# Project: Vraj Network Infrastructure

## Objective

* Provide end to end highly available and secured integrated campus wide network infrastructure that can support Voice, Video & Data applications cost effectively at best possible performance possible for the next 10 years.

## Purpose

* Overhaul outdated network infrastructure that has resulted in many weeks of outages impacting Vaishnavs, volunteers and staff, poor intra-net and internet performance, over utilization of scarce network resources by multi-media applications and poor network security that allows anybody to pulg-in any device, including WiFi routers.
* Provide seamless modern day communication service to serve and protect Vaishnavs at far flung locations within the campus.
* Create foundation for to deploy future applications for Vaishnavs, far and near to digitally experience Vraj.
* Provide reliable and cost efficient communication infrastructure for staff, volunteers & Vaishnavs visiting Vraj.

## Applications

Following are few examples of applications that can be supported on e2e integrated network infrastructure:

* Voice Over IP - telephone
* Internet - data
* Video Surveillance System
* Broadcasting of temple events within campus and across internet (ex: live broadcast of lecture in main haveli auditorium to the hall in Murari Krupa)
* WiFi network access for Vraj residents and Vaishnavs
* Restrict and monitor network access to prevent abuse
* Charge for network access to optimize utilization of resources
* Many more…..

## Project Feature (PF)

The scope of the Vraj Network Infrastructure project includes following:

### PF# 1 Comcast for high speed internet connection

* + Shri Krupa - 25 Mbps
  + Main Haveli – 100 Mbps
  + Subodhani- 25 Mbps

### PF# 2 Network cabling for high speed communication between the buildings:

* + Main Haveli, Anugrah, Shri Krupa, Murari Krupa, Govind Krupa, Balbodh & Krishna Krupa
  + Fiber cable between Navratna and Anugrah
  + 1 G Ethernet Cat6 between all residences
  + Fiber cable between main haveli to Navratna (ultimate goal by avoiding inside Anugrah but to go through outside of Anugrah)

### PF# 3 WiFi network for basic communications between the remote building

* + Security Office/Guru Kutir, Subodhani, Gusaiji & Jalbedh
  + Balbodh, Chatursloki (big kitchen)

### PF# 4 Long Distance WiFi for Vraj perimeter security

* + Long Distance WiFi Access Point deployment at Govind Krupa East Side, Yamunaji Temple and Main Entrance on RT 895
  + Unidirectional
  + For Giriraj / Main temple – Unidirectional?? TBD

### PF# 5 Virtual Private Network through Comcast cable network for communication between main campus network & remote buildings

* + Main Haveli, Shri Krupa & Subodhani
  + But FW is at Anugrah??

### PF# 6 Overhaul main Haveli and Anugrah network

* + Create separate virtual network for voice, video & data
  + Install WiFi access point across both buildings to provide full coverage within and nearby areas outside the building
  + Interconnect electric room, A/V room & Anugrah with high speed cable

### PF# 7 Cabling for Video Surveillance

* + North Campus – Shri Krupa, Krishna Krupa, Govind Krupa, Balbodh, Chatursloki

### PF# 8 Cabling for VoIP / Analog phone

* + North Campus – Shri Krupa, Krishna Krupa, Govind Krupa, Balbodh, Chatursloki
  + South Campus – Subodhini, Gusaiji, Jalbedh
* PF# 9 Network activity
  + Guest nw / main nw for main haveli, Anugrah, and North campus
  + Wireless server and firewall
* 4x48 port switches SG 300-52 TBD
* 10x24 port switches model??
* 3 x Firewall –
  + Sonic wall firewall
  + Anugrah, Shreekrupa (guest wifi/video camera), Subodhini
  + 2 x NSA 240 VPN connection
  + 1 x NSA 2600 Big FW
* Windows 2016 server
  + licensing
  + Active Directory
* Wireless devices – Meraki?? TBD
  + 3 devices
  + Wireless routers – Access Points
  + Antenna
* VLANs
  + 4 VLANs
    - VOIP
    - Video
    - Data
    - Wifi (surveillance)
      * Main
      * Guest
    - QOS at VLAN/User level (tiered QOS)
  + Make appropriate naming convention
  + 3x1000 ft CAT-6 cables
  + Order bundeled 10ft / 6 ft ready made cables for patch panels etc
* Network Device location:
  + In Electric room
  + Covered with rack

Priority

1. Haveli / Switch / Firewall / Active Directory
   1. Buy switches
   2. Buy firewalls
   3. Buy UPS
   4. Get server ready for AD
2. Fiber all the way from main temple to shree krupa
3. Deploying network in
   1. North campus (shree krupa / Krishna kripa …)
   2. Morari kripa, balboth and big kitchen
   3. Subodhini, Guru kutir, Gusaiji and Jalbhed
   4. Girirarji
   5. Main entrance

