



Goodbye to WIMPs: *A Scalable Operator Interface for ALMA Operations*

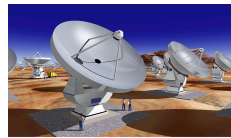
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ALMA sites in Chile



Antenna
Operations Site
(AOS, 5000m)

6/60 MB/s
(avg/peak)

Operations
Support
Facility
(OSF, 3000m)

6 MB/s
(average)

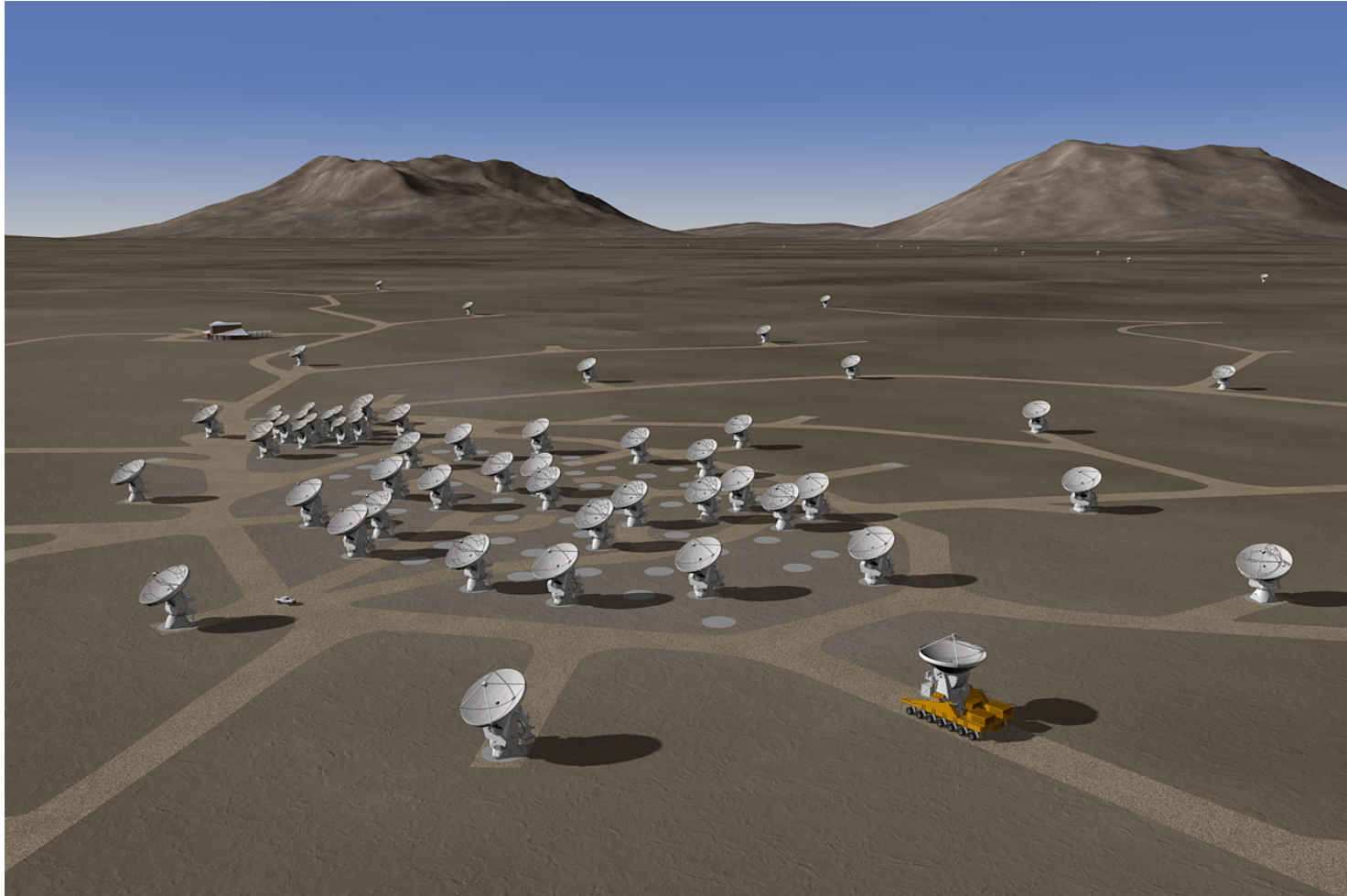
Santiago Central
Office (SCO)



Goodbye to WIMPs - ADASS – 10 November 2010, Boston



So many antennas, so little time...



Goodbye to WIMPs - ADASS – 10 November 2010, Boston



Operations Control Room



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Manage a 66-antenna radio interferometer

- Usually subdivided into ≥ 2 independent arrays
 - 50-element 12m array, 16-element 7/12m ACA
 - Observing different objects, w/different observing modes
- Continuous reconfiguration on ~ 200 pads
- Operator is far (35-50 km) from antennas
 - Humans at 3000 m ($O_2!$), hardware at 5000 m (dry)
- Objective: reliable, 24/7 operations
 - Act correctly: minimize errors
 - React quickly: minimize delays
 - Do it cheaply: minimize head count



WIMP-based operator interface

- Familiar: WIMP in use for ~ 35 years
- Flexible
- But reaches its limits
 - Presenting large quantity of information in an intuitive way
 - Will be difficult to scale to 66 antennas, 2000+ baselines
- Even power users (operators) need an intuitive UI
 - Makes operations more efficient
 - By reducing stress, it reduces errors



UI should enable the user to:

