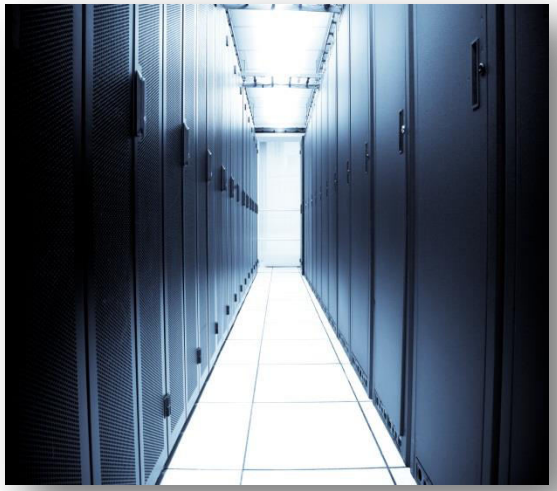
BSNL WiFi Solutions

Carrier Grade 5G Wi-Fi NW Architecture
&
University Campus Deployment Models



A Partner You Can Trust For Next Generation Network Services

Aim for Campus WiFi

Executive Summary of CAMPUS Wide WiFi

- **5th Gen WiFi is the Global Standard for Campus wide Mobile Internet Access**
- Universities exploit the existing NKN Bandwidth for WiFi Services proliferation
- **Better Utilisation of sunken investments for NKN in realisation of WiFi**
- BSNL as a choice for University Campus wide WiFi Services on Build and OMC basis.
- **QuadGen Wireless in PPP relationship with BSNL after a due process of selection**
  - Buidling,Operating and Maintaining the Telco Grade WiFi in Campuses
  - Proven Credibility and time tested Experience and Global leadership for WiFi services
- **Global Stds compatible Future Proof WiFi Technology with ability to**
  - Scale up with Best QoS and QoE from 2000 to 20,000 students per campus
- Already executed Campus Wide WiFi in 6 universities with BSNL- QuadGen
  - Campuses and Students quite satisfied with Q0S
- **Committed for Digital India Mission with Campus wide Mobile Internet Access through 5G WiFi**
- Ability to Implement in fastest time due to PPP model with BSNL
  - QuadGen fronting the Supply , Installation and Commissioning

QuadGen Techno Commercial Modeling Supports

Most Affordable, Sustainable, Future proof & Scalable WiFi Service packs from Rs 135 per Month per User to Rs 125 per month per user

5th Gen Campus WiFi

5G WiFi for Mobile Broadband and High Speed Internet

WiFi offers 3x the speeds at 1/3rd the cost compared to any existing Mobile Data service to serve high density of users .

5G Technologies in BSNL-QuadGen 5G WiFi

Radio Access Network (RAN)

- Dual band 2.4 / 5 GHz band on **5th Gen 802.11ac std** with downward compatibility
- RAN based on Dual-band deployments with Integrated Access cum Backhaul option

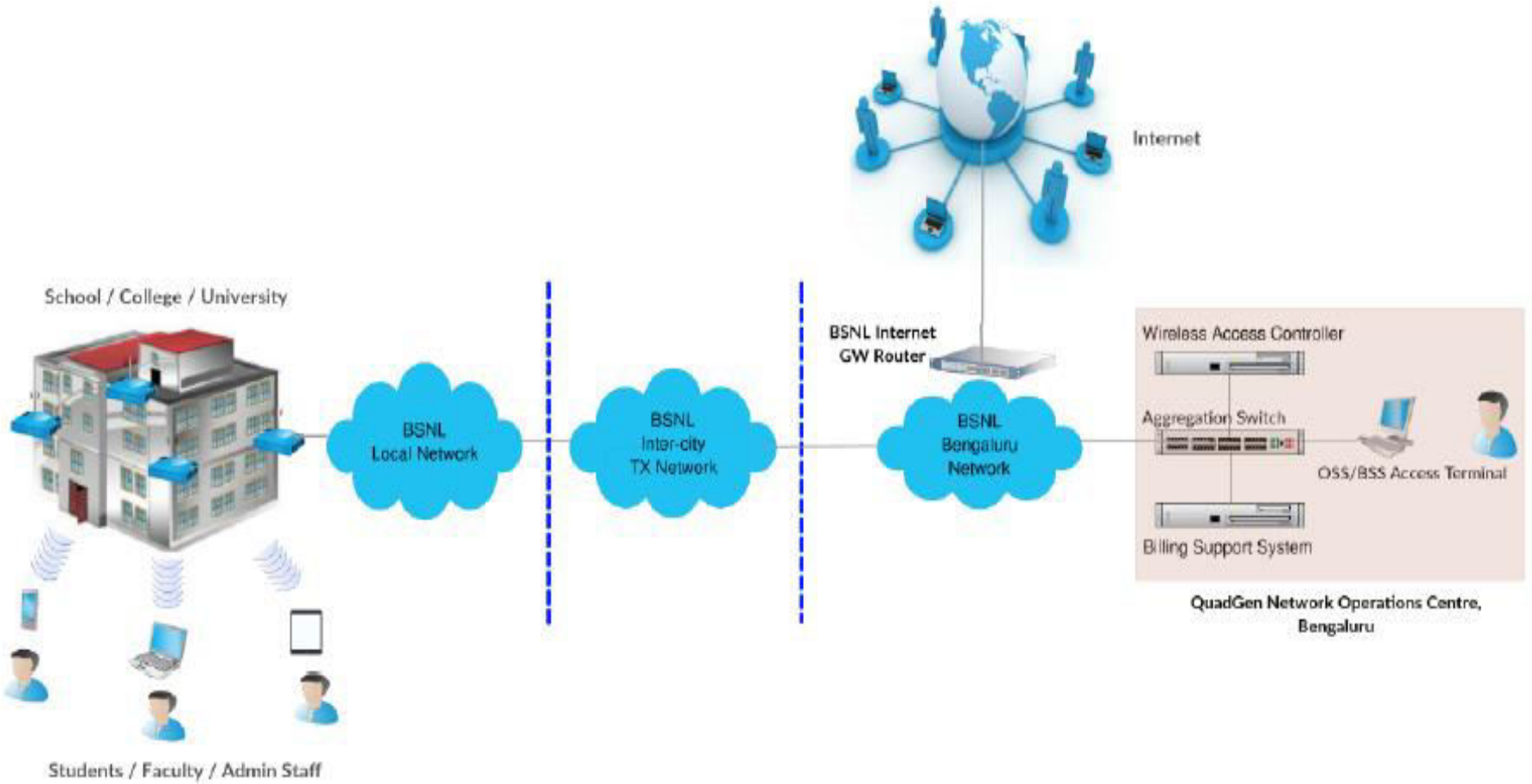
BackHaul to BSNL NW :

- Fiber 10 Mbps /100Mbps / 1Gbps Links (Existing)
- Metro Ethernet backhaul for IP back haul (MPLS) also supported (if required)

Core NW:

- Wi-Fi Core Network with High Availability on EPC technology standards
- Authentication mechanisms supported on AAA (EAP-SIM, AKA, TTLS/TLS, PEAP,EAP over HTTP and TAL and seamless authentication using WISPr2.0)
- WAC & WAG plat forms conforms to Multi Service Routers (MSR) category
- NGH & HOTSPOT 2.0 compatible standards

Macro level Architecture for Campus WiFi

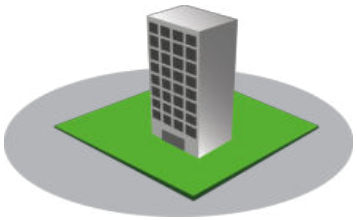


Target Coverage areas for Campus WiFi

Campus Wide Coverage
Hostels
Department Buildings
University Main Building
Hospital in University
Bus Stands
Bus Stops
Library
Parks
On campus Temples/Mosque/etc
On campus Shops
On Campus Stadiums
Campus Banks
Convention Centers
Campus Housing Complexes

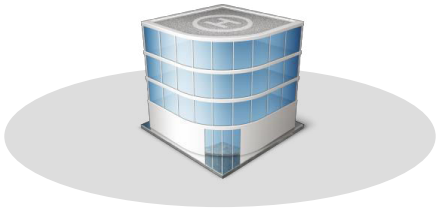
University Campus wide Coverage …

Campus Hospital



Campus Buildings

Gardens and Parks



Campus HQ

Campus Stadiums

Campus Cafeteria

Campus Stores

Hostels

BSNL-QuadGen 5G WiFi Service Attributes

- **Speed :** Assured throughputs between 2 to 10 Mbps to the users at the HotSpot
- **Availability** : 99.9% availability of WiFi service at the HotSpots
- **Network Management :** Centralised Provisioning ,Activation and Monitoring
- **Security :** Absolutely secure authentication in conformance to LEA requirements (LIM)
- **Scalability :** 10 to 50 WiFi APs and beyond **per campus of the college/university**
- **Coverage :** At Hot Spot Premises From 300 mt *300 mt area per access point to 1 Km * 1 Km area with multiple access points inter-connected mode
- **Capacity :** From 200 subscribers to 4000 subscribers in the proposed Hot Spot area
- **Customer Support :** 24 / 7 dedicated Wi-Fi Service Customer Support Center
- **Affordable Pricing :** Affordable Competitive tariffs for Campus users

Types of WiFi Services Offered

- End user WiFi services on B2C basis for **Time-based** and **Volume-based packs**
  - Time-based : 30 min / 1 hour / 4 hour / 1 day / 1 week / 1 month
  - Volume-based : 100 MB / 300 MB / 500 MB / 1 GB / 2 GB / 3 GB
  - **> 4 GB and upto to 10GB with FUP**
- **e-Vouchers / Hard Vouchers : Time / Volume WiFi Service Packs**
- **Departmental Managed WiFi Services**
  - **B2B-basis with n*10 Mbps BW**
  - **Supporting users from 200 to 5000 depending on the Dept size**
  - **with every user in the Dept/Campus supported with**
    - **Time-based or Volume-based WiFi Service Packs as mentioned above**

Carrier Grade vs Consumer Grade

Feature	Carrier Grade Wifi	Consumer Grade Wifi
Wireless Access Points	Indoor/Outdoor	Indoor
No of Devices/Users Supported per Access Point(AP)	300+	20-50
WiFi E2E NW Architecture	Like Cellular	Like Home Device
Access NW Architecture	Like GSM/3G/4G	Island/Home
BackHaul and Core NW Architecture	Like Cellular	No
Centralised Management of Access points and Controllers	Yes	No
Proactive & Remote Fault Management	Yes	No
Centralised Performance Monitoring for all APs	Yes	No
Scalability Manage 10s of APs to 1000s of Access Points	Yes	No
Ethernet/Fiber Interfaces for AP	Yes	only ethernet
Automatic Interference Management of Acess Points	Yes	No
Automatic Channel Switching in case of Interference	Yes	Limited
NW Availability of 99.9%	Yes	No
Redundant Wireless Access Controllers	Yes	No
Centralised EMS/NMS & BSS Integration	Yes	No
AAA, DHCP Server and Firewall Integration for better Security	Yes	No
Policy Definition & Control Integration **per user basis**	Yes	No
Per User Status Usage and Analytics Support	Yes	No
Law Enforcement Agencies (LEA)/LIM (Lawful Intercept Monitoring) Support	Yes	No
Throughput per Wireless Access Point	1.2 Gbps	60Mbps
Reliability (MTBF)	High MTBF	very low MTBF
Maintainability	Online	On site
MTTR	Very Low	Extremely high
O&M by WiFi Service provider on Centralised basis	YES	NO
5th Generation technology with 3*3 MIMO & Concurrent DualBand 2.4/5Ghz	YES	NO

- University Campuses are categorized into 3 Types
  - Type A : Students below 3,000 and Area of Coverage for WiFi 30 acres
  - Type B : Students betn 4,000 & 8,000 and Area for WiFi Coverage of 50 acres
  - Type C : Students betn 9,000 &15,000 & Area for WiFi upto 100 Acres

- Colleges are categorised into 5 Types
  - Type 1 : Students below 1000 and area of coverage 5 acres
  - Type 2 : Students betn 1000 to 3000 with Area of 10 Acres
  - Type 3 : Students betn 3000 to 5000 with Area of 30 Acres
  - Type 4 : Students betn 5000 to 7000 with an area of 50 acres
  - Type 5 : Students betn 7000 to 10,000 with an area of 100 acres

Telco Grade

WiFi Network Infra Investments vary depending on Coverage area and Capacity

Hyderabad University – Estimation Study

Attribute	Qty	Remarks
Area of Campus	2300 Acres	One of the largest Campuses
WiFi Coverage area	224 Acres	Maximum Foot fall area covered
Academic Buildings	36	Maximum Coverage of WiFi
Hostels	34	All hostels to have good Wifi
RKM of OFC	150	Distributed Fiber NW in the Campus
Indoor WAPS	375	Optimal Quantity
Out Door WAPs	40	Most Optimal for needed O/D coverage
PTP WiFi Back Hauls	7	Used for WiFi extension in non OFC area
Racks with L2 Switches &UPSs	100	WiFi Hub Locations in the campus
RKM of CAT5 / 6 Cabling	30	Indoor wiring for I/D WAPs
Students	13000	
Academic & Non teaching Staff	2000+	
Total Capex	Rs. 255 Laks	
Bandwidth charges w/o Internet Gateway	Rs. 26 Laks/Year	100 Mbps at TRAI &40% Discount
Recurring charges per student with > 4GB/month with only BH BANDWIDTH	Rs. 130	For 15K students + staff + Guests

Targeted Capex and Recurring Charges per Student/PM/4 GB @ 2 to 4 Mbps with NKN gateway

Type of University	Capex in Rs lacs	Recurring Charges in Rs /user/month/4GB w/0 BW
A	60 to 70	90 to 140
B	90 to 100	85 to 95
C	200 to 300	80 to 75

Type of College	Capex in Rs lacs	Recurring Charges in Rs /user/month/4GB w/o BW
1	10 to 15	110 to 130
2	20 to 30	90 to 80
3	30 to 40	80 to 70
4	40 to 50	70 to 60
5	50 to 60	60 to 50

Data of University WiFi executed by BSNL - QuadGen
Without BackHaul and Internet Bandwidth

		Some Universities Executed by BSNL-QuadGen			
Sl.No	Criteria	Telangana University	AMU - Mallapuram	Cochin Univeristy - Cochin	Hubli University
1	WiFi Coverage Area in Acres	15	10	10	10
2	Type of Coverage	Indoor & Outdoor	Indoor & Outdoor	Indoor & Outdoor	Indoor & Outdoor
3	# of Buidlings Covered	8	25	6	5
4	# of POPs	5	2	3	1
5	Internet & Bakhaul Badnwidth Offered	50Mbps	12 Mbps	10Mbps	10Mbps
6	# of APs Deployed	30	14	12	7
7	Built Up Capacity - # of Students + # of Staff	9000	4200	3600	2100
8	Serving Capacity - # of Students + # of Staff	2000	1000	1200	900
9	Speeds Observed during Peak Hours Per User	4-8Mbps	2-4Mbps	2-4Mbps	1-3Mbps
10	Estimated Capex Cost for WiFi NW Infra creation (APs+L2 Switch+UPS - 4Hrs+Wiring+Meshing+Core NW+OSS+EMS+LIM) with NO Backhaul & Internet BW Charges	30,00,000	14,00,000	12,00,000	7,00,000
11	Capex Cost (APs+L2 Switch+UPS - 4Hrs+Wiring+Meshing+Core NW+OSS+EMS+LIM) **per Student for Built up capacity (Sl.No 8)**	333	333	333	333
12	Capex Cost (APs+L2 Switch+UPS - 4Hrs+Wiring+Meshing+Core NW+OSS+EMS+LIM)**per Student for Serving Capacity (Sl.No 9)**	1,500	1,400	1,000	778
14	Recurring Charges (CAPEX+OPEX+AMC) **Per Serving Student Per Month** in INR (Sl.No 9)	136	127	91	71
15	Recurring Charges (CAPEX+OPEX+AMC) **per Student per builtup capacity Per Month** in INR (Sl.No 8)	31	31	31	31
16	Maximum Download per month/student	4GB	4GB	4GB	4GB

Equipemnt Requirement w.r.t Area of Coverage:

Per Acre - 2 Outdoor APs
Per 6000 sq ft - 1 Indoor AP
Per 6000 sq ft, multiple walls- 2 Indoor AP
3 storied building of area - 100 x 50 mtrs, 2 out door APs, 5 Indoor APs

Data of Generic University WiFi Models

With Out Backhaul & Internet BW from BSNL - QuadGen

		Model Univeristies		
Sl.No	Criteria	Type 1 University	Type 2 University	Type 3 University
1	WiFi Coverage Area in Acres	30	40	50
2	Type of Coverage	Indoor & Outdoor	Indoor & Outdoor	Indoor & Outdoor
3	# of Buidlings Covered	16	20	25
4	# of POPs	10	12	15
5	Internet & Bakhaul Badnwidth Offered	100Mbps	125Mbps	150Mbps
6	# of APs Deployed	60	75	90
7	Built Up Capacity - # of Students + # of Staff	18000	22500	27000
8	Serving Capacity - # of Students + # of Staff	5400	7875	10800
9	Speeds Observed during Peak Hours Per User	2-4Mbps	2-4Mbps	2-4Mbps
10	Estimated Capex Cost for WiFi NW Infra creation (APs+L2 Switch+UPS - 4Hrs+Wiring+Meshing+Core NW+OSS+EMS+LIM) with NO Backhaul & Internet BW Charges	60,00,000	75,00,000	90,00,000
11	Capex Cost (APs+L2 Switch+UPS - 4Hrs+Wiring+Meshing+Core NW+OSS+EMS+LIM) **per Student for Built up capacity (Sl.No 8)**	333	333	333
12	Capex Cost (APs+L2 Switch+UPS - 4Hrs+Wiring+Meshing+Core NW+OSS+EMS+LIM)**per Student for Serving Capacity (Sl.No 9)**	1,111	952	833
14	Recurring Charges (CAPEX+OPEX+AMC) **Per Serving Student Per Month** in INR (Sl.No 9)	101	87	76
15	Recurring Charges (CAPEX+OPEX+AMC) **per Student per builtup capacity Per Month** in INR (Sl.No 8)	31	31	31
16	Maximum Download per month/student	4GB	4GB	4GB

Equipemnt Requirement w.r.t Area of Coverage:

Per Acre - 2 Outdoor APs
Per 6000 sq ft - 1 Indoor AP
Per 6000 sq ft, multiple walls- 2 Indoor AP
3 storied building of area - 100 x 50 mtrs, 2 out door APs, 5 Indoor APs

Note: Vouchers can be made available at very special price for students consuming more than 4GB/month Data
BSNL POP is assumed to be within 5-7 kms of university campus

3G/4G vs 5G WiFi

3G vs LTE vs 5G WiFi

		3G	4G	5G WiFi
1	Spectrum Cost per telco per 5Mhz in Rs Crores	15000	18000	Free
2	Spectrum Availability per telco	5MHz	5-10 MHz	up to 200MHz
3	Total Througput	42Mbps	75-100Mbps	1300Mbps
4	No of Users per cell site @ 2Mbps	20	30	450
5	Practical Avg Speed per User as per TRAI norms	128Kbps	256Kbps	2Mbps*
6	Capex Per Cell Site $	$20,000	$25,000	$950
7	Most Competitive Service Package Pricing - 4GB Package in Rs	INR 699- 799	INR 699-799	INR 130

* No TRAI norms given for Wi-Fi as it is in unlicensed spectrum

TRAI Tariffs

Ceiling tariffs (in Rs. per annum) for domestic leased circuits of E1 (2 Mbps), DS-3 (45 Mbps), STM-1 (155 Mbps) and STM-4 (622 Mbps) capacities

Table-I

Distance (in Km)	Ceiling tariff for E1 (2 Mbps)
5	12,086
10	19,117
20	33,180
30	47,243
40	61,305
50	75,368
60	89,431
70	103,493
80	117,556
90	131,618
100	145,681
150	169,353
200	193,750
250	218,147
300	242,544
350	266,941
400	291,339
450	315,736
500	340,133
>500	341,000

Table-II

Distance (in Km)	Ceiling tariff for DS-3 (45 Mbps)	Ceiling tariff for STM-1 (155 Mbps)	Ceiling tariff for STM-4 (622 Mbps)
<50	584,000	1,610,000	4,188,000
50	584,919	1,610,973	4,188,531
60	690,388	1,887,831	4,908,361
70	795,858	2,164,689	5,628,191
80	901,327	2,441,546	6,348,020
90	1,006,797	2,718,404	7,067,850
100	1,112,267	2,995,261	7,787,680
150	1,317,960	3,459,645	8,995,077
200	1,508,698	3,960,333	10,296,865
250	1,699,436	4,461,020	11,598,652
300	1,890,174	4,961,707	12,900,439
350	2,080,912	5,462,395	14,202,226
400	2,271,650	5,963,082	15,504,014
450	2,462,388	6,463,770	16,805,801
500	2,653,126	6,964,457	18,107,588
>500	2,654,000	6,965,000	18,108,000

Discounts upto a Maximum of 35% is only applicable

Details

QuadGen as a PPP partner with BSNL for Campus wide WiFi

- Identify, maximum Footfall areas in University Campus
- Plan and Design Radio NW for Coverage in Different Zones of the campus
- Plan for Subs Capacity & Internet Bandwidth needs for the Campus
- Deploy, Own & Operate Wifi NW connectivity in the Campus .
- Commissioning & Deployment of the WiFi HotSpot(HS) solution
- Operate BSS/OSS & O&M center for WiFi NW
  - Provide WiFi Subscriber Usage Reports on per user basis,per Dept basis and University as a whole etc
  - Ensure Cyber Security compliance
- Establish & Manage Call center for end user WiFi Service support
- Set up and manage a portal for online registration, recharge etc.,

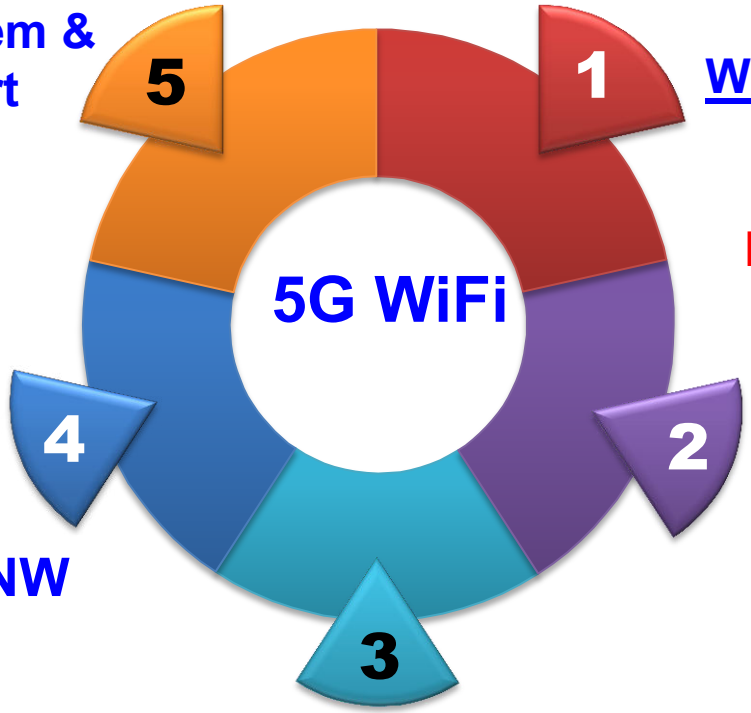
BSNL Responsibility for Campus wide WiFi

- BSNL to extend the OFC backhaul links at nx10Mbps at most competitive rates as compared to any in the telco Industry
- BSNL to provide QoS enabled Internet BW for campus connectivity

  if NKN gateway is not there
- Internet Gate way services support by BSNL
- Law Enforcement Agency (LEA) interface
  - Lawful Intercept Monitoring and IPDR sharing to LEAs.
- BSNL @GM level officer to co-ordinate and monitor the extension of backhaul links to University Campuses

5 segments of
Carrier Grade WiFi NW for University Campus

BSS& CS
Billing Support System &
Customer Support
In BSNL NoC



WAP
Wireless Access Points
In University
Out Door areas and
Indoor deployments

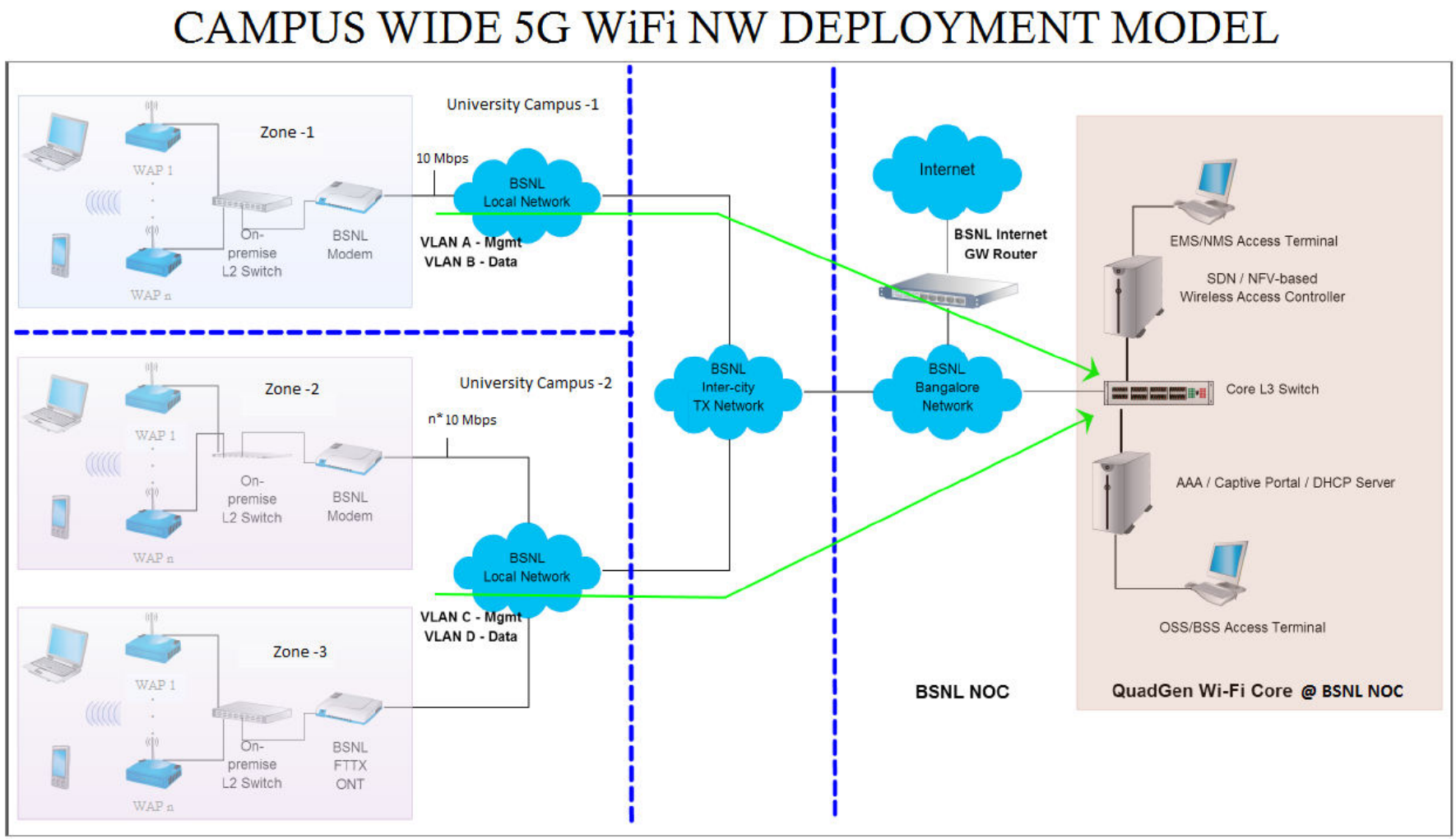
WAC
Wireless Access Controller
In BSNL NoC

EMS / NMS of WiFi NW
In BSNL NoC

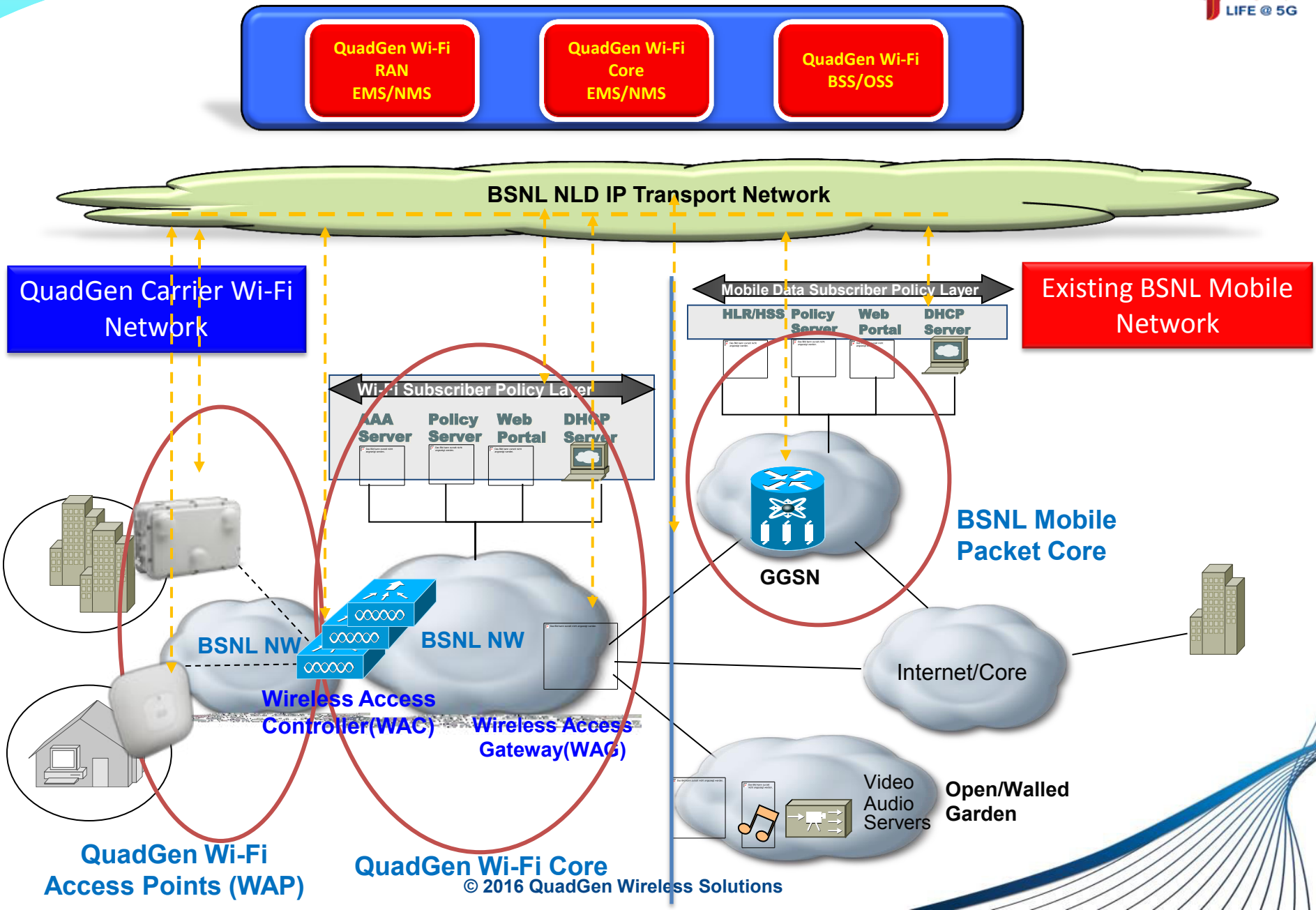
WAG
Wireless Access Gateway
In BSNL NoC

Carrier Grade 5G Wi-Fi

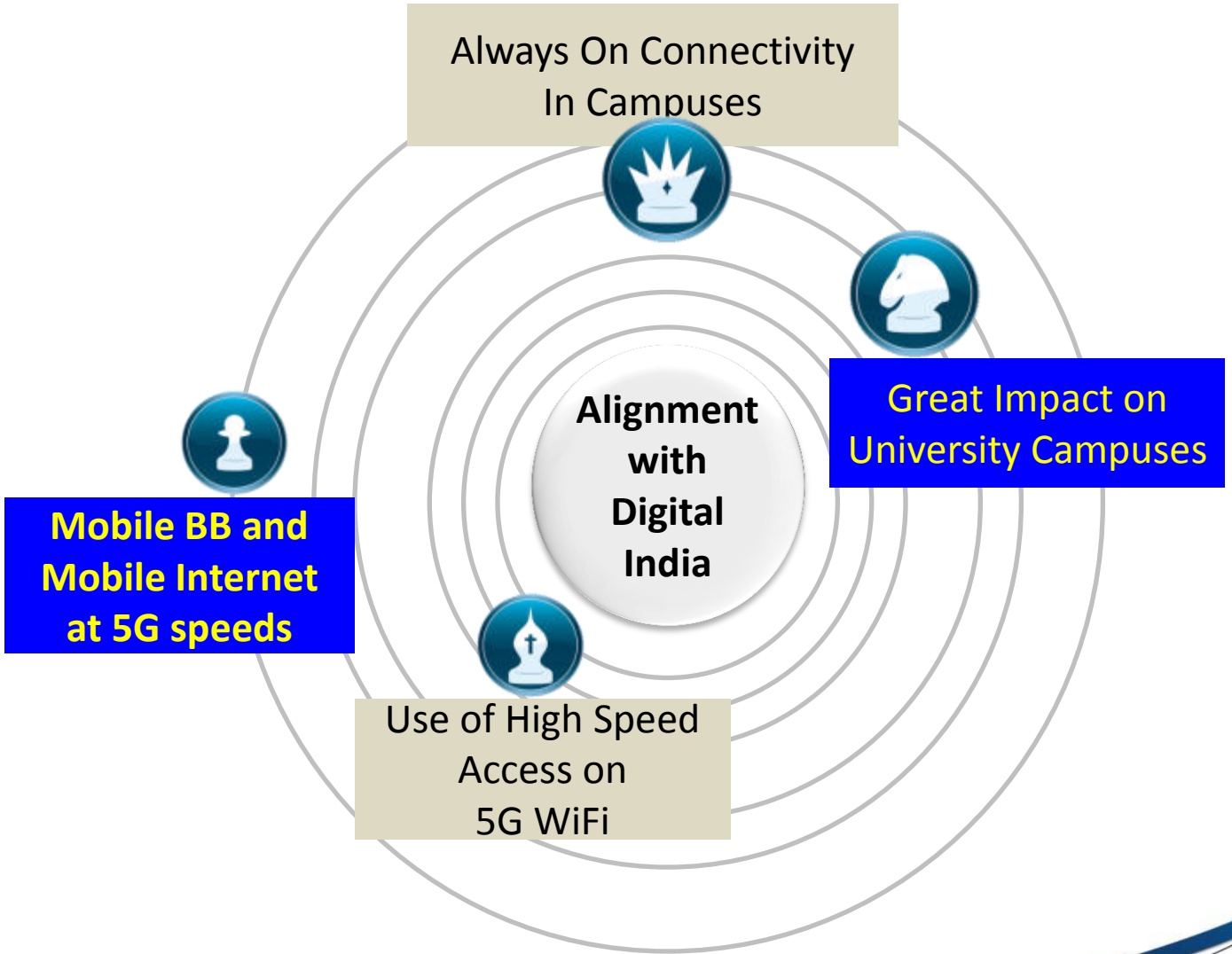
Macro Level Network Architecture



Carrier Wi-Fi Network Architecture



Digital India Initiative for University campuses



Carrier Grade 5G WiFi offer from BSNL

WHAT IS 5G WIFI (802.11ac)?

