

# Best Practices for Enterprise Data Management

Greg Pleiss and Don Hong discuss a procurement and deployment pattern for data management including architecture considerations and necessary features.

<http://video.esri.com/watch/672/best-practices-for-enterprise-data-management>

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## Video Transcription

**00:01** Thanks for joining us here. I want to get started on the Best Practices for Enterprise Data Management session. I'm Greg Pleiss. This is Don Hong.

**00:06** We're both from Esri's Professional Services organization, and we were asked by the conference team to give a little presentation...

**00:13** ...on some of our experiences through Professional Services engagements and doing enterprise data management activities...

**00:20** ...and present to you some of the best practices and the approaches that we're following today...

**00:25** ...in our project work for enterprise data management.

**00:29** Quick look at the agenda here...

**00:32** ...the topics we're going to talk a little bit about different procurement approaches for enterprise data management systems.

**00:37** We'll dive in a little more detail to the necessary features and what the commercial off-the-shelf, or COTS...

**00:43** ...architecture looks like to support these enterprise data management systems.

**00:48** Don's going to jump in then to some deployment considerations...

**00:52** ...the best practices and the things you need to think about when deploying a COTS-based enterprise data management system.

**00:58** We'll wrap it up with some summary and hopefully have some time for some Q&A at the end, if we can keep on track here relatively.

**01:07** So I wanted to start out by just kind of laying out the spectrum of different approaches for procuring enterprise systems...

**01:14** ...and this truly is a spectrum. On one end, we've got the entirely custom-built systems. These are 100 percent custom code...

**01:23** ...designed to meet very specific business needs.

**01:26** On the other end of the spectrum, what we're seeing emerging now is the ability to build a COTS-based system...

**01:31** ...really contrasting the custom system. It's based on commercial software. It's configured with minimal development.

**01:39** In the middle of that spectrum, then, we have the notion of a component-based system.

**01:44** This is systems that use COTS-based components but still use fairly significant amounts of custom code...

**01:50** ...to glue those pieces together and make a holistic system.

**01:53** So we wanted to really start to zero in on what we've seen in our experience is becoming more and more possible...

**02:01** ...and more and more a best practice for building these enterprise data management systems...

**02:06** ...and that's moving as far to the right of the spectrum as we can and really trying to embrace the COTS foundation and configuring, not customizing.

**02:16** [Audience question] What does COTS mean?

**02:17** COTS is commercial off-the-shelf. So commercial off-the-shelf technology, or COTS.

**02:21** And you'll hear me say COTS quite a bit, so thank you for asking for that clarification.

**02:27** As we compare these different approaches, again on the left here, the custom systems are really custom-built to meet specific business goals.

**02:36** Contrast that with a COTS-based system, where we're talking about orchestrating COTS technology to meet some business objectives.

**02:45** On the left, custom systems have a heavy emphasis on software development. We're building new software.

**02:50** We're doing software engineering to build this system.

**02:54** On the right, a COTS system has that emphasis on defining workflows and configuring the commercial software to work...

**03:00** Another real distinction here in the approaches. Custom-based systems really get into detailed feature function requirements to do their design.

**03:01** ...to meet the end business goals.

**03:13** They're going to focus heavily on how things are done. On the right, with a COTS-based system, we really want to understand...

**03:20** ...what needs to happen, what are the driving business goals, and how can we then configure the COTS and align it with existing COTS capability.

**03:27** So we're less concerned with how we get things done and more concerned with...

**03:32** ...are we meeting the right business goals and doing it in an efficient way.

**03:37** Again, probably the biggest distinction here in the different approaches...

**03:41** ...custom systems, we're talking about considerable development time, considerable development effort.

**03:47** It's a software engineering task to build a very focused system. COTS-based system...

**03:51** ...we try to minimize that development time and effort and really rapidly get a system that's meeting business needs into the user's hands.

**04:00** And finally, probably the biggest distinction here, this last bullet...

**04:05** ...custom systems end up being very static. They do what they're designed to do and they do it very well.

**04:11** A year later, when the business needs to change, when the process needs to change...

**04:16** ...you can't adapt that custom system without inputting more, another round of considerable effort and time and development to upgrade it.

**04:25** A COTS system, on the other hand, can continually evolve with the COTS releases and take advantage of those incremental releases...

**04:31** ...in the COTS software to be a much more dynamic system and a much more agile and adaptable system for your organization.

**04:41** So what is the COTS approach, where we talk about the COTS approach for building enterprise data management.

**04:47** It really is all about going with the grain. We want to maximize the investment in our commercial software.

**04:53** We want to meet business goals by leveraging that commercial software...

**04:58** ...so that means configuring and extending the COTS base and avoiding developing new software as much as possible.

**05:08** Another hallmark of this is really its ability to provide immediate capability.

**05:12** We already have a foundation in the commercial software that can deliver capability today.

**05:17** So we're not talking about a year-long or a six-month-long requirement design phase before we even begin building the enterprise system.

**05:25** We're talking about leveraging that commercial platform immediately and getting it in the users' hands...

**05:31** ...and then incrementally improving and continually improving that throughout the COTS life cycle.

**05:37** And finally, it does...another distinction here, and I kind of alluded to it just a second ago...

**05:42** ...is that the COTS approach really engages users early and often to iteratively improve that system.

**05:49** So again, we're not talking about large, upfront requirement design initiatives before users have a system in their hands...

**05:56** ...to start meeting business goals and providing feedback on where things can be better, where things should be different.

**06:02** So that really is a big differentiator for a COTS-based enterprise system.

**06:09** So this really is a different way of thinking for a lot of people and a lot of organizations.

**06:15** It's going to challenge the common procurement models. Requirements are going to be focused on business goals...

**06:21** ...not the detailed feature function, you know. It's the what we need to accomplish, not how we need to accomplish.

**06:27** Let the business define what its goals are and then pair that with the COTS experts to understand...

**06:34** ...how do we meet those goals without building a custom system that's static and requires a lot of investment over time.

**06:41** So we're really talking about selecting the commercial software that best meets those business goals and then...

**06:47** ...implementing with the grain for the best results.

**06:49** So getting a good understanding of what the path of the commercial software is and aligning our objectives...

**06:55** ...and our incremental delivery of this enterprise system with that road map of the COTS software.

**07:03** Another area that this can be challenging from a common procurement model is when we talk about scheduling...

**07:08** ...and Don will talk about some of these aspects from a deployment perspective later.

**07:13** But one of the things we're going to want to do here is really schedule our rollout of this, linked with those commercial software releases.

