

# Architectural Considerations for Mapping Distribution Protocols

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# Outline of the Talk

- **Management of mapping distribution of subprefixes spread across multiple ETRs**
- **Management of mapping distribution for scenarios with a hierarchy of ETRs and multi-homing**
- **Conclusions / Future Work**

# Fundamentals of the Problem

## Quoting Brian Dickson (July 9, 2008)\*:

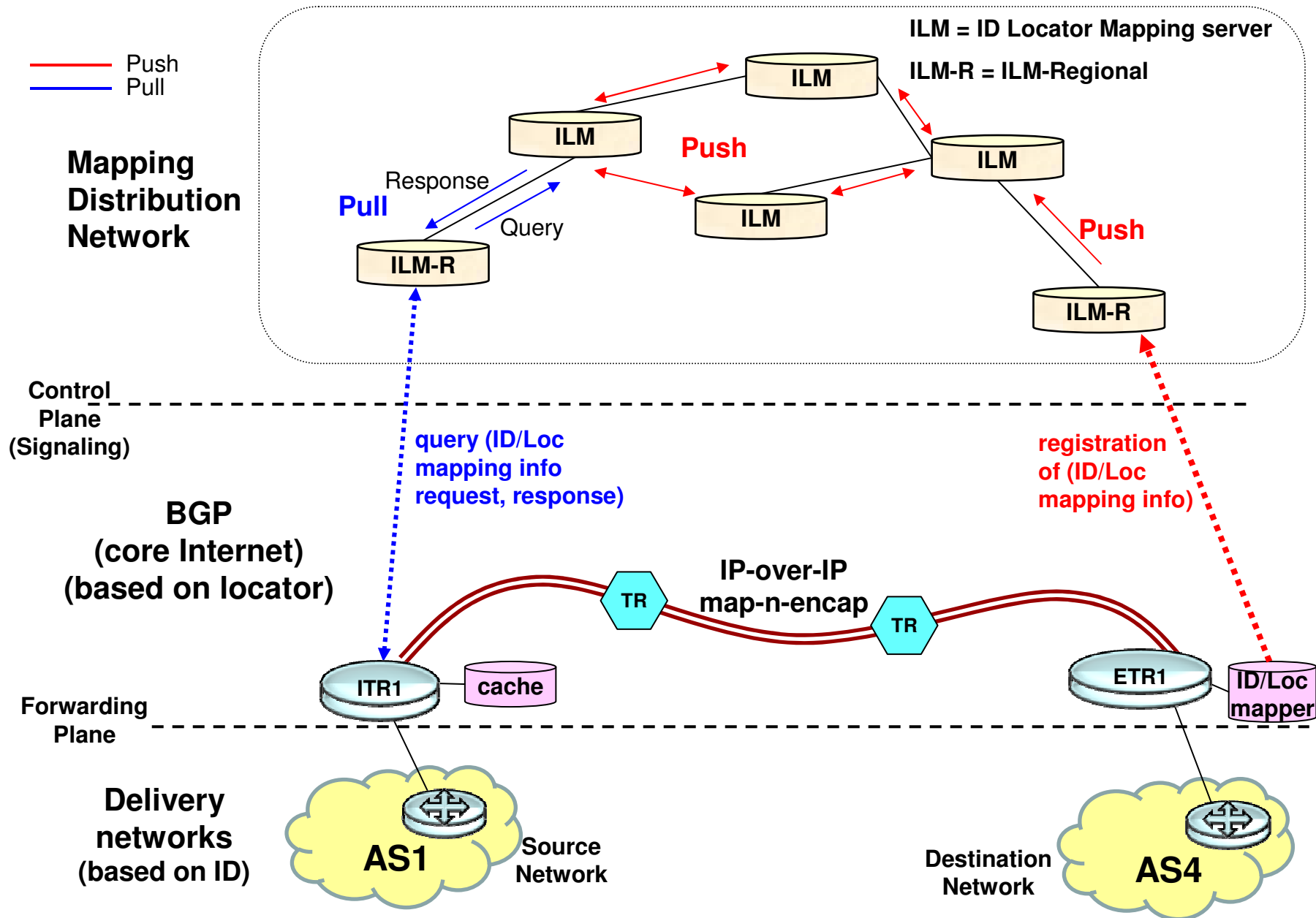
- Basically, scaling requires "layering", e.g. aggregation, or indirection, or other similar techniques.
- But, a dynamic location in the food chain, automatically means that we need the **ability** to routinely handle "layer violations".
- I think drilling down on this, providing means to incorporate such violations **into** the addressing /identifier /locator/ mapping system, is the way forward.

