Taking aim at the transcription bottleneck: Integrating speech technology into language documentation and conservation

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Setting the scene

- Three related observations:
  1. Transcription *(and translation)* is a **central activity** in language documentation and conservation (LDC)—but rarely a **central focus** of documentary linguistic discussions[1]

1. Jung & Himmelmann (2011: 201)

“

[T]he **transcription** and **further annotation** of recordings (...) constitute the **major workload** in a documentation project.

”

Himmelmann (2008: 347; emphasis added)

“

It is only a minor exaggeration to say that **language documentation** is **all about transcription.**

”

Himmelmann (2018: 38; emphasis added)

“

Transcribing narrative and conversational speech is a **core activity** of all linguistic fieldwork, though **one of the less attractive ones**. (…) Nevertheless, it is without doubt one of the most important tasks to be carried out in the field requiring close cooperation between speaker(s) and researcher(s).

”

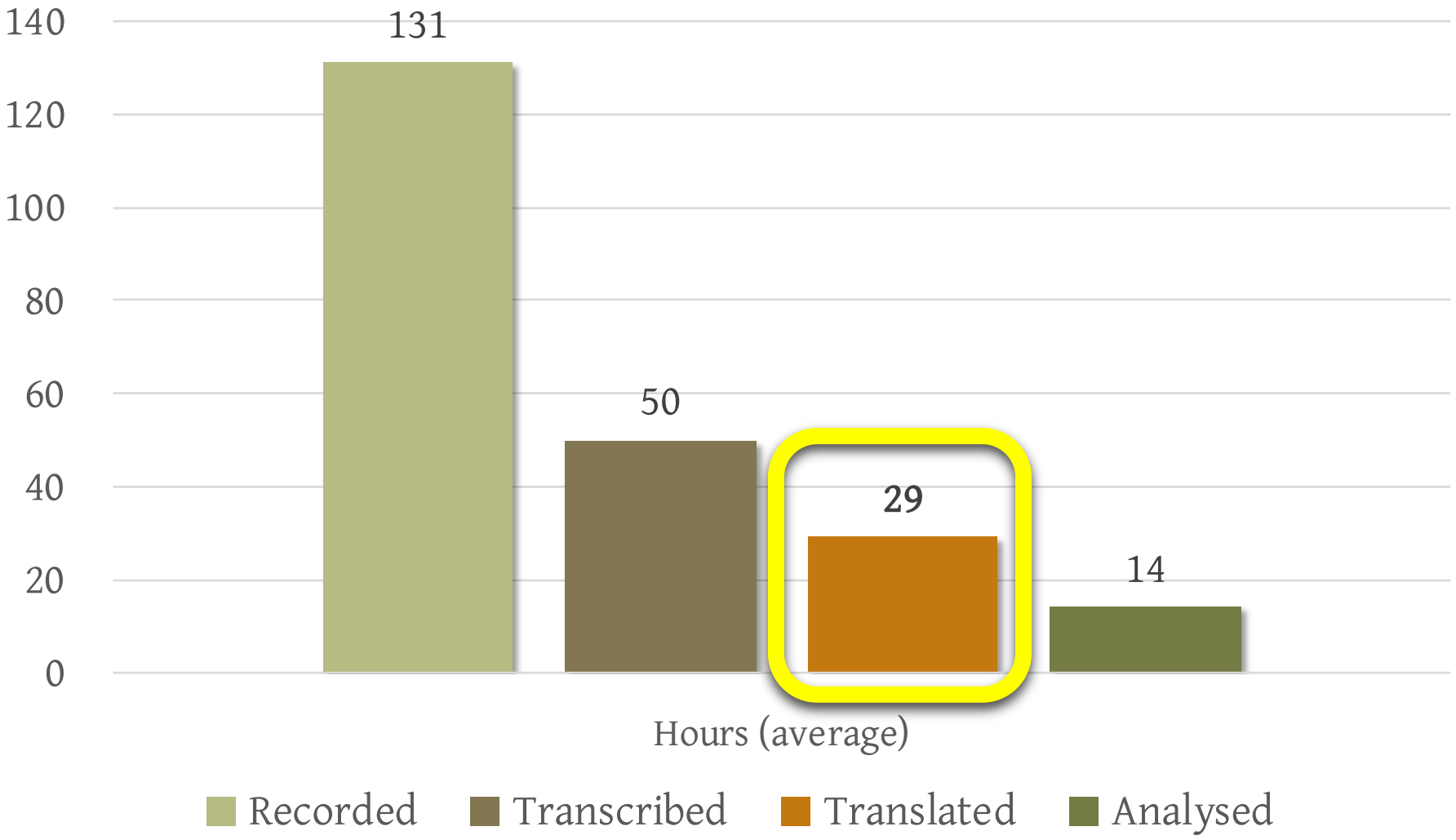
Jung & Himmelmann (2011: 201; emphasis added)

