



Project Controls

E X P O

Project Controls Expo – 13th Oct 2015
Emirates Stadium, London

Artificial Intelligence Meets Project Controls

About the Speaker

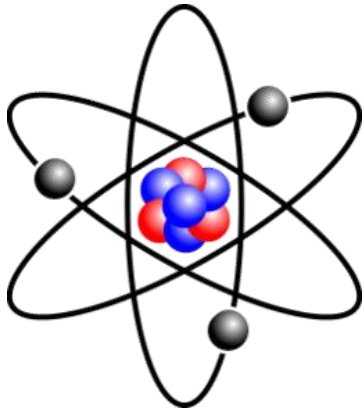
Charlie Sundling

Charlie is currently the CEO, Pipeline Group, Inc., a software technology company based in California. He has more than 25 years of computer science and industrial engineering background. Charlie has a particular focus on human work performance as it relates to complex project execution. In this field he has design many advanced systems, publications and holds related patents.

Artificial Intelligence and Project Controls

This presentation explores the development of an advanced computer system used by the US civil nuclear industry to gain better control over the execution of their reactor refueling projects.

Case Study



The Syntempo Initiative

Joint research between US civil nuclear operators and Pipeline Software, Inc.



SAN ONOFRE, SOUTHERN CALIFORNIA



DIABLO CANYON, CENTRAL CALIFORNIA

Anatomy of a Nuclear Refueling Project

- Refuel every 18 mos
- 2,500 people
- 35,000 activities
- Scheduled to hour/minute
- 25-30 day schedule
- \$40M-\$50M budget
- ~\$3M per day late



Delima

We invested millions of dollars in best-in-class project management systems and processes but our refuel project performance has not improved.

Why?