- Fifth generation Wi-Fi
- Adds more capacity through wider channels
  - 80 and 160 MHz
  - 256 QAM Encoding
- 11ac is primarily a 5 GHz Technology
  - 2.4 GHz will still be 11n rates

Number of Streams	802.11n	802.11n	802.11ac	802.11ac
	20 MHz	40 MHz	80 MHz	160 MHz
1	75 Mbps	150 Mbps	433 Mbps	867 Mbps
2	150 Mbps	300 Mbps	867 Mbps	1.7 Gbps
3	225 Mbps	450 Mbps	1.3 Gbps	2.6 Gbps

5G WiFi Attributes

Faster Throughput

- Streaming content
- Access to the “Cloud”
- Video Conference

Higher Capacity

Supports higher density of users

Broader Coverage

Fewer dead spots throughput the business

Battery Life

Work longer

5G WiFi complements Wireline Gigabit LAN

Complement to Gigabit Ethernet

- Mobile devices
- Video conferencing
- CRM

Enables exploding growth in Wi-Fi enabled devices

- PCs, Tablets & Smartphones

New Features provide range, coverage & higher network efficiency

- MU-MIMO
- Beam-forming

Enables deployment of Enterprise Cloud without risk of locally stored data

Thank You

Comparative rate chart for University Venue

Universities

	Students Min	Students Max	Size (Acres)	Capex (in Lakhs)	Recurring Charges @ 6500 EMI	Recurring Charges @ 8000 EMI	Recurring Charges @ 9000 EMI
Type A		**3000**	**30**	60	130	160	180
Type B	**4000**	**8000**	**50**	100	81.25	100	112.5
Type C	**9000**	**15000**	**100**	200	108.33	106.67	120

Colleges

	Students Min	Students Max	Size (Acres)	Capex in Lakhs	Recurring Charges @ 6500 EMI	Recurring Charges @ 8000 EMI	Recurring Charges @ 9000 EMI
Type 1		1000	5	10	65	80	90
Type 2	1000	3000	10	20	43.33	53.33	60
Type 3	3000	5000	30	60	78	96	108
Type 4	5000	7000	50	100	92.86	106.12	128.57
Type 5	7000	10000	100	200	160	104	180

Pricing Data Calculation for University Venue

AP Cost (in USD) – (A)	$750		
Total APs – (B)	30		
Conversion rate (USD - INR) – (C)	INR 84		
Total student Count	2000		
Total Capex – **A*B*C**	1890000		
Recurring EMI charge per lakh (INR)	6500	8000	9000
Recurring charge per student per month	56.7	75.6	85.05

Scenarios (Charge per student per month)	**Access**	**BH**	**Total**
Scenario 1 -Access Network with BH and I/G	86	45	131
Scenario 2 - Acccess Network with BH w/o I/G	86	22	108

TU University - Network Usage Statistics

Date	2/8/16	2/9/16	2/10/16	2/11/16	2/12/16	13/2/16	14/2/16	15/2/16	16/2/16	17/2/16
Total Sessions in a day	4522	3543	4098	4994	4228	3886	4405	5005	5080	5625
Daily sessions per hotspot (5 hotspots)	904	709	820	999	846	777	881	1001	1016	1125
Average Session time	52 mins	43 Mins	52 Mins	52 Mins	51 Mins	44 Mins	45 Mins	48 Mins	42 Mins	42 Mins
# of Unique Mac ID in a day	462	423	457	453	416	422	346	321	334	331
# of Unique Mobile Number in a day	513	489	518	508	478	497	430	333	363	342
Number of Sessions >10 mins in Peak Hour	200	235	217	243	208	202	202	243	240	220
# sessions downloading upto 300 MB daily	4307	3400	3923	4810	4044	3732	4181	4815	4891	5436
# sessions downloading more than 300 MB and less than 1 GB daily	171	103	142	150	138	129	185	156	155	159
# sessions downloading more than 1GB daily	44	40	33	34	46	25	39	34	34	30
Peak Hours	6 PM - 8PM	8 PM-10 PM	9 PM- 11 PM	1 PM - 3 PM	6 PM - 8PM	7 PM- 9 PM	10 AM -12 PM	8 PM - 10PM	12 PM - 2PM	12 PM - 2PM
Total data consumed in GB/Day	233.71	172.24	181.97	206.61	214.63	167.75	235.43	221.49	221.87	216.24
Daily Data Download in Peak Hour across all Hotspot in GB	19.23	17.53	20.03	27.83	15.39	20.88	25.77	23.48	12.79	14.54
Data download in peak hour per hotpsot	3.846	3.506	4.006	5.566	3.078	4.176	5.154	4.7	2.56	2.91
# Sessions in peak hour	760	705	470	620	606	579	661	814	838	874
# Session in peak hour per hotspot	152	141	94	124	121	116	132	163	168	175
Average Session download in peak hour in MB	115	85	136	120	142	126	98	92	78	148
Average Speed in peak hour in Mbps	1.95	1.89	3.5	1.19	1.6	1.4	2.4	1.05	1.02	2.21
Maximum Speed/Per User experienced in Peak Hour	4.48 Mbps	5.17 Mbps	7.46 Mbps	4.15 Mbps	6.73 Mbps	4.65 Mbps	5.87 Mbps	6.32 Mbps	4.9 Mbps	4.67 Mbps
Average online time in peak hour	24 mins	30 mins	38 Mins	1 Hour 22 Mins	41 Mins	50 Mins	38 Mins	33 Mins	32 Mins	44 Mins
Maximum Speed/Per User experienced in NON Peak Hour	13-28Mbps	13-28Mbps	13-28Mbps	13-28Mbps	13-28Mbps	13-28Mbps	13-28Mbps	13-28Mbps	13-28Mbps	13-28Mbps

Note:
Total APs : 30
Average Number of active session in a peak hour : 20 – 40 sessions per AP

Indicative Equipment for Generic University WiFi Models

- **Equipment Requirement w.r.t Area of Coverage:**
- Per Acre - 2 Outdoor APs
- Per 6000 sq ft - 1 Indoor AP
- Per 6000 sq ft, multiple walls- 2 Indoor AP
- 3 storied building of area - 100 x 50 mtrs, 2 out door APs, 5 Indoor APs

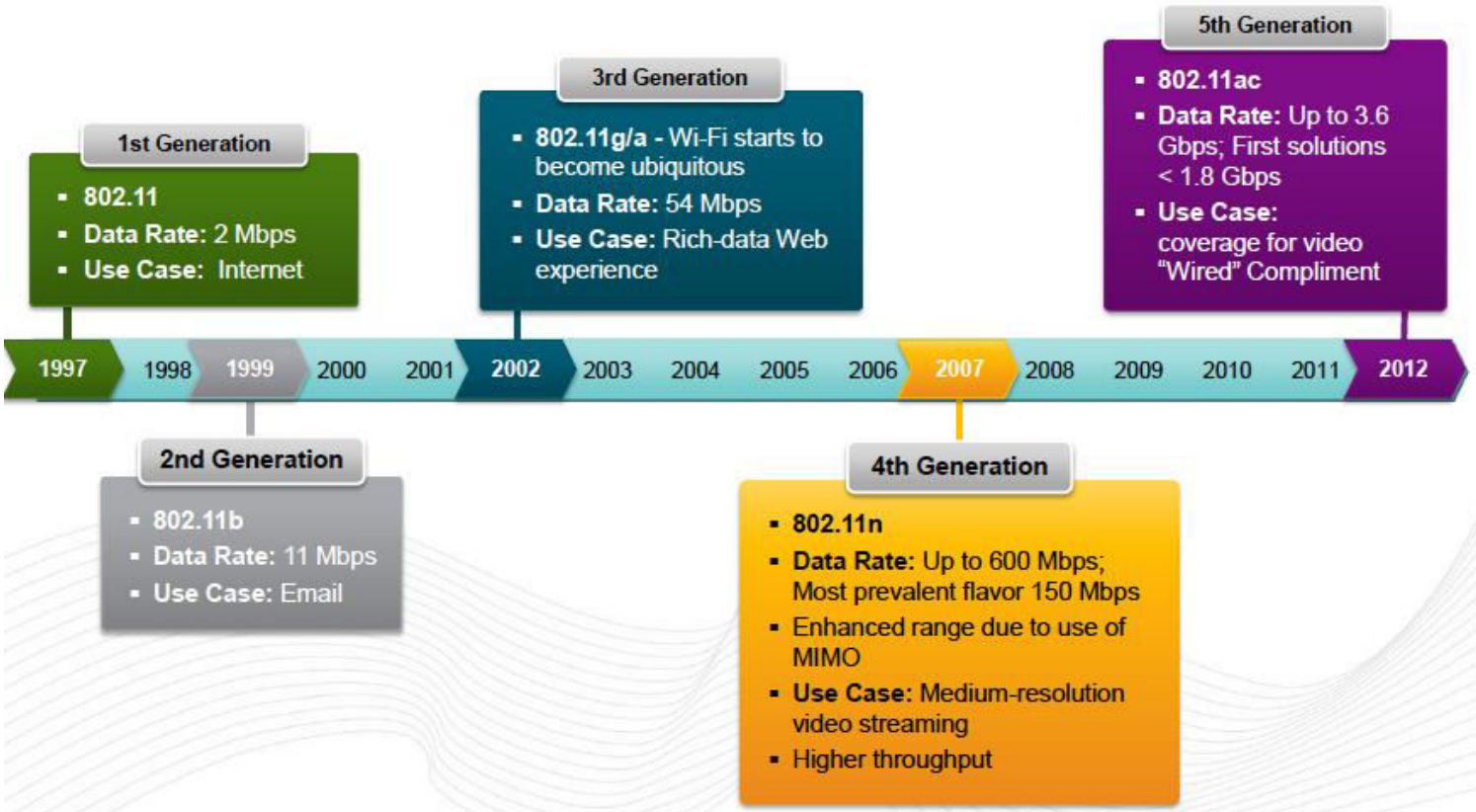
Note:

- Vouchers can be made available at very special price for students consuming more than 4GB/month Data
- BSNL POP is assumed to be within 5-7 kms of university campus

Limitations of available options for High Speed Access

- **Telcos do not have access to sufficient 3G/4G spectrum**
- Available 3G/4G spectrum is prohibitively expensive for Operators
- Indoor penetration capability of **3G/4G networks is very poor**
  - due to macro cellular architecture around **1800/2100/2300/2500 MHz**
- **Cellular 3G/4G base stations do support** only
  - 40 subscribers @ 512 kbps speeds per base station with 5 MHz spectrum
- **Wireline** high speed internet access can only be done by the incumbent Telcos for subscribers within 1-3 Kms range of the Telco's POPs
- **Fiber based** high speed internet access to the end users
  - Prohibitively expensive due to cost, deployment logistics, RoW permissions, and long gestation period in building the NW for service offering
- **Hybrid Fiber Co-ax** networks deployed by the cable operators
  - Tech incompatibility & poor construction standards inhibits high speed

5th Gen WiFi is the natural Global choice for Campus Wide High Speed Access



5G wireless is all about (a) wider channel at n*20 Mhz, (b) higher order MiMO > 3*3(c) 256 QAM and (d) aggregate air interface throughputs > 1 Gbps and OFDMA protocol.

802.11ac Wifi standard adopted and deployed by BSNL meets all the above criteria and thus the wifi service launched by BSNL is 5G compatible

WHAT IS 5G WIFI (802.11ac)?

BROADCOM

- Fifth generation Wi-Fi
- Adds more capacity through wider channels
  - 80 and 160 MHz
  - 256 QAM Encoding
- 11ac is primarily a 5 GHz Technology
  - 2.4 GHz will still be 11n rates

Number of Streams	802.11n	802.11n	802.11ac	802.11ac
	20 MHz	40 MHz	80 MHz	160 MHz
1	75 Mbps	150 Mbps	433 Mbps	867 Mbps
2	150 Mbps	300 Mbps	867 Mbps	1.7 Gbps
3	225 Mbps	450 Mbps	1.3 Gbps	2.6 Gbps

Broadcom as the world's largest chip manufacturer for 802.11 ac Wi-Fi is the leader in promoting 5G compatible standards for Wi-Fi technology

A-VIEW Phase II

Kamal Bijlani
Amrita University

A-VIEW
Amrita Virtual
Interactive E-learning World

- 10,000 + colleges connected
- Global Recognition by Cisco
- Over 1 crore training hours

Supported by
National Mission on Education
(NME-ICT), Ministry of HRD

Developed by Amrita University | Partners IIT Bombay | Partner s IIT Madras | Partners IIT Kharagpur

www.aview.in, aview@amrita.edu
+91 476 280 4405, +91 94470 51380

Agenda

- Overview
- A-VIEW Phase I
  - Platform Overview
  - Impact, Feedback
- A-VIEW Phase II
  - Objectives
  - Modules
  - Deliverables, Budget

A-VIEW Overview

A-VIEW: Unique Live Synchronous Interactive Multimedia Platform

Designed For Huge Number of Learners

Open, Extensible
Customizable, Integrable

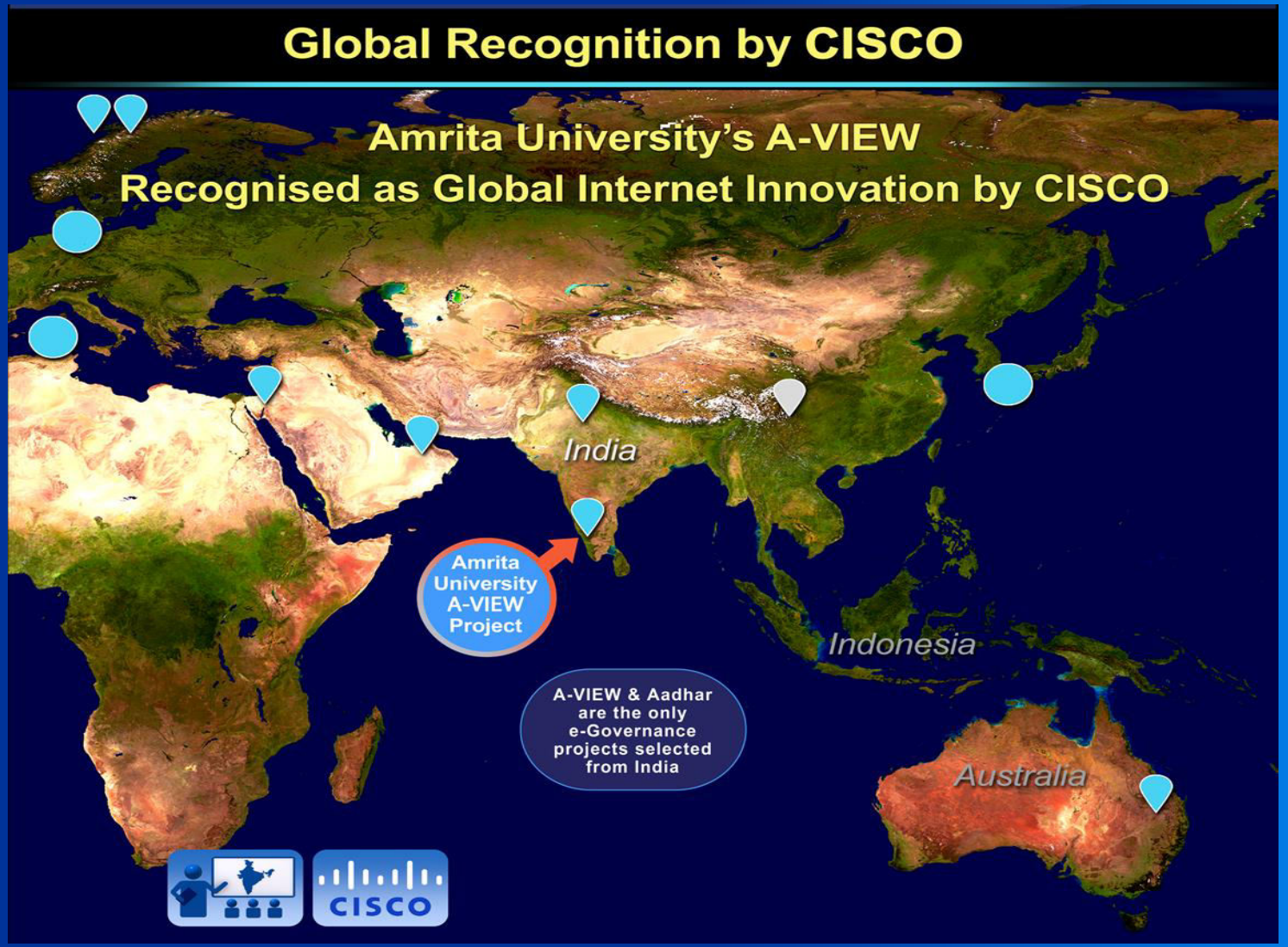
A-VIEW Overview

Benefits:

- E-Learning
- Online Meetings
- Online Training / Workshops
- Webcasts

- Deployed at over 10, 000 institutions
- Over 40,000 trained in a day.

Global Recognition by CISCO



A-VIEW Overview

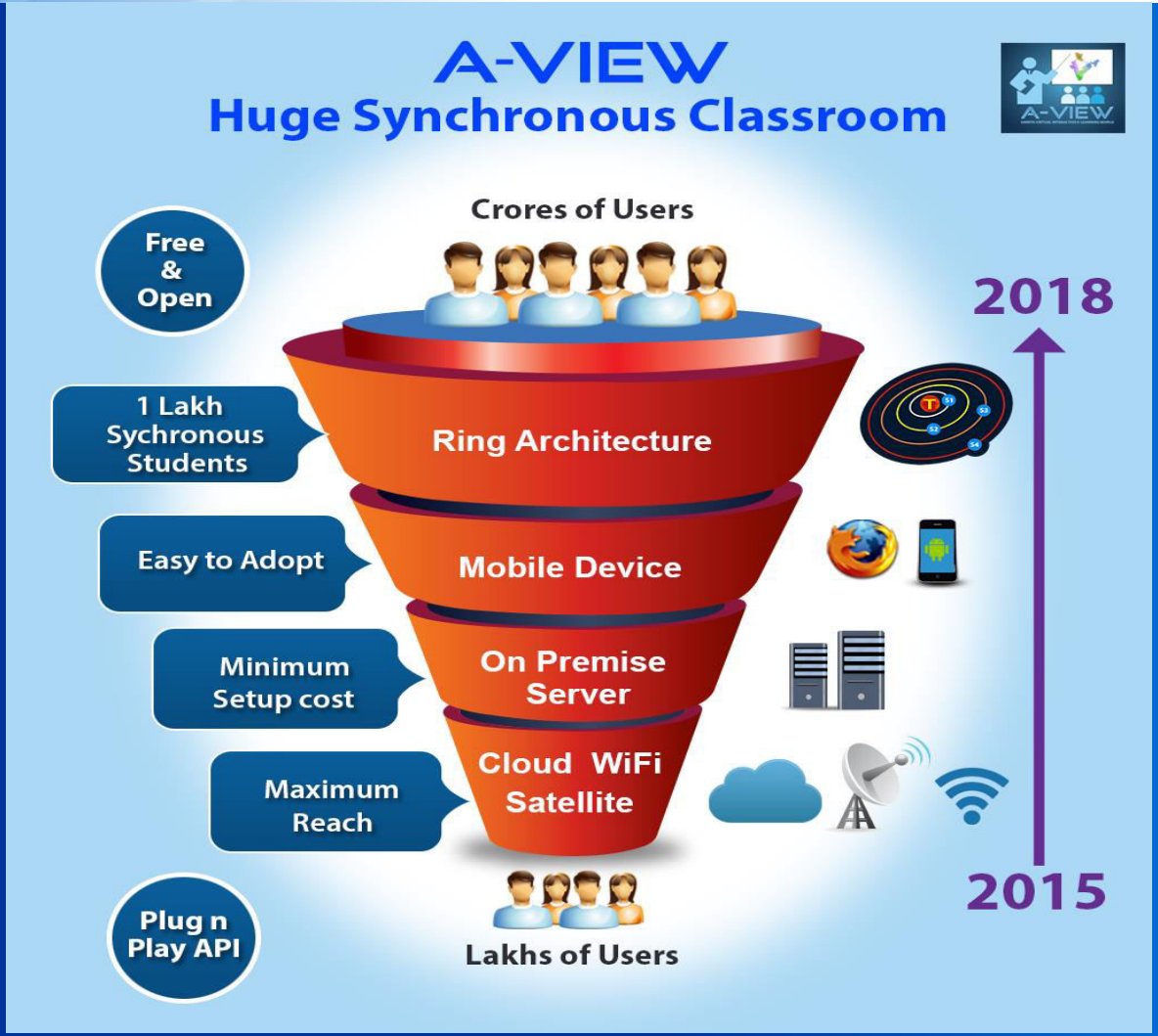
Phase II

- Crores benefited
- 25,000 Institutions (Higher Edu)
- Large Scale: Schools, Skill Training

Phase I

- Lakhs benefited
- 10,000 Institutions (Higher Edu)
- Pilots: Schools, Skill Training

A-VIEW Phase II



A-VIEW Phase I : Features

Live Interaction

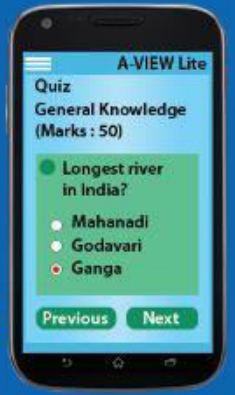
Hand raise to ask question

Live Audio/Video Interaction

Question & Chat

Polling

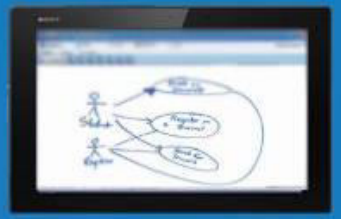
Quiz



Content Collaboration

Desktop Sharing

Document Sharing



Whiteboard

Video Sharing

2D/3D Viewer

Interaction in Classroom

Whiteboard Interaction

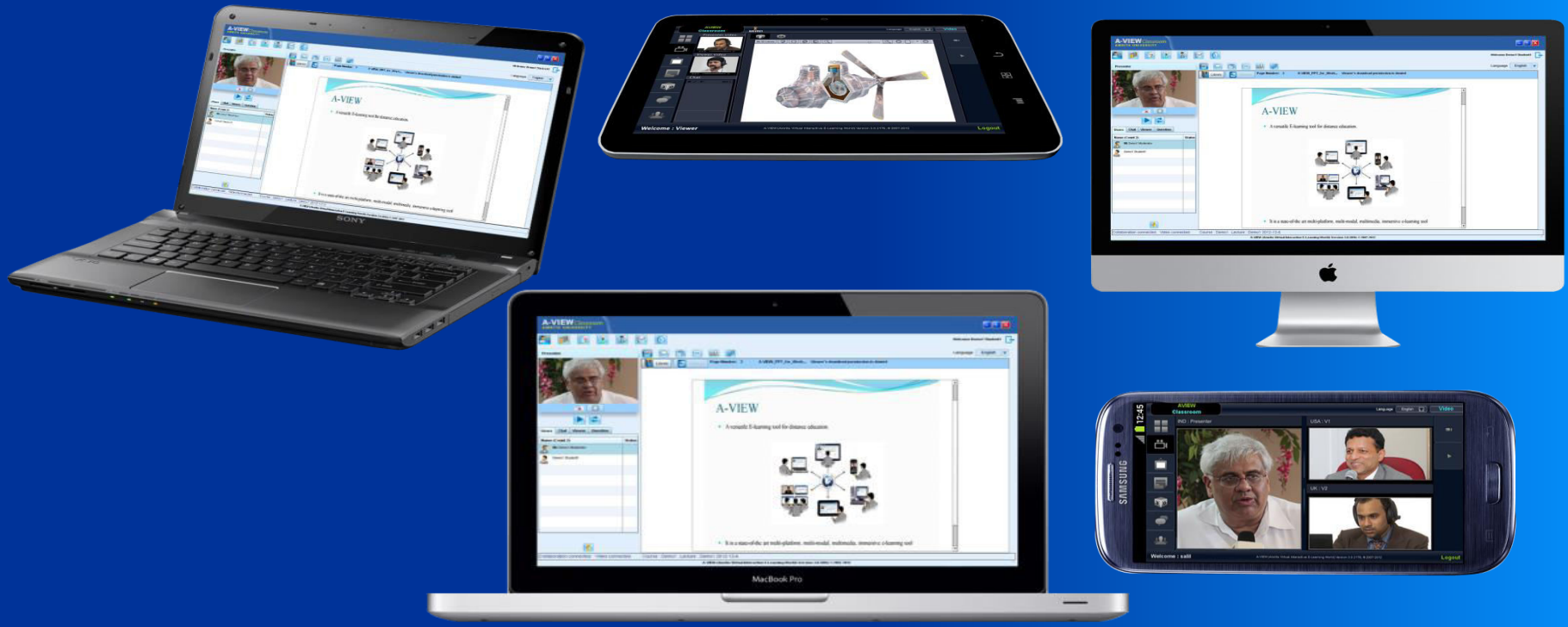
Live Question

Mobile Quiz

Tablet Poll

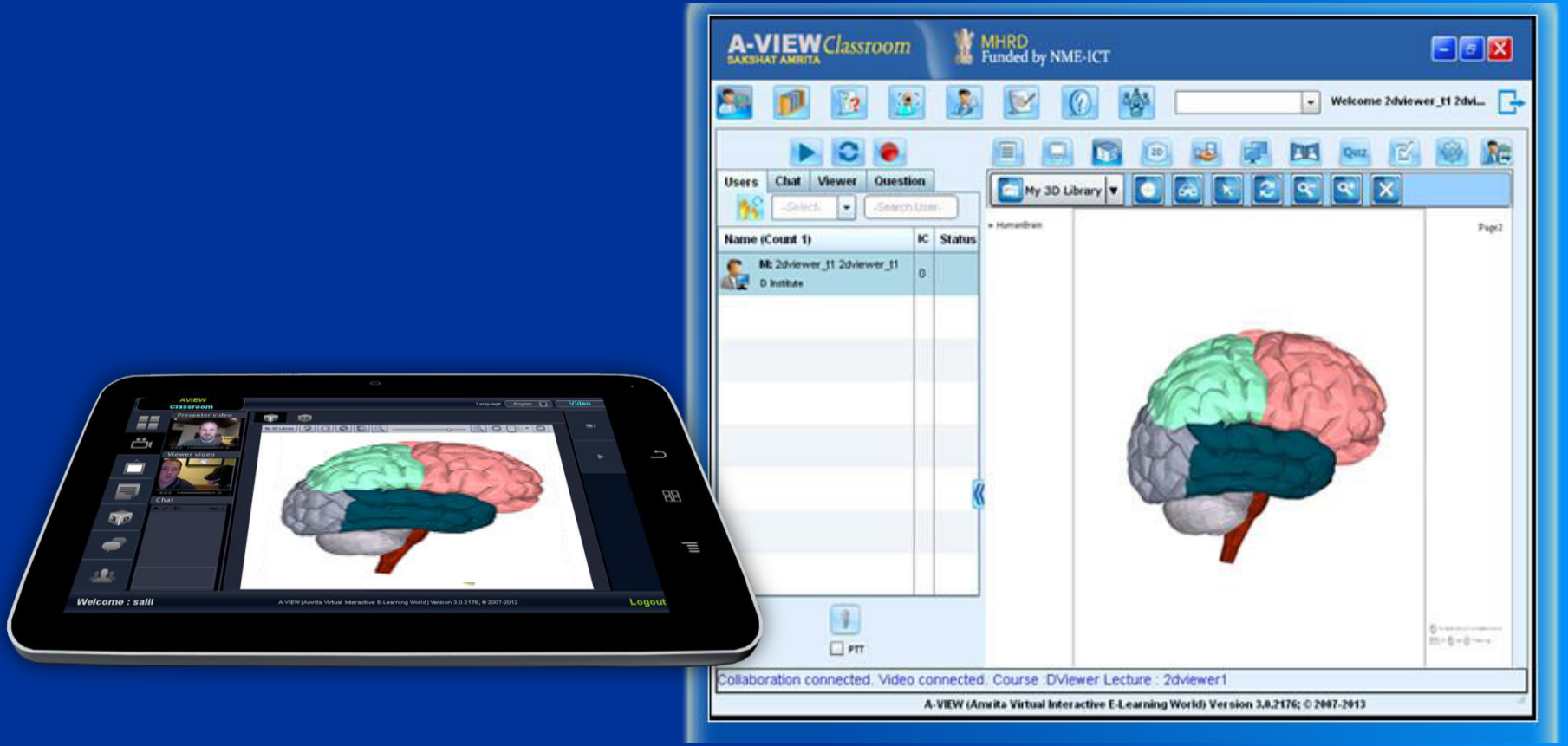
A-VIEW: Multiple Platforms

- A-VIEW is currently running on Windows, Mac, Ubuntu, Android phones and Tablets.