**07:21** So again, we don't want to invest a lot of time and effort and money building a custom function that, six months later...

**07:27** ...is going to be in the next commercial release of the software and becomes obsolete. So understanding that road map...

**07:34** ...understanding what's coming next and what the future direction of the commercial baseline is...

**07:39** ...is a real driver for how we schedule the rollout and what business goals we accomplish first

versus second, versus third.

**07:46** The COTS approach really also asks users to consider new business processes...

**07:54** ...so we don't necessarily just want to model the way we do things today.

**07:58** Again, we're not going to get focused on the detailed how things get done; we're focused on the bigger picture business goal...

**08:06** ...what are we trying to accomplish.

**08:08** And then we're looking at potentially new workflows based on the COTS capabilities for implementing those.

**08:13** And that can be difficult. Individuals resist change, organizations resist change.

**08:19** So it really is a different way of thinking, and a lot of organizations require a bit of a top-down approach...

**08:24** ...and top-down buy-in from executive management that this is worth the investment, this is worth changing our business process.

**08:32** We can still meet our business goals, but we change our business process in order to meet those goals in a much more sustainable way...

**08:38** ...that we can grow incrementally and not sustain a long maintenance tail of a custom system...

**08:44** ...that's continually being updated and redeveloped as the times change.

**08:49** And finally, a last bullet here, again, a different way of thinking. To implement a COTS-based system...

**08:56** ... you really need to resist that change to overly customize.

**09:00** The best intentions of many people often start to spiral down into the, well, if we just change this, if we just change this, if we just change this...

**09:07** ...before you know it, you're pretty far away from that COTS baseline...

**09:11** ...and you've got all sorts of parts and pieces in here that aren't going to just incrementally evolve as the COTS platform does.

**09:18** So you really need to be conscious, continually conscious of the cost benefit here of customization versus configuration...

**09:28** ...and be willing to look at how your business processes can change to meet your business goals...

**09:34** ...in a more sustainable, maintainable fashion.

**09:41** So I think we've all seen this slide a number of times probably already this week and certainly in the past.

**09:47** But I really want to just kind of emphasize, from a technology standpoint, this ArcGIS system concept.

**09:53** It is the backbone for a COTS-based enterprise data management system.

**09:59** More so now than ever, we've got the pieces in place that really give us that foundation that we need with the flexibility...

**10:05** ...to support a wide range of users and a wide range of uses, from desktop, mobile, to the web...

**10:11** ...from local to enterprise to cloud-based services, the platform is there in all of these different fashions...

**10:17** ...and we want to start looking at how we can now leverage that to very quickly and rapidly turn out...

**10:24** ...enterprise data management systems that can evolve over time with the COTS platform.

**10:31** So before we dive into some of the feature functions and the real technology aspects of this...

**10:37** ...I want to take just a view here from a user perspective, if you will, of that enterprise GIS pattern.

**10:45** Enterprise data management, users...

**10:48** ...organizations that are really interested in enterprise data management are often what I would call authoritative content producers.

**10:55** They are the ones producing the authoritative content in their domain, in their region, in their area of specialty.

**11:03** They're getting data in from the fields or from VGI-type inputs.

**11:08** They've got a need to then produce data and map products of that authoritative content as well as...

**11:13** ...services, map services, analysis services, et cetera.

**11:17** And they may be contributing to basemaps or be a consumer of basemaps, but really, they want to do all of this...

**11:23** ...through a configurable and shared set of workflows, production tools, and business rules for quality control, et cetera.

**11:30** So, I just want to kind of jump in for a little bit here and look at some of the...

**11:34** ...sort of the key features of an enterprise data management system as well as the COTS architecture that supports that.

**11:43** So at a very high level, we can really put this into three main categories, and what I'd like to do here is...

**11:49** ...dive into each one of these a little bit, and then we'll actually kind of run through a little bit

of a demo on each one of these sections...

**11:55** ...to give you a view of a configured COTS-based system for doing end-to-end data management in line with what you see here.

**12:03** So at a high level, what we're talking about are production management capabilities, the ability to task the work force...

**12:10** ...report on the status and progress of the data production activities that the work force is conducting...

**12:16** ...and the ability to do some basic management capabilities...

**12:20** ...job assignment, job scheduling, those basic types of capabilities.

**12:25** The center of that enterprise data management system really is geodata management and maintenance activities.

**12:31** This is the geodatabase and the workflows that support...

**12:35** ...the user interaction with the geodatabase for geodata management and data update activities.

**12:40** And finally, we're all doing enterprise data management not for the sake of managing data...

**12:46** ...but for the sake of ultimately providing content dissemination to our end users...

**12:52** ...defining detailed information products and being able to disseminate those to end users.

**12:55** So that really is sort of the third key feature of an enterprise data management system here.

**13:03** So let's kind of start at the beginning and like I said...

**13:05** ...I'd like to kind of sprinkle in here some demonstrations for each of these key areas and really kind of...

**13:11** ...look at a bit of an end-to-end flow from tasking and reporting through workflow execution and ultimately...

**13:17** ...out to the data content, the content dissemination piece.

**13:22** When we look at production management, again, we're talking about configuring...

**13:26** ...the COTS platform to support that tasking reporting and management of the data maintenance activities that are ongoing.

**13:32** This is important. It provides transparency both within the organization and potentially it can be leveraged to do it...

**13:39** ...external to the organization as well if you open these portals to the public.

**13:45** Again, through these production management applications, we're tasking and managing production.

**13:49** We're providing that status and reporting. We do that through utilizing role-based functionality.

**13:55** So I, as an executive manager, have a different set of needs for what I want to see from a production management application...

**14:02** ...versus a line supervisor who's actually responsible for the day-to-day activities and doing out work...

**14:08** ...to the individual data editors and keeping tabs on them.

**14:12** So we really want to target the user experience. Think about role-based functionality and how we keep it simple within those roles.

**14:21** And what this allows us to do is really extend the reach of those GIS workflows. We can start to...

**14:26** ...through using simple web-based access, roll in the non-GIS users that are stakeholders in one way or another...

**14:33** ...in the GIS activities that are happening in our organization, like I said, be it from an executive manager's point of view...

**14:39** ...who just needs to have that immediate, up-to-date window of what's going on in my organization...

**14:46** ...where are we on track, where are we off track, where are we doing work, where are we not doing work...

**14:52** ...all the way down to a true line manager who, again, isn't a heavy-duty GIS user but is the personnel manager...

**15:00** ...that's responsible for assigning work and balancing workloads amongst the GIS staff themselves.

**15:08** So we can start to really fold in those non-GIS users and extend the reach of our workflows across the organization.

