Hong Kong
Financial Data Center
Racing into the Future of Digitalization
NTT Communications is one of the largest data center service providers in the world, offering services at over 140 locations* worldwide under the brand name “Nexcenter”. With an international footprint and business presence, our data center services are designed to meet the needs of global enterprises. We realize our Nexcenter promise through high-quality facilities, industry-leading SLAs, innovative technologies and robust security that are designed to keep our customers always a step ahead of the market. We also understand that it is important to grow with your business, and are committed to offering the same professional service levels and consistent practice no matter where you are located. This assurance has seen many global enterprises choosing our data centers to house their data and applications.

* As of Sep 2015

High Evaluations and Prestigious Awards
Data Centers in Hong Kong

NTT Communications currently operates three data centers in Hong Kong, each offering tailored services that best match our customers’ diverse business needs.

I. Hong Kong Financial Data Center (FDC™) in Tseung Kwan O: FDC1 and FDC2
II. Hong Kong Data Center in Tai Po
III. HKNet Data Center in Kwai Chung
The FDC™ Promise

The role of data centers has evolved. Businesses today are becoming increasingly data driven and digitalized. Modern data centers need to go beyond reliable and secure data storage; they need to be future-proofed with innovative and advanced energy-efficient technologies that cater for better business performance.

The FDC™ is the largest data center¹ in Hong Kong, with industry-leading space, power and cooling capacity. Located on a parcel of 30,000 m² company-owned land in Tseung Kwan O, it is a purpose-built complex with two data center towers (FDC1 and FDC2) and one command and control tower. Its Tier IV ready infrastructure features a vast array of leading-edge technology and new innovations designed for customers who demand the very best on their digitalization journey.

FDC¹-at-a-Glance

- Tier IV ready infrastructure
  - 100% uptime service level
  - Fault tolerant design with no single point of failure
  - Continuous cooling
  - Continuous rating generator
  - Infrastructure compartmentalization
  - Dual utility power
- Capacity
  - 70,000 m²+ gross floor area
  - 7,000+ racks of server space
  - 200MVA power capacity
- Modular design for hybrid tiering
- 8 layers of physical security
- On-premise ASE cable landing station and NTT Communications Global Network node
- Green infrastructure design with LEED Gold certification and market leading PUE

FDC1

FDC1 is the first phase of the complex launched in 2013. Engineered with one objective in mind — always on, always available — it has achieved great success in transforming the hosting landscape for mission-critical data center in Asia.

With over 3,000 racks of server space, FDC1’s Tier IV ready infrastructure offers a sophisticated fault tolerant design that features continuous cooling and infrastructure compartmentalization. It is the first data center in Hong Kong with Tier 4 design certified by Uptime Institute, and the first data center in the region to adopt a modular design that allows customized tier level in different ICT halls (hybrid tiering), giving customers total flexibility for choosing when they want to upgrade from Tier III to the most stringent Tier IV standard.

¹ Offered by data center service providers. As of Dec 2015.
INNOVATIVE DATA CENTER TECHNOLOGIES TO DRIVE BUSINESS PERFORMANCE

FDC2

As digital transformation, big data, cloud and virtualization generate new demands on IT infrastructure, customers are looking for data centers to drive their transformation journeys. They need the right facilities that offer the agility to grow and leap ahead, while driving innovation and opening doors to new revenue streams.

Launched in 2015, the second phase of the data center complex (FDC2) builds on the success of FDC1 to integrate the latest innovative technologies, with the vision to enhance customers’ business performance and optimize Total Cost of Ownership (TCO). With over 4,000 racks of server space, FDC2 is designed with ultra-high power density, ultra-tall rack, innovative energy-efficient cooling and data visualization technologies to create new values and enhance business performance for enterprise customers. It underscores our value as a technology strategy partner for next-generation data centers offering the best-in-class technologies.

FDC2 Key Differentiations
- Ultra-high power density up to 24kVA per rack
- Ultra-tall rack up to 54U
- Cooling Battery - the largest thermal energy storage system in Hong Kong for uninterrupted cooling
- Water-side economization
- Cooling Wall - front-flow cooling with hot aisle containment improve energy efficiency by 20%
- Smart lighting for actionable intelligence
- Virtual Data Center for performance visibility

Cooling Battery - Thermal Energy Storage System
Extreme Level of Rack Power Density

Increase in digitalization and data consumption has seen the demand for more data storage equipment and space grow rapidly. The onset of virtualization and cloud also calls for high density computing applications and equipment that consume more power and emit excessive heat. This makes effective cooling systems critical in order to avoid heat-related failures, as the burden on TCO increases and forms a major obstacle for any digital transformation journey.