<http://psg.com/lists/rrg/2008/msg01773.html>

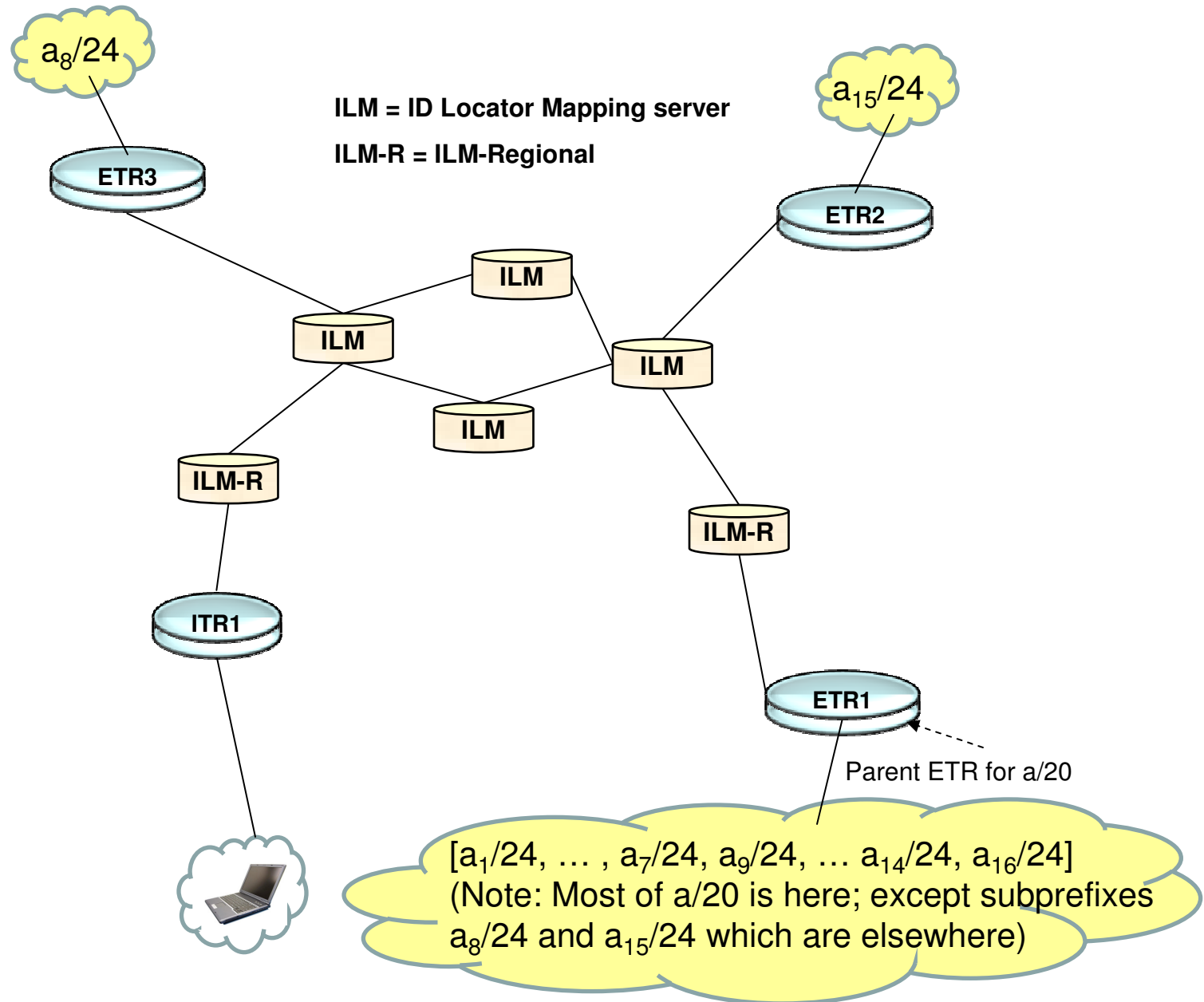
\* I noticed Brian's email well after I submitted this contribution to RRG list

[http://www.antd.nist.gov/~ksriram/NGRA\\_map\\_mgmt.pdf](http://www.antd.nist.gov/~ksriram/NGRA_map_mgmt.pdf)

