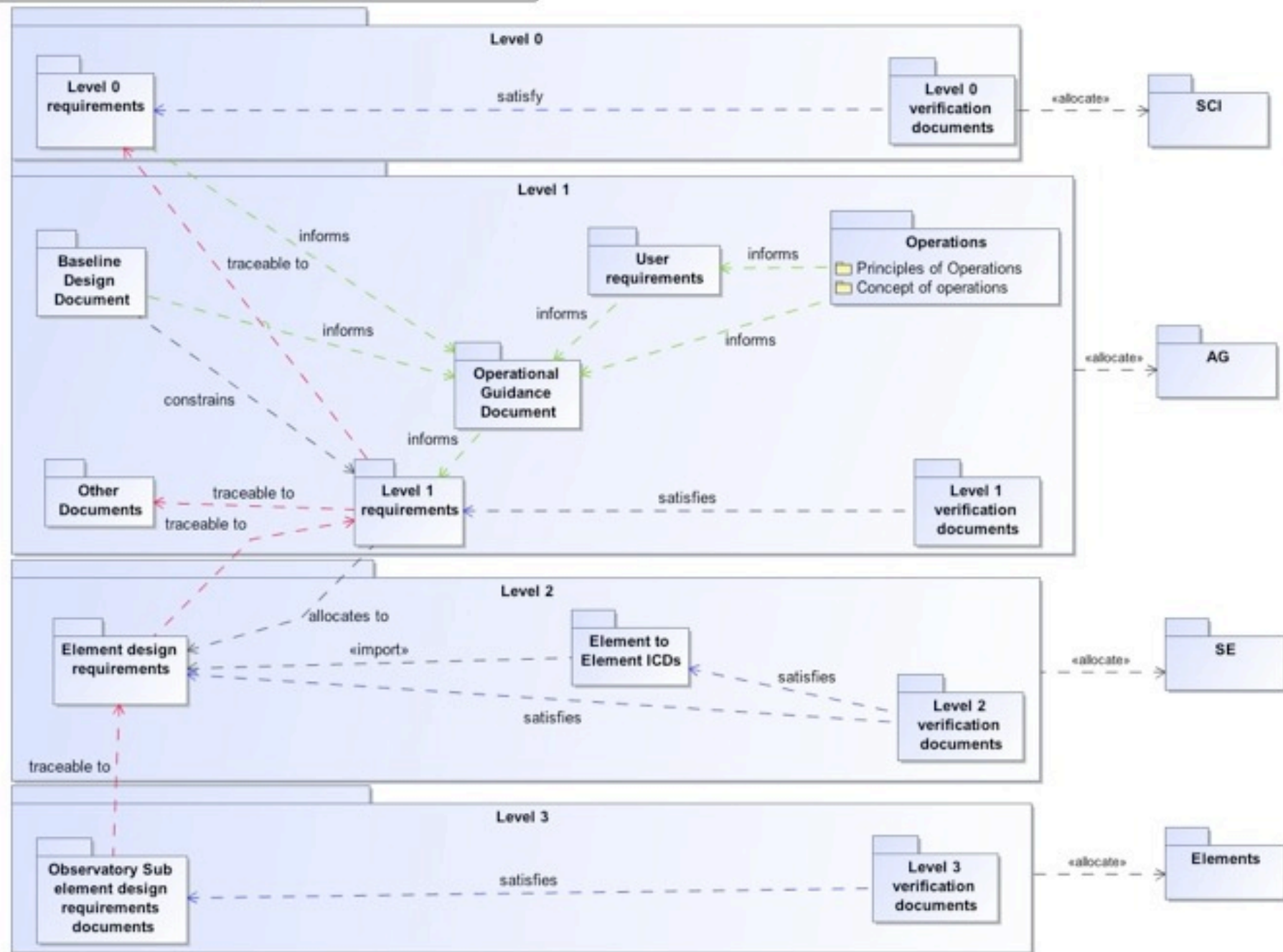


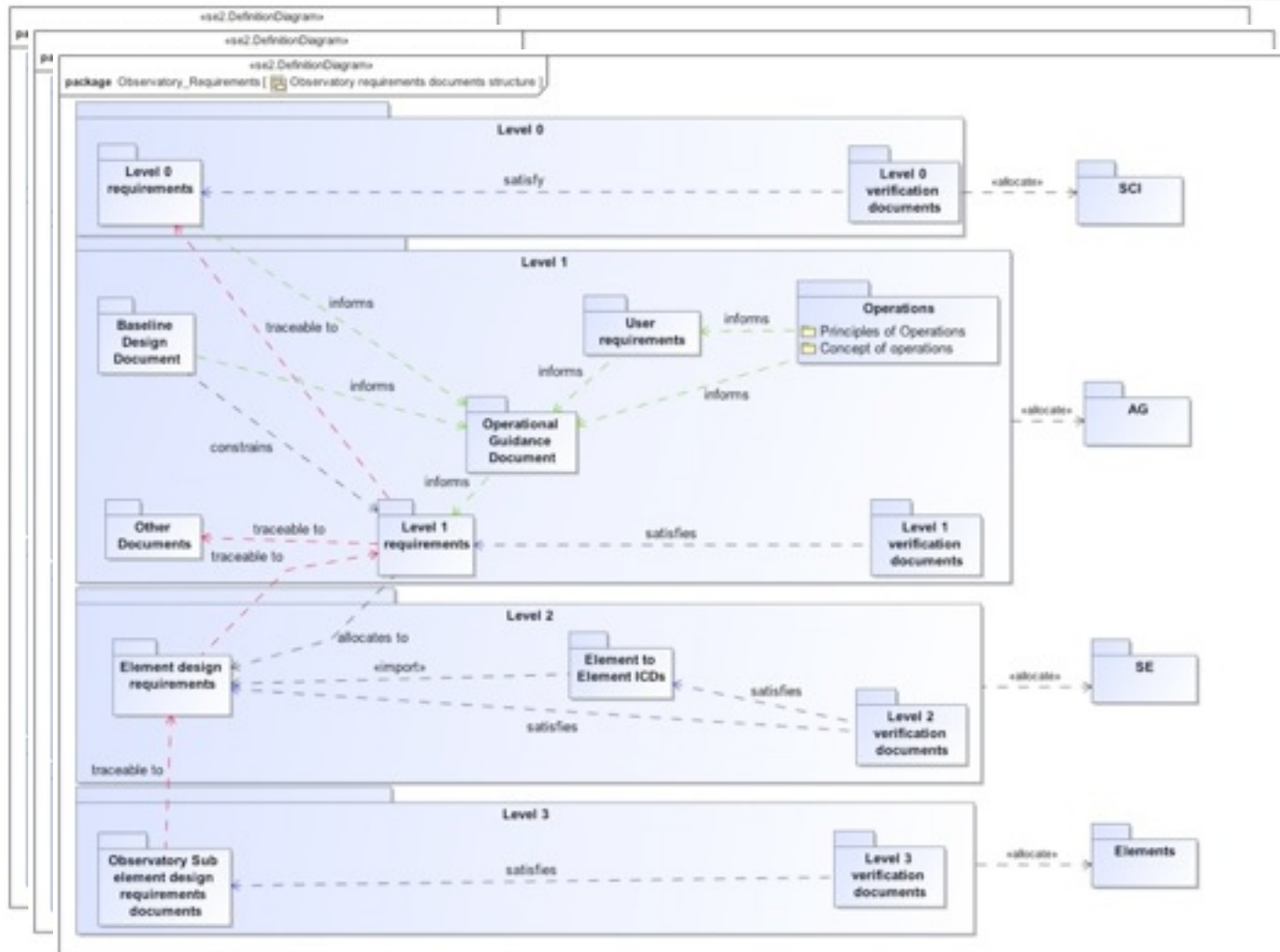


SKA Level 1 Requirements

Tim Cornwell,
Architecture Group
Square Kilometre Array



Successive baselines



Exploring the Universe with the world's largest radio telescope

Deliverables from the Office



- T0
 - ConOps draft
 - Level 1 requirements with TBC's, TBD's
 - SysML model of Observatory
- T0 + 12
 - Baselined ConOps
 - Baselined Level 1 requirements with TBC's, TBD's filled in
 - Baselined SysML model of Observatory

