



Analysis of the Side-Effects on Latency Bounds of Combinations of Scheduling, Redundancy and Synchronization Mechanisms in Time-Sensitive Networks

Journées GdR RSD

Ludovic Thomas (CNRS/LORIA)

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Supervised by Ahlem Mifdaoui (ISAE-SUPAERO)
and Jean-Yves Le Boudec (EPFL)

The Patients Zero of the Research's Virus

Prof. Emmanuel Lochin
ENAC (ex ISAE-SUPAERO)

Dr. Nicolas Kuhn (HDR)
Thales Alenia Space (ex CNES)

– [Thomas, *et al.* 2019] [Ludovic Thomas, Emmanuel Dubois, Nicolas Kuhn, and Emmanuel Lochin \[2019\]. “Google QUIC Performance over a Public SATCOM Access”](#). In: *International Journal of Satellite Communications and Networking* 37.6. DOI: [10.1002/sat.1301](#)

Thesis Mentors

Prof. Ahlem Mifdaoui
Full Professor, ISAE-SUPAERO

Prof. Jean-Yves Le Boudec
Professor Emeritus, EPFL

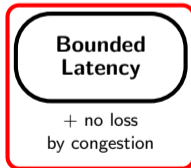
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Public networks
(e.g., the Internet)



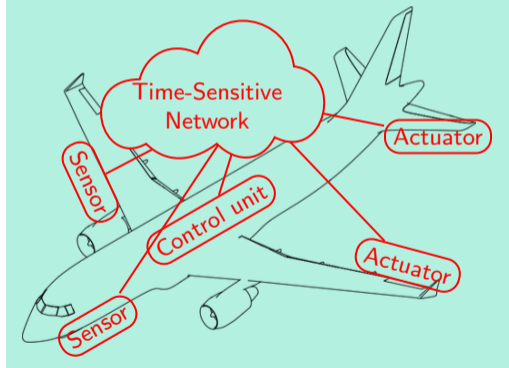
Time-Sensitive
Networks

Deterministic Service



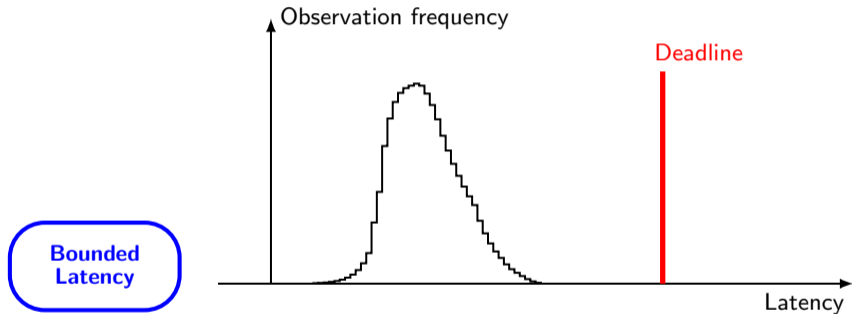
IEEE *Time-Sensitive Networking* (TSN)
IETF *Deterministic Networking* (DetNet)

