Alacrity Results Management

An Introduction to ARM's Results Management and Modelling Capabilities

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1.0 What Is ARM?

Alacrity Results Management (ARM) is a product that provides a powerful toolbox for Performance Management and other application areas. It supplies the components required to build custom performance management systems (or other applications which require multiple hierarchies of numeric information) analogous to the way Microsoft® Excel provides the ability to use cells and formulas to analyze numbers. Far beyond Excel, ARM provides powerful tools to manage the complexity inherent in a 'real world' system, while being both flexible and scalable.

Excellent uses for ARM include:

- budgeting
- activity-based costing
- performance management
- modelling

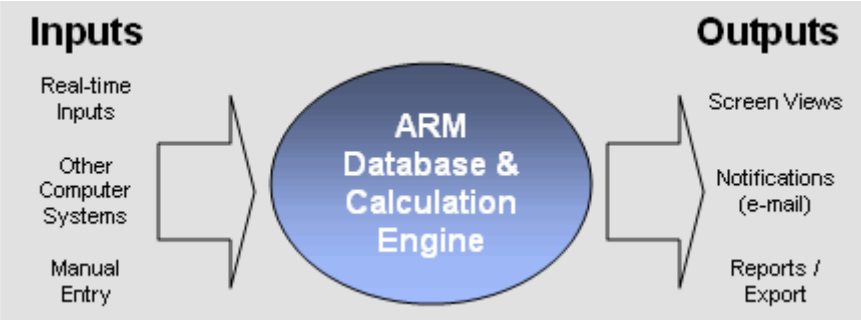


Figure 1 – High Level ARM view

The diagram above shows ARM at a very high level. The core is a Database and Calculation Engine which is fed from

- real-time inputs
- automatic data from other computer systems
- manual entry (shared entry by your key staff and stakeholders)

ARM allows you to:

- View up-to-date data on-line using various screen views
- View up-to-date data on-line using various screen views
- Generate e-mail notifications for out of range values

- Export the data you are viewing to Excel
- Print customized formatted reports

You may be asking yourself "why can't I just do it in Excel?". If you are following a small number of values and the calculations are not very complicated, perhaps you may reasonably use Excel; however, if you have a multi-level (performance management) system with many data points and complicated calculations, or if you require more than one concurrent user, Excel is not an appropriate application for that purpose. For a detailed discussion of using Excel vs. ARM for large complicated models, view:
http://www.CherniakSoftware.com/homepage/ARM/ARMvsExcel.pdf

ARM is a single package that combines the following:

- A modelling tool (allowing you to model your business down to the lowest level in which you are interested)
- A data warehouse (taking data from multiple sources in your company and storing it in the company model in a common format)
- An inquiry tool (allowing you to query on information at all levels in the model using multiple views see ARM Outputs)
- A reporting tool (providing formatted Excel worksheets from any worksheet; custom reports can be achieved using Crystal Reports)

From a technical point of view, ARM is written in Visual Age Smalltalk, and uses a GemStone database as the back end. ARM, developed in a fully object client and server model, is being used to drive a model that is essentially object oriented as well, consisting of groups and members rather than classes and instances.

The remainder of this article will explore the various outputs from a user point of view, delve into ARM's technical architecture, then discuss the benefits of the ARM approach.

2.0 Performance Management

Performance Management is a hot topic in business today. Many companies now understand that unless you develop goals and an associated Performance Management process it is difficult

- to succeed (as the entire company is not aligned in what they are trying to accomplish) and
- to provide the corporation with a long-term focus that is achievable

2.1 Why Performance Management?

Carter McNamara, PhD, defines the following as the key benefits of Performance Management.

1. **Performance Management focuses on results, rather than behaviours and activities.**
   A common misconception among supervisors is that behaviours and activities are the same as results. Thus, an employee may appear extremely busy, but not be contributing at all toward the goals of the organization. An example is the employee who manually reviews completion of every form and procedure, rather than supporting automation of the review. The supervisor may conclude the employee is very committed to the organization and works very hard, thus, deserving a very high performance rating.

2. **Aligns organizational activities and processes to the goals of the organization.**
   PM identifies organizational goals, results needed to achieve those goals, measures of effectiveness or efficiency (outcomes) toward the goals, and means (drivers) to achieve the goals. This chain of measurements is examined to ensure alignment with overall results of the organization.

3. **Cultivates a system-wide, long-term view of the organization.**
   Richard A. Swanson, in Performance Improvement Theory and Practice (Advances in Developing Human Resources, 1, 1999), explains an effective performance improvement process must follow a systems-based approach while looking at outcomes and drivers. Otherwise, the effort produces a flawed picture. For example, laying off people will likely produce short-term profits. However, the organization may eventually experience reduced productivity, resulting in long-term profit loss.

4. **Produces meaningful measurements.**
   These measurements have a wide variety of useful applications. They are useful in benchmarking, or setting standards for comparison with best practices in other organizations. They provide consistent basis for comparison during internal change efforts. They indicate results during improvement efforts, such as employee training, management development, quality programs, etc. They help ensure equitable and fair treatment to employees based on performance.

Carter McNamara, PhD, http://www.managementhelp.org/perf_mng/benefits.htm

2.2 Other Benefits of Performance Management *

- Helps you think about what results you really want. You're forced to be accountable, to "put a stake in the ground".
- Depersonalizes issues. Supervisor's focus on behaviors and results, rather than personalities.
- Validates expectations. In today's age of high expectations when organizations are striving to transform themselves and society, having measurable results can verify whether grand visions are realistic or not.
- Helps ensure equitable treatment of employees because appraisals are based on results.
- Optimizes operations in the organization because goals and results are more closely aligned.
- Cultivates a change in perspective from activities to results.
- Performance reviews are focused on contributions to the organizational goals, e.g., forms include the question "What organizational goal were contributed to and how?"
- Supports ongoing communication, feedback and dialogue about organizational goals. Also supports communication between employee and supervisor.
- Performance is seen as an ongoing process, rather than a one-time, snapshot event.
- Provokes focus on the needs of customers, whether internal or external.
- Cultivates a systems perspective, that is, focus on the relationships and exchanges between subsystems, e.g., departments, processes, teams and employees. Accordingly, personnel focus on patterns and themes in the organization, rather than specific events.
- Continuing focus and analysis on results helps to correct several myths, e.g., "learning means results", "job satisfaction produces productivity", etc.
- Produces specificity in commitments and resources.
- Provides specificity for comparisons, direction and planning.
- Redirects attention from bottom-up approaches (e.g., doing job descriptions, performance reviews, etc., first and then "rolling up" results to the top of the organization) to top-down approaches (e.g., ensuring all subsystem goals and results are aligned first with the organization's overall goals and results).

