Welcome to Team 301 SDR SAR First Review Session!

Marius Urdareanu - Hardware/Power Analyst
Grant Steans - Software Engineer
Tyree Lewis - Simulation Analyst and Data Collection
Nathaniel Henry - Front-to-Back End Integration

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Sponsor

Northrop Grumman will be sponsoring and providing us with the guidance and resources needed to accomplish the goals for this project.

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Team Roles

Speaker: Grant Steans

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Hardware/Power Analyst

Responsible for RF Front End design to the SDR, as well as power management of the overall project. Ensures that the RF front-end receives and transmits signals efficiently, and the overall performance of the project is optimized for power consumption and flow.

Speaker: Marius Urdareanu

Software Engineer

Responsible for designing the SDR back end behavior, including programmatic responses to receiving and transmission of signals. Responsible for providing pseudocode for design, as well as implementing and debugging software components of the project.

Speaker: Grant Steans

Simulation Analyst and Data Collection

Responsible for utilizing MATLAB/Simulink software to effectively model the project specifications and establishes a baseline of theoretical data for real world implementation. Focuses on data collection and analysis for improving project design and specification.

Speaker: Tyree Lewis

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Front-to-Back End Integration

Responsible for ensuring communication between the front end and back end components of the project are interconnected and communicating between each other in efficient and expected ways.

Speaker: Nathaniel Henry

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Scope and Needs

Speaker: Nathaniel Henry

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Customer Needs - Requirements

- The minimum requirement for the redesign of the radar system is to have the current design be revamped with software-defined radios to reduce noise from the SAR horns

- Must be able to identify metal objects at a range of 20ft

Speaker: Nathaniel Henry

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Customer Needs - Constraints

- Old design must be modified to fit the new SDRs

- These radios must be programmable and full-duplex capable

- Radios must operate on 5GHz bandwidth

- Limit of $5000 budget for the whole project

- Radios must have an individual cost less than $1200

- Two semesters of development, testing, and finalizing time

Speaker: Nathaniel Henry

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Trade-offs

Device	Cost	Software	Frequency Range	Duplex	I/O Channels	Bandwidth (Real-time)
USRP B210	$1,216.00	GNU Radio, Simulink	70 MHz - 6 GHz	Full	2/2	56 MHz (61.44MS/s)
USRP B200	$ 745.00	GNU Radio, Simulink	70 MHz - 6 GHz	Full	1/1	56 MHz (61.44MS/s)
USRP 2900	$1,031.00	LabVIEW	70 MHz - 6 GHz	Full	1/1	56 MHz (61.44MS/s)
USRP N200	$1,673.00	LabVIEW, GNU Radio, Simulink	DC - 6 GHz	Full	2/2	Up to 50MS/s Streaming

- Other SDRs were considered, such as those from AirSpy, HackRF, and bladeRF.
  - Not included in the trade-off chart because they did not meet minimum requirements.
- The team has decided that because of its cheaper cost, the B200 will be chosen as up to five could be bought for the cost of three B210s.

Speaker: Marius Urdareanu

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Budget Report

	COST ($)	UNITS	TOTAL ($)
VCO	350	2	700
B200	830	2	1660
MIXER	50	3	150
LO AMP	100	2	200
SPLITTER	70	2	140
		SUBTOTAL	2850
		EST TAX	0.07
		TOTAL	3049.5

Speaker: Marius Urdareanu

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Project Scope

To recap, the team will:

- Refine the existing SAR to use SDRs to resolve the problems that occured in the previous iteration of the project.

- Ensure that metal object can be identified from at least 20ft.

