BMX6

a routing protocol with social aspects

- Coming from Batman routing protocol
- Forke: BMXd (BatMan-eXperimental)
- After a while thinking, this must be all done different!
- And I recognized, we can learn a lot from human networks...
- New Version: BMX6
  - No technical details today :-)

17. 3. 2011 - Wireless Battle Mesh V4 - Sant Bartomeu del Grau - Catalunia

www.bmx6.net Axel Neumann <neumann at cgws dot de>

Human and Social Networks

- Real life
  - World population ~6 billion
  - I spend > 99% of social live with < 0.0001%
  - And even more with an even smaller subset
  - 100% of my life is related to myself (some egoism helps)
- Why good
  - most of my time with the same friends & neighbors
  - I know their: weaknesses, strength, reliability, friends
  - Trust and easy communication
  - Tolerance, others even accept my strange way of doing...
  - Narrowing my mind - But acting as a team makes you stronger

Mesh- versus Human- Networks

Similarities and Assumptions:

- Number of “good” NBs is limited and usually small compared to network size
- “Good” Neighborhood often not related to geographically close individuals
- Common prosperity requires social measures
  - Some nodes hardly perceive NBs and are solar powered...
- Different opinions, objectives (situation dependent)

Focus on transportation of information:

- Speed, reliability, size, range → Routing algorithm and parametrization

Social Aspects of BMX6

- Regarding being egoistic
- Regarding behaving social within neighborhood
- Regarding tolerance within whole mesh cloud

Social Aspects of BMX6

Regarding being egoistic

- Internally organizes topology knowledge optimized for itself
  - Individual vocabulary (identifiers)

    -> reference nodes & NB
  - Exports knowledge using own vocabulary

    (but common grammer)

Measurements in virtual network

CPU load depending on network size

CPU@Fonera2100, 2 perfect neighbors, 1 – 100 nodes mesh (4-NBs grid)

Nodes	1	20	40	60	80	100
CPU max [%]	1	4	3	3	4	6
CPU avg [%]	1	2	2	2	2	3

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  Thats reasonable!

  - **Because Node has to deal with itself all life long!**
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Social Aspects of BMX6

Regarding behaving social within neighborhood

- Invest lots of efforts to learn about NBs
  - Learn their vocabulary (identifiers)
  - Afterwards benefit from perfectly optimized vocabulary
    - Less overhead and processing

    Known as: Statefull Compression

  Measurements: CPU-load and protocol traffic overhead:

Measurements in virtual network

CPU-load depending on Neighbors

CPU@Fonera2100, 2 – 10 perfect neighbors, 100 nodes mesh (4NBs grid)

