Self Organization: Creating Order from Chaos!

- What happens immediately after nodes are randomly deployed.
- Find your own location.
- GPS requires a lot of power, [Line of Sight] do not use sophisticated HW.

- Start collecting data.
Self Test
obtain a locally unique identity
Learn your neighbors (neighbor discovery)

Random Deployment
Find Your Location

Construct Routing Tree

Start Collecting Data

time

Wireless collisions
Communication has collision problems.

Need some protocol to avoid collision.

ALOHA, medium access protocol (MAC)

CSMA (Carrier sense medium access) / CD (Collision Detection)
## Medium Access Protocol

<table>
<thead>
<tr>
<th></th>
<th>TDMA</th>
<th>Random Access (ACMANA)</th>
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</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>predictable,</td>
<td>may be - under light load, dynamic allocation (can be more efficient)</td>
</tr>
<tr>
<td>Latency</td>
<td>real time</td>
<td></td>
</tr>
<tr>
<td>Bandwidth</td>
<td>State allocation</td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>saves content in help nodes to sleep</td>
<td></td>
</tr>
<tr>
<td>Complexity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>s/w, adaptability, to changes in topology</td>
<td></td>
</tr>
</tbody>
</table>

### Diagram

```
<table>
<thead>
<tr>
<th>Node</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed (Static) Allocation</td>
<td></td>
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```

B/W
Security

- Shared Key System & Public-Private Key System

Key Establishment

1) Single shared key pre-deployment
   - If the key is compromised then the entire node is compromised.
   - Each node has
2) A shared key with the BS.