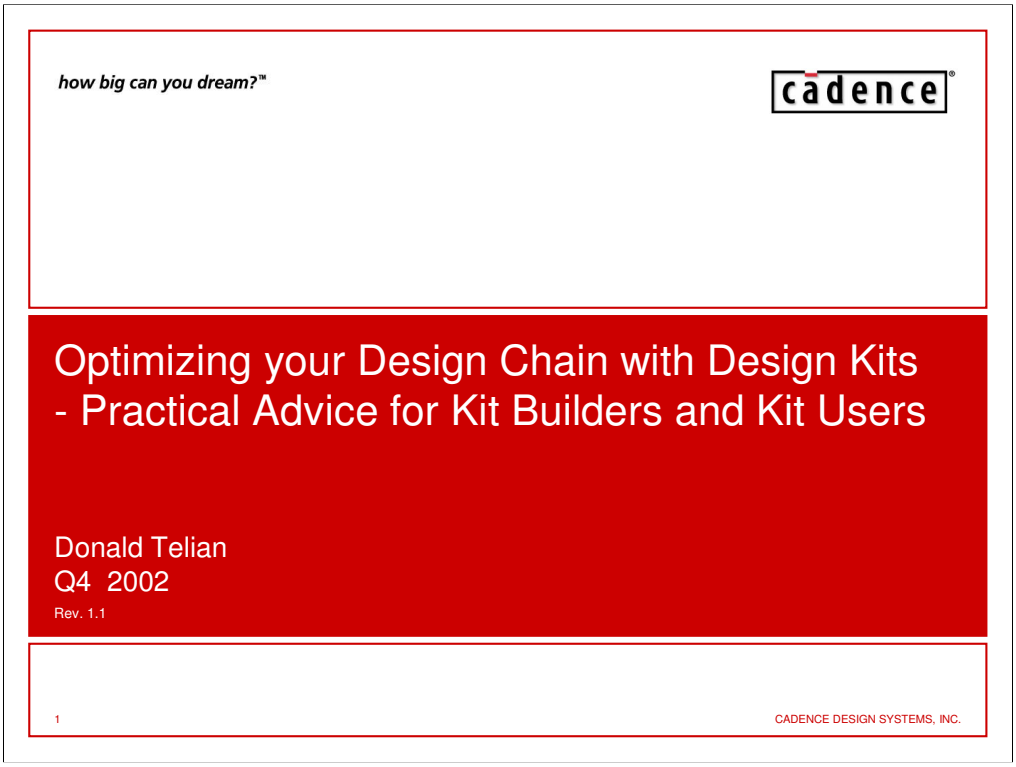

Abstract:

One challenge of Silicon-Package-Board design is that each piece must be designed comprehending the electrical performance of the others. Often the pieces must be designed concurrently, which can be very difficult when they are developed by different divisions or companies. This challenge has given rise to new ways to optimize the Design Chain. For years manufacturing engineers have learned to "kit" components to optimize their Supply Chain. In a similar way design engineers are now forming "kits" of devices, not of physical components for assembly, but of electrically coherent virtual components. These "Design Kits" are simply packaged EDA databases that can be transferred and shared between all participants in the Silicon-Package-Board Design Chain. Proper use of Design Kits not only yields a successful first-pass design, but also accelerates design cycle throughput. This presentation provides valuable ideas for both Kit Builders and Kit Users, using successful web-downloadable Kits for Intel Processors and Xilinx FPGAs as examples.

About the Author

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Donald has been involved in high-speed PCB design for over 17 years. At Cadence, he works with industry leaders to develop next generation tools, technologies, and "Design Kits" to support advances in technology. Prior to that, Donald worked at Intel Corporation where he founded and managed the Signal Integrity Engineering group that resolved high-speed design issues for 10 Intel Architecture desktop platforms for 486, Pentium(R), and PentiumPro processor-based systems. He also led the design and validation of the PCI Bus electrical specification, co-wrote the original IBIS specification, and founded the IBIS Open Forum.

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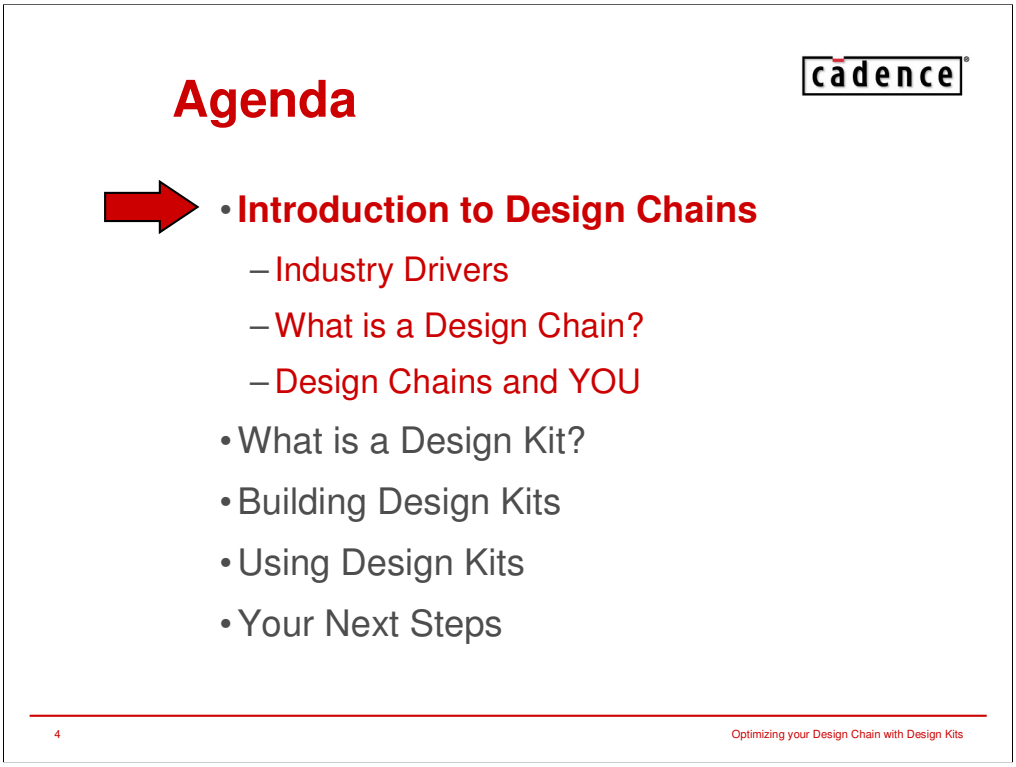
Agenda

- Intro to Design Chains
- What is a Design Kit?
- Building Design Kits
- Using Design Kits
- Your Next Steps

Optimizing your Design Chain with Design Kits

This presentation will proceed through these five topics. First, both “Design Chains” and “Design Kits” will be introduced, defined, and illustrated. For each concept, we will describe how they directly relate to *you.* Then, we will describe the 6-step process you can use to Build Design Kits. We’ll conclude with relevant detail on Using Design Kits and propose Your Next Steps towards using Design Kits to help optimize your Design Chain.