Missing Link

PASS

Work Planning systems & controls

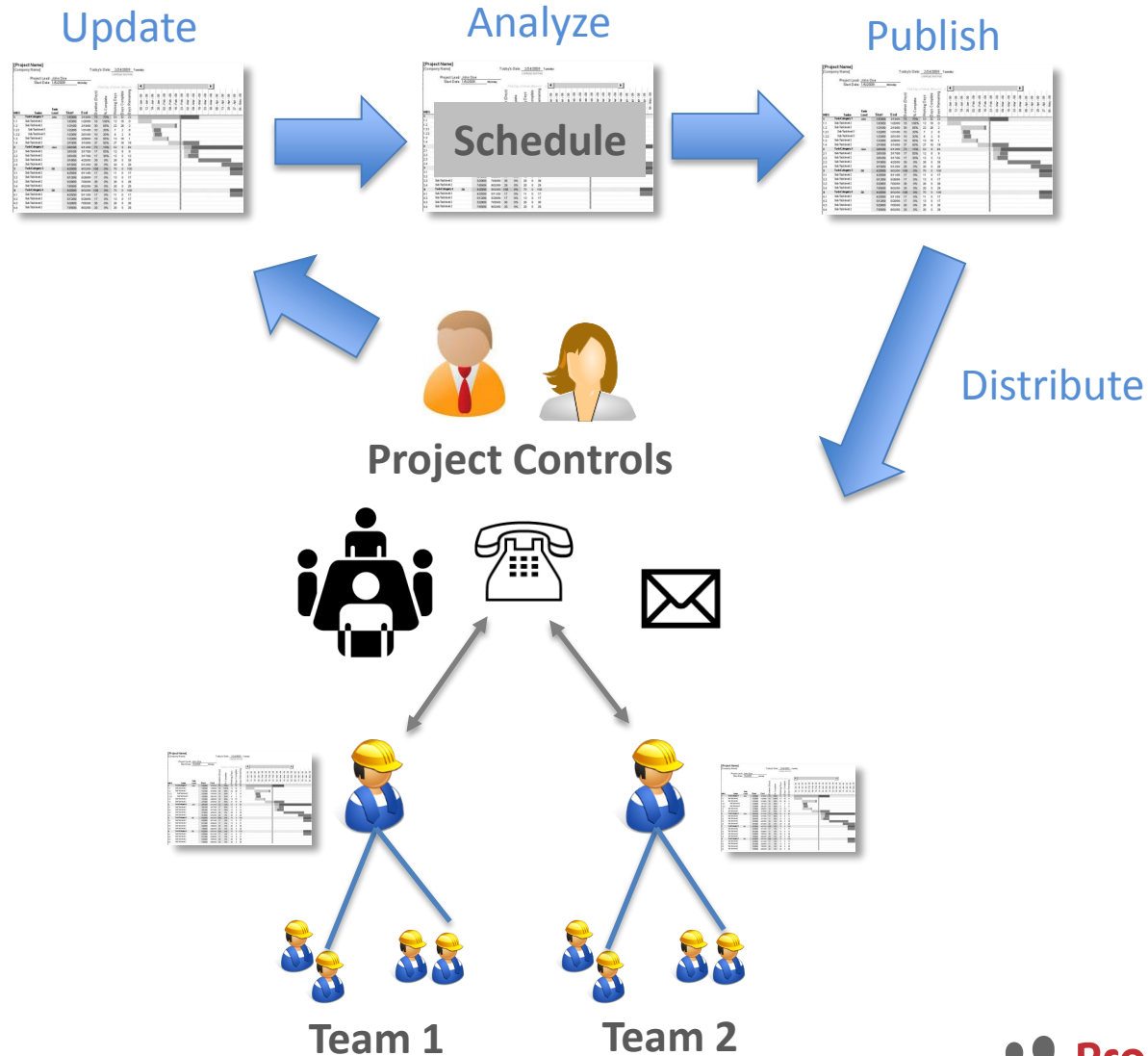
PASS

Work Scheduling systems & controls

FAIL

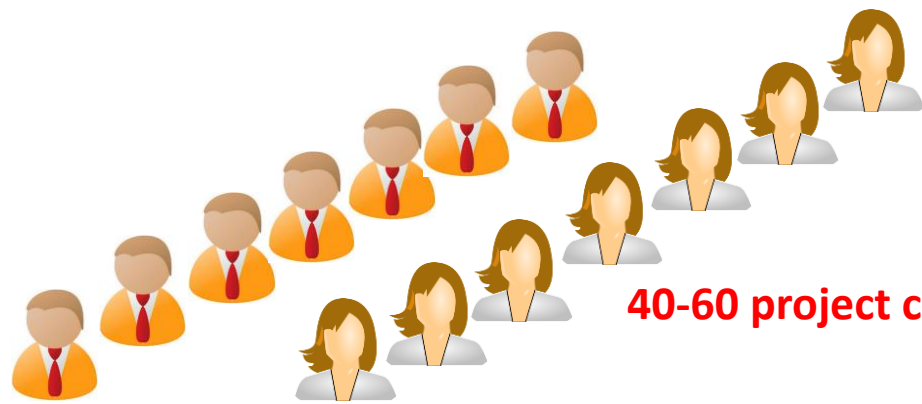
Work Execution systems & controls

Project Execution Communication Cycle

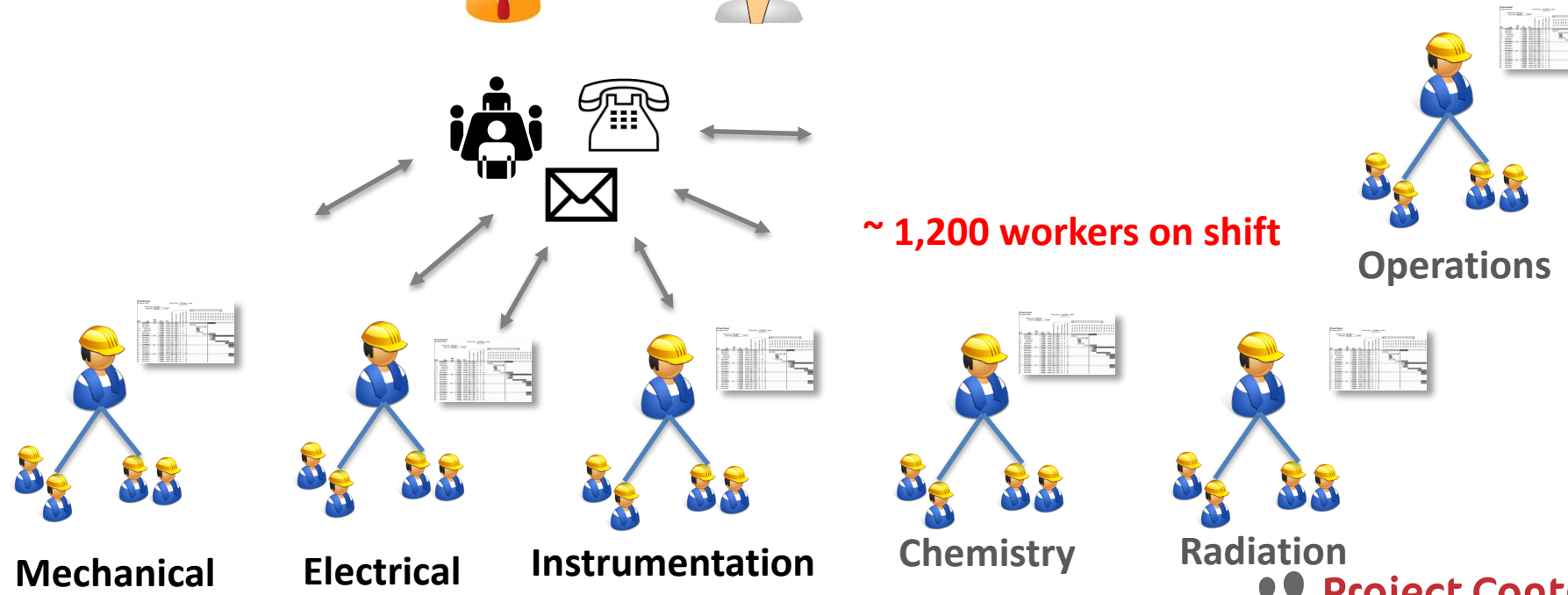


Unmanageable

| Task Name | Start | End | ES | EF | LS | LF | ES | EF | LS | LF | ES | EF | LS | LF |
|--------------|----------|----------|------|----|----|----|----|----|----|----|----|----|----|----|
| Task Name 1 | 10/00/00 | 10/00/00 | 100% | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 |
| Task Name 2 | 10/00/00 | 10/00/00 | 100% | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 |
| Task Name 3 | 10/00/00 | 10/00/00 | 100% | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 |
| Task Name 4 | 10/00/00 | 10/00/00 | 100% | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 |
| Task Name 5 | 10/00/00 | 10/00/00 | 100% | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 |
| Task Name 6 | 10/00/00 | 10/00/00 | 100% | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 |
| Task Name 7 | 10/00/00 | 10/00/00 | 100% | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 |
| Task Name 8 | 10/00/00 | 10/00/00 | 100% | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 |
| Task Name 9 | 10/00/00 | 10/00/00 | 100% | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 |
| Task Name 10 | 10/00/00 | 10/00/00 | 100% | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 | 12 |



