Comments to Public_Safety_RFI_05162012

June, 15, 2012

To: NTIA, U.S. Department of Commerce, HCHB Room 4812,
1401 Constitution Avenue NW., Washington DC 20230

Fr: Consistel PTE Limited, Singapore and Consistel Inc, Austin, TX
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Introduction: Consistel for more then a decade has been singularly focused in the planning, designing, integrating and upgrading of indoor Distributed Antenna Systems (DAS) to support in-building mobile and wireless coverage and capacity for its mobile operator customer base in South Asia. In the last 9 months, Consistel has extended its experience and domain expertise around in-building networks by being part of the LTE upgrade cycle for more then 500 buildings in Singapore that will be deployed within the next 12-18 months.

Consistel's in-building network domain expertise honed by delivering over 3,500 turnkey programs has been reflected into ATRIUM. ATRIUM is an enterprise software platform, purpose built to reduce the time to plan, design and deploy in-building networks across their entire lifecycle.

ATRIUM utilizes the Oracle 11g Data Base Server to store and provide near real time data for access and use across functional teams within and amongst network operators, System Integrators and other relevant stakeholders organizations. ATRIUM allows users (account holders) to based on permission to access relevant data to allow them to manage and control any and all aspects of the in-building program(s) for indoor DAS and small cell networks that provide mobile and wireless (802.X and WiMax) services to mobile device users including roamers throughout that building as well as many venues and buildings within municipalities and throughout states.

The diagram on the next page depicts the high level view of ATRIUM. ATRIUM is made up of integrated modules that have access to relevant data and enables users to use and update that data to support their specific project and functional areas. Also to provide a video depiction of ATRIUM and its role in developing in-building network coverage and capacity, please click on this link ***ATRIUM Video*** to a YouTube video.

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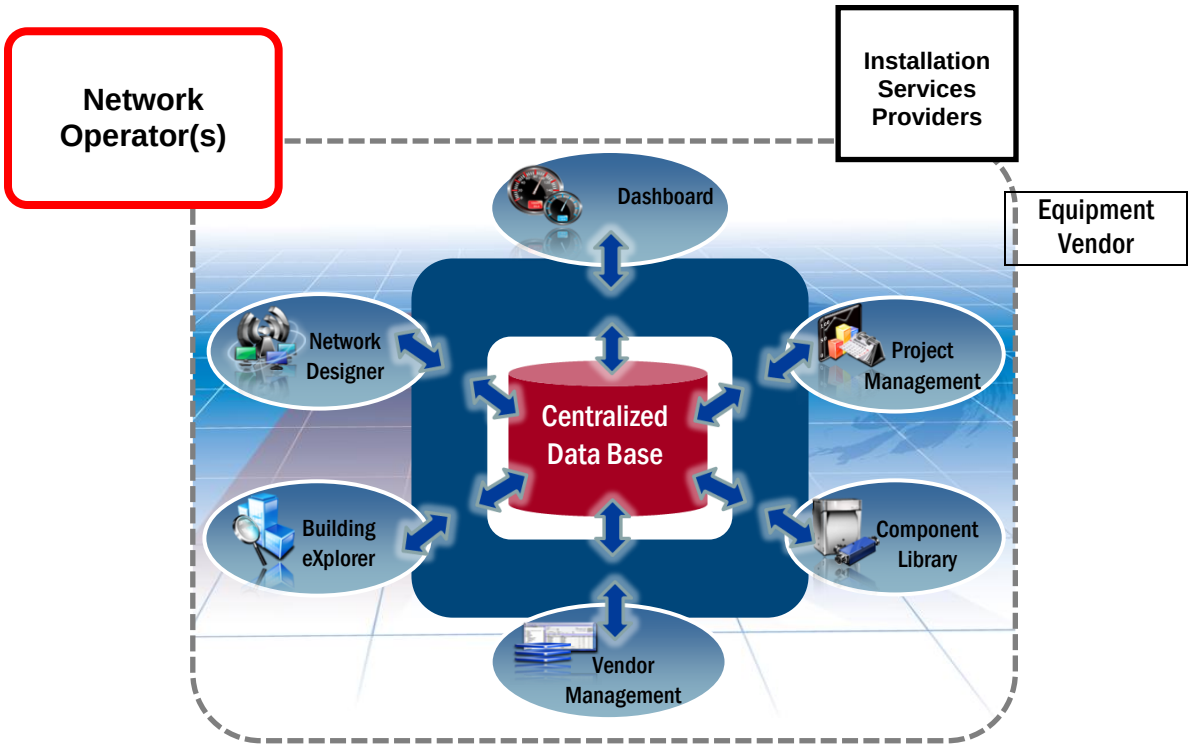

ATRIUM is not only valuable to the LTE network operators for planning budgeting, design, and deployment of in-building networks but also for supporting Network Management and Asset Management of "all things in-building" that may be of value to first responders". The value data can be made available across all regional, State, tribal and local levels from a centralized Venue and Building Data Base (V&Bdb) that can be remotely shared and accessed by those agencies and personnel based on credentials and permissions.

