Plug and Play for SpaceWire networks: centralized algorithm

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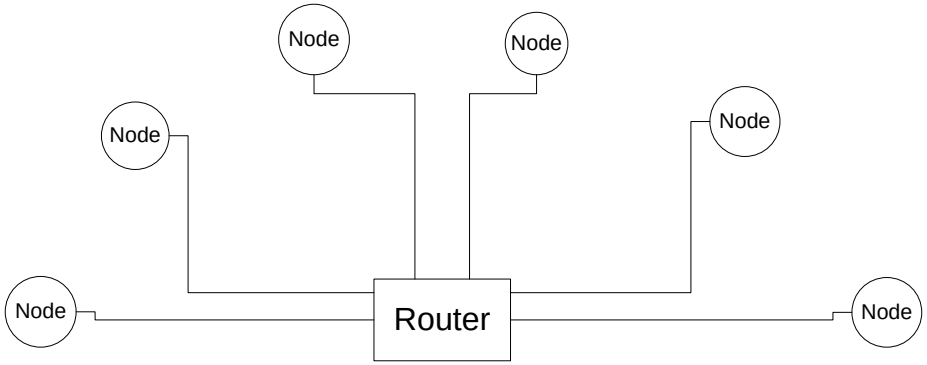
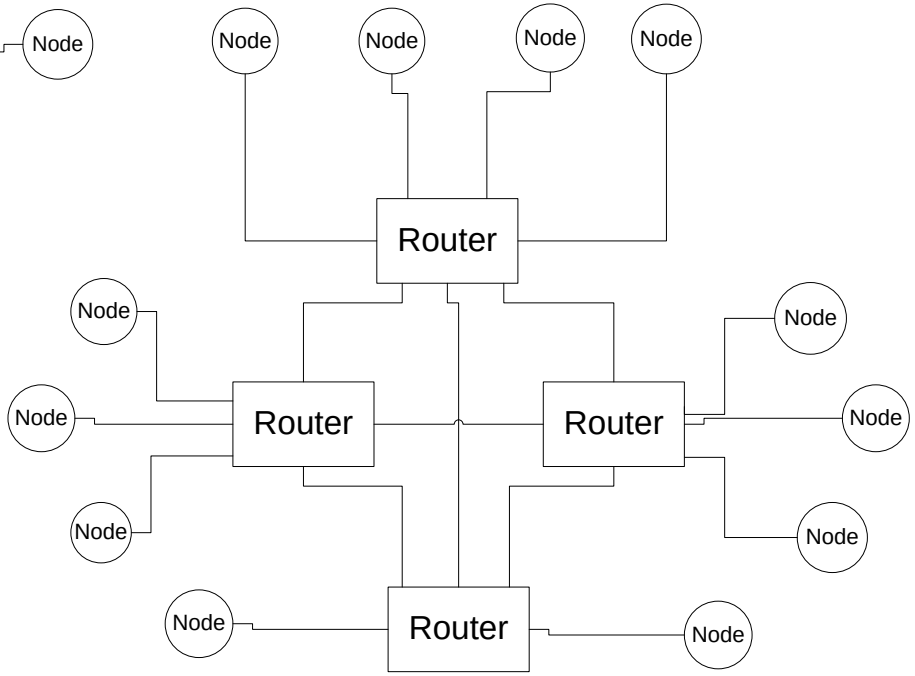
Network configuration and administration