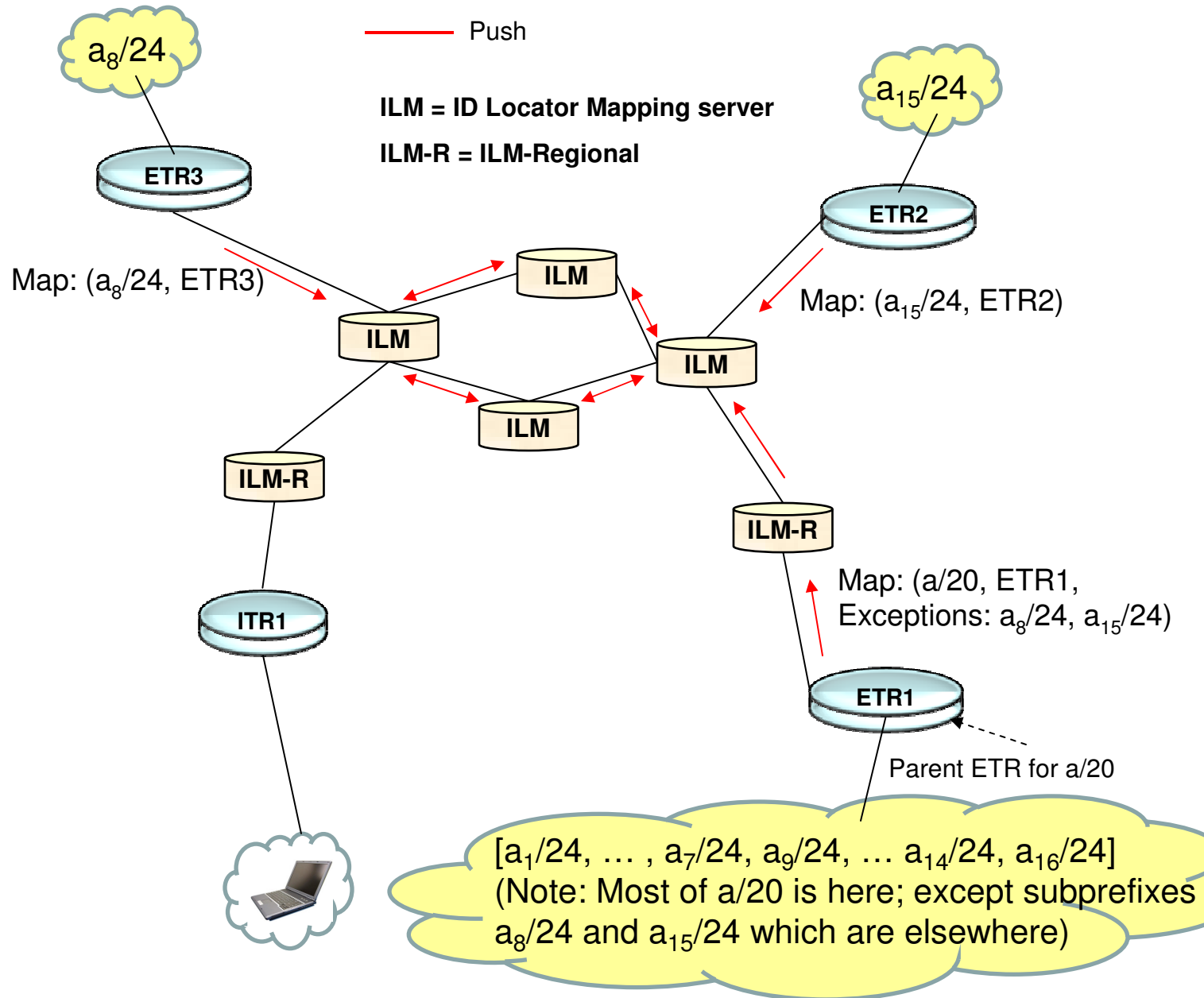
# Overview of an Example Architecture



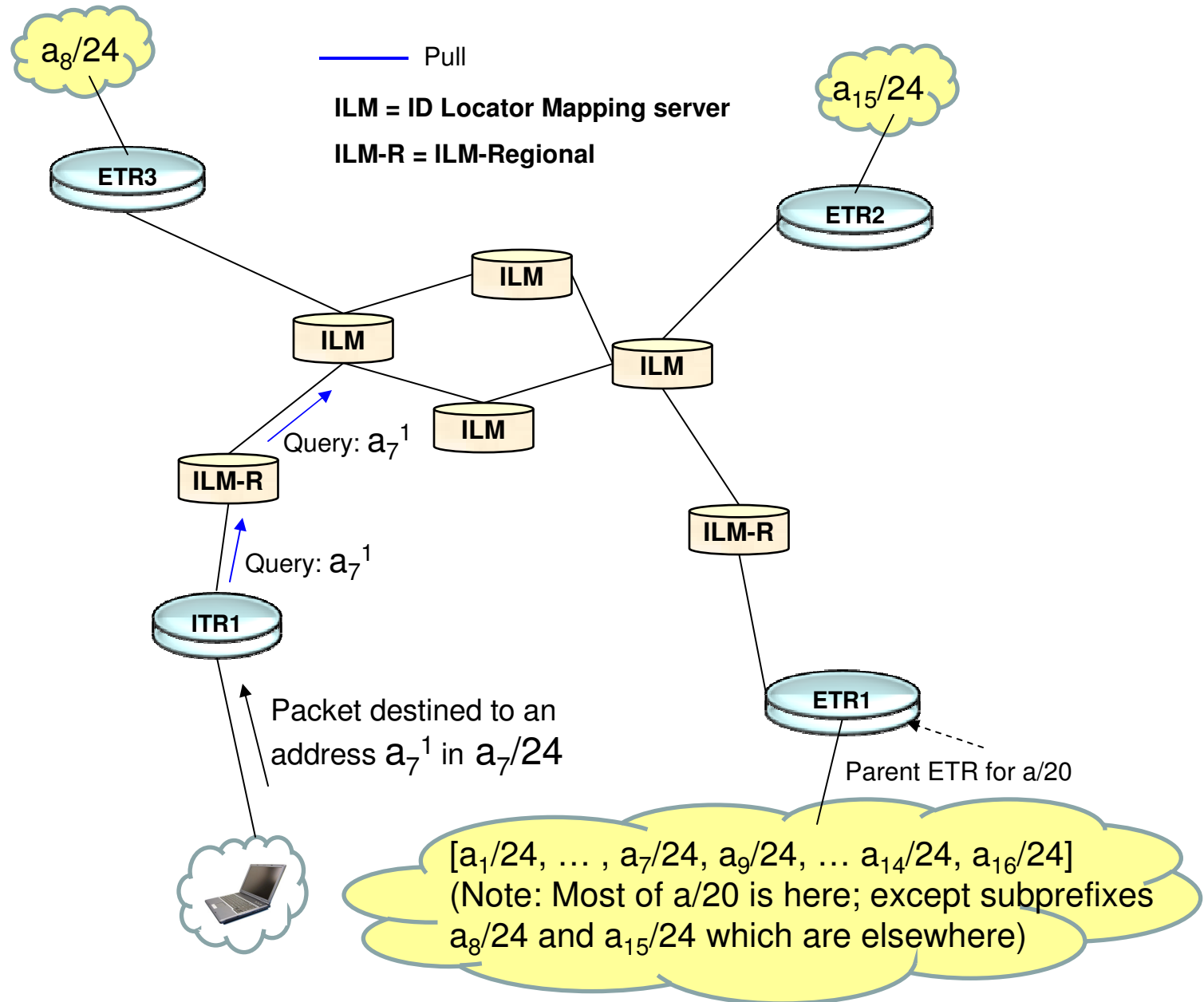
# Subprefixes Spread Across Multiple ETRs



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# Subprefixes Spread Across Multiple ETRs



