



Configurable software-based edge router architecture

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Outline

- Requirements and challenge
- Control and data plane separation: ForCES
- Proposed model
- Performance evaluation and results
- Conclusion



Requirements and challenge

The edge routers play a major role in NGN:

- Control of connections, sessions, QoS, security, mobility
- Achieve internetworking and cooperation

Edge IP router requirements:

- High Flexibility
- Performance
- Scalability

Challenge:

To increase the flexibility and adaptability of routers while at the same time offering higher packet forwarding performance.



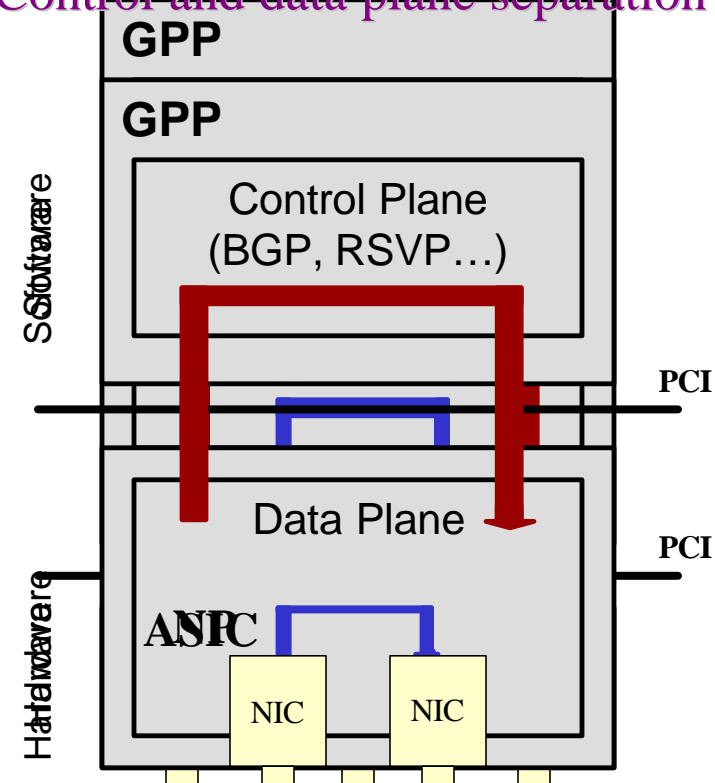
Existing architectural solutions for IP routers

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- **Software-based routers**
 - + Flexibility: New features are easily added
 - Performance limitation
- **ASIC-based routers**
 - + Very fast
 - Flexibility problem
- **Network processor-based routers**
 - + Flexibility, Performance, Scalability
 - Dependent Toolkit, Difficult deployment