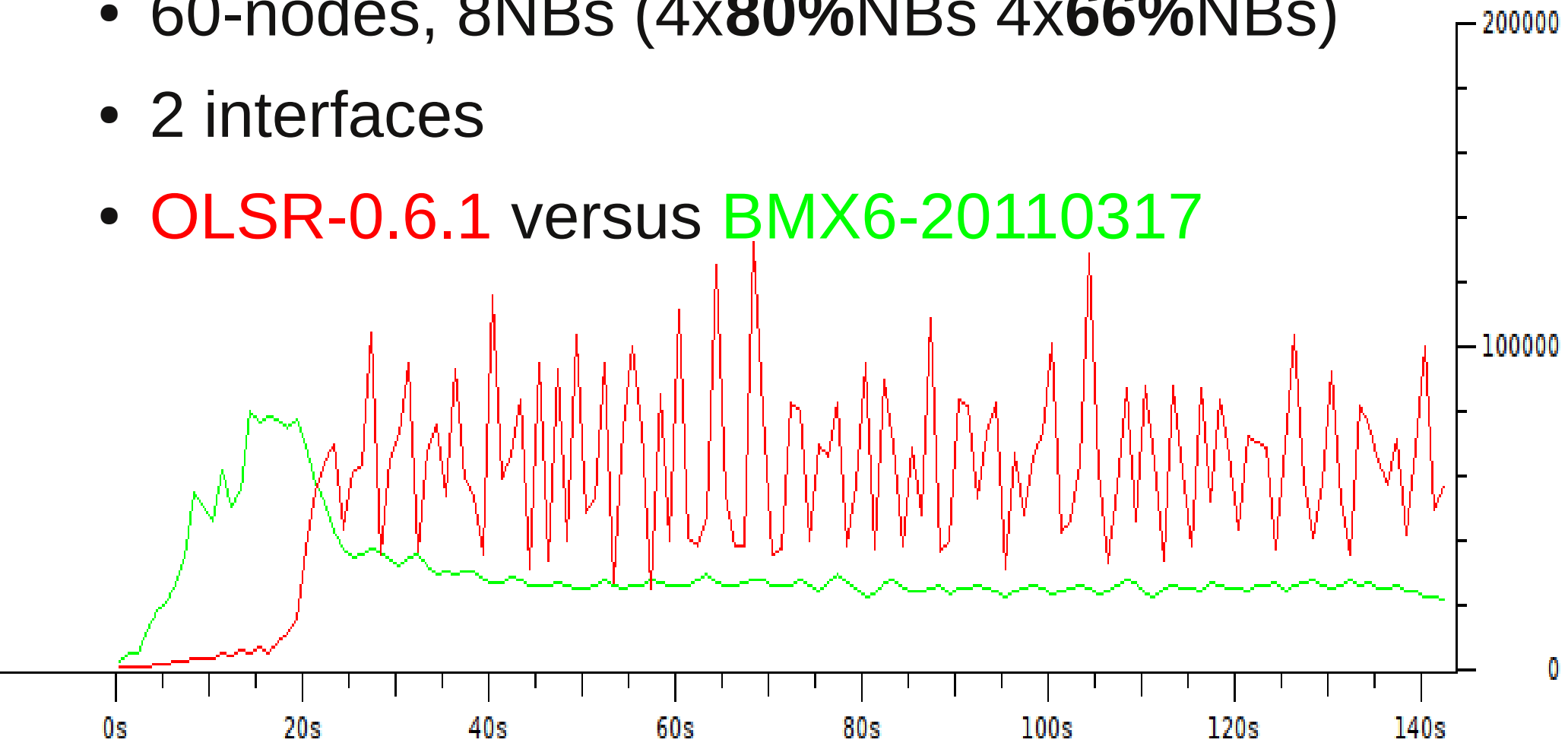
Neighbors	2	4	6	8	10
CPU max [%]	6	6	9	11	9
CPU avg [%]	3	3	4	4	5

CPU@Fonera2100, 10 – 30 100%-33%-LQ neighbors, 100 nodes mesh (4NBs grid)

