



International Telecommunication Union

# ITU-T Study Group 12

## The qualification and selection procedure of ITU-T Recommendation P.862

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Workshop on QoS and user-perceived transmission quality in evolving networks  
Dakar (Senegal), 18 - 19 October 2001



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# The qualification and selection procedure of ITU-T Recommendation P.862

- Short tutorial on objective speech quality measures
- Milestones of ITU-T Rec. P.862 development
- Capabilities of P.862
- Future work within next Study Period
- Conclusions



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## Short tutorial on objective speech quality measures

- How would you assess the speech quality of a telephone call?
  - You would pick up the handset and establish the connection
  - You would listen to the voice
  - You would compare the quality with your experience you made in the past
  - You would note your impression

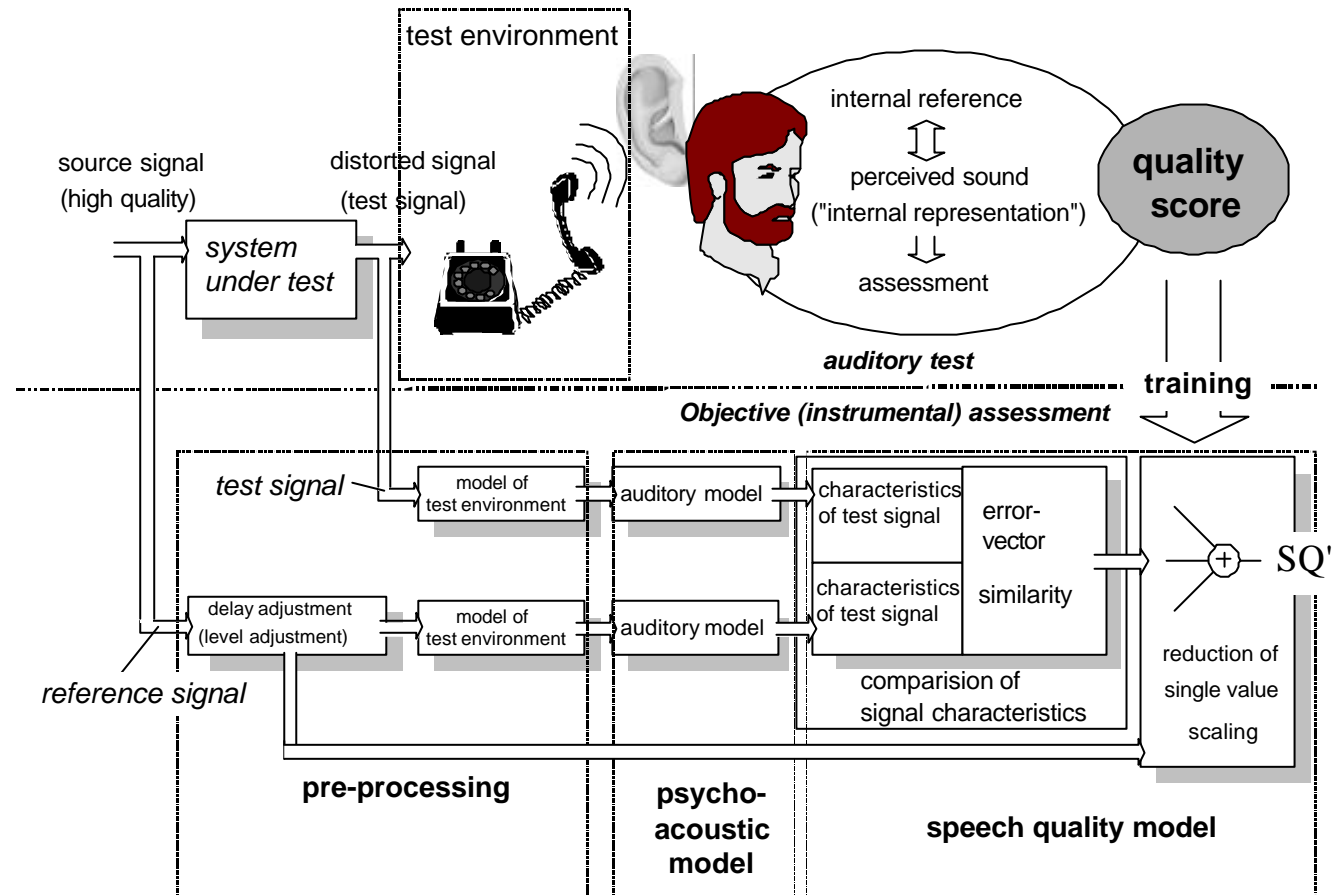
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# Short tutorial on objective speech quality measures



