December 22 | 14

Request for Proposals

BEMC NOC Modernization

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Ohio | Broadcast Educational Media Commission

Introduction

The Ohio Broadcast Educational Media Commission (BEMC) is seeking vendors to supply both hardware and services for the modernization of its technical facilities on North Star Road in Columbus, Ohio, near the Ohio State University Campus. BEMC is an independent agency of the government of the State of Ohio charged in part with providing assistance to the public television stations in Ohio. A predecessor to the BEMC was eTech Ohio. As part of its mission the BEMC maintains a very close relationship to the stations (collectively OETS, Ohio Educational Television Stations). The stations involved include Think TV (Dayton), ideastream® (Cleveland), WOSU (Columbus), WOUB (Athens), WGTE (Toledo), WBGU (Bowling Green), WCET (Cincinnati), and Western Reserve Public Media (Kent). BEMC is a collaborator with and supplier of services jointly to the stations. In the context of this RFP it is important that OGT, Ohio Government Television, is included in the modernization of playout facilities. OGT originates a 24x7 channel, which is used by the stations. It is currently produced in SD, but will be switching to HD in the near future. We include the playout of OGT in the count of channels in this RFP.

This modernization is intended to support the latest in broadcast technology and provide a platform for delivery of new services using IT networks and other platforms through the stations to consumers. It will enhance the playout capability of the North Star Road Network Operations Center, including the ability to centralize playout for any portion of the 41 continuous channels originated by the stations and BEMC today.

The North Star facility includes connection to an existing statewide interconnection system at gigabit/sec. bandwidth (operated by OARnet on behalf of the stations and BEMC) to provide content sharing services to the stations. Those services include real time playback of content, recording and archiving of content originating from PBS and other distributors, and facilitation of the sharing of content among all of the OETS stations (as files and streams). The systems at North Star have begun to age and this project centers around modernizing the facility and providing enhancements which will allow it to provide cutting edge, highly relevant services well into the future.

Some portions of the current facility are suitable for extension well into the future and will be retained. Among those we believe must be retained are:

- A large Harmonic MediaGrid, which is capable of storing approximately 500 TB of content. We anticipate the new playout platform will be capable of storing approximately one day of material locally for each channel, thus reducing the need to have real time access to the MediaGrid. We recognize that it is possible the ftp FTP bandwidth of the MediaGrid may need to be increased.
- The Utah Scientific routing switcher. With port reassignment as necessary, we believe it is adequate to serve the current and near term future needs as the facility gradually evolves to more and more IP based routing. We recognize that

some offerors may prefer to replace the routing to enable multi-image processing in ways most efficient for their product offerings, but we do not believe the budget warrants replacing the routing as part of this project.

- Most or all of the transmission compression equipment used in the IP delivery to the stations from the North Star NOC is sufficient for the intended purpose. We believe that it is desirable to have direct IP outputs from the playout platform, which would reduce the load on the current MPEG2 based delivery equipment.
- Existing satellite reception equipment will be retained and incorporated into the modernized facility.

This request for proposals does not specify a list of hardware intended to satisfy the requirements. Instead, the intent is to provide a functional specification for what must be supplied. This is a complete service RFP and bidders must supply, install, interface, and debug all systems; and provide supervision of cutover from existing hardware and software systems to new platforms and workflow. Sign off is for a completely working system, not one ready to be debugged by the BEMC staff or those at the stations. Complete system training and commissioning is required.

Funding and Schedule

This project is fully funded in the current State of Ohio biennial budget. The successful bidder must complete the project before the end of June 2016. The total budget for the project has been approved subject to contract review and final release of funds by the State of Ohio up to the maximum of $2,700,000 provided for in law. Proposals exceeding the budget, will not be awarded the contract.

Relationship to OARnet

OARnet is a state owned and operated high speed fiber optic data network, which is tasked to support public broadcasters and education.

> *"Today, the OARnet network consists of more than 1,850 miles of fiber-optic backbone. The network blankets the state, providing connectivity to Ohio's colleges and universities, K-12 schools, public broadcasting stations, academic medical centers, and state, federal and partnering research organizations."*

BEMC is a client of OARnet in the context of this RFP. Some portions of the 'last mile' connections to the stations utilize commercial carriers. A high level drawing of the interconnection is appended to this RFP.

Consultant

The Ohio BEMC has retained the services of John A. Luff as a consultant to advise BEMC on the preparation of this RFP and evaluation of responses. After a contract is awarded for the work described in this RFP Mr. Luff will act as the owners representative in the management of the project. Any contact related to this project by potential bidders with

Mr. Luff after issuance of this RFP during the bidding process and outside of the procedures outlined in the RFP may result in the rejection of any bidder's offer.

Project Description

The new systems installed at both the BEMC facilities and at the stations must, at a minimum, provide playout services that supply all of the content currently received by the stations. The current system topology does not have all content originating from the North Star Network Operations Center (NOC). Rather each station has local satellite reception equipment, as well as file reception equipment (PBS NRT), that supply most of the content. The current role of the NOC is to add capacity and provide for time shifting in a way that enhances station capability.

The modernized NOC facility must as well make it possible for any single stream, or all 41 supported streams across all stations, to be delivered from the North Star in a centralized operations topology. While we expect the majority of streams to operate in a centralized operation, (including remote monitoring from North Star of each station's air operation sampled at the station end) it is possible that a portion of the streams will continue to traffic and automate on local servers at the station(s), combined with some feeds delivered from North Star to the stations over the OARnet private 'WAN'. Any and all content originated from the NOC will play out from the platform bidders are required to supply. The existing platform, with the exception of the MediaGrid, will be decommissioned in an orderly fashion after completion of this project.

To that end, we anticipate the provided facilities (the playout platform) will include the following elements:

- Playout engines based on a Channel in a Box (CIAB) approach. Vendors will be expected to provide an 'N+M' redundancy and failover plan capable of maintaining full service in the event of no less than 10% of the capacity for both HD and SD being out of service at any one time. NOTE: Vendors are requested to supply an option price that would make all channels capable of delivering HD content.
- We ask that offerors propose virtualized playout solutions. This does not mean proposing off site 'cloud based' playout services, which are not acceptable. We are aware that some current virtualized systems may have somewhat lower functionality than might be possible with systems composed of baseband components. Offerors are required to fully identify any limitations on the functionality of the virtualized playout channels in their responses to this RFP. We will entertain proposals in which both virtualized components and baseband components are used in an integrated whole. In any case, we do not anticipate awarding this project on the basis of exclusively baseband solutions.

- Automation for all playout related functions that are tightly coupled to the CIAB platform provided. This will include essence and metadata ingest, media timing, metadata acquisition functions, and movement of the content between ingest, the air platform, and the existing Harmonic MediaGrid nearline storage as appropriate to scheduled playbacks.
- Tight integration with existing station traffic systems over the OARnet WAN environment (all stations use Myers Data Systems ProTrack for traffic).
- Ability to deliver content in the format as received from PBS, or other distributor, including pass through of DVS, surround sound, and the original video format including original aspect ratio as determined by the distributor.
- For all of the 11 HD capable channels the ability, channel by channel, to choose synthesized surround sound at the option of the receiving station.
- Provision of, and integration with, Myers "Hub ProTrack" to aggregate and coordinate all record and playout traffic system communication between the stations and the NOC platform.
- Provision of and integration with a remote monitoring solution suitable for full centralized operation of all stations. Hardware and software will need to be installed in each station to facilitate this function. Further details of our expectations for monitoring are discussed later in this document.
- Implementation of remote monitoring and transmitter remote control over the WAN suitable to fully centralized operation (unattended at the stations). Vendors will not be asked to design transmitter remote control systems, simply to extend existing systems across the WAN and provide the environment for them to be monitored at the North Star NOC (Network Operations Center).
- Tightly coupled with ProTrack Hub, vendors are required to provide for implementation of a PBS supplied NRT (Non Real Time) Station Services Platform (SSP) for delivery of essence and metadata to the NOC. A description of the SSP is appended to this document. BEMC will supply a PBS NRT terminal to the project.
- Interface to the existing MediaGrid for primary bulk storage of content.
- We expect that in the future a robotic tape archive will be added to the system and vendors are asked to provide pricing for hardware and software as an option to their response to this RFP.
- Interface to and control over the existing NOC Utah Scientific routing systems as necessary to make each playout channel fully functional. We require each output channel to have the ability to switch live content received via satellite or other means to air via the existing Utah routing switcher.
- The NOC facilities provided in response to this RFP, must also include the ability to manage and automate one or more playlist(s) which controls 10 outputs of the NOC Utah Scientific 400 router for feeds bypassing the playout platform, originating in individual stations and destined to be delivered over the WAN bandwidth to other stations using existing MPEG 2 infrastructure. BEMC may

repurpose existing ProTrack instances to create the playlist(s) that is the input to this process.

