GREEN WLAN:
On-Demand WLAN Infrastructures
Wireless Local Area Networks:

- essential tool for a flexible service;
- centralized management;
- basic coverage → dense WLANs with redundant layers;

Objective: to meet user demand during peak time.
Fact: peak times rarely occur.
⇒ APs remain idle ⇒ energy waste.
Solution: adoption of highly efficient resource management strategies that depend on user demand.
In practice: SEAR.

François Santy
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Resource on-demand strategy: efficiently manage WLANs resources, provide a high quality service. Demand-driven ⇔ schedule-driven. RoD strategies must fulfill three requirements:

- ensure coverage;
- maintain client performance;
- avoid frequent client re-associations.
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Four steps:

1. green clustering;
2. user demand estimation;
3. topology management;
4. user management.
Green clustering

Objective: form clusters of APs.

Idea: only one AP within each cluster can ensure basic coverage.

Two steps:

1. Neighborhood discovery
2. Cluster formation

One AP within each cluster is named as the cluster's head.
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Objective: estimate user demand within each cluster.
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In practice: channel utilization.
Topology management
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Objective: reconfigure the network by powering on or off APs.
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In practice: done at regular time intervals.
User management
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re-associations ↗⇒ performances ↘

User management
Objective: reduce excessive roaming between APs.
re-associations $\uparrow \Rightarrow$ performances $\downarrow$
$\Rightarrow$ determines the quality of service.
Does SEAR satisfies each requirements?
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⇒ evaluate
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Two WLANs infrastructures:
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1. 15 APs and 9 clients, two adjacent floors;
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2. 3 APs and 9 clients, same room;
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Two WLANs infrastructures:

1. 15 APs and 9 clients, two adjacent floors;
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2. 3 APs and 9 clients, same room;
   ⇒ evaluate user association management;
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   ⇒ evaluate user association management;

What are the results?
Client connectivity:
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⇒ each client receives connectivity from at least one AP.
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⇒ each client receives the same throughput whatever AP is powered on.
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⇒ each client receives connectivity from at least one AP.
⇒ each client receives the same throughput whatever AP is powered on.
⇒ one AP per cluster is sufficient to provide basic coverage.
Throughput:
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⇒ small decrease in the average throughput.
⇒ still, not significant.
Power savings:

- Depends on a few parameters (especially a channel utilization threshold).
  - Threshold = 60%
  - Cut in energy consumption of 46%.
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**Power savings:**
Depends on a few parameters (especially a channel utilization treshold).
⇒ $\text{treshold} = 60\% \Rightarrow \text{cut in energy consumption of 46\%}$. 
What are the conclusions?

1. powering off APs has minimal impact on client performances;
2. extra APs are only necessary during peak times;
⇒ Resource on-demand strategies lead to energy savings.

Still, better performances could be achieved.
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