

35th UN/CEFACT Forum Webinar

Supply Chain Management and Procurement Domain meeting

eNegotiation project

October 13th, 2020

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Orchestrating a brighter world

NEC brings together and integrates technology and expertise to create the ICT-enabled society of tomorrow.

We collaborate closely with partners and customers around the world, orchestrating each project to ensure all its parts are fine-tuned to local needs.

Every day, our innovative solutions for society contribute to greater safety, security, efficiency and equality, and enable people to live brighter lives.

Agenda

- Introduction (25m)
- Short Q&A (10m)
- Action requirement(10m)
- Free Discussion (10m)
- Wrap-up (5m)
 - Action plan
 - Call schedule



Type your question on slido

Like other participant's question

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Agenda

Outline

Background AI technologies

Evolutional Steps towards AI Negotiation

Baseline: Alternating Offers Protocol

Variant: Mutually Dependent Negotiations

Negotiation Rule Definition

Three Use Cases

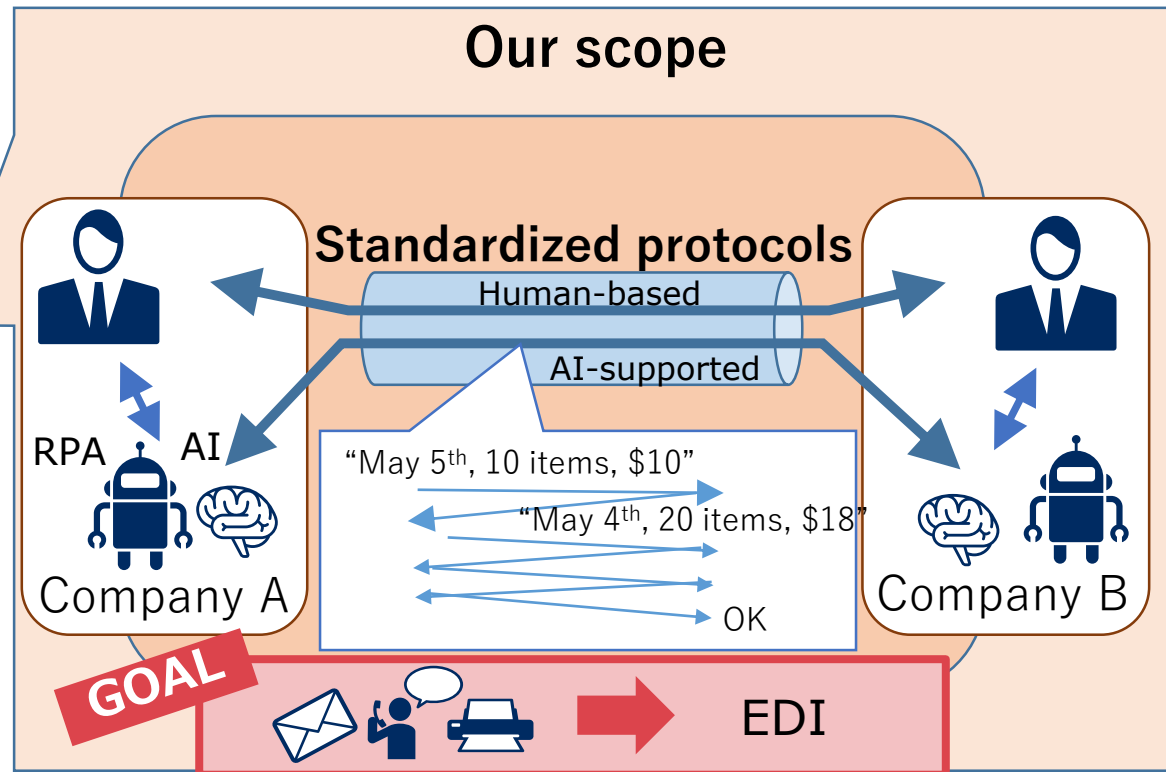
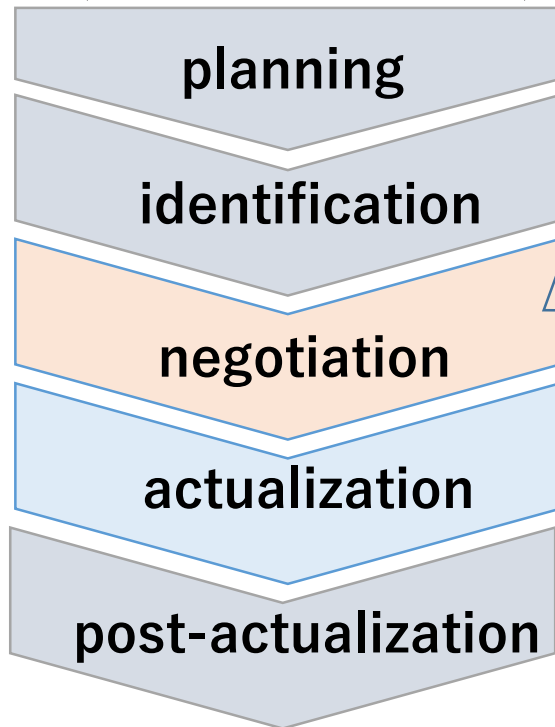
Deliverables

FYI: AI Negotiator

Outline

A business negotiation requires several message exchanges until an agreement and is done via email, telephone or fax. EDI can replace the communication, and RPA/AI can replace a human negotiator

Five fundamental activities of a business transaction (ISO/IEC 15944-1)



Background AI technology: Automated Negotiation

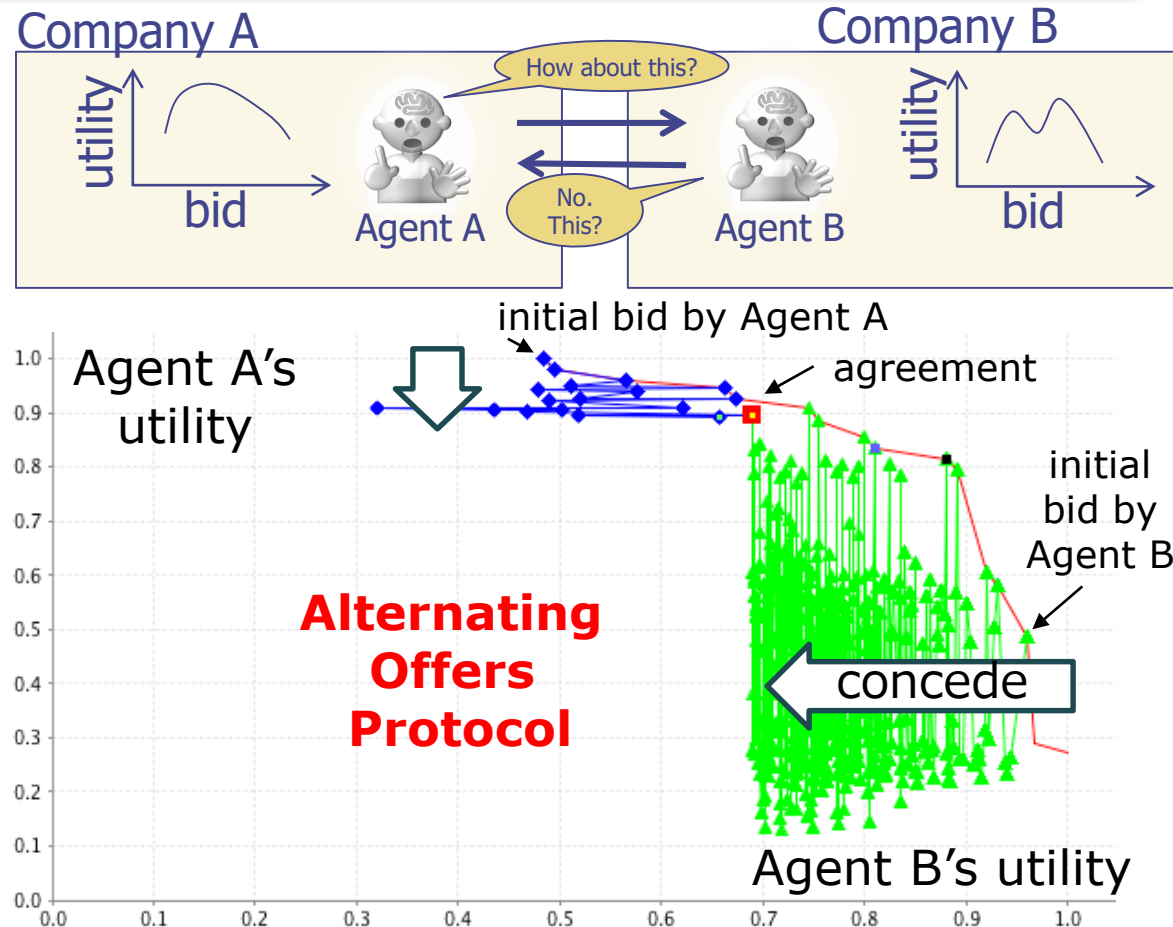
AI-based negotiation has been studied for decades. Strategies for bidding and acceptance are implemented as AI algorithms.

