Project: ‘Enhancements & Roadmap to Aakash Platform’ (Control Number: AAC18011212361)

**The major objectives of this project as laid out in the proposal are:**

To improve the Aakash tablet with respect to higher usability, power consumption, cost and ruggedness, a study of the design and conduction experiments are required. As part of the study, the complete design and component usage will be reviewed to improve performance and cost effectiveness. Several experiments will be conducted to improve the usability for many types of people behavior and to improve power consumption efficiency and ruggedness. A study will be conducted to find out OS aspects including porting of a higher OS. A report will be generated with the recommendations for enhancements.

**Approach**

This project is proposed by IITM’s Telecom Center of Excellence, an independent R&D lab setup in 2009 by Department of Telecom and IITs. IITM’s TCoE has a team of engineers with expertise in embedded product development. This project is proposed to be run as a technical research project with a 2-3 member team that will constitute TCoE engineers / student of IITM, with the guidance of faculty support from IITM.

**Project Calendar & Cost**

The time estimate for the current phase of the project proposed is 1 year. The project cost estimated to execute the project is roughly Rs.25 lakhs.

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| --- | --- |
|  | Duration 1 year  |
| Human Resources | 15 lakhs |
| Travel and Institute Overheads | 4 lakhs |
| Hardware Platform/Software tools/Test equipments  | 3 lakhs  |
| Field Trials  | 3 lakhs |
| **Total** | **25 lakhs** |

Status Update Report as of March 2013

**Lead: Mr. Rishikeshlal Babu**

A twelve member committee from IIT, Madras, IIT, Bombay, CDAC, Noida, and CDAC, Trivandrum and five numbers of consultants were utilized in drafting the Aakash IV specification. The committee and consultants met for two days at TCoE, IITM Research Park to draft Aakash IV specification. Rest of the communication among committee members and consultants was done through several email exchanges and phone calls. Feedbacks from all potential Aakash manufacturers were also taken into account. The outcomes of these meetings and interactions resulted in the following enhanced Aakash IV draft specification at an additional cost of approximately Rs.300. This new specification is based on the performance of CPU/Hardware Accelerator, Battery, etc. rather than on specifying CPU/GPU running at a minimum clock frequency, or Battery with minimum capacity in terms of mAh.

* RAM - from 512 MB to 1 GB
* Connectivity - from WiFi to WiFi + Bluetooth
* USB port - from one to two (one powered)
* SD Card interface compatible with NFC based SD Card
* Rubber protected plastic cover
* Increased battery capacity - three hours under heavy load to six hours under light load of operation
* Primary boot of Android from flash, and secondary boot of GNU Linux from external SD Card
* Mechanical, safety, environmental, radio emission standard compliance tests have been added
* Modular approach with connectors for easy serviceability and maintainability
* Most commonly used Indian languages support
* Developer support enabled for developing android applications
* Performance metrics were specified for various parameters under the following categories in the form of minimum score (if higher score is better) or maximum score (if lower score is better)
	+ CPU
	+ Memory
	+ Database with SQL
	+ Video performance
	+ Web browsing performance
	+ Battery

The functional and performance tests that will be conducted on the tablets to be submitted for evaluation were captured in Aakash evaluation process document and reviewed by the committee members. Vendors meet for discussing the draft Aakash 4 technical specification was organized in CDAC, Noida in which more than 40 people from various vendors participated and provided their feedback. Representatives from the following companies Edutor Technologies, Cellkon, Freescale, Kemsys, STAMP computers, Analog Devices, Conexant, Binatone, Lite On Mobile, Datawind, HCL, ITI, BEL, Dataway Solution, Sanmina, Toshiba attended the Vendors meet. Five more tablet developers have been identified in the fourth quarter apart from eight tablet developers identified in the first, second, and third quarters. We had several direct face-to-face interactions with the potential manufacturers. A team of three Engineers (software and hardware) continue to support for comparison of tablets and develop android applications to test performance for e.g., touch screen test, audio performance test, battery under different WiFi usage scenarios, etc. One Consultant continues to provide guidance to the Engineers in doing advanced performance evaluation.

215 different tests have been carried out on all Aakash candidate tablets to measure their performances. Weighted average of test results have been calculated to get overall performance score for each of the tablet for comparison of performances of candidate Aakash tablets. They would go onto strengthen the next Aakash version significantly. In order to qualify in the evaluation process, the candidate tablet should pass all functionality and performance tests specified in the Aakash 4 technical specification. For compliance testing, the manufacturers should get the compliance certificates from the respective authorised organisations. Audio test setup measures the frequency responses of microphone and speaker present in the tablet. The expected result for each test is indicated in the evaluation process document.

Type of tests:

* Android Benchmark Tests: Antutu, Andro Bench, Quadrant Standard, AndEBench, Passmark Performance, RealPi, Boot Benchmark, Phone Tester, Linpack, Nenamark2, Z-Device, RL Benchmark SQL, Basemark GUI, Audalyzer, Sensor List, GL Benchmark, CF Bench, Octane, Browsermark, Sunspider
* All other tests: Touch screen test, signature capture, document formats verification, accessing online video, playing different audio and video formats, effects of WiFi, LCD, video display, e-reader, etc. on battery performance and its life cycle, USB and SD card test, image viewer, audio/video/text chat, accelerometer, web-browser, hard keys, ruggedness, safety tests

We have tested hardware and software functionalities and performances of about 10 potential Aakash tablets before arriving at the detailed Aakash 4 technical specification. Interactions with authorized test labs e.g. UL Labs, Bengaluru, ETDC (STQC), TUV were carried out to understand test facilities available in India and cost implications of the same. Similar such interactions with potential Aakash manufacturers and detailed analysis resulted in specifying appropriate standards for mechanical, safety (IS13252 mandatory in India), security, RF, environmental, and material tests.

As the scope of the project had increased and hence to give increased focus, a proposal for extending the project “Enhancement and Roadmap for Aakash” by one year was sent to Mr.N.K.Sinha (MHRD) on 16th October 2012 and requested him to let us know what we have to do. While we have been following up with the proposal and **long waiting for the Aakash enhancement project clearance since 16th October 2012**, we continued with further efforts needed including creating the test setup with the following facilities for Aakash candidate tablets qualification for technical bid clearance in the Aakash 4 tender process. Potential Aakash manufacturers with the necessary resources allocated are also waiting with their manufacturing roadmap ready for the announcement of Aakash 4 tender so that cost-effective time-bound quality Aakash tablets can be manufactured in India.

* Hardware: Tablet under test, Sample Tablet Batteries, USB Storage Device – 16 GB Pen Drive, USB Keyboard, USB Mouse, USB to Ethernet Adaptors, USB Printer, USB to HDMI Cable, USB Hub – 4 ports, 2G/3G Phone / Data Connectivity Dongles, Bluetooth Dongle, Multimeter, NFC Compatible SD Card – 8 GB, high quality PC speakers and microphone, WiFi Router, Desktop PC or Laptop
* Software: All android benchmark tests and in-house tests, Matlab, Audio Recording, Software, Battery Logger.

Status of Funding & Expenditure (as of March 2013)

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| --- | --- | --- | --- |
| **Project Title** | **Approved**(In Lakhs) | **Received**(In Lakhs) | **Spent**(In Lakhs) |
| Enhancement & roadmap to Aakash Platform | 25.00 |      7.5 | 9.73 |