# **Alternative Ways of ILM-R to ITR Mapping Distribution**

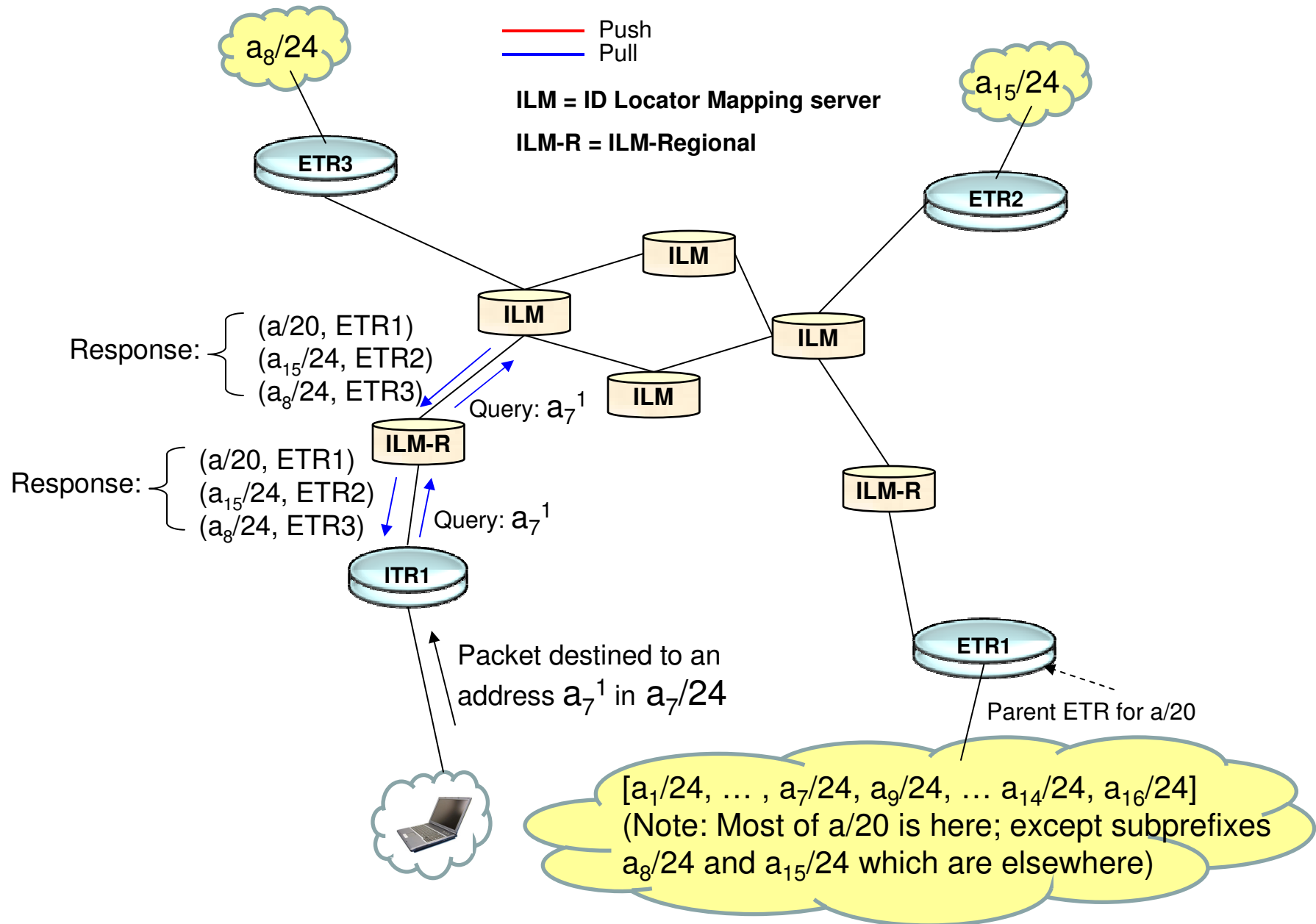
**Approach 1: ILM-R provides the complete mapping information for *a/20* to ITR1 including all the maps for the relevant exception subprefixes.**