Automated Negotiation

- Game theoretic problem
- Alternating offers protocol
- Private utility function

ANAC

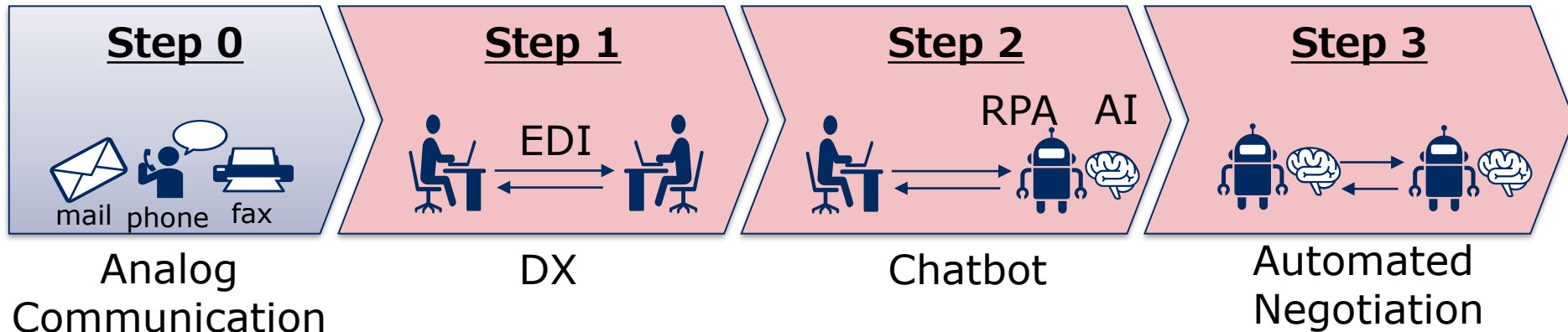
- AI Competition from 2010
<http://web.tuat.ac.jp/~katfujii/ANAC2020/>
- In conjunction with IJCAI/AAMAS
- We organize SCM league
http://web.tuat.ac.jp/~katfujii/ANAC2020/cfp/scml_cfp.pdf
- Open platform: GENUIS [1]
<http://ii.tudelft.nl/genius/>



[1] Raz Lin, et al., "Genius: An Integrated Environment for Supporting the Design of Generic Automated Negotiators," Computational Intelligence, 2014

Evolution towards Automated Negotiation

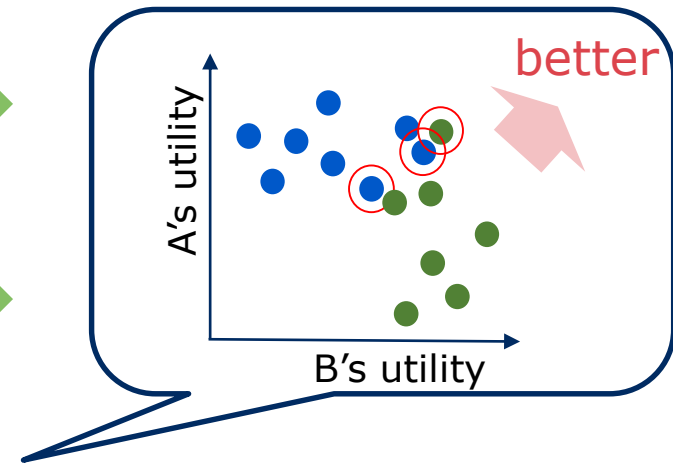
EDI replacement is just 1st step. As RPA/AI is used, negotiation becomes easier, and its agreement becomes faster and better.