* Written by Carter McNamara, PhD, http://www.managementhelp.org/perf_mng/benefits.htm

3.0 ARM Outputs

The discussion below depends on an understanding of an Example Model.

3.1 Example Model

Let us examine an example ARM model than can be defined by the relatively simple rules below.

- ABC Company operates in three provinces (BC, Ontario and Quebec).
- BC and Quebec each have one store, Ontario has two stores.
- Each store has Sporting Goods (S), Ladies Wear (L) and Houseware (H) departments.
- Each store keeps track of Sales and Costs on a monthly basis by department. Income is computed from Sales – Costs.

This model seems very simple at first, but after looking more closely, we can see that if we want to keep track of information at the Store level, the Province level and the Company level for each of the departments, we need quite a number of objects and relationships. This is the classic "matrix" organization with both a geographical and a departmental hierarchy to manage. One way to map these objects and relationships is shown below.

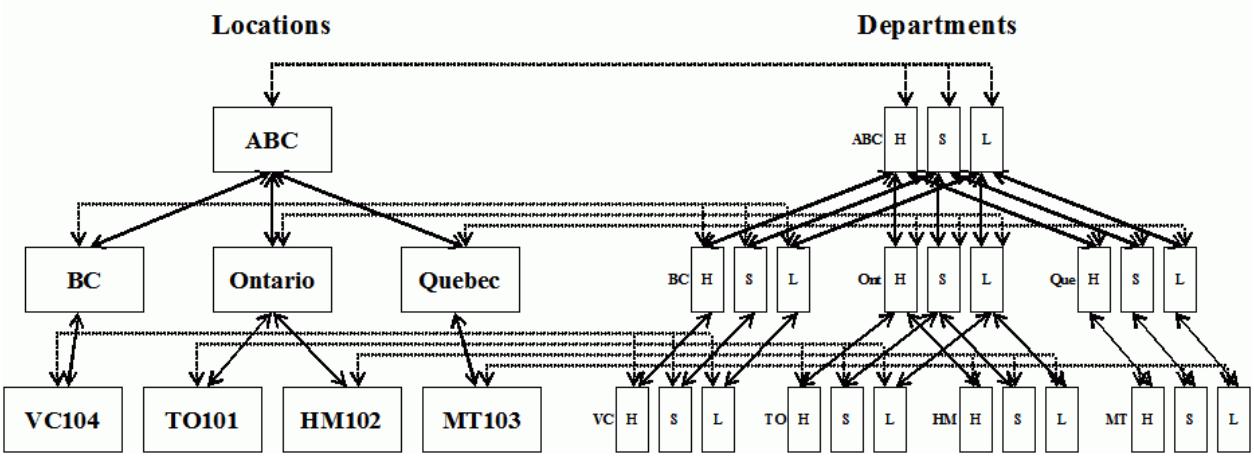


Figure 2 – Object Relationship in ABC Company

Notes:

- Three times as many departments exist than locations.
- The three departments for each object are linked to each of the associated locations.
- In the Locations hierarchy, the corporation, provinces and stores are linked appropriately to each other.

- In the Departments hierarchy, the corporation departments, provincial departments and store departments are linked in much the same way.

Each Location and Department node above needs a place to keep track of Sales and Costs on a monthly basis as well as a place to hold the Income amount. Now that you see the whole model, imagine developing a model in Excel that caused Sales numbers entered for any department of any store for a certain month to automatically update the appropriate Sales and Income numbers for all related cells. We submit it would be very difficult to do, especially if you may wish to add other measures later. In ARM, it is quite easy to model this relatively simple situation, and ARM provides the ability to model 'real world' situations as well.

You may be wondering how these relationships are defined. They are done by configuring ARM.

> **Configuration** is an activity carried out by a person, knowledgeable in the problem domain with training in ARM, to define or change the ARM model to match the requirements of the client. The process is done separately from the ARM program and does not require the expertise of a computer programmer.

Many parts of ARM are configured, and are therefore changeable by the client. The details of how to configure is beyond the scope of this article, but essentially, the configurator defines the model using a multi-paged Excel spreadsheet within a supplied configuration environment and 'imports' the resulting files into ARM.

3.2 Screen Views

The user can select a view in one of three ways. This first will be illustrated here, while the other two will be mentioned only briefly as they require a greater understanding of the tool than this short article will enable.

The first way to navigate to the information you want to work with is through a series of hierarchical graphical images. These are basically GIFs with hotpoints defined. Each Hotpoint can take you either to another graphical image or to a data view. Since the images are GIFs, they can be as complex as needed.

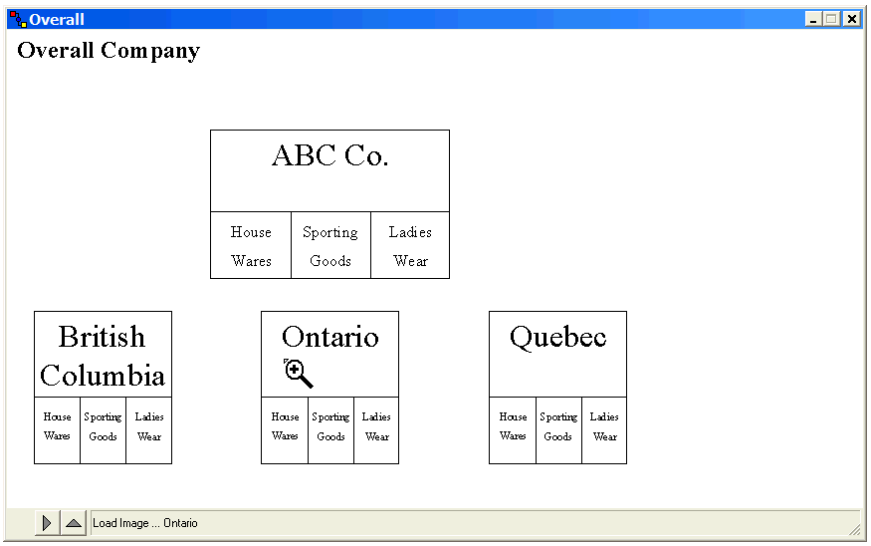


Figure 3 – Navigation Graphic – ABC Company Top

Figure 3 above shows a navigation graphic for the ABC Company. You can see the three Provinces and the departments for the Company and the Provinces. Putting the cursor over the box with Ontario makes the cursor show as a magnifying glass, indicating drilldown to another picture. Clicking yields the figure below.