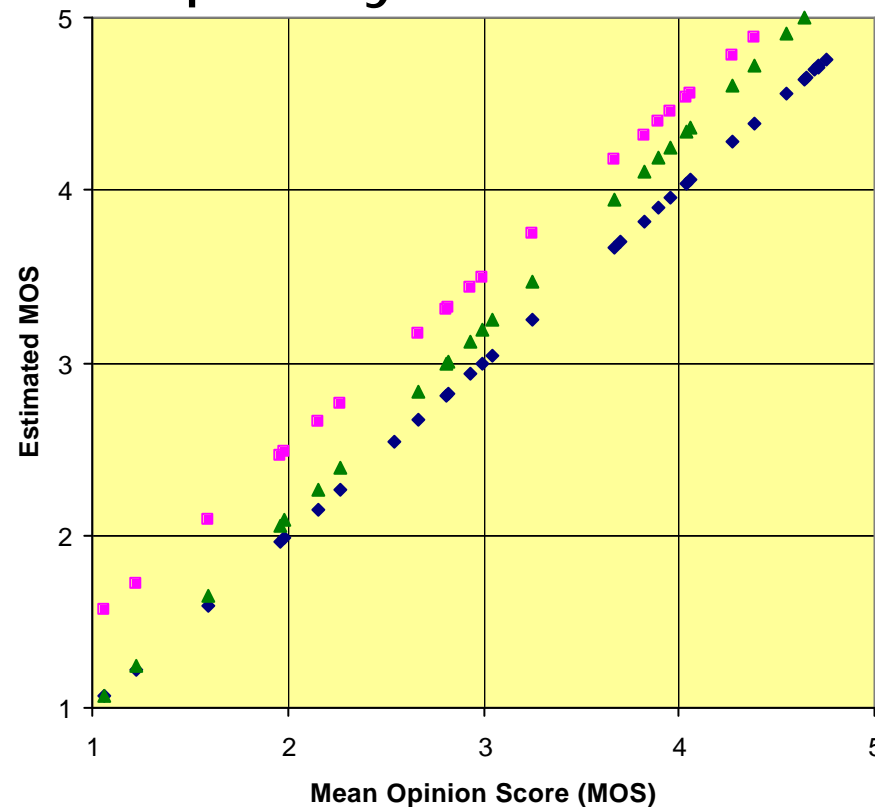


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# Short tutorial on objective speech quality measures

## Ideal characteristics of objective speech quality measures



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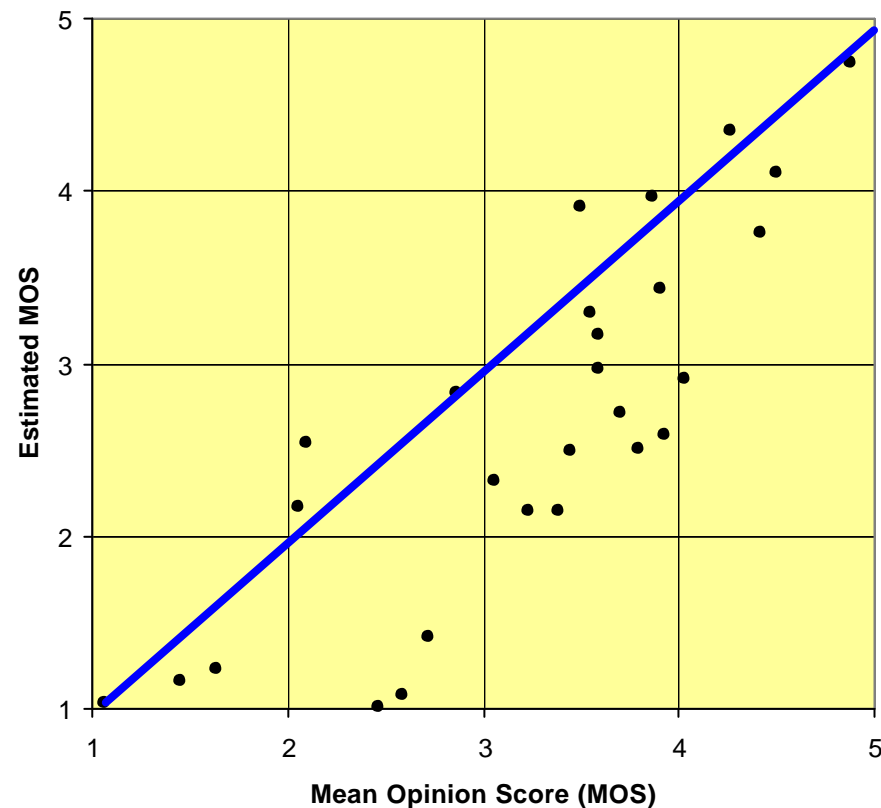
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# Short tutorial on objective speech quality measures

Example for bad performance ( $\rho = 0,89$ )