- Connection to existing MPEG 2 encoding and decoding systems as necessary, as well as supply of any additional transmission equipment needed to deliver the streams to the stations. If the new playout platform supplies all content over IP outputs directly to the WAN for delivery to the stations, we require that the offeror be responsible for either integration with the existing decode solutions in place in the system, or supply new decoders as necessary to facilitate all delivery to the stations.
- The playout platform provided must be capable of future expansion of capacity to no less than 55 output channels without fundamental changes to the architecture of the systems. Capacity expansion must include the ability to expand automation and add more instances of a traffic interface. However, there is no need to provision beyond the mandatory deliverables identified in this RFP. Vendors must describe the process of expanding both hardware and software while offering guidance for the expected costs per stream based on 2015 pricing in effect at the time of this RFP. That price is expected to provide the basis for future additional purchases of technology compatible with the intent of the RFP.
- In addition to this capacity expansion, the system must be capable of the future inclusion of services that do not use linear playout, such as VOD and non-real time delivery to other platforms for media consumption. Again, provision of those services now is not part of this RFP and vendors only need assure BEMC that the system can include those capabilities in the future and how that might be accomplished.

Vendors will be responsible for the following services:

- Evaluation of the existing equipment and systems to determine how their proposed solution can best leverage current technology while providing for the future.
- Design and documentation of all systems in their final configuration, as well as any interim documentation necessary to complete an orderly transition from the existing systems to the new platform. Documentation must be supplied in native editable format, along with a PDF version and printed formats appropriate to document complexity and readability. Documentation should include a list of all supplied hardware, software supplied as well as all connections that are part of the completed system.
- Project management for workflow, hardware and software systems. This includes managing regular and effective project communication on the progress (scope, cost, and schedule). BEMC will supply a single point of contact for contractual and technology issues.

- Vendors must supply a testing plan before acceptance testing begins. Such a test plan is subject to approval by BEMC.
- Overall responsibility for all software interfaces necessary to make all systems fully functional as described in their offer.
- Installation and debugging of all hardware and software systems.
- Assistance during shadowing of existing services prior to cutover to new delivery platforms and software on a station-by-station basis.
- Correction of any defects in the performance of any and all software and hardware systems. BEMC and the Vendor will jointly agree on items deemed to be defects in writing not less than 30 days before contract mandatory completion.
- Complete training for NOC operations personnel on supplied hardware and software systems. Proposal should detail the training to be provided including the number of personnel (minimum 15) to be trained and the length of the training period on site at the NOC. All training will be paid for on a second purchase order, which is not part of the budget identified for the project.
- Complete training for NOC technical personnel on the setup and maintenance of the supplied software and hardware systems. Proposal should detail the training to be provided including the number of personnel (minimum 10) to be trained and the length of the training period on site at the NOC.
- Complete training on the remote monitoring system. This training may be offered as web based to engage as many of the station personnel as possible.
- Warranty support by the manufacturer of each hardware and software item. Warranties must pass through in the case of hardware or software supplied by any party not legally part of the bidders team.
- Support services for all systems and software that are fully paid for with a duration of 5 years from final acceptance and final payment. Support services will be paid for with a separate purchase order not as part of the budget identified in this RFP.

Offerors are required to act as a prime contractor, and may utilize subcontractors for any portion of the work so long as all parties and their relationship to the 'prime contractor' are identified in response to this RFP. In all cases the 'prime contractor' who is the sole party legally responsible for bid response and will accept full responsibility for all subcontractors and their performance. Acceptable bidders include both system integrators and manufacturers. The BEMC retains the right to be the sole judge of the suitability of any proposed changes in relationship between the prime contractor and sub contractors, and may at its sole discretion reject any proposed subcontractor change after contract award.

Preservation of Future Capability Options

To the extent possible this RFP seeks offers which will preserve the ability of the NOC to deliver services beyond the linear streams currently required. To do so will require bidders to provide creative responses, which have the ability to respond to changing business needs and technology options. As a result, we strongly believe that a purely baseband replacement of the current facility would not serve our interests. We recognize that the transition from baseband uncompressed video streams to a facility fully embracing delivery of content solely over IT based platforms is challenging. However, we strongly believe that this modernization project must attempt to be responsive to change which is inevitable. We expect solutions offered will have some elements of baseband technology to accommodate live feeds and delivery over existing MPEG 2 transmission equipment, which have baseband inputs. Delivery from the playout platform to IP distribution is preferred, and vendors who propose an IP delivery approach should demonstrate that the signals will be able to be received at the stations exactly as they are today, including the provision of any new decode equipment needed at the stations.

Preferred Solutions

After careful consideration we strongly feel that solutions that make maximum use of software virtualization and SOA (particularly FIMS), are preferred to preserve maximum flexibility in the future. It is important to note that purely service offerings that minimize capital cost in return for high yearly operating cost will not be acceptable.

Virtualization

After careful study we believe that the ability to add services (linear playout or nonlinear delivery of content in the future) is enhanced by moving to playout engines which operate in virtualized hardware environments using COTS IT technology. We are asking for offers that utilize a virtualized environment to provide for new services and also for managing redundancy in the platform provided. The use of blade servers is encouraged, though standalone computers are acceptable.

SOA and FIMS

To the extent possible, we believe that management of the workflow should use SOA (Service Oriented Architecture) and the FIMS (Framework for Interoperable Media Services, a standard developed jointly by the European Broadcasting Union and the Advance Media Workflow Association) when appropriate. Proprietary software managing the systems is still acceptable, but offers with standardized interfaces may be scored higher. However, it is important to note

that we are NOT requiring FIMS or SOA based systems. We recognize to do so would potentially not be possible within the budget available.

Cloud Based Services
The BEMC is aware of recent product introductions that use cloud based computing for some portions of systems compatible with the goals enumerated in the RFP. We have determined that a purely service based offering is not in the best interests of BEMC or the State of Ohio.

Location of ATSC Encoders
This RFP does not assume the delivery of ATSC formatted, or multiplexed, signals ready for emission by the stations. To the contrary, it assumes all signals will be delivered to the stations at mezzanine compression levels for later encoding at ATSC streams in existing station transmission equipment. Thus, no PSIP or ATSC format compliance issues should affect the design of the playout platform.

It is possible that in the future, the ATSC encoders for some, or all, of the stations might be relocated to the NOC, but at this time we do not anticipate any stations will choose to do so, thus is it not part of this RFP.

EAS
The stations will of course still have a legal requirement to participate in EAS. Currently, the stations use a combination of approaches to managing EAS. Some insert the text in their master control switchers, or branding engines. Others use a downstream device to key the text into the stream. Vendors are asked to provide a strategy for insertion of EAS at minimum cost and complexity, realizing that the trigger for EAS must come from the station.

There is a project underway, managed in part by the Ohio Emergency Management Agency (Ohio EMA) and some of the public broadcasters to aggregate all emergency messaging in the state into a common bitstream and deliver it to all users. During the design phase of this modernization project the selected contractor will be asked to participate in a review of approaches to both delivering the bitstream over the OARnet bandwidth and utilizing it to enhance emergency services statewide.

Other Metadata Delivery
The playout platform shall be capable of supplying ratings, vChip, Neilsen encoding, AFD, Dolby Metadata including DialNorm, closed captioning, and all other customary station metadata.

Required Facilities

The following summarizes the required facilities that shall be provided in full. Bidders are cautioned that they are responsible for a working system inclusive of all labor and materials, as well as training and 5 years of warranty regardless of the detailed equipment list provided in response to this RFP.

