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# Strategic Design

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# Design with a purpose

All design has an end goal, what is yours, today?

Thinking outside the box does not fulfil today's purpose

Live within the rules and use them to funnel your design

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# The Kickoff pitfall

*“Welcome to the 2017 FIRST Robotics Competition and this year’s game \_\_\_\_\_!”*

The moment we forget everything we’ve learned

Pause,  
slow down,  
don’t forget your towel\*

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\*Water game hint

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# From a banner, backwards to today

1. Blue Banner
  2. Win 6 matches in the bracket
  3. Pick the best alliance partners (scouting)
  4. Seed number 1
  5. Own the ranking system
  6. Build a robot that can execute the above
  7. Plan/design said robot
  8. Select the right path to head down for the season
  9. Kickoff - learn everything
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**Today's purpose is to  
select the correct path...**

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# The correct path for...

- Your team
  - This year
  - Your build plan
  - Your time
  - Your budget
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# Using the ranking system Meta Game

Stronghold!

Order Sort	Criteria
1 <sup>st</sup>	Ranking Score
2 <sup>nd</sup>	Cumulative sum of AUTO points
3 <sup>rd</sup>	Cumulative sum of scored SCALE and CHALLENGE points
4 <sup>th</sup>	Cumulative sum of High and Low GOAL points from AUTO and TELEOP
5 <sup>th</sup>	Cumulative sum of CROSSED UNDAMAGED DEFENSE points (AUTO and TELEOP)
6 <sup>th</sup>	Random sorting by the FMS

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# Robot Actions Vs Points

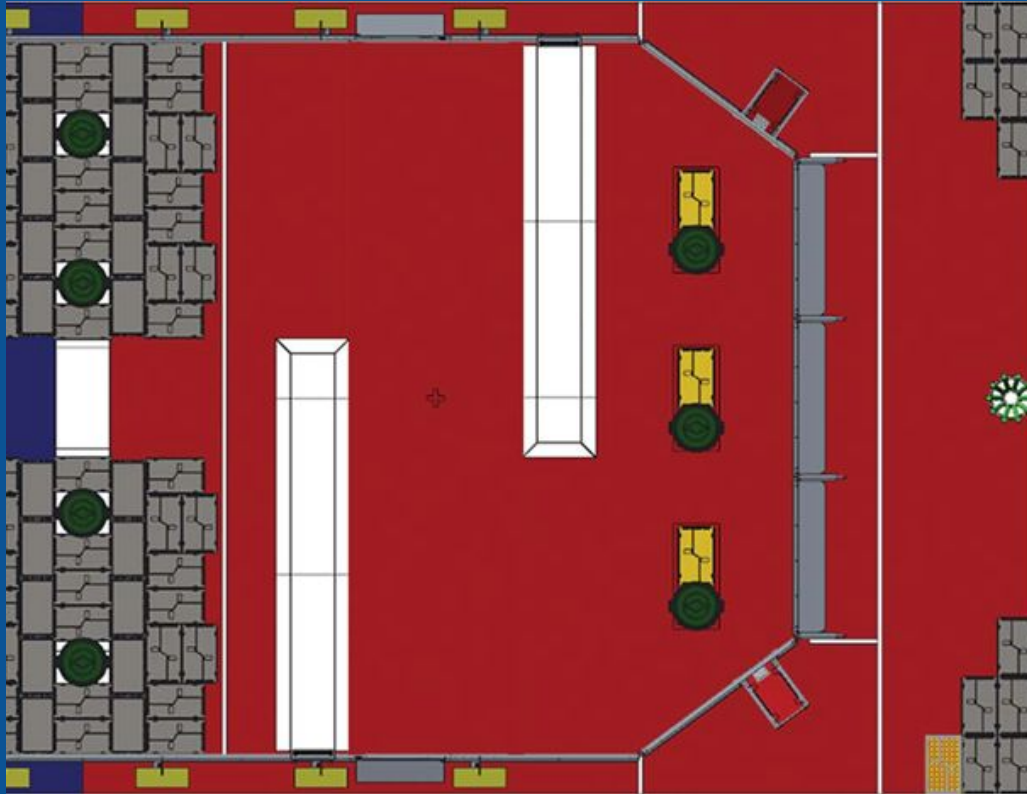
## Velocity Vortex

Scoring Achievement	Autonomous Points	Driver-Controlled Points	End Game Points**	Reference
<b>Beacons Triggered</b> - State of <i>Claim</i> is all lit at end of period	30 / <i>Claim</i> + Bonus <i>Particle</i> awarded (up to 2)	10 / <i>Claim</i>		1.5.2.1 and 1.5.4.2
<b>Cap Ball</b> - On <i>Playing Field</i> - Off <i>Playing Field</i> below crossbar - Raised above crossbar - Capped <i>Center Vortex</i>	5 - - -		10 20 40	1.5.2.2 and 1.5.4.1a 1.5.4.1b 1.5.4.2c
<b>Particle</b> - Scored in <i>Center Vortex</i> - Scored in <i>Corner Vortex</i>	15* 5*		5* 1*	1.5.2.3 and 1.5.3.1
<b>Robot Parked</b> - On <i>Center Vortex Base</i> - Completely On <i>Center Vortex Base</i> - On <i>Corner Vortex Ramp</i> - Completely On <i>Corner Vortex Ramp</i>	5 10 5 10		- - - -	1.5.2.4a 1.5.2.4b 1.5.2.4c 1.5.2.4d

- Look for tasks or actions that can score points throughout the match
- How many points are available per sector
- Is a sector point capped?



# Map of Points on the Field



## Recycle Rush

- The value of field locations can determine priority



This style analysis showed how important the center RCs were

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# Cycles Vs. 1 Time Events

FRC 2013 Ultimate Ascent

Cycles: 4 disks (rules limit) @ 3pts/disk = 12pts/cycle

End Game: 30pts (high climb), or 50pts with disks too

Crossover is 4.167 cycles

Robot would need to drive at least 400ft/match

Cycle time needs to be less than 27 sec/cycle

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# Setting a Priority List

Select the best use of your team's time and energies for the next 16 weeks

Helps with decision making later in the year

Emotionlessly communicates order of operation/importance

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# Robot Effort Points

This is a way of quantifying the difficulty of the robot build

Every team has a different number of points

If you have 30 points:

$$10/10 + 10/10 + 10/10 \quad \text{Vs} \quad 5/10 \times 6$$

Cyber Cards are at 22-25pts

Veronica was about 30pts

A 'standard' sub-system is 10pts

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# Example Priority List

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## Options along the path

- Prime objective or role player?
- Design as one or staggered evolution/addition?
- Auto, Teleop, or End game?
- Driver focused robot or process based?

## Constraints and Forcing Functions

- Resources and build plan
  - Manpower and throughput
  - Memory, past success, ranking system, commonality
  - Time for drive practice
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