**15:16** So I'm not going to spend too much time on this.

**15:18** I think it's better maybe to just take a quick look at a production management application and the types of capabilities that we can provide.

**15:26** The key technologies here, ArcGIS Server with the Workflow Manager extension, all being leveraged...

**15:33** ...through the ArcGIS Server web APIs. So let me just kind of jump over here.

**15:41** So there's kind of three key things that I need to be able to do from a production management application perspective.

**15:47** I need to be able to visualize the location and age...

**15:54** ...the status, if you will, of my current data holdings.

**15:57** I need to be able to see where I've got current data production activities or data maintenance activities ongoing.

**16:05** And I need to be able to task and report on the activities within my organization.

**16:11** So we look at the enterprise production manager web application here. On the landing page, right away I can see a data currency legend here...

**16:20** ...that shows me all of my current GIS data holdings.

**16:23** In this case, each one of these represents a tile of GIS data symbolized by when it was last updated in our enterprise.

**16:30** So I get a real quick idea of where's my data current, where is my data not current.

**16:35** The next thing I want to do is be able to see, well, where do I have current production activities or data update activities ongoing.

**16:43** So I can turn on a production status layer here, hopefully. And what this is going to do is going to show me all of those locations...

**16:54** ...it's not going to come back for me, though--all of those locations where I've got current activity, current data production activity happening.

**17:02** So quickly, what I can see from this view, if my production status layer would come up, is how old is my data...

**17:08** ...how new is my data, where am I currently updating things.

**17:11** And I can now start to evaluate those customer requirements as they come in.

**17:16** I've got a need for updated data in a given location; I can quickly come here and see, well, how current is my data?

**17:24** Am I already doing work there? Or if I'm not already doing work there, I need to task some work versus expediting some existing work.

**17:36** So hopefully, this isn't going to continue for me here. I was having some problems with my VPN connection right before we started.

**17:44** Let me try something here. Definitely having some problems here. I'll tell you what. In order to keep us on track here...

**18:08** ...I'm going to do a little bit of a fallback here. I've got some of these actually recorded. So let me just go ahead and jump in on...

**18:18** ...instead of waiting for the Internet connection here to come up, let me just go ahead and do this...

**18:23** ...play a short, little video demonstration for you here.

**18:35** [recording] [unintelligible]...production maintenance activities based on customer requirements...

**18:41** ...and report on the location and status of ongoing data production efforts.

**18:47** In our example, each of these capabilities is provided by the enterprise production manager web application...

**18:53** ...which leverages the web APIs provided by ArcGIS Server and the ArcGIS Server Workflow Manager extension.

**19:01** This easy-to-use web application can be accessed and leveraged by both the GIS and non-GIS stakeholders throughout the enterprise.

**19:09** This same application can also be deployed externally to provide the general public with visibility...

**19:16** ...and input into the data production activities within the organization.

**19:21** From the landing page, I can quickly visualize the location and age of the organization's existing GIS data holdings.

**19:28** Each cell on the map represents a single tile of GIS data and is color coded based on the date it was last updated.

**19:36** I can turn on a production status layer to view all locations where data production activities are currently under way.

**19:44** Finally, I can select any given location to view more detailed information about the existing data holdings...

**19:51** ...and any associated data production or maintenance activities that are under way. As a manager for my enterprise...

**19:59** ...these tools quickly give me the ability to evaluate the new data requirement received from a customer.

**20:04** Now let's take a look at how I can use this application to task and report on data production activities.

**20:11** To task the workflow with a new data production or maintenance requirement, I simply launch the dashboard...

**20:18** ...click on the Submit New Production Request tool, and enter some basic information about the requirement...

**20:24** ...including the type of data required, the date the work needs to be completed...

**20:30** ...and an e-mail address that will be used to communicate status updates and data availability information as the production activity progresses.

**20:40** I can also enter additional comments or descriptive information as needed to communicate details about the work to the production staff.

**20:48** Next, I specify the location of the work to be performed by drawing a bounding box on the map display.

**20:56** Clicking Submit Request will initiate a new production activity in a centralized workflow management system used throughout the enterprise.

**21:04** The user to whom the work has been assigned will be notified via e-mail that they have a new production activity...

**21:11** ...that has been tasked for them to complete.

**21:14** At this point, a new production activity has been created and tasked.

**21:19** To keep tabs on this job, I can use the reporting functions provided by the enterprise production manager application.

**21:26** Here, the application is connecting to the centralized workflow management system to retrieve up-to-date information...

**21:33** ...on all of the jobs I'm interested in, which it then presents geographically on a map.

**21:38** By selecting different report options, I can visualize production work in different ways.

**21:44** For example, here I've categorized activities by priority, showing me geographically where my high-priority work is taking place.

**21:53** Notice here that I can also see the newly tasked production activity indicating the immediate and up-to-date nature...

**22:00** ...of the reports generated from the ArcGIS production mapping system.

**22:05** But the real power comes from the fact that we are working in standardized workflows that have been configured...

**22:11** ...to match the business processes of the enterprise. Throughout the execution of these workflows...

**22:16** ...status and progress information is automatically captured in the centralized workflow management system.

**22:22** This provides the ability to visualize ongoing work categorized by schedule status, for example...

**22:29** ...so that I can quickly determine where production activities are falling behind their scheduled completion dates.

**22:35** To find out why a specific activity is falling behind, I can easily drill into the details.

**22:42** I can check to see if any relevant notes were captured during the workflow execution.

**22:47** I can view a detailed activity log, which gives me the full history of everything that's happened during the execution of this activity.

**22:54** And I can see if there are any holds associated with this activity. In this case, I can see that the job was placed on hold...

**23:01** ...because the imagery needed to perform the GIS updates had too much cloud cover, so

we're awaiting for new...

**23:08** ...cloud-free imagery to be acquired and provided.

**23:11** We've now seen how the ArcGIS enterprise production mapping system can be used to quickly and easily task new production activities...

**23:19** ...as well as how its centralized workflow management system can be used to manage and report status against those activities.

**23:29** [live speaker] So, sorry, I apologize to not be able to actually run that for real. Jump back in here.

**23:41** So now that we've created a job, we've tasked the production work force, I want to step in and talk a little bit...

**23:47** ...about the geodata management and geodata maintenance feature of an enterprise data management system.

**23:54** The center of that enterprise data management system is the geodatabase...

**23:58** ...and so I think it's important to talk a little bit about some of the best practices for geodatabase design in an enterprise setting.