Playout Channel Count

- Playout facilities for 11 HD channels (all 1080i30 except for two 720p60)
- Playout facilities for 30 SD channels

	HD Playout Channels	SD Playout Channels
OGT	1	0
WBGU	1	2
WCET	1	4
WGTE	1	3
WNEO	2	2
WOSU	1	3
WOUB	1	4
WPTD	2	8
WVIZ	1	4
Totals	**11**	**30**

Traffic Interface

Each playout channel shall be controlled by automation supplied as part of the project. All automation channels must interface with Myers Information Systems, Inc. ProTrack TV traffic systems located at the stations, not at the North Star Road NOC facility. The selected vendor will be responsible to provide all necessary software interfaces to bring the playlist to the NOC using BXF to communicate the data, and to return the log to the stations for reconciliation using BXF as well.

In addition, vendors shall supply and fully interface a single instance of ProTrack Hub at the NOC to aggregate media requests and provide an interface to the supplied automation system.

Currently the BEMC operates ProTrack instances which provide air logs to an existing automation system. Those instances will not be used in the future and should have no impact on this project.

Automation

All responses to this RFP shall provide full playout automation for all 41 channels provided. Operator interfaces shall be fully explained in responses to this RFP, and screen capture stills of all operator screens should be provided in sufficient detail to see all text on screen. It is acceptable to have a dynamic display showing all automation channels in summary form, but can show channels at higher resolution and larger size with 'exceptions' (missing media, media which failed to cue, etc).

Secondary events must be supported to enable graphics insertion, audio over functionality, and other common playout channel capability. Communication between the playout platform automation and ProTrack Hub shall use SMPTE BXF in a fully live mode (individual events in the playlist can be changed without loading a new list).

Interface to PBS NRT

The system supplied must fully interface with a PBS NRT Station Services Platform (SSP) that will be supplied by BEMC. The SSP receives content delivered via satellite from PBS in Alexandria and provides the ability to heal files received with errors. Metadata related to the content is parsed upon delivery and will be made available locally at the NOC to the Hub ProTrack system. When requests are made by stations to move content cached in the SSP to the primary air storage platform, a transcode operation is initiated followed by a request to move a copy of the content to the central playout storage. Through communication between ProTrack and automation, the content is then available for air. An expanded description of NRT functionality is provided as an attachment to this RFP.

Future PBS 'v6' Delivery

PBS has been planning for a replacement of the above current NRT delivery system when their current contracts for satellite services are due to expire (Q3/2016). The details of that replacement are not known at this time with sufficient precision to definitively say how they might affect this project, however we expect the impact to be minor. We will ask the contracted vendor to advise us as plans for NRT replacement advance during the design and construction of the system.

File Transfers to/from Stations and NOC

Interstitial content and programming will be delivered via FTP, or other means, from the stations and OGT to the central storage system at the NOC. In response to this RFP, vendors should explain how content will be discoverable by traffic and automation if it is delivered via manually initiated file transfers. Similarly, though not directly affecting air

operations at the NOC, we expect file transfers between stations and OGT using the same WAN, while bypassing the NOC and NOC storage.

This RFP requires no involvement by the bidder in facilitating transfers between stations. However, as part of the response to the RFP, vendors should make recommendations about file formats for sharing content in these ways. Vendors should describe how, and where, file transcode operations will be necessary to make the system bidders are supplying work in the most seamless fashion with files from all sources (PBS, stations, other program distributors).

NOC Operations Area

The BEMC NOC has an operations console supporting the current operation. It is anticipated that a new operations area may need to be established during the build of the new playout platform and shadow operations period. Bidders shall provide all design and fabrication of an operations console suitable to monitoring and controlling all channels, including automation screens, technical monitoring equipment needed to monitor transport streams at the NOC and at the stations, and transmitter remote controls as appropriate to each station.

Figure 1 Existing BEMC NOC Operations Area

This will include the ability to control software panels, for the routing switchers at each station, that will be used for selecting monitoring feeds delivered from the stations to the NOC. Possible locations for this new console have been identified and will be shown to bidders during the mandatory pre-bid conference in Columbus.

The NOC operations area must be equipped to permit personnel to verify the presence and accuracy of captions including the accurate placement of captions as per the recent FCC NPRM. Loudness measurement on all outputs must be available and loudness that is outside of acceptable tolerances must create an alarm that will draw an operator's attention to the fault.

The monitoring solution provided must display the outputs of the monitoring system at each station provided as part of this RFP, including outbound streams from the NOC and return feeds from the stations. Satellite feeds from PBS shall be monitored full-time. Each of the 41 output channels shall be monitored full-time. The Operators should have

access to waveform monitors that can be routed across all monitored feeds. MPEG syntax monitoring that can monitor and alarm from any of the bit streams available are required. Proposed alterations to the operations console must allow for an existing general-purpose computer for normal office communications.

Remote Monitoring Solution

At each station a monitoring solution must be provided. The basic package will be the same, however each station implementation may be slightly different due to different hardware. The intent is to provide one real-time output that can be fed via existing MPEG2 transmission equipment to the NOC through the station's routing system. That single output will need to be remote controlled from the NOC using a software control panel. Vendors will be asked to provide interface should it be needed to permit this router control. Using that output the NOC can select any available signal for high quality monitoring. Enhancements providing better views into the station are encouraged. Offerors should explain the extent of station monitoring in detail. For instance, vendors might offer to generate a single screen with four signals (quad split) to make monitoring more efficient. Default monitoring selection of failed signals might also be provided.

Critical feeds should be monitored using appropriate techniques, such as low bandwidth monitoring solutions. Checking for signal integrity (audio, video, captions) would in principal be done this way. We expect proposals will monitor the following monitoring at a minimum.

- Each on air stream (for instance 3 SD and 1 HD output to ATSC transmission)
- All Incoming real time feeds from the NOC
- Station transmitter remote control system
- MPEG monitoring of ATSC transport stream

In addition to the above, we expect the full ATSC transport stream to be returned via IP delivery over the WAN to the NOC, where at least two decoders can be switched among the various feeds for troubleshooting purposes.

Communications

As part of the mandatory deliverables, vendors must include a matrix intercom system which will be connected via VOIP to all locations (NINE in total plus the NOC; all seven station origination facilities plus OGT and WCET in Cincinnati, which is controlled from Dayton). Each station will determine the location of individual panels at their facilities. At the NOC panels for the following locations must be provided:

- 3 at the operations console in the NOC
- 2 in the rack area in the NOC

Communication should be possible to all stations at once on a single button, or any single panel should be able to speak to any other. The ability to interface to analog and

digital intercom systems at the station end is desired and bidders should explain fully the capability to make such connections.

Stream Delivery Equipment
BEMC utilizes MPEG-2 encoders for delivery of both HD and SD content to the stations. MPEG-2 encoders are also utilized for returning HD and SD content from stations to the NOC, where it can be routed to other stations, or can be recorded on the existing storage platform.

The proposed system solution must repurpose these delivery channels, as appropriate, in the transition to the new distribution platform. Offerors will be required to provide a plan showing how they will repurpose delivery channels, as appropriate, in the transition to the new distribution platform.

If the new playout platform can provide transport streams directly to the network, thus reducing or eliminating the necessity to repurpose existing encoders, that should be clearly noted in the offerors response.

BEMC utilizes MPEG 2 encoders for delivery of both HD and SD content to the broadcasters, as well as to return content from stations to the NOC where it can be routed to other stations, or can be recorded on the existing storage platform. Those delivery channels will be repurposed as appropriate in the transition to the new distribution platform. Respondents will be required to provide a plan showing how they will do so. If the new playout platform can provide content directly to the network via IP interface and thus reduce the necessity to repurpose existing encoders that should be clearly noted in response to the RFP. Information including all encoding parameters (compression standard, scanning standards supported, sample grid supported (4:2:2, 4:2:0, 4:4:4), number of audio channels and audio coding supported, bit rate, bit depth, etc.) shall be provided in response to the RFP. It is critical that vendors identify what additional decoders or encoders they will be supplying in response to the RFP, and provide for adequate spares for maintaining the system at full capacity.

In addition of the NOC to station links, the proposed system solution must accommodate both full-time monitoring of one full bandwidth signal from each station to the NOC, as well as a program delivery channel (capable of both SD and HD delivery) from the station to the NOC. The NOC monitoring systems must also be capable of streaming a monitoring feed from the NOC to the stations to be used during troubleshooting at the station in collaboration with NOC personnel. (See remote monitoring in this RFP)

NOC infrastructure
The NOC currently has frame synchronizers on all satellite receivers and contribution

links, while utilizing embedded audio for all HD services and discrete audio for SD services.