Setting the scene

- Three related observations:
  1. Transcription *(and translation)* is a **central activity** in language documentation and conservation—but rarely a **central focus** of documentary linguistic discussions[1]
  2. Our **ability to record** *(and archive)* language materials **outstrips** our ability to **make their contents accessible** through transcription[2]

1. Jung & Himmelmann (2011: 201) 2. Himmelmann (2006)

DOBES Projects *(2000–2009)*



(after Wittenburg (2009: slide 34), cited in Austin 2010)

The ubiquitous backlog

- *Elephant in the room:* Most language documentation and conservation initiatives that involve recording end up with a **backlog** of **unannotated**, **'raw' recordings**
  - Not at all unusual, but generally not discussed *(at least not in public)*
  - Issue for both documentation and revitalization-focused initiatives

Example: Consultation sessions

- Language meetings with speakers of **Tsuut'ina** (Na-Dene; ISO 639-3: `srs`)
  - Sessions **multilingual** *(Tsuut'ina, English)* and **multi-speaker** *(2–3 people in meeting)*
  - Meetings typically recorded *(cf. Jung & Himmelmann 2011)*—**200+ hours** of audio
  - Recordings valuable, but contents difficult to access due to extent *(not feasible to manually segment, even only Tsuut'ina-language portions; time investment for oral annotation prohibitive)*

Setting the scene

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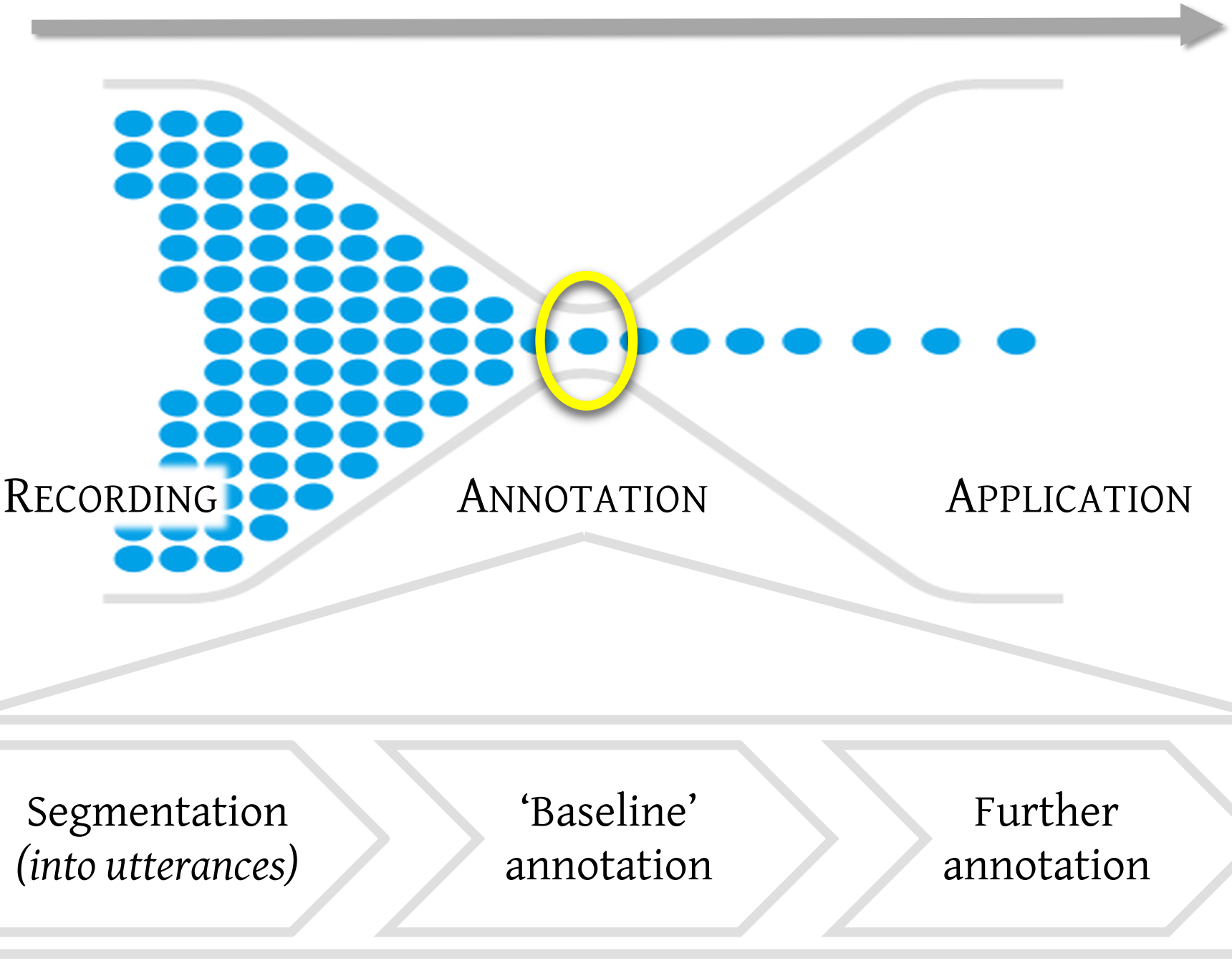
  1. Transcription *(and translation)* is a **central activity** in language documentation and conservation (LDC)—but rarely a **central focus** of documentary linguistic discussions[1]
  2. Our **ability to record** *(and archive)* language materials **outstrips** our ability to **make their contents accessible** through transcription[2]
  3. Addressing the resulting accessibility issues is a **standing challenge** for current work in LDC[3]

