Constrained-Energy Lapped Transform (CELT) codec

`draft-valin-celt-codec-01.txt`

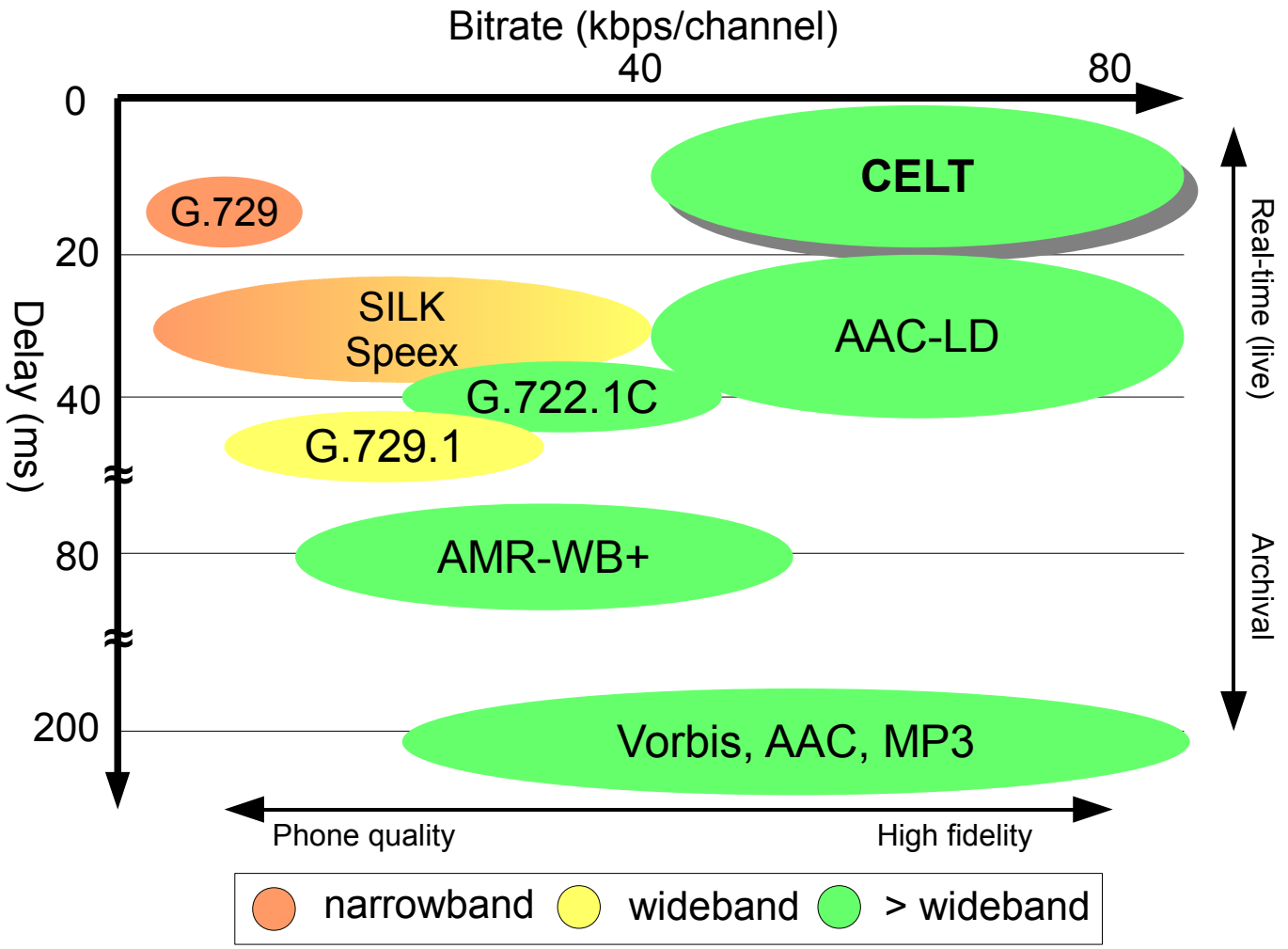
Very Low-Delay Coding

- Benefits
  - Reduces acoustic echo problems (even w/o AEC)
  - Enables new applications
    - Collaborative network music performances
    - Transparent network sound servers
  - Better loss robustness
- Challenges
  - Limited frequency resolution
  - Must minimize overhead in bit-stream

