



ASIA-PACIFIC TELECOMMUNITY

2<sup>nd</sup> APT/ITU Conformance and Interoperability Workshop

(C&I-2)

26 August 2014, Bangkok, Thailand



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# "Acceleration of R&D Towards Speech Translation Technologies in the Asia-Pacific Region by U-STAR"

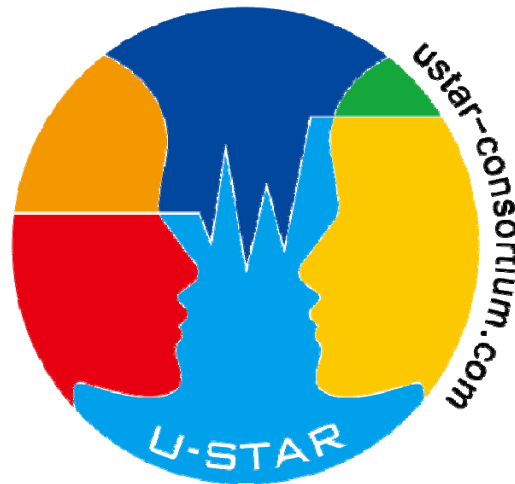
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# "Acceleration of R&D Towards Speech Translation Technologies in the Asia-Pacific Region by U-STAR"



**Chiori Hori**

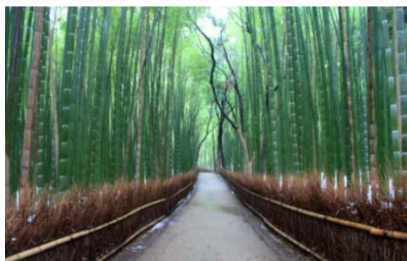
Spoken Language Communication Laboratory

National Institute of Information and Communications Technology

# National Institute of Information and Communications Technology

## Universal Communication Research Center

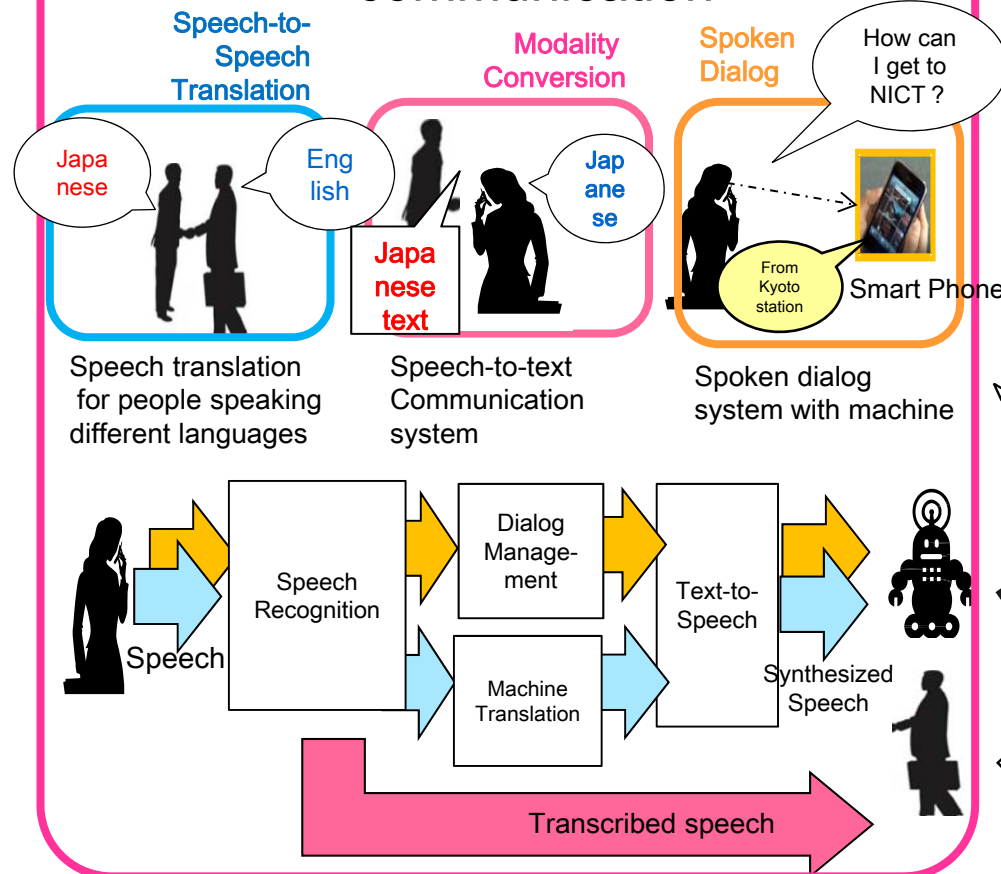
### Spoken Language Communication Laboratory