The NOC is built on embedded audio for all HD services and has frame synchronizers on all satellite receivers and contribution links. SD services currently use discrete audio.

The supplied playout platform must be capable of live content on every channel. It is acceptable for vendors to propose reuse of existing SD and HD frame synchronizers to facilitate live feeds.

The existing router (Utah Scientific Model 400) is adequate for the system envisioned after modernization.

Existing MediaGrid Storage Platform

BEMC intends to use an existing Harmonic MediaGrid as the nearline bulk storage platform for the NOC, as they do today. In the current system, a Harmonic Media Spectrum server platform is used for playout. It will be retired from use after completion of the modernization project. However, the MediaGrid will continue to be used into the future.

The MediaGrid is approximately 471 TB in capacity, and as used after replication of content on the storage it provides 235 TB of usable space. It is approximately 52% full. Content is stored as both SD and HD files. The currently content include 25,182 files in various formats.

Vendors must explain how they will interface with the MediaGrid and any restrictions use will place on their overall approach.

File QC

Vendors are asked to provide a product capable of automated checking of content as it is ingested, including content transferred via WAN from stations, or LAN as in delivery from the PBS NRT SSP. Responses should explain operational aspects of utilizing automated file QC technology, and provide a list of tests the software makes on the content.

Transcoding Existing Content

If the proposed playout platform will require existing content to be transcoded or rewrapped, vendors should provide a plan for migration of content that will not make the content unavailable for use during the cutover period, when some channels may be operating from the new platform while others are still operating from the existing platform.

Media ID

We recognize that a common playout platform will require common media IDs to be used by all stations. Vendors should explain a strategy and methodology for changing the media IDs on existing content to be ready for use in the new playout platform.

File Interchange between Stations/NOC

It is expected that after completion of this project, stations will utilize file transfer for delivery of content to other stations on the WAN more heavily than in the past. We also recognize that utilizing a standardized format (wrapper and essence/metadata) for file interchange is an appropriate way to manage the complexity of variables each station faces. Vendors should specify which format they would recommend for interchange and how that can be implemented most efficiently across the entire network. We believe there may be merit to standardizing on AS-03/PBS to remain compatible with files transferred into the SSP by PBS.

Required Playout Platform functionality

The playout platform must, at a minimum, be capable of all customary master control functions including switching, mixing, audio over/under, and emergency message keying. Two variations of requirements shall be provided:

- For all HD channels in addition to the above minimums, must provide 2D squeeze back with graphical background and a minimum of two independent keyed overlays. Graphics should be template based and be capable of being activated by traffic system commands, which include text to be filled into templates. Audio only clips must be possible and shall be stored for recall by traffic. An additional identification 'bug', with animation capability shall be available on all channels. Mixing of surround sound with audio over clips is required.
- SD channels shall have the same capabilities, with the exception that no squeeze back capabilities are required and two keys in addition to the identification bug are required. The ability to downmix surround sound to stereo for playback is required.

Graphics creation and management software for all stations and the NOC must be part of the provided system. If graphics can be created in other common platforms (i.e. Adobe Creative Suite or others) please explain how graphics templates are created and managed. Also explain how content is delivered to playout channels when called for in playlists from ProTrack.

We expect all playout channels to have local storage for content and software. Vendors should explain how their system will perform in the event the bulk content store is unavailable, or if links between the playout channel and traffic/automation are not available for a period of time. It is highly desirable that each individual channel continue to play out for eight hours without connection to supporting systems.

Supported Formats

All playout channels shall be capable of the following internationally recognized standards:

- 1080i30 – Interlace 59.94 fields per second HDTV
- 720p60 – Progressive 59.94 frames per second HDTV
- 483i30 – Interlaced 59.94 fields per second SDTV

Each playout timeline must be capable of sequentially playing back any of these formats, back to back, with no restrictions. If this is not possible, vendors must explain how they would work around this requirement. BEMC has significant archive SD content, which will be used on all channels.

Each vendor must also explain how multiple compression types can be played by the playout platform they have proposed. In particular, native support for MPEG2, AVC (H.264), and AS-03/PBS files is highly desirable. Vendors should discuss the addition of other compression formats in the future, including H.265, as both an input and output format.

It is desirable that each playout channel be capable of both IP and baseband video (S259 and S292) outputs simultaneously. Vendors should explain how they would transition to IP playback if it is not part of the initial delivered system. If the system does not have baseband outputs, vendors should detail how baseband monitoring and distribution will be accommodated to achieve a complete system.

Redundancy

This operation will support 41 full-time channels and must be provided with adequate online 'hot' spare playout channels to insure that software and hardware updates, channel failure, or other events do not prevent maintaining the full capability of the system. Vendors shall propose a methodology to insure continuity of service to all outputs. This could take the form of a minimum number of SD and/or HD channels capable of being inserted in any service output in the event of an interruption of service, preferably on an automated basis. In such a case, the playlist and content for the failed or unavailable channel shall be duplicated on a redundant channel and the replacement channel switched into the outgoing service with a minimum of human interaction.

Vendors may also propose other strategies, including 'warm spares' which require more human interaction, or 'cold spares' on a shelf. Vendors shall fully describe how their redundancy strategy will operate and provide a prediction of the system availability specifications based on demonstrable metrics if possible. Responses that offer

automated channel replacement may be scored higher than those that don't. We do not believe that the budget can support '1 for 1' redundancy approaches.

This RFP does not specify the minimum number of redundant channels, but vendors proposing less than 2 redundant HD channels and 3 redundant SD channels must explain how their proposed solution will adequately protect the integrity of air operations.

Ingest
Offerors must describe how content that exists today on recorded media, including videotape and disk storage, will be ingested into the playout platform and the workflow needed to deliver it to the Harmonic MediaGrid storage platform. Content may also be acquired from live baseband feeds, satellite (either single or multi-program streams), or as file transfers.

Bidders must detail how content that exists today on recorded media, including videotape and disk storage will be ingested into the playout platform and the workflow needed to deliver it to the Harmonic MediaGrid storage platform. Content may also be acquired from live baseband feeds, via satellite as either single or multi-program streams, or as file transfers. Vendors should detail the ingest process their system provides, including timing of content, ingest and creation of metadata, storing content and moving it to the appropriate storage platform, and interfacing with traffic to insure all content is available to air operations.

Vendors shall supply the ability to record 12 simultaneous feeds with at least 8 being HD capable.

Complete Nature of System
Vendors are required to provide a complete, END-TO-END system capable of achieving the normal operations of station air playback, acquisition and storage of media, preparation for air, and remote monitoring of all station facilities in such a manner as to facilitate smooth operations that one can expect from any broadcaster today. The bidding party is fully responsible to BEMC for the entire package, including any work, hardware, or software provided by subcontractors. Signoff will not occur until the vendor has satisfied BEMC of the completeness and full functionality of the complete system. BEMC will be the sole judge of whether the contract has been fulfilled.

Options

Disaster Recovery Options
BEMC is **not** requesting a disaster recovery plan or hardware as part of this RFP. However, the stations have asked that if the playout solution lends itself to a stand

alone stand-alone ‘backup’ channel, which could be implemented at station cost and on station property, that the offeror provide a quoted price per channel in a stand-alone configuration that would be suitable for such purpose. This could be another version of the hardware, or in the case of a virtualized playout solution, the quoted backup might be a CIAB stand-alone solution using a version of the same automation as the main NOC system. If such an approach is available, vendors should describe the ways in which content could be kept current (for example, evergreen content or content from the current day’s schedule).

Bidders shall supply a price for stand-alone channels to be installed at station sites at station expense. In the Response, Bidders shall fully describe the capability of this option, and how it will receive content and operate independently from the NOC. There is no guarantee any Disaster Recovery channels will be purchased by the stations. This RFP does not include the purchase of any such systems, which should not be included in the Offeror’s pricing.

Logging System

Bidders shall supply a price for a Logging System to be installed at the NOC. The Response shall fully describe the system proposed. The logging system should be capable of logging audio and video content from all 41 playout channels at all times. The system should be equipped with sufficient storage to allow 90 days of unattended operation before any logged content must be moved to alternative storage.