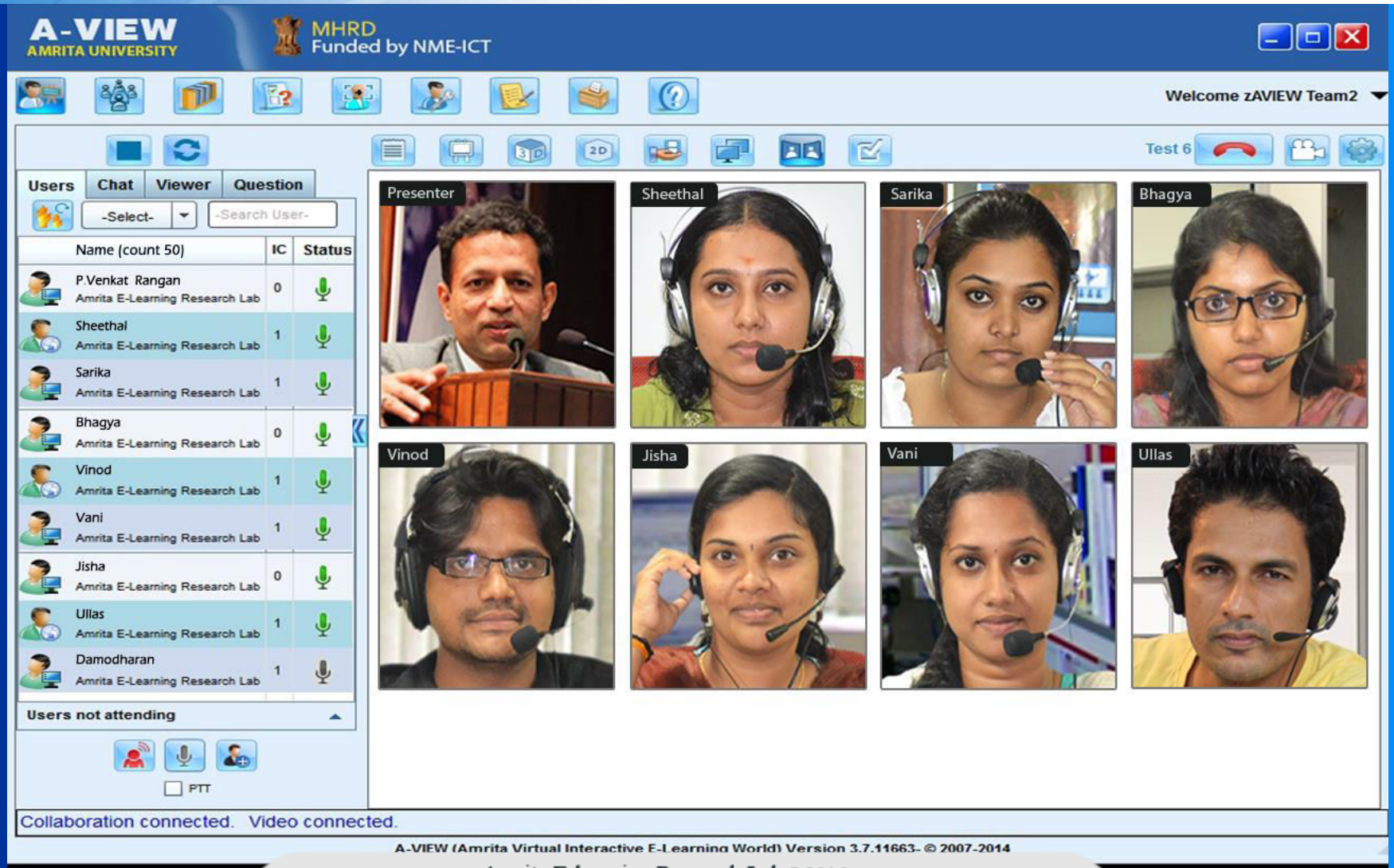


Question Interface- Voting

Multimedia Content Sharing

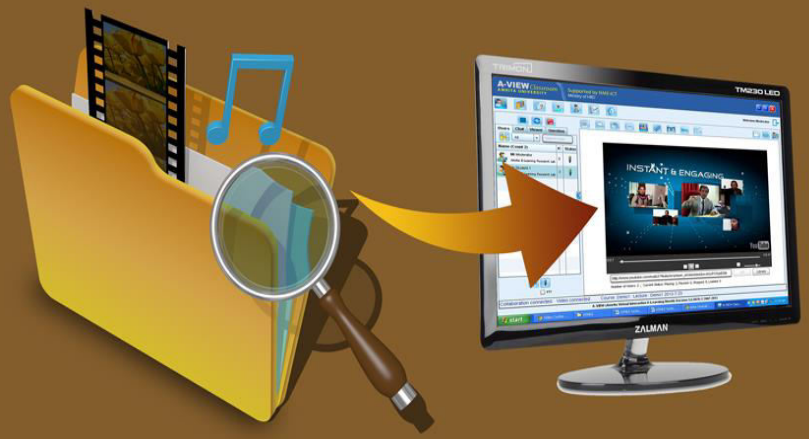


A-VIEW as a Meeting Tool



A-VIEW Features

Record & Playback

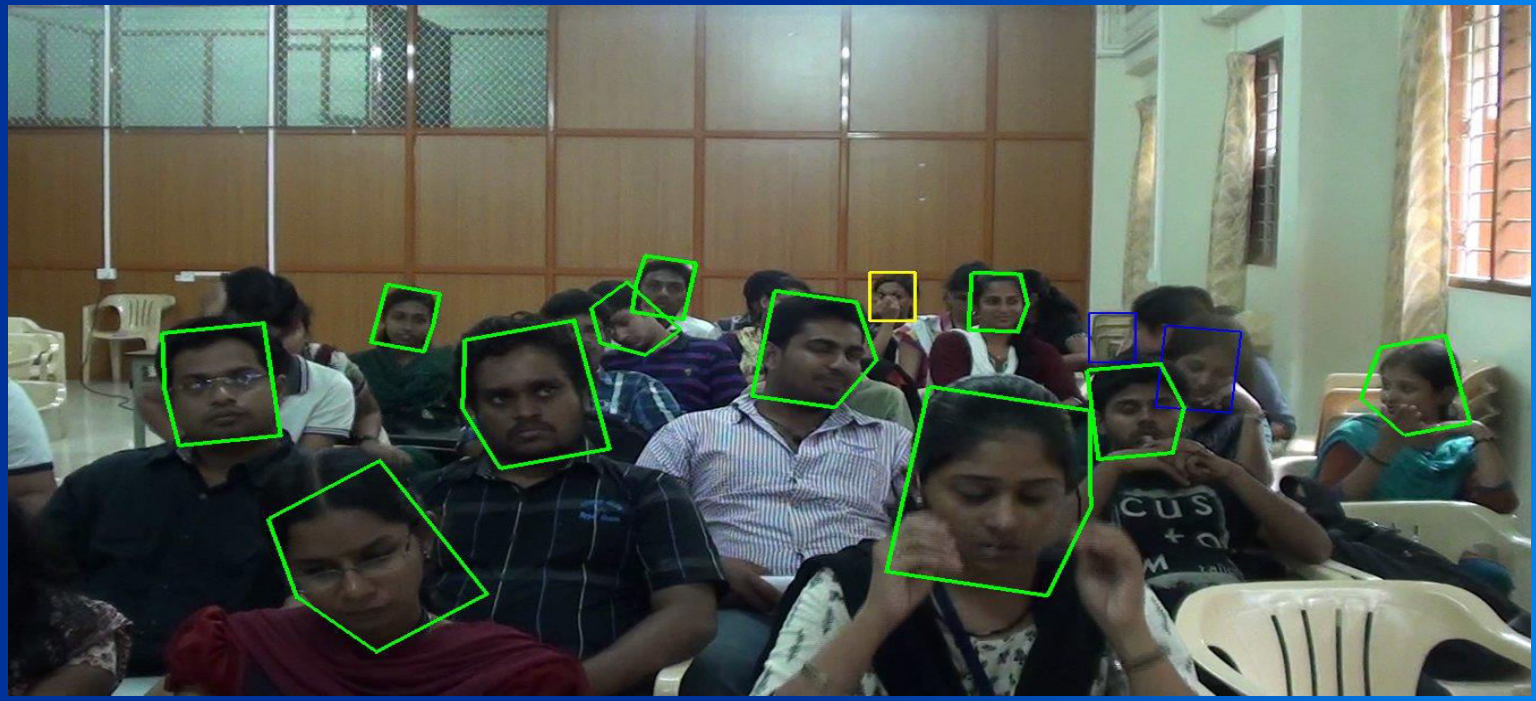


Administration

Manage

- Courses
- Classes
- Users
- Lectures

Automated People Count

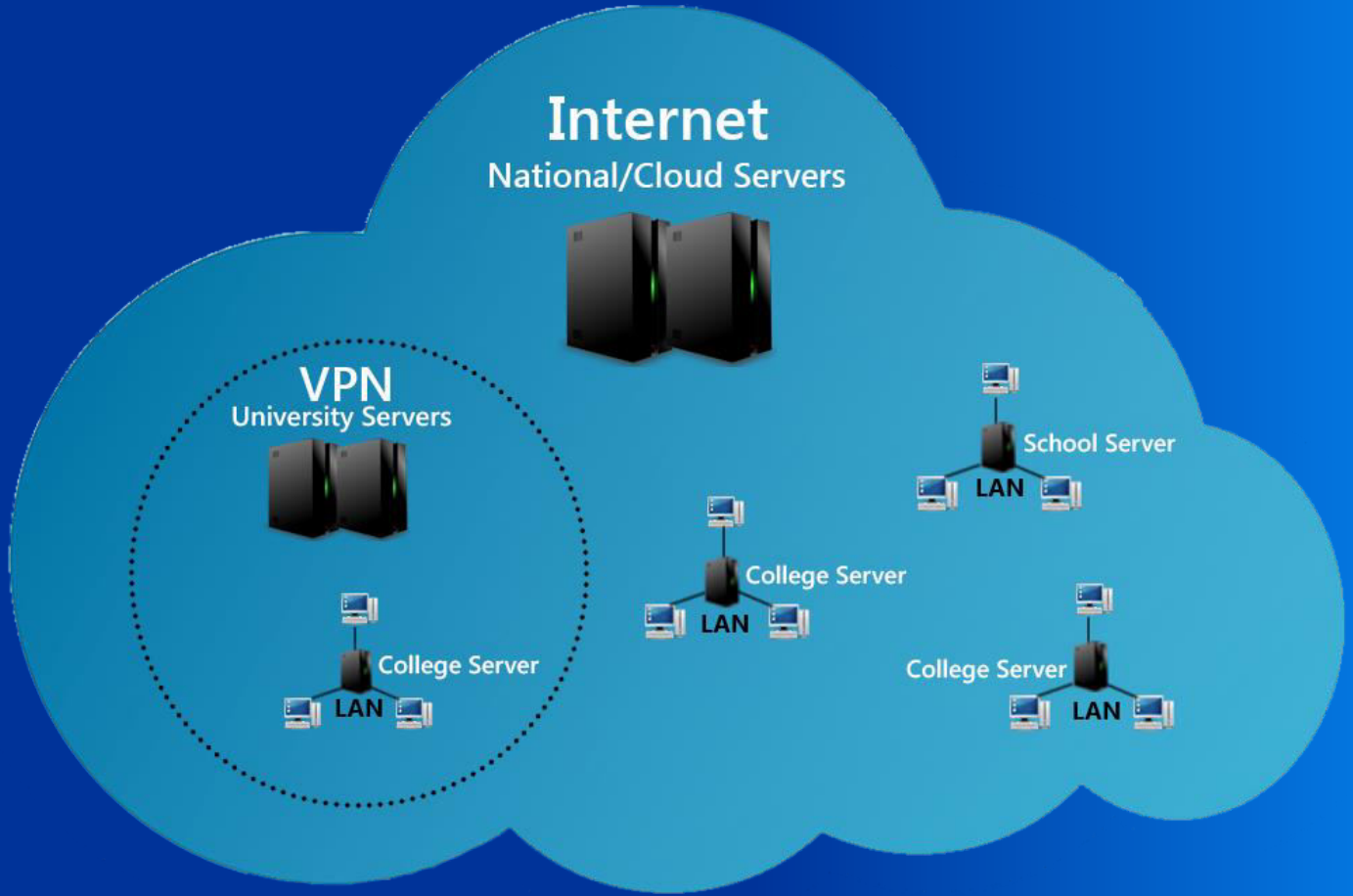


Green color shows better detection

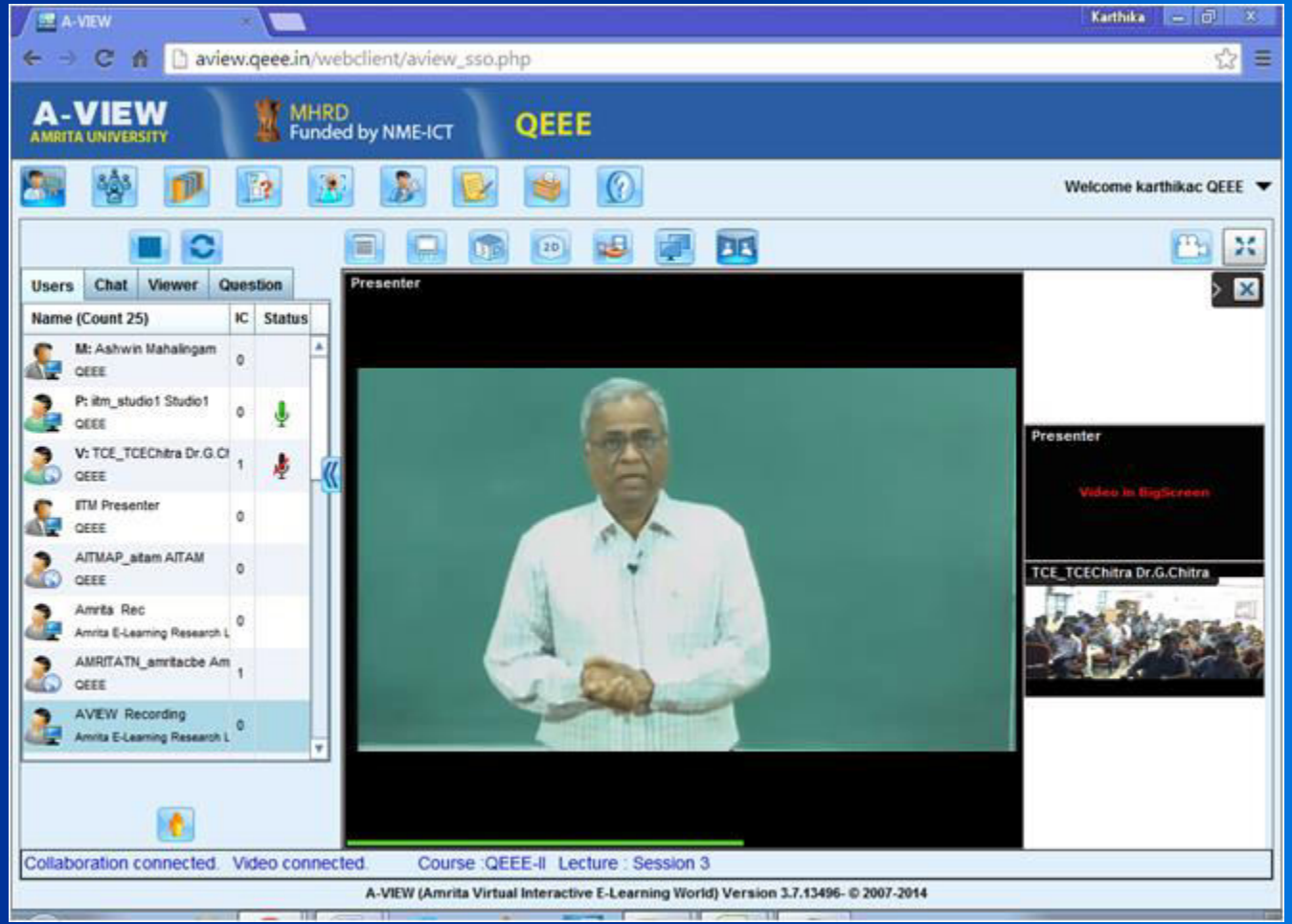
Yellow color shows average detection

Blue color show bad detection

A-VIEW server implementation flexibility



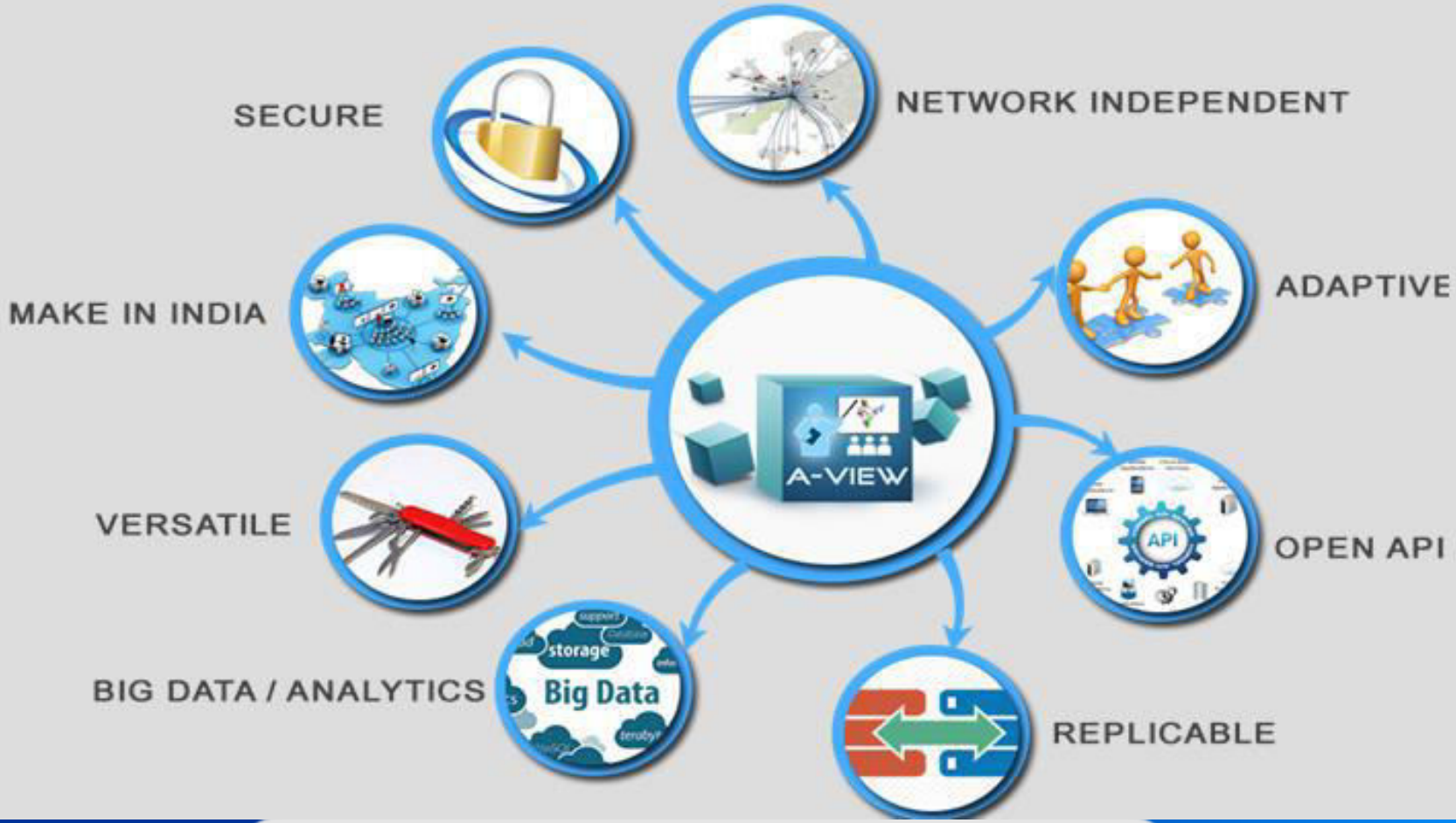
A-VIEW API: QEEE Integration Example



Open A-VIEW

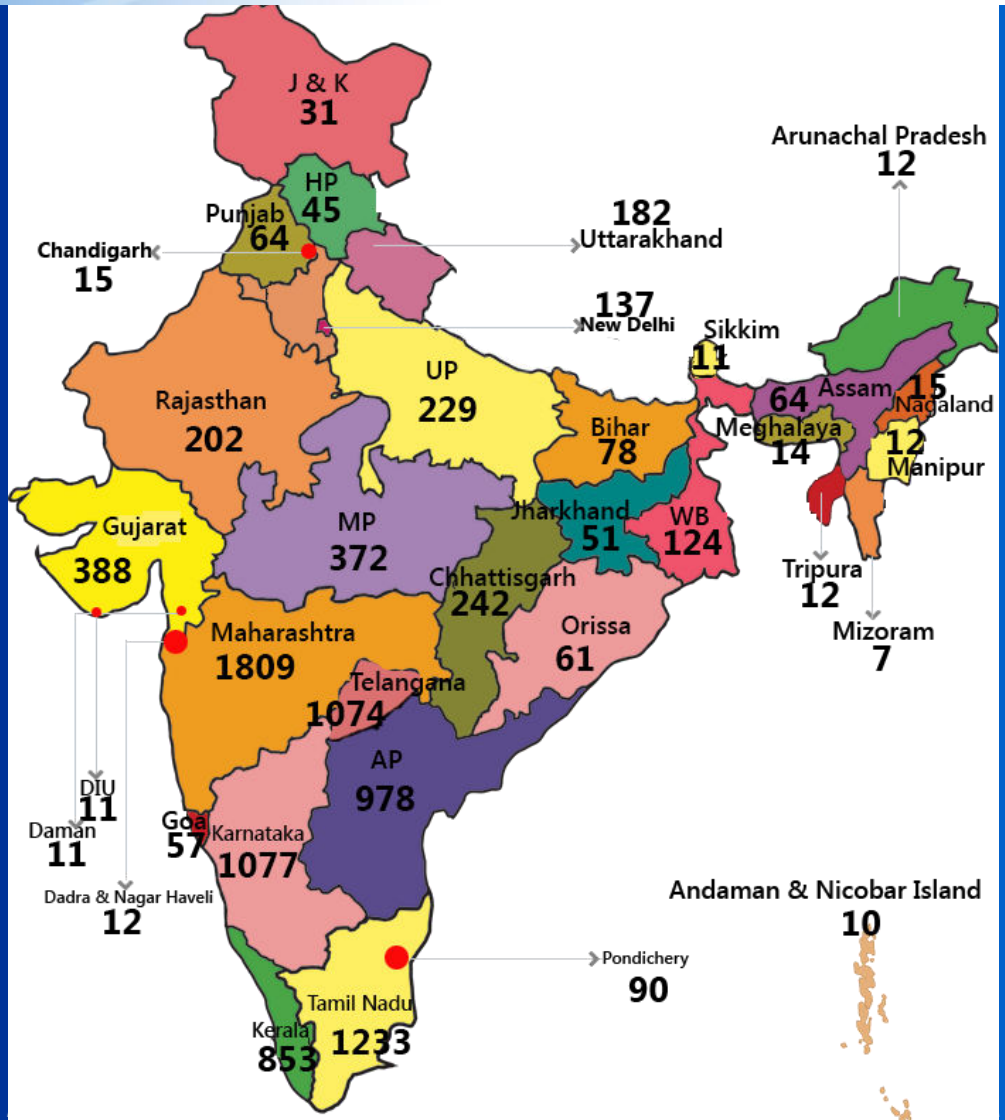
- Open
  - Client
  - Admin
  - Server
  - API
  - Source
- Fully Customizable
- Fully Extensible

A-VIEW UNIQUE STRENGTHS



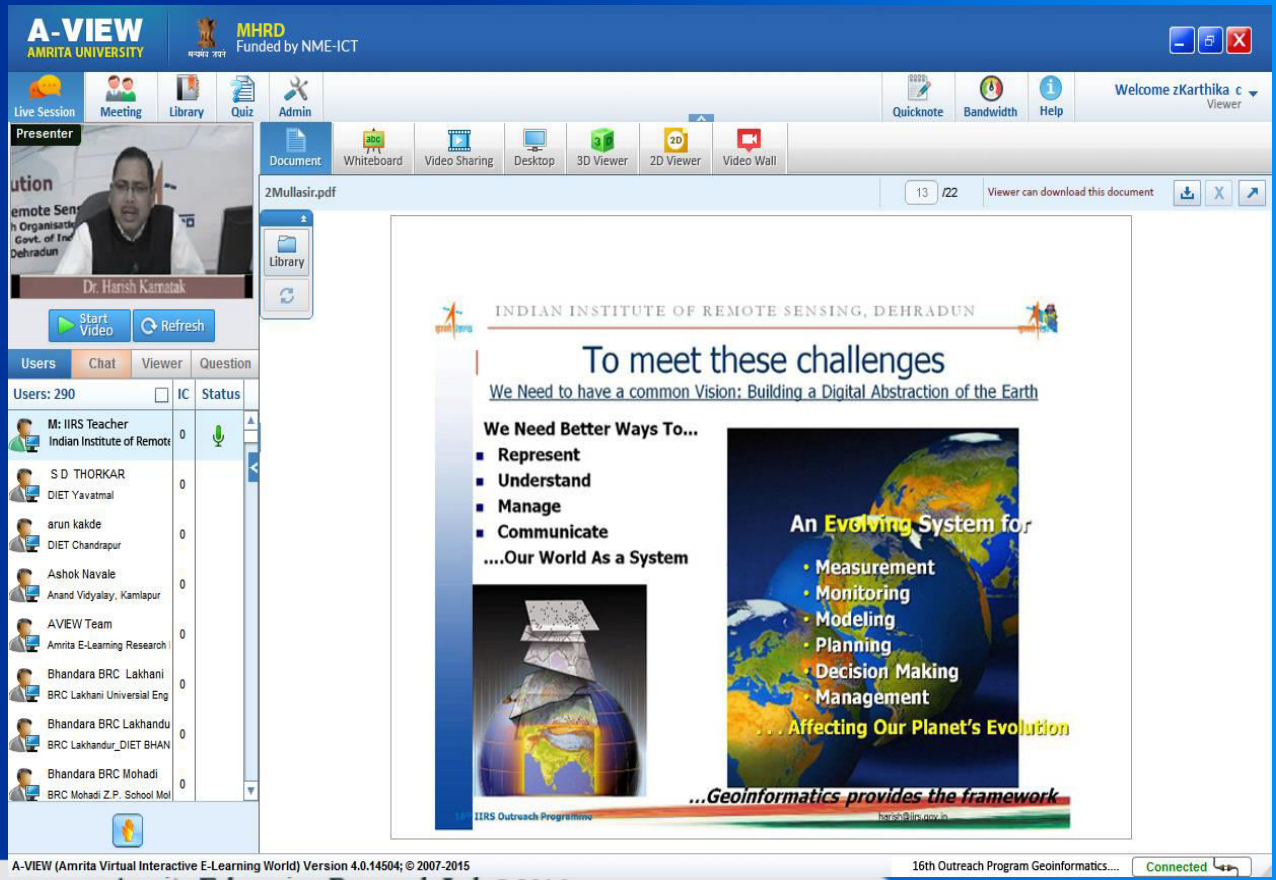
A-VIEW Phase I : Impact

A-VIEW: 10,000 Institutions

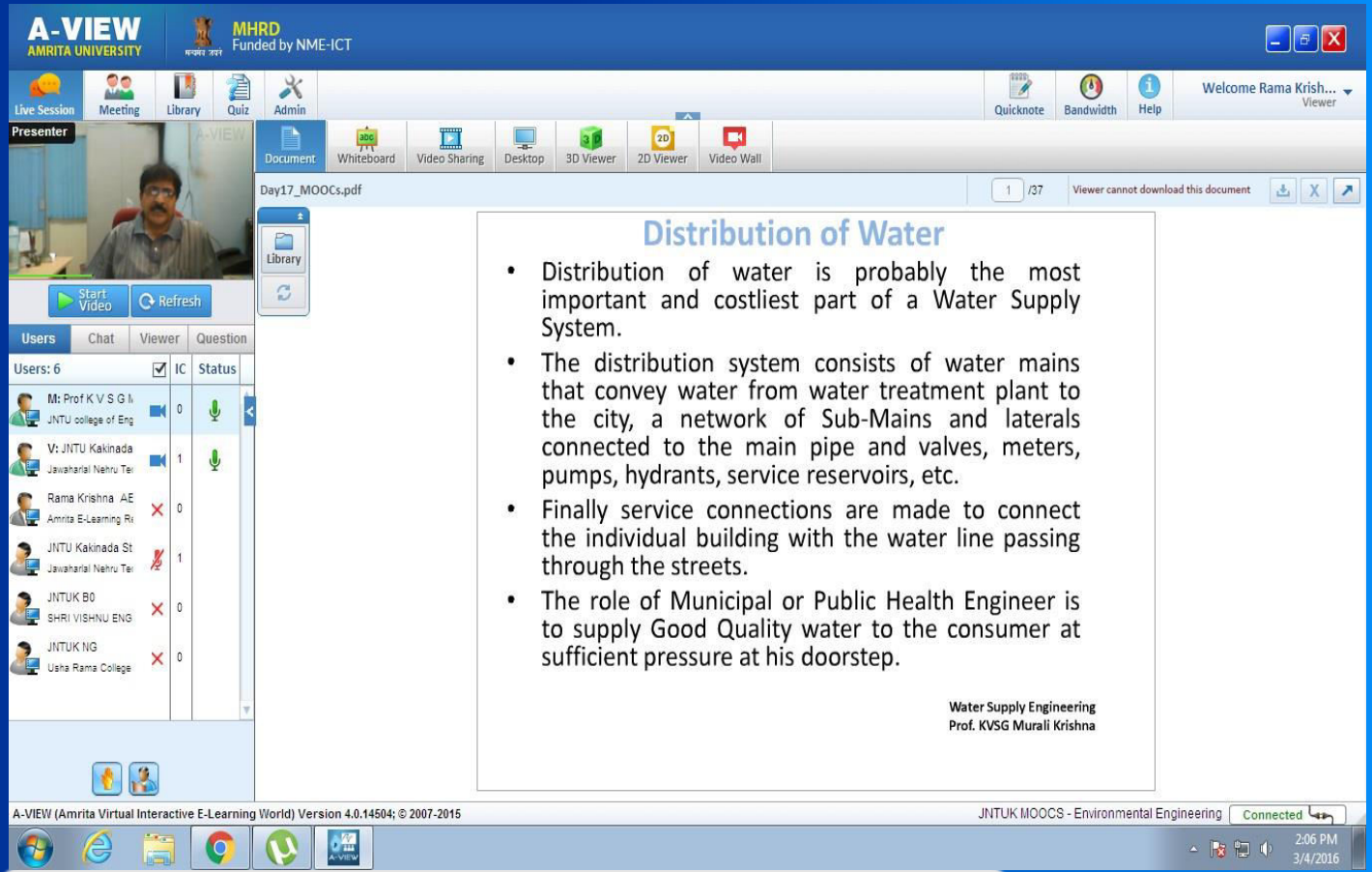


ISRO, Harish Karnatak, IIRS, Dehradun

A-VIEW has grown significantly during last few years and now it is one of the best products for online training and education. Total 24,173 participants from 370 Universities/Institutions have participated in IIRS Outreach Programme. The feedback was excellent from the participants with great satisfaction for A-VIEW and its technology.



A-VIEW tool is very useful for conducting online courses with minimal cost and equipment. With this tool, expert lectures are delivered for almost 12,000+ students in different JNTU-K affiliated colleges.



T10KT - Prof. Deepak B Phatak, IIT Bombay

More than one lakh teachers have been trained

1 Lakh Teachers Trained

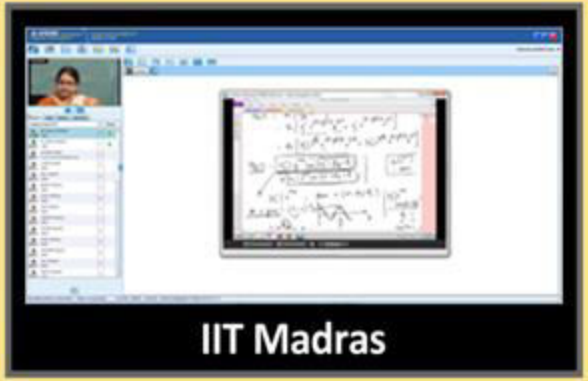
Train 10,000 Teachers Simultaneously - T10kT

Teacher Training Programme by

IIT Bombay and IIT Kharagpur

QEEE Prof. Ashok Jhunjhunwala, IIT Madras, Direct to Students

I am writing to thank you and your team for your efforts towards making QEEE-IV a decent success. Please continue to work closely with our team and help with the forthcoming requirements.



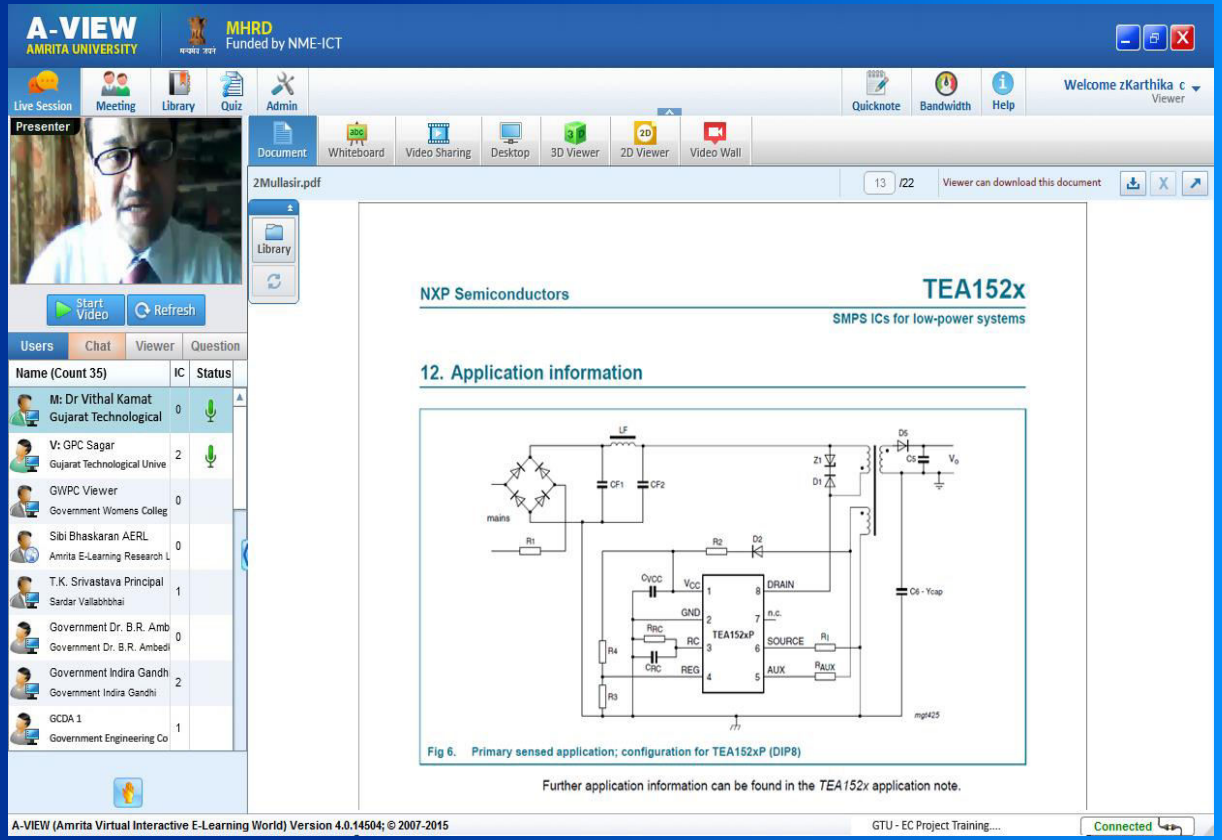
Live classes by IITs to Thousands of Engineering Students

QEEE Programme by IIT Madras

Completed 4 Phases (Semesters)

Dr. Vithal N. Kamat, Gujarat Technological University

Gujarat Technological University is using A-VIEW thrice in a week for training their 'EC (Electronics & Communication) Project Training Classes' students for their initiative. A number of institutes have registered and 9,000 students are attending these sessions.



Skill Ministry using A-VIEW for Online Training

THE NEW INDIAN EXPRESS

Central Ministry Adopts Amrita Varsity App

Express News Service

Kollam: Ministry of Skill Development and Entrepreneurship has adopted the distance learning platform developed by Amrita University in its ambitious skill training program for over 50 crore Indians, after it was demonstrated in front of Prime Minister Narendra Modi on World Youth Skills Day.

Prof. Kamal Bijlani of Amrita University demonstrating A-VIEW to PM Narendra Modi and MoS for Skill Development Rajiv Pratap | EXPRESS

During the inauguration of the event, the Prime Minister interacted with thousands of trainees across the nation using the platform named A-VIEW (Amrita Virtual Interactive E-Learning World). Prof Kamal Bijlani, the chief architect of A-VIEW, demonstrated the usage of A-VIEW with 100 ITIs. The new skill development program by the Central Government aims to reach its target by 2022. The Skills Ministry has used A-VIEW in the past to train 15000 ITI trainees remotely.

A-VIEW, a free application developed by the University, is the preferred distance education video conferencing software package used in India. A-VIEW along with GOI's Aadhar were the only two internet-based technology innovations from India chosen by CISCO to receive their prestigious award.