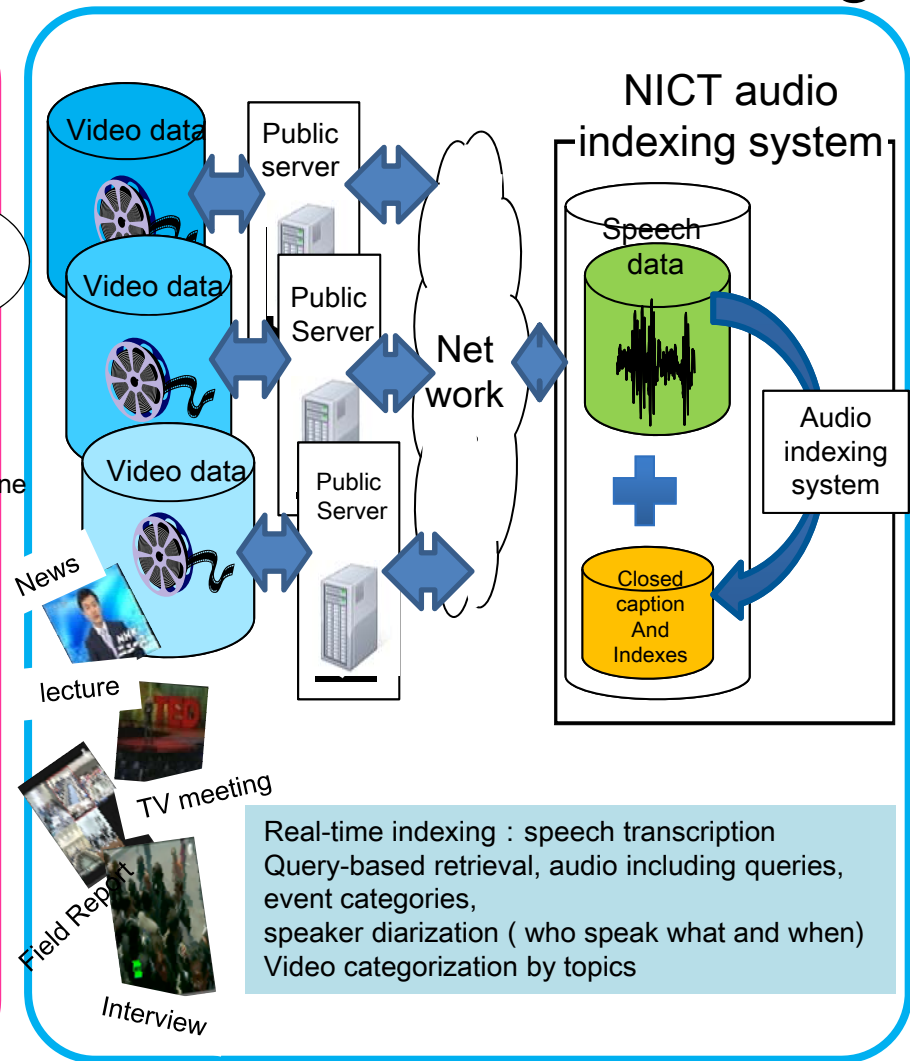
# Research Target

## Speech Interface

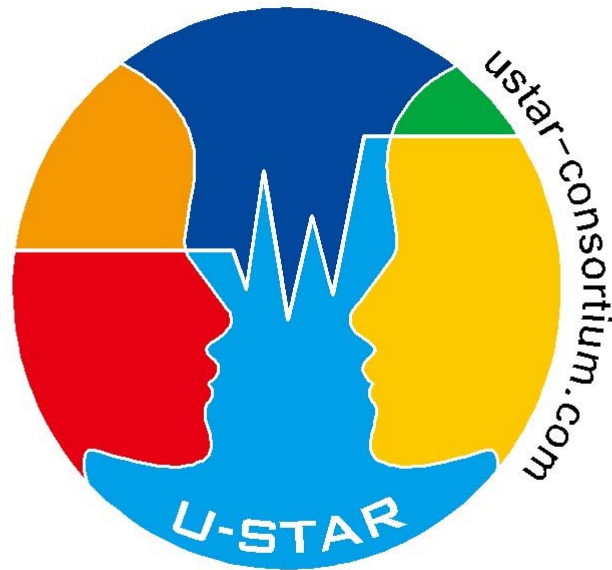
Human and Human, Human and Machine for natural communication



## Real-time Audio indexing



# "To Create a World Without Language Barriers" by International Research Consortium



# How to overcome language barriers?

- Many different languages in the world
- Overcoming the language barriers is a long-held dream of mankind.
- Speech translation technology



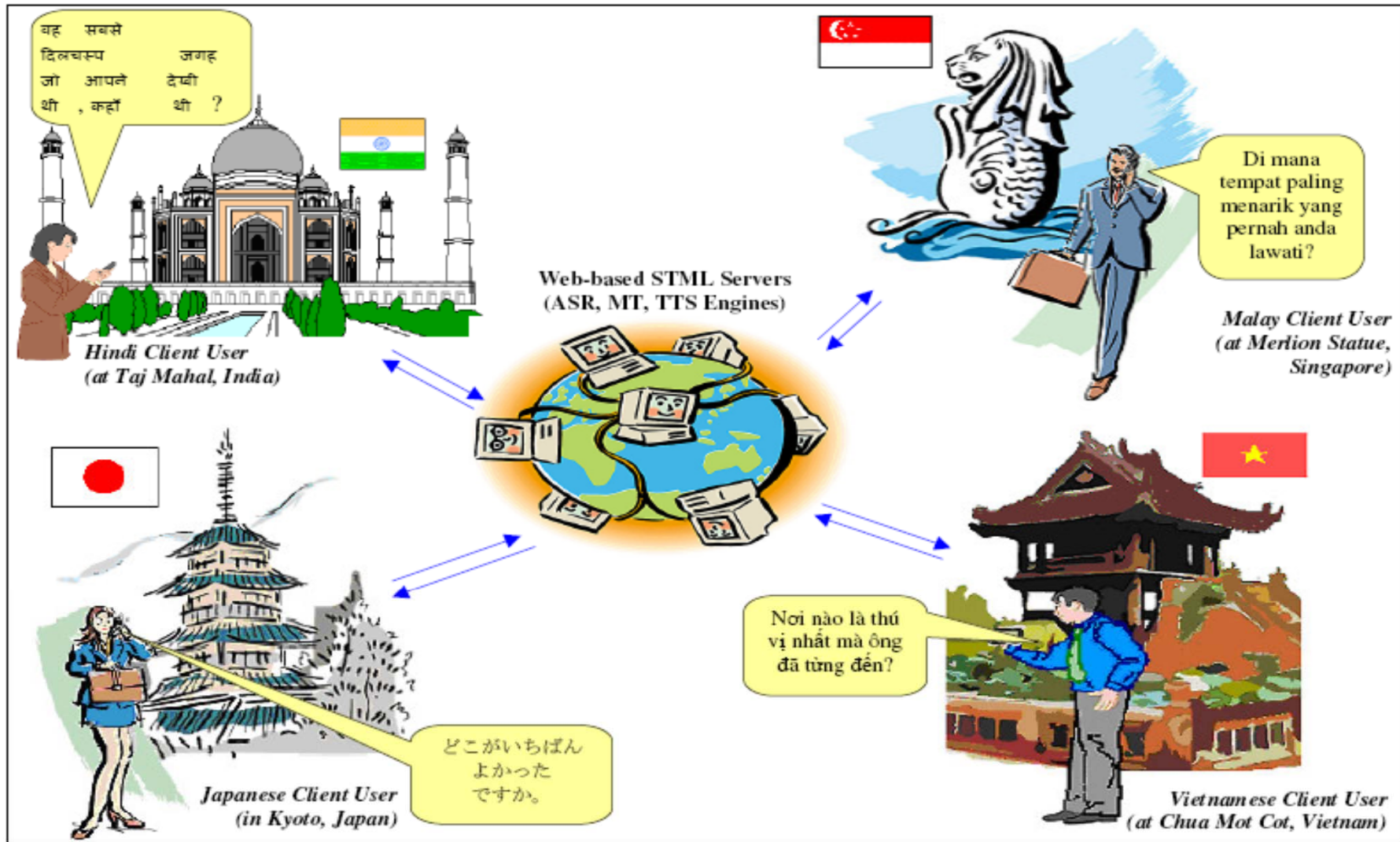
## Breaking the language barriers

Some examples of the language groups

Niger-Congo	Albanic	Uralic	Nuclear Malayo-Polynesian	American Indian
Bantu	Arabic	Dravidian	Papuan	Algic
Nil-Saharan	Armenian	Sino-Tibetan	Pama-Ngyungan	Uto-Aztecan
Khoisan	Austrian	Chinese	Tai-Kadai	Mayan
Indo-European	Azerbaijani	Burmese-Tibetan	Isolate	Andean
Germanic	Basque			Tupian
Albanic	Belarusian			Brazilian indigenous
Romance	Belgian			
Slavic	Belgian			
Indo-Iranian	Belgian			
Baltic	Belgian			
Caucasian	Belgian			

