About ARIB

Establishment
- 15 May 1995 as a public service corporation
- By merging two organizations, RCR and BTA, who had worked on standardization from 1985 to 1995.

RCR: Research & Development Center for Radio Systems
BTA: Broadcasting Technology Association

Objectives
- To develop technical standards for radio systems as “ARIB Standards”
- To conduct study and R&D for utilization of radio waves
- To conduct correspondence, coordination and cooperation with foreign organizations

Members (as of 4 August 2017)
- Regular members: 187
  - Telecom Operators: 8
  - Broadcasters: 18
  - Manufactures: 133
  - Others: 28
- Supporting members: 24
ARIB Activity - Work Contents

- **Study/R&D - Standardization**
  - work on telecom (Radio) & broadcasting fields
  - develop Standard by consensus

- **Promotion of Radio Industry**
  - hold special seminars, monthly seminars
  - issue yearbook, quarterly bulletin, weekly news

- **Consultation on Radio Wave Use**
  - design radio links / select best available frequency for microwave and satellite links

- **Cooperation with SDOs**
  - having MoU and Agreement with 16 organizations world wide
Standardization Flow

Demands for radio systems

Committees and subordinate groups for standardization inside ARIB

Technical Committee

Advanced Wireless Communications Study Committee

Electromagnetic Environment Committee

Study Groups

R&D Groups

Results of R&D

Draft ARIB Standard

Standard Assembly

ARIB Standard

Considerations on Technical Requirements

Rule making by the Ministry (Mandatory)

Draft Standards

MIC : Ministry of Internal Affairs and Communications

MIC

Other Organization

Draft Standards

Considerations on Technical Requirements

Rule making by the Ministry (Mandatory)
Major Issues on Standardization Activities

- **Big three issues**
  - 5G : Collaborate worldwide through 5GMF
  - UHDTV : Promote the system worldwide
  - ITS : Harmonized (co-existence of ITS standards, ITS and other systems) frequency bands for the implementation of evolving ITS

- **Close cooperation with Fora / Consortia**
  - draft standard with complete specification
  - full IPR submission
    - gathering and analyzing information on IPR policy
  - English Version of ARIB Standards
Challenges on R&D Activities

- Establishment of 5G Trial Project Promotion Center
  - Actively involved in the 5G Field Trial led by MIC

- Development of New Wireless Access System towards IoT

- Development of Advanced private wireless communication systems
Suggestions to ASTAP/APT

- To facilitate collaboration and cooperation between ASTAP and AWG;
  - e.g. Seamless access communication systems, IoT application/services, security, etc.

- To hold a round-table discussion involving developing countries on a specific topic;

- To develop recommendations rather than reports in the APT work programs; and

- To keep the appropriate interval between ASTAP and AWG meetings more than one month.
Thank you for your attention!

http://www.arib.or.jp/english/index.html
http://5gmf.jp/en/
Supplementary Slides
ARIB in Summary

[ as of 31 March, 2017 (31 March, 2016) ]

- **Membership**
  - Regular Member : 189 (195)
  - Supporting Member : 13 ( 4)

- **Standardization**
  - Standard (STD) : 165 (166)
  - Technical Report (TR): 70 ( 66)

- **Technical Committee**
  - Study Group : 1 ( 3)
  - R&D Group : 4 ( 4)

- **Advanced Wireless Communications Study Committee (ADWICS)**
  - Subcommittee : 4 ( 4)

- **Promotion Strategy Committee**
  - Subcommittee : 1 ( 1)
  - ISDB-T : 19 countries ( 18)
    (new : El Salvador, January 2017)

- **Electromagnetic Environment Committee**
  - Subcommittee : 2 ( 2)
## ARIB Activity - Statistics -

<table>
<thead>
<tr>
<th>(FY)</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Member</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular members</td>
<td>208</td>
<td>211</td>
<td>195</td>
<td>189</td>
</tr>
<tr>
<td>Supporting members</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td><strong>Income</strong> (100M¥)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>member fee</td>
<td>2.4</td>
<td>2.4</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Business</td>
<td>7.1</td>
<td>6.4</td>
<td>5.3</td>
<td>5.2</td>
</tr>
<tr>
<td>- consultation</td>
<td>3.0</td>
<td>2.4</td>
<td>1.8</td>
<td>2.0</td>
</tr>
<tr>
<td>- others</td>
<td>4.1</td>
<td>4.0</td>
<td>3.5</td>
<td>3.2</td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STD (Standard)</td>
<td>155</td>
<td>159</td>
<td>166</td>
<td>165</td>
</tr>
<tr>
<td>TR (Technical Report)</td>
<td>64</td>
<td>63</td>
<td>66</td>
<td>70</td>
</tr>
</tbody>
</table>
Secretariat

Secretary General: Mr. Fusaki MATSUI
Managing Director: Mr. Shunsuke KODAMA
Executive Director: Dr. Shigeki MORIYAMA
Executive Director: Mr. Seiji NISHIOKA

Administration Department
- General Affairs
- Personal Affairs
- Accounts

R&D Headquarters
- Investigation and R&D
- Development of Technical Standards

Radio Utilization Consulting Department
- Consultation and Information Services for Spectrum Utilization

Planning and International Affairs Department
- Administrative work related to "ARIB Standards"
- Education and Popularization
- Correspondence with other national/international standards organizations

Development Center
5G Trial Project Promotion Center
9 Groups
Structure of ARIB
ARIB Standard Assembly

- **Establishment**
  - May 1995

- **Operation**
  - To ensure fairness and transparency
  - To set standards by consensus

- **Membership**
  - Open to any entity, organization and person
  - Independent from ARIB membership
  - Members: 168 (as of 4 August 2017)
    - Telecom Operators: 7
    - Broadcasters: 14
    - Manufactures: 126
    - Others: 21