**24:05** Our goal here, remember, is to deliver high-performance, application-ready geodata. We want the data to be usable right away by end users.

**24:14** They shouldn't have to jump through a bunch of hoops and do translations from one format to another to be able to get value out of our data.

**24:21** So we really want to emphasize our geodatabase design around end-user capabilities. Define those detailed information products...

**24:29** ...and then build to deliver those information products. Avoid the what-if scenarios. We really want to focus on...

**24:36** ...what is it that users want to be able to do with our data and how do we make the simple things simple...

**24:41** ...and not get caught up in the 10 percent case or the 1 percent case that's always going to be there.

**24:49** Again, in an enterprise environment, from a geodatabase design perspective...

**24:53** ...you want to embrace the notion of federated compilation and maintenance.

**24:57** Within any one department or organization within the enterprise, you need to be realistic about what your expertise is in that area...

**25:05** ...and what your capability and capacity is within that area.

**25:09** And don't be afraid to let other parts of the organization collect pieces of data that you need but they're better suited...

**25:15** ...better capable, better capacity to do so. And then you simply define information products for them of how you need to use their data.

**25:24** And you consume those, you integrate those, not at the RDBMS level but at the service level.

**25:29** We start doing web service-based mashups to get information content from different parts of the enterprise together.

**25:35** We don't need to do a single über database, über data model across the entire organization.

**25:41** As long as we've got clear data stewardship rules between the different parts of the organization and...

**25:46** ...we've got good communication about how the data needs to be used or integrated between those organizations...

**25:52** ...we can do that at the service level, not at the RDBMS level...

**25:55** ...and start to let people really focus on what they're best at and contribute what they're best at.

**26:02** And then finally, we want to design for COTS usability, so this is again coming back to that COTS approach.

**26:08** Leverage the geodatabase concepts, feature classes, subtypes, et cetera.

**26:12** Really embrace the COTS capabilities that are there to ease your data collection and to ease your information product delivery...

**26:22** ...keeping in mind as you do that that you will need to have some balance between the maintenance side of things...

**26:28** ...and the dissemination side of things. It is difficult to get a single geodatabase that works perfectly for data collection activities...

**26:37** ...and also perfectly for data dissemination activities.

**26:39** And so you do need to be constantly thinking about those tradeoffs and how do you come up with a best of breed...

**26:46** ...that supports your data collection users as well as your end information product users.

**26:54** From a geodata management perspective, once we've got that geodatabase design laid out, the COTS software...

**27:03** ...the ArcGIS platform really does provide you with a number of options for how you distribute those geodata management activities.

**27:10** A couple key things I want to get across here. One is this notion of a production database versus a publication database.

**27:18** One of these, the production database, is really tuned for data editing and has read-write access.

**27:23** The other, the publication database, is tuned for service delivery, content dissemination, and read-only access.

**27:31** We separate these two in the enterprise world. We've got authoritative content in our production side and then we've got...

**27:38** ...a mechanism for providing approved content that's published out to the rest of the world or the rest of the enterprise to consume.

**27:49** So that's one kind of key concept is that distinction or differentiation between your production database...

**27:55** ...and your publication database and the tuning that happens that's different to each of those.

**28:00** The other sort of key thing here is the notion of geodatabase versions and replication. So versions...

**28:06** ...hopefully most everybody here is familiar with geodatabase versioning.

**28:10** It's been around for quite some time. It gives us that direct editing capability for a multiuser environment.

**28:16** Great for connected multiuser editing scenarios. But recently, in the past few releases of the geodatabase...

**28:22** ...we've built on versioning to establish geodatabase replication, and this starts to open up a series of new patterns for us...

**28:31** ...for how we further distribute those geodata management activities to both connected groups of users who, again...

**28:39** ...just like the production database and publication database, are separate and can be tuned separately and have access control separate.

**28:47** There may be workgroups within your organization that want to carve off a specific geographic area or a specific set of features...

**28:54** ...have their own sort of mini data stewardship group that manages those and then synchronizes just their changes up to the authoritative content.

**29:02** So there's a use for connected replication for two-way exchange of data. And then there's also the notion of disconnected replication...

**29:11** ...and this is where we really open up the possibility for extending the geodata management activities not just inside the enterprise but outside.

**29:19** A lot of organizations that are doing large-scale enterprise data management and enterprise data production activities...

**29:25** ...are leveraging a contract or work force or contracted agencies that are doing some of that work or specific areas of that work for them.

**29:34** And disconnected replication and check-out replicas give you two mechanisms to easily transfer sets of geodata...

**29:42** ...outside of your organization for maintenance activities to occur and then just get transactionally the updates...

**29:47** ...back of what that organization has done. So again, this is another one of those things that has evolved...

**29:53** ...over the last couple of releases of the ArcGIS platform that starts to open up this notion of...

**29:58** ...we can have a COTS-based enterprise data management capability here.

**30:03** There's a lot of the building blocks are actually in place, and we can start to leverage those now.

**30:08** From a data maintenance perspective itself, this is all about workflows and workflow-driven, rule-based production.

**30:16** We want to model both new and existing processes that are going to integrate the GIS and non-GIS aspects of the organization.

**30:23** The goal here is to standardize and streamline those activities; to define the best practices within the organization...

**30:30** ...of how data maintenance occurs; and then do that in a way that, again, to contrast it with a custom system approach...

**30:37** ...isn't static, isn't locked in stone, but can continually evolve both with the COTS platform...

**30:44** ...and with the organization's needs as they change.

**30:47** So it really is all about configuring a common rule base of a number of different types.

**30:53** There's feature templates, new in ArcGIS 10 for the data editing so we can start to standardize how, what types of features we collect.

**31:01** We may come up with a geodatabase design and a data model that allows us to, from a number of combinations...

**31:08** ...and permutations perspective, to have 300 different kinds of roads.

**31:13** But we really want to standardize within this area or within this project or within the organization.

**31:18** Here's the 10 different road classifications and combinations that occur 99 percent of the time in our area.

**31:25** We can define feature templates that have those 10 road combinations, distribute those out to the organization...

**31:32** ...and start to standardize the way the data collection activities are occurring.

**31:37** Map templates, obviously, they allow us to start to standardize the way we look at and the way we share that information...

**31:43** ...what the layers are, what the symbology is, what the labeling rules are.

**31:48** And then finally, another key one here in the enterprise data maintenance side of things...

**31:52** ...is quality control rules and really standardizing the quality control aspects so that we don't have bad data...

