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# Somax 2

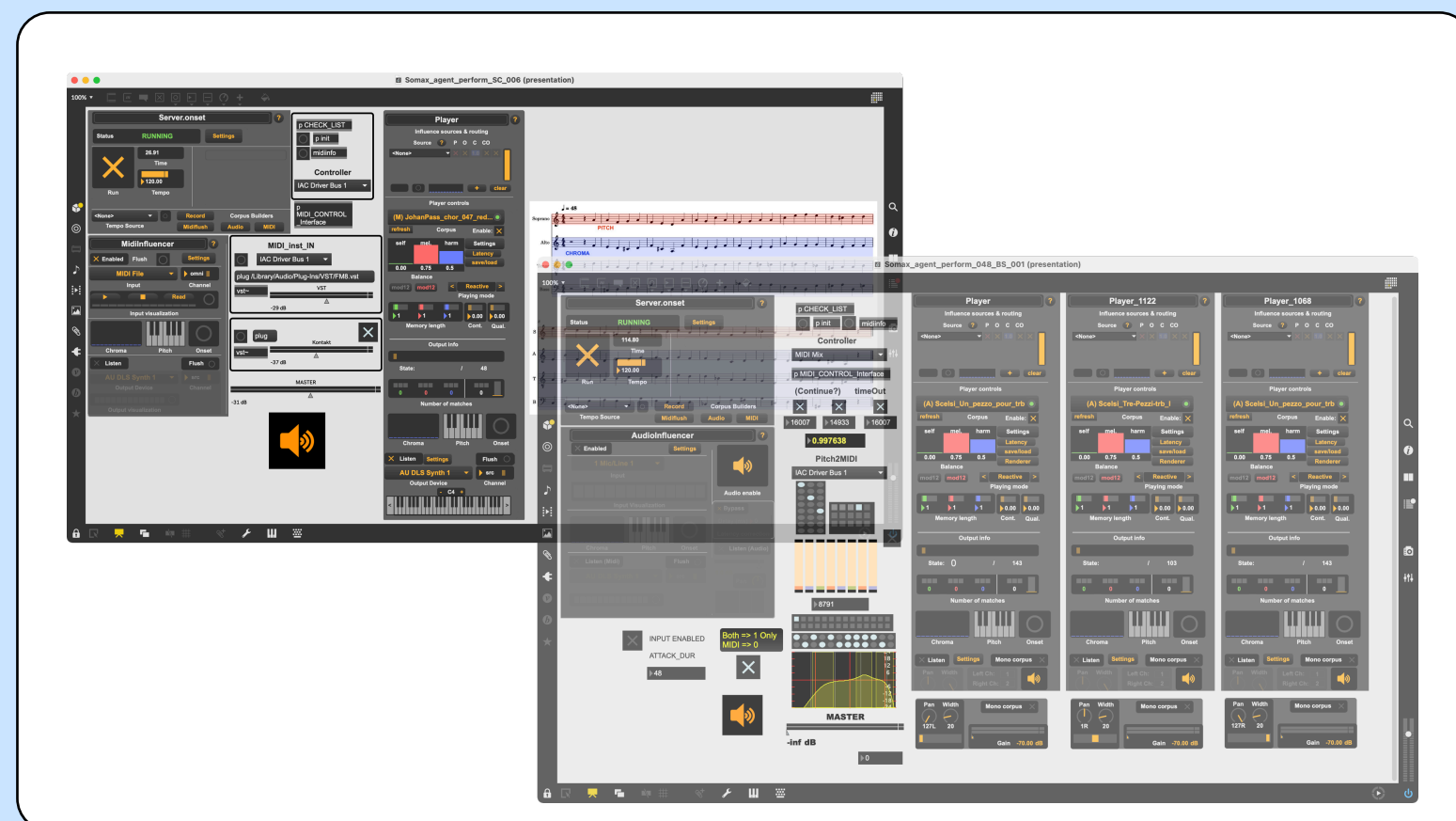
## a Reactive Multi-Agent Environment for Co-Improvisation

Joakim Borg, Gérard Assayag, Mikhail Malt

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### Introduction

**Somax 2** [1] is a multi-agent interactive system performing live machine co-improvisation with musicians, based on machine-listening, machine-learning, and generative units. The actual version [6, 7, 8] is a recent development and algorithms improvement from the former Somax version and previous work in RepMus team [3,4, 5, 9, 11, 12].

