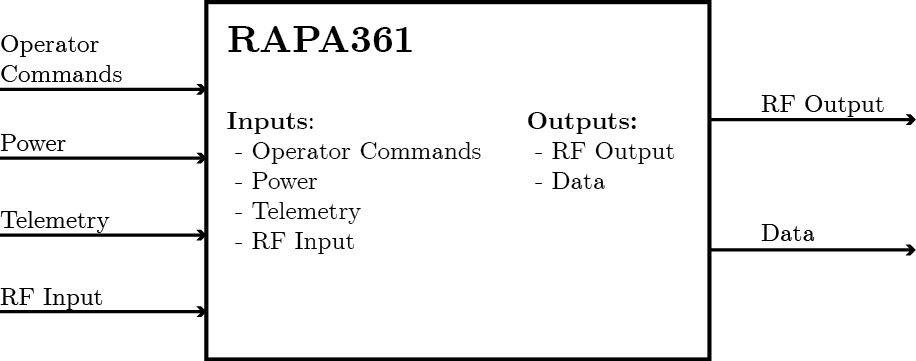
**Phase Factor – Functional Decomposition**

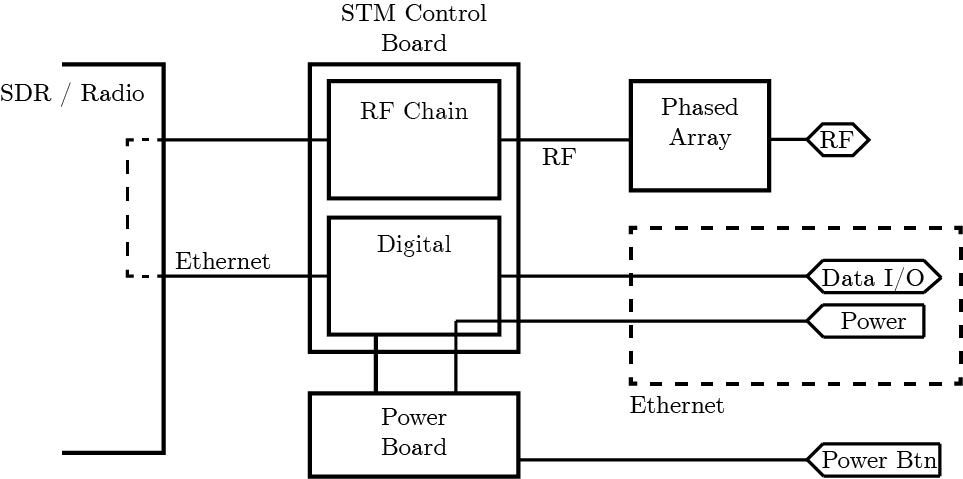
**ECEN 4620**

**FD0**



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| **Module** | Radio Agnostic Phased Array |
| **Inputs** | * Operator Commands – On/Off, modes of operation, data to be sent to drone * Power – Power over Ethernet or from external batteries * Telemetry – Information on the location of the drone * RF Input – Received RF input from the drone |
| **Outputs** | * RF Output – generic RF data sent to drone * Data – Interpreted data from drone to be sent to user. Also includes system status information |
| **Functionality** | Radio agnostic phased array designed to interface with one or more mobile UAVs. It serves as a data pipe from the user to a generic user provided radio, and connects to the UAV via the phased array system. It can be switched from power over Ethernet to power from external batteries, depending on the application. |

**FD1**



*NOTE: The system operates in half-duplex, so inputs and outputs have to be separated in modes of operation. All digital and RF signals represented above are bi-directional.*

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| **Module** | Phased Array |
| **Inputs** | *Transmit Mode:* Phase and amplitude adjusted RF signal from the radio  *Receive Mode:* RF signal from the UAV |
| **Outputs** | *Transmit Mode:* RF signal sent to the UAV  *Receive Mode:* Received RF signal to RF adjustment chain and radio |
| **Functionality** | The phased array is an antenna. It will either send or receive a RF signal directionally, depending on how the phase shifters and attenuators are set in the RF chain. |

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| **Module** | RF Chain |
| **Inputs** | *Transmit Mode:* Raw RF information from Radio  *Receive Mode:* Received signal from the phased array and UAV |
| **Outputs** | *Transmit Mode:* Phase/amplitude adjusted signal for the array and UAV  *Receive Mode:* Reconstructed signal sent to SDR/Radio |
| **Functionality** | The RF Chain is what, in concert with the phased array elements, allows for the RF signal to be steered. The RF Chain is responsible for doing phase adjustment and amplitude attenuation. |

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| **Module** | Digital |
| **Inputs** | Power will be passed to this system (via Ethernet)  *Transmit Mode:* Ethernet data from the user, containing information to send to UAV  *Receive Mode:* Decoded information from the SDR and UAV |
| **Outputs** | The power received from the Ethernet will be passed to the power board  *Transmit Mode:* Set the RF chain to send the signal in the correct direction, and push information to the SDR/Radio  *Receive Mode:* Make sure the RF chain is directed correctly to receive, and push received information to the user |
| **Functionality** | The digital board is the brains of the entire system. It is responsible for handling pointing/tracking using the RF chain, as well as interpreting incoming and outgoing packets, and pushing them to the correct places. It also handles any inputs from the user for system control, not related to the RF system. |

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| **Module** | SDR/Radio |
| **Inputs** | *Transmit Mode:* Ethernet data from the Digital board to be sent to the UAV  *Receive Mode:* RF signal from the UAV to the system and user |
| **Outputs** | *Transmit Mode:* Interpreted digital signal converted into RF signal for transmission to UAV  *Receive Mode:* The digital signal decoded from the RF input and phased array |
| **Functionality** | The SDR (software defined radio) is capable of translating digital commands into RF signals, and vice versa. This is going to be provided by the user, and the rest of the system should not be dependent on the inner workings of the radio. We will likely be using a radio from XetaWave for proof of concept. |

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| **Module** | Power Board |
| **Inputs** | Power from the STM control board or directly from an external source. |
| **Outputs** | Power rails required by the rest of the system |
| **Functionality** | This board is intended to take in the raw power given to us over the Ethernet connection or directly from an external source, and clean it up and convert it as necessary for the rest of our systems. |