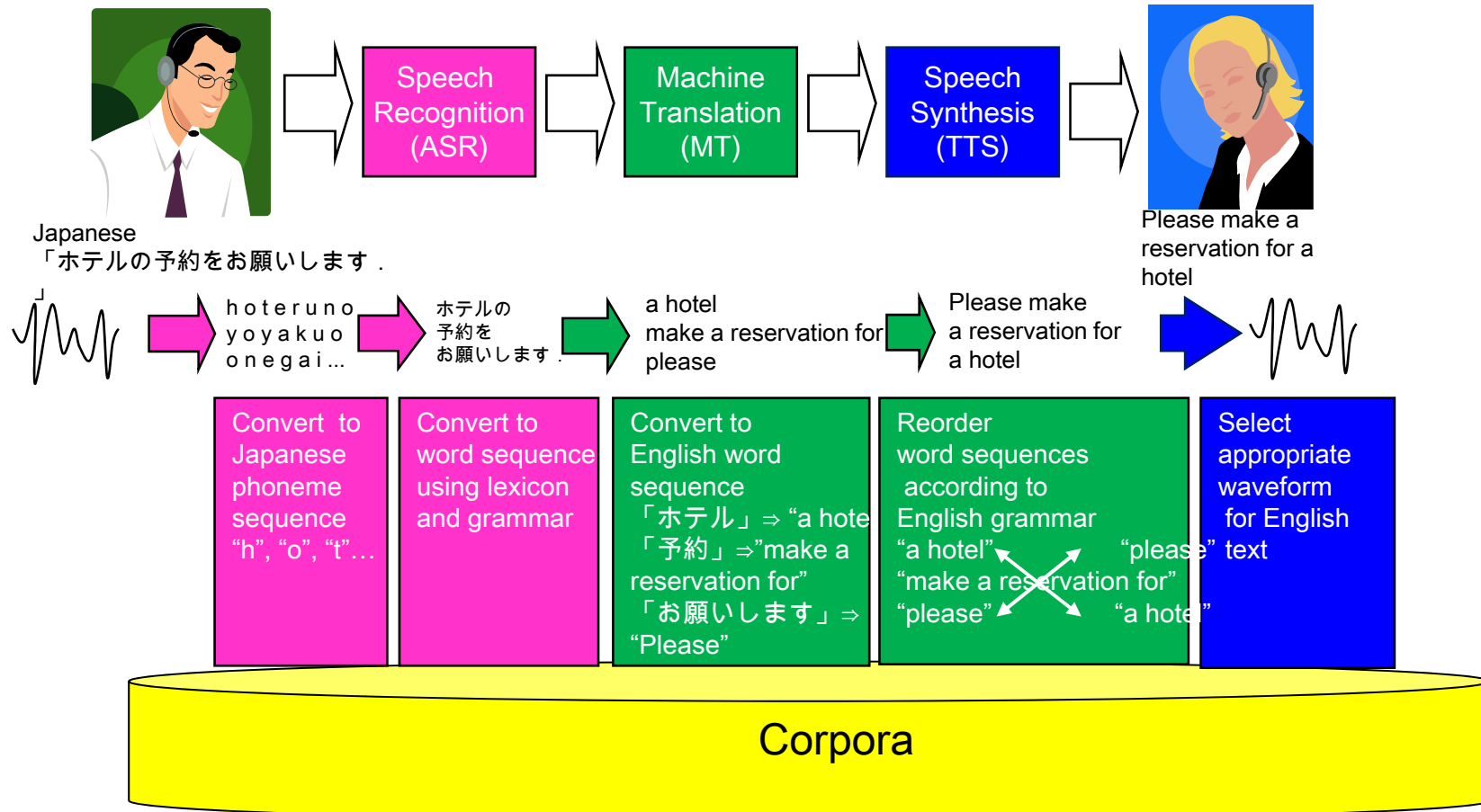


# Multilingual Speech Translation



English meaning: "Where was the most interesting place you've visited?"

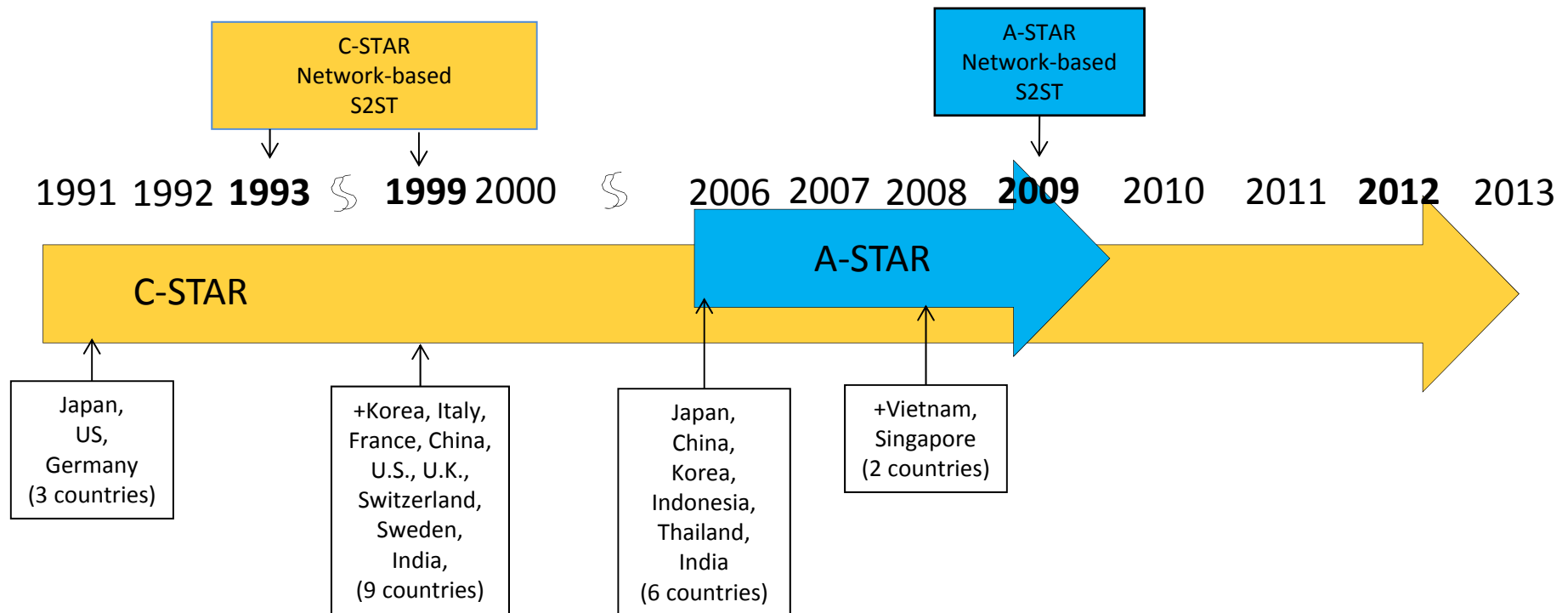
## A means of communication between different language speakers





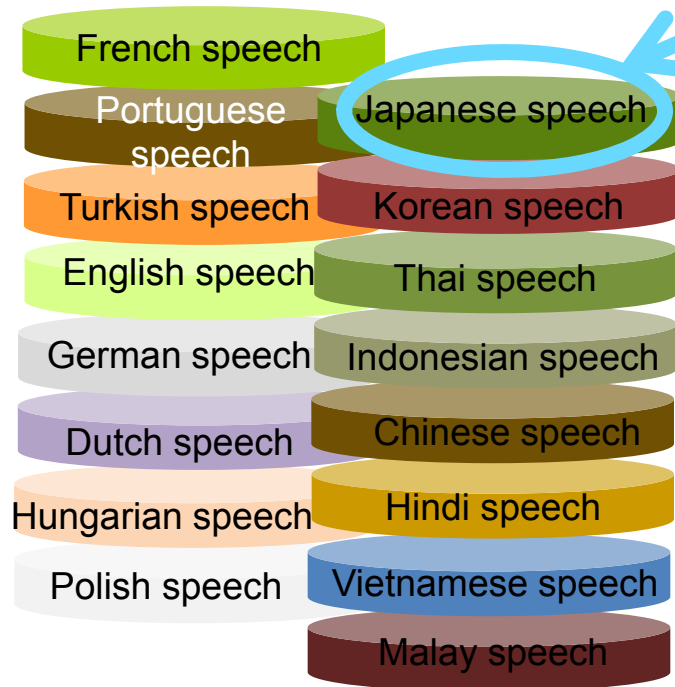
# History of the International Consortium (1)

