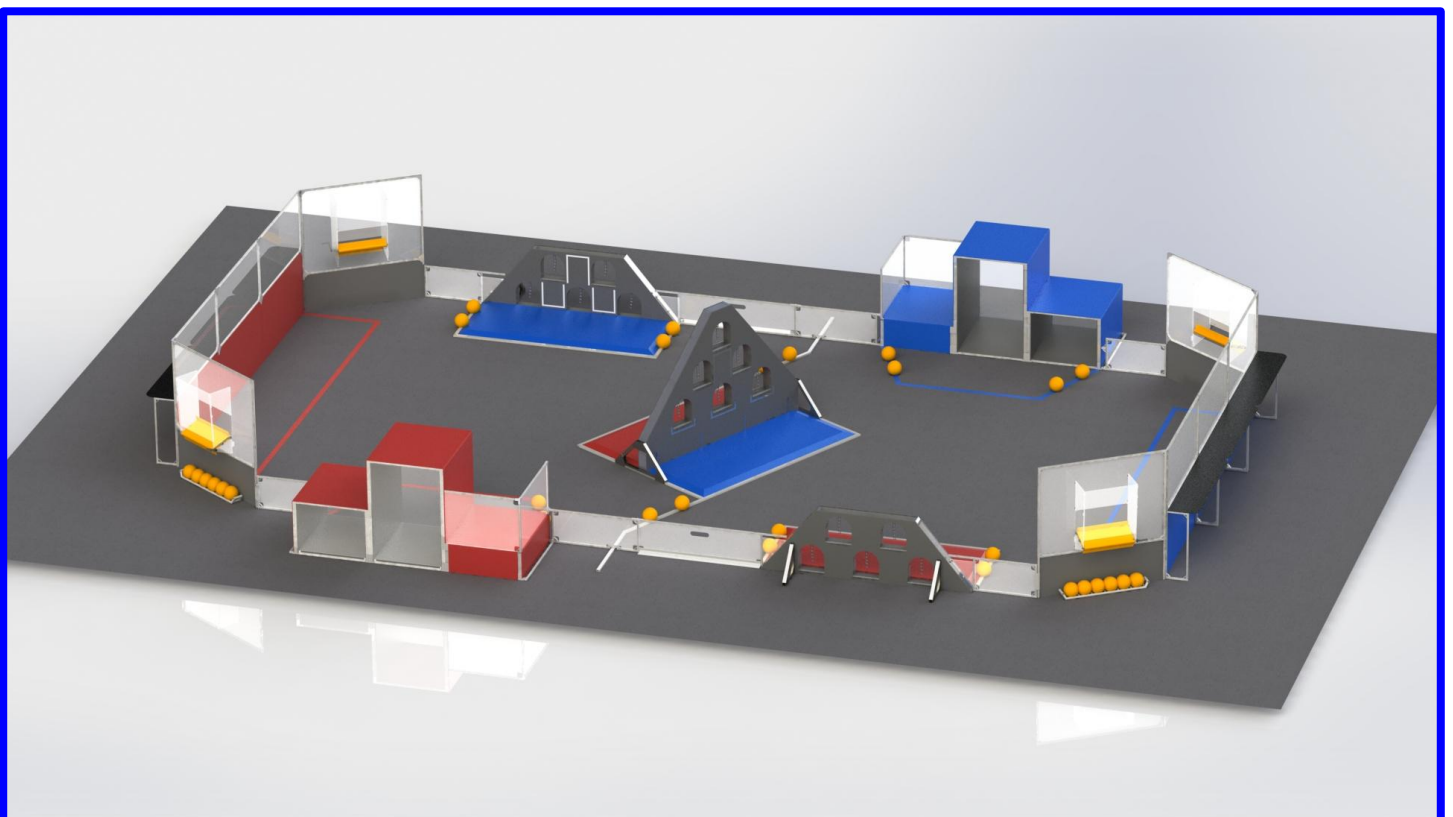