Speaker: Nathaniel Henry
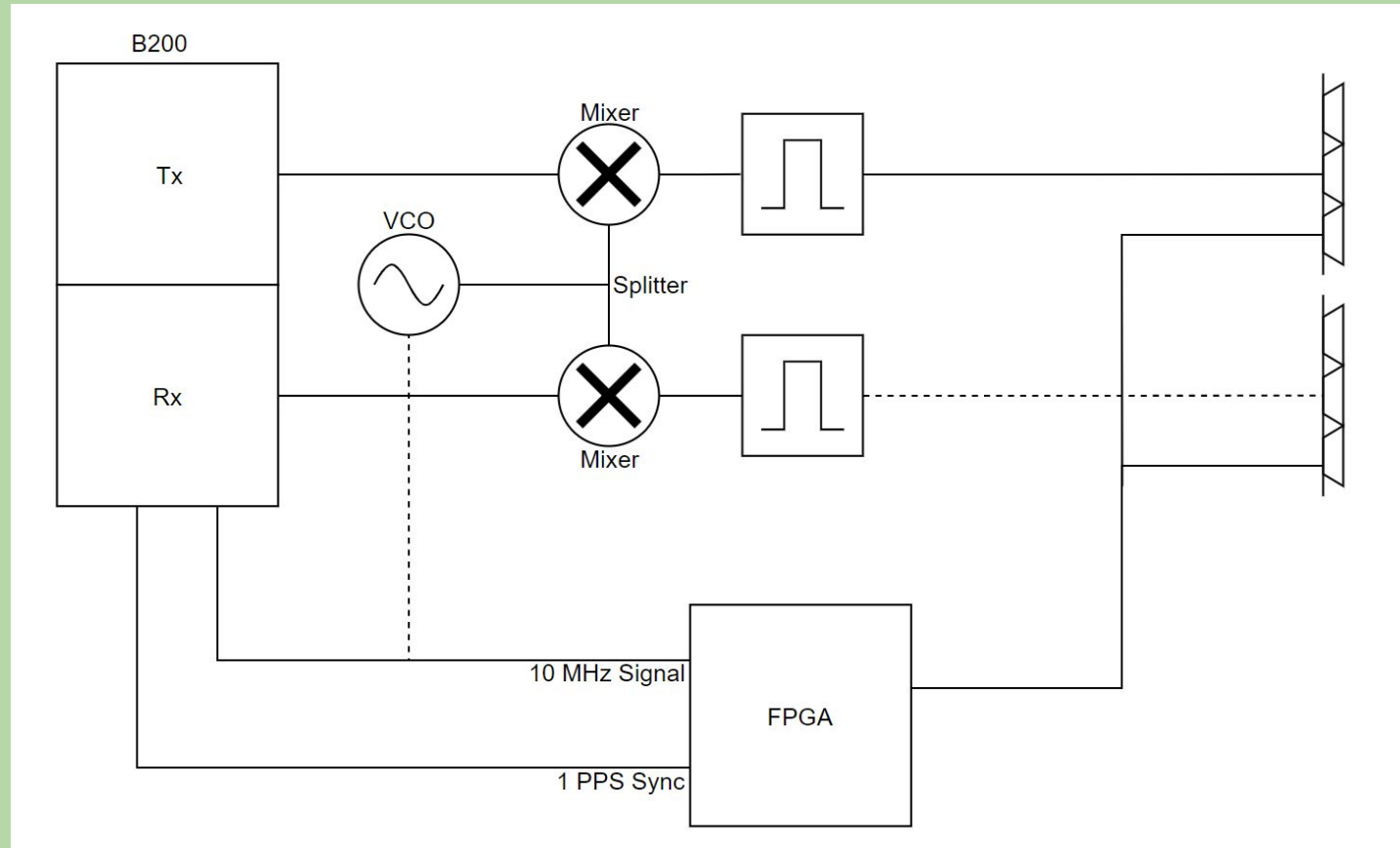
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Project Scope

Assumptions:

While redesign will be necessary, the current SAR will still incorporate many features from previous work. The changes made will not require the SAR to be rebuilt from scratch.

Speaker: Nathaniel Henry

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Market

The primary market consists of security companies, such as security within government offices, airports, and train stations.