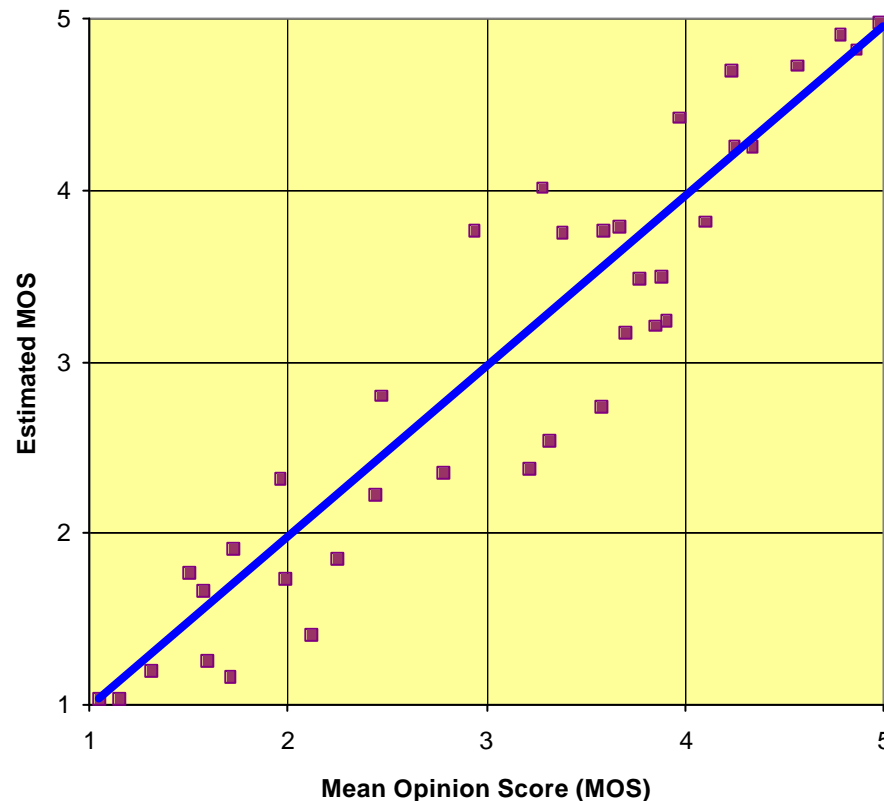
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# Short tutorial on objective speech quality measures

Today's performance of objective  
speech measures ( $\rho = 0.96$ )





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## Milestones of ITU-T Rec. P.862 development

- Why decided ITU-T on the development of P.862?
- Requirements from the industry
  - to assess end-to-end speech quality
  - to assess speech transmission quality of packet-oriented networks
  - to assess speech + background noise
- P.861 was here not applicable



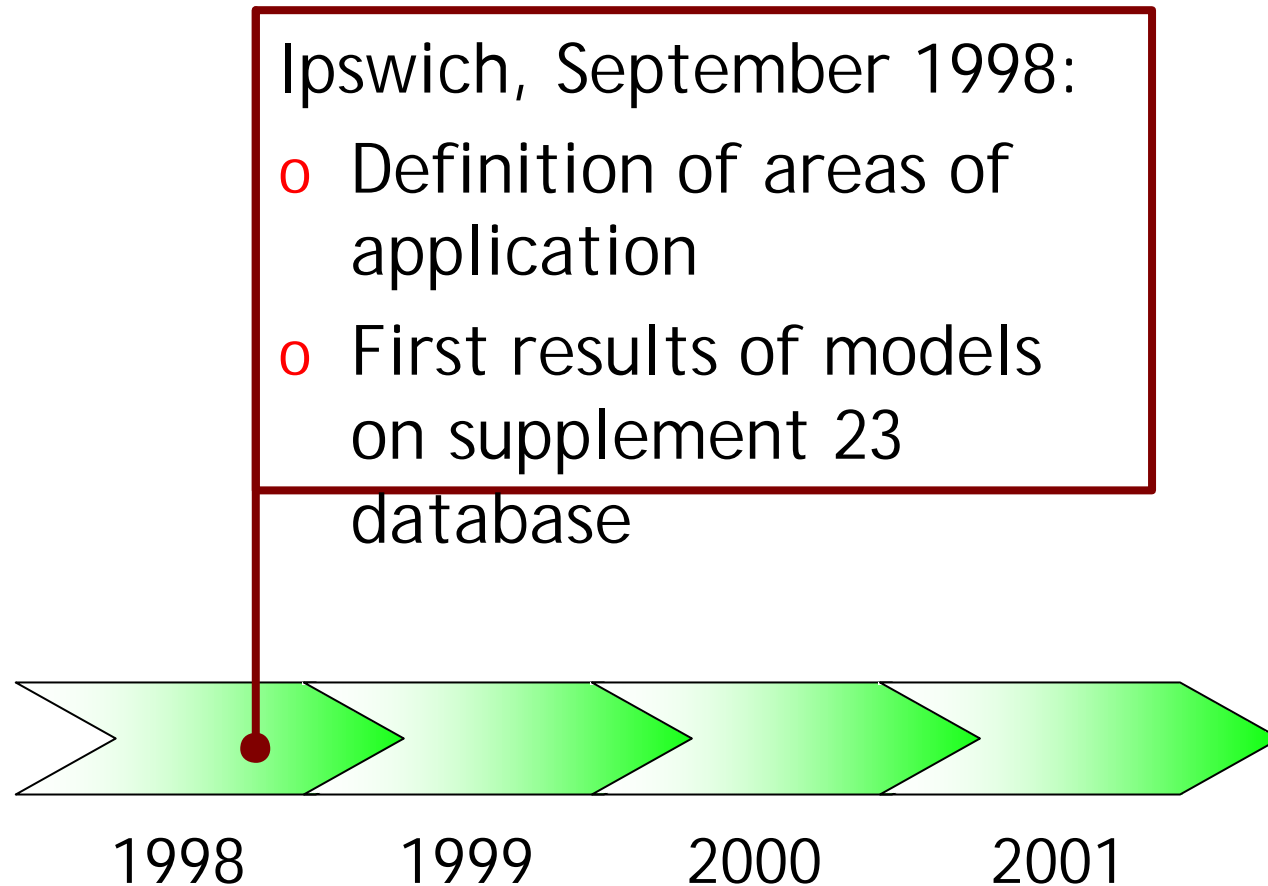


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# Milestones of ITU-T Rec. P.862 development



