ASEAN IVO Forum 2017
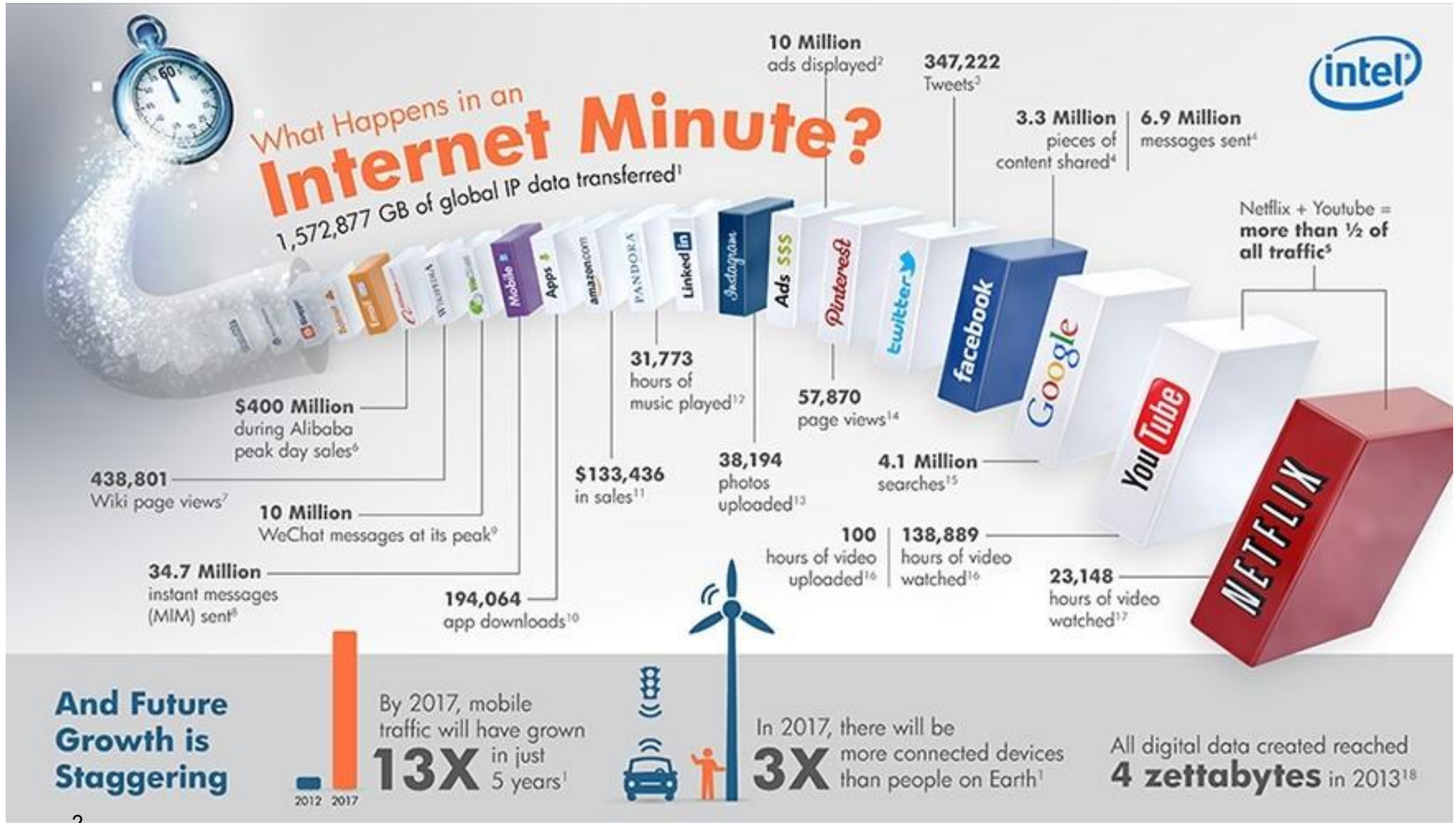
Socio-economic Development Indices and Their Reflection on Internet Performance in the ASEAN Countries