**Approach 2:**

**Approach 3:**



# Mapping Distribution: Approach 1



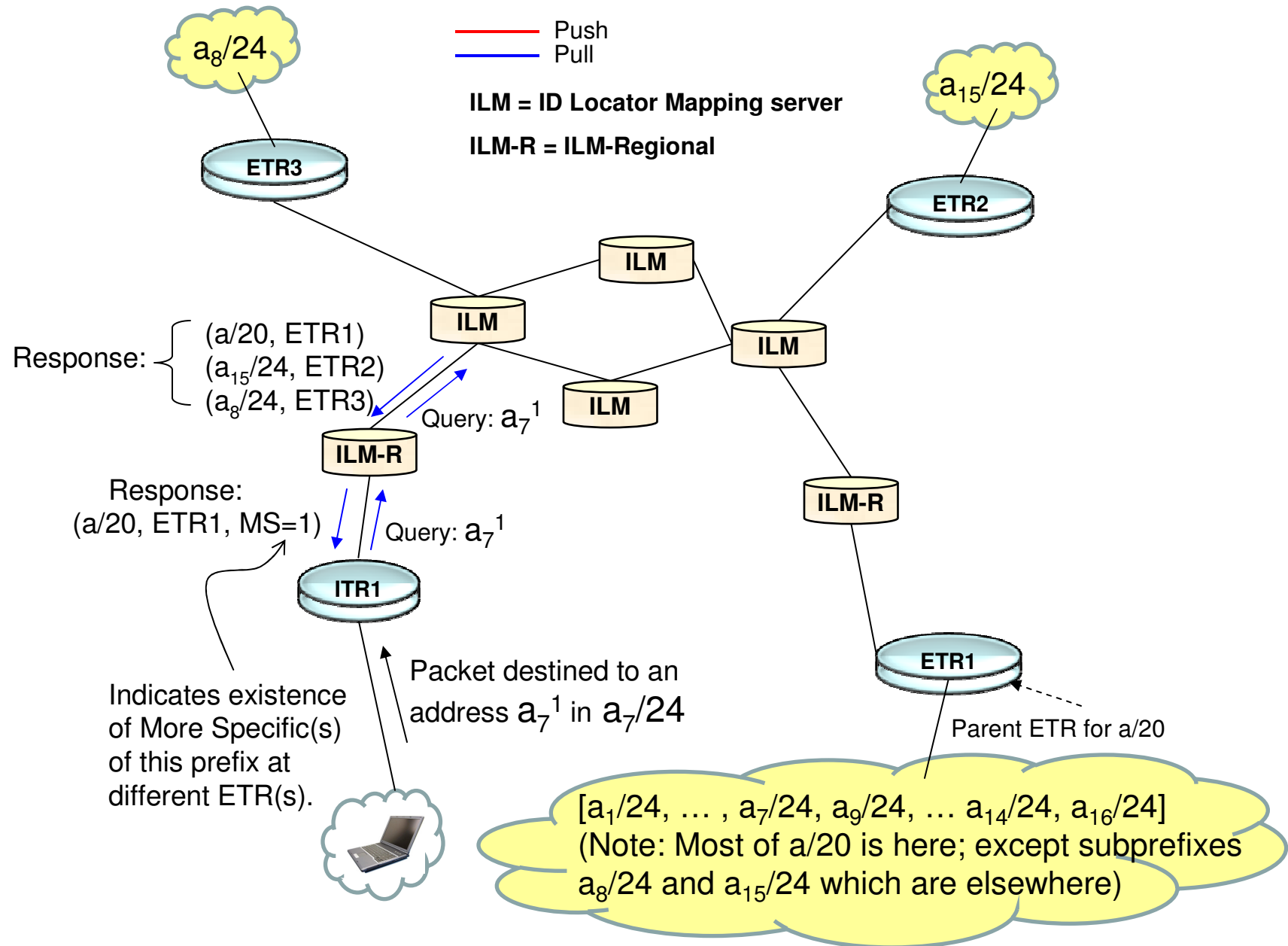
## Mapping Distribution: Approach 2

**Approach 1:** ILM-R provides the complete mapping information for  $a/20$  to ITR1 including all the maps for the relevant exception subprefixes.

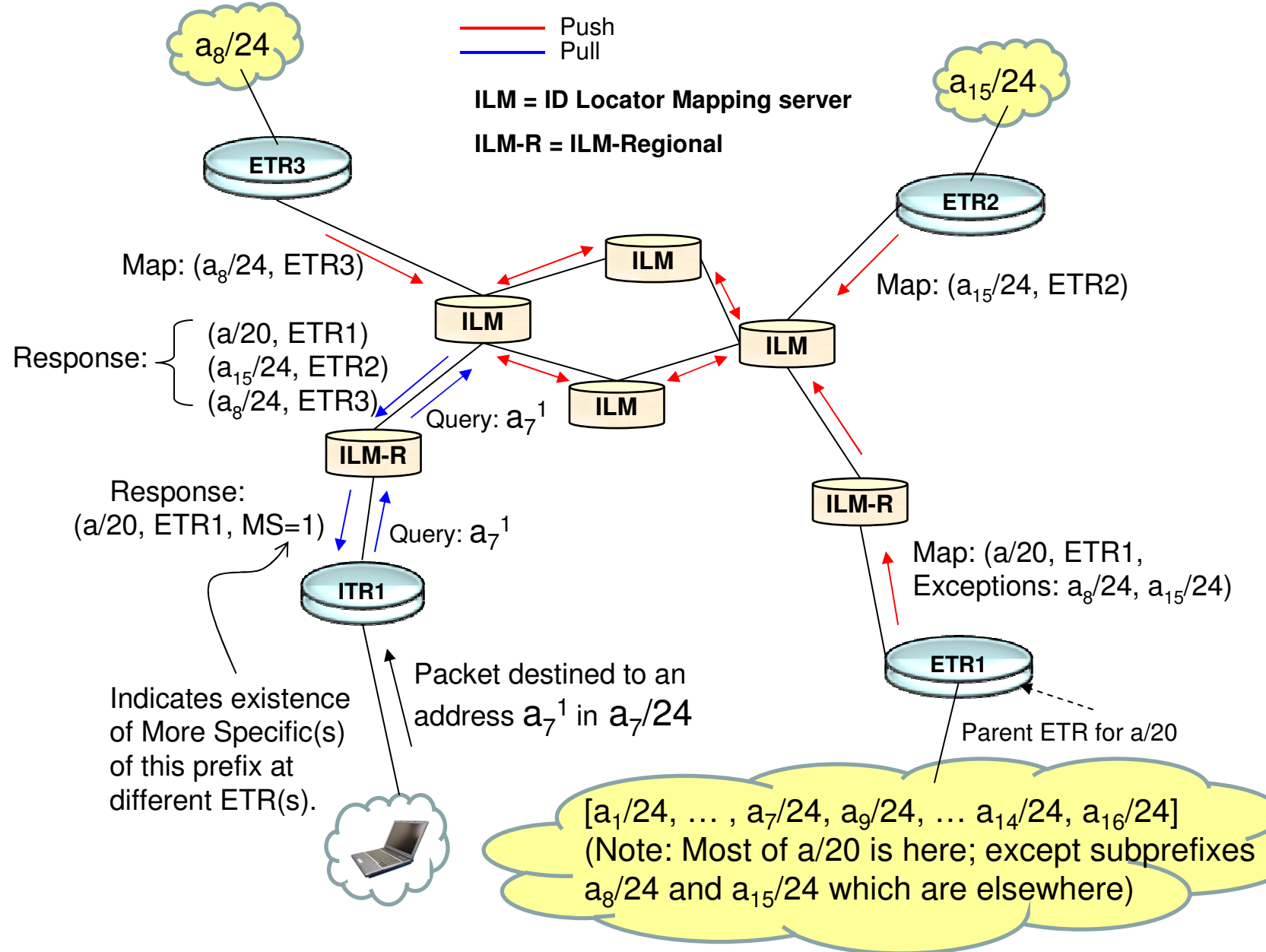
**Approach 2:** ILM-R provides only the directly relevant map to ITR1 which in this case is  $(a/20, \text{ETR1})$ .