To introduce Design Chains let's begin by looking at the Industry Drivers that have made them such a relevant topic in today's economy. From there, we'll define what a Design Chain is and help you (as an engineer) understand your place in your Design Chain.

Design Chain Drivers

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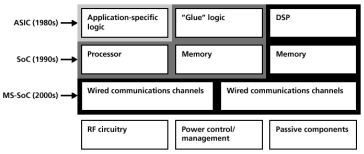
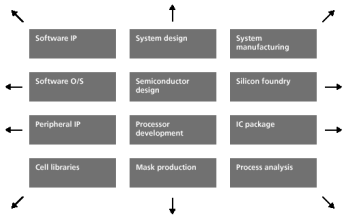
- Silicon Integration
  - More of the system on silicon
  - Teams must work together
- Industry Disaggregation
  - Vertical to horizontal





- Refer to whitepaper: "Design Chain Optimization"
  - http://register.cadence.com/register.nsf/designChain

5 Optimizing your Design Chain with Design Kits

The "Design Chain" concept is very adequately defined in the Executive White Paper entitled "Design Chain Optimization". Please register for and read this paper at the URL provided for a thorough description of Design Chains. The paper describes the two main industry drivers that have caused the relevance of – and the need to optimize – Design Chains. These drivers are:

1. Silicon Integration – Over the last 20 years more and more of systems have been consumed by silicon. Modules and sub-systems that used to be designed and delivered by disjoint groups now must be combined by a single team in the System-on-Chip era. This has created a "Chain" of inter-related engineers who *must* work closer together than they ever had to before.
2. Industry Disaggregation – While Silicon Integration is requiring teams to work closer together, Industry Disaggregation is causing teams and companies to be split apart and "spun out".

Unfortunately, these two drivers do not complement each other well. As such, "Optimizing" the "Design Chain" is becoming a very real challenge and – for those who succeed – a powerful competitive differentiator.

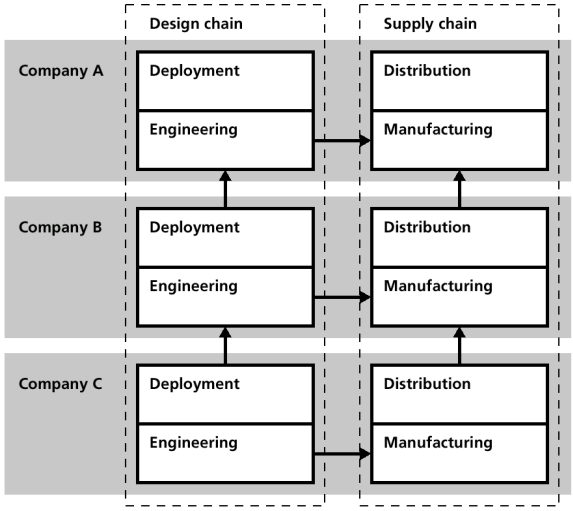
Again, please refer to the White Paper for an excellent and expanded discussion of this topic.

What is a "Design Chain"?

- Like a Supply Chain
- Virtual components
- Many companies

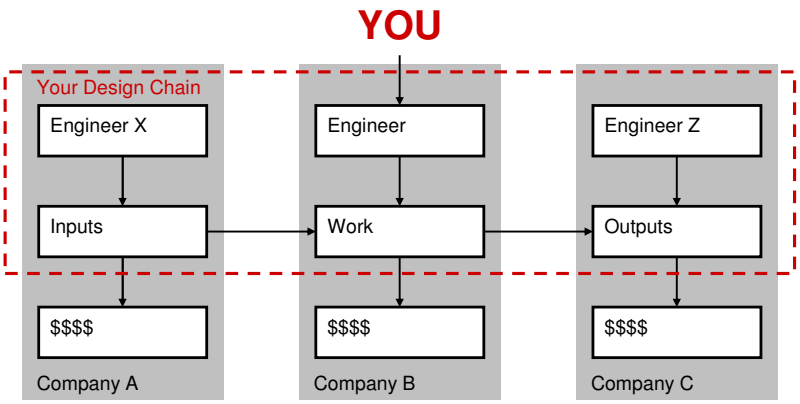
"engineering and technology deployment organizations that work together to deliver end-product designs to the supply chain"

"Design Chain Optimization", page 4



Both the quoted definition and the associated diagram work together to provide a definition of the "Design Chain". Note that the Supply Chain passes real components from Company to Company, while the Design Chain must pass virtual components and information.

Design Chains and YOU



Think horizontal, not vertical

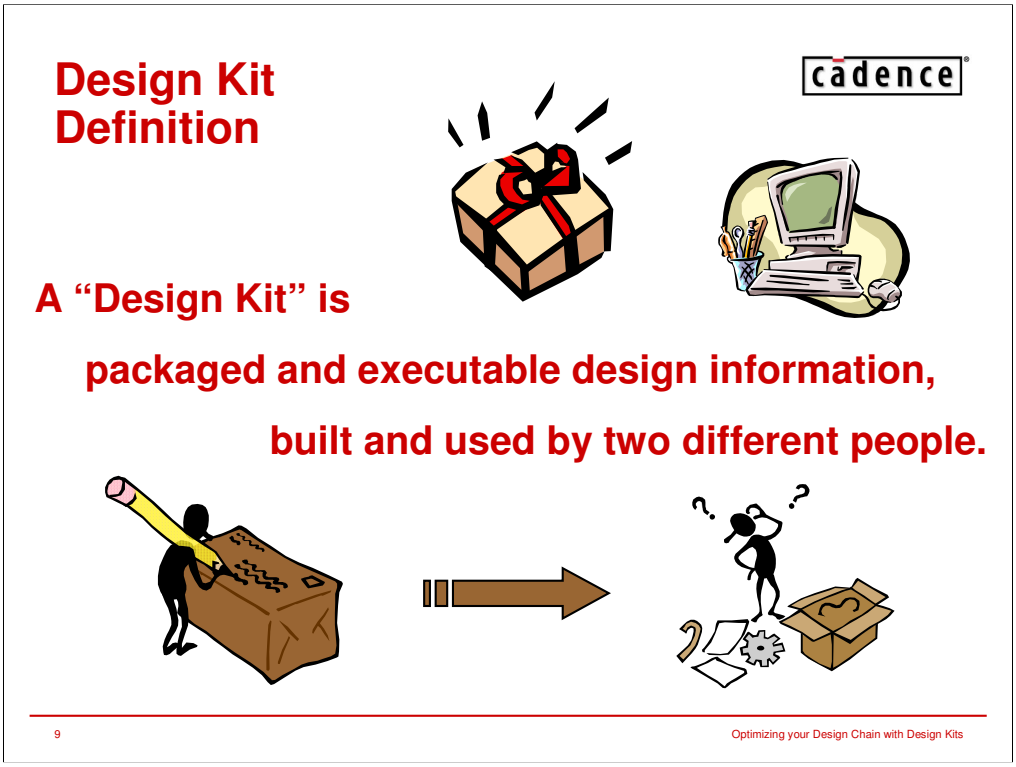
This diagram works best in “slide show” mode.