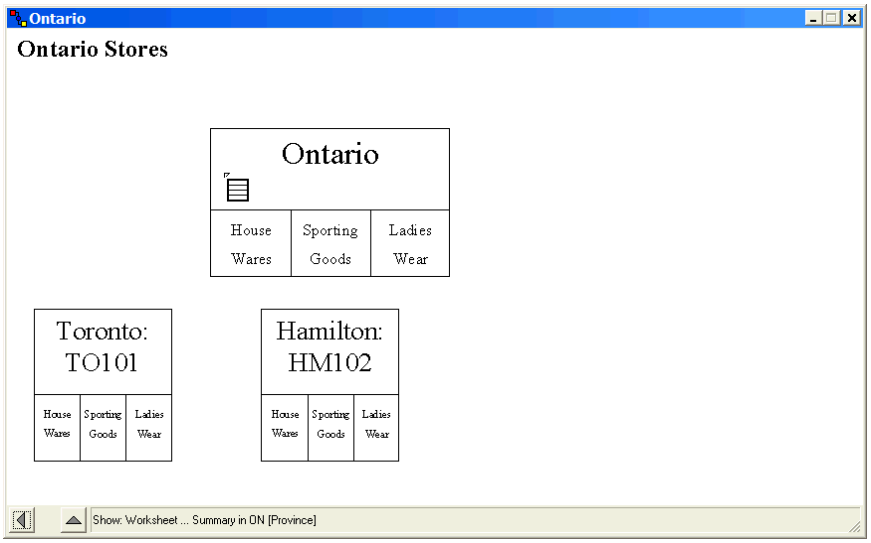


Figure 4 – Navigation Graphic – Ontario

We are now looking at the Ontario graphic, showing the two Ontario Stores, and the departments for Ontario and each of the Stores. If we put the cursor over the box with Ontario, we now get a different symbol. It is a worksheet symbol, showing that clicking there will provide data, rather than a further graphic. Clicking leads to the graphic shown below.

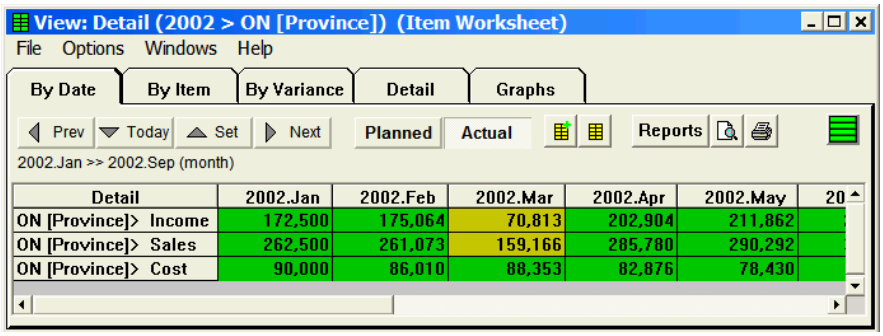


Figure 5 – Ontario Worksheet by Date

Figure 5 shows a worksheet which is the main vehicle to display data in ARM. The main part of the worksheet is the data area which, in this worksheet, shows the values of Income, Sales and Cost for Ontario by month.

Drilldown

Perhaps the most powerful feature in the entire ARM program is the ability to drill down every calculation in the system to its source values. This feature allows you to both validate a model when it is being built, and to answer many questions about a calculated number in a running model. A small example will illustrate this point.

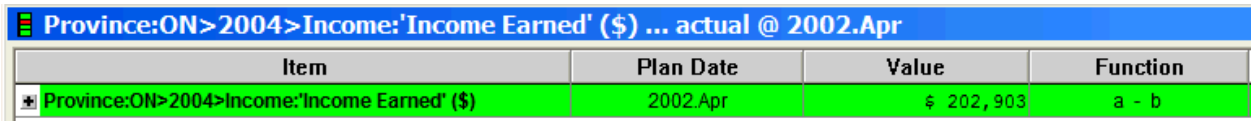


Figure 6 – Drilldown Top

If you choose 'Show Value Detail' after selecting the April 2002 Income cell, you get Figure 6, representing the top of the drill down tree for this value. Remember that we are looking at the measurement items for the Province of Ontario. Where does the $202,903 come from? The Function used to compute it is an 'a – b', that is a subtraction of two values. What are the values? Just press the '+' button on the left of the line and get to Figure 7.

Province:ON>2004>Income:'Income Earned' ($) ... actual @ 2002.Apr

Item	Plan Date	Value	Function
Province:ON>2004>Income:'Income Earned' ($)	2002.Apr	$ 202,903	a - b
Province:ON>2004>Sales:'Sales Received' ($)	2002.Apr	$ 285,779	sum
Province:ON>2004>Cost:'Cost Incurred' ($)	2002.Apr	$ 82,875	sum

Figure 7 – Drilldown, second level

As you might have expected, the Income is the Sales less the Cost, as is shown. Let us carry this on one more level. Where does the Sales amount come from? The Function used to compute it is 'sum' meaning add up a number of items. Just press the '+' to the left of the Sales line to see what those items are (Figure 8).

Province:ON>2004>Income:'Income Earned' ($) ... actual @ 2002.Apr

Item	Plan Date	Value	Function
Province:ON>2004>Income:'Income Earned' ($)	2002.Apr	$ 202,903	a - b
Province:ON>2004>Sales:'Sales Received' ($)	2002.Apr	$ 285,779	sum
Province Department:ON HW>2004>Sales-Dept:'Sales Received' ($)	2002.Apr	$ 171,520	sum
Province Department:ON SG>2004>Sales-Dept:'Sales Received' ($)	2002.Apr	$ 81,691	sum
Province Department:ON LW>2004>Sales-Dept:'Sales Received' ($)	2002.Apr	$ 32,567	sum
Province:ON>2004>Cost:'Cost Incurred' ($)	2002.Apr	$ 82,875	sum

Figure 8 – Drilldown, third level

Of course the Sales for Ontario is the sum of the sales for Housewares, Sporting Goods and Ladies Wear for Ontario. We could keep drilling down on any of these calculations until we reach the source data. Imagine being able to do this in Excel!

