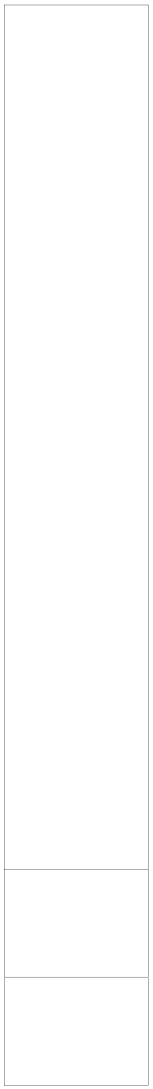
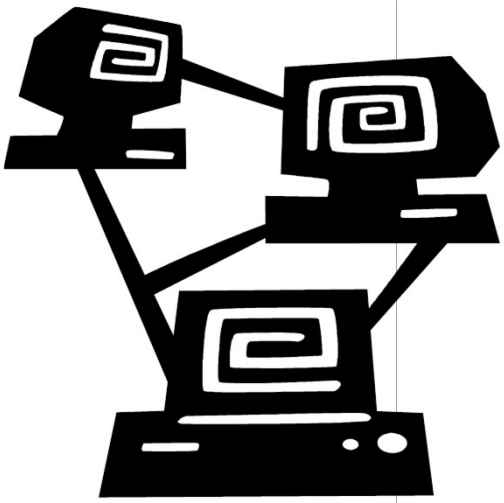
OSPF

Foundations of computer networks



Properties of OSPF

- Autonomous system is splited into areas
  - area 0 (backbone – communication between areas)
  - areas 1 – 4 294 967 295 (2^{32}-1)
- Taking into account the status of links (inside area only)
- Flooding of area by routing information
  - link-state advertisements (LSAs)
  - high convergence
  - each router know the topology of its area
- Building the shortest path tree



IP only

Roles of routers

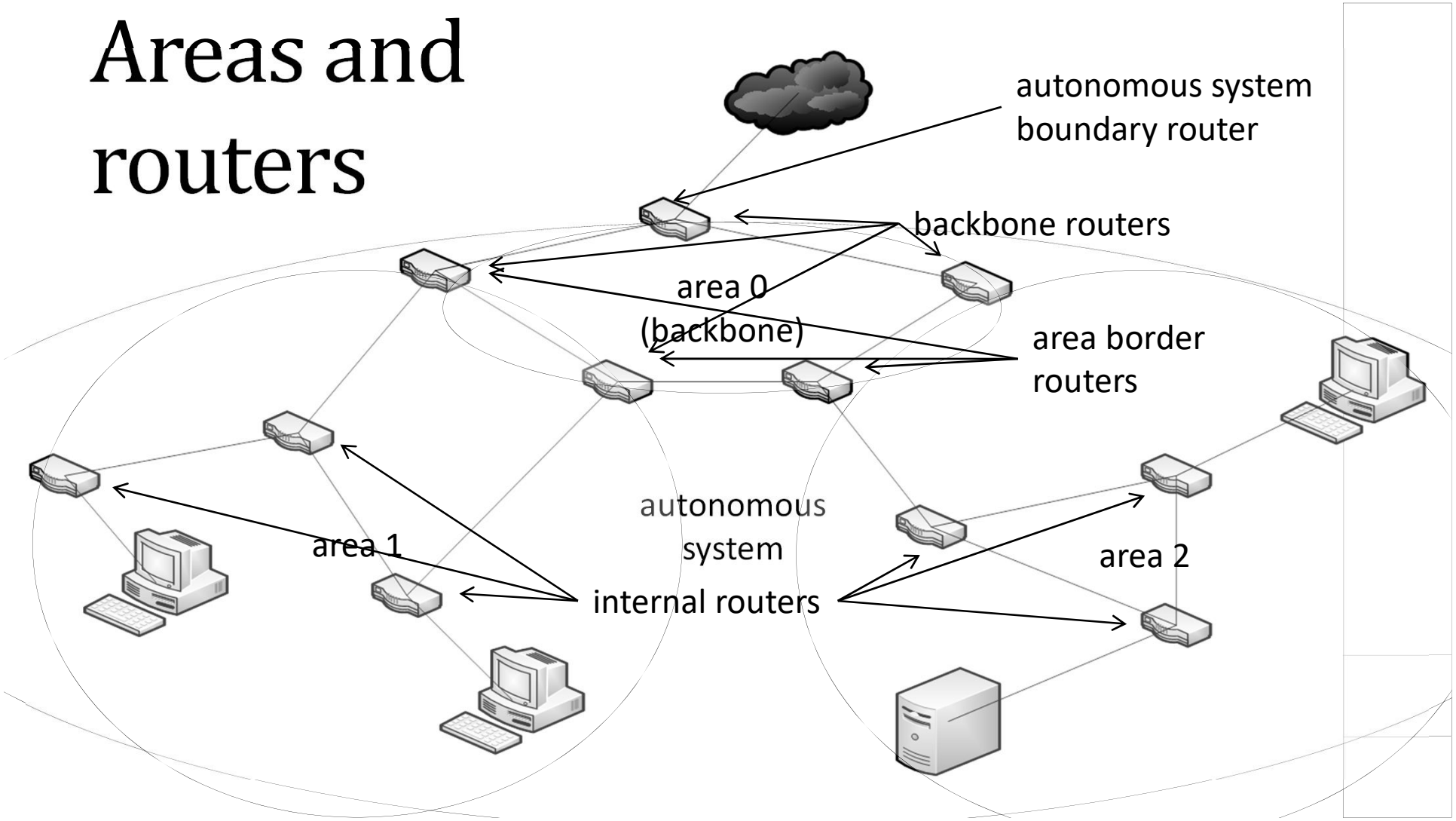
- internal routers (IR)
- area border routers (ABR)
- backbone routers (BR)
- autonomous system boundary router (ASBR)

