# Analysis of Feature SP-774, TIMS ticket TIMN-176

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## Referenced Baseline Documents

[1] SKA1 LOW SADT to LFAA Interface Control Document, 100-000000-026
[2] SKA1 LOW SADT to INFRA AUS Interface Control Document, 100-000000-024
[3] LINFRA To NSDN (LOW) IICD, SKA-TEL-SADT-0000445
[4] LFAA Architectural Design Document, SKA-TEL-LFAA-0200028
[5] LFAA Signal Processing System Detailed Design Document, SKA-TEL-LFAA-0500035
[6] NSDN Detail Design Report (LOW), SKA-TEL-SADT-0000301
[7] NSDN Detailed Construction Costs, SKA-TEL-SADT-0000707

## The issue

*"The CDR panel suggested that in the event of power loss, under UPS power, some network functionality should remain available. This should at least be able to signal the presence (or lack of) power in each cabinet."*

## Solution Options and Analysis

### Proposal 1 – New 1GE network in CPF and provision for low-power mode network equipment

#### *Email: 4 March 2019 from G. Comoretto*

*Dear Alessio,*

*The CMB in each cabinet provides limited (~10 minutes) battery power. If a 1Gb network is added to the system, this functionality would be granted. This has the extra advantage of providing LMC functionality with just the CMB powered, limiting the "low power mode" power to <50W per cabinet.*

*There are a few problems with this solution*
*- the network must be added to the LFAA PBS. This includes a few (4?) 1Gb switches, and cables. Nothing expensive, but it has to be accounted for in all documents.*

*- the system works quite well for CPF cabinets. I have no idea of whether a 1Gb LMC connection is available in the RPFs, or whether the connectivity allows this. If not, we have to route everything on the 100 Gb network, i.e. what is done now, and thus a set of equipments must be kept on in low power mode in the MCCS. Cpuld you please point me to what is required, apart from the switches?*

*I modified the network diagram to tentatively include this. Please have a look and comment. I would not change the figure in the ADD at the moment, as it would require changing a lot of other elements, but if Daniel thinks this can be done, I will include your remarks in the graph and send it to Daniel.*

*Thank you*

*Gianni*

As Gianni Comoretto's proposes in his email, there are a few problems associated with adding a 1GE network to the existing design. Firstly, the new switches would need to be accounted for in all of the design documents [4], [5] and cost models, secondly an additional out-of-band 1GE network is not feasible for the remote RPF locations, so everything would still need to be routed back on the in-band 100GE LFAA network. However, the 100GE network equipment in the RPFs could be designed to be powered off UPS, a so called "low power mode", to provide network connectivity in the event of power failure. Gianni has produced a modified diagram of the LFAA network showing the new 1GE network connections in the CPF and the equipment required to operate across the sites in low power mode (highlighted in yellow), see Figure 1 below.

