

Institute for Plasma Research Gujarat (IPR)

Wi-Fi for Research

HFCL Fuels the Institute for Plasma
Research with an Advanced Wi-Fi Solution




Background

The Institute for Plasma Research (IPR) is an autonomous research institute under the Department of Atomic Energy, Government of India. Established in 1986, IPR is located in Gandhinagar, Gujarat and is dedicated to pursuing research in the area of plasma science and fusion energy.

Plasma science involves the study of ionized gases, also known as the fourth state of matter after solids, liquids, and gases. Plasma research has applications in various fields, including fusion energy, materials science, astrophysics, and space exploration. IPR's primary focus is on developing fusion energy as a safe, sustainable, and virtually inexhaustible source of energy. Fusion energy is the process that powers the sun and stars, where light atomic nuclei fuse together to form heavier nuclei, releasing tremendous amounts of energy.

Scientists at IPR are working on designing and developing fusion reactors, which can harness this energy in a controlled and safe manner. One of IPR's major projects is the development of the Steady State Superconducting Tokamak (SST-1), a fusion reactor that uses magnetic fields to confine and control the hot plasma required for fusion reactions.

The institute is also involved in several national and international collaborations, including the International Thermonuclear Experimental Reactor (ITER) project, which aims to demonstrate the scientific and technological feasibility of fusion energy. Apart from fusion research, IPR also conducts research in other areas of plasma science, including plasma processing of materials, plasma diagnostics, and computational plasma physics. The institute has state-of-the-art facilities and collaborates with various national and international research organizations, universities, and industries. The Institute for Plasma Research in Gujarat continues to be at the forefront of India's fusion energy ambitions. Its research efforts hold immense potential for unlocking a clean and virtually limitless source of energy for the future.



Our deployment of HFCL's advanced Wi-Fi solution at the Institute for Plasma Research in Gujarat has helped in overcoming significant challenges such as signal penetration obstacles and outdated infrastructure; we've successfully provided seamless connectivity across the entire campus. Our tailored solution has improved network performance while enhancing the security and management capabilities

Anand Kumar
(Associate Vice President, Communications)

Challenge

IPR had an existing Wi-Fi network running on outdated technology. To meet the growing campus connectivity needs, the institute needed to revamp the entire Wi-Fi infrastructure with the latest technology—ensuring better coverage, enhanced security, and seamless access for legitimate users. Additionally, the new setup had to comply with Government of India's "Make in India" directives, aligning with national policies on indigenous technology adoption.

Solution

To address these challenges, HFCL deployed its advanced Wi-Fi 5 4x4 indoor and outdoor Access Points across the IPR campus. The deployment strategy focused on providing blanket coverage with seamless connectivity, ensuring no dead zones, regardless of the signal penetration challenges posed by the building materials. The solution was deployed across the institution's buildings, hostels, and faculty residences within the campus boundary, providing a unified and secure wireless network infrastructure.

The presence of integrated omni-directional antennas in the indoor Access Points and external omni-directional antennas in the outdoor Access Points provided 360-degree coverage, ensuring broad coverage in all directions. At the same time, the external omni-directional antennas in outdoor Access Points focused their signals in specific directions, providing concentrated coverage where it's needed most. This combination optimized network performance by directing signal strength and reducing interference, improving overall throughput. Technologies like MU-MIMO, Transmit Beamforming, and enhanced receiver sensitivity allowed the Access Points to effortlessly cater to the large number of students simultaneously across the campus.

The Access Points support fast roaming and fast handover that help in seamless transition amongst the APs, as the user moves from one location to another, without any drop in the network connection, letting the users experience flawless connectivity in the entire campus. The Access Points come with WPA2 security, offering highly secure Network & shielding the students as well as the College Administration from unwanted cyber-attacks and hackers.

Additionally, we implemented an on-premise controller integrated with Institute for Plasma Research's existing Active Directory (AD). This integration ensures efficient network management, scalability, and robust security, allowing authorized users and devices to access the network while keeping potential threats at bay. To further strengthen network security, we have also implemented a fully integrated and highly secure AAA+ Captive portal. This advanced portal extends beyond standard authentication and access control, ensuring that only authorized users can access the network. User permissions are clearly defined, and all activities are meticulously tracked for both security and management purposes.

Indoor Wi-Fi

Wi-Fi 5 Access Point



Outdoor Wi-Fi

Wi-Fi 5 Access Point



Result

- 01** Achieved seamless Wi-Fi coverage across the IPR campus, including areas with signal penetration challenges.
- 02** The solution significantly reduced network downtime, resulting in a 3x decrease in disruptions. Ensured uninterrupted network operations and research activities by upgrading the outdated Wi-Fi infrastructure.
- 03** Enhanced network security with the implementation of a secure AAA+ Captive portal.
- 04** Improved network management and optimization capabilities through the deployment of the on-premises controller.
- 05** Enabled support for growing network demands and future scalability.

Conclusion

HFCL's deployment of its advanced access solution at the Institute for Plasma Research in Gujarat addressed the institute's challenges of providing seamless Wi-Fi coverage and upgrading its outdated network infrastructure. The solution not only enabled uninterrupted research activities and campus operations but also enhanced network security, management, and scalability. This successful deployment meets the current network requirements while laying the foundation for future scalability, ensuring a seamless network experience for all.



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