

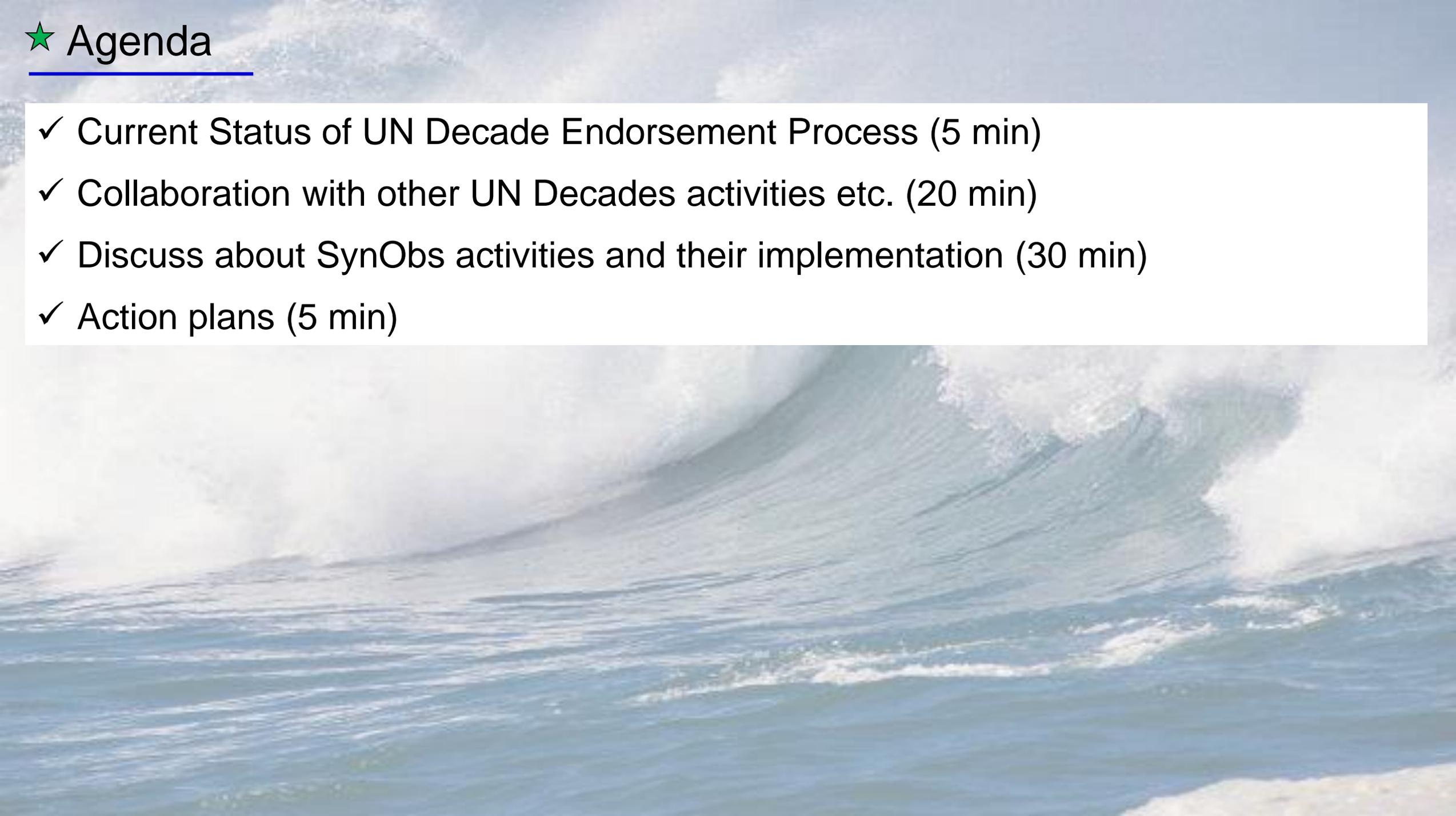
# ***2nd SynObs ST Meeting***

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# ★ Agenda

- ✓ Current Status of UN Decade Endorsement Process (5 min)
- ✓ Collaboration with other UN Decades activities etc. (20 min)
- ✓ Discuss about SynObs activities and their implementation (30 min)
- ✓ Action plans (5 min)



## ★ Current Status of UN Decade Endorsement Process

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- **26 April:** Submit the Due Diligence Form for JMA/MRI

**15 April – 13 May 2022:** As necessary, supplementary information will be requested from submission proponents. (I haven't got any request from IOC so far.)