Easier Negotiation

Faster Agreement

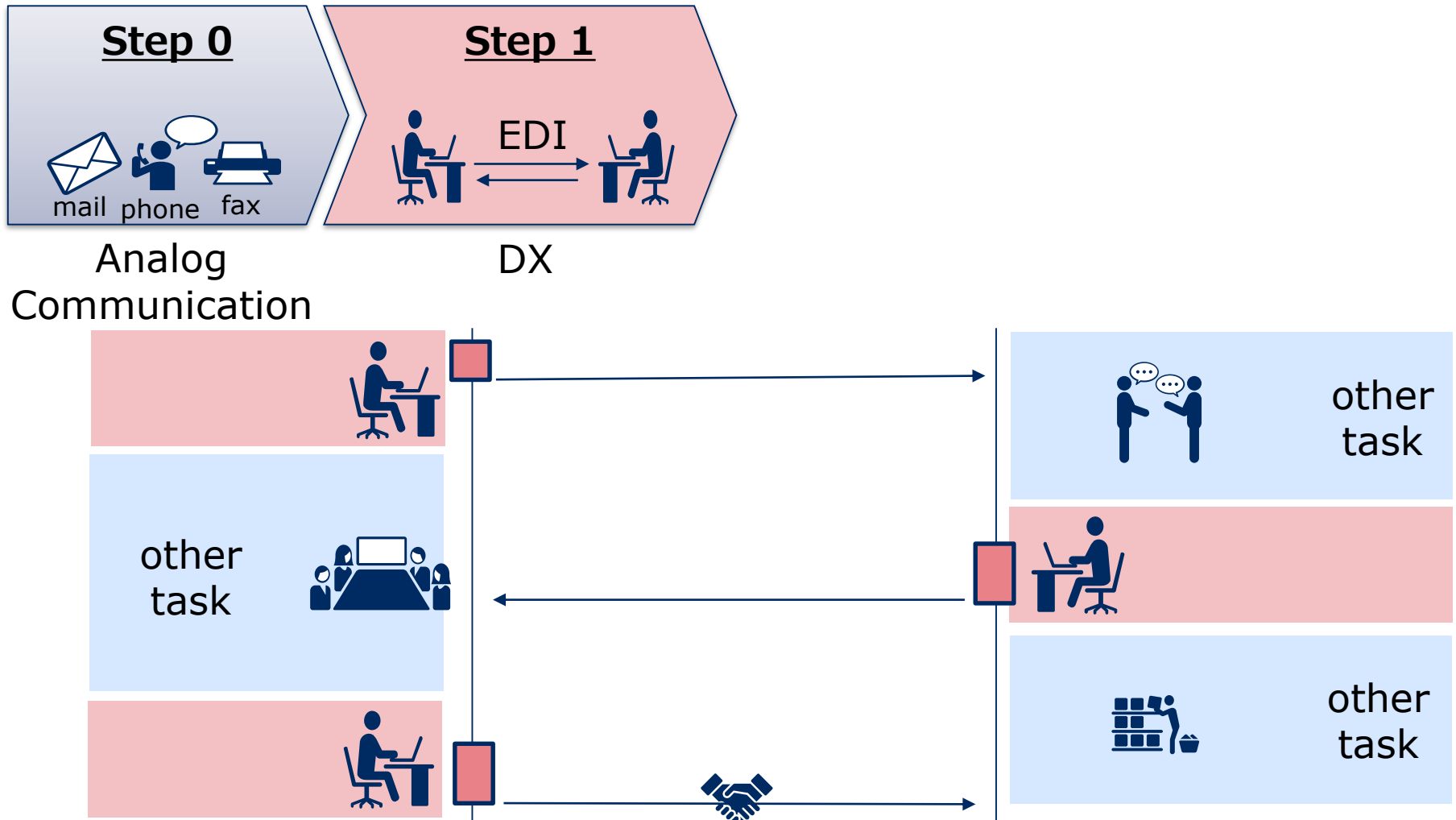
Better Agreement



As # of proposals increases, both utility tend to become better

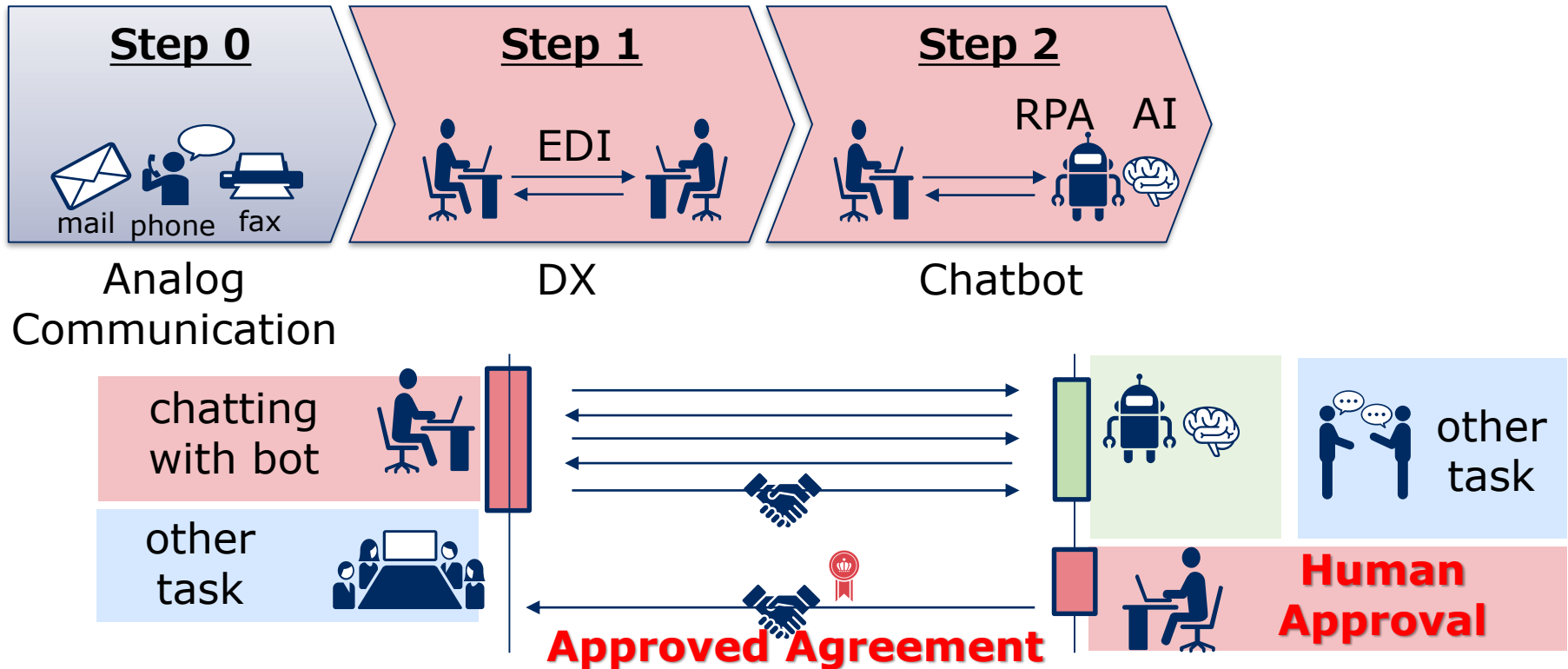
Digital Transformation (DX) of Negotiation

EDI can digitalize a negotiation process, but a human negotiation takes more time. Besides, the number of exchanges is limited.



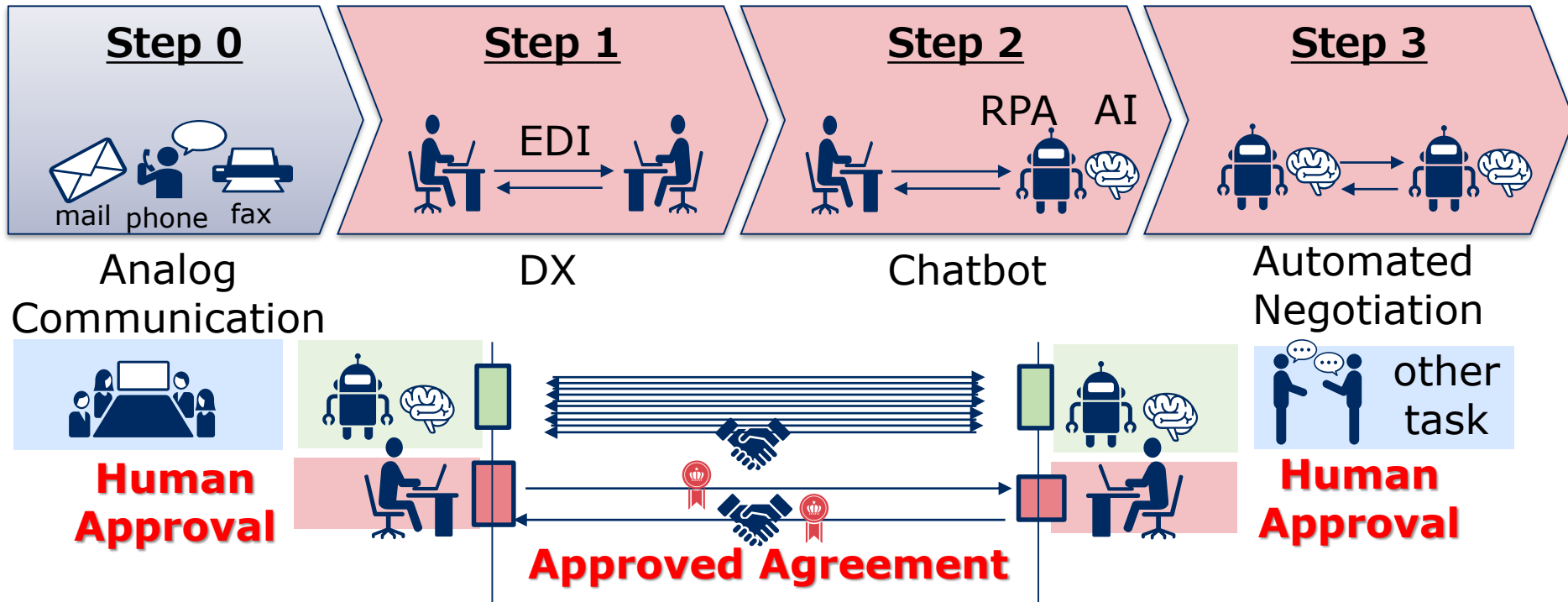
Chatbot for Negotiation / One-side Automation

If one side uses RPA/AI, the other side can enjoy the benefit of “chatbot”. The human need not wait for the counterpart’s action.



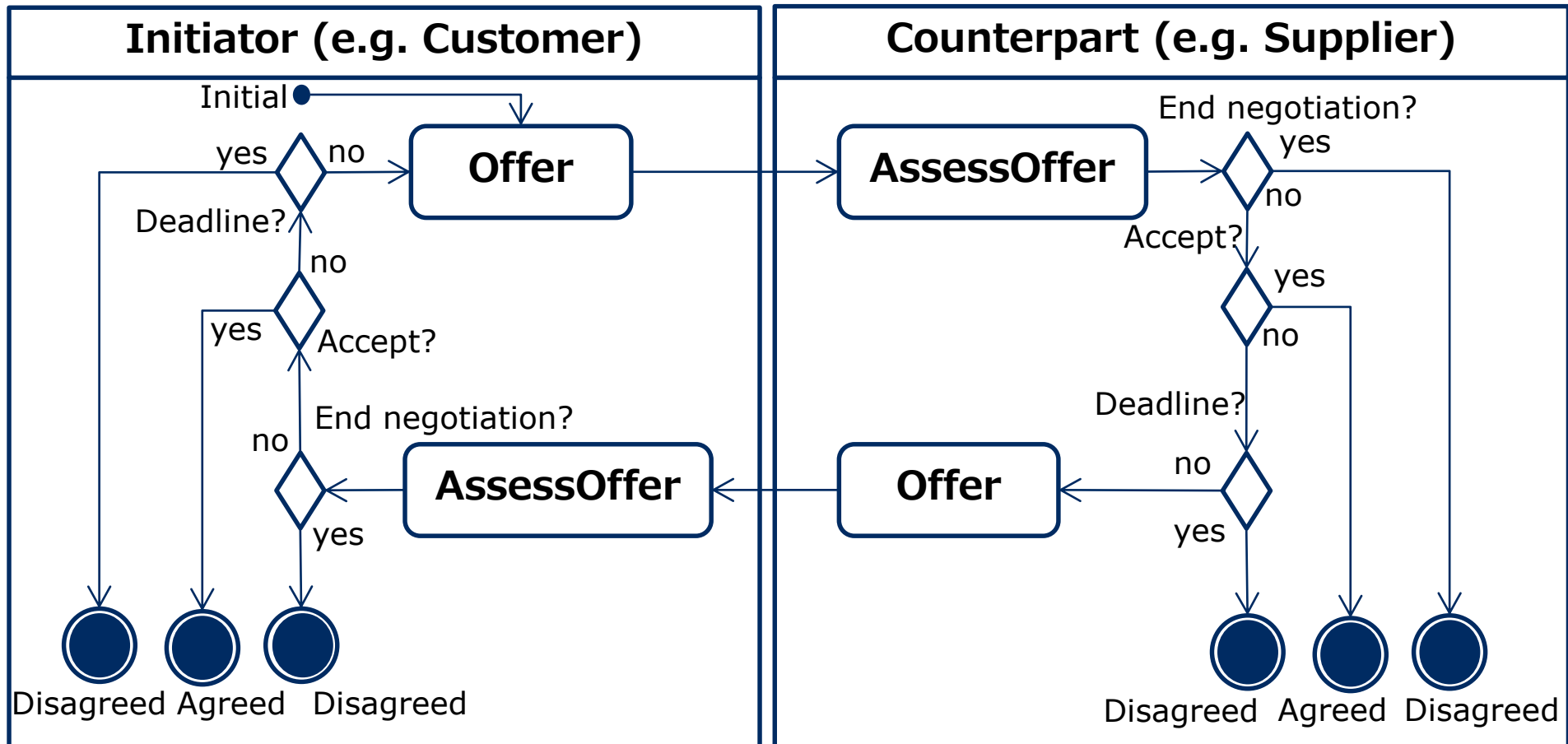
Automated Negotiation

If both sides use RPA/AI, a negotiation may automatically happen and closes. What human do is to approve their results.




