

# LOW-EFFORT GNURADIO-REDHAWK INTEGRATION

Thomas Goodwin  
Geon Technologies, LLC  
**geontech.com**

# SPECIAL THANKS

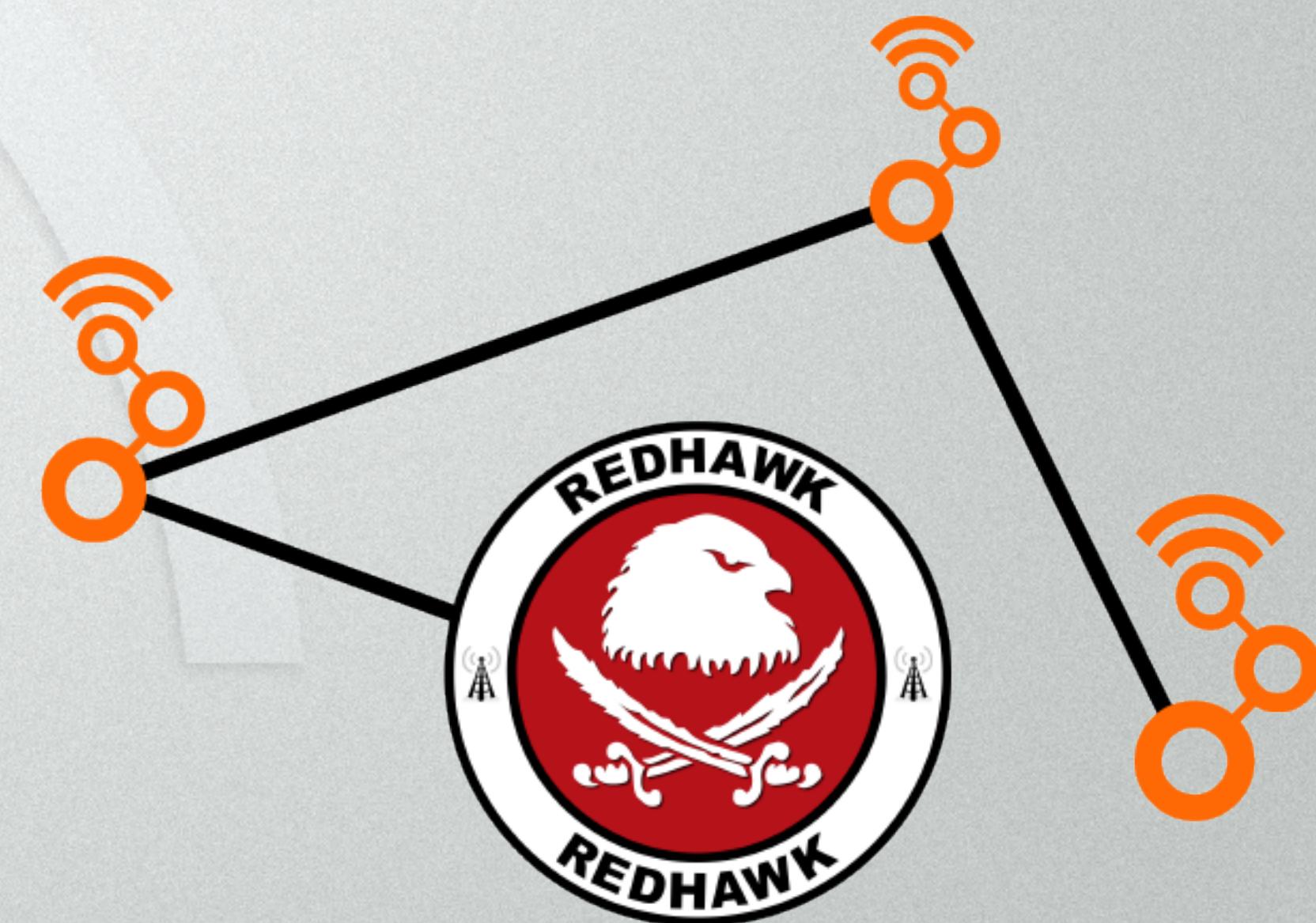
Drew Cormier  
Chris Conover  
*Geon Technologies, LLC*

Johnathan Corgan  
*Corgan Labs*

# OVERVIEW OF TOPICS

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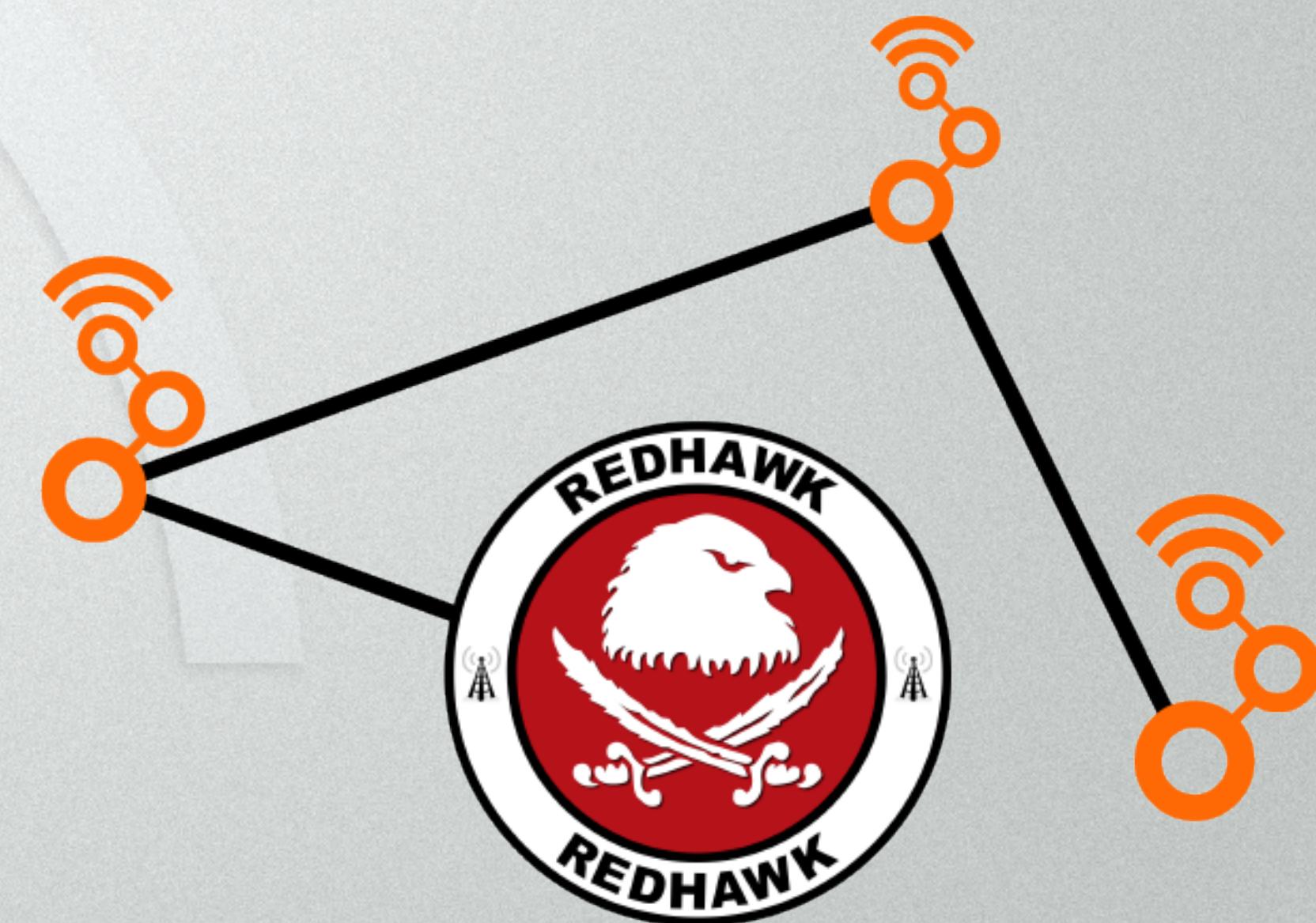
- What is REDHAWK?



**GNU Radio + REDHAWK**

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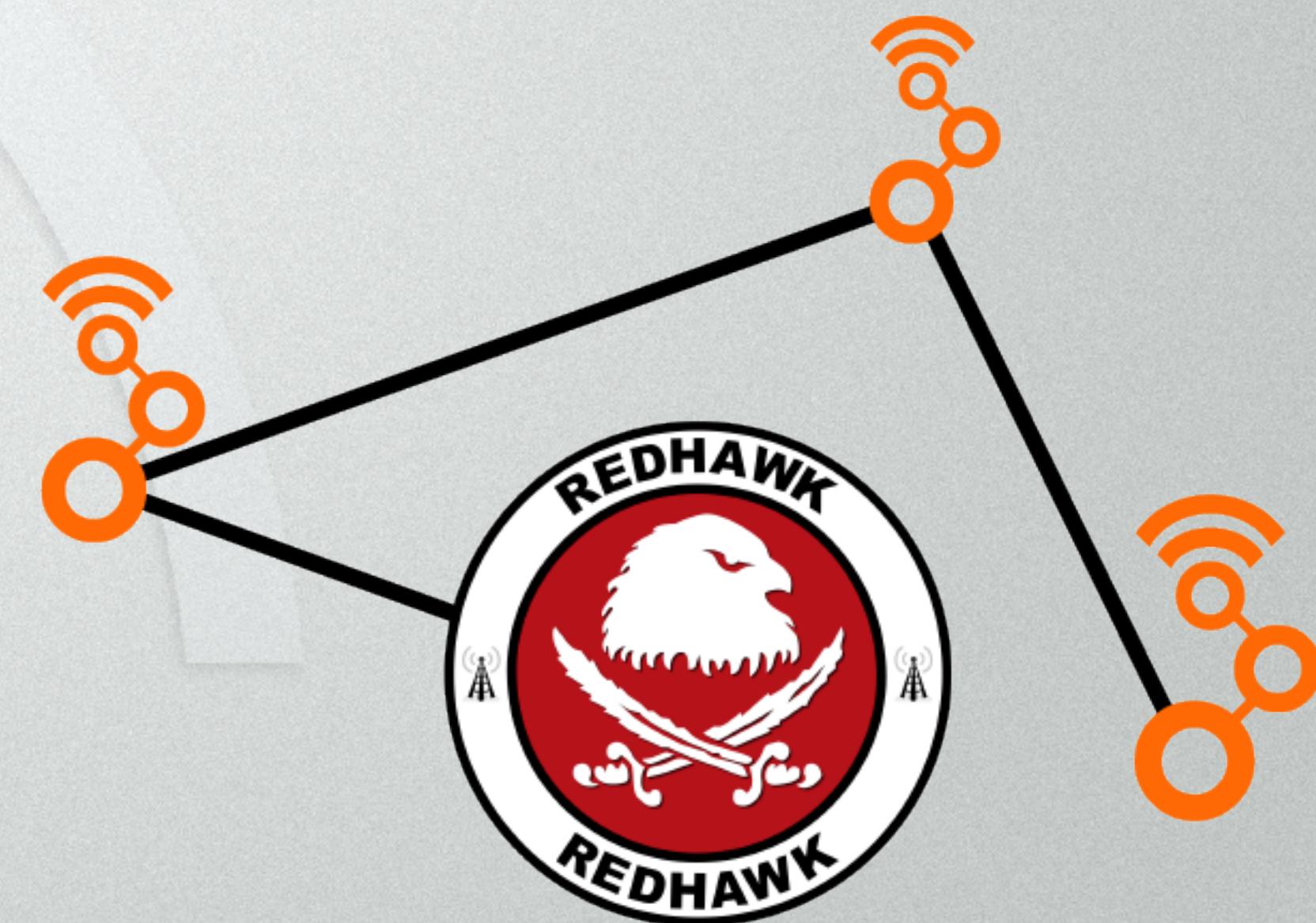
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- Why integrate with REDHAWK?



**GNU Radio + REDHAWK**

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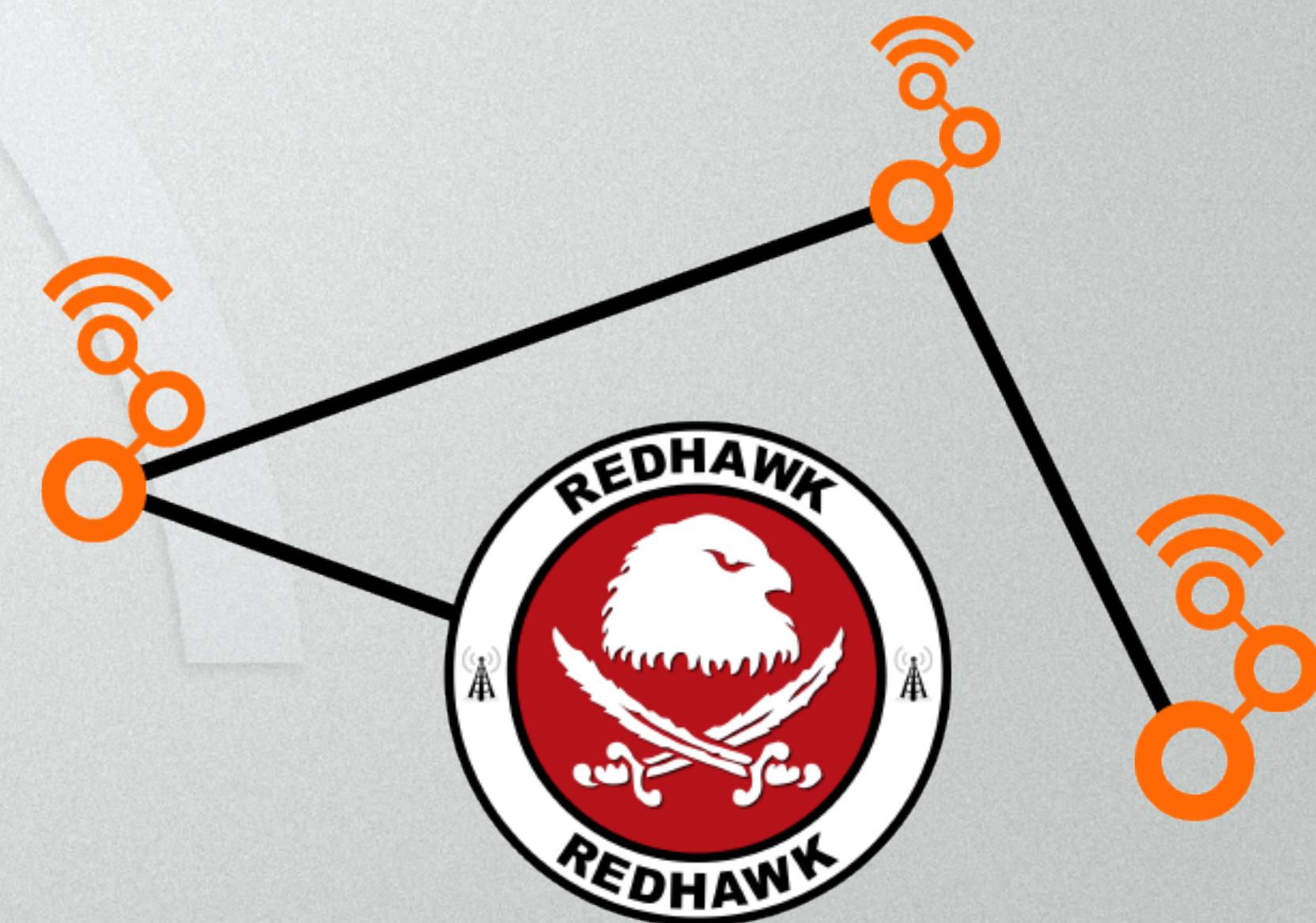
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**GNU Radio + REDHAWK**