**32:00** ...or data of different quality coming in. Everybody's playing on a level field.

**32:03** We define a single set of quality control rules that live in the geodatabase and can be leveraged by all users of the geodatabase...

**32:11** ...so that we've got consistent quality being applied by all data editors, by all data maintenance activities across the organization.

**32:20** So, again, kind of the pieces here that are at play--ArcGIS Desktop is going to be our primary foundation for our GIS professionals...

**32:30** ...that are going to be doing most of this heavy lifting, leveraging the Esri production mapping suite, and again...

**32:35** ...that centralized workflow management repository that Workflow Manager provides to guide those activities.

**32:41** But also, on the ArcGIS Server side, with the ArcGIS web APIs and mobile APIs, this is, again...

**32:46** ...where we can start to reach out to either our field GIS users who need to be part of those overall data collection...

**32:52** ...data maintenance workflows for the enterprise, or again, those non-GIS users who aren't doing the heavy lifting of GIS...

**33:00** ...but need to be involved in approvals as the workflow progresses or need to be involved in routing the work...

**33:07** ...from one individual to another in making some of those business decisions about our GIS workflows.

**33:13** So just a quick view here--yeah, I really have lost my Internet connection. Alright. So I apologize. I'm going to do this to you again.

**33:21** I'm going to--luckily, I had most of these recorded, at least. So just a quick view.

**33:28** [recording] ...data production workstation, and I can see all of the production activities currently assigned to me for completion.

**33:34** When I select a specific job, I can view all of the same information that was provided to the production management web application...

**33:41** ...including job assignment, job priority, dates, description, notes, holds, and more. In addition to these items...

**33:52** ...the production staff is also provided with the preconfigured workflow window that outlines the steps required...

**33:58** ...to complete the specific type of production activity tasked by the production management web application.

**34:06** This workflow window is much more than just a pretty picture, though. It is interactive.

**34:09** It actually steps the user through the workflow process. As the user executes each step in the workflow...

**34:16** ...the workflow management system is preconfigured to automatically launch the necessary applications...

**34:22** ...and log workflow execution progress and status.

**34:26** Once logged, this information is immediately visible to managers at stakeholders for up-to-the-minute reporting.

**34:33** Each of these workflows is configured to model an end-to-end data production process...

**34:38** ...from source data acquisition through data compilation and quality control and, ultimately, content dissemination.

**34:49** [live speaker] So the main take-away there, right, is that this is all powered by that centralized workflow management system.

**34:54** If I could have been running this demo for you live, you'd see all of the, you know...

**34:59** ...the job we created on the web is now available to me as a GIS user on the desktop.

**35:05** Again, all that information that was put in from the production management staff is available to me--attachments, other things.

**35:11** And now I'm guided, step by step, through my workflow. What applications do I need to use...

**35:16** ...and I don't have to do anything special beyond executing that workflow to communicate back to my management...

**35:23** ...and executive staff what the progress is and where we are along the way. That's all built-in, configured as part of the workflow...

**35:29** ...and is just automatically providing that real-time status back to that web dashboard...

**35:35** ...that executive viewer window that we were seeing previously.

**35:45** So each one of those steps--and I apologize 'cause it was kind of hard to see up there...

**35:50** ...but every one of those boxes in that workflow has the notion of, what percent complete am I when this step is done?

**35:56** So simply by marking a step as complete, the workflow management system is now saying, okay, I'm 10 percent done...

**36:02** I'm 15 percent done, I'm 25 percent done.

**36:04** And that's again, you know, when we talk about configuring COTS to meet your business

processes...

**36:10** ...that's where a lot of the work comes in, is defining those workflows and making the decisions about...

**36:15** ...once I've reached this point, I can say I'm roughly 50 percent done or 80 percent done.

**36:21** That's all configuration and that's all stuff that is flexible and can change on the fly as your workflows change...

**36:27** ...and as you build a historic basis of, well, we thought we were halfway done when we got to this point...

**36:33** ...but history is showing us that there was still three more months of work left on almost every project once we hit this point.

**36:39** Well, let's go update the workflow to say we're actually only 25 percent done.

**36:44** And so that's that very dynamic and nonstatic nature of configuring workflows versus building custom systems.

**37:00** So kind of stepping through here to the--like I said, none of us are into data maintenance for the sake of data maintenance.

**37:08** We're all doing data maintenance activities because ultimately, we want to serve end users...

**37:12** ...and provide content dissemination services to end users. And this is, again where...

**37:18** ...the COTS platform has evolved now to a point that we've got a variety of ways to meet end-user needs and provide end-user applications...

**37:28** ...that deliver a variety of diverse information products, from visualization information products, map services...

**37:34** ...be they basemaps or dynamic overlay services, to analysis services, the publishing of geoprocessing rules...

**37:41** ...and analysis tradecraft that leverages your data and your expertise, to geodata services themselves.

**37:49** So the geodatabase replication has web service end points that actually allow us, through a web services perspective...

**37:56** ...to distribute not just images of the information products but the raw data behind it.

**38:02** That's true for the vector data with a geodata replication service, and that's true for image services with a data download option...

**38:11** ...as you may have seen during the plenary yesterday, as well. So we really can, at a COTS level, provide a very rich...

**38:16** ...and very diverse series of information products. They enable search and discovery, both from a standards-based...

**38:25** ...OGC-based search and discovery mechanism, using something like the geoportal server, to the more lightweight...

**38:32** ...ArcGIS Online tags and description searches that are enabled now. And again, the COTS platform also allows us...

**38:41** ...to support both the internal and external user. So web services clearly connect all of our internal or connected users.

**38:49** But as I said, through these geodata services and other mechanisms, we can easily put transactional updates onto traditional media...

**38:58** ...that get carried over to a new network to an offline, sort of LAN environment, and we can stand back up all of that geodata content...

**39:05** ...and all of those content services within a local node, and then manage through traditional media updates or...

**39:15** ...if we're in a sometimes connected mode, through these web service-based updates, transactional updates that says every month...

**39:21** ...this publication node is going to connect back to the mother ship, update with all the data maintenance activities...

**39:27** ...and then be able to reoperate in an offline mode with the most current data as of our last connection point.

**39:34** So a lot of these things are there. The foundation is there in the COTS platform, and, like I said...

**39:41** ...they're leveraging ArcGIS Server, the Geoportal extension, and really, you know, as we drive forward, they're also leveraging...

**39:49** ...you know, just the straight ArcGIS Online and this notion of being able to publish your services directly to the cloud...

**39:56** ...sharing them with private groups. We saw--for those of you that were in the plenary yesterday, you saw Scott Oppmann...