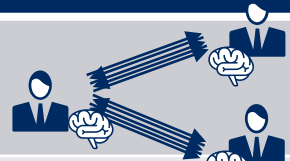
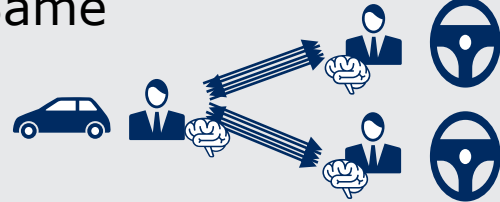
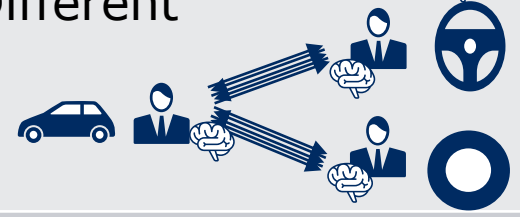
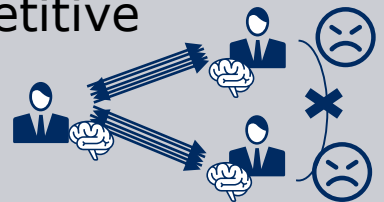
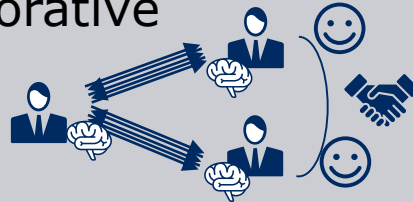
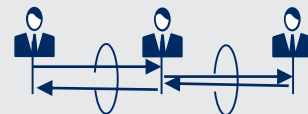
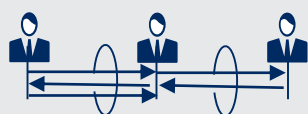
Baseline: Alternating Offers Protocol

Standardization for bilateral negotiation may start with the simplest protocol called Alternating Offers Protocol (AOP).



Variant: Mutually Dependent Negotiations

To represent a complex negotiation in real business, protocols for mutually dependent negotiations are required to be modeled.

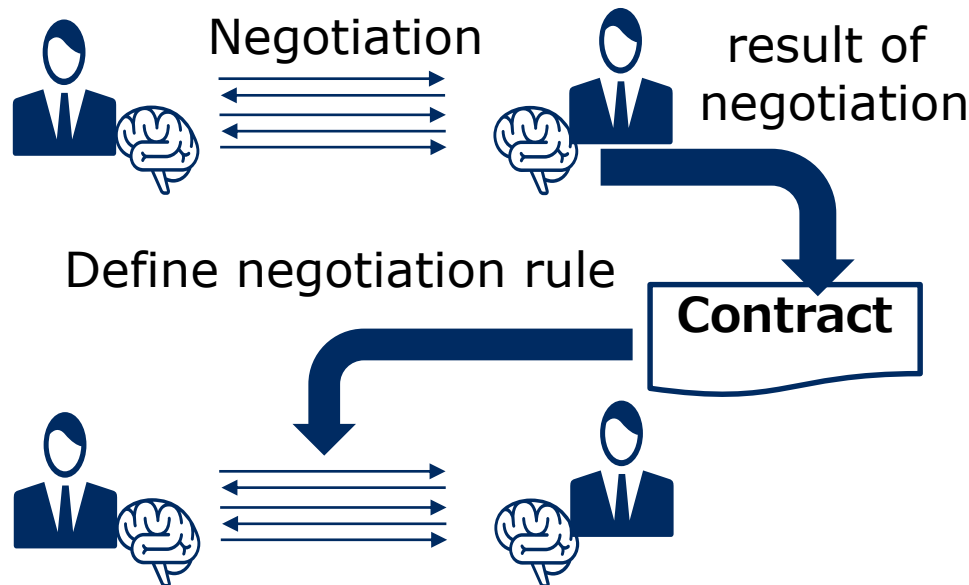
		Option 1	Option 2
Tier		Inter-tier (nested) 	Intra-tier 
Intra-tier	Product/Service Category	Same 	Different 
	Competitiveness	Competitive 	Collaborative 
Timing		Sync. 	Async. 

How to Define Negotiation Rule

A negotiation rule (e.g. deadline) must be defined in advance. A contract derived from previous negotiation may define the rule.

Options

1. Business custom
2. Publication from initiator
3. Previous contract



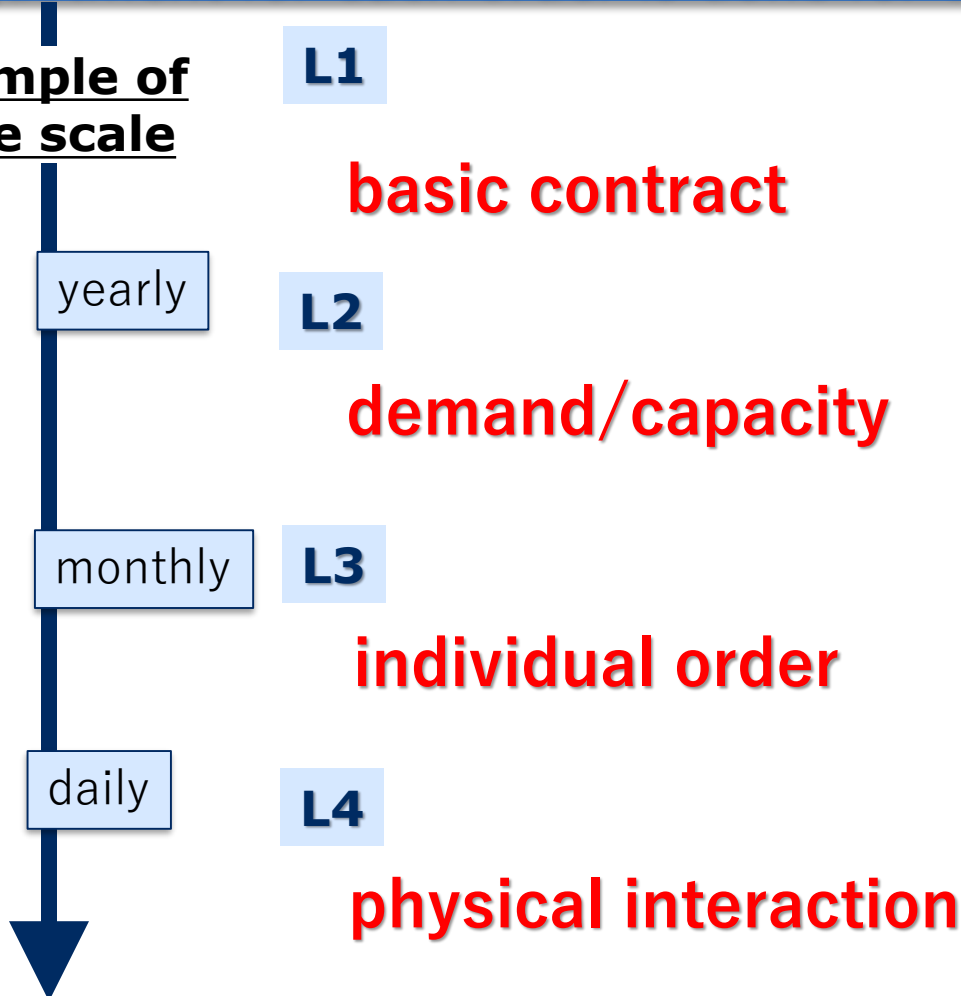
The result of negotiation is stored in a ledger as a contract

The contract may define the rule of succeeding negotiations

Negotiation for Different Contracting Level



In B2B, companies usually negotiate to have a yearly contract. Demand and capacity is adjusted a couple of months ahead. An adjustment for each order is done for deciding due date.



