Scope (Sub-Systems)

- Observation Preparation
- Scheduler
- Executor
Scope (Concepts)

- EVLA Project Model
- Dynamic Scheduling
- Sub-Arrays
- Command Translation
NRAO Project Model
Projects → Programs → Scheduling Blocks

E2E Model

Proposal

Project

Program

Scheduling Block

Execution Block

observing program

program block

0...*

{or}

1

1

1

1

1

1

1

1

1

1

0...*

1...*

subordinate program

set of programs

0...*

"Observed" Session

EVLA Model

Proposal

Project

Program

Program Block

Observe Script

Scheduling Block

Scheduling Block Meta-data

"Observed" Session

Execution Block

Configuration

Projects → Programs → Scheduling Blocks

June 14, 2004

EVLA Subsystems I

Boyd Waters
Programs → Scheduling Blocks

- **Proposal** + Allocated Time = “Project”
- **Project** + Telescope Configuration = **Program**
- **A Program** has a **Program Block**
- **Program Blocks Organize Scheduling Blocks**

- Proposal + Allocated Time = “Project”
- Project + Telescope Configuration = Program
- A Program has a Program Block
- Program Blocks Organize Scheduling Blocks
Dynamic Scheduling

- Observations are comprised of Scheduling Blocks

- Scheduling Blocks are Atomic Units of Execution

Scheduling Block

- Scheduling Constraints

- Script
Scheduling Block Selection

Scheduler Selects the Best Block from a “Pool” of All Available Blocks

• Scheduling Block
  Pre: (Other Scheduling Constraints)
  Script

• Scheduling Block
  Pre: (Other Scheduling Constraints)
  Script

• Scheduling Block
  Pre: (Other Scheduling Constraints)
  Script

...
Dependencies Between Scheduling Blocks may be (logically) Expressed in the Program Block

**Implementation Note:** Scheduler is Simplified if dependencies are tracked in the Scheduling Blocks
Scheduling Block Iteration

- Absolute iteration: “repeat for N”
- UV Coverage
- RMS constraints: “repeat until RMS >= n”
SB Iteration: “Absolute”

- “Do this block N times.”
- An SB has an **Iteration Count**.
- Interruption of iteration does NOT reset the iteration count.
Given an LST Range, divide the LST range up into N chunks.

Observe all N chunks...

Each chunk is an "LST Slot" that has the potential to be observed on a different (sidereal) day.
SB Iteration: RMS Constraints

- Applied to an SB to build up integrations until the desired signal level is achieved.
- RMS values delivered by TelCal
Other SB Constraints

- Time Constraints
  - $T_{\text{nominal}}$ and $T_{\text{max}}$
  - $LST\ Constraints$
- Equipment Status
- Weather
  - $T_{\text{sys}}$
Scheduling Block Dispatch

- Executor Idle
- Executor Alert (failure)
- Time Range Exceeded
- Rapid-Response Science Interrupt
- Operator (or Astronomer) Interrupt
- Environmental Conditions Alerts
SB Pre-Emption

- **Hard Interrupt**
  
  Force the currently-executing block off of a sub-array *immediately*.

- **Soft Interrupt**
  
  Force the currently-executing block off of a sub-array after the end of the current integration.
Sub-Arrays

- Sub-Array is a set of Antennas that can make baselines.
Sub-Arrays

- **Astronomical Sub-Arrays**
  - *Created during Execution of Observation Script*
  - *Shared Script Execution Environment*

- **Administrative Sub-Arrays**
  - *Created for Independent, Parallel Execution of Different Observation Scripts*
  - *Independent Script Execution Environments*
Sub-Array Scheduling

Scheduler will only dispatch SBs for which the required antennas are available.
Administrative Sub-Arrays

- Independent, Parallel Execution of Different Observation Scripts

- Executor may Create a Sub-Array (with associated Executor) in Response to Scheduling Block dispatch.

- (Unless Sub-Array already exists.)
Astronomical Sub-Arrays

myVLA = new Subarray(VLA[0:25])

myband = LoIfSetup('10GHz', 8453.0, 8503.1)

myVLA.setLoIfSetup(myband)
Command Translation

Subarray

Script Executor Engine

Antenna
Antenna
Antenna

COMMAND MESSAGES

M&C Subsystem

EVLA Antenna
VLA Antenna
NMA Antenna