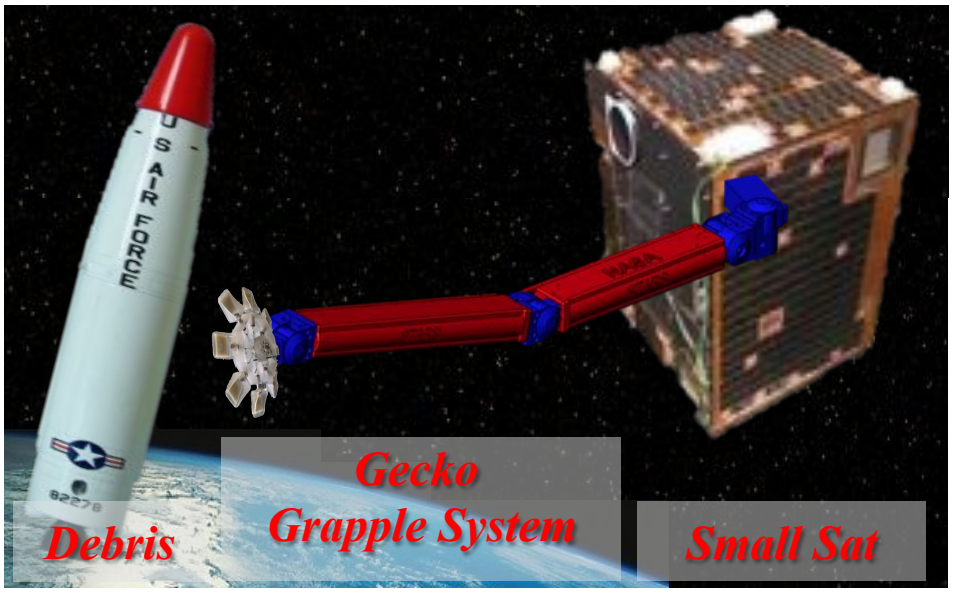
Where we are in the process:

- Find a reasonable "usage case" – assume technology will continue to improve, cost will come down.
- Find a **User** and think about what she or he needs
- Thursday: quick update from each team on how things are progressing
- Before 25 March: schedule individual meeting with each team

benchmarking: technology + users

Lockheed Space Systems current user architecture

Gecko-Inspired ON-OFF Adhesives For Orbital Debris Mitigation



Task Objectives:

1. Develop full capture head using current gecko adhesive and leveraging small-scale two pad gripper prototypes

2. Mock up compliant robotic arm and integrate with capture head for floating object capture demonstration on RoboDome testbed

Infusion Path:

option A: Small Sat Demo (partner with Qinetiq and Aerospace Corp)

option B: ISS experiment or inspection (partner with JSC)

Technical Approach / Expected Accomplishment:

Develop Robotic Capture Head

Mock up compliant robotic arm

Demo floating object capture

Role	Team Members	Section
PI	**Aaron Parness**	347
Co-I	**Mark Cutkosky**	Stanford
Co-I	**George Studor**	JSC
Co-I	**Victor White**	389
Co-I	**Carl Seubert**	344

Critical Milestones	Date
Demo of capture head on stiff mount	**Apr 2013**
Completion of mock-up compliant arm	**Jun 2013**
Demo of floating object capture	**Sep 2013**

Primary Technical Hurdles:

- ***Scaling 2-pad prototypes to full capture head***
- ***Correctly sizing compliance in robotic arm***
- ***Integrating elements for demo***

meet ~~Kevin~~ (Aaron)