Agents provide stylistically coherent improvisations based on learned musical knowledge while continuously listening to and adapting to input from musicians or other agents in real time. The system is trained on any musical materials chosen by the user, effectively constructing a generative model (called a corpus), from which it draws its musical knowledge and improvisation skills. Corpora, inputs and outputs can be MIDI as well as audio, and inputs can be live or streamed from MIDI or audio files. Somax 2 is one of the improvisation systems descending from the well-known Omax software, presented here in a totally new implementation. As such it shares with its siblings, the general loop [listen/learn/model/generate], using some form of statistical modeling that ends up in creating a highly organized memory structure from which it can navigate into new musical organizations, while keeping style coherence, rather than generating unheard sounds as other ML systems do. However Somax 2 adds a totally new versatility by being incredibly reactive to the musician decisions, and by putting its creative agents to communicate and work together in the same way, thanks to cognitively inspired interaction strategies and finely optimized concurrent architecture that make all its units smoothly cooperate together.

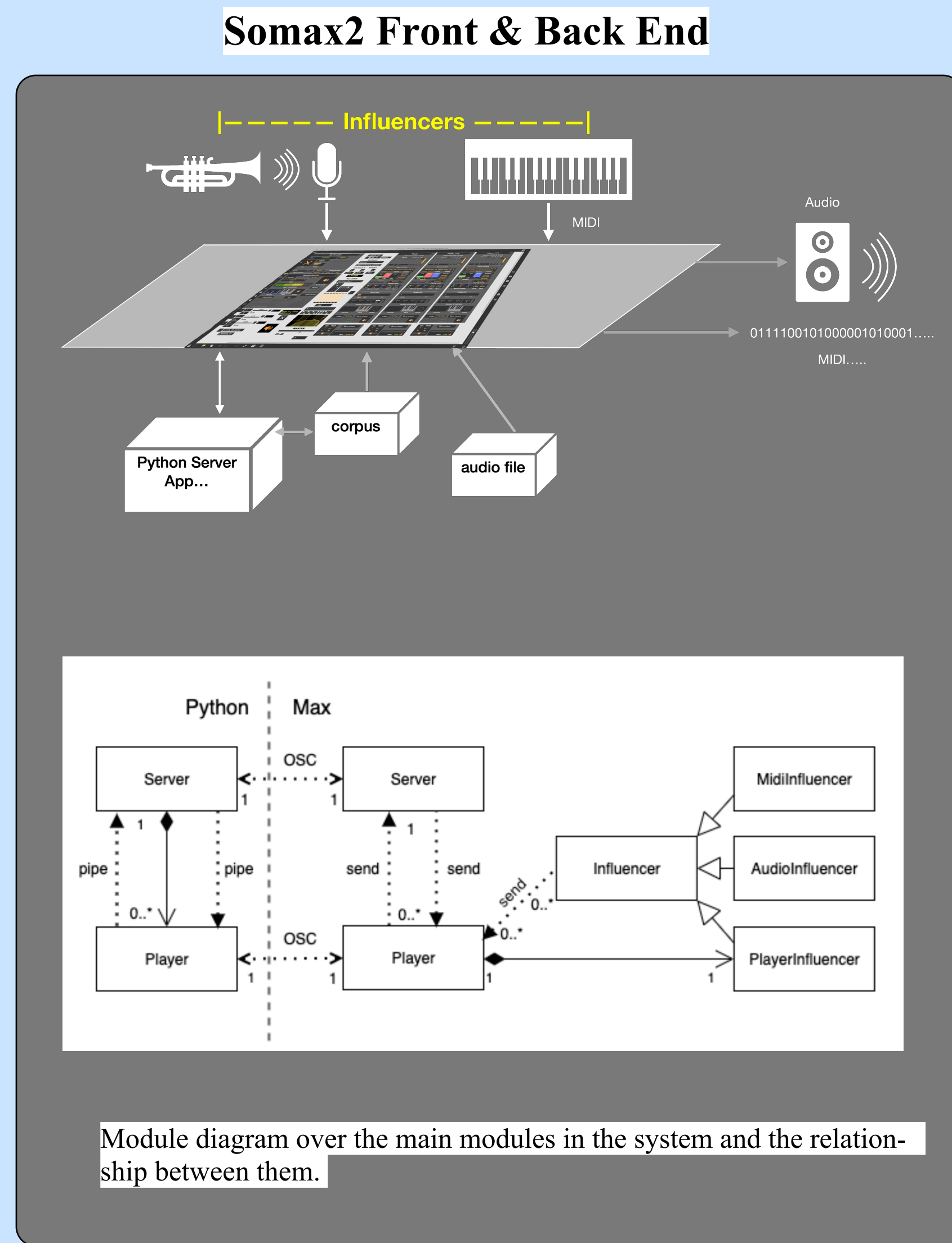
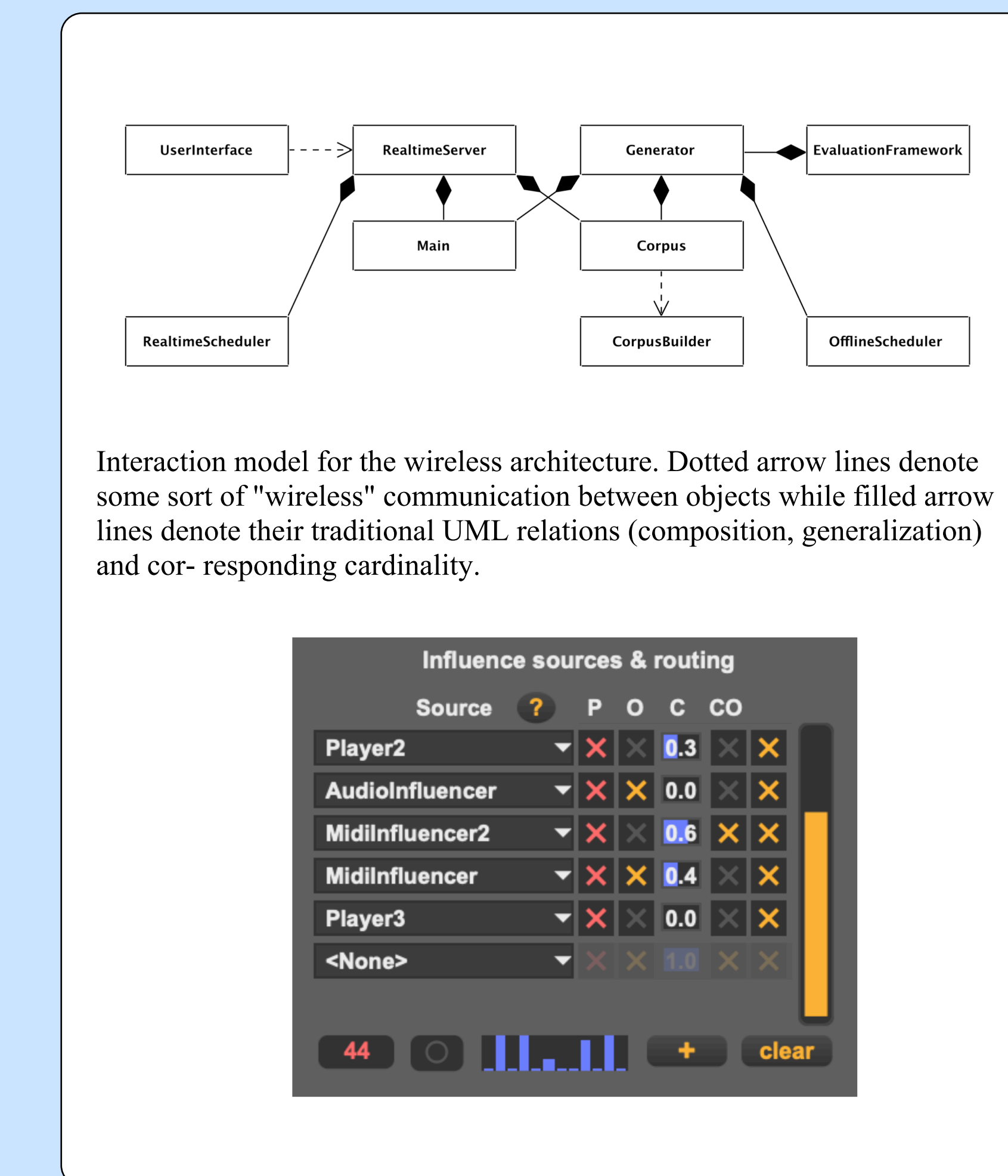
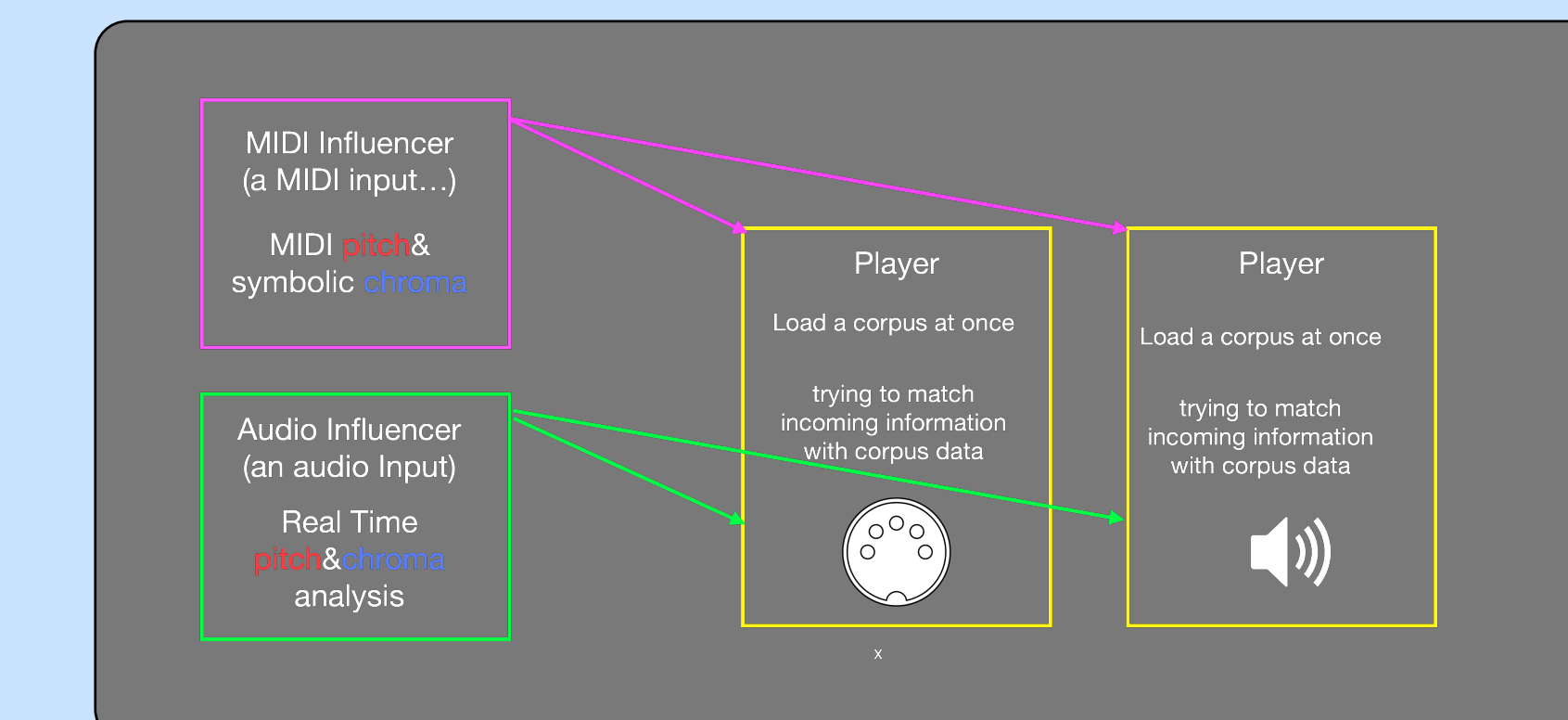
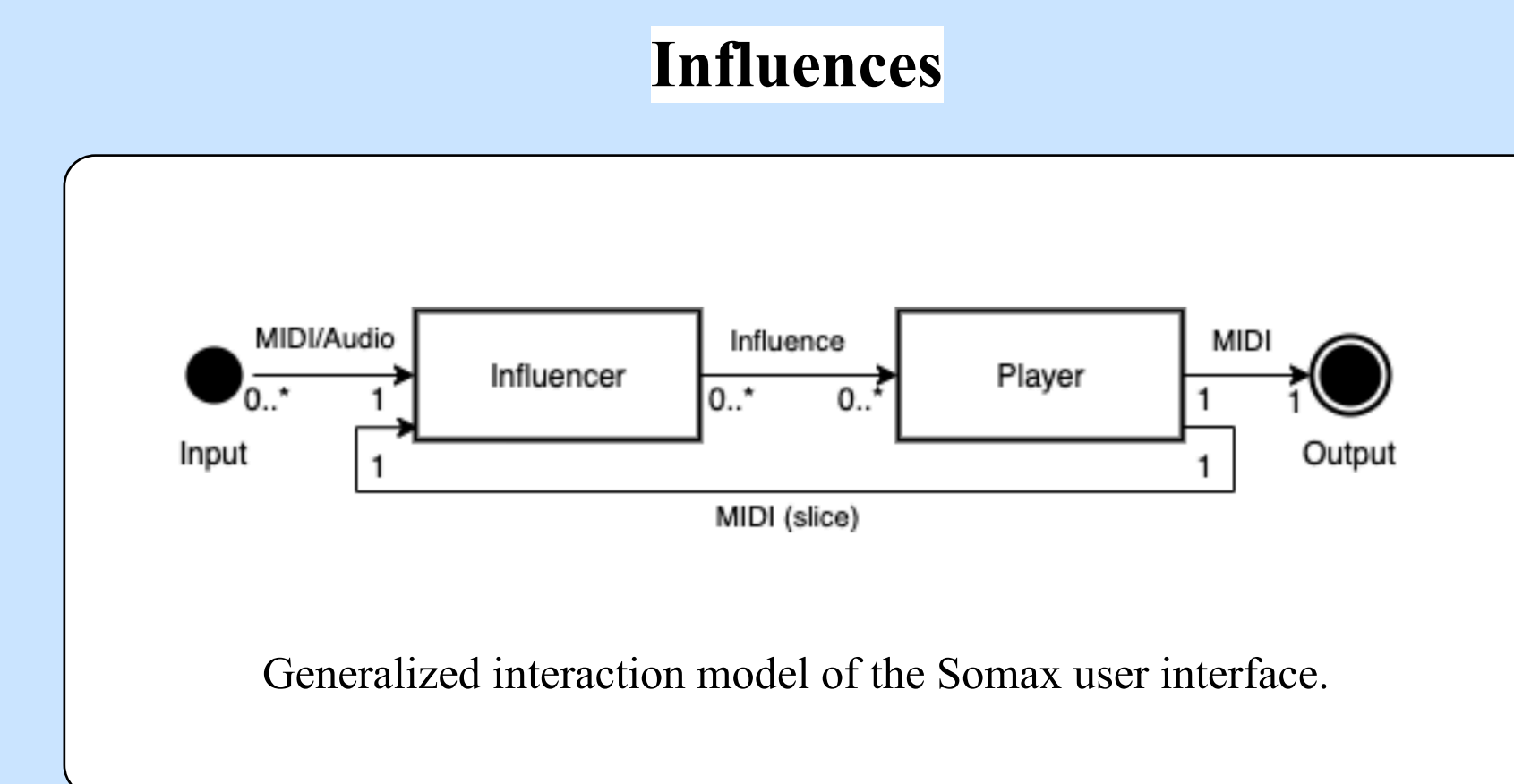