Features should be fully described, including how measurement and logging of loudness, all captions, video description, emergency messages and other services is accomplished. Logged content should be available to the WAN connecting the NOC to the stations and ‘player’ applications should be supplied for all locations. If it is possible to install the system in a ‘distributed network’, with logging inputs connected from the station end, bidders may offer that option as well. Bidders must detail all operational and technical aspects of the system.

Archive Option

Though no archive system or specific provisions are part of the required deliverables in this RFP, we seek optional pricing and technology planning for adding a robotic tape archive to the completed system. Bidders should assume LTO 6 capable drives using SMPTE AXF formatted content. For planning purposes vendors should assume that 40 hours of HD content could be stored in any 24 hour period, and 10 hours restored from the archive to online playout in 24 hours. The initial size of the archive should be 400 TB, expandable to 1000 TB.

Vendors should fully explain management of the content and, if available, how proxy copies can be viewed by stations across the WAN, as well as by BEMC staff in the NOC and NOC traffic department.

The system proposed should be capable of managing content in the NOC system and ideally capable of archiving content over the WAN from stations as well. (Three of the stations currently have local tape archives and the other 4 do not.)

Design Process

After contract award and successful negotiation of a suitable contract, BEMC will host a meeting to kick off the process. All personnel involved in the design and management of the project will be expected to attend. That meeting will be within 10 calendar days of awarding of the contract. The project schedule must be provided in response to this RFP and will be accepted or modified at that meeting, along with a comprehensive list of goals the project will achieve.

BEMC will require at least two separate design reviews, which may be conducted in part by videoconference (BEMC operates a large videoconferencing system which can be made available during the project for meetings with the design team or suppliers). The first review, Preliminary Design Review, will be expected to outline the full scope of the system design including rack layouts and conceptual interconnection drawings that identify all hardware to be supplied. At this review, all software interfaces must be identified. Where they can be, interfaces should be demonstrated in person or via remote connection. If conceptual software integration is not complete the vendor must provide a timeline and list of resources dedicated to completing the work within the time allotted.

The second design review is Critical Design Review. At this review, all single line drawings detailing the entire installation must be presented, complete with IP address and port assignments ready for delivery to installation personnel. By this time, we will expect a demonstration of system functionality to have been achieved. That will include the ability to interface all software and hardware into a complete and working system. At the conclusion of the Critical Design Review, BEMC will approve drawings as annotated for installation at the NOC and all stations.

Installation

Due to the scale of the project and the number of sites involved (BEMC and eight station facilities), we expect the vendor to demonstrate that they are capable of installation of all systems within the time available. That will mean more than one team installing the NOC facilities and multiple station facilities in approximately a two month period.

To achieve the shadowing of the stations from the centralized hub at the NOC, it is expected that installation of at least one remote monitoring package at a station and the NOC facilities needed to support it will need to be completed early. While there is no fixed schedule order for completing station implementation, it may be advantageous

to use WOSU in Columbus as the first site shadowed due to proximity (both are in Columbus) and the ability for bidder's staff to actively participate at both sites with ease. That determination will be made jointly by BEMC and the successful bidder.

The implementation schedule must also take into account changes to the current NOC operations console needed to accommodate simultaneous operation using the current system while completing an orderly transition to the new playout platform. Bidders are asked to describe how they will accomplish this changeover.

Form of Response and Bidding Procedures

This RFP requires responses to be delivered not later than January 30, 2015. It also requests attendance at a pre-bid conference at the BEMC offices in Columbus on January 16, 2015 at 1000 EST. Bidders will be required to register their intent to make an offer and RSVP for the bidder's conference not later than 5 business days before the conference. Registration will be via the email address rfp@broadcast.ohio.gov. Videoconferencing is available for the Bidders Conference, but bidders are strongly encouraged to attend in person.

The bidder conference will allow for visiting the technical facility, the current NOC, and give bidders an opportunity to understand the physical environment where the installation will take place. Time for questions will be provided. Representatives of each station will be present to answer any questions about how the monitoring package will interface in their individual stations and where it will be mounted (pictures of each location are included in this RFP).

After initial review of the responses to the RFP, the Evaluation Committee may, at it's discretion, ask for presentations from some of the respondents to clarify issues not fully understood in their offers prior to making a recommendation. Those meetings, if necessary, will take place in Columbus around the week of February 23, 2015.

All responses to the RFP must be delivered in sealed envelopes. We seek a single proposal package with a detailed cost analysis showing labor and equipment prices separated out, with equipment pricing identified by line (divisible hardware shall have individual prices identified).

Proposals will be evaluated by a review committee consisting of representatives from BEMC, BEMC's consultant (who acts as the 'Owner's Representative'), OETS, and representatives from the stations. Responses will be scored in a manner explained later in this RFP.

Between the issuance of this RFP and Contract Award, contact by any party (prime contractor or sub contractor) with any employees of the BEMC, any employee of any of the stations, or the Consultant to the BEMC (John Luff) may lead to invalidating any bidders response.

Questions may be submitted via the RFP email address beginning with the issuance of the RFP and closing on 01/23/2015 at 1200 EST. A full description of the Q&A procedure will be available at the time of the Bidder's Conference.

After the review and scoring process is complete, each offer will be scored and ranked. Though we seek the lowest responsible offer, the Act establishing the BEMC does not require acceptance of the lowest bid. Thus price will affect the score, but not necessarily override the technical recommendation.

After review of the final scoring, the BEMC may request a 'best and final' offer before proceeding to contract award at the sole discretion of BEMC, and may ask for clarifications of any part of the response, which is not fully understood. We may also ask for presentations from any vendor prior to proceeding to contract award. The intent as of the time of release of the RFP is to award this contract before March 1, 2015.

Timeline

Due to the State of Ohio budget year, it is necessary that the project be complete and all invoices paid before the payment cutoff date in mid June, 2016. This will require that substantial completion be achieved by May 1, 2016, allowing 30 days for satisfaction of any defects.

The rest of the timeline should be proposed in response to this RFP. However, it is our belief that testing and shadow operations must commence in before the end of 2015 to allow for training and resolution of any technology issues.

A sample time line showing the critical milestones is included as an attachment to this RFP.

Bidders Required Information

Bidders are required to provide the following information. Failure to provide any of the required information may result in the rejection of Part One of the response and result the return of Part Two of the response unopened, invalidating the offer completely.

- Identification of the Prime Contractor and all Subcontractors, their legal names and addresses, identification of ownership (public corporation name, or if privately owned anyone owning more than 25%, or controlling interest), the last two year's income statement and balance sheet as of the end of the last fiscal year.

- Two reference projects of similar scale and scope within the last two years (with contact names, email addresses, and phone numbers).
- Name and resume of proposed Project Manager, and a statement that this individual will be assigned throughout the project. All official project communication will be through this person.
- Name of a Customer Relations Manager who will be available as necessary throughout the entire project.
- Name and resume of the Engineer in Charge for the project and a statement that this individual will be assigned throughout the project.
- Affirmation that the bidder has not had contact related to this project with any employees of the BEMC, OETS, the Consultant to BEMC, or any employee of any of the stations since the date the RFP was issued.
- Timeline identifying March 1, 2015 as Contract Award and June 10, 2016 (or sooner) as Project Completion, and showing all significant milestones during the project, including any required technical and installation sign off dates necessary to meet the completion date specified.
- Affirmation that the bidder understands that they are responsible for any and all hardware, software, and services necessary to meet the goals of the project within the specified time.
- Disclosure of any Change Process the bidders intends to use in the project. Note, Change Orders will only be accepted if signed in hard copy form by a representative identified by the BEMC. This is a fixed price contract with a budget that cannot be exceeded. Technical changes which do not affect bidder pricing will still be required to be done with appropriate change authorization.
- An affirmation that, if successful, the company will provide a performance bond in the full amount of the project.
- Proposed Payment Schedule based upon measurable milestones. No less than 10% can be due with the final invoice.
- Proposed contract between the BEMC and the Offeror acceptable to the Offeror. (BEMC reserves the right to require use of a State of Ohio approved contract)
- If any part of the information in the Part One Response is confidential, it must be clearly identified as such.

Bidders are required to provide sufficient technical information to fully evaluate their response. Sales brochures are welcomed, but may be insufficient to evaluate the offer. If additional information can be supplied under NDA, please identify that fact. Provide as much technical depth as is possible in all responses. In the response, BEMC requires an enumerated list of equipment the vendor will supply with sufficient detail for BEMC to confirm the offeror has covered all required deliverables.