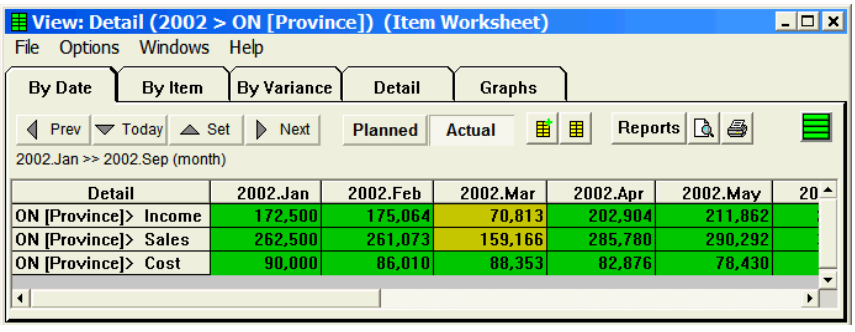
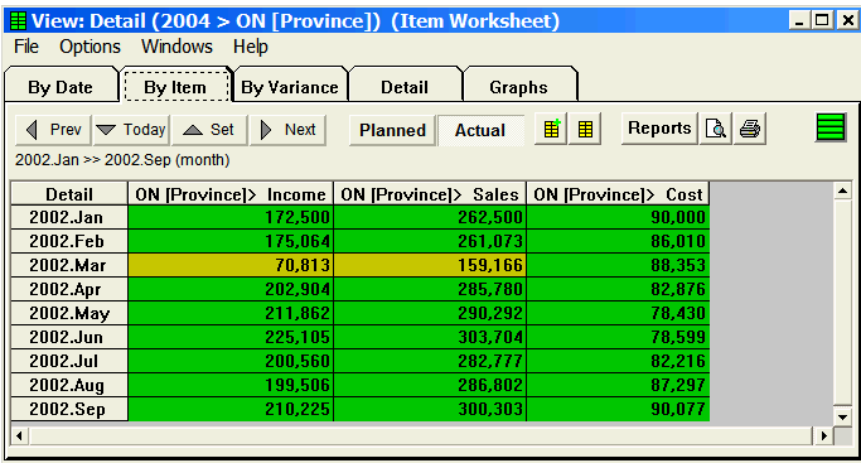


Figure 9 – Ontario Worksheet by Date

Back to the worksheet (Figure 9), you can see five tabs (By Date, By Item, By Variance, Detail and Graphs) which appear on all worksheets and allow you to view the data in different ways.

We are currently on the ‘By Date’ tab, showing dates across and items down. The ‘By Item’ tab is shown in Figure 6 and is the transpose of the ‘By Date’ tab – dates down, items across.



Detail	ON [Province]> Income	ON [Province]> Sales	ON [Province]> Cost
2002.Jan	172,500	262,500	90,000
2002.Feb	175,064	261,073	86,010
2002.Mar	70,813	159,166	88,353
2002.Apr	202,904	285,780	82,876
2002.May	211,862	290,292	78,430
2002.Jun	225,105	303,704	78,599
2002.Jul	200,560	282,777	82,216
2002.Aug	199,506	286,802	87,297
2002.Sep	210,225	300,303	90,077

Figure 10 – Ontario Worksheet by Item

Just above the numbers in the table and below the tabs, you can see the ‘Planned’ and ‘Actual’ buttons. These are the configured names for the dimensions (parallel sets of numbers) of the model. You can have any number of dimensions, each with a name you specify. In this model, there is a ‘Planned’ and ‘Actual’ set of numbers for each measurement. The ‘Actual’ button is pressed, so the worksheet is showing the ‘Actual’ numbers. The ‘Planned’ button will show the corresponding ‘Planned’ numbers. Selecting the ‘By Variance’ tab allows you to see ‘Planned’ vs ‘Actual’ for any one date for all items in the worksheet.

We will not discuss the ‘Detail’ tab here to any great extent. Suffice to say that it shows calculation rules for each item, and is not used very often in normal practice.

Figure 11 shows a graph of Income over time for the ‘Actual’ dimension. You can:

- show any or all of the dimensions on a graph
- choose any or all of the items you are measuring in separate graphs

