Demand-aware Resource Management Techniques for Flexible Broadband Satellite Communication Systems

SIGCOM Group

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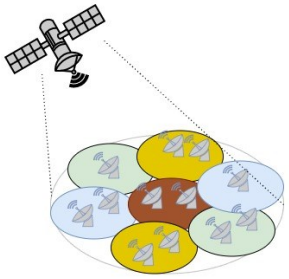
Introduction

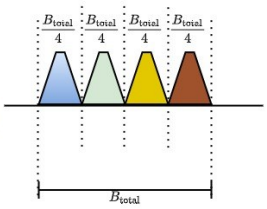
- With the wide range of satellite applications available, end-users are **increasingly demanding satellite** services.
- The satellite is expected to accommodate this increasing **heterogeneous demand**.
- However, satellite **resources are limited**, and **proper resource management** is necessary to meet the increasing demand.

Conventional Resource Management Technique

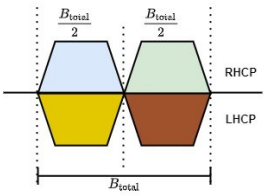
- Multi-beam technology



- Frequency reuse scheme
- Uniform resource allocation
- Example, four color scheme

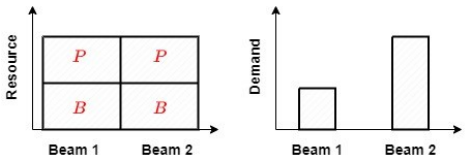


Single polarization



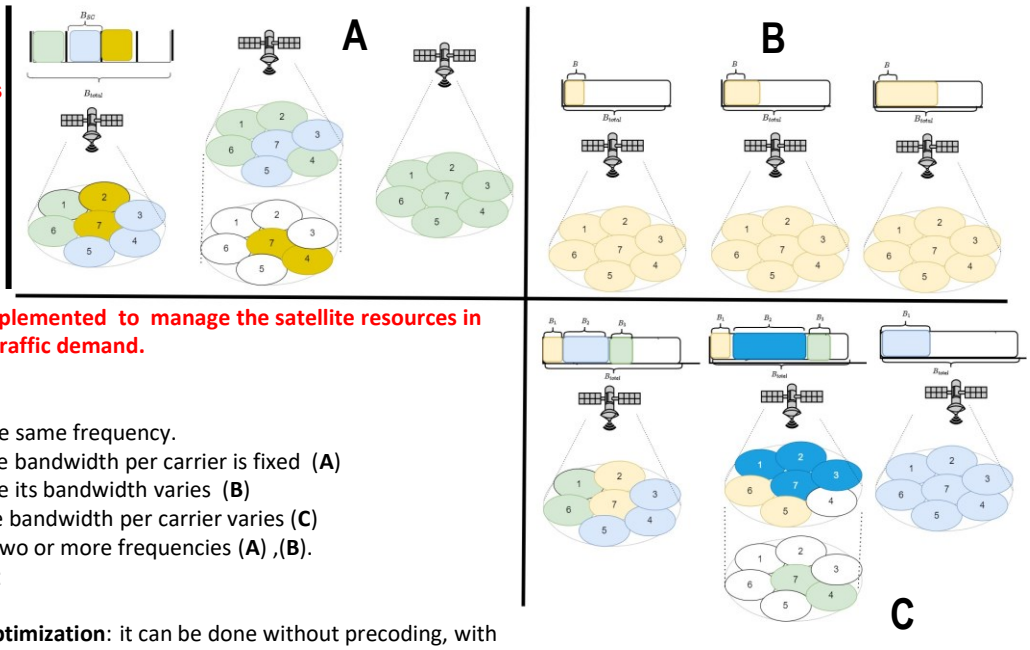
Dual polarization

- This resource allocation is not efficient for heterogeneous demand.
- We may not be able to provide a service if there is high demand.
- Example, we may not satisfy user demand in Beam 2.



Demand-Aware Resource Management Techniques for Flexible Broadband Satellite Communication Systems

- Multi-beam technology
- **Onboard digital payloads**
  - ✓ It is possible to change the **bandwidth**, **carrier frequency**, and **transmit power** of the system.



Advanced algorithms can be implemented to manage the satellite resources in response to the heterogenous traffic demand.

The algorithm is based on:

- Aggressive frequency reuse
- Multiple beams can reuse the same frequency.
- Multi-carrier operation while bandwidth per carrier is fixed (**A**)
- Single-carrier operation while its bandwidth varies (**B**)
- Multi-carrier operation while bandwidth per carrier varies (**C**)
- Each beam can be assigned two or more frequencies (**A**) ,(**B**).
- Interference management:
  - ✓ **Power optimization**
  - ✓ **Flexible precoding optimization**: it can be done without precoding, with partial precoding , or with full precoding to control interference.

INSTRUCT BSG SatCom

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