Contents

1. 5 Reasons, Why Beijing Airport Choose LampSite
2. Beijing Airport LampSite Solution Introduction
3. Highlights of LampSite in Beijing Airport
**Reason 1**: Beijing airport is the largest airport in China, which is one of the important landmarks in Beijing, it also is an important brand for operators, user experience is essential.

**Area**: 1.4M m²

**Passengers**: 80M/year

**LTE MIMO is Must**
Reason 2: Traditional solution need 2 DAS to support LTE MIMO, which is hard to deploy

Traditional DAS

LampSite

Single pRRU support MIMO, which is easier to deploy
Reason 3: Special projects, more limitation of construction, construction period is not controllable, the DAS LTE performance is more uncontrollable

Internal and external structure is very complex

- Sensitivity scenarios, airport property have more restrictions and requirements on the device configuration, installation location, routing, security performance and other aspects
- The existing DAS system is embedded in the building, it is difficult to build another new DAS system for MIMO, which is hard to ensure link balance and system performance
Reason 4: LampSite supports flexible capacity, one deployment support long-term capacity evolution, long-term investment protection.

Initial period:
- OSS
- BBU
- RHUB
- Cells 1, 2, 3

Later stage:
- OSS
- BBU
- RHUB
- Cells

Software cell split capacity increase $N$ times.
Reason5: LampSite E2E Visible, Clear KPI Traffic Distribution, Easy Troubleshooting

Traditional DAS
- Coupler
- Antenna
- Splitter

No OM for DAS

LampSite
- pRRU
- RHUB
- BBU
- Unified OSS with Macro

Monitoring all end nodes, no blind spot
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### Beijing Airport LampSite network size

<table>
<thead>
<tr>
<th></th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBU</td>
<td>3</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>RHUB</td>
<td>&lt;50</td>
<td>&lt;100</td>
<td>100+</td>
</tr>
<tr>
<td>pRRU</td>
<td>100+</td>
<td>400+</td>
<td>600+</td>
</tr>
<tr>
<td>Cells</td>
<td>6</td>
<td>21</td>
<td>37</td>
</tr>
</tbody>
</table>

46 BBU, 2200+ pRRU, 100+ Cells
**Customized design for different traffic features to guarantee coverage, mean while controlling interference**

- **Easy deployment**: utilize LampSite ethernet cable deployment flexibility, deployed pRRU in the compass box, ceiling, glass walls, shops and other locations, to ensure the implementation of the project.

- **Easy expansion**: Rational use of directional antenna and pRRU physical location separation, to ensure the quality of coverage (cell splitting). Deploy one more ethernet cable, convenient expansion, and disaster recovery.

- **Reasonable coverage**:

<table>
<thead>
<tr>
<th>Area type</th>
<th>Region definition</th>
<th>Coverage criteria</th>
<th>RSRP (dBm)</th>
<th>RS-SINR (dB)</th>
<th>Cell edge rate (DL/UL)</th>
<th>Single user peak throughput (Mbps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Departure hall, check-in processing zone, Departure lounge, VIP terminal</td>
<td>High</td>
<td>≥-100</td>
<td>≥6</td>
<td>DL/UL : 6/2</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Arrival hall, baggage claim area, shopping area, dining area, staff office</td>
<td>Common</td>
<td>≥-105</td>
<td>≥3</td>
<td>DL/UL : 4/2</td>
<td>DL/UL:150/50</td>
</tr>
<tr>
<td>III</td>
<td>Airport equipment room, warehouse, basement, etc.</td>
<td>Low</td>
<td>≥-110</td>
<td>≥0</td>
<td>DL/UL : 3/2</td>
<td></td>
</tr>
</tbody>
</table>
Customized design for different traffic features to guarantee coverage mean while controlling interference

Different area planning different pRRU cover radius

Directional antenna cover, reduce interference

Reasonable design overlap coverage area, to ensure the follow-up expansion is convenient

Use compass box to block

Coverage  Capacity  Handover  Deployment  Expansion
Capacity Planning Need to Meet the Demands of Next 3~5 Years

LTE business forecast in the next 3~5 years

<table>
<thead>
<tr>
<th>Input parameters</th>
<th>values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport passenger traffic volume (million)</td>
<td>8000</td>
</tr>
<tr>
<td>Daily busy hour traffic flow (person)</td>
<td>18000</td>
</tr>
<tr>
<td>Terminal penetration</td>
<td>30%</td>
</tr>
<tr>
<td>Total number of registered users</td>
<td>5400</td>
</tr>
<tr>
<td>LTE registered user scale</td>
<td>50%</td>
</tr>
<tr>
<td>Busy time LTE registered users</td>
<td>2700</td>
</tr>
<tr>
<td>Average rate of LTE users</td>
<td>DL/UL: 5M/2M</td>
</tr>
</tbody>
</table>

- Beijing airport is expected in the next 3~5 years busy hour LTE registered users to **2700** people
- According to the characteristics of the data traffic, it is expected to reach the user average rate of **downlink 5Mbps, uplink 2Mbps**