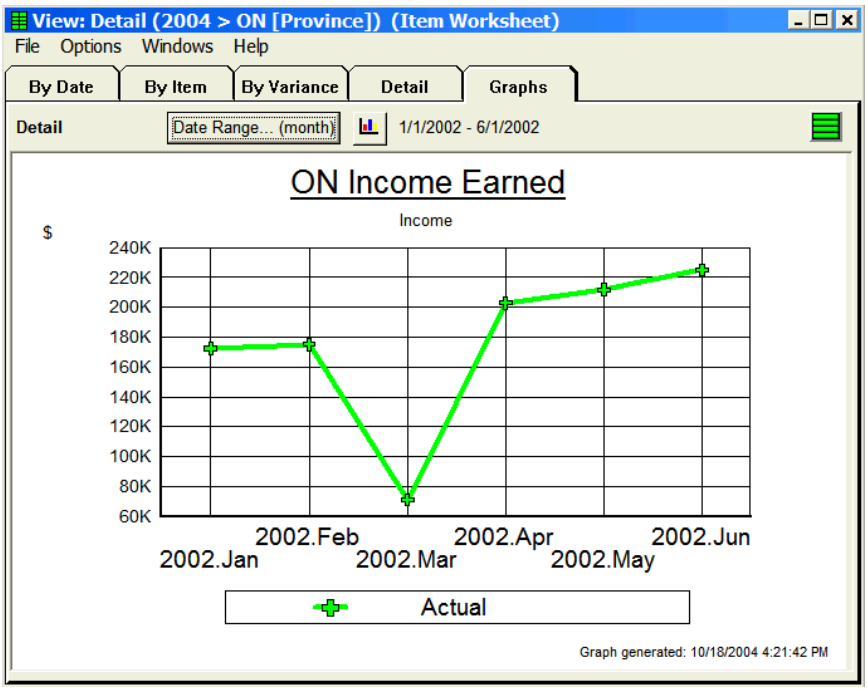


Figure 11 – Ontario Worksheet Graph

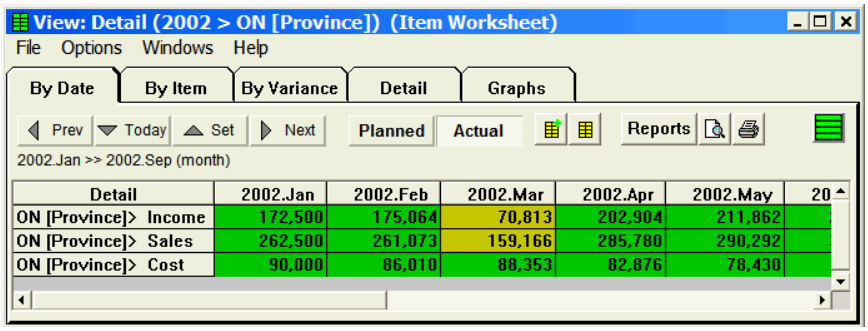


Figure 12 – Ontario Worksheet by Date

See Figure 12 – the 'By Date' tab.

- Four buttons exist just under the 'By Date' tab. We will not describe them in detail, but they provide the ability to change date ranges (more or fewer months) or change the date frequency (to show by month, by quarter or by year) or both.
- We already discussed the 'Planned' and 'Actual' dimension buttons.
- The two yellow buttons to the right of the 'Actual' button provide you with the ability to make and access your own worksheets, containing information from anywhere in the

model (these worksheets are called ‘Ad hoc Worksheets’ and provide the means for end users to get the precise view of the data they require without changing the model).

- The last three buttons are used for reporting via Crystal Reports®.

ARM provides two other ways to navigate to worksheets. One requires a fairly detailed understanding both of the model you are navigating and the building blocks of ARM, and is beyond the scope of this article. The other is a fairly straightforward way of choosing the Worksheet Group (or common worksheet layout) followed by the Member (the actual worksheet) as illustrated in Figure 13.

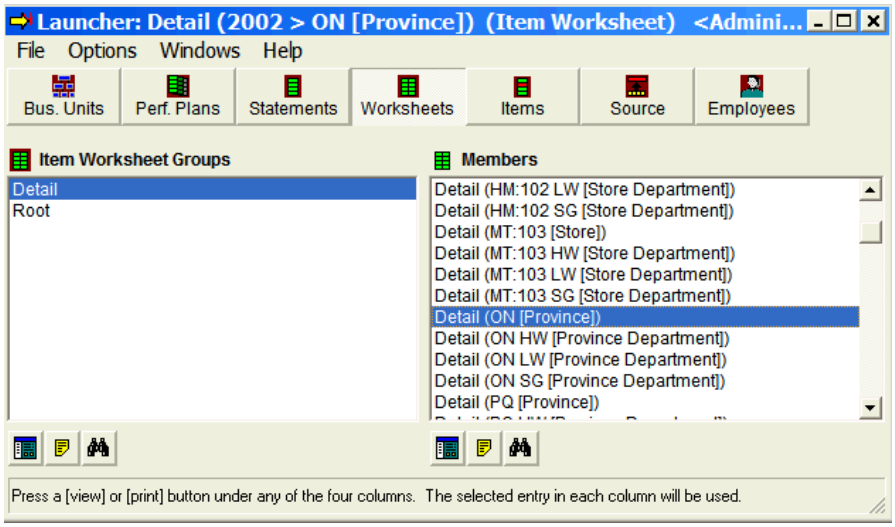


Figure 13 – Alternative Worksheet Selection

In this example, a Worksheet Group named Detail has a number of Members, each one representing information from a different Department or Location. The highlighted Member is the one we had selected from the navigation graphic above.

3.3 Exports

ARM provides a way to export data to Microsoft® Excel so you can manipulate it in any way you wish, in contrast with any Windows program where you can use various screen capture programs (such as SnagIt) to print screen snapshots, but cannot then manipulate the data with other tools. Additionally, this data is exported formatted in such a way that you can print it directly from Excel with reasonable headers, footers, bolding, gridlines, repeated titles and more as you can see in Figures 13 and 14.

ABC HW **Income Earned** **2002-Jan**

Item	Plan Date	Value	Function	Status
Corp Department:ABC HW>2002>Income-Dept:'Income Earned' ($)	2002.Jan	175,000	a - b	good
Corp Department:ABC HW>2002>Sales-Dept:'Sales Received' ($)	2002.Jan	250,000	sum	good
Corp Department:ABC HW>2002>Cost-Dept:'Cost Incurred' ($)	2002.Jan	75,000	sum	good
Province Department:ON HW>2002>Cost-Dept:'Cost Incurred' ($)	2002.Jan	45,000	sum	good
Province Department:PQ HW>2002>Cost-Dept:'Cost Incurred' ($)	2002.Jan	22,500	sum	good
Province Department:BC HW>2002>Cost-Dept:'Cost Incurred' ($)	2002.Jan	7,500	sum	good

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Figure 13 – Excel Export of Drilldown

ABC HW **Detail** **2002**

Detail	Income-Dept	Sales-Dept	Cost-Dept
2002.Jan	175,000	250,000	75,000
2002.Feb	177,204	246,361	69,157
2002.Mar	74,141	148,453	74,312
2002.Apr	189,352	265,033	75,681
2002.May	183,996	260,107	76,112
2002.Jun	197,136	271,313	74,178
2002.Jul	168,011	244,669	76,658
2002.Aug	170,887	250,513	79,627
2002.Sep	174,373	257,284	82,911
2002.Oct	197,340	276,510	79,171
2002.Nov	204,543	284,284	79,741
2002.Dec	205,212	292,242	87,030

