Ultra-Low Latency Connectivity for Financial & Capital Markets

Visit us at www.ctamericas.com
Network Options

- **Multiprotocol label switching (MPLS) virtual private network (VPN):** Get service level agreements with 99.9%-plus availability for secure converged data, voice and video traffic—all on a single network connection.

- **Private line services:** Support your global networking, security, and business continuity requirements with Ethernet Virtual Private Line, Ethernet Private Line, Optical Wavelength Service and International Private Line.

- **Internet bandwidth:** Connect your users and bandwidth-intensive business applications, with superior peering and interconnectivity—plus reliability with a network recovery time of less than 50 milliseconds.
Round Trip Latencies (POP-to-POP)  
June 2018

<table>
<thead>
<tr>
<th>Region</th>
<th>City Pairs</th>
<th>Expected</th>
<th>Guaranteed</th>
</tr>
</thead>
<tbody>
<tr>
<td>China-USA</td>
<td>Shanghai – Chicago</td>
<td>155ms</td>
<td>158ms</td>
</tr>
<tr>
<td></td>
<td>Shanghai – New York</td>
<td>171ms</td>
<td>174ms</td>
</tr>
<tr>
<td></td>
<td>Hong Kong – Chicago</td>
<td>172ms</td>
<td>175ms</td>
</tr>
<tr>
<td></td>
<td>Hong Kong – New York</td>
<td>190ms</td>
<td>193ms</td>
</tr>
<tr>
<td></td>
<td>Hong Kong – Los Angeles</td>
<td>140ms</td>
<td>143ms</td>
</tr>
<tr>
<td>Japan-USA</td>
<td>Tokyo – Chicago</td>
<td>126ms</td>
<td>129ms</td>
</tr>
<tr>
<td></td>
<td>Tokyo – New York</td>
<td>143ms</td>
<td>146ms</td>
</tr>
<tr>
<td>China - Euro</td>
<td>Shanghai – Frankfurt (TMP)</td>
<td>155ms</td>
<td>158ms</td>
</tr>
<tr>
<td></td>
<td>Shanghai – Frankfurt (TSR+)</td>
<td>145ms</td>
<td>147ms</td>
</tr>
<tr>
<td></td>
<td>Shanghai – London</td>
<td>148ms</td>
<td>151ms</td>
</tr>
<tr>
<td></td>
<td>Hong Kong – Frankfurt (TMP)</td>
<td>167ms</td>
<td>169ms</td>
</tr>
<tr>
<td></td>
<td>Hong Kong – Frankfurt (TSR+)</td>
<td>153ms</td>
<td>156ms</td>
</tr>
<tr>
<td></td>
<td>Hong Kong – London</td>
<td>159ms</td>
<td>162ms</td>
</tr>
<tr>
<td></td>
<td>Hong Kong – Moscow</td>
<td>122ms</td>
<td>125ms</td>
</tr>
<tr>
<td>Inner Asia</td>
<td>Shenzhen – Hong Kong</td>
<td>1.82ms</td>
<td>2.00ms</td>
</tr>
<tr>
<td></td>
<td>Shanghai – Hong Kong</td>
<td>25ms</td>
<td>26ms</td>
</tr>
<tr>
<td></td>
<td>Shanghai – Singapore</td>
<td>53ms</td>
<td>55ms</td>
</tr>
<tr>
<td></td>
<td>Shanghai – Tokyo</td>
<td>24ms</td>
<td>26ms</td>
</tr>
<tr>
<td></td>
<td>Hong Kong – Singapore</td>
<td>30ms</td>
<td>32ms</td>
</tr>
<tr>
<td></td>
<td>Tokyo – Singapore</td>
<td>65ms</td>
<td>67ms</td>
</tr>
<tr>
<td>China Mainland</td>
<td>Shanghai – Dalian</td>
<td>35ms</td>
<td>37ms</td>
</tr>
<tr>
<td></td>
<td>Shanghai – Zhengzhou</td>
<td>19ms</td>
<td>20ms</td>
</tr>
<tr>
<td></td>
<td>Zhengzhou – Dalian</td>
<td>36ms</td>
<td>37ms</td>
</tr>
</tbody>
</table>

- Expected Latency figures are based on SDH loopback test (Bandwidth: E1, round trip delay)
- Expected Latency figures are only obtained from tests between the selected POP in each city
Shanghai – Chicago

Primary Routing
Latency: 155ms

**Resilience options can be provided on individual case basis**
Primary Routing
Latency: 171ms

**Resilience options can be provided on individual case basis**

Updated: 03-APR-2015
Hong Kong – Chicago

Primary Routing
Latency: 172ms

**Resilience options can be provided on individual case basis**
Primary Routing
Latency: 190ms

**Resilience options can be provided on individual case basis**
Hong Kong – Los Angeles

Primary Routing
Latency: 140ms

Updated: 14-APR-2017

**Resilience options can be provided on individual case basis**
Tokyo – Chicago

Primary Routing
Latency: 126ms

Updated: 14-APR-2015

**Resilience options can be provided on individual case basis**
Tokyo – New York

Primary Routing
Latency: 143ms

Updated: 03-APR-2015

**Resilience options can be provided on individual case basis**
Resilience options can be provided on individual case basis
Shanghai – Frankfurt (Transit-Kazakhstan)

