

Dynamic Interface and Address Grouping

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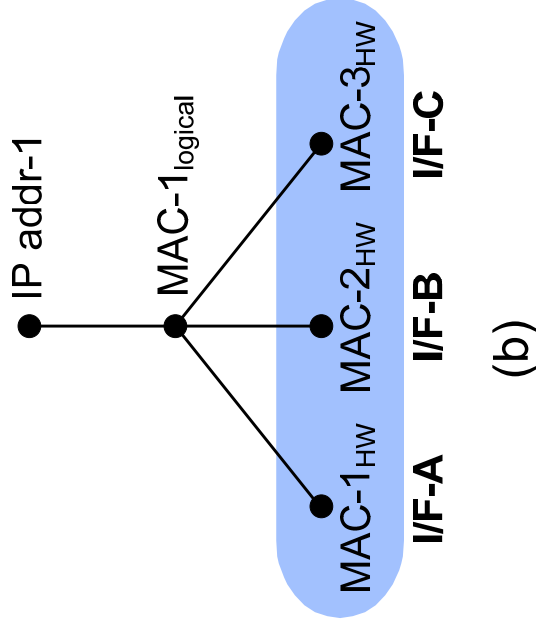
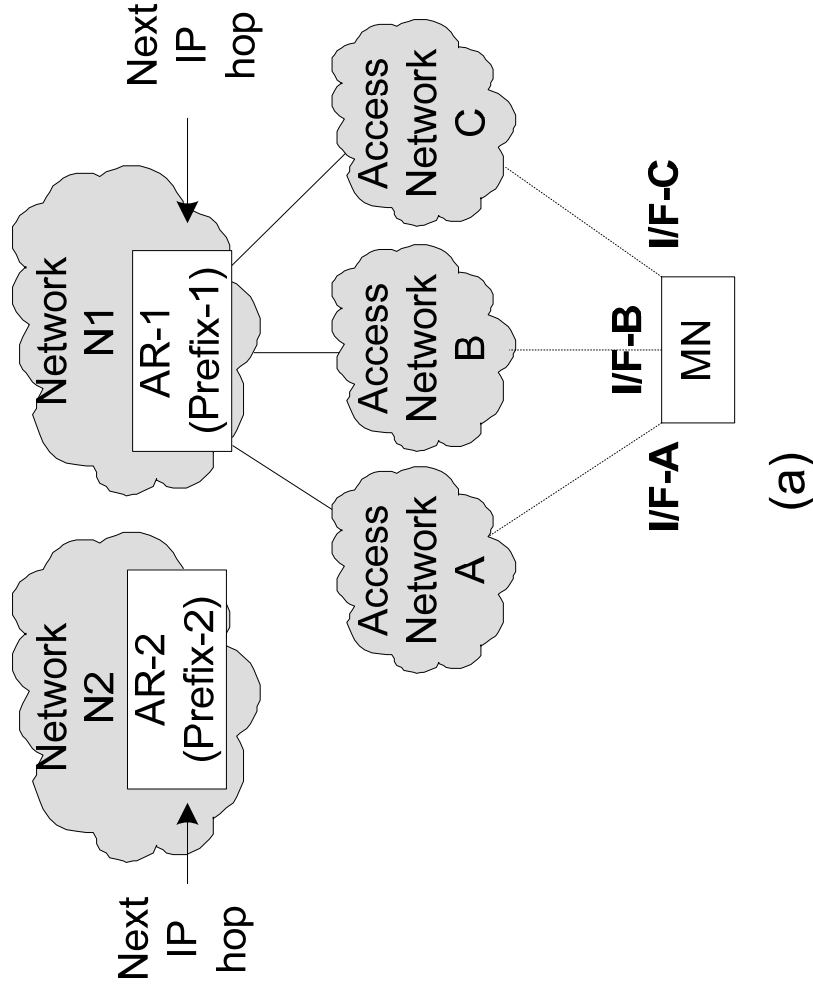
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Background and the problem

- They are multiple and heterogeneous access technologies available to many devices
- However, they work basically as individual accesses
- Each access has its specific MAC and L3 address and works independently from any other accesses in the devices
- One cannot let the accesses to benefit each other for providing such as better cost efficiency, performance, and reachability to the applications of the devices