Neighbors	10	20	30
CPU max [%]	8	19	21
CPU avg [%]	6	8	10

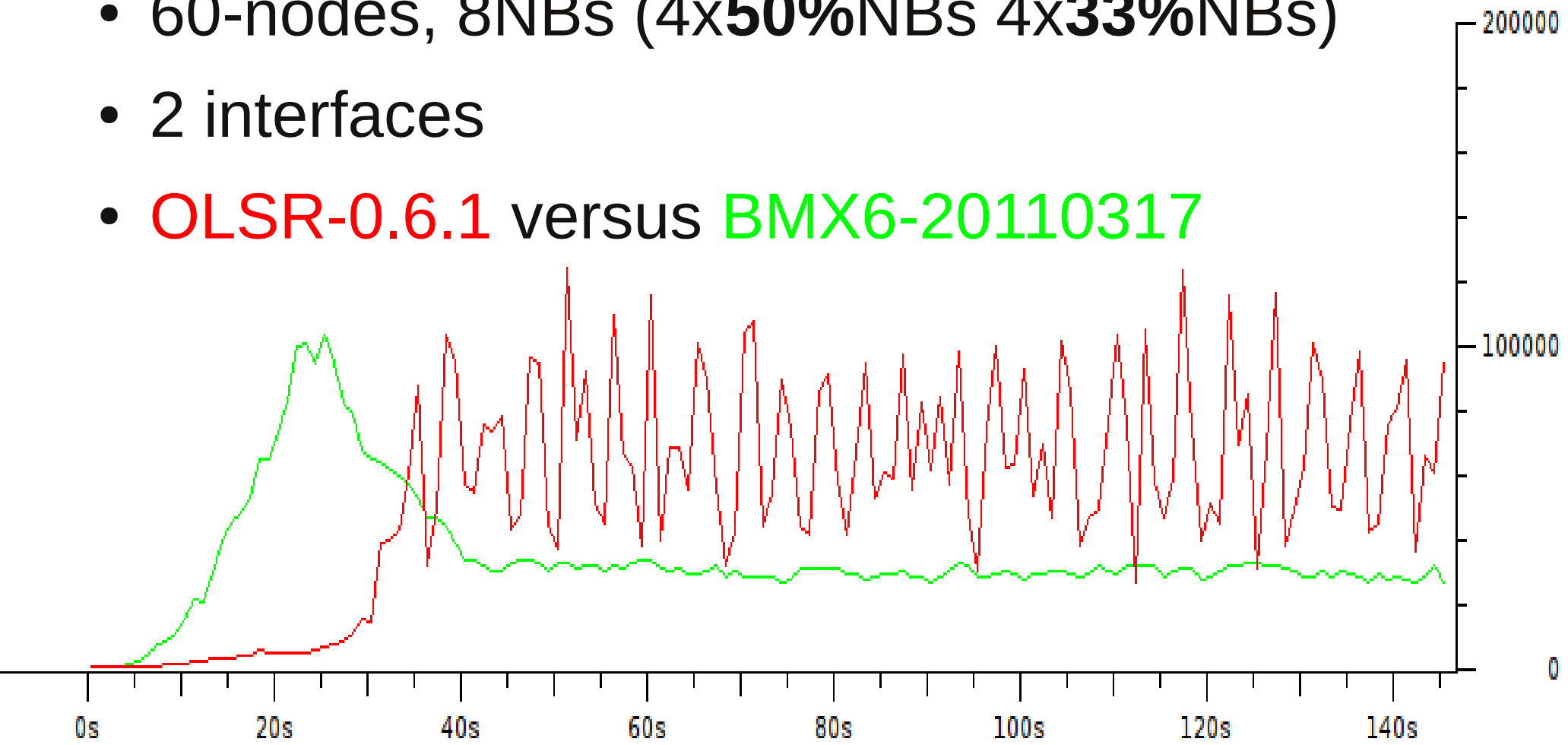
IPv4 Protocol overhead measurement in virtual mesh

- IPv4 discovery phase and long term phase
- 60-nodes, 8NBs (4x**80%**NBs 4x**66%**NBs)
- 2 interfaces
- OLSR-0.6.1 versus BMX6-20110317



IPv4 Protocol overhead in weak-links mesh network

- IPv4 discovery phase and long term phase
- 60-nodes, 8NBs (4x**50%**NBs 4x**33%**NBs)
- 2 interfaces
- OLSR-0.6.1 versus BMX6-20110317