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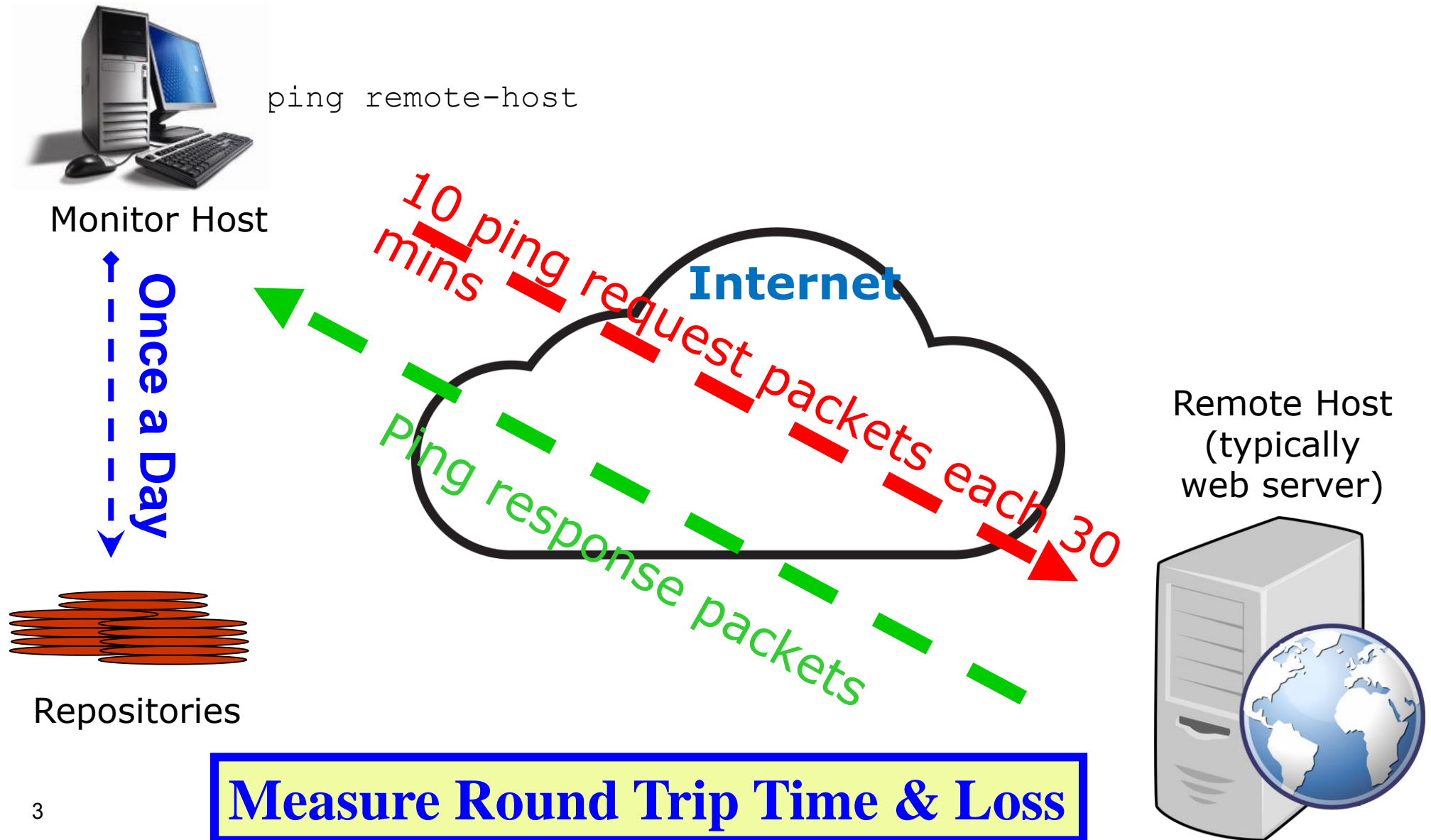Head of InterNetWorks Research Platform
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**Brunei Darussalam
23 November 2017**