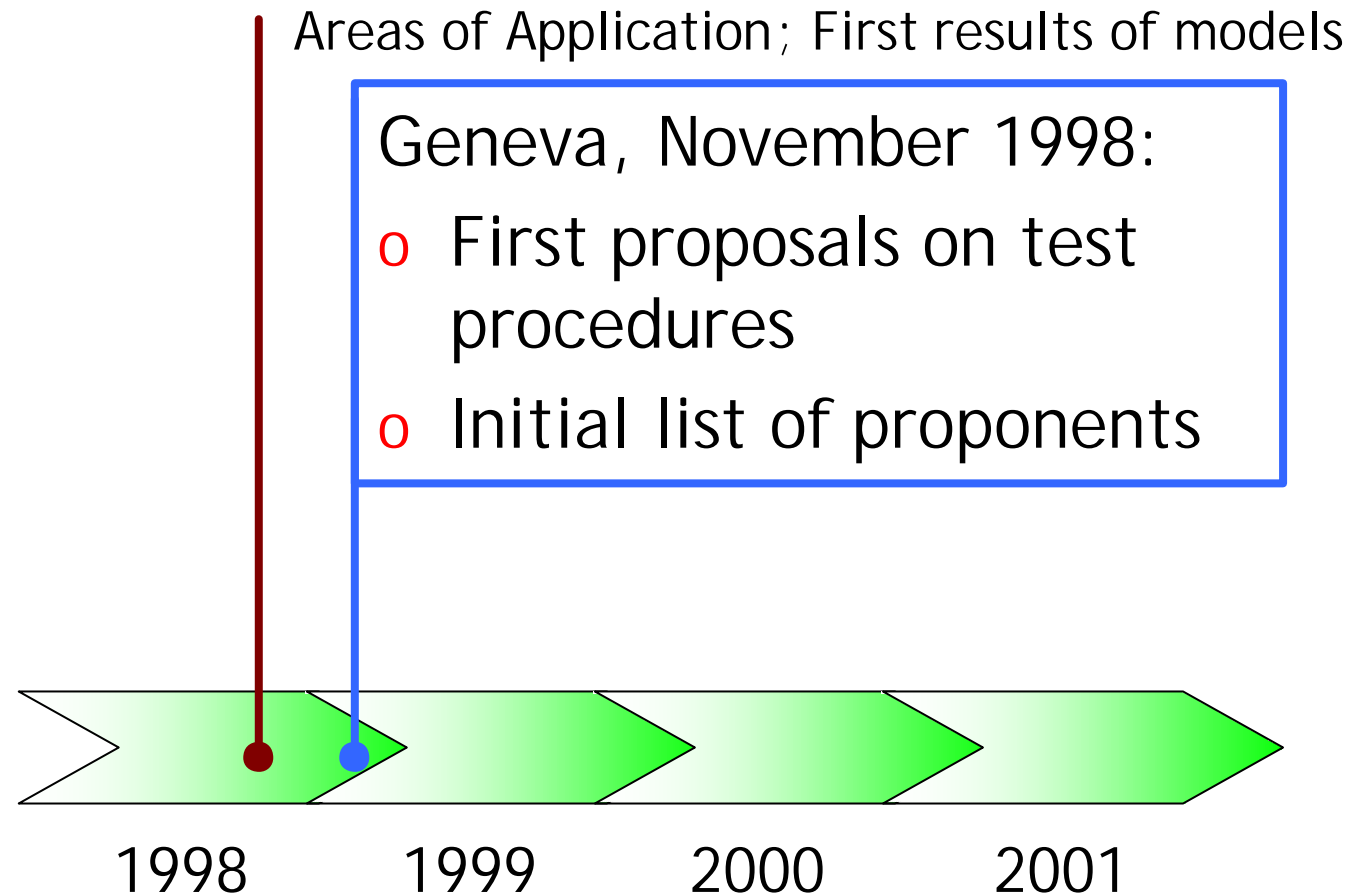
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# Milestones of ITU-T Rec. P.862 development

