

# KDR ROS

**Sebastjan Šlajpah**

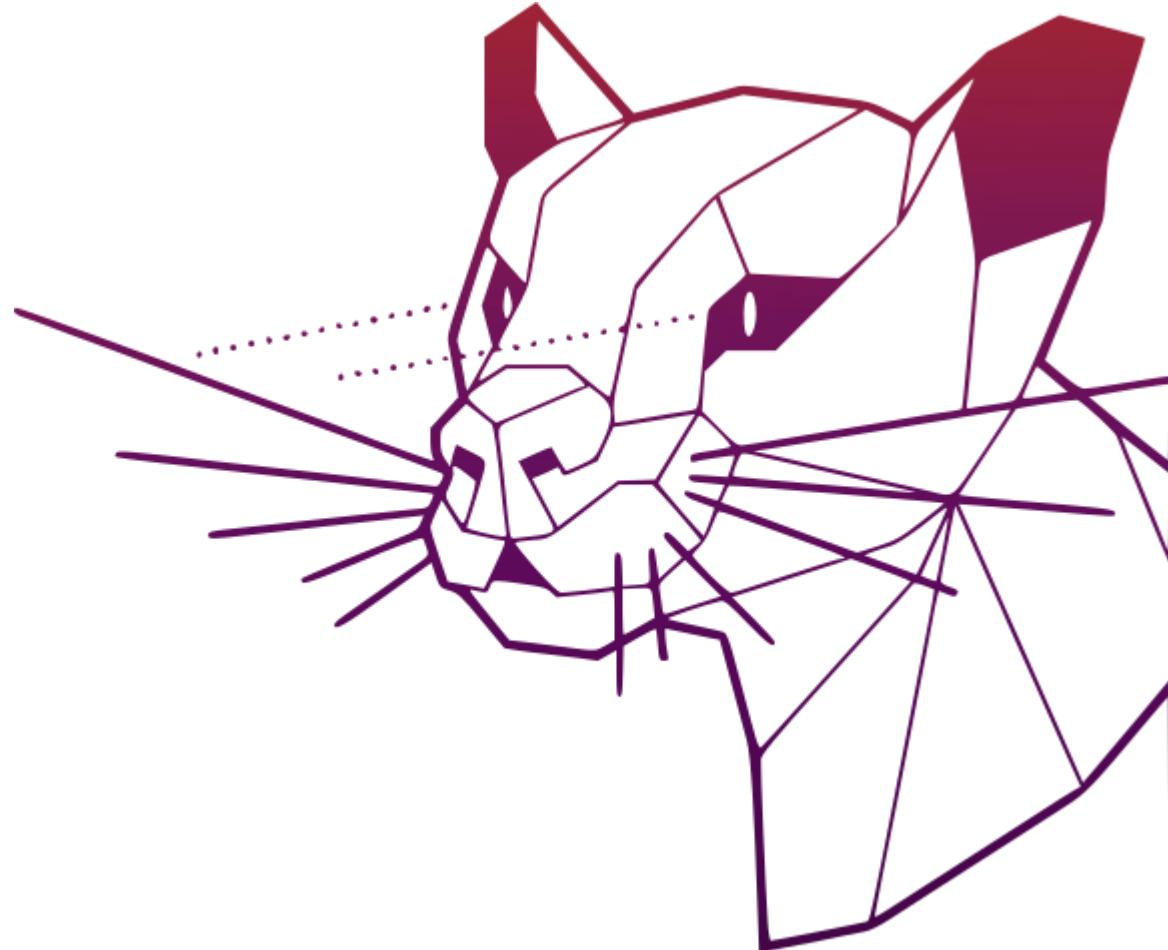
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# Linux distribucija