1

Internet and our Life

Source: Cisco VNI 2015

PingER Project

Monitor Host

`ping remote-host`

Once a Day

Repositories

Internet

10 ping request packets each 30 mins

Ping response packets

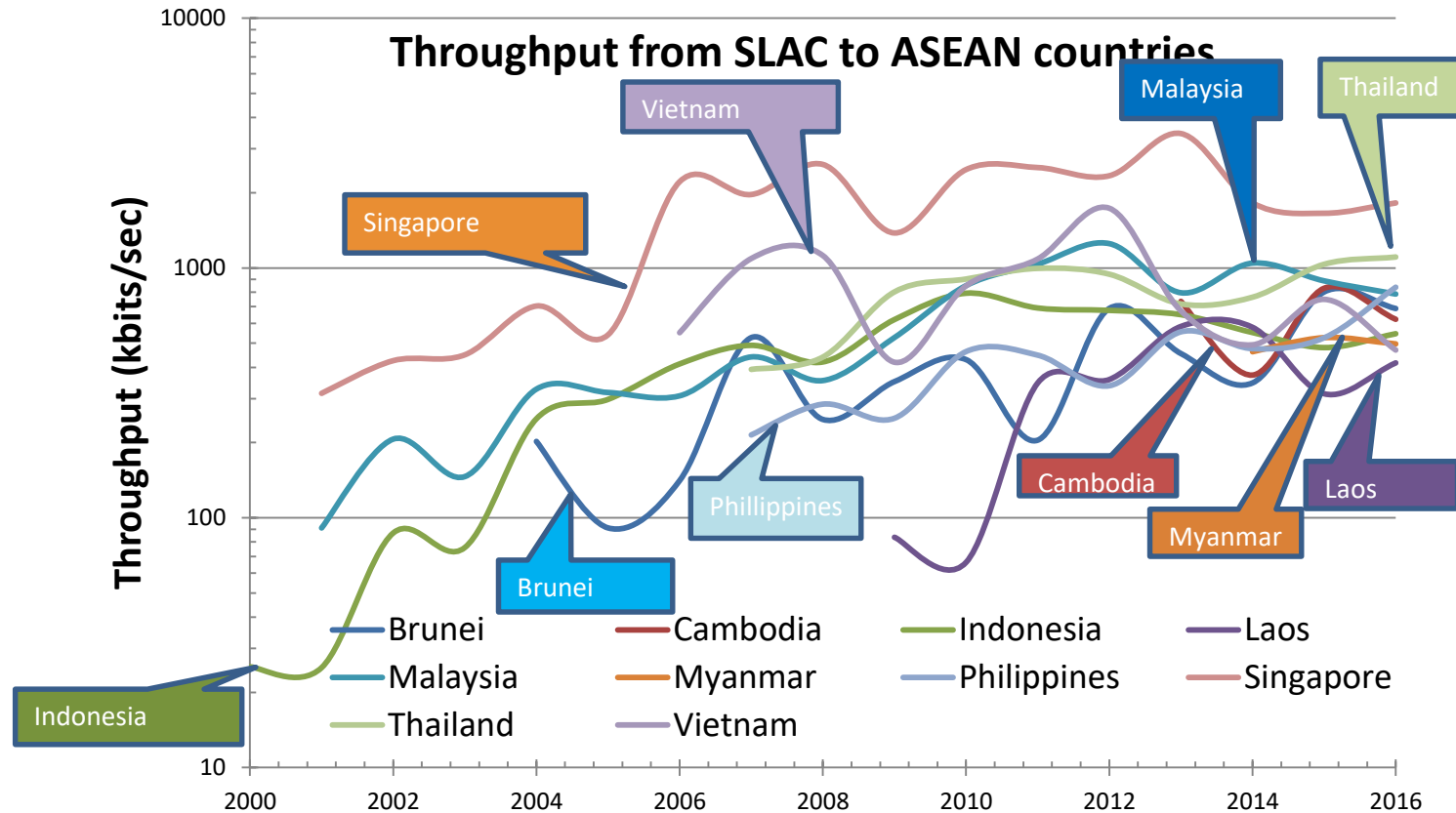Remote Host (typically web server)

Measure Round Trip Time & Loss

Internet Performance

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

Throughput from SLAC to ASEAN countries

Throughput (kbits/sec)