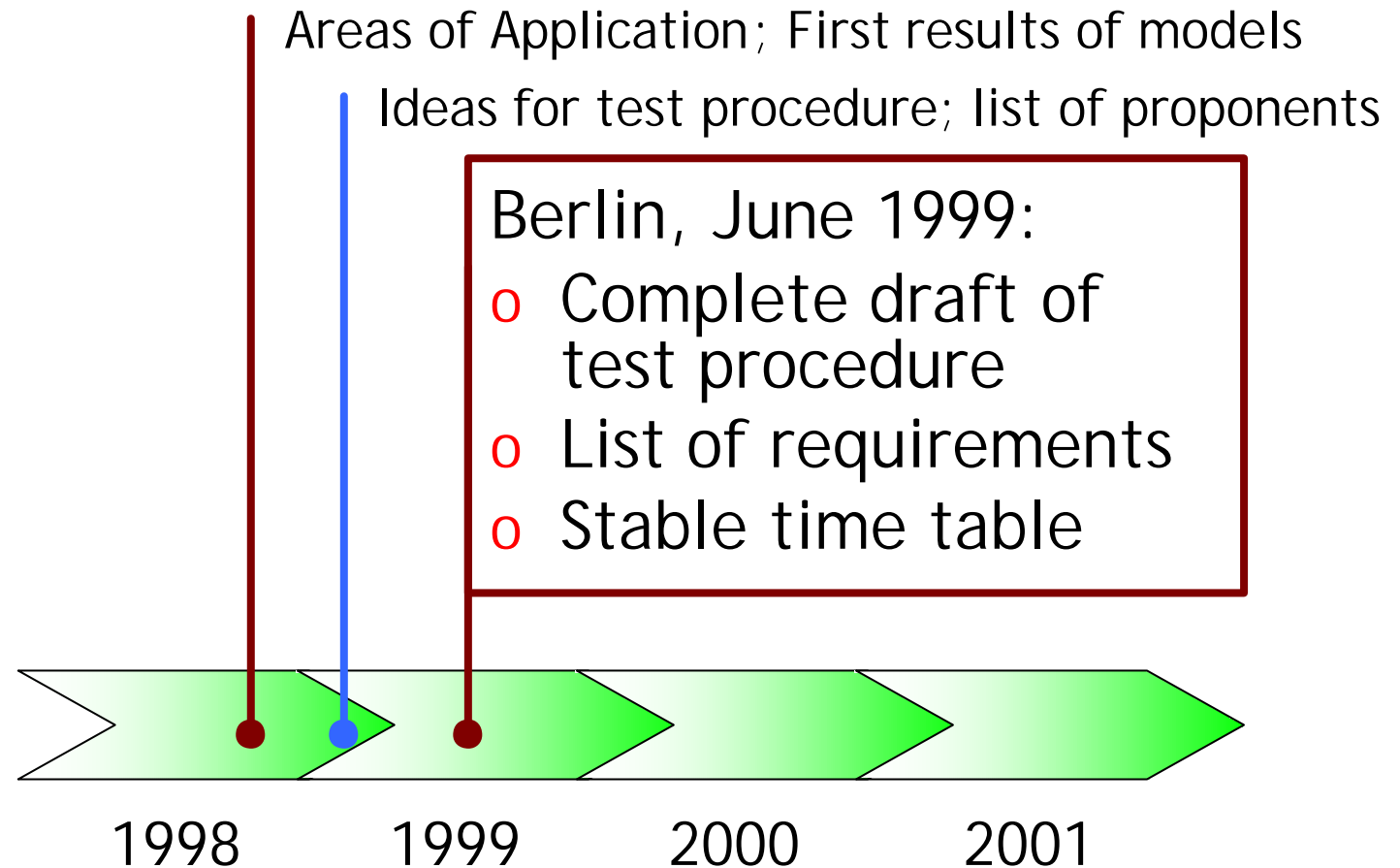




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# Milestones of ITU-T Rec. P.862 development





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## Milestones of ITU-T Rec. P.862 development

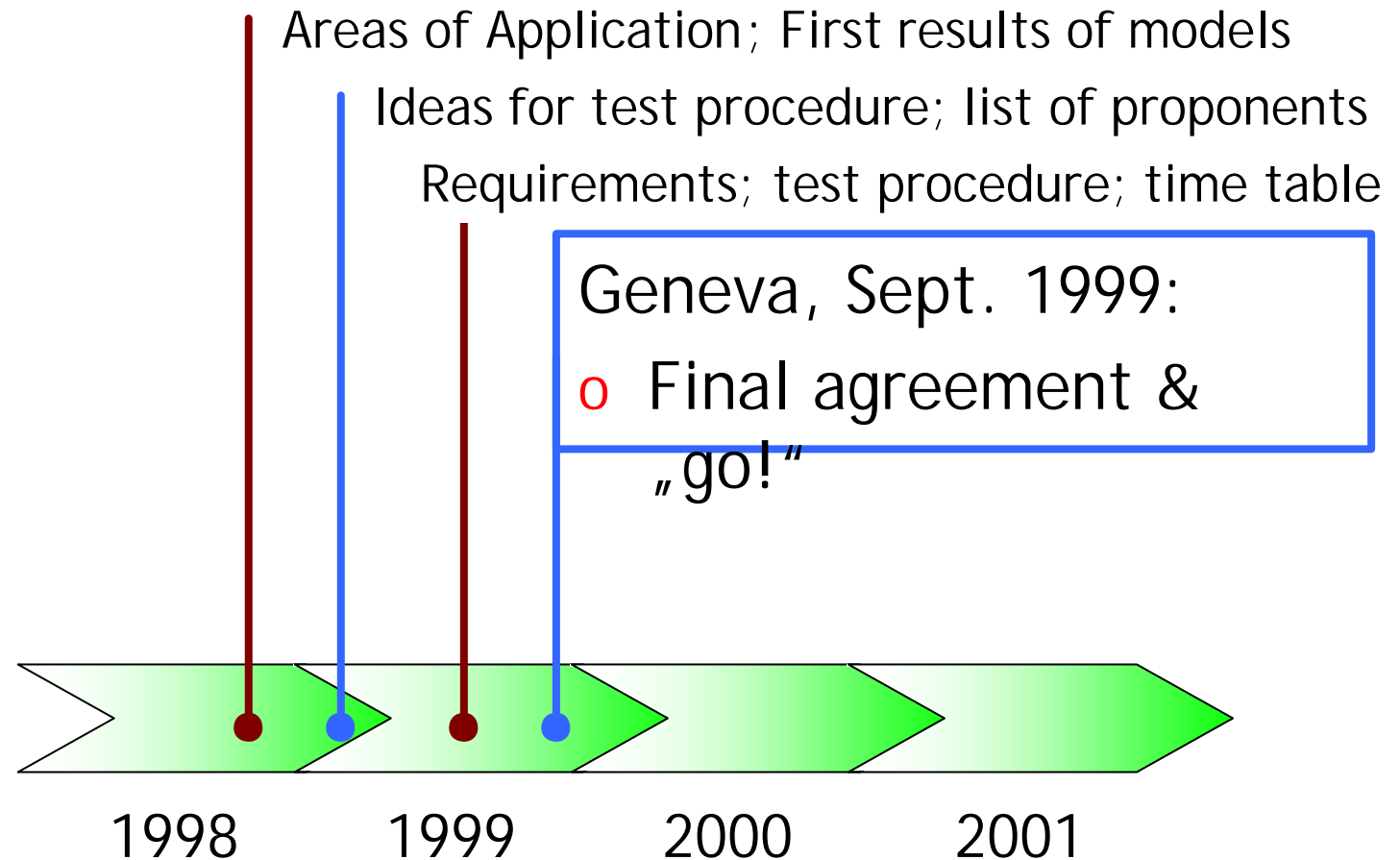
- Test procedure (key issues):
  - Two types of speech databases:
    - Proponent's databases (known by the proponent exclusively)
    - Databases known by all proponents
  - A series of new listening tests for
    - Background noise
    - Network measurement and emulation
    - ETSI Voice over IP database
  - Priority list for statistical parameters



