innovate achieve lead

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Pilani | Dubai | Goa | Hyderabad

Wireless Sensor Network – case study

Redwood Climate Monitoring

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Redwood Climate Monitoring

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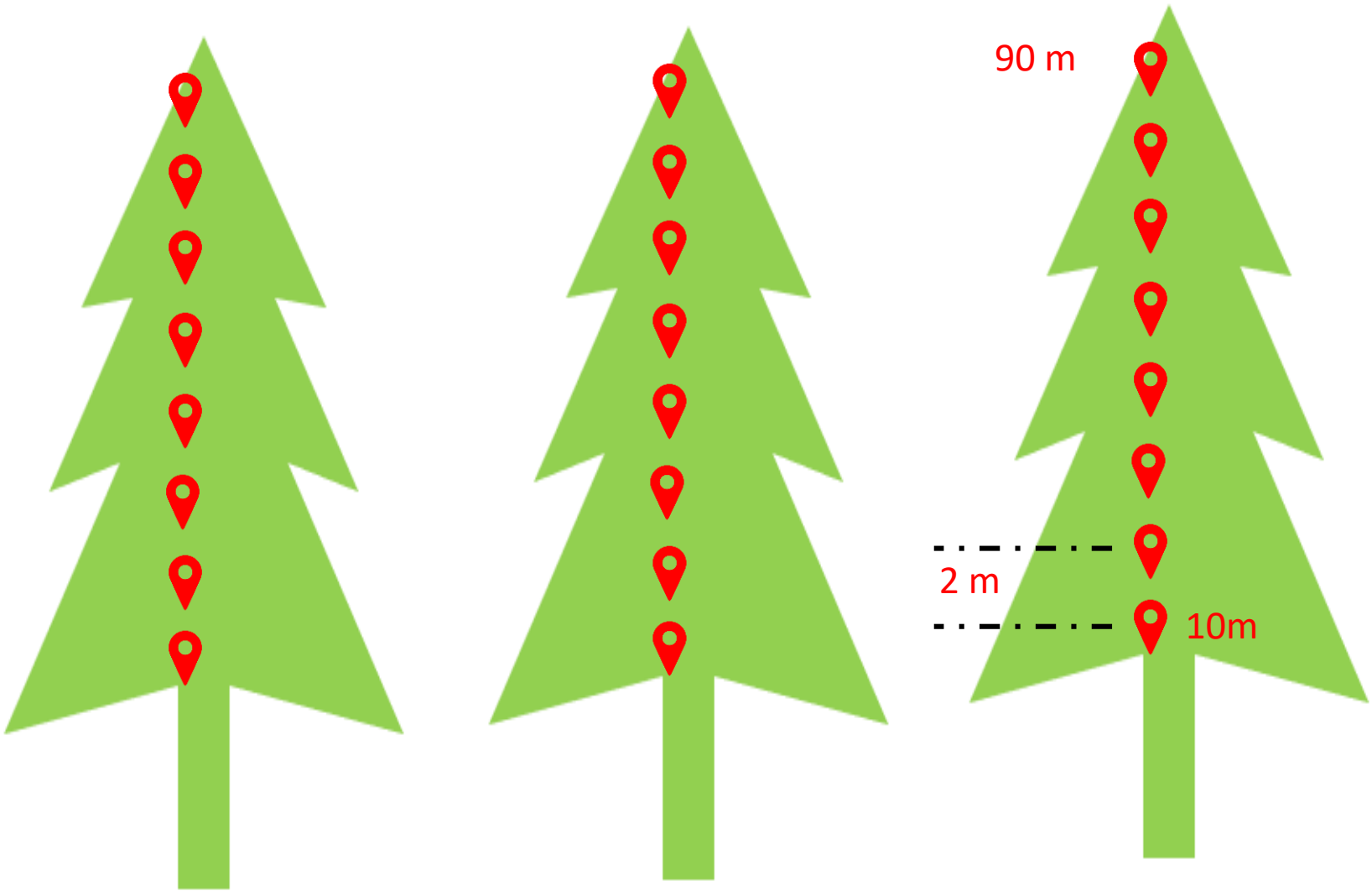