Cyber-Physical Systems

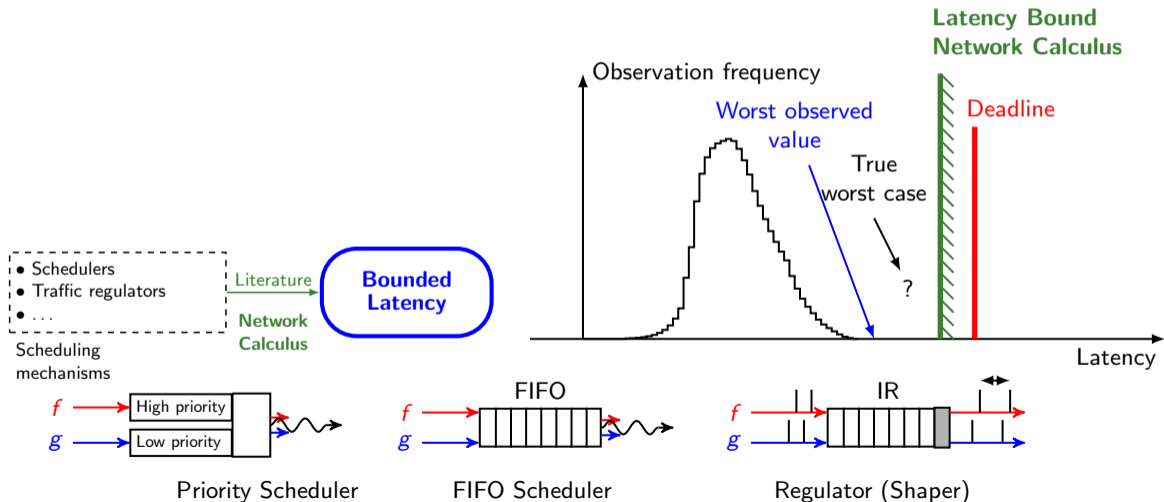


Safety-critical applications

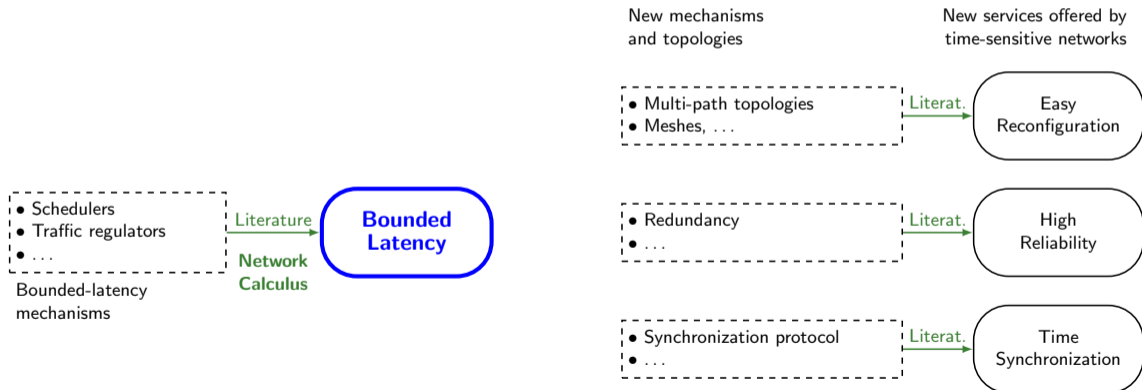
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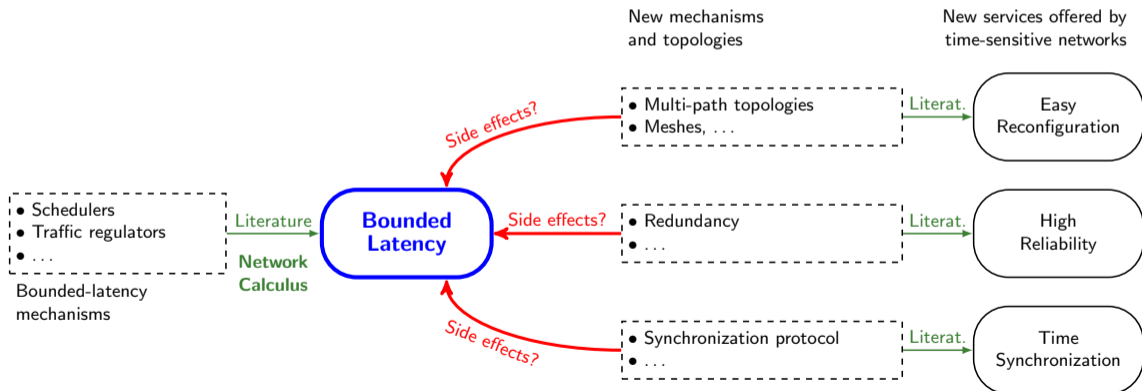
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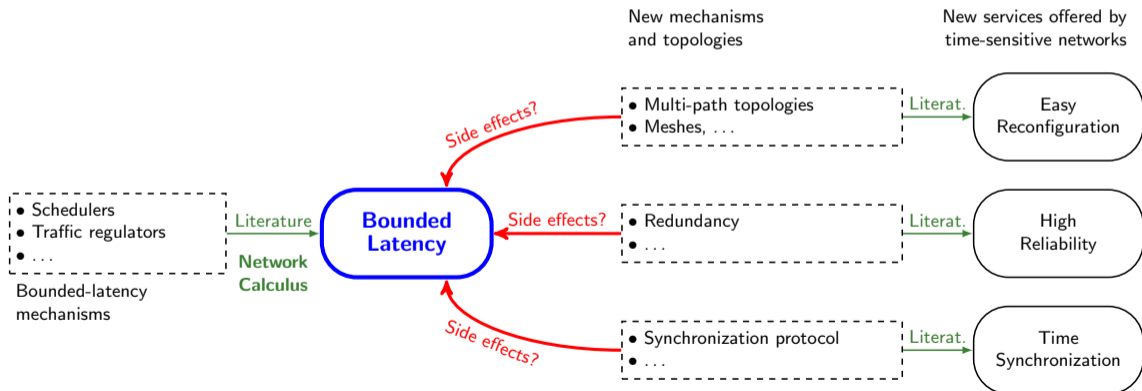