**Mid to late May 2022:** Decisions on endorsement will be completed and communicated to all proponents from Call for Decade Actions No. 02/2021

**08 June 2022:** Anticipated announcement of the newly endorsed Decade Actions on World Oceans Day

## ★ Collaboration with DITTO

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- ◆ **DITTO Summit:** 4-5 May 2022 at London by G7 FSOI.  
<https://www.g7fsoi.org/digital-twin-ocean-summit>
- ◆ **Satellite Event by JAMSTEC:** 28 Apr. 2022, online.
  - Y. Fujii will talk about activities in OceanPredict and possible future collaboration between ForeSea/SynObs and DITTO.
  - Collaboration with DITTO (G7 FSOI) may improve Funding status of the UN Decade in Japan, since Japanese Government ordered JAMSTEC to be the Japanese focal point for Digital Twin Ocean in G7 FSOI.
- ◆ How SynObs (and ForeSea) can collaborate with DITTO?
  - Generating and Managing Nature Runs? Conducting OSSE?
  - Providing the OS-Eval report to DITTO?
  - Share ocean prediction systems and user-interface?

# ★ Collaboration of Observing System Simulation Experiment (OSSE)

## Observing System Simulation Experiment (OSSE)

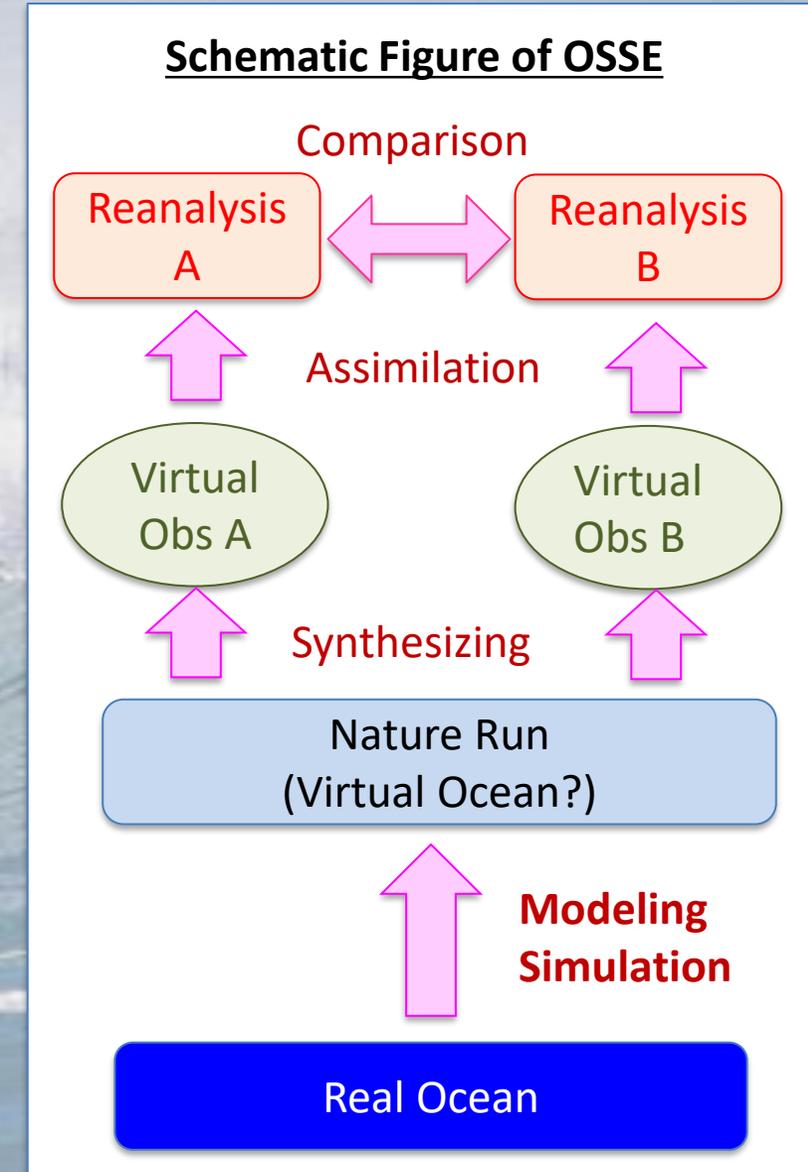
- Also called as Identical Twin Experiments
- Variety of virtual Observation data are synthesized from a virtual ocean data, called “Nature Run”
- Assess the impacts of observation data by comparing assimilation results with/without specific type of virtual obs data.