The ATRIUM platform would also deliver value to NTIA and FirstNet by enabling these administrations the overall management and control of LTE network rollout and performance inside targeted building.

The existing and future commercial and all public safety networks could also become included in this proposed centralized data repository. This would enable NTIA and FirstNet to maximize the utilization of commercial LTE networks. This can be decided once QoS performance indicators of these mobile networks are satisfactorily tested, confirmed and documented.

The data collected, digitized and included in the proposed establishment of a centralized Venue and Building Data Base (V&Bdb) will have significant value not only for planning and optimizing indoor data services for first responders but will be potentially even more valuable to augment situation awareness related to first responder efforts inside buildings. The V&Bdb can be accessed remotely to obtain floor plan, building materials and dimensions, available networks, video monitoring and surveillance camera locations, HVAC infrastructure, building environmental controls, security assets, building alarm locations, areas where hazardous materials are stored, building management and contact info, as just a few examples of data that can be stored and made available from the V&Bdb as required in support of first responders.

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In addition, as a value proposition for Local, State and Homeland Security, advanced use cases that are being prototyped by Consistel's development team would extend the platform to cover video monitoring and surveillance as well as civil defense and emergency warning systems. The use cases could be highly relevant for municipalities, states and federal public safety and homeland security agencies ability to enhance situation awareness for first responders as they move into and around buildings.

It is with this background that we submit our comments for the FirstNet program being administered within NTIA and the Department of Commerce.

Since our domain knowledge and expertise is focused on providing in-building mobile and wireless network coverage and capacity, so to are our comments focused on how NTIA and FirstNet can provide States, Tribal and Local public safety personnel and first responders an ability to support the warranty of adequate capacity inside targeted venues and buildings to execute their mission and also improve the safety of first responder.

The in-building focus for the design of LTE networks proposed within FirstNet's charter can significantly add to the situational awareness. Knowing the quality of the networks inside buildings and the ability to receive and send building specific data" when they need it and where ever they need it" can be critical to the execution of a first responder's mission.

Request for Comment

The Consultation Process
1. (i) In the last decade globally and in the last two years in North America commercial mobile operators have significantly increasing their CAPEX associated with in-building networks in order to provide adequate 3G capacity within targeted buildings.

This has created the need for operators to understand what they have in place inside buildings in terms of infrastructure before they begin to upgrade that mobile, wireless networks or add 4G capabilities.

1.(ii) In building coverage and capacity of existing, planned and future LTE networks will no doubt be critical KPI for first responders. The complexity of LTE and the applications it will deliver changes the paradigm e.g. where networks should be designed from inside out versus limited to outside in. Thus not limiting the network design from whether adequate signal can get into a building but to design in building networks as part of the overall initial network not as an after thought.

1.(iii) Many critical venues and building are already well supported in terms of 3G capacity. These DAS in-building mobile and wireless networks are deployed by mobile operators, building and venue owners and neutral host providers. These networks could be identified, surveyed, measurement based tested and the data included into the regional, state, tribal and local building data base(s). This data base would allow FirstNet's to leverage to the maximum extent economically possible existing commercial wireless infrastructure to speed deployment of the network. If the existing in-building networks are known and documented in terms of capabilities and QoS KPIs, they can be more readily utilized to be used by first responders. The in-venue and in-building networks and those being upgraded to support LTE can therefore be more readily utilized in the first responder network foot print if the existing networks are base lined and therefore made part of the overall NTIA and FirstNet driven consultation and planning efforts.

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1.(v) and (vi) Assignment for priority access for in-building networks can best be done if the in-building networks are part of a venue and building data base(V&Bdb) that can be accessed by all relevant agencies. The data included in the (V&Bdb) can include as examples: which networks and technologies are supported by floor or area, quality of signal strength, data throughput, etc and all displayed on a 3D view of the building.
1. (vii) Training for in-building design tools, data collection tools and enterprise software platform's like ATRIUM are readily available. Dozens of companies exist that provide the site survey/audit, planning, design, procurement, deployment, optimization, maintenance and upgrade services needed to provision an in-building network. A core value proposition of ATRIUM is that it enables FirstNet, regions, states, tribal and local entities to have management control of how well these entities are delivering, executing, documenting and then be able to validate the quality of those in building networks both before and after they are deployed.