## Network-based S2ST research by consortiums of C-STAR and A-STAR

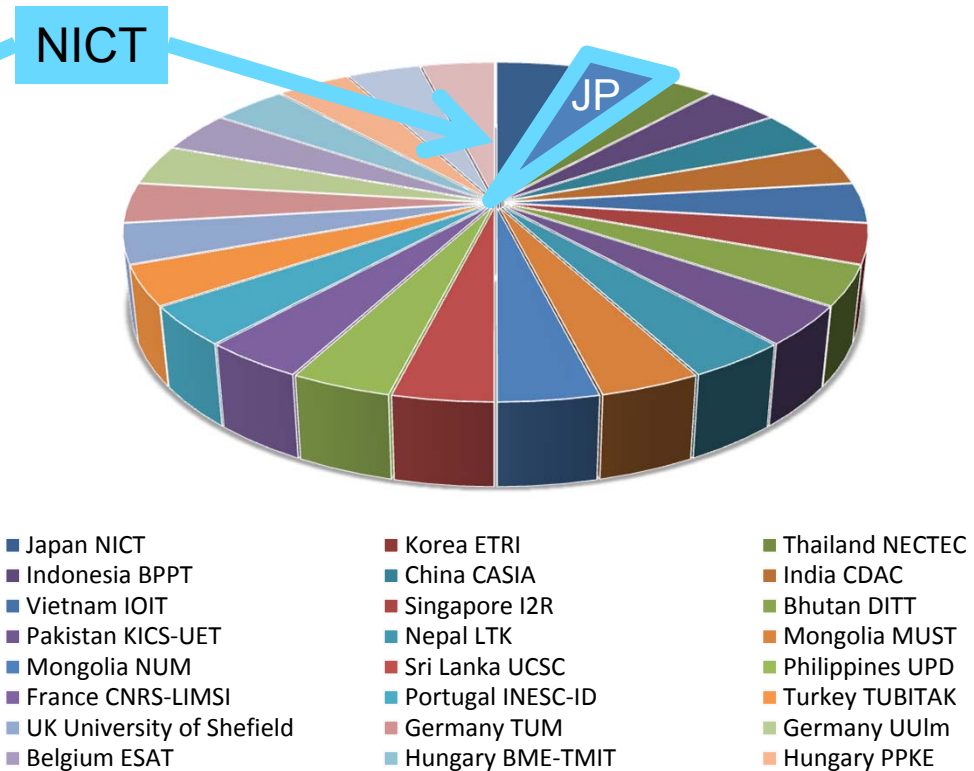


# Preparation for the U-STAR Research Activity

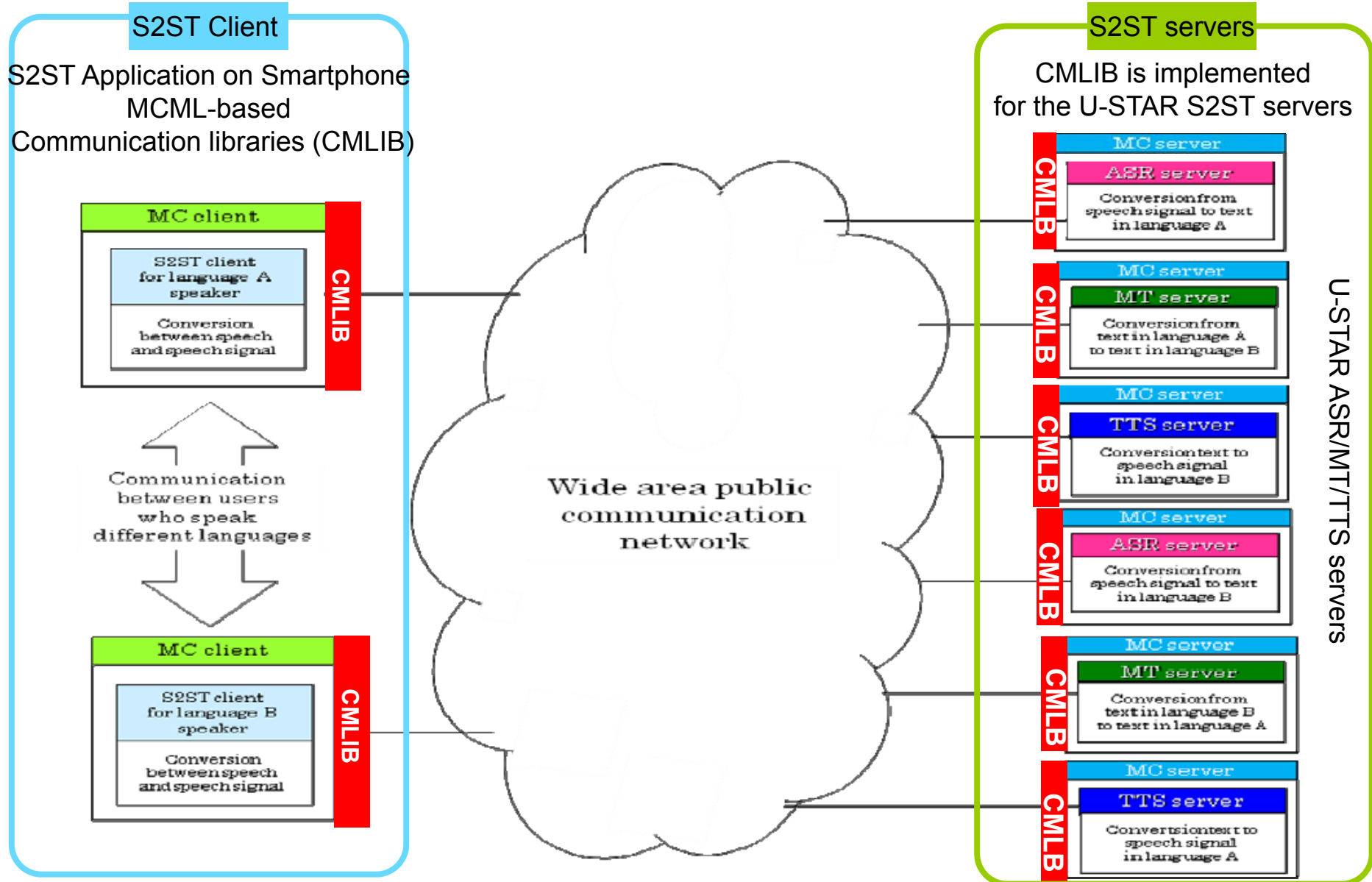
Speech data for training acoustic models



