

# Building Android Robots

Juan Ignacio Ubeira  
Julian Cerruti

The logo icon for EKUMEN is a white hexagon with a purple outline, divided into six triangles by three intersecting lines.

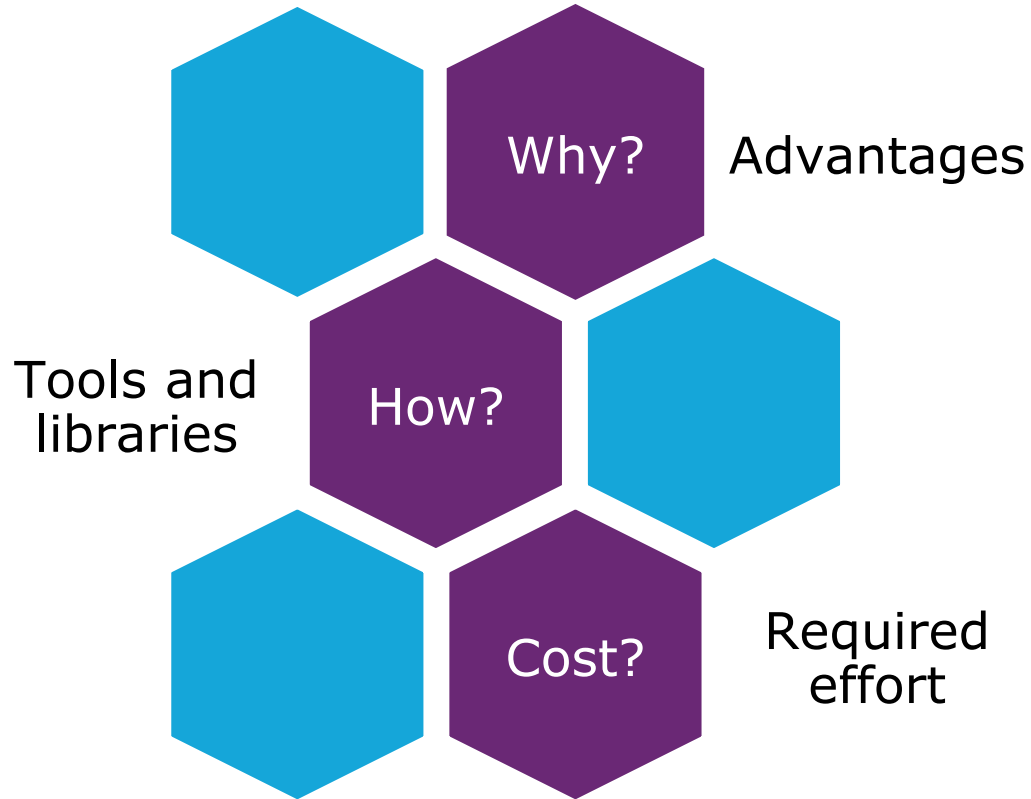
# EKUMEN

The Google logo, featuring the word "Google" in its characteristic multi-colored font (blue, red, yellow, green, blue, red).

Google

The logo icon for intermodalics is a blue, stylized, four-lobed shape resembling a flower or a molecular structure.