Within the next few months, States could begin the process of determining which buildings and venues should be targeted for LTE capacity in support of first responder data needs. As the targeted building list is compiled and approved, states could collect relevant data from Architectural CAD files, site survey and existing network documentation and then digitize this data and stored it in a relational data base for planning processes.

Once the relational data base is created, planners can determine where and when existing commercial wireless infrastructure either from outdoor LTE sites and/or in-building DAS networks. All this in-building specific information on a state, tribal and local level basis and across states could be stored in a central repository managed by FirstNet.

ATRIUM utilizes Oracle 11g date base server to provide users the ability to submit and access information, work flow data and work in process or completed deliverables from this centralized data repository . The client server architecture of ATRIUM allows this V&Bdb to shared, accessed and updated remotely allowing individual’s projects to be managed separately and work groups across organizations to collaborate and have access to the most concurrent data available.

1 a. States should compile all venues and building where the QoS for first responders to access LTE applications will require a coverage and capacity warranty in order to protect the first responder and the public they serve. With these structures identified, data collection can begin and the commercial networks QoS or existing public safety networks assessed to determine best way to deliver on the LTE network coverage and capacity SLA.

1 b. The items mentioned in 1a. should be covered by the State and Local Implementation grant program. By moving this work forward, planners will be allowed to focus on critical in-building support of first responders public safety activities at the beginning of the program versus after the wide area LTE network is constructed and in-building holes are identified. The delay in finding these weak serving areas, comes at the risk of first responder's ability to protect the public as well as their well being by being off net and losing the value added that "always on" data network can deliver to improve situational awareness.

2. a. through d. No Comments

2. e. In order to ensure that local and tribal public safety entities are able to participate in the planning process they should at a minimum identify relevant buildings and venues that should have LTE data services available to first responders when inside.

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These tribal and local entities should have access to all data compiled for their serving areas. In addition, they can lead and/or assist in the collection of data such as auto CAD drawings and help manage site availability for surveys and eventually deployment of in-building networks when required with building owners.

The budget to carry out this work should be included in the grants.

2. f. The selection of targeted building and venues where in-building DAS networks are required to meet a specified performance level should include inputs from all public safety disciplines including but not limited to police, fire, EM, sheriffs, and public health agencies.

2. g. No Comments

2. h. Federal entities should be invited to review the FirstNet V&Bdb and include additional building and venues as required by their agencies.

FirstNet should allow for and promote inclusion of specific buildings and venues in infrastructure RFPs so that the network provided is complete and serves the best interests of the public's safety and the safety of first responders.

Today some estimates put in building usage of commercial mobile networks as high as 70%. In global deployments of LTE, some estimates are that 90% of LTE applications are accessed by users inside buildings. Will public safety usage patterns differ? We don't think so.

Given the mission critical nature of the use cases to be supported by LTE apps and delivered to first responder in the field which is often in public and commercial buildings. So in-building performance of the proposed network could be of the greatest importance.

As an example, to know what LTE network(s) can be accessed and their anticipated/designed service level before a firefighter reaches a fire on 22nd floor or in the under ground parking garage of a commercial building is of the up most of importance to both support the public's and the firefighter's safety.

With a V&Bdb repository with 3D display of each floor with relevant data e.g. mobile and wireless technology prediction plots stored and accessible, this information can be sent to the vehicle and/or first responders handheld device(s). Video feeds from cameras on that floor or garage level could become part of this use case. The location, type of camera and access details could also be included in the proposed centralized venue and building data base.

3. a. Some portion of the grants should be earmarked to support RFPs for collecting and creating a V&Bdb of targeted buildings and venues. The V&Bdb could include existing network coverage and capacity measurements of state, regional, tribal and local networks as well as mobile and wireless commercial operator networks. Images, photos, CAD data, frequencies, leases, contact info, building data, drawings and schematics, technology specs such as antenna types and specs, can all be collected and stored in a relational data base proposed as the First Net V&Bdb for use by approved users with permission to use in supporting of their role in protecting the public's safety by improving situation awareness around the inside of buildings and any building assets that can utilized to further that mission.

Many large venues such as NCAA Division I and professional team stadiums, convention centers, corporate and university campuses and thousands of buildings across the United States have some form of

in building mobile and wireless networks. The network technologies already in place can be as simple as a repeater or as complex as an active DAS network supporting either or all commercial, private and public safety mobile services.

Consistel often includes Tetra and Tetrapol network support for the in building projects it designs, deploys and manages in South Asia. The Marina Bay Sands Casino and Resort at over 6M sq. ft. project in Singapore completed last year supports 12 different network technologies on one DAS network.

Walk testing these venues and buildings with an Android and iOS based smart phone or tablet configured with downloadable software applications which collect and report all relevant measurement KPI's and metrics as experienced at the device level. This software is offered by no less then 6 vendors and the data collection services are offered by many global, national, regional and local companies.