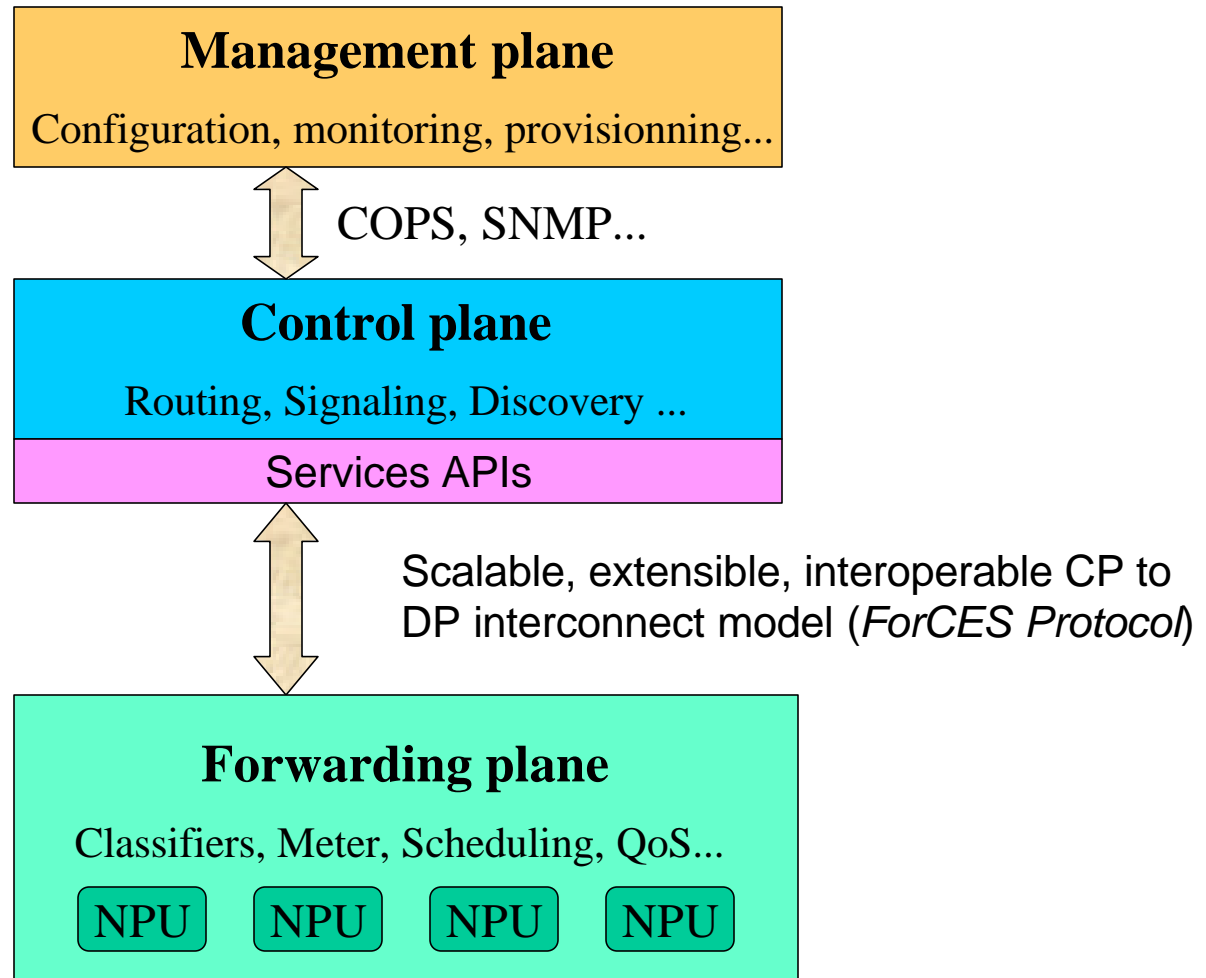


Control and data plane separation



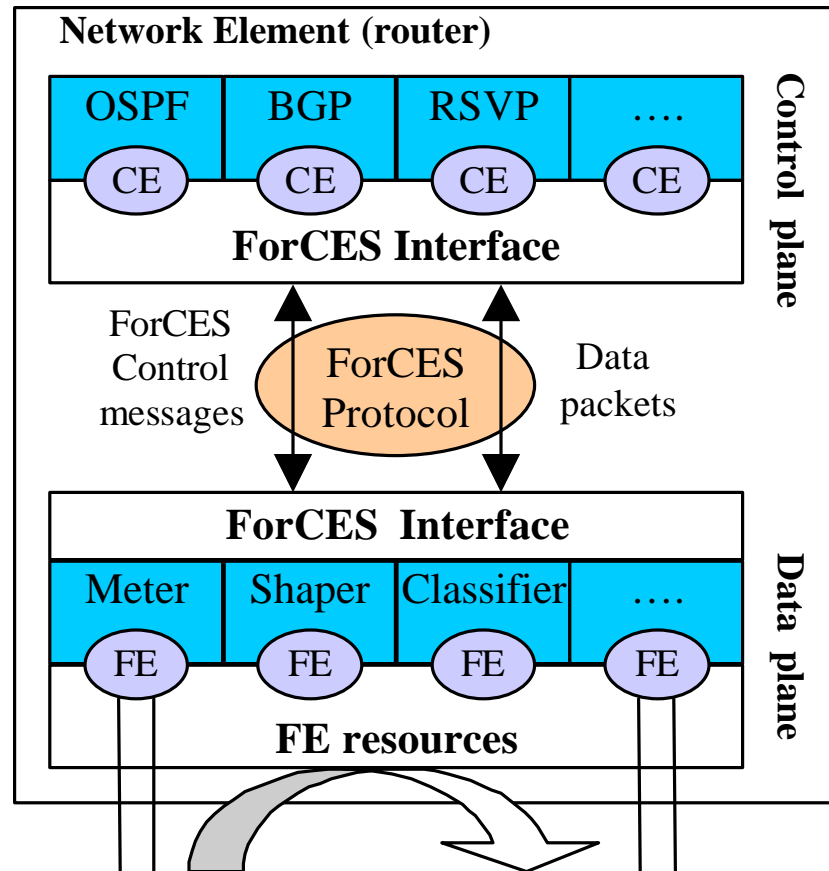


Control and data plane separation



ForCES (Forwarding and Control Element Separation) Architecture

- ForCES: Defines and standardizes the required interfaces, protocols and the exchange of information between the separated planes.



