Core/Universe and Development Process
Our goals

- To build safe and high-functioning Autonomous Vehicles efficiently.
  - It doesn't mean to accomplish "Automotive Grade" right now.
- (After that) To accelerate Autonomous Driving community/business with Autoware.

Challenges:

- We cannot know the entire requirements/specifications from the beginning.
- Generally it’s difficult to accomplish both development speed and quality at the same time.

Approach

- We should have prototype-development phases.
  - Use case based development under light rules for rapid prototyping.
  - High-quality development under strict rules for production level code.
- Actually, we’re doing similar process as ODD based development such as AVP/Cargo/Racing/Bus/…
  - However, the current Autoware.Auto development seems to be mixing prototyping and production.
  - That slows down development speed or incomplete code is merged to production codebase.

The next slide shows the figure!
High-level development process of Core/Universe

Use-case Based Development (Universe)

Use case (Demo) Definition → Scenario Creation → Scenario-Based Development → Demo → Cleanup

- Design/Impl Knowledge
- Effective Scenario Set

High-Quality Development (Core)

Writing Design Documents → Implement High-Quality Code → Scenario-Based CI → Comprehensive Testing → Stable Release

- Scenario Set of Each ODD
- Unit/Component Automated Testing
Timeline

Autoware.Auto
- Cargo ODD Development
  - Clean up after demo

Autoware.Universe
- Preparation
  - Move to GitHub
  - Merge AWF member's proposal code
- Bus ODD Prototype Development
  - Set up Vehicle/ECUs/Sensors
  - Develop based on scenarios
- Define initial architecture
- (Optional) If enough resources:
  - Write design docs
  - Refactor and merge necessary Universe packages

Autoware.Core
- Preparation
  - Discuss architecture
  - Write rough design docs
  - Consider merge criteria

Core Development
- Write/refine design docs
- Refactor/reimplement Universe code

Demo
- Write READMEs
- Refactor code

Clean Up
- Go maintenance mode
- Port necessary packages

12/M(now) 1/E 6/E? T.B.D.
## Expected tasks for the time being

<table>
<thead>
<tr>
<th>Category</th>
<th>Task</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo ODD Development</td>
<td>Clean up after demo.</td>
<td>ASWG members will work on.</td>
</tr>
<tr>
<td>Universe Preparation</td>
<td>Move to GitHub and build the base development platform.</td>
<td>Tier IV is working on at <a href="https://autowarefoundation/autoware.universe/">autowarefoundation/autoware.universe/</a>.</td>
</tr>
<tr>
<td></td>
<td>Merge AWF member's proposal code.</td>
<td>We should call for participation.</td>
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<tr>
<td>Core Preparation</td>
<td>Discuss software architecture.</td>
<td>Ongoing in <a href="https://github.com/autowarefoundation/Autoware.Auto">Discussion: Bus ODD Software Architecture - Autoware.Auto</a>. We should call for participation to this as well.</td>
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<td>Consider merge criteria including coding guidelines, test strategy, etc.</td>
<td>Tier IV is preparing a draft of proposal. Will propose by the January TSC.</td>
</tr>
<tr>
<td>Bus ODD Prototype Development</td>
<td>Many.</td>
<td>We need to discuss with Bonolo-san and communicate with member companies who are interested in.</td>
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</tbody>
</table>
Conclusion

Tier IV's proposal

- Starting from a simple structure of one .repos and one branch.
  - Revisit the structure after the prototyping is done.
- Introducing 2-phase development with Core/Universe.
  - Core will be empty for a while.

Proposed action items for 1/E:

- ASWG members will continue Cargo ODD for a while.
  - After that, will notify .Auto goes to maintenance mode.
- Tier IV will build the base development platform for Universe.
- Tier IV will propose a proposal for Core development by the January TSC.
- We should call for participation to:
  - Software architecture discussion.
  - Merging member's code to Universe.
- AWF maintainers should discuss the tasks for Bus ODD development with Bonolo-san.
Links

- Core/Universe Sync
  https://tier4.github.io/AutowareCoreUniverseDocs/coreuniverse/concept/
- Autonomy Software WG Meeting 2021/09/14 (#160) · Issues · Autoware Foundation / Autoware Foundation
  https://discourse.ros.org/t/technical-steering-committee-tsc-meeting-36-2021-11-17-minutes/23168
- CoreUniverseArchitectureProposal