https://www-robotics.jpl.nasa.gov/people/Aaron_Parness/

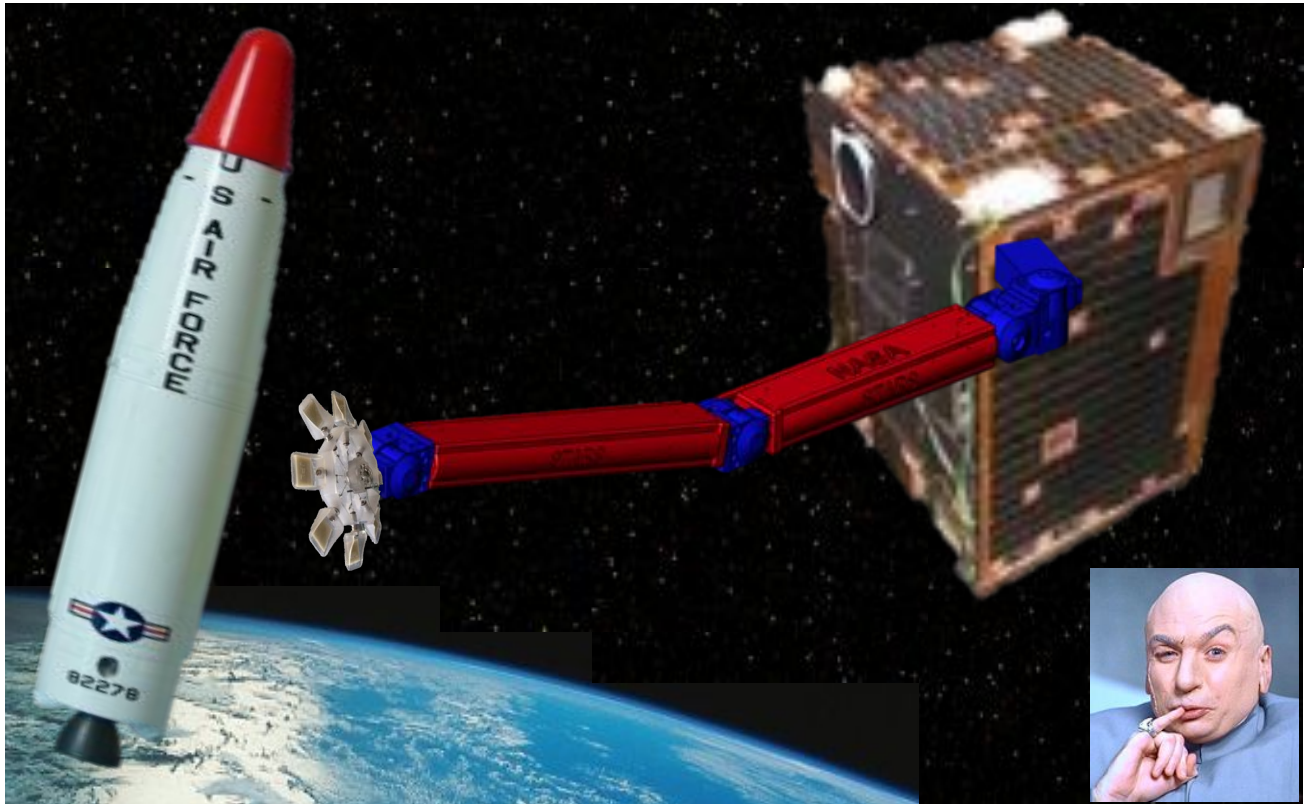
what does Aaron want or need?

Make it work for Aaron

Aaron will be on the ground, controlling a robot in space to acquire dangerous space debris – ideally in way that some components can be recycled.

*Decompose Aaron's requirements. The best way to do this is to **imagine the process he will need to follow** in some detail:*

- ***locate** space junk*
- ***contact** surface*
- ***align** to surface*
- ***attach** to surface*
- ***retrieve** space junk*
- ***store** onboard host satellite*



