Acquisition of Asynchronous Data and Parameter Estimation based on Double-Cross-Correlation Processor with Phase Transform (DXCP-PhaT)

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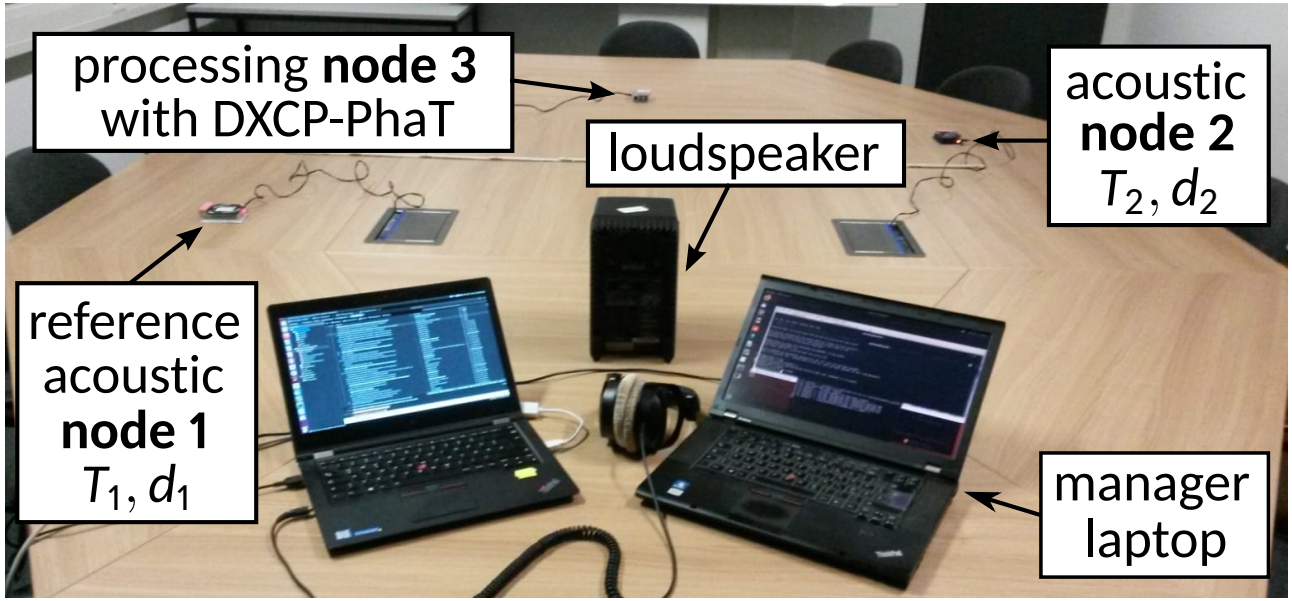
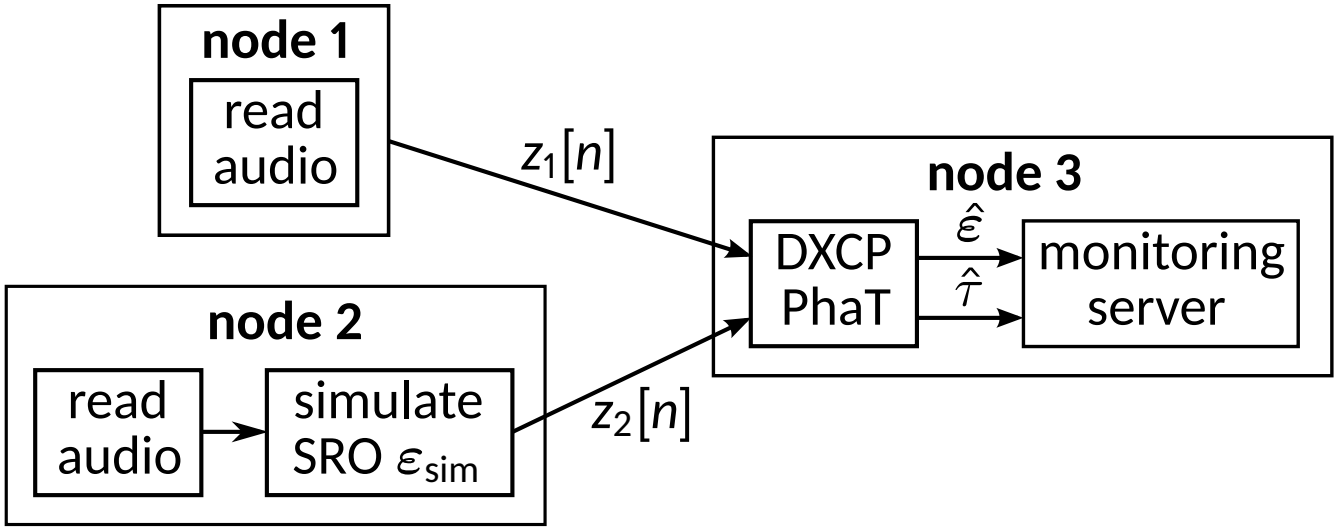
Wireless Acoustic Sensor Network with Ad-hoc Nodes

A real WASN on Raspberry Pis (Fig. 9 from [Chinaev, 2021])



- **Asynchronous** audio **signals** $z_1[n]$ and $z_2[n]$:
  1) Sampling-rate offset (**SRO**) ε defined via sampling period $T_2 = (1+\varepsilon)\cdot T_1$
  2) Start of recordings with a sampling-time offset (**STO**) $d = d_2 - d_1$
  3) Accumulating Time Drift (**ATD**) $\tau[n] = \varepsilon \cdot n + d$ **grows with time** index n
- $z_1[n]$ and $z_2[n]$ are sent over **WLAN** to the node 3 and used for **online estimation** of SRO, STO & ATD by applying **DXCP-PhaT** [Chinaev, 2021]

Block diagram of MARVELO-Implementation [Afifi, 2018]



setxml ./Configurate_DXCP_PhaT_Demo.xml in MARVELO

- 10.0.2.13 (**node 1**): Single-channel **audio signal acquisition**
- 10.0.2.15 (**node 2**): Audio acquisition and **signal resampling** [Schmalenstroeer, 2018] **for simulated SRO** ε_{sim} of e.g. 60 parts-per-million (ppm)
- 10.0.2.16 (**node 3**): **Estimation** of SRO, STO & ATD by **using DXCP-PhaT** with **storage** of $z_{1,2}[n]$ and providing of estimates to **monitoring server**

python3.6 Visualize_DXCP_PhaT_Demo.py -ip 10.0.2.16

Build-In Video

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References, Code and Contact

[Chinaev, 2021] A. Chinaev, P. Thuene and G. Enzner, “Double-Cross-Correlation Processing for Blind Sampling-Rate and Time-Offset Estimation”, IEEE Trans. Audio, Speech, Lang. Process., 2021

[Afifi, 2018] H. Afifi et.al., “MARVELO - A Framework for Signal Processing in Wireless Acoustic Sensor Networks”, Proc. ITG Conf. Speech Commun., 2018.

[Schmalenstroeer, 2018] J. Schmalenstroeer and R. Haeb-Umbach, “Efficient Sampling Rate Offset Compensation - An Overlap-Save Based Approach”, Proc. EUSIPCO, 2018.

Code and more details available at https://github.com/CN-UPB/WASN

If you have **any questions**, please feel free to **contact me** at
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