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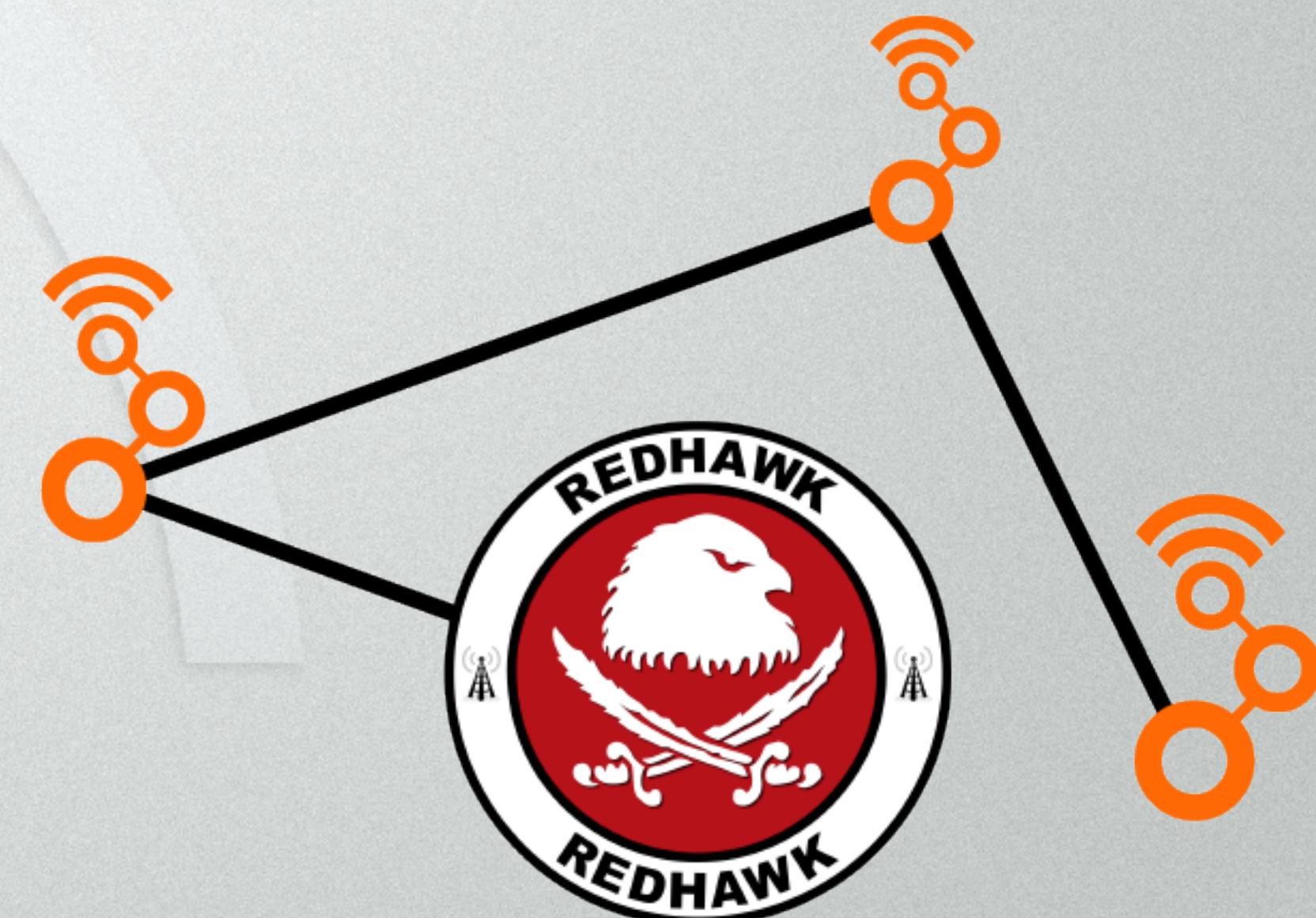
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- Flow Graph Converter



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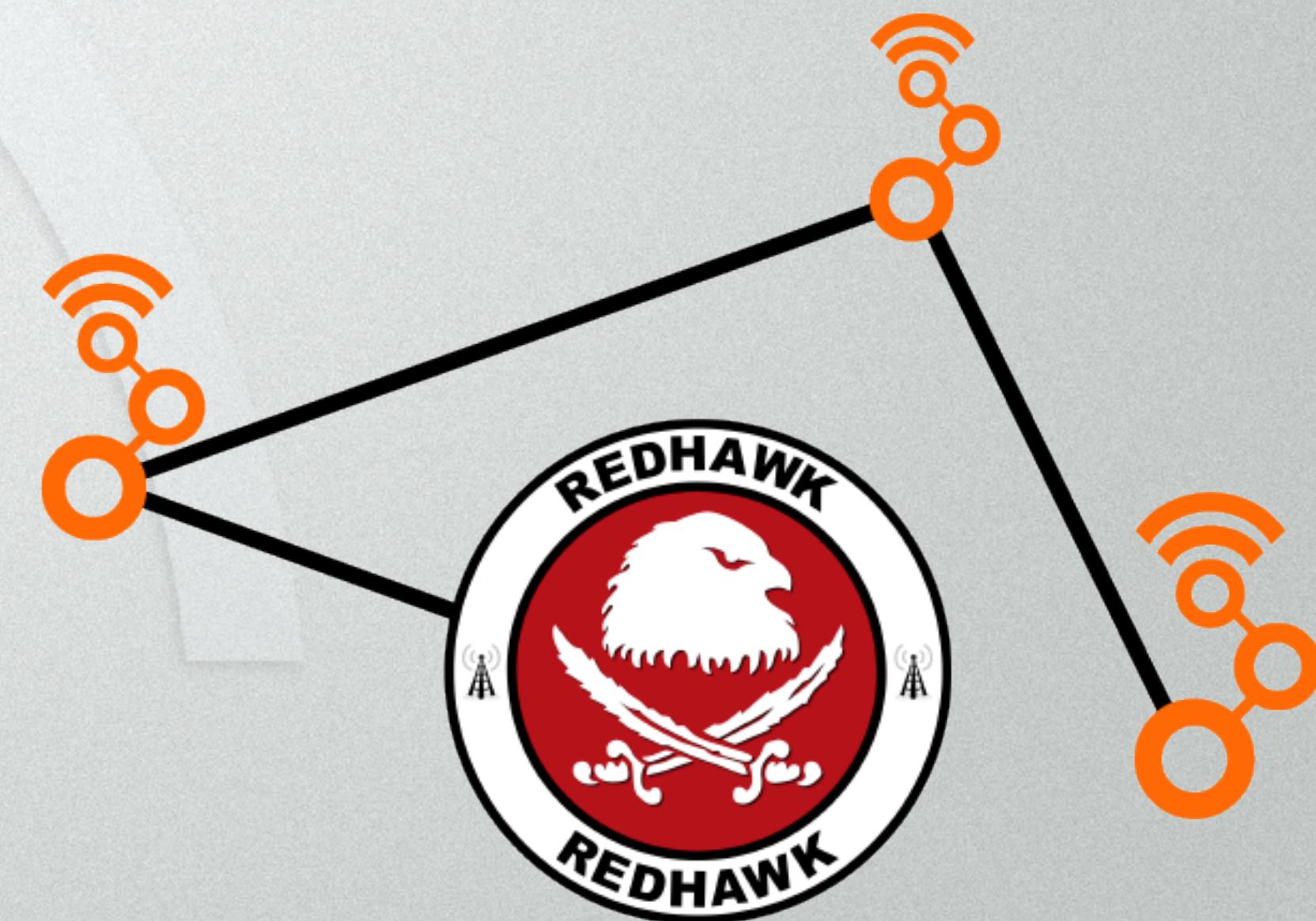
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- Flow Graph Converter
- Docker-Aware GPP



**GNU Radio + REDHAWK**

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- What is REDHAWK?
- Why integrate with REDHAWK?
- Integration Concept
- Flow Graph Converter
- Docker-Aware GPP
- Parting Thoughts



**GNU Radio + REDHAWK**

# WHAT IS REDHAWK?



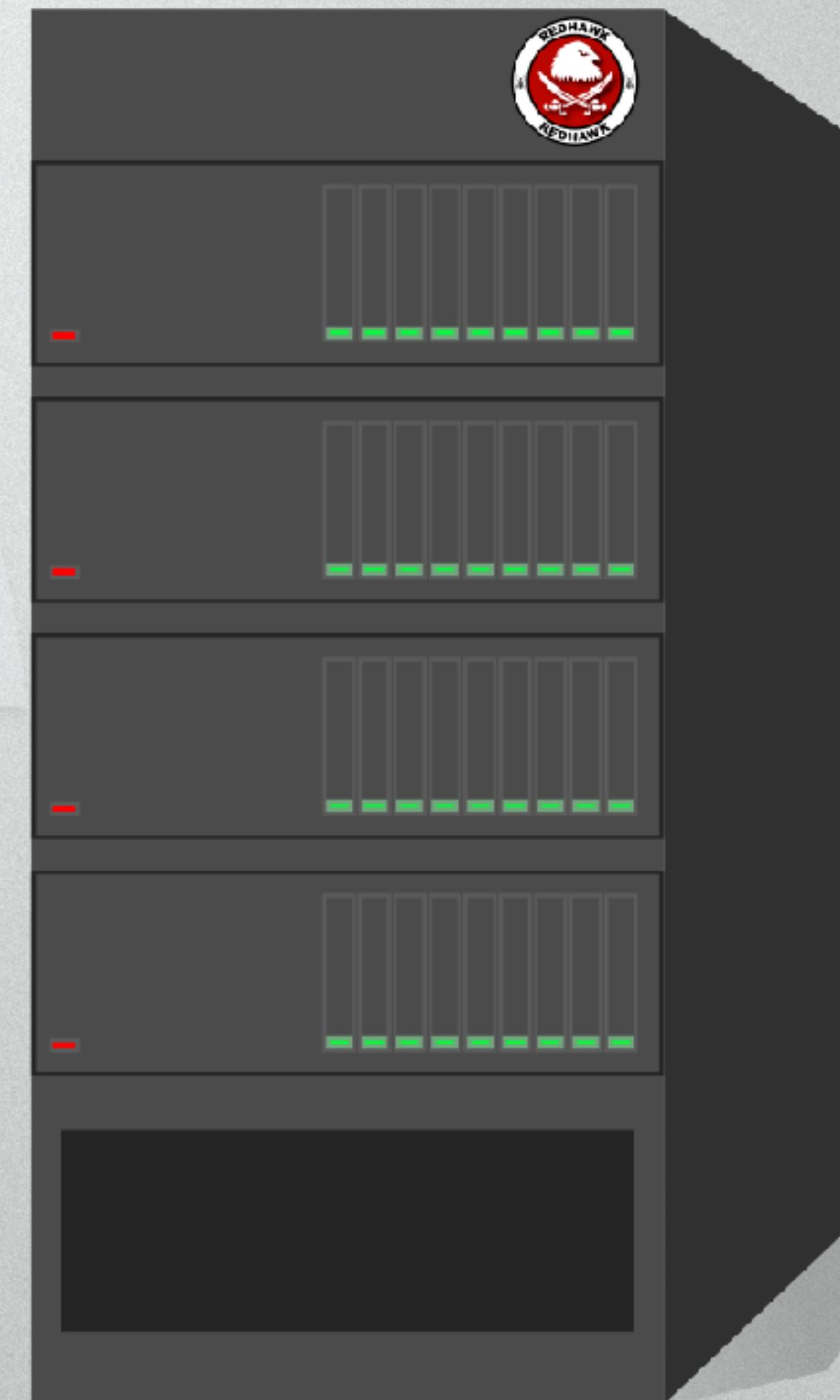
# WHAT IS REDHAWK?