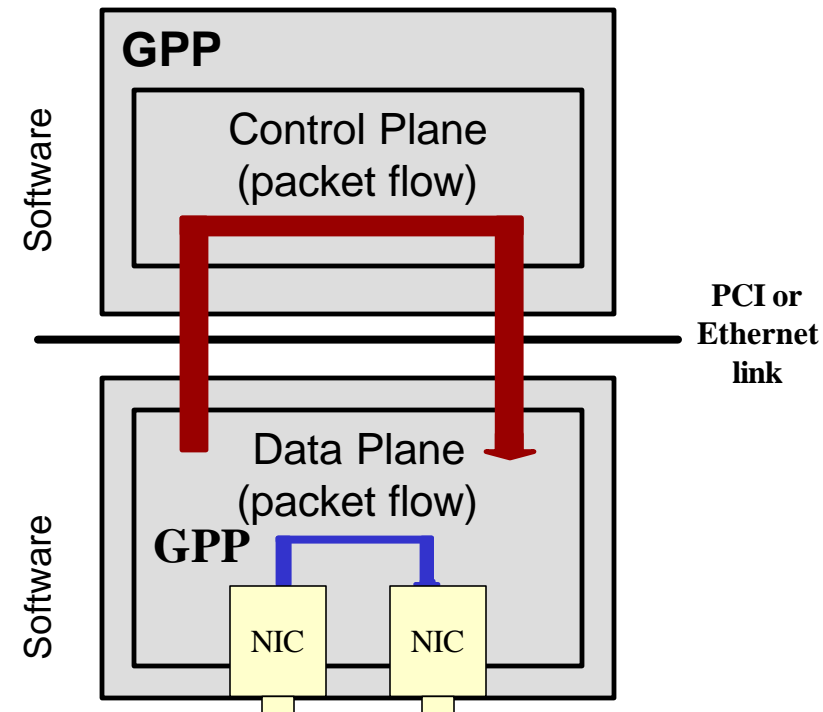


Software-based router improvement

- Software router can adopt the same notion of plane separation
- Data plane can use high performance software

Challenges:

- Which Software?
- How can we ensure the interaction between ForCES and the software?





Modular router: Click

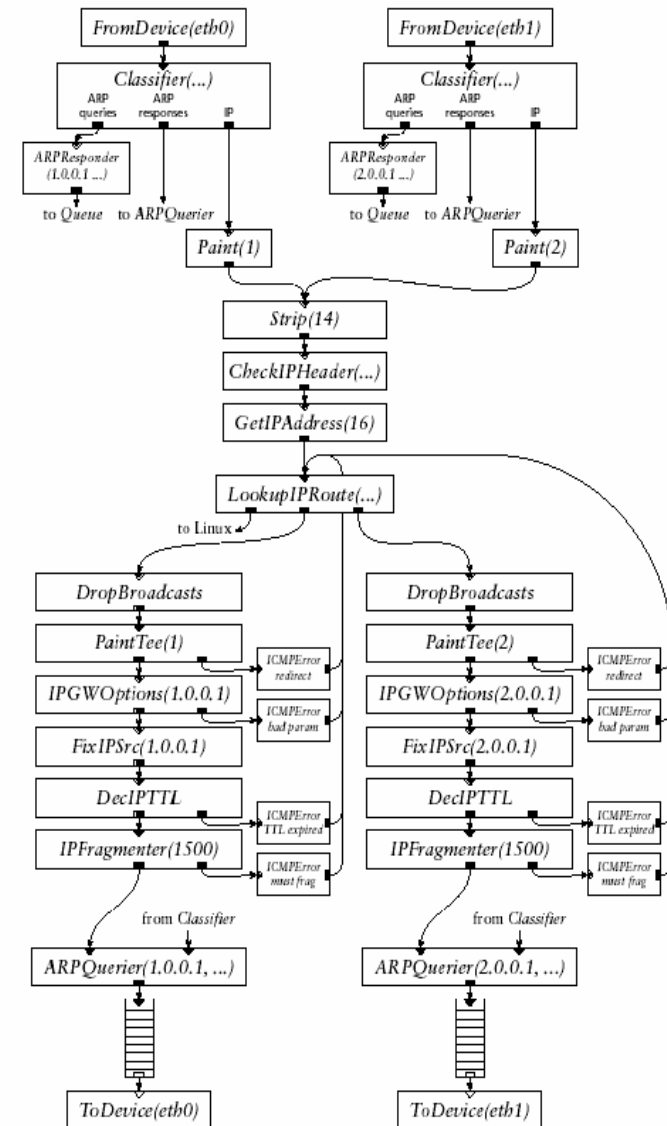
- Developed by MIT
- Modular, flexible, extensible and configurable
- Built from packet processing modules called « *Elements* ».