Legend: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam

Country labels on chart: Vietnam, Malaysia, Thailand, Singapore, Phillippines, Cambodia, Myanmar, Laos, Brunei, Indonesia
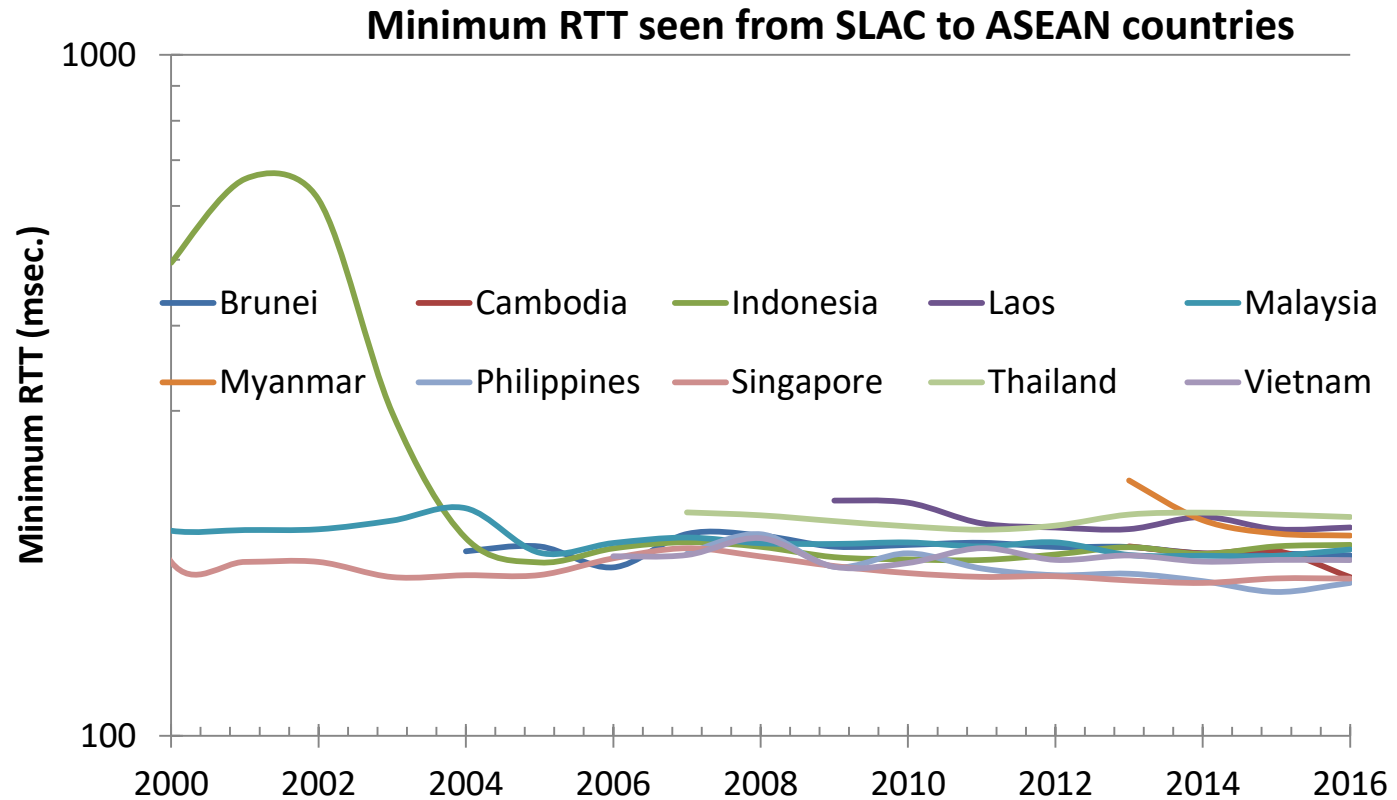
Derived throughput ~ 8 * 1460 /(RTT * sqrt(loss))
Mathis et. al

4

Internet Performance

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

Minimum RTT seen from SLAC to ASEAN countries

Legend: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam

Y-axis: Minimum RTT (msec.)
X-axis: 2000, 2002, 2004, 2006, 2008, 2010, 2012, 2014, 2016