Parameters Monitored

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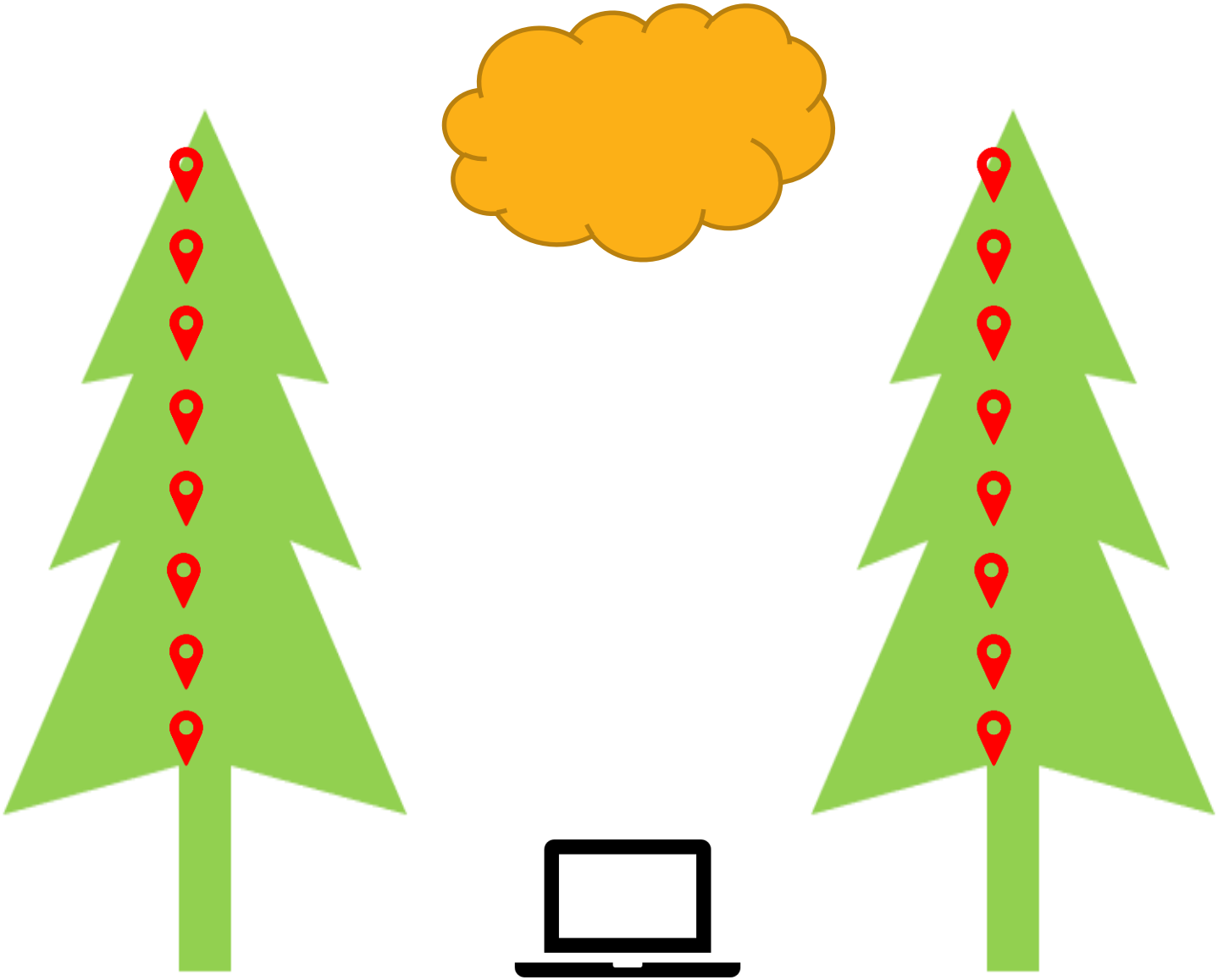
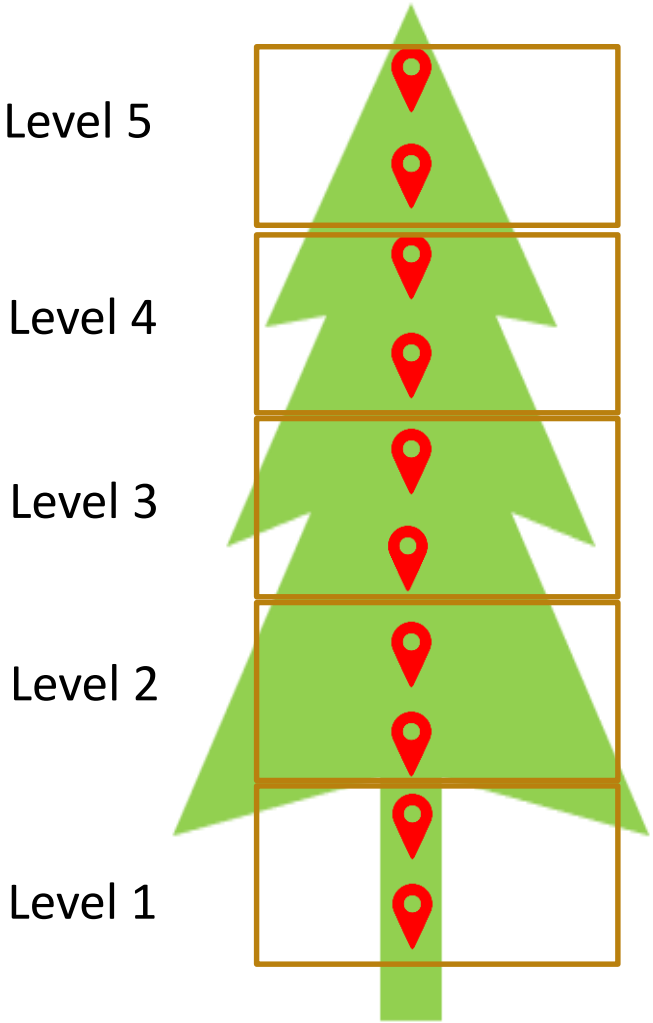
- Temperature
- Humidity
- Solar Radiation
- Light Levels
- Photosynthetically active radiation