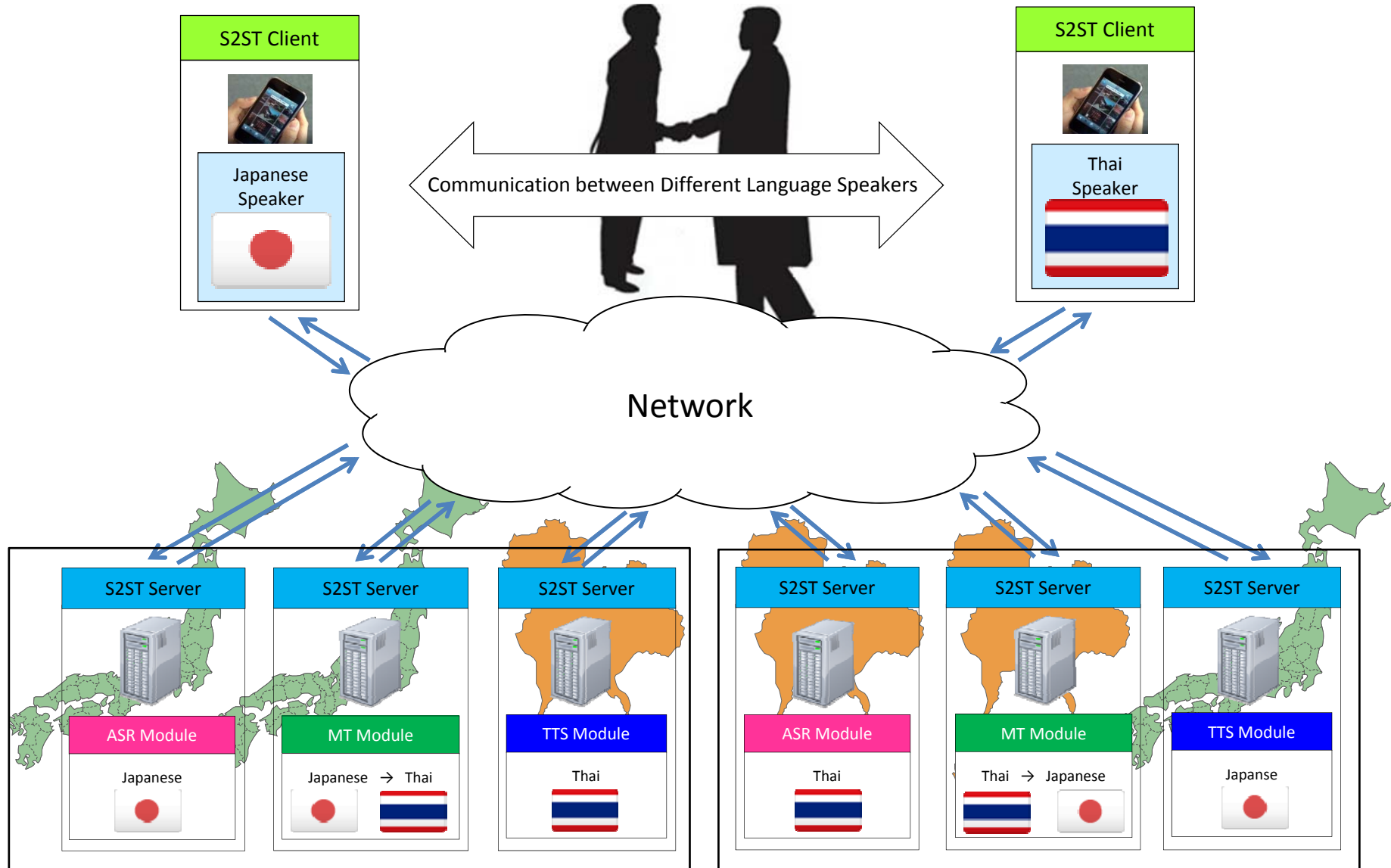
Parallel corpus and dictionary for training translation models from English to the target language



# Speech-to-Speech translation



# Network-based Speech-to-Speech Translation (S2ST)



# Initiation of Standardization from Asia

- A-STAR Speech-to-speech Translation Demo in 8 Countries (July 2009)



- APT ASTAP Meeting (August 2009)

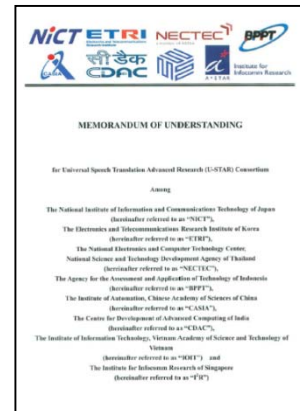


- U-STAR MOU (July 2010)

## From Asia to the World

### ASTAP 16 Plenary Session

Discussion to develop the standardization activity more internationally, not limited to the Asian-Pacific region.  
 -> Approved to raise the standardization draft from APT to ITU-T

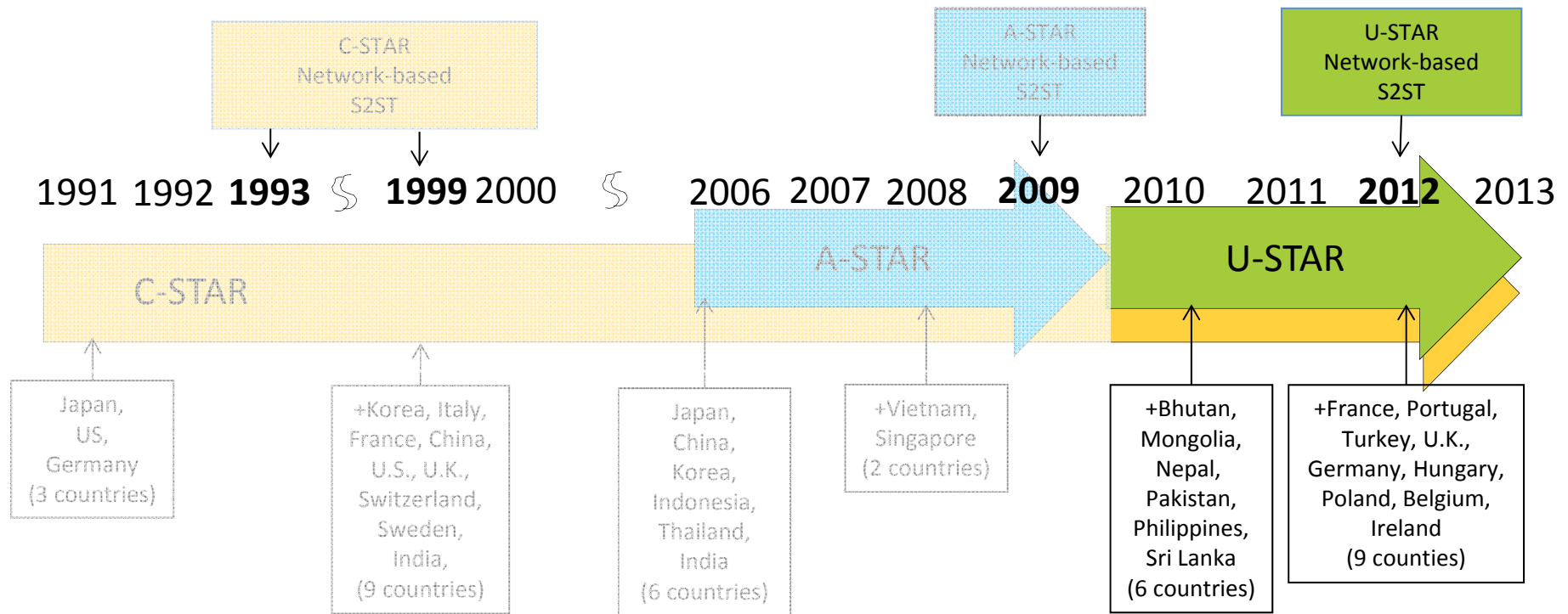






The Universal Speech Translation Advanced Research Consortium is an international research collaboration entity aiming to break language barriers around the world through network-based speech-to-speech translation (S2ST) technologies.