IPv4 Protocol overhead in BAD-links mesh network

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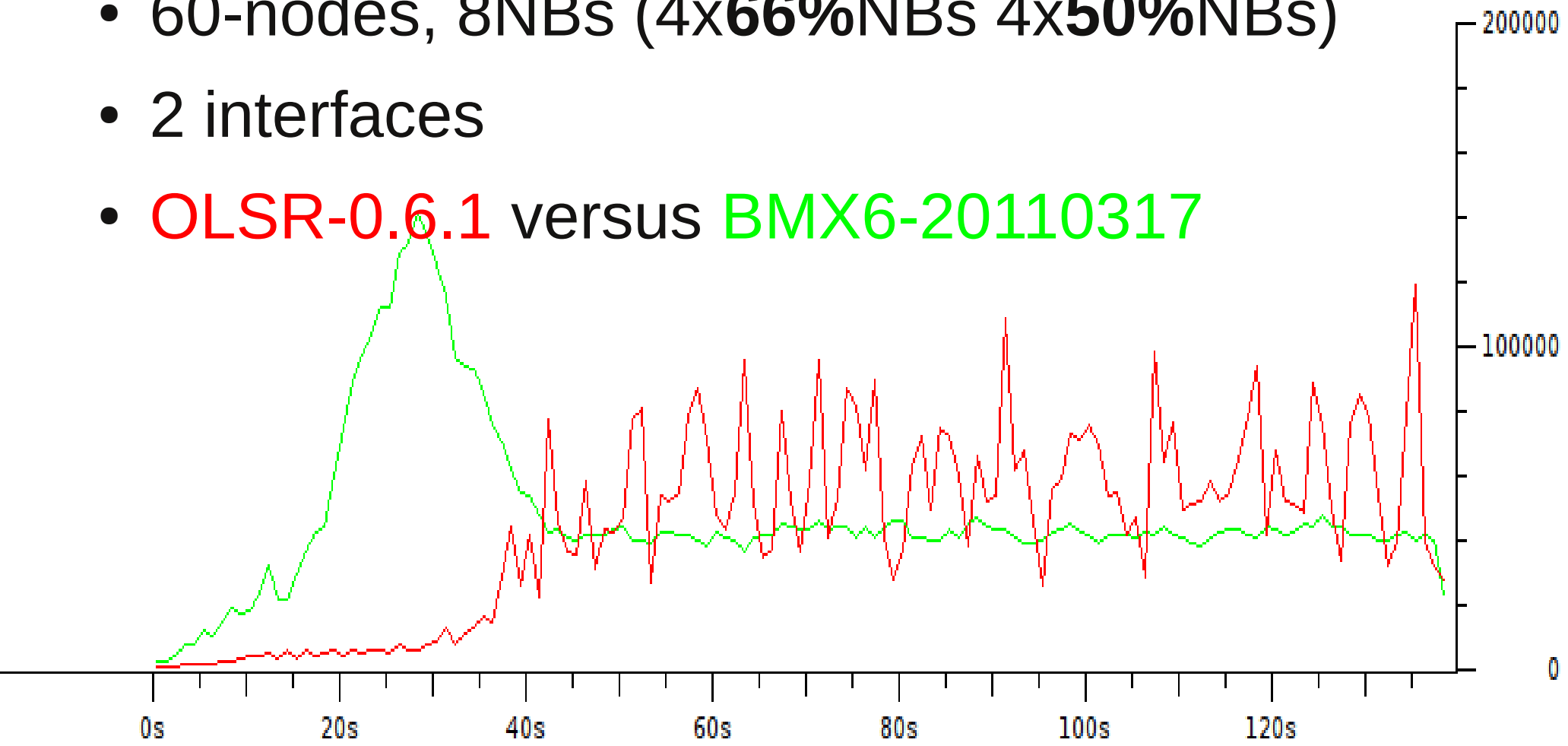