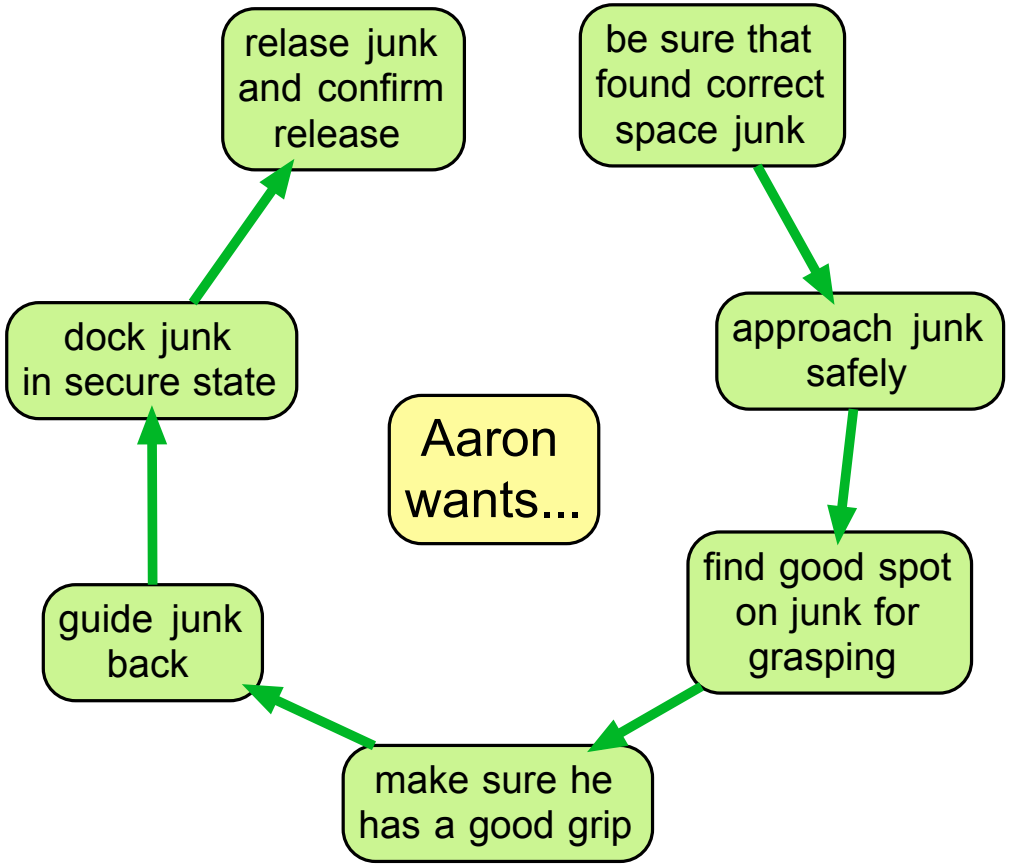
What does Aaron want or need?

Aaron wants...

User-centered:
start with person,
not with stuff!

What does Aaron want or need?