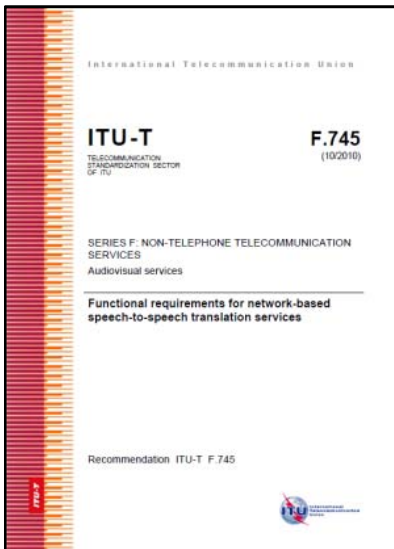

## Network-based S2ST research by U-STAR



# From ASTAP To ITU-T

Recommendations for network-based speech-to-speech translation and was published by HP2/SG16.



	<u>F.745</u> <a href="http://www.itu.int/rec/T-REC-F.745-201010-I">http://www.itu.int/rec/T-REC-F.745-201010-I</a>	<u>H.625</u> <a href="http://www.itu.int/rec/T-REC-H.625-201010-I">http://www.itu.int/rec/T-REC-H.625-201010-I</a>
Title	Functional Requirements for Network-based S2ST	Architectural Requirements for Network-based S2ST
Recommendation (2010)		


























# U-STAR Network-based Speech Translation

S2ST servers located all over the world  
are connected through network.



The orange-colored areas indicates the countries whose official languages are supported by U-STAR's apps.

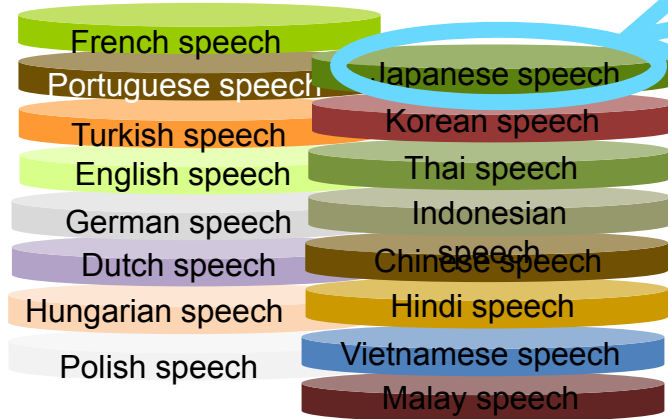
# 29 Research institutes from 24 countries/regions

 <p>Agency for the Assessment and Application of Technology (BPPT), Indonesia</p>	 <p>Institute of Automation, Chinese Academy of Sciences (CASIA), China</p>	 <p>Center for Development of Advanced Computing (CDAC), India</p>	 <p>Electronics and Telecommunications Research Institute (ETRI), Korea</p>	 <p>Institute for Infocomm Research (I2R), Singapore</p>
 <p>Institute of Information Technology (IOIT), Vietnam</p>	 <p>National Electronics and Computer Technology Center (NECTEC), Thailand</p>	 <p>National Institute of Information and Communications Technology (NICT), Japan</p>	 <p>Department of Information Technology and Telecom (DIT), Bhutan</p>	 <p>Al-Khwarizmi Institute of Computer Science, UET (KICS-UET), Pakistan</p>
 <p>Language Technology Kendra (LTK), Nepal</p>	 <p>Mongolian University of Science and Technology (MUST), Mongolia</p>	 <p>National University of Mongolia (NUM), Mongolia</p>	 <p>University of Colombo School of Computing (UCSC), Sri Lanka</p>	 <p>University of the Philippines Diliman (UPD), Philippines</p>
 <p>Budapest University of Technology and Economics Dept. of Telecommunications and Media Informatics (BME-TMIT), Hungary</p>	 <p>National Center of Scientific Research (CNRS-LIMSI), France</p>	 <p>Institute of Systems and Computer Engineering - Research and Development in Lisbon, (INESC-ID), Portugal</p>	 <p>Polish-Japanese Institute of Information Technology, (PJIT), Poland</p>	 <p>Pázmány Péter Catholic University, (PPKE), Hungary</p>
 <p>University of Sheffield, Department of Computer Science, Speech and Hearing Group, (SpandH), UK</p>	 <p>KU Leuven, Dept. Electrical Engineering, division PSI-Speech, (ESAT), Belgium</p>	 <p>Technische Universität München, (TUM), Germany</p>	 <p>Trinity College Dublin, (TCD), Ireland</p>	 <p>Center of Research for Advanced Technologies of Informatics and Information Security, (TUBITAK), Turkey</p>
 <p>Ulm University - Institute of Communications Engineering, (UUm) Germany</p>	 <p>The Centre for Development of Advanced Computing, Kolkata, (CDAC, KOLKATA), India</p>	 <p>University of Edinburgh, (UEDIN), UK</p>	 <p>Research Center for Information Technology Innovation (CITI), Academia Sinica, Taiwan</p>	

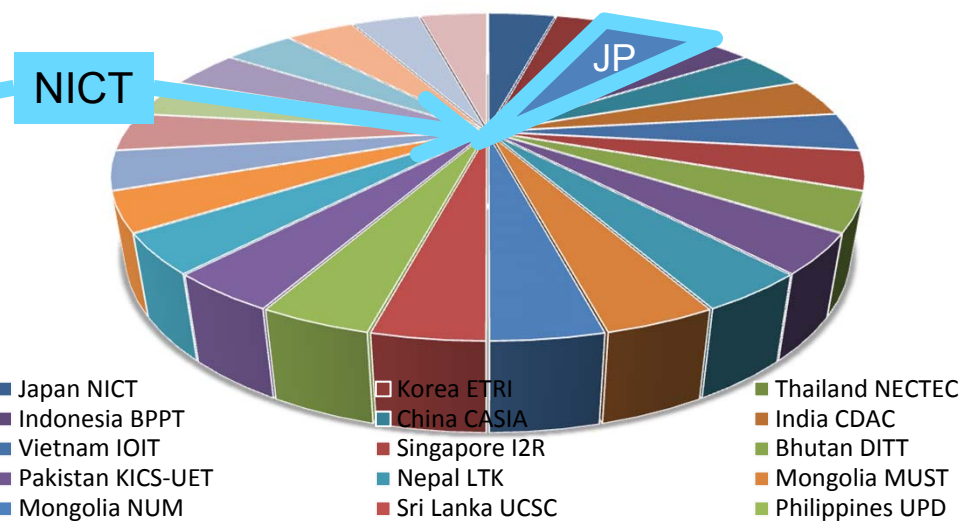


# Preparation for the U-STAR Research Activity

Speech data for training acoustic models



Parallel corpus and dictionary for training translation models from English to the target language