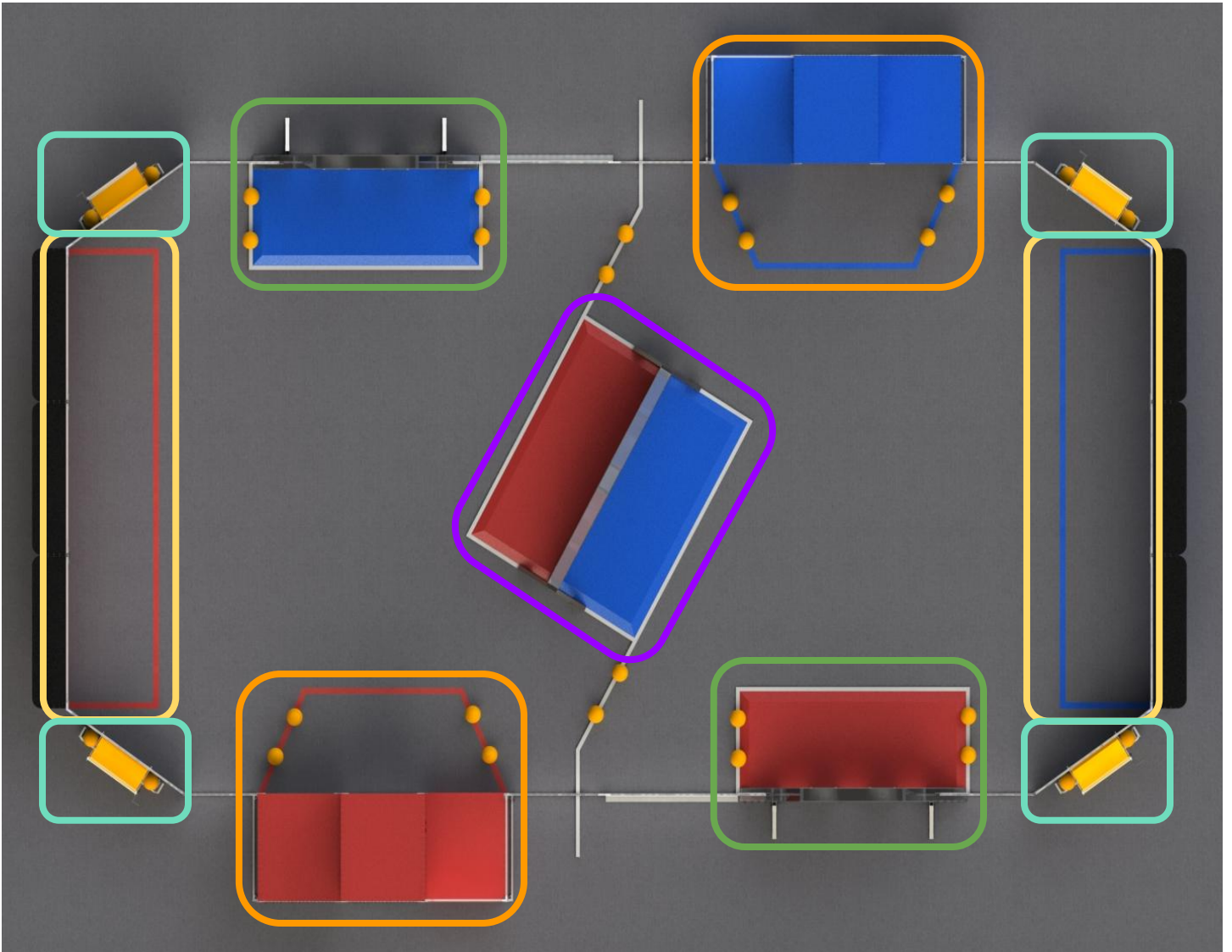