Developed by



- ConOps:
 - Operations Working Group chaired by Douglas Bock (CSIRO)
 - Talk on Thursday at 9am
- Level 1 Requirements:
 - Architecture group
- SysML model:
 - Architecture group, mostly Tim Cornwell

Status of documents



- ConOps has been discussed extensively
 - Presented to the Board
- Level 1 Reqs reviewed but immature
 - Mostly consistent with BD
 - Many TBC's and TBD's
 - Likely to have incorrect or missing entries
- SysML model immature
 - Office experience with SysML is limited
 - Model likely to undergo some further revision
 - Still very useful

Deviations from Baseline



- Quite a number of deviations from Baselines in RfP submissions
- Some have been rejected and Baseline restored
- Please submit a Change Request in favor of your deviation

Examples



- SDP processing estimates
 - Assumes baseline-dependent averaging
- NIP parameters
- SaDT CSP to SDP bandwidth
 - Assumes baseline-dependent averaging
- LFAA network topology

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Example requirements

SYS_REQ-XXXX

SKA1_survey imaging dynamic range – band 3. The SKA1_survey array shall have an imaging dynamic range in band 3 of greater than 54dB for a 1000 hour single-field integration

Proposed

Baseline
Design Table
15 Row 72

Test



8.3.10 SKA1_survey spectral dynamic range

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-XXXX	SKA1_survey spectral dynamic range. TBJ	Proposed	Baseline Design Table 15 Row 73	Test

8.3.11 SKA1_survey - Identical PAFs

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-XXXX	SKA1_survey – identical PAFs ASKAP MkIII PAFs shall be identical for both ASKAP and SKA1 antennas	Proposed	Baseline Design section 9.5.1 para 3 bullet 3	Inspection

8.3.12 SKA1_survey beam positions

ID	Requirement	Status	Parent Requirement	Verification
SYS_REQ-XXXX	SKA1_survey beam positions. SKA1_survey beam positions on the sky as a function of frequency shall be identical for both ASKAP and SKA1 antennas	Proposed		Test