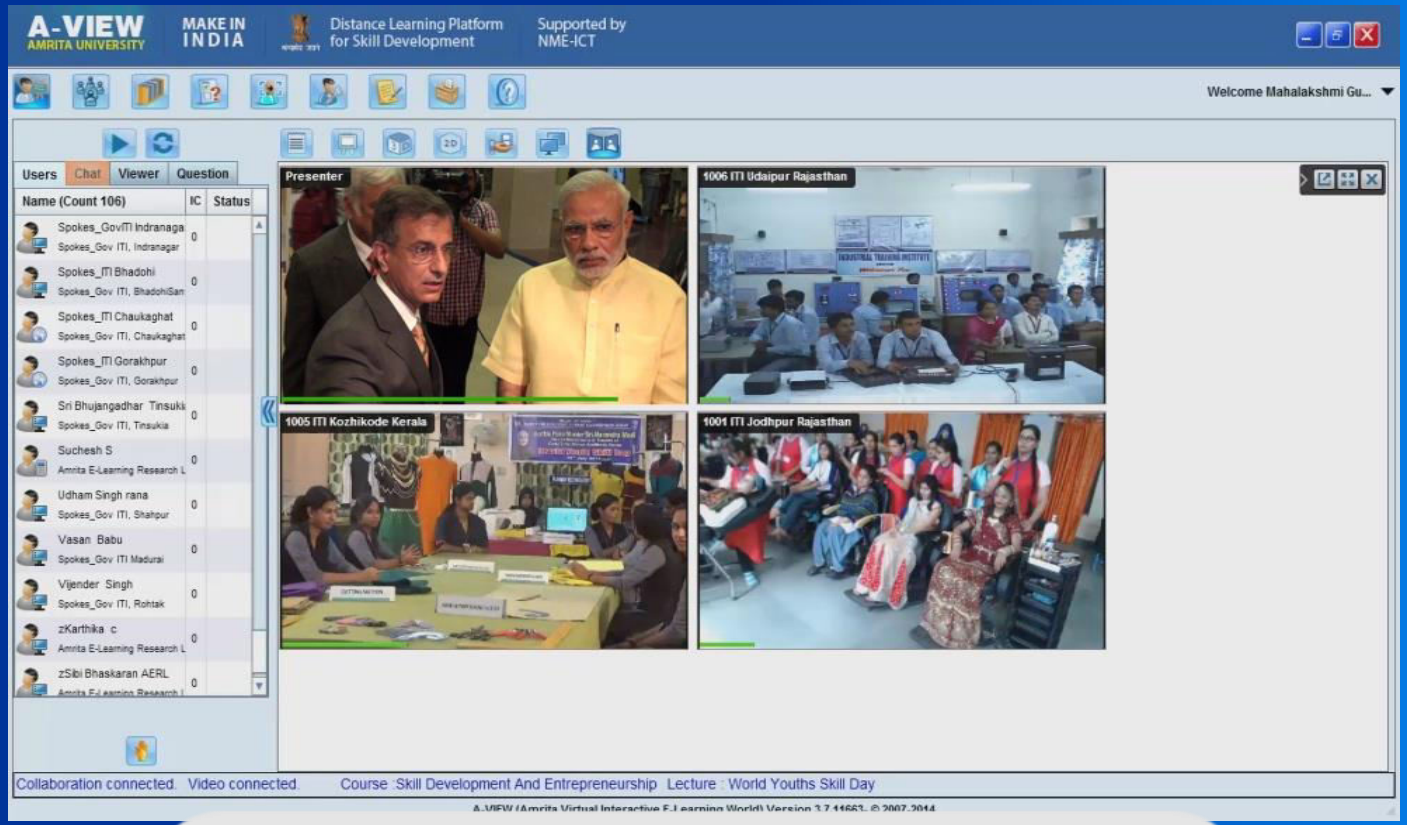
It is a proven large-scale distance education and skill training platform already deployed in over 8,000 institutions in India. A-VIEW is also being used in CBSE schools and National Skill Development Centres.

For the past several years, IIT-Bombay has been using A-VIEW to successfully train 10,000 teachers. Recently, the Government of Maharashtra trained over 35,000 school teachers simultaneously using the platform.

A-VIEW, developed by Amrita University in partnership with IIT-Bombay and NMEICT, Ministry of HRD, features a number of easy-to-use features for skill development.

Dr M. Jayaprakasan, Deputy Director, ATI, Skill Ministry

We are extremely grateful to Amrita for the fullest co-operation rendered during the entire process of commissioning our A-VIEW server in Chennai... Really the fully open support given by the Amrita E-Learning Lab was very marvelous.

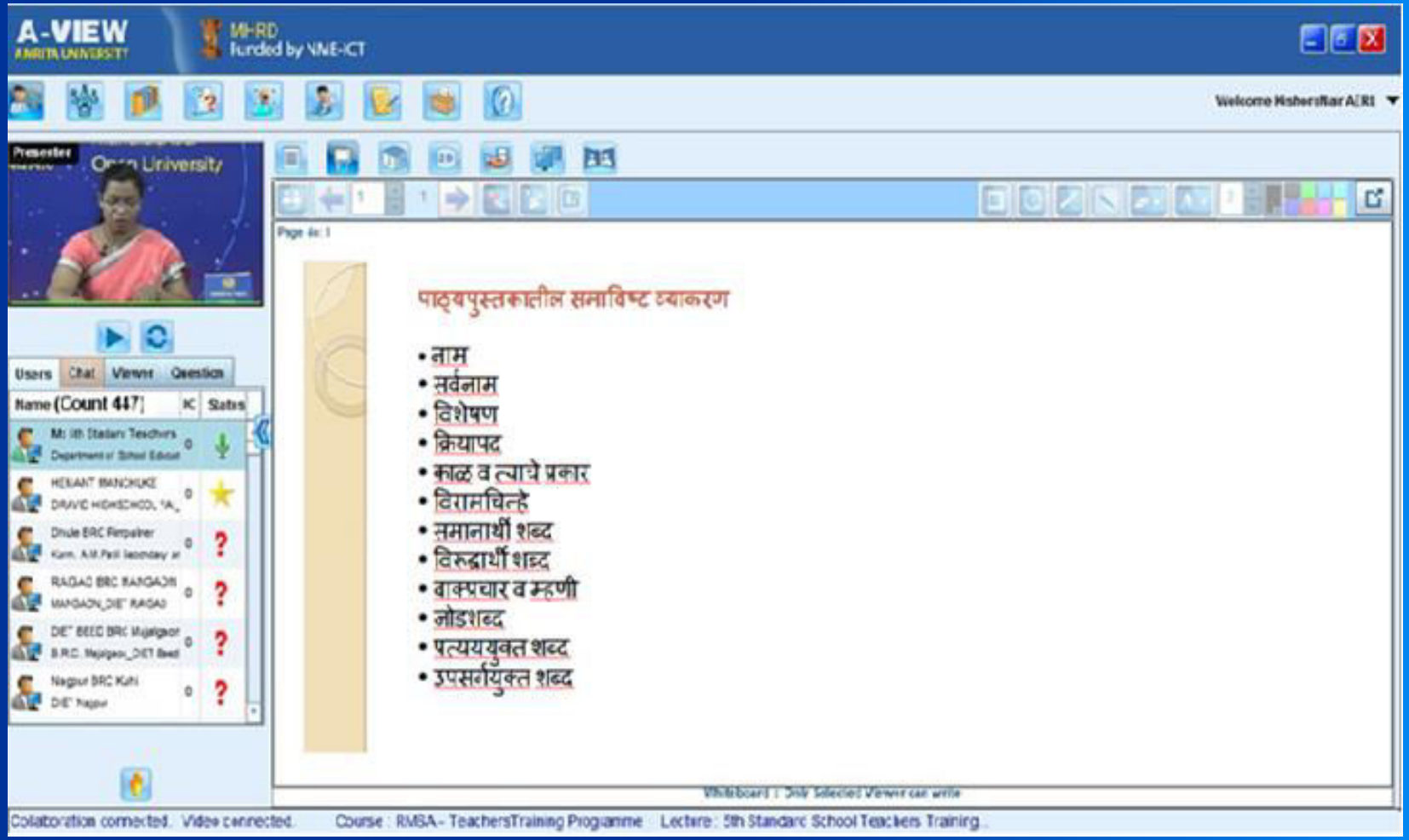


A-VIEW used for Digital India Programmes, IT Ministry

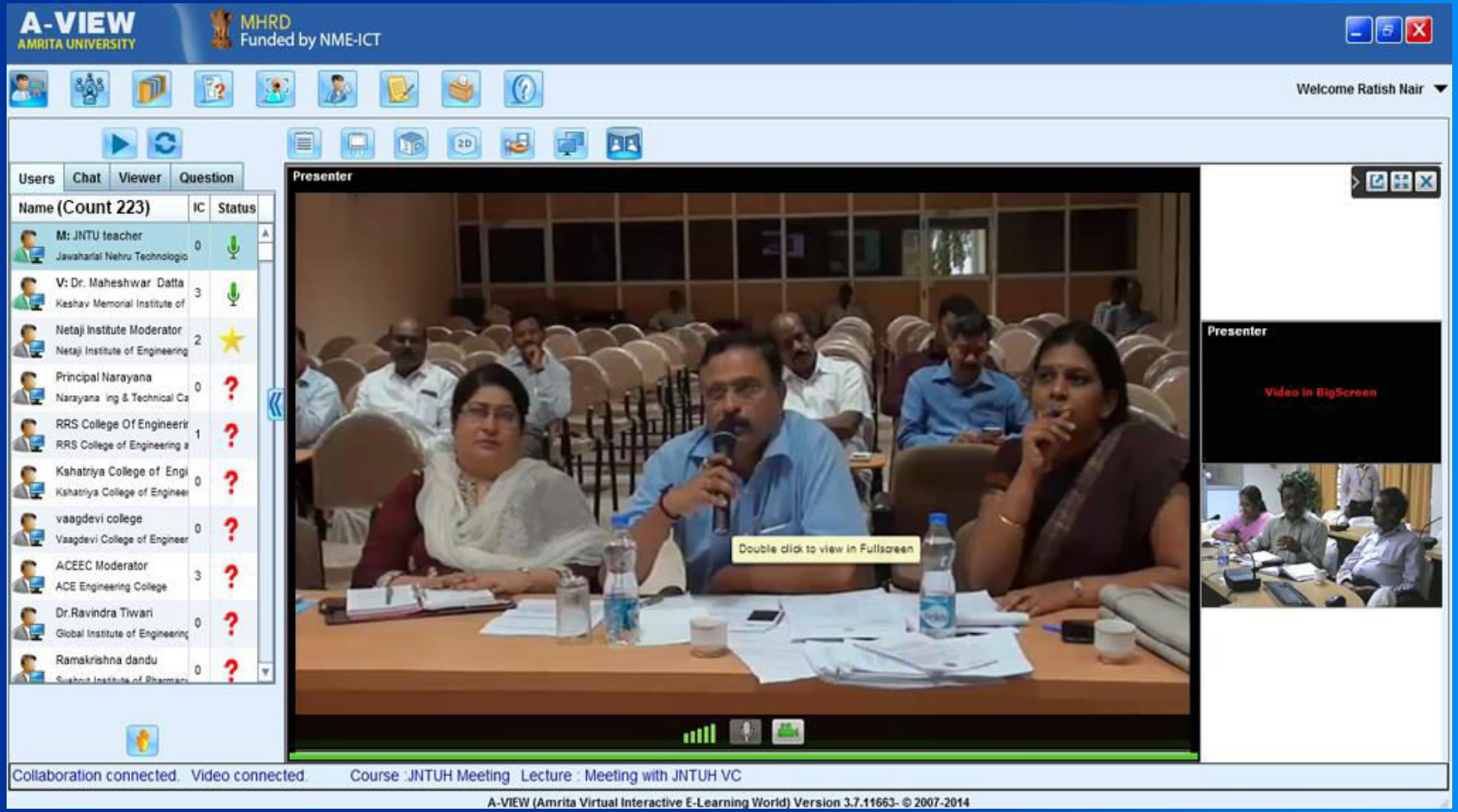
A-VIEW NIELIT Center – Jammu and Kashmir

35,000 School Teachers Trained Simultaneously by Maharashtra Government

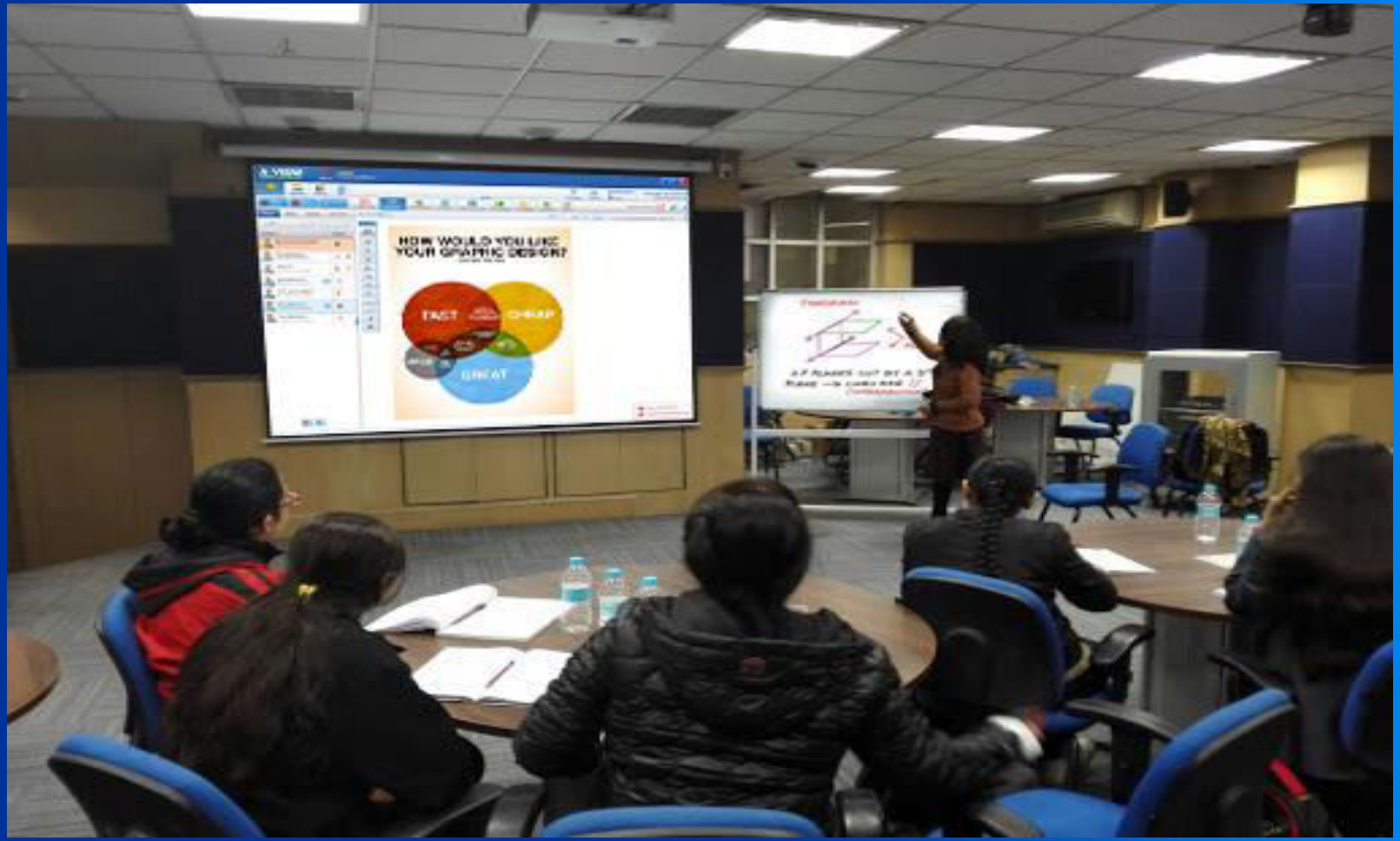
Teacher Training in regional languages



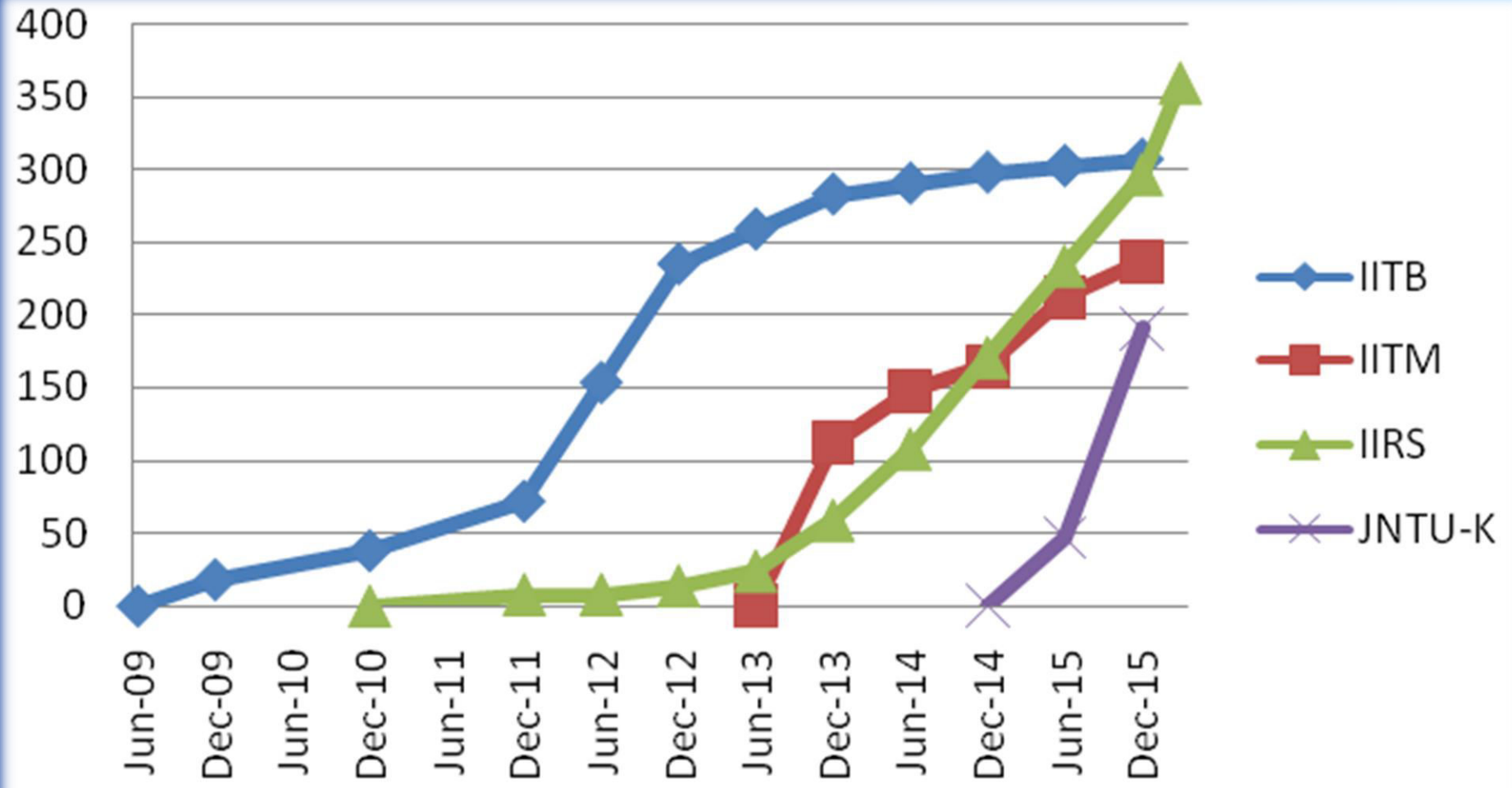
JNTU VC Meeting with 220 College Principals



UDAAN National CBSE Student Tuition



A-VIEW Remote Centers – Higher Education



Major Users- 10,000+ Institutions Connected

Higher Education	
IIT Bombay	Anna University
IIT Madras	Mumbai University
IIT Kharagpur	ANU Andhra Pradesh
ISRO (IIRS Dehradun)	NITTTR Chennai
JNTU Hyderabad	NITTTR Bhopal
JNTU Kakinada	GTU Gujarat

Major Users

School/ Government	Skill/ Technical
HRD Ministry	ATI Chennai
Skill Ministry	ATI Mumbai
INFLIBNET Centre	ATI Bhopal
CBSE School	DOTE Hyderabad
MSCERT	DOTE Madhya Pradesh
NIOS, New Delhi	NVTI Noida

Appreciation letters

IIRS - ISRO

भारत सरकार
अंतरिक्ष विभाग
भारतीय सुदूर संवेदन संस्थान
4, कालीदास मार्ग, पो. बाक्स स. 135
देहरादून– 248 001, भारत
दूरभाष : +91-135-2524399
फैक्स : +91-135-2741987, 2748041

सत्यमेव जयते

Government of India
Department of Space
Indian Institute of Remote Sensing
4, Kalidas Road, P.B. No. 135,
Dehradun - 248 001, India
Telephone : +91-135-2524399
Fax : +91-135-2741987, 2748041

Prof. P.L.N. Raju
Group Head, Remote Sensing and Geoinformatics &
Project Manager, IIRS EDUSAT Program

No. IIRS/EDUSAT/2014/13
Dated: July 9, 2014

Sub.: Request for allotment of time slot for IIRS Thirteenth Outreach Programme on "Basics of RS, GIS & GNSS" conducted during 04 August- 14 November, 2014 for live telecast from IIRS

Dear Prof. Kamal Bijlani ji,

As you are aware that IIRS has so far conducted twelve Satellite Based Outreach Programs, benefitting more than 13000 participants from around 135 Indian universities / institutions/colleges. To promote and expand the scope further, IIRS has announced thirteenth course on **"Basics of RS, GIS & GNSS" conducted during 04 August- 14 November, 2014** by utilizing A-VIEW software. This Programme is sponsored by NNRMS, Department of Space, Government of India for Capacity Building.

IIRS expresses sincere gratitude to Amrita University, E-learning Research Laboratory for continuous support, and enabling successful conduct of IIRS Distance Learning Programs since 2011. We have been able to train **5648** number of participants through A-View software as given in table below.

Sl No	Course	Duration	No of Univ./Inst.	No of Participants
1	7th course	01 Aug - 08 Nov, 2011	08	549
2	8th course	13 Feb - 30 Mar, 2012	08	361
3	9th course	06 Aug - 22 Oct, 2012	14	413
4	10th Course	11 Feb – 15 Mar, 2013	24	657
5	11th Course	05 Aug – 13 Oct, 2013	59	1508
6	12th Course	02 Feb – 29 Mar, 2014	108	2160

Like previous courses, you are requested to create an account for IIRS to conduct the scheduled course during 04 August- 14 November, 2014 (1100 hrs – 1800 hrs) for telecasting the IIRS programme as per the time table enclosed. Time slots during the July 14, 2014 to July 31, 2014 may also be provided for testing purposes with existing and new universities/institutions/colleges for better reception of Programme.

You are requested to provide 500 Nos. user IDs for A-VIEW individual users to receive IIRS thirteenth Course live. The individual user's details will be sent in due course of the time. A copy of the announcement brochure and tentative schedule of this course is enclosed herewith for your information.

With regards and best wishes,

Yours sincerely,

(P. L. N Raju)

To,
Prof. Kamal Bijlani
Director
Amrita E-Learning Research Lab, Amrita Vishwa Vidyapeetham,
Amritapuri, Clappana P.O, Kollam, Kerala 690525.

CC: 1. Shri. Krish Gopalasamy, Associate Director, Amrita E-Learning Research Lab
2. Ms. Kandhimathy Swarnam, Software Quality Manager, Amrita E-Learning Research Lab
3. Shri J.K Srinivasan, Amrita E-Learning Research Lab

Enclosures: 1. Course Brochure 2. Tentative Time Table

JNTU - Kakinada

Grams: "TECHNOLOGY"
Email: registrar@jntuk.edu.in
gvrp_raju@yahoo.com

Phone: Off: 0884 -2300900
Fax: 0884 -2300901

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh (India)

Lr.No. JNTUK/A-View appreciation Date: 18-03-2016

Dr. G. V. R. PRASADA RAJU
B.E, M.E., Ph.D.
REGISTRAR

To,
Prof. Kamal Bijlani
Director, Amrita E-Learning Research Lab
Amrita University
Amrtiapuri, Kollam
Kerala

JNTUK Kakinada has conducted Massive Open Online Courses (MOOCs) for two semesters. Using A-VIEW JNTUK has successfully conducted 02 subjects in the first semester and 05 subjects in this semester.

It is found that A-VIEW tool is very useful for conducting online courses with minimal cost and equipment. With this tool expert lectures are delivered for almost 12000+ students in different JNTUK affiliated Colleges.

JNTUK thank the Amrita University and A-VIEW team for providing this tool and appreciate the technical support given by Shri Rama Krishna Kumar, Assistant Manager, A-VIEW team-Amrita University. Looking forward for your support in future.

Regards
REGISTRAR
J.N.T. University Kakinada
KAKINADA-533 003

REGISTRAR'S OFFICE * JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA * KAKINADA

DoTE - Chennai

Directorate of Technical Education, Chennai-25

STATE PROJECT COORDINATION UNIT

PRAVEEN KUMAR, I.A.S.,
Principal Secretary to Govt. /
Commissioner of Technical Education /
Chief Implementation Officer

Phone : 044-22354672
Fax : 044-22354672
Email : spcudte@hotmail.com

Lr.No.DOTE-SPCU/Aview/2015 **Date : 25-3-2015**

To

Prof. Kamal Bijlani
Director
Amrita E-Learning Research Lab
Amrita University
Kollam, Kerala - 690525

Dear Sir,

I would like to place on record my appreciation of the Excellent work done by the team of members from Amrita E-learning Research Lab, Kollam, in establishing Video Conferencing Broadcasting Centres in Directorate of Technical Education, Chennai, and Polytechnic Colleges in Tamil Nadu and for their coordination in broadcasting Class Room Sessions for the benefit of the staff and students of Polytechnic Colleges in Tamil Nadu, through Video Conferencing using A-View Software.

This initiative will go a long way in improving the Quality of Education in Polytechnic Education System in Tamil Nadu.

I wish the coordination between the Directorate of Technical Education, Chennai and A-View Team at Amrita e-learning Research Lab, Kollam, to continue for the benefit of the Student Community.

Commissioner of Technical Education /
Chief Implementation Officer

NIOS, New Delhi

दूरभाष: 0120-4089899 ● फैक्स: 0120-4626902
राष्ट्रीय मुक्त विद्यालयी शिक्षा संस्थान
आईएसओ 9001:2008 प्रमाणित
(मा.सं.वि.मं., भारत सरकार के अधीन एक स्वायत्त संस्था)
ए-24-25, इंस्टीट्यूशनल एरिया, एन.एच.-24,
सेक्टर 62, नोएडा-201309, जिला गौतम बुद्ध नगर (उ.प्र.)

Telephone: 0120-4089899 ● Fax: 0120-4626902
NATIONAL INSTITUTE OF OPEN SCHOOLING
ISO 9001:2008 Certified
(An autonomous Institution under MHRD Govt. of India)
A-24-25, Institutional Area, NH-24, Sector-62,
NOIDA-201309, Distt. -Gautam Buddha Nagar (U.P.)

डॉ. कुलदीप अग्रवाल
निदेशक (शैक्षिक)
Dr. Kuldeep Agarwal
Director (Academic)

E-mail : diracad@nios.ac.in
Web Site : www.nios.ac.in

F.No. 89-26 NIOS/Acad/AEP-LEA/6000
Date: October 21, 2015

Subject: Creating 32 IDs and passwords for A-view in context of Learners Engagement Activity - 2015

Dear Prof. Bijlani,

National Institute of Open Schooling (NIOS) is an autonomous institution under Ministry of Human Resource Development (MHRD) Government of India. With 2.7 million learners on roll, NIOS has emerged as the largest open schooling institution in the world. In order to prepare young people for a safe and productive life, NIOS through UNFPA-MHRD, Govt. of India supported Adolescence Education Programme (AEP in Schools). For reaching the unreached, NIOS is organizing an event called 'Learner Engagement Activity-2015' in first week of December, 2015 at 15 Regional Centers of NIOS across India and 32 additional centers of North East India.

Hon'ble HRD Minister is likely to inaugurate this event and address all the Learners and Tutors gathered at different venues of LEA-2015, through A-View conferencing.

In view of establishing dialogue between our Hon'ble Chief Guest, Learners and Tutors during LEA-2015, you are requested to create 32 User Ids and Passwords for the selected centres. Please find enclosed list of selected venues. User Ids and passwords for 15 Regional Centres of NIOS is already available with the respective Regional Centres.

So, as to test the operational working of A-VIEW facility across our centres, it is proposed that 3 dry runs may be organized at all selected venues during November, 2015. Therefore, please make it convenient and create the User Ids and passwords by October 30, 2015.

I look forward to a positive response and approval from your side.

With regards,

Director (Academic)

Prof. Kamal Bijlani
Director, E- Learning
Research Lab
Amrita University

Awards & Recognitions

World Education Summit 2011
Best Innovation in Open and Distance Learning

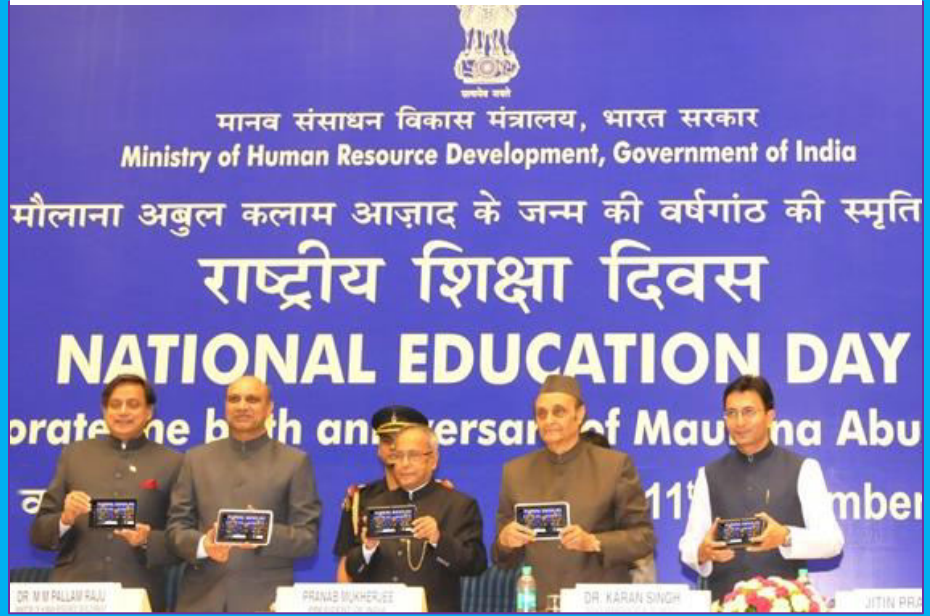
Educational Excellence Award
Indo Global Educational Summit 2012

Computer World Honors Laureate 2012 For Training and Education

Manthan Award South West India 2014
e-Education, Learning and Development

First major release of A-VIEW on 12th August 2009 by **Dr. A.P.J. Abdul Kalam**

A-VIEW on tablet - Launched on 11th November 2012 by Shri **Pranab Mukherjee**



A-VIEW Phase I - Conclusion

A-VIEW: Unique Strengths

- Custom-built for Large-Scale Classrooms
  - User Interaction
  - User Management
  - Client-side Bandwidth Optimization
  - Automatic People Count using Image Recognition
  - ...