- Not GNURadio's Enemy :-)



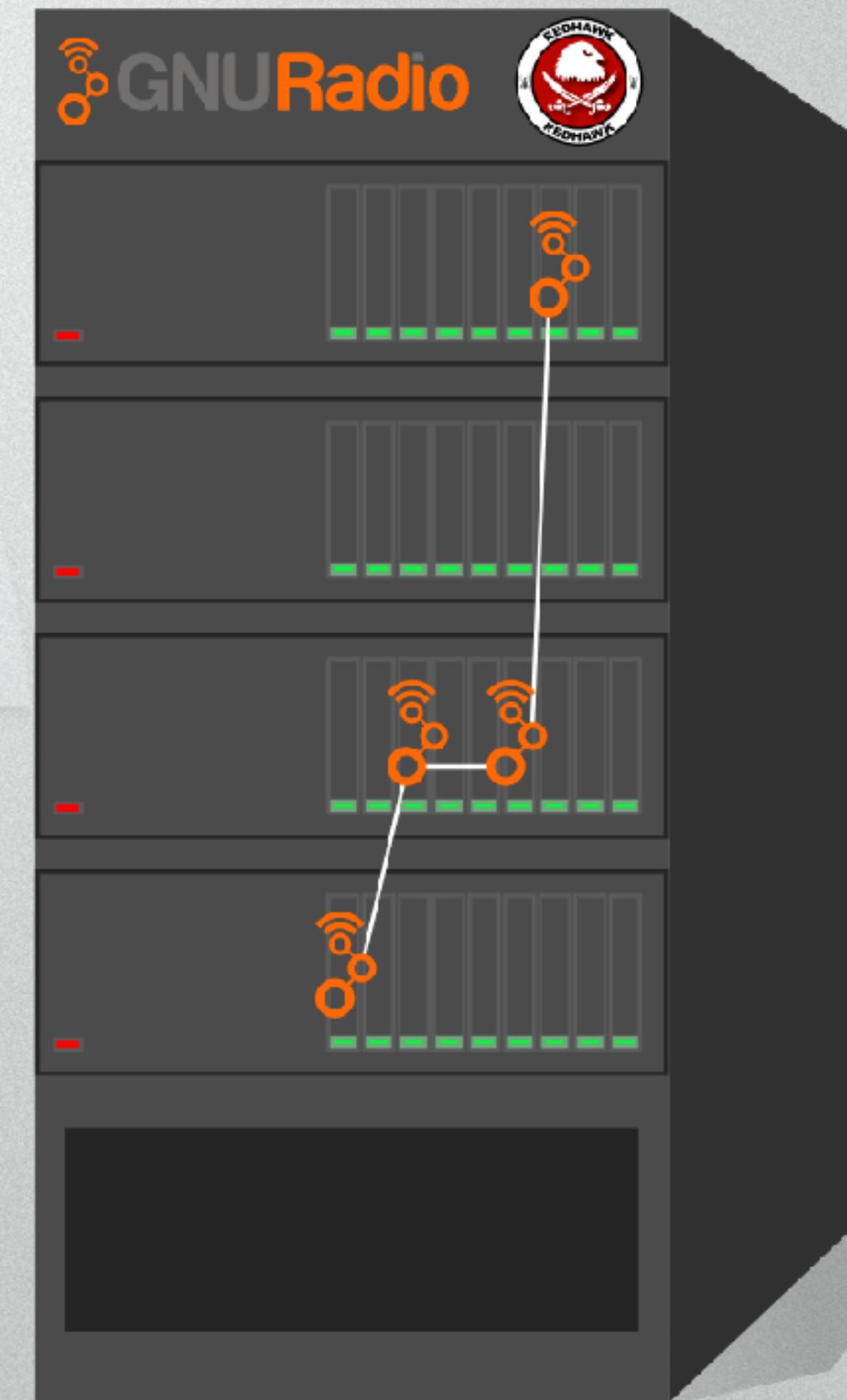
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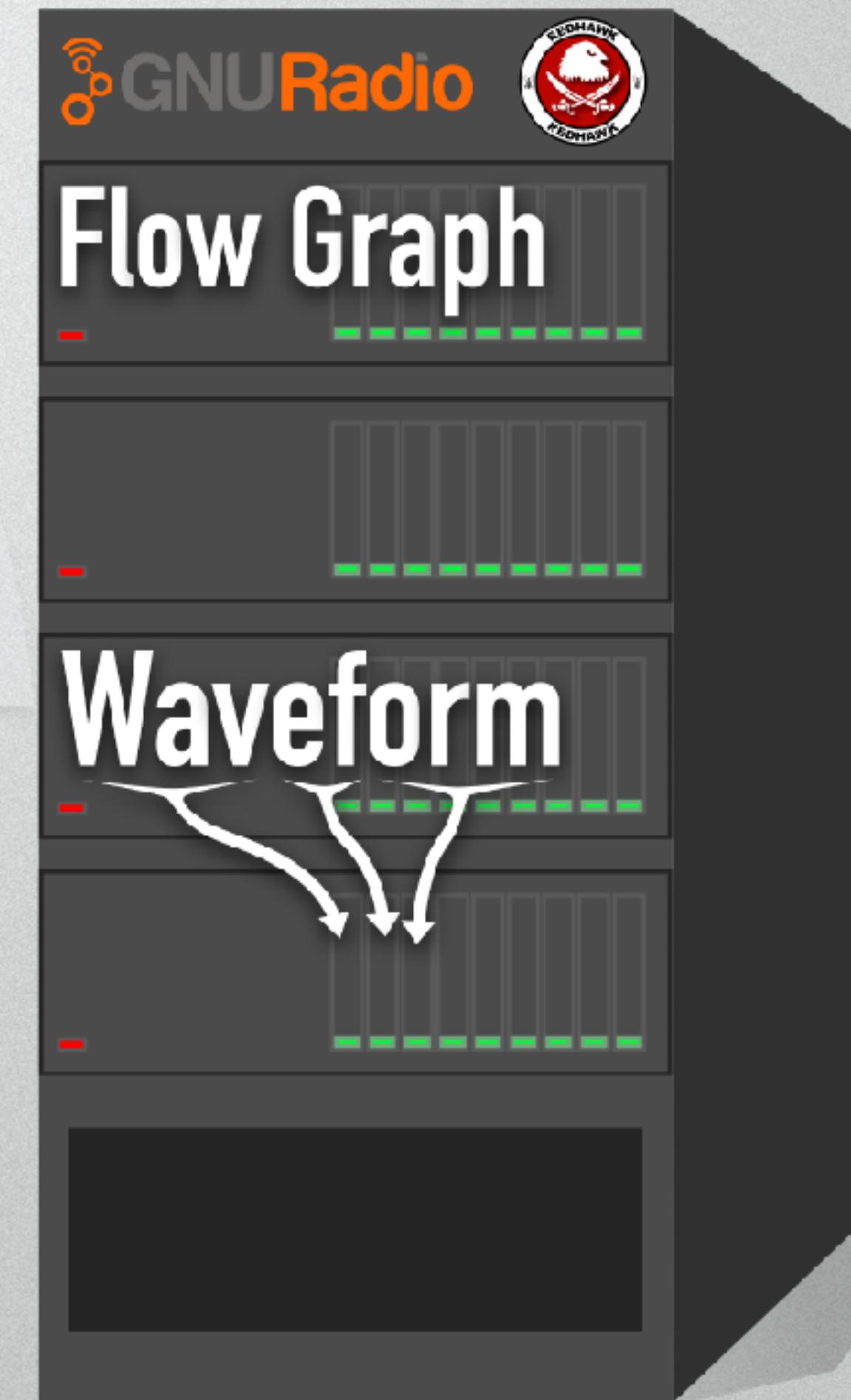
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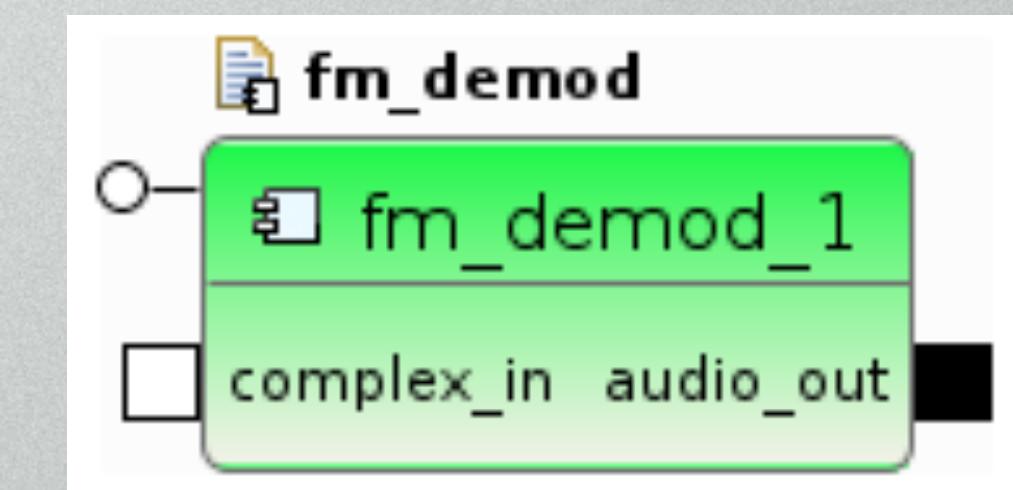
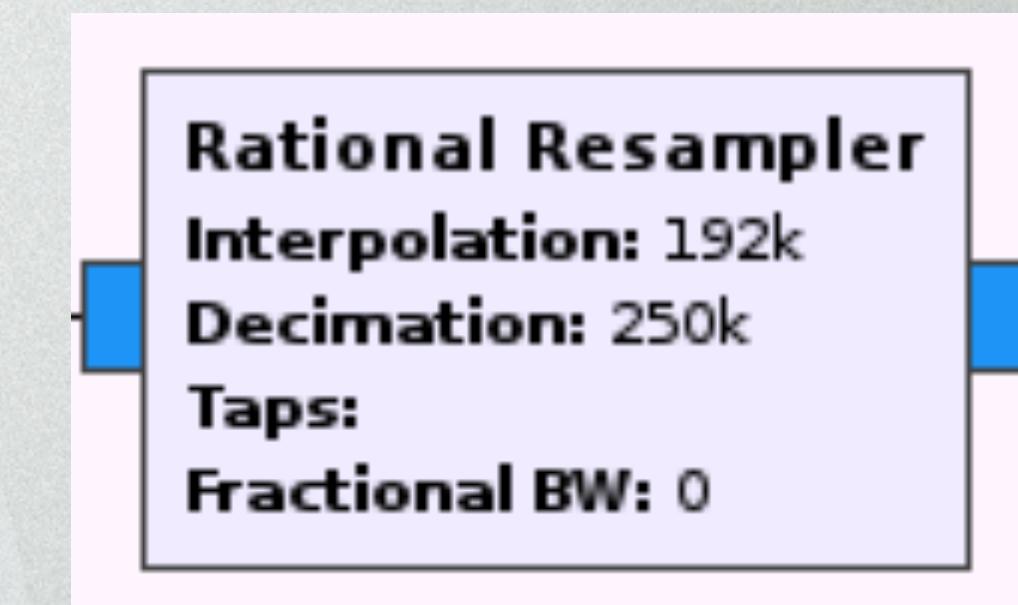
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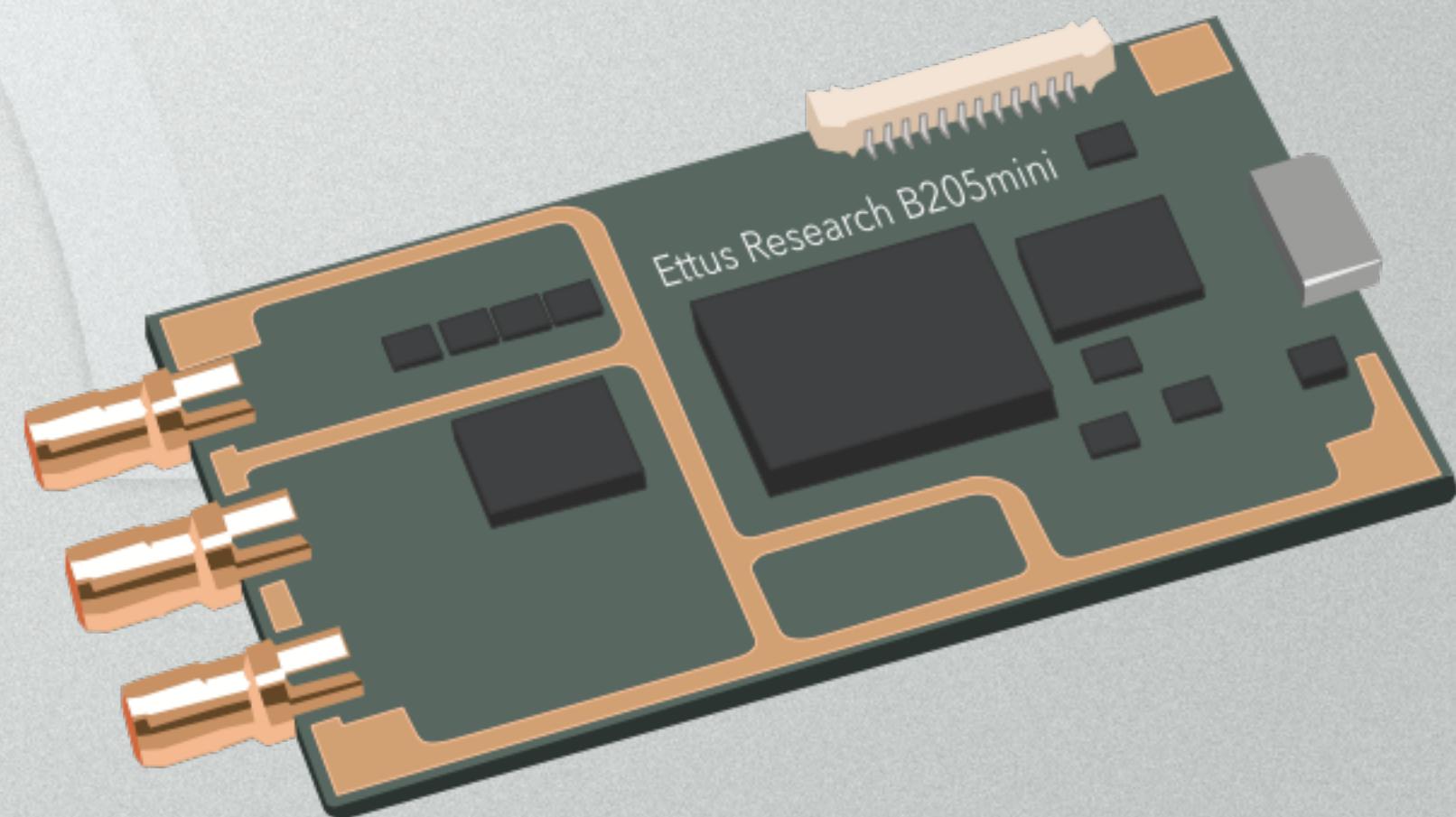
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  - Block vs. Component