**40:02** ...give a demonstration of the portal, the Esri-hosted portal configured for the City of Louisville.

**40:07** So when you logged in with the City of Louisville account, you didn't see all of the generic, Esri-produced content.

**40:13** You actually saw focused content that was all contributed by and relevant to the City of Louisville.

**40:19** So there's cloud and managed, hosted services capabilities in ArcGIS Online that you can take advantage of.

**40:26** And coming at 10.1, there's also the notion of being able to have ArcGIS Online on-premises with what we're calling ArcGIS Portal.

**40:33** And what we see here is an example of--this is no longer an ArcGIS.com URL, but this is a privately hosted...

**40:35** So planning the rollout is a key in COTS approach, and we need to include software releases, with us or with other vendors...

**40:41** ...privately run version of ArcGIS Online that, again, has been configured. This is no customization. This is all configuration around...

**40:48** ...what are the main things we want to do? Our users--we want to be able to visualize, we want them to be able analyze...

**40:53** ...we want them to be able to access the data. And these just become all--yeah, of course, I'm offline...

**40:59** ...these just become all configuration of that ArcGIS Portal, and the queries that the ArcGIS Portal is running to filter the content...

**41:07** ...and this is now running local, on your private cloud, on your own internal infrastructure...

**41:13** ...as opposed to externally on the public ArcGIS.com site.

**41:21** So really, just to kind of wrap up here with that first simplistic diagram--kind of blown out a little bit here.

**41:28** What did we look at? We looked at production management, feeding the geodata maintenance...

**41:34** ...and geodata management activities of the organization--those are performed primarily by the GIS users...

**41:41** ...and the field users and rely heavily on this notion of configured workflows, adaptable workflows, and a common...

**41:46** ...rule-based and template concept that standardizes and streamlines those activities.

**41:52** There's a variety of geodata management options available for how you distribute those activities...

**41:57** ...both within and outside of your organization. And ultimately...

**42:01** ...that is what feeds the visualization analysis and data access web services that reach out to your end users...

**42:08** ...both in a connected and disconnected fashion. So the pieces are really there from a COTS perspective to build this...

**42:15** ...end-to-end tasking reporting production dissemination system without having to do a lot of heavy, custom development.

**42:25** So as we talk about how to do that, I'm going to go ahead and turn it over to Don...

**42:27** ...and let him talk through some of the deployment considerations here.

**42:33** Thank you, Greg. That was a lot of stuff.

**42:45** And I have to tell you, you know, that demos are real and I've seen them.

**42:50** So if you're interested, then come up and see us and we're more than happy to show it to you.

**42:55** So in the previous two sections, Greg can show you, what is a COTS approach...

**43:01** ...and he also showed you what are the necessary features and architectures as associated with that approach.

**43:07** I hope that you get a better understanding of the COTS approach...

**43:10** ...and I hope that you think it's beneficial to your project and to your organization. Maybe you still, you know...

**43:17** ...think it's a good idea but you still have doubts on how to get it done, right, how to put it into my organization.

**43:24** And in this section, we're going to talk about that and talk about how you're going to implement as a project management...

**43:32** ...or as a techie. So before I start, I want to have a show of your hands, and how many of you consider yourself techies...

**43:39** ...you know, program? Good portion--thank you. And how many of you think of yourself as a project manager...

**43:49** ...executive level...decision makers? Good. The rest of you, that didn't raise your hand...? Alright, so just listen to me.

**43:59** Okay. So I think--where's my remote control? Thank you. So...

**44:12** ...I think it's not an understatement that COTS approach has greatly impacted the software development life cycle in a good way.

**44:21** And when we look at software development, I think it's best to compare the COTS approach to a...

**44:29** ...traditional approach to get a better understanding what we are talking about.

**44:34** There are many, as you know, many software development life cycles out there--waterfall, spiral...

**44:42** ...iterative process, or recently, the more agile type of development approach.

**44:49** If you notice, there is a common thread among these development processes.

**44:55** It's a set of common activities in the development life cycle, and some of them are on the slides.

**45:03** We plot them onto two scales so that you can compare them. On a more traditional development approach...

**45:09** ...you look at the planning, requirements, design, development, testing, implementation--the development is fairly large...

**45:17** ...'cause we are developing software and we need to gather requirements and we need to plan the testing activities and deployment for it.

**45:28** As you look at the COTS approach, the fundamental assumption is that we're leveraging COTS functionality.

**45:35** So consequently, you see that you have much shorter life cycle and you have a quicker, accelerated delivery schedule...

**45:46** ...which means a quick turnaround time. And how does the benefit being realized is through these...

**45:53** ...shortened phases in that life cycle. You spend approximately same amount of planning and deployment effort, although shorter.

**46:03** And most of the benefits are realized in the requirements design and testing. We cross out development...

**46:14** ...because we don't do a whole lot of development. We do configuration. We leverage existing functionalities.

**46:23** We involve a lot of users upfront. So we interact with the user because we can. We have COTS-based product.

**46:32** We can show them what we are talking about, rather than on a piece of paper. And remember this diagram.

**46:39** This provides a lot of insights on a COTS implementation approach. There will be a quiz at the end.

**46:46** No, just kidding. It's supposed to be a joke.

**46:52** Planning. So as we start planning our GIS system, COTS approach puts a lot of focus on business process and objectives.

**47:03** And not to say traditional approach does not emphasize that--we do. But the COTS approach allows you to do more...

**47:11** ...because you have less time to worry about the development, right?

**47:17** And you're really just leveraging what we currently existing functionality that we offer to you.

**47:24** So you can emphasize--the typical goals that we're trying to achieve--improving productivity, increasing revenue, reducing costs...

**47:34** ...supporting regulatory requirements, and one of the key things that I found, myself...

**47:42** ...very hard to do in a COTS implementation project is the temptation of customizing.

**47:50** There's a lot of things that I want to do specifically for my organization that COTS doesn't offer, okay.

**47:57** So it's that temptation that you need to resist, not because you can't do it; it's what the business really needs.

**48:06** And how many times that we actually develop something without asking whether the business truly need them.

**48:14** But it's because we can do it, and it's cool. So we need to pay attention to that.

**48:24** Because releases of COTS software continues, they offer new functionality, in turn, help us building our system.

**48:50** ...in your project schedule, and we need to work with them as a partner, right.

**48:55** And you need to work closely with us, say GIS, that we include you in our holistic testing.

**49:02** We solicit your input to our COTS-based functionality so that you can do your job better.

**49:09** Then, that is what we call there in the rollout, using multiple phases and iterations of software, the COTS software functionality...