**Approach 3:**

## Mapping Distribution: Approach 2



# Full Diagram with All Flows: Approach 2



# Pros/Cons Approach 1

**ILM-R provides the complete mapping information for *a/20* to ITR1 including all the maps for the relevant exception subprefixes.**

- **Advantages:** ITR1 has all the complete Mapping information for all components of *a/20* and need not generate repeated queries for subsequent first packets; Better response time for the first packets
- **Disadvantage:** If the exception subnets are significant in number, then both ITR1 and ILM-R can face processing overload; Also, results in inefficient usage of cache/memory at ITR1

## Pros/Cons Approach 2

**ILM-R provides only the directly relevant map to ITR1 which in this case is (a/20, ETR1).**

- **Advantages:** This will help avoid resource exhaustion at the ITRs and also possibly at ILM-R
- **Disadvantages:**
  - ITR1 must be informed that there are potentially more specifics (via use of More Specific (MS) field in the Map)
  - ITR1 needs to re-enquire for each first packet
  - Slightly larger first packet delays overall

# Mapping Distribution: Approach 3

**Approach 1:** ILM-R provides the complete mapping information for  $a/20$  to ITR1 including all the maps for the relevant exception subprefixes.

**Approach 2:** ILM-R provides only the directly relevant map to ITR1 which in this case is  $(a/20, \text{ETR1})$ .

**Approach 3:** The mapping information transaction between ILM-R and ITR1 can dynamically use approach 1 or approach 2 above depending on the context (further explanation of this is provided below).

## Benefits of Approach 3

**The mapping information transaction between ILM-R and ITR1 can dynamically use approach 1 or approach 2 above depending on the context.**

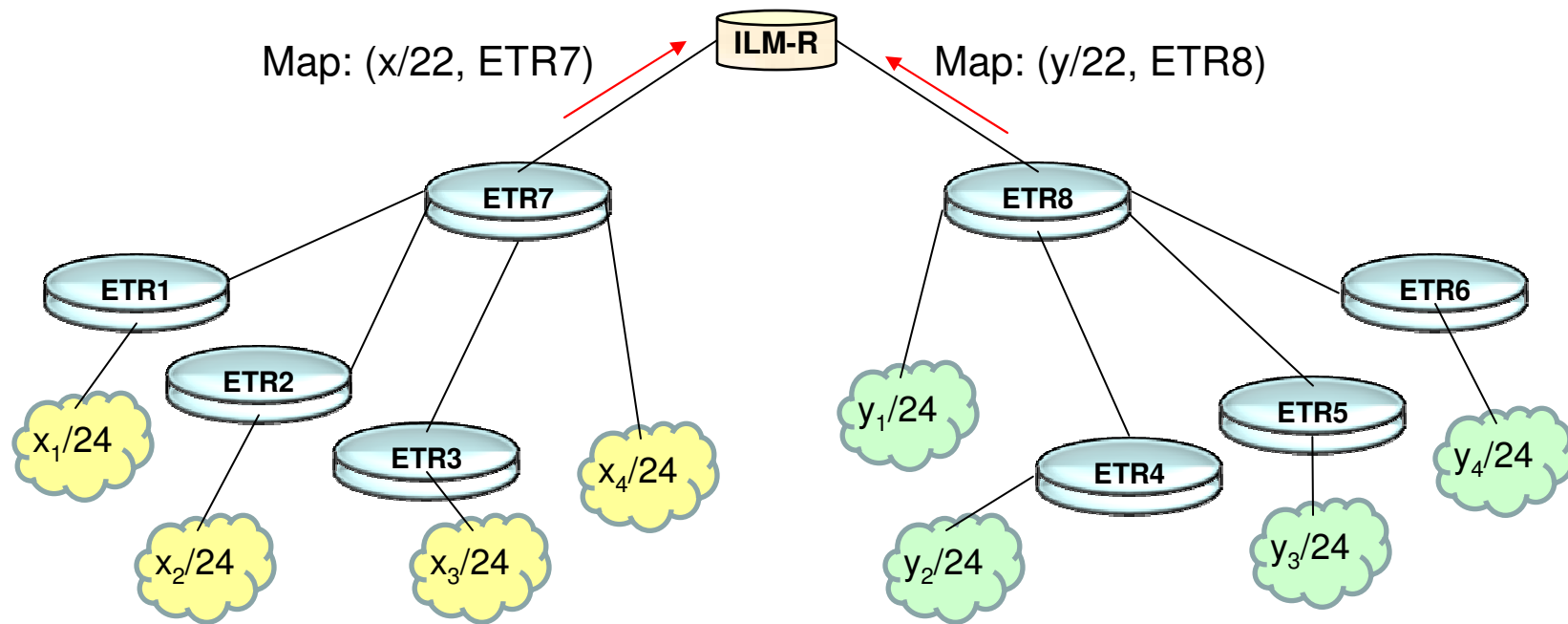
- Here a parameter can be potentially defined such as the maximum number of maps (map for the parent prefix plus all the maps for the relevant exceptions subprefixes) that would be involved in a mapping transaction
- If this parameter is below a threshold, then the first approach would be used, else, the second approach would be used
- This parameter can also be tuned administratively or dynamically (e.g., dependent on load at ILM-R)
- Seeking to combine of benefits of approaches 1 & 2