1. Jung & Himmelmann (2011: 201) 2. Himmelmann (2006) 3. Thieberger (2016)

Annotation and documentary linguistics

- Difficulties in providing 'baseline' bilingual annotation as possibly informing the direction that some areas of LDC are currently taking:
  - Movement **away from projects involving extensive recording** and relatively little baseline annotation *(e.g., 100–200 hours recorded, 10–20% bilingually annotated)* and **towards smaller projects** with much more annotation *(e.g., 10–20 hours recorded, 90–100% bilingually annotated)*[1]

1. Austin (2017)


RECORDING
ANNOTATION
APPLICATION
Segmentation
(into utterances)
'Baseline'
annotation
Further
annotation

Current approaches

- Thankfully, several **emerging methods and technologies** to addressing different aspects of this bottleneck:
  - *Oral annotation:* **BOLD** *(Reiman 2009, 2010, Boerger 2011, Boerger et al. 2019)*, **Aikuma** *(Bird et al. 2014, Adda et al. 2016, Gauthier et al. 2016)*, *inter alia*
  - *Written annotation:* **Automatic phoneme recognition** *(e.g., Persephone: Adams et al. 2018, Michaud et al. 2018, Cox et al. 2018)*, **automatic speech recognition** *(e.g., Foley et al. 2018, Jimerson & Prud'hommeaux 2018, inter alia)*

Looking outside of LDC

- Many other areas of research *(and digital life, more broadly)* face similar challenges in addressing this 'data deluge':
  - Similar challenges in oral history research, corpus linguistics, media production, etc.
  - Increasingly addressed with methods from **computational linguistics** and **natural language processing** *(e.g., automatic captioning of YouTube videos in several languages)*

Looking outside of LDC

- Until recently, these methods have largely seemed **out of reach** for smaller or lesser-studied languages, with CL/NLP research focused on larger languages with extensive digital resources[1]

- Thankfully, that has begun to change:
  - *People:* Increasing interaction between computational linguistics and LDC (e.g., ComputEL)
  - *Tools:* Integration of **web services** *(text-focused)* and **recognizers** *(A/V-focused)* into common documentary tools like ELAN

1. Bird (2009)

CRIM-Carleton collaboration

- **CRIM:** Expertise in development of speech technologies *(e.g., state-of-the-art automatic speech recognition for Canadian French/English)*
  - Existing web-based platform, **VESTA**, into which speech technologies had been integrated to support social science and education research *(2014–)*

Speaker segmentation

Partition an audio frame into segm
the identity of the person spe
provides facilities to determine
person is speaking and the gen

Speech-to-text

Transcribe the speech of an audio frame. A domain specific vocabulary can be provided to improve the results.