It’s common to have a vertical view of your “job”. You’re an Engineer, who does work, and gets paid.

To understand your place in the Design Chain, you have to look sideways. Start by considering the work you do. What are the “Inputs” you use, and what are the “Outputs” you create. When you include these with the Engineers who work with them, you have found your place in the Design Chain. A top-level Design Chain that delivers end product designs to the Supply Chain is actually composed of many of these smaller person-to-person, job-to-job Design Chains.

Keep this model in mind, and in a few slides we’ll show how it relates to Design Kits.

What is a Design Kit? We'll illustrate this with both a definition and some actual examples. Then we'll look at the reasons to use Design Kits and again show how they relate to you and your everyday work.



Data and information is called a “Design Kit” if it meets *all three* of these criteria. It must be:

1. Packaged,
2. Executable, and
3. Built and used by two different people.

Lots of things meet one or two of these criteria, but not all three – as we’ll see on the next slide.

Are These "Design Kits"?

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- A Datasheet?
  - No, it's not "executable"
- Engineer B works on the same layout database Engineer A is working on
  - No, it's not "packaged"
  - This is "Concurrent Team Design" – not a "Design Chain"
- Company X offers a reference PCB layout file for their new 10 Gbit XAUI IC on the web
  - Yes

10 Optimizing your Design Chain with Design Kits

There's lots and lots of information in the engineering world. But not all of it is contained in Design Kits.

For example, while Datasheets have been traditionally used to communicate a product's operation, it is not "executable" and cannot be immediately inserted into the user's design environment. Instead, the information must be digested by an engineer and then represented in some electronic format to be useful. Transferring information in paper (or PDF) documents is helpful, but it can also slow the design process. While this method is typical, it's important to look at options beyond datasheets when you're trying to optimize a Design Chain.

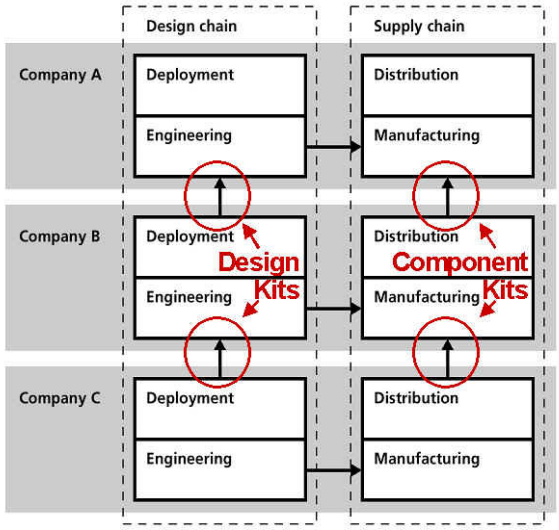
Similarly, there *are* many executable files that are shared by multiple engineers. But, as shown in the second example, this data does not represent a "Design Kit" because there has been no deliberate attempt to "package" it for consumption by other engineers in the Design Chain.

The third example represents a type of Design Kit that is becoming increasingly common and available. More and more companies offer reference designs – in packaged and electronic format – to

1. offer their customers a more complete description of how a product works,
2. help their customers speed their product to market, and
3. Optimize their Design Chain

Design Kits in the Design Chain

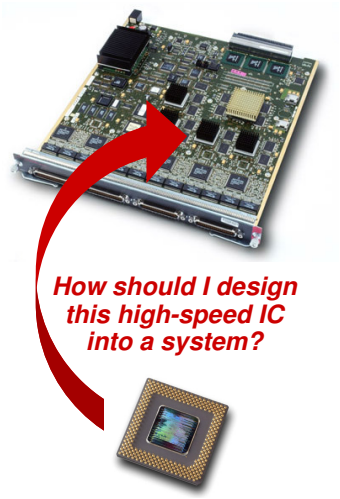
- Design Kits *are* the packaged and executable Design Chain Hand-off from Deployment to Engineering
- Like Component Kit Supply Chain transfers from Distribution to Manufacturing



Assuming you've understood the concepts so far, this diagram should make the position and role of Design Kits very clear. Design Kits should represent the collection of information deployed from engineer to engineer in the Design Chain. This transfer may be between different companies, but it need not be.

Just as there has been effort to "Optimize the Supply Chain" by making, combining, and marking components so that they are immediately useable by the next company's Manufacturing process, so must we endeavor to "Optimize the Design Chain" by forming "Design Kits" that are immediately useable as well.

Traditional Design Kits
Accelerate Silicon-Pkg-Board TTM



SoCs design-in bottleneck

Problem

- 1000s of pins and critical timing
- PCB design takes many months
- Every day is lost volume & profit

High-Speed PCB Design Kits

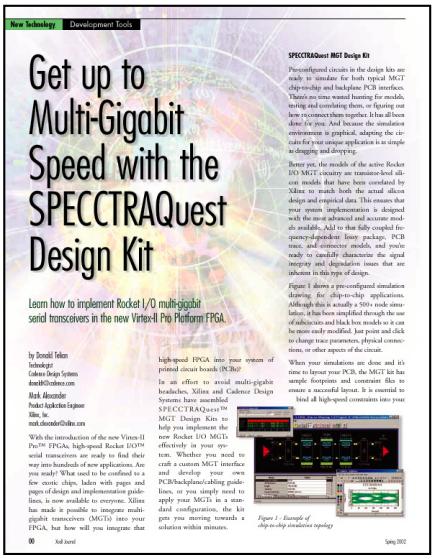
Solution

- Ready-to-use models, schematics, layouts
- Saves months in design

That's the conceptual level explanation of Design Kits. Probably the most common situation where Design Kits are used is in accelerating the Silicon-Package-Board design in Time-To-Market (TTM). New high-speed System-on-Chip (SoC) ICs have always been challenging to implement in a system of PCBs, but the problem has been further exacerbated by new types of IC packages that condense 1000s of pins into a very small area. In an effort to help their customers quickly and successfully design-in their components, many IC vendors provide "Reference Design Kits" that show at least one way to implement the IC. These Kits might include pre-configured and correlated simulation models, and schematics and layouts that illustrate proper connectivity. Trying to communicate the proper design techniques in a typical paper document is unwieldy, and there are always language and communication problems. In the case of a pre-tested Design Kit, a picture is truly worth a thousand words.