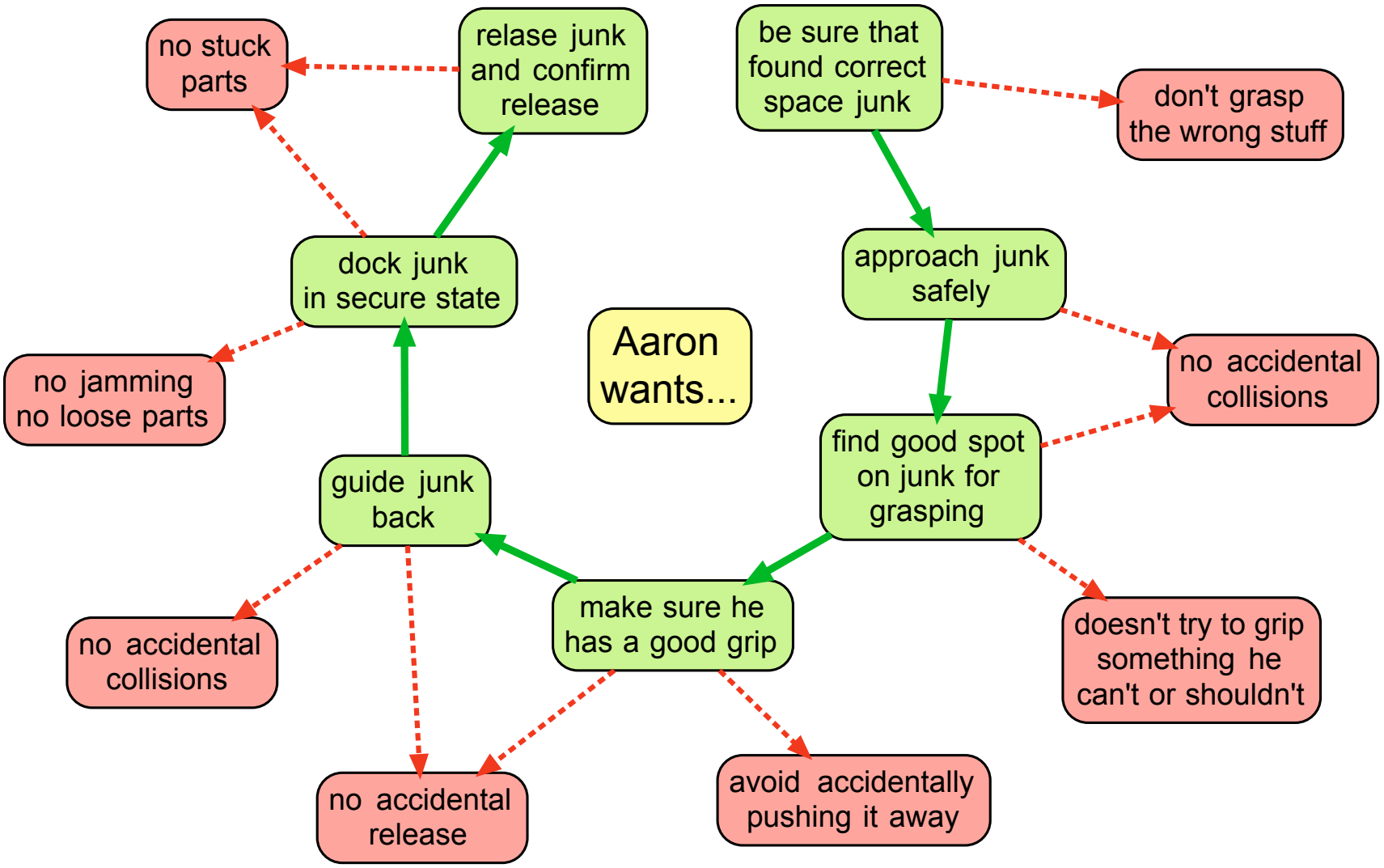
Tasks: ➔ functional requirements



Graph built using VUE: free graphing tool from Tufts University (http://vue.tufts.edu/)

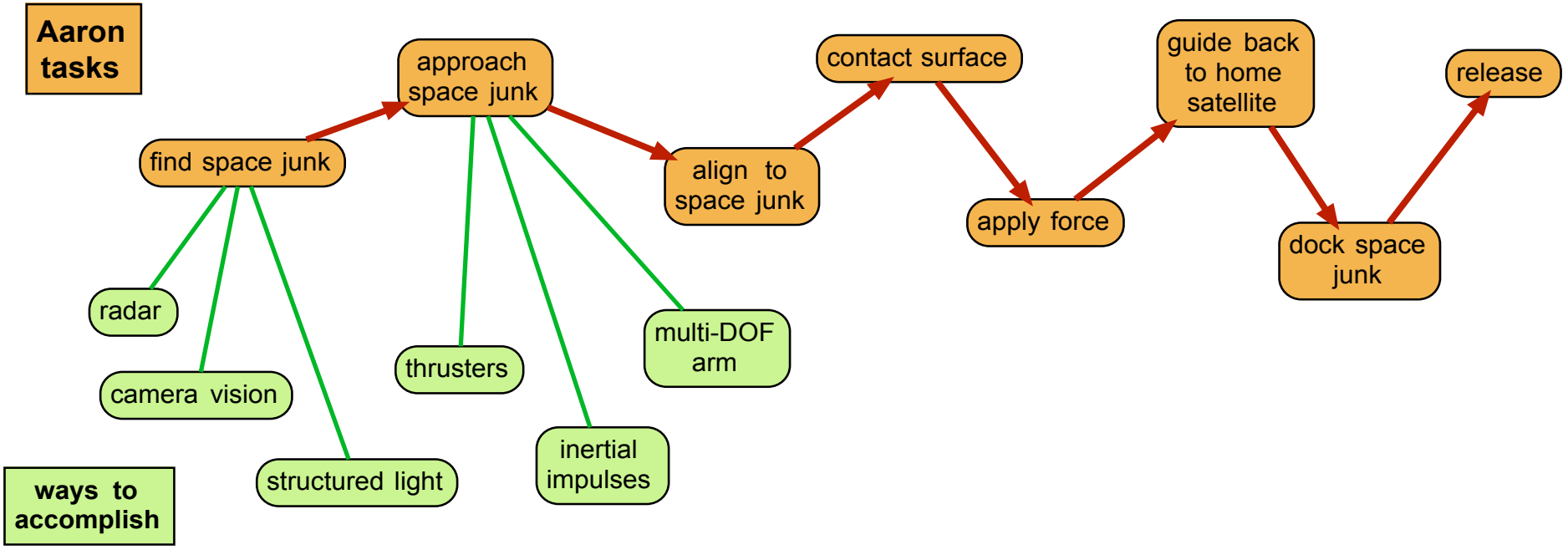
What does Aaron want or need?