Government entities can own and control this valuable data included in the FirstNet V&Bdb and use it to make more complete RFPs to build better and lower cost LTE networks and use commercial networks to further reduce deployment times and investment of taxpayers money to support first responder(s) with mobile data services anywhere required, "inside and out".

3. b. Consistent standards and processes should be used to collect, tag, analysis, and data mine the building data collected in the V&Bdb. Also systems engineering rigor should be applied to determine standards for in-building mobile network performance as provided by outside sites or inside networks. Many competent radio and system engineers are employed by state and local law enforcement agencies and within NTIA that can be utilized to develop of LTE KPI performance standards for RSPP Coverage and PDSCH throughput.

Software platforms such as ATRIUM enable all parties involved in making sure adequate in building coverage and throughput is available and that those involved in planning, design and deployment phases can manage their work flow items and tasks and allow their local program managers as well as the FirstNet PMO to monitor and control all aspects of deployment.

3. c. The FirstNet V&Bdb site surveys, measured data collection and building data digitization activities should be on going activity as new construction and new targeted structured are added as time goes on. The work for this activity can begin quickly as there are many law enforcement agencies and companies capable of delivery on this scope of work.

Many public safety entities have established contractual warranty's with their vendors for coverage inside key and critical venues and building within their jurisdictions. In many instances the warranty has required in-building infrastructure to better support the warranty. Much of the data required measurement and KPI performance to required to provide and deliver this SLA is already available within those agencies and can now be moved into a centralized data base e.g. V&Bdb for future use in designing the LTE networks.

Consistel would make ATRIUM software available as needed to provide the platform for housing, mining and sharing this data within FirstNet, States, tribal and local agencies. The ATRIUM enterprise software platform could be used to develop fast, reliable and lower cost in-building network designs using automated design programs that reduce this deliverable for days and weeks to hours. This would have high relevance for FirstNet for budgeting purposes and RFP development.

4. a. through g. No Comments

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5. From an in-building point of view the existing commercial and public safety network should be benchmarked and data shared across jurisdictions. The buildings themselves can be digitized and all relevant info stored and shared as needed. The states and local should be given grant funding in order to begin this existing in-building infrastructure inventory and asset management data base e.g. V&Bdb. The V&Ddb would include digitized floor plans and building CAD data as well as the measured in building coverage and throughput performance of either or both outdoor and indoor infrastructure.

The state and local jurisdictions have the greatest intimacy about what venue and buildings will required a coverage and capacity warranty for their first responders. The data base should be created first by them and then added requirements: sites, venues, buildings, etc can be introduced upon review by federal agencies.

5. a. Best way for States and local jurisdictions to use and/or determine the suitability of their existing infrastructure and equipment for integration into the public safety broadband network is measure and benchmark it's current in building network performance. In building signal strength due to attenuations cause by frequency band, building material and building type are the hardest to predict and therefore requires the most attention and consideration from a planning, budgeting and design point of view.

This measured data can be analyzed and used to better plan future network sites and determine which existing sites are relevant in the LTE network. It is assumed by this writer and has also been confirmed by commercial LTE network operators that more LTE sites will be required when compared with existing sites. Therefore the use of in building sites can be used to reduce need for outdoor sites required to provide good and reliable in-building service to first responders.

5. b. States could have comprehensive information about venues, campuses and buildings in their jurisdiction be digitized and in the FirstNet V&Bdb and accessible to tribal and local entities efforts focused on the LTE network planning, design and deployment.

Also States have radio network, system engineering. civil engineering and operational expertise that can better perform their role if the data they can access and use is coherent and easily accessible and shared as needed between work team members. So having the V&Bdb centrally available is a significant attribute to develop and allow FirstNet, State, tribal and local entities to deliver the required quality of network performance for first responders where they need it most e.g. in buildings, reliably, on time and in budget.

ATRIUM supports all this but also allows all entities involved to better manage the infrastructure CAPEX and OPEX and reduce the Total Cost of Ownership since the complete lifecycle processes for in-building networks can be tracked and monitored.

5. c. Utilities and other third parties like universities, libraries, hospitals, museums, etc may want first responders to have proper in building LTE network coverage and throughput. If they are, then they should become part of the venue and in building data base and included in the network planning and design phase. They could also share in costs for the data base efforts and even the network CAPEX and OPEX costs especially if their security and building management personnel can access it to assist first responder in carrying out there mission and duties.