A-VIEW: Unique Strengths

- Works with existing hardware
- Collaborative Content Sharing
  - Video Sharing
  - 2D/3D
- Open, Extensible, Customizable
  - Client, Admin, Server, API, Source
- Full Class Recordings

A-VIEW Phase I - Conclusion

- Significant technology delivered in Phase I
- Open Source Version released in September 2015
- Lakhs of teachers and students benefited
- Phase 1 Project completed successfully
- Phase 2 based on requests from existing users

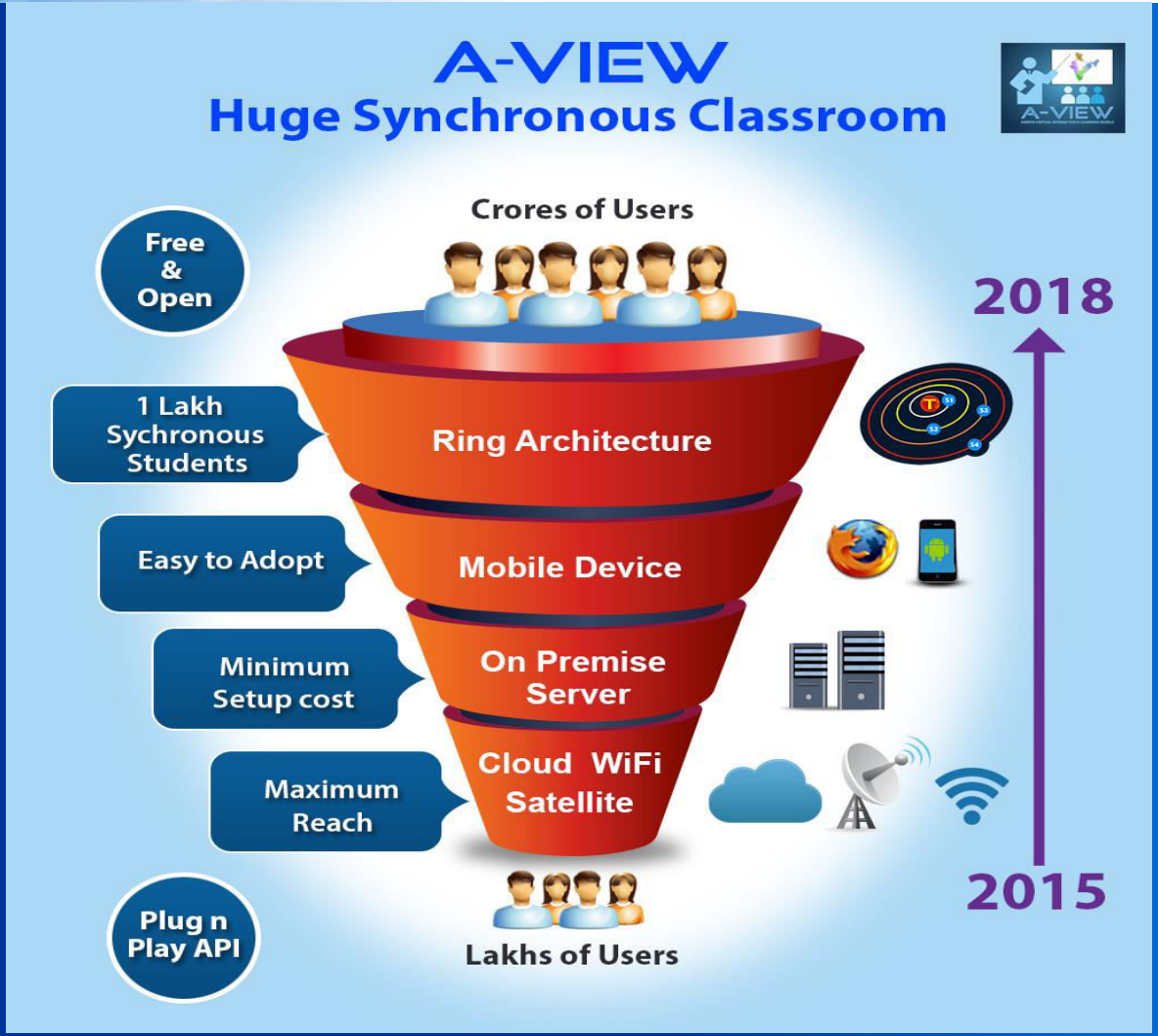
A-VIEW Phase II – Feature Requests

- Over 200 feature requests from active users
- Major common requests are prioritized and cateogrized into 8 major modules

Module	Top Requesting Partners
Huge Virtual Synchronous Classroom	IIT-B, IIRS, …
Classroom Monitoring & Attention Analysis	IIT-B, IIT-M, Mumbai University, …
Adaptive Plug and Play Devices	IIT-M, IIRS, NITTR-B, NITs, …
Open Source Server Components	IIT-B, Skill Ministry, JNTU-K, …
Major Requests From Stakeholders	IIT-B, IIT-M, JNTU-K, JNTU-H, …
Synchronous Tutoring Groups	IIT-B, IIRS, NIITTR Chennai, …
A-VIEW using Low-End Mobiles	IIT-B, IIT-M, Skill Ministry, IIRS, …
Local Synchronous Producer and Player	JNTU-K, IIRS, …

A-VIEW Phase II - Short

A-VIEW Phase II



A-VIEW Phase II – Objectives

- Upto 1 Lakh Synchronous Students
  - Ring architecture
- Easy to adopt
  - Low-cost mobile device
- Managing huge community of Live Online Classes simultaneously

A-VIEW Phase II – Objectives (2)

- Minimum setup cost
  - On-premise, free-of-cost server
- Video Quality
  - Adaptive Video
- Maximum reach
  - Satellite/DTH

A-VIEW Phase II – Objectives (3)

- Plug-n-Play
  - Ease of use, Reuse existing hardware
- Open Plug-in API
  - Integrate into any external system
- Standalone A-VIEW
  - Offline mode for Smart Classroom

Phase II – Modules

M1: Huge Virtual Synchronous Classrooms

M2: Classroom Monitoring & Attention Analysis

M3: Adaptive Plug and Play Devices

M4: Open Source Server Components

M5: Major Requests From Stakeholders

M6: Synchronous Tutoring Groups

M7: A-VIEW Using Low End Mobiles

M8: Local Synchronous Producer And Player

M9: Automation Testing & System Integration

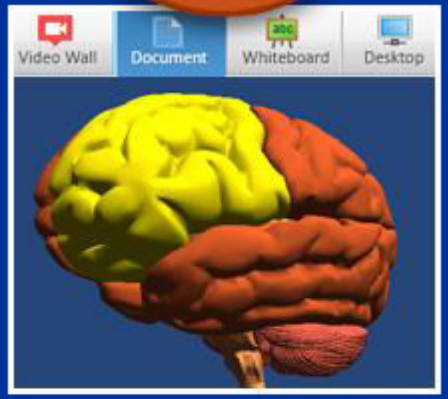
M10: Implementation For One Crore Users

M1: Huge Virtual Synchronous Classrooms

User Interface for each Role Type

Teacher

Content

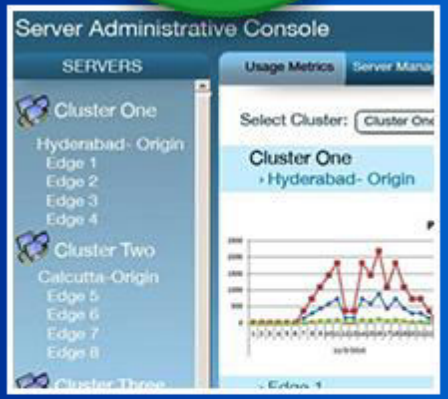


Teaching Assistant

Content, Forum, Interaction

System Admin

Troubleshooting

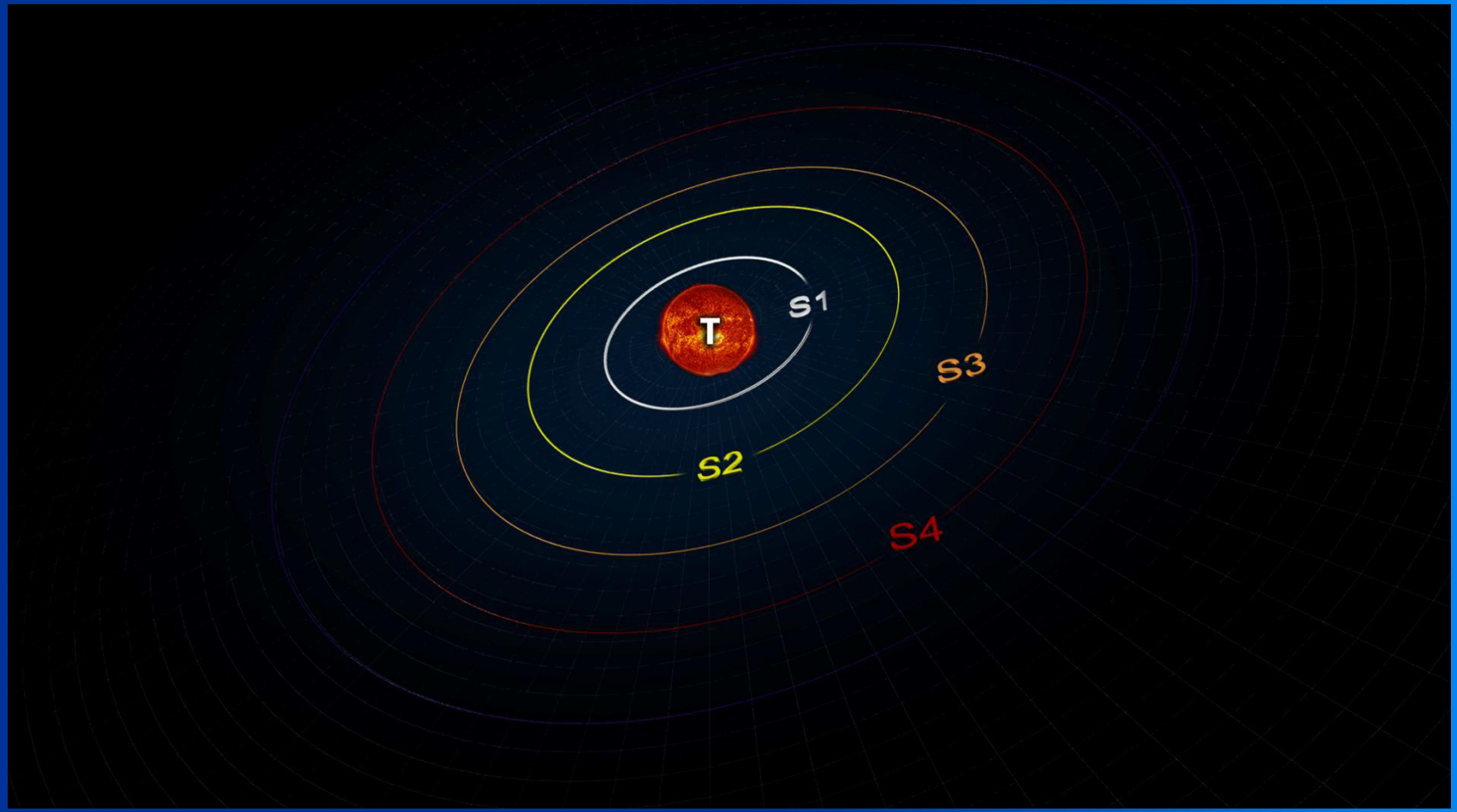


Monitor

Supervision, Analytics

Immediate Feedback Mechanism

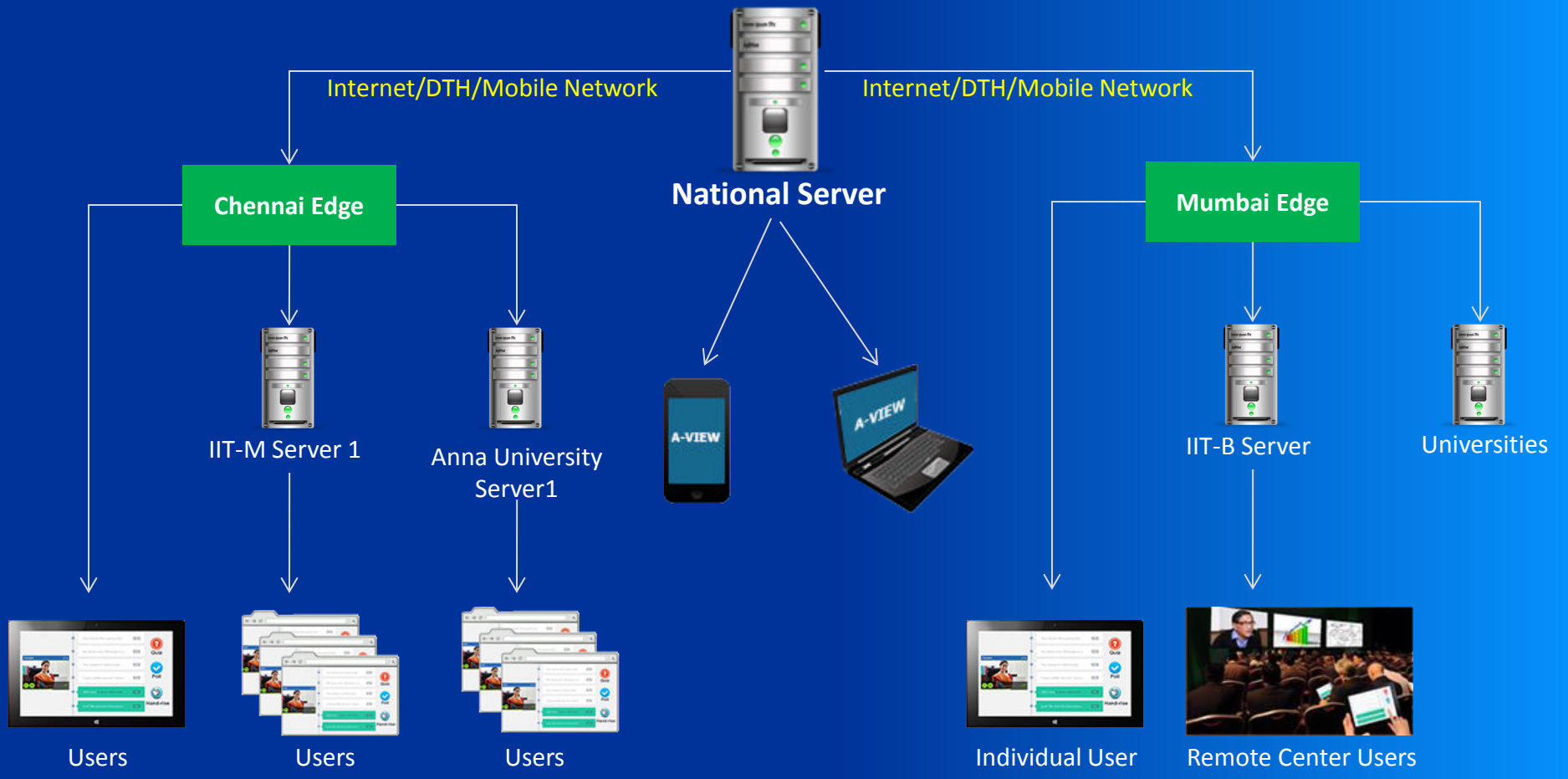
M1: Huge Virtual Synchronous Classrooms



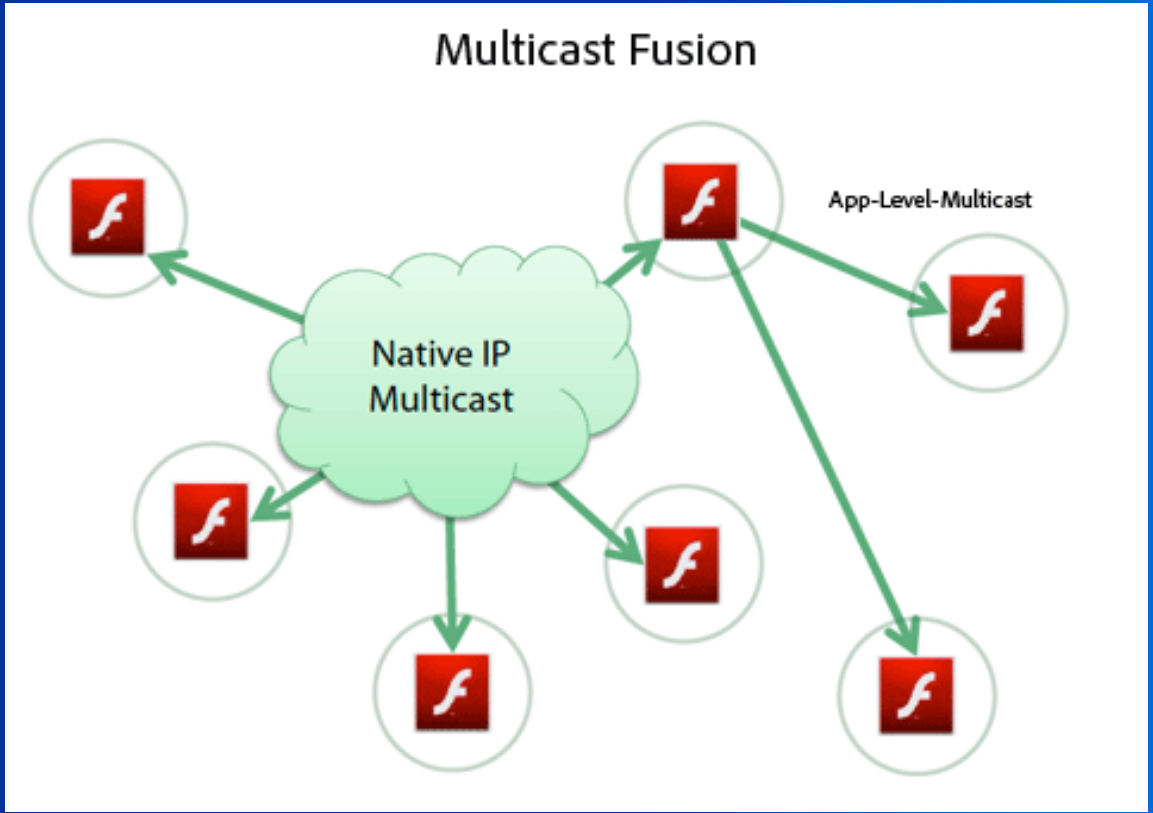
Interaction Mode

Column1	View A-V	A-V Interaction	Integrated Text Interaction	Text Interaction using Mobile App	Question / Poll using Regular Phone	No Text Interaction	Use Case
S1	Yes	Yes	Yes	N/A	N/A	N/A	Synchronous Direct Teacher-Student, Teacher-Teacher Sessions; Tutoring Groups
S2	Yes	No	Yes	N/A	N/A	N/A	Huge Synchronous Teacher-Student, Teacher-Teacher Sessions
S3	Yes	No	No	Yes	N/A	N/A	Student & Teacher Training using Remote Centers
S4	Yes	No	No	No	Yes	N/A	Rural Area Student & Teacher Training (DTH/Satellite + Regular Phone)
S5	Yes	No	No	No	No	Yes	Remote Area Student & Teacher Training (DTH/Satellite; No Phone)

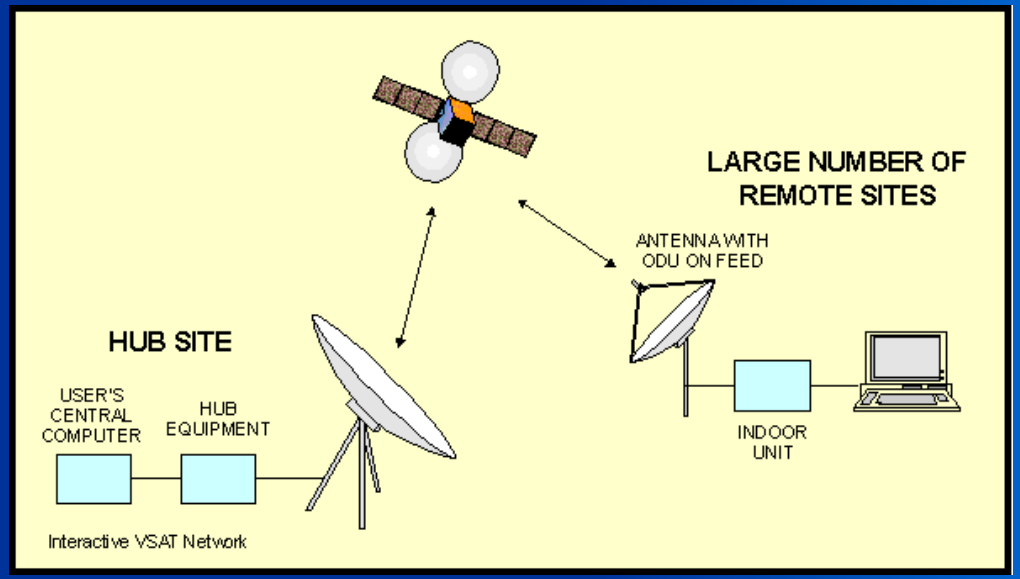
Video Delivery Network



Hybrid Multicast



Leveraging DTH



Deliverables

Release	Deliverables
R1	Detailed Specification and Review, Design of Inner Circle/Outer Circle Paradigm
R1	Document Prefetcher: Download/show thumbnail preview of document when conversion is happening
R1	Document Prefetcher: Progress bar for conversion
R1	User Manager: Smarter notifications for user list changes, user entry, exit
R1	User Manager: Sort by Moderator, Presenter, Student, etc.
R1	User Manager: Sorting Management – Sort by audio-video capabilities.
R1	User Manager: Sorting Management – Sort by interaction count.
R1	User Manager: Status messages for role changes
R1	User Manager: Warning message for user's who are not publishing video for A/V interaction
R2	Login using Email Id's (Single sign-on)
R2	Satellite: Audio-Video Interaction over Satellite (Multicast)
R2	Time based speaker access, like a person has 5 minutes to speak the he is automatically muted again
R3	HSC: Admin can configure how many users can be in each circle
R3	HSC: Inner Circle / Outer Circle Prototype
R3	HSC: Integrated client to switch between live interaction and receive-only: webinar, dth
R3	HSC: Presenter video and Viewer Video publishing can be done to different servers
R3	HSC: Single Site, Single Level Internet-only edge
R3	Integrated client to switch between live interaction and receive-only: webinar, dth
R3	Satellite: Bridged Classes between Satellite and Internet (e.g., NKN)
R4	Document Prefetcher: Multi document upload
R4	HSC: Admin work for configuring policies (live/receive-only ratios, special treatment)
R4	HSC: Dashboard for viewing the list of users in each Circle
R4	HSC: Queuing if the inner circle is fully occupied
R4	HSC: Reservation for special users
R4	HSC: User Can move from Outer Circle to Inner Circle
R4	Satellite: Desktop Sharing over Satellite (Multicast)
R4	User Manager: Displayed Information for users' action (eg:drawing, scrolling, deleting etc.)
R5	HSC: API's for edge deployment and configuration
R5	HSC: Deployment scripts for deploying over any external delivery network
R5	Satellite: Document Sharing over Satellite (Multicast)
R6	HSC: Phone Integration for users to join from phones to A-VIEW classes.
R6	Satellite: Whiteboard over Satellite (Multicast)

Phase II – Modules

M1: Huge Virtual Synchronous Classrooms

M2: Classroom Monitoring & Attention Analysis

M3: Adaptive Plug and Play Devices

M4: Open Source Server Components

M5: Major Requests From Stakeholders

M6: Synchronous Tutoring Groups

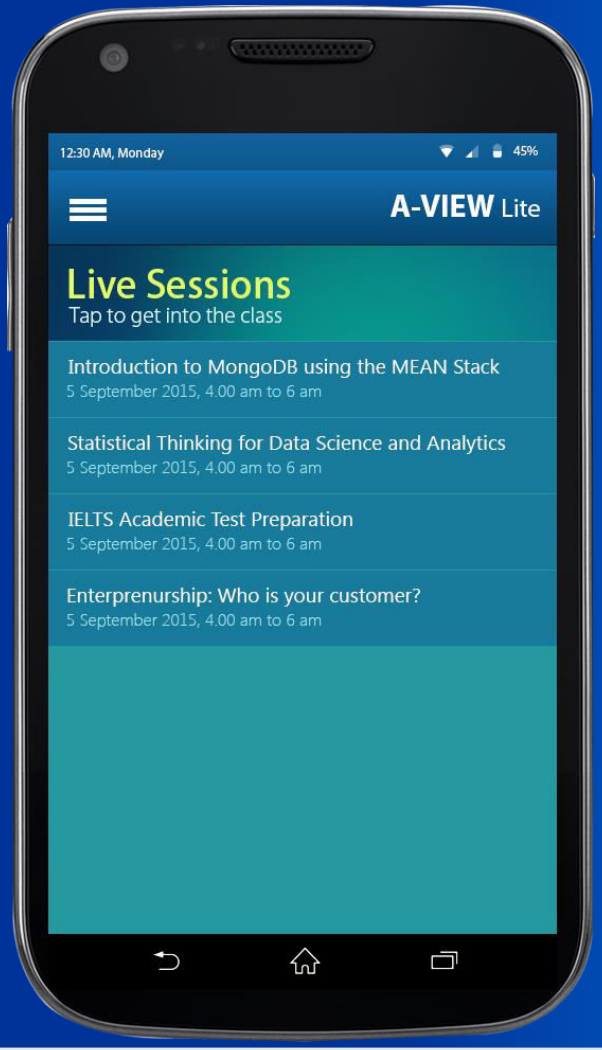
M7: A-VIEW Using Low End Mobiles

M8: Local Synchronous Producer And Player

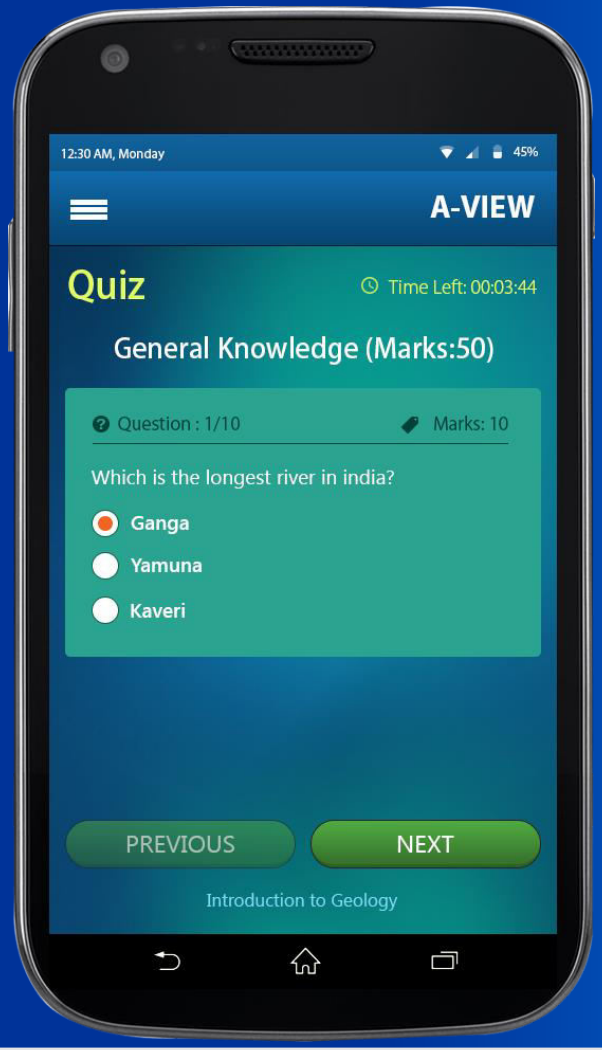
M9: Automation Testing & System Integration

M10: Implementation For One Crore Users

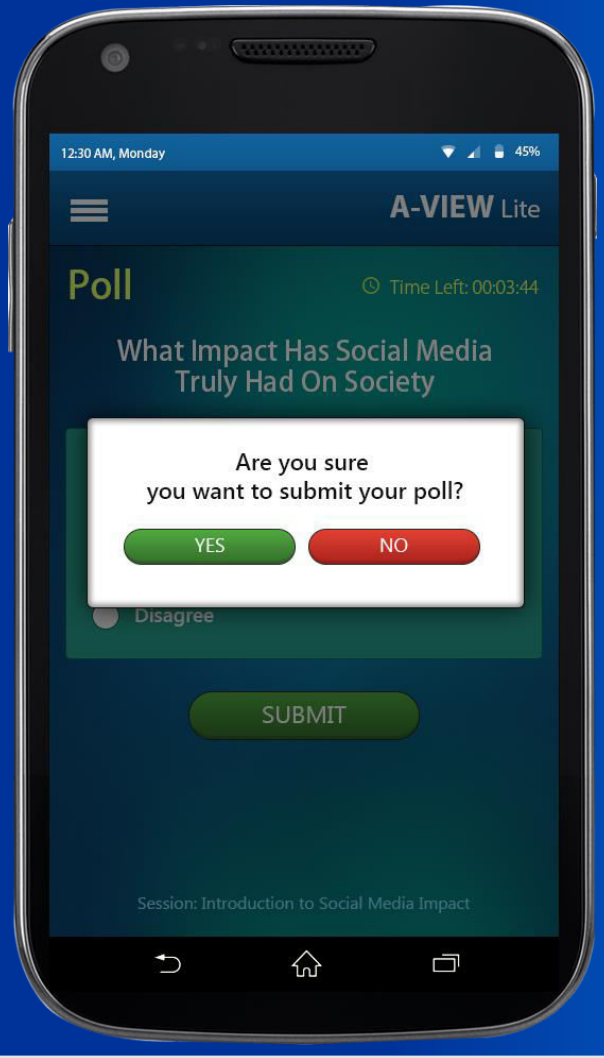
Low-End Mobile Platform



Live Mobile Quiz



Live Poll



M7: A-VIEW Using Low End Mobiles

- Low-end android mobile phones to high-end phones
- Submit questions to instructor
- Instant polling and quizzes
- Upto 1 Lakh students

Mobile Application Features

- Chat: Text Chat, Private Chat
- Assessments: Poll, Quiz
- Feedback: Automatic Handraise Recognition, Manual Handraise, Live Questionnaires
- Analytics: Feedback Form
- Bandwidth: Low Bandwidth, Multiple Channel (Wireless, Data Plans)
- Download Recordings for Offline Viewing (MP4)
- Live Video and Audio Interaction
- Content Collaboration: Desktop Sharing, Whiteboards

Deliverables

Release	Deliverables
R1	Detailed Specification and Review, Design
R2	Basic User List
R2	Enter Program Session
R2	Exit Program Session
R2	HTML5 client on Android
R2	List of Programs
R2	Program Session Details
R2	Sign-in
R2	Sign-out
R3	Chat
R3	Hand-raise
R3	Live Class Dashboard
R3	Question Interface
R4	Advanced Specs
R4	Get Help (Technical Support)
R4	Poll Module
R4	Quiz Module
R4	Works on Apple IOS
R5	Downloadable Lecture Recordings
R5	Feedback Module
R5	Local User Photo
R5	Other User Photo
R5	Self Testing
R6	Feedback
R6	Group Chat
R6	Works on Windows Phone

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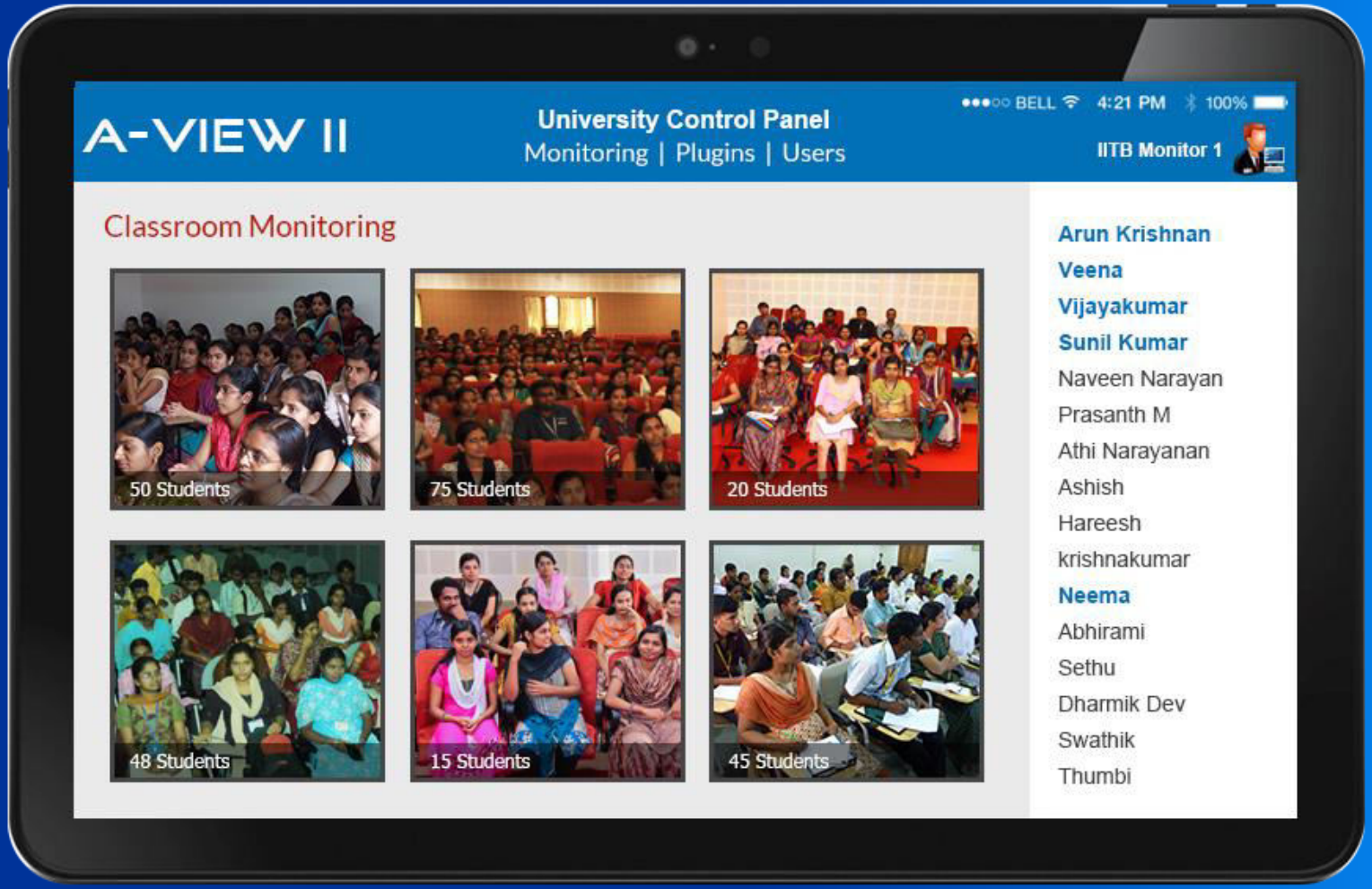
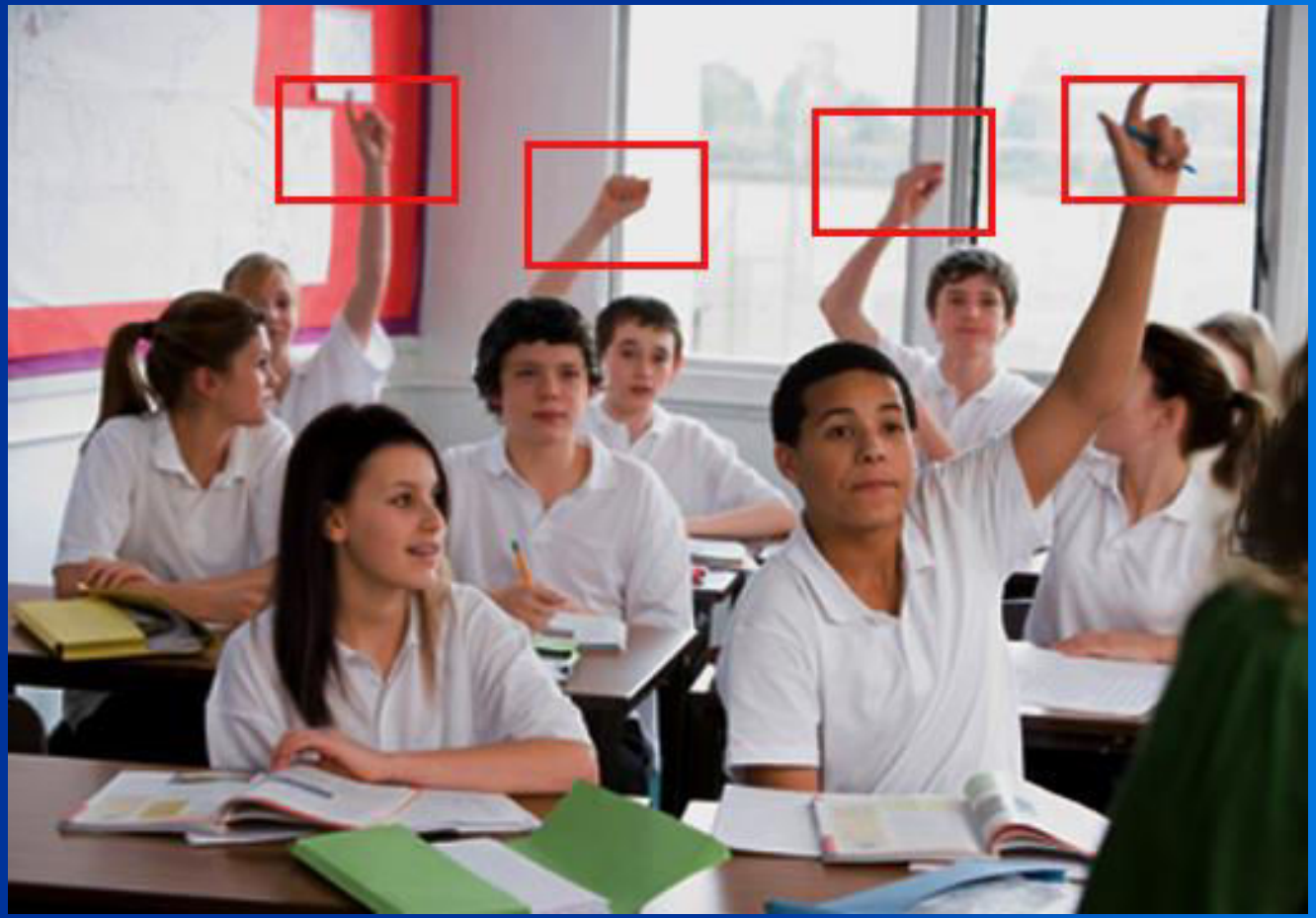
Classroom Monitoring and Attention Analysis



