Comparison of Routing Software in Linux

Master's Thesis Presentation
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1. Overview

The purpose of routing:

A Router needs to forward the Internet Protocol packets towards the destination

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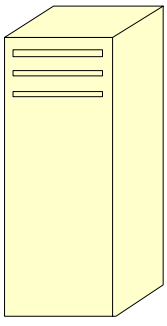
Routing software:

An application that performs the routing tasks

Routing tasks:

1. Keep the routing information database up to date
2. Forward the packets to the right direction



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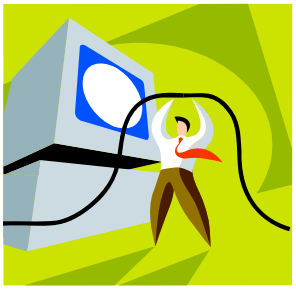
2. Objective

- We have a good routing software in FreeBSD
- We need a routing software in Linux
- Measure how well the FreeBSD software works in Linux



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3. Methods

- Migrate the routing software from FreeBSD to Linux
- Compare the migrated routing software to a few other routing software packages in Linux
- Comparison consists of
  - Performance and
  - Software complexity measurements

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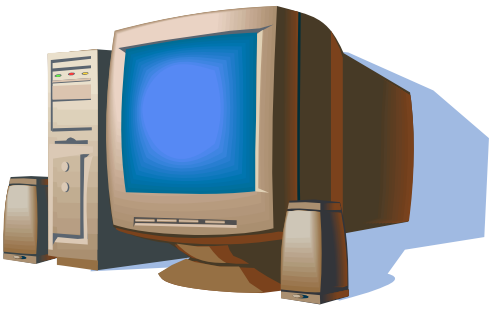
Compared routing software packages:

- Nokia ipsrd
- IpInfusion ZebOS
- NextHop GateD
- Quagga



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Performance comparison contents:

- Insertion time of a big amount routes
- Memory usage
- OSPF convergence time

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Software complexity measurement contents:

- Lines-of-code metrics
- Cyclomatic complexity measurements
- Information volume
- Maintainability Index

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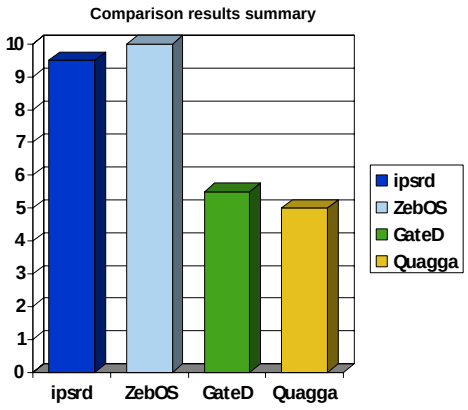
4. Results

- Ipsrd works well also in Linux
- ZebOS and ipsrd are on about the same level but better than the others
- GateD and Quagga are also equally good



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Performance results:

- No big differences in route insertion time
- Ipsrd and GateD use significantly less memory than ZebOS and Quagga
- OSPF convergence times are much smaller with ZebOS and Quagga than with ipsrd and GateD

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Complexity measurement results:

- Lines-of-code metrics:

  No big differences between the routing solutions. Ipsrd get slightly the best points, GateD is the second. ZebOS and Quagga are equally good.

- Cyclomatic complexity measurements:

  Quagga and GateD are the best. Ipsrd and ZebOS are worse and on about the same level.

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Complexity measurement results:

- Information volume:

  No big differences between the routing solutions. ZebOS is slightly the best. Ipsrd and Quagga share the second place.

- Maintainability Index:

  Ipsrd gets the first place in this measurement. ZebOS and GateD share the second place. Quagga is the most difficult to maintain.

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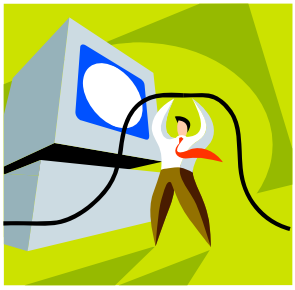
5. Conclusion

- The initial objectives were fulfilled in the thesis
- Ipsrd placed well in the comparison results even if it was only a pilot version
- Future work is needed to optimize ipsrd for Linux



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Thank You!

Something to clarify?