According to the LTE traffic model to design the cell number

<table>
<thead>
<tr>
<th>Input parameters</th>
<th>values</th>
</tr>
</thead>
<tbody>
<tr>
<td>User activation rate in busy hour</td>
<td>30%</td>
</tr>
<tr>
<td>Online user number in busy hour</td>
<td>810</td>
</tr>
<tr>
<td>DL/UL traffic duty cycle</td>
<td>22%/15%</td>
</tr>
<tr>
<td>LTE DL/UL scheduling user number in busy hour</td>
<td>179/122</td>
</tr>
<tr>
<td>DL/UL Cell average throughput (Mbps)</td>
<td>30M/20M</td>
</tr>
<tr>
<td>DL/UL capacity demand</td>
<td>895M/244M</td>
</tr>
<tr>
<td>DL/UL cell number</td>
<td>30/13</td>
</tr>
</tbody>
</table>

- In the next 3~5 years, Beijing airport capacity will be **DL 895Mbps, UL 244Mbps**
- Beijing airport cell number: DL>30 ; UL>13
According to different area’s traffic feature to plan cells

**T3 A-3 departure hall**: dense User, low mobility, high incidence of various data services, need to fully absorb capacity, planning 11 cells

**T3 A-2 Arrival hall baggage claim**: User are mainly short stay, capacity is small, coverage is the main demand, planning 2 cells

**T3 A-3 Security port**: Inspection area without traffic, suitable for setting into the cell boundary, ensure user handover experience

**T3 A-B2 car park**: low traffic, planning one cell, ensure that the wide area continuous coverage, to avoid handover, to ensure user experience
Iterative simulation and verification, to ensure the solution is excellence.

Omnidirectional antenna simulation results

Directional antenna simulation results

Using professional IBWAVE and other simulation tools, according to the detailed simulation results to design and adjust the solution, to ensure that the minimum interference.

After changed omni-directional antenna with directional antenna, the overlap area SNIR is obviously improved.
According to the layout of the building, to effectively control the interference.

Set handover area in low traffic region, such as the security zone and the working area.

According to the structure of the building to set the handover region, to facilitate cell splitting and expansion.

Working area use multi pRRU co-cell to reduce interference.

- pRRU deploy into the room, using of wall blocking, easy to splitting, to ensure the user experience.
- Upper and lower layer co-cell.

Coverage | Capacity | Handover | Deployment | Expansion
According to the different scenarios customized installation strategy

**Ethernet cable deployment**

The narrow line and the construction space of the airport are suitable for the ethernet cable deployment.

**pRRU deployment**

- pRRU deployed in the compass box, Both to ensure that the implementation of the airport, mean while do not affect the appearance (T3A-3F)
- pRRU deployed in the shop
- pRRU ceiling mounting in the shop
- pRRU deploy behind the glass (T3A-3F)
- Deploy in the ticket counter (T3A-4F)
- pRRU wall mounting behind the glass

- Compass box
- Directional antenna rod mounting
Combination of product feature and engineering design to ensure smooth evolution.

Initial stage co-cell

T3A 3F can be from the current 11 cells, through software configuration quickly expanded to 23 cells or more.

Future cell splitting

Cell A
Cell B

pRRU level cell splitting ensure that the precise expansion of LampSite
Strict quality control, standardization work

Installation guide

Strict quality control, standardization work
Project fast delivery, excellent network quality

<table>
<thead>
<tr>
<th>Area</th>
<th>Equipment</th>
<th>Number</th>
<th>Completion rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1/T2/T3</td>
<td>BBU</td>
<td>46</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>RHUB</td>
<td>400+</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>PRRU</td>
<td>2200+</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Test result:** all KPI are better than China Unicom demand

- Download peak: 146Mbps
- Upload peak: 49Mbps
- 99.97% area RSRP > -100dBm
- 99.16% area SINR > 6dB

Only using 3 months finish 2200+ pRRU, 400+ RHUB and 46 BBU deployment
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### Key Words LampSite in Beijing Airport Project

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<thead>
<tr>
<th>Fast Deployment</th>
<th>High Performance</th>
<th>Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4 working hrs/day</strong>&lt;br&gt;00:00~04:00&lt;br&gt;<strong>4 months</strong>&lt;br&gt;<strong>2200+ pRRU</strong>&lt;br&gt;<strong>1/3 time of DAS</strong></td>
<td><strong>140Mbps</strong>&lt;br&gt;Peak speed&lt;br&gt;<strong>100Mbps</strong>&lt;br&gt;Average speed&lt;br&gt;<strong>LTE MIMO</strong>&lt;br&gt;<strong>3 times of DAS</strong></td>
<td><strong>Reduce 50%</strong>&lt;br&gt;deployment cost than DAS&lt;br&gt;<strong>Reduce 10%</strong>&lt;br&gt;total cost than DAS&lt;br&gt;<strong>90% cost of DAS</strong></td>
</tr>
</tbody>
</table>
Thanks to a good user experience, Beijing Capital Airport China Unicom 4G traffic increased 27 times in 1 year, the number of users increased 26 times.
Thank You

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