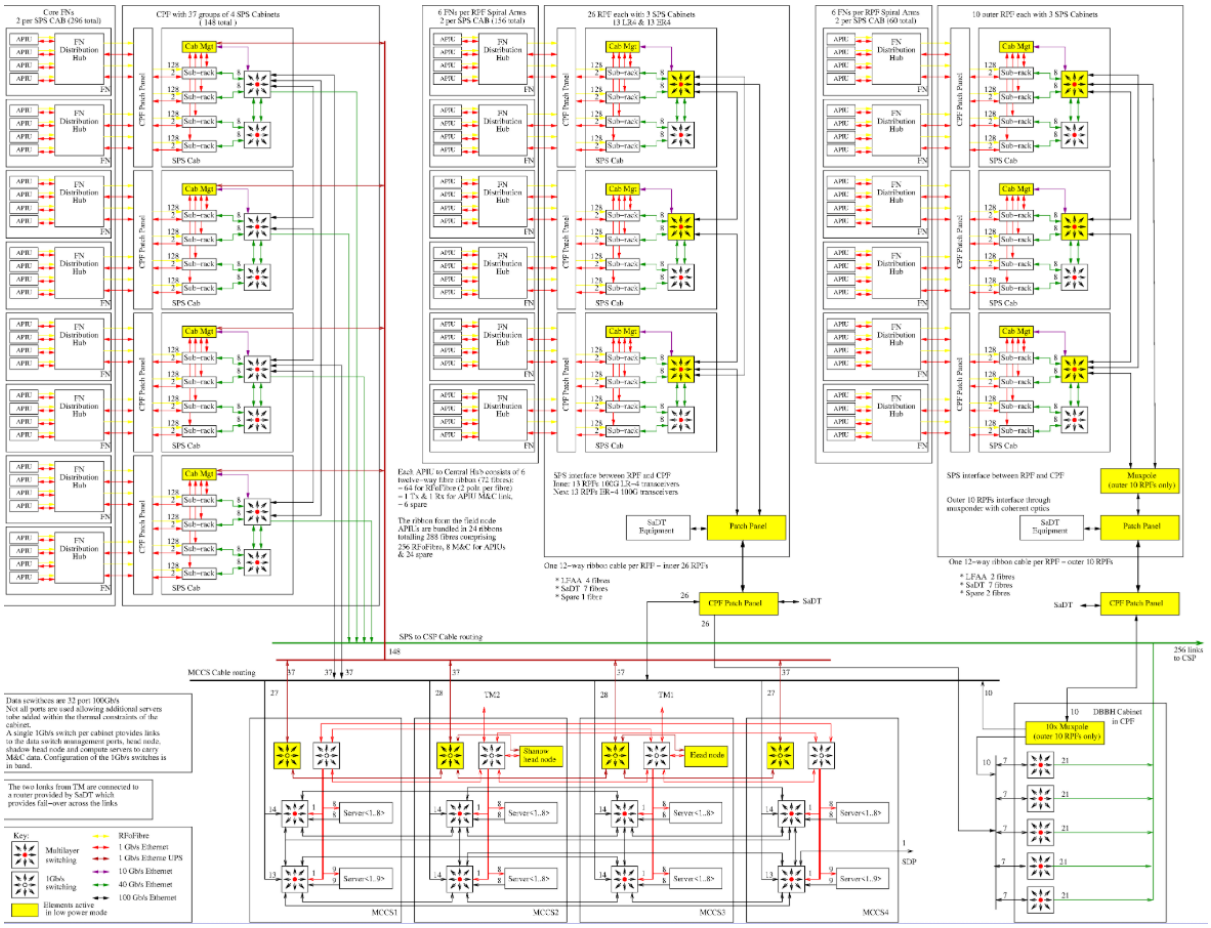


*Figure 1 Proposed LFAA network showing new 1GE network and equipment (in yellow) that could operate in low power mode*

## Proposal 2 - Out of band connectivity using NSDN

An alternative solution, would be to connect the CMBs to the local Non Science Data Network (NSDN) switches. NSDN provides reliable and secure out-of-band transport for other LMC traffic and critical services across the entire telescope [6]. The CMBs could be connected to the 1GE ports on nearby NSDN switches, from where they could be routed to

the MCCS clusters and head nodes that are already connected to NSDN [1], for their NTP connection.

In the RPF, there are spare ports available on the NSDN access switch (~12 spares on an assumed 24 port switch) [6] or each CMB in the 3 Signal Processing System (SPS) cabinets to connect to, as shown by the orange connections in the modified RPF network diagram, Figure 2 below. The NSDN Access Switch already has 1x 1GE port reserved for the LFAA network to provide NTP [1]. The NSDN access switch is powered by a rack mounted UPS that keeps the NSDN network available during a power outages.