Source: The PingER project
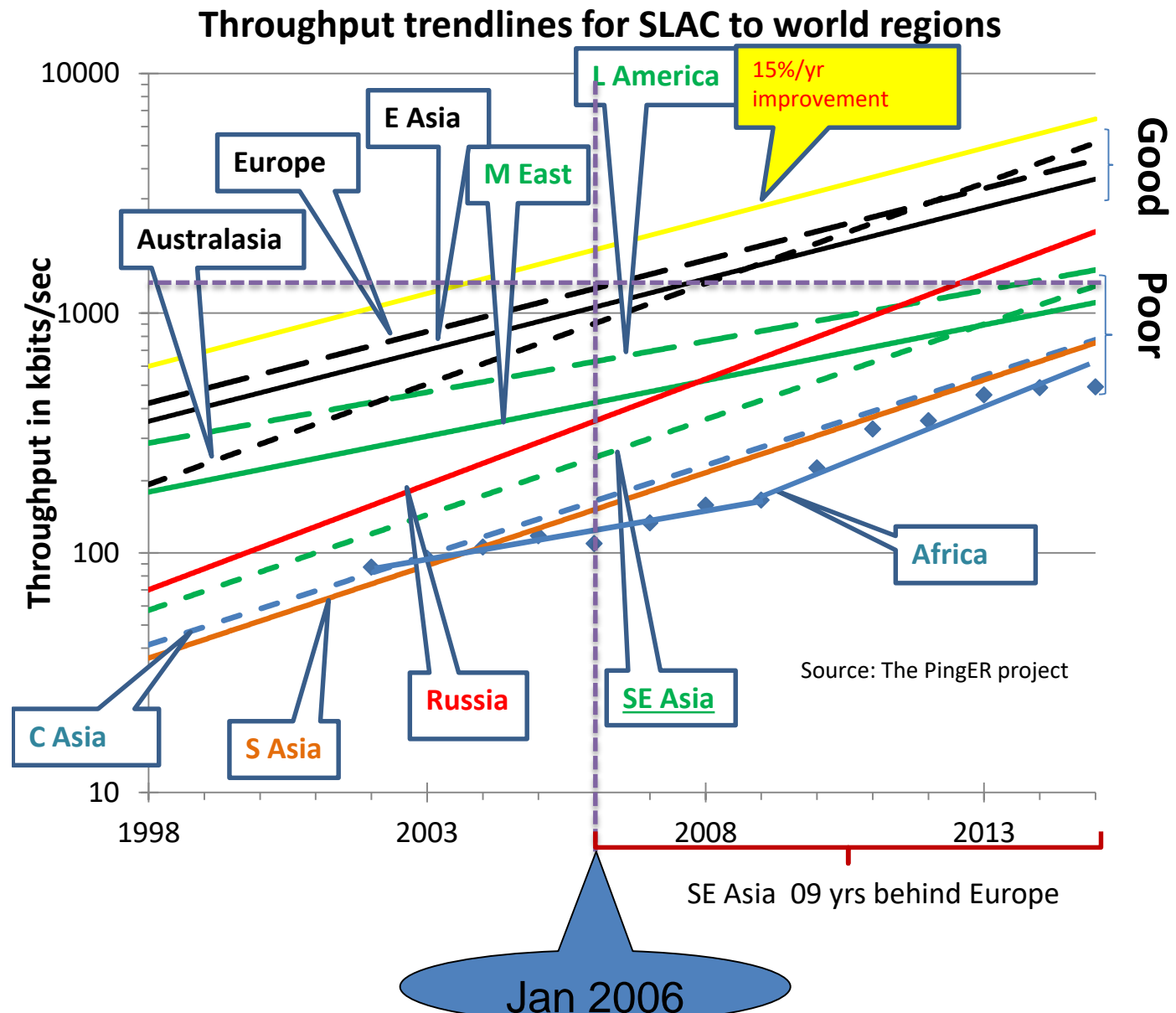
Internet Performance