5. d. Within the scope of insuring proper in-building mobile access to LTE data services for first responders there are many opportunities for public/private partnerships. The primary area for partnerships is to leverage the existing or planned in-building networks being or to be installed/upgraded to support LTE. Neutral Host Operators and Mobile Operators could be targeted partner companies. These partners

may share their infrastructure for a fee versus require FirstNet to fund the CAPEX for this infrastructure to be acquired by State, tribal and local agencies involved in public safety.

6. a. through d. No Comments

7. No Comments

8. The activities best done under State and Local Implementation grants would be around in-building network performance, building data and details and infrastructure inventory within targeted buildings that will require adequate in building coverage and throughput in support of LTE data services for use by first responders. Data collection and data base management, analysis and the utilization of the data included in the proposed FirstNet V&Bdb can critical to developing better RFP's for LTE network vendors to bid on.

9. The following activities (representative not complete list) focused on developing a FirstNet V&Bdb should be eligible for funding under the State and Local Implementation plan as these activities will provide a critical source of data for use in planning, designing and deploying LTE coverage and capacity for first responder use. The data will allow planners and designers to provide a coverage and data throughput warranty associated with LTE data services provided to first responders inside targeted venues and buildings.

1. Development and review of a list of targeted venue and building where a in venue or in building coverage and data throughput warranty is required from a public safety point of view.
2. Selection and acquisition of financial and project prioritization analysis tools to help in determining CAPEX for in building projects and to prioritize buildings based on public access, type of building, public safety requirements, etc. This is included as part of the Building Explorer module in ATRIUM.
3. Schedule and facilitate training to understand In Building Solution Design and Program Management specific to LTE. Can be provided by several companies this writer has worked with over the last 25 years.
4. Selection and acquisition of Mobile and Wireless Data Measurement and Collection Software Licenses from many providers.
5. Selection and acquisition of iOS and Android Mobile Devices and Tablets to be used in data measurement and collection and site survey process.
6. Selection and acquisition of Data reporting Software Licenses often already included in item 4 above.
7. Selection and acquisition of Enterprise Grade DB Server Software License and may already be covered in existing agreements.
8. Selection and acquisition of Enterprise Software License for In Building Project lifecycle Management. ATRIUM can be provided for pilot purposes in order to allow FirstNet to develop it's RFP requirements.
9. Selection and obtain System Integration support to manage integration for items 4. - 8. above. SI is often a value add provided by engineering services companies which provide data collection and site surveys.
10. Determine whether to in source or out source technician level staff to undertake data collection, site surveys, building Auto CAD drawings, digitize this data and input into proposed data base
11. Selection, finalize Scope of Work and staff accordingly based on analysis of 10. above.
12. Selection and acquire Data Base Administrator manage data base and access controls and be internal or included in out sourcing SoW for item 11. above.
13. Selection and staff Program Manager to make insure timelines, budgets, and quality standards are met.

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14. RFP development and procurement support to outsource data collection, site surveys and data base creation and management services
15. Select and Acquisition an Indoor Coverage and Capacity Planning Tools. this is included in ATRIUM Network Design Module.
16. Determine, select and obtain In Building DAS Consulting Support for PMO and Engineering expertise as needed
17. Design, procure hardware and deploy hosting facilities in an existing secure government or commercial data center.

Typical costs for commercial network operator to collect this data and digitize it and input and tag it into a relational data base for 50 buildings within inside dimensions that fit into the 500K -1.5M sq ft range. Assuming all these buildings are in one designated urban area, the costs to collect and prepare reports should be in the range of $10,000 to $25,000 per building. The range provided depends on size of building, structure (high rise or mall) and how much documentation is already available from building owner/manager. An average of $15,000 should be used for budgetary purposes. Availability of as built drawings of in building DAS networks and Auto CAD drawings of the building can help reduce the costs and improve the value of the data considerably. All the mobile network performance data can be collected with Smart Phones and Tablets using commercially available software to take measurement and location data. These same devices can use other software to take images and fill out data survey forms of critical information to be included in the proposed data base.

To tune the prediction model used for in-building network design may occasionally require a test transmitter and the devices mentioned above to be used to collect signal strength data where structure and materials used should be accounted for in order to make the design more accurate. This can be done by the survey teams as an added scope of work and once captured can be used to create another propagation model that may be repeated and reused as more of those building types are included in data base e.g. State Capital buildings built 100 plus years ago have some unique attributes that may be relevant and require design tools to accommodate these nuances in their predictions. This measured data collection can add $2-5K of additional cost to the building survey and audit.

9. All the personnel, contractors, planning meetings, software license fees, data collection equipment and analysis/assessment costs to create this critical data base e.g. FirstNet V&Bdb of highly relevant and valuable data for use by all entities should be considered allowable costs. This investment in data profile can be critical inputs in planning what the LTE infrastructure is needed to support first responders.

This same data could be used post deployment to support first responders with critical data about buildings they are about to enter or are in as they protect the public's safety.