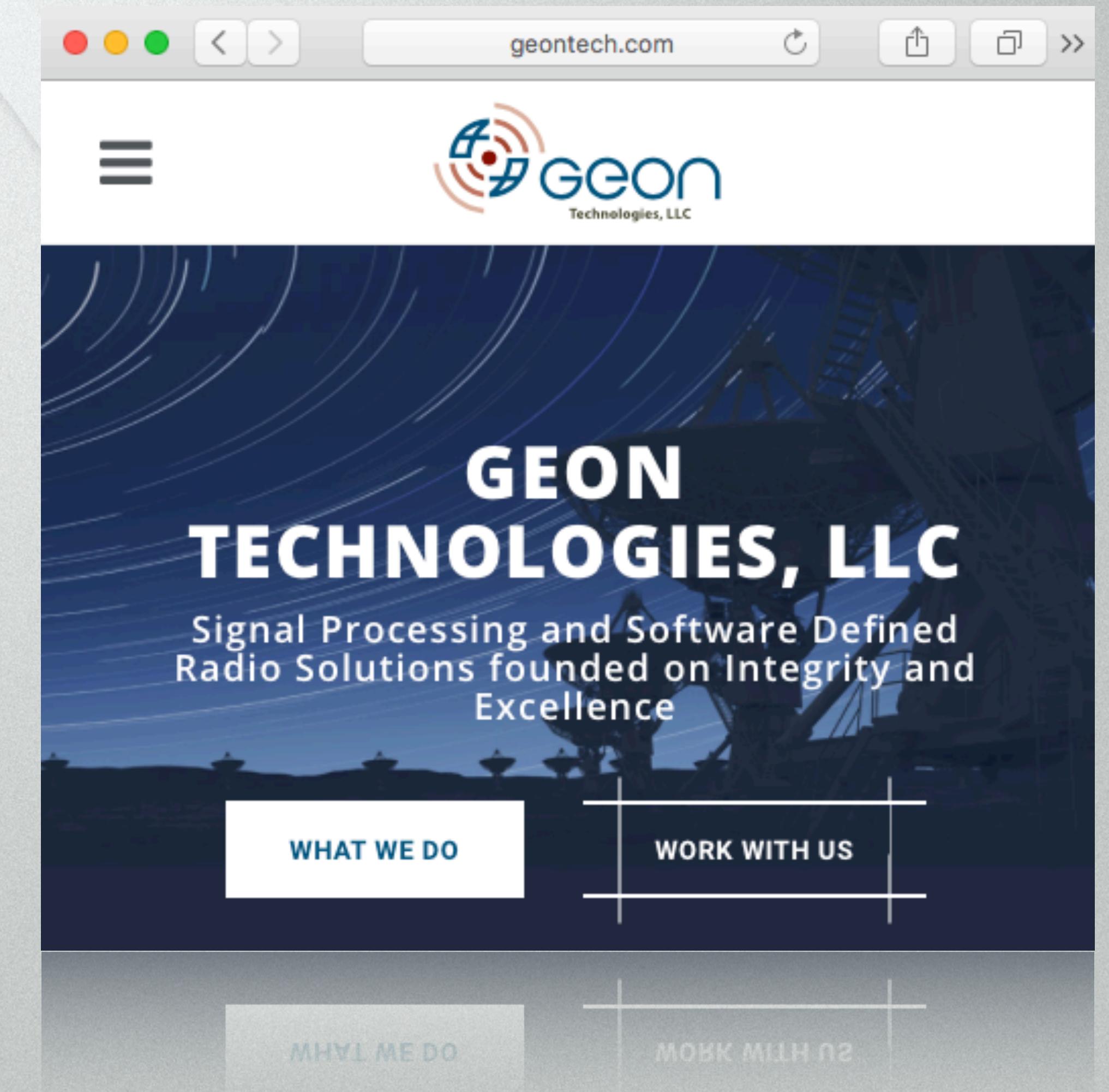
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- Not GNURadio's Enemy :-)
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  - Block vs. Component
  - Device? Hmm...
- Don't like CentOS? Need embedded?



# WHY INTEGRATE WITH REDHAWK?



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- RF front end agnostic using FrontEnd Interfaces spec.

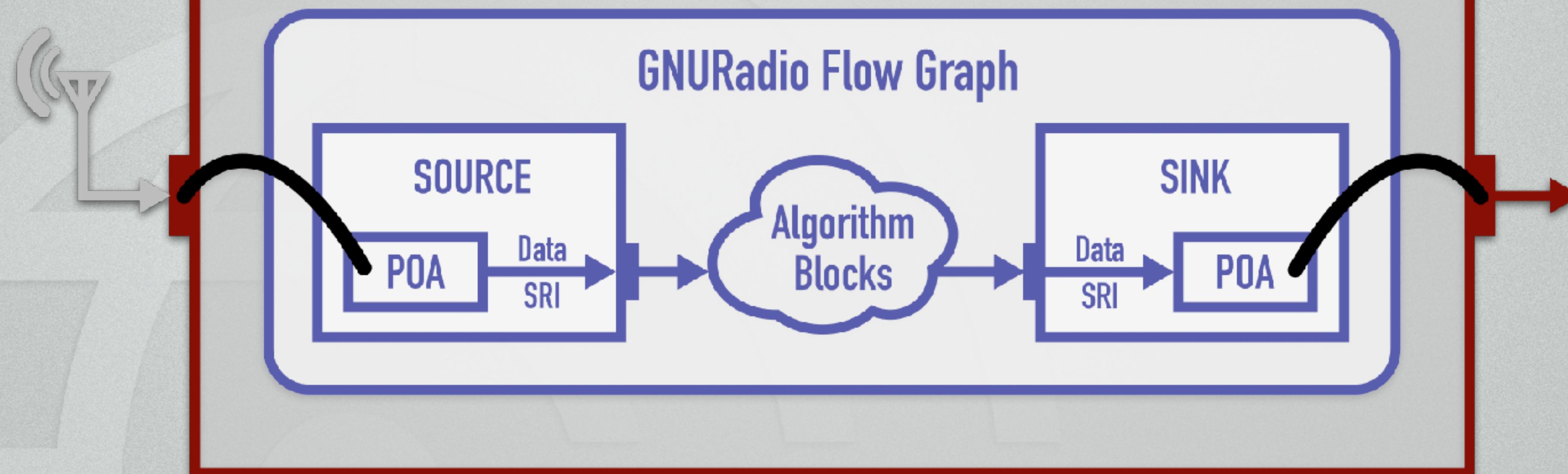
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- RF front end agnostic using FrontEnd Interfaces spec.
- Infrastructure as a Service (IaaS)
- Integration with ISR infrastructure (e.g., TOA)

## REDHAWK Component



## INTEGRATION CONCEPT

Wrapping a Flow Graph with a Component

# INTEGRATION CONCEPT



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- Component manages run state

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- Properties update variables

## REDHAWK Component

### GNURadio Flow Graph



VARIABLE  
samp\_rate: 250e3

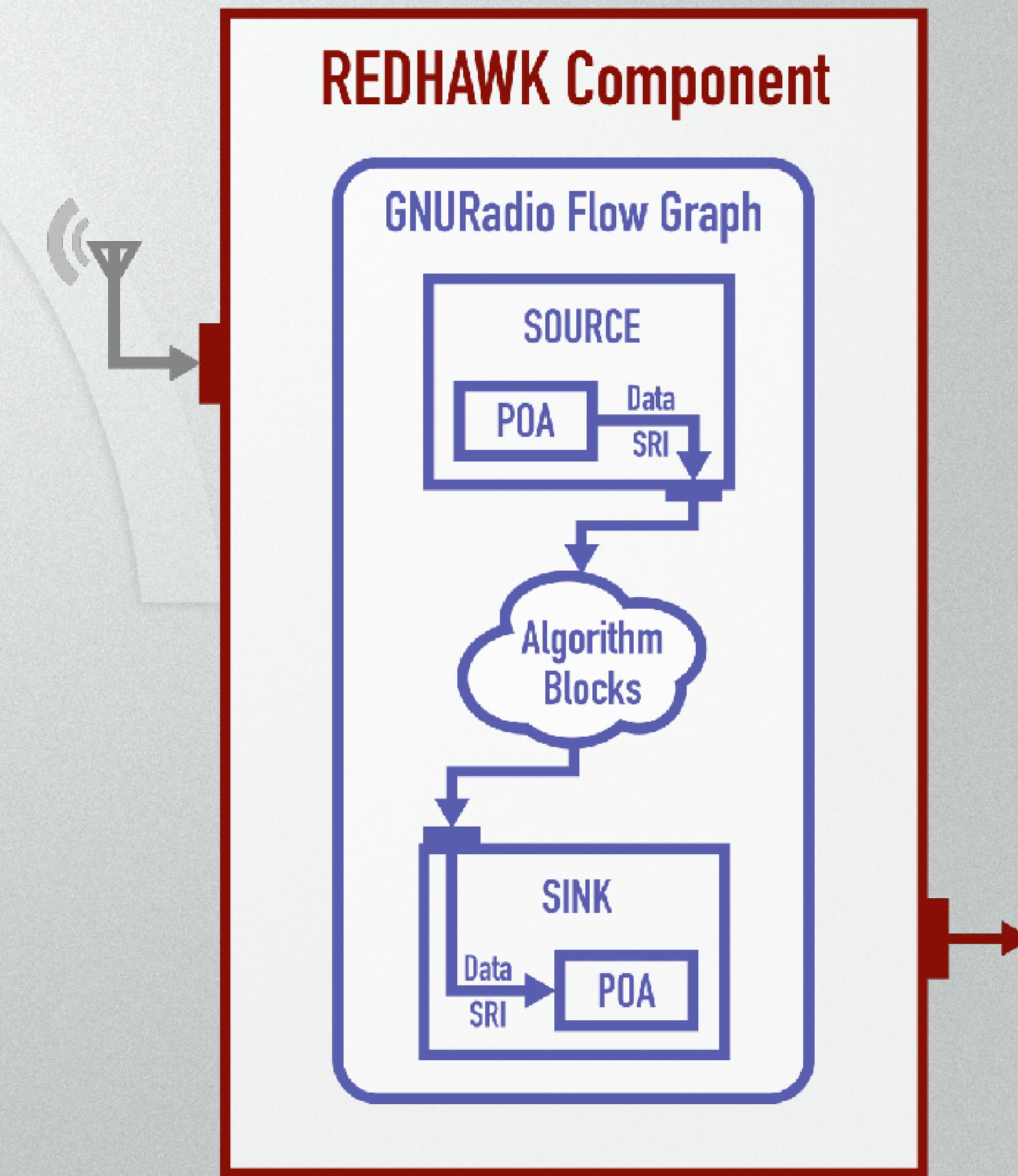
VARIABLE  
audio\_rate: 48e3

⋮

Algorithm  
Blocks

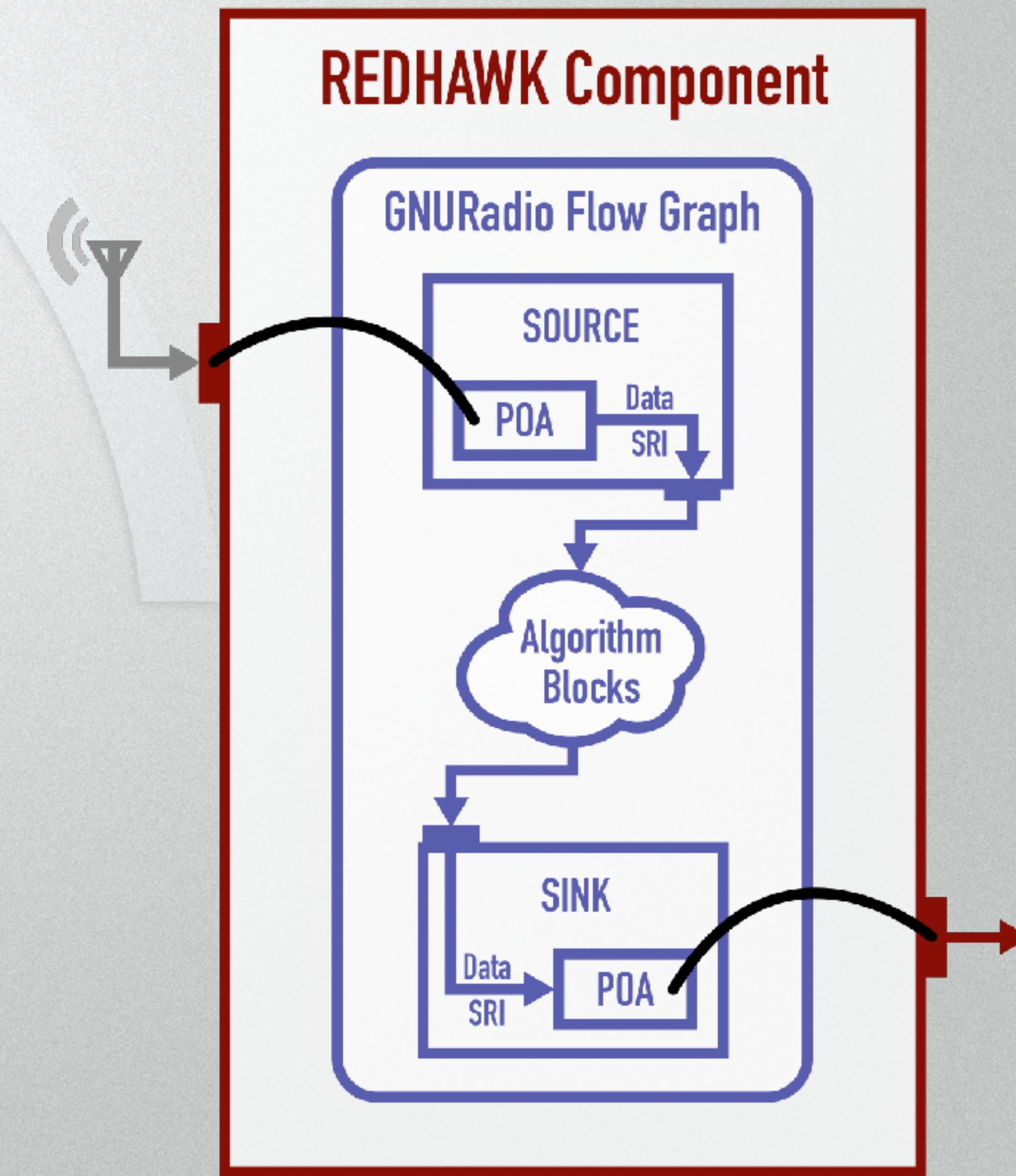
# INTEGRATION CONCEPT

- Component manages run state
- Properties update variables
- Ports map to source and sink blocks