**49:21** ...which enabled heavy user interactions and validation as the releases evolved through time. Because user is part of this...

**49:32** ...as we're going show later on. User interactions start from the beginning, unlike traditional approach...

**49:39** ...that you have to put things on paper and you quickly go and build them...

**49:44** ...and then you come back and show that and time has passed.

**49:48** By the time you finish all your functionality, there's a new releases coming out, and you have to catch up on that...

**49:54** ...and you have to put in new code again. So it's an endless cycle, right? And so you carry that baggage throughout.

**50:01** So plan that ahead in the COTS approach that we do those things for you. But we need to talk. We need to do things together.

**50:12** So it's a partnership, it's a true partnership that we're talking about. And also, understand, there's a tradeoff between COTS.

**50:22** It's not, you know, the beautiful day, like outside--it's perfect--because there's a tradeoff.

**50:28** We talk about COTS cannot meet a hundred percent of your needs, and you have to be ready to sacrifice certain things.

**50:35** And that is the change that we talked about. Embrace the change.

**50:40** Maybe we spend 80 percent of our time developing 20 percent of the functionality that is critical to the business...

**50:48** ...but can they change their process to save maybe 50 percent of that 80 percent?

**50:55** So that requires this upper management buy-in, the top-down approach, and rather than...

**51:03** ...I've very seldom to see a very successful implementation from the bottom up from that perspective.

**51:13** Planning is about developing detailed work breakdown structure, and we know...

**51:18** ...project managers know those detailed activities are critical.

**51:22** And this is the diagram to show you the COTS approach. The first phase is out of box...

**51:31** ...put your hand off the coding and focus on configuring the tools and quickly deliver those functionality to the user.

**51:40** You'll get their buy-in, right, and get them talking to you, and this is what I like, this is what I don't like...

**51:46** ...this is what I need, and to do. And then you have a list of things that you can start negotiating with them...

**51:50** ...and that would be the refinement in the second phase. And talking about those things and say, well, how important is it to you?

**51:57** If I offer slightly different functionality, would you die tomorrow? Probably not. And so, and you can still operate as you go.

**52:07** So that's sort of the negotiation. Phase 2 is multiple phases, not just one. It's phase N, really.

**52:16** It's the iterative process until a point, and then you say, Yes, I'm finalizing it and I'm deploying it.

**52:24** Now, it's very simple to say that I'm ready for deploy in a traditional approach because, once you deploy, that's it.

**52:33** It is static. People sign off on it, and it's going to be there for six months, a year, or two years. But in a COTS approach...

**52:42** ...it's less nerve-racking, because we know it will continue to evolve. COTS releases will come out.

**52:51** We can continue to configure the tool. It requires less effort to do that, alright. That's the benefit that we are talking about.

**53:02** In a COTS system, the requirements are satisfied by COTS functionality design around best practices...

**53:09** ...and it's been tested by many organizations before we release them, right? And so, really...

**53:18** ...understand the COTS capability and how it impacts the system business process.

**53:23** And it's critical for you to efficiently implementing with the grain of the software, so you need to understand...

**53:30** ...what the software provides to you, so that you can tell your user and you can make

intelligent decisions.

**53:38** And also, really, because we have time to focus on what this software can help the customer achieve, and we don't need to...

**53:52** ...we have less time to worry about how to deliver them, because we have the COTS software behind your back to help you to do that.

**54:00** What I have seen many successful user used to do is to use COTS to demonstrate a vision of the system early on...

**54:12** ...and instead of talking about modifying the technology to meet the business needs. In other words, you lead rather than you follow...

**54:24** ...right, and you need to paint a vision. And because COTS products allow you to do that, you have the tools.

**54:31** In the old time when we need to custom develop these tools, it takes time. And so leverage that, and that is very, very powerful.

**54:44** Iterative and demo-based implementation approach sort of merge the requirement and design together.

**54:55** So as we develop requirements, we're really showing people how the system works and at the same time designing the system...

**55:06** ...and then they provide feedback and I come back and revise my application. So these two actually are being combined...

**55:16** ...and just imagine in your requirements workshop and design workshop that you are sitting down with the users.

**55:24** And I am the COTS expert; I can configure things. You have business users sitting down with me in the same room...

**55:35** ...and as you say, I want to do X and Y and Z, I can quickly configure the tool and show you...

**55:41** ...you can accomplish maybe 80 percent of that X and Y and Z. And that's very powerful.

**55:47** You deliver something to the user instantaneously, right?

**55:51** And maybe the 20 percent let me go back and talk to my technical staff. Maybe I do custom or maybe I talk to Esri.

**55:58** We provide additional--there may be other tools that you can leverage. So that is what we see the gain.

**56:05** Again, remember the chart up front. The small blocks of design and requirements are being realized because of this.

**56:19** In my view, this whole process of design, as requirement, gathering, planning--it's like a user feedback-driven machine, right.

**56:30** The key components are--there's prototypes, there's designs, there's configuration.

**56:37** Any of these component terms and the other goes, right? It's all running together. It propels and is moving forward.

**56:45** It's very dynamic. It's very iterative. So if nothing else in this implementation approach that you remember...

**56:53** ...please remember iterative. Please remember user interaction, and this is what it's all about in a COTS implementation approach.

**57:05** Develop--this is where you actually develop something. And we like to say you configure rather than developing.

**57:16** The difference between the COTS and the traditional approach, it's most dramatic in this case, and we have a rule of thumb.

**57:25** If you do more than 10 percent of coding in your system, you're not truly doing COTS, and we want to resist that temptation...

**57:35** ...again, to do custom code because we can. We provide a lot of those APIs for you to do that...

**57:43** ...but just think about kind of the benefits that you get or the less trouble you get into...

**57:49** ...by maintaining those code in the future, right. Not only quickly turn around a solution to your user if you use COTS...

**58:00** ...you also save money in the long term. You don't need to maintain that.

**58:03** You don't need to carry a group of programmers or contractors or yourself to maintain it moving forward.

**58:13** Testing--this is another area that is significantly different and benefit people who implement COTS...

**58:22** ...because we don't develop code. The testing in the common, the traditional approach sense...

**58:30** ...it really is for testing a specific business case. You pull out a use case, all written nicely in a table...