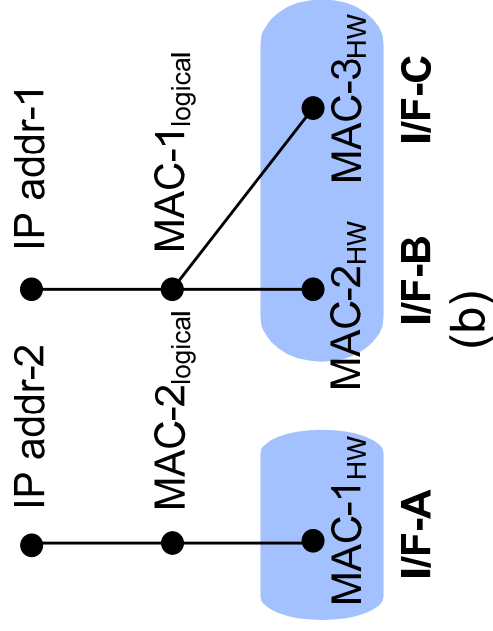
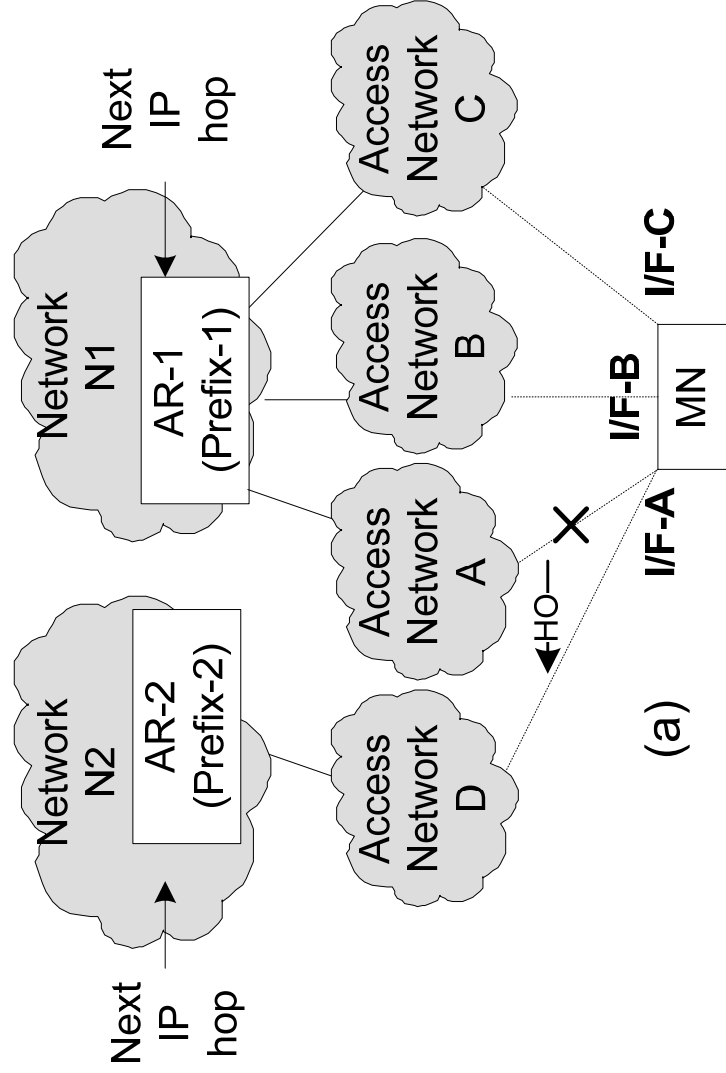
Concept of interface and address grouping (1/3)

Concept 1: To group one or more radio interfaces under a logical MAC interface that binds to an L3 address