Example of time scale





Example of what to decide

What 
Who 
How much 

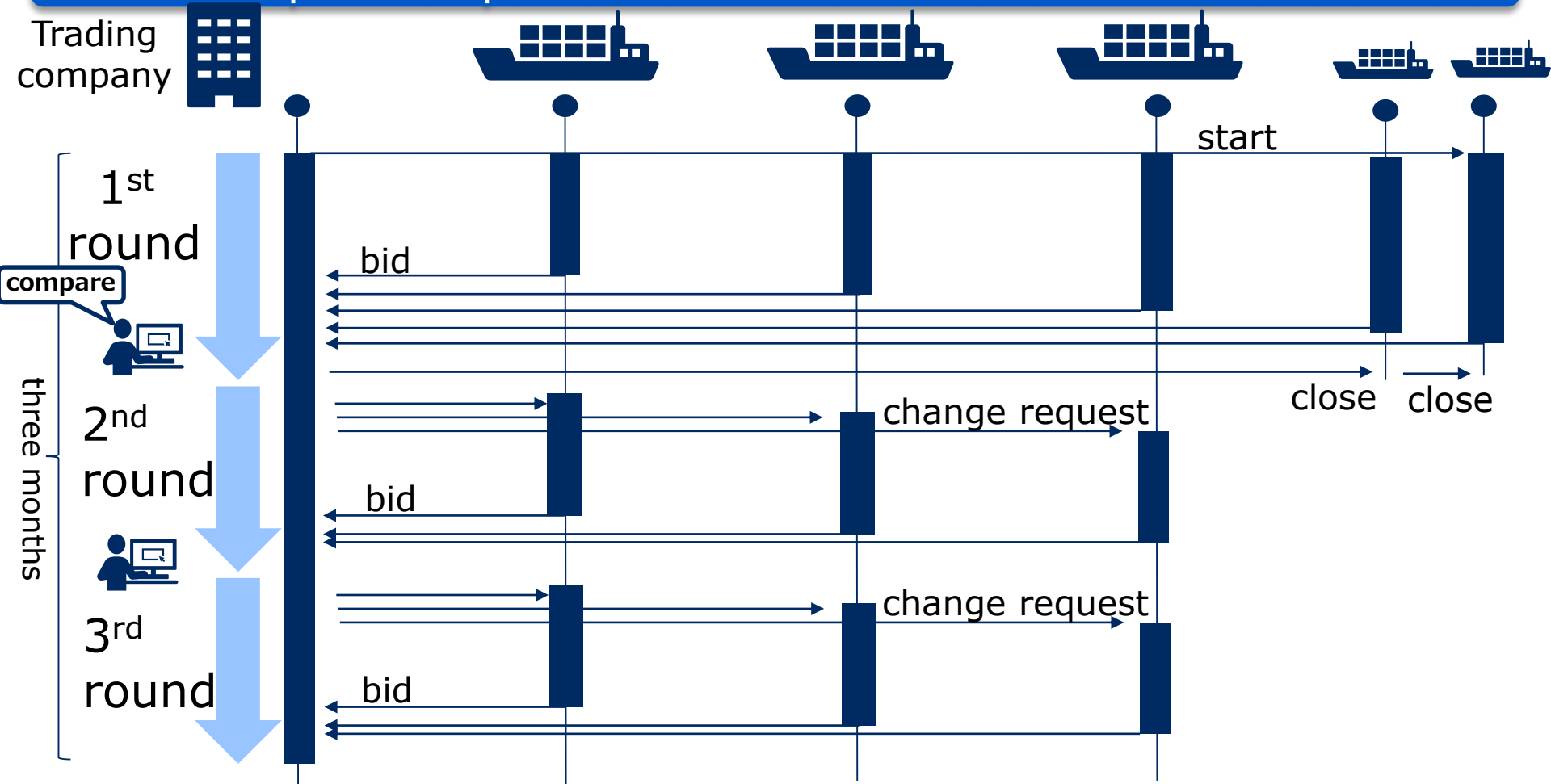
How many (rough)  x 200
Where (rough) 

How many (exact)  x 1
When (rough) 

When(exact) 
Where(exact) 

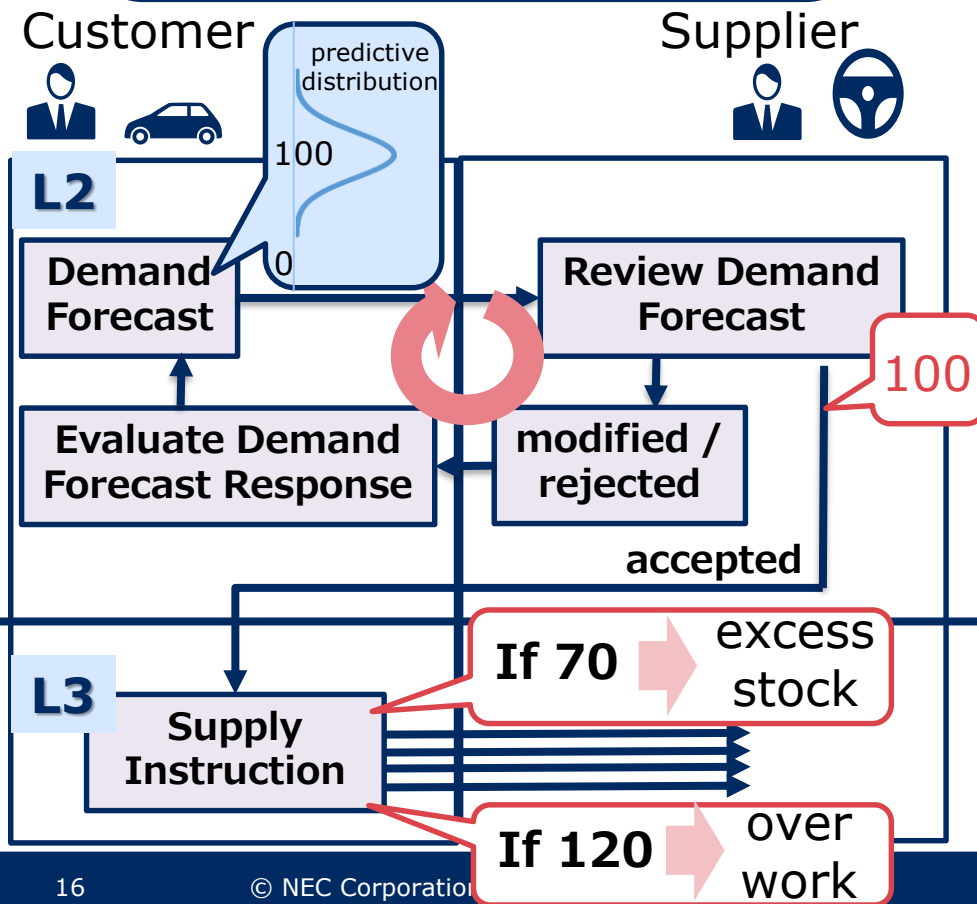
Use case: Marine Transport

A trading company chooses marine transport companies once a year. The company can compare bids by using a bidding system, while transport companies cannot do it due to the lack of standard.

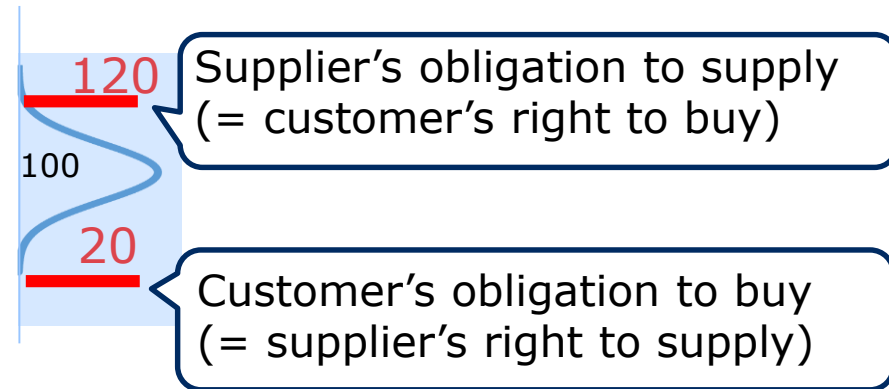


Cross Industry Scheduling defines a negotiation-like message exchange. But, the lack of obligation induces supplier's excess stock or over work. Obligations should be defined at first.