All information in the offer must be provided in written form (four copies, in four envelopes identified clearly with the Bid Identification Number and the Name of the

bidding entity, and a contact person if there are any questions about the content). In addition the entirety of the offer must be supplied in a single Adobe PDF. That file should be provided on electronic storage devices, such as CDROM or USB storage device. The electronic copies must be clearly identified with the bidder's name.

Response Scoring

Responses will be scored numerically and ranked on total points achieved on all measures. Since price is evaluated separately after the Technical Responses are vetted and scored, it is not included in the ranking. Price will account for 20% of the final total, taking into account the ranking established on the Technical Response. The following is the list of criteria that will form the basis of the ranking, and the factors to be considered:

Measure		Section Weighting
	TOTAL	**100**
Bidder		
TOTAL POINTS		**10**
	Completeness of Response	
	Required Statements Provided	
	Bondable	
	Payment Schedule	
	Financial Stability	
	Project Manager Resume	
	Engineer Resume	
	Prime Bidder Credentials	
	Partner Credentials	
	References	
Technology Summary		
TOTAL POINTS		**10**
	Provides Virtualization of Playout	
	Use of WAN 'cloud services'	
	Mix of baseband and IP Approaches	
	Forward Looking Concepts	
Playout Technology		
TOTAL POINTS		**20**
	Playout Channel Features	
	Storage	
	Graphics Look	
	Graphics Import & Management	
	Expandability	
	SD/HD Capability	
	Redundancy and failover Capability	
	SDI/IP Playout Interface	
	Compression Technology	
	AS-03 Compatibility	
	File Formats Supported	
	EAS Capability	
	SNMP Interface	
	Live Inputs	
	Playout Redundancy	
Automation		

TOTAL POINTS	**15**
ProTrack Compatibility	
ProTrack Hub Installation	
BXF Interface	
BXF Live Log	
Operator Interface Screen	
WAN Automation Interface at Station	
Live Breakaway/Rejoin	
Secondary Events	
Control of AFD	
Ingest Capabilities	
Automation Platform	
Recording Scheduling/Control Capabilities	

Infrastructure

TOTAL POINTS	**10**
Router Interface at BEMC	
Limited Router Interface at Station	
Embedded Audio Support	
Discrete Audio Support	
Reuse of Existing Infrastructure	
Channel Delivery at Stations	
Remote Control of OGT Playout	
Monitor Wall	
Operations Console	

Remote Monitoring Solution

TOTAL POINTS	**10**
Control of Station Router over WAN	
Monitoring & Control of Transmitters over WAN	
Thumbnails Provided	
Real Time Full Screen Monitoring	
Analysis and Trouble Shooting Tools	
Operator Interface at BEMC NOC	
Expandability	
Remote logging system access and QC	

Schedule

TOTAL POINTS	**10**
Meets Required Completion Date	
Provided Detailed Schedule Development	

Installation

TOTAL POINTS	**5**
Timeliness of Installation Start	
Installation at Stations	
Plan for Shadow Operations	
Plan for NOC Operations Console	

File transfer and transcoding Capability

TOTAL POINTS	**5**
File transfer between BEMC NOC and stations	
File transcoding	

Support and Maintenance Contract

TOTAL POINTS	**5**
Tech Support after Installations and Commissions	
Future Support Contract	

A package containing four copies of the response in written form must be provided (four copies, in four envelopes identified clearly with the Bid Identification Number and the Name of the bidding entity, and a contact person if there are any questions about the content). Accompanying those responses must be three electronic copies of the complete response in a single Adobe PDF file secured with separate passwords for both opening and printing (copying should not be prevented by password). The storage media must be clearly identified with the bidder's name and will be returned to the bidders upon completion of the evaluation and scoring.

In Summary, here is the packaging required of all responses:

1. One shipment for all information supplied
    a. Detailed financial offer for additional playout channels suitable for station backup use at the stations (to be purchased at station option outside this RFP at a guaranteed price for three years).
    b. Option for logging system as described above.
    c. Option for archive system and software
    d. Complete equipment list with pricing
    e. Proposed payment schedule
    f. Required statements

Station Rack Space – Remote monitoring Package

The following pictures represent areas in the station's rack rooms where the equipment for the Remote Monitoring Package will be located.

Figure 2 WOSU Rack Space

Figure 3 WOUB Rack Space

Figure 4 WBGU Rack Space

Figure 5 WGTE Rack Space

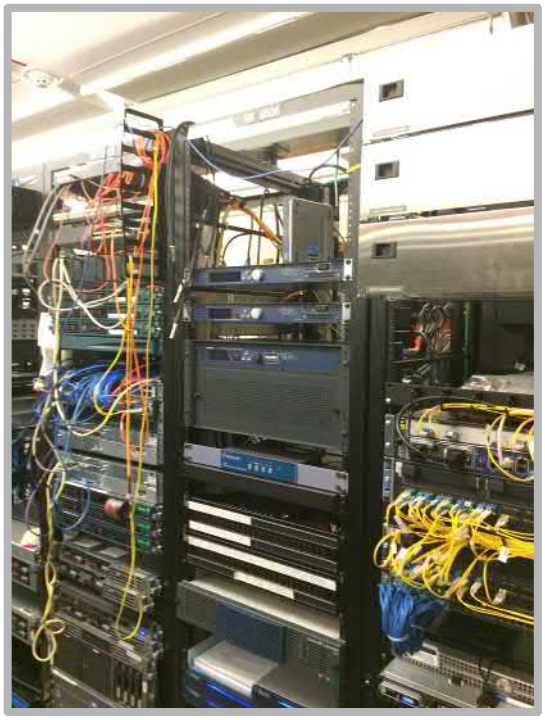


Figure 6 ideastream Rack Space

Figure 7 WNEO Rack Space

Figure 8 ThinkTV Rack Space

PBS Non-Real Time Terminal Description

"*Overview of NRT System*

Summary: Overview of NRT system - what it is, brief explanation of each component

Key Words: File Transfer System, SSP, FileStore, AS-03, CSP, TDP

Classification: External

FTS - The File Transfer System (FTS) is the system used to distribute files in Non-Real-Time over the Interconnection System. The FTS has three components: a transmission component at the PBS Network Operations Center (NOC), a redundant pair of receivers at each station, and a management and configuration server, also at the NOC. The major advantage provided by the NRT FTS system compared to the Real-Time system, is when occasional random errors and occasional periods of Ku-band rain fade burst errors (up to several minutes)

during transfer, the FTS has a mechanism to replace or repair damaged files, without the needed intervention of Member Station personnel.

SSP - The overall purpose of the Station Services Platform (SSP) software is to adapt the NRT System to the unique operating environment of each station. It provides the station interface to the NRT System and enables stations to perform all of the functions to move files from the NRT FileStore device into the station's server. Additionally, the (SSP) provides a higher level of fault tolerance in comparison to the RT system, by constantly monitoring the station-side NRT components for errors and exception conditions and provides alerts.

NRT FileStore - The NRT FileStore is an HP Proliant DL370G6 server with a 12 disk RAID array. It houses the storage of AS-03 program files for the ten-day retention period and is also the host for the Station Services Platform (SSP) software. It communicates with the FTS Receivers to pull in new files as they arrive and provides status information via the TDP.

CSP - The objective of the CSP is to provide an interface to the network traffic system to allow the scheduling of content for delivery via the File Transfer System (FTS). In order to achieve this result, the CSP manages the following tasks:

- *Ingest – importation of transfer lists from the PBS Broadview Scheduling System.*
- *Queue management/ optimization – prioritizing transfer of content and preventing unnecessary re-transmission of content.*
- *Verification of content – ensuring content is present prior to transmission.*
- *Control of FTS – initiating file transfers to stations using FTS.*
- *Status and reporting – providing file transfer status updates and reports.*

- *TDP –The TDP is a virtual private network (VPN) established to enable PBS to remotely monitor the NRT Systems at each station. It employs a very small channel, usually DSL or a Cable Modem, to allow the equipment at the station to be remotely checked for both the arrival of files and for the health of the NRT equipment. PBS will be able to detect when a program file has arrived and whether any errors have occurred. Any files that are missing bits of data can be repaired prior to the file becoming available on the station's server. Also, PBS will know if any equipment in the NRT System is failing and can alert station engineers or arrange for a replacement component. The Terrestrial Data Path (TDP) is implemented via the Hughes Network Services managed network service offering. Hughes purchases IP connectivity on the open market and deploys IPsec equipment to each endpoint. Hughes manages the connectivity from its own NOC, and provides an IP data utility to PBS to monitor the NRT System. "*

Myers ProTrack Hub Description

The following was produced by Myers in support of this project. BEMC would like to remind bidders that the system described in the following text was not produced by BEMC or in collaboration with BEMC. However it is our expectation that bidders will either supply the Myers described solution or provide a system fully equivalent in all respects to this solution.