Handraise Count



Summary

- Monitoring / Rating Dashboard for Classes
  - Live Class Monitoring
  - Automatic Rating
    - Bandwidth Capabilities
    - Device Capabilities
    - Analytics of Issues Faced
    - Notification / Alerting to Institutions
- Handraise / Attention Analysis

M2: Classroom Monitoring and Attention Analysis

Other Areas:

- Image Recognition
- Automatic attendance estimate
- Expression analysis
- PTZ remote control …

Deliverables

Release	Deliverables
R1	Detailed Specification, Review, Design - People Monitoring
R1	Detailed Specification, Review, Design - Attention Analysis & Mood Estimation
R1	Research: Image recognition for face, hand recognition
R2	Automated bandwidth test for remote centers
R2	Ease of Admin: Dedicated monitoring role
R2	Functionality: Able to view video of one or more selected student nodes from monitoring node
R2	Monitoring dashboard - Individual node pretesting/device status reports
R2	Research: Image recognition for face, hand recognition
R2	Snapshots: Automatic snapshots at configured intervals, timestamps
R2	User List shows the capabilities and status of remote centers
R3	Ability for system administrator to not allow interaction if remote center doesn't meet criteria
R3	Analytics: Reports by Email, Dashboards
R3	Attendance estimate of student nodes using image recognition
R3	Attendance Estimate Reports: Student Node, Time, Count of People
R3	Best Practices Guide (document) for remote centers
R3	Dashboard shows the centers without requisite minimum bandwidth
R3	Ease of Use: Choose interested student nodes, save as "Custom"
R3	Functionality: Estimate of hand raise gestures
R3	Functionality: System to capture the hand raise count and propagate it to all clients
R3	Get manual feedback from student node administrators
R3	Interaction: Private chat with student nodes
R3	Remote center certification by trained a-view personnel
R3	Remote pretesting by system administrator
R4	Attendance Estimate Reports: End of class summary report
R4	Correlate manual feedback with analytics for making improvements
R4	Detailed Specification, Review, Design - Expression Analysis
R4	Ease of Admin: Automatic allotment to all available monitors
R4	Monitoring Dashboard - Periodic full system emails to all centers
R4	Monitoring dashboard - Rating of institutions
R4	Quality: High resolution video images
R4	Use mobile camera to send remote center video when student is asking for doubt.
R4	UX: Detect hand raise and translate that into a "request for interaction"
R4	UX: Detect hand raise in the context of a poll with timeout, and translate that into yes/no count
R5	Correlate analytics with manual feedback to make improvements
R5	Correlate manual feedback with analytics for making improvements
R5	Mood estimate of student nodes
R5	Moosic of all attendees / interacted attendees
R5	Reports: student node, time, mood histogram
R5	UX: Camera/Focus should zoom into hand raising person
R5	UX: Detect hand raise in the context of a teacher's question, and translate that into yes/no

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M3 : Adaptive Plug and Play Devices

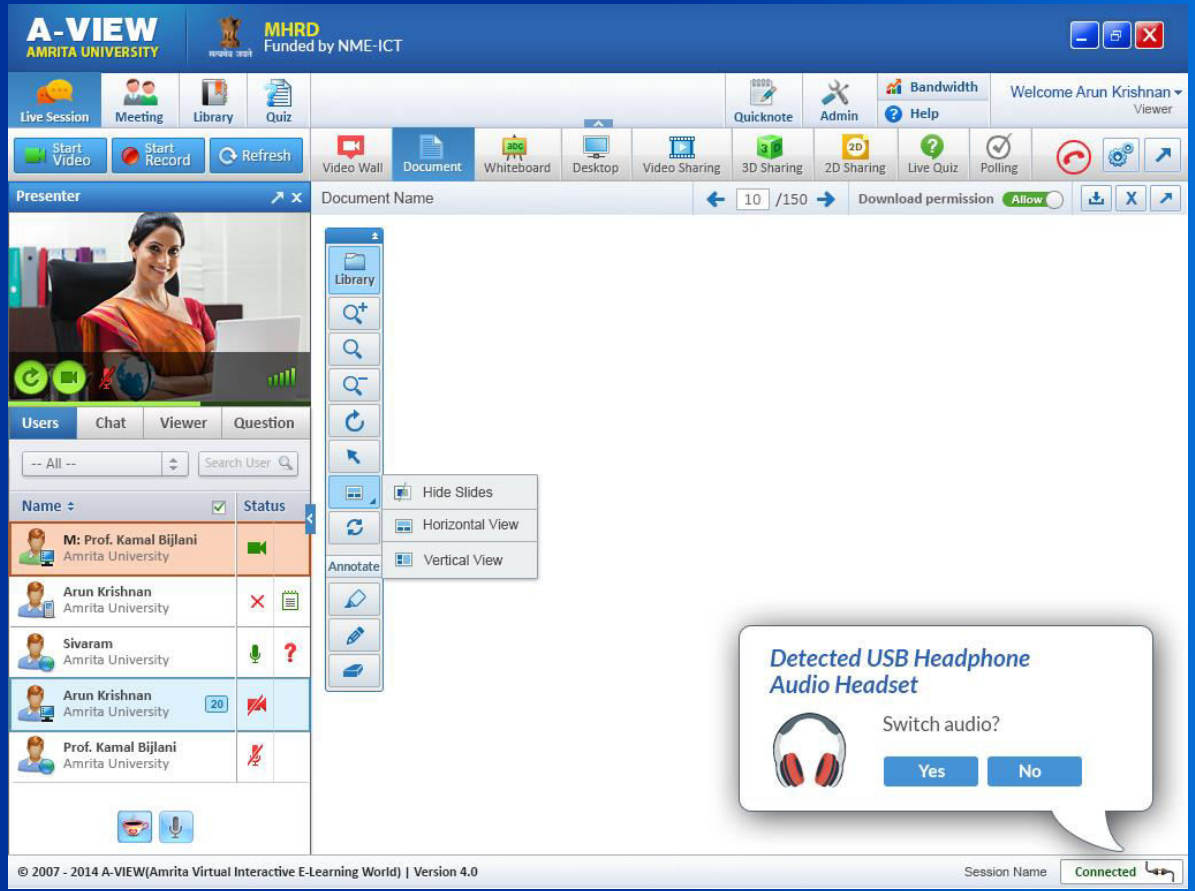
Summary: Plug and Play Devices

Automatic detection / configuration of existing audio and video devices.

Overview:

- Automatic Device Recognition
- Seamless reconfiguration
- Cloud-based Profiles and Roaming
- Device Certification
- Quality Lab

Plug And Play Devices



M3: Adaptive Plug and Play Devices

Summary: Adaptive Video Quality on any Device

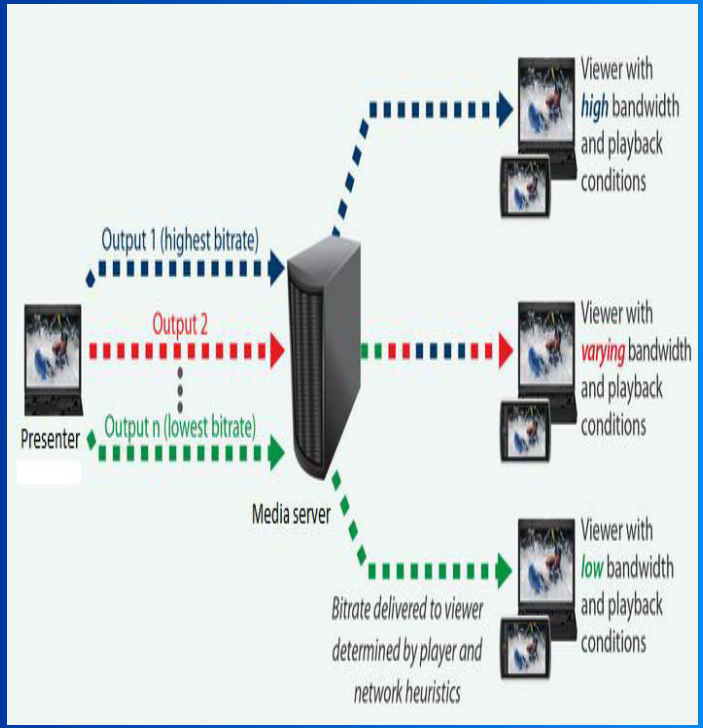
Improved audio-video quality with adaptive bit-rate streaming.

Overview:

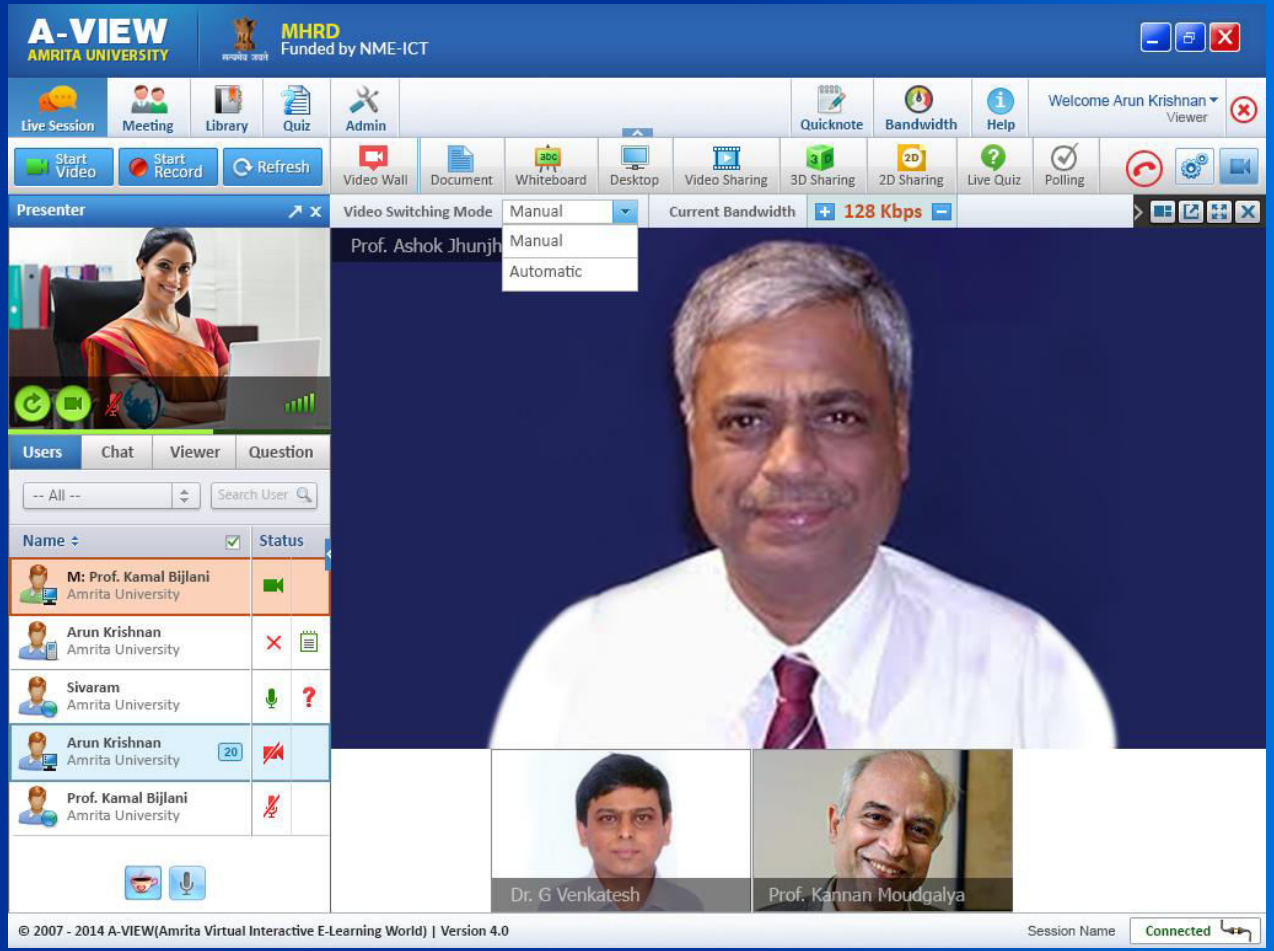
- Adaptive bandwidth
- Seamless manual bandwidth switching
- Codec investigation and integration
- Active visual feedback for users

Video Quality - Adaptive Bitrate Streaming

- Bandwidth Monitoring and Estimation
  - Automatically estimate available bandwidth
- Automatic switching between High, Medium and Low automatically
  - Multiple bit rates transmitted from Server
  - Viewer picks up high or medium or low based on available bandwidth
- Visual Feedback to User
- Manual Override (next slide)



Video Quality - Manual Video Switching



Video Quality – Codec Investigations

- Video: HEVC/H.265 investigation under progress.
  - 50% bandwidth savings
  - Improved video quality
  - Higher CPU utilization
- Audio: AAC integration under progress
  - Improved audio quality
- Codec Tuning investigations under progress
  - Key Frame, FPS, Codec Presets

Deliverables

Release	Deliverables
R1	Ability to know whether mic is working all the time
R1	Detailed Specification and Review, Design for Pretesting module
R1	Detailed Specification, Review, Design for Adaptive Bandwidth Module
R1	Detailed specification, review, design for Plug and Play Devices Module
R2	Automatic Audio Device Change Handling
R2	UI Health Status indication – mixer, a/v studio device, signal, noise levels
R2	User Interface to show current selected bandwidth
R2	User Interface to upgrade or downgrade video bandwidth
R2	Video bitrate changes should be seamless
R3	Ability to Send the video to Presenter but not to Other users unless explicit permission is given by publisher
R3	Analytics to capture how the feature is behaving, and what the users do
R3	API's for integration
R3	Automatic Video Device Change Handling
R3	Automatically ask to stop video in case of poor quality
R3	Bandwidth and latency monitoring and upload to Analytics for reporting about sites that need to upgrade their infrastructure
R3	Start video automatically when users enter into classes
R3	Switch of bandwidth when user initiates upgrade/downgrade action
R3	UI to support automatic/manual switching modes
R3	User can save selected profile to cloud
R3	Visual indication of automatically estimated available bandwidth
R4	Analytics on automatic estimation
R4	Analyze user feedback on manual bandwidth, and tune the feature
R4	Auto-select Camera based on user profile
R4	Certification program – initial certified audio device list
R4	Cloud driven configuration module – service changes
R4	Detailed Specification, Review, Design
R4	First time sign-in wizard for a/v device selection
R4	First time sign-in wizard for tuning and pretesting
R4	Get User feedback on the feature
R4	Implement in-stream bandwidth estimation
R4	Initial version of automatic bandwidth switching based on network stats
R4	Selected profile from cloud is fetched and used in any machine with compatible configuration
R4	Works with HTTP Proxies (closed networks)
R5	Advanced Features, Detailed Specification and Review, Design
R5	Certification program – initial certified video device list
R5	Cloud driven configuration module – client changes
R5	Dashboard to view Pretesting History
R5	Get User Feedback on how automatic estimation helped
R5	Research HEVC prototype with FMS

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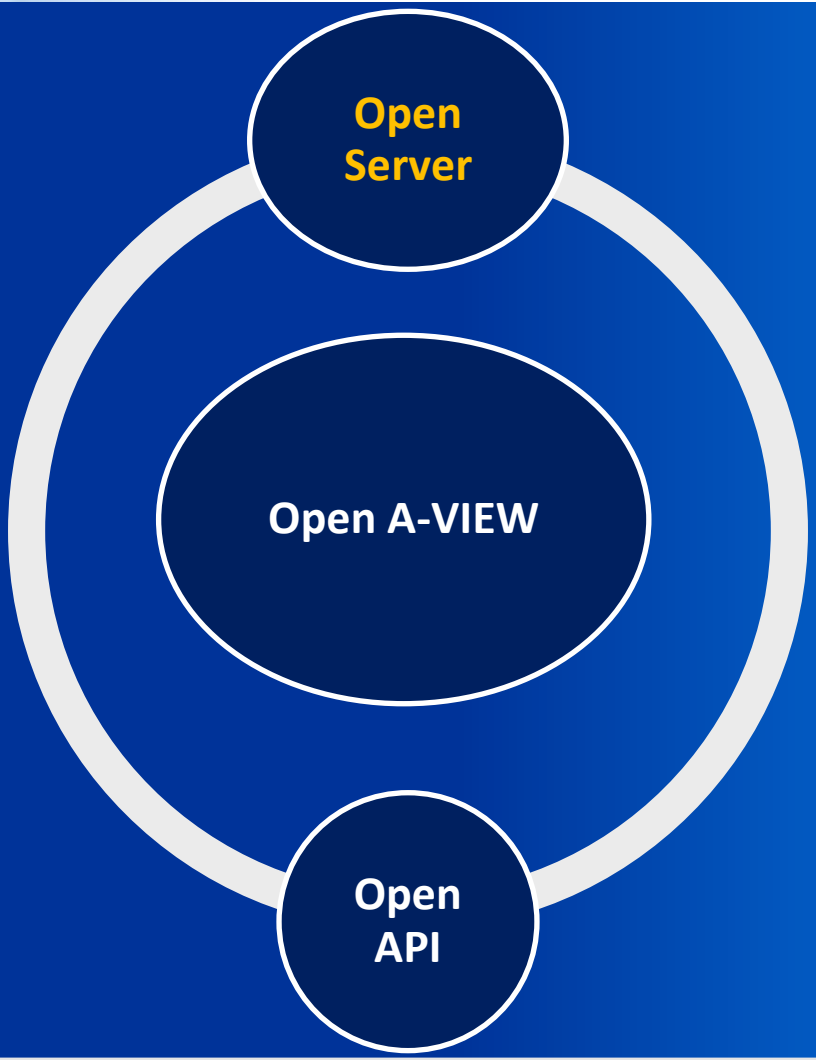
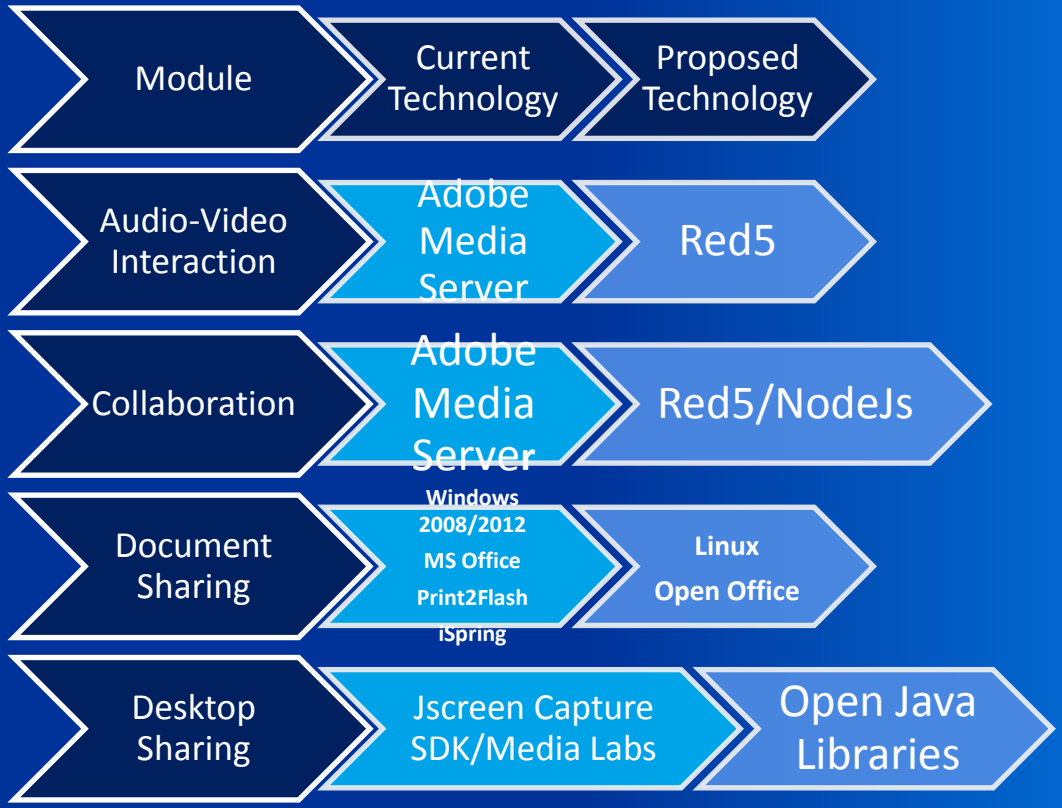


Substitution of licensed software



Feature: Open Server

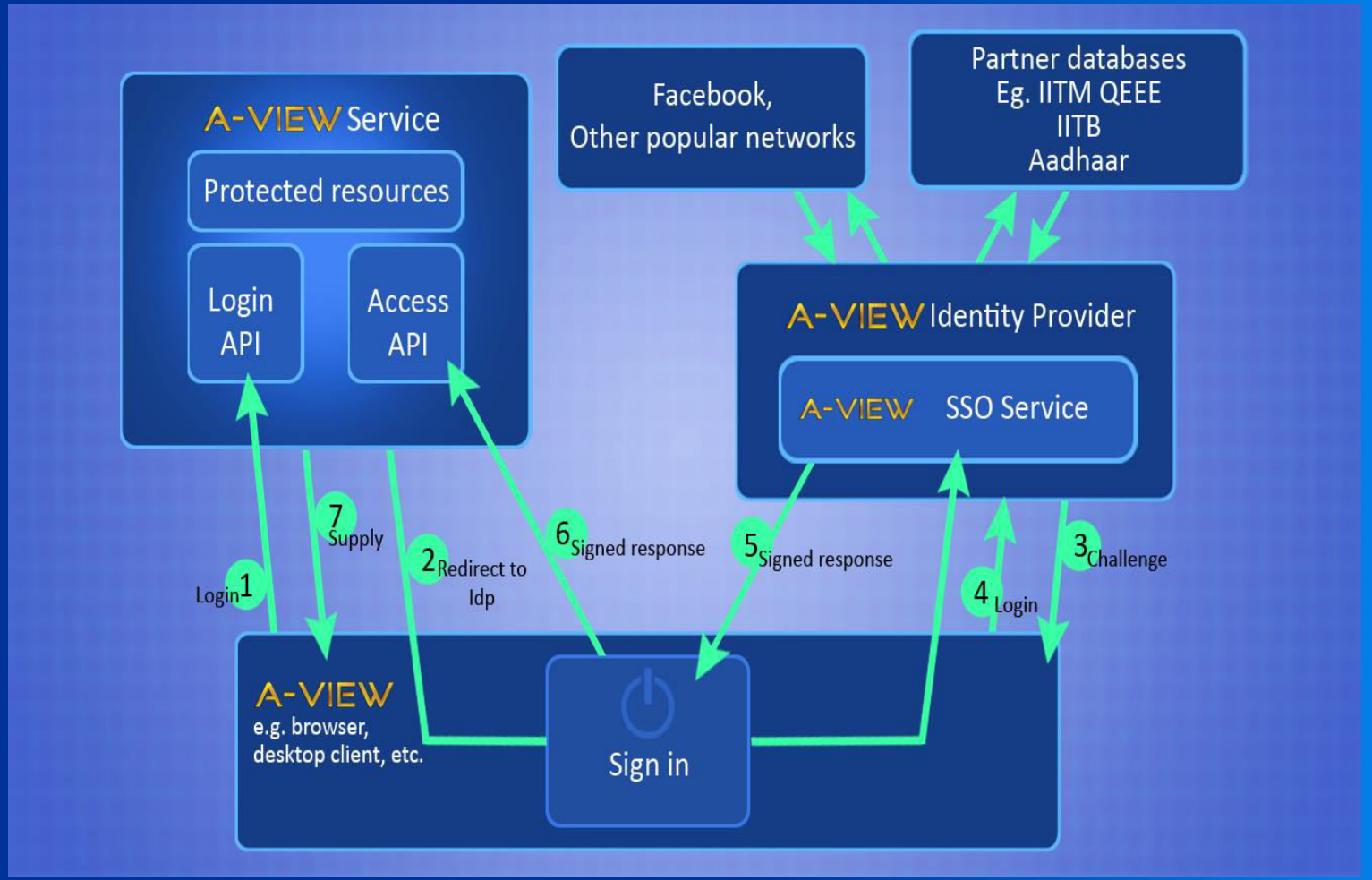
Summary

- Substitute third-party licensed products with free or open source equivalent

Overview

- Zero cost A-VIEW Server
- Organizations can have their own full A-VIEW Deployment
- Identify capacity of free version vs. licensed version

Single Sign-On API



Feature: Open API

Summary

- Integrate A-VIEW into external systems using A-VIEW Open APIs

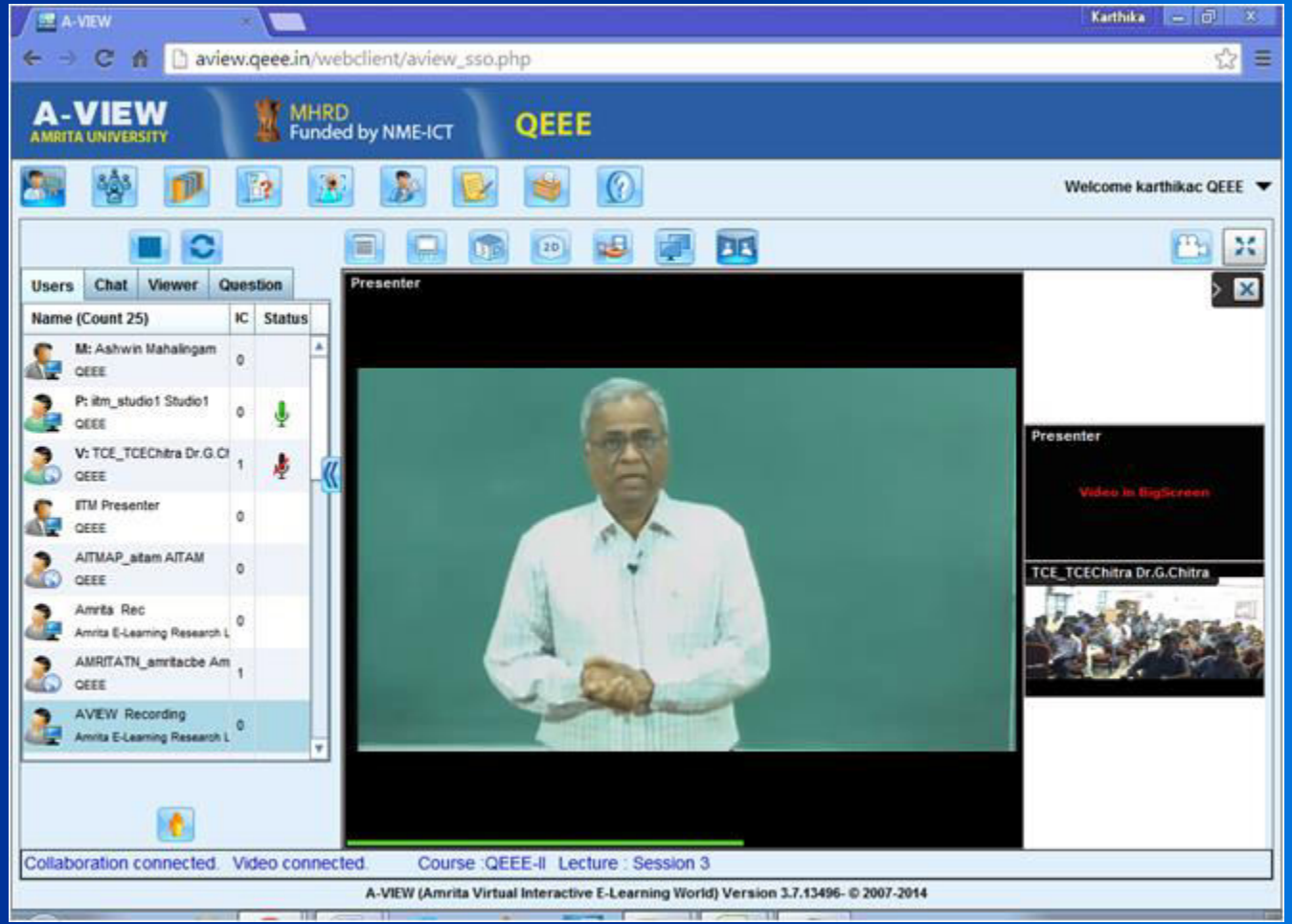
Overview

- Single sign-on work
- A-VIEW for live interaction
- A-VIEW for generating recordings

Single Sign-On Features

- Flexible Integration without needing to replicate password databases
  - Popular Social Networks (e.g., Facebook)
  - National Databases (e.g., Aadhar)
  - Insitutional Databases (e.g., IITM QEEE, IITB)
- Open Standards
  - OAuth/OAuth2
- Plugin Architecture
  - Any one can write SSO Plugin for their own User Database
- Examples published as part of Source Code

IITM QEEE Integration Example



Deliverables

Release	Deliverables
R1	Admin Activities: "Setup -> Course" and "Setup -> Class" should start with the users institute by default
R1	Admin Activities: Add an activation date for the class, so than onwards only it may appear in searches.
R2	Bulk Admin Activities: Add an activation date for the class, so than onwards only it may appear in searches.
R2	Bulk Admin Activities: Allow moderator to bulk create/edit/delete lecture
R3	2D Module
R3	Admin Activities: User should be able to register a course from start date of a month to another month or to a several months
R3	Admin Activities: Web site integration to show all courses, plugins etc.
R3	Bulk Admin Activities: Bulk class registration
R3	Bulk Admin Activities: Bulk search lectures with date
R3	Common Content Server (for those not wanting their content server)
R3	Red5 Desktop Sharing
R4	3D Module
R4	Admin Activities: Presenter (Moderator) should be able to schedule and re-schedule a class which is already created by the Administrator.
R4	Admin Activities: SMS Integration
R4	Bulk Admin Activities: Bulk user registration / deregistration
R4	Bulk Admin Activities: SMS notification of admin activities to concerned parties
R4	Common FMS for Desktop Sharing
R4	Remove paid component dependency and make it fully free
R5	Bulk Admin Activities: Automated Server Side Installer
R5	Institute based branding: Color themes, Fonts & Styles, Custom content at pre-defined locations, Suffix/prefix Title, Look and feel preferences
R5	Web Site for Document Upload/Download (LAN case)
R6	Common iSpring Service to save cost for private user deployments

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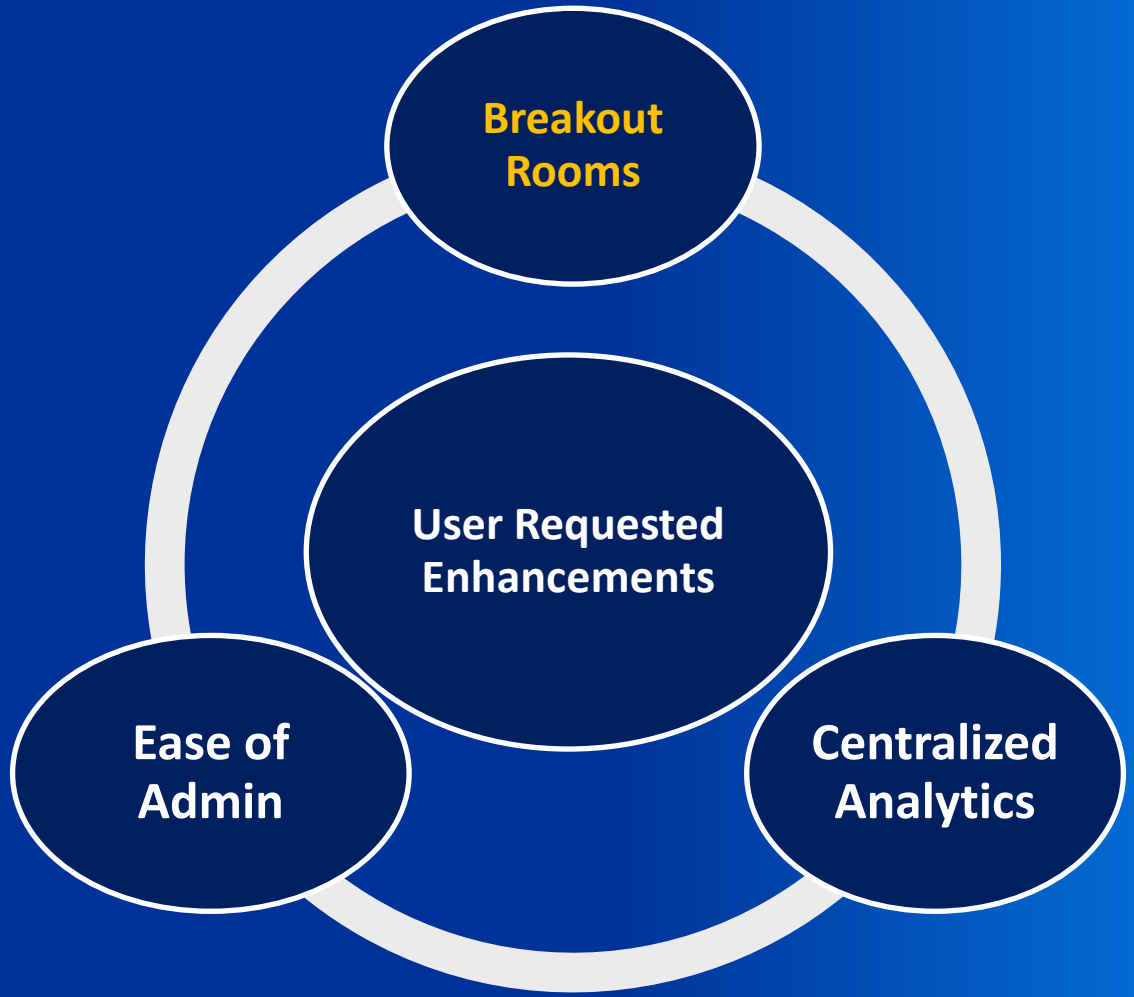