## Requirement for Nature Run.

- A “Nature Run” must imitate the real ocean well. In particular, they need to share a similar statistical nature.
- Very high-resolution is required for Nature Runs.
- Huge computer resources are required to generate a Nature Run.

## Suggestion of Collaboration

- Collaboration for generating the Nature Run. (“Nature Run” is a kind of the virtual ocean or the digital twin ocean).
- Actually, OSSE can be considered as a familiar application of the concept of the digital twin ocean.



# ★ Sharing ocean prediction systems and user-interface technologies

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## Ocean prediction systems

- The concept of the digital twin ocean indicates it has ability to predict ocean variations under some artificial assumption.
- Developing/improving ocean prediction systems which can predict ocean variations is the main target of OceanPredict and ForeSea, and they put considerable efforts for that.
- OceanPredict and ForeSea can share the ocean prediction systems with DITTO.



## User-interface Technologies

- User-interface technologies are very important part of the digital twin ocean because it will increase the value when many users use it for various purpose through functional user-interface. Therefore, we expect that many user-interface technology will be developed in DITTO.
- OceanPredict and ForeSea aim to enhance the ocean prediction value chains among observing systems, prediction systems, and end-users. They also need user-interface technologies to achieve the purpose.
- Collaboration for developing user-interface technologies is fascinating!

## ★ Collaboration with Ocean Observing Co-Design

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- ◆ Y. Fujii will talk about the achievement of OS-Eval TT in the Co-Design Workshop at 7-9 June.
- ◆ Co-Design aims to include more than one modelers in each initial exemplars (1. Carbon Budget, 2. Coastal inundation and storm surge, 3. Hurricane and Tropical Storms, 4. Marine Heatwaves, 5. Biodiversity, 6. Boundary Currents) and request the collaboration for that.
  - Can SynObs send representative for 4. (large-scale) Marine heatwaves and 6. Boundary currents?
  - Discuss with MEAP-TT for 1. Carbon Budget and 5. Biodiversity(?)
  - Discuss with CP-TT for 3. Hurricane and tropical Storms.
  - CoastPredict modelers participates in 2. Coastal inundation and storm surge.

## ★ Collaboration with CoastPredict

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- SynObs currently support Coastpredict Core Project 1 “Integrated coastal ocean observing and predicting (PredictOnTime)”, WP5 (especially 5.4)

### **WP5 Data assimilation in the coastal ocean**

**Objectives:** Develop new or strengthen data assimilation towards coastal EOY estimation and prediction; DA frameworks; Machine learning techniques

5.1 Assimilation of existing and new datasets for coastal forecasting

5.2 Machine learning methods in data assimilation

5.3 Coastal ocean analysis and reanalysis

5.4 OSSE (Observing Systems Simulation Experiments) and OSE (Observing System Experiments) for optimization of coastal observatories

**Deliverables:** Open and free data assimilation codes available; Best practices reports; data assimilation manuals;

- I will suggest to collaborate through OSEs for evaluating synergistic effects of SWOT, conventional altimeters, and Argo floats (and coastal observations) on the predictions of boundary currents and marine heatwaves later.

## ★ Collaboration with MEAP-TT (Some suggestion)

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- Invite MEAP-TT members to the observing system evaluation showcase.
- Summarize what data are assimilated in the ocean BGC prediction systems (i.e., generate the use-of-observation table for ocean BGC prediction system)
- Share the information on the development of DA schemes for GC through the on-site and on-line meetings of SynObs
- Collaborative evaluation of the impacts of satellite ocean color data and BGC Argo floats. (It needs large efforts. Is it feasible?)
- Include the result of the evaluation of BGC observations in the SynObs report.
- Send representatives to the Co-Design exemplars 1. Carbon Cycle, and 5. biodiversity, and share the achievements in SynObs, and ForeSea with them.