- Create and maintain a mental model
- Retain context: “Where am I?”
- Reduce unnecessary cognitive load
 - *e.g.*, managing windows
- Leverage gut-level cognitive abilities:
 - Spatial memory & spatial orientation
 - Picture enhances or replaces text
- HCI expertise needed
 - For visualization techniques
 - For toolkits (<http://zvtm.sourceforge.net/>)

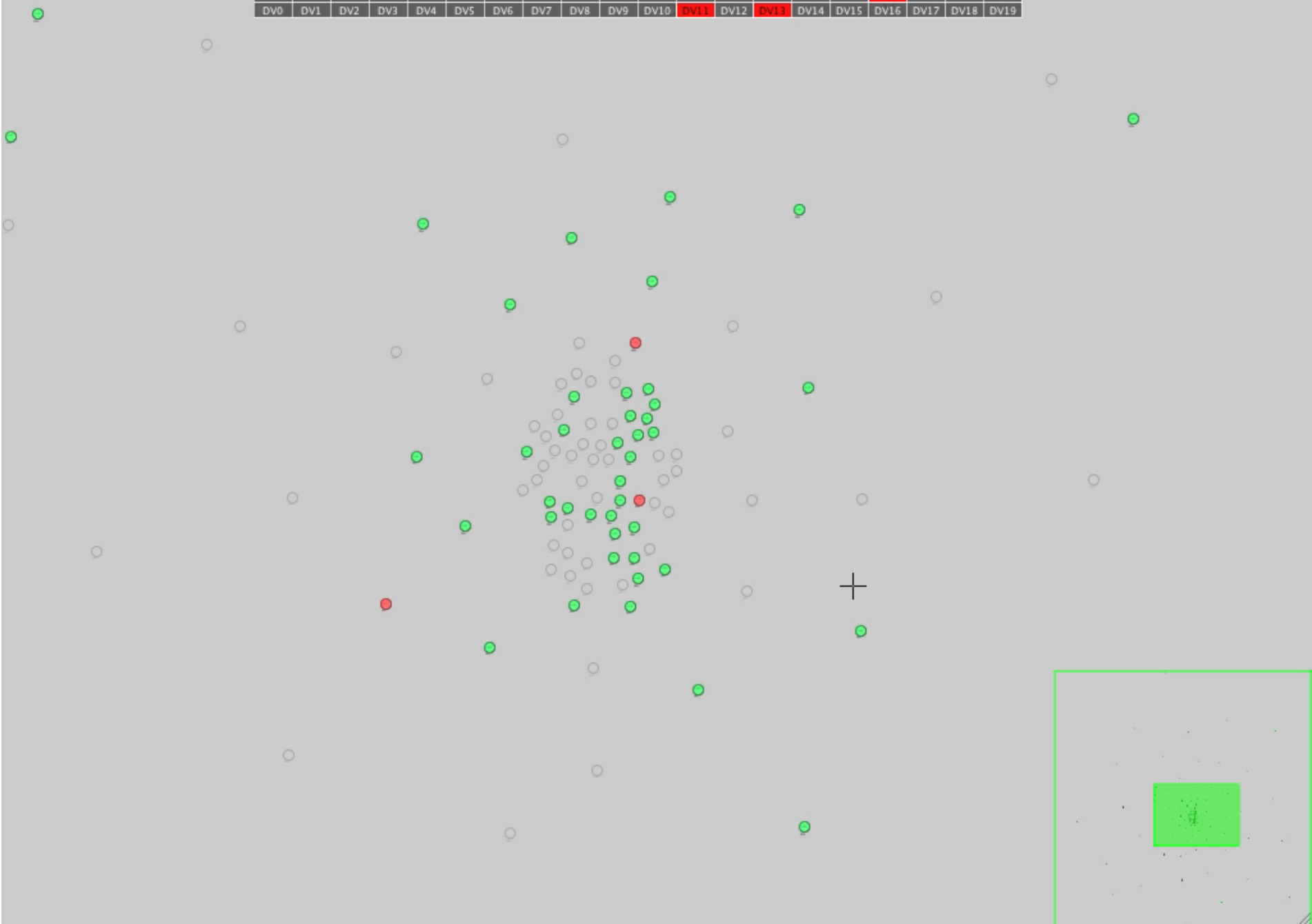


Development process

1. HCI experts visit, interview users (see next slide)
2. Participatory design workshop (1-2 days)
 - Users explain problems, team offers possible solutions, agree on first draft concept
3. Develop mockup/prototype (~5 days)
4. Participatory design workshop (~1 day)
 - Get feedback, modify/rework concept, agree anew
5. Implement (3-6 months)
6. Iterate steps 3-4 as needed
7. Test & deploy

AOS Visualizer

DV40	DV41	DV42	DV43	DV44	DV45	DV46	DV47	DV48	DV49	DV50	DV51	DV52	DV53	DV54	DV55	DV56	DV57	DV58	DV59
DV20	DV21	DV22	DV23	DV24	DV25	DV26	DV27	DV28	DV29	DV30	DV31	DV32	DV33	DV34	DV35	DV36	DV37	DV38	DV39
DV0	DV1	DV2	DV3	DV4	DV5	DV6	DV7	DV8	DV9	DV10	DV11	DV12	DV13	DV14	DV15	DV16	DV17	DV18	DV19





Represent arrays by networks

- Antennas as nodes, baselines as edges
- Visualize in an adjacency matrix (antenna ids label rows and columns)
- Non-empty cells are baselines