9. a. Data gathering of "all things in building" as mentioned and noted throughout this comment submission should be considered an allowable cost.

9. b. State and Local Implementation grants should be used to fund any added staff required to provide the value add that the proposed building data base will provide LTE Network planners and eventually the dispatch, field support and first responders them selves who can access this data when needed.

These incremental staffing, software licenses and support costs can be more then offset by savings in deploying a more reliable network by reducing costs associated with field retrofits and unexpected post deployment upgrades needed to support data services for first responders. In addition, the data will be useful to enhance situation awareness and therefore provide the public added value in terms of making their city, reservation, state and country safer.

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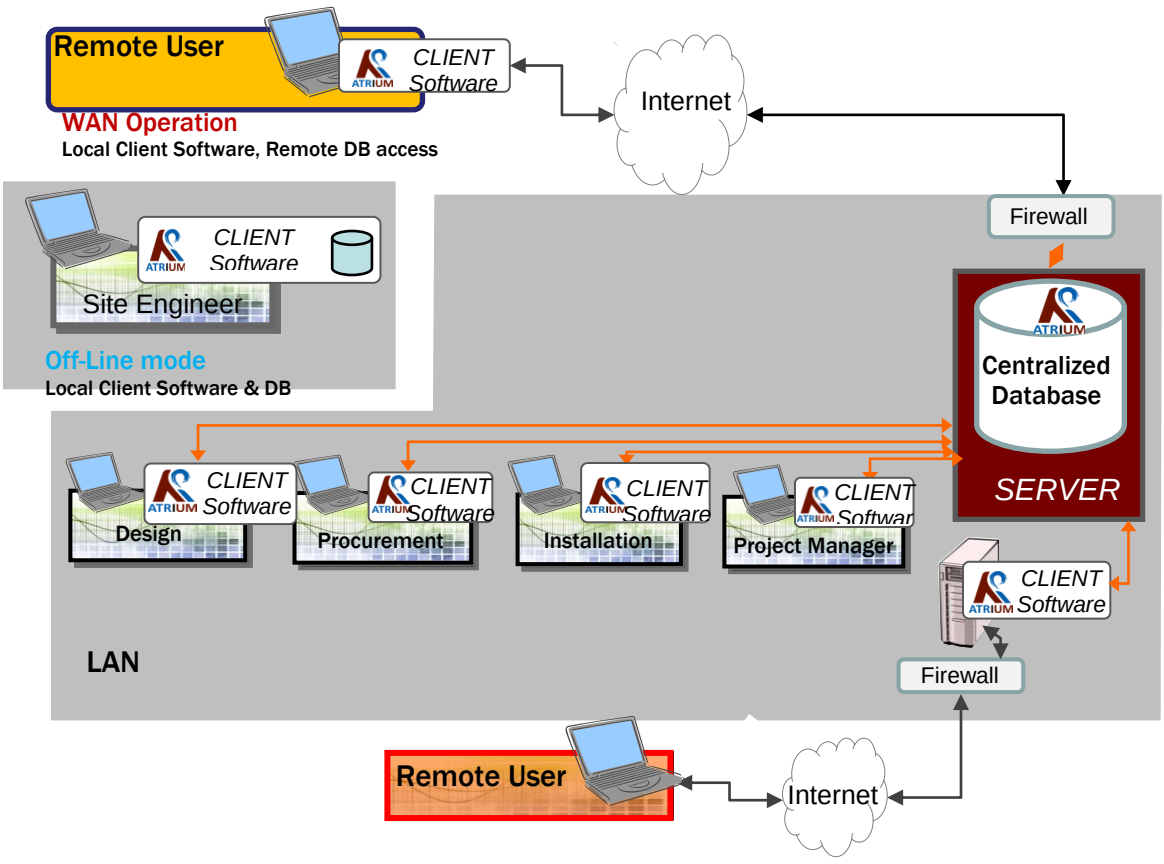
An option for NTIA and FirstNet to consider is to provide the Data Base Administration, staff and license costs for the enterprise and data base software (such as ATRIUM and Oracle) to support the proposed FirstNet V&Ddb. NTIA can then make the data and platform capabilities available to federal, state, tribal, local entities and System Integrators to utilize the V&Bdb as needed to carry out their scope of work and for first responders to complete their mission.

NTIA via the proposed V&Bdb would have total view of in-building networks planning, design, deployment and asset management that can be used in network management and overall PMO for the tracking of the program execution to stated goals. This could include hours worked by type of job title per network deployment and across entire scope of program. this would be very valuable as FirstNet is setup under a Job's Creation Act.