Use of requirements

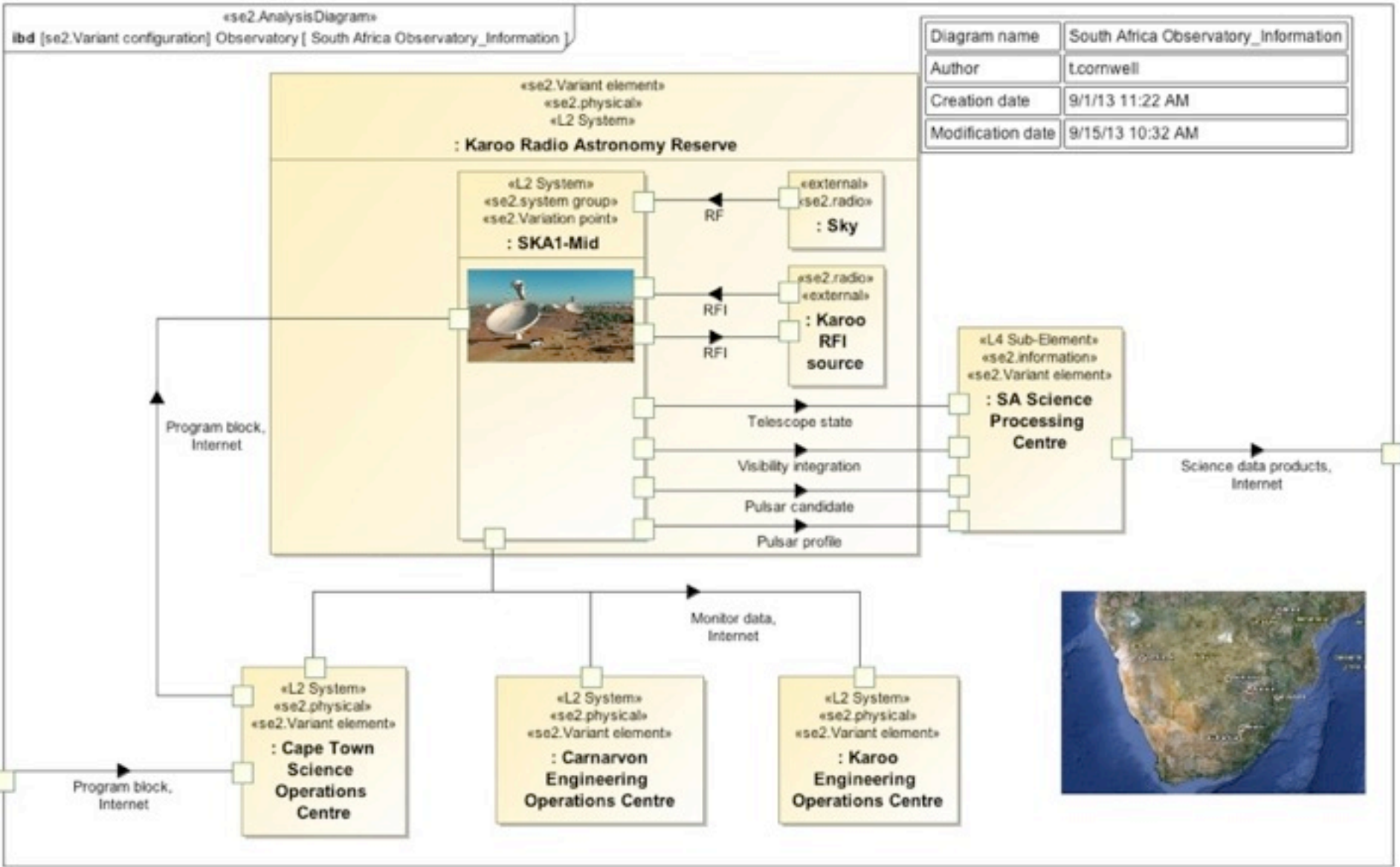


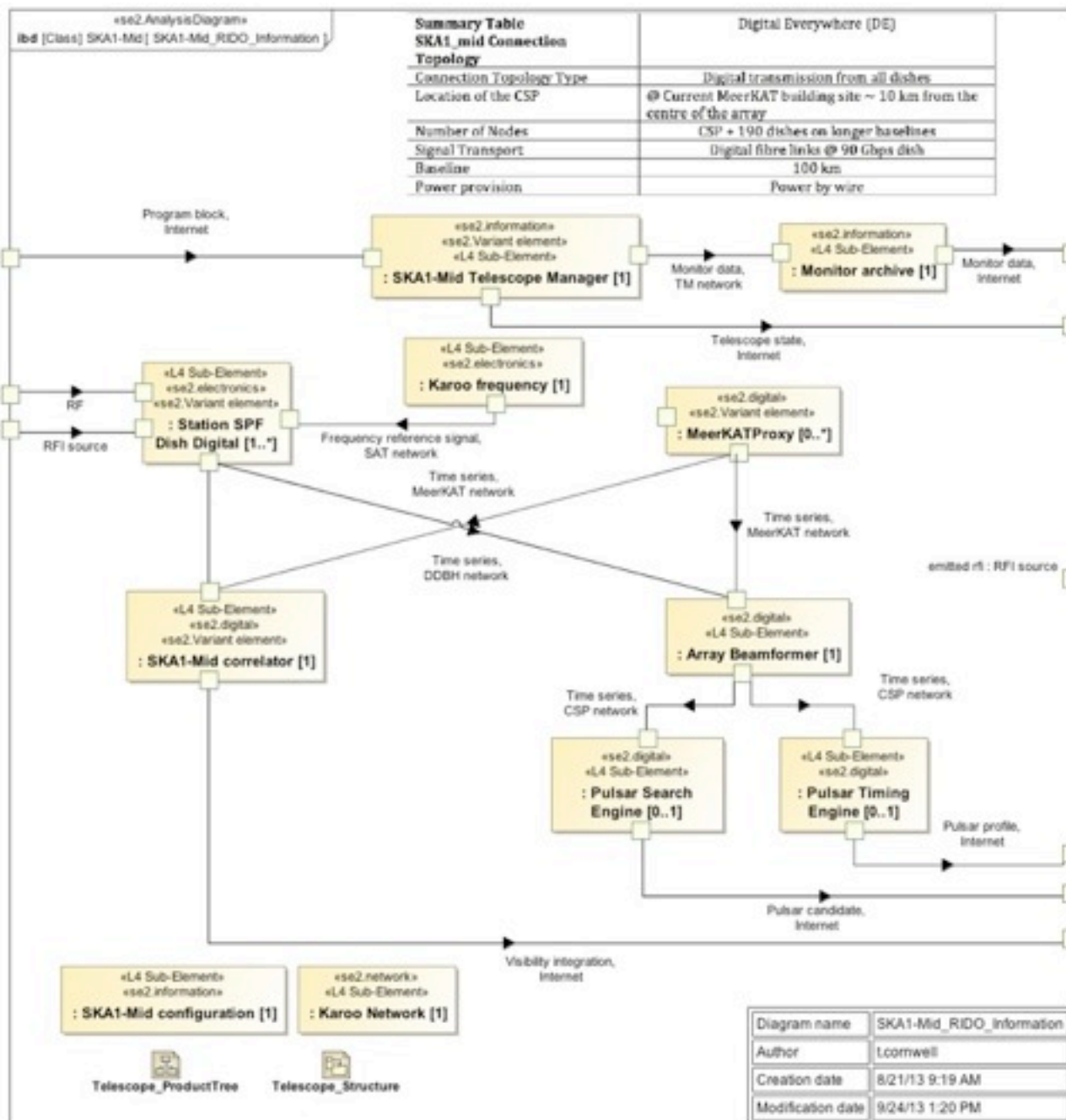
- Constrain the design
- Allocate each requirement to structure in the model
 - (Could be to functions first but we already have the BD)
- Ensure that model satisfies requirement
 - Both requirements and model derived from Baseline Design