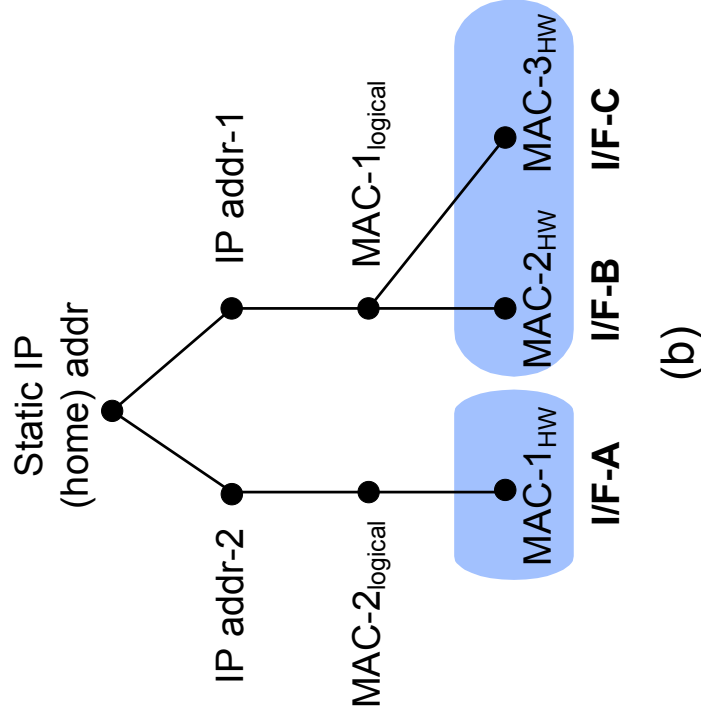
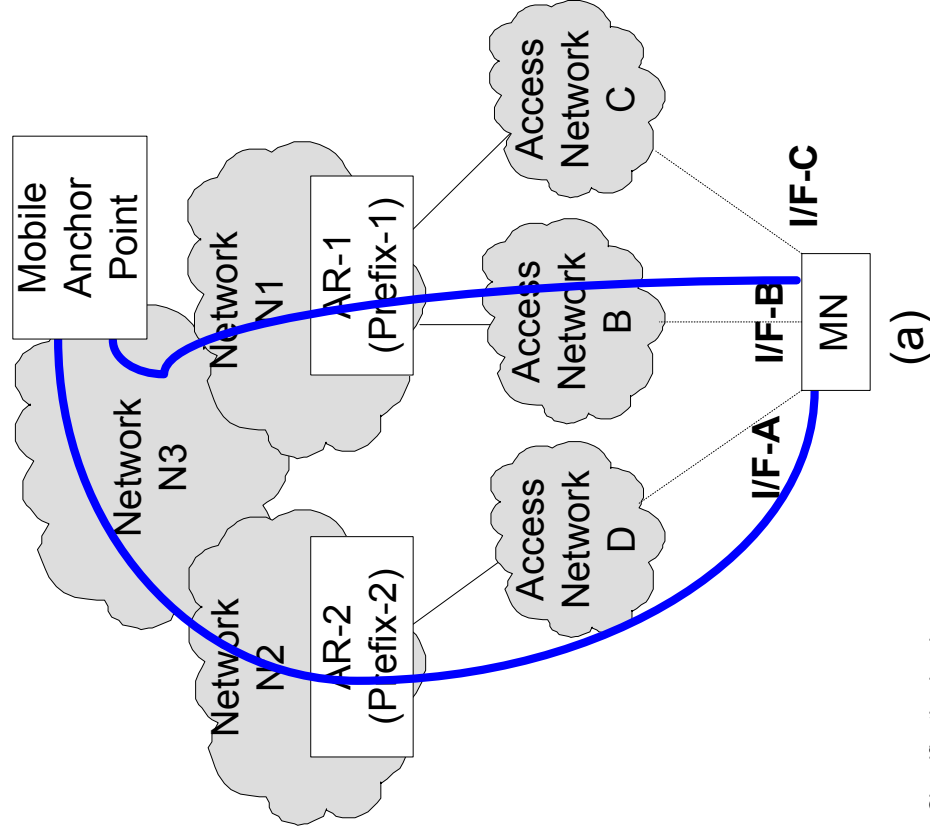
Concept of interface and address grouping (2/3)

Concept 2: To group one or more radio interfaces according to their associated networks, where the radio interfaces are grouped under two or more logical MAC interfaces that binds to two more L3 addresses



Concept of interface and address grouping (3/3)

Concept 3: To group/bind one or more L3 addresses under a static L3 address (e.g., home address) of a device