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# Milestones of ITU-T Rec. P.862 development





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## Milestones of ITU-T Rec. P.862 development

- Subjective and objective evaluation
  - Conduction a set of 8 listening tests
    - production of new speech material
    - tests for five European languages
    - five listening labs
  - Objective evaluation
  - Statistical evaluation
  - Cross-checking of results by independent organization

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# Milestones of ITU-T Rec. P.862 development

## Listening laboratory of T-Systems



Photo: T-Systems

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# Milestones of ITU-T Rec. P.862 development

## Speech quality assessment on Touch-Screens



Photo: T-Systems

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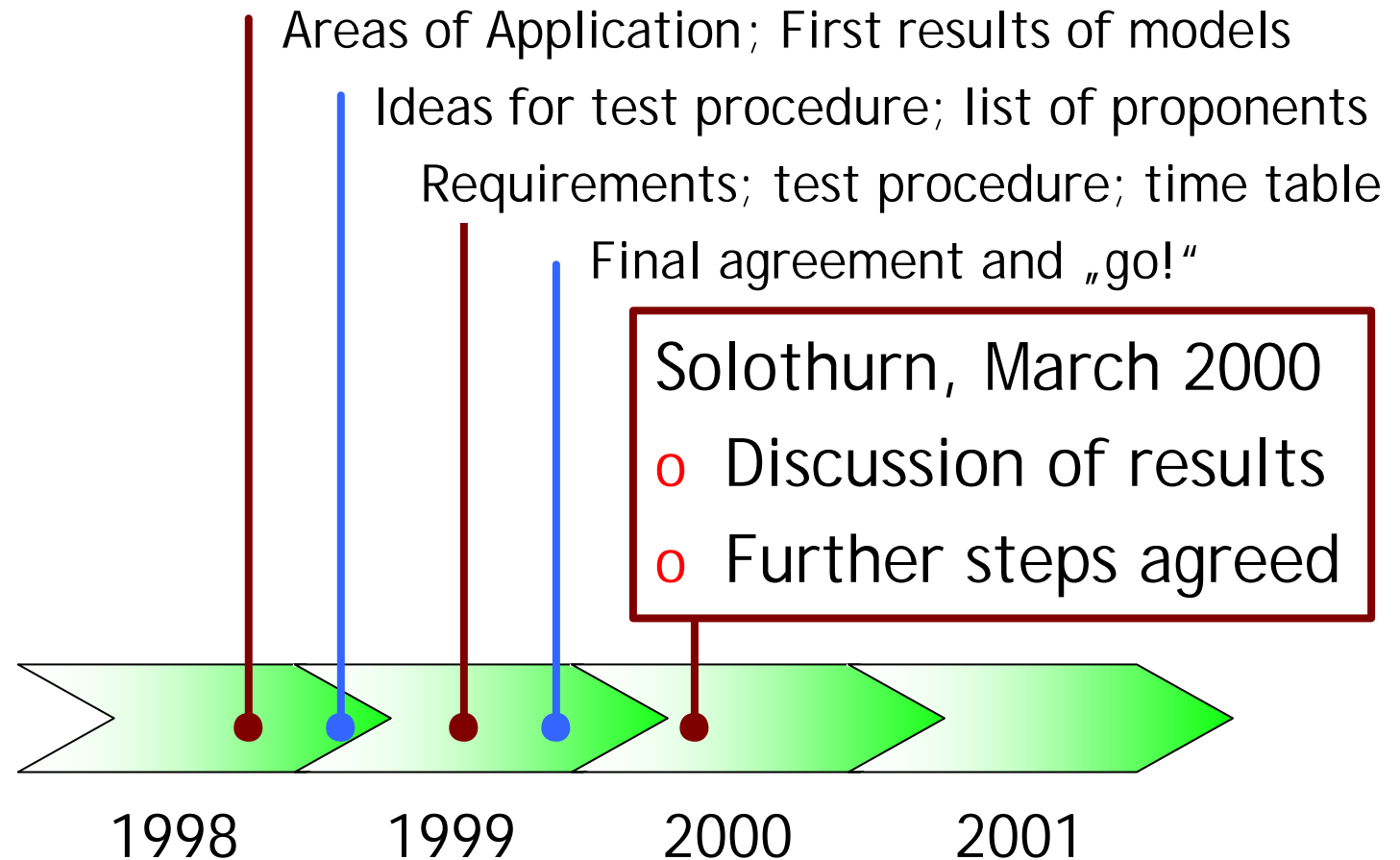