## U-STAR members

Coverage of the official languages

27 MT servers, 17 ASR servers, 14 TTS servers



## Client App

Chat system using speech translation on a smartphone

Example of Hindi



# ASR using the Collected Speech

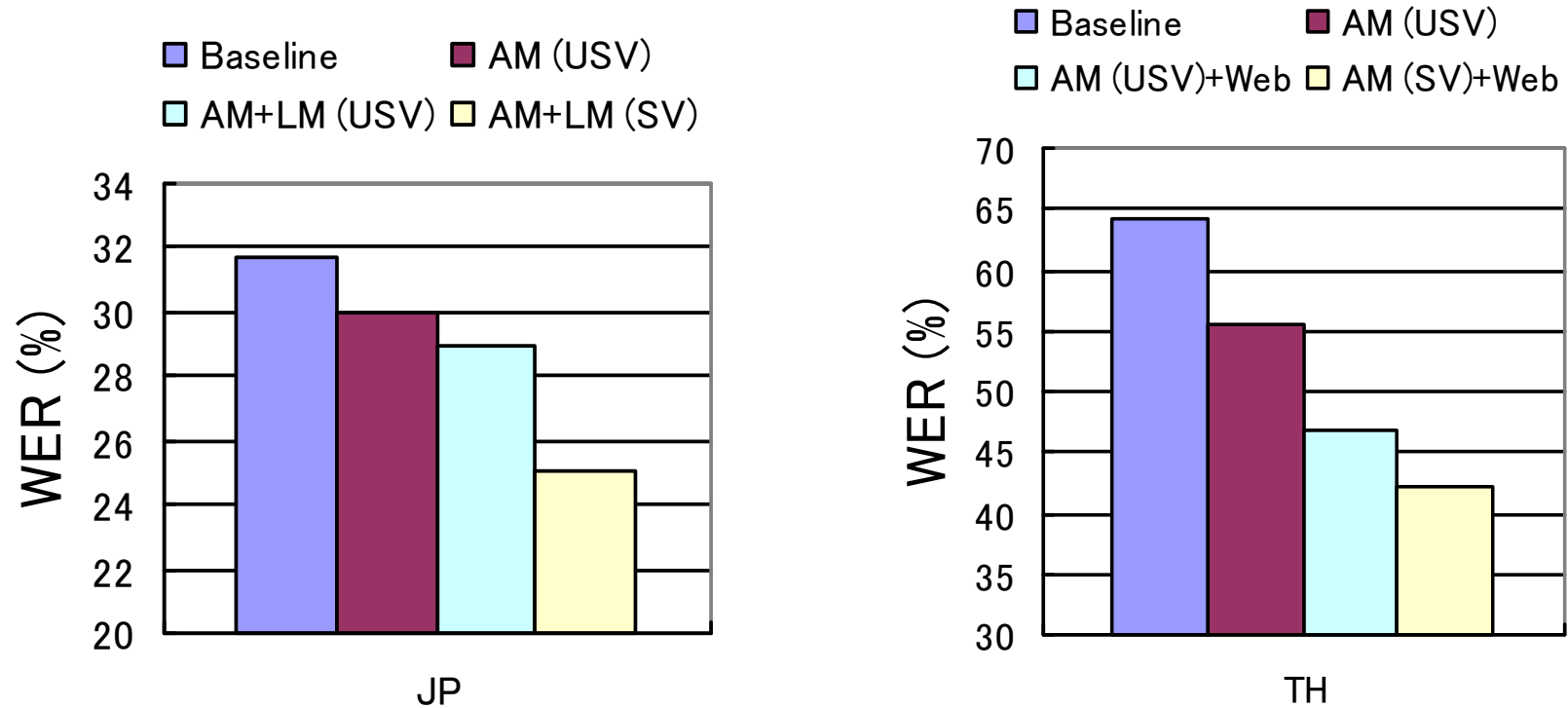


Fig. Evaluation of Model Adaptation: Japanese (left) and Thai (right)

**Accuracy improvements  
using the collected speech**

# VoiceTra4U on Android

Data collection through iPhone and android phone application for speech translation

## iOS

- [Overview](#)
- [How to Use](#)
- [Details](#)
- [Video](#)
- [FAQ](#)
- [Languages](#)

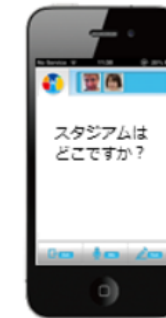
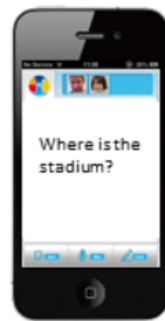
## Android

- [Overview](#)
- [How to Use](#)
- [FAQ](#)
- [Languages](#)