# Outline of the Talk

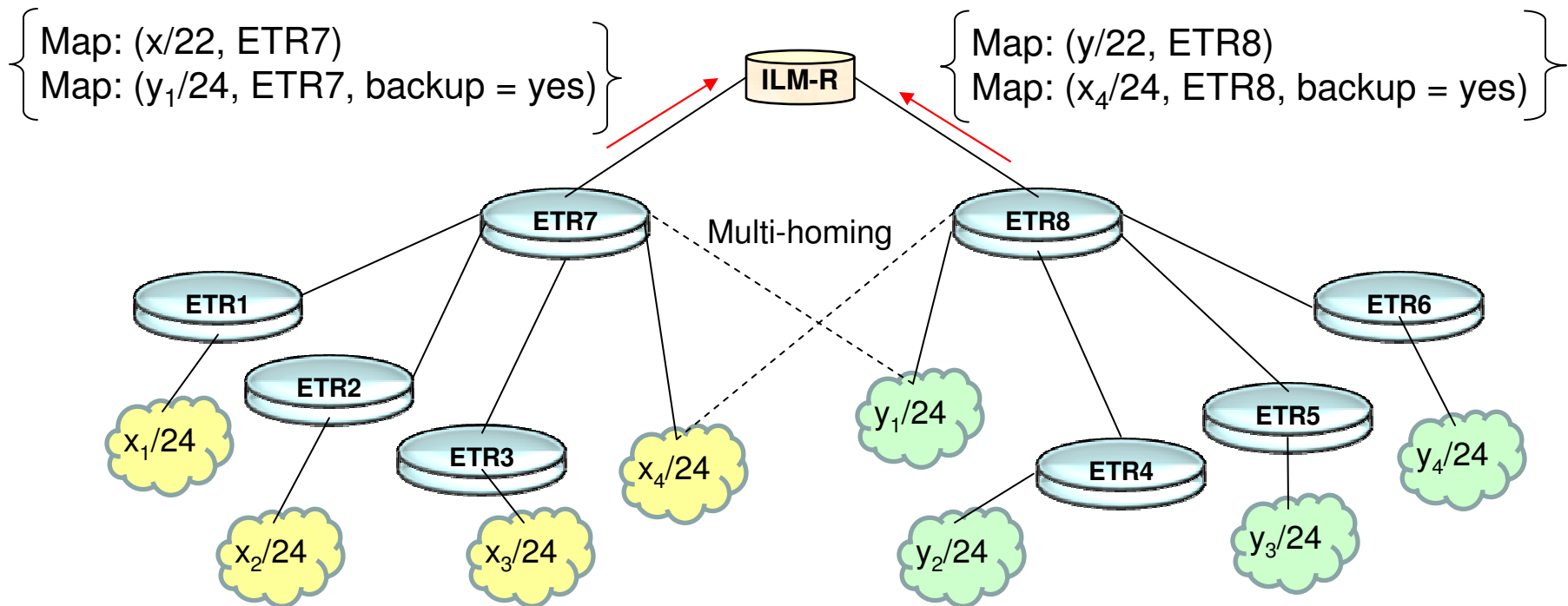
- **Management of mapping distribution of subprefixes spread across multiple ETRs**
- **Management of mapping distribution for scenarios with a hierarchy of ETRs and multi-homing**
- **Conclusions / Future Work**