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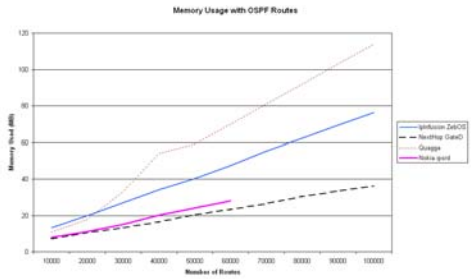
Performance Results

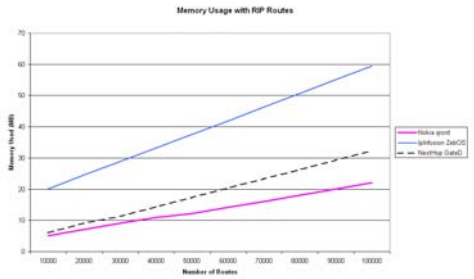
Time to insert 100000 OSPF routes

	Nokia ipsrd	IpInfusion ZebOS	NextHop Gated	Quagga
time (s)	N/A	539	567	550

OSPF Convergence time

	Nokia ipsrd	IpInfusion ZebOS	NextHop Gated	Quagga
Routes	time (s)	time (s)	time (s)	time (s)
100	8.70	5.81	10.09	1.63
1000	9.57	7.50	15.68	3.07
10000	33.62	13.61	34.02	10.93





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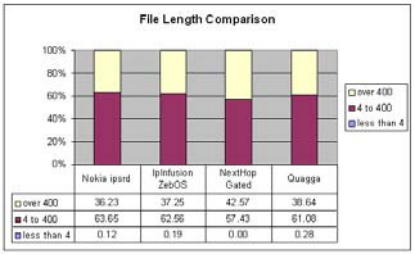
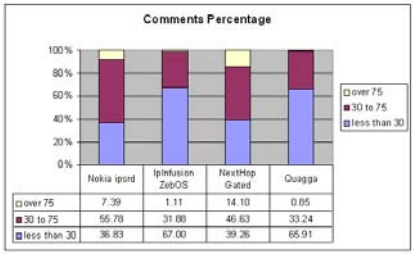
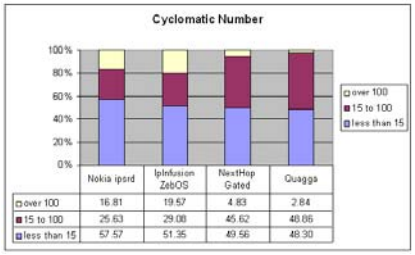
Complexity Results 1/2



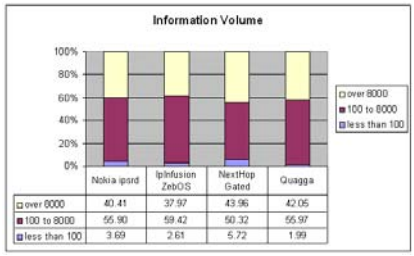
	Nokia ipsrd	IpInfusion ZebOS	NextHop Gated	Quagga
over 400	36.23	37.25	42.57	38.64
4 to 400	63.65	62.56	57.43	61.08
less than 4	0.12	0.19	0.00	0.28



	Nokia ipsrd	IpInfusion ZebOS	NextHop Gated	Quagga
over 75	7.39	1.11	14.10	0.65
30 to 75	55.78	31.88	46.63	33.24
less than 30	36.83	67.00	39.26	65.91



	Nokia ipsrd	IpInfusion ZebOS	NextHop Gated	Quagga
over 100	16.81	19.57	4.83	2.84
15 to 100	25.63	29.08	45.62	46.86
less than 15	57.57	51.35	49.56	48.30



	Nokia ipsrd	IpInfusion ZebOS	NextHop Gated	Quagga
over 8000	40.41	37.97	43.96	42.05
100 to 8000	55.90	59.42	50.32	55.97
less than 100	3.69	2.61	5.72	1.99

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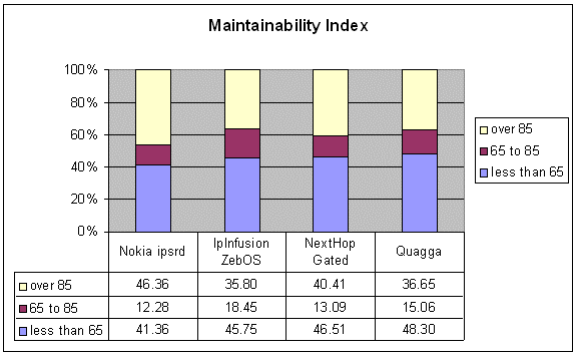
Complexity Results 2/2



	Nokia ipsrd	IpInfusion ZebOS	NextHop Gated	Quagga
over 85	46.36	35.80	40.41	36.65
65 to 85	12.28	18.45	13.09	15.06
less than 65	41.36	45.75	46.51	48.30

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Comparison Summary

Weighted comparison results

	Nokia ipsrd	IpInfusion ZebOS	NextHop GateD	Quagga
Performance				
Inserting 100000 OSPF routes	0	3	1	2
Memory Usage Average	2.5	1	2.5	0
OSPF Convergence	1	2	0	3
Sum	*3.5*	*6*	*3.5*	*5*
Complexity Measurements				
Maintainability Index	3	2	1	0
Double MI	*6*	*4*	*2*	*0*
Sum				
	9.5	10	5.5	5