40-60 project controls staff



~ 1,200 workers on shift

Mechanical

Electrical

Instrumentation

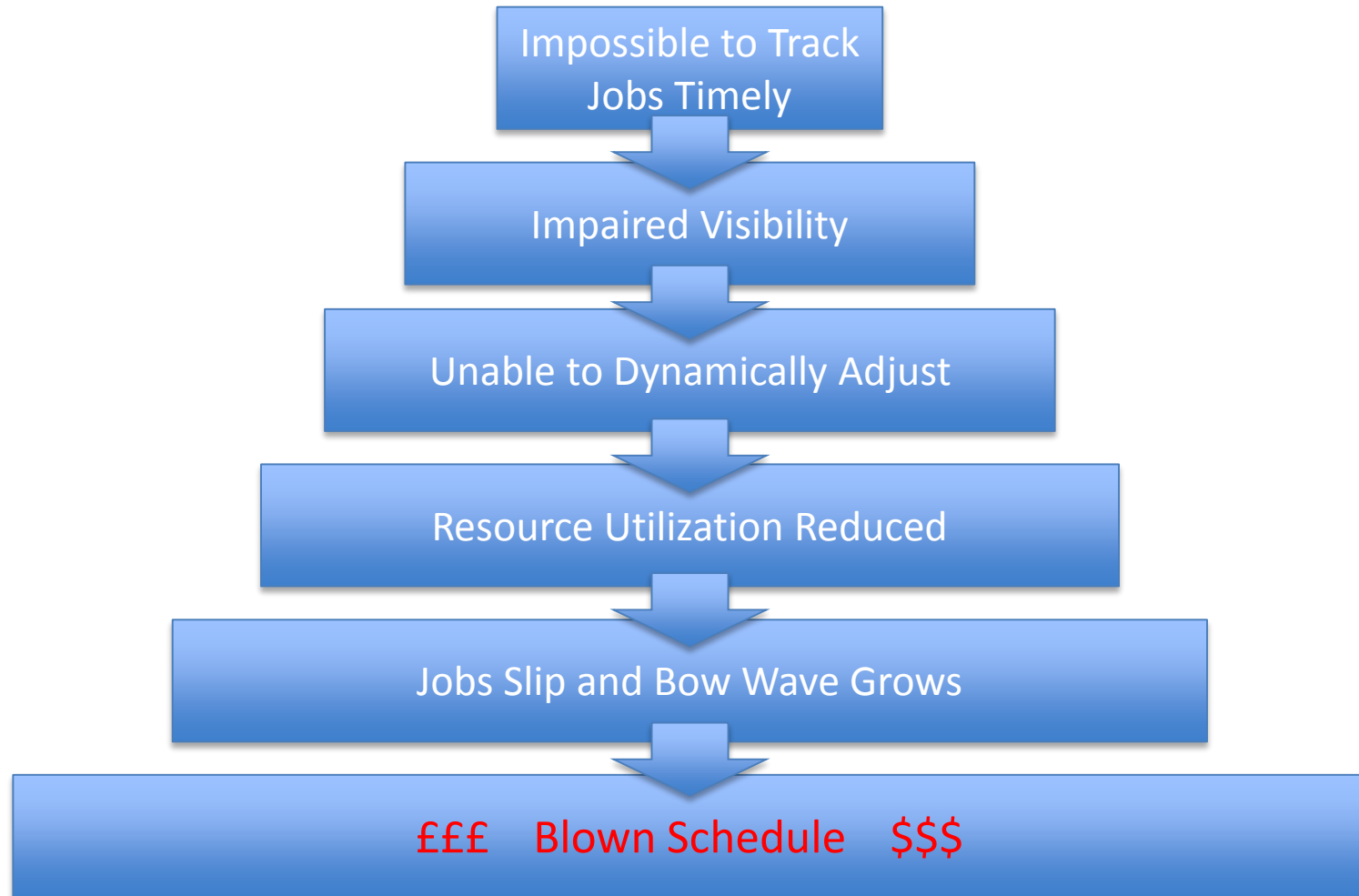
Chemistry

Radiation

Operations



Cause and Effect



What Was Needed?

Hire 200 additional project control staff, OR,
hire one that could...

- Monitor 1,000's of activities in parallel
- Follow up with hundreds of workers in parallel
- Analyze the schedule every 30 seconds
- Publish and distribute updated schedule every 30 seconds to everyone involved in the project



Impossible. But could a computer do this?

