Measuring Internet Resilience
Who We Are

Together with our global community, we extend the Internet’s reach and protect its long-term well-being.

We help grow the Internet.
One-third of the world’s population isn’t connected. We are committed to closing the digital divide by bringing together the people and technology needed to give everyone the access they want.

We make the Internet stronger.
We advocate for a secure, trusted and more resilient Internet. We defend the Internet from those who could make it less secure, less resilient, and less open.

We shape the Internet of the future.
We are a global movement that champions an Internet of hope, opportunity, and celebrates humanity. But Internet access is no longer a luxury. It is a virtual lifeline. Be part of the solution.
Our work aligns with our goals for the Internet to be **open**, **globally connected**, **secure**, and **trustworthy**.

We seek collaboration with all who share these goals.
Enabling an OGST Internet

<table>
<thead>
<tr>
<th>Open</th>
<th>Globally Connected</th>
<th>Secure</th>
<th>Trustworthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The open Internet allows people and organizations to mix and match technologies without permission and with minimal barriers.</td>
<td>The globally connected Internet is inclusive. It allows networks and users to interconnect without geographical restrictions.</td>
<td>A secure Internet is resistant to attacks on its infrastructure, delivering a robust service to its user community.</td>
<td>A trustworthy Internet meets the expectations of its users by offering a resilient and reliable base for applications and services.</td>
</tr>
</tbody>
</table>

Why we measure

• To answer questions/validate beliefs
• To set a baseline from which we can track change/show results
• To demonstrate value
• To justify decisions
• To identify opportunities for improvement
• Advance our knowledge
• Launched December 2020.

• We curate Internet measurement data from trusted sources to help everyone gain deeper, data-driven insight into the Internet.

**Trusted data from multiple sources:**

• **Benefit:** Helps to assess whether efforts to ensure that the Internet remains open, globally connected, secure, and trustworthy are working.

• **Benefit:** Allows policymakers, researchers, journalists, network operators, civil society groups, and others to better understand the health, availability, and evolution of the Internet.

pulse.internetsociety.org
Pulse Data Partners

• Data is provided by our trusted data partners
A resilient Internet connection maintains an acceptable level of service despite faults and challenges to normal operation.
The framework collates around 30 sets of public metric data that relate to **four pillars** of a resilient Internet:

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Performance</th>
<th>Security</th>
<th>Market Readiness</th>
</tr>
</thead>
<tbody>
<tr>
<td>The existence and availability of physical infrastructure that provides Internet connectivity.</td>
<td>The ability of the network to provide end-users with seamless and reliable access to Internet services.</td>
<td>The ability of the network to resist intentional or unintentional disruptions through the adoption of security technologies and best practices.</td>
<td>The ability of the market to self-regulate and provide affordable prices to end-users by maintaining a diverse and competitive market.</td>
</tr>
</tbody>
</table>

Internet Resilience — Globally

https://pulse.internetsociety.org/resilience
Overall Internet Resilience — By Region

- **Europe**: 60%
- **Asia**: 46%
- **Americas**: 45%
- **Oceania**: 45%
- **Africa**: 35%
Overall Internet Resilience — By Sub-Region

South-Eastern Asia: 49%
- Overall Resilience
- Infrastructure
- Performance
- Security
- Market Readiness

Eastern Asia: 49%
- Overall Resilience
- Infrastructure
- Performance
- Security
- Market Readiness

Western Asia: 47%
- Overall Resilience
- Infrastructure
- Performance
- Security
- Market Readiness

Southern Asia: 43%
- Overall Resilience
- Infrastructure
- Performance
- Security
- Market Readiness

Central Asia: 39%
- Overall Resilience
- Infrastructure
- Performance
- Security
- Market Readiness
Overall Internet Resilience — By Country

Singapore: 72%
Viet Nam: 52%
Brunei Darussalam: 51%
Malaysia: 51%
Thailand: 51%
Indonesia: 48%
Philippines: 46%
Myanmar: 45%
Cambodia: 43%
Lao PDR: 42%
Timor-Leste: 38%
## Singapore – Internet Resilience Index