Myers – OBEMC NOC Collaborative Project

Overview:

This document outlines the high-level product, services and workflows of the Myers ProTrack Hub & Spoke™ environment for schedule, content, and metadata exchange for the Ohio Broadcast Educational Media Commission (OBEMC).

ProTrack™ is currently deployed and actively utilized at all nine Ohio public television stations (Spokes). As such, Myers will provide the required development and integration services to connect the Spokes' instance of ProTrack TV to the centralized ProTrack Hub, to be installed at the OBEMC's Network Operations Center (NOC).

The ProTrack Hub provides content management and aggregates media acquisition needs across all Spokes, providing consolidated instructions to automation. Services will include: processing initial metadata; processing updates; capturing content revisions; and tracking media locations on playout and archive storage devices at the NOC.

The ProTrack Hub coordinates broadcast management & traffic services using BXF standard protocols for metadata exchange to efficiently communicate with automation. It is the on-air driver for delivering playback instructions to automation via standardized Play-list exports (including primary and secondary events).

"Live Log" Play-list updates may be included to accommodate changes to logs that are currently running in master control. The ProTrack Hub will also provide Purge Orders and Pull-lists to manage content workflows.

For acquisition of real-time and non-real-time content, the ProTrack Hub will send Record-list/Orders to automation, including material registration information. In addition, the ProTrack Hub will send Ingest/Dub Orders to facilitate the delivery of metadata for independently ingested content. It will assign a source ID and provide metadata, for all Spoke and NOC contributions, to pre-register assets for recorded, ingested and transferred material.

ProTrack Hub will import As-Run reconciliation logs; Media Update messages that include multiple media markups; Purge Confirm messages, and purge messages indicating content removal by the automation side of the house.

To further define markups, automation will need to provide the ProTrack Hub different markup timings for the same material. For example, PBS material may need a single SOM with two EOM messages. One EOM is inserted at the end of the PBS logo and one EOM is inserted at the end of each program package. On some occasions, promotional material for a show is sent after the end of the program package, requiring an EOM for a third version. There are also segmented programs where each call letter station may air the same base program information, but segment and play back the material differently, thus creating another marked-up version. These marked-up versions will use the same base file using tags to play back the different versions.

Example Material Markups –

Full:

First frame of video to last frame of video – packaged out to include post-logo fill. (Excluding any material preceded by black, such as a promo fed at the tail of program.)

Logo:

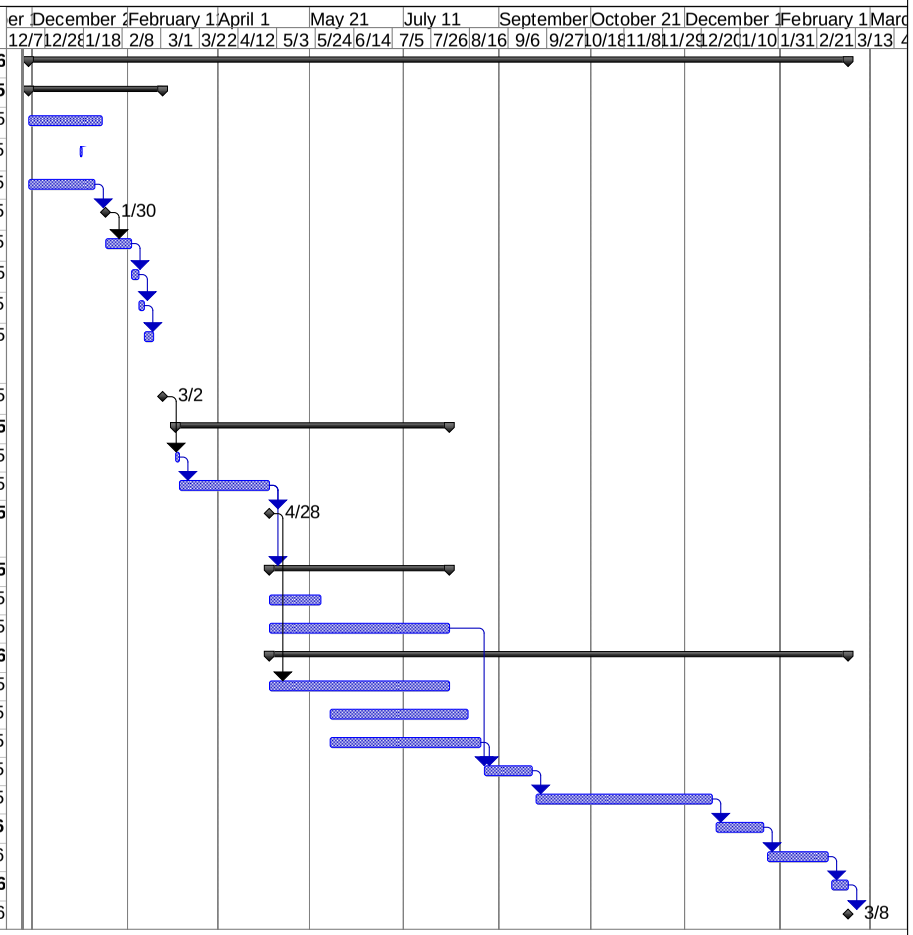
First frame of video to end of Logo.

Segmented:

All program material with internal breaks (i.e. pledge, virtual events, internal breaks, etc.) will provide timings for each individual segment (as well as the full length).

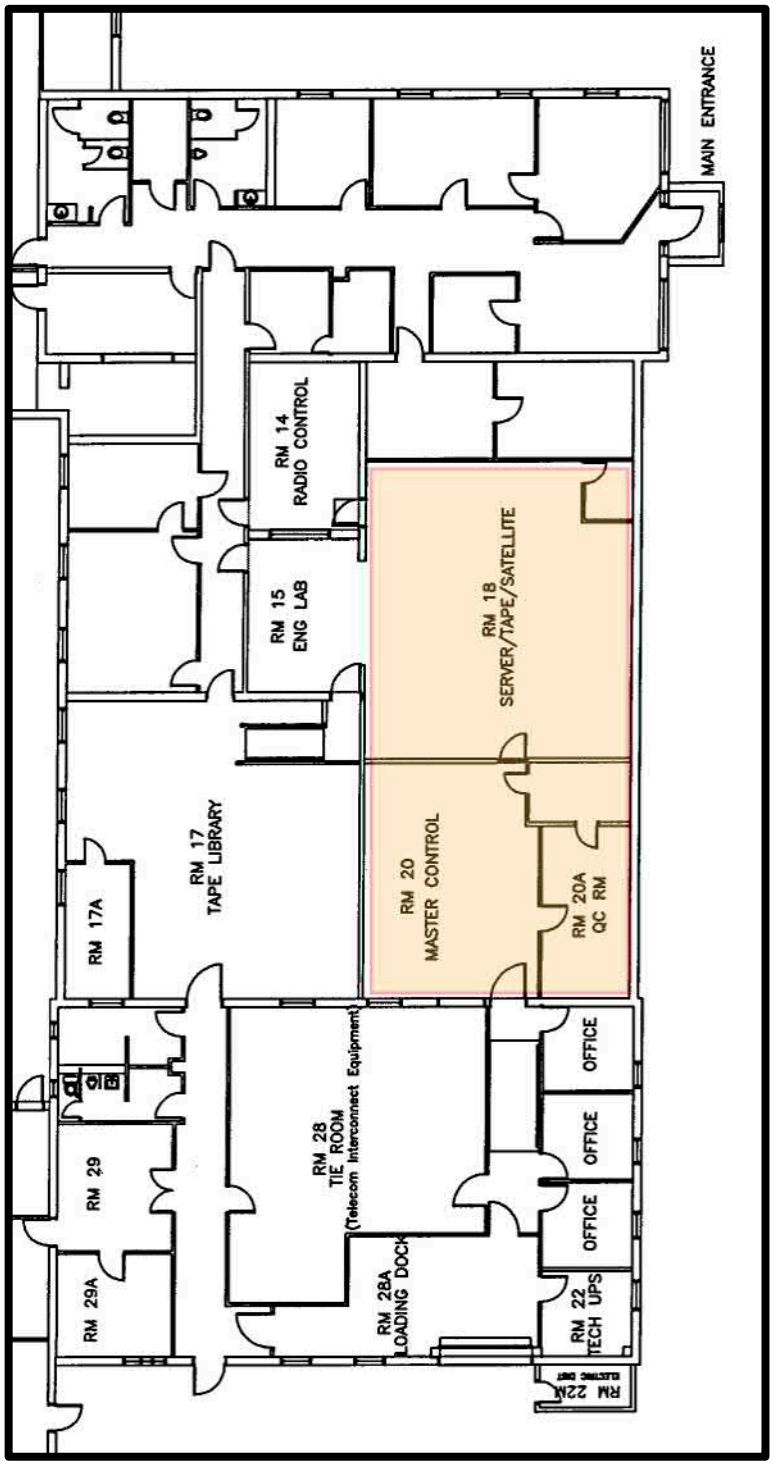
Ohio Broadcast and Educational Media Commission Northstar Modernization Project

