CFR Communication Architecture

External Device (TCP/IP Client)

- Send ASCII only (case-sensitive)
- Terminate with '\n' (linefeed char)

- Open a server at port 10001 after initiated to listen feedback regularly

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PORT: 10001
CHANNEL 2
- Feedback states regularly 80ms

PORT: 10000
CHANNEL 1
- ED sends command
- CFR replies status

CFR PC (TCP/IP Server)

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- Receive ASCII from TCP/IP client

CFR Service (ROS2 Services)

- INIT
- START
- STOP
- RESET

- ROS2 CFR Server

CFR FSM (States Manager)

- IDLE
- READY
- RUNNING
- STOPPED
- ERROR
- MANUAL

- FSM

CFR Controller (ROS2 Nodes)

- CFR Actuation
- CFR Blades Control
- CFR Dynamics
- CFR States
- CFR Path Tracer

- Convert joints angle to command velocity

CFR Manual Control (Remote Controller)

- Tele-operation
- Control blades speeds
- Switch between manual and external device mode

- Remote controller

CFR Hardware (Robot)

- CFR Actual Robot

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CFR Simulation (GAZEBO)

- CFR Gazebo
- CFR Control
- CFR Description
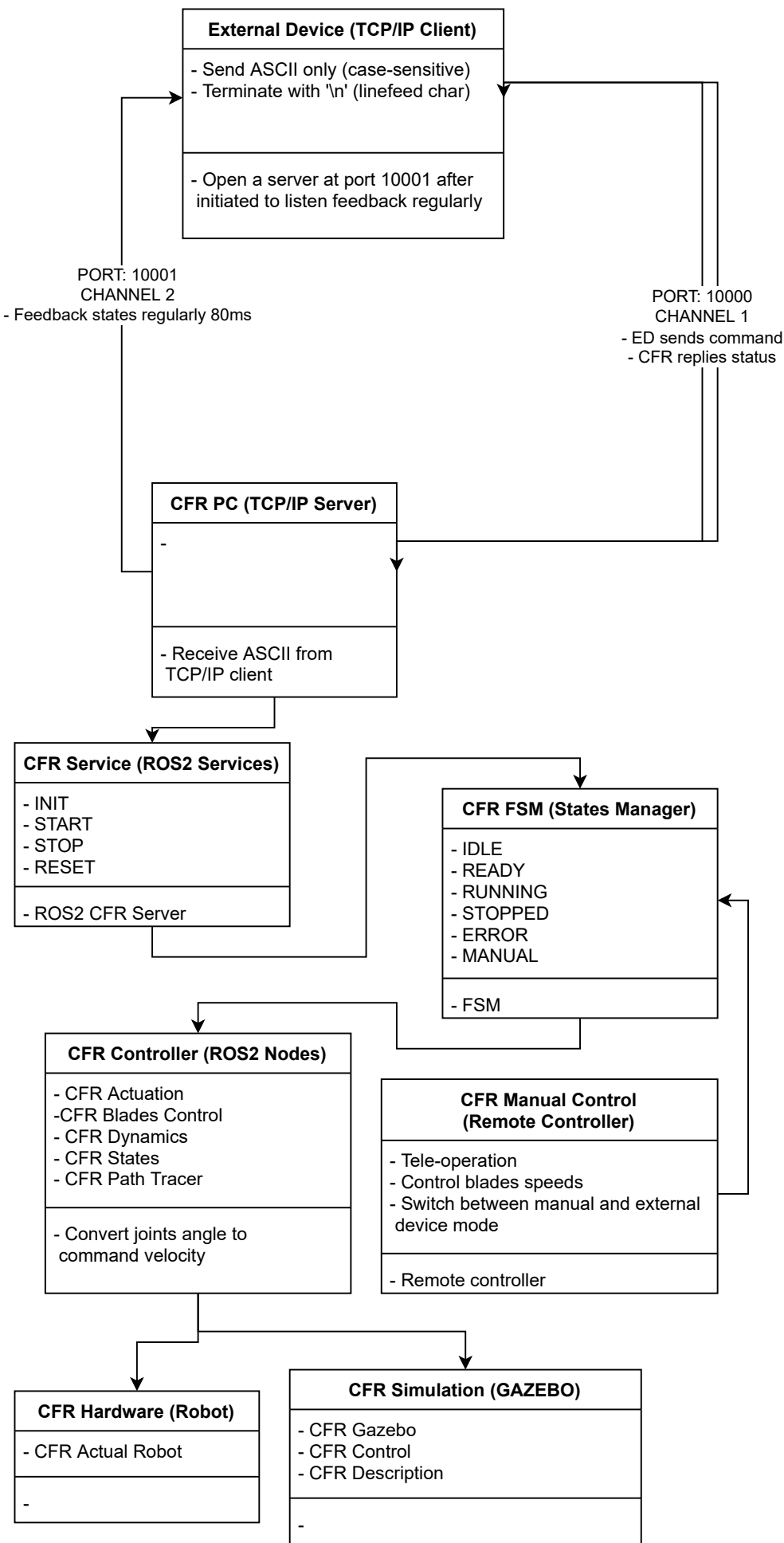
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CHANNEL 1

ED: STATUS
CFR: STATUS, <status>

ED: FB,1
CFR: FB,1,OK
CFR: FB,ERR,<errmsg>

ED: INIT
CFR: INIT, OK
CFR: INIT,ERR,<errmsg>

ED: START
CFR: START,OK
CFR: START,ERR,<errmsg>

ED: STOP
CFR: STOP,OK
CFR: STOP,ERR,<errmsg>

ED: STARTENGINE
CFR: STARTENGINE,OK
CFR: STARTENGINE,ERR,<errmsg>

ED: CTRL,<spd>,<fwd>,<rot>,<side>
CFR: CTRL,OK
CFR: CTRL,ERR,<errmsg>

CHANNEL 2

CFR:<ts>,<x>,<y>,<theta>,<bspd>

SAFETY

1. CFR stops when no external command
2. When CHANNEL 1 or CHANNEL 2 is dropped, or has error
3. When any ED results in an error

CFR
Finite State Machine