Ever 5 Minutes



Redwood Climate Monitoring – Deployment Pattern



- Redwood Pine – Tallest Tree
- Grows to height of 90 M
- On a single tree 40 motes

Per Level - 8 nodes

Level - Cluster Level 1 – CL1

Redwood Climate Monitoring – Deployment Pattern

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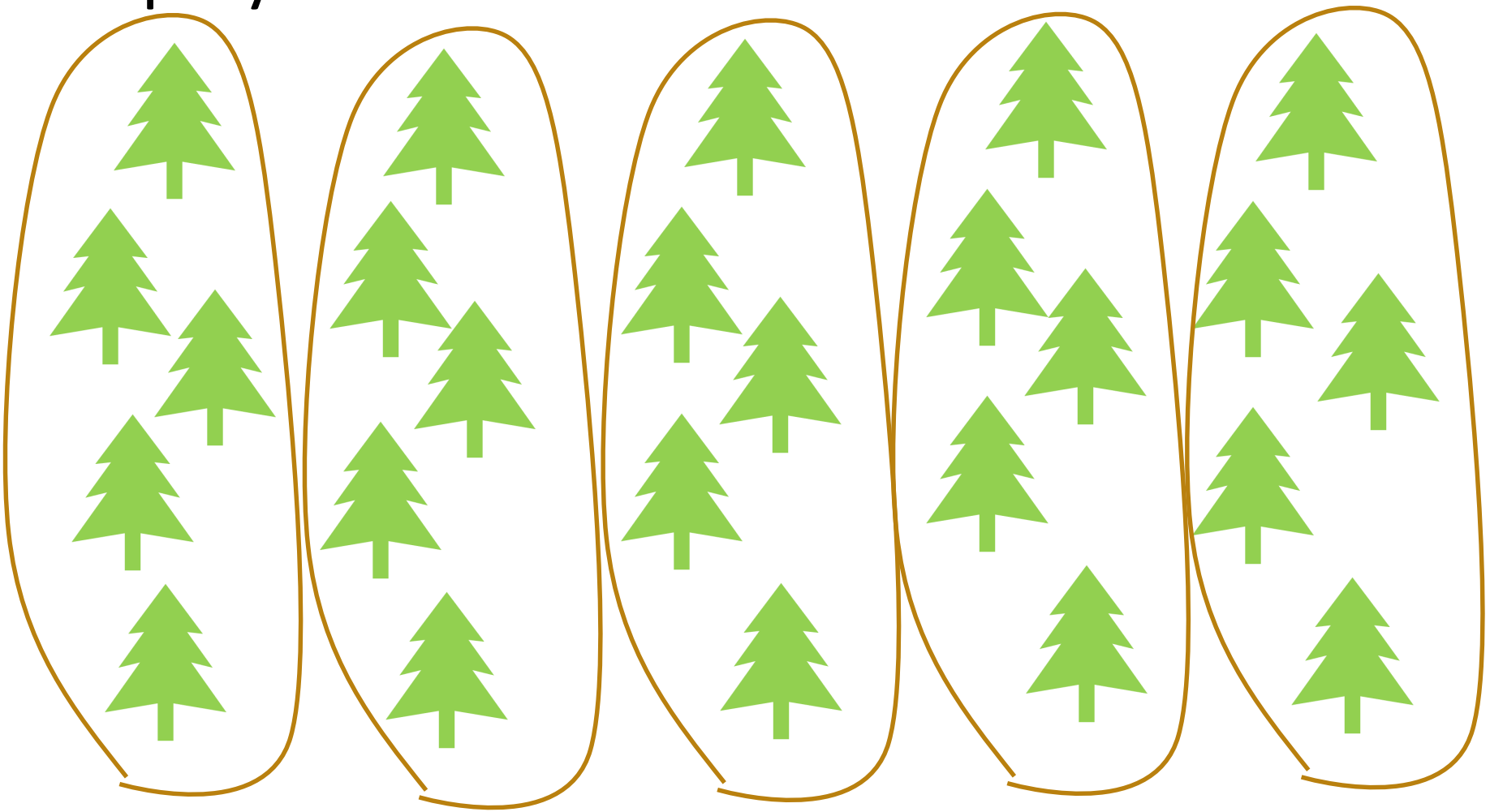