Vague obligation in Cross Industry Scheduling



Well-defined obligation for negotiation



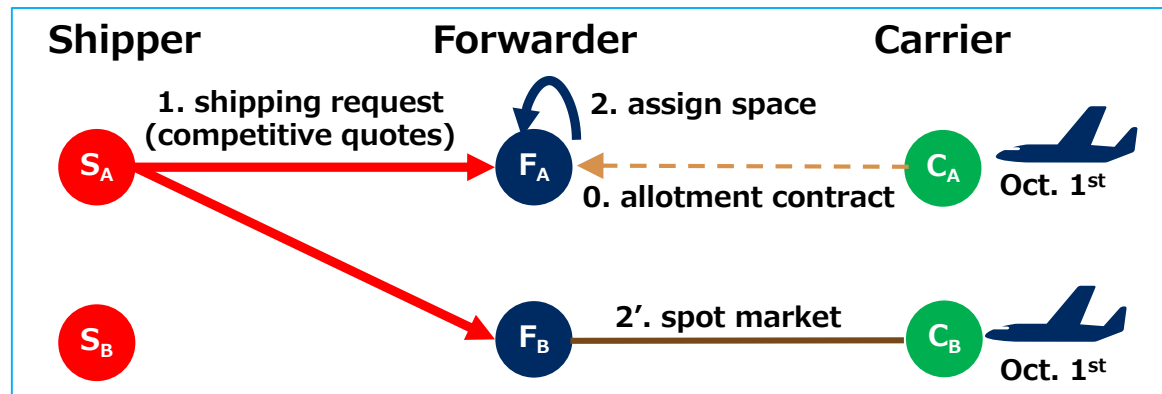
These topics are controversial.
So, we need to have more
conversation with industry

Use case : Freight Space Adjustment

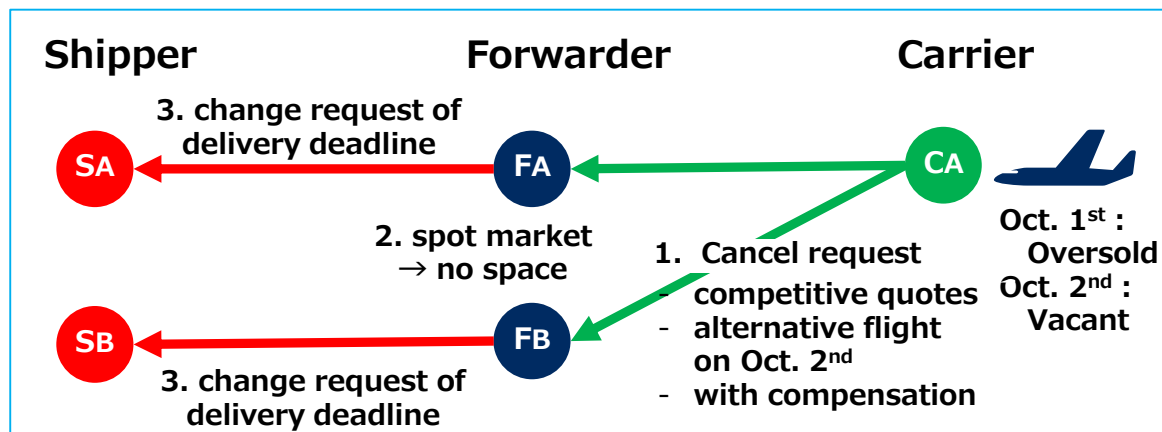
L3 individual order

A sudden change in demand or supply (e.g. COVID19) induces a negotiation for deciding price, delivery deadline, compensation, and so on. Complicated negotiation (e.g. nested) actually happens.

Order request from buy side



Cancel request from sell side



Work Tasks and Deliverables

BRS on eNegotiation and a corresponding Implementation Guideline are published as deliverables. Three usecases are included.

domain specific use case

Marine Transport



Air Cargo



Manufacturing



Implementation Guideline

Negotiation Framework



eNegotiation BRS

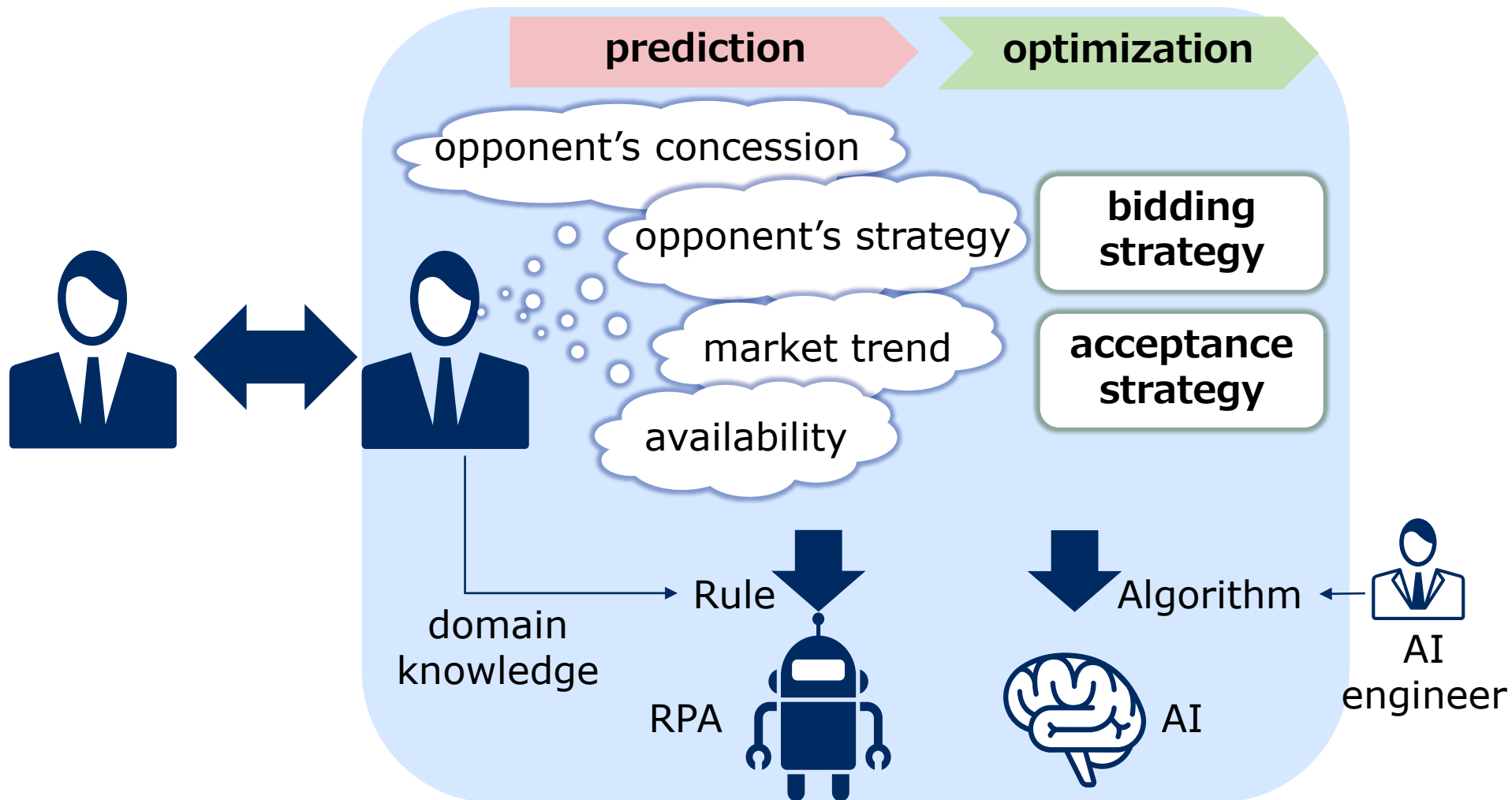
message structure

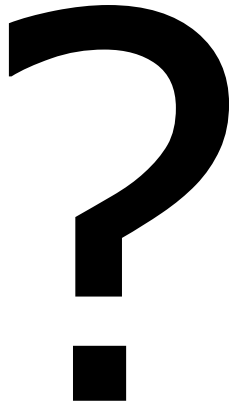
CCBDA

**CCL update
(neg. terminology)**

FYI: AI Negotiator

As a human negotiator does, AI negotiator should predict the circumstance of negotiation and optimize its own action





Type your question on [slido](#)