# ★ Expected Activities in SynObs

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## 1. Collaboration for evaluation and design

- Provide Nature runs
- Multi-System OSE and OSSE
- Establish a best practice method or a model case

## 2. Supporting DA scheme development

- Summarize required development for extracting synergy from the targeted combinations
- Observation campaigns

## 3. Providing information from ocean prediction systems in real time

- Regular reporting on information of QC, innovations, increments, etc.
- Explore the methods to evaluate observing system status in real-time operation

## 4. OS-Eval showcase and reporting

- Collect OS-Eval examples and introduce them (Showcase)
- Generate a report on observation requirements and design

## ★ Action recommended at the last OS-Eval TT Meeting

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- ◆ **4-1. OS-Eval Showcase (2022-early 2024):** Collect OS-Eval examples for all targeted observations and introduce them to the broad communities (particularly to observational communities) to show the potential of OS-Eval.
- ◆ **4-2. OS-Eval Report (late 2024 -2026):** Generate a report on the observation requirements and design based on various OS-Eval studies.
- ◆ **1-1. Summarizing information on available Nature Rus:** We will take a questionnaire and the results will be open at the web page. (However, also confirmed that the motivation to the Nature Runs is increasing and we should talk with other groups (modeling groups, DITTO?) for collaboration on it.)

## ★ 1.2 Collaboration for OS-Eval

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- ◆ Implementation of a full multi-system OSSE will be considered only when we can collaborate with other groups and we can secure funds for the experiments.
- ◆ **Create a platform or web environment** (e.g., Slack, Teams, etc.) in which collaboration of multi-system OSEs (such as current OSEs for Argo Salinity Drifts) are easily suggested by anyone and the results (Figures and data(?)) of OSEs can be easily shared among the community.
  - We expect multi-system OSEs desirable and feasible for some centers will be suggest using this platform.
  - **But only this seems to be too passive.**
- ◆ **Declare to implement OSEs for evaluating synergistic effects of SWOT, conventional altimeters, and Argo floats on the predictions of boundary currents and marine heatwaves as the flagship activity?**
  - SWOT is currently planned to be launched at Nov. 2022.
  - Boundary currents and marine heatwaves are exemplars of Co-Design
  - They are also targets of coastal predictions, and we can collaborate CoastPredict through these targets.

## ★ 2. Supporting DA scheme development

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- ◆ Share the information on the development of DA schemes through the on-site and on-line meetings
- ◆ Discuss required development for extracting synergy from the targeted combinations
- ◆ Seek the possibility of effective observation campaigns and other collaborating activities, and discuss with the appropriate observational community for their implementation.
  - Collocated observations of Infrared Hyper spectrum satellite and Argo floats. (Suggested)
  - Anything else? (e.g., Enhanced Argo observations in the tropical storm areas)
- ◆ Summarize the results of above activities in the regular (annual) report

## ★ 3. Providing information from ocean prediction systems in real time

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Regular reporting (web page?) on information of QC, innovations, increments, etc.

- Extension from the table of observation use
- We need to discuss (or confirm)
  - What centers can participate the activities?
  - What can be reported (QC info, innovations, increments, others?)
  - Who and how often the report (web page?) can be updated.
- Discussion will be started at the Tsukuba meeting or an on-line meeting before.

Explore the methods to evaluate observing system status in real-time operation

- SynObs promote developing the methods for real-time evaluation (e.g., DFS and FSOI or multi-system ensemble) (2022-2024)
- Establish a regular reporting framework (2025-2026)

# Time Line of SynObs Activity



Category	2022	2023	2024	2025	2026
1. Collaboration for evaluation and design	Nature Run Database				
	multi-system OSE suggestion platform				
	OS-Eval Collaboration for SWOT, conventional Altimeters, and in-situ data				
2. Supporting DA scheme development	Information sharing and discussion for necessary development and observation campaign (summarize the achievement in the regular reports.)				
3. Providing information from ocean prediction systems in real time	QC, info (design)		perform regular reporting		
	real-time evaluation (developing)			Construct the framework	
4. OS-Eval showcase and reports	OS-Eval Showcase				
			OS-Eval Report		



## ★ Action Items

- ✓ Draft of the implementation plan (until the next meeting)
- ✓ Meeting of Tsukuba Meeting Organizing Committee (Tomorrow)
- ✓ Next meeting (the end of May or the middle of July)

