

# Putting a STAR on the Walkway of Higher Education Data Warehousing

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## **Session #25500**



**Alliance Conference  
Las Vegas, Nevada**

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# Building Next Generation Data Marts at Cornell University



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Presented by:

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# Cornell University



Cayuga Lake taken from the Cornell University Bell Tower

- Main Campus is in Ithaca, NY
- Founded 1865
- Both a State & Private Institution
- Undergrad enrollment is 13,515
- Graduate enrollment is 5,932
- Faculty members = 2,633
- Staff employees = 11,236



# Phytorion

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- Full enterprise data warehouses
- Area-specific data marts
- Operational & Strategic content
- Integration of any source systems
- Fully custom approach as well as packaged data marts



PHYTORION

DATA WAREHOUSING BUSINESS INTELLIGENCE

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# The Cornell Enterprise Data Warehouse

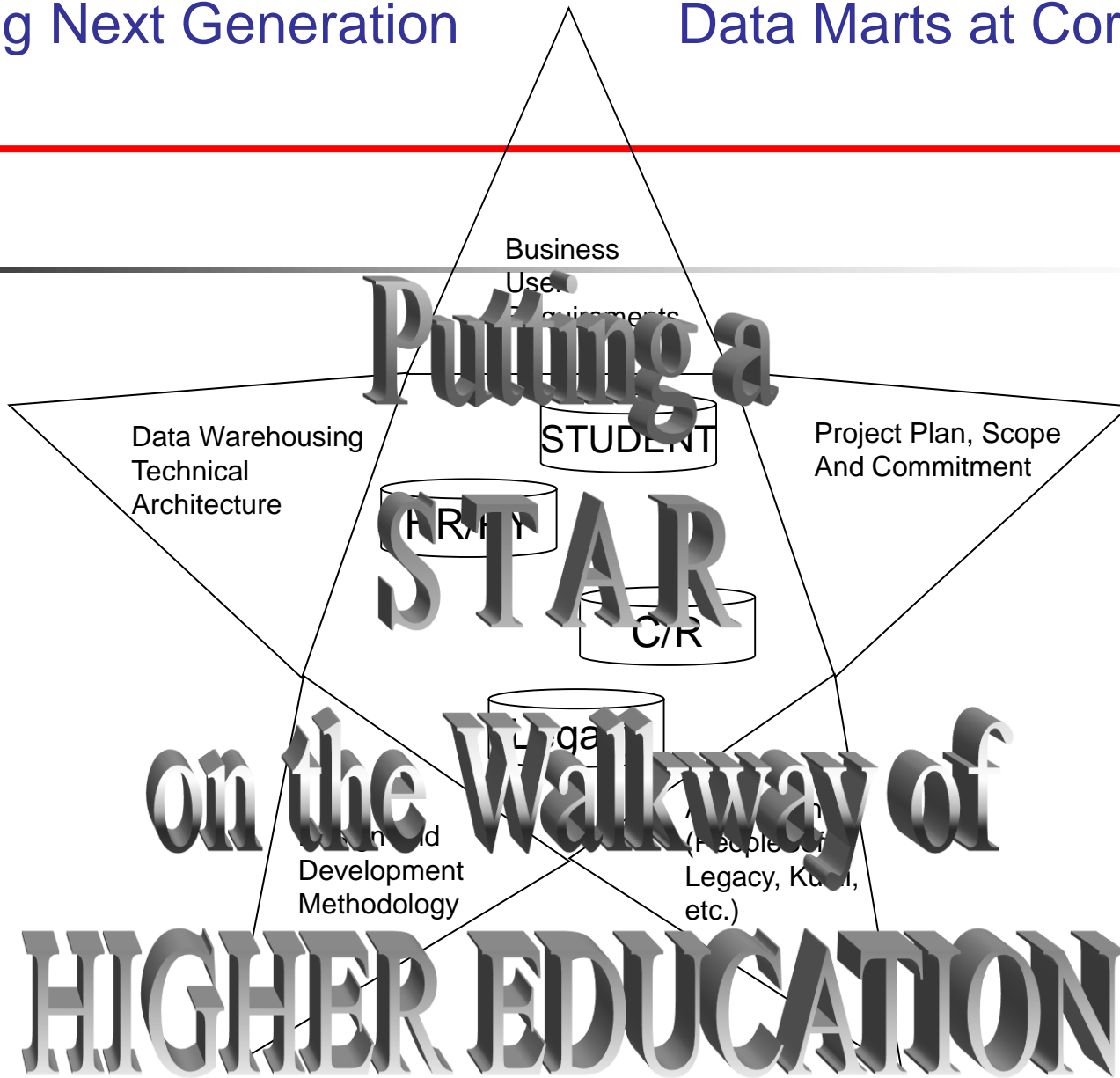


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*A collection of data that can be defined and shared across the whole University by using common definitions.*

began ~ August 2006







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# Overview