Identify failure modes ➔ need for systems or sensing



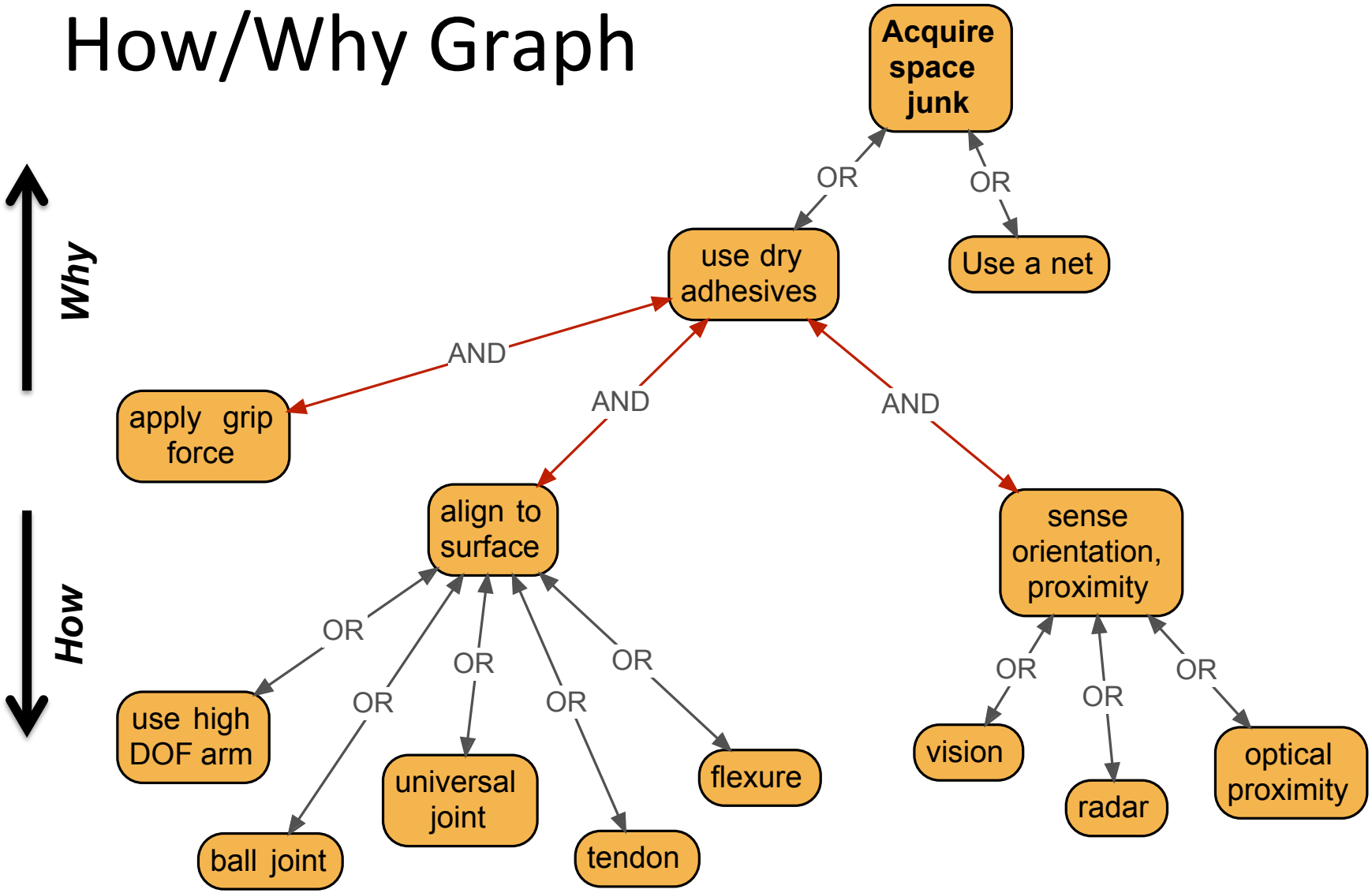
Graph built using VUE: free graphing tool from Tufts University (http://vue.tufts.edu/)

Mapping from **tasks**, or **functions**, to **systems**, or **structures**



Graph built using VUE: free graphing tool from Tufts University (http://vue.tufts.edu/)

How/Why Graph



Graph built using VUE: free graphing tool from Tufts University (http://vue.tufts.edu/)

Once user needs are defined, we pick a "**critical**" one for prototyping…

For now:

- Spend some time with your group articulating user needs (functional) and ways to achieve (systems)
- Draw on large sheets paper and/or use a tool like VUE if you like.
- Meanwhile… Cutkosky starts some individual group meetings
- For Thursday: Each team should provide a short update what they have discovered