Design Kit Examples

- Xilinx Multi-Gigabit Transceiver Design Kit
  - Helps you implement 3.125 Gbps FPGAs on PCBs
  - http://www.xilinx.com/publications/xcellonline/partners/xc_speckit42.htm
- Other Design Kit Examples
  - Processors, Motherboards, etc.
  - http://www.specctraquest.com/Optimize/DesignKits.asp



New Technology | Development Tools

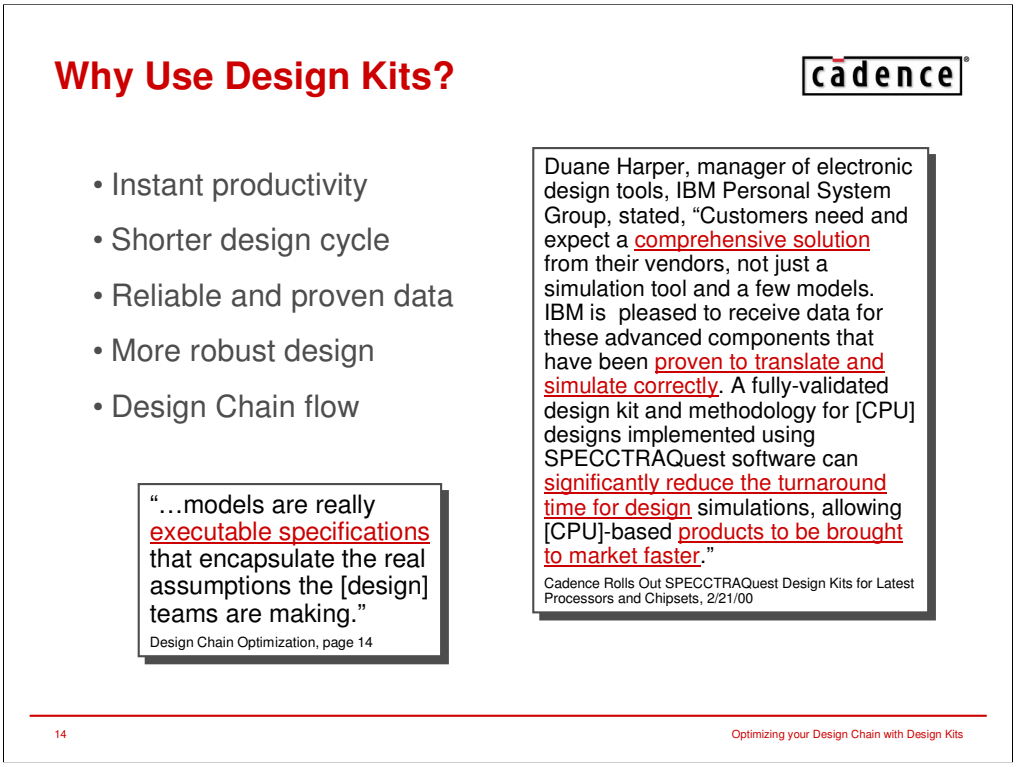
Get up to Multi-Gigabit Speed with the SPECCTRAQuest Design Kit

Learn how to implement Rocket I/O multi-gigabit serial transceivers in the new Virtex-II Pro Platform FPGA.

SPECCTRAQuest MGT Design Kit

Figure 1 - Example of chip-to-chip simulation topology

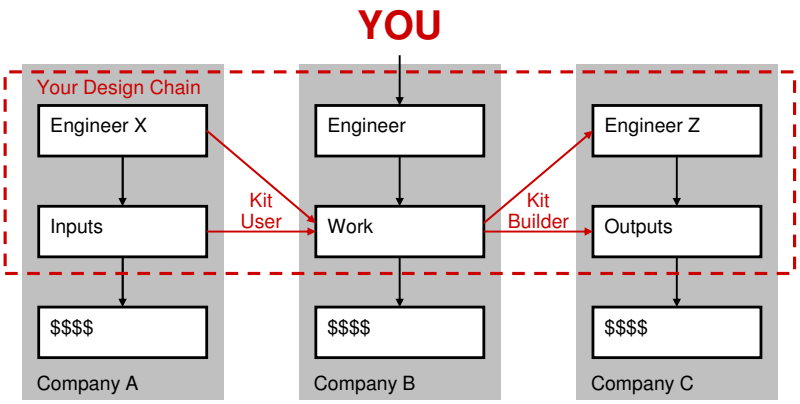
Here's URLs for examples of various existing web-downloadable PCB Design Kits. Both Multi-Gigabit SERDES Transceivers and the latest Microprocessors represent significant challenges for Silicon-Package-Board system design, and are common technologies where silicon vendors must offer some kind of additional support to their Design Chain. These Kits can be downloaded and browsed as good examples you can reference. And the numbers of examples – and hence, companies working on optimizing their Design Chains – continues to grow.



Many of the benefits of using Design Kits may already be obvious. But consider each of these points (augmented by the quotes on the slide):

1. Instant Productivity – Kit users find that they can perform real work within minutes of opening a good Kit.
2. Shorter Design Cycle – as noted by the gentleman from IBM
3. Reliable and proven data – when you use the same models/files that your vendor prepared and used you avoid translation errors, guesswork, and other forms of miscommunication.
4. More robust design – follows from the additional information in the Kit and the "executable specifications" that either validate or alter a team's design decisions.
5. Design Chain flow – the easy and efficient flow of design information is what we're after and trying to optimize.

Design Kits and YOU



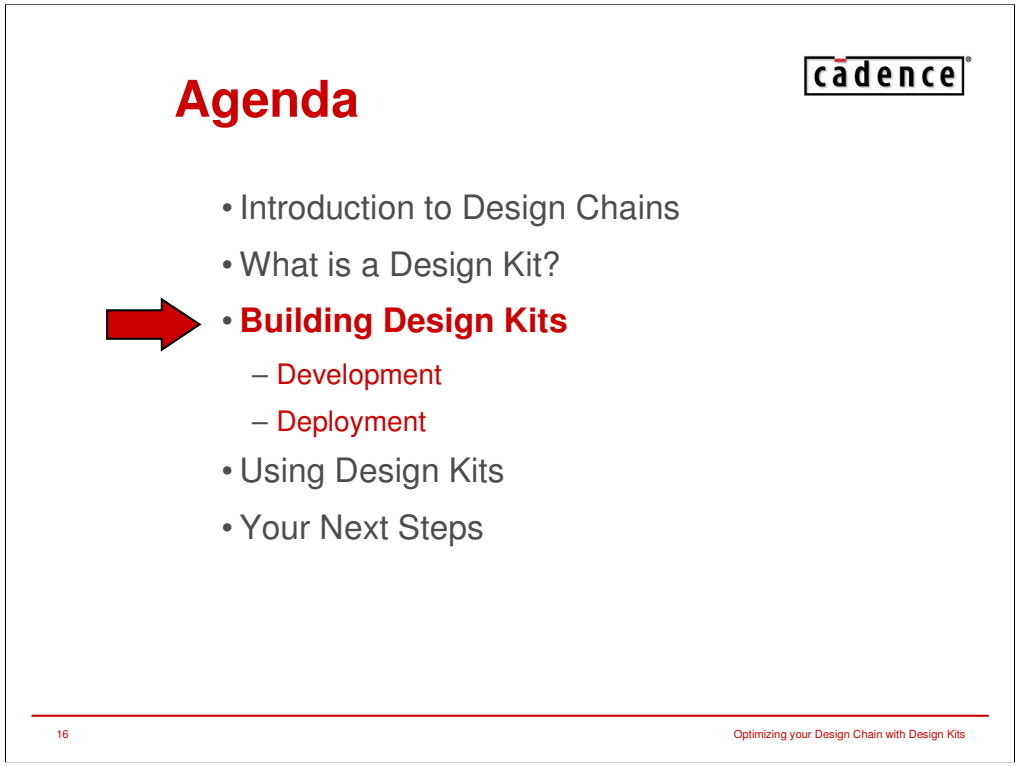
Increase your productivity & value by being both Kit Builder and Kit User