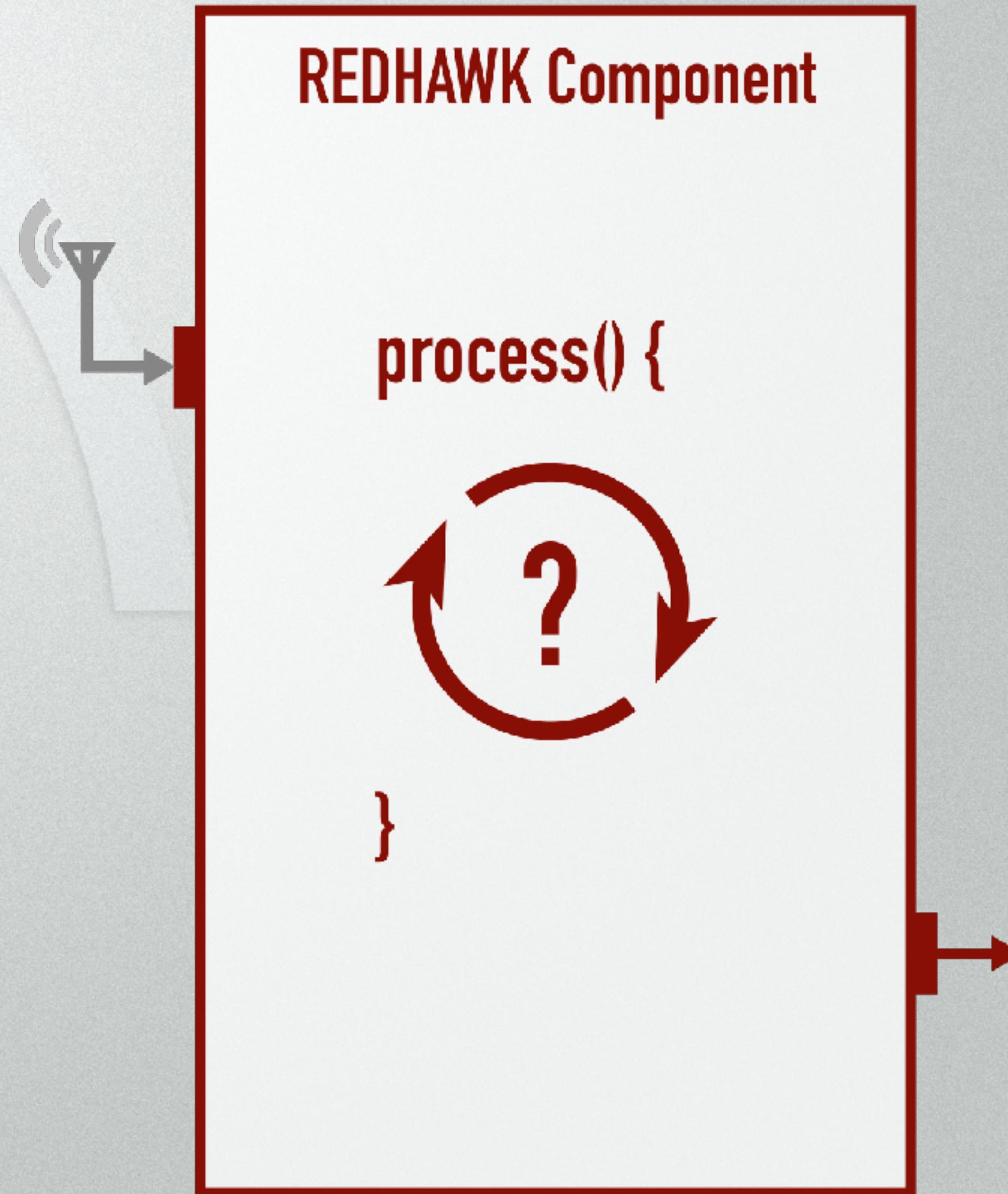
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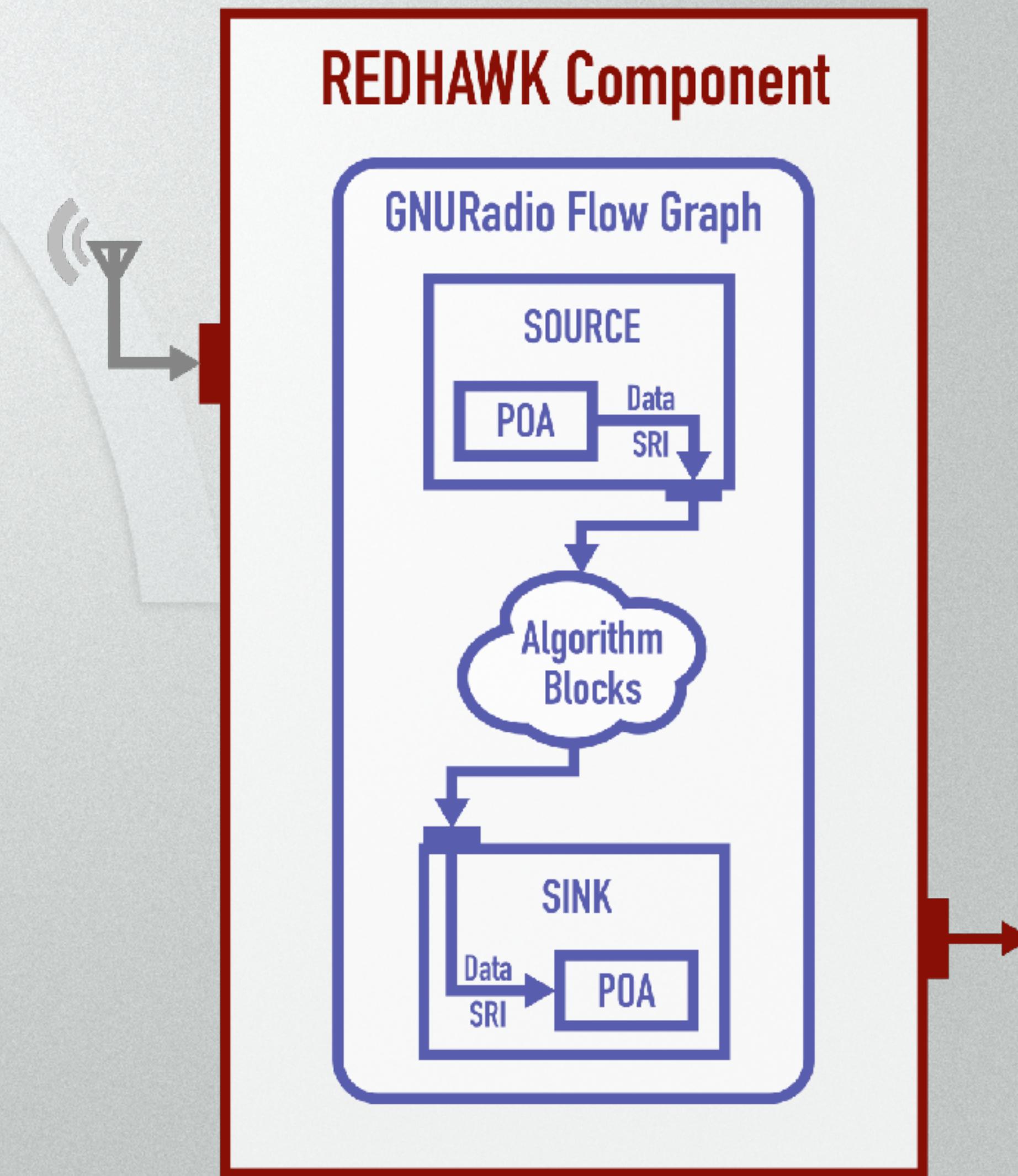
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# INTEGRATION CONCEPT

- Component manages run state
- Properties update variables
- Ports map to source and sink blocks
- Port connections are to the block
- Component process loop does...