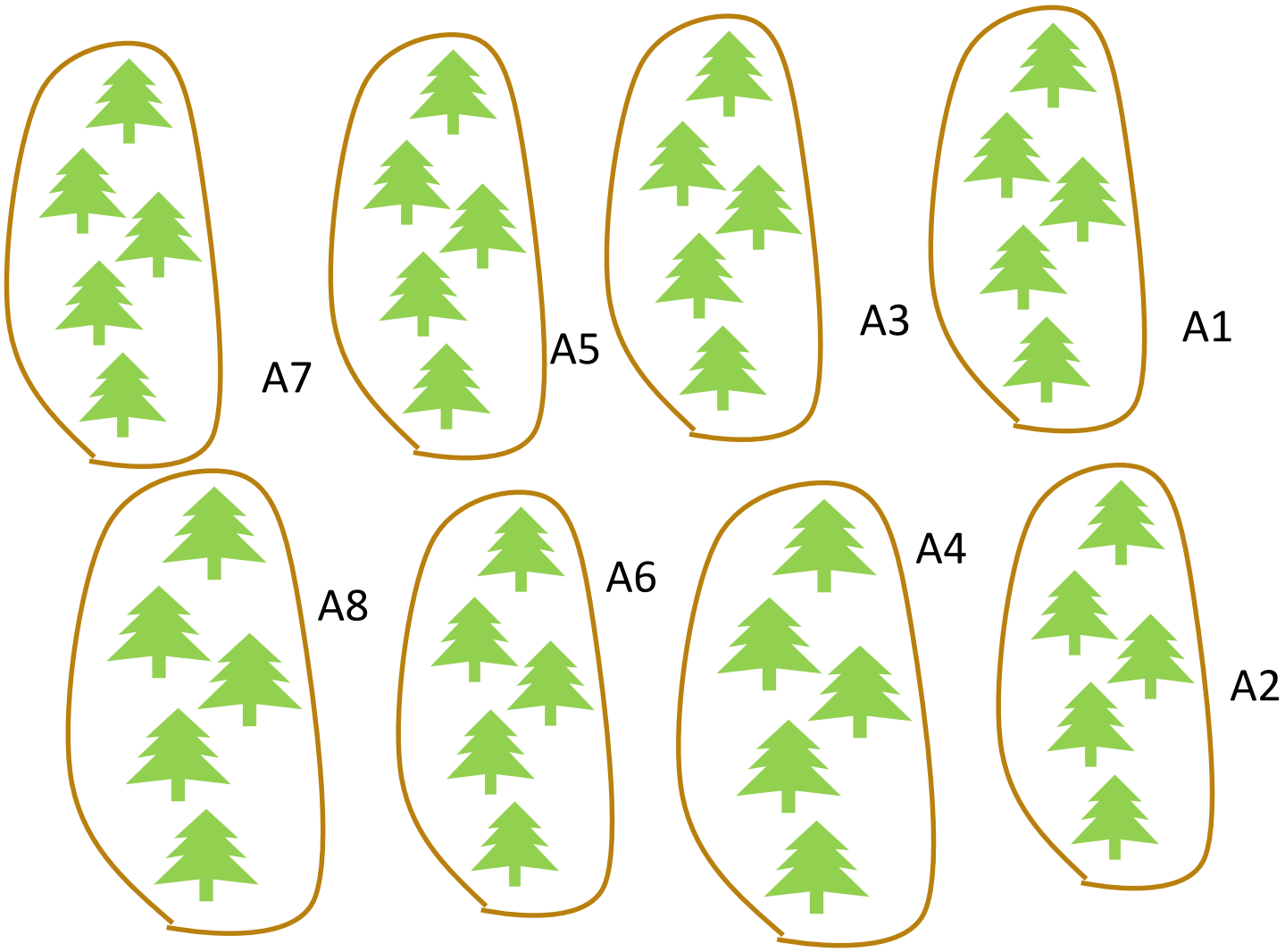
- Every cluster in CL1 will have a Cluster head dynamically elected using LEACH
- Nodes in L5 will send data to CH of L5 – aggregates data and send data to node to CH of L4
- Nodes in L4 will send data to CH of L4 that aggregates the data along with data of L5 and send to CH of L3
- And so on..
- L1 CH – try to connect and send data to BS