Ubuntu 20.04 LTS Focal Fossa

<https://releases.ubuntu.com/focal/>



# ROS Noetic Ninjemys

<http://wiki.ros.org/noetic>



# Robotics Operating System

# Kaj je skupnega?





Martin Cooper, Motorola (1983)



olab



Steve Wozniak in Steve Jobs

olab



# Popularizirani produkti



STROJNA OPREMA



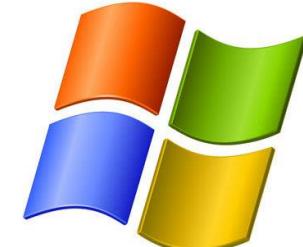
# Popularizirani produkti



STROJNA OPREMA



OPERACIJSKI SISTEM



# Popularizirani produkti



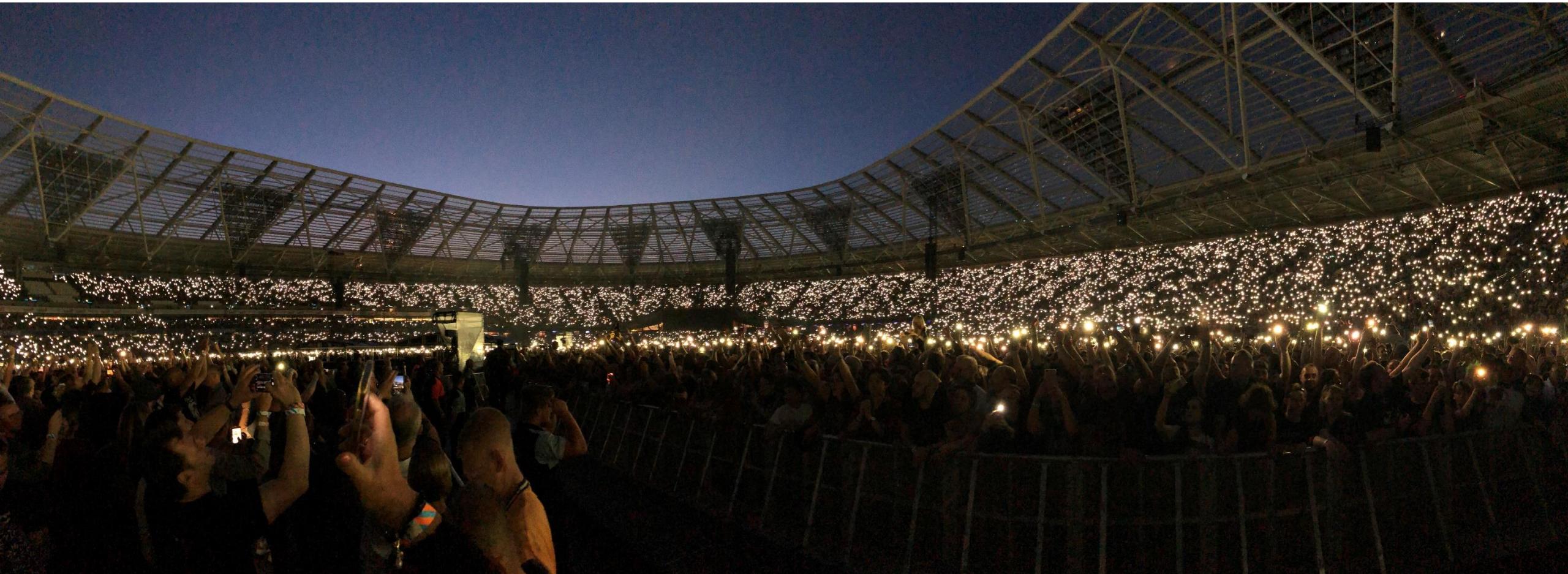
STROJNA OPREMA



OPERACIJSKI SISTEM



APLIKACIJE

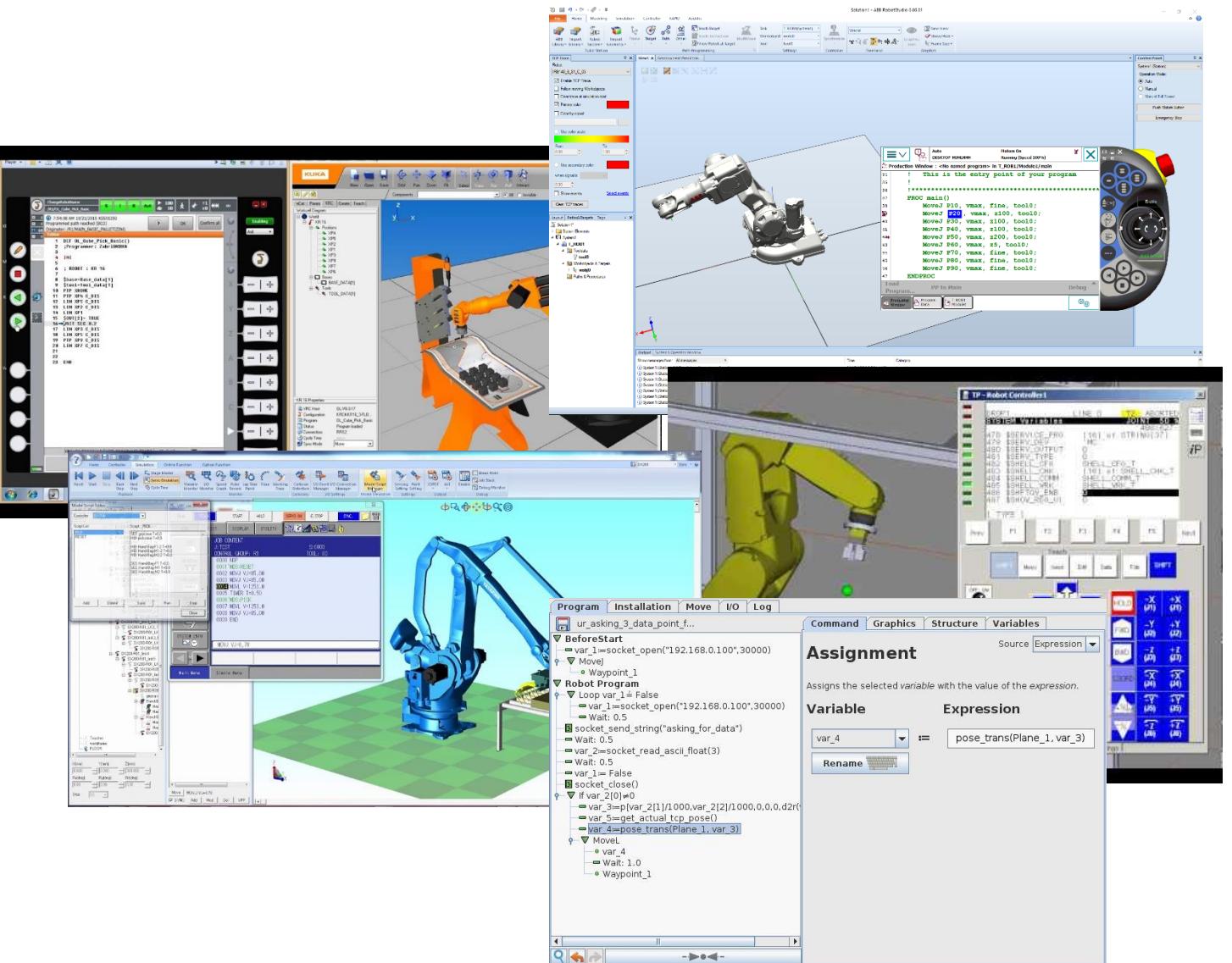


# Ustrezna programska oprema

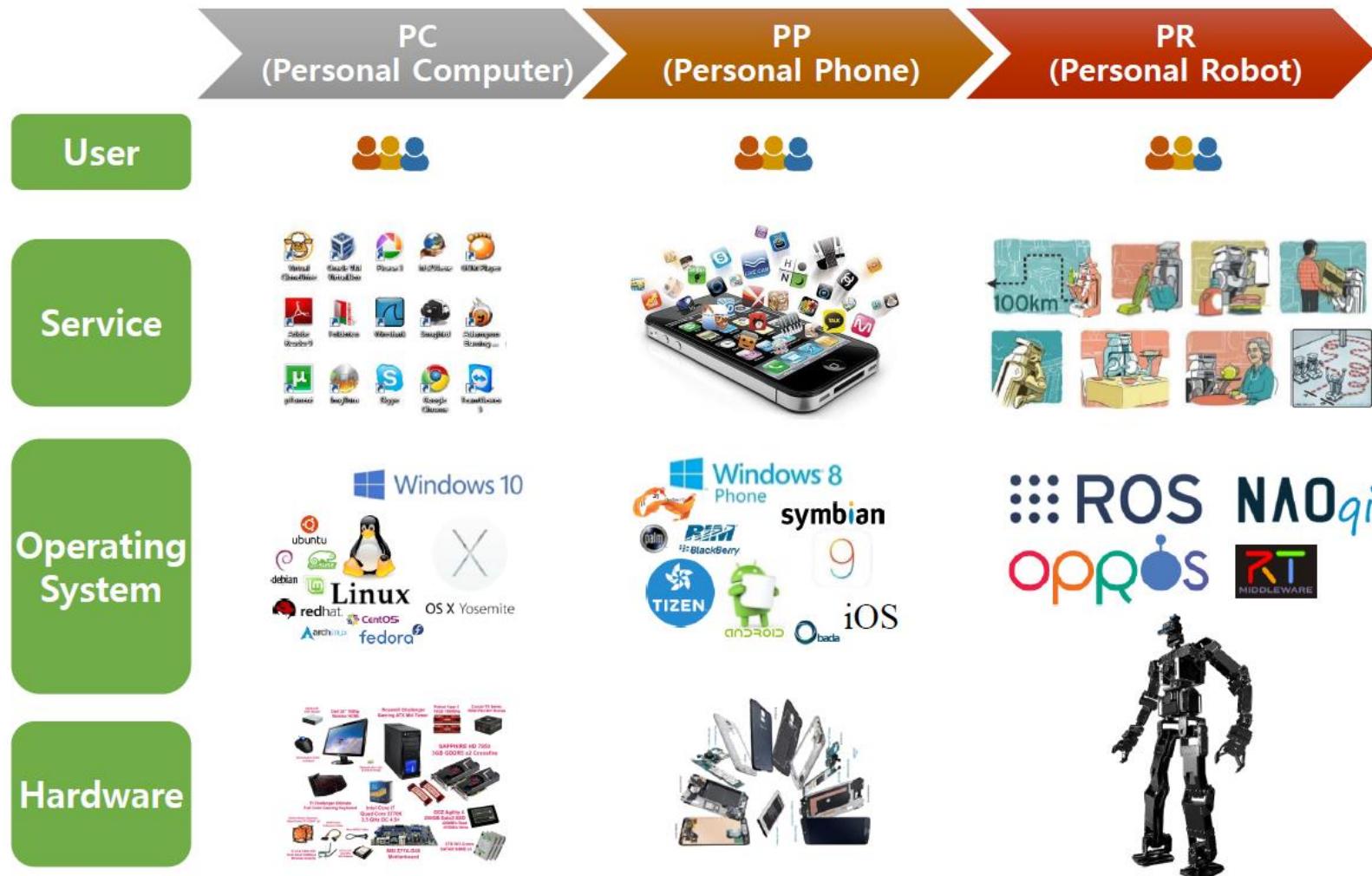
- Integracija s strojno opremo
- Standardizacija in modularnost strojne opreme
- Padec cene, dvig zmogljivosti
- Ločitev strojne opreme, operacijskega sistema in aplikacij
- Individualizacija potreb uporabnika
- Več uporabnikov (svoj ekosistem)

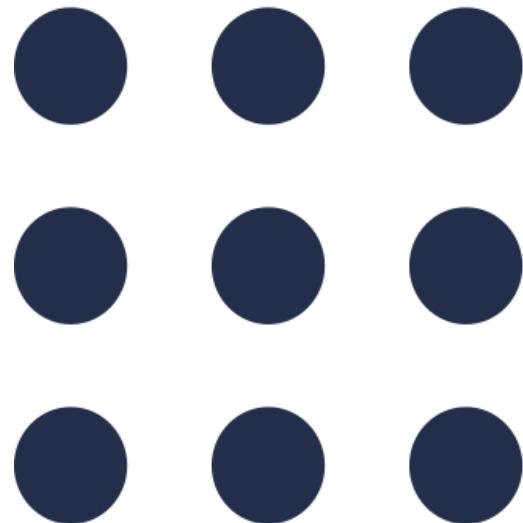
# Kaj pa robotika?