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Cornell University has chosen and is implementing a path towards an Enterprise Data Warehousing solution. This strategy involves:

- Using the Kimball Methodology to manage the project lifecycle along with developing Dimensional Models (Star Schemas) for new Data Marts,
- Utilizing the mature infrastructure and resource with Cornell Information Technology,
- Utilizing both Internal Resources and an External Data Warehousing Company, Phytorion for new data marts and when re-engineering existing data stores;
- Delivering data marts in support of new Operational Application roll-outs.



# Current EDW Strategy

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- Design and build new datamarts and re-engineer existing data-stores using:
  - A "*business questions to be answered*" approach. Focusing on Customer Needs and Data Requirements.
  - Keep requirement sessions open to all development efforts / teams.
    - Meetings
    - Documentation
    - Models
    - Training
    - Data Governance
  - Keep design strategies / implementation open to all development efforts / teams. (for example)
    - Incremental loading
    - Security
    - Metadata Management
- Stay on Schedule, or modify schedule when needed.







# Phytorion and Cornell Experience

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- Successful Partnership
- Flexible
- Easy to work with
- Focused on Delivery



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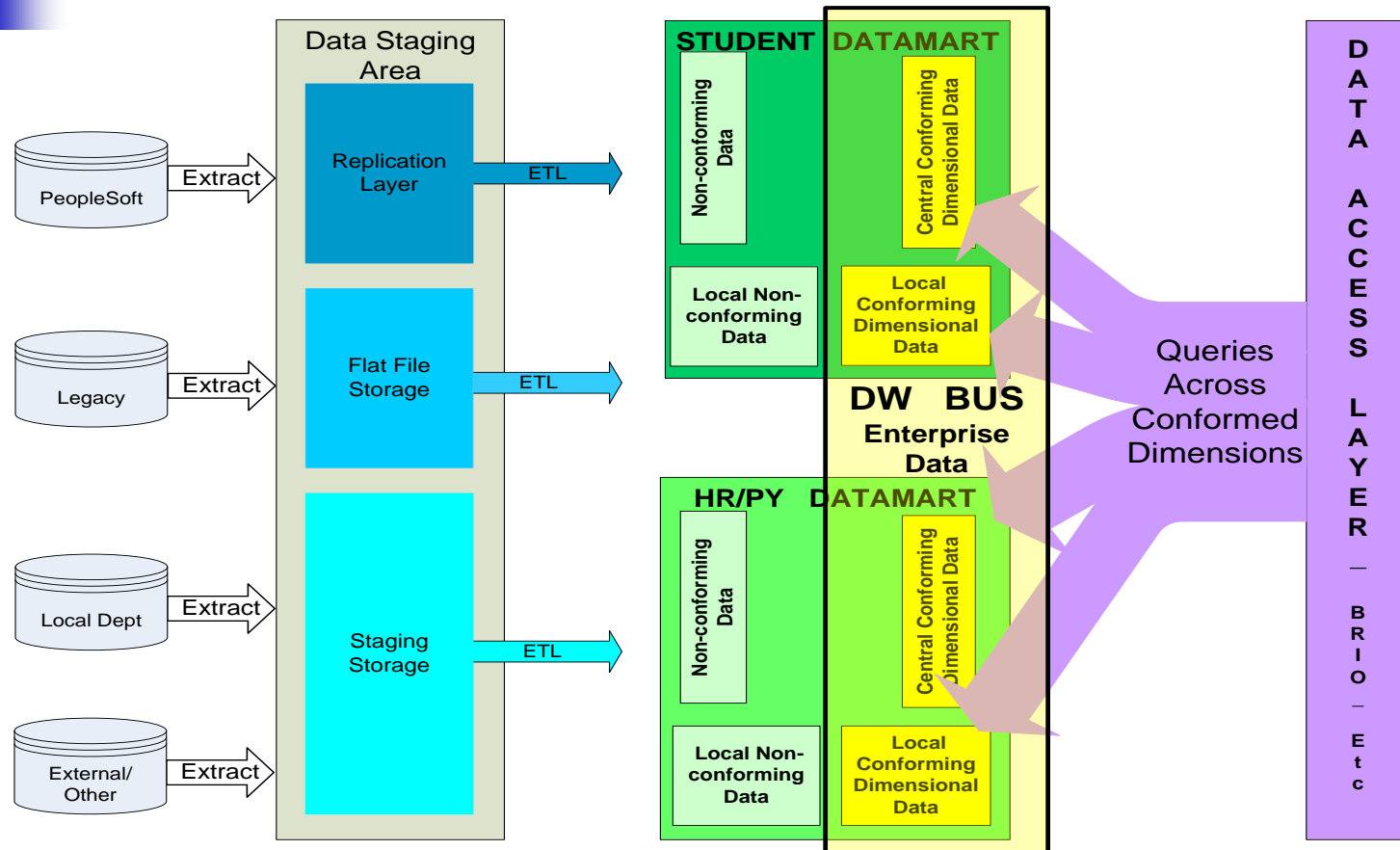
# Dimensional Marts in Production