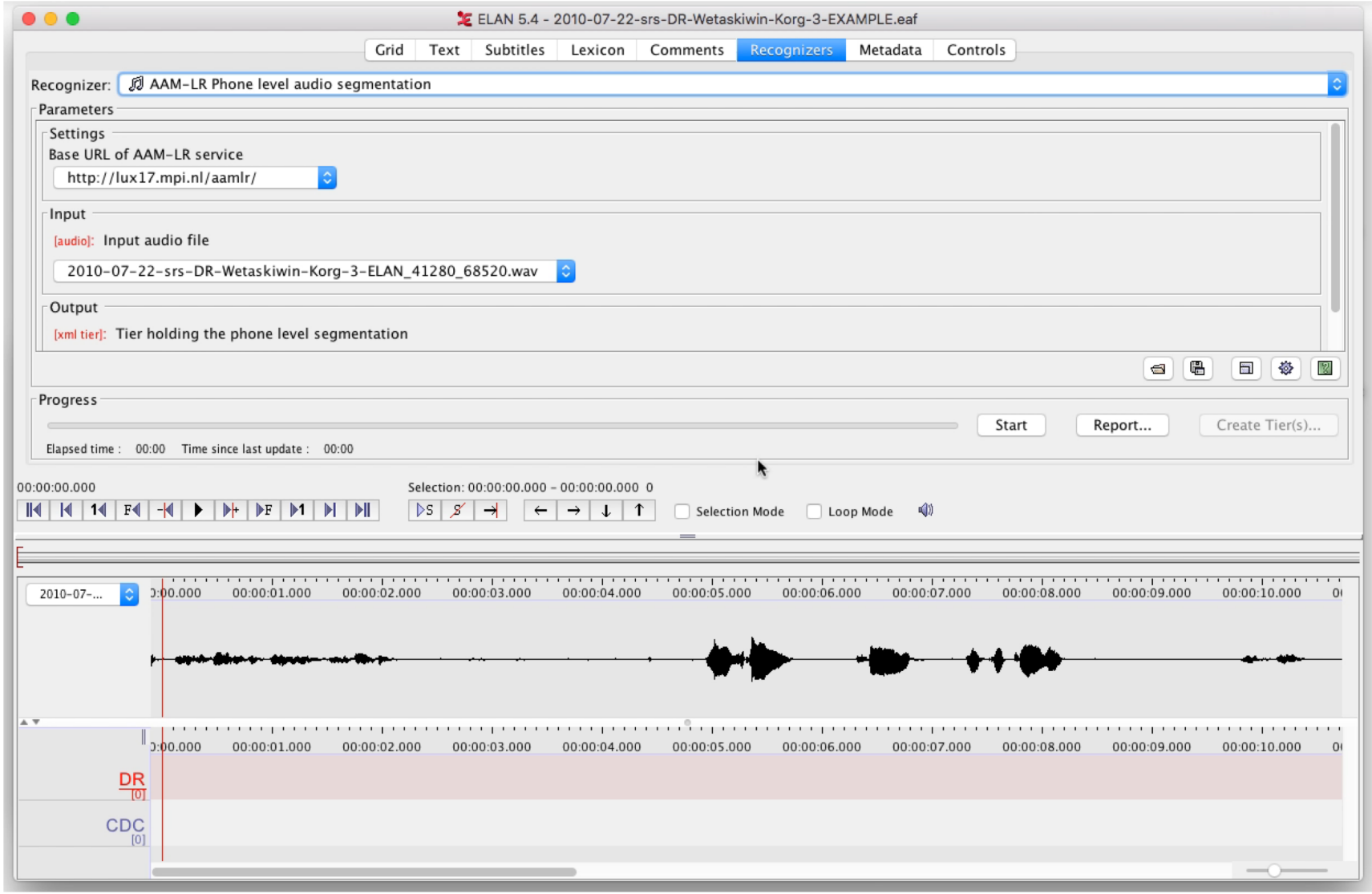
CRIM-Carleton collaboration

- **CRIM:** Expertise in development of speech technologies (*e.g., state-of-the-art automatic speech recognition for Canadian French/English)*
  - Methods robust, implemented as web services that could be called from anywhere—but not previously applied to lesser-studied languages
  - Q: Could these same functions be **integrated into common documentary linguistic workflows**?