- RAPID (ABB)
- INFORM (Yaskawa)
- KRL (Kuka)
- KAREL (Fanuc)
- PDL2 (Comau)
- AS (Kawasaki)
- VAL3 (Staubli)
- URScript (Universal Robots)
- ...



# Ponavljanje zgodovine?





ROS

# Kaj je ROS?

The Robot Operating System (ROS) is a set of software libraries and tools that help you build robot applications. From drivers to state-of-the-art algorithms, and with powerful developer tools, ROS has what you need for your next robotics project. And it's all open source.



ROS = Meta-operating system; a system that performs scheduling, loading, monitoring, error handling and utilizing distributed computing resources as a virtualization layer between applications and distributed computing resources

# ROS zasnova

|                                       |                     |                             |                      |                      |                   |                 |        |
|---------------------------------------|---------------------|-----------------------------|----------------------|----------------------|-------------------|-----------------|--------|
| <b>Client Layer</b>                   | roscpp              | rosipy                      | roslisp              | rosjava              | roslibjs          |                 |        |
| <b>Robotics Application</b>           | MoveIt!             | navigatioin                 | executive smach      | descartes            | rospeex           |                 |        |
|                                       | teleop pkgs         | rocon                       | mapviz               | people               | ar track          |                 |        |
| <b>Robotics Application Framework</b> | dynamic reconfigure | robot localization          | robot pose ekf       | Industrial core      | robot web tools   | ros realtime    | mavros |
|                                       | tf                  | robot state publisher       | robot model          | ros control          | calibration       | octomap mapping |        |
|                                       | vision opencv       | image pipeline              | laser pipeline       | perception pcl       | laser filters     | ecto            |        |
| <b>Communication Layer</b>            | common msgs         | rosbag                      | actionlib            | pluginlib            | rostopic          | rosservice      |        |
|                                       | rosnode             | roslaunch                   | rosparam             | rosmaster            | rosout            | ros console     |        |
| <b>Hardware Interface Layer</b>       | camera drivers      | GPS/IMU drivers             | joystick drivers     | range finder drivers | 3d sensor drivers | diagnostics     |        |
|                                       | audio common        | force/torque sensor drivers | power supply drivers | rosserial            | ethercat drivers  | ros canopen     |        |
| <b>Software Development Tools</b>     | RViz                | rqt                         | wstool               | rospack              | catkin            | rosdep          |        |
| <b>Simulation</b>                     | gazebo ros pkgs     | stage ros                   |                      |                      |                   |                 |        |

# F1: Komunikacijska podpora

- Zagotavlja komunikacijo med posameznimi deli
- Komunikacijski vmesnik med strojno opremo in aplikacijo (middleware)
- Sinteza in analiza sporočil
- Snemanje in predvajanje sporočil
- Uporaba različnih programskih jezikov za posamezne dele
  - roscpp, rospy, roslisp, rosjava, roslua, rosccs, roseus, PhaROS, rosR

# F2: Robotско podprte funkcionalnosti

- Definicija standardnega sporočila za robote
- Izračun robotskih parametrov (transformacije)
- Jezik za opis robota
- Diagnostika
- Senzorika in zaznavanje
- Navigacija
- Manipulacija (DK, IK)

# F3: Razvojna orodja

- Zagotavlja orodja za hiter in učinkovit razvoj aplikacij
- Konzolni ukazi
- RVIZ
  - 3D vizualizacija
- RQT
  - UI, shranjevanje/predvajanje sporočil, vizualizacija povezav
- Gazebo
  - 3D simulacija z vključeno fiziko