The diagram below depicts how a client server architecture could be utilized by NTIA and proposed FirstNet V&Bdb to provide each state, tribe and local entities access to the end-to-end services platform required to manage and control the in building aspects of their networks and services provided to their first responders.



This architecture would allow NTIA and FirstNet to host and manage the server side of an enterprise solution like ATRIUM, to provide these administrations a critical control point to manage the many individual programs, the 50-70 work tasks that comprise an in-building network deployment and the quality of in- building LTE service provided by commercial LTE network providers.

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Lastly with this data secured and centralized at a national level, federal agencies can have an overall view of any and all building data included in the data base to serve their homeland security mission.

10. NTIA should allow state, tribal and local public safety entities serving rural areas to include targeted buildings and venues. Those structures prioritized as critical could be survey and planned for accordingly in order to provide required adequate LTE network coverage and capacity to support first responders.

11. No Comment(s)

12. a. and b. No Comment(s)

13. From what is proposed in our overall comments it would be recommended that NTIA and FirstNet provide state, tribal and local Implementation Grants to prioritize target buildings that lie in rural areas. Rurally located universities, prisons, energy related facilities, military buildings, court houses and utilities may need adequate in building coverage for first responders.

In many of these targeted structures first responders will need to interop with campus or military police or security personnel. this can be enabled only if a shared LTE infrastructure is available and reliable.

The teams that collect and prepare the data for inclusion within urban areas into the proposed centralized data base could also potentially survey these rural and tribal venues, buildings, campus and facilities as well.

13. a. Specific to the proposed creation and management of a venue and building data base that includes critical data about the performance of existing infrastructure from either outdoor sites or indoor DAS networks already deployed and proposed LTE networks could be relevant and valuable to NTIA, FirstNet, States, tribal, local entities and their LTE Network Providers or System Integrators for the purposes planning, designing, deploying and managing these in building networks and monitoring the performance indoors of outdoor sites all the data would be in a relational data base like Oracle 11g.

Performance at the data base level can be easily support since missing data, incorrect parameters and incomplete info or work item can be flagged for any designated project related to a targeted venue or building approved and set up by Federal, State, tribal and local agencies. FirstNet can provide overall management and control of this centralized data base e.g. V&Bdb in order to better track and monitor via it's own dash board intended to manage outcomes of the grant program on a nationwide basis.

13. b. The measurement of the outcomes of the grants specific to the activities to create a centralized data base to be used by FirstNet and Federal, State, tribal and local entities to insure that first responders have adequate in-building LTE data services will be stated in the SLA or coverage and capacity warranty provided by the Network Provider and/or System Integrator who provides the overall design for the serving areas which will also include the targeted buildings.

Also as part of the data base development work flow ATRIUM as the enterprise platform can then be used to develop the in-building network designs, Bill of Materials and overall projects costs can be completed within hours of the building digitization process has been completed. ATRIUM has patented auto design capabilities which can automatically place antennas based on implied and stated KPIs and/or cost and physical constraints per floor, area, etc within that targeted venue and building. Once this is run and antenna locations defined within the building, components and cable routing can be automatically determined by the system to complete the design, select BoM items, price and estimate services time and

costs to complete the project. All this work can be done in a few hours which would normally take days and weeks.

These automatic design attributes about ATRIUM would allow FirstNet to manage the entire program more effectively and efficiently from a budget point of view in terms of providing LTE data service inside targeted venues and buildings. The budgeted costs can be considerably more accurate then any other approach since the program results have been validated on many projects deployments. The use of a software program greatly reduce potential for human errors and improves consistency of deigns since it will not under engineer or over engineer designs which is a subjective error that even design experts can make.

This preliminary design could be added to scope of the data collection digitization and data base development scope of work proposed by our comments. This effort is the typical next step in the in building planning process and the work will have short term pre RFP value to allow NTIA and FirstNet set more accurate budgets . The preliminary designs can then be shared with vendors to fine tuned as the projects move from planning to deployment phase. These designs can be easily reviewed and approved by any entity having access to the venue and in building data base.

It should be noted that ATRIUM primary customers segment is LTE mobile operators, LTE network providers and System integrators involved in LTE network rollouts. ATRIUM to ATRIUM data sharing features will enhances coordination with and between these entities.

13. c. The worked described in this Comment submission can be done at state level with local and tribal resources provided to supplement efforts as needed. There are at minimum of thirty (30) companies that this writer knows that could do this work on an outsourced basis. So outsourcing may be the best course to consider by the entities receiving the States and Local Implementation grants since so many resources are available that have the software, devices, tools and technical competencies.

If outsourced FirstNet will still own the data and the State, tribal and local entities will have access to it for their needs. The data here is extremely valuable and this is unique opportunity to justify it's collection and use.

