```
1    cmake_minimum_required(VERSION 3.8)
2    project(tutorial_interfaces)
3
4    if(CMAKE_COMPILER_IS_GNUCXX OR CMAKE_CXX_COMPILER_ID MATCHES "Clang")
5      add_compile_options(-Wall -Wextra -Wpedantic)
6    endif()
7
8    # find dependencies
9    find_package(ament_cmake REQUIRED)
10   # uncomment the following section in order to fill in
11   # further dependencies manually.
12   # find_package(<dependency> REQUIRED)
13   find_package(rclcpp REQUIRED)
14   find_package(rosidl_default_generators REQUIRED)
15
16
17   rosidl_generate_interfaces(${PROJECT_NAME}
18     "msg/Num.msg"
19     "srv/AddThreeInts.srv"
20    )
21   if(BUILD_TESTING)
22     find_package(ament_lint_auto REQUIRED)
23     # the following line skips the linter which checks for copyrights
24     # comment the line when a copyright and license is added to all source files
25     set(ament_cmake_copyright_FOUND TRUE)
26     # the following line skips cpplint (only works in a git repo)
27     # comment the line when this package is in a git repo and when
28     # a copyright and license is added to all source files
29     set(ament_cmake_cpplint_FOUND TRUE)
30     ament_lint_auto_find_test_dependencies()
31   endif()
32
33   ament_package()
```
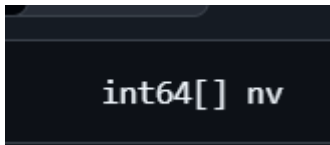
https://docs.ros.org/en/crystal/Tutorials/Custom-ROS2-Interfaces.html

해당 링크를 참고하여 제작.

Msg에 int vector설정,
해당 파일 불러오기
Srv는 서비스 프로토콜이라 현재로서는 필요없음

msg

Int 64 형식의 백터, 이름은 nv

```
1   <?xml version="1.0"?>
2   <?xml-model href="http://download.ros.org/schema/package_format3.xsd" schematypens="http://www.w3.org/2001/XMLSchema"?>
3   <package format="3">
4     <name>tutorial_interfaces</name>
5     <version>0.0.0</version>
6     <description>TODO: Package description</description>
7     <maintainer email="david@todo.todo">david</maintainer>
8     <license>TODO: License declaration</license>
9
10    <buildtool_depend>ament_cmake</buildtool_depend>
11
12    <build_depend>rosidl_default_generators</build_depend>
13    <exec_depend>rosidl_default_runtime</exec_depend>
14    <member_of_group>rosidl_interface_packages</member_of_group>
15
16    <test_depend>ament_lint_auto</test_depend>
17    <test_depend>ament_lint_common</test_depend>
18
19    <export>
20      <build_type>ament_cmake</build_type>
21    </export>
22  </package>
```

https://docs.ros.org/en/crystal/Tutorials/Custom-ROS2-Interfaces.html

해당 링크를 참고하여 제작.

```cpp
#include <chrono>
#include <memory>
#include <iostream>

#include "rclcpp/rclcpp.hpp"
#include "tutorial_interfaces/msg/num.hpp"      // CHANGE

using namespace std::chrono_literals;

tutorial_interfaces::msg::Num data;

class MinimalPublisher : public rclcpp::Node
{
public:
  MinimalPublisher()
  : Node("minimal_publisher")
  {
    p = this->create_publisher<tutorial_interfaces::msg::Num>("topic", 10);    // CHANGE

    int i=0;

    std::cout<<"숫자 입력 ";
    std::cin>>i;
    if(!std::cin){
      std::cout<<" 입력 실패"<<std::endl;
      std::cin.clear();
      std::cin.ignore(1000, '\n');
    }
    else{
      data.nv.push_back(i);
    }
    p->publish(data);
  }
```

https://docs.ros.org/en/crystal/Tutorials/Custom-ROS2-Interfaces.html

해당 링크를 참고하여 제작
-전역으로 msg를 data로 설정

-숫자 입력 받기

-예외 처리
(숫자 아니면 버퍼 지움)

-data가 백터이기에 해당 백터에 I push_back 하여 추가

Data 송신

```cpp
#include <memory>
#include <iostream>
#include "rclcpp/rclcpp.hpp"
#include "tutorial_interfaces/msg/num.hpp"        // CHANGE
using std::placeholders::_1;

class MinimalSubscriber : public rclcpp::Node
{
public:
  MinimalSubscriber()
  : Node("minimal_subscriber")
  {
    subscription_ = this->create_subscription<tutorial_interfaces::msg::Num>(        // CHANGE
        "topic", 10, std::bind(&MinimalSubscriber::topic_callback, this, _1));
  }

private:
  void topic_callback(const tutorial_interfaces::msg::Num::SharedPtr msg) const        // CHANGE
  {
    for(auto i : msg->nv){
      std::cout<< i<<std::endl;
    }
  }
  rclcpp::Subscription<tutorial_interfaces::msg::Num>::SharedPtr subscription_;        // CHANGE
};

int main(int argc, char * argv[])
{
  rclcpp::init(argc, argv);
  rclcpp::spin(std::make_shared<MinimalSubscriber>());
  rclcpp::shutdown();
  return 0;
}
```

https://docs.ros.org/en/crystal/Tutorials/Custom-ROS2-Interfaces.html

해당 링크를 참고하여 제작

송신 받은 백터를 msg로 저장

입력 받은 백터를 출력(1일차 송신부와 동일)