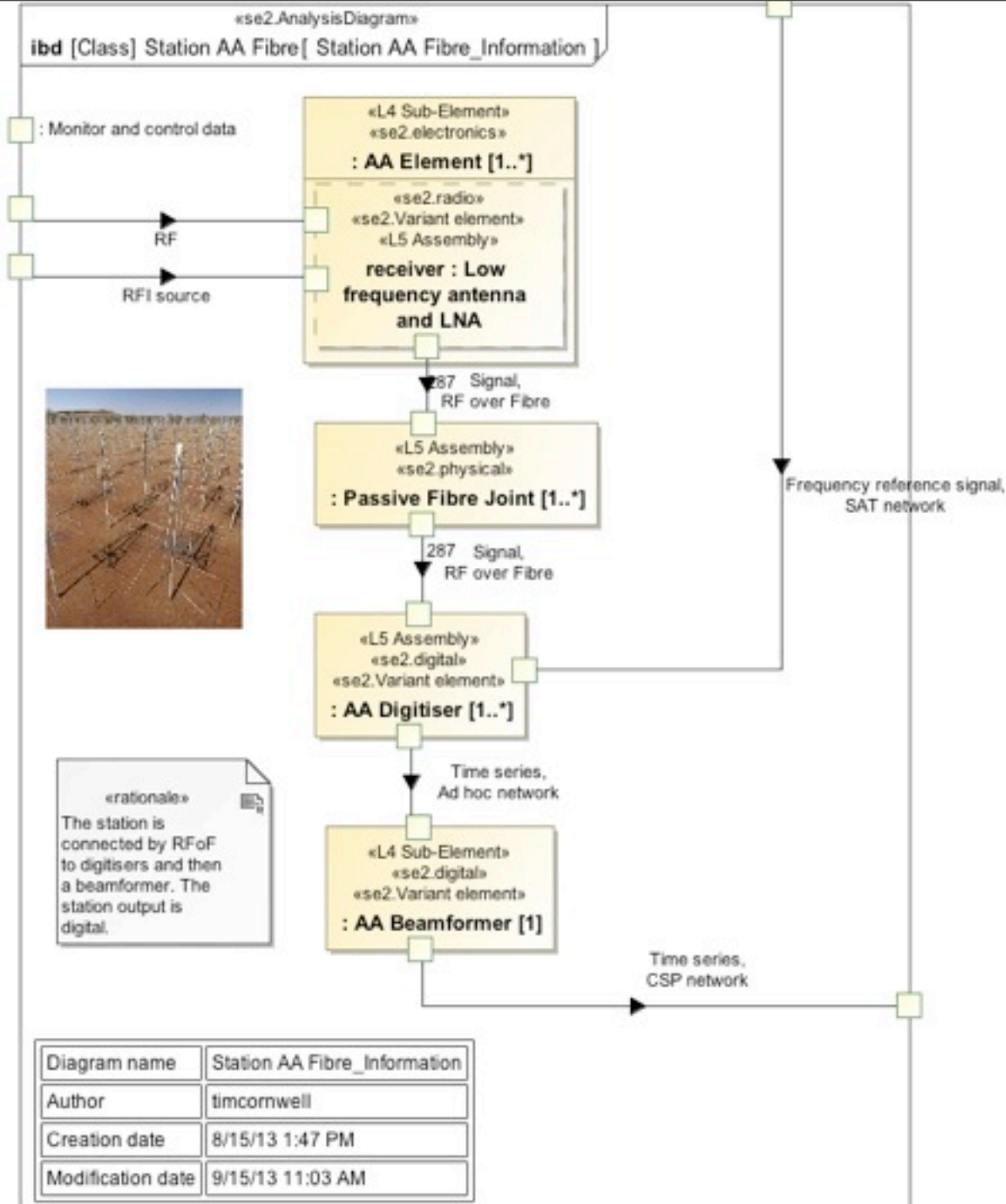
Converting BD to a model



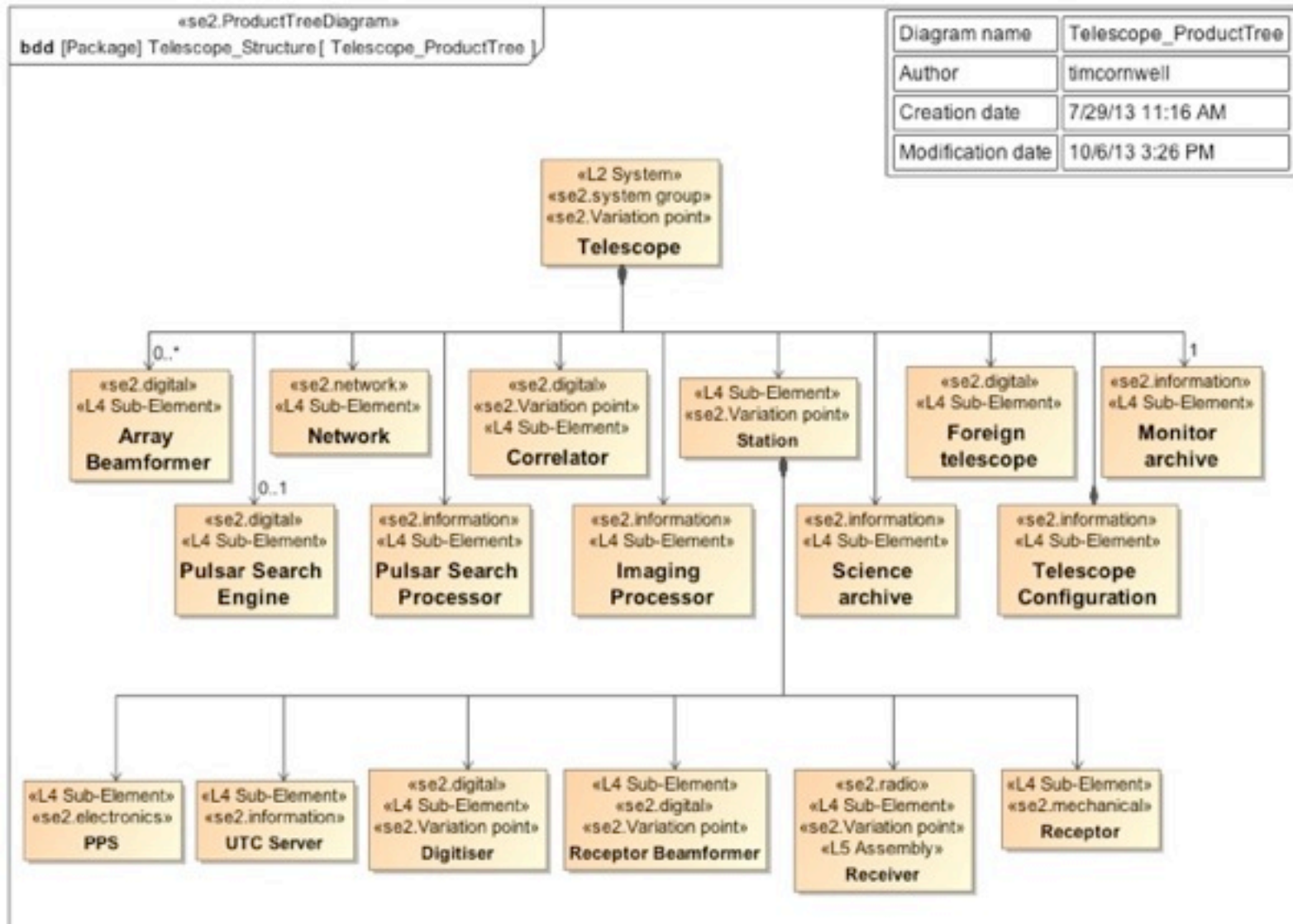
- BD 1 is mostly textual, with many tables and figures
 - Inevitably results in ambiguity, inexactitudes, omissions
 - Allocation of requirements to design elements very difficult
- The Office Architecture Group has produced a SysML version of BD 1
- We will use the SysML model as a tool for reasoning about changes to the design
 - e.g. Requirement allocations can be done via SysML model
 - e.g. Parametric modeling







Telescope product tree



Status of this SysML model



- This SysML model is a representation of the textual Baseline Design V1
 - SKA-TEL-SKO-DD-001-1_BaselineDesign.pdf
- In the event of a difference, the textual version is authoritative
- This is the second generation SysML model
 - Based on INCOSE SE² challenge