Like other participant's question

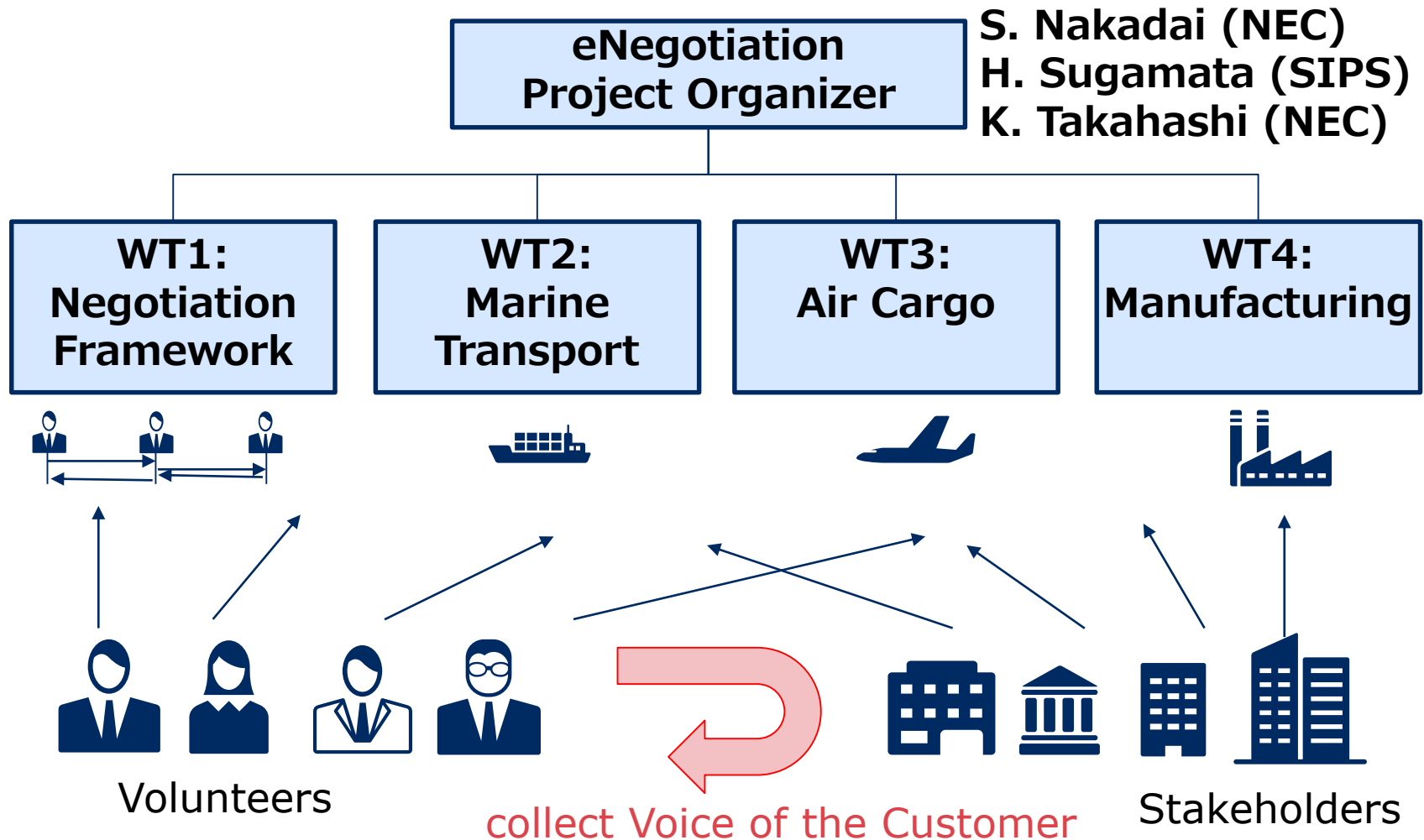
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Work Tasks and Team Organization

To accomplish each work task, we plan to organize four teams. We welcome volunteers who can contribute our project.



Scope of Standards

Main scope is a framework, but feedback from usecases is important

Out of Scope

Internal system

- Human interaction & RPA/AI

In Scope

A) Standard Negotiation Procedure

- AOP (Alternating Offers Protocol)
- Applicable from human negotiation to AI negotiation

B) Complex Negotiations

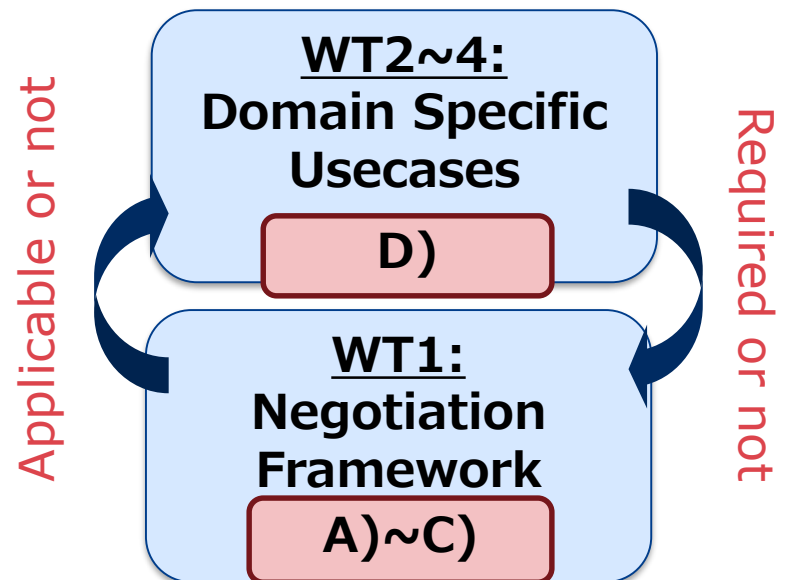
- Competitive negotiation
- Nested negotiation