FDC2 offers a more sustainable data center solution that enables customers to maximize the utilization of IT equipment and flexibility for future expansion to reduce TCO in the long run. Our extreme level* rack power density of up to 24kVA per rack ensures that high power equipment is housed in an optimal environment. It also supports the use of ultra-tall racks of 54U, which is ideal for top-of-rack cabling topology that maximizes the utilization of servers and network equipment within the same rack.

* AFCOM Data Center Institute categorized Rack Power Density into four levels in 2014:

<table>
<thead>
<tr>
<th>RACK POWER</th>
<th>DENSITY LEVEL POWER RANGE (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>0-4</td>
</tr>
<tr>
<td>Moderate</td>
<td>5-8</td>
</tr>
<tr>
<td>High</td>
<td>9-15</td>
</tr>
<tr>
<td>Extreme</td>
<td>16 and above</td>
</tr>
</tbody>
</table>

Cooling Wall - Front-flow Cooling with Hot Aisle Containment
Energy-Efficient Technologies

A complete suite of innovative energy-efficient technologies and cooling infrastructure design enable extreme level of rack power density, high reliability and lower TCO. Together, they offer a strong value proposition for customers who want a data center solution that grows with their operational demands, while streamlining their TCO in the long term. Key innovations include:

Cooling Battery
Designed to address the continuous cooling requirement for a Tier IV data center, FDC2’s unique thermal energy storage system is equipped with a total of 3,600,000 liters of chilled water, and are by far the largest stratified thermal energy storage system in Hong Kong. It can override 6 cycles of chiller restart without re-charging, and provides 42 minutes of uninterrupted cooling to ensure that the cooling systems remain operational to maintain stable temperature and humidity inside the ICT hall in the case of a power interruption.

Cooling Wall
FDC2’s pioneer front-flow cooling design with hot aisle containment, supports ultra-high power density per rack and improves energy efficiency of the cooling system by more than 20%, compared to the traditional down-flow cooling with cold aisle containment.

Water-side Economization
By elevating the chilled water temperature to 14°C, FDC2 enables water-side economization of 24 days in a year. When wet-bulb temperature is lower than 10.5°C, the chillers will be shut down and the cooling system uses the cooling towers for direct cooling. Together with the Cooling Wall, FDC2 can achieve a market-leading annualized PUE of below 1.5 at full load condition.

Smart Lighting
This Power-Over-Ethernet LED lighting system transforms data of FDC2 into actionable intelligence to help reduce energy costs, enhance security and user safety. Integrated with the access control system, the motion sensor embedded will add an extra layer of security to the data center. It can also be leveraged to direct users during emergency evacuation when needed.
**Enhanced Service Visibility**

FDC2 features a digitalization and big data analysis approach for end-to-end data center lifecycle management. Being a pioneer to adopt Building Information Modeling (BIM), FDC2 takes the concept further by integrating information and data with in-house Data Center Management System (DCMS) to offer a comprehensive solution for lifecycle management of all critical facilities. The integrated automation could provide insights on planning, design, construction, commissioning, and operation of FDC2.

**Virtual Data Center**

Customers can realize the benefits through FDC2’s Virtual Data Center customer portal to gain enhanced visibility for real-time and historical data center performance information, which ultimately helps them make better informed decision and strategic planning.

Through the Virtual Data Center customer portal, customers can visualize and access vital information about the data center, including capacity, efficiency and availability. This largely enhances the transparency of data center service performance.

**Cascade SLAs for Better Service Guarantee**

Along with the new service transparency given by real time data from the Virtual Data Center customer portal, FDC2 is introducing a brand new SLA model that promises better guarantee and transparency. It goes beyond traditional SLAs on power and cooling, and extends to cover connectivity, security and response time. It redefines the industry standards, and offers a brand new approach for always-on assurance and performance visibility that digitalization needs.
Robust Physical Security

Eight layers of physical security measures with digital sign-in through FDC’s Access Management System (AMS) ensure that our customers’ mission-critical assets are in safe hands. Physical security controls at the site, building and lobby entrances, in the lifts, at the floor and ICT hall mantraps right down to the cages and cabins ensure only the right approved personnel can access your servers.