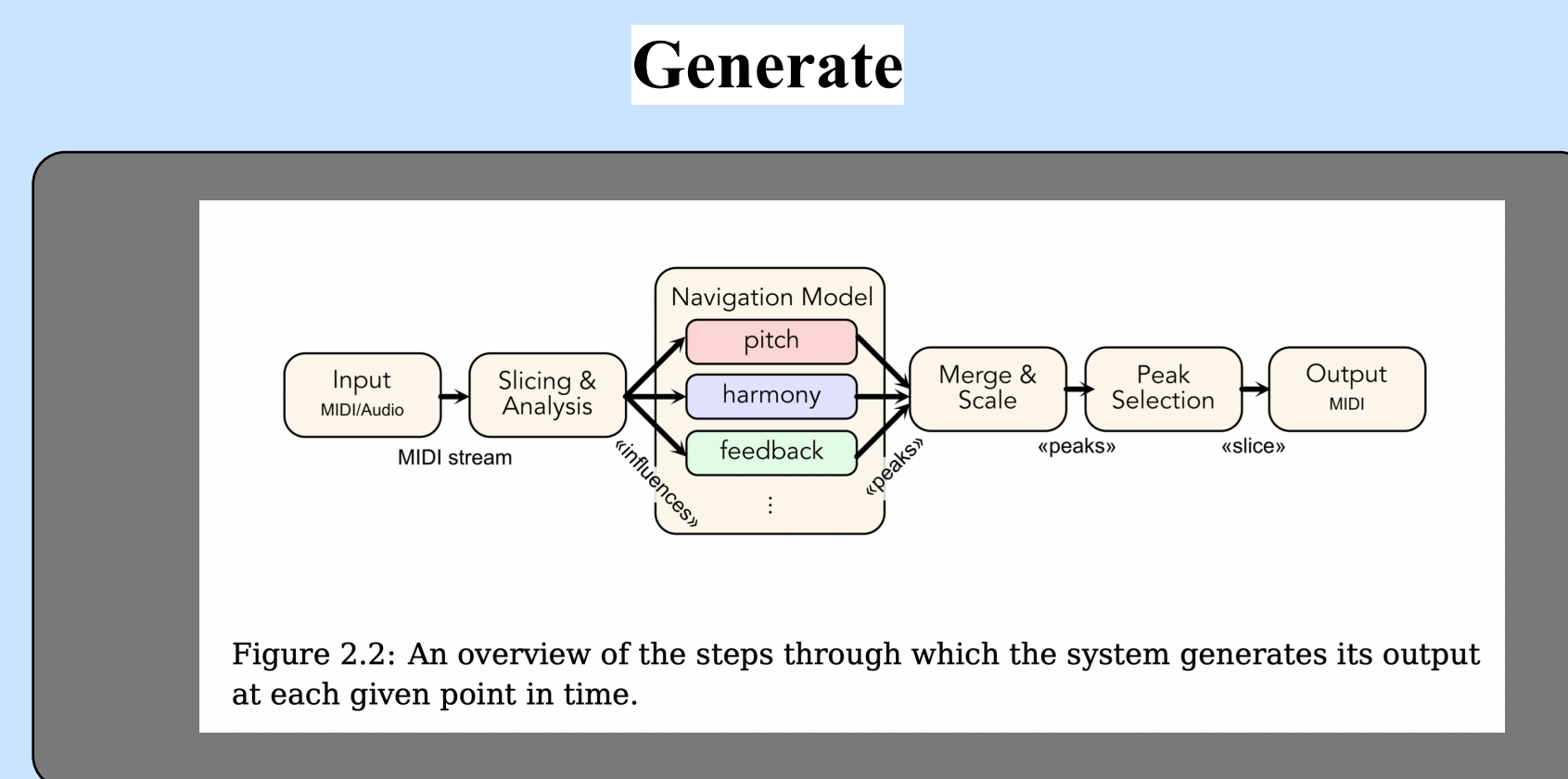
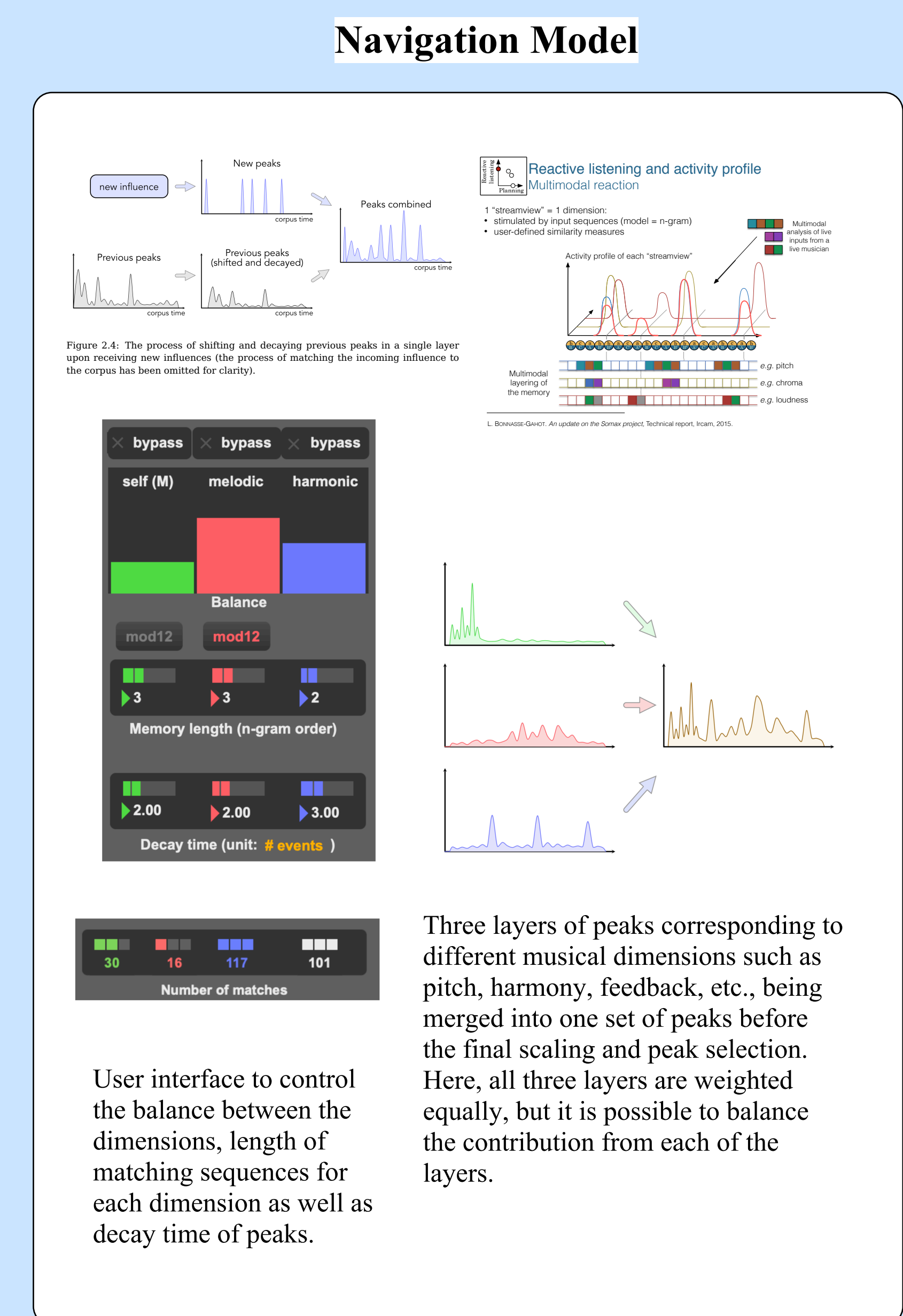
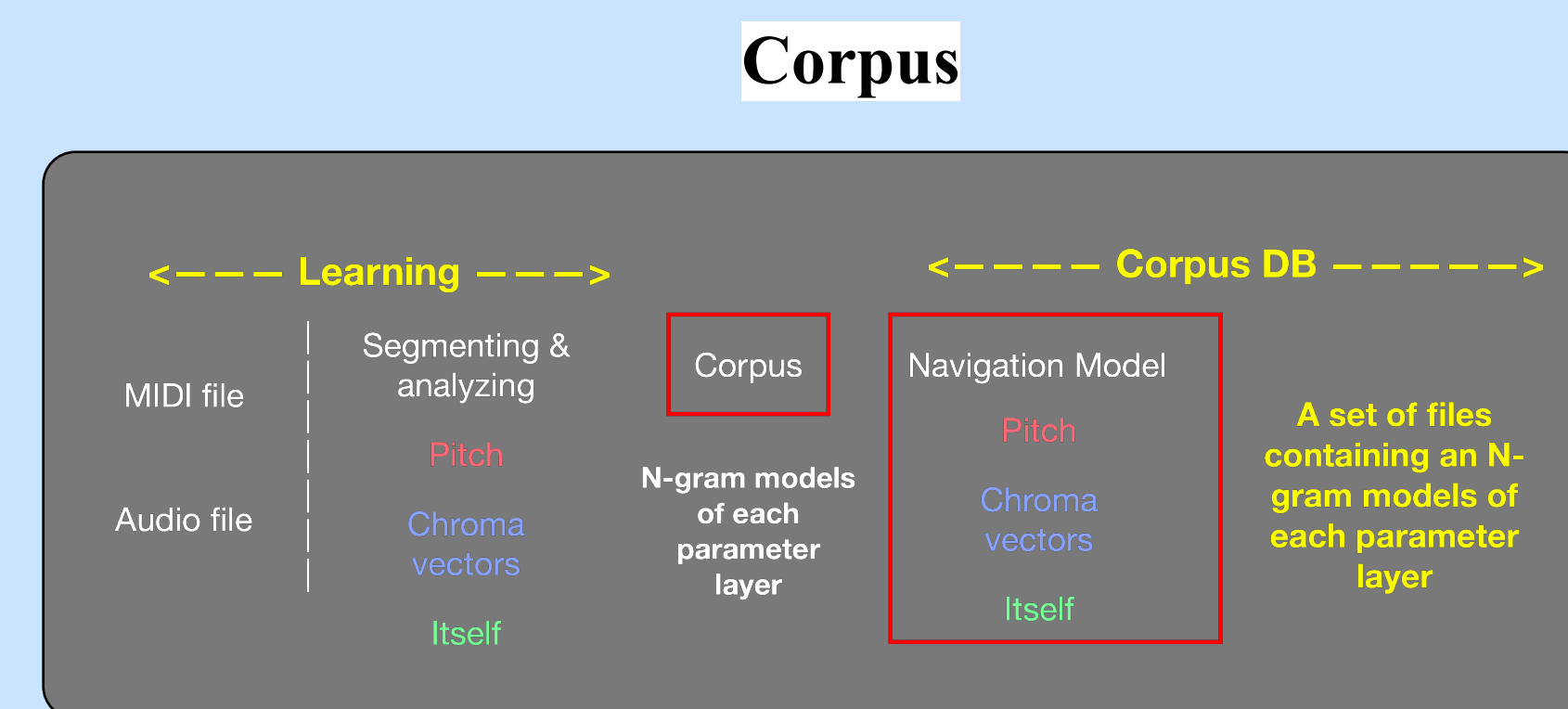
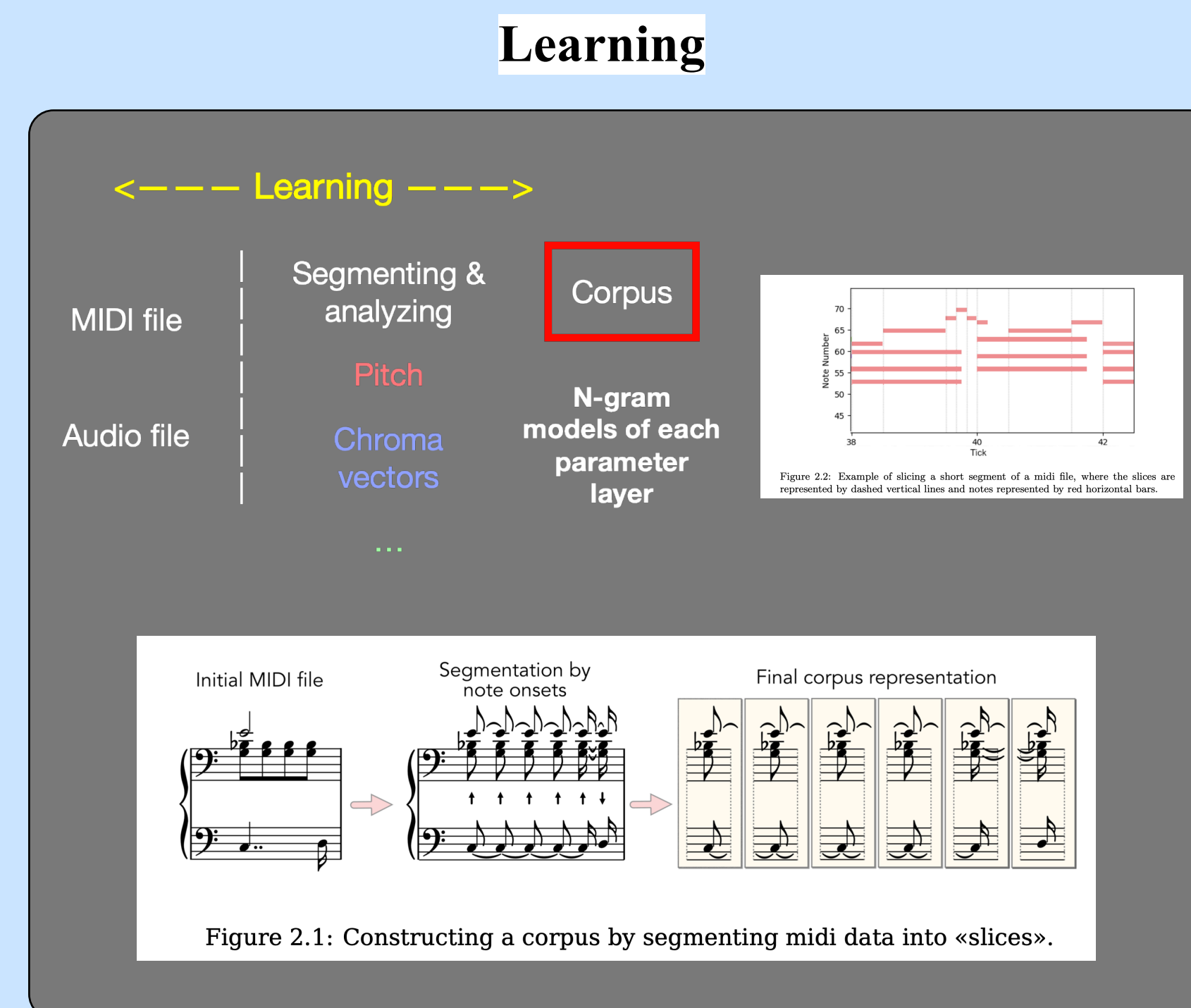
Somax 2 allows detailed parametric controls of its players and can even be played alone as an instrument in its own right, or even used in composition workflow. It is possible to listen to multiple sources and to create entire ensembles of agents where the user can control in detail how these agents interconnect and "influence" on each