Click Element

- Software component representing a unit of router processing
- Interconnected interfaces « *connections* »

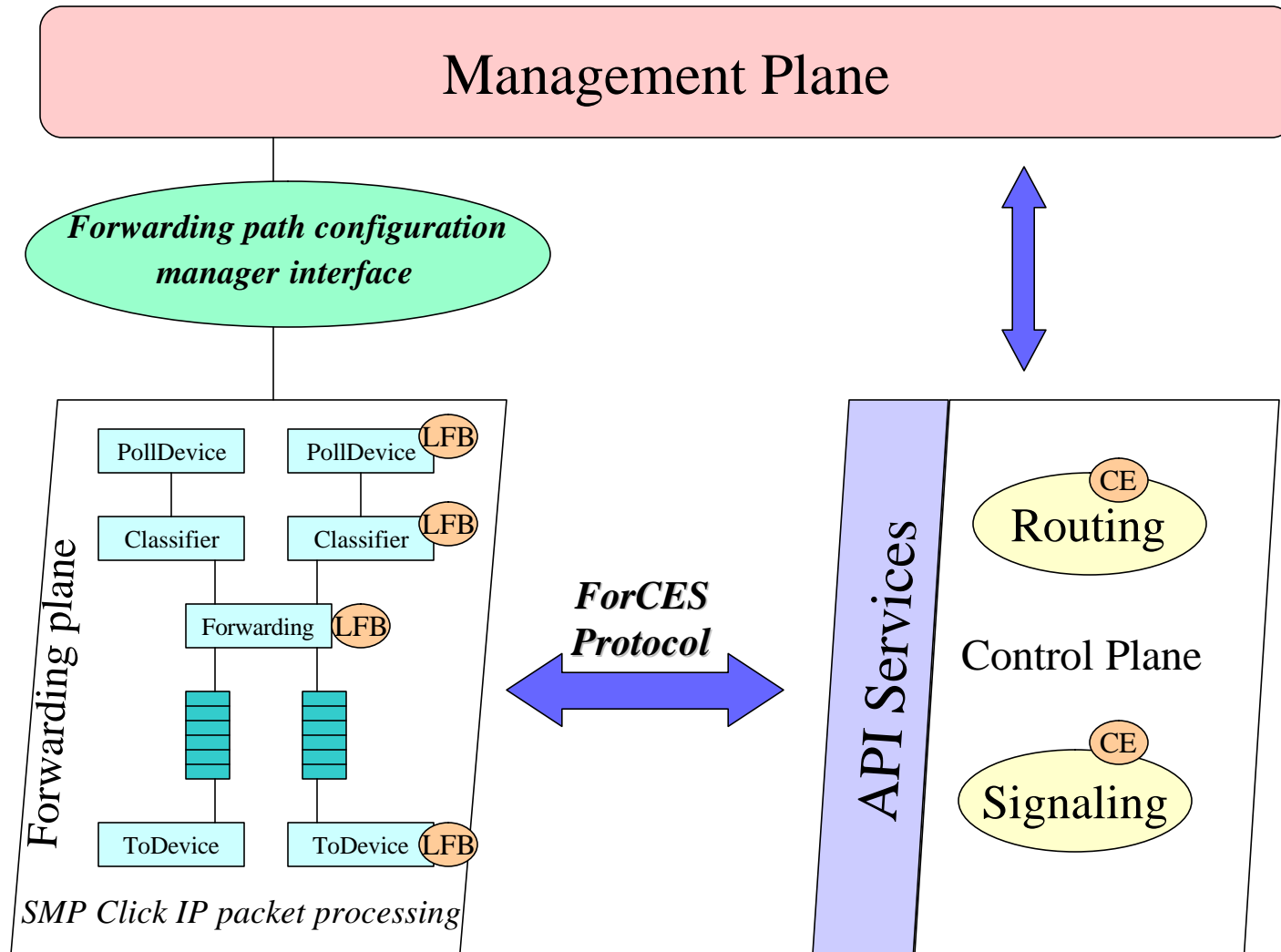
SMP Click