**Nothing.**



# FLOW GRAPH CONVERTER

Lowering the Bar

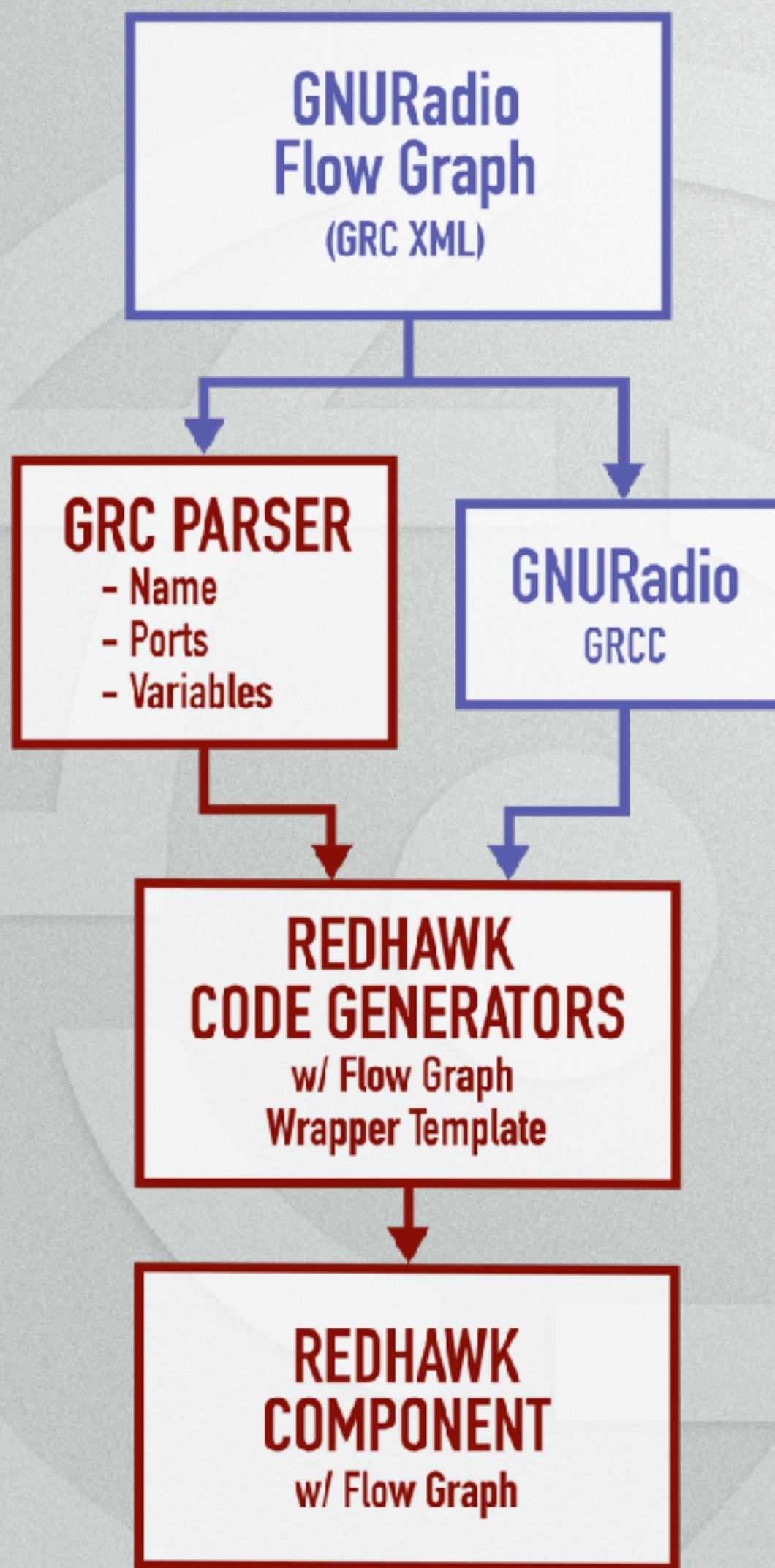
# FLOW GRAPH CONVERTER

Lowering the Bar ... To Entry

# FLOW GRAPH CONVERTER

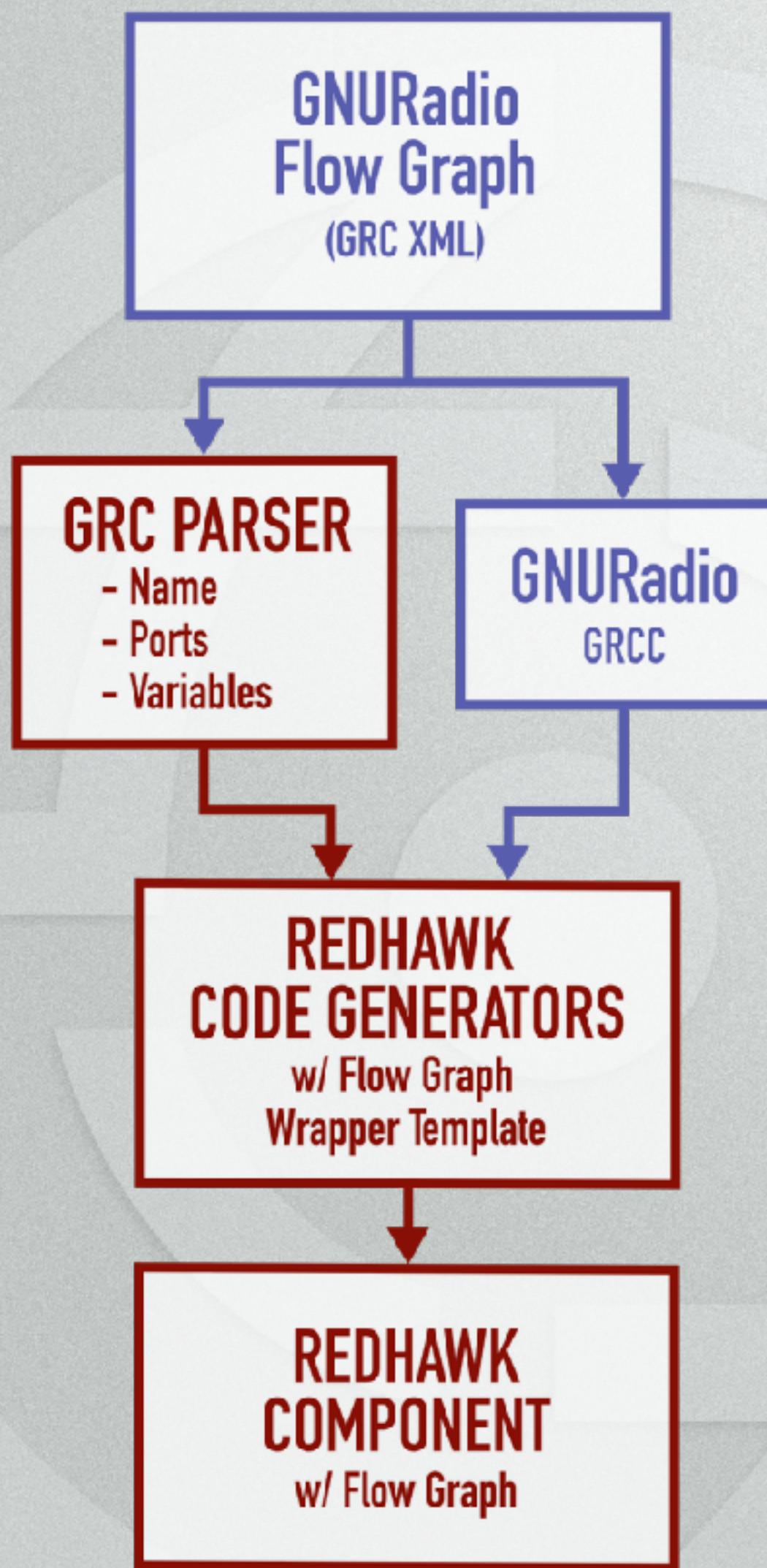


# FLOW GRAPH CONVERTER



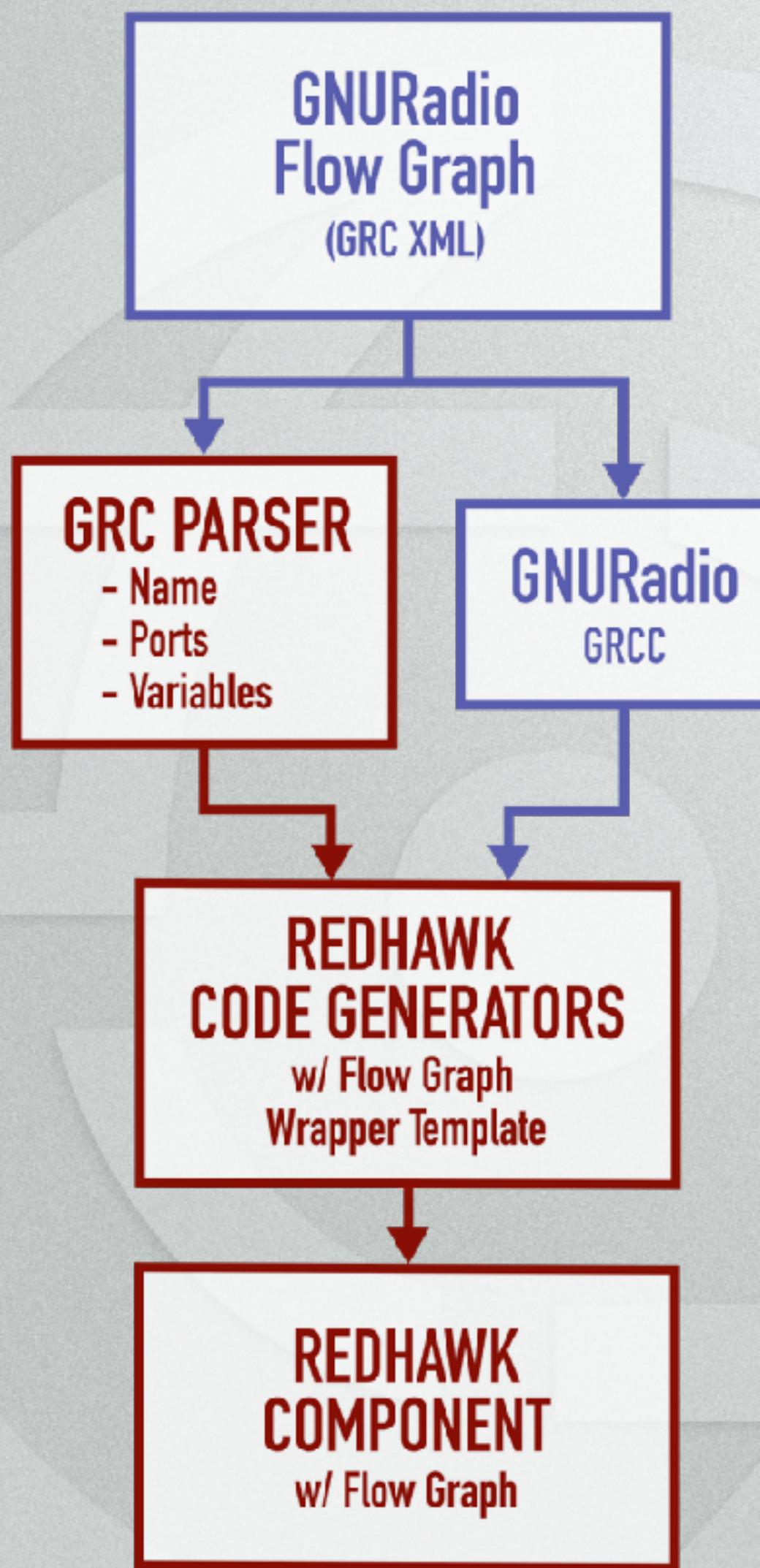
- Converts GRC to REDHAWK XML

# FLOW GRAPH CONVERTER



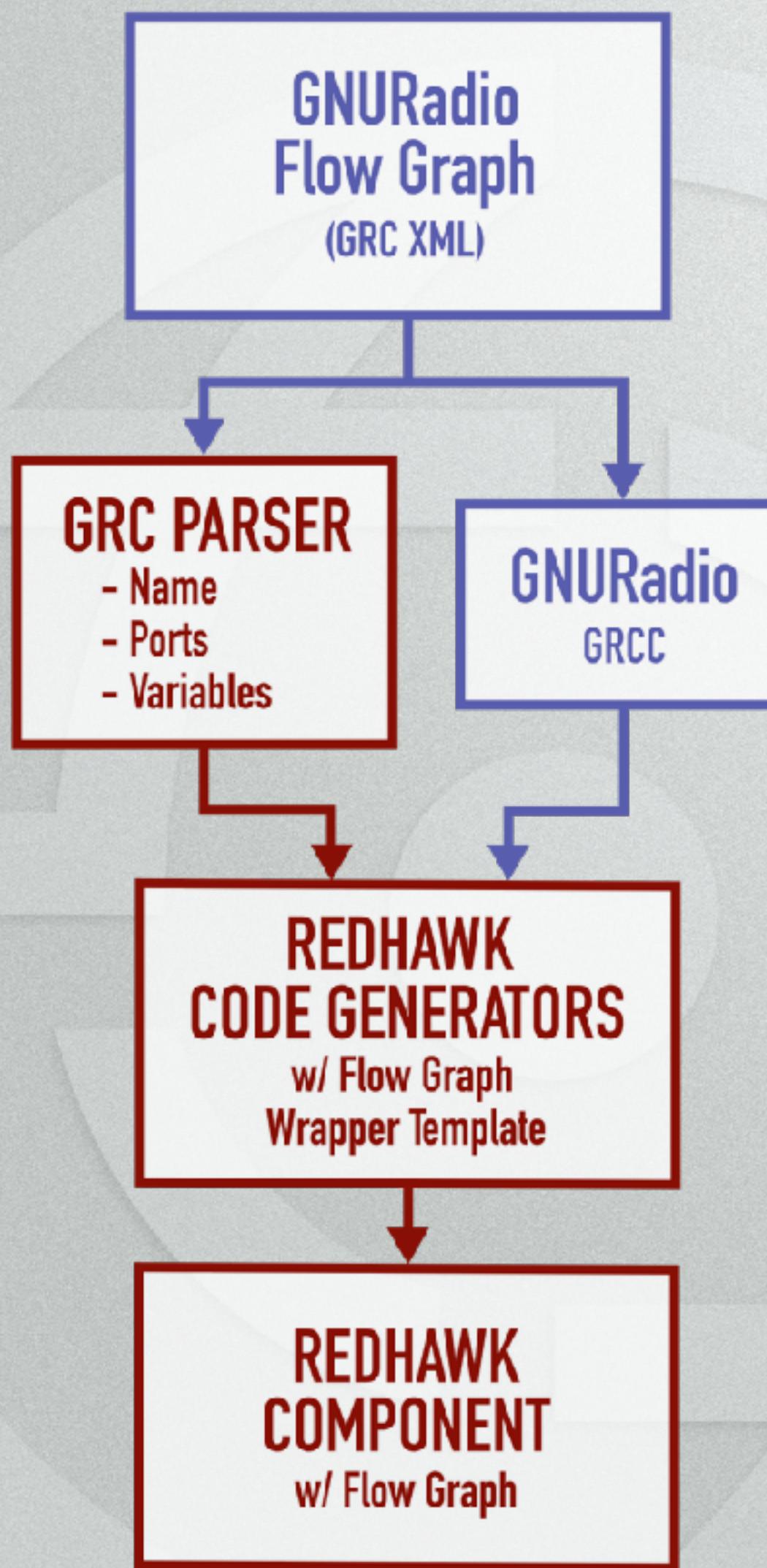
- Converts GRC to REDHAWK XML
- Searches for variables and blocks

# FLOW GRAPH CONVERTER



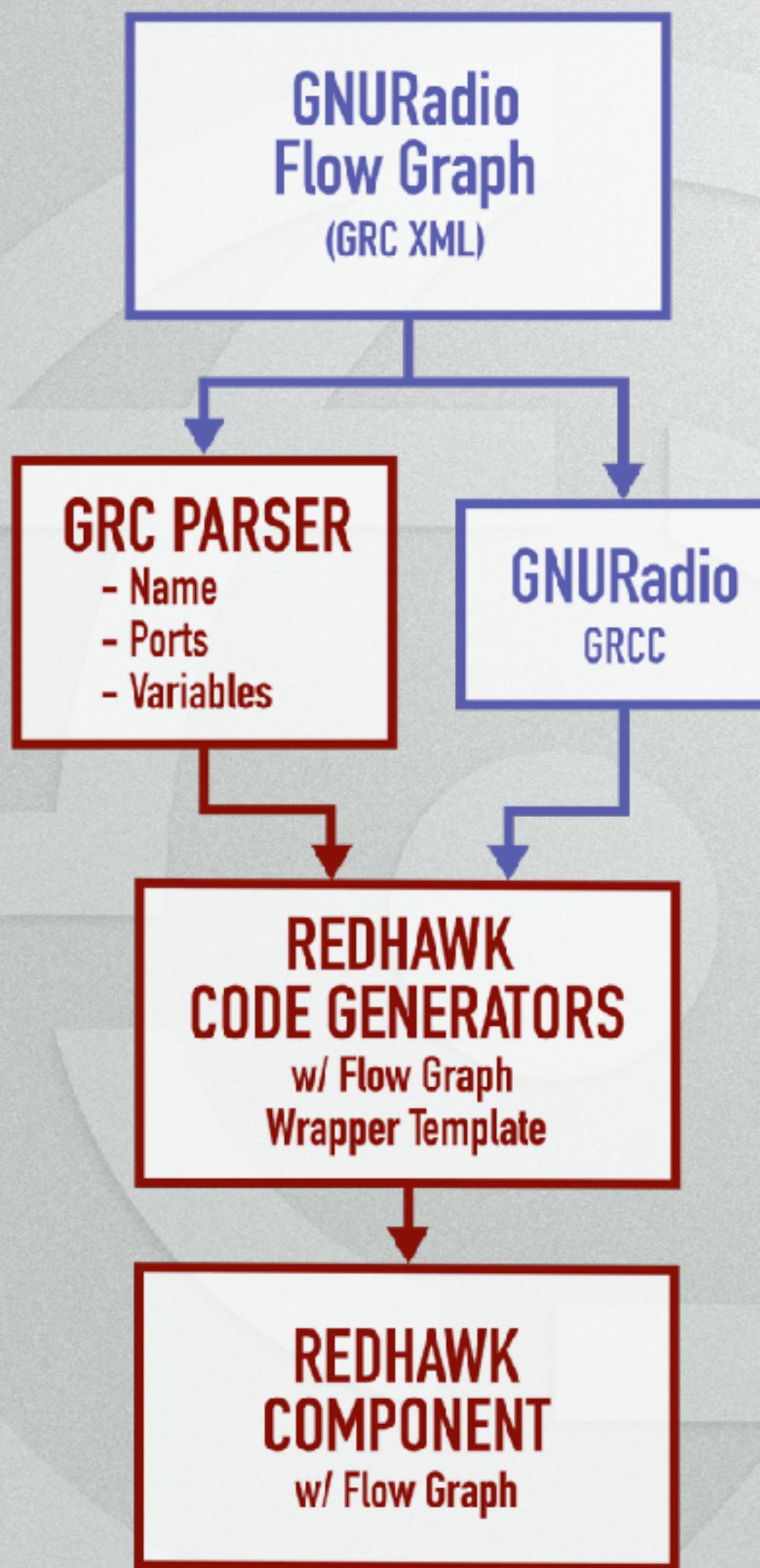
- Converts GRC to REDHAWK XML
- Searches for variables and blocks
- Resulting lists become project files