# Scenarios with a Hierarchy of ETRs

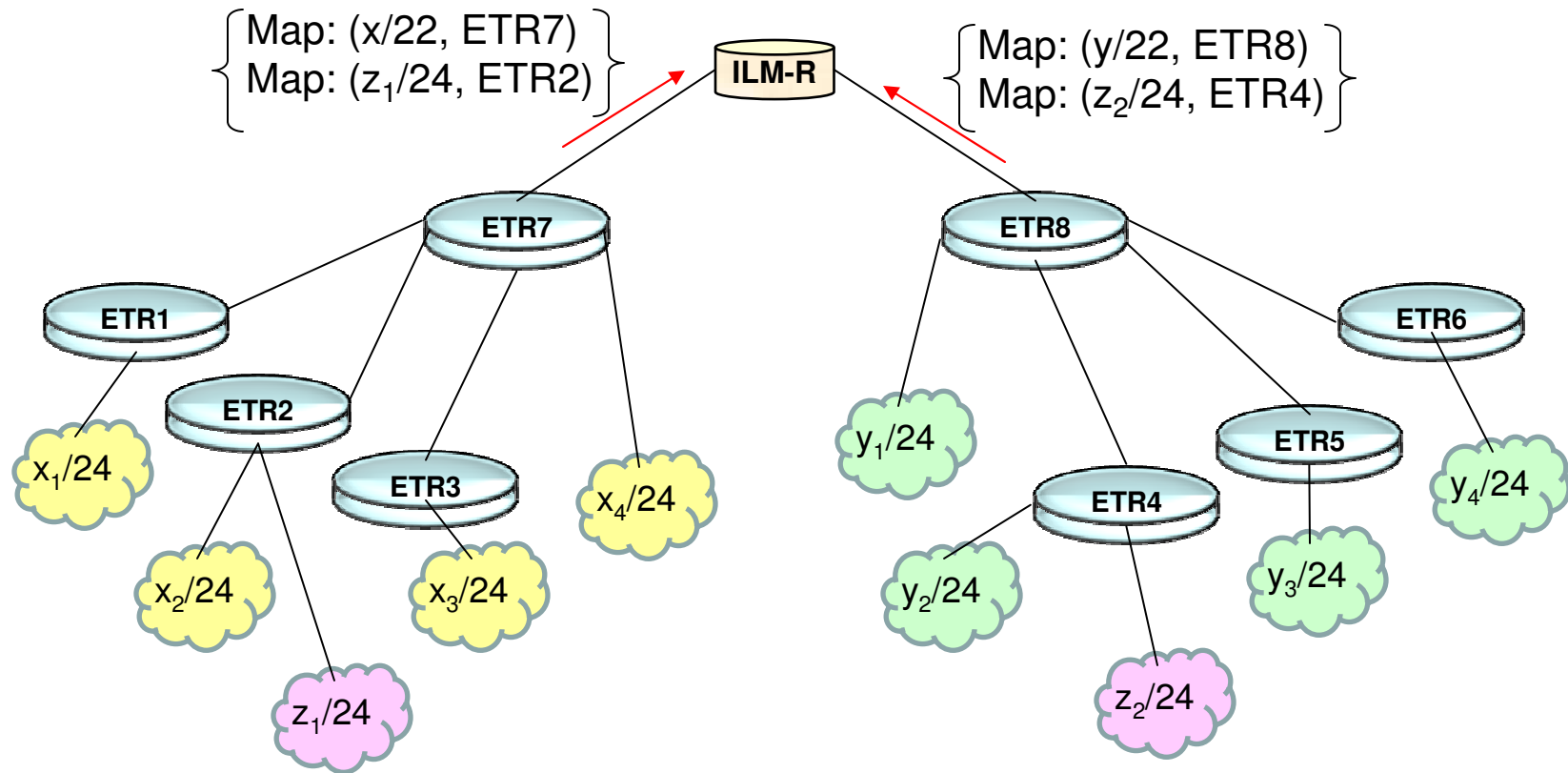


- Aggregation of EID subprefixes of ETR1, ETR2, ETR3 at ETR7
- Method of ETR7 to { ETR1 / ETR2 / ETR3 } packet forwarding:
  - Table look up: EID address to next hop?
  - Consideration of recursive map-and-encap?

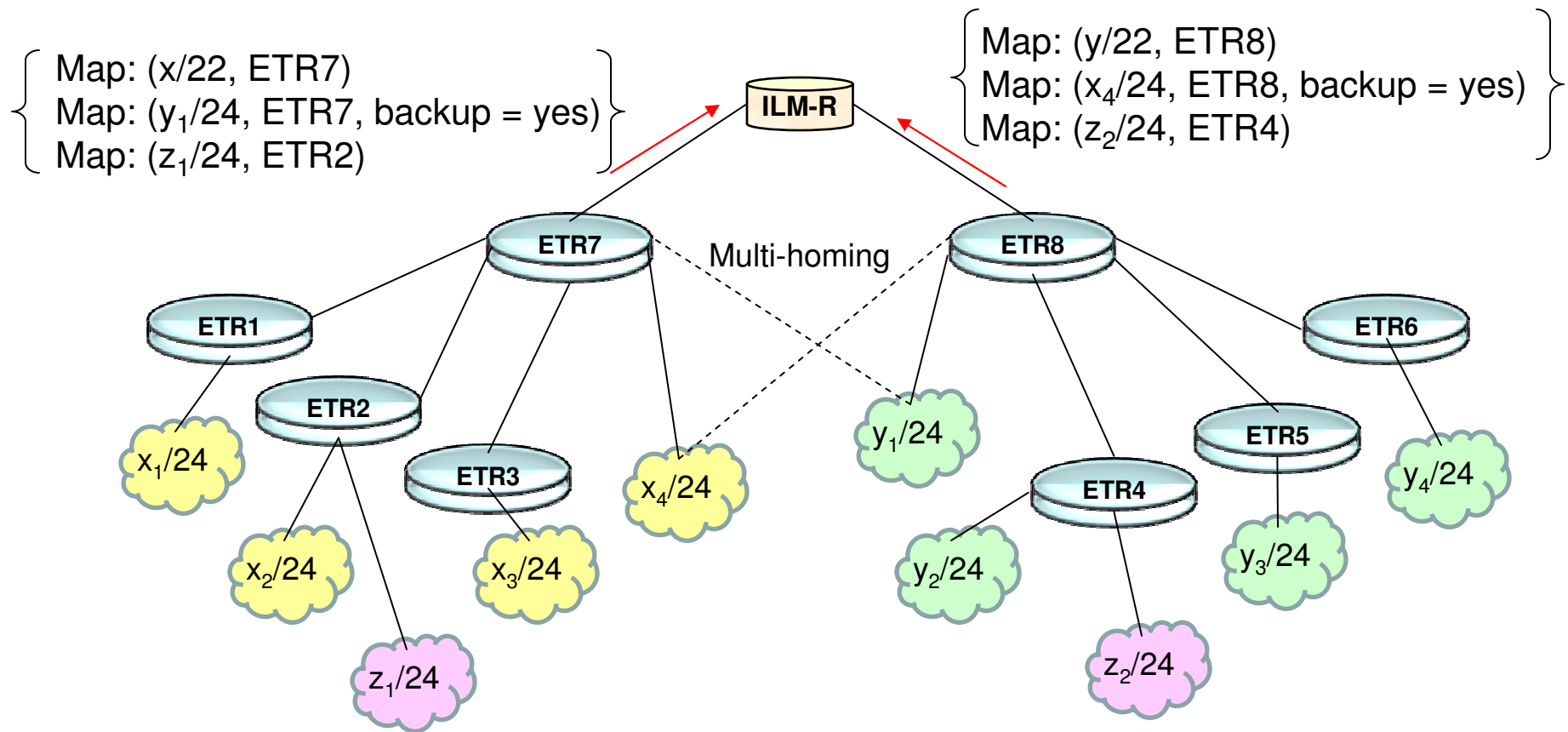
# Scenarios with a Hierarchy of ETRs and Subnet Multi-Homing



# Scenarios with a Hierarchy of ETRs: Can't Hide ETRs Below



# Scenarios with a Hierarchy of ETRs: Combination of Possibilities



## **Conclusions and Future Work**

- Discussed various architectural questions related to the mapping distribution and management
- Raised some questions regarding aggregation possibilities for the EID address space associated with delivery networks
- Ways of dealing with exception subnets or subprefixes in the mapping distribution protocol
- Consideration of recursive map-and-encap