Redwood Climate Monitoring – Deployment Pattern



Cluster Level 2

Redwood Climate Monitoring – Deployment Pattern



Redwood Climate Monitoring – Deployment Pattern

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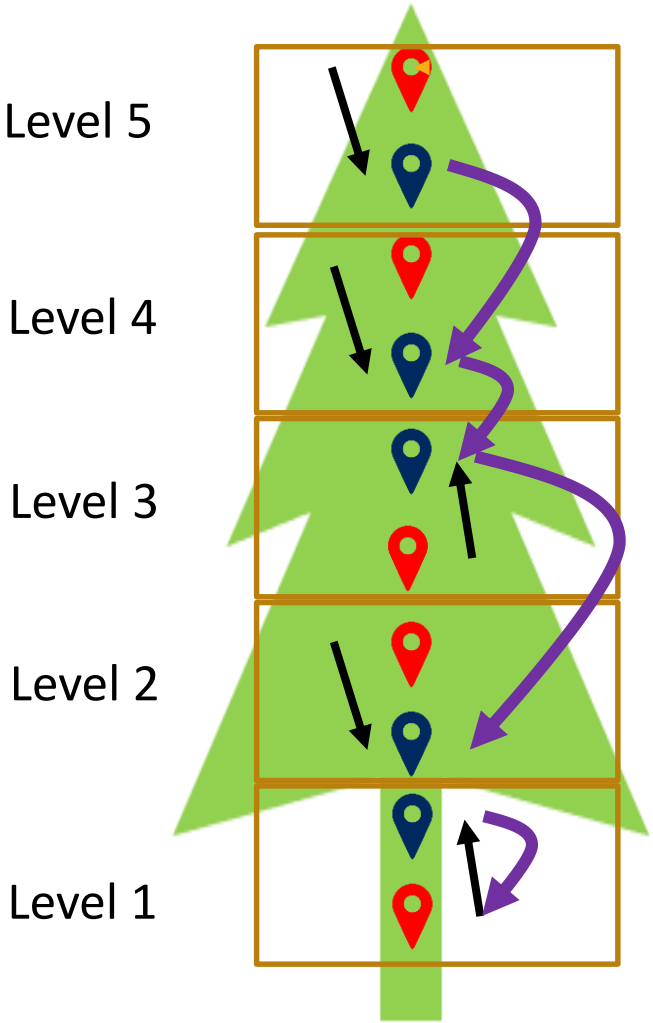
- CH of L1 of all trees within an area (say A7) will be the members of the cluster
- Every cluster in CL2 will have a Cluster head dynamically elected using LEACH
- All member of A7 will send data to CH of A7 – that aggregates the data
- CH of A7/A8 will send data to CH of A5/A6
- And so on..
- Thus data is geographically routed towards BS