Allocation matrix



	12213 SKA1-SYS_REQ-596	12214 SKA1-SYS_REQ-598	12215 SKA1-SYS_REQ-600	12216 SKA1-SYS_REQ-602	12217 SKA1-SYS_REQ-604	12218 SKA1-SYS_REQ-606	12219 SKA1-SYS_REQ-608	12220 SKA1-SYS_REQ-611	12221 SKA1-SYS_REQ-613	12222 SKA1-SYS_REQ-616	12223 SKA1-SYS_REQ-618	12224 SKA1-SYS_REQ-620	12225 SKA1-SYS_REQ-623	12226 SKA1-SYS_REQ-625	12227 SKA1-SYS_REQ-627	12228 SKA1-SYS_REQ-629	12229 SKA1-SYS_REQ-631	12230 SKA1-SYS_REQ-633	12231 SKA1-SYS_REQ-635	12232 SKA1-SYS_REQ-637	12233 SKA1-SYS_REQ-639	12234 SKA1-SYS_REQ-641	12235 SKA1-SYS_REQ-643	12236 SKA1-SYS_REQ-645	12237 SKA1-SYS_REQ-647	12238 SKA1-SYS_REQ-649	12239 SKA1-SYS_REQ-651	12240 SKA1-SYS_REQ-653	12241 SKA1-SYS_REQ-655	12242 SKA1-SYS_REQ-657
PPS_Structure [PPS]																														
PPS																														
Receiver							1		1													2	2			2	2	2		
Receiver_Structure																														
Receiver																														
Receiver_Variations							1		1													2	2			2	2	2		
Low frequency antenna and LNA																														
PAF and LNAs																														
SPF and LNAs																														
Receptor												1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1
Receptor_Structure																														
Receptor																														
Receptor_Variations																														
AA Element																														
SKA Dish																														
Dish with PAF																														

Use of allocation matrix



- Check for:
 - Design elements without requirements
 - Requirements not allocated to any design element

	REQ	12185 SKA1-SYS_REQ-537	12186 SKA1-SYS_REQ-539	12187 SKA1-SYS_REQ-541	12188 SKA1-SYS_REQ-542	12189 SKA1-SYS_REQ-543	12190 SKA1-SYS_REQ-545	12191 SKA1-SYS_REQ-547	12192 SKA1-SYS_REQ-549	12193 SKA1-SYS_REQ-551	12194 SKA1-SYS_REQ-553	12195 SKA1-SYS_REQ-555	12196 SKA1-SYS_REQ-557	12197 SKA1-SYS_REQ-559	12198 SKA1-SYS_REQ-564	12199 SKA1-SYS_REQ-566	12200 SKA1-SYS_REQ-568	12201 SKA1-SYS_REQ-570	12202 SKA1-SYS_REQ-572	12203 SKA1-SYS_REQ-574	12204 SKA1-SYS_REQ-576	12205 SKA1-SYS_REQ-578	12206 SKA1-SYS_REQ-582	12207 SKA1-SYS_REQ-584	12208 SKA1-SYS_REQ-586	12209 SKA1-SYS_REQ-588	12210 SKA1-SYS_REQ-590	12211 SKA1-SYS_REQ-592	12212 SKA1-SYS_REQ-594	12213 SKA1-SYS_REQ-596
Observatory_Structure		1	2	1	1	1	1	1	1	1	1	1	1	1	18	1	1	2	3		1	1	1	4	4	3	2	2	2	2
Engineering Operations Centre					1	1				1	1																			
Engineering Operations Centre_Structure																														
Engineering Operations Centre	4																													
Engineering Operations Centre_Variations					1	1				1	1																			
Boolardy Engineering Operations Centre	2																													
Carnarvon Engineering Operations Centre	2																													
Geraldton Engineering Operations Centre	2																													
Karoo Engineering Operations Centre	2																													
Global Headquarters_Structure [Global Headquarters]																														
Global Headquarters	46																													
Science Operations Centre				1																										

Feedback on Requirements



- Suggestions welcome re:
 - Rollups to higher level
 - Missing Requirements
 - Missing Details
 - Missing TBCs and TBDs

Changes to Requirements



- Follow SKA Change Request Procedure
 - SKA-TEL.SE.CDM-SKO-PR-001
- Informal requests will not be accepted
- Minor changes in a single area can be rolled into one CR
- Submit via Project Managers

Status of Requirements doc



- SKA-TEL.SE.REQMAN-SKO_SRS
- Requirements designed to be (mostly) consistent with Baseline Design
 - Adds in other areas
- To be finalised within 2 weeks
- Internal review
- To be issued week of T0
- Currently over 133 pages, 510 requirements

- Filehold Document Management System
- Microsoft Word
- JAMA Contour (Office use only)
 - Export via Word
- Cameo System Modeler
 - Interchange via XML