partitioning of authonomous systems into areas

area 0

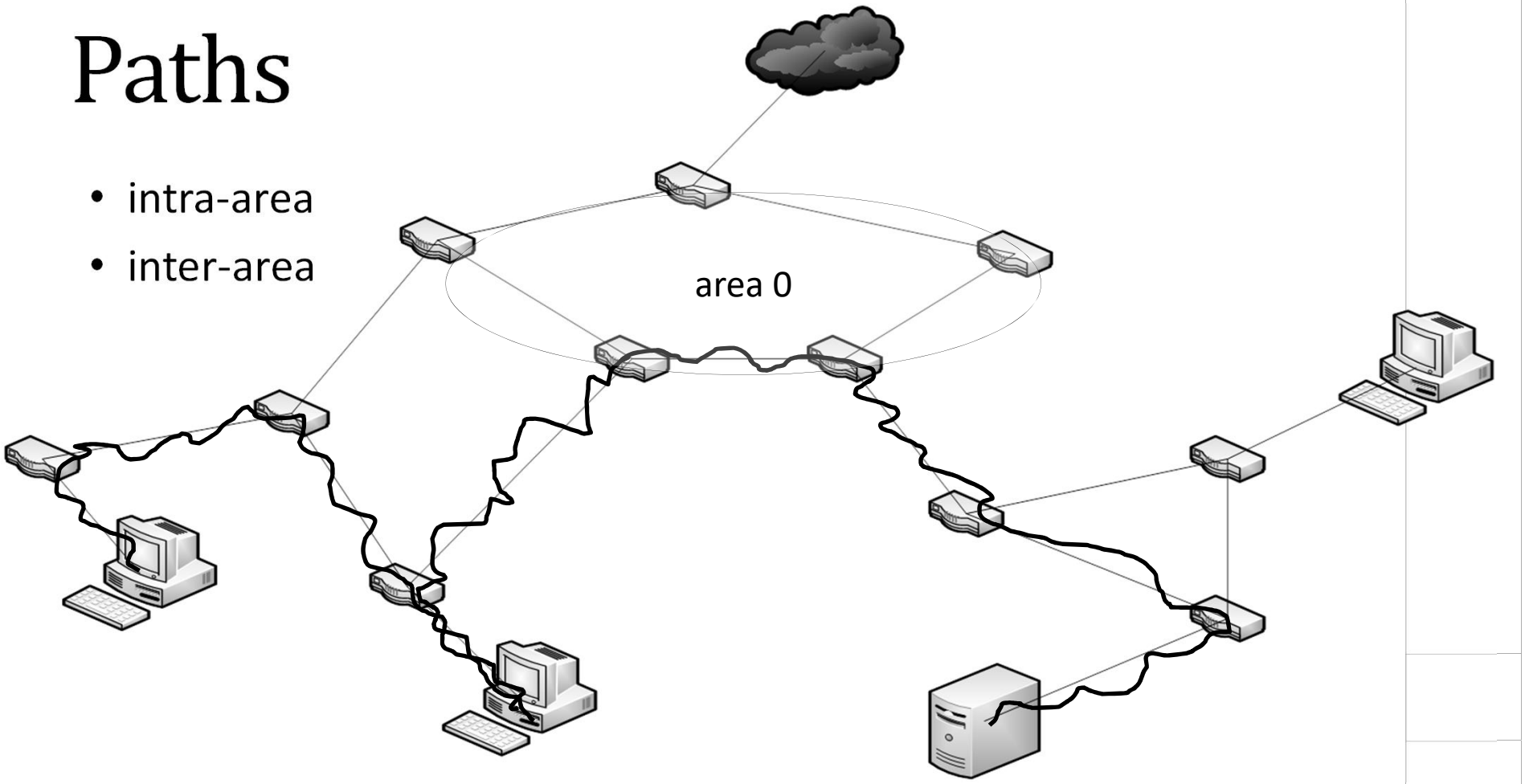
communication between autonomous systems