ID	Task Name	Duration	Start	Finish
1	**BEMC Modernization Project**	**318 days**	**Fri 12/19/14**	**Tue 3/8/16**
2	**Bidding**	**51 days**	**Fri 12/19/14**	**Mon 3/2/15**
3	Bid Period	28 days	Fri 12/19/14	Tue 1/27/15
4	**Mandatory Pre-Bid Meeting**	1 day	Fri 1/16/15	Fri 1/16/15
5	Vendor Question Period	26 days	Fri 12/19/14	Fri 1/23/15
6	Bid Closing	0 days	Fri 1/30/15	Fri 1/30/15
7	Bid Evaluation	10 days	Fri 1/30/15	Thu 2/12/15
8	Vendor Presentations	2 days	Fri 2/13/15	Mon 2/16/15
9	Vendor Best and Final Bids	3 days	Tue 2/17/15	Thu 2/19/15
10	Evaluation of Best and Final Offers	3 days	Fri 2/20/15	Tue 2/24/15
11	Bid Award	0 days	Mon 3/2/15	Mon 3/2/15
12	**System Design**	**107 days**	**Mon 3/9/15**	**Tue 8/4/15**
13	Kick Off Meeting	2 days	Mon 3/9/15	Tue 3/10/15
14	System Design Phase	35 days	Wed 3/11/15	Tue 4/28/15
15	**Design Approval & Design Frozen**	**0 days**	**Tue 4/28/15**	**Tue 4/28/15**
16	**Documentation**	**70 days**	**Wed 4/29/15**	**Tue 8/4/15**
17	Construction Documentation	20 days	Wed 4/29/15	Tue 5/26/15
18	Software Integration	70 days	Wed 4/29/15	Tue 8/4/15
19	**System Deployment**	**225 days**	**Wed 4/29/15**	**Tue 3/8/16**
20	Equipment Ordering & Delivery	70 days	Wed 4/29/15	Tue 8/4/15
21	Station Deployment	55 days	Mon 6/1/15	Fri 8/14/15
22	Northstar Deployment	60 days	Mon 6/1/15	Fri 8/21/15
23	Commissioning	20 days	Mon 8/24/15	Fri 9/18/15
24	Shadow Existing Streams	70 days	Mon 9/21/15	Fri 12/25/15
25	**Acceptance Testing**	**20 days**	**Mon 12/28/15**	**Fri 1/22/16**
26	Punch List	25 days	Mon 1/25/16	Fri 2/26/16
27	**Final Acceptance**	**7 days**	**Mon 2/29/16**	**Tue 3/8/16**
28	Project Completion	0 days	Tue 3/8/16	Tue 3/8/16

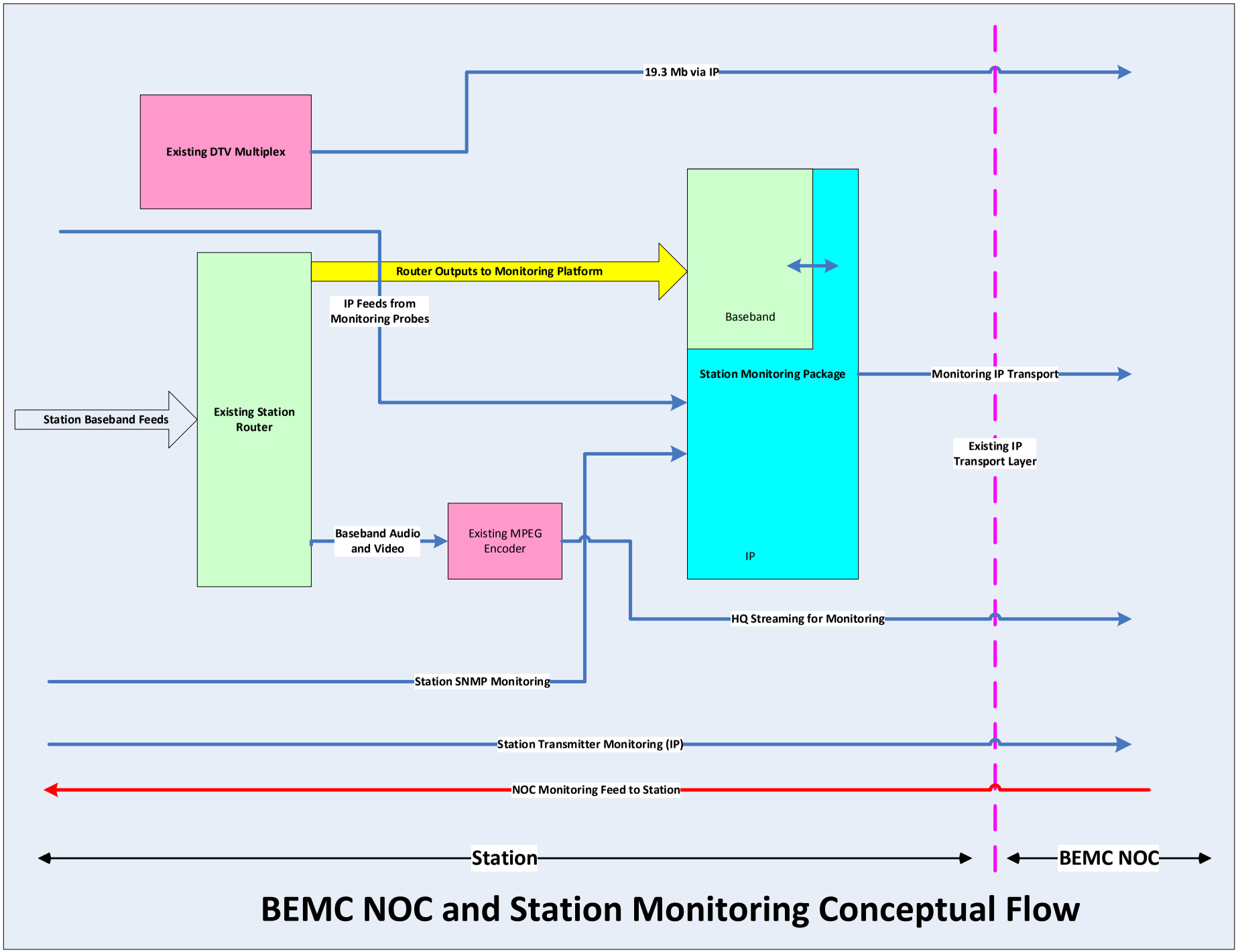


Project: BEMC Modernization Schedul
Date: Tue 12/16/14

Task	External Milestone	Manual Summary Rollup
Split	Inactive Task	Manual Summary
Milestone	Inactive Milestone	Start-only
Summary	Inactive Summary	Finish-only
Project Summary	Manual Task	Progress
External Tasks	Duration-only	Deadline



BEMC North Star Facility Floor Plan (all bidder work in shaded area)



BEMC NOC and Station Monitoring Conceptual Flow