The secondary market will be any other buildings or events that require security checkpoints for entry.
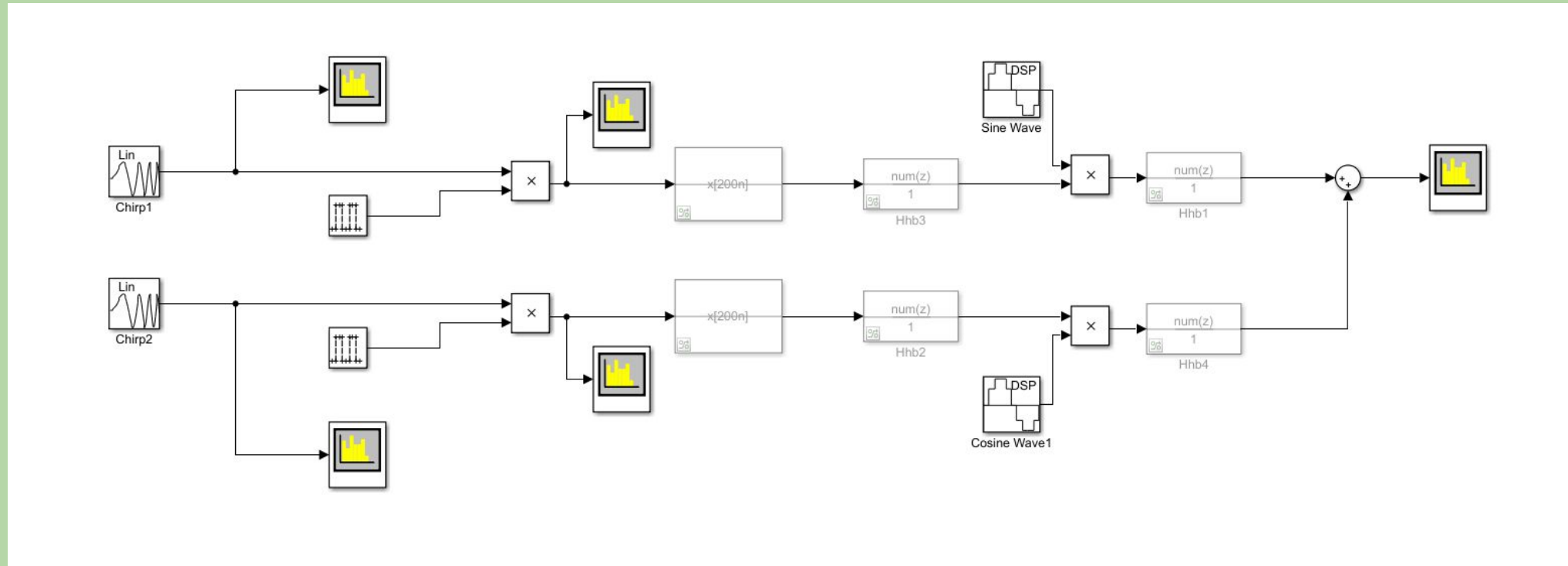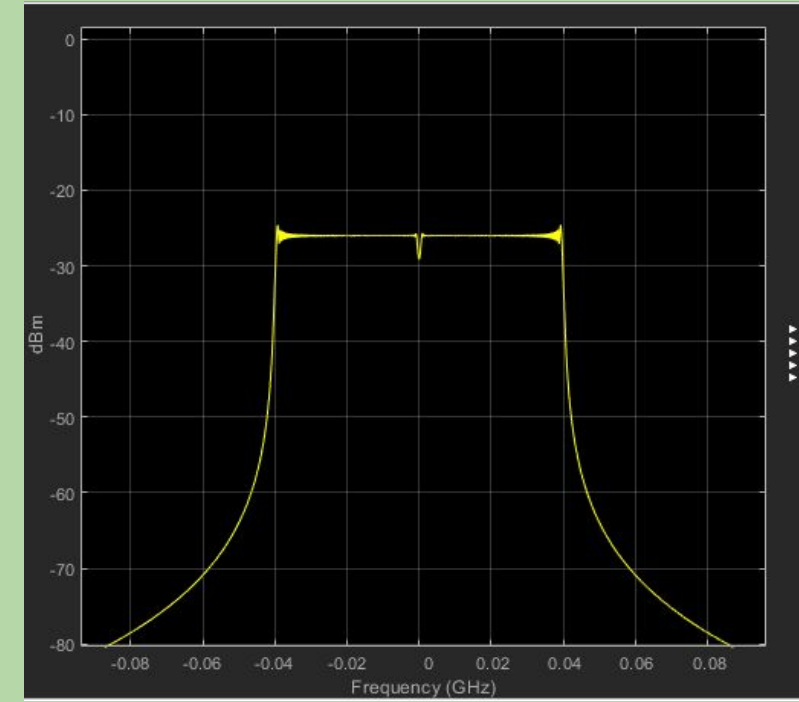
Speaker: Grant Steans