Redwood Climate Monitoring – Deployment Pattern



Redwood Climate Monitoring – Deployment Pattern

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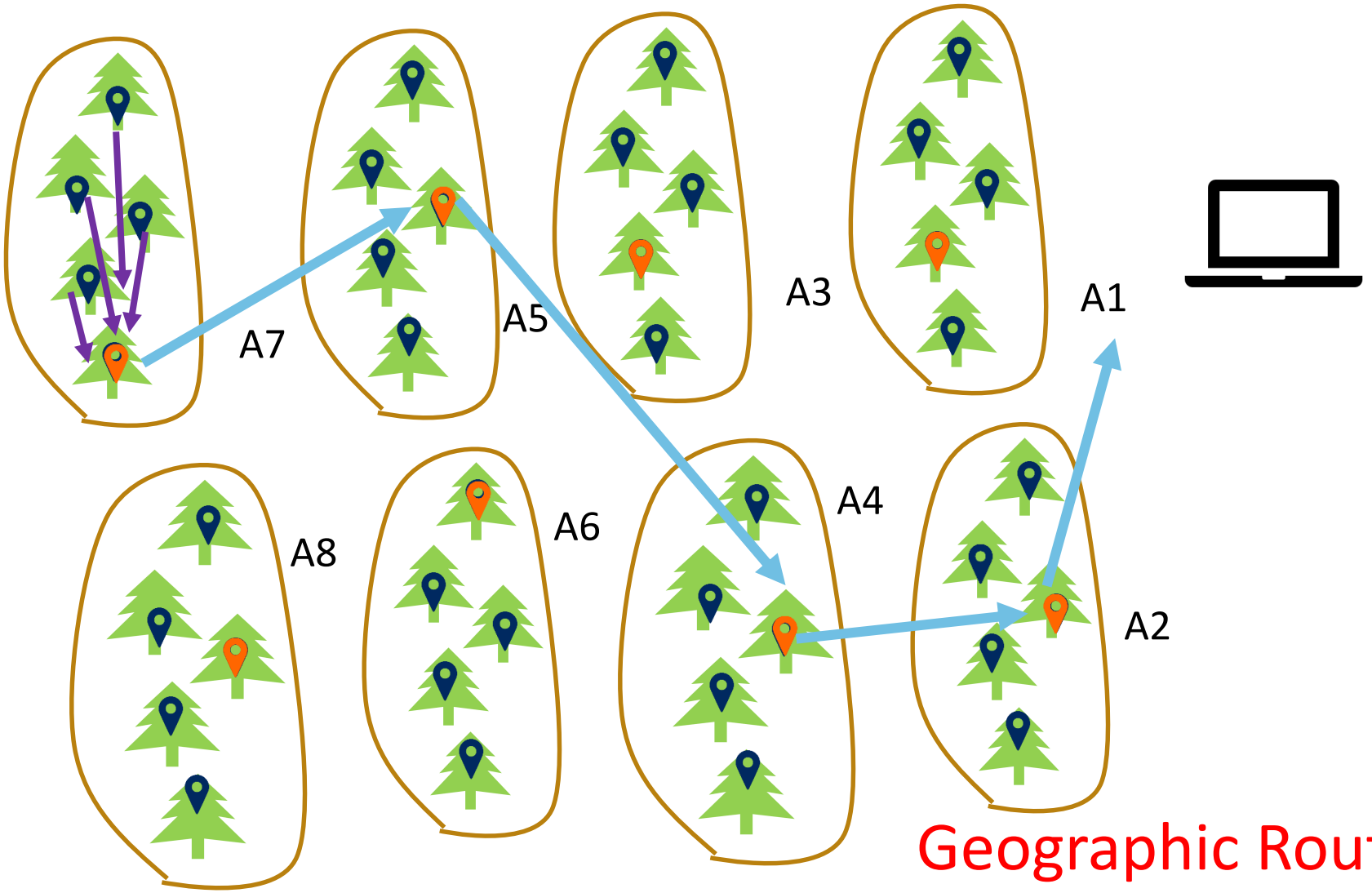

Addressing

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- Area: Tree: Level: ID
- Geographic Addressing

Network Protocols

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- Addressing Scheme
- Routing & Clustering - Proactive
- Topology Control
- MAC & PHY
- Time Sync
- Localization