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- CR
- Student
  - Prospect
  - Admissions
  - Financial Aid
  - Campus Community
  - Student Records

# Riding the Bus at Cornell

## Basic Elements of BUS Data Warehouse Proposed for Cornell





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# Project Plan, Scope and Commitment

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- Set High-level Scope and Plan,
- Identify Sub-Project,
- Get Sub-Project Sponsor,
- Set Milestone Dates;
- Assign Project Manager.



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# Project Management

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- Uses the Cornell Project Management Methodology (CPMM).
- Follows the Cornell Project Initiation Process (PIP) for getting an approved University Project / Sub-Project.



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# Data Warehouse Technical Architecture

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- Cornell Warehouse Environment,
- Consistent and Reliable Source,
- High Data Availability,
- Load Monitoring and Notification,
- High Database Availability,
- System Availability Monitoring,
- Performance Monitoring and Tuning;
- Security Management.



# High Data Availability

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- A copy of the warehouse data is available to the users at all times.
- Warehouse is fully available during load processes.
- Warehouse administrator may rollback load process in the event of faulty load.





# High Data Availability-DM Tools

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***DMTools is a Data Warehousing infrastructure management tool developed and in use by Cornell University.***

- Allows high data availability – 24X7 access
- Repository driven
- Manages loads
- Toolbox written in Oracle PL/SQL (O.S. independent)
- GUI console to manage load related metadata
- Available, as free download, through JA-SIG Clearinghouse [www.ja-sig.org](http://www.ja-sig.org)



# Security Management

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- Automation of user & role management
- Peoplesoft Based Marts
  - Role, & Row and Column, and Field Level Security defined in Peoplesoft database
- Non-Peoplesoft Based Marts security mgt.
  - Account creation & removal
  - Role management



# Business User Requirements

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*Requirements are gathered through many sources and ways. Engaging the “Right” Customer is Key.*

Examples include:

- Interviews
- Reports
- Existing Applications / Documentation



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# Business Areas

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- Undergraduate and Graduate Admissions
- Institutional Research and Planning
- Student Services
- Bursar
- Continuing Education
- Accounting
- Financial Aid



# Colleges We Met With

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- Engineering
- Law
- Business
- Natural Resources
- Veterinary
- Hotel Management
- Library Science