intermodalics  
from software to robots



## Technological evolution (2008 – 2017)

### Samsung Galaxy S8



**T-Mobile G1**



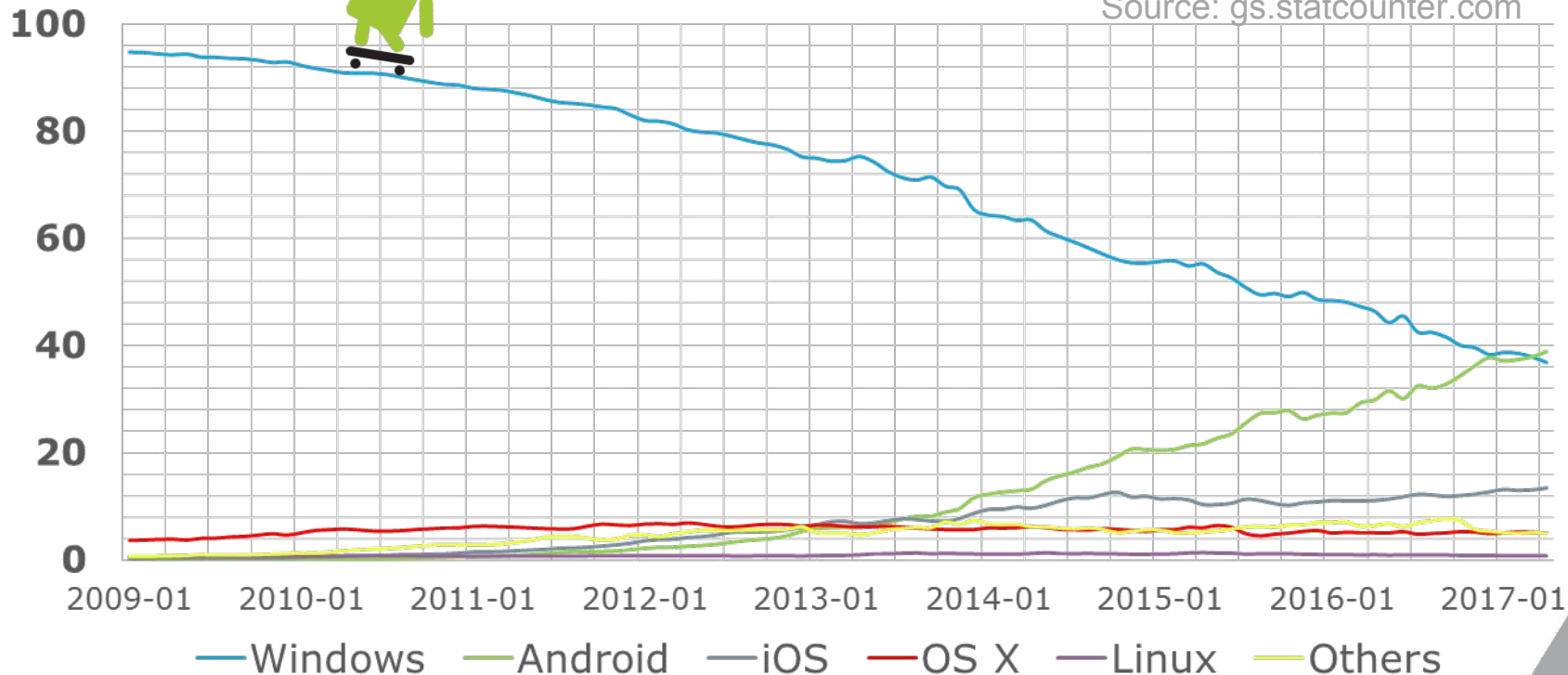
- ✓ 7x faster processor
- ✓ 20x memory size
- ✓ 140x faster networking bitrate
- ✓ 100x video resolution
- ✓ More integrated sensors

## Popularity pushes innovation forward



### Global OS market share

Source: [gs.statcounter.com](http://gs.statcounter.com)





## Tools and libraries

### Infrastructure ROSJava

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- ROS implementation in pure Java
- <http://wiki.ros.org/rosjava>



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### Native Libraries Android NDK (roscpp\_android)

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- Cross compiled ROS packages – JNI with native node wrapper
- [http://wiki.ros.org/android\\_ndk](http://wiki.ros.org/android_ndk)



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### Java libraries ROSJava Maven repository

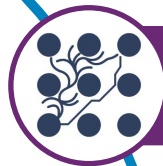
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- Place to share compiled Java artifacts
- [https://github.com/rosjava/rosjava\\_mvn\\_repo](https://github.com/rosjava/rosjava_mvn_repo)





## Tangobot: A Turtlebot spinoff



Autonomous



Android Powered



Research platform



Open source

Tangobot's wiki page: <http://wiki.ros.org/Robots/Tangobot>

TANGOBOT DEMO SEP 2017

 EKUMEN





Generic autonomous robot: Hardware components

## Perception devices

- Lasers, IMU, cameras, etc.