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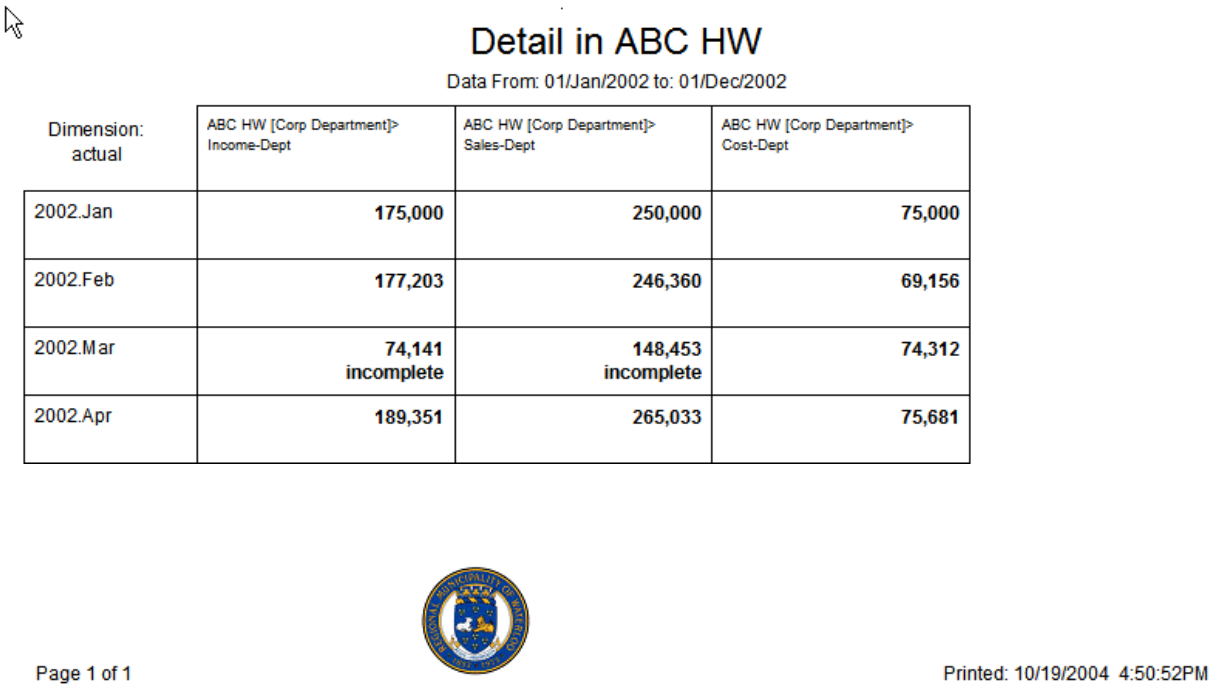
Figure 14 – Excel Export of Worksheet

Note that no formatting was done to get the above two figures. If you have ever exported data to a text file then imported to Excel, you will know how much work this saves each time. A tool called FormatX is used to do this automatic formatting. (See http://www.CherniakSoftware.com/FormatX for more information)

3.4 Reports

ARM interfaces with Crystal Reports in two ways. Generic 'cross tab' reports can be defined in Crystal Reports to provide a standardized view for worksheet data.



Detail in ABC HW

Data From: 01/Jan/2002 to: 01/Dec/2002

Dimension: actual	ABC HW [Corp Department]> Income-Dept	ABC HW [Corp Department]> Sales-Dept	ABC HW [Corp Department]> Cost-Dept
2002.Jan	**175,000**	**250,000**	**75,000**
2002.Feb	**177,203**	**246,360**	**69,156**
2002.Mar	**74,141 incomplete**	**148,453 incomplete**	**74,312**
2002.Apr	**189,351**	**265,033**	**75,681**

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Figure 15 – Crystal Report Output for Cross Tab Report

These report definitions can be made in one place and used for all worksheets in the system. In Figure 15, not only the value for an item is shown, but also its status, a benefit of using Crystal Reports. However, if you need a specialized report, the ability to define customized Crystal Reports templates is available to give you much more flexibility.

3.5 E-mail Notifications

If you are keeping track of the height of a water reservoir or the temperature of a critical process, there are times when appropriate people should be informed if metrics are above or below a critical threshold. ARM provides the facility to inform an individual or group of individuals for each item being measured, and for each calculated value as well.

4.0 ARM Configuration Basics

An ARM model is made up of two parts, the 'Knowledge Model' and the 'Operational Model'. The Knowledge Model defines what we call in ARM the types of components that are being used and how they relate to each other, whereas the Operational Model contains the actual components of the model. Let us use an example to illustrate. Note that this example is very basic to illustrate configuration concepts.

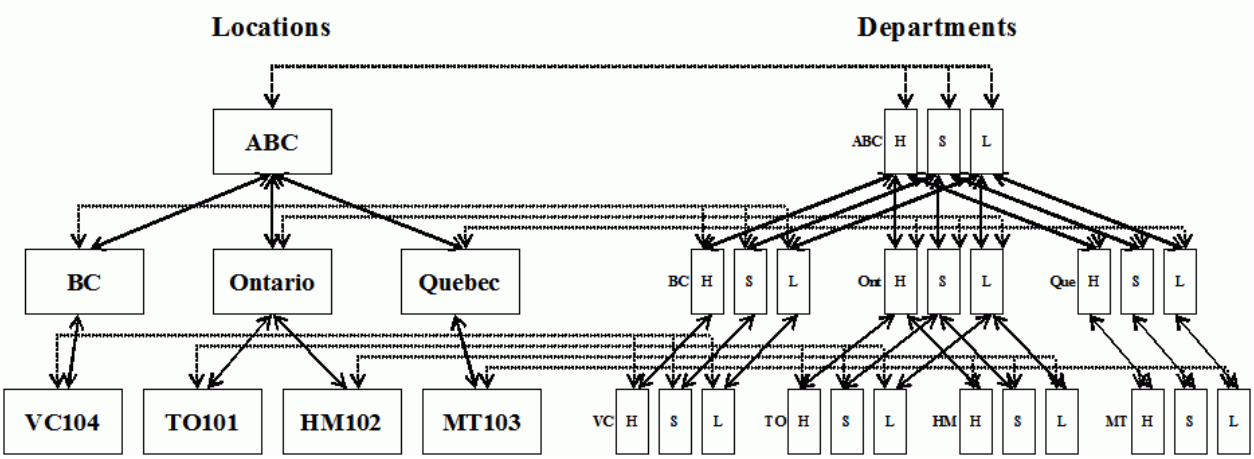

Figure 16 – Operational Model of Business Units

If you read the Detailed Output View you will have already seen Figure 16. The figure identifies the objects (Business Units in ARM), in our example model, about which we are keeping measurement results. This detailed object view is part of the Operational Model. Figure 17, in contrast, takes a higher level abstracted view, defining six different types of objects (Business Unit Groups in ARM), that correspond exactly to the Business Units in Figure 16.