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# Milestones of ITU-T Rec. P.862 development

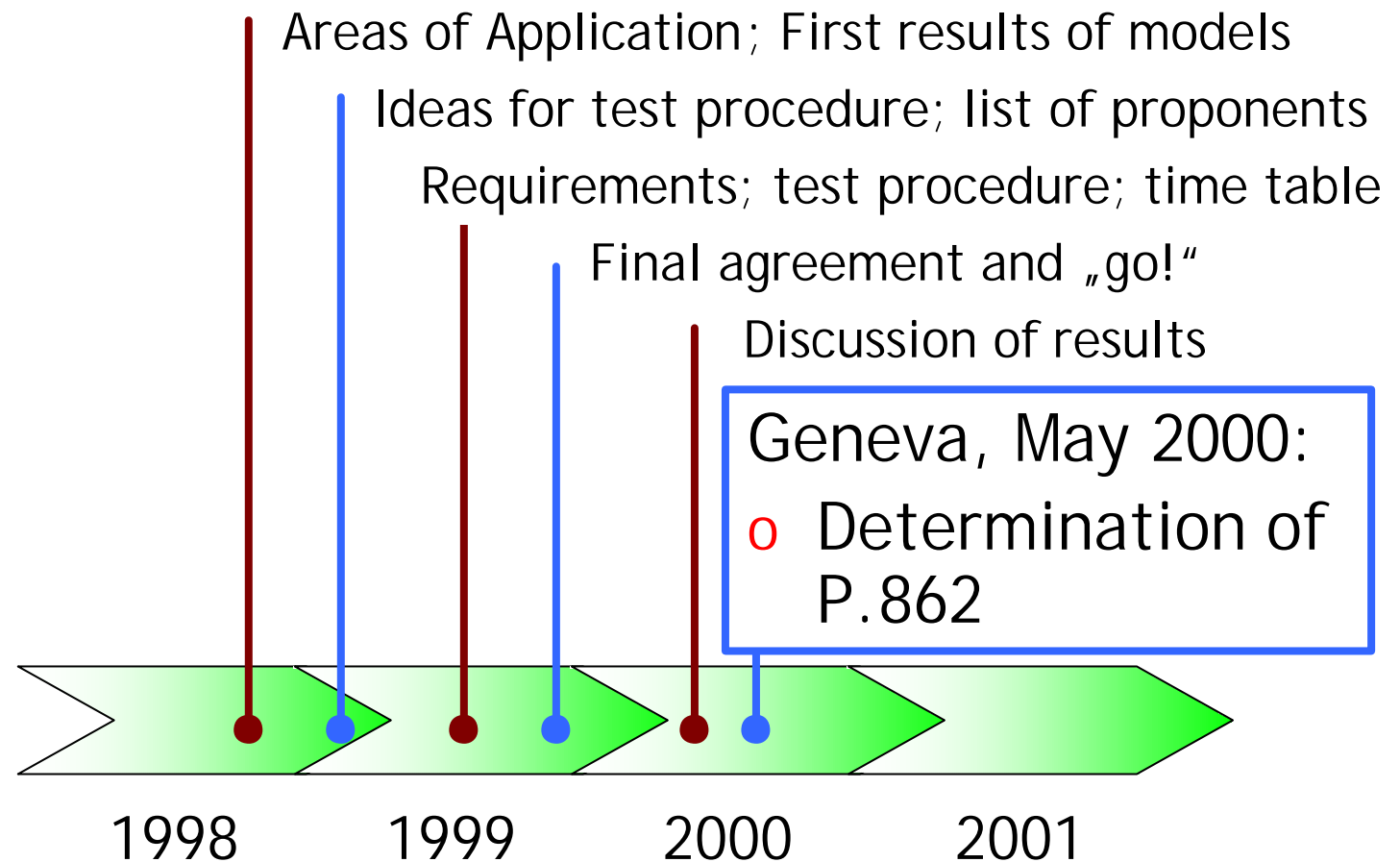




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# Milestones of ITU-T Rec. P.862 development