How to utilize the grouped interfaces and addresses? (1/2)

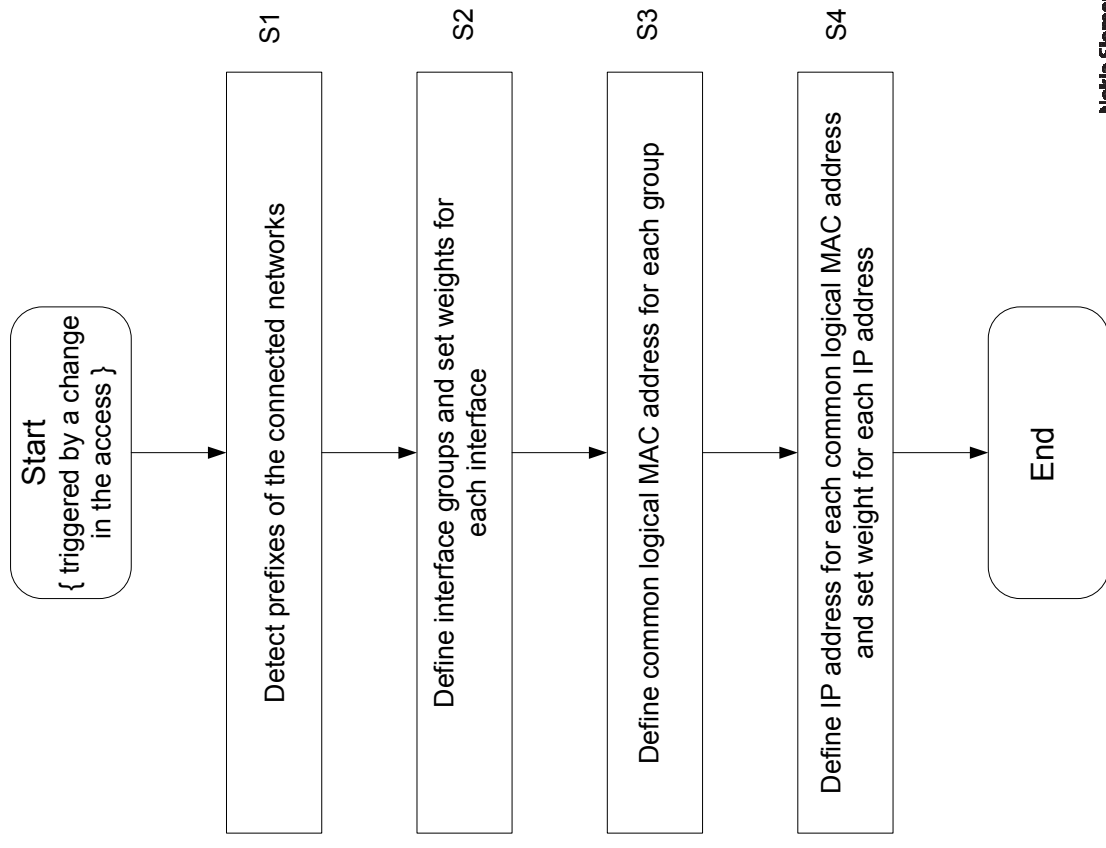
- As said, the purpose of the grouping is to enhance such as the cost-efficiency, performance, and reachability
- Different objective may result in a different approach.
- For example, one approach may be to use the multiple available accesses under different weights for an application.
 - Here, there are the questions: (1) how to assign the weights and (2) how to apply the weights.
- ✓ Regarding how to assign the weights, different options are:
 - Only mobile device assigns weights,
 - Only MAP assigns weights, and
 - Both do this.
- ✓ Regarding how to apply the weights, different options are correspondingly:
 - Only mobile device uses weights,
 - Only MAP uses weights, and
 - Both use them.

How to utilize the grouped interfaces and addresses? (2/2)

- For another example, if there are two or more active radio accesses grouped under one or more logical MAC addresses, the device could put some of the active radio accesses into certain power-saving mode, given the remaining active radio access or accesses are enough to support the application.
- When, situation changes due to, e.g., mobility, some of the radio accesses in the former power-saving mode can be put back to active.