While the Executive White Paper (referenced earlier) calls for Design Chain Optimization from the top down, it can also be driven from the inside out. If you figure out how to do this, it will greatly increase your productivity and value (as well as that of those around you).

When you get the Engineer who provides your Inputs to package and upload those Inputs you become an efficient Kit User in your Design Chain.

When you deliberately gather and package your Outputs and databases for downstream engineers you become a Kit Builder and greatly improve the productivity of others in your Design Chain.

And when you succeed at optimizing your Design Chain, everyone wins.

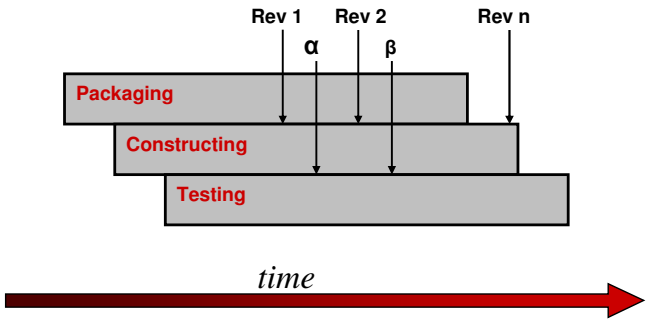


Assuming you've identified a Kit you could build, let's look at the basic 6 steps and process you could use.

This process has two important parts: Development and Deployment.

While it's easy to feel that the bulk of the work in building a Kit is in Development, you can increase the value and usefulness of a Kit if you do a good job at Deployment. It's important to focus on both aspects when you're building a Kit, as we'll explain further.

Design Kit Development



Development process involves:
Packaging, Constructing, and Testing

17 Optimizing your Design Chain with Design Kits

Design Kit Development consists of three overlapping steps and stages: Packaging, Constructing, and Testing.

A Packaging strategy and format must come first, because it provides a framework for everything you develop during Construction. And Testing should proceed in parallel as each piece is developed.

The arrows make an important point. A Design Kit typically has revisions. If you plan for this up-front you're more likely to make items available in a timely manner and you can also leverage Testing help from a larger number of sources.

We'll now look at the three parallel stages of Development in more detail, starting with Packaging.

Development: Packaging

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Packaging
Constructing
Testing

- Target it
  - Understand your user's skill level and expectations
    - Many will expect the Kit to do their job for them
- Organize it
  - Web-site: understandable and layered format
  - Can be leveraged inside (and later) outside firewalls
- Use multimedia
  - Use PC screen demonstration movies

Develop a packaging strategy before you begin Constructing

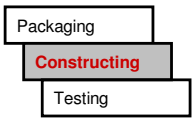
No matter how good the content is, your Design Kit will not get used unless it is packaged effectively. One of the primary benefits of a Design Kit is its ability to speed up the user's design process, and that won't happen with a Kit that is poorly organized and/or documented. Before the Kit is even started, you need to build a plan for how it will be packaged. In determining your best packaging option, you need to:

Target it. A common mistake made by Kit builders is to assume that anyone who uses the Kit will automatically know what all the files are and what they are used for. However, this is never the case. In fact, Kits are often downloaded by people who expect the Kit to do most of their design work for them and make their job a lot easier. The packaging must make up the difference between how well the Kit builder knows the data, and how simple the Kit user expects it to be to use it. Indeed, one of the challenges for the Kit builder - who knows the information so well - is to view the Kit from the eyes of someone who has never seen it before. And, most likely, the Kit user will be less experienced in doing the design tasks the Kit is trying to help with. A Kit builder should ask these questions: How long should it take from the time the Kit user opens the Kit until they can begin doing useful work? How much time can the user remove from his design cycle by using this Kit? What are the pre-requisites required for using this Kit? Does the Kit assume the user knows certain tools and/or processes? The Kit should be packaged in a way that answers these questions, and minimizes both the user's design cycle and their time to useful work.

Organize it. Obviously, good documentation is essential. But it must not be unwieldy. Experience has shown that it's best to have "layers" of documentation that allow the Kit user to stay as abstract - or go as deep - as they want. Since nearly everyone is familiar with the process of navigating an HTML (web) browser, it has been found that the best way to organize a Kit is as a web-site. Organizing a Design Kit as a web-site has many advantages: 1) users instantly understand how to navigate through the information, once you direct them to the "home page", 2) the Kit can be loaded to the user's intranet, allowing others in the same company to access it, 3) it provides a convenient way to "layer" the documentation, and hide deeply technical details in sub-pages (for those who are interested), 4) a web-site is structured as directories and sub-directories of files which provides a natural and self-documenting organization for a Kit (which would be files and directories anyway), 5) when the data in the Kit becomes public (most Kits require an NDA when first introduced) it can be easily loaded to the world-wide-web so engineers everywhere can benefit, 6) web-sites can be easily updated and revised, 7) users are forced to take files and information "from" the web-site, which tends to always leave a clean or "golden" version of the files that may have become altered if they were simply loaded as directories onto the user's machine. The fact that users everywhere understand the web-browsing use model AND that it is an easy way to share the information among engineering teams and/or sites makes the selection of a web-site compelling.

Use multimedia. Ideally, a Kit builder should produce a demonstration movie showing how the Kit should be used. Since it is simple to do, inexpensive, and provides a ***huge*** benefit to the Kit user, there's really no good reason not to. Tutorial "Movies" are simply computerized recordings of the Kit builder talking and demonstrating how to use aspects of the Kit. They capture both the Kit builder's voice explanation and his computer screen as he talks. As soon as major portions of a Kit are completed and working right, the Kit builder should simply record a movie explaining that section of the Kit. (And do it fast, because even you will forget how everything should work.) Two inexpensive programs (~$100 US) have been used successfully for this purpose. They are TechSmith's Camtasia and IBM/Lotus' ScreenCam.