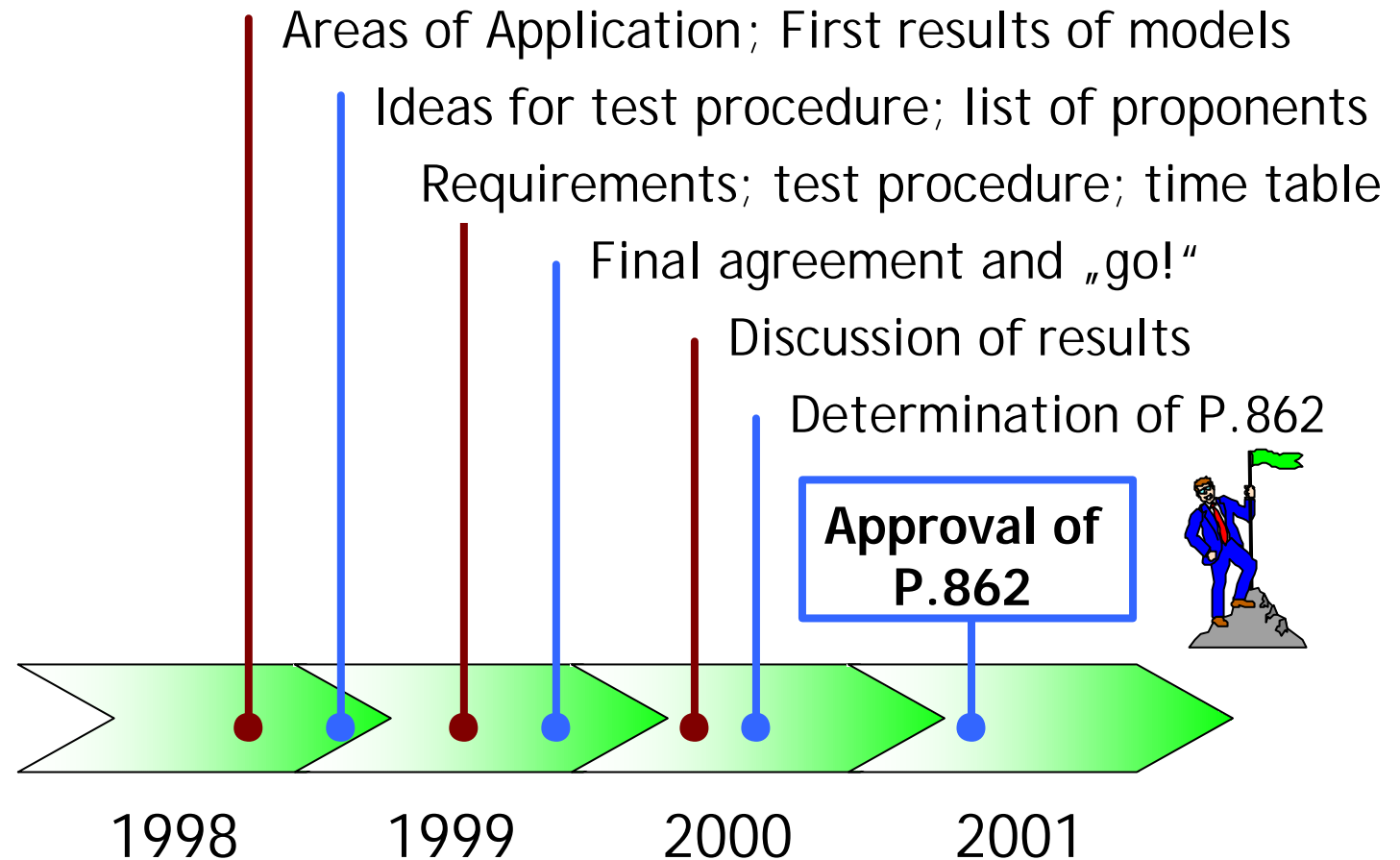




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# Milestones of ITU-T Rec. P.862 development





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# Milestones of ITU-T Rec. P.862 development

## o Input

- Three year's period of development
- Speech data with several thousand speech files
- Extensive listening testing
- Total costs of more than 250.000 US\$

## o Output

- Several thoroughly tested objective speech quality algorithms
- A huge speech data base



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# Capabilities of ITU-T Rec. P.862

- Acceptable accuracy for
  - a large number of codecs
  - transcodings
  - transmission channel errors
  - short- and long-term time warping
  - network testing via electrical interfaces
  - packet-oriented networks (limitations!)
- One single algorithm
- Variable licensing models

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## Future work within Study Period 2001-2004

- New recommendations for
  - Mouth-to-ear speech quality measurement (including terminals)
  - Wide band speech quality measure
  - Single-ended measurement for voice over packet-oriented networks
  - Speech quality assessment of talker dependency ('talker quality')



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## Conclusions

- ITU-T Rec. P.862 had been proven as a big progress (compared to former P.861) and had been thoroughly tested
- The evaluation procedure is well-engineered and of high accuracy
- It can be used as a basis
  - to easier define requirements of new objective speech quality methods, and
  - to faster evaluate new algorithms

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## Conclusions

- Today there is a great demand for
  - flexible solutions (no monopoly!)
  - scalable with respect to performance and price
  - easy to obtain, implement and run
  - professional support
- ITU-T will adopt its standardization strategy to meet the requirements of their members

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