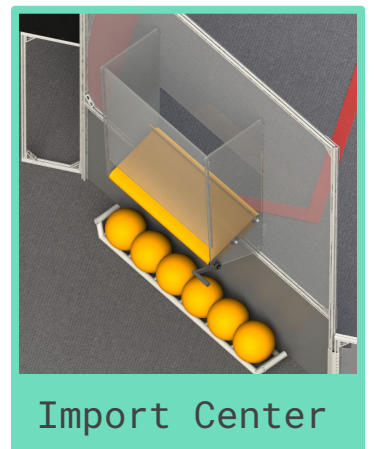
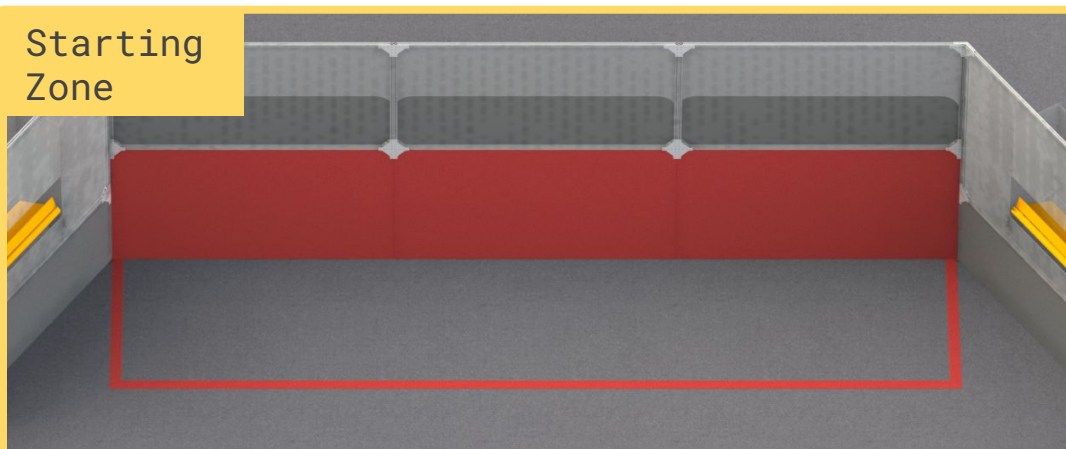
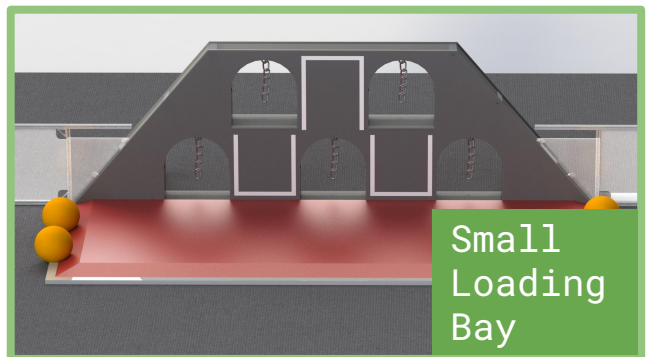
Two rival shipping companies, *Rapid Express Delivery (RED)* and *Best Loaders Universal (BLU)*, are racing to become the largest in the shippers in the world! Both companies have asked for your help to utilize robots to meet their loading bay's demand. You must help to claim Cargo Ports for your Company during the work day, and self-store in the Shipping Site when the day is over. The company that meets the most demand claims the title of the best shipping company in the world!