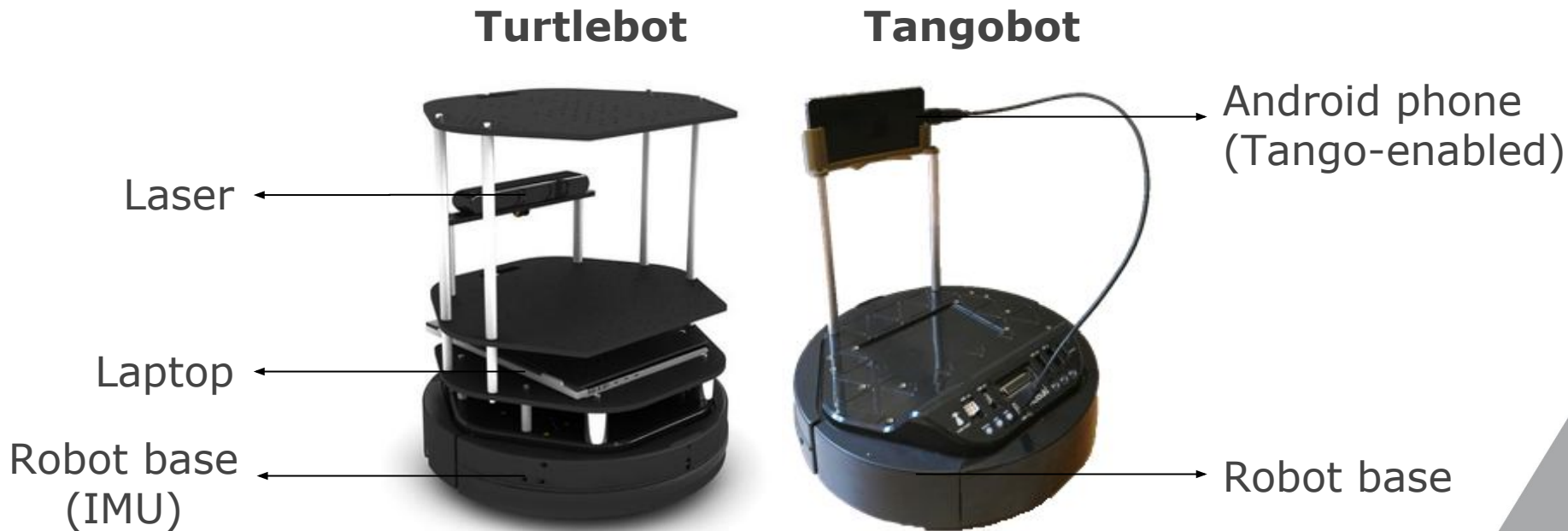
## Processing unit

- CPU & Memory

## Actuators

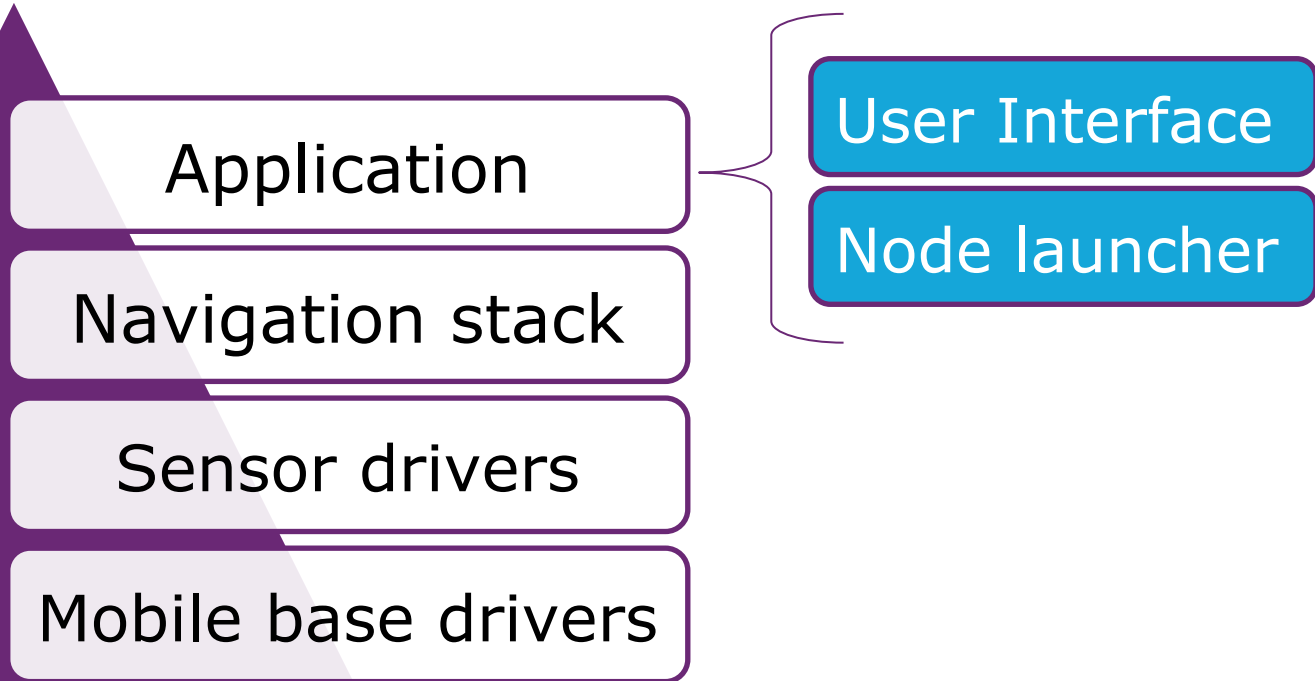
- Mobile base

## Tangobot: Hardware components



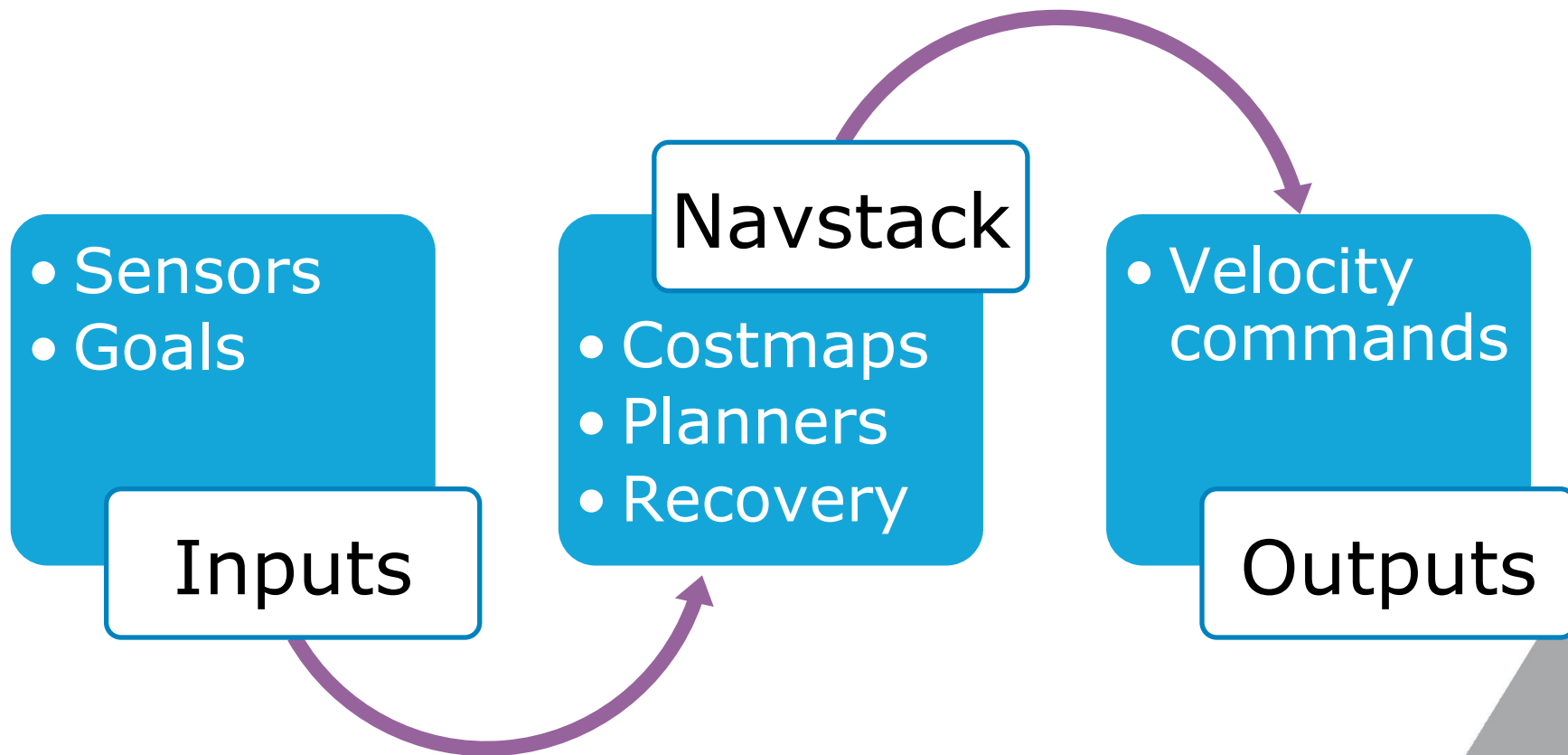