Feature: Breakout Rooms

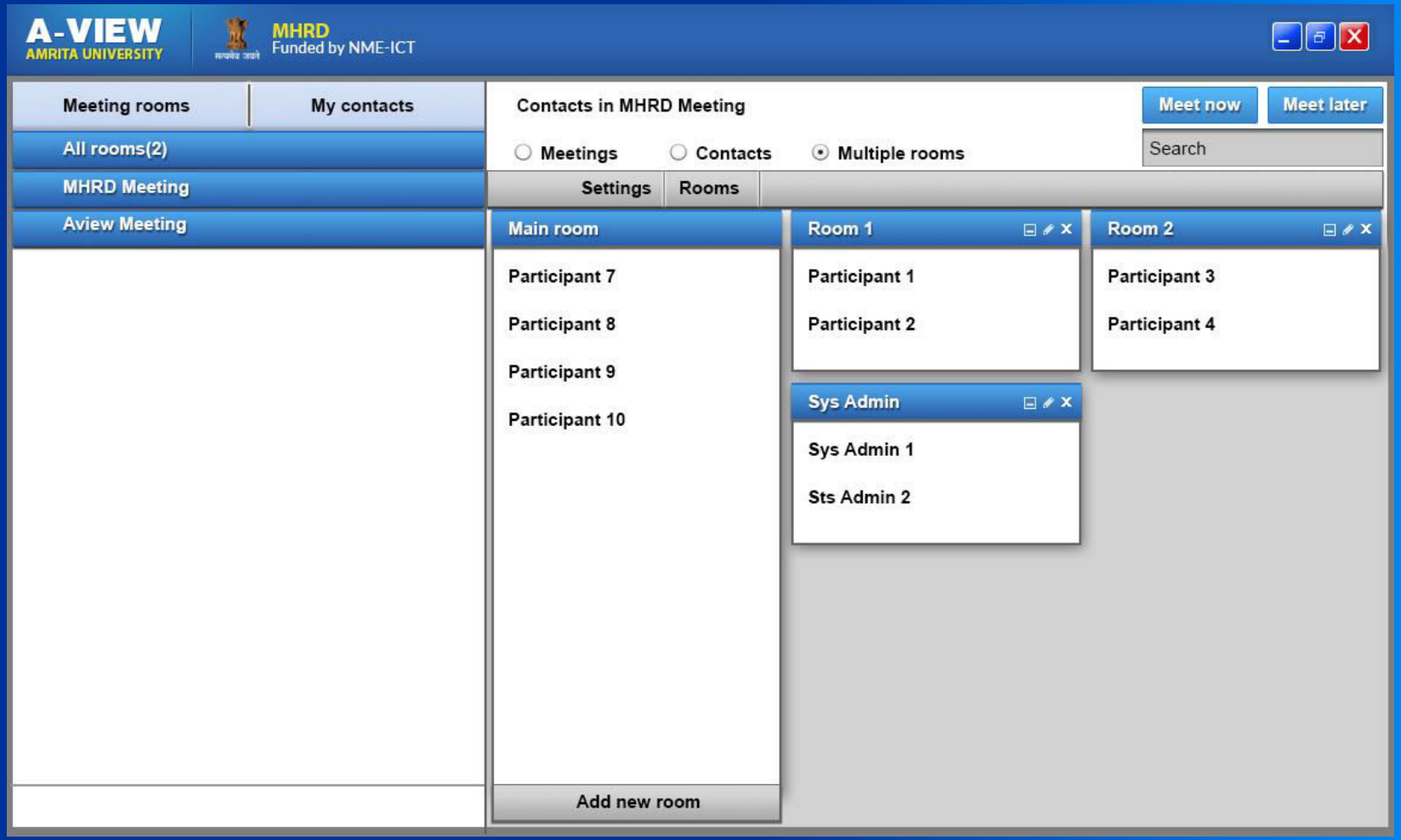
Summary:

Breakout room for group class work

Overview:

- Breakout room for group class work
- Coaching breakouts
- Sys admin breakout for troubleshooting
- Teacher breakouts (panel of teachers)
- Automatic/manual assignment
- Breakout management - timers, send a message, teacher join

Breakout Rooms



Breakout Rooms : Applications

- Classroom: Divide a live class into multiple sub-groups to work on problems
- Coaching: Assign a coach to one or more selected students
- Private Interaction: Panel of teachers can have their own room
- Troubleshooting: Users with technical issue join Breakout with Sys Admins to get help

Feature: Centralized Analytics

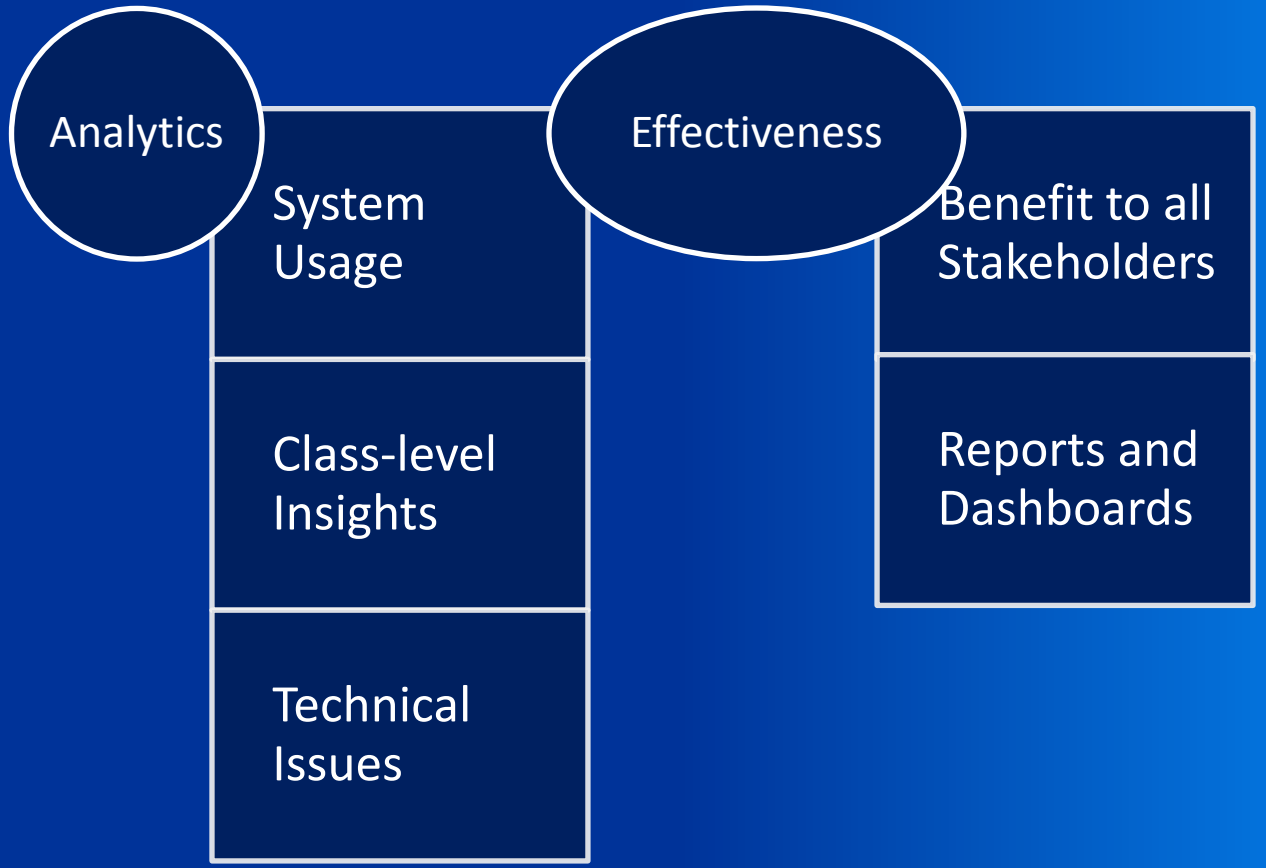
Summary:

Capture, measure, analyze data to find out the effectiveness of the platform. Acts as a feedback mechanism to the system to reinforce strong practices and strengthen weak links of the platform.

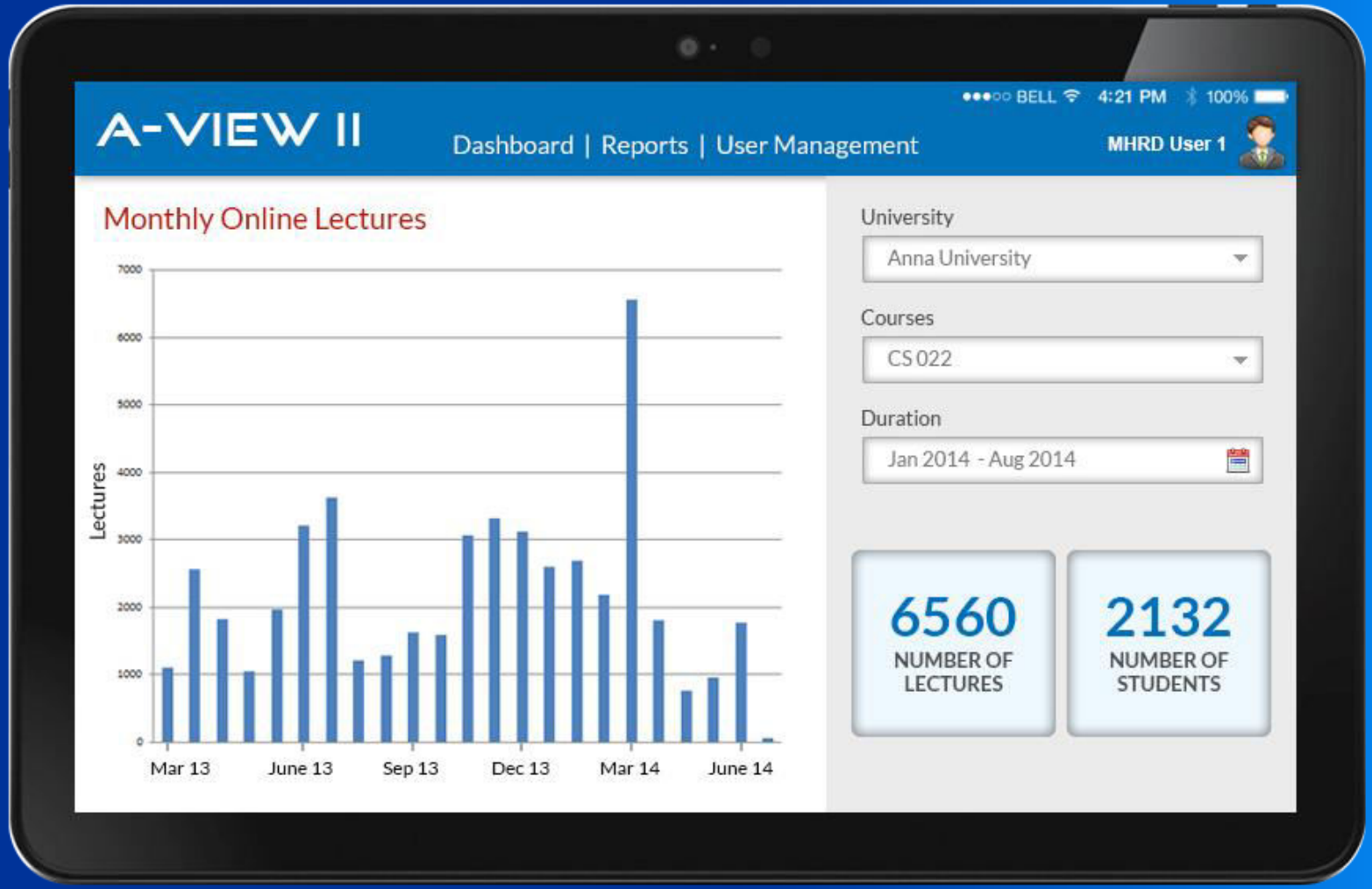
Overview:

- Collect and collate usage data
- Throw light on usage pattern across different parameters
- Helps in understanding usage
- Perform course correction for areas which are not well received

Analytics / Effectiveness



System Usage

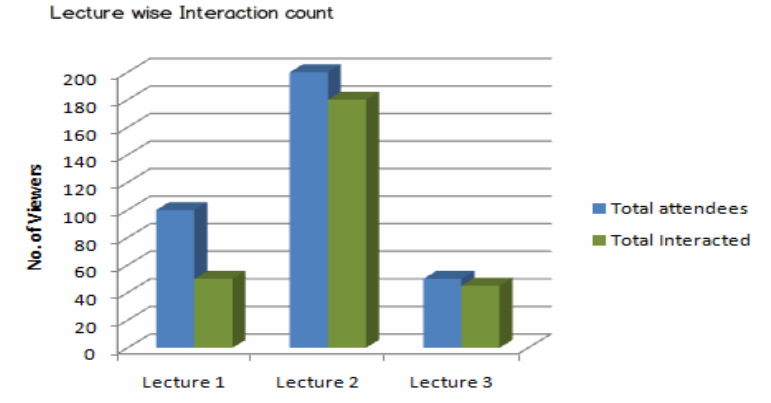


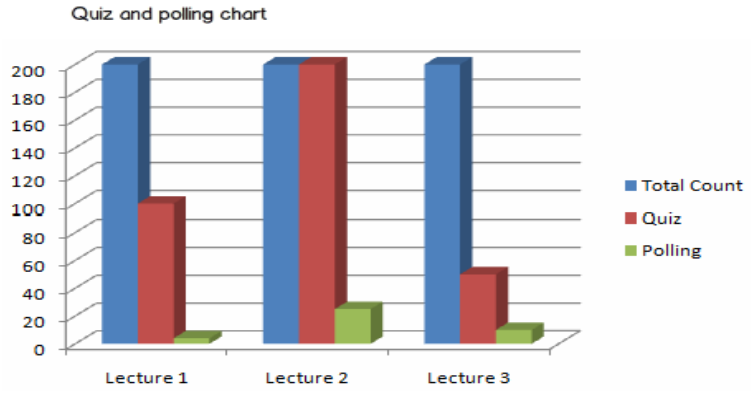
System Usage - Features

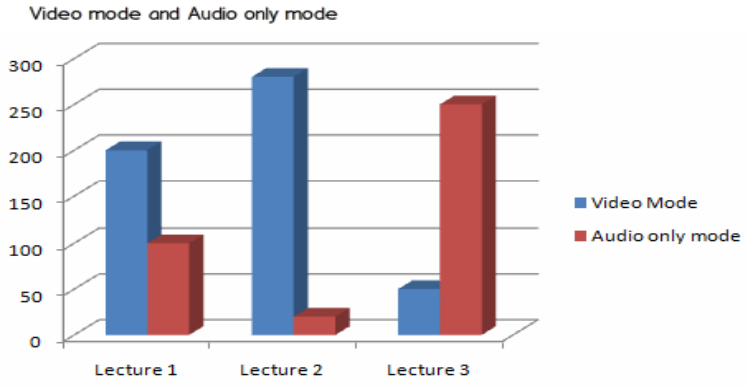
- How is the system being used ?
- What are the most active modules ?
- Which areas have issues with Live Interaction (e.g., bandwidth issues) ?
- Who are the active colleges ?
- What is the distribution across various States ?
- Customized for
  - Government Agencies
  - Institute Administrators
  - Teachers and Teaching Assistants
  - Developers
- Zoom-in by Region, State, University, and College
- Scheduled Reports by Email – Daily, Weekly, Monthly

Class Level Insights

Module Usage | Class Level | Lecture Level | Technical issues



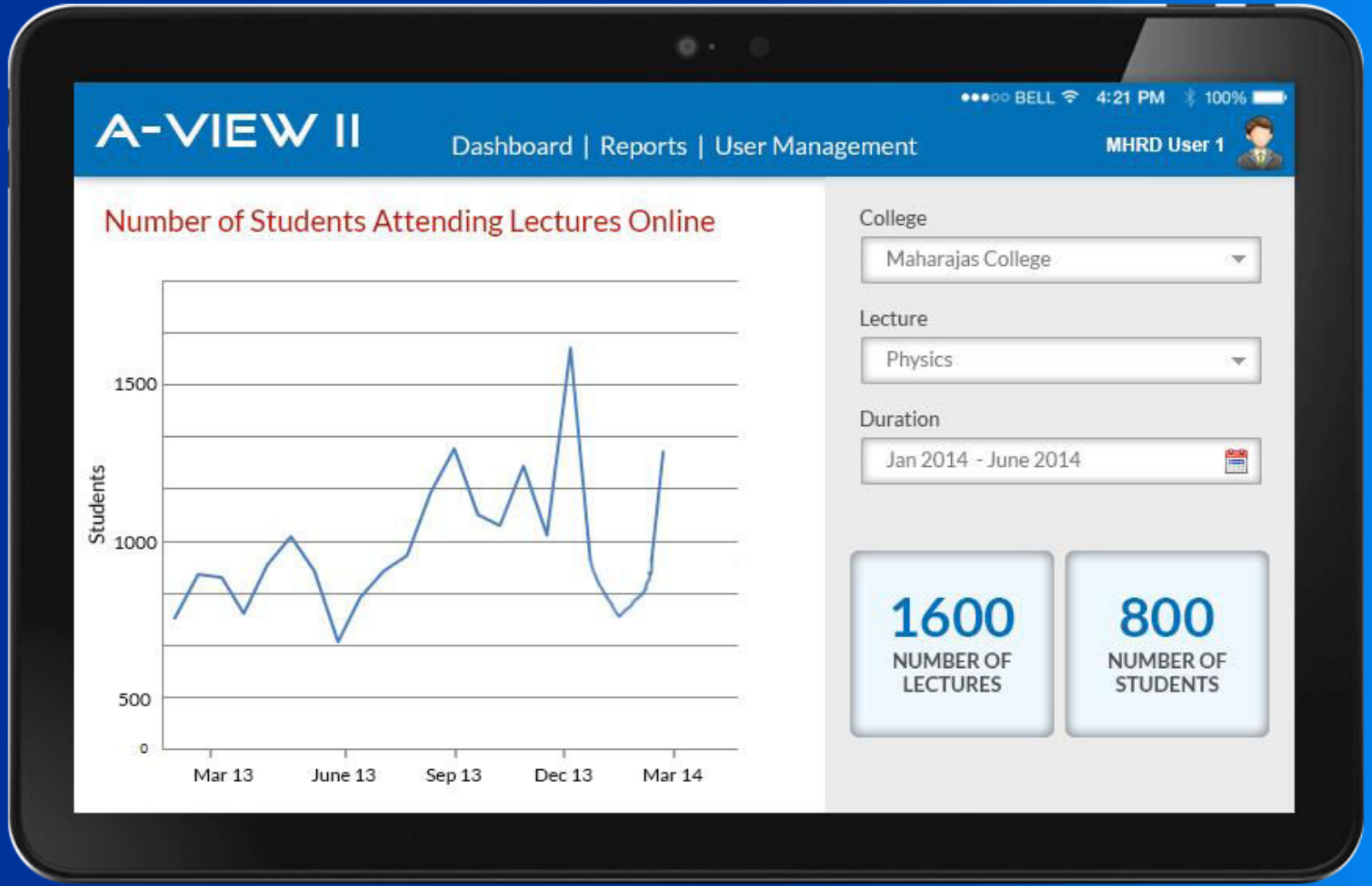




Class/Lecture Level Insights - Features

- Attendance Percentage
- Live Interaction Ratio
- Percentage of users who are using audio vs. audio-video
- Percentage of users who are participating in Quizzes/Polls etc
- Customized for
  - Government Agencies
  - Institute Administrators
  - Teachers and Teaching Assistants
  - Developers
- Zoom-in by Region, State, University, and College
- Scheduled Reports by Email – Daily, Weekly, Monthly

Benefits to Students



Benefits of Effectiveness Analysis

- Teaching Community
  - Understand quality / effectiveness of course content
  - Understand how students are participating in class
  - Understand learning patterns
  - Pinpoint areas needing more Focus (e.g., too easy exams, quiz with poor results)
- Government Agencies
  - Understand benefit to students
  - Understand teaching quality
  - Pinpoint E-Learning Adoption Issues across the Country

Deliverables

Release	Deliverables
R1	Chat: Chat only with Moderator
R1	Chat: Smiley's in chat
R1	System Analytics: Analytics for doc sharing, desktop sharing usage
R1	Whiteboard: Changeable whiteboard background
R1	Whiteboard: Delete a particular shape in whiteboard
R1	Whiteboard: Fill shapes/objects with colour, sophisticated paint & brush tools
R1	Not clear how to get to question paper of student to see exactly which answers the student did.
R1	Question: Implement search feature in Question tab
R1	Quiz Graphical representation of student performance by location
R2	Breakout room – Prototype: User List, Live Audio-Video Group Chat
R2	Breakout Room: Presenter Controls – Configure Automatic Breakout
R2	Breakout Room: Presenter Controls – Create Automatic Breakouts
R2	Doc Sharing: Multiple documents/images/videos/3d/2d can be loaded at the same time
R2	System Analytics: Module Usage
R2	System Analytics: System Usage
R2	Whiteboard: Drag and Drop function
R2	Whiteboard: Export & Import to PDF, PPT and .doc format
R2	Whiteboard: Support for graph tools in whiteboard
R2	Whiteboard: Whiteboard there should be an option to clear all pages in one shot
R2	Whiteboard: Whiteboard undo/redo
R2	Polling: Time frame should be defined for polling facility: If within a time frame, a client does not submit any answer then popup must be closed automatically from the client side
R2	Quiz interface can be improved and simplified.
R2	Quiz: Scheduled Quiz
R3	Application Sharing: Share desktop of any viewer to all students
R3	Application Sharing: View any user's desktop / Selected student desktop
R3	Breakout room - Live Audio-Video 1:1 Chat
R3	Breakout room - Live Content Collaboration
R3	Breakout room - Live Desktop Sharing
R3	Document Sharing: Expanded support for more file formats
R3	Document Sharing: Multi-tab document sharing to show multiple documents
R3	Institute based branding: Color themes, Fonts & Styles, Custom content at pre-defined locations, Suffix/prefix Title, Look and feel preferences
R3	Quick Note: Export to .txt format
R3	System Analytics: Program Insights
R3	System Analytics: Program Session Insights
R3	Video Sharing: There should be an option to unload the video under Video Sharing
R3	Whiteboard: Ability to load any media on top of whiteboard
R3	Whiteboard: Annotate on any media anywhere
R3	Whiteboard: The mouse pointer icon in whiteboard should be changed based on the tool selected
R3	Whiteboard: There should be provision to all to write on whiteboard without permission of teacher. It should be provided only for that remote center that is selected by teachers.

Phase II – Modules

M1: Huge Virtual Synchronous Classrooms

M2: Classroom Monitoring & Attention Analysis

M3: Adaptive Plug and Play Devices

M4: Open Source Server Components

M5: Major Requests From Stakeholders

M6: Synchronous Tutoring Groups

M7: A-VIEW Using Low End Mobiles

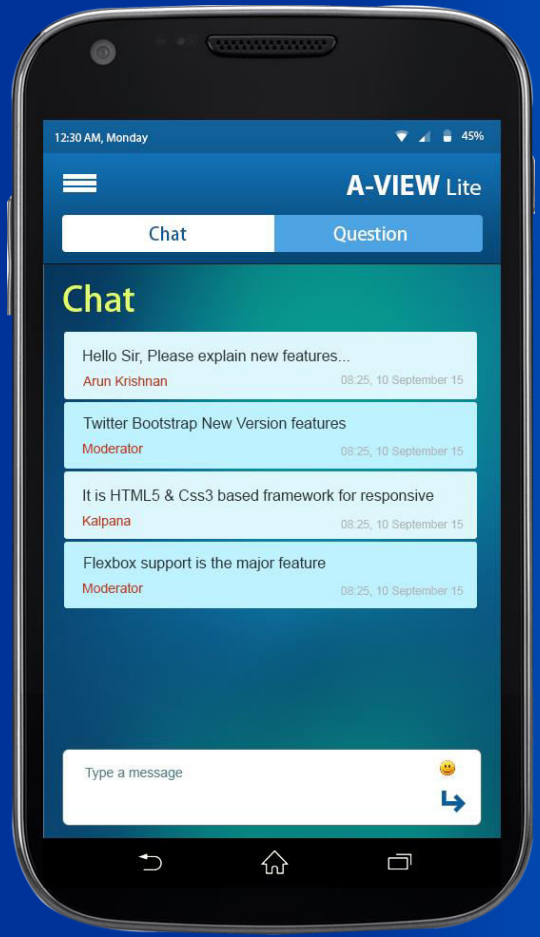
M8: Local Synchronous Producer And Player

M9: Automation Testing & System Integration

M10: Implementation For One Crore Users

Synchronous Tutoring Groups

Mobile Synchronous Tutoring Groups



Synchronous Tutoring Groups

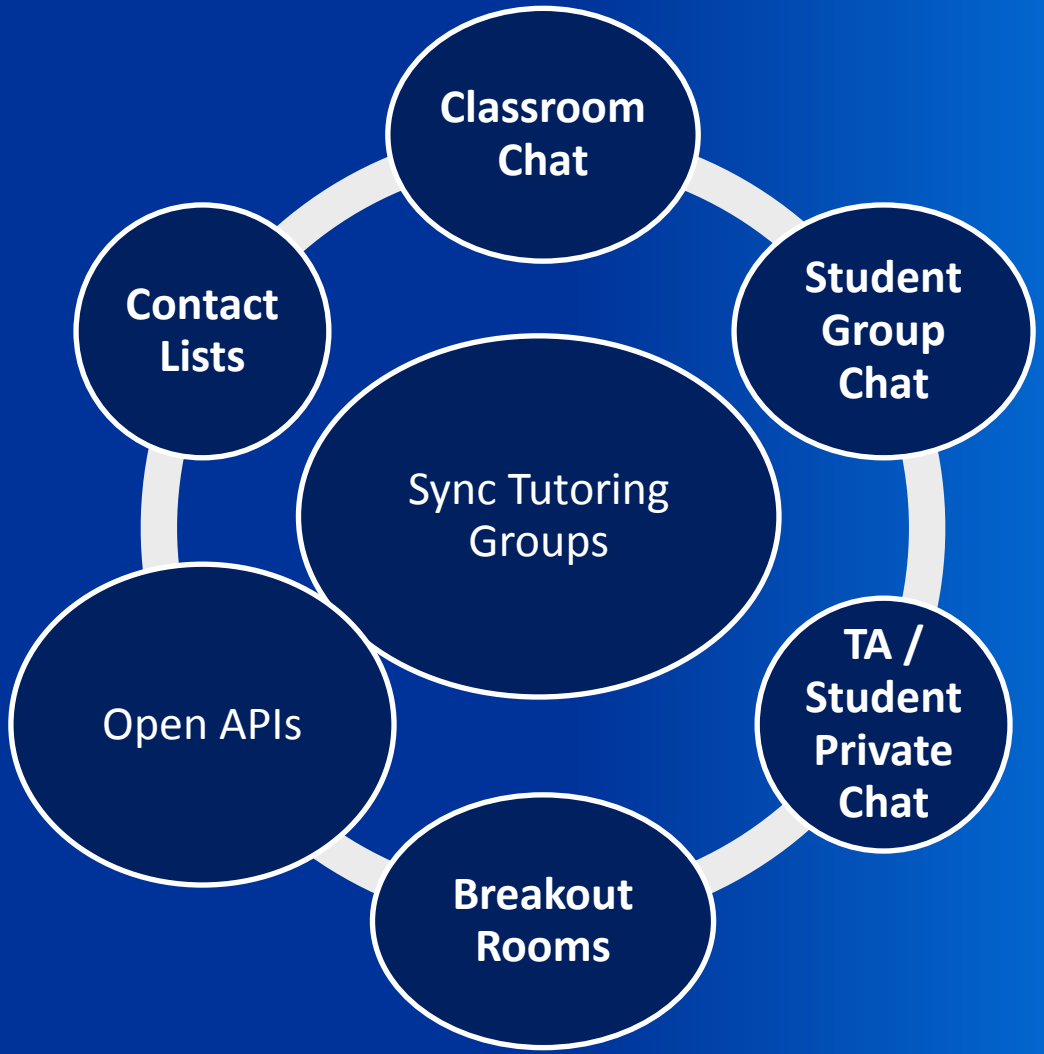
Summary

- Per-Class Tutoring Group with Synchronous Capability
- Similar to a Whatsapp Group; automatically created

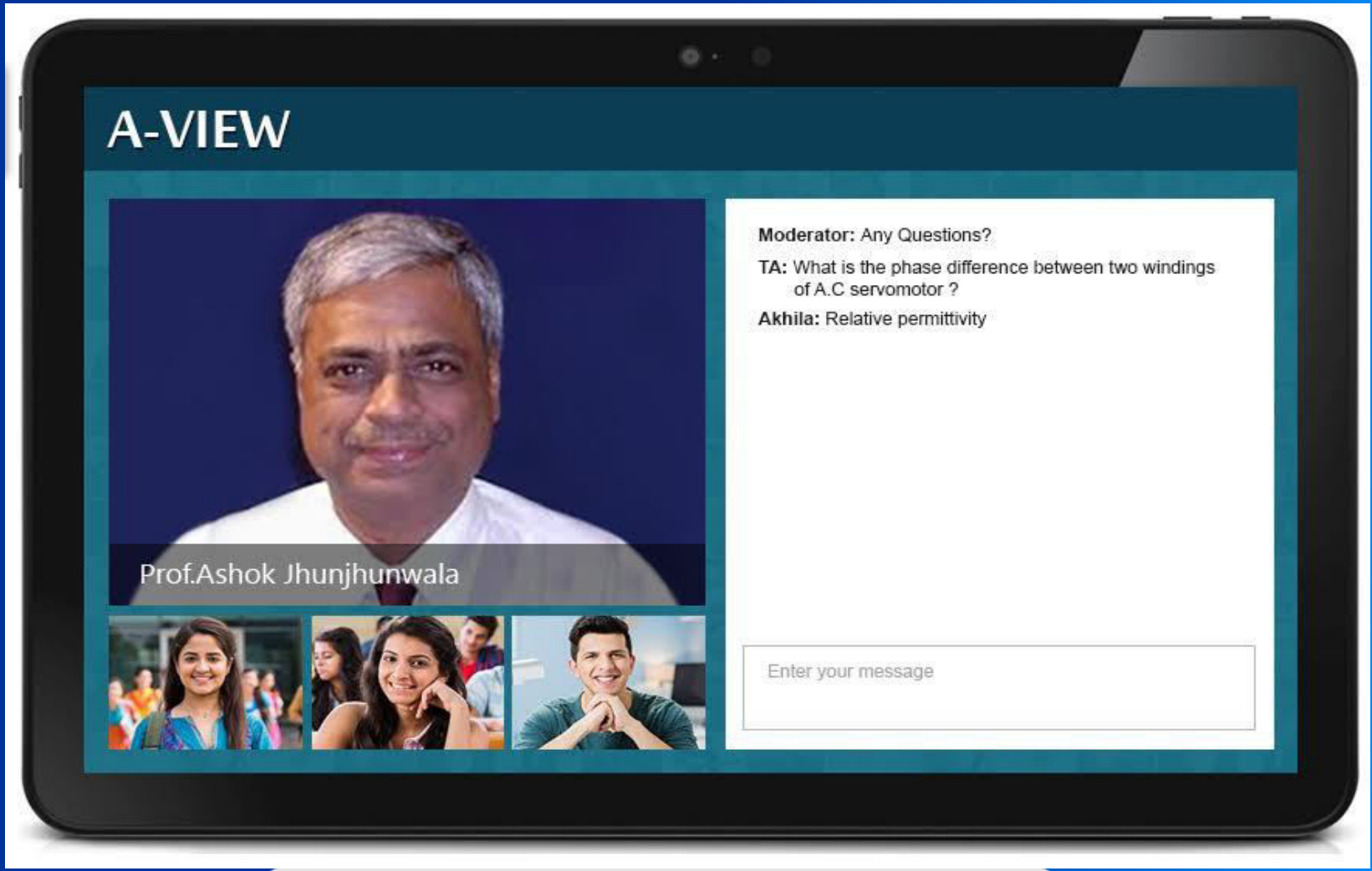
Overview

- Synchronous Class Group Chat with Tutor
- Student <-> Tutor 1:1
- Automatic Contacts, Group Management
- Share Files
- Meeting Minutes