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

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

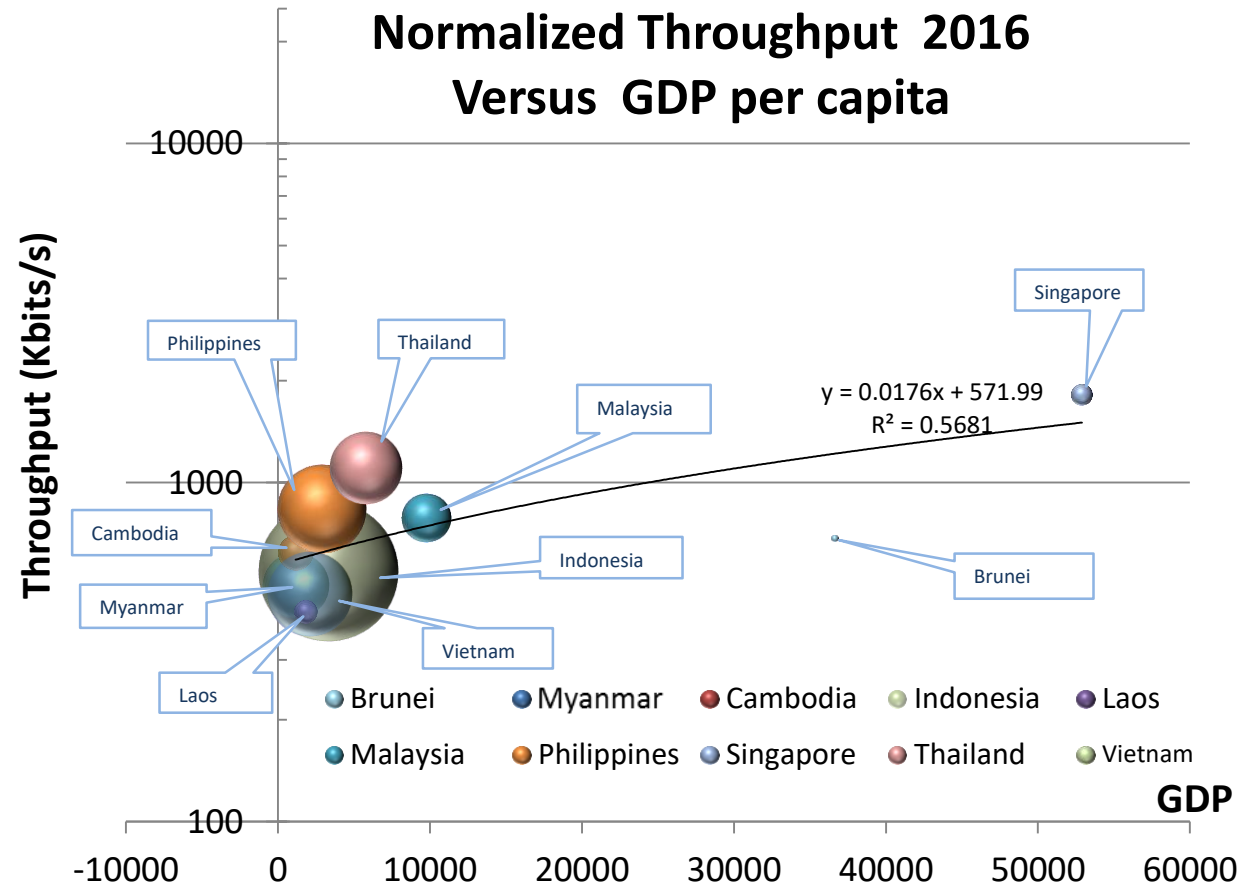**9 yrs: SE Asia**

12-14 yrs: India, C. Asia

18 yrs: Africa

Throughput trendlines for SLAC to world regions

Throughput in kbits/sec

10000

1000

100

10

1998   2003   2008   2013

L America

15%/yr improvement

E Asia

Europe

M East

Australasia

Good

Poor

C Asia

S Asia

Russia

SE Asia

Africa

Source: The PingER project

Jan 2006

SE Asia 09 yrs behind Europe

Socio-economic Development Indices and Their Reflection on Internet Performance

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**

Normalized Throughput 2016 Versus GDP per capita

$y = 0.0176x + 571.99$
$R^2 = 0.5681$

Throughput (Kbits/s)

Philippines Thailand Malaysia Singapore Cambodia Indonesia Brunei Myanmar Vietnam Laos