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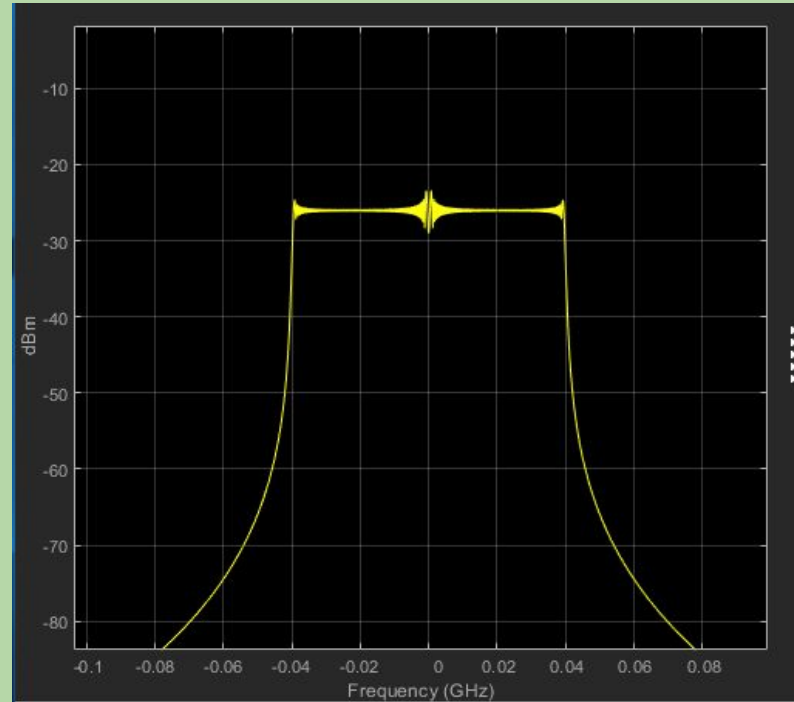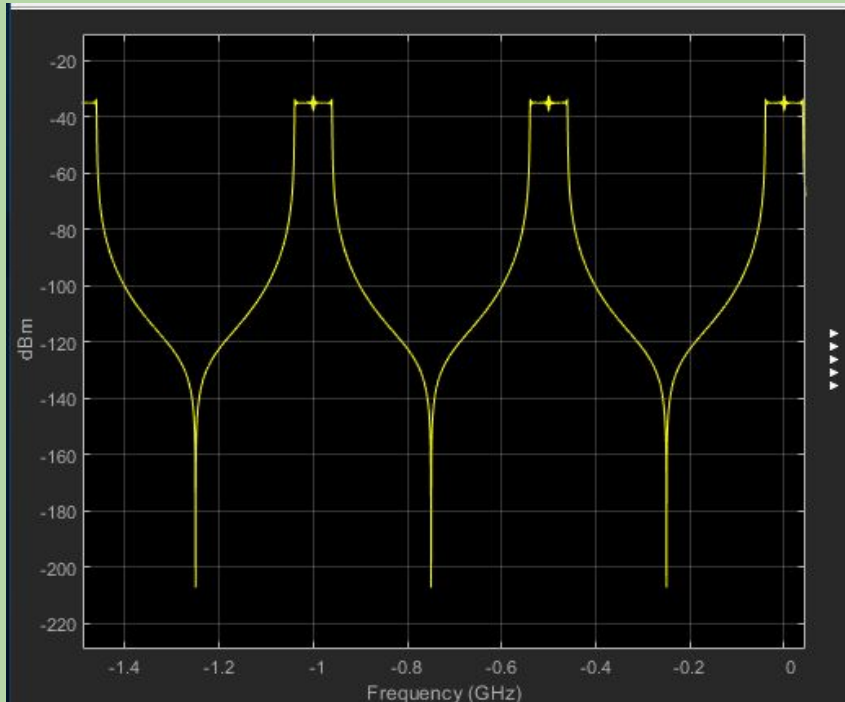
Top-Level Diagram