**58:41** ...and you test one by one and check off them. In the COTS approach, you don't...you don't do that.

**58:48** What you do is you test the configuration. If I have a problem, I just change it.

**58:54** So less effort goes into this rigid testing, and in turn, that you gain benefit on time and cost.

**59:06** Implementation is the last phase. It really, truly is a deployment, and as you're getting ready...

**59:13** ...I have my system, I need to deploy into my IT framework. One of the real strengths of COTS-based system...

**59:22** ...is that it will continually evolve and improve, both by configuration and by releases. And...

**59:30** ...and that's why the decision to go into deployment, it's a lot easier, 'cause I know that I have support for my back...

**59:38** ...that someone will continue, will have new functionality for me to continue to improve my system...

**59:45** ...and I need to work with them to do that. So the deployment--the typical consideration on a deployment are, you know...

**59:53** ...leveraging, sort of the human elements of the deployment is, you know, get your user buy-in, get them trained...

**1:00:00** ...now, that's another side benefit of COTS is you get them involved early on in your project, so they already know the system.

**1:00:08** They already got trained, right? And it's really, the testing and training should be sort of coming together.

**1:00:15** You're actually doing one thing and benefit both, right. And so user has better buy-in, and my view is that as they go through this...

**1:00:25** ...they know how to use it and they know the aerial pointers, so there's less learning curve going on.

**1:00:32** The other thing is probably about the same. You may have to look at, you know, IT standards, security...

**1:00:38** ...you look at the demonstration side once you deploy--who's actually managing my geodatabase, who's my system administrator, how...

**1:00:45** ...how to keep your data up-to-date. And there are oftentimes, people put the system out and they...

**1:00:53** ...forgot that I need to keep my data up-to-date. And very quickly, people say, well, your tools are great...

**1:00:59** ...but my data--your data is outdated. It doesn't mean anything to me, so they're not going to use the system.

**1:01:05** So we need to avoid that, and that's actually common on both sides.

**1:01:09** So this is the last slide on the implementation.

**1:01:16** Iterative--COTS approach is an iterative process, and you see these circles and the pilot...

**1:01:25** ...deployment, phase 1, phase 2--the pilot being the bigger circle because it requires you to do more as you change.

**1:01:35** The people--so the paradigm within the organization, how to implement a system, and you have to get the buy-in...

**1:01:43** ...you have to configure things, and you build from scratch.

**1:01:46** It will become easier in the deployment phase 1 because you are refining. You are not

creating anything from scratch.

**1:01:55** Phase 2 is slightly bigger because we think it is a learning experience for you to work with the COTS vendor...

**1:02:03** ...and you need to include more of their input or they will need to include your input. So as you learn, you'll get better.

**1:02:12** To conclude my session on this, I want to give you a quote.

**1:02:17** It's from one of my favorite organization management author, Jack Welch, a CEO from General Electric.

**1:02:27** He says about organizational change, quote...

**1:02:31** ..."Getting it right is iterative. You get better at it with experience and observation, and eventually, after some time passes...

**1:02:42** ...you notice it's not getting harder anymore. It's just what you do."

**1:02:47** And I think he's talking about COTS approach through software development, as well.

**1:02:54** Alright. Thank you, and now I hand it back to Greg for summary.

**1:03:08** So we just wanted to wrap up to kind of, you know...

**1:03:11** ...make sure you get what we think are some of the key take-aways of this COTS approach...

**1:03:17** ...and what are the benefits of trying to adopt a COTS approach to your enterprise data management needs.

**1:03:24** And they really summarize down to this: It's minimized cost to implement. You're not building and procuring and paying for large...

**1:03:31** ...custom development efforts that then incur maintenance over the long run. You're leveraging your existing investment.

**1:03:39** You're shortening the schedule. You're immediately involving users and immediately having the users...

**1:03:44** ...exercise the base platform capabilities that are there, getting real capability into their hands much faster.

**1:03:52** You're reducing your risk. As Don talked about in sort of a testing side of things here...

**1:03:57** ...the technology that you're implementing on is proven by a very wide user base.

**1:04:01** Thousands, tens of thousands of users across the world that are leveraging that same COTS platform and are running through...

**1:04:07** ...those same COTS capabilities and functionalities really reduces your risk and increases your testing work force, if nothing else.

**1:04:18** Again, it is lowered maintenance costs. We're not continually redeveloping or re-upgrading

custom developed pieces...

**1:04:27** ...every time a COTS release comes out. We're simply riding the coattails of and implementing the next release of...

**1:04:33** ...the COTS technology without having to do COTS maintenance plus separate custom development maintenance.

**1:04:41** Like we said, this really allows your system to evolve with future COTS functionality. It's not a static system.

**1:04:48** It's a very dynamic system that has a known update schedule, with several times a year...

**1:04:54** ...you can expect updates to the COTS baseline to come out.

**1:04:58** And ultimately, what this gives you is a wider range of qualified people to use and maintain the system.

**1:05:02** It's not a one-off system that you have to get special training on.

**1:05:06** It's a COTS platform that people are getting trained on through their school and education backgrounds...

**1:05:13** ...they're getting trained on with other organizations before they come to your organization. It is...

**1:05:18** ...it is just the standard COTS platform that they need training on, not a bunch of custom widgets and custom system pieces.

**1:05:26** So, in summary here, we think COTS configuration is a more efficient way to approach system development...

**1:05:34** ...when you look at it in the long run and the big picture.

**1:05:37** The COTS approach redefines the system development process with a focus on the mission needs.

**1:05:44** Instead of building software, what is it that the business needs, what is the business trying to accomplish...

**1:05:49** ...not what kind of software can we build. And finally, ArcGIS, and really at ArcGIS 10...

**1:05:56** ...provides that platform for configuration and rapid development...

**1:06:01** ...and we think that's really what's starting to make this COTS approach viable and something that can compete with...

**1:06:08** ...maybe the more traditional mentality of large, custom system developments that's been much more pervasive in the past.

**1:06:18** So, I want to thank you guys all for attending. I appreciate the turnout.

**1:06:24** I've got some links here for those of you that might be interested in some more information on this.

**1:06:28** We did have an ArcNews article around this topic. The link is here. There's also a white paper that we published...

**1:06:36** ...out to esri.com if you're interested in getting some more detail on this COTS approach and some of the concepts and ideas behind it.

**1:06:44** You're certainly welcome to send Don or myself an e-mail offline if there's any other questions or things we can answer for you.

**1:06:51** And then, last thing, I want to encourage everyone to fill out the online evals we are doing.

**1:06:57** No one's passing out papers this year; we're all doing them online, so if you get a chance, please fill it out.

**1:07:02** Give us some feedback. We'd really appreciate kind of your thoughts on, if this is a viable approach or not...

**1:07:09** ...and other ways that we can make this session or this topic of more interest and more use to you all. So thank you very much.