10000
1000
100

-10000   0   10000   20000   30000   40000   50000   60000

GDP

- ○ Brunei ● Myanmar ● Cambodia ○ Indonesia ● Laos
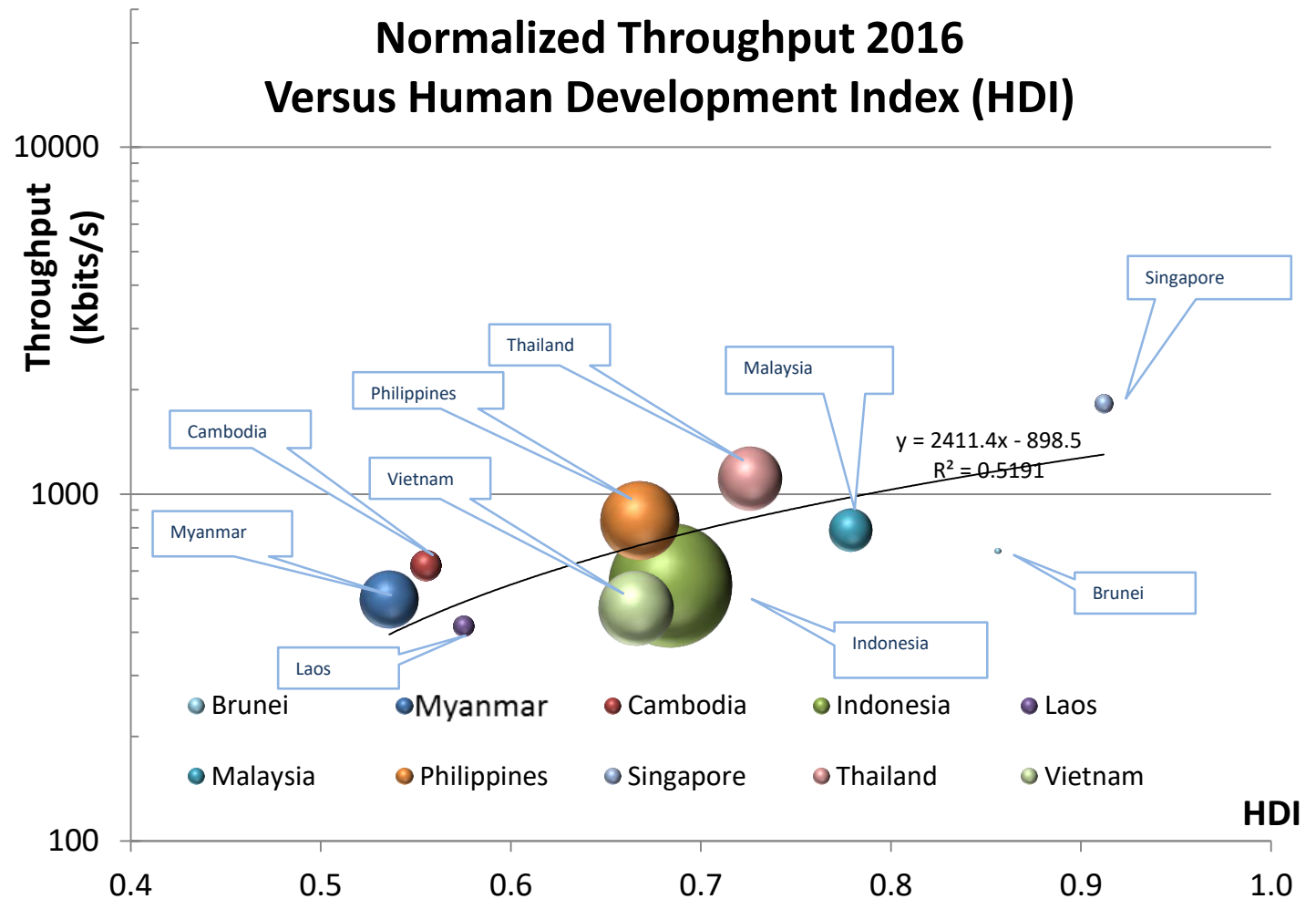- ● Malaysia ● Philippines ○ Singapore ● Thailand ○ Vietnam

A Clear Correlation Between the GDP per capita and the Internet Performance

Socio-economic Development Indices and Their Reflection on Internet Performance

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

Normalized Throughput 2016 Versus Human Development Index (HDI)