Development: Constructing



- When to build
  - During product development when files are working
- What's in Rev 1
  - Plan something that is both *substantial* yet also *achievable*
  - Form a list of materials needed
- Build to a roadmap
  - Kits have many revisions, each with more complete information
  - Publish the revision roadmap in the Kit

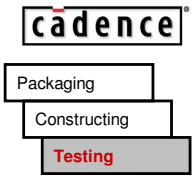
Constructing is primarily Packaging and Testing what already exists

When to Build. Easily, the best time to build a Kit for a certain product is when that product is being developed. More often than not, most items that would be offered in a Kit are built naturally during the design process. As such, *while models/schematics/files are current and working correctly, save golden copies for inclusion in a Kit*. In this way, there's no time wasted hunting for files, remembering what they are, and making sure they work right. However, this is unfortunately often not the case. Many Kits are built as an afterthought, almost as a "documentation" step. When this happens, something is always lost in the process. It's important to try to change this mindset and plan Kit construction to occur coincident with product development. Doing so will produce the best output with the least amount of work.

Contents of Revision 1. When it's time to build a Kit, and all the other details are in place (e.g., legal, packaging, resources...) the first step is to determine what contents are required in the first revision. It's important that the first revision be both: a) Substantial, and b) Achievable. "Substantial" means that it must have sufficient content included to motivate an engineer to download it, open it, and use it. "Achievable" means that in your effort to make it substantial, you must not "overbuild" it so it takes a long time to release the first revision. This will cause either the Kit to be released too late or people to lose interest in the project. If you have to slant your choice to one of these criteria, it's best to choose Achievable and delay some of the proposed items to subsequent revisions of the Kit. So don't overdo it - Kit Construction is primarily about packaging up materials that already exist and making them available/understandable to a wider set of users. Once a list of items in the Revision 1 Kit has been compiled, form another list that details all the inputs/deliverables you'll need in order to build the Kit. You may find that not all of the items you thought should be included actually make sense in the Kit. But it is still important to generate and agree on a list of what you *think* should be in the first revision of the Kit.

Build to a roadmap. A key item to include in the first revision of a Kit is the roadmap for subsequent revisions. This should detail what will be added to the Kit, and when it will be made available. This practice is especially important to use with complex new technology. In these cases, you probably need to use the roadmap as a Kit development schedule, and figure out how to use early Kit revisions to get smaller - but important - data out to the Kit users. Users appreciate getting as much as they can as soon as they can. For example if your end deliverable is a system-level model with many smaller components, Kit users prefer to receive incremental revisions (albeit, not too many) that contain more and more of the smaller elements. In this way, they can try each piece out and ensure their configuration is working correctly. And sometimes the most clever users may figure out a way to build a complete solution faster than you can deliver it. So be sure to build and publish a revision roadmap, as it will help guide both you and the end user.

Development: Testing



- Incremental
  - Test as you construct
- Alpha
  - Train and leverage those who will provide Kit Support
- Beta
  - Select a couple Kit Users who will provide feedback
  - Expect to find mostly Packaging issues

Thorough testing minimizes eventual Support overhead

Before a Design Kit sees a wide distribution, it must be adequately tested. If planned for ahead of time, testing can become a natural part of the Design Kit Development flow.

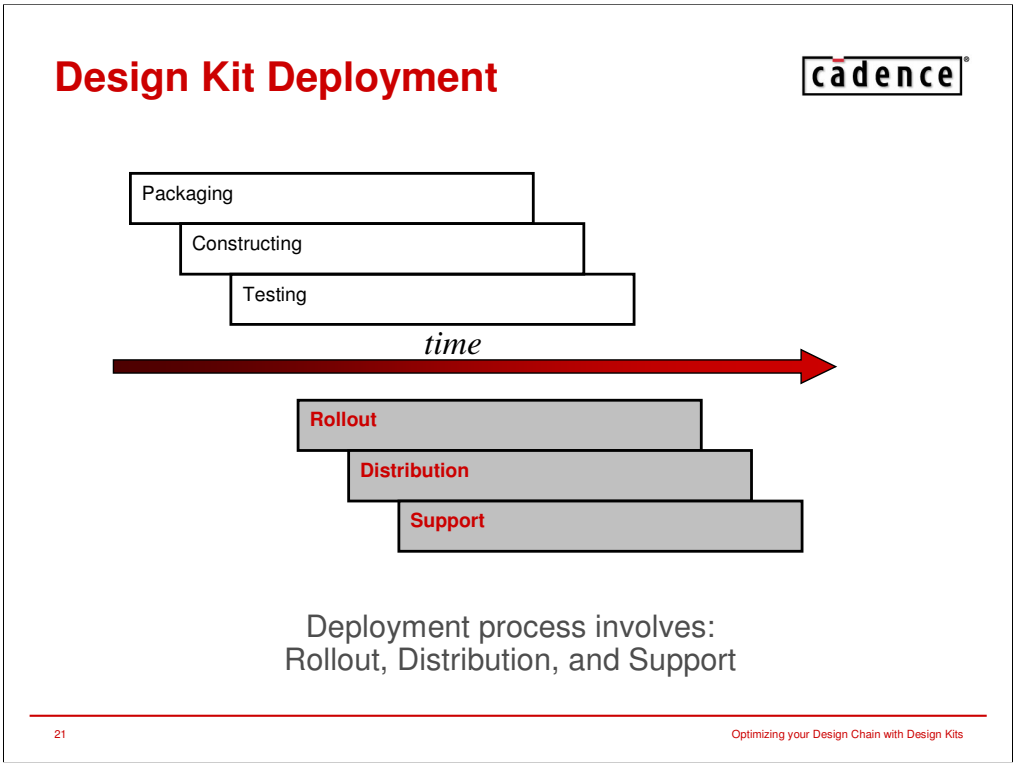
Incremental Development Testing. Just as the previous slide explained that it is not advisable to try to construct all the pieces of a Design Kit at once, so it is with Testing. It's best to thoroughly test each piece of a Design Kit separately *as it is developed*. This incremental approach to testing helps avoid many problems. However, you will find you still miss things.

Thorough testing is required by and from all Kit developers. But nuances in the developer's system configuration and/or use model may make some things work for them, but not for others. As such, others need to be enlisted into the testing process to make sure the testing is adequate and complete. This is explained in the next two sections.

Alpha Testing: Support. By the time a Kit Developer has a revision nearing completion, it should be clear what additional resources are on board to help support the Kit. These people may be in the same company, or perhaps in one of the Kit's partner companies. Realizing that these people must be trained before the Kit is deployed makes them a natural selection for Alpha test. They can both learn the Kit, test different aspects, and provide feedback to the developers. If there are a number of support personnel involved - perhaps in various geographic locations - have them all learn the basics of the entire Kit, but also assign each person a different section to focus on and test in-depth.