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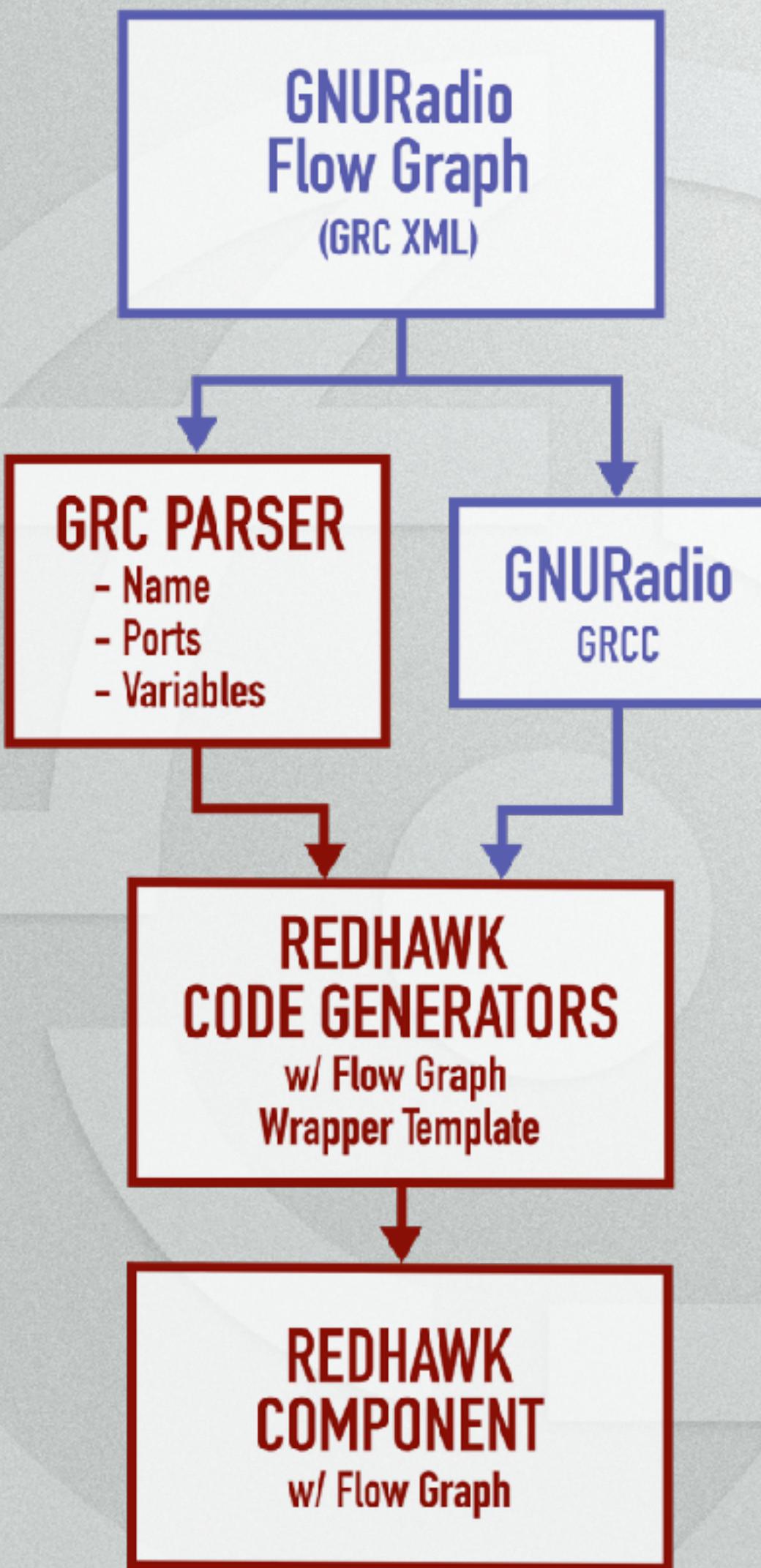
- Converts GRC to REDHAWK XML
- Searches for variables and blocks
- Resulting lists become project files
- Uses REDHAWK Code Generation

# FLOW GRAPH CONVERTER



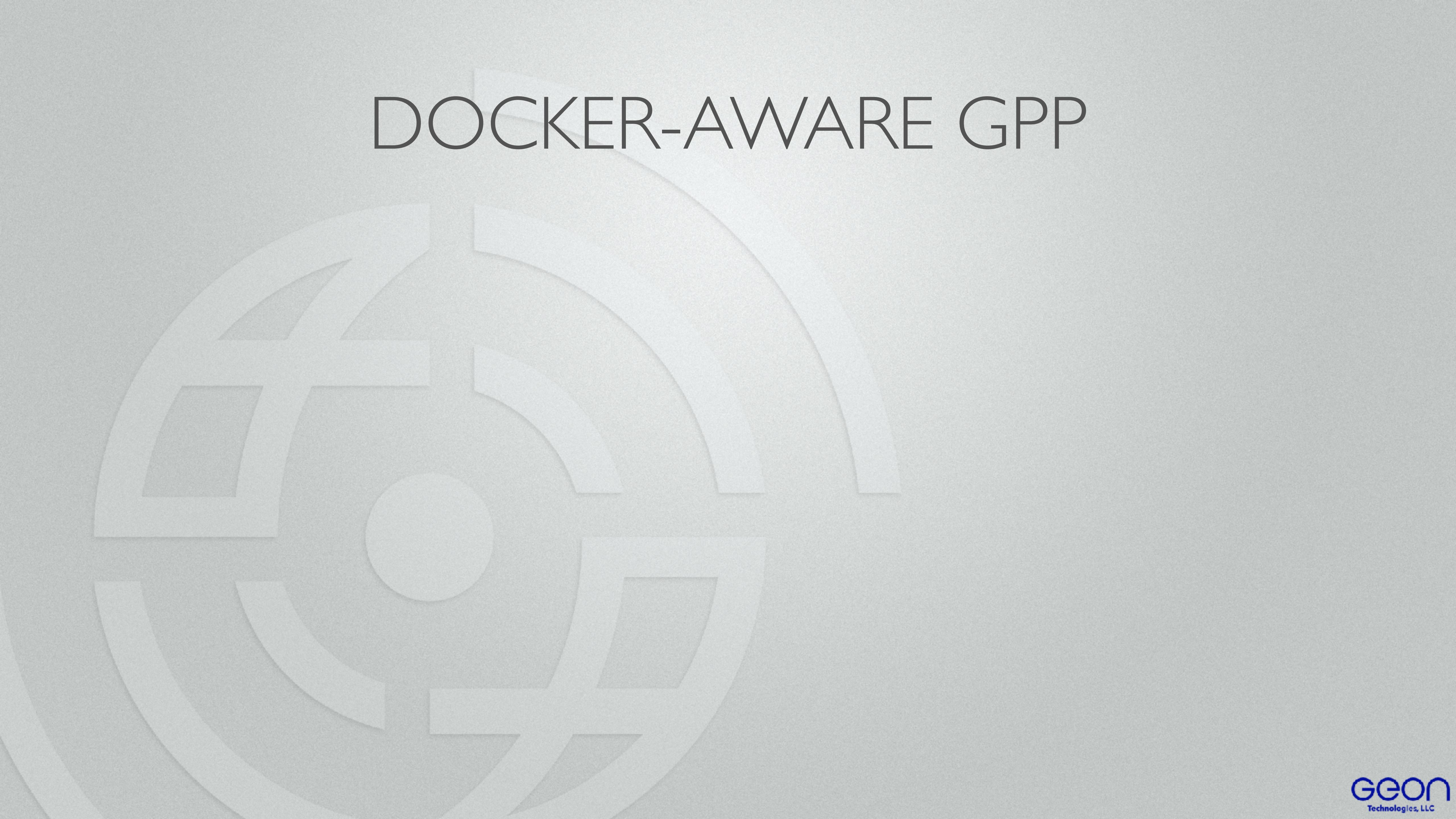
- Converts GRC to REDHAWK XML
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- Uses REDHAWK Code Generation
- Also generates Docker-aware versions

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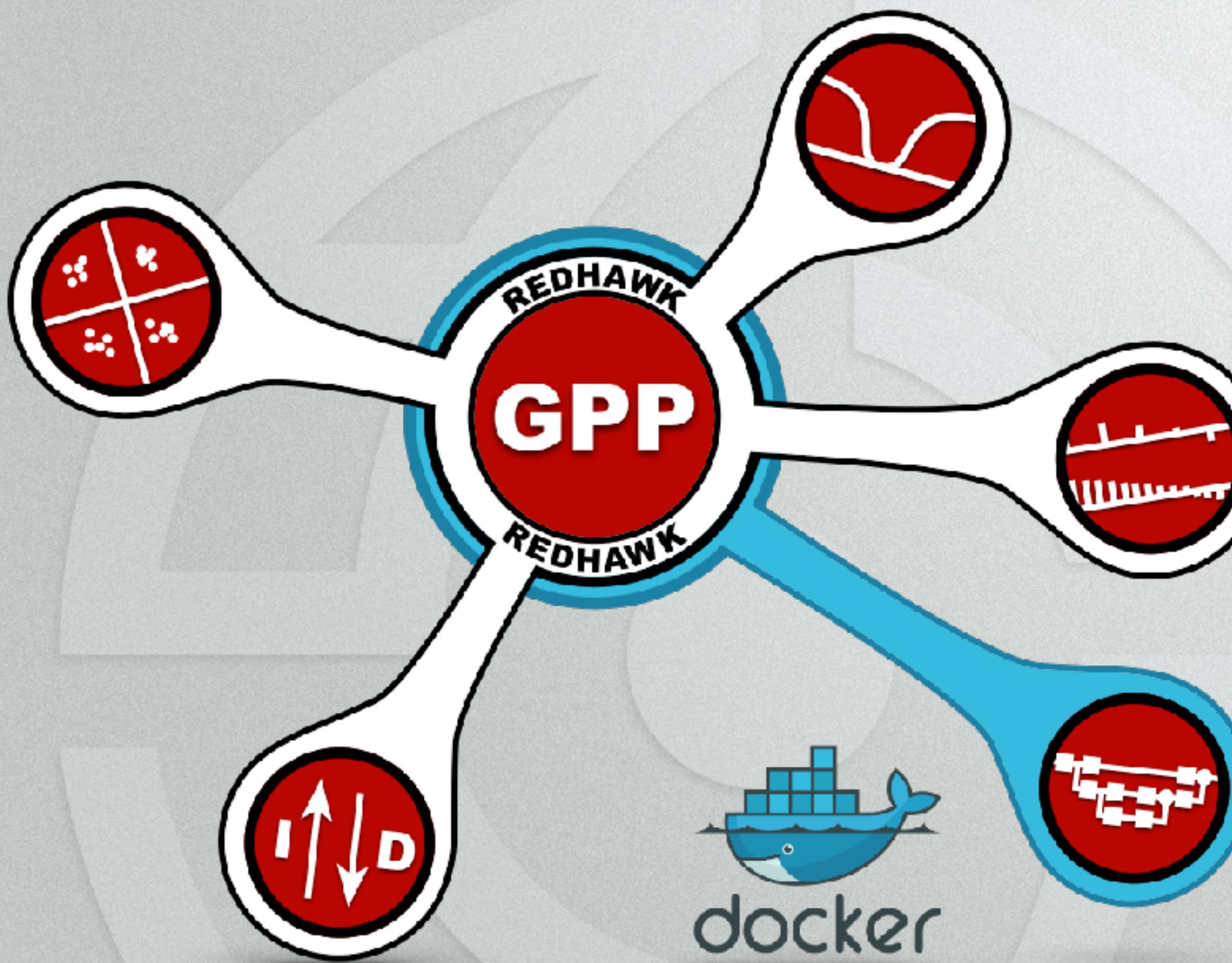


- Converts GRC to REDHAWK XML
- Searches for variables and blocks
- Resulting lists become project files
- Uses REDHAWK Code Generation
- Also generates Docker-aware versions
- Supports simple properties and BULKIO at this time