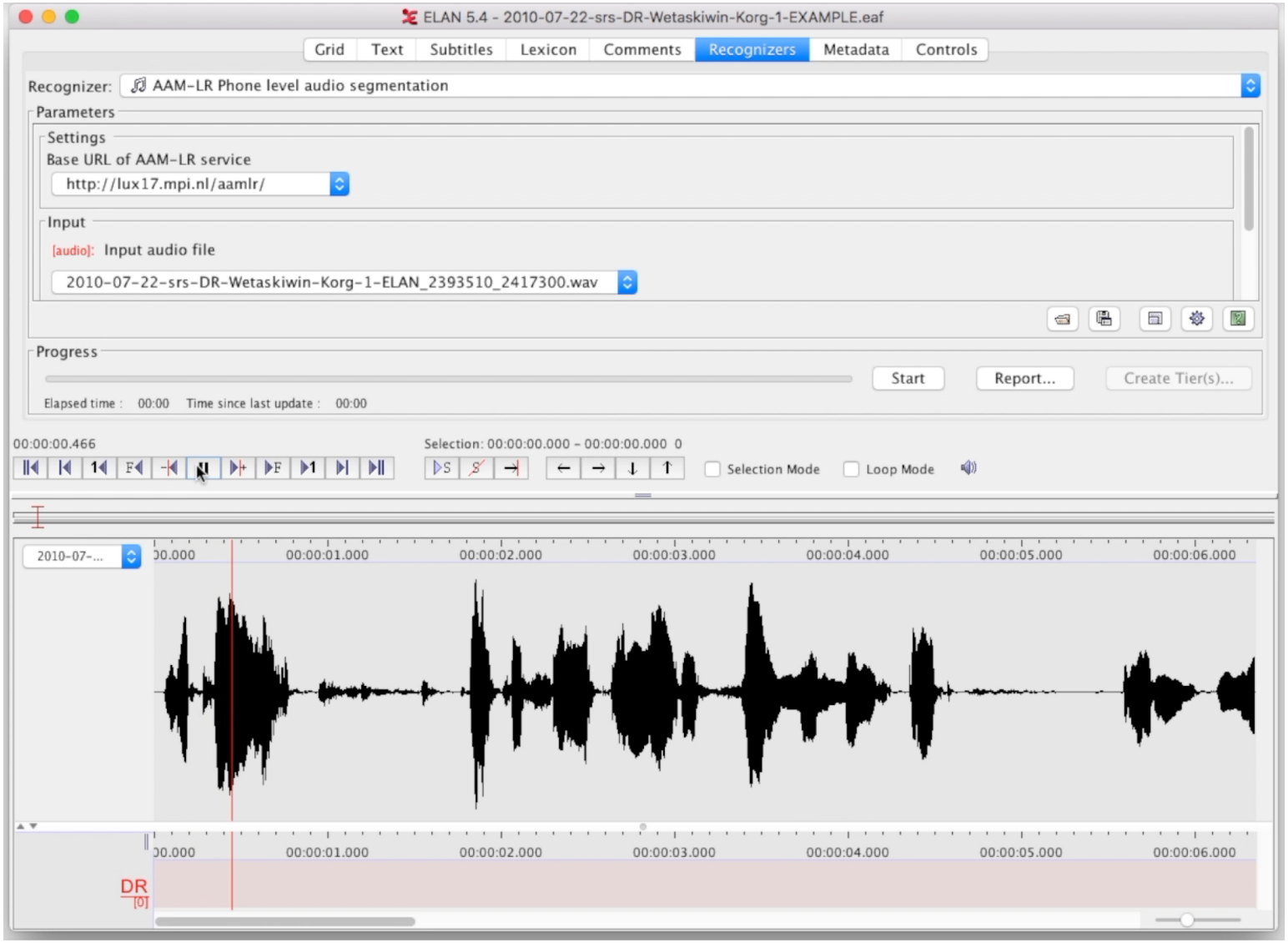
Introducing VESTA-ELAN

- *Idea:* Integrate VESTA services directly into ELAN for easier use in documentation projects:
  1. **Automatic segmentation:** Identify speech vs. non-speech sections of recordings *(language-independent task)*
  2. **Speaker diarization:** Attribute speech sections to different speakers *(language-independent task)*
  3. **Content language identification:** Recognize which segments are primarily English and which aren't *(language-dependent task; work in progress)*
  4. **Automatic speech recognition:** Transcribe any speech in English or French *(language-dependent task)*

