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Lessons Learned in EVM Control Account Analysis & Design

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#7112 – Lessons Learned in Earned Value Management (EVM) Control Account Analysis & Design

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Abstract

- Earned Value Management (EVM) is a powerful method of program management and control that integrates cost with the technical and schedule objectives of a project.

- EVM is used in the aerospace/defense industry throughout the world, including Raytheon Company.

- The purpose of this presentation is to discuss and examine Lessons Learned regarding the analysis and design of Control Accounts in an EVM system.

- The presentation will list several practical Control Account strategies employed at Raytheon Space and Airborne Systems that any organization can use to improve the quality and utility of their program's EVM system.

Presentation Assumptions

Space and Airborne Systems

Participants Have Basic Knowledge of

- EVM

- Program Structures

  - Work Breakdown Structure (WBS)

  - Organizational Breakdown Structure (OBS)

  - Control Accounts (CAs)

- Integrated Master Schedule (IMS)

- EVM Baseline Development Basics (Work Packages, Planning Packages, Earned Value Techniques, etc.)

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Agenda

- WBS

- OBS

- Control Account

  – What Is It?

  – Formation

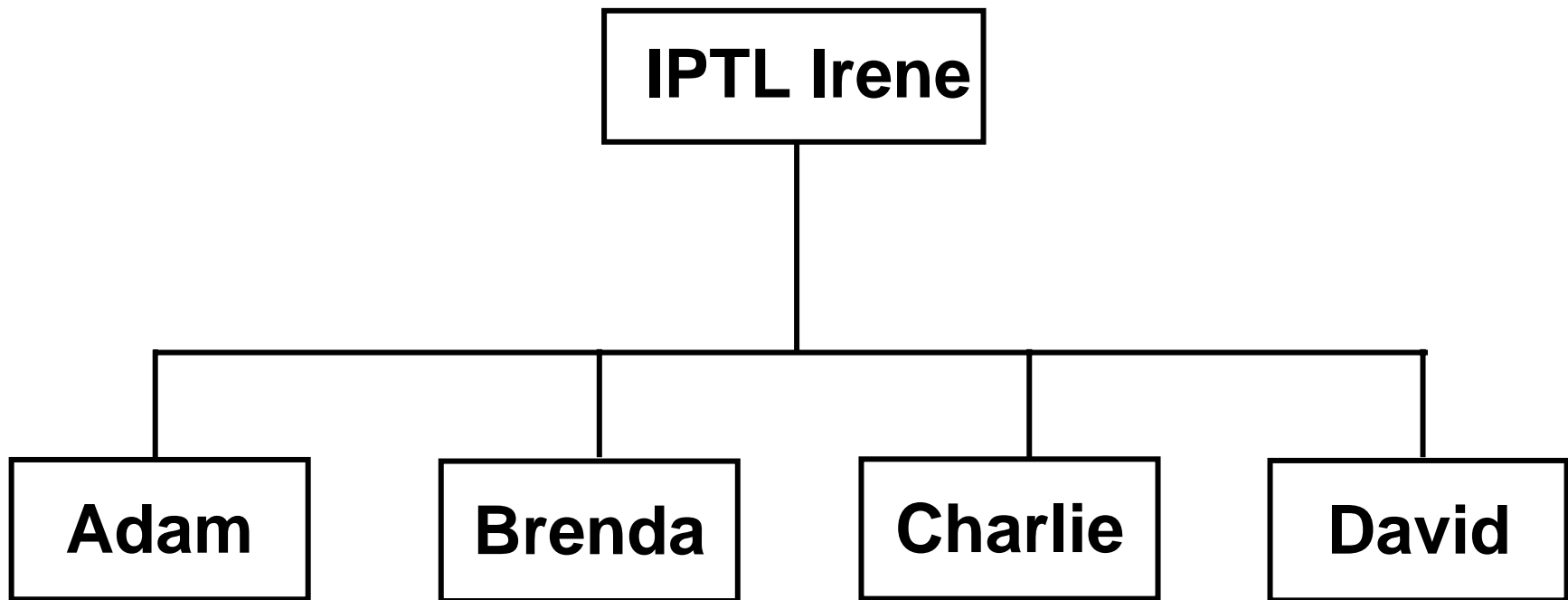 – Planning

  – Analysis

  – Design

Work Breakdown Structure (WBS)

- A product-oriented family tree
  - End-items, goods, and/or services
- Subdivides program into consistent, well-defined elements
  - Allows clear management accountability
- Provides a structure for budgeting and tracking performance to cost and schedule
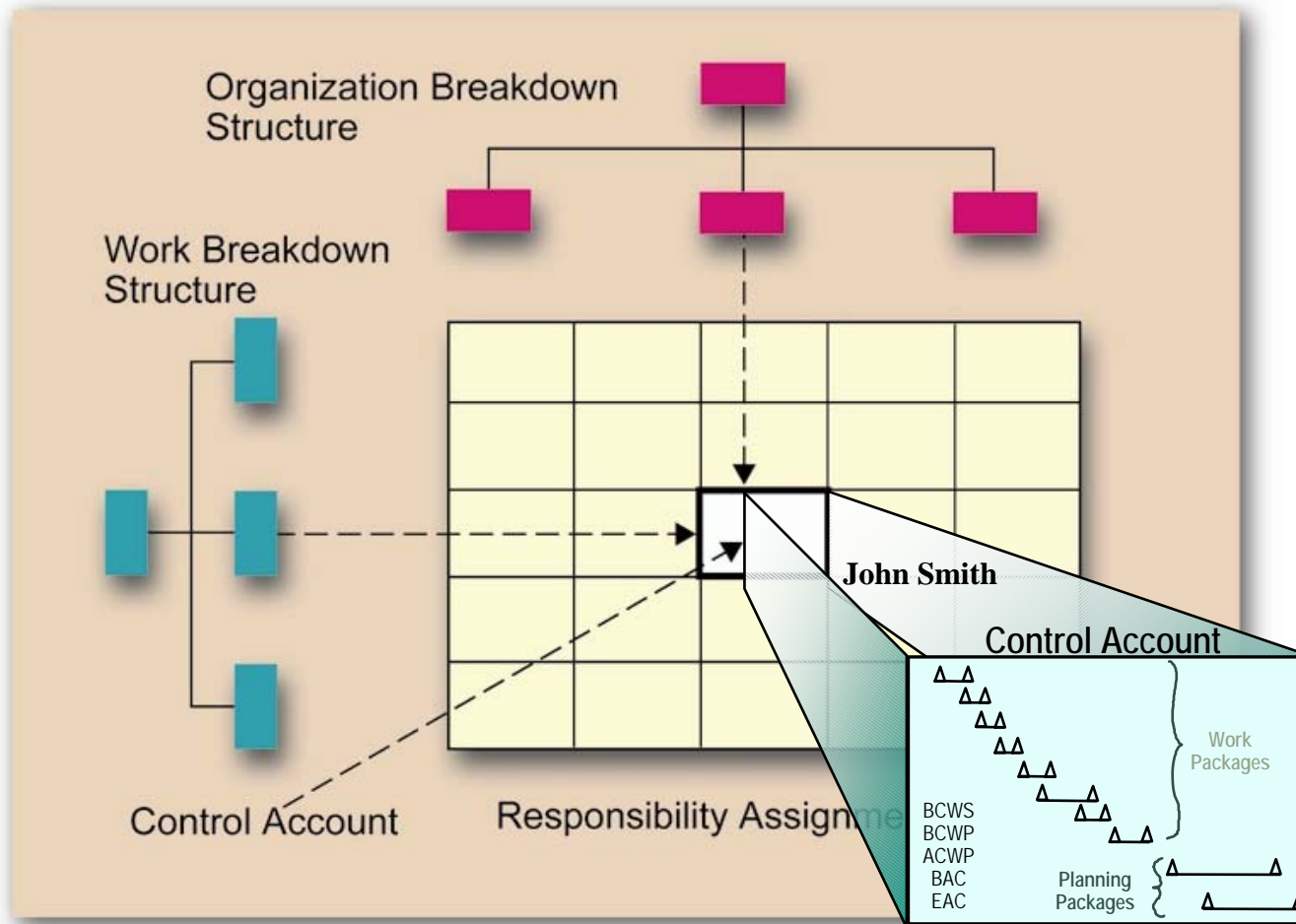- Reference: MIL-HDBK-881A

Contract

Engine **STE** **Manuals**
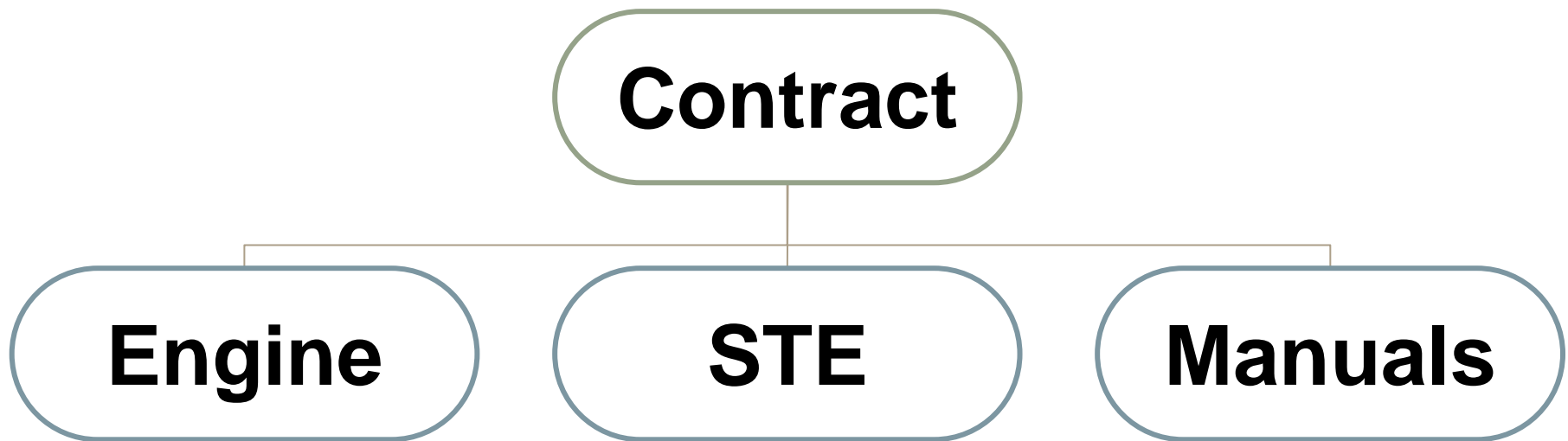
Organizational Breakdown Structure (OBS)

- Identification of organizational responsibilities
- Assigned to each WBS element

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How a Control Account is Formed

Integration of Work Scope, Budgets & Organizational Responsibility Occurs at the Control Account

What Is A Control Account (CA)?

- Defined as an intersection of the WBS and OBS

  – Multiple intersections result in multiple Control Accounts

- Each CA is assigned to a single responsible manager

  – The Control Account Manager (CAM)

- A management control point in an EVM system

  – Represents the work assigned to one responsible organizational element or IPTL/CAM on one program WBS element

- Level most commonly used for internal & external reporting

- Further sub-divided into work packages (tasks), planning packages and charge numbers

What Is A Control Account (CA)?

- The purpose of the Control Account is to integrate together
  - Technical Scope, Schedule and Budget

- As the program executes, actual costs are *also* collected into each CA and then compared against the budgets (resource plans) and the earned value for management control purposes
  - Scope, schedule, and budget flow into the CA via IMS work packages
  - Costs flow into the CA via charge numbers in the accounting system
  - The budgets (BCWS) and the costs (ACWP) in each CA are then compared to the Earned Value (BCWP) in each CA to get the EV derived metrics used by management
    - SV, CV, SPI, CPI, etc. (see List of Acronyms)

Typical Control Account Planning

1. Define Control Accounts

2. Define work packages & planning packages

3. Sequence work package & planning package tasks

4. Establish work package & planning package durations & resources

   - Type of resource

   - Amount of resource

5. Assess resource plan – is plan reasonable?

   - Too flat?   Too steep?   Too erratic?

6. Review, validate and reconcile baseline

Typical Control Account Planning

1. **Define Control Accounts** ← **Focus of Today's Lessons Learned**

2. Define work packages & planning packages

3. Sequence work package & planning package tasks

4. Establish work package & planning package durations & resources

   ■ Type of resource

   ■ Amount of resource

5. Assess resource plan – is plan reasonable?

   ■ Too flat?   Too steep?   Too erratic?

6. Review, validate and reconcile baseline

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- **Evaluate the work to be performed in the control account per unit of time**
  - Type of work
    - Level of Effort (LOE)? Discrete?
    - Labor? Material? Other Direct Costs (ODC)?
  - Amount of work
  - Time factors
    - Serial effort(s)
      - May only need one Control Account
    - Parallel efforts
      - May need more than one Control Account

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- **Segregate Level of Effort (LOE) into its own control account**

  - LOE can cloud or hide performance of discrete work

Notes:

- Level of Effort is a specific Earned Value Technique (EVT) for a work package.
- LOE tasks have no measurable product or output and are measured through the passage of time rather than by completion of a discrete effort.

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Control Account Design
Lesson Learned #3

- **When terminating a Control Account in the WBS structure, ensure future growth potential into a parallel WBS leg**

  – Verify termination point for every control account created provides the opportunity path forward for future parallel control accounts

  – Preparation for future business

  – Good fundamental structure in case of future difficulties

  – Preserves the WBS structure

- **When terminating a Control Account in the WBS structure, ensure future growth potential into a parallel WBS leg**

Example 1: WBSxxx22A – IPT Management (Mgmt)

WBSxxx22B – Engine

WBSxxx22C – Special Test Equipment (STE)

WBSxxx22D – Manuals

Example 2: WBSxxx22A1 – IPT Mgmt

WBSxxx22B1 – Engine

WBSxxx22C1 – Special Test Equipment (STE)

WBSxxx22D1 – Manuals

Example 2 is an Improvement over Example 1

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Control Account Design
Lesson Learned #4

- **Accommodate managers with varying experience levels**
  - More experienced managers
    - Can handle multiple Control Account assignments
  - Less experienced managers
    - Assign fewer Control Accounts to each manager
    - Equivalent coverage is obtained with more managers
  - Example
    - STE as a single Control Account versus
    - STE split into multiple Control Accounts: Software, Hardware, etc.
  - Why? Improved program risk management
    - Succession planning – Attrition and turnover
    - Provides opportunities for career growth with less experienced staff members

Control Account Design
Lesson Learned #4

- **Accommodate managers with varying experience levels**

Example 2:   WBSxxx22A1 – IPT Mgmt

WBSxxx22B1 – Engine

WBSxxx22C1 – STE

WBSxxx22D1 – Manuals

Example 3:   WBSxxx22A1 – IPT Mgmt*

WBSxxx22B1 – Engine*

WBSxxx22C1 – STE

WBSxxx22C1A1 – STE Hardware*

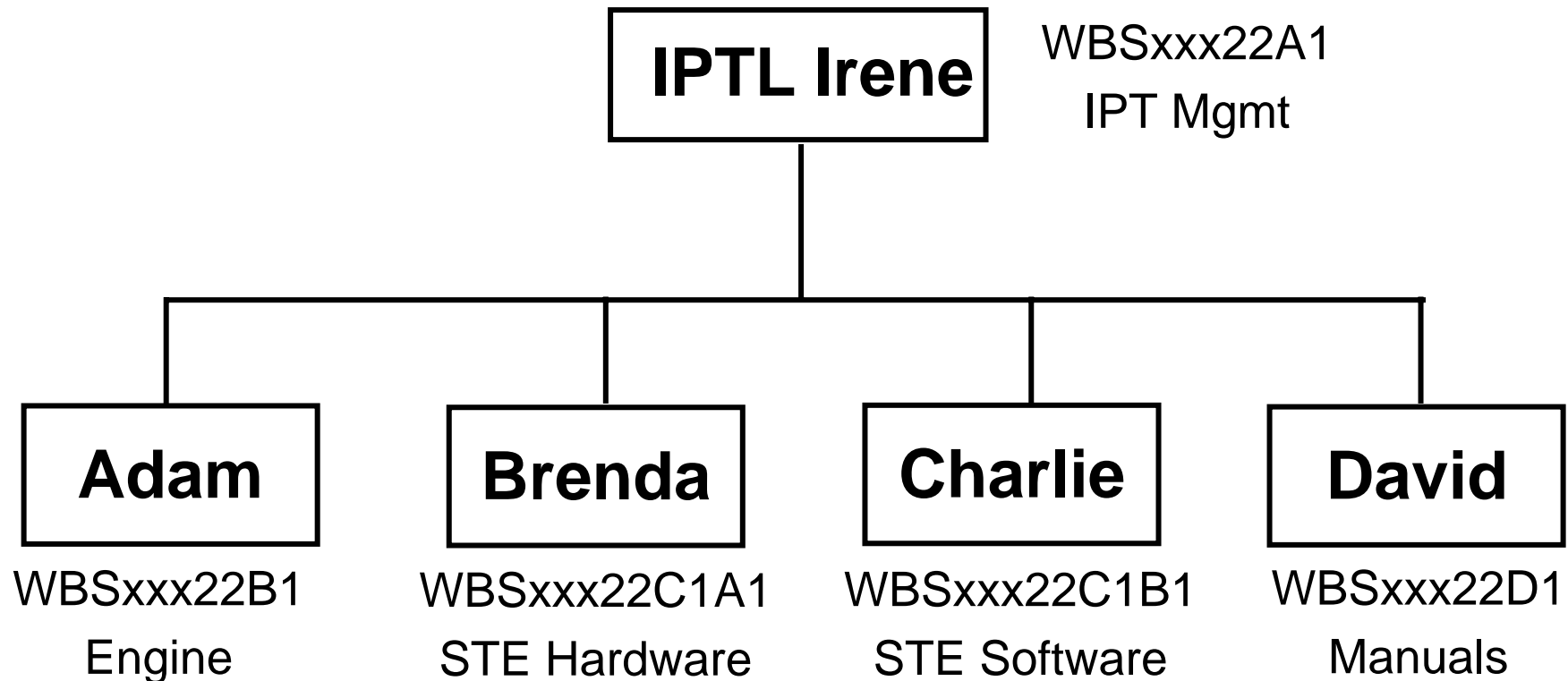WBSxxx22C1B1 – STE Software*

WBSxxx22D1 – Manuals*

*Designated Control Account

Example 3 is an Improvement over Example 2

Control Account Design
Lesson Learned #4

- **Accommodate managers with varying experience levels**
  - OBS (org chart) now showing Control Account assignments

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                    ┌─────────────┐
                    │ IPTL Irene  │   WBSxxx22A1
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   │  Adam   │ │ Brenda  │    │ Charlie │ │  David  │
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  WBSxxx22B1  WBSxxx22C1A1   WBSxxx22C1B1  WBSxxx22D1

  Engine      STE Hardware   STE Software  Manuals
```

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Control Account Design
Lesson Learned #5

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- **Create control accounts that are "wide and shallow" versus "narrow and deep"**

  - The river analogy

  - Assumption = You really do want to know what's going on

  - Let the accounting system do the work for you

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Control Account Design
Lesson Learned #6

- **Include Event and Failure Reports (EFRs) / Anomalies into your baseline budget plans**

- **Recommend separating into different Control Accounts the "regular" work (if no failures occurred) from the Event and Failure Reports (EFRs) / Anomalies**

  – Bring to bear auto analysis tools from finance system: TCPI, IEAC, etc.

  – Will not have to manually track & calculate whether over runs / under runs are due to

    - Regular work

    - EFRs

    - A combination of both

- Management uses EVM data to proactively respond to program indicators, not just to generate historical EVM data. This proactive response is the ultimate EVM contribution to a program's success.

- Effective analysis and design of control accounts will enable a PM / IPTL / CAM

  - To better match the WBS with their team org chart

  - To proactively manage variances of schedule and cost

  - To preserve the program's overall performance baseline

List of Acronyms

- **ACWP – Actual Cost of Work Performed or _Actual Cost_ (Cost of work accomplished)**
- **BAC – Budget At Completion**
- **BCWP – Budgeted Cost of Work Performed or _Earned Value_ (Value of work accomplished)**
- **BCWS – Budgeted Cost of Work Scheduled or _Planned Value_ (Value of work planned)**
- **CA – Control Account**
- **CAM – Control Account Manager**
- **CPI – Cost Performance Index**
- **EAC – Estimate At Completion**
- **EFR – Event and Failure Report**
- **EVM – Earned Value Management**
- **IEAC – Independent Estimate at Completion**
- **IPTL – Integrated Product Team Lead**
- **LOE – Level of Effort**
- **OBS – Organizational Breakdown Structure**
- **ODC – Other Direct Costs**
- **PM – Program Manager**
- **SPI – Schedule Performance Index**
- **STE – Special Test Equipment**
- **SV – Schedule Variance**
- **TCPI – To Complete Performance Index**
- **WBS – Work Breakdown Structure**

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Contact Information

- Questions ?

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