Network Protocols – Time Sync

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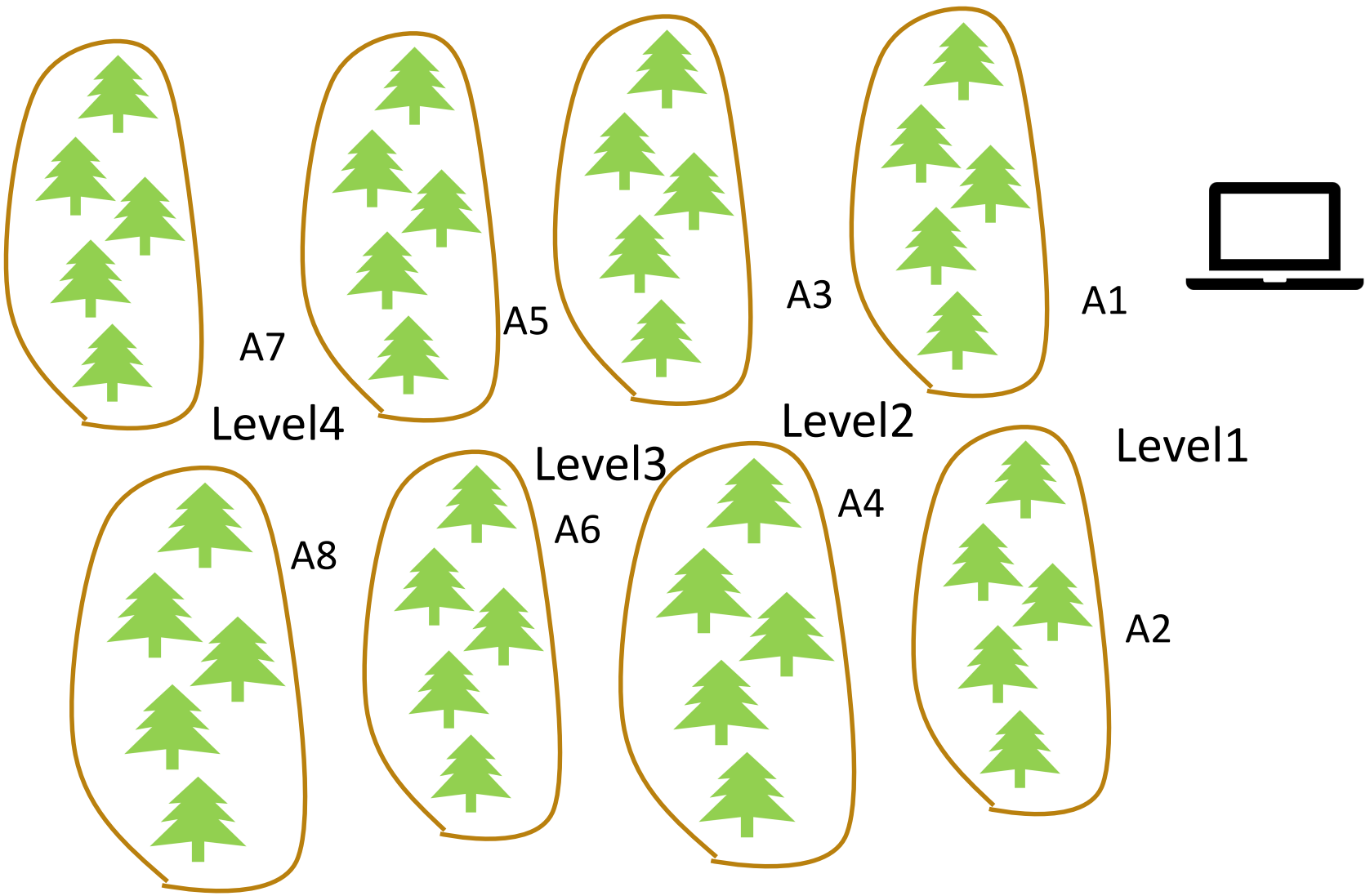
- TPSN variant
- Levels already there
- BS – Level 0

Redwood Climate Monitoring – TPSN



Network Protocols – Time Sync

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- Process repeated within Cluster Level2
- CH at bottom of tree– Level 0
- CH at next height – Level1

Network Protocols – Time Sync

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- Process repeated within Cluster Level1
- CH – Level 0
- Other Members – Level1

Localization

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- Not Required
- Nodes Placed in preplanned position

Topology Control

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- Once only every 5 minutes data communicated
- The whole process may take less than a minute
- All nodes sleep for 4 minutes and are awake for 1 minute
- Duty Cycle – 25%
- All nodes sleep wake at the same time

MAC & PHY

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- CC 2xxx Radio on motes
- MAC within clusters – TDMA
- Between clusters variant of CSMA – such as SMAC/ DMAC