Business modelling for SaT5G use cases

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Integrated Satellite & 5G networks

- What can be the role of satellite in 5G networks?
- Where does the integrated network provide a viable alternative compared to terrestrial-only solutions?
- What is the average cost per user and how does it relate to the willingness to pay?
- Who bears the risk in case of a failure in the integrated network?
- How can technological evolutions such as slicing and caching help the business case?
Techno-economic analysis of integrated sat-5G networks

Consists of multiple, iterative steps:

- Evaluating new business models, including the role of a broker
- Calculation of the total cost for deploying and operating the network
- Showing the impact of technological innovation on the total cost
  - (1) impact of caching – less bandwidth to be used over the backhaul (satellite) link
  - (2) impact of network slicing – more efficient use of resources
- Evaluating the uncertainty that links the model outputs to the inputs.
Total Cost of Ownership (TCO) Model

The goal of the TCO model is to evaluate for which use cases and scenarios satellite provides a viable alternative to terrestrial connectivity solutions.
Use case 1: Edge delivery & offload

Updating the VOD content of CDN nodes and providing a live streaming service
Use case 1: Edge delivery & offload

Updating the VOD content of CDN nodes and providing a live streaming service

The ACPU is higher in low population density areas than in high population density areas (e.g. France vs Botswana).

<table>
<thead>
<tr>
<th>ACPU/#CDN</th>
<th>20</th>
<th>100</th>
<th>1000</th>
<th>6000</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACPU</td>
<td>0.002€</td>
<td>0.01 €</td>
<td>0.1€</td>
<td>0.4 €</td>
</tr>
<tr>
<td>Bandwidth saving</td>
<td>1 Gbps</td>
<td>7 Gbps</td>
<td>76 Gbps</td>
<td>457 Gbps</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACPU/CDN</th>
<th>3</th>
<th>9</th>
<th>125</th>
<th>426</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACPU</td>
<td>0.02€</td>
<td>0.04€</td>
<td>0.3€</td>
<td>1.1€</td>
</tr>
<tr>
<td>Bandwidth saving</td>
<td>228.5 Mbps</td>
<td>685.5 Mbps</td>
<td>10 Gbps</td>
<td>32 Gbps</td>
</tr>
</tbody>
</table>
The goal of the cost allocation model for network slicing:

- fairly allocate network costs to deployed slices (services) and,
- show that network slicing makes more efficient use of the network.
Use case 2: 5G fixed backhaul

Satellite backhaul for providing eMBB to rural areas
Use case 2: 5G fixed backhaul

Satellite backhaul for providing eMBB to rural areas

Cost allocation for network slicing

Cost saving of network slicing in the core network

<table>
<thead>
<tr>
<th>Cost 5G core per Mbps</th>
<th>Cost of the traditional core network</th>
<th>Cost reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>21€</td>
<td>38 euro per Mbps (5 to 6 euro per Mbps for the hardware and 30 to 35 euro per Mbps for software).</td>
<td>45%</td>
</tr>
<tr>
<td>53€</td>
<td>60 euro per user.</td>
<td>12%</td>
</tr>
</tbody>
</table>
Different business models for SaT5G solution

SaT5G solution for providing inflight connectivity
Business models for inflight connectivity

**Wholesale model**
- End user pays € to MNO for Connectivity
- MNO charges Airline € for full project

**Retail model**
- End user pays € to MNO for Connectivity
- MNO charges Airline and Share of revenues

**Freemium wholesale model**
- End user pays € (premium) to MNO for Connectivity
- MNO charges Airliner € for full project

**Freemium retail model**
- End user pays € (premium) to MNO for Connectivity
- MNO charges Airliner and Share of revenues
Integrating satellite communication into 5G networks causes management issues.

This raises several questions:

- Who bears the risk in case of a failure in the network?
- How to manage the network of another operator?
- How to get the best offer for a specific location with specific requirements?
- How to forecast demand to justify investment?

➢ A trusted third party can be the appropriate solution
Different business models for the broker

Based on the lifecycle of satellite resources reservation

**BM 1: the broker as a negotiator**

- **Negotiation process:** Get SNO offers
  - Know the different services provided by the SNOs
- **Buy or lease satellite equipment:** Make the contract
- **Configure the OSS:** Configure the equipment and set up connection with satellite
- **Use satellite resources:** Release radio resources
- **Give back leased satellite equipment:**

**BM 2: the broker as a leasing company**

- **Negotiation process:** Get SNO offers
  - Know the different services provided by the SNOs
- **Buy or lease satellite equipment:** Make the contract
- **Configure the OSS:** Configure the equipment and set up connection with satellite
- **Use satellite resources:** Release radio resources
- **Give back leased satellite equipment:**

**BM 3: the broker as a re-selling operator**

- **Negotiation process:** Get SNO offers
  - Know the different services provided by the SNOs
- **Buy or lease satellite equipment:** Make the contract
- **Configure the OSS:** Configure the equipment and set up connection with satellite
- **Use satellite resources:** Release radio resources
- **Give back leased satellite equipment:**
Main takeaways from the techno-economic analysis

Value network and business model
• Identification of key stakeholders
• Establishment of value network
• Potential business models

Broker: a third-party facilitates interactions between different stakeholders.

Different business models are possible e.g. wholesale model, retail, sponsorship etc.

Sensitivity Analysis
• Basic sensitivity analysis
• Global sensitivity analysis

Viability study
• TCO model
• Revenue assumption
• Comparison between ARPU and WTP

Impact of new technology on business case
• Caching popular content
• Network slicing
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SaT5G solution is economically viable for:
• rural areas deployment
• VOD catalogue updates
• small businesses
• inflight connectivity
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Sensitivity Analysis
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Impact of new technology on business case
- Caching popular content
- Network slicing

Caching popular content to the edge saves more from 20% to 40% of the OPEX;
Network slicing makes efficient use of the network and saves costs on the core network side
Satellite multicast decreases the OPEX for the integrated SaT5G solution
The ACPU is very sensitive to:
- population density variation (i.e. to the number of users).
- caching rate
- bitrate per user
Main takeaways from the techno-economic analysis

Results show that an integrated satellite-5G network can definitely provide a viable alternative to terrestrial-only solutions, given that the right use is made of edge caching, slicing and third-party management.
The broker emulator

Keith Briggs (BT, UK)