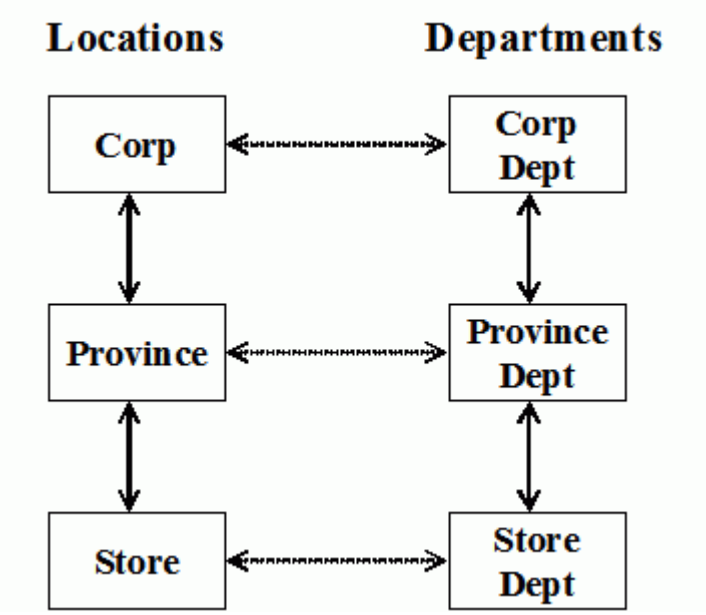

Figure 17 – Knowledge Model of Business Unit Groups

For example, the Business Unit Group 'Province' has three Business Units (BC, Ontario and Quebec) associated with it (and perhaps more over time). This Business Unit Group definition (part of the abstracted or Knowledge Model) makes the model definition easier to understand.

Another example should make the value of a Knowledge Model more concrete.

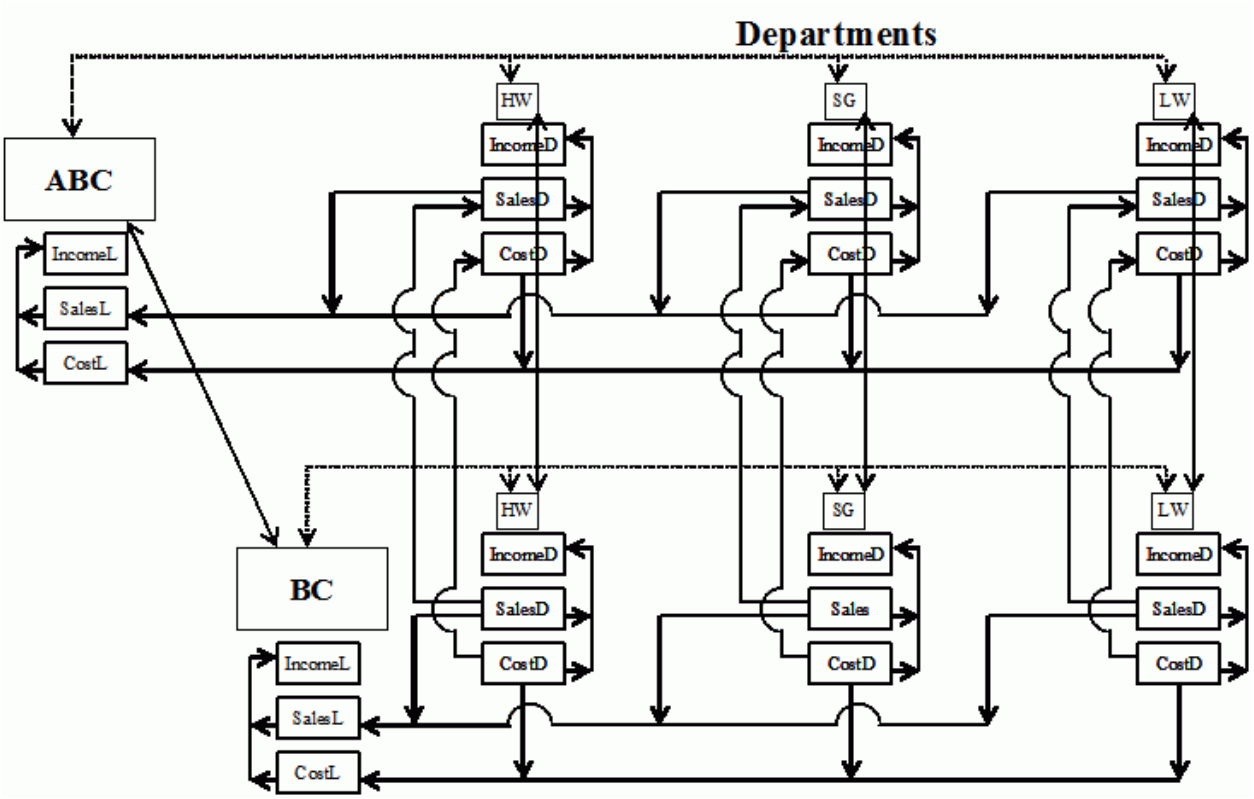

Figure 18 – Operational Model of Numeric Items

Figure 18 shows the measurement items (called Numeric Items in ARM) associated with each of the Business Units for part of the model. This is part of the Operational Model as it represents the actual objects and not abstractions of these objects. As you can see, each Business Unit has a separate Numeric Item for each of Income, Sales and Cost. The arrows represent calculations, e.g. Each Income is dependent on the Sales and Cost for that Business Unit. Two things you should notice:

- This looks quite complicated
- Only 8 of the 24 Business Units shown in Figure 16 are shown here

In contrast to the complicated Figure 18, look at Figure 19. From a Knowledge Model point of view, only six Numeric Item Groups exist (Sales, Income and Cost for both of Locations and Departments) versus 96 in the full Operational Model (only 25% of which is depicted in Figure 18). Of course, if more Business Units are added, the number of Numeric Item Groups does not change, whereas the number of Numeric Items would increase by three times the number of additional Business Units.