13. d. Many venues and buildings throughout the USA already have reliable in building coverage through use of in building repeaters and DAS networks. So the coverage warranty required by public safety entities should include a considerable amount of back up data including acceptance test results and as built drawings since this infrastructure would be owned by the State, tribal and local agencies.

In the USA over the last 2-3 years, Mobile carriers and in building neutral host providers have collected considerable data about mobile network in building coverage. The design of these networks can be shared via a pdf based viewer.

14. No Comment(s)

15. No Comment(s)

15.a. For purposes of the proposed venue and building data base development the number of targeted venues and buildings may be a more accurate basis for funding this particular effort.

15.b. No Comment(s)

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15.c. Yes funding should be phased.

State Funding and Performance Requirements

16. No Comment(s)

17. No Comment(s)

18. No Comment(s)

19. As a primarily Singapore based company our comments around matters related to many questions in this RFI have been No Comment(s) only because we felt it is not our place to make recommendation around those areas.

What we are proposing the creation of a FirstNet V&Bdb built on top of an enterprise software platform like ATRIUM, we believe is important. That in- building performance of commercial mobile networks are now being defined by the not only coverage they provide their 2G, 2.5G, 3G and 3.5G subscribers but the capacity needed to support data apps where these subscribers use their mobile devices most... inside buildings. Why will this not be the reality for first responders as they serve to protect the public and themselves.

In order to do this properly we are proposing that the same steps commercial mobile operators have or are now doing are required, such as:

1) Determine what in-building networks assets they have in place as part of an asset management requirement and to better understand how to upgrade what they already have.
2) Determine and prioritize what venues and building need in building mobile network service improvement, added capacity or which existing networks require upgrades to 4G.
3) To collect in building user level (device level) measurements and performance data and create a V&Bdb of this data for use by network planners.
4) Set up best practices so that this focus is part of everyday life for their engineering and operations teams.
5) Determine what software and tools can allow them to better predict, collaborate, manage, monitor and control the network performance and quality they offer in building subscribers from the outside in or from the inside in order to provide required capacity and/or due to signal attenuation caused by building characteristics, materials, structures etc or where radio signals macro site can not reach such as high rises, elevator shafts, under ground garages, etc...

The enterprise platform we have developed or for that matter any other that may exist can be used to provide value to the entire value chain associated with providing first responder reliable in building LTE data services. In summary, these salient value propositions are to the available from this type of comprehensive enterprise platform:

1) FirstNet can more accurately determine the overall budget for LTE infrastructure since planners can access data collected which will be both relevant and valuable to them to design the marco network and where small cells or DAS networks need to support that in building traffic. Auto design feature of a platform are just a big bonus as it reduces errors, provides more comprehensive estimates and can be done in hours versus days and weeks. plus

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alternative design can be easily accommodate so a costs and benefit considered and a best decision made based on needs and tradeoffs.

2) FirstNet can add significant value to RFP process by making sure targeted building are covered and with the required capacity.
3) FirstNet can from one centralized platform get dashboard and progress reports around every in building project and in what stage of the life cycle it is at and when it is expected to be in service, etc... If a defective antenna is found and recalled one simple query can provide users where and on what floor of what building that antenna is installed.
4) FirstNet by hosting the client server enterprise solution can secure and make this data available to any interest party with a need to know. This data of what is inside a building is unique set of data that will serve purposed for constructing and managing this LTE program but also has perhaps greater value to support first responders in action performing their mission and duties.
5) States, tribal and local entities can all leverage the data and the platform capabilities to manage their own LTE construction programs.
6) The data can be continually updated with more measurements from LTE devices in the hands of first responders and map that data to their very specific locations etc to make sure the network or networks can support them anywhere.

Parting comment, NTIA can view FirstNet not only as an important next step in the way first responders access data, how the funding provided will stimulate and create jobs but it can also be a revenue generator.

Today Singapore has deployed in-building networks to support commercial, private and public safety users in about 1,000 buildings. This close to what has been deployed across the United States. So the need to get more in-building networks in place to serve future LTE device users is very large. Even major carriers are being challenged to get buildings signed up and deployments done to keep up with network growth and very increasing mobile data usage.

FirstNet could include commercial mobile network operator needs for any targeted building currently not covered by them today in the proposed first responder network. This is an already well established business model and several neutral host providers are currently very active in this space.

So the model we are proposing could be where commercial LTE operators have existing or planned networks deployed (now or in future) in buildings FirstNet secures LTE capacity on those networks and where FirstNet funds the deployment a LTE in building network that that network be considered to provide commercial LTE network operators capacity on a monthly re-occurring revenue basis.

The economic driver for this model is that CAPEX and OPEX costs of a indoor DAS systems to support multiple operators and technologies is incremental relative to one operator DAS networks..