Areas and routers

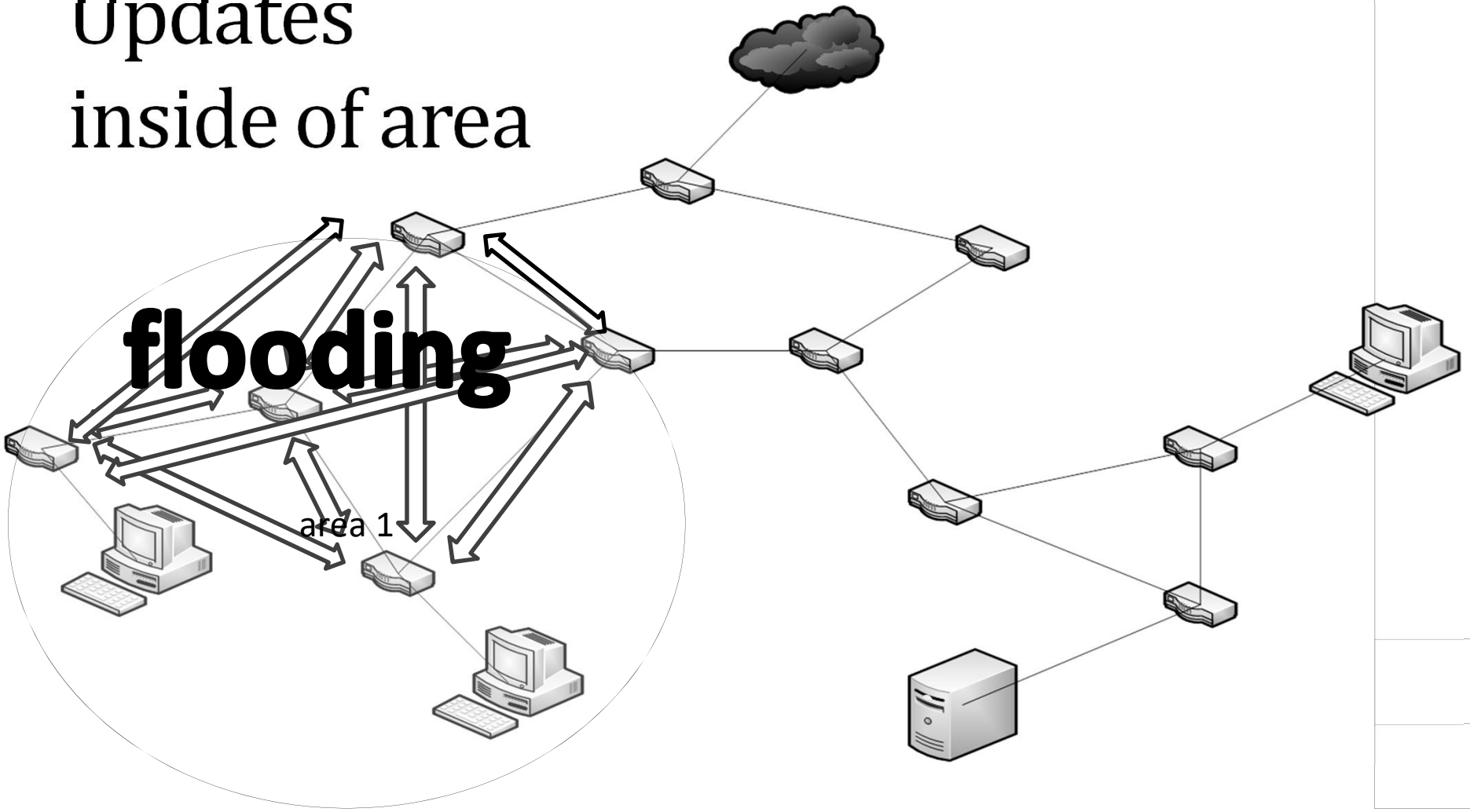


Paths

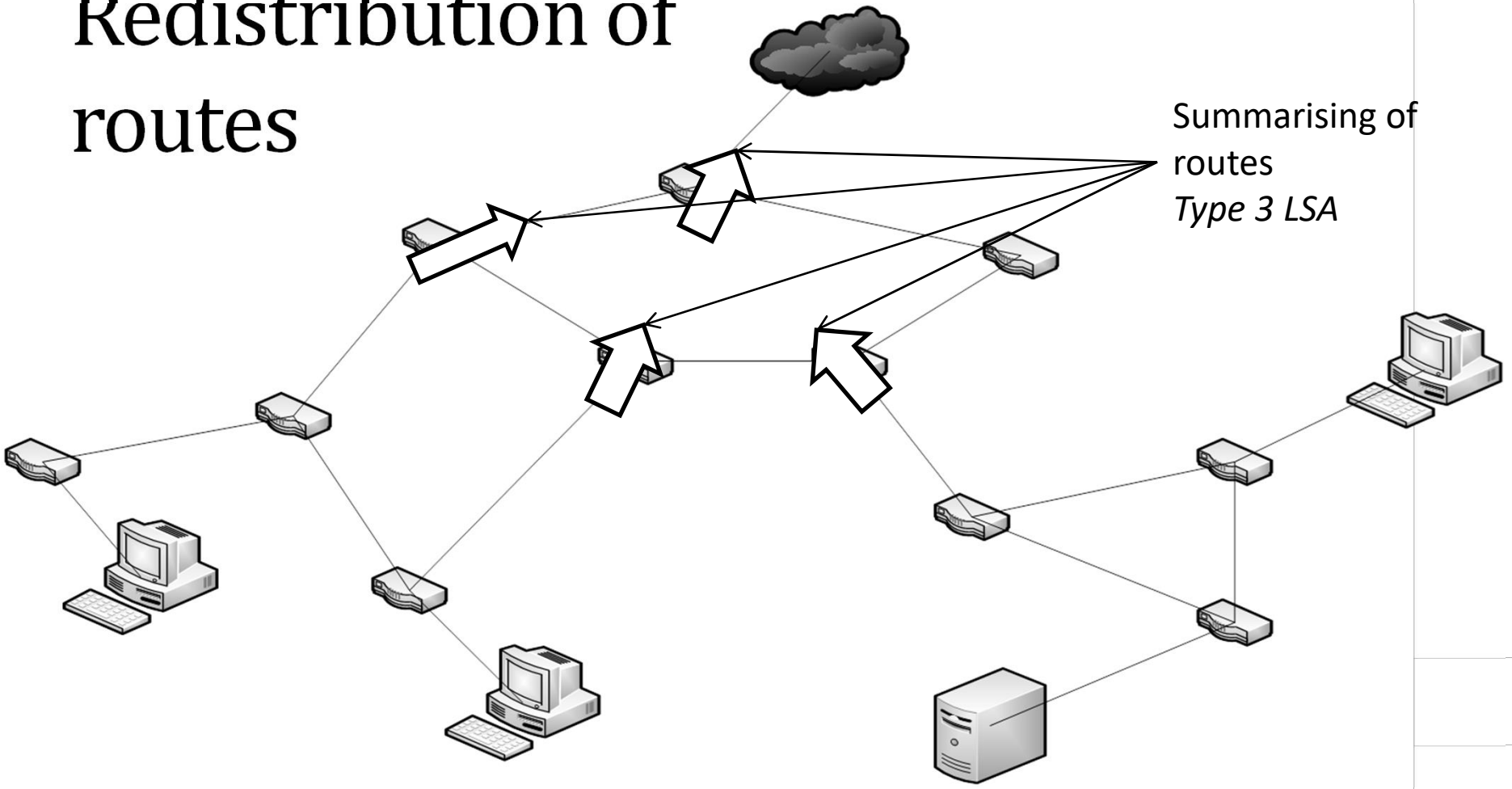
- intra-area
- inter-area



Updates inside of area



Redistribution of routes



Communication in OSPF

- Comm

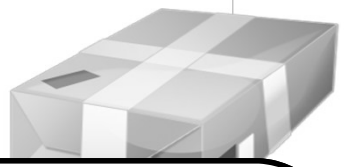
IPv4 – 1, **2**
IPv6 - 3

version	type	length
router ID		
area ID		
checksum	authentication type	
authentication		

- Message types
  - hello (*type 1*)
  - database description (*type 2*)
  - link state request (*type 3*)
  - link state update (*type 4*)
  - link ... ackn... (*type 5*)

To choose from eg.:
none,
password,
MD5

Communication in OSPF



- Message types
  - hello (type 1)
  - database description (type 2)
  - link state request (type 3)
  - link state update (type 4)
  - link state acknowledgment (type 5)

Establishes communication and communication parameters:

- broadcast frequency HELLO
- network mask
- time to recognise the router as the dead
- the list of neighbors
- designated router ID
- backup designated router ID

Communication in OSPF

- Message types
  - hello (type 1)