Configuration in ARM has more details, but you now have enough knowledge to understand the basics, which is essentially:

- The Business Unit Groups and the Numeric Item Groups are defined by the configurator

- The Business Units are identified by the configurator
- ARM automatically makes Numeric Items and links where needed throughout the model using the previously specified information

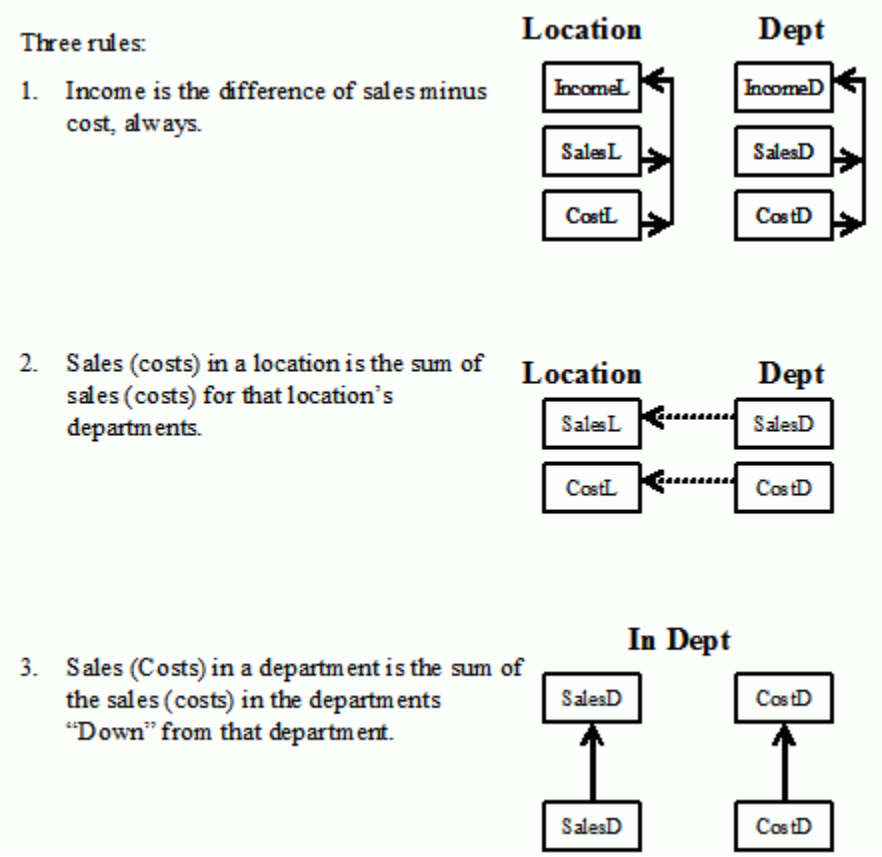

Figure 19 – Knowledge Model of Numeric Item Groups

Think about that for a minute. ARM **automatically** makes Numeric Items and links where needed throughout the model. That means that calculation rules are defined in one place, and each instance of that calculation is automatically maintained. Imagine that you have designed this model in Excel, and decide that instead of:

Income = Sales – Costs

we desire:

Income = Sales - Fixed Cost – Variable Cost

or some other similar change. In Excel, each of the 96 (multiplied by the number of dates being represented – leading to a very large number of cells!) must be changed to reflect the new calculation reality. In ARM, just change the Knowledge Model rules, and the changes

automatically propagate throughout the model. As a result, you have the powerful combination of ease of use and robustness.

5.0 ARM Technical Architecture

As mentioned in the introduction, ARM is an object-oriented system developed to generate an object model. First we will discuss the hardware and software environment, and then examine the software components of the solution.

5.1 Hardware and Software Environment

ARM runs on a Windows machine running Windows XP. The client is based on VisualAge Smalltalk with an Envy code repository, (using the Instantiations module VA assist Pro to improve the Smalltalk Development Environment and expanded by the use of WindowBuilder Pro (for widget support) and Business Graphics for generating charts). The database is GemStone/S (the powerful object database with its own Smalltalk virtual machine) providing a seamless link from the client to the database without the need for object / relational translation.

5.2 ARM Software Components

To understand ARM's software components, you need to have a basic understanding of configuration in ARM. The Knowledge Model makes the model definition easier to understand and is analogous to Smalltalk classes, whereas the Operational Model is analogous to Smalltalk instances. In fact, this analogy to Smalltalk is what makes the code map very well to the application.

Each of the Knowledge Model Groups (e.g. Business Unit Groups) is represented by a Smalltalk Class, and each of the Operational Model Items (e.g. Business Units) is represented by instances of a Smalltalk Class. In this way we ensure that all members (i.e. Business Units of a particular Business Unit Group) of a Knowledge Model Group have the same characteristics.

ARM is architected so that most everything runs on the GemStone database. Certainly user interfaces need to run on the client, but little else does. Three main advantages of this architecture are:

- The ability to send most patches to clients without their having to change the client Smalltalk image
- Enhanced performance due to relatively little information moving to and from Gemstone over the network
- Separation of the model from the user interface, thus simplifying the code

6.0 Key Benefits

- **ARM puts you in control of your application**. Configuring ARM is can be done by a person in your company, with appropriate training. Therefore, modifications to the application are kept under your control.
- **ARM is Low Cost**. ARM is a combined database, calculation engine, enquiry and reporting tool. By combining all this functionality, the overall cost for an information warehouse developed using ARM is much lower than the competition.
- **ARM is Low Risk**. ARM can be configured using a prototype approach, adding complexity over time. You can prove ARM's value very early in the implementation cycle.
- **ARM is Robust.** ARM uses an industrial strength database, and through its powerful drilldown capability provides you with confidence that your numbers are not only correct but also completely auditable.
- **ARM is Flexible.** Business environments can change very rapidly. ARM configurations are designed to be able to keep up to those business changes. Therefore ARM has no rigid sets of definitions that require weeks or months to modify.
- **ARM is Secure.** Each measurement and / or each object in the model can be protected from viewing or changing by unauthorized personnel.
- **ARM is Scalable.** The ARM database runs on small Windows servers and large UNIX boxes with no code changes. ARM can grow with your requirements.
- **ARM is Fast.** All numbers are stored. You never have to wait for long computations to complete. When you open a worksheet, the results appear virtually immediately.

7.0 Further Information and Contact

Alacrity Results Management (ARM) is an extremely flexible application which allows customers to define their own system without program changes.

Excellent uses for ARM include:

- budgeting
- activity-based costing
- performance management
- modelling

You have now seen the 'tip of the iceberg' of what ARM can do. For more information, please visit http://www.CherniakSoftware.com/arm

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