other. Somax 2 is conceived to be a co-creative partner in the improvisational process, where the system after some minimal tuning is able to behave in a self-sufficient manner and participate to a diversity of improvisation set-ups and even installations.

### RepMus Omax Co-Improvisation Paradigm

- Listen** : cognition aware discovery of a symbolic vocabulary from any audio stream
  - Learn** : create incrementally a sequence model, a structured memory that becomes a generative source of new music
  - Generate** : Navigate all the relations inside the memory/model using smart heuristics / strategies and create new sequences on the fly
- Omax** has then refined into several co-creative softwares :
- ImproteK / Djazz** : adds a global guidance by a formal scenario (temporal composition, idiomatic frames)
  - Somax** : adds a reactive guidance through a continuous real-time influence from the live context
  - Dyci2** : adds the concept of micro-scenarios triggered incrementally

The actual version, developed by **Joakim Borg** under the supervision of **Gérard Assayag** ([Borg 2020], [Borg 2021a], [Borg 2021b]), is a recent development and algorithms improvement from the... Former Somax version and previous work in RepMus team ([Bonasse-Gahot 2012], [Bonasse-Gahot 2014], [Carsault 2017], [Carsault 2019], [Carsault 2020], [Carsault 2021])

**Actual Somax2 Version** : <https://github.com/DYCI2/Somax2/releases/>



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