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Simulink Data - LFM Signal Generation

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Simulink Data - Spectrum Analyzer

Speaker: Nathaniel Henry

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Work Breakdown

		Name	Duration	Start	Finish	Predecessors	Resources
1		⊟Evaluation	85.38days?	09/23/2018	12/07/2018		
2		Peer Evaluation 1	46days?	09/25/2018	10/11/2018		Whole Team
3		Peer Evaluation 1 Submission	1day?	10/11/2018	10/11/2018	2	Whole Team
4		Peer Evaluation 2	64.13days?	10/12/2018	11/02/2018		Whole Team
5		Peer Evaluation 2 Submission	1.13days?	12/06/2018	12/07/2018		Whole Team
6		Sponsor Evaluation	90days?	09/23/2018	10/23/2018		Whole Team
7		Sponsor Evaluation Submission	1day?	12/07/2018	12/07/2018		Whole Team
8		Faculty Advisor Evaluation	90days?	09/23/2018	10/23/2018		Whole Team
9		Faculty Advisor Evaluation Submission	1day?	12/07/2018	12/07/2018		Whole Team
10		⊟Initiating	25.75days?	09/01/2018	09/23/2018		
11		⊟Gather Project Information	19.13days	09/01/2018	09/20/2018		
12		Identify Goals and Objectives	1day?	09/01/2018	09/01/2018		Whole Team
13		Research Previous Experience	1day?	09/01/2018	09/02/2018	12	Whole Team
14		Meet with advisor.	1day?	09/17/2018	09/18/2018	13	Whole Team
15		⊟Develop Preliminary Project Scope Statement	1day?	09/23/2018	09/23/2018	11	
16		Document Project Costs and Benefits	1day?	09/23/2018	09/23/2018		Whole Team
17		Develop High Level Work Breakdown Structure	0.5day?	09/23/2018	09/23/2018		Whole Team
18		Prepare Customer Needs Statement	0.5day	09/23/2018	09/23/2018		Whole Team
19		⊟Planning	4.5days?	09/23/2018	09/27/2018		
20		⊟Develop Project Schedule	4.5days?	09/23/2018	09/27/2018		
21		Build Work Breakdown Structure	1day?	09/23/2018	09/23/2018		Whole Team
22		Complete Customer Needs Statement	1day	09/24/2018	09/24/2018	21	Whole Team
23		Develop Resource Plans	7.13days?	09/24/2018	09/27/2018	22	Whole Team
24		Prepare Project Estimate Budget	1day?	09/26/2018	09/26/2018		Project Manager
25		⊟Research	3.88days?	09/24/2018	09/27/2018		
26		Determine the best SDRs to purchase	3days?	09/24/2018	09/26/2018		Whole Team
27		Research Digital Beam Forming	0.5day?	09/26/2018	09/26/2018		Whole Team
28		Research LSM Waveforms	0.5day?	09/27/2018	09/27/2018		Whole Team
29		Research Pulse Compression	0.5day?	09/27/2018	09/27/2018		Whole Team
30		⊟Review Number 1 Presentation	14.13days?	09/27/2018	10/10/2018	10,19,25	
31		⊟Set Up PowerPoint Presentation	9days?	09/27/2018	10/05/2018		
32		Team and Project Introduction	7.88days?	09/27/2018	10/04/2018		Marius Urdareanu
33		MATLAB Simulation Old and New Modifications	7.88days	09/27/2018	10/04/2018		Tyree Lewis
34		Software Needed for Completion of Tasks	7.88days?	09/27/2018	10/04/2018		Grant Steans
35		Selections for Radio and Best Option	7.88days?	09/27/2018	10/04/2018		Nathaniel Henry
36		Submit VDR1	1.13days?	10/04/2018	10/05/2018	32,33,34,35	Marius Urdareanu