- Provides both flexibility and performance on multiprocessor platforms



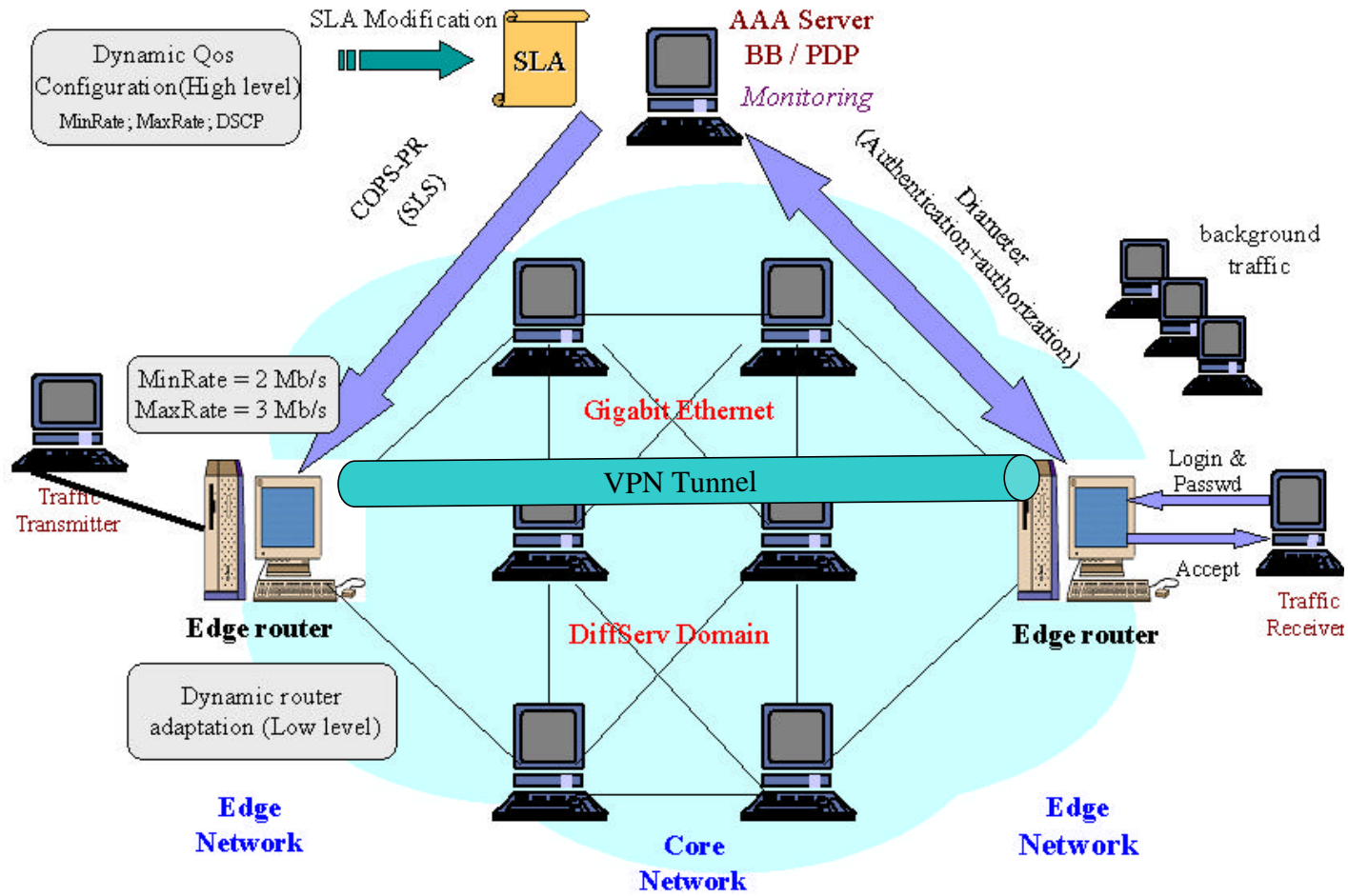


Our proposed Software router design based on the plane separation approach