# What We Deliver

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- Prospects and Admissions
  - Application
  - Athletic Participation
  - Academic Interests
  - External Academic Data
  - Honors and Awards
  - Prior Work Experience
  - Prospect Data
  - Test Scores



# What We Deliver

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- Student Records
  - Advisors
  - Courses and Classes
  - Enrollment and Grades
  - Enrollment Appointments
  - Milestones
  - Programs and Plans
  - Student Degrees
  - Student Groups
  - Transfers and Test Credits





# What We Deliver

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- Student Financials
  - Accounting Line
  - Credit History
  - General Ledger
  - Financial Items
  - Student Accounts
  - Tax Data



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# What We Deliver

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- Campus Community
  - Checklists
  - Comments
  - Communications
  - Bio Demo Data
  - External Organizations
  - Events and Meetings
  - Service Indicators



# What We Deliver

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- Financial Aid
  - Financial Aid Applications
  - ISIR
  - Awards and Disbursements
  - Item Types
  - Student Budgets
  - Promissory Notes
  - Loans
  - Pell Grants

**PERSON\_DATED\_DATA\_DM**  
*PERSON\_DATED\_DATA\_SID*

**PRIM\_PROG\_PLAN1\_DM**  
*PRIM\_PROG\_PLAN1\_SID*

**PRIM\_PROG\_PLAN2\_DM**  
*PRIM\_PROG\_PLAN2\_SID*

**ALT\_PROG\_PLAN1\_DM**  
*ALT\_PROG\_PLAN1\_DM*

**ALT\_PROG\_PLAN2\_DM**  
*ALT\_PROG\_PLAN2\_DM*

**LAST\_SCHOOL\_ATTENDED\_DM**  
*LAST\_SCHOOL\_ATTENDED\_SID*

**APPLICATION\_ATTRIBUTES\_DM**  
*APPLICATION\_ATTRIBUTES\_SID*

**APPLICATION\_FC**  
*PERSON\_DATED\_DATA\_SID*  
*PRIM\_PROG\_PLAN1\_SID*  
*PRIM\_PROG\_PLAN2\_SID*  
...  
LAST\_SCHOOL\_GPA  
LAST\_SCHOOL\_CLASS\_RANK  
LAST\_SCHOOL\_CLASS\_SIZE  
ACADEMIC\_INDEX  
APPLICATION\_COUNT\_FIELD  
COMPLETED\_APP\_COUNT\_FIELD  
WITHDRAWN\_COUNT\_FIELD  
ADMITTED\_COUNT\_FIELD  
ADMITTED\_PRIM\_COUNT\_FIELD  
ADMITTED\_ALT\_COUNT\_FIELD  
ENTERING\_PRIM\_COUNT\_FIELD  
ENTERING\_ALT\_COUNT\_FIELD  
ENTERING\_COUNT\_FIELD  
DENIED\_PRIM\_COUNT\_FIELD  
DENIED\_ALT\_COUNT\_FIELD  
DENIED\_COUNT\_FIELD  
RUN\_DATE  
CURRENT\_FLAG  
SNAPSHOT\_FLAG

**RECRUITER\_DM**  
*RECRUITER\_SID*

**ADMIT\_TERM\_DM**  
*ADMIT\_TERM\_SID*

**REGION\_DM**  
*REGION\_SID*

**SNAPSHOT\_DATE\_DM**  
*SNAPSHOT\_DATE*

**SPECIAL\_APP\_INDICATORS\_DM**  
*SPECIAL\_APP\_INDICATORS\_SID*

**PRI\_PROG\_ACTN\_STAT\_RSN\_DM**  
*PRI\_PROG\_ACTN\_STAT\_RSN\_SID*

**ALT\_PROG\_ACTN\_STAT\_RSN\_DM**  
*ALT\_PROG\_ACTN\_STAT\_RSN\_SID*



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# Design and Development Methodology

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- Data Modeling – Designing a STAR,
- ETL Delivery Techniques;
- Data Delivery - Brio.