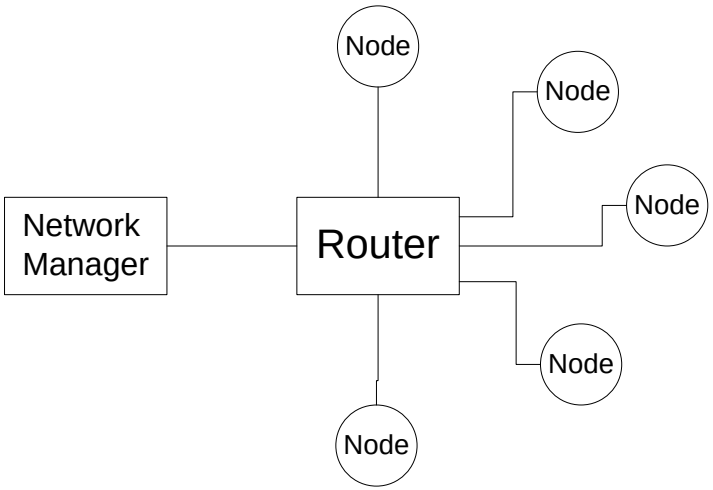
Human - operator

Plug and Play

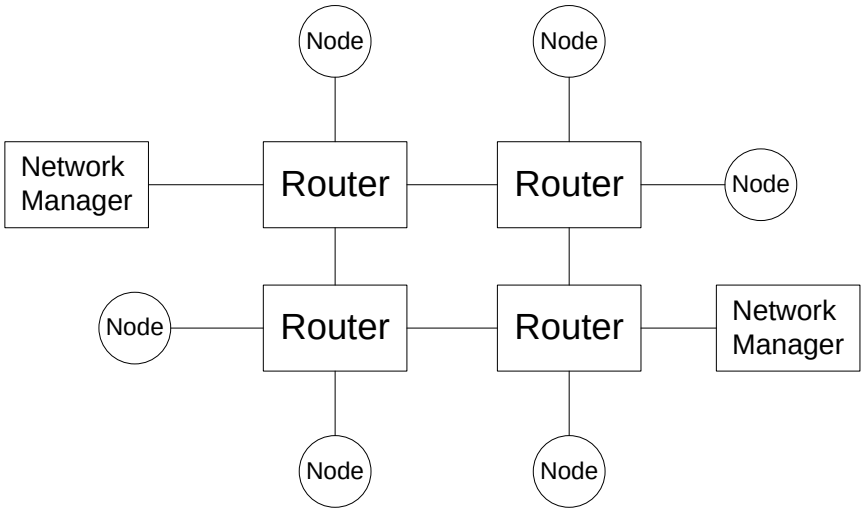


Plug and Play algorithms (1/2)

- The centralized algorithm



- The decentralized algorithm



Plug and Play algorithms (2/2)

	Offered by NASA	Offered by Dundee University	The algorithm considered in this presentation
The initiator	Router	Network Manager	Network Manager
Type	Centralized and decentralized	Centralized and decentralized	Centralized
Protocol	New protocol based on RMAP	New protocol based on RMAP	RMAP
Requirements	Additional requirements to device software	Additional requirements to device software	Nodes have to process RMAP packets

SpaceWire and RMAP

- SpaceWire is the standard for high-speed connections and networks for use onboard a spacecraft.
- Remote Memory Access Protocol (RMAP) is used for access to remote program available elements of device.

Defining the network and the devices

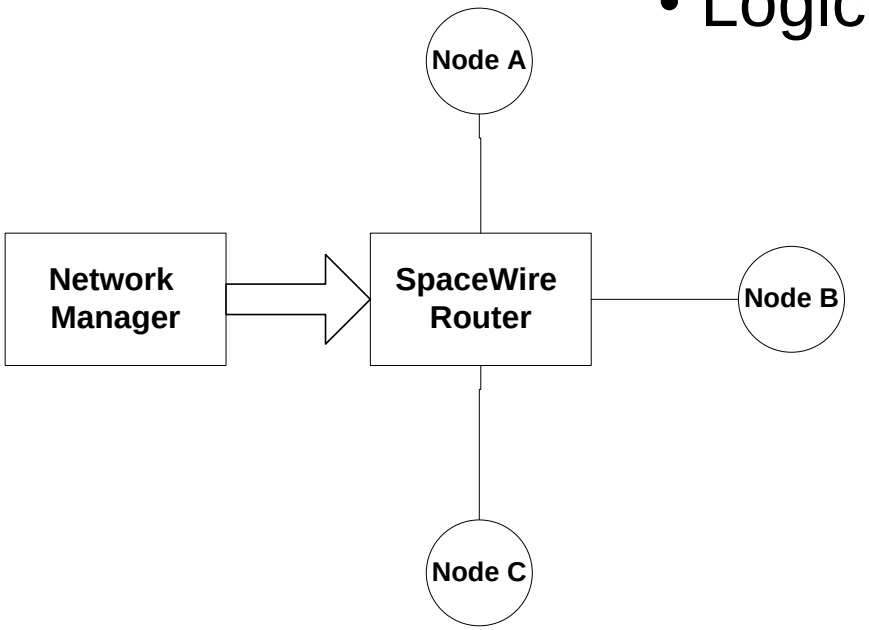
The network consists of nodes and routers (devices).