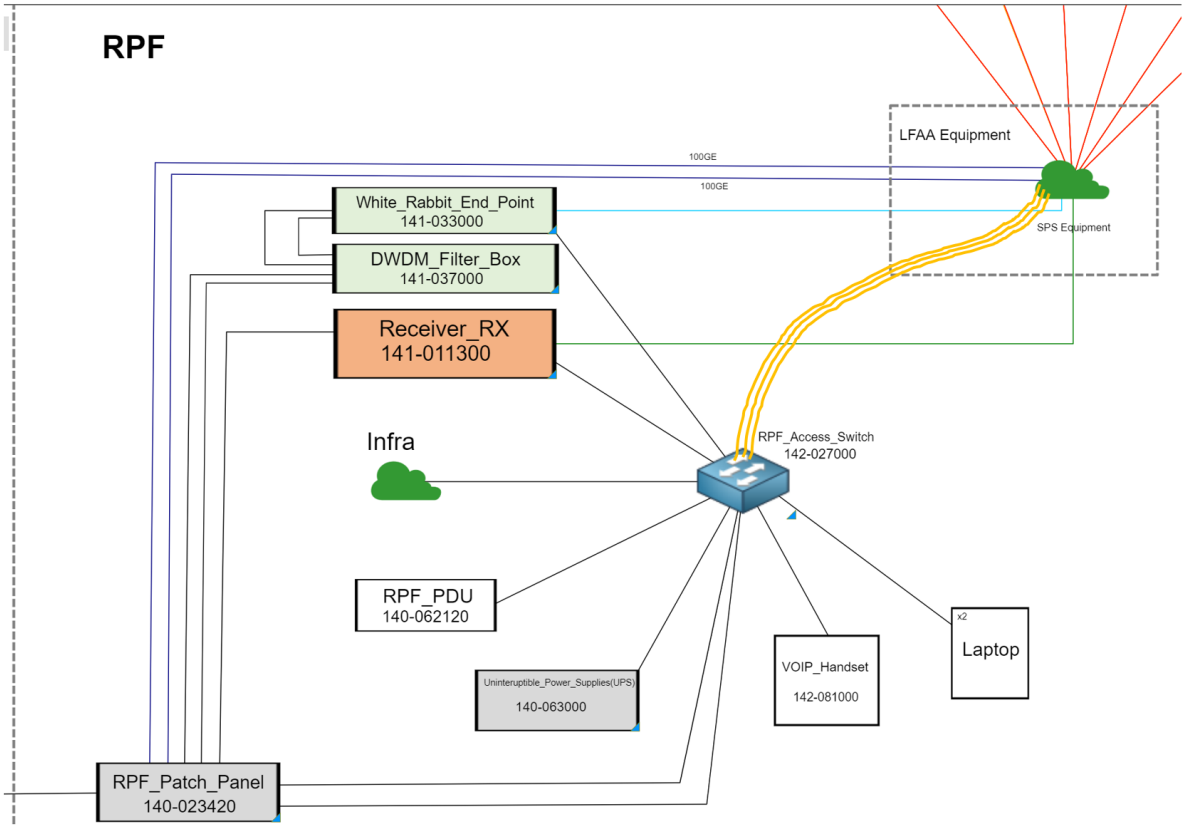


*Figure 2 Proposed RPF Logical Network showing new NSDN connections (in orange) to SPS Equipment with CMB interfaces*

In the CPF, NSDN Utility Switches are available at the end of each aisle to provide VoIP and temporary internet access for laptops, etc. These utility switches are specified with 24 ports, so there are plenty of spare ports available (>10) for the CMBs in each SPS cabinet to connect to. Figure 3 illustrates the connections (in orange) for each SPS cabinet to the end of aisle utility switch. Once the CMBs are connected to the utility switch they can be logically routed to MCCS cluster and head nodes that are already physically connected to NSDN.