Beta Testing: Select Users. After some Alpha testing, enlist two or three select Kit Users who will provide feedback in exchange for an early delivery of the Kit. These will be your Beta test sites. Perhaps they might be users you are familiar with and can count on for good feedback (and understanding if a couple things don't work perfectly), but this is not a requirement.

You will find that testing at this stage will primarily reveal problems with the Kit Packaging. Certain files don't unzip right, some items aren't adequately explained - and things like that. It's best to collect this feedback and make those adjustments to the Kit before it is available to a wider set of users.



Like Kit Development, the Deployment process also has three overlapping stages: Rollout, Distribution, and Support.

Time-wise, it's best to run the Deployment activities in parallel with Development for a number of reasons:

1. Marketing Communications (if used) often have a lead time and need to be planned and staged.
2. There's likely to be many revisions of the Design Kit, yet the bulk of your Deployment should be focused on Rev 1 or 2.
3. You can and should get your Support teams involved in Testing.
4. Often, Distribution mechanisms need to be built and tested themselves.

We'll now examine each of the three Deployment stages in more detail.

Deployment: Rollout

Rollout
Distribution
Support

- Timing
  - Rule-of-thumb: 12 weeks before product samples
- Training
  - Prepare any field, marketing, or support people who need to know
    - Goal is to NOT have to train the Kit User
- Communications
  - Use Press Releases, Conferences, Web-sites, Articles, etc

Rollout's goal is to let potential users know about your Kit

Design Kit Rollout is a set of activities focused on letting the industry know about your new Kit. In practice, it can take as much time and effort as Kit Development.

Timing. The rule-of-thumb for a high-speed PCB Kit that is focused on a new IC (or set of ICs) is to make sure it's available at least 12 weeks before silicon samples. In this way, engineers have time to use the Kit in their simulation-schematic-layout process and have boards ready when the first silicon arrives.

Obviously, any models in this first revision of the Kit will not be silicon-correlated. In fact, to hit this milestone the Kit will be released even before the silicon tapeout. This is another reason why it's important to plan for revisions in your Kit Development process.

So if the Kit can be timed to release before the silicon, it will be important to stage the Rollout activities below accordingly for greater effectiveness.

Training. Before Rollout can occur, you will need to train various individuals. For example,

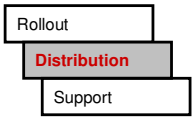
- field personnel at all companies involved in the Kit need to know when the Kit is available, what's in it, where it can be obtained, and why it's valuable
- support personnel need to be prepared to handle detailed questions about the Kit
- marketing personnel need to know how to represent the Kit, and its primary features and benefits

PlaceWare has been used effectively to train global field organizations. This mechanism allows for both slide presentations and live software demonstrations. Another excellent feature is the ability to record the training session so those who could not attend can view it at a convenient time. This is critical since field personnel reside all over the world in different time zones; trying to organize even multiple sessions to train them would not be successful.

However, your goal is to NOT have to train the Kit Users. A well-packaged Kit should take care of that for you.

Communications. There are many methods to spread the news about your Kit. They include: Press Releases, Journal and On-line Articles, Seminars, Webinars, Web-sites, Email Blasts, and Conferences. A good Rollout will use many of these options simultaneously, using the existing marketing channels at each of the companies involved in the Kit.

Deployment: Distribution



- Pricing
  - Well, actually, Design Kits are almost always “free”
  - ROI = increased product sales or customer satisfaction
- Ownership
  - Existing Kits distributed by either component or tool vendor, or both
- Options
  - Preferred choice is external web- (or ftp-) site download
    - New NDA and password options exist

Distribution must be able to easily handle numerous Kit revisions

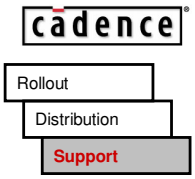
There was a time when design collateral was distributed only by a company's field personnel or representatives. But the internet has changed that model significantly. Today even very sensitive data can be downloaded over the web, assuming you have the right passwords. Whatever option is chosen, every team working on a Kit will have to determine how the Kit will be distributed.

Pricing. Design Kits have a long history of being "free" to the user. Money is recovered to pay for their development/deployment overhead by selling the tools and components represented in the Kit. While selling Design Kits is certainly possible, it would represent a new paradigm, would need a clear value statement, and would probably have to be the only solution available (i.e., no competition). In general, Design Kits (like datasheets) are free. And it would be quite a challenge to change that expectation.

Ownership. Each Kit team will have to determine who "owns" the distribution of the Kit. In general, distribution will be handled by either the component supplier(s) or the tool supplier, or both. Component Supplier. Since the component supplier typically has the most IP (Intellectual Property) in the Kit, they will often want to control and track its distribution. This was true for some of the Processor Kits and the Xilinx Rocket IO Kits mentioned earlier. Tool Supplier. Sometimes the component supplier may want to off-load the distribution task, and utilize the tool supplier's distribution channels. For example when Intel designed the PCI (Peripheral Component Interconnect) bus specification, all of its IO and PCB models were distributed on the CDs with the software that ran them and the usage instructions were written into the tool's manuals. In this way, Intel could easily distribute the open industry-standard information and assumptions and did not have to use their resources for distribution or support. Both. Some Kits may want to use any and every channel available for distribution in an attempt to canvas more users and saturate the market with their information. This is often done for technologies that get used in many different applications like capacitor or connector model Kits. The downside of using all channels at once is that there is no longer a single distribution point and it is easy for the different sources to be simultaneously distributing different revisions of the Kit.

Options. The existing options for Design Kit Distribution are: Tool Vendor Web-site, Component Vendor Web-site, Component Vendor Web-site with click license NDA, Tool Vendor Software CDs, Component Vendor Field Personnel (traditional methold), Component Vendor Field Personnel with paper NDA. Of these options, the Component or Tool Vendor Web-site are the preferred choice. Whatever option is chosen, make sure the process is straight-forward to release and distribute updated revisions of the Kit. Revisions will happen, so plan ahead for it. Kits are normally distributed as a "zip" or "tar" collection of directories and files. Sometimes the Kit files are offered in expanded form on a CD. When tutorial movies are included, it is common for Design Kits to require over 100MB of space. Yet they will almost always fit on a single CD. Refer to the slide on Packaging for more information on formats etc.

Deployment: Support



- Explain Support within Kit
  - Even if none is offered
- Little Support is actually needed
  - If Kit is well packaged and tested
- Kits actually *reduce* Support overhead
  - Because the Kit Users have more data

Don't let Support concerns keep you from Kit Building

Design Kit Support

Every Design Kit should include information on how and where Kit Users can get Support, should they need help.

However, a well-packaged and tested Kit should require little support overhead. And, in practice, this has been found to be true. Engineers are resourceful, and if Beta testing is done correctly all the bugs will be removed from the packaging and usability issues so they can succeed with the Kit.