Routers

- Device type
- Routing table
- Notification register
- Active ports

Nodes

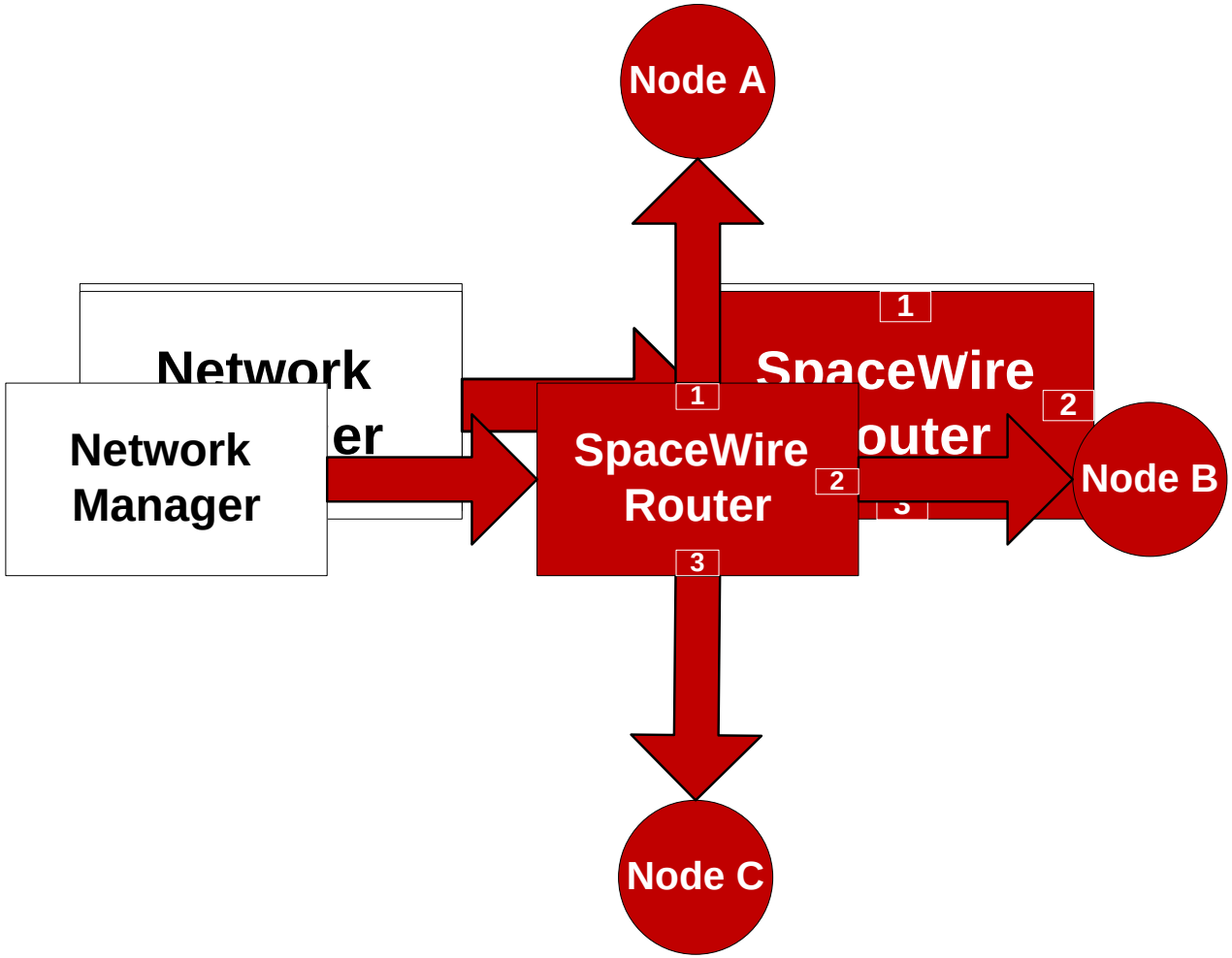
- Logic address



SpaceWire Plug and Play organization

- The initiator is Network Manager. All other devices are targets.
- Network Manager use RMAP, namely:
  - read,
  - response to read,
  - write with acknowledge commands.

The Network Manager Algorithm



Modeling and results (1/2)

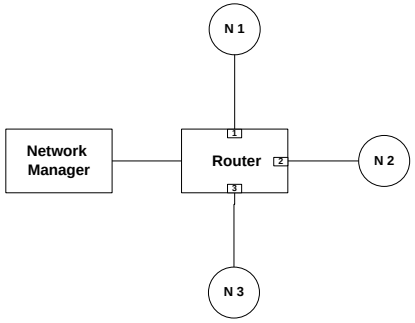
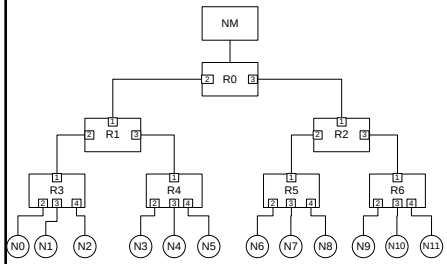
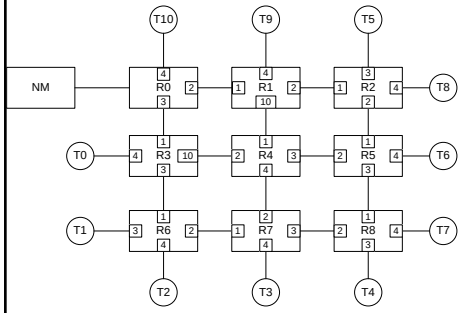
DCNSim – the simulation software functioning of the distributed network

It was necessary to write the main functions software of the router, node and Network Manager:

- Form,
- Analyze RMAP packets

The SpaceWire standard has already realized in used software

Modeling and results (2/2)

	Simple	Tree	Lattice
			
EBR = 0	11730 ns	130160 ns	99230 ns
EBR = 10^{-12}	29207340 ns	More than $3*10^8$ ns	More than $3*10^8$ ns

Conclusion

- With standard error bit rate (10^{-12}) the algorithm need to have a much more time for configure network.
- With standard error bit rate (10^{-12}) the network also will be configured but for a long time.
- In future the decentralized algorithm will be created

Thank you for attention