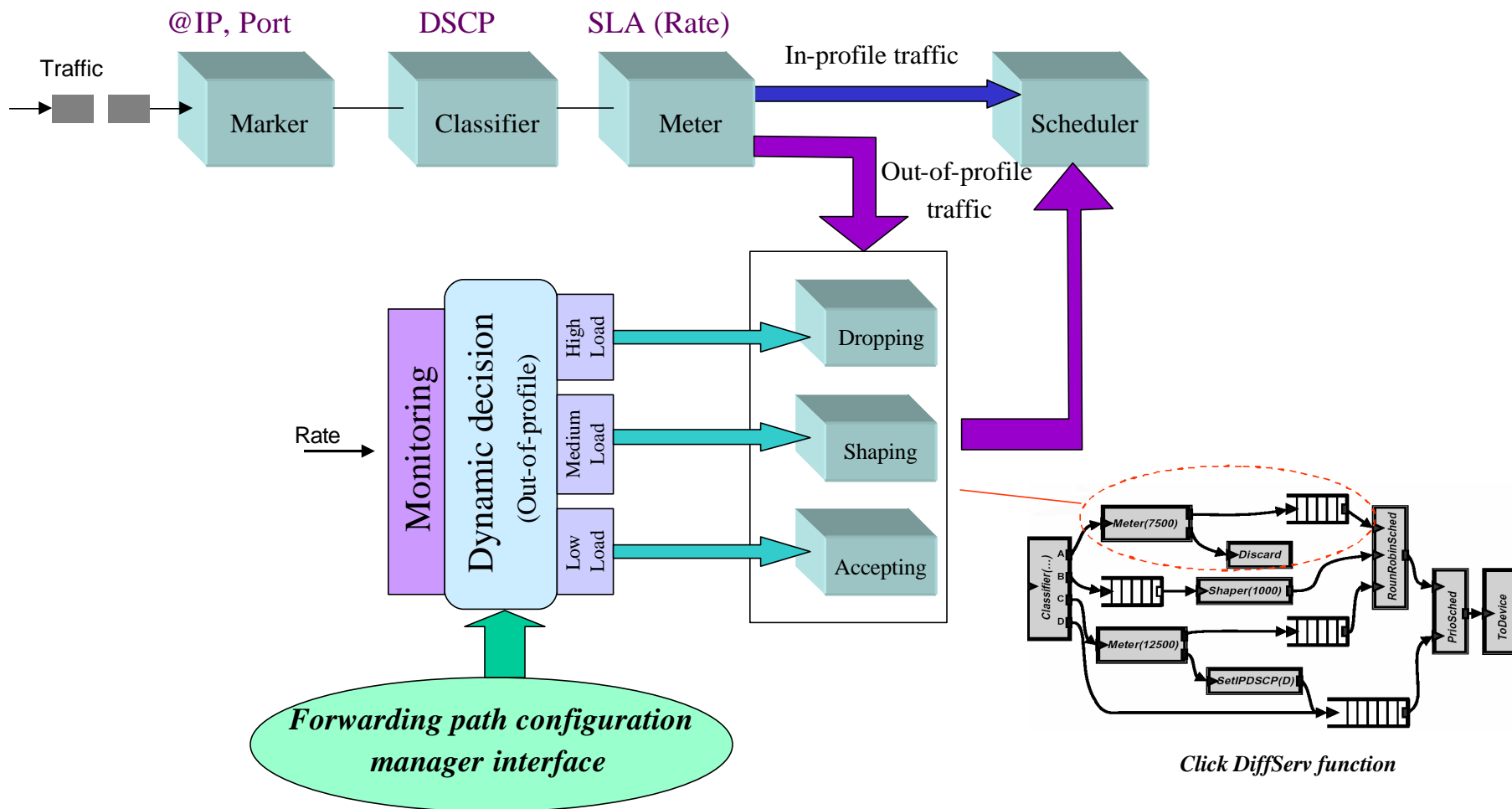


Dynamic adaptation of edge routers



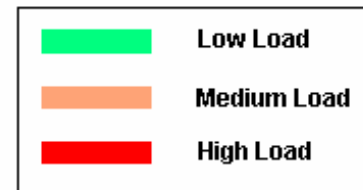
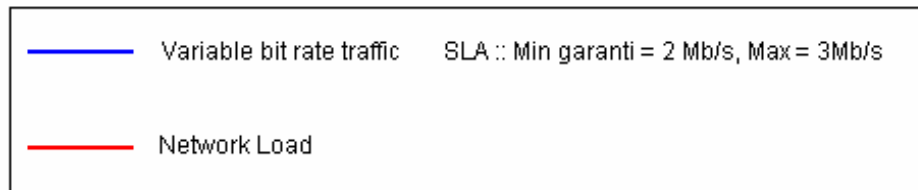
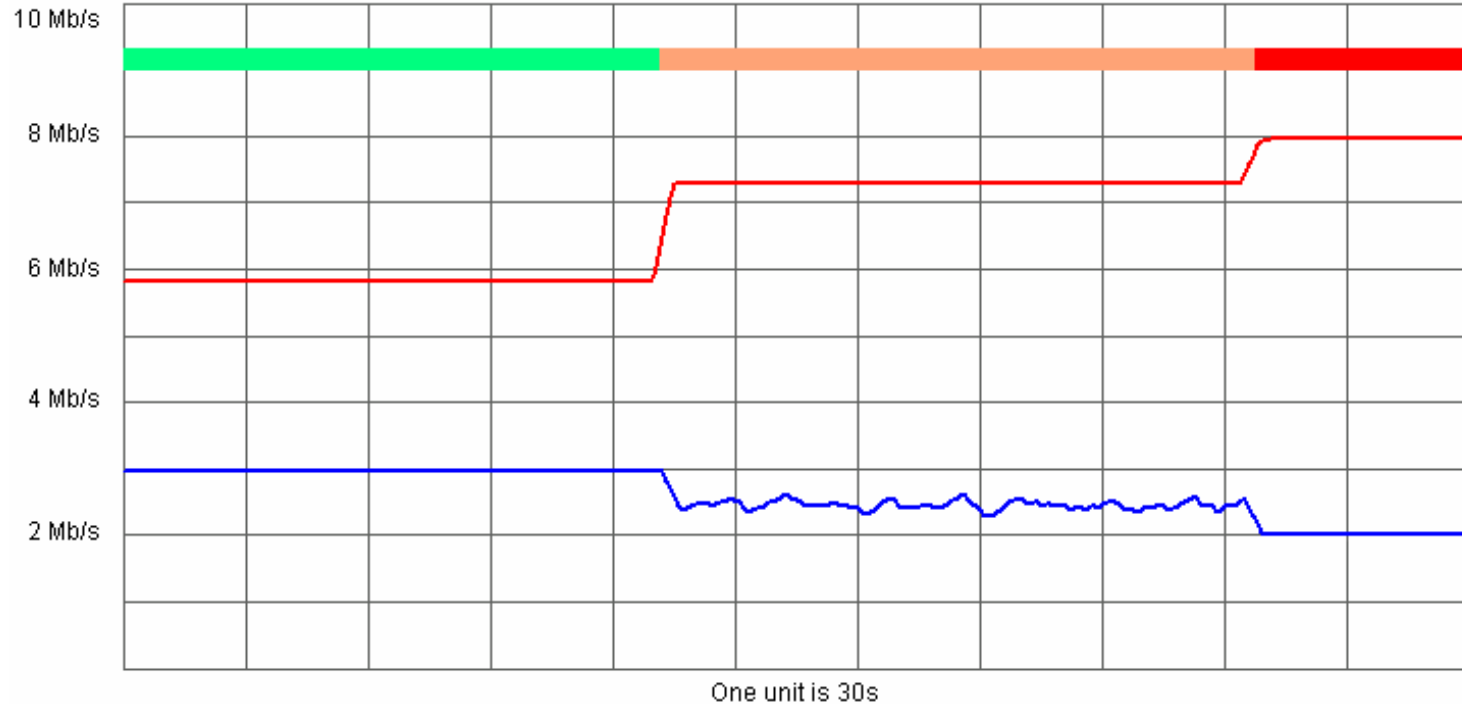