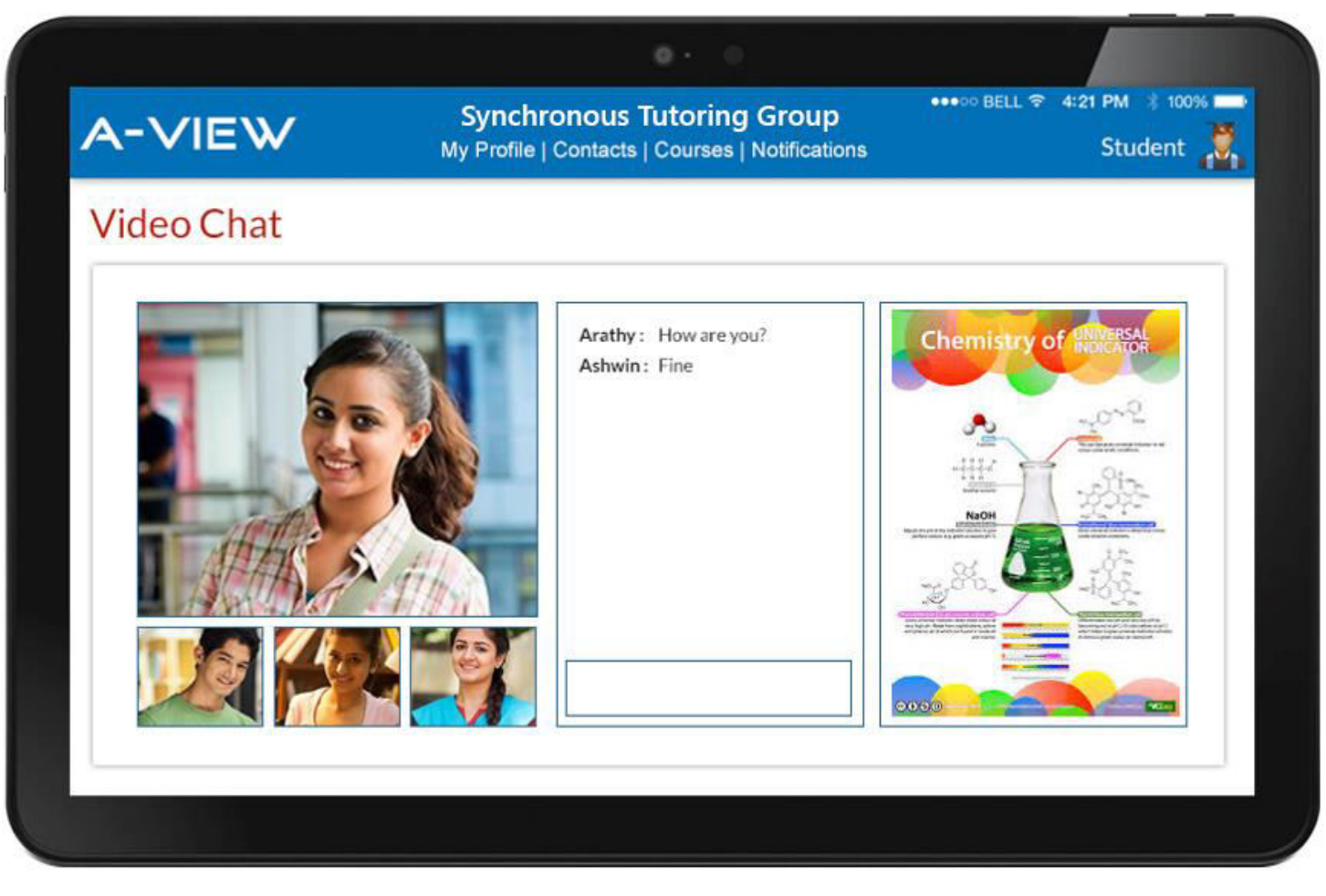
M6: Synchronous Tutoring Groups



Teacher-Student Classroom Chat



Student Group Chat



Deliverables

Release	Deliverables
R1	Detailed Specification, Review and Design
R2	Analytics Integration
R2	Automatic Creation of Tutoring Groups from Class Registration
R2	Private Tutoring Groups - Synchronous
R3	Add option for students/moderator/presenter to download transcript
R3	Automatic spell check
R3	Emoticons in Tutoring Groups
R3	File Sharing Functionality
R3	Longer text messages, adjustable fonts
R3	Mobile App support
R3	Mute a particular person the group
R4	Breakout Room Integration
R4	Disable Tutoring Groups for every one
R4	Open API for integration with external systems
R4	Public Tutoring Groups (post class)
R4	Students can connect only with TA
R5	Tutoring Group Activity Transcript
R6	Complete Interaction Scenarios
R6	Multi-Lingual Support

Phase II – Modules

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M5: Major Requests From Stakeholders

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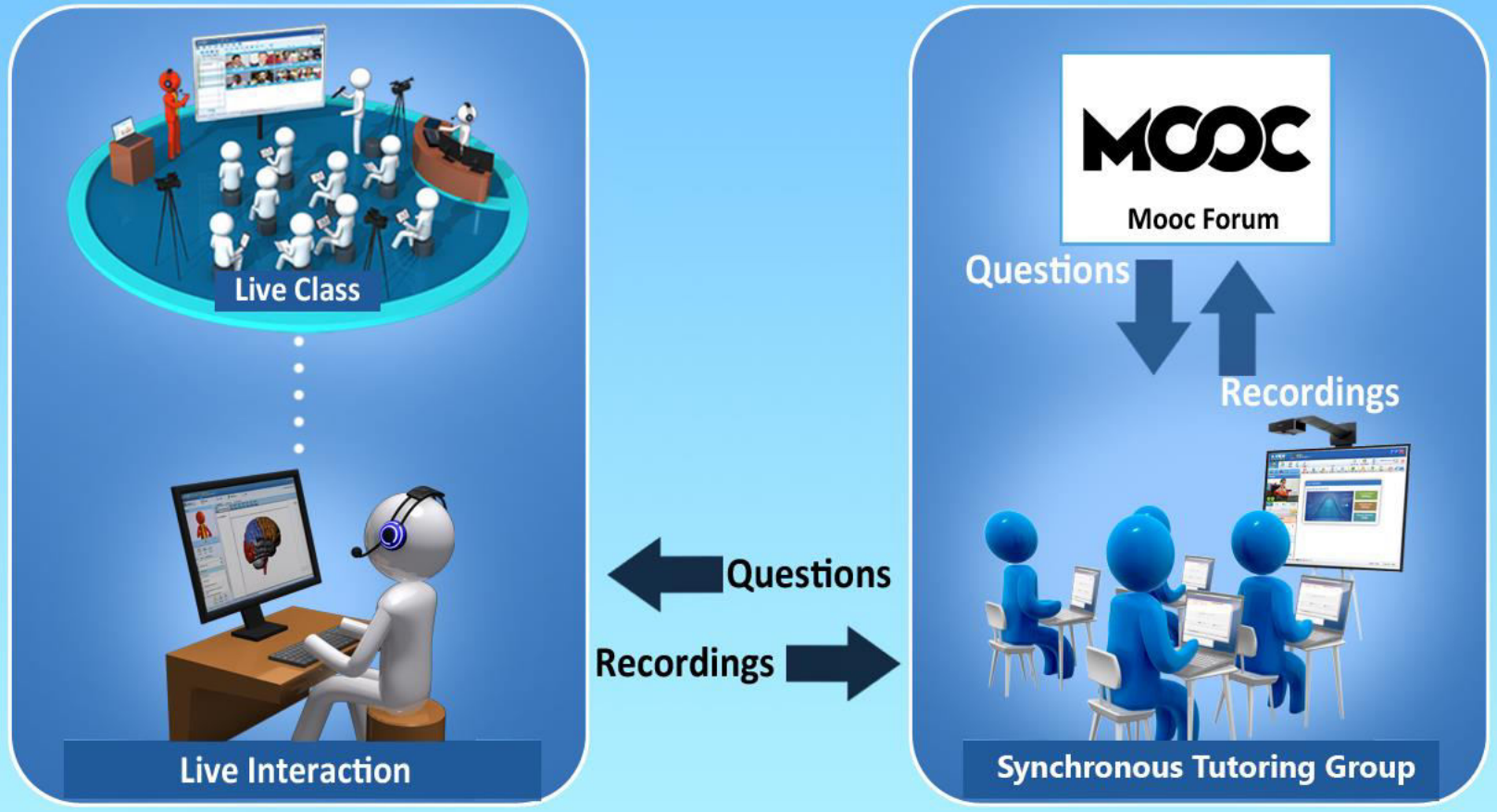
M9: Automation Testing & System Integration

M10: Implementation For One Crore Users

M8: Local Synchronous Producer & Player

Blended Doubt Clearance



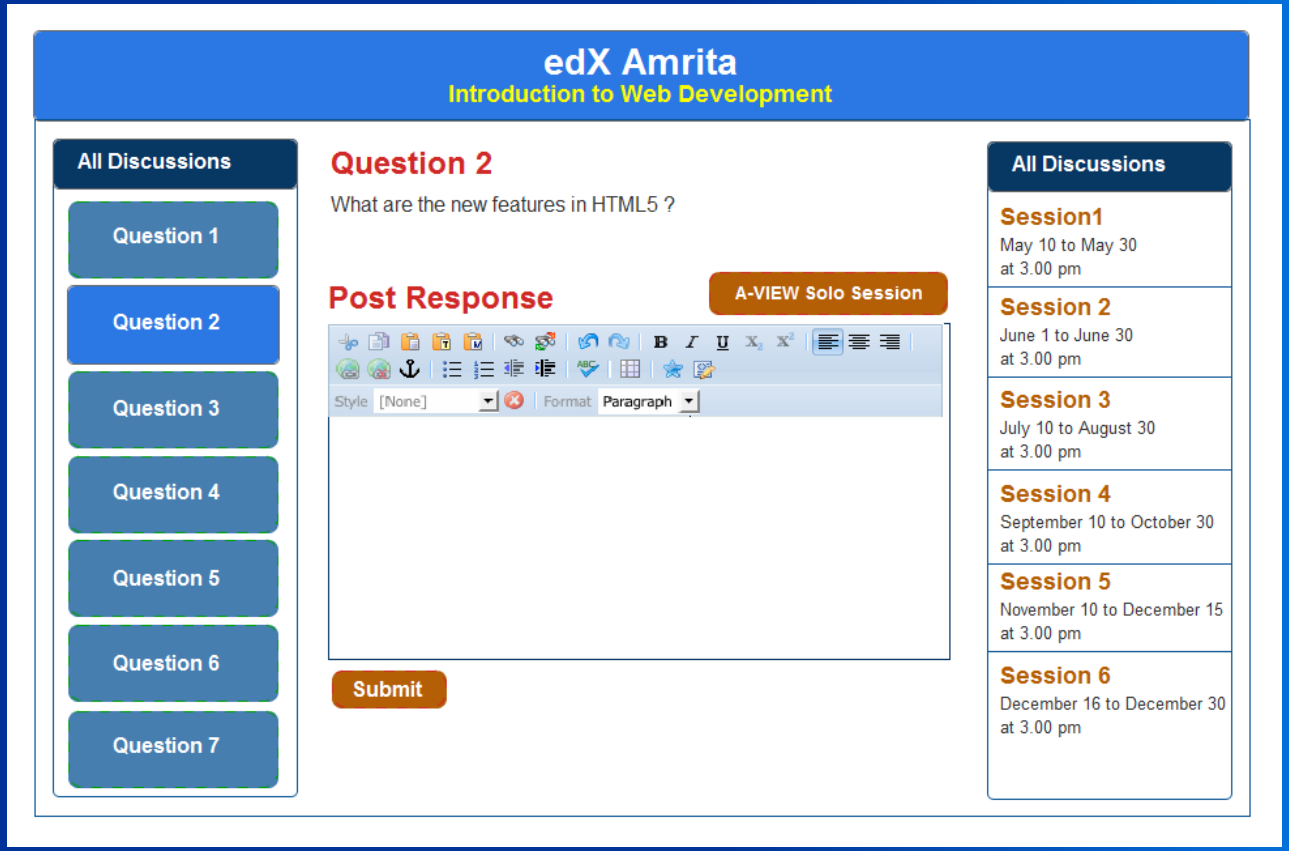
Features

- Local Lectures can be self recorded by Teachers
- Offline Mode – No Network Connectivity Required
- Full Power of A-VIEW can be Leveraged
- Self-contained, no external software needed

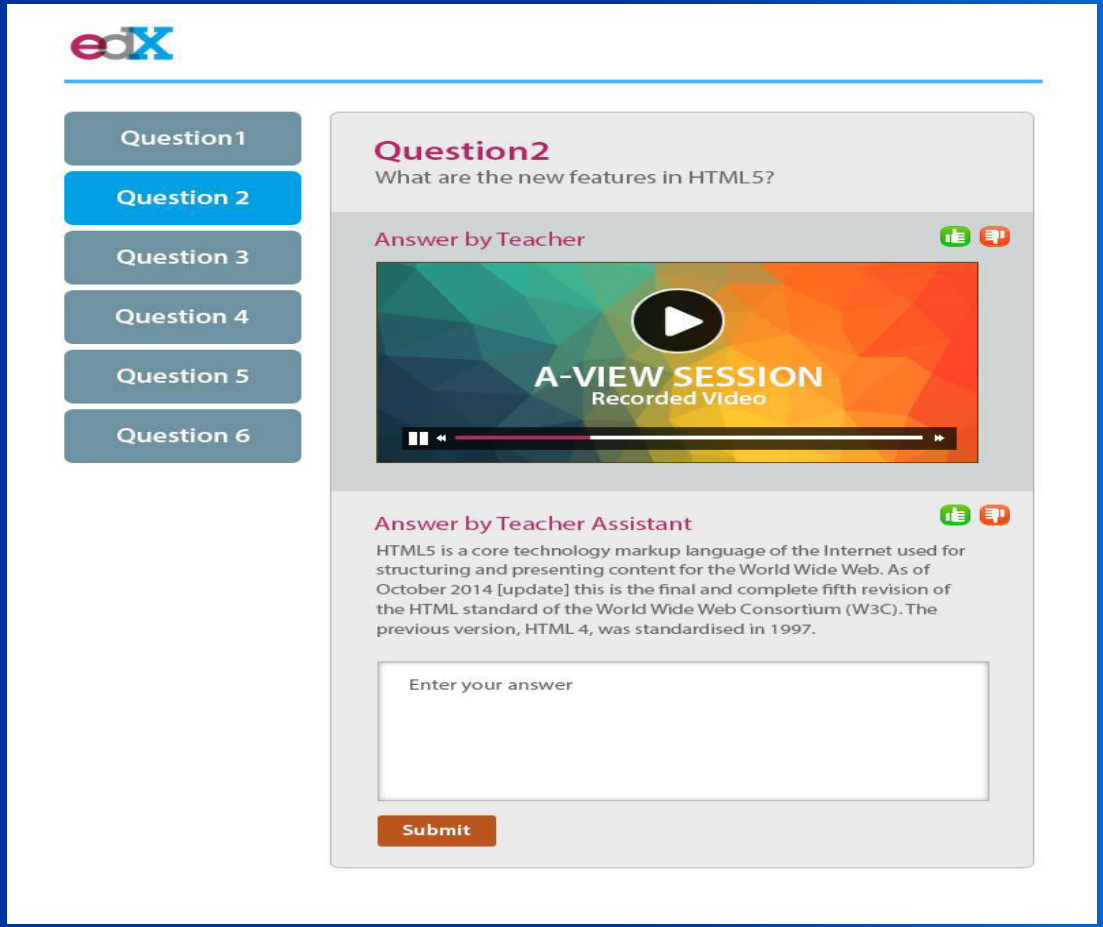
Features

- MP4 file available immediately after lecture
- Can be uploaded to any course library
- Blended Doubt Clearance Mechanism (next slide)

Assign forum questions to upcoming Live sessions



Video answers to Questions



Local Synchronous Producer and Player

Summary

- Teachers can self-record lectures in offline mode
- Class lectures are automatically recorded
- Recordings are generated as MP4 video files
- Searchable recordings
- Recordings annotated with metadata.
- Published to any course library (pluggable)

Deliverables

Release	Deliverables
R1	Design Specification and Review with Stakeholders
R2	At the end of a lecture, an MP4 file is available in the User's Local File System
R2	Convenient Recording UI - single-click
R2	Path and Location off the recording can be specified
R2	Quality of the recording can be specified
R2	Something to capture the attention of users when they get selected for recording remotely
R3	Moderator/Admin can do the recordings on his/her machine instead of using Teacher machine
R3	Notification mail once recording MP4 is made available.
R3	Option to choose necessary features like only audio/video, audio/video & document, audio/video & white board or all the features
R3	Playback possible in Web Browser without any dependencies.
R3	Recordings can be made available in Server Side Library at the end of class in MP4 format
R3	Separate UI for Local Recorder (simple, bare metal)
R4	Lip-sync tuning of local recordings
R4	Local lecture can be recorded without requiring network connection
R5	Content is pre-sync'd so that the Local Lecture can be recorded in offline mode
R5	Enable in Web Version
R5	Lecture can be recorded from mobile device using the mobile camera
R6	Recording is uploaded to Service after the machine goes online

Phase II – Modules

M1: Huge Virtual Synchronous Classrooms

M2: Classroom Monitoring & Attention Analysis

M3: Adaptive Plug and Play Devices

M4: Open Source Server Components

M5: Major Requests From Stakeholders

M6: Synchronous Tutoring Groups

M7: A-VIEW Using Low End Mobiles

M8: Local Synchronous Producer And Player

M9: Automation Testing & System Integration

M10: Implementation For One Crore Users

M9: Automation Testing & System Integration

- Automation Testing
  - Server / Cloud Validation
  - Client Automation
  - Load Testing
    - Satellite
    - IP Multicast
- Tools for Deployment Validation
  - Private Cloud Deployments
  - Self-Check Tools for Admins

Automation Testing & System Integration

- System Integration
  - Govt. Cloud
  - University Portal
  - External Course Web Sites
- Beta Programs
  - Early Preview for Major Partners
  - Identification of Compatibility Issues

Phase II – Modules

M1: Huge Virtual Synchronous Classrooms

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M8: Local Synchronous Producer And Player

M9: Automation Testing & System Integration

M10: Implementation For One Crore Users

M10: Implementation for 1 Crore Users

- Deploy to 1 Crore Learners and Teachers
  - Divide the Country into Regions
  - Regional Phased Deployments
  - Bi-Annual Managed Refresh
- Regional Support Coordinator
  - Regional Implementation Plan
  - Dedicated Trainings in Selected Cities
  - Minimize Travel Budget for Admins

Implementation for 1 Crore Users

- Central Deployment Team
  - Assisted Remote Deployments
  - Regular Online Trainings
- 24x7 Technical Support
  - Phone / Chat / Email Support
  - Prioritized Ticketing System
- 24x7 IT Support
  - On-Call System Admins
  - Network Alerting, Escalation

Implementation for 1 Crore Users

- Training & Documentation
  - A-VIEW II Setup & Management
  - A-VIEW II – Configuring and Managing Users
  - A-VIEW II User Guide
  - Videos showing how to use A-VIEW II
  - Mobile App User Guide
  - Videos showing how to use the Mobile App
  - Multi-Language Documentation
  - Multi-Language Trainings

Consolidated Deliverables and Budget

M1 - Deliverables

Release	Deliverables
R1	Detailed Specification and Review, Design of Inner Circle/Outer Circle Paradigm
R1	Document Prefetcher: Download/show thumbnail preview of document when conversion is happening
R1	Document Prefetcher: Progress bar for conversion
R1	User Manager: Smarter notifications for user list changes, user entry, exit
R1	User Manager: Sort by Moderator, Presenter, Student, etc.
R1	User Manager: Sorting Management – Sort by audio-video capabilities.
R1	User Manager: Sorting Management – Sort by interaction count.
R1	User Manager: Status messages for role changes
R1	User Manager: Warning message for user's who are not publishing video for A/V interaction
R2	Login using Email Id's (Single sign-on)
R2	Satellite: Audio-Video Interaction over Satellite (Multicast)
R2	Time based speaker access, like a person has 5 minutes to speak the he is automatically muted again
R3	HSC: Admin can configure how many users can be in each circle
R3	HSC: Inner Circle / Outer Circle Prototype
R3	HSC: Integrated client to switch between live interaction and receive-only: webinar, dth
R3	HSC: Presenter video and Viewer Video publishing can be done to different servers
R3	HSC: Single Site, Single Level Internet-only edge
R3	Integrated client to switch between live interaction and receive-only: webinar, dth
R3	Satellite: Bridged Classes between Satellite and Internet (e.g., NKN)
R4	Document Prefetcher: Multi document upload
R4	HSC: Admin work for configuring policies (live/receive-only ratios, special treatment)
R4	HSC: Dashboard for viewing the list of users in each Circle
R4	HSC: Queuing if the inner circle is fully occupied
R4	HSC: Reservation for special users
R4	HSC: User Can move from Outer Circle to Inner Circle
R4	Satellite: Desktop Sharing over Satellite (Multicast)
R4	User Manager: Displayed Information for users' action (eg:drawing, scrolling, deleting etc.)
R5	HSC: API's for edge deployment and configuration
R5	HSC: Deployment scripts for deploying over any external delivery network
R5	Satellite: Document Sharing over Satellite (Multicast)
R6	HSC: Phone Integration for users to join from phones to A-VIEW classes.
R6	Satellite: Whiteboard over Satellite (Multicast)

M2 - Deliverables

Release	Deliverables
R1	Detailed Specification, Review, Design - People Monitoring
R1	Detailed Specification, Review, Design - Attention Analysis & Mood Estimation
R1	Research: Image recognition for face, hand recognition
R2	Automated bandwidth test for remote centers
R2	Ease of Admin: Dedicated monitoring role
R2	Functionality: Able to view video of one or more selected student nodes from monitoring node
R2	Monitoring dashboard - Individual node pretesting/device status reports
R2	Research: Image recognition for face, hand recognition
R2	Snapshots: Automatic snapshots at configured intervals, timestamps
R2	User List shows the capabilities and status of remote centers
R3	Ability for system administrator to not allow interaction if remote center doesn't meet criteria
R3	Analytics: Reports by Email, Dashboards
R3	Attendance estimate of student nodes using image recognition
R3	Attendance Estimate Reports: Student Node, Time, Count of People
R3	Best Practices Guide (document) for remote centers
R3	Dashboard shows the centers without requisite minimum bandwidth
R3	Ease of Use: Choose interested student nodes, save as "Custom"
R3	Functionality: Estimate of hand raise gestures
R3	Functionality: System to capture the hand raise count and propagate it to all clients
R3	Get manual feedback from student node administrators
R3	Interaction: Private chat with student nodes
R3	Remote center certification by trained a-view personnel
R3	Remote pretesting by system administrator
R4	Attendance Estimate Reports: End of class summary report
R4	Correlate manual feedback with analytics for making improvements
R4	Detailed Specification, Review, Design - Expression Analysis
R4	Ease of Admin: Automatic allotment to all available monitors
R4	Monitoring Dashboard - Periodic full system emails to all centers
R4	Monitoring dashboard - Rating of institutions
R4	Quality: High resolution video images
R4	Use mobile camera to send remote center video when student is asking for doubt.
R4	UX: Detect hand raise and translate that into a "request for interaction"
R4	UX: Detect hand raise in the context of a poll with timeout, and translate that into yes/no count
R5	Correlate analytics with manual feedback to make improvements
R5	Correlate manual feedback with analytics for making improvements
R5	Mood estimate of student nodes
R5	Moosic of all attendees / interacted attendees
R5	Reports: student node, time, mood histogram
R5	UX: Camera/Focus should zoom into hand raising person
R5	UX: Detect hand raise in the context of a teacher's question, and translate that into yes/no

M3 - Deliverables

Release	Deliverables
R1	Ability to know whether mic is working all the time
R1	Detailed Specification and Review, Design for Pretesting module
R1	Detailed Specification, Review, Design for Adaptive Bandwidth Module
R1	Detailed specification, review, design for Plug and Play Devices Module
R2	Automatic Audio Device Change Handling
R2	UI Health Status indication – mixer, a/v studio device, signal, noise levels
R2	User Interface to show current selected bandwidth
R2	User Interface to upgrade or downgrade video bandwidth
R2	Video bitrate changes should be seamless
R3	Ability to Send the video to Presenter but not to Other users unless explicit permission is given by publisher
R3	Analytics to capture how the feature is behaving, and what the users do
R3	API's for integration
R3	Automatic Video Device Change Handling
R3	Automatically ask to stop video in case of poor quality
R3	Bandwidth and latency monitoring and upload to Analytics for reporting about sites that need to upgrade their infrastructure
R3	Start video automatically when users enter into classes
R3	Switch of bandwidth when user initiates upgrade/downgrade action
R3	UI to support automatic/manual switching modes
R3	User can save selected profile to cloud
R3	Visual indication of automatically estimated available bandwidth
R4	Analytics on automatic estimation
R4	Analyze user feedback on manual bandwidth, and tune the feature
R4	Auto-select Camera based on user profile
R4	Certification program – initial certified audio device list
R4	Cloud driven configuration module – service changes
R4	Detailed Specification, Review, Design
R4	First time sign-in wizard for a/v device selection
R4	First time sign-in wizard for tuning and pretesting
R4	Get User feedback on the feature
R4	Implement in-stream bandwidth estimation
R4	Initial version of automatic bandwidth switching based on network stats
R4	Selected profile from cloud is fetched and used in any machine with compatible configuration
R4	Works with HTTP Proxies (closed networks)
R5	Advanced Features, Detailed Specification and Review, Design
R5	Certification program – initial certified video device list
R5	Cloud driven configuration module – client changes
R5	Dashboard to view Pretesting History
R5	Get User Feedback on how automatic estimation helped
R5	Research HEVC prototype with FMS

M4 - Deliverables

Release	Deliverables
R1	Admin Activities: "Setup -> Course" and "Setup -> Class" should start with the users institute by default
R1	Admin Activities: Add an activation date for the class, so than onwards only it may appear in searches.
R2	Bulk Admin Activities: Add an activation date for the class, so than onwards only it may appear in searches.
R2	Bulk Admin Activities: Allow moderator to bulk create/edit/delete lecture
R3	2D Module
R3	Admin Activities: User should be able to register a course from start date of a month to another month or to a several months
R3	Admin Activities: Web site integration to show all courses, plugins etc.
R3	Bulk Admin Activities: Bulk class registration
R3	Bulk Admin Activities: Bulk search lectures with date
R3	Common Content Server (for those not wanting their content server)
R3	Red5 Desktop Sharing
R4	3D Module
R4	Admin Activities: Presenter (Moderator) should be able to schedule and re-schedule a class which is already created by the Administrator.
R4	Admin Activities: SMS Integration
R4	Bulk Admin Activities: Bulk user registration / deregistration
R4	Bulk Admin Activities: SMS notification of admin activities to concerned parties
R4	Common FMS for Desktop Sharing
R4	Remove paid component dependency and make it fully free
R5	Bulk Admin Activities: Automated Server Side Installer
R5	Institute based branding: Color themes, Fonts & Styles, Custom content at pre-defined locations, Suffix/prefix Title, Look and feel preferences
R5	Web Site for Document Upload/Download (LAN case)
R6	Common iSpring Service to save cost for private user deployments

M5 - Deliverables

Release	Deliverables
R1	Detailed Specification, Review and Design
R2	Analytics Integration
R2	Automatic Creation of Tutoring Groups from Class Registration
R2	Private Tutoring Groups - Synchronous
R3	Add option for students/moderator/presenter to download transcript
R3	Automatic spell check
R3	Emoticons in Tutoring Groups
R3	File Sharing Functionality
R3	Longer text messages, adjustable fonts
R3	Mobile App support
R3	Mute a particular person the group
R4	Breakout Room Integration
R4	Disable Tutoring Groups for every one
R4	Open API for integration with external systems
R4	Public Tutoring Groups (post class)
R4	Students can connect only with TA
R5	Tutoring Group Activity Transcript
R6	Complete Interaction Scenarios
R6	Multi-Lingual Support

M6 - Deliverables

Release	Deliverables
R1	Admin Activities: "Setup -> Course" and "Setup -> Class" should start with the users institute by default
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R5	Bulk Admin Activities: Automated Server Side Installer
R5	Institute based branding: Color themes, Fonts & Styles, Custom content at pre-defined locations, Suffix/prefix Title, Look and feel preferences
R5	Web Site for Document Upload/Download (LAN case)
R6	Common iSpring Service to save cost for private user deployments

M7 - Deliverables

Release	Deliverables
R1	Detailed Specification and Review, Design
R2	Basic User List
R2	Enter Program Session
R2	Exit Program Session
R2	HTML5 client on Android
R2	List of Programs
R2	Program Session Details
R2	Sign-in
R2	Sign-out
R3	Chat
R3	Hand-raise
R3	Live Class Dashboard
R3	Question Interface
R4	Advanced Specs
R4	Get Help (Technical Support)
R4	Poll Module
R4	Quiz Module
R4	Works on Apple IOS
R5	Downloadable Lecture Recordings
R5	Feedback Module
R5	Local User Photo
R5	Other User Photo
R5	Self Testing
R6	Feedback
R6	Group Chat
R6	Works on Windows Phone

M8 - Deliverables

Release	Deliverables
R1	Design Specification and Review with Stakeholders
R2	At the end of a lecture, an MP4 file is available in the User's Local File System
R2	Convenient Recording UI - single-click
R2	Path and Location off the recording can be specified
R2	Quality of the recording can be specified
R2	Something to capture the attention of users when they get selected for recording remotely
R3	Moderator/Admin can do the recordings on his/her machine instead of using Teacher machine
R3	Notification mail once recording MP4 is made available.
R3	Option to choose necessary features like only audio/video, audio/video & document, audio/video & white board or all the features
R3	Playback possible in Web Browser without any dependencies.
R3	Recordings can be made available in Server Side Library at the end of class in MP4 format
R3	Separate UI for Local Recorder (simple, bare metal)
R4	Lip-sync tuning of local recordings
R4	Local lecture can be recorded without requiring network connection
R5	Content is pre-sync'd so that the Local Lecture can be recorded in offline mode
R5	Enable in Web Version
R5	Lecture can be recorded from mobile device using the mobile camera
R6	Recording is uploaded to Service after the machine goes online

Deliverables Consolidated

Module	R1	R2	R3	R4	R5	R6	Grand Total
Huge Virtual Synchronous Classrooms	9	3	7	8	3	2	32
Classroom Monitoring & Attention Analysis	3	7	13	10	8	4	45
Adaptive Plug & Play Video	4	5	11	13	7	2	42
Open Source Server Components	2	2	7	7	3	1	22
Major Requests from Stakeholders	9	14	19	7	2	2	53
A-VIEW using Low-End Mobiles	1	8	4	5	5	3	26
Local Synchronous Producer & Player	1	5	6	2	3	1	18
Synchronous Tutoring Groups	1	3	7	5	1	2	19
Grand Total	30	47	74	57	32	17	257

Overall Budget

Development, Testing & Implementation for Crores of Users (For 3 Years, Figures in Lakhs of Rs)						
#	Item	Functional Description	Year I	Year II	Year III	Budget (in Lakhs
1	Module 1	Huge Virtual Synchronous Classrooms	64	50	56	170
2	Module 2	Classroom Monitoring and Attention Analysis	51	38	42	130
3	Module 3	Adaptive Plug and Play Devices	36	30	33	100
4	Module 4	Open Source Server Components	33	30	34	97
5	Module 5	Major Requests from Stakeholders	59	47	52	158
6	Module 6	Synchronous Tutoring Groups	50	38	42	130
7	Module 7	A-VIEW using Low End Mobiles	54	42	47	143
8	Module 8	Local Synchronous Producer and Player	27	24	27	78
9	Module 9	Automation Testing and System Integration	68	33	37	138
10	Module 10	Implementation of A-VIEW for Crores of Users	92	105	142	339
		Subtotal In Lakhs (Rs)	**533**	**438**	**513**	**1484**
			Year I	**Year II**	**Year III**	**3 Year Total**
		Total Budget	**533**	**438**	**513**	**1484**

Thank You

Appendix

Comparison of A-VIEW with other E-Learning/Meeting Tools

Comparison of A-VIEW with other E-Learning/Meeting Tools

	Lecture Video Creation	2D-3D support	People Count	Remote Monitoring	MP4 Recording	Annotation and Drawing	Desktop sharing	Whiteboard	Application Sharing	Technical Support
A-VIEW	✓	✓	✓	✓	✓	✓	✓	✓	✓	Free
Blackboard	✗	✗	✗	✗	✓	✓	✓	✓	✓	Free
Adobe Connect	✗	✗	✗	✗	✓	✓	✓	✓	✓	Free
Cisco webex	✗	✗	✗	✗	✓	✓	✓	✓	✓	Free
skype	✗	✗	✗	✗	✗	✗	✓	✗	✗	Free
Hangouts	✗	✗	✗	✗	✗	✓	✓	✗	✗	Free

Comparison of A-VIEW with other E-Learning/Meeting Tools

	File Transfer	Document Sharing	Quiz	Poll	Questions	Handraise	Feedback	Network Audio Testing	Chat	Breakout Rooms	Virtual Storage
A-VIEW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗
Blackboard	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
Adobe Connect	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗
Cisco webex	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗
skype	✓	✗	✗	✗	✗	✗	✓	✓	✓	✗	✗
Hangouts	✓	✗	✗	✗	✗	✗	✓	✓	✓	✗	✗

Comparison of A-VIEW with other E-Learning/Meeting Tools

	User Authentication	Biometric Login	Guest Login	Multi Presenter	Remove user within session	Change role within session	Connect via web	Connect via satellite	Support Multicast	Adaptive Bandwidth/ Multibitrate
A-VIEW	✓	✓	✓	✓	✓	✓	✓	✓	✓	Multibitrate
Blackboard	✓	✗	✓	✗	✓	✓	✓	✗	✗	✗
Adobe Connect	✓	✗	✓	✓	✗	✓	✓	✗	✓	Multibitrate
Cisco webex	✓	✗	✓	✗	✗	✓	✓	✗	✗	Adaptive Bandwidth
skype	✓	✗	✗	✗	✗	✗	✓	✗	✗	Adaptive Bandwidth
Hangouts	✓	✗	✓	✗	✗	✗	✓	✗	✗	Adaptive Bandwidth

Comparison of A-VIEW with other E-Learning/Meeting Tools

	Pretesting	Support Plug and Play Devices	Face Recognition	Lecture Report	People Count Report	Windows Support	Linux Support	iOS Support	Android Support	Network Reconnection
A-VIEW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Blackboard	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓
Adobe Connect	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓
Cisco webex	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓
skype	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓
Hangouts	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓

Comparison of A-VIEW with other E-Learning/Meeting Tools

	Adhoc/Instant Meetings	Schedule Meetings	Meeting Calender	Recurring Meetings	Chat Directory	Record Meeting	Participant Intimation	Private /Public Chat	View Partipant Details	Cost
A-VIEW	✓	✓	✓	✓	✓	✓	✓	✓	✓	Free
Blackboard	✓	✓	✗	✓	✓	✓	✓	✓	✓	Paid
Adobe Connect	✓	✓	✗	✓	✓	✓	✓	✓	✓	Paid
Cisco webex	✓	✓	✓	✓	✓	✓	✓	✓	✓	Paid
skype	✓	✓	✓	✓	✓	✓	✓	✓	✓	Free
Hangouts	✓	✓	✓	✓	✓	✓	✓	✓	✓	Free

Overall Summary