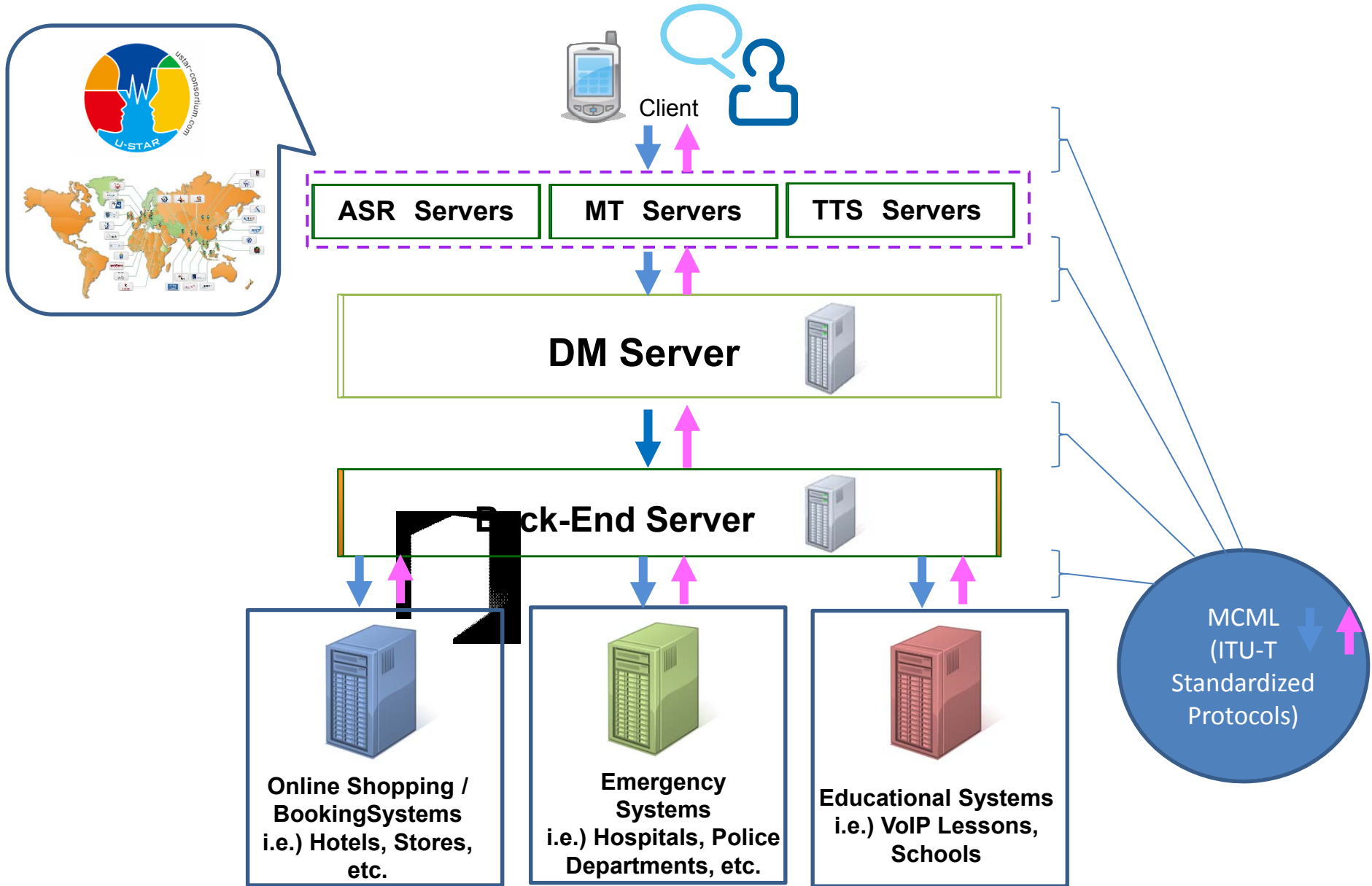
Speech Translation App

# 'VoiceTra4U'

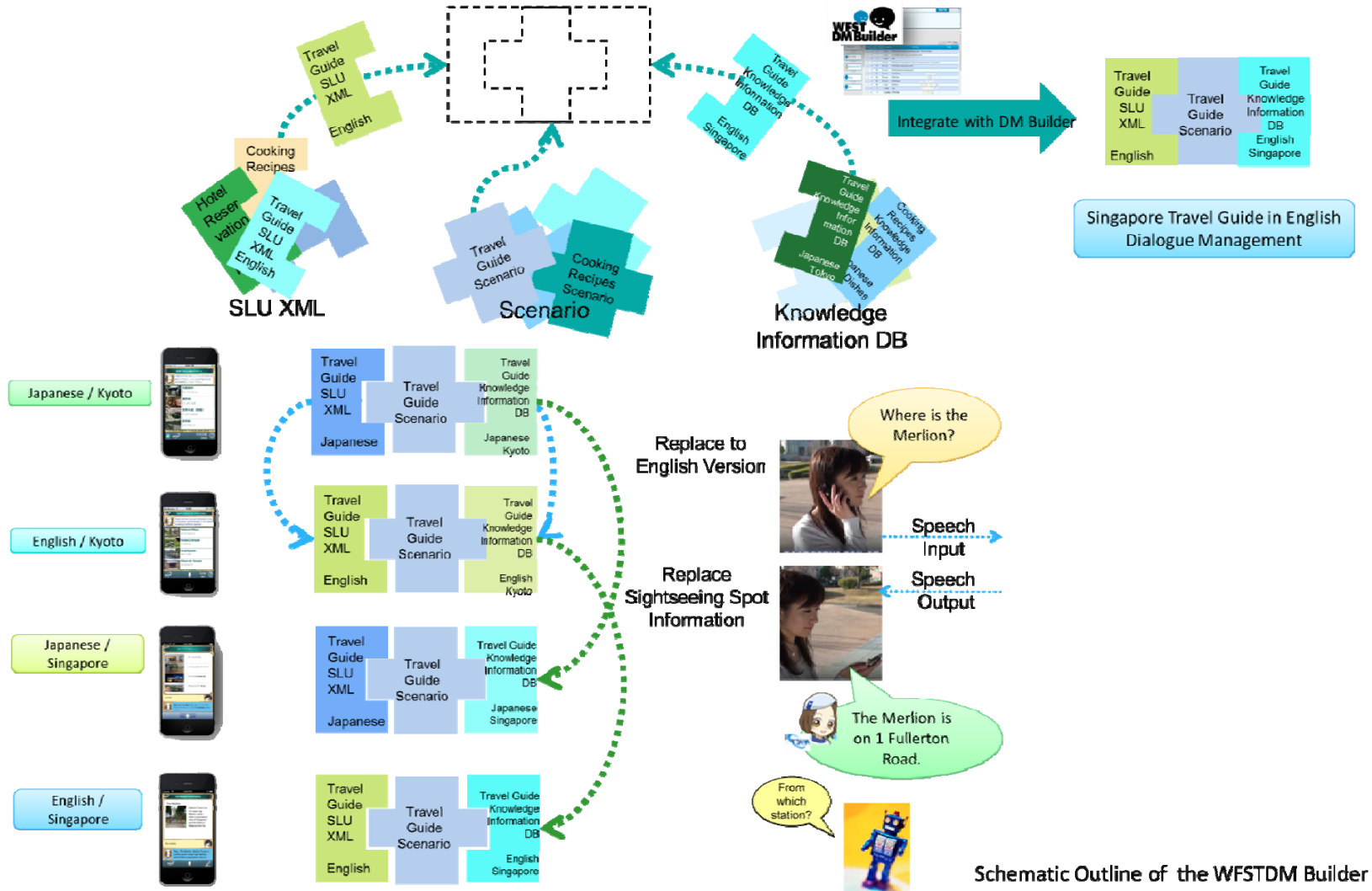


# Intraoperable Speech Communication Platform for

1) human-to-human and 2) human-to-machine



# Language and Domain Portability for Speech Communication Tool using ITU-T standardized S2ST protocol

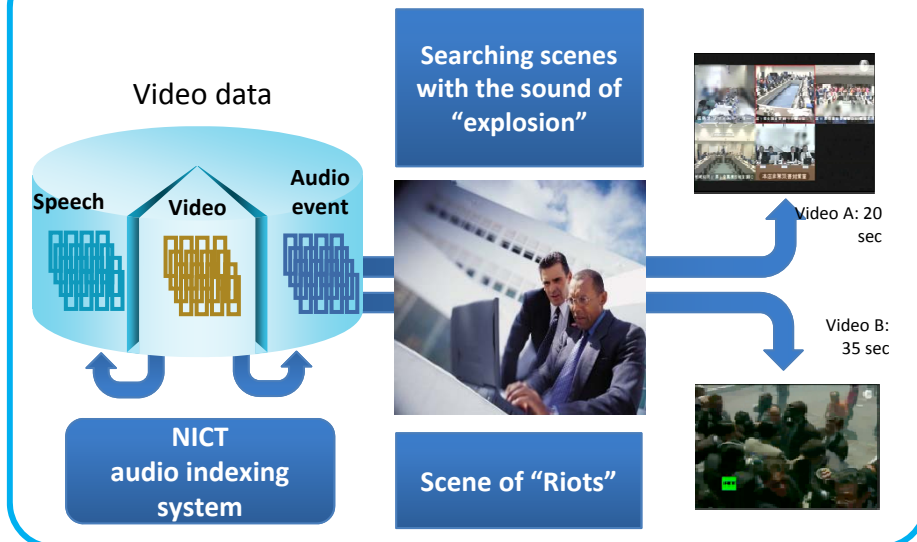




# Multilingual Communication Project

2020  
Olympics  
in Tokyo

## Real-Time Indexing



## Speech-to-Speech Translation

- 17 languages for ASR, 27 for MT, and 14 for TTS
- Chat for up to 5 people



Speech Translation App

**'VoiceTra4U'**

Available on the App Store



## Spoken Dialog System

