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Temporary ordered routing algorithm (TORA)

TORA (Temporally Ordered Routing Algorithm) is a source initiated on demand routing protocol.

It was invented by **Vincent Park and M. Scott Corson** from university of Maryland in 1997 for wireless ad hoc network.

TORA is a highly adaptive, efficient, loop-free and scalable routing protocol based on link reversal algorithm.

The main objective of TORA is to limit message propagation in the highly dynamic mobile computing environment. It means, it is designed to reduce communication overhead by adapting local topological changes in ad hoc network. Another main feature of TORA routing protocol is the localization of control packets to a small region (set of nodes) near the occurrence of a topological changes due to route break. Hence, each node of the network required to contain its local routing and topology information about adjacent nodes.

TORA supports multiple routes to transmit data packet between source and destination nodes of mobile ad hoc network. In short, TORA exhibits multipath routing capability.

The TORA's operation can be compared to that of water flowing downhill toward a sink node through a grid of tubes that model the routes in the real world network. The tube junctions represent the nodes, the tube themselves represent the route links between the nodes, the tube's water represents the packets flowing between nodes through the route links toward the destination, as shown in the figure:

TORA works in three main phases:Route creation: Route creation from source to destination.
Route maintenance: Maintenance of the route.
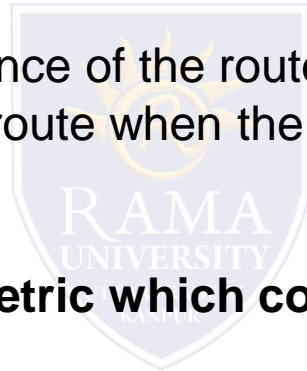**Route erasure:** Erasing of the route when the route is no longer valid.

TORA contains a quintuple metric which consists of: Logical time of link failure.
Unique ID of the node that defines the new reference level.
A reflection indicator bit.
A propagation ordering parameter.
Unique ID of the node.

Hybrid protocols attempt to take advantage of best of reactive and proactive schemes. The basic idea behind such protocols is to initiate route discovery on demand but at a limited search cost. One of the popular hybrid protocols is zone routing protocol (ZRP).

Zone routing protocol (ZRP)
Zone routing protocol is a hybrid of reactive and proactive protocols. It combines the advantage of both reactive and proactive schemes.
ZRP was invented by Zygmunt Haas of Cornell University. Zone routing protocol finds loop free routes to the destination.
ZRP divides the network into zones of variable size; size of the zone is determined radius of length ?, where the ? is the number of hops or nodes to the perimeter of the zone and not the physical distance.
In other words we can say that, the neighborhood of the local node is called a routing zone. Specifically, a routing zone of the node is defined as the set of nodes whose minimum distance in hops from the node is no greater than the zone radius.
A node maintains routes to all the destinations proactively in the routing zone. It