Fujitsu 5G system green technologies
Based on prediction of user behavior and usage

<table>
<thead>
<tr>
<th>Application</th>
<th>Green Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>User application/Business application</td>
<td>Predict user mobility and application usage, and reduce redundant resources.</td>
</tr>
<tr>
<td>RIC/SMO</td>
<td>Run on shared cloud resources with minimum power consumption.</td>
</tr>
<tr>
<td>Virtualized CU/DU</td>
<td>Keep QoE and reduce power consumption with optimal radio resource allocation for the number of users to be served. May halt radio at night for zero power.</td>
</tr>
<tr>
<td>Radio Unit</td>
<td></td>
</tr>
<tr>
<td>UE</td>
<td></td>
</tr>
<tr>
<td>User mobility</td>
<td>CO₂ emission of total system to be 1/2 of today’s amount by FY 2025 *</td>
</tr>
</tbody>
</table>

* Compared with conventional RAN system

© 2022 Fujitsu Limited
Optimizing control of base station resources by analyzing packets and Users Quality of Experience (QoE) estimation

RIC/SMO

Packet Capture

Traffic estimation per each application

Optimization control by QoE estimation

Estimate network traffic per each application for multiple pins of network slicing

User application/
Business application

Low latency Requirement

High bandwidth

GTP

S-NSSAI
Cell-ID

QFI (QoS Flow)
Session

Video
Remote controlling
Office Apps

autonomous driving
AR/VR

Sensor

This material includes information from a project commissioned by the New Energy and Industrial Technology Development Organization (NEDO).
Fujitsu 5G system green technologies
Based on prediction of user behavior and usage

5G system energy and facility resource reduction

User traffic volume (Line Chart)
Energy and facility resource (Bar Chart)

Electric power and facility resource amounts are fixed based on the maximum value + secure buffer
Dynamically reduce resources based on traffic

Technologies

Non real-time control
Auto Cell Re-Design Technology
- AI/ML predictions future traffic fluctuations
- Digital Annealer Technology Enables Fast Optimal Cell Design Based on Predictions

Real-time control
Dynamic Resource Allocation Technology
- Scheduler technology and flexible fronthaul configuration allow flexible changes in the relationship between RUs and Virtualized CU/DU.
- Provides operational resource optimization
Fujitsu virtualized CU/DU Key differentiators

virtualized CU/DU that achieves both power saving and performance

1. High Performance/High Capacity
   - With DU Accelerator Card
   - Contribution to reduced installation space and power consumption

2. Flexible dynamic resource allocation according to the number of cells
   - Utilizing Flexible FH Structure
   - Allocate cell resources according to traffic and operating conditions

3. vRAN Autoscale
   - By resource control per cell

4. Automatic cell re-design
   - Use up vRAN resources to the fullest

This material includes a part of outcomes from a project commissioned by the New Energy and Industrial Technology Development Organization (NEDO).

© Fujitsu 2022
Fujitsu 5G system green technologies
Based on prediction of user behavior and usage

RU Power Consumption Reduction technologies with RIC/SMO

Achieve “No data, no power” (0 bit, 0 watt) and “Zero power standby” by interworking with RIC/SMO

High-gain antenna technology, and high efficiency amplifier technology

Level of Service Load (Amount of Data Passing RU (bits))

No Load
Light Load
Medium Load
Heavy Load

Power consumption curve of current RU
Power consumption curve when relevant green technology is applied

- High-gain antenna technology
- High efficiency amplifier technology

Optimization and Sleep Control

RIC/SMO

Areas with fewer users
Areas with a high number of users

direction of user movement during the day
Fujitsu Radio Technology
Key differentiators

High efficiency power amplifier and in-house device technology that achieves power saving

1. High Efficiency Power Amplifier
   - DPD technology achieves high efficiency power amplifier with low ACLR
   - Reduce power consumption of RU along with high gain antenna technology

2. In-house device development
   - World first RFIC supporting multi-beam multiplexing for mmWave
   - High-capacity with low power consumption and small size

3. Sleep control of RU
   - Now power consumption during sleep mode
   - Reduce power consumption by “0-bit, 0-watt” technology

4. Device technology toward 6G
   - In-house development of GaN-HEMT, InP-HEMT device for 6G
   - High output power in Sub-THz (100-300GHz) frequency range

© Fujitsu 2022
Reduce environmental impact throughout the product life cycle

Percentage of CO2 emissions through the product life cycle *

Power consumption in operation

Operation process

Technologies to reduce power consumption (product-relevant only)

Radio Unit

Higher efficiency

Higher sensitivity

Power consumption to be reduced to 1/2 in FY2025

Optical Transport

Photonics-Electronics Convergence technology

Larger capacity and higher performance

Power consumption to be reduced to 1/2 in FY2025

Disposal process

Waste reduction *

Easy-to-recycle design

Easy-to-dismantle design

Raw material labeling

Reuse of parts

Use of recycled materials

Material

Manufacturing, Logistics

Less than 10%-

Less than 5%

More than 80%

Less than 5%

Material/Manufacturing/Logistics processes

Reduction of material*

Smaller and lighter

Reduce the parts

Recycled materials

Less packing materials

© Fujitsu 2022

*Fujitsu Product LCA Initiatives
https://www.fujitsu.com/jp/about/environment/lca/index.html
Thank you