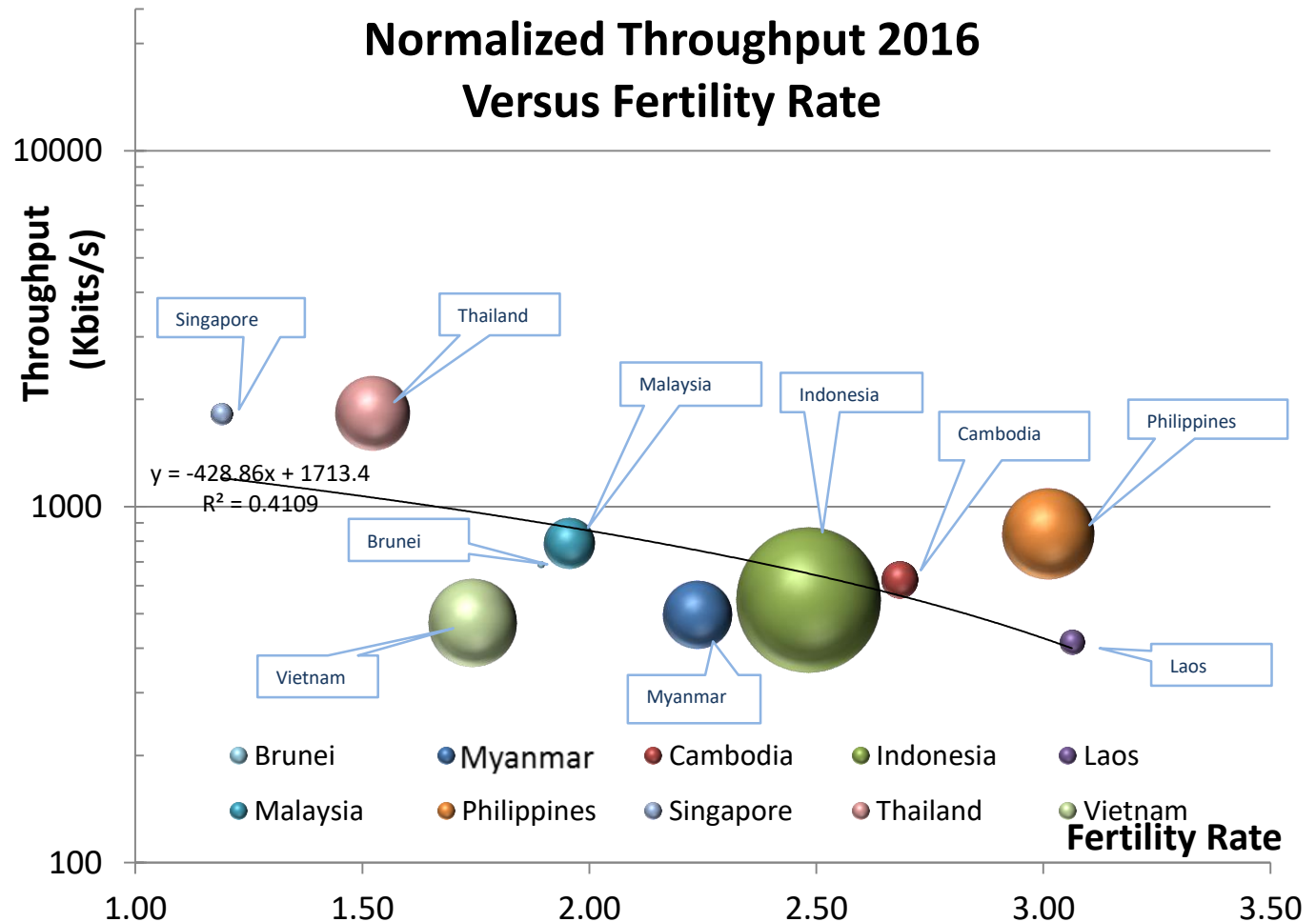


Positive Correlation Between the IDI and the Throughput

# How does the Internet assist development?

## 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**

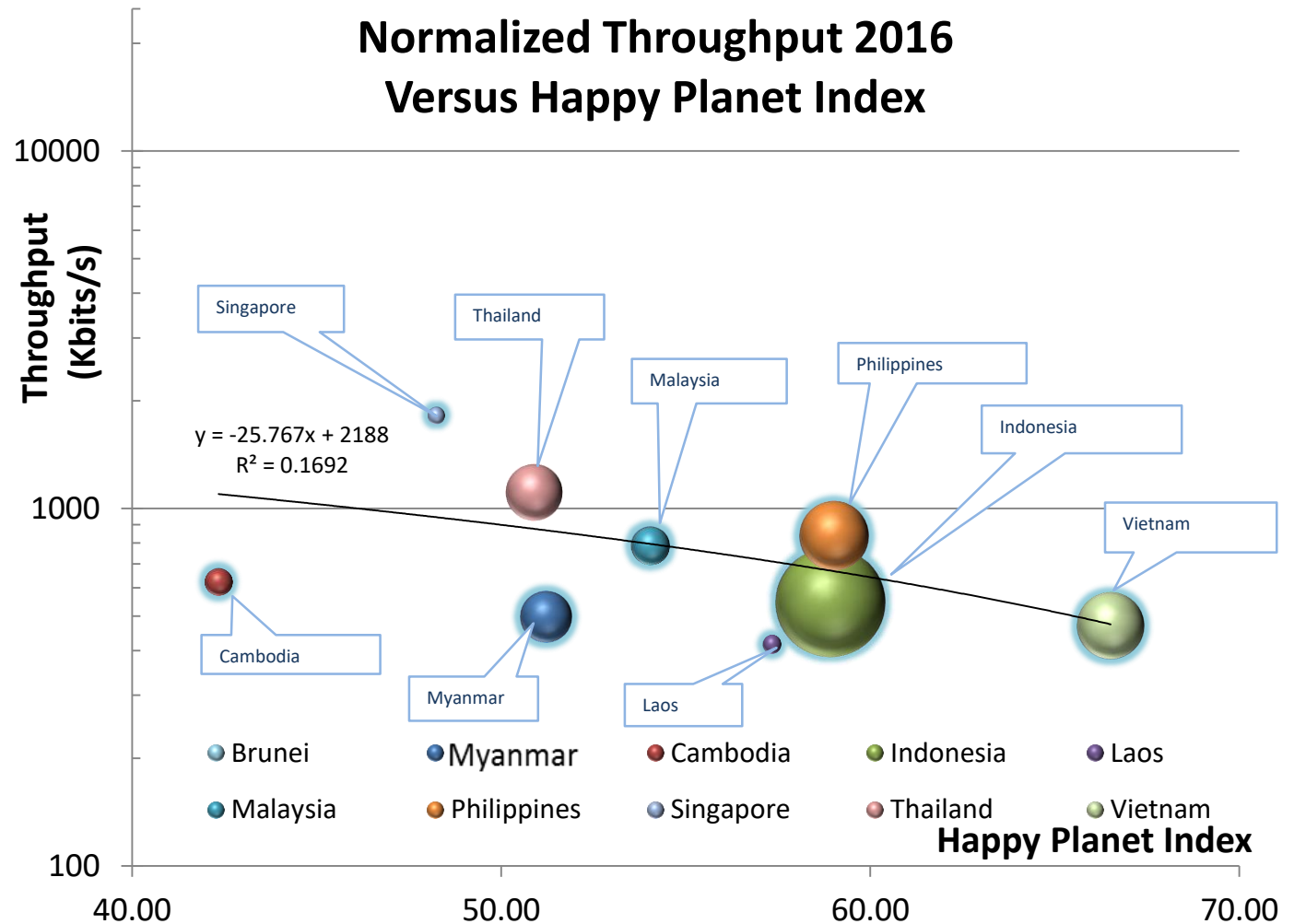


**- Negative Correlation Between the Fertility Rate and the Throughput**

# 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



\_A weak negative Correlation BTW HPI and the Throughput

# What Is Next

- 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 supecede the wireless transmissions of the Google balloons.