Primary Routing Latency: 147ms

**Resilience options can be provided on individual case basis**

Updated: 07-APR-2016
Shanghai – London (Transit-Mongolia)

Primary Routing
Latency: 148ms

**Resilience options can be provided on individual case basis**

Updated: 14-APR-2015
**Resilience options can be provided on individual case basis**
Hong Kong – Frankfurt (Transit-Kazakhstan)

Primary Routing
Latency: 156ms

**Resilience options can be provided on individual case basis**
Hong Kong – London *(Transit-Mongolia)*

Primary Routing
Latency: 159ms

**Resilience options can be provided on individual case basis**

Updated: 14-APR-2015
Hong Kong – Moscow (Transit-Mongolia)

Primary Routing
Latency: 122ms

**Resilience options can be provided on individual case basis**
Shenzhen – Hong Kong (Terrestrial Cable)

**Primary Routing Latency: 2ms**

*Updated: 14-APR-2015*

**Resilience options can be provided on individual case basis**
Shanghai – Hong Kong

Primary Routing
Latency: 25ms

Updated: 14-APR-2015

**Resilience options can be provided on individual case basis**
Shanghai – Tokyo

Primary Routing
Latency: 24ms

**Resilience options can be provided on individual case basis**
Hong Kong – Singapore (Equinix)

Primary Routing
Latency: 30ms

**Resilience options can be provided on individual case basis

Updated: 14-APR-2015
Tokyo - Singapore

**Resilience options can be provided on individual case basis**

Primary Routing

Latency: 65ms
Shanghai – Dalian

Primary Routing Latency: 35ms

Updated: 25-SEP-2015

**Resilience options can be provided on individual case basis**
Shanghai – Zhengzhou

**Resilience options can be provided on individual case basis**

Primary Routing
Latency: 19ms

Updated: 14-APR-2016
Zhengzhou-Dalian

Primary Routing
Latency: 36ms

Updated: 14-APR-2016

**Resilience options can be provided on individual case basis
Failover Options

Failover due to primary fault

Automatic Restorative Failover

Manual Restorative Failover
Active Recovery After Failover

**Manual-Recovery on demand**
For OFFNET resources or some submarine cable systems which are not controlled by CT, active recovery procedure is as following:

1. Trouble ticket issued by GCSC upon reception of customer’s requirement
2. Negotiation with OFFNET vendor or submarine cable NOC to determine maintenance window after primary route fault has been fixed
3. Switch customer circuit from backup route to primary route during maintenance window

**Auto-Recovery**
- Domestic SDH systems (International Usage)
- Overseas SDH systems (ONNET)

**Auto-Recovery**
- OFFNET resources OR Submarine cable systems
Proximity Hosting
Transmission POPs Inside Key Securities Exchanges & Financial Data Centers

HKEx Data Center
CME Data Center, Aurora

SGX Data Center
Tokyo Chuo Center 1/F

60 Hudson St.

**Extra latency will be introduced due to inner city optical fiber transmission**
Industry-leading APAC Latency Figures

<table>
<thead>
<tr>
<th>Route</th>
<th>Latency</th>
<th>Route Detail</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hong Kong – New York</td>
<td>189ms</td>
<td>Via SJC+PC-1</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td>198ms</td>
<td>via TPE</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td>218ms</td>
<td>via AAG</td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td>205ms</td>
<td>via EAC+UNITY</td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td>196ms</td>
<td>via IA+PC-1</td>
<td>Other</td>
</tr>
<tr>
<td>Hong Kong – Shenzhen</td>
<td>2ms</td>
<td>HK to SZ Direct</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td>8-10ms</td>
<td>via Guangzhou</td>
<td>Other</td>
</tr>
<tr>
<td>Shanghai – Singapore</td>
<td>53ms</td>
<td>APCN2 via Shantou</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td>58ms</td>
<td>via EAC</td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td>60ms</td>
<td>via IA</td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td>62ms</td>
<td>APCN2 via Hong Kong</td>
<td>Other</td>
</tr>
<tr>
<td>Hong Kong – London</td>
<td>159ms</td>
<td>via Mongolia terrestrial cable</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td>174ms</td>
<td>via Mongolia terrestrial cable</td>
<td>Other</td>
</tr>
</tbody>
</table>
Key Service Features & Benefits

- Competitive SLA pledge
  SLA commitment on latency, MTTR, Service Delivery Date & more!

- Industry-leading Service Availability
  Managed connectivity into exchanges w/ autofailover redundancy

- High Service Security
  Dedicated circuits based on SDH/SONNET

- Scalable Bandwidth
  Available bandwidths up to 100Gig-E with range of access options

- Proximity with Major Financial Exchanges
  24 established low – latency routes directly connecting 13 premier financial markets around the world.

- Global One-Stop Service
  Global 24x7 help desk, trouble ticketing portal and dedicated customer project teams.
Get Connected and Stay Ahead

▪ Schedule a Meeting

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▪ Visit Us: https://www.ctamericas.com