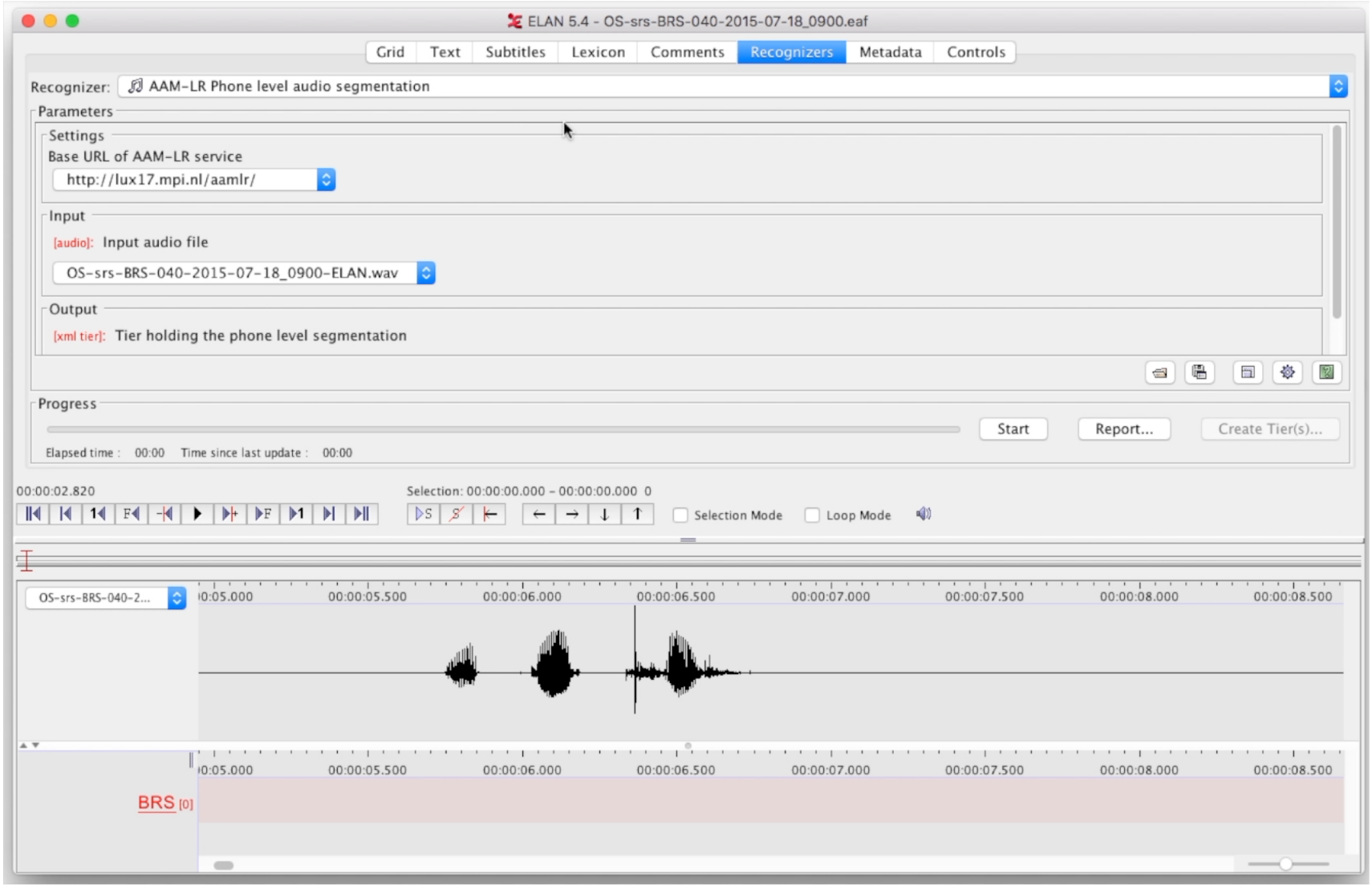
Example 1: VESTA diarization



Example 2: VESTA speech recognition



Example 3: VESTA + Other recognizers



Conclusions

- VESTA-ELAN services target a particular range of issues in the current transcription bottleneck, aiming to **make written annotation more feasible**
  - Sets the stage for further **automatic** and **semi-automatic annotation** to be applied *(e.g., first-pass phonemic transcription using Persephone; cf. Adams et al. 2018, Cox et al. 2018)*

Conclusions

- The VESTA-ELAN recognizers will be **made generally available for public use** soon
  - Aim to be a useful addition to the LDC toolkit—one that facilitates both 'traditional' transcription/translation and automatic annotation techniques
  - Integration with other, similar annotation services currently under development may help reduce the "transcription bottleneck"—encouraging more expansive documentation projects than may currently be feasible.

Thanks!