This fact is contrary to the primary reason companies often give to NOT build and offer Kits: "It will require too much support. Who will handle all of that?" In actuality, it could be argued that offering Kits actually *reduces* the amount of support required because the information in the Kit automatically answers a myriad of questions that would normally be asked.

In supporting Design Kits, generally the Kit's tool vendor handles the tool questions and the Kit's component vendor handles the component questions - all through the normal channels. Each vendor should be cross-trained on the basics of the other one's offerings. And many times the component vendor will need to buy or borrow licenses from the tool vendor in order to assist with Support.

This concludes our in-depth look at a process you can use for building Design Kits.

Next, we'll take a look at your role as a Design Kit User.

As A Kit User You Should…

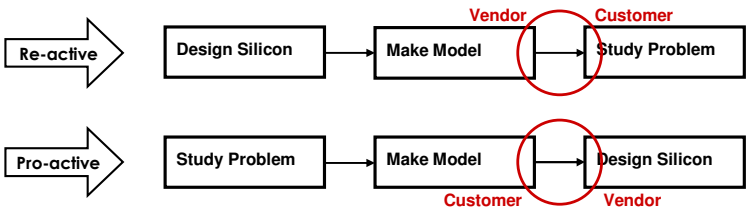
- Identify the upstream suppliers in your Design Chain
  - Form a list of important inputs and potential Kits
- Request those "Kits" from your suppliers
  - Not just models, they should be pre-packaged and working
  - Let them know what would be helpful to you
    - Particularly data you suspect they already have
  - Make it a part of your purchase agreement
- Offer feedback to Kit Builders
  - Both positive and negative

Build, grow, and strengthen your Design Chain with Design Kits

Many potential Kits won't happen unless someone asks for them. You're probably aware of lots of data that would help you do your job better if your supplier could be persuaded to give it to you. You may be able to make the request part of the purchase agreement, but that is not the only option. Many engineers have developed the valuable skill of knowing how to get information flowing in their Design Chain. Give it a try – you may be surprised to find that "all you had to do was ask". That's often true, particularly when you ask the right person.

The primary reason suppliers hesitate is that they suspect that you will demand lots of support or will just complain about what you get. Surprise them by only calling to say thank you.

Or, Send the Kit Builder the Kit You Want

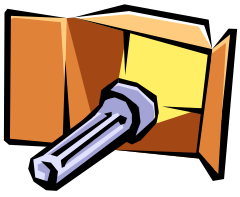


- Specification level Design Kits
- Two-way Design Chain Kit transfer
- Process in use by industry leaders

Design Chains need not flow information in only one direction. In fact, a Kit User can even pro-actively send their supplier the characteristics of the components they want in a “Specification Design Kit”. This has been successfully done by engineers in order to further improve the Design Chain, and proactively circumvent design problems, as shown in the diagram. This is an example of how participants in a Design Chain can use electronic data “Kits” to jointly develop a product that inherits the collective knowledge of each member in the Chain.

So what can you do to Optimize your Design Chain? Probably the simplest pro-active thing you can do is become a Kit Builder by making the effort to Package and Distribute what you've already done. Let's look at the steps in doing that.

Build a Design Kit



1. Who is downstream in your Design Chain?
2. What do you have you could package?
3. Sell the value and/or process improvement.
4. Consider enlisting your tool vendor to help.
5. Develop, Deploy,

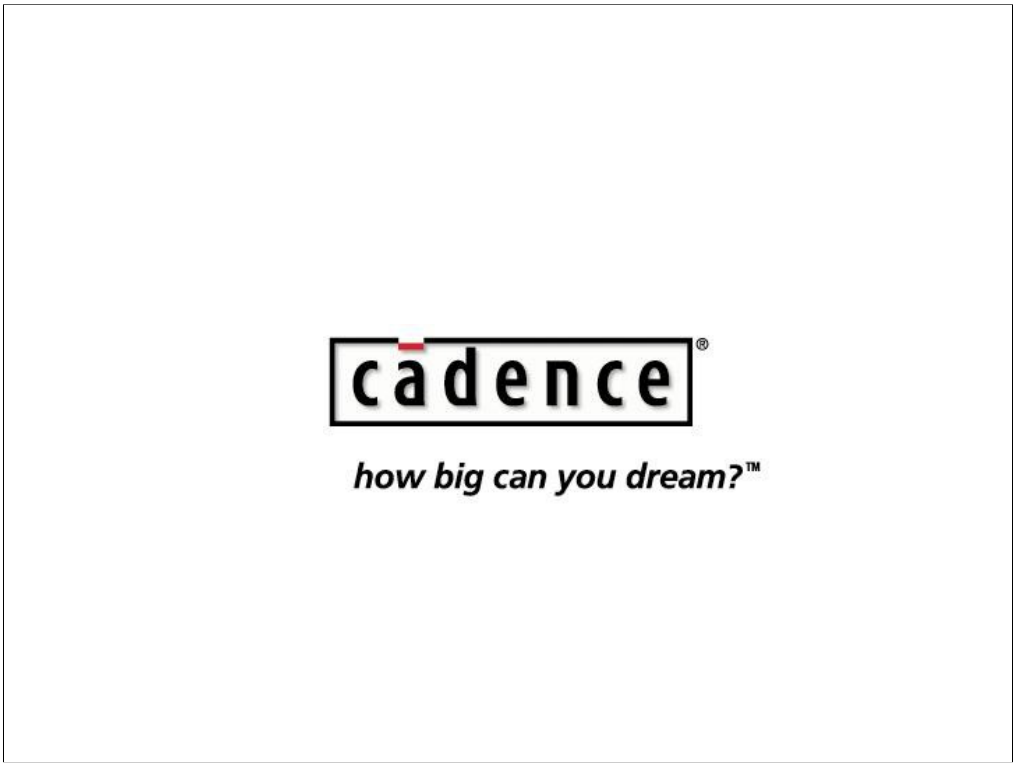
…and help Optimize your Design Chain with Design Kits !

Again, simply look downstream in your Design Chain and identify something they need that you already have. Package and Deploy it, and you're done.

Step 3 points out that, since this may take a little extra time, be sure to sell the value of your Kit to your management. Teach them about how the Design Chain works and how you can improve the process. They probably don't have the same insight you have on what could be done, yet are very interested in ideas like this.

Step 4 highlights the fact that you may not be as alone in the task as you might think. It's very common for EDA vendors to help with Kits if you can demonstrate a wide spectrum of interested users. This helps the EDA vendor contribute "solutions" rather than just "tools". In particular, Cadence has pioneered many of the concepts in this paper and makes an excellent partner for many types of Kits. In a recent EETimes survey, board designers gave Cadence the highest ranking in categories such as "clear vision of the future", "most ethical company", "technology leader today", "customer satisfaction", and many others (see EETimes article "Different srokes for different designer folks", June 24 2002, page 20). Cadence continues to be a pro-active facilitator of Design Chain Optimization.

So Develop, Deploy, and help Optimize your Design Chain with Design Kits!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