TO DO

1. Krishna to do Model survey and provide xls
2. Rikesh to provide Visio drawing

## Out of Scope

* Purchase & installation of applications is out of scope

## Technical Requirements (TR)

* TR# 1 - Redundant network, including cable and switches between buildings to provide high availability
* TR# 2 - All switches must be managed or semi-managed and must support L2+ routing. Core switch in the main Haveli need to support L3 routing
* TR# 3 - PoE (power over Ethernet) switches, minimum 24 ports for backhaul switches between the building
* TR# 4 - Network Firewall for all internet network access points
* TR# 5 - AAA/Directory server to restrict access to authorize devices and users
* TR# 6 - SNMP monitoring of all switches
* TR# 7 - Network Management System to administer and monitor network performance and utilization
* TR# 8 - Remote network management capability
* TR# 9- VPN capability for the edge switches
* TR# 10 - VLAN capability for all switches
* TR# 11 - PoE WiFi router for in-building service
* TR# 12 - Long Distance WiFi router (+1 mile) for perimeter security system
* TR# 13 - Single Mode fiber cable for inter building cable connectivity
* TR# 14 – QoS configuration capability at device, user & application type level.

## Issues

1. The project requires only 3 Comcast internet access point, but 9 have been ordered and deployed. Vraj will incur addition expenses for 6 other access point that will not be used.
2. There is a small Zultys, VoIP phone system in Shri Krupa basement. Whether the system is working or not and how to administer it is not known. Providing VoIP communication across North Campus without working VoIP phone system will not be possible. An interim solution will be to use Comcast voice analog connections in Shri Krupa, Krishna Krupa & Govind Krupa for Voice communication.
3. Increase the capacity of Shri Krupa Comcast speed from 25 Mbps to 100 Mbps.
4. Murari Krupa electric room is not temperature controlled for it to be used as hub to house network infrastructure equipment.
5. Running fiber optic cable to connect Shri Krupa with Augrah/Main Haveli could be challenging from cost & installation perspective.

## Risks

1. Implementation of North Campus Security system independently of the common network infrastructure could result in additional cost and fragmented networks.
2. If Murari Krupa is to be used as central hub for the North Campus network and it is not temperature controlled then expect frequent failure of network equipment in the room , outages and additional cost to replace the failed equipment.
3. If North Campus & Main Haveli are not connected via fiber optic cable then VPN connection via Comcast at 100 Mbps, which will be a shared network with other network traffic will have to be used for connectivity. This could impact the performance of performance sensitive applications, such as video and may require stricter rationing of bandwidth across users and applications.

## Project Phases

Following is the logical grouping of projects to optimize cost, time and deployment of the end to end integrated network.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Phase | Scope | Technical Components | Infrastructure Components | Comments |
| TBD | PF# 1-Comcast for high speed internet connection:   * Shri Krupa - 25 Mbps * Main Haveli – 100 Mbps * Subodhani- 25 Mbps |  |  |  |
| TBD | PF# 2-Network cabling for high speed communication between the buildings:   * Main Haveli, Anugrah, Shri Krupa, Murari Krupa, Govind Krupa, Balbodh & Krishna Krupa |  |  |  |
| TBD | PF# 3-WiFi network for basic communications between the remote building:   * Security Office, Subodhani, Gusaiji & Jalbedh * Balbodh, Chatursloki (big kitchen) * Subodhani, Security Cabin, Gusaiji, Jalbedh |  |  |  |
| TBD | PF# 4-Long Distance WiFi for Vraj perimeter security   * Long Distance WiFi Access Point deployment at Govind Krupa East Side, Yamunaji Temple and Main Entrance on RT 895 |  |  |  |
| TBD | PF# 5-Virtual Private Network through Comcast cable network for communication between main campus network & remote buildings   * Main Haveli, Shri Krupa & Subodhani |  |  |  |
| TBD | PF# 6-Overhaul main Haveli and Anugrah network   * Create separate virtual network for voice, video & data * Install WiFi access point across both buildings to provide full coverage within and nearby areas outside the building * Interconnect electric room, A/V room & Anugrah with high speed cable |  |  |  |
| TBD | PF# 7-Cabling for Video Surveillance   * North Campus – Shri Krupa, Krishna Krupa, Govind Krupa, Balbodh, Chatursloki |  |  |  |
| TBD | PF# 8-Cabling for VoIP / Analog phone   * North Campus – Shri Krupa, Krishna Krupa, Govind Krupa, Balbodh, Chatursloki * South Campus – Subodhani, Gusaiji, Jalbedh |  |  |  |
|  |  |  |  |  |

# Project Feature Requirement

TBD