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Gantt Chart
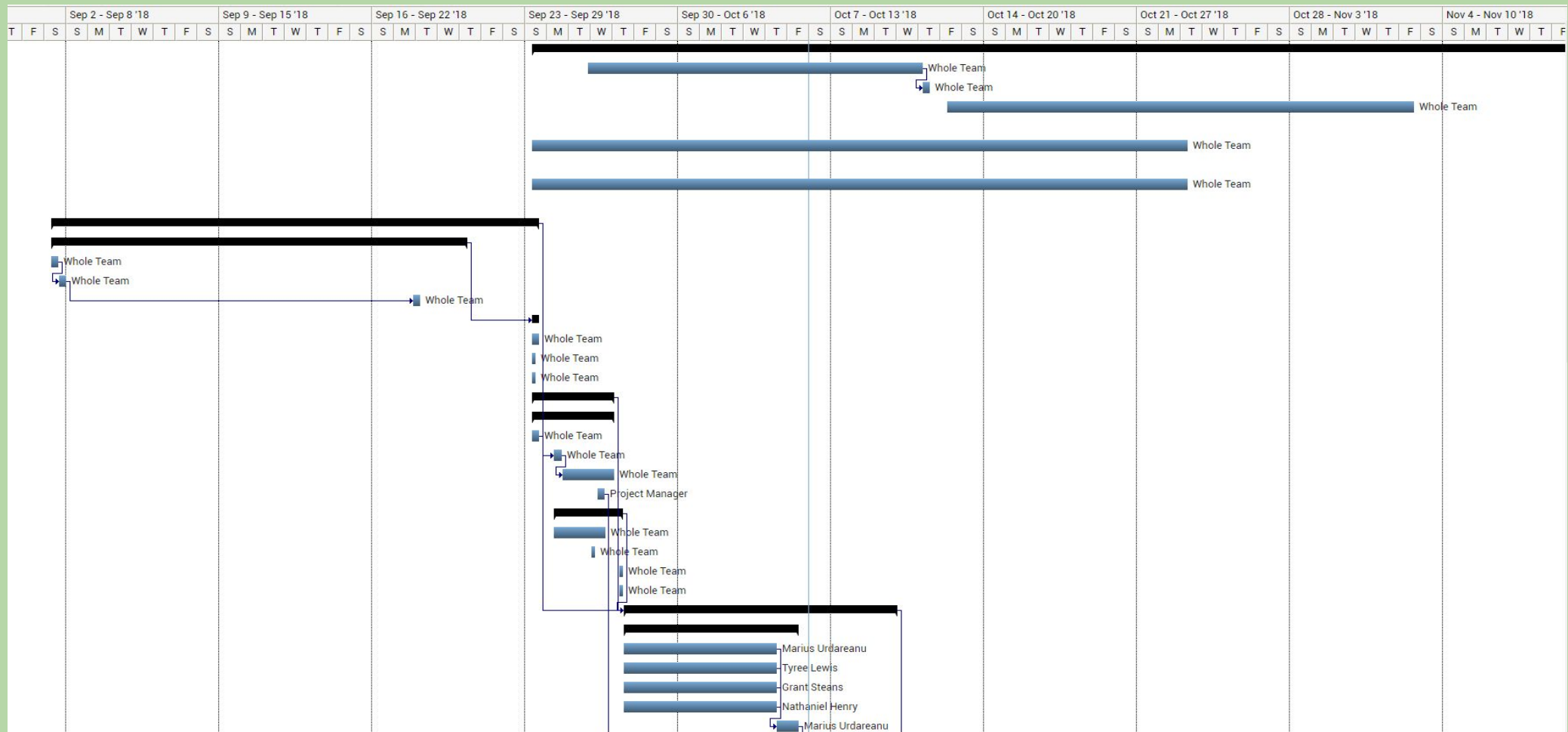
Speaker: Marius Urdareanu

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Conclusion

Our goals by the end of this semester include purchasing the SDRs for the project and planning the integration of the radios into the overall system. Simple tests to verify the performance of the radios will be performed.

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Any Questions?

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