## Tangobot: Software components



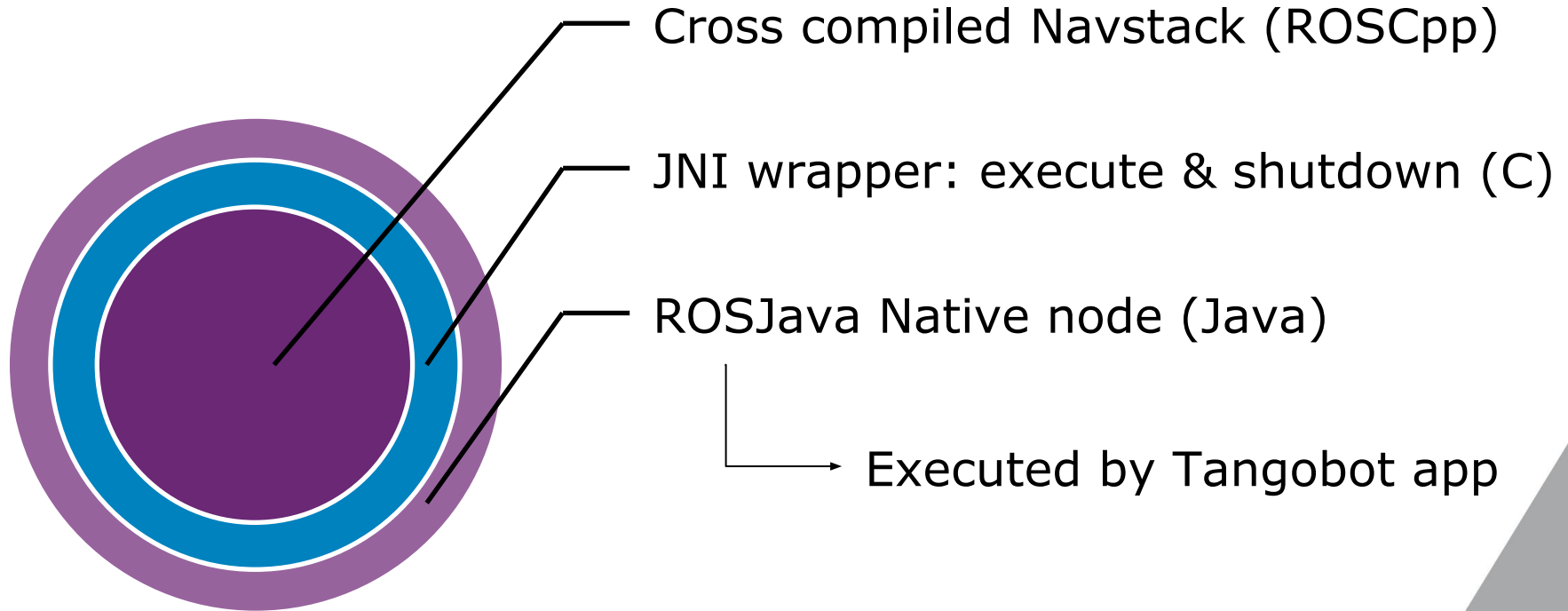


## Generic Navigation stack workflow



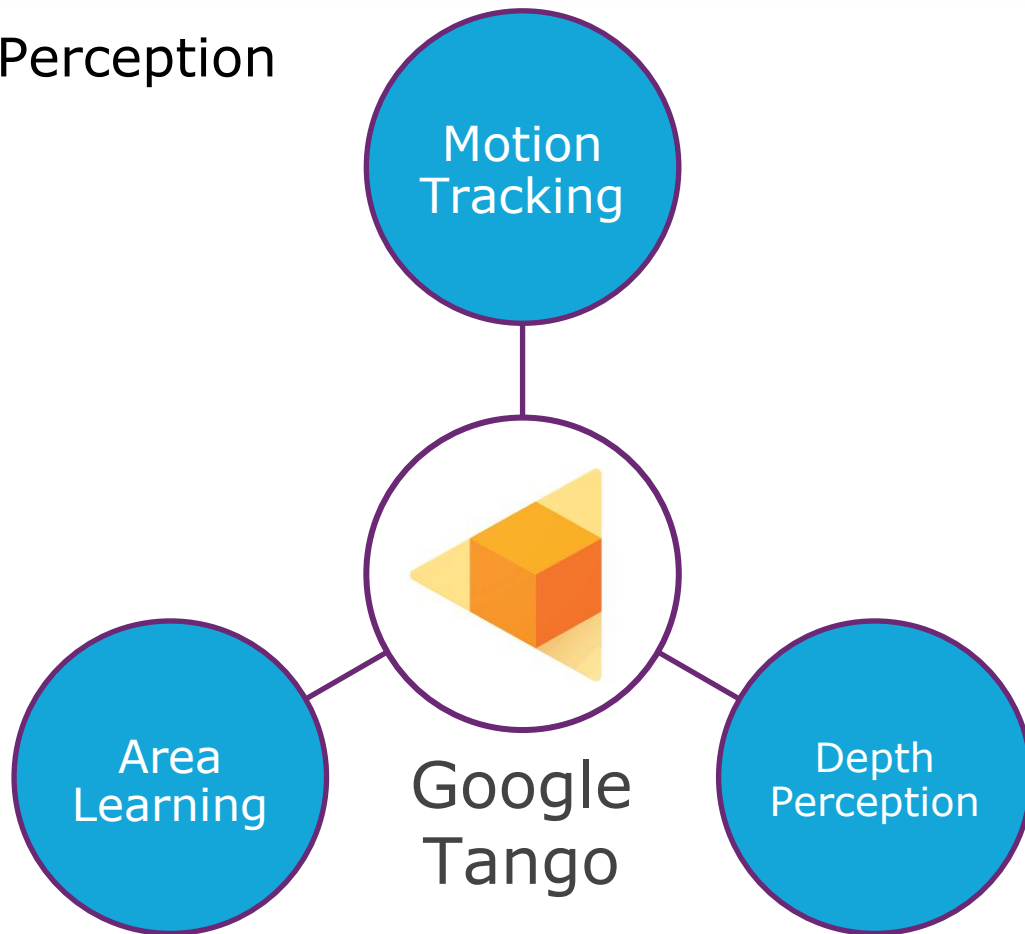


## Tangobot: Cross compiled navigation stack





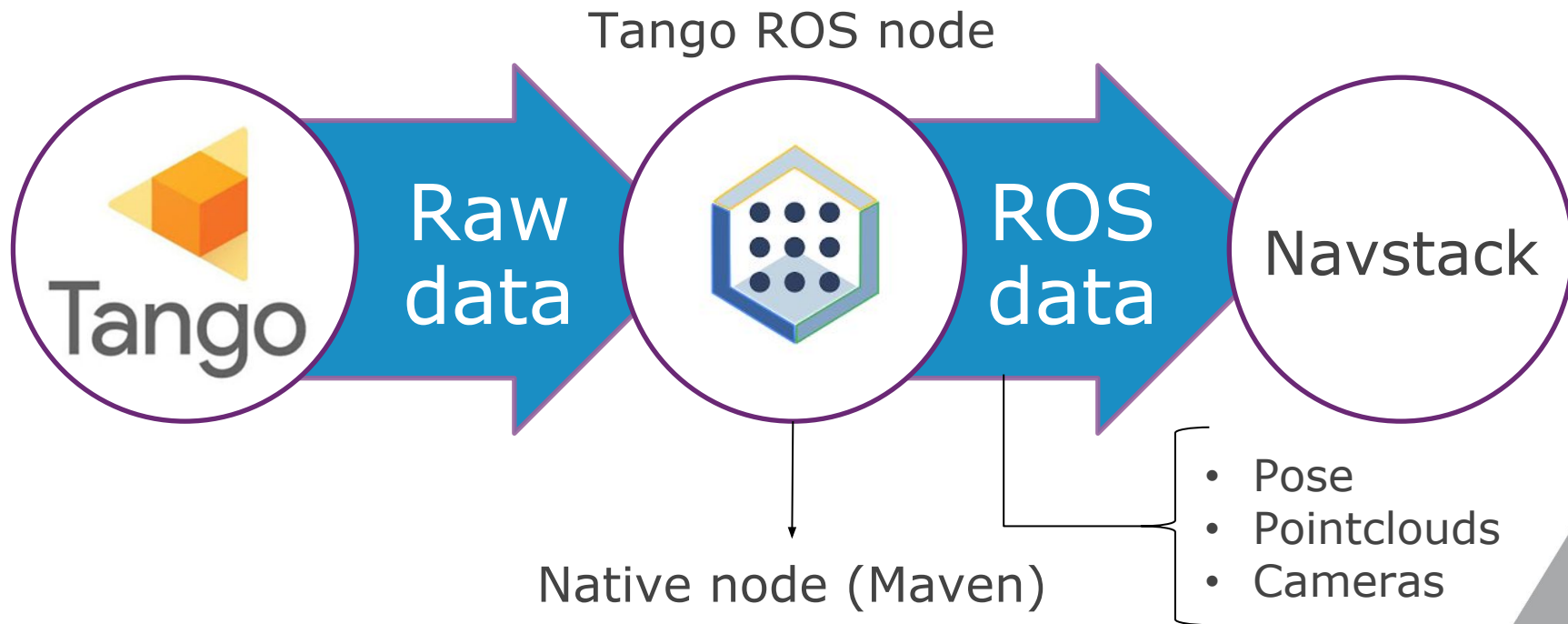