Artificial Intelligence:

“The branch of science that pertains to making computers perform the tasks normally requiring human intelligence”

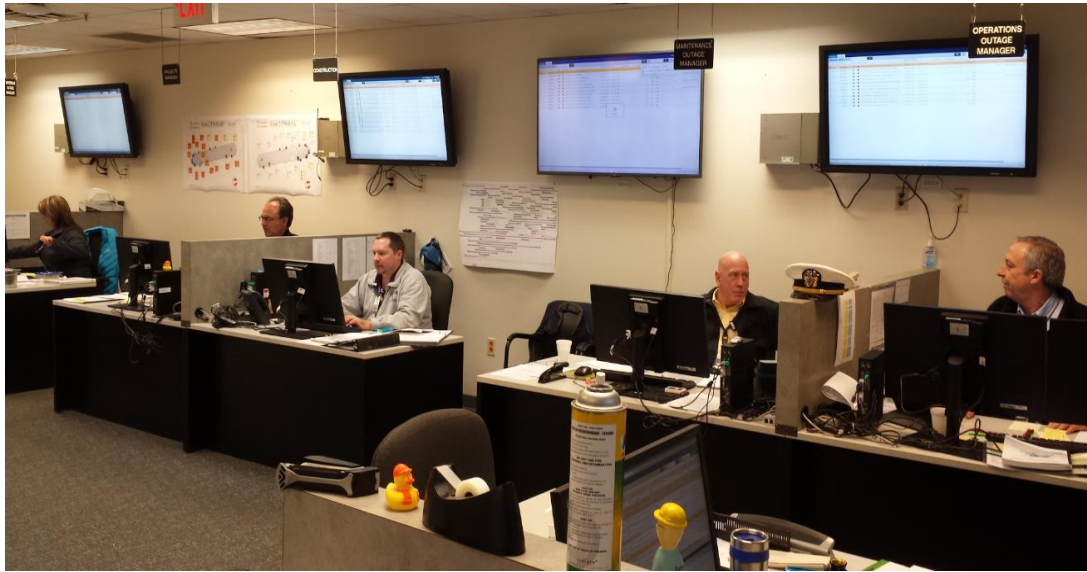


Hello Dave.

Would you like me to
help you manage your
project?

>_

STEP 1: Prepare Facility



Monitors, kiosks and tablets throughout the facility; offices, meeting rooms, shops, desktops, plant floor, etc.

STEP 2: Discover Team Structure



“Hello team. Please tell me how you are organized.”



Instrumentation



Operations



Mechanical



Electrical

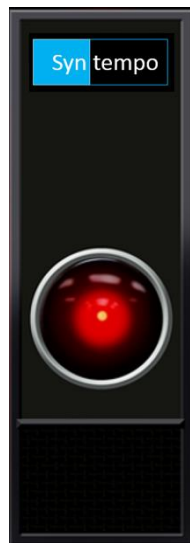


Chemistry



Radiation

STEP 3: Discover Individuals

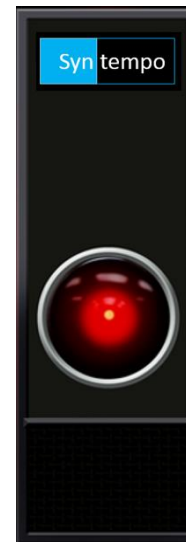


“Hello Bob. Please give me your badge number, email, phone, and pager ids. Oh, and where do you usually sit?”

STEP 4: Load Schedule & Press “Play”