The Field & Elements

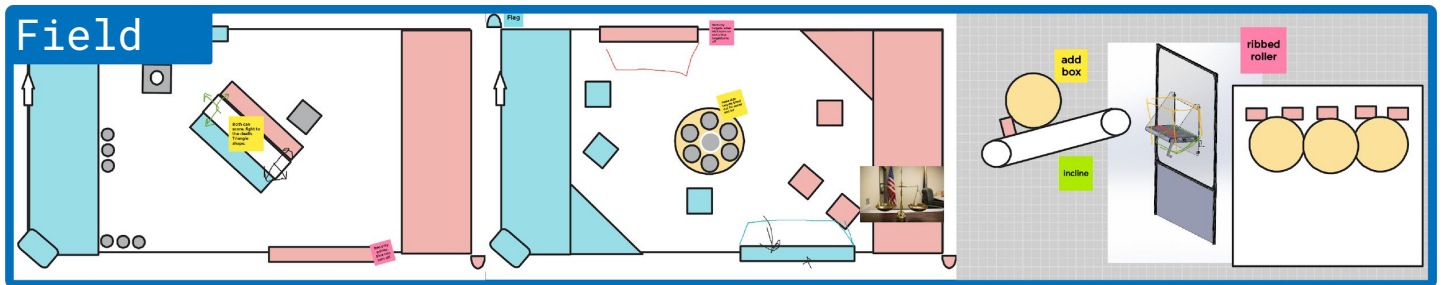


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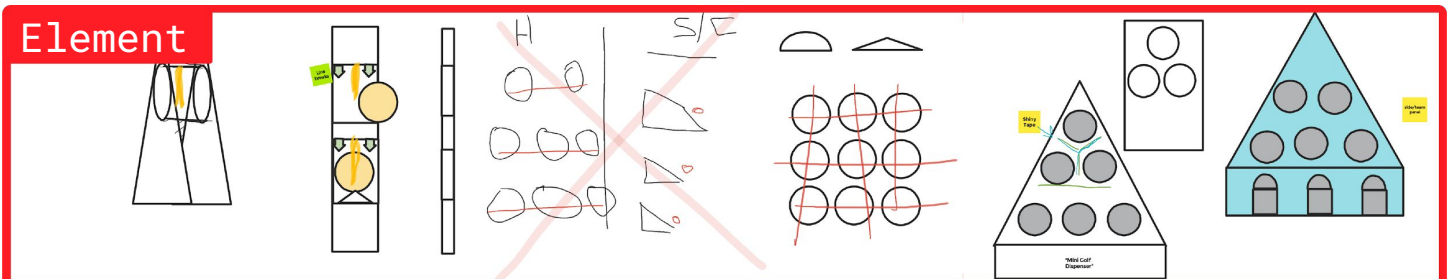


Our Design Process

Getting here was an iterative process. We brainstormed several ideas for elements and endgame – Even something as small as the game piece took multiple discussions to fully figure out. Below are some of our “whiteboards” and notes we took.

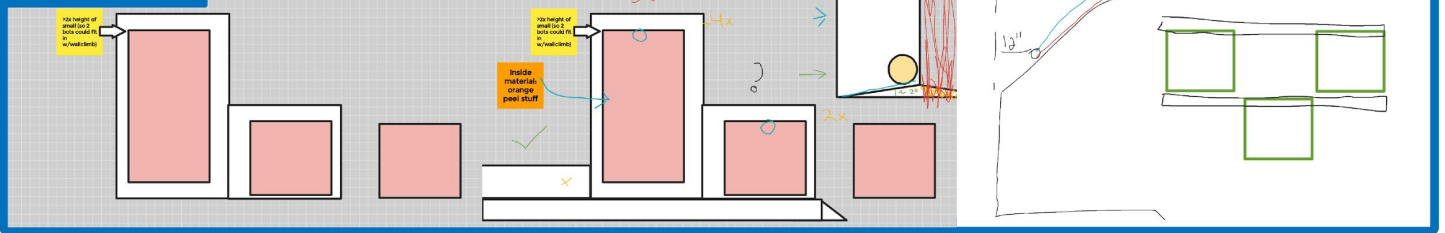


Our design for the field layout has gone through a few iterations. The one pictured on the left resembles the our final product the most, but at one point we were thinking of a carnival theme with the center of the field having a ring toss style field element. Our human player station has stayed relatively consistent. The two main changes were (1) adding a conveyor belt to fit with the theme and (2) increasing the depth of the ‘box’ so Human Players couldn’t toss the Packages onto the field.



