Kongsberg Satellite Services

- HQ in Tromsø, Norway
- Branch offices at Svalbard, Oslo and in Stockholm.
- 130 employees
- Support of about 18000 satellite passes monthly
- World’s largest commercial ground station service provider
- Operates 9 ground station facilities including both Antarctic and Arctic locations
Background

- Small Satellites for Earth Observation
- We are talking about a very large range of missions, differing in
  - Technology
  - Purpose
  - Concept

- No «One fits all» ground station concept
- «Buy or Build?» Question probably evaluated by many of these missions

- Missions are increasingly based on constellation architectures
- Commercial missions with tough near real time requirements
- Scientific and commercial value lies very often in the detection of change

- The combination of these requirements drive the design of the ground segment
- Cost efficiency is THE major requirement for most smallsat missions
Three common ground station concepts

a) **Single Site**
- Satellite operator purchases and installs a low cost antenna system often at the operator’s facility.

b) **Global sites with dedicated mission antenna network**
- Satellite operator installs and operates antennas at multiple locations around the globe.

c) **Existing Global multi-mission antenna network**
- Satellite operator buys capacity on an existing ground station network. Antennas are owned, operated and maintained by a service provider.

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<thead>
<tr>
<th></th>
<th>Concept a</th>
<th>Concept b</th>
<th>Concept c</th>
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<tbody>
<tr>
<td>Required Initial Investment</td>
<td>Medium</td>
<td>High</td>
<td>None</td>
</tr>
<tr>
<td>Number of visible passes</td>
<td>Low</td>
<td>Medium to High</td>
<td>High</td>
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<tr>
<td>Maintenance Cost</td>
<td>Medium</td>
<td>High</td>
<td>Part of service price</td>
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<tr>
<td>Backup capability</td>
<td>Requires additional investment and running cost</td>
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<td>Local and geographic backup available as integrated part of the service</td>
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<tr>
<td>Financial Risk in case of mission failures or stand-by phases</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Service fee Price/Pass</td>
<td>None</td>
<td>None</td>
<td>High on traditional networks</td>
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Requirements for low-cost ground station service

These are the top-level requests for smallsat ground stations we concluded:

- **Substantially reduced operational cost with low initial investment**
- High quality antenna systems and professional maintenance to ensure uptime
- Sometimes ok to compromise on operational requirements concerning antenna availability
- High flexibility requirements for pass selection and priority allocation
- Lower RF performance on satellite would require higher performance on ground
- High degree of flexibility to adapt to fluctuations in support volume requirements
KSAT light Concept

Substantially reduced operational cost
- Small antennas (with lower RF performance)
- Automated operation and pass booking scheme
- Single Standardized Interface

Low initial investment by users
- KSAT owns and operates antennas
- Multi-mission antennas
- Benefits from existing infrastructure at KSAT sites

Operational Considerations
- Standardized SLAs with varying degrees of priority access
- More customers on same antenna lead to reduced cost
- Backup antennas available thanks to antenna pool concept
- High quality equipment and professional maintenance

Flexible pass booking
- Web based antenna pass scheduler
- Can be integrated for machine-to-machine scheduling
Technical Details

- 3.7 m S (up&down) and X Band (down) antennas, UHF antennas also available
- X-Band Rx G/T ca 27 dBK
- 720 MHz intermediate frequency standardized interface
- Customer Furnished Equipment hosted at KSAT sites
- Flexible booking routines, open until shortly before passes
- Automated Interface - KSAT light scheduler

- **Ka-band** is emerging as operational downlink on smallsats
  - Will be integrated into KSAT light
  - TT&C uplink on S-Band
  - Ideal locations thanks to extremely dry Arctic and Antarctic climate
Locations

Network available now.
Will be extended based on user’s mission needs.
Contact Information

Thank you very much for your attention!!!

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