Advancing each generation.

ALCOA

Pot Health Analysis with Smart Manufacturing

Geff Wood – Director GPM IPS Manufacturing & Process Control Systems and Automation

OSISoft User Conference: 9/25/2014

Presentation Agenda

- Background on Alcoa and typical Aluminum Smelter
- Analytical Example for Pot Health (Asset Integrity)
- KPI Dashboard with Critical Rollups
- Planned Next Steps
- Questions?

Global leader in lightweight metals engineering and manufacturing

- Celebrating **125 years** in 2013; **inventors** of the original **aluminum process**
- Delivers **value-add products** made of **titanium, nickel and aluminum**, and produces **best-in-class bauxite, alumina and primary** aluminum products
- **200+** locations in **30** countries
- 2013 revenues of **$23.0 billion; 60,000** employees

Downstream - EPS

- Fastening Systems
- Power & Propulsion
- Wheels & Transportatio
- Building & Construction
- Forgings & Extrusions

2013
57% Revenue
80% ATOI
value-add

Midstream - GRP

- Global packaging
- Aero, transportation and industrial
- China and consumer electronics

Upstream - GPP

- Bauxite mining
- Alumina refining
- Aluminum smelting
- Power

GPP: Combined Alumina and Primary Metals segments, GRP: Global Rolled Products, EPS: Engineered Products and Solutions
Source: February 24, 2014 BMO conference

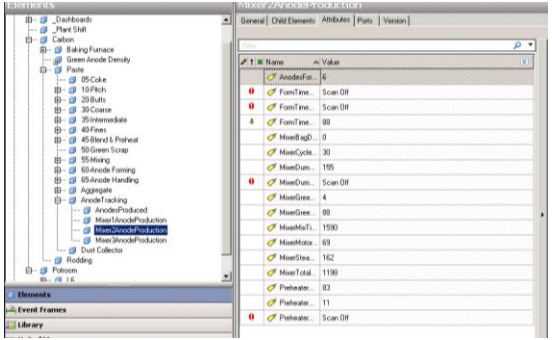
Typical Smelter for Scale

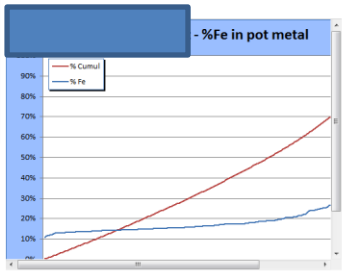
- Aluminum smelter has very large physical footprint
- Legacy has created many dissimilar systems used to generate overall system
- Before PI Server, each of these systems were information silos, some with limited history
- Now over 1M tags per plant in PI Server
- All plants using same ‘Data Model’ at base

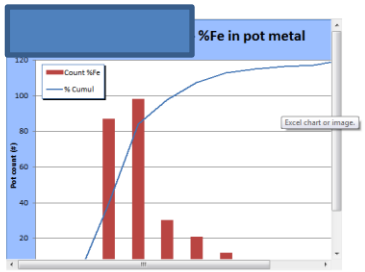
Quick look inside the plant

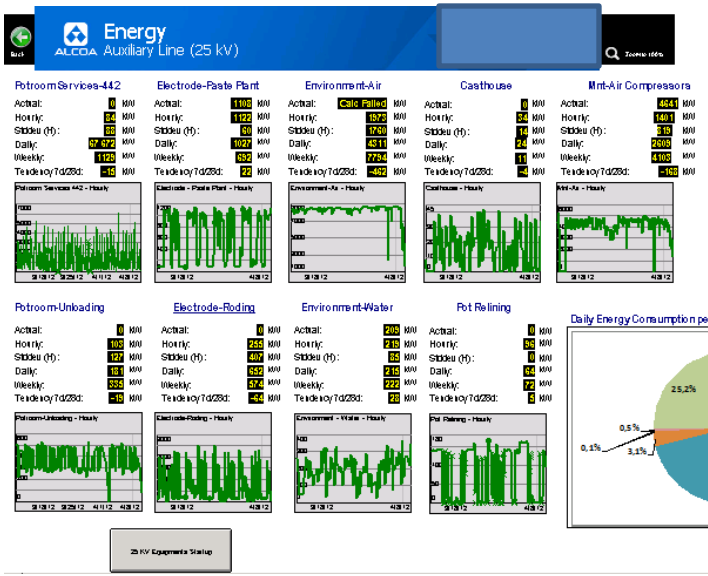
Recognizing phases of ‘SMART Manufacturing’

- Phase I – Data Integration ➔ Visualization of Actionable Information
- Phase II – Advanced Analytics / Modeling / Intelligence
- Phase III – Product & Process Innovation / Market Intimacy









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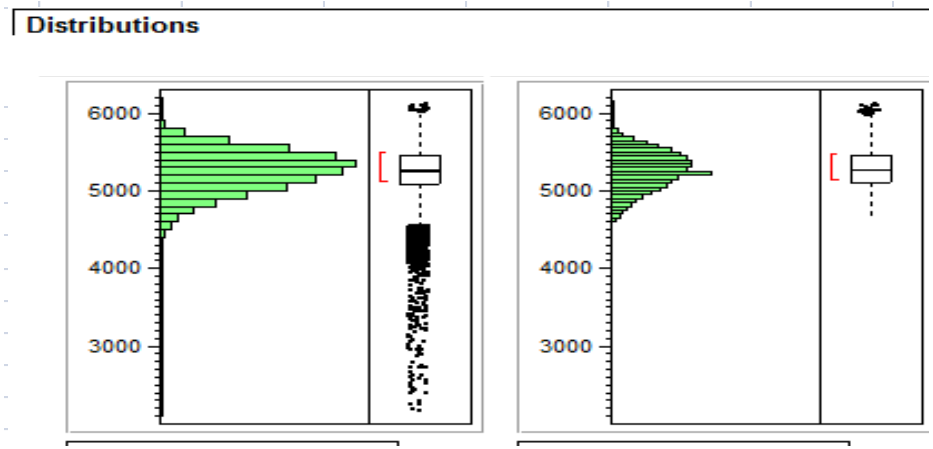
Problem Definition: Need to minimize pot to pot variability

Develop/Deploy Solution with 'Smart' to Minimize Pot Variability



- Description: Process of adjusting pot parameters and plant reactions to pots that are running outside the normal pot operation and move outliers to normal.

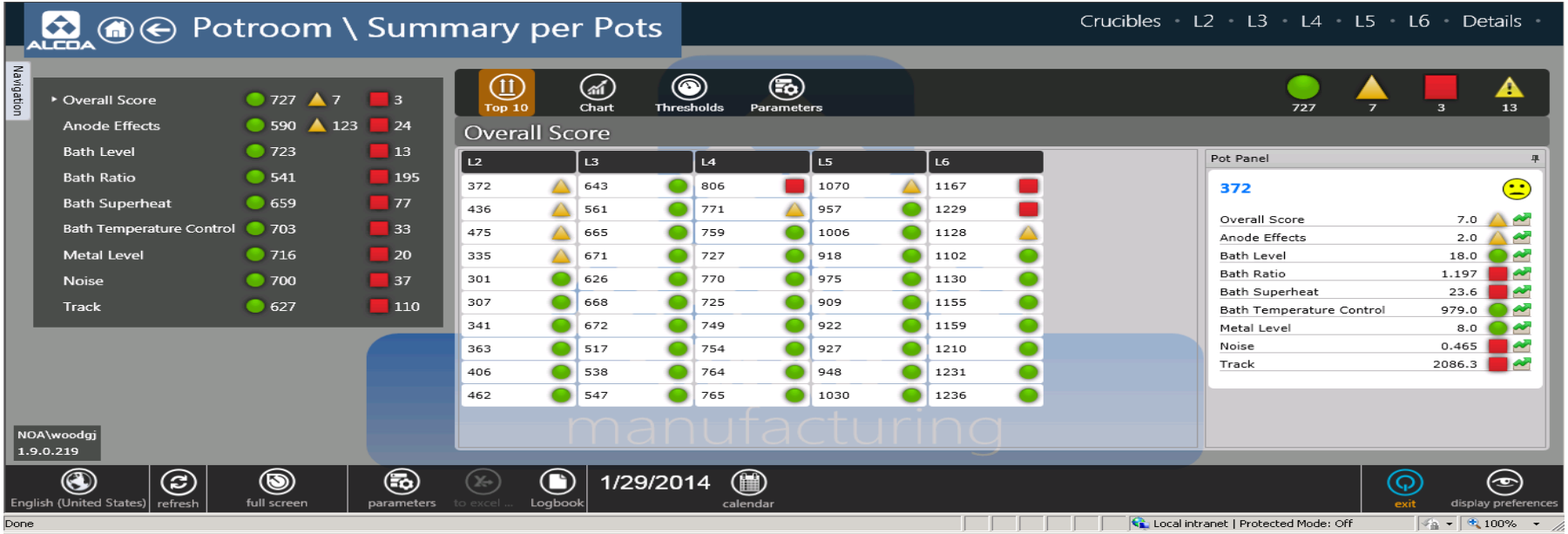
- Benefits
  - More Stable Operations
  - Better Current and Energy Efficiency
  - Reduction of exception Pots
- Technical Challenges
  - Find Root Causes
  - Consistently Fix
- Status:
  - Business Case Analysis complete
  - Pilot for Visualization in Progress
  - Full Project plan being developed
- Applicability: All plants but Business Case is variable

Solution outline to reduce pot to pot variability

The Fix

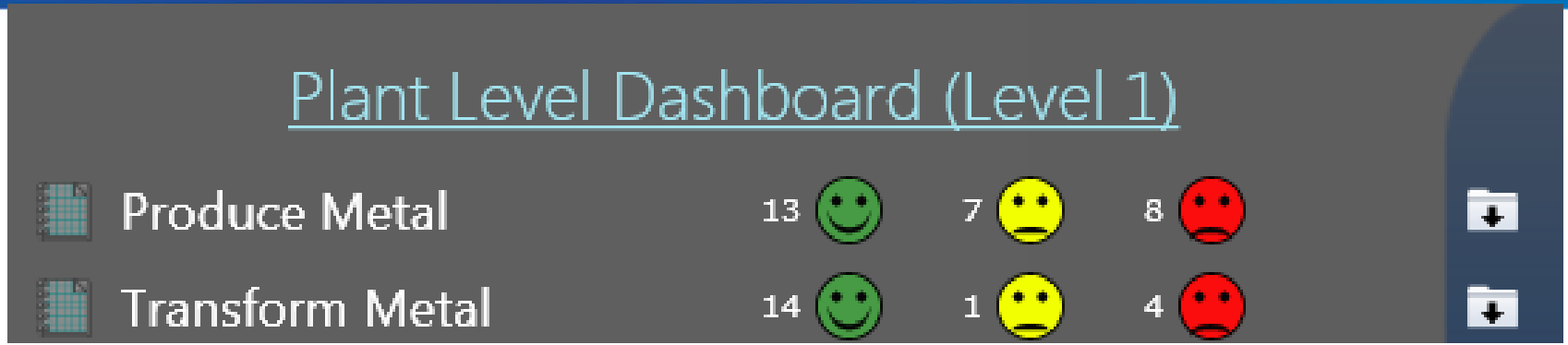
- Use Smart Manufacturing and Advanced Analytics to provide
  - Better Manual Intervention – **Codify the Best Practices**
    - Monitor / Alarm / Report exception pots
    - Monitor / Alarm / Report manual modifiers
    - Online PMS for above as well as:
      - Set on time and correctly
      - Tap on time and correctly
      - Cover on time and correctly
      - Applies to all standardized work
  - Better Operational Equipment Effectiveness (OEE)
    - Operations and Maintenance visibility of failed equipment
    - Monitor / Alarm / Report Waiting Time (Crucibles, Cranes…)
    - Online Visible Schedule and Performance to Schedule of Daily Work
  - Better Control
    - Use Visible Statistics to set Resistance and Feed targets
    - Improve Noise Control and use visible statistics to tune
    - Make Real-Time Control ‘Big Data’ aware

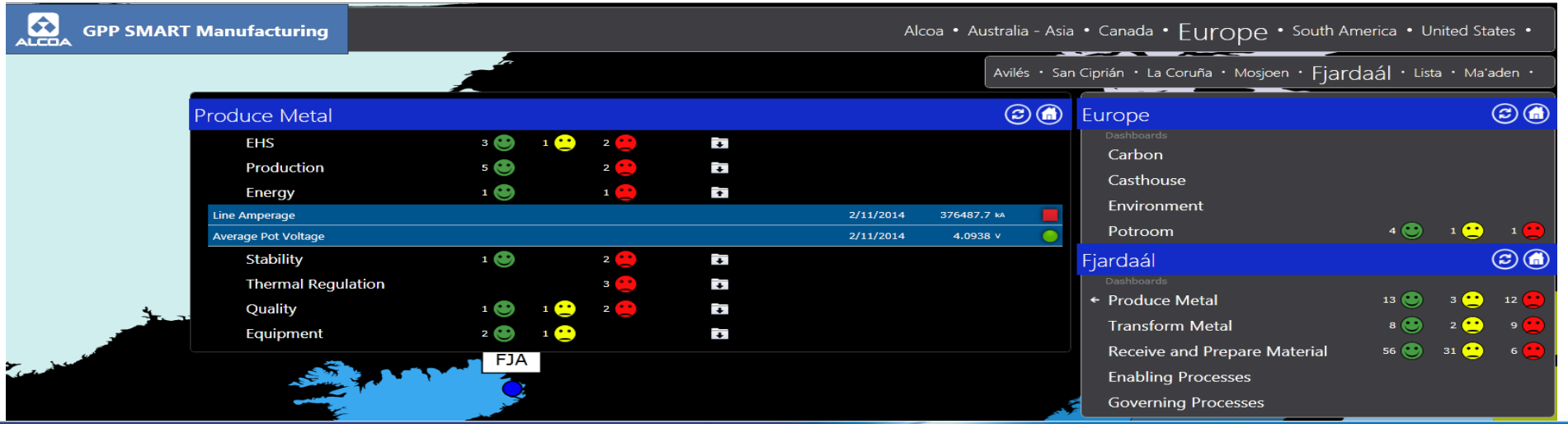
Actionable Data at the Per/Pot Level



- Determine which pots are outside “normal operations”
- Determine which pots will be outside “normal operations” if not changed
- Recommend mitigating actions to return pots to Normal Operation

Roll Up Data to Various Levels of Business





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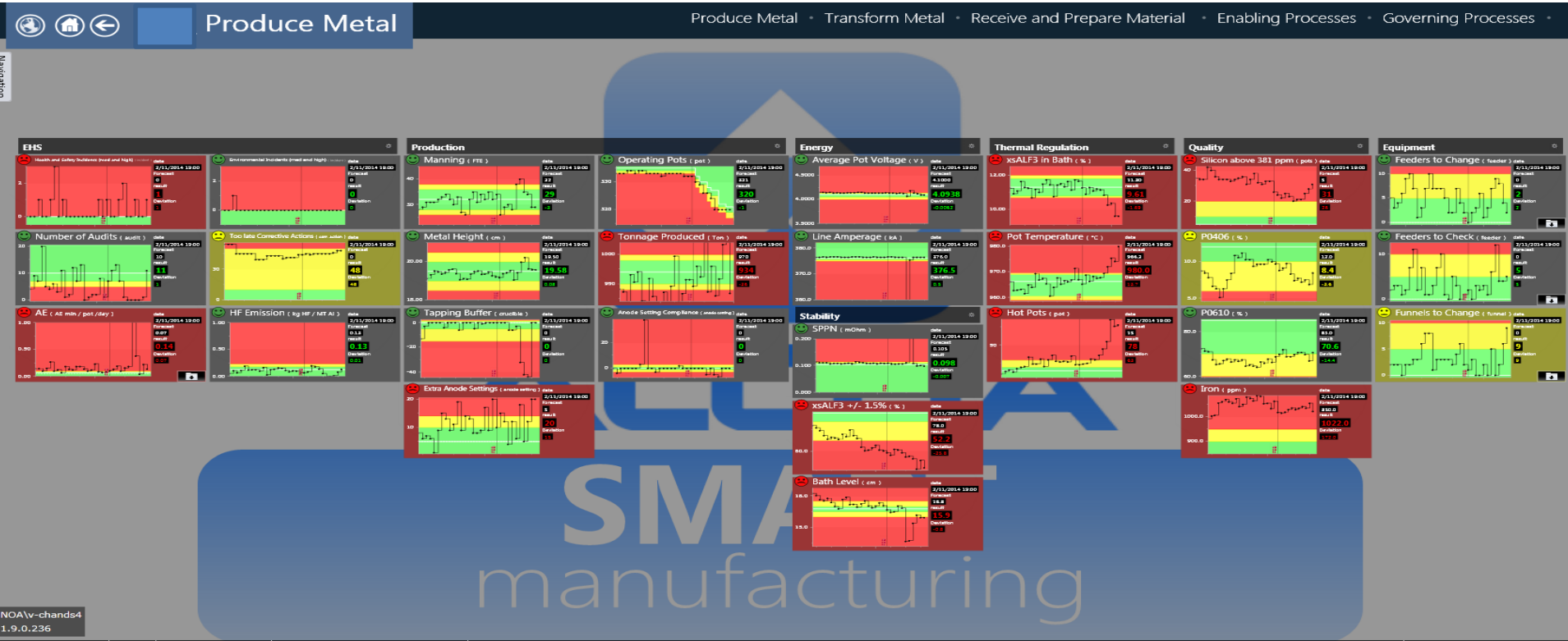
OR… Drill down to Individual KPI Performance

Drill Downs same format for all plants enforcing Alcoa Business Systems standards



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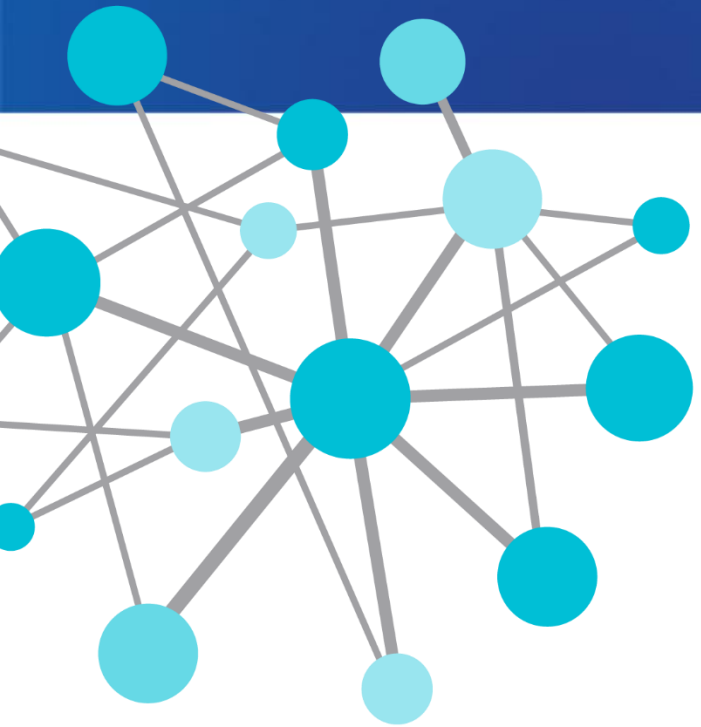
OSIsoft Product Names

- OSIsoft
- OSIsoft vCampus
- PI Advanced Computing Engine (PI ACE)
- PI Asset Framework (PI AF)
- PI Coresight
- PI Interface for several Data Sources
  - PI Interface for OPC DA
  - PI Interface for Modbus Ethernet
- PI Interface for Universal File and Stream Data (UFL)
- PI Manual Logger (PI ML)
- PI Notifications
- PI OLEDB Enterprise / PI OLEDB Provider
- PI ProcessBook
- PI SDK and AF SDK
- PI Server
- PI System Management Tools (PI SMT)
- PI to PI Interface
- PI Web Services



Planned Next Steps

Further Develop and Leverage

- Validate Models in multiple smelters with multiple pot types
- Copy / Paste Results fast to all plants
- Develop more specific models for more specific issues
- Future Model will be better Stability Indication
- All Analytical Results back into Data Model for Continued Study
- Targeted Roll-ups at Multiple Disciplines and Levels of Organization(s)

Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

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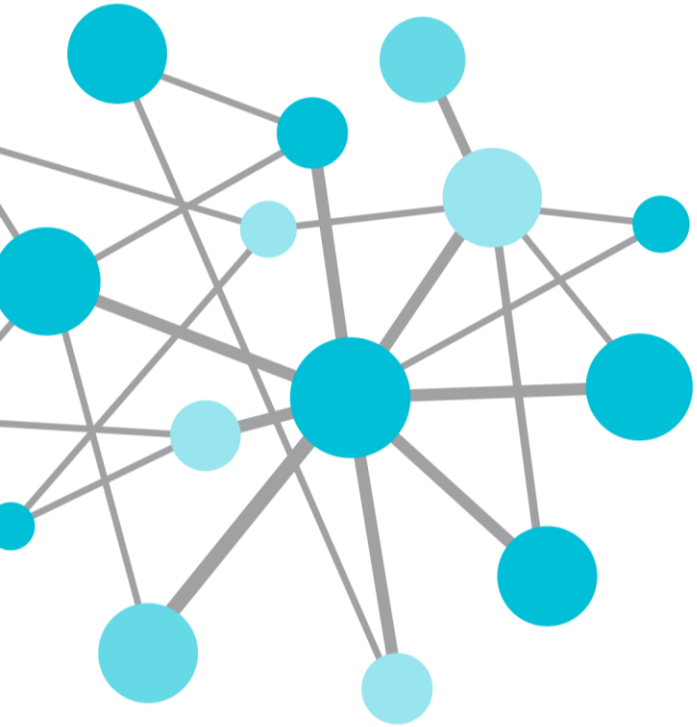

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