$y = 2411.4x - 898.5$
$R^2 = 0.5191$

A Clear Correlation Between the UNDP HDI and the Internet Performance

Socio-economic Development Indices and Their Reflection on Internet Performance
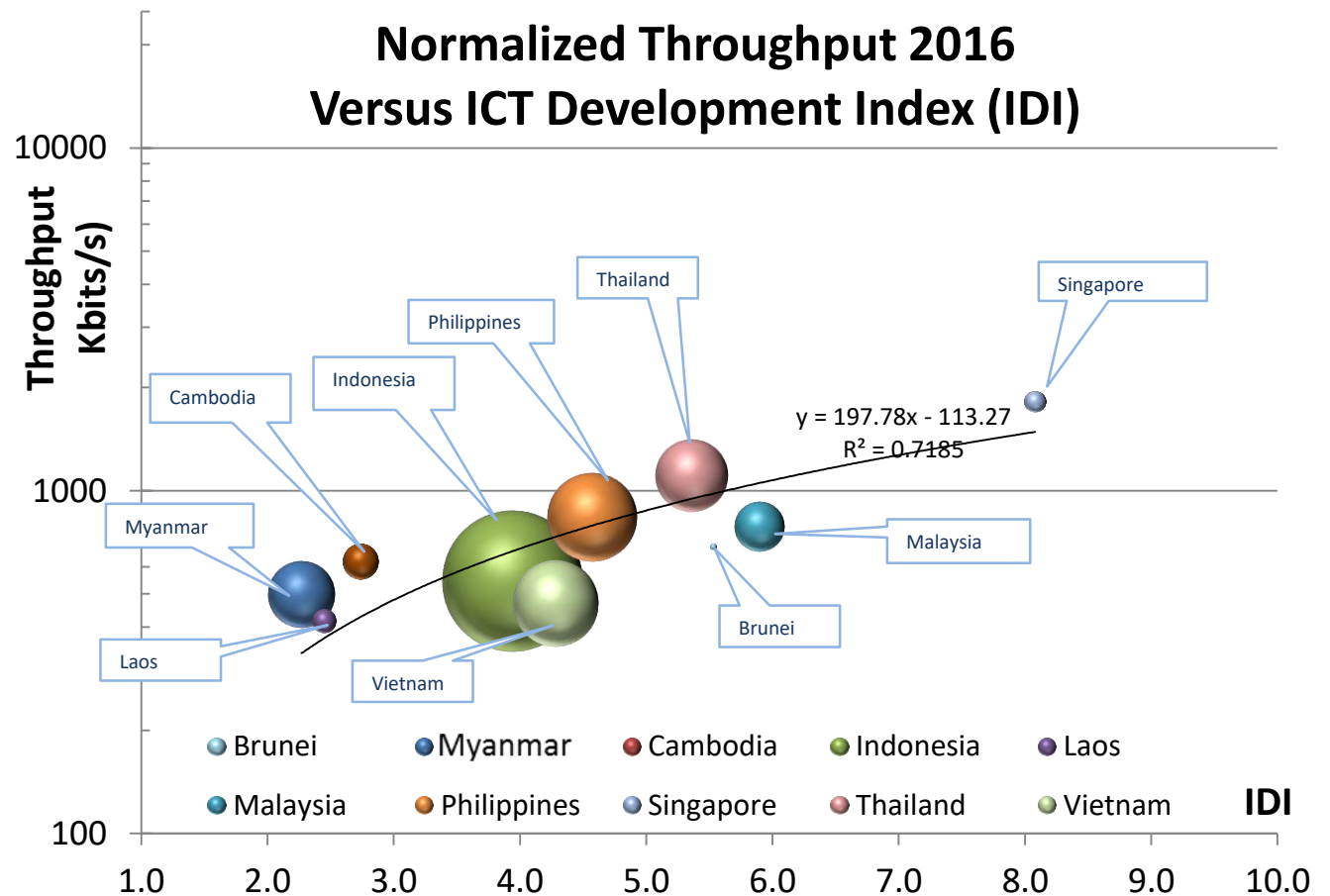
ITU IDI:

◆ **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**

Normalized Throughput 2016 Versus ICT Development Index (IDI)

$y = 197.78x - 113.27$
$R^2 = 0.7185$

Positive Correlation Between the IDI and the Internet Performance

What Is Next

- Join PingER team and let's work together to study the 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)