# Data Modeling - Designing a STAR

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For Dimensional Data Modeling Activity:







- Decision Matrix
- Bus Matrix
- Object Definition Document (Dimensions / Facts)
- Source Data Model

# Decision Matrix (Applicant Example)

## Cornell University -- Applicant Decision Matrix

Objectives	Decisions	Type of Info	Grad/Pr	CESS	Colleges	Questions	Associated To-Be(s)	Readiness	Description	In Scope/Out Scope	Priority
	Waive Requirements	List				Which international applicants should have TOEFL waived	Create Applicants	now			
	Determine if we are	Count/%	X		X	Application Funnel: Application	Create Applicants	now	Note: multiple business units		
		Count/List/%	X		X	What is the ethnicity breakdown of the applicant pool?	Create Applicants (all)	now			
		Count/List	X		X	What is the international applicant breakdown (based on visa type, citizenship) by region?	Create Applicants (all careers)	now			
		Count/List	X		X	What are the admissions decisions for all applicants?	Create Applicants (all careers)	now			

# Bus Matrix (Partial Example)

Functional Area	Business Process	Dimensions																							
		Date	Constituent	Int'l Mbr Org	Role / Title	Session	Designation/Brg	Account Tbl	Motivation Cd	Dept Cd	Status Checklist	Status Checklist Item	Checklist Item Code	Employee Job	Position	Term	Student	Course	Grad. Appointment	Academic Org	Account	Financial Org	Accounting Period	Grant	Funding Agency
Alumni Affairs & Development	<b>Campaign &amp; Proj. Management</b>																								
	Monetary	X	X	X																	X	X			
	Workflow	X	X	X																					
	Goals	X	X	X																					
	<b>Membership Management</b>																								
	Membership Dues	X	X	X	X			X																	
	Goals	X	X	X																					
	<b>Gift &amp; Pledge Management</b>																								
	Recognition	X	X	X	X																				
	Designation	X	X	X	X	X	X	X	X								X								
Tributes	X	X	X	X																					
Matching Gifts	X	X	X	X			X	X																	
<b>Other</b>																									
Volunteer Participation	X	X	X	X																					
GL Account Reconciliation	X	X	X	X			X	X													X	X			
Pledge Write-Off Process	X	X	X	X	X	X	X	X																	
HRP	<b>Employment Management</b>																								
	Employment Transactions	X											X	X	X		X				X				
	Position Management	X											X	X											
Student	<b>Enrollment Management</b>																								
	Registration																	X							
	Appoint Grad. Students																								
Finance	<b>Course Management</b>	X																							
	Expense Management																								
	Expense Reporting	X																			X	X	X		
Research Administration	<b>Grant Management</b>																								
	Submission	X											X	X							X	X	X	X	X





# Dimension Documentation

This dimension describes ethnic background. It includes descriptions for multi-ethnicity (both under-represented and non-under-represented). History is not maintained on this dimension.

**Table Type** : Dimension

Security:

Shared Dimensions

**Technical Notes:**

**Change History** 30 July – Created

Add the following static values to the dimension: MLT\_URM, Mult URM, Multi-ethnic Underrepresented Minority

MLT\_NURM, Mult NonUR, Multi-ethnic Not Underrepresented Minority

**ETHNICITY\_D**

**M**

Attribute	SourceTable	SourceColumn	Sourcing Instructions	Description
ETHNICITY_SID			Populated by the ETL	
ETHNICITY	PS_ETHNIC_GRP_TBL	ETHNIC_GRP_CD	IGNORE SETID KEY, MAX(EFFDT), EFF_STATUS = 'A'. See technical notes above.	8-character code for the ethnicity
ETHNICITY_SDESCR	PS_ETHNIC_GRP_TBL	DESCRSHORT		10-character description of ethnicity
ETHNICITY_LDESCR	PS_ETHNIC_GRP_TBL	DESCR50		50-character description of ethnicity



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# ETL / Delivery Techniques

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- Development / Migration Strategy
- Metadata used for:
  - Object Definition Documents
  - ETL Code/Build
  - Business Metadata Definitions
  - Unit Testing



# Data Delivery

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- Standard reports
- Dashboard
- Ad-hoc Reports

## BI Models:

- Single Fact
- Non-fact
- Galaxies and Constellations (monster model)



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# Questions ?

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## Thank You:

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