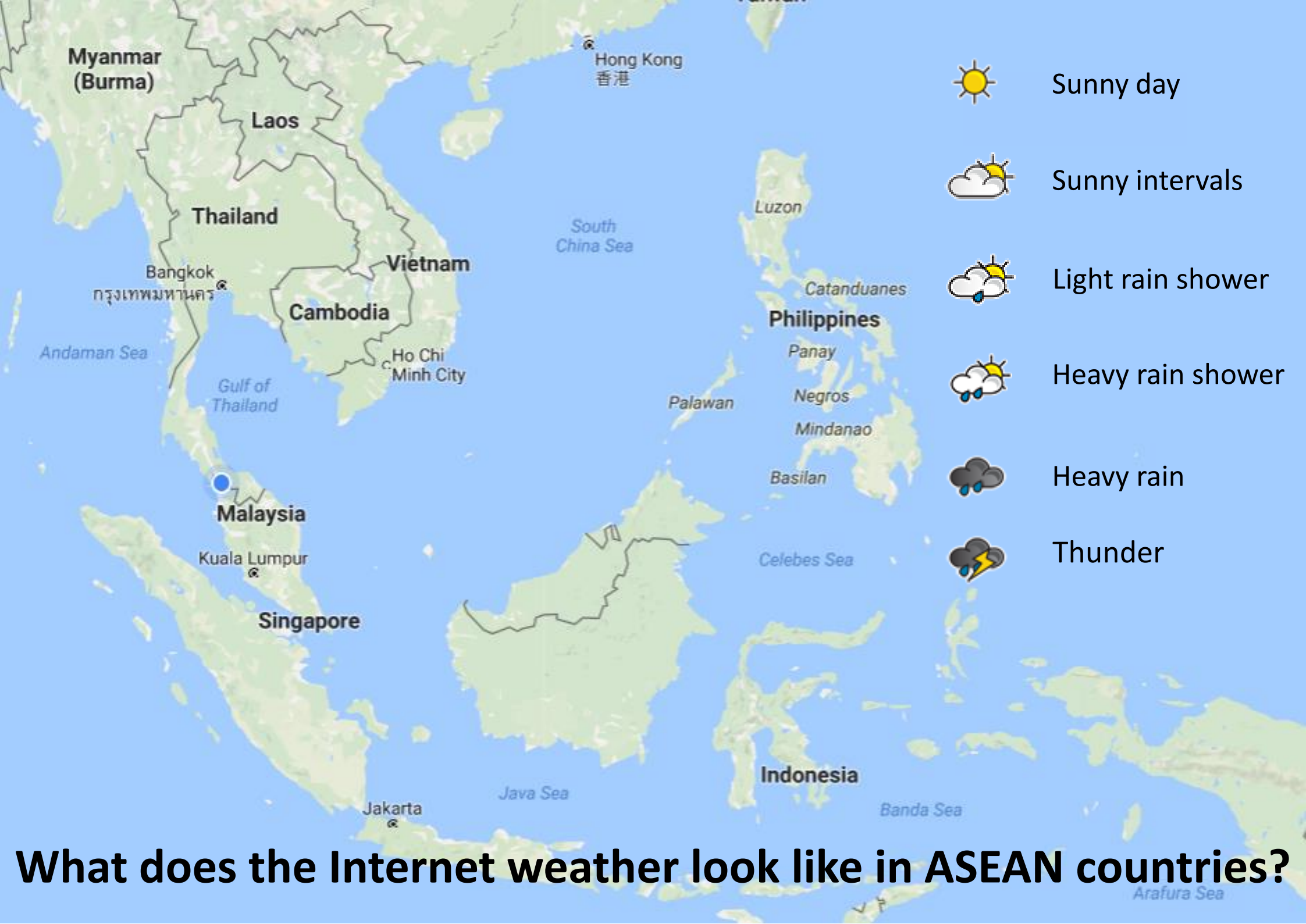




# What Is Next

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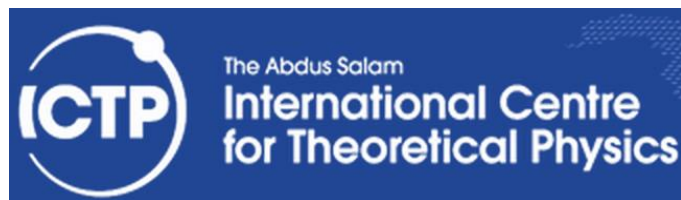
- Join PingER team and let's work together to study Internet performance in ASEAN countries:
  - Identifying last mile problems
    - Noisy (jitter & loss)
    - Very indirect connections
  - Discovering poor routing
  - Identified and quantified rates of improvement for countries /regions
  - Evaluating 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