- **Holding period**
  - 4 times a year
Outcome from Standard Assembly

- **ARIB Standard (STD)**
  - Technical requirement for radio systems
- **ARIB Technical Report (TR)**
  - Operational guidelines for radio systems

**Number of STD and TR**

<table>
<thead>
<tr>
<th>Category</th>
<th>STD</th>
<th>TR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telecommunications</td>
<td>92</td>
<td>24</td>
</tr>
<tr>
<td>Broadcasting</td>
<td>73</td>
<td>46</td>
</tr>
</tbody>
</table>

[As of 31 March, 2017]

- **ARIB Standard URL**
  
Big Three Issues on Standardization
- 5G, UHDTV, ITS -
【5G】Action plan (mid-term) of 5GMF

Accelerate practical implementations of 5G towards 2020.

- **Vision**
- **Requirements**
- **Proposal**
- **SPECs**
- **WS**
- **Evaluation**

**Rel.13 (4G)**
**Rel.14 (LTE-Advanced Pro)**
**Rel.15 (5G Phase1)**
**Rel.16 (5G Phase2)**

**Concept**
**System Trial by MIC**

- **2019 Rugby WC Tokyo**
- **2020 Tokyo Olympic Paralympic**

**5GMF White Paper**
## Outline of experiment

<table>
<thead>
<tr>
<th>I</th>
<th>High-definition video content distribution and wide area surveillance, telemedicine of general hospitals and regional clinics</th>
<th>Site</th>
<th>Technology target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tokyo</td>
<td>Enhanced mobile broadband</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wakayama</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>High-definition video delivery to high-speed mobile body (railway, bus)</td>
<td>Site</td>
<td>Technology target</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tochigi</td>
<td>Enhanced mobile broadband</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shizuoka</td>
<td>Mobility</td>
</tr>
<tr>
<td>III</td>
<td>Real-time data transmission with mobile, such as remote operation of construction machine</td>
<td>Saitama</td>
<td>Ultra-reliable and low latency</td>
</tr>
<tr>
<td>IV</td>
<td>Simultaneous delivery of free viewpoint images at indoor stadium and collection and distribution of high-definition images at the railway station</td>
<td>Site</td>
<td>Technology target</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Okinawa</td>
<td>Enhanced mobile broadband</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tokyo</td>
<td>High connection density</td>
</tr>
<tr>
<td>V</td>
<td>Running in rows of trucks, remote monitoring and control of vehicles</td>
<td>Yamaguchi</td>
<td>Ultra-reliable and low latency</td>
</tr>
<tr>
<td>VI</td>
<td>Logistics management and inventory management from production to consumption, smart office and telework</td>
<td>Site</td>
<td>Technology target</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hokkaido</td>
<td>Massive machine type communications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Osaka</td>
<td></td>
</tr>
</tbody>
</table>

Coverage and outdoor driving experiments in a large premise

Outdoor trial in open square environments crowded with people

Indoor environments crowded with people
Expected Situation

Tokyo Olympic and Paralympic Games are televised in 4K / 8K.
Enthusiasm for the Olympic Games are shared nationwide through public viewing.
Many people are enjoying 4K / 8K programs at home

Reception environment of LHCP are well developed as well as that of RHCP.

Various full broadcasting programs via BS (LHCP) and 110E CS (LHCP) are televised.

RHCP: Right Hand Circular Polarization, LHCP: Left Hand Circular Polarization
【UHDTV】Technology for 4K/8K

**UHDTV Broadcasting**

<table>
<thead>
<tr>
<th>Video (Resolution)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2K</strong></td>
</tr>
<tr>
<td>Approx. 2 million pixels</td>
</tr>
<tr>
<td><strong>4K</strong></td>
</tr>
<tr>
<td>Approx. 8 million pixels</td>
</tr>
<tr>
<td>4-fold compared with 2K</td>
</tr>
<tr>
<td><strong>8K</strong></td>
</tr>
<tr>
<td>Approx. 33 million pixels</td>
</tr>
<tr>
<td>16-fold compared with 2K</td>
</tr>
</tbody>
</table>

**Sound**

22.2 Multi-channel Sound

**SDR / HDR Contrast**

Source: NHK
【ITS】Enhancement of ITS Connect services

- Addition of Infrastructure-to-Infrastructure Communication (700MHz)

1. Broad provision of approaching emergency vehicle
   - Addition of Infrastructure-to-Infrastructure Communication (700MHz)

2. Broad provision of traffic signal information (from multiple intersection)

3. Failure resistant

**Current system**
- Traffic control center
- Traffic signal information
- Interlocking
- Interlocking does not work
- Line failure
- Disconnection

**I to I communication added system**
- Traffic control center
- Traffic signal information
- Interlocking
- Secondary line
- Main line
- Disconnection
Standards Collaboration (General)

Up Stream

ITU

AP&T

AWG

ASTAP

MIC : Ministry of Internal Affairs and Communications, Japan

Down Stream

ARIB

ITU

GSC/GRSC

ATIS

CCSA

ETSI

ISACC

TIA

TTA

TTC

MIC

CCSA

TTA

TTC

ITU Standards Meeting
Relation with other organizations
(Specific Projects)

Broadcasting
- ARIB/DVB Regular Meeting
- ETSI/DVB
- SMPTE
- FoBTV

Telecommunications
- (IMT-2000/Advanced)
  - 3GPP/3GPP2
- (IMT-Advanced)
  - CJK IT Standards Meeting
- (Wireless Access/WLAN/ITS)
  - IEEE 802.11, 16, 20, etc.
  - WiMAX Forum
  - XGP Forum
  - ETSI TC-ITS
  - oneM2M