<table>
<thead>
<tr>
<th>Component</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td></td>
</tr>
<tr>
<td>Cable ecosystem</td>
<td>80%</td>
</tr>
<tr>
<td>Mobile connectivity</td>
<td>97%</td>
</tr>
<tr>
<td>Enabling infrastructure</td>
<td>45%</td>
</tr>
<tr>
<td>Performance</td>
<td></td>
</tr>
<tr>
<td>Fixed networks</td>
<td>81%</td>
</tr>
<tr>
<td>Mobile networks</td>
<td>68%</td>
</tr>
</tbody>
</table>

### Security
- Enabling technologies (42%)
- Domain name system security (82%)
- Routing hygiene (82%)
- Security threat (89%)

### Market Readiness
- Market structure (73%)

### Traffic Localization
- 57%

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[Internet Resilience](https://pulse.internetsociety.org/resilience?search=sg)

Internet Society Pulse
pulse.internetsociety.org

data source: Pulse Internet Resilience Index
# Singapore Internet Resilience Index

## Infrastructure

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## Enabling Infrastructure

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<th>Component</th>
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<tbody>
<tr>
<td>Data centers</td>
<td>44%</td>
</tr>
<tr>
<td>Number of IXPs</td>
<td>46%</td>
</tr>
</tbody>
</table>

## Performance

<table>
<thead>
<tr>
<th>Component</th>
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<tbody>
<tr>
<td>Fixed download</td>
<td>98%</td>
</tr>
<tr>
<td>Fixed jitter</td>
<td>95%</td>
</tr>
<tr>
<td>Fixed latency</td>
<td>95%</td>
</tr>
<tr>
<td>Fixed upload</td>
<td>46%</td>
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## Mobile networks

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<td>Mobile download</td>
<td>67%</td>
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## Market Readiness

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<tr>
<td>Affordability</td>
<td>97%</td>
</tr>
<tr>
<td>Upstream provider diversity</td>
<td>56%</td>
</tr>
<tr>
<td>Market diversity</td>
<td>66%</td>
</tr>
<tr>
<td>Domain count</td>
<td>50%</td>
</tr>
<tr>
<td>EGD</td>
<td>93%</td>
</tr>
<tr>
<td>Peering efficiency</td>
<td>34%</td>
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</table>
Keeping Traffic Local

10
Active IXPs

76
Networks (members) peering at the IXPs

11.23%
Proportion of the local Internet that can be reached through IXPs

>50,000 Gbps
Total traffic capacity of IXPs

https://pulse.internetsociety.org/en/ixp-tracker/?country_code=SG
Keeping Traffic Local

**Popular Content Locality**
A measure of how much locally popular web content is hosted in-country or in-region

77%
Regional
Rank: 5

48%
Asia avg.

See details

Source: Internet Society Pulse • Data: Google CRUX, FintCDN, IPinfo/MannixID

https://pulse.internetsociety.org/reports/sg
Keeping Traffic Local

50/50 Vision
Working together to keep half of all traffic local in selected economies by 2025

Methodology

https://www.internetsociety.org/issues/access/50-50-vision/
Limitations
Limitations

• The data is pulled from external public sources, not always up-to-date.
  • E.g. An indicator is not included if data is missing on more than 25% of countries in the Index.

• Without in-country measurements, it’s difficult to validate the data.
  • RIPE Atlas and OONI are doing great work in this area, but more is needed.

• Some of the data undergoes processing, normalization, and weighing, we use a methodology that is reproducible.
  • You can see raw numbers via API. Email us for access pulse@isoc.org

• Ultimately, the Index benchmarks countries with one another and helps decision makers recognize gaps and weaknesses to conduct further study into validating these and work towards addressing them.
We all have a role to play
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Contribute to Pulse
pulse@isoc.org

Review the Pulse IRI methodology
Thank you