  - database description (type 2)
  - link state request (type 3)
  - link state update (type 4)
  - link state acknowledgment (type 5)

Transmit description (structure) of link state database

Communication in OSPF

- Message types
  - hello (type 1)
  - database description (type 2)
  - link state request (type 3)
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Transfer the selected part of the link state database request

Communication in OSPF

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Communication in OSPF

- Message types
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Transfer the selected part of the link state database acknowledgment

OSPF does not use the transport-layer protocol, so it must ensure the reliability of the communication by itself

LSA types

- LSA of router
- LSA of network
- LSA summary of IP network
- LSA summary of ASBR router
- LSA outside autonomous system

The state and cost of the router's links to the area

The state and the cost of all routers link in area (sending by designated router)

A summary of information about routes in the area for the adjacent areas (areas

A summary of information about routes in the area for the other areas (AS boundary routers)

Information about the locations which are available outside the OSPF network

age LSA	options	LSA type
link state ID		
broadcast router ID		
order number		
checksum		length

routers costs calculation

- Automatic calculation of the cost of a link based on the available bandwidth
  - 1 – 100 Mb/s
  - 10 – 10 Mb/s
  - 64 – 1,544 Mb/s
  - 1768 – 56 kb/s
- The cost of the default
  - accepted in the case a small link diversity
  - the cost of the path = hops number * default cost
- Manually fixed costs
  - …

100 Mb/s *w^{-1}

links between routers are considered only

A tree of shortest paths

- Each router has a knowledge of the structure of the area
- Each router builds its tree, in the which is the root
- Router cost is the sum of links costs
- If for the particular destination there are more routes with the same cost
  - all of them are held
  - all of them are in use (load balancing)