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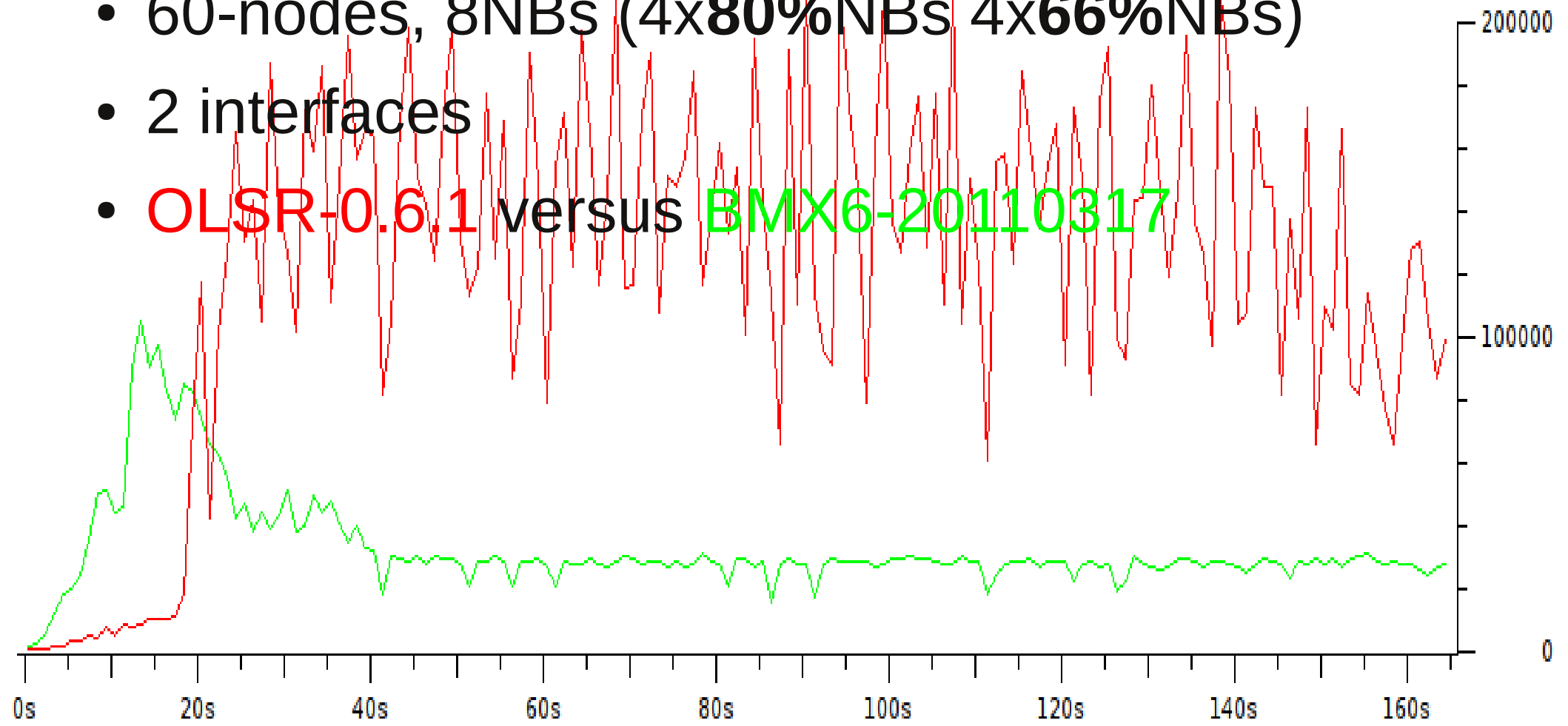

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  Measurements: CPU-load and protocol traffic overhead:
- **Learn about NB weaknesses, strength, reliability**
  - Connectivity to Neighbors and Wold (links-, paths- qualities)
  - Willingness to quickly forward routing information
  - Usefull for me? Does NB need my help?

  Measurement: Flipping link

Re-Convergence Measurement due to altering link quality

- 4x10 nodes (node 100...149)
- Direct on/off link between node 100<->149
- Ping probes send between 112 ↔ 128

convergence time (due to flipping long shot in 40-nodes mesh)

			0%->100%	100%->0%	0%->100%	100%->0%
	1th icmp	total	102 new path	209 old path	303 new path	403 old path
OLSR 0.6.1	23	421/500	33 secs	27 lost, 6 TTL=0	33 secs	27lost, 5 TTL=0
BMX6	8	472/500	20 secs	11 lost	25 secs	12 lost

Social Aspects of BMX6

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  Thats reasonable!

  - Because Node has to deal with itself all life long!
- Regarding behaving social within neighborhood

  Thats worth!

  - **Because nodes' team consists of same few NBs most of the time**
- Regarding tolerance within whole mesh cloud

Social Aspects of BMX6

Regarding tolerance within whole mesh

(Mesh networks: routing objectives)

- Support routing objectives of each node
  - Identify other nodes' routing algorithm (TQ, ETX,..)

    learn desired parametrization (sliding window size,...)
  - Treat each nodes' packets respectively
  - Do NOT break global routing

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  Thats pluralism...

Thanks

...http://www.bmx6.net