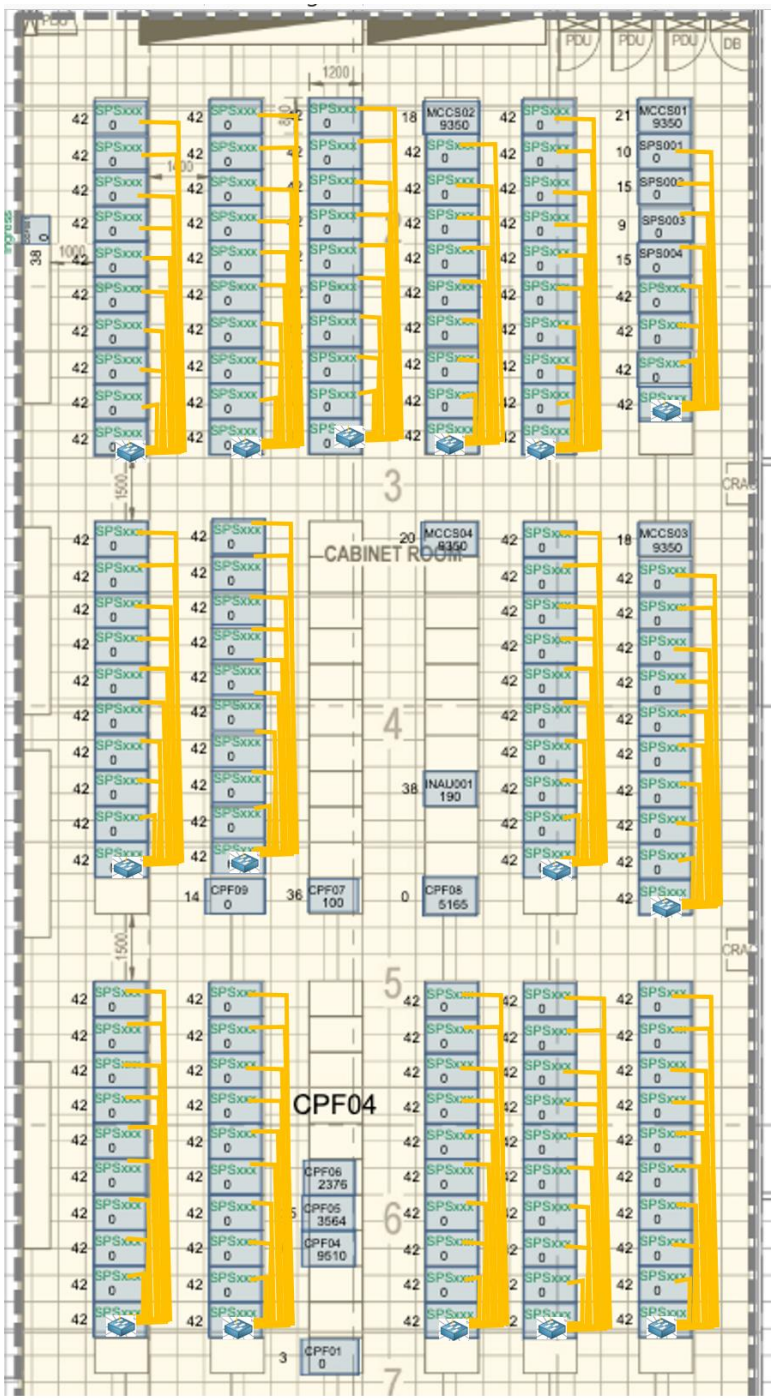


*Figure 3 Proposed CPF floor plan showing cabinet locations and connectivity between NSDN end-of-aisle utility switches and SPS equipment (in orange)*

There are a number of advantages by using NSDN:

- NSDN allows a centrally managed and restricted network across the observatory, so for example, user and device access can be restricted, and the LFAA LMC can be segregated onto its own VLAN.
- No need for any additional switch equipment at any location
- The NSDN network at the remote RPF already runs of its own UPS, and connections back to the CPF are resilient in case of equipment/connection failures.

- There would be 10 or less cable connections to each NSDN utility switch in the CPF, that is better than routing 148 cables to a few new 1GE switches near the MCCS network, as described in proposal 1.
- No significant change to cost [7] and power budgets, and minimal design document changes.

## Further work and outstanding issues

- Check that a 1GE connection from CMB is available, the SPS Detailed Design Document mentions a 10GE is used to connect the monitor and control data to the LFAA 100GE network?
- Check LMC traffic capacity calculations, and confirm that NSDN has enough bandwidth to support the additional services.
- Check the LFAA network logical network design and configuration for the LMC services e.g. network addressing schemes. Note that the LFAA logical network design and configuration is a bigger task than covered by this TIMS ticket.

## Impacted Documents

- NetTerrain representation of the network
- LFAA Architectural Design Document, SKA-TEL-LFAA-0200028
- LFAA Signal Processing System Detailed Design Document, SKA-TEL-LFAA-0500035
- SKA1 LOW SADT to LFAA Interface Control Document, 100-000000-026
- NSDN Detail Design Report (LOW), SKA-TEL-SADT-0000301
- SADT.NWA Detailed Design Report (LOW), SKA-TEL-SADT-0000530
- Non-Science Data Network Cost Model, SKA-TEL-SADT-0000129-SADT.NSDN.XXX-CRE-01