## Tangobot: Perception





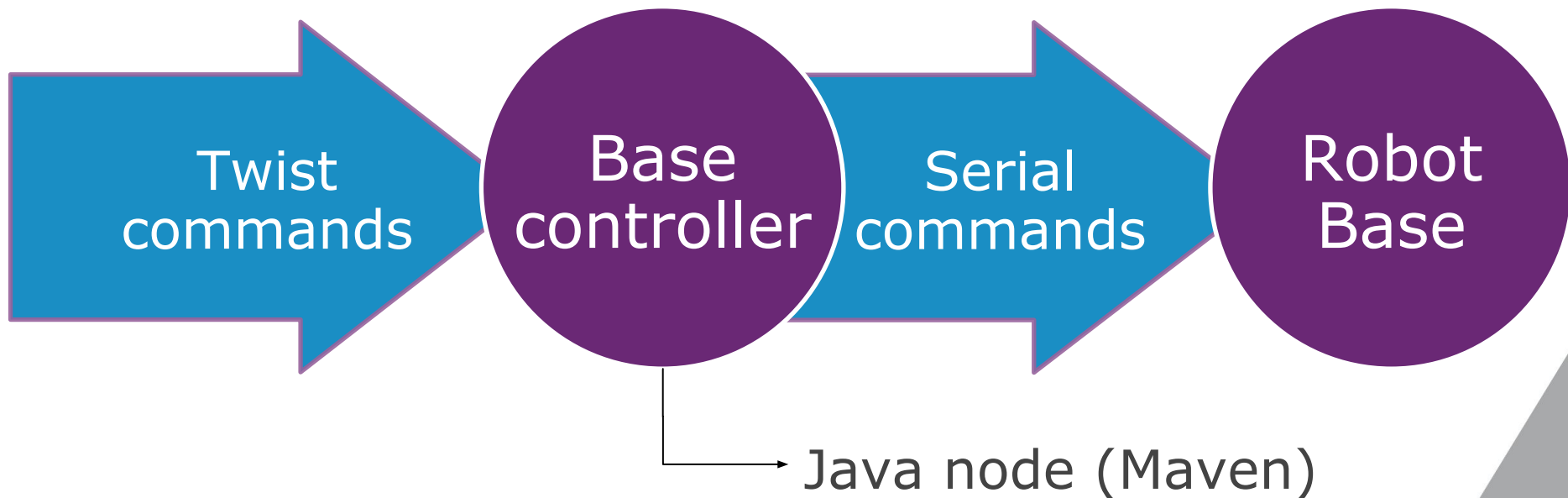


## Tangobot: Tango and ROS interfacing





## Tangobot: Robot base driver





## Tangobot roadmap

### Maps Global costmap

- Build
- Navigate
- Share

GMapping

Tango ADF

### Bases New platforms

- TurtleBot 3
- iRobot Create



## Challenges

Multiple technologies

Package availability



## Advantages

Popular devices

Evolving devices

## Tools

ROSJava

ROSCpp  
Android



Thanks!





## Useful links:

- <http://ekumenlabs.com>
- <http://wiki.ros.org/Robots/Tangobot>
- <http://wiki.ros.org/rosjava>
- [http://wiki.ros.org/android\\_ndk](http://wiki.ros.org/android_ndk)
- [http://wiki.ros.org/tango\\_ros\\_streamer](http://wiki.ros.org/tango_ros_streamer)