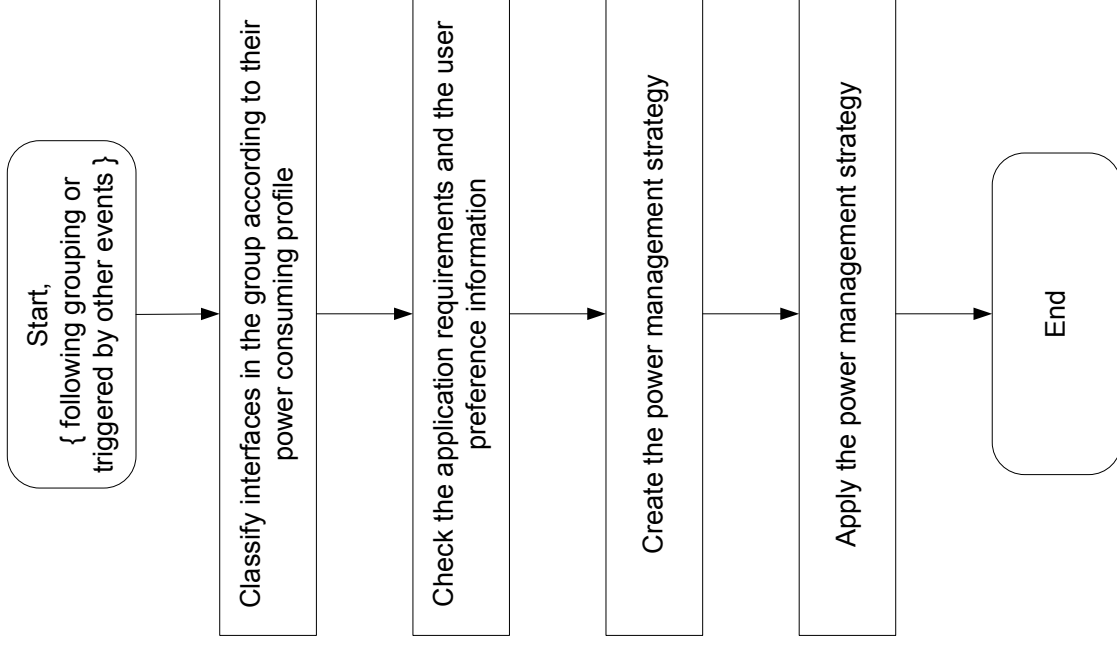
Generic configuration procedure for grouping the interfaces and address

This procedure can be performed each time when the interfaces are taken into use and/or when a handover of one of the interfaces is detected.



Generic Power-saving procedure for a group of interfaces and addresses

This allows to evaluate the state of the interface group and adjust the unnecessary active interfaces in the group into a low power consuming mode or state and, at the same time, maintain sufficient communication capabilities of the group.



Benefits of interface and address grouping

At link level, they are,

- ✓ Single link interface towards the IP (Layer 3),
- ✓ Load balancing over the physical link associated to an IP address,
- ✓ Support of seamless IP communication when two or more active links are grouped under the IP address,
- ✓ Practical means to dynamically manage link assignments for an IP address without the awareness by the IP level ,
- ✓ Easier scheduling of the power management among the links in the groups, and
- ✓ Dynamic assignment and management of the link weights reflecting link conditions.

At IP level, they are,

- ✓ Exploitation of multiple radio access simultaneously through a single IP address,
- ✓ Load balancing over the IP addresses associated to the home IP address or host identity of the mobile device,
- ✓ Support of seamless IP communication from an application to the mobile device,
- ✓ Practical means to dynamically manage what CoAs bound to the home address or host identity are used to communicate,
- ✓ Easier scheduling of the power management among the link interfaces in the groups, and
- ✓ Support of dynamic packet scheduling schemes in accordance with the link weights and conditions for both asymmetric and symmetric routing.

Conclusion and next step

- There are clear benefits for the interface and address grouping such as single communication service interface towards IP and the application, load balancing, seamless communication service, and more flexible power management.
- In the future work, we will study further on (1) how to use different kinds of power saving schemes for an interface group in a consistent way, (2) how to realize L3-interface grouping with state-of-art mobility management mechanisms like HIP and MIP, and (3) the effects of different load balancing methods/principles on interface grouping.

Questions?

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