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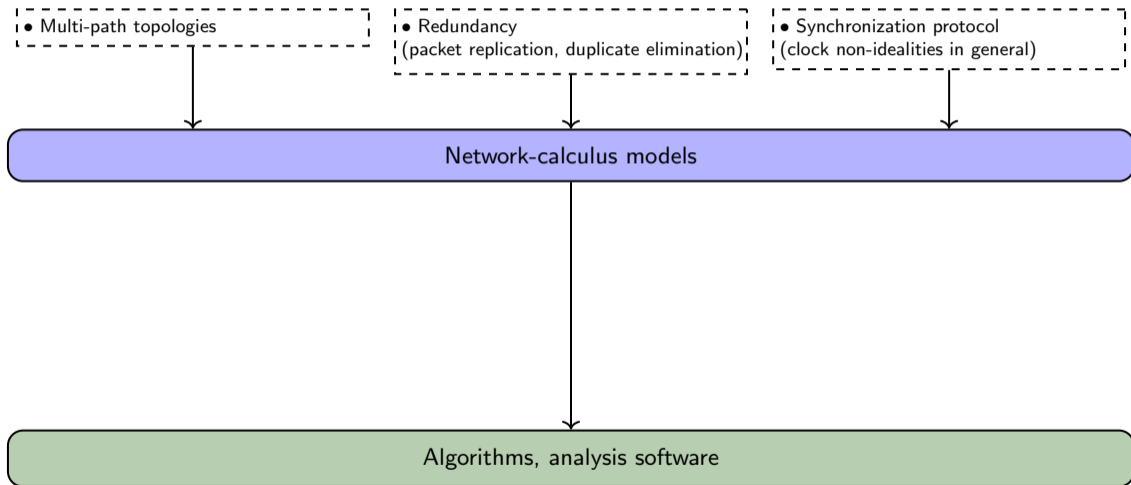
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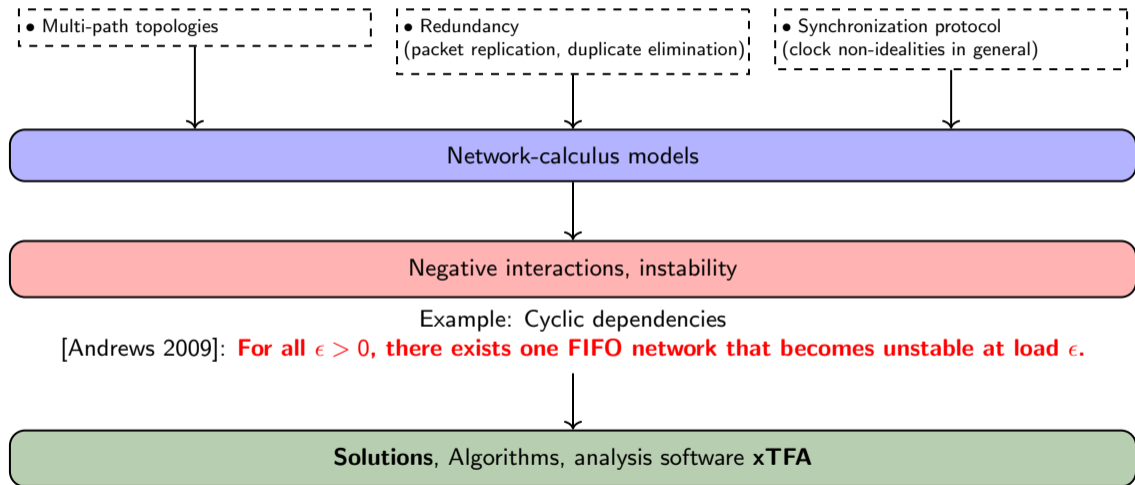
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The Plan:



What Really Happened



– [Andrews 2009] [Matthew Andrews \[July 4, 2009\]](#). “Instability of FIFO in the Permanent Sessions Model at Arbitrarily Small Network Loads”. In: *ACM Transactions on Algorithms* 5.3. DOI: [10.1145/1541885.1541894](https://doi.org/10.1145/1541885.1541894)

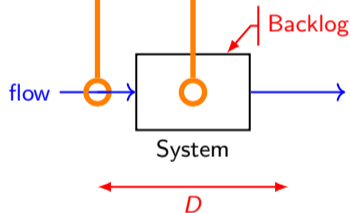
Network Calculus Relies on **Two Main Abstractions**

Arrival Curve α

upper-bounds the **maximum amount of traffic** of the flow over any interval

Service Curve β

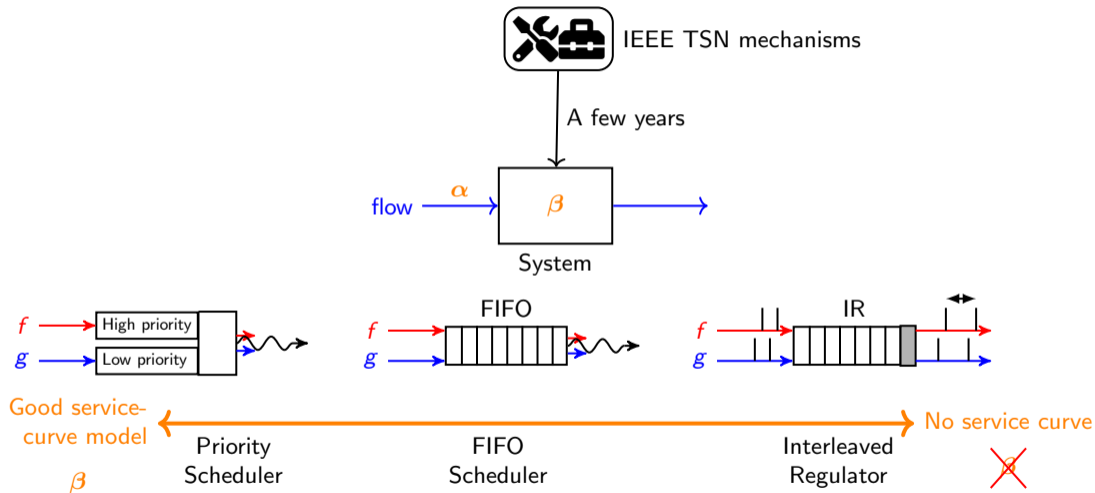
lower-bounds the **minimum amount of service** offered to the flow*



Guaranteed upper bounds

* Simplification

Service-Curve Models



Bibliography I

- [Andrews 2009] Andrews, Matthew (July 4, 2009). “Instability of FIFO in the Permanent Sessions Model at Arbitrarily Small Network Loads”. In: *ACM Transactions on Algorithms* 5.3, 33:1–33:29. ISSN: 1549-6325. DOI: 10.1145/1541885.1541894. URL: <https://doi.org/10.1145/1541885.1541894> (visited on 11/09/2022).
- [Thomas, et al. 2019] Thomas, Ludovic et al. (2019). “Google QUIC Performance over a Public SATCOM Access”. In: *International Journal of Satellite Communications and Networking* 37.6, pp. 601–611. ISSN: 1542-0981. DOI: 10.1002/sat.1301. URL: <https://onlinelibrary.wiley.com/doi/abs/10.1002/sat.1301> (visited on 11/10/2022).