Dynamic decision in the edge router



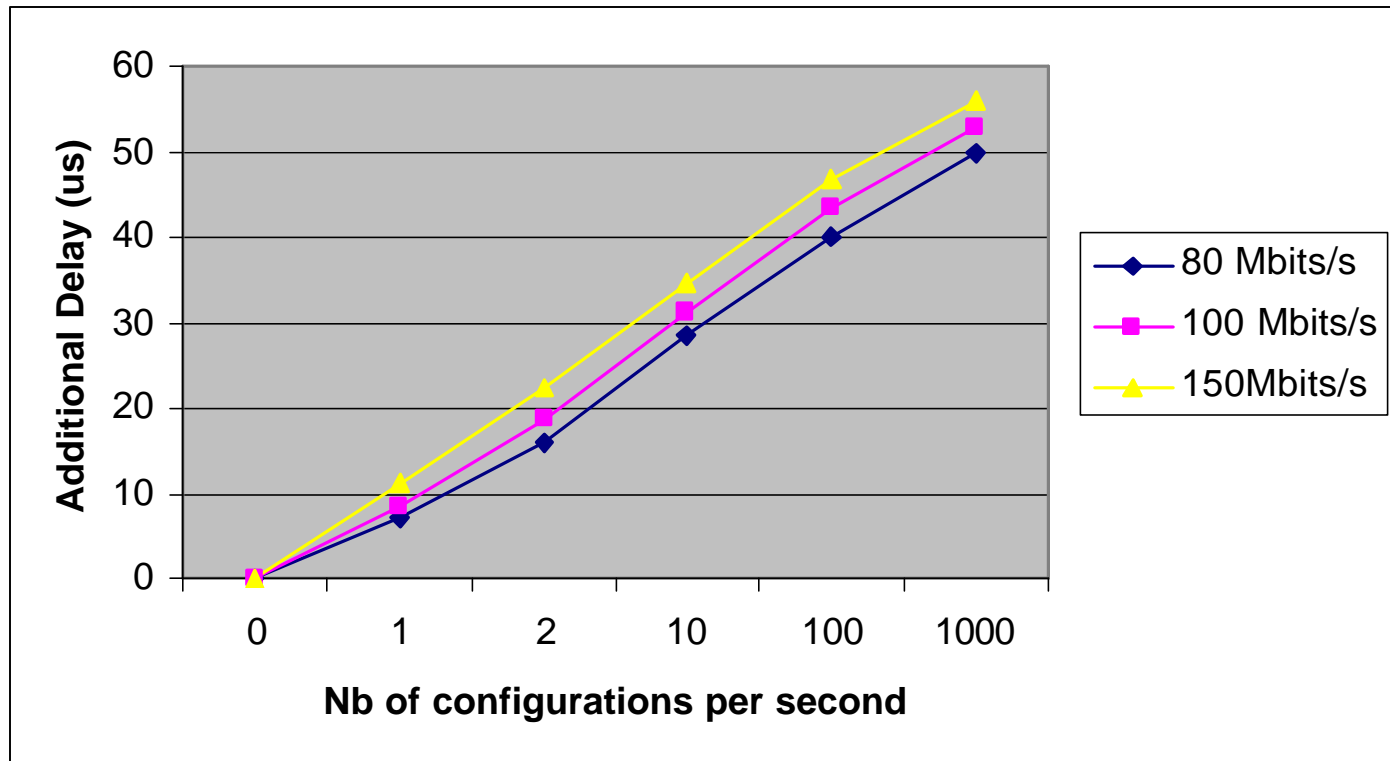


Dynamic behavior of an auto-configuration edge router



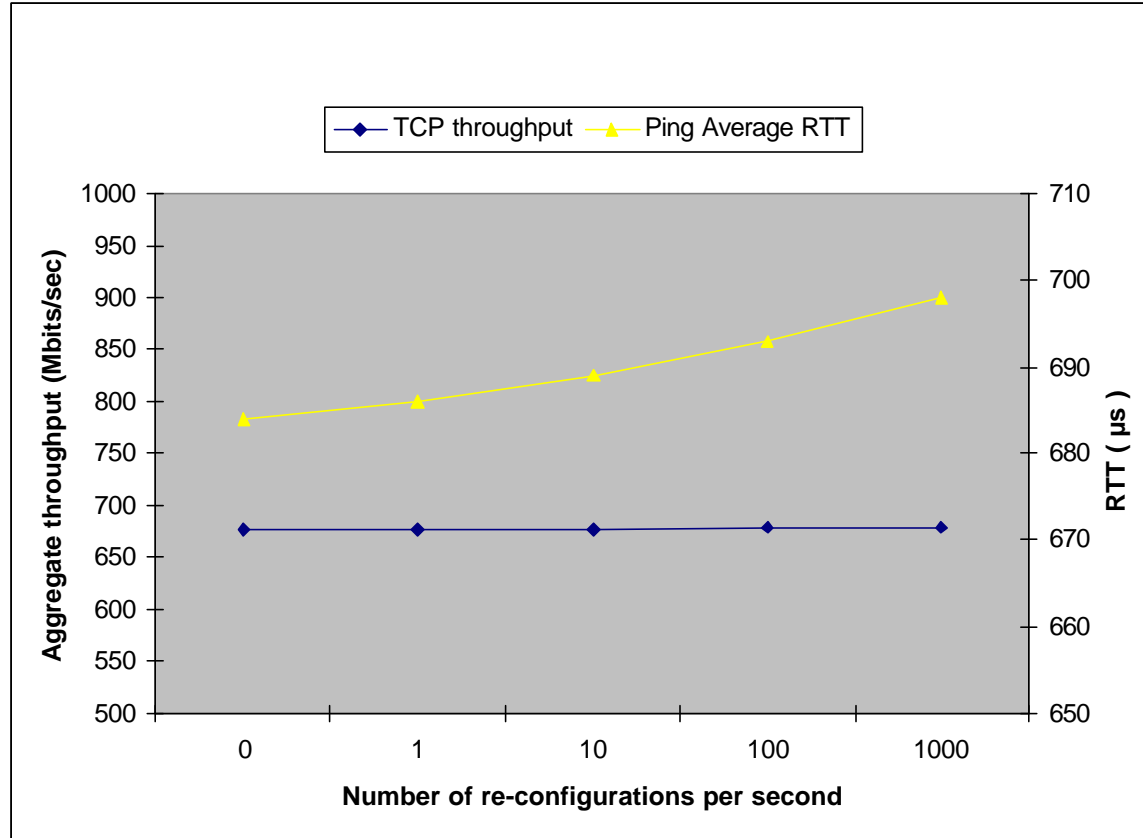


Additional delay caused by dynamic configurations





Effect of dynamic configurations on the Round Trip Time





Conclusion

- Improvement of the Software based router design to achieve performance requirement.
- The proposed design is based on:
 - Plane separation: ForCES architecture
 - SMP Click language (Forwarding plane)
 - Forwarding path configuration manager interface
- The experienced marginal delays and packet losses are a favorable sign for the use of software based routers using the separation principle and the SMP Click language.
- Larger scalability studies should comfort these findings and foster the use of these routers.



Thank you !



Losses versus aggregate rate

