Wireless Sensor Network (WSN): An autonomous, ad hoc system consisting of a collective of networked sensor nodes designed to intercommunicate via wireless radio.

- Wireless – Communication via radio waves
- Autonomous – Independent, self-configurable, self-managing
- Ad hoc network – A network without a fixed, well-defined infrastructure
- Sensor node – Device that produces a measurable response to a change in physical condition

Berkeley Mote
Advances in Wireless Sensor Nodes

Consider Multiple Generations of Berkeley Motes

<table>
<thead>
<tr>
<th>Model</th>
<th>Rene</th>
<th>Mica</th>
<th>Mica-2</th>
<th>Mica-Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>1999</td>
<td>2002</td>
<td>2003</td>
<td>2004</td>
</tr>
<tr>
<td>CPU</td>
<td>4 MHz</td>
<td>4 MHz</td>
<td>4 MHz</td>
<td>4 MHz</td>
</tr>
<tr>
<td>Flash Memory</td>
<td>8 KB</td>
<td>128 KB</td>
<td>128 KB</td>
<td>128 KB</td>
</tr>
<tr>
<td>RAM</td>
<td>512 B</td>
<td>4 KB</td>
<td>4 KB</td>
<td>4 KB</td>
</tr>
<tr>
<td>Radio</td>
<td>10 Kbps</td>
<td>40 Kbps</td>
<td>76 Kbps</td>
<td>250 Kbps</td>
</tr>
</tbody>
</table>

Historical Comparison

Consider a 40 Year Old Computer

<table>
<thead>
<tr>
<th>Model</th>
<th>Honeywell H-300</th>
<th>Mica 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>6/1964</td>
<td>7/2003</td>
</tr>
<tr>
<td>CPU</td>
<td>2 MHz</td>
<td>4 MHz</td>
</tr>
<tr>
<td>Flash Memory</td>
<td>None</td>
<td>128 KB</td>
</tr>
<tr>
<td>RAM</td>
<td>32 KB</td>
<td>4 KB</td>
</tr>
</tbody>
</table>

Typical Sensor Network Applications

- Environmental monitoring
- Habitat monitoring
- Wildfire detection
- Structural health monitoring
- Power grid monitoring
- Health applications
- Supply chain management
Military

- Desirable characteristics of sensor networks
  - rapid deployment,
  - self-organization
  - fault tolerance
- Example applications
  - Monitoring friendly forces, equipment and ammunition
  - Battlefield surveillance
  - Reconnaissance of opposing forces and terrain
  - Targeting
  - Battle damage assessment
  - Nuclear, biological and chemical attack detection and reconnaissance

Environment

- Desirable characteristics of sensor networks
  - Untethered sensors
  - No interruption to the environment
  - Redundancy
- Example applications
  - Forest fire detection: Strategically, randomly, and densely deployed sensor nodes can relay the exact origin of the fire.
  - Biocomplexity mapping of the environment: integrating information across temporal and spatial scales.
  - Flood detection: rainfall, water level and weather sensors supply information to the centralized database system.
  - Precision Agriculture: the pesticides level in the drinking water, soil erosion, and air pollution.