

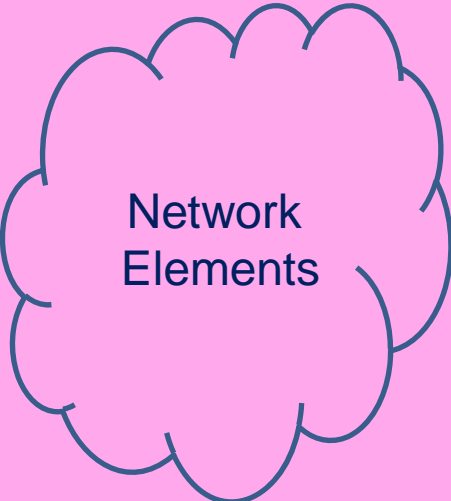
Data Mining and Anomaly Detection

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Getting More Value from Data

Sources of Data Communications

- **Network**
 - **Circuit Switch: Signaling**
 - **IP: Netflow, Packets**
 - **Mobility, Wireless: RAN, RNC, Routers**
- **Services**
 - **Call Detail Records**
 - **Usage**
- **Customers**
 - **Billing**
 - **Customer Service**
 - **Surveys**
- **Challenges – Alert/Alarm Systems**
 - **Scale**
 - **Integrity**
 - **Security, Privacy**
 - **Efficiency**



Call Detail Record Data Analysis

Example Fields:

- **Initiating Number**
- **Terminating Number**
- **Start Time and Date**
- **Call Duration**
- **Billing Number**
- **Phone Exchange**
- **Call Results – Busy, Failed, etc.**
- **Call Type – Voice, SMS, etc.**

Example Uses of Network Recording Data:

- **Billing**
- **Fraud**