# DOCKER-AWARE GPP

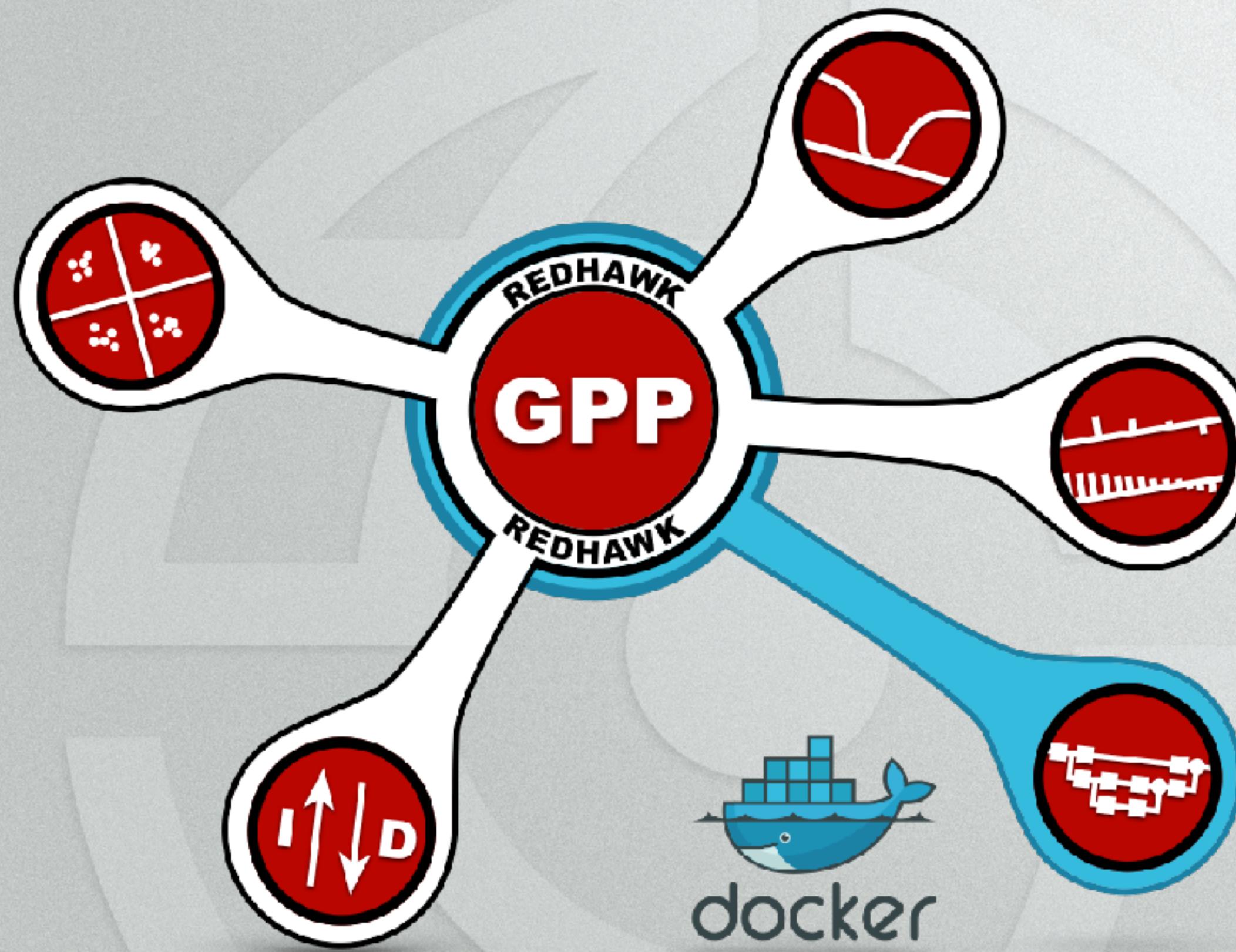


# DOCKER-AWARE GPP



- Standard GPP + Docker Control

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- Standard GPP + Docker Control
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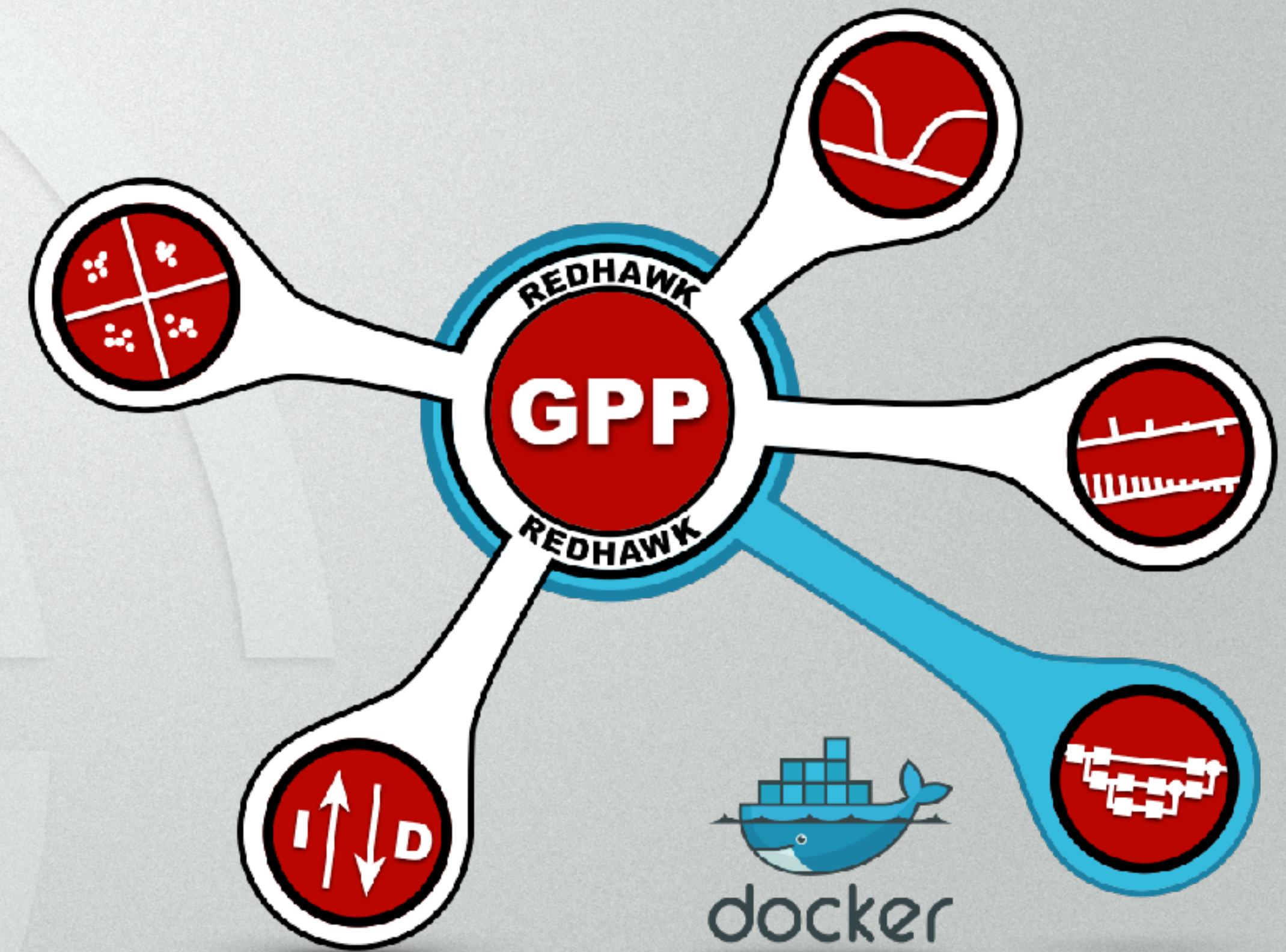


- Standard GPP + Docker Control
- Component's dependencies installed in a Docker Container
- Docker-GPP can launch the Container from a standard REDHAWK installation
- GNURadio-REDHAWK Runtime image is based on Ubuntu 16.04



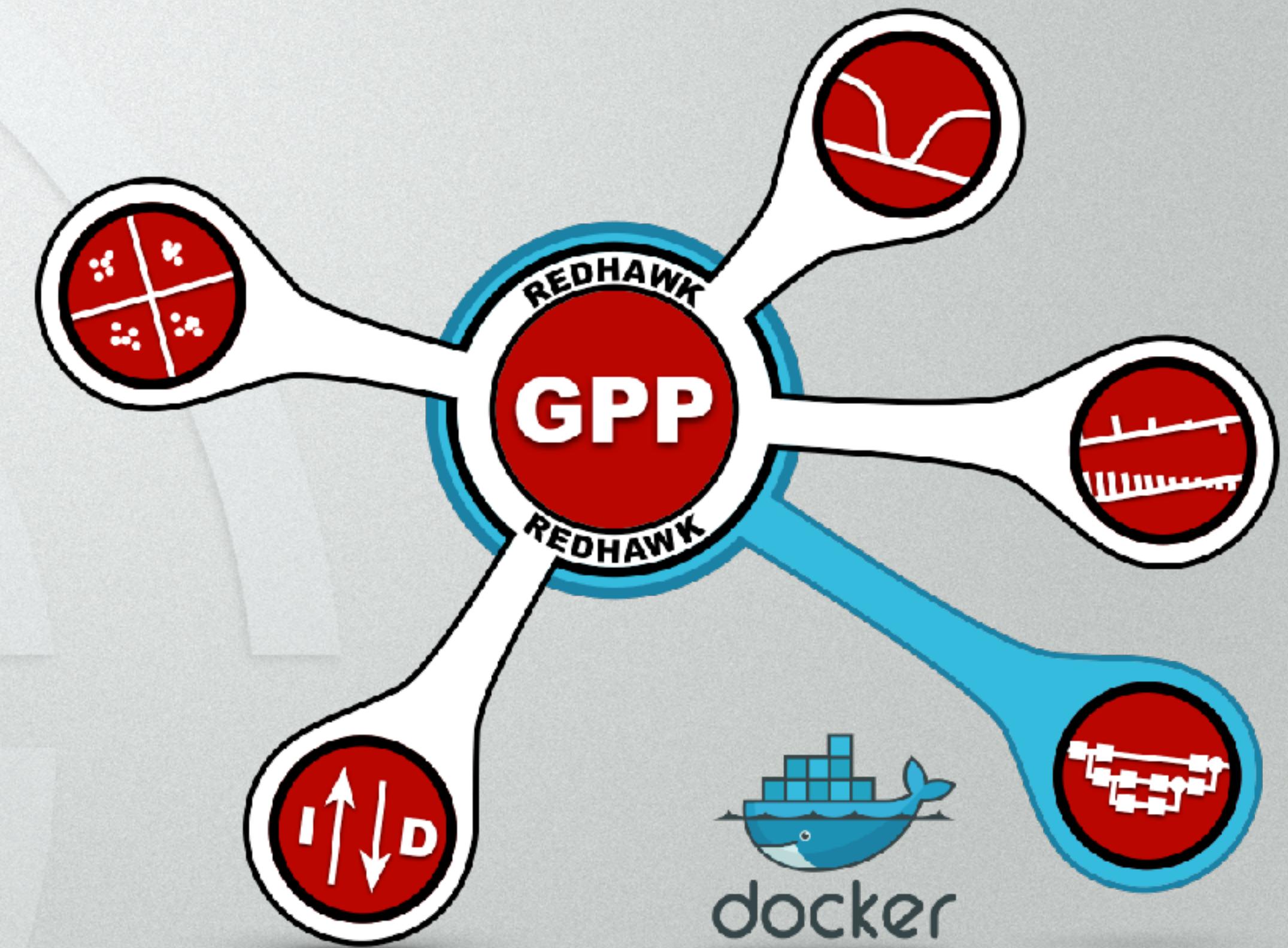
# PARTING THOUGHTS...

# IS DOCKER-GPP REQUIRED?



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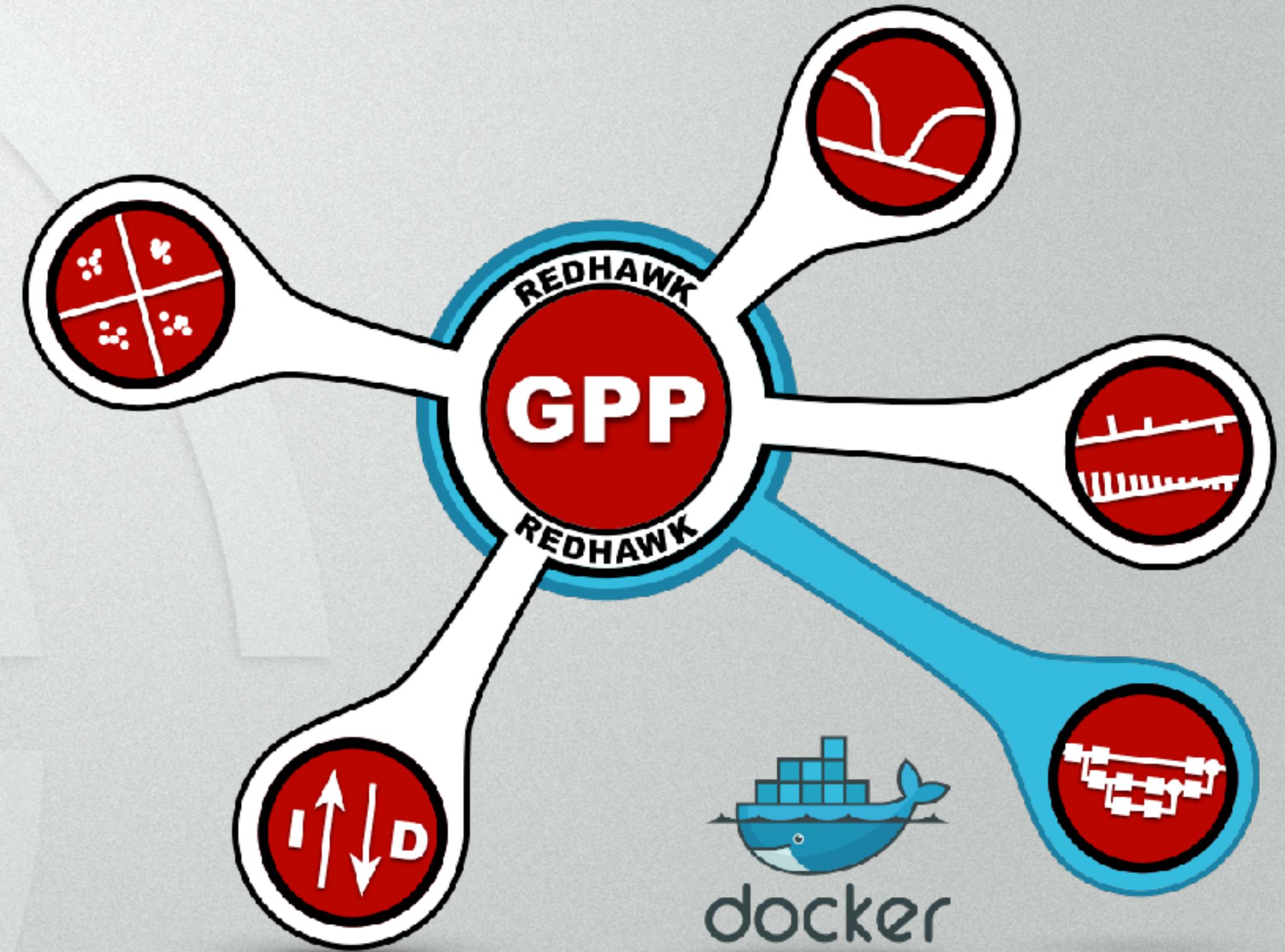
No.



# IS DOCKER-GPP REQUIRED?

No.

However, this means installing the superset  
of dependencies at every REDHAWK GPP\*





# PERFORMANCE?

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Tested at a little over 1 Msps Complex  
Floats without overflowing

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Translating to C would likely help



MORE DETAILS  
EXAMPLE  
DEMO:

[geontech.com/gnuradio-redhawk-integration](http://geontech.com/gnuradio-redhawk-integration)



**GNURadio + REDHAWK**