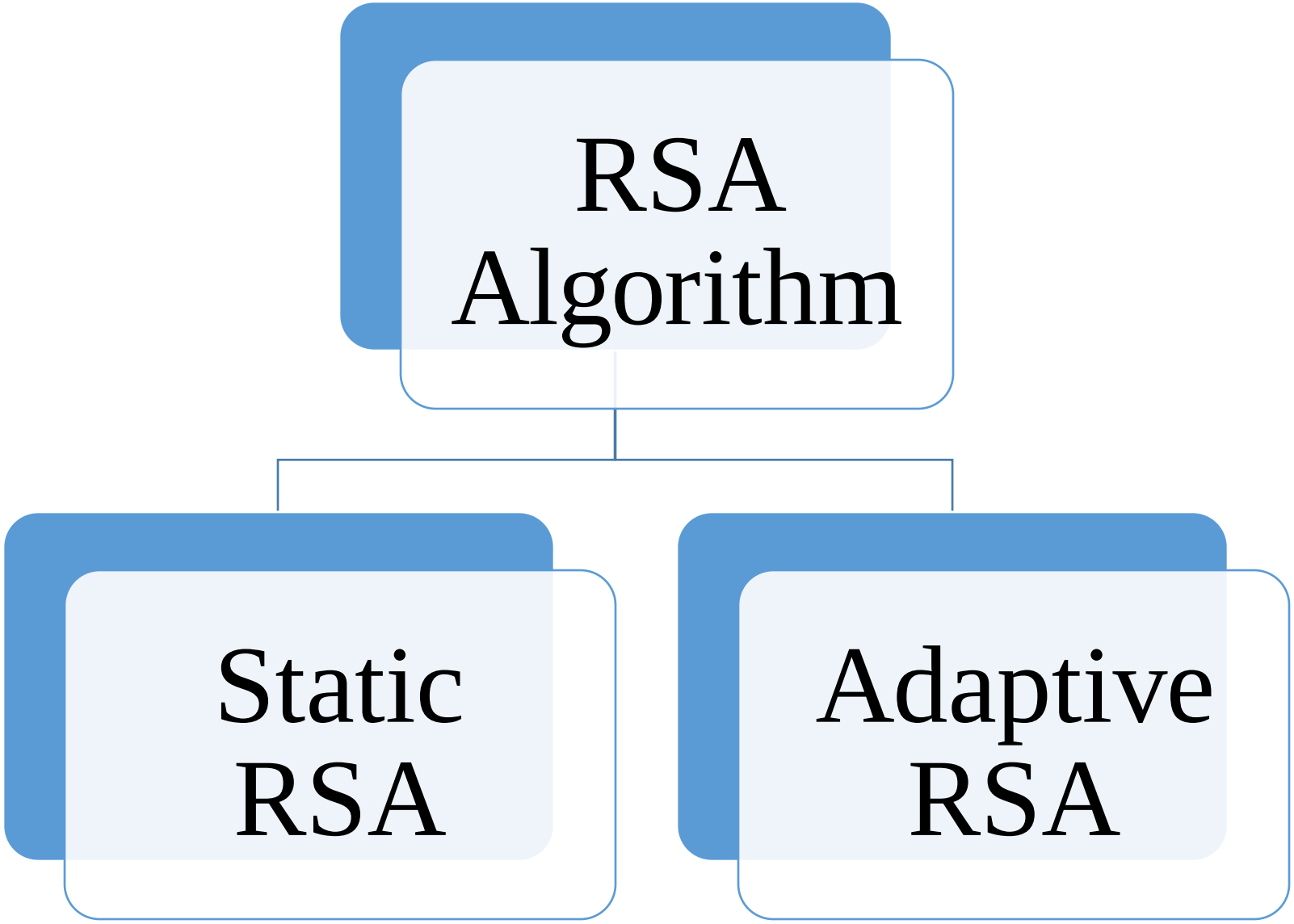
Distributed Routing and Spectrum Assignment

Centralized RSA	Distributed RSA
A central SDN controller takes decision for Routing and Spectrum Allocation for all the incoming lightpaths	Individual nodes within the networks are responsible for the lightpath traversing through it and take the decision of their Routing and Spectrum Allocation.
If the central SDN controller fails, the whole network goes down.	If any of the node fails only the lightpaths passing through, starting or terminating at the nodes fail. All other lightpaths remains unaffected.
For large networks, the decision taken by a single controller, increases the overhead with increase in network size, thus scalability is poor.	In distributed scenario, since each node acts independently, the RSA decisions are taken by each node locally and no extra load due to the network size. Scales well with the size.
The central controller takes less time in making RSA decisions for smaller networks. The solution is always the converged solution, as controller has the information of all the nodes present in the network.	Each node takes RSA decisions independently and has information about its neighbouring nodes. Therefore, it may take longer time for the solution to converge.

Depending on the type of metric used for RSA



Static Distributed RSA

- Cost - Distance, Hop Count..
- In static distributed RSA, each node needs to maintain routing table.
- Each node keep information of its neighbouring node.
- The table contains Source Node, Destination Node, Neighbouring Node, Cost.
- Routing Information Protocol, Bellman-Ford Algorithm can be used for routing,
- Once the path found, spectrum availability can be checked over the path.

Adaptive Distributed RSA

- Cost – Spectrum Status, Release Time, Link and Node Availability, Fragmentation Metric, ..
- In adaptive distributed RSA, each node needs to maintain routing table.
- Each node keep information of its neighbouring node in its routing table.
- The table contains Source Node, Destination Node, Neighbouring Node, Cost.
- Once the adaptive parameters value changes the routing table of each responsible node needs to be updated.
- Routing Information Protocol, Bellman-Ford Algorithm can be used for routing,
- It returns the path with required spectrum slots information.

Further Work

- RIP – RFC1058.
- Bellman-Ford Algorithm – RFC6126 and RFC7557 (The Babel Routing Protocol).
- Proposed Algorithms – Static and Adaptive RSA.