C) Rule Definition

- Contract

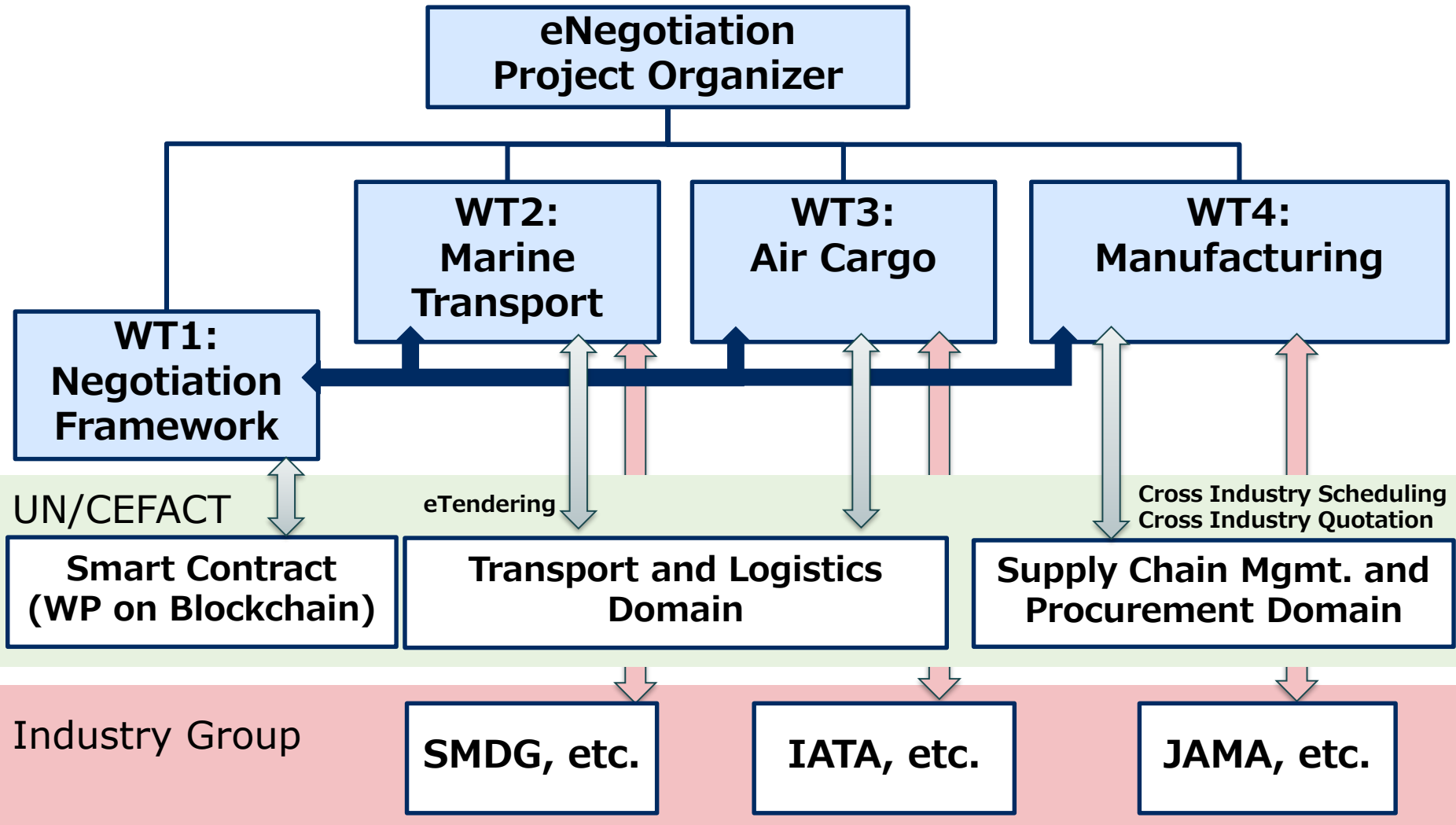
D) Domain Specific Terminology

- e.g. Obligation used in demand/capacity



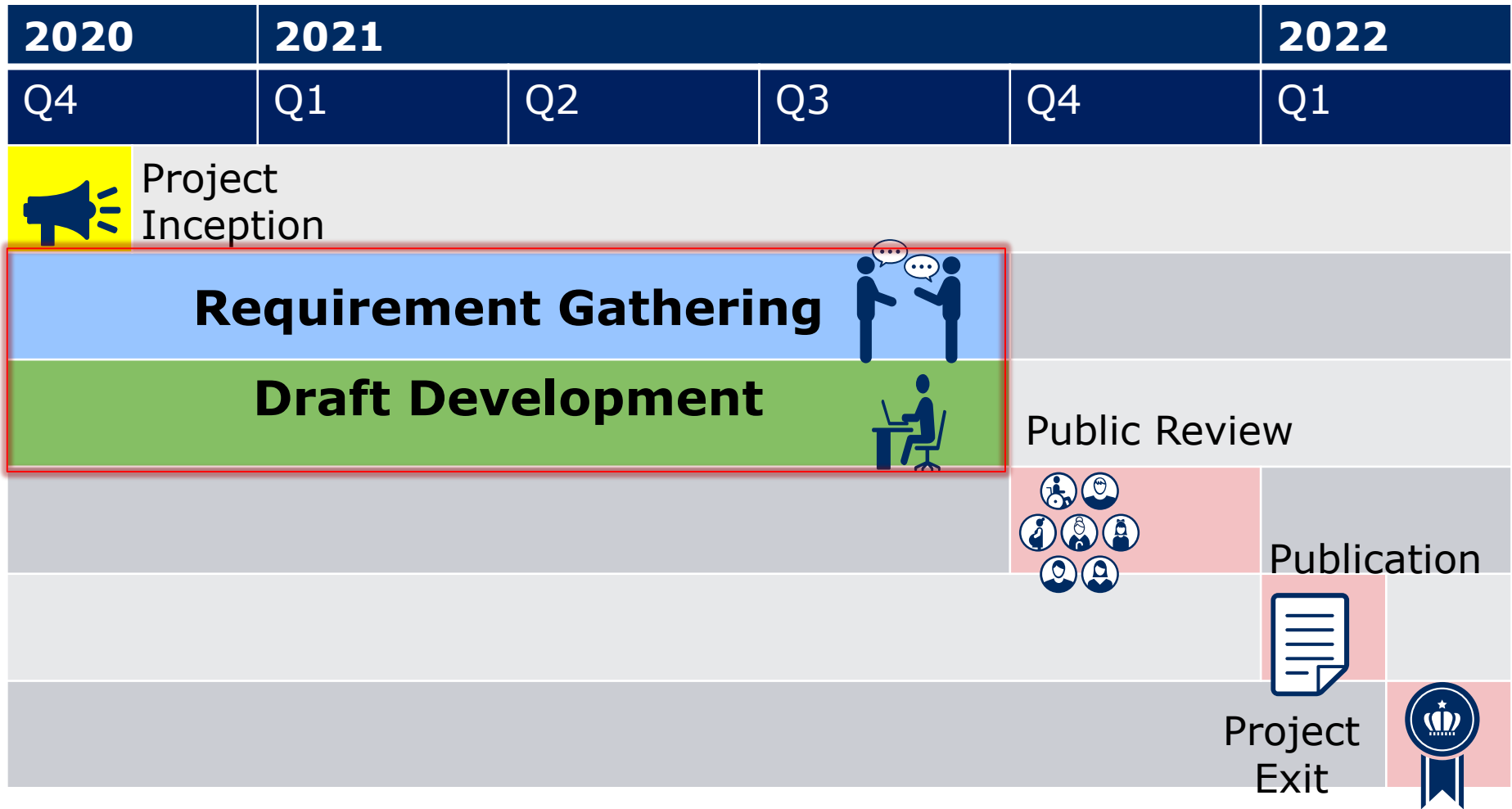
Collaboration inside and outside UN/CEFACT

We foster collaboration with other projects and organizations



Milestones



















Our current plan is to finalize the project by Q1 Forum 2022. Activities in upcoming one year may be the key to success.



Meeting Schedules in Upcoming One Year

We plan to have a quarterly meeting in each work task.
WT2 (Marine Transport) may be able to be finalized in Q1 2021.

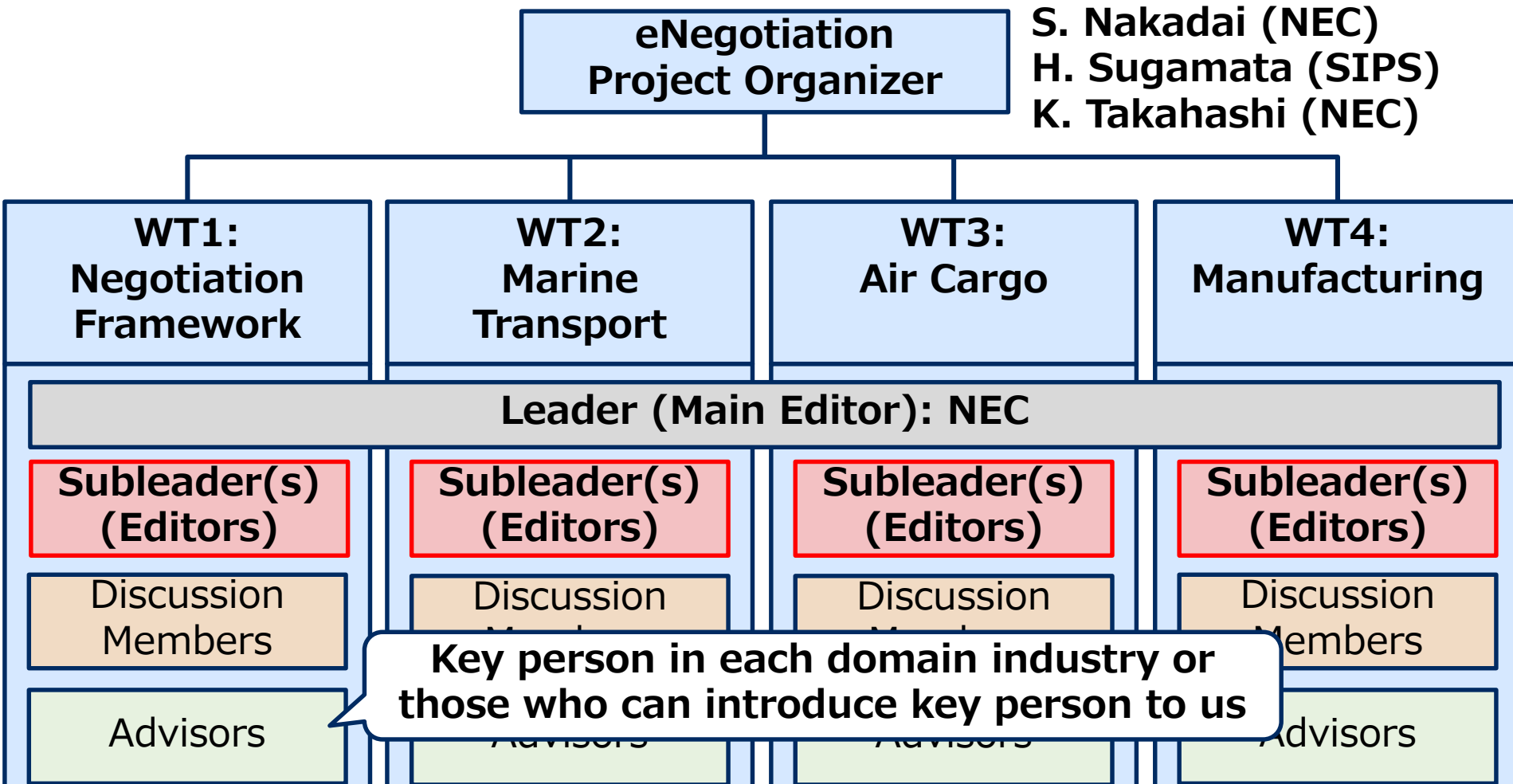
 : Introduction  : Demand gathering  : Drafting

	2020		2021				
		Q4	Q1		Q2	Q3	
Framework	35 th Forum		 	36 th Forum			37 th Forum
Marine Transport			 				
Air Cargo					 		
Manufacturing					 		

end of team
organization

Call for Volunteers

Although we make an effort to accomplish the standardization, we welcome volunteers to make it interoperable and unbiased.



Where to Start: Existing System and Demo Implementation

An existing bidding system and our demo system developed under SIP may be the good start points. We start with their introduction.

Cross-ministerial Strategic Innovation
Promotion Program (SIP)

Bidding system
of a trading
company in Japan

**WT2: Marine
Transport**



**WT3:
Air Cargo**



**WT4:
Manufacturing**



WT1: Negotiation Framework



SIP

Application and
demo system

OSS
NegMAS [2]

[2] <http://www.yasserm.com/negmas/>

Acknowledgement

This work was supported by Council for Science, Technology and Innovation, “Cross-ministerial Strategic Innovation Promotion Program (SIP), Big-data and AI-enabled Cyberspace Technologies”. (funding agency: NEDO)

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