At the start, we wanted our field elements to require the use of a shooter or elevator. However, we realized when brainstorming hypothetical alliance compositions that newbie teams would have few doable objectives. This led us to adding the low Cargo Ports in the Small Loading Bay as well as lowering the bottom row of Cargo Ports in the Large Loading Bay to the height of the high Cargo Ports in the Small Loading Bay. To determine scoring, we settled on line break sensors but had talked about the possibility of using an inclinometer attached to the chain as well as having team-colored Packages and color sensors. Additionally, for the ranking point, we initially planned for it to be earned after a set amount of Small Loading Bay points. We changed this to needing all five Small Loading Bay Cargo Ports Possessed to incentivize counter-play (the opposing alliance can deactivate the Ports) and counter-counter-play (an alliance can sit a robot to play defense in the safe zone)

Endgame



Compared to the rest of the design, the Endgame was the most challenging to figure out because we didn't want to follow the classic climb endgame. Our goal was to have an objective with a low entry level, but high skill ceiling that had a collaborative aspect to it. We brainstormed a tug-o-war idea, then added a flag-raising mechanism, then changed to a seesaw concept. Finally, the idea "What if instead of climbing a bar, they climbed a wall?" was proposed. With that, the idea of hollow crates was born. This incentivizes teams to be volume-conscious when designing their Robots (something we hadn't otherwise emphasized). With the interior of the crates being lined with a rubber similar to that used on the HAB in 2019, the 'napkin physics' shows that it is feasible to wall climb! This isn't the only option, and ramp-bots (and surely many other strategies we haven't considered) are also viable.

Scoring

	Score	Score	Σ Times Possessed	
Auto — Line Crossing	3	36		
Small Fulfill — Dozer	3	12	330	390
Small Fulfill — 1st	2	12	180	260
Large Fulfill — 1st	4	20	200	390
Large Fulfill — 2nd	2	14	60	260
Large Fulfill — 3rd	1	10	40	130
Shipping — In zone	1	12		
Shipping — Tall	1	18		
Shipping — Small	1	36		
Shipping — Wall climb	0	0		
Shipping — Crate	0	0		
Points Scored:	170		660	830

	Score	Score	Σ Times Possessed	
Auto — Line Crossing	12	-	-	
Auto — Fulfillment	2x	none	none	
Small Fulfill — Dozer	4	1	1	
Small Fulfill — 1st	6	1	1	
Large Fulfill — 1st	5	1	2	
Large Fulfill — 2nd	7	1	2	
Large Fulfill — 3rd	10	1	2	
EG — Fulfill	1x	none	none	
Shipping — In zone	12	-	-	
Shipping — Tall	18	-	-	
Shipping — Small	36	-	-	
Shipping — Wall climb	36	-	-	
Shipping — Crate	24	-	-	
Points Scored:	200			788

Med playoffs	# Scored	Score	Σ Times Possessed
Auto — Line Crossing	3	36	
Small Fulfill — Dozer	3	12	330
Small Fulfill — 1st	2	12	180
Large Fulfill — 1st	4	20	255
Large Fulfill — 2nd	4	28	200
Large Fulfill — 3rd	2	20	100
Shipping — In zone	1	12	
Shipping — Tall	0	0	
Shipping — Small	1	36	
Shipping — Wall climb	0	0	
Shipping — Crate	1	24	
Points Scored:	200		788

Raw	Score
404	Dozer
651	Low quals
830	Med quals
920	Hi quals / Lo playoffs
988	Med playoffs
1055	Hi playoffs / lo worlds

To determine the weight of the various objectives, we made a spreadsheet and came up with 8 different hypothetical robot compositions. These ranged from an alliance made up of complete newbies to one made up of worlds-levels bots. Using these, we played around with the weights of the passive and instant points until we had a good distribution of scores. Then, we set the weight of auto and end game objectives to be proportional to the an 'average' composition's score. After that, we set the minimum number of points needed for a ranking point to be just above the points earned by In-Zone, Fitting in Small, and Fitting in Large to incentivize Wall Climbs.