8 Layers of Physical Security at FDC™

1. Campus Entrance Checkpoint with Road Blocking Devices
2. Command & Control Tower Checkpoint
3. Data Center Tower Checkpoint
4. Data Center Floor Checkpoint
5. Data Center Zone Checkpoint
6. ICT Hall Checkpoint with Anti-tailgating System
7. Cage Checkpoint
8. Rack Checkpoint
With NTT Communications’ Tier 1 network infrastructure and Asia Submarine-cable Express (ASE) connected directly with the FDC™, customers can enjoy exceptional ultra-low latency and reliable global connectivity to meet their needs for “frictionless” business communications in today’s fast-changing world.
## Specifications

<table>
<thead>
<tr>
<th>Location</th>
<th>Tseung Kwan O</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building</strong></td>
<td>Dedicated purpose-built data center premises owned by NTT Communications</td>
</tr>
<tr>
<td><strong>Rack</strong></td>
<td></td>
</tr>
<tr>
<td>Rack Capacity</td>
<td>7,000+</td>
</tr>
<tr>
<td>Rack Space Option</td>
<td>Open Area, Caged Area, Private Suite</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td></td>
</tr>
<tr>
<td>Power Density</td>
<td>Max 18 kVA/rack Max 24 kVA/rack</td>
</tr>
<tr>
<td>Utility Power</td>
<td>Dual power substations through diversified paths</td>
</tr>
<tr>
<td>Generator</td>
<td>N+1, continuous rating N + Catcher, continuous rating</td>
</tr>
<tr>
<td>UPS</td>
<td>2N</td>
</tr>
<tr>
<td>UPS Power Distribution</td>
<td>2N Active with STS</td>
</tr>
<tr>
<td>Fuel Distribution</td>
<td>2N, PLC control</td>
</tr>
<tr>
<td>Fuel Storage</td>
<td>36 hours at full load 24 hours at full load</td>
</tr>
<tr>
<td>CRAC</td>
<td>N+1, down flow N+1, front flow, UPS powered</td>
</tr>
<tr>
<td>Chiller</td>
<td>N+1 Water Cooled (Upgradable to 2N, Water Cooled + Air Cooled) N+1, Water Cooled, PLC control</td>
</tr>
<tr>
<td>Makeup Water Storage</td>
<td>36 hours at full load 24 hours at full load</td>
</tr>
<tr>
<td>Chilled Water Distribution</td>
<td>2N, UPS powered                        2N, UPS powered, PLC control</td>
</tr>
<tr>
<td>Continuous Cooling</td>
<td>10 minutes continuous cooling at full load 42 minutes continuous cooling at full load, PLC control</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td>7x24 security operation center and security patrol, CCTV surveillance camera</td>
</tr>
<tr>
<td>Fire Protection</td>
<td>VESDA System (Very Early Smoke Detection Apparatus), FM200 Gas Suppression System and Double Interlock Type Pre-Action Sprinkler System</td>
</tr>
<tr>
<td><strong>Network</strong></td>
<td>Carrier Neutral</td>
</tr>
<tr>
<td><strong>Network</strong></td>
<td>Multiple Local Carrier Entry from diversified paths</td>
</tr>
<tr>
<td>Network</td>
<td>Dual Entrance Room, Local Carrier Room &amp; Meet-me Room</td>
</tr>
<tr>
<td><strong>Service Support</strong></td>
<td>Dedicated in-house 7x24 facility management and service operation support team</td>
</tr>
<tr>
<td>Service Support</td>
<td>In-house 7x24 customer service support team with 7x24 service hotline</td>
</tr>
<tr>
<td><strong>Certificate/Compliance</strong></td>
<td>ISO/IEC 27001, ISO 9001, ISAE3402, PCI-DSS, LEED Gold Design, Uptime Tier IV Design</td>
</tr>
<tr>
<td>Certificate/Compliance</td>
<td>ISO/IEC 27001, ISO 9001, ISAE3402, PCI-DSS, LEED Gold Design</td>
</tr>
</tbody>
</table>