Technology

- Transform codec (MDCT-based)
- Central ideas
  - Coding (and constraining) the energy in each band explicitly so that the spectral envelope is preserved
  - Use of PVQ as spherical quantizer
- Uses range coding (1979)
- Pyramid Vector Quantization (1986)

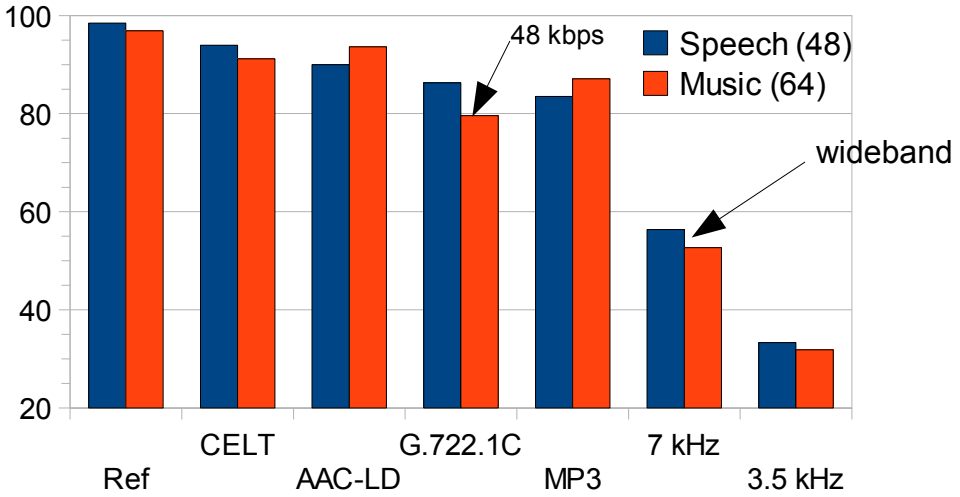
Codec Landscape



Quality

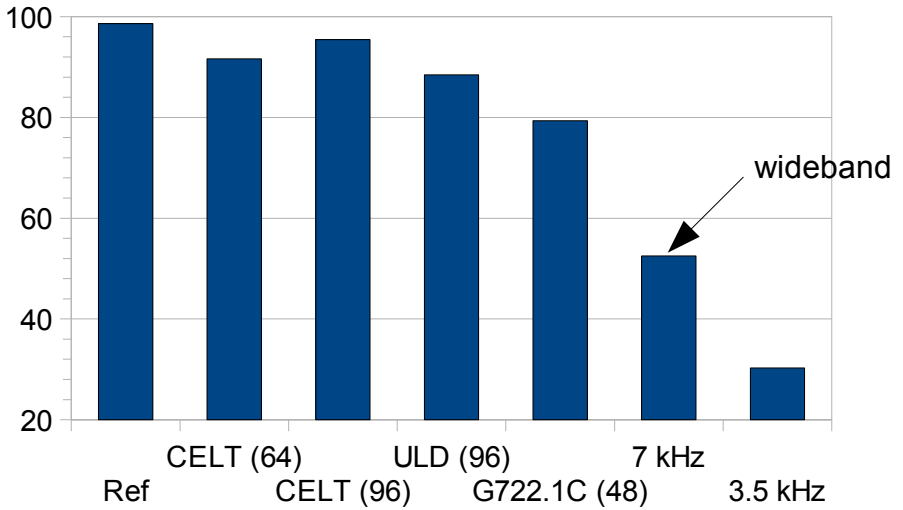
- Internal MUSHRA (ITU-R BS.1534) tests of development versions

V0.3.2



Delay (ms)	**8.7**	34.8	40	>100		

V0.5.1



Delay (ms)	**8**	**4**	5.3	40

Conclusion

- CELT is designed for very low delay, high quality speech and music
- Complementary to SILK
- Resources
  - http://www.celt-codec.org/
  - List: celt-dev@xiph.org
  - IRC: irc.freenode.net #celt