| Task Name | Duration | Start | End |
|------------------------------------|----------|----------|----------|
| 1 Construction Project | 91 days | 9/30/00 | 6/6/00 |
| 2 2.1 General Conditions | 17 days | 9/30/00 | 9/30/00 |
| 3 1.1 Receive notice to proceed | 3 days | 10/00/00 | 10/00/00 |
| 4 1.2 Submit bond and insuran. | 2 days | 10/00/00 | 10/00/00 |
| 5 1.3 Prepare and submit prop. | 2 days | 10/00/00 | 10/00/00 |
| 6 1.4 Prepare and submit sche. | 2 days | 10/00/00 | 10/00/00 |
| 7 1.6 Obtain building permits | 4 days | 10/00/00 | 10/00/00 |
| 8 1.6 Submit preliminary shap. | 2 days | 10/00/00 | 10/00/00 |
| 9 1.7 Takeover site | 1 day | 10/00/00 | 10/00/00 |
| 10 1.8 Site Grading and Utilities | 3 days | 10/00/00 | 10/00/00 |
| 11 1.8.1 Clear and grub site | 3 days | 10/00/00 | 10/00/00 |
| 12 1.8.2 Install underground | 1 day | 10/00/00 | 10/00/00 |
| 13 1.8.3 Install temporary go. | 1 day | 10/00/00 | 10/00/00 |
| 14 1.8.4 Install water fire lin. | 1 day | 10/00/00 | 10/00/00 |
| 15 1.8.5 E-rod along batter. | 1 day | 10/00/00 | 10/00/00 |
| 16 2. Foundations | 16 days | 10/00/00 | 10/00/00 |
| 17 2.1 Excavate foundations | 2 wks | 10/00/00 | 10/00/00 |
| 18 2.2 Excavate elevator pit | 2 days | 10/00/00 | 10/00/00 |
| 19 2.3 Form column piers and s. | 4 days | 10/00/00 | 10/00/00 |
| 20 2.4 Rough concrete and pu. | 4 days | 10/00/00 | 10/00/00 |
| 21 2.5 Form elevator pit walls | 4 days | 10/00/00 | 10/00/00 |
| 22 2.6 Pour column piers, found. | 4 days | 10/00/00 | 10/00/00 |
| 23 2.7 Cure | 1 day | 10/00/00 | 10/00/00 |
| 24 2.8 Strip forms | 1 day | 10/00/00 | 10/00/00 |
| 25 2.9 Install pneumatic tube in. | 1 day | 10/00/00 | 10/00/00 |
| 26 2.10 Prepare and pour concre. | 1 day | 10/00/00 | 10/00/00 |
| 27 3.1 Steel erection | 16 days | 10/00/00 | 10/00/00 |
| 28 3.1.1 Erect steel columns. | 2 wks | 10/00/00 | 10/00/00 |
| 29 3.1.2 Erect steel columns. | 2 wks | 10/00/00 | 10/00/00 |
| 30 3.1.3 Install miscellaneous. | 2 wks | 10/00/00 | 10/00/00 |
| 31 3.1.4 Install miscellaneous. | 2 wks | 10/00/00 | 10/00/00 |
| 32 3.1.5 Install stairs and m. | 2 wks | 10/00/00 | 10/00/00 |
| 33 3.1.6 Finish-up paintwork. | 1 wk | 10/00/00 | 10/00/00 |
| 34 3.2 Form and Pour Concrete | 16 days | 10/00/00 | 10/00/00 |
| 35 3.3 Install rebar and in-floor. | 6 days | 10/00/00 | 10/00/00 |
| 36 3.3 Pour concrete floors | 4 days | 10/00/00 | 10/00/00 |

Primavera P6
MS Project
SAP PS
Maximo



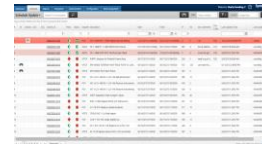
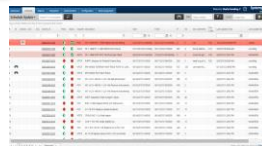
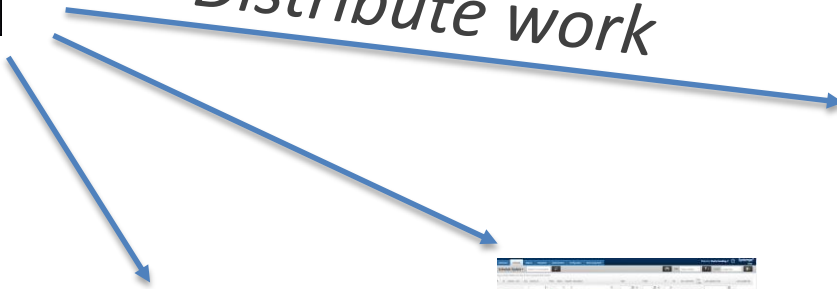
Let the Fun Begin



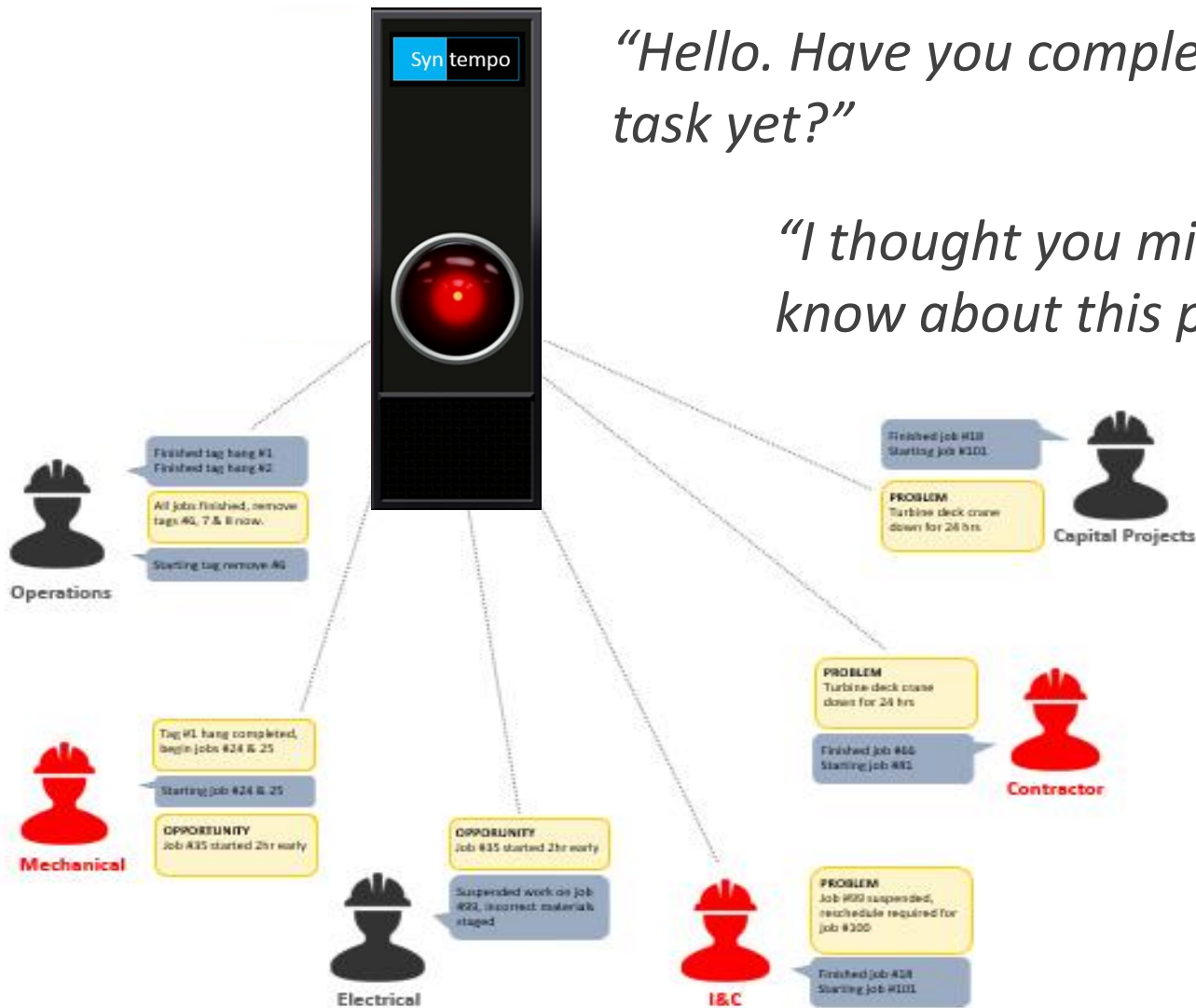
Begin Broadcast



Distribute work



Communicate



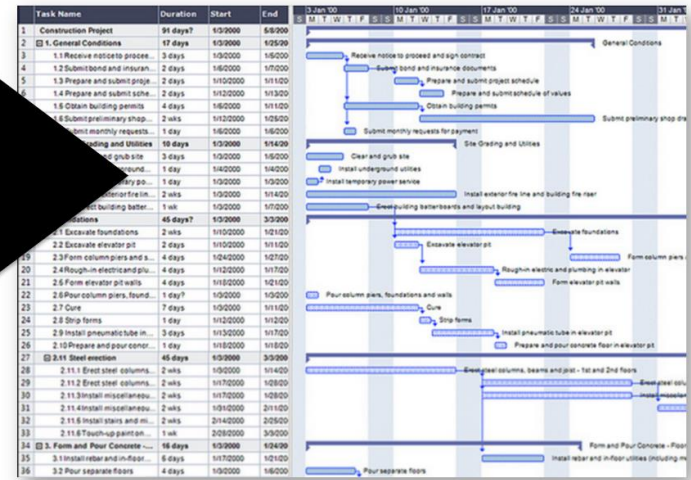
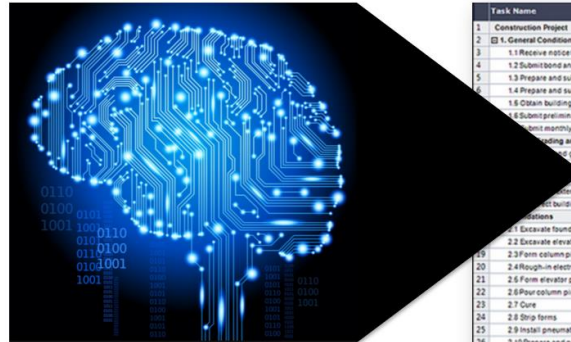
“Hello. Have you completed that task yet?”

“I thought you might like to know about this problem.”

Collect Feedback From The Field



Perform Schedule Analysis



“Hmm. How can we do better?”

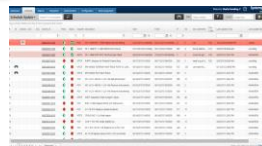
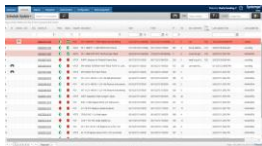
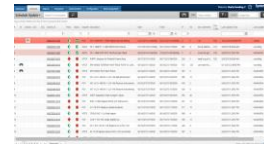
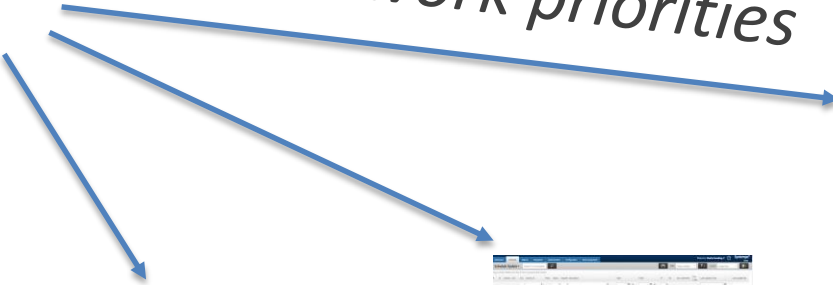
Do it Again



Potential problems



Updated work priorities



Results

- Massive reduction in “status chasing”
- 90% reduction in keyboard time
- Improved visibility
- Increased human resource utilization rates
- Bow wave reduction
- Schedule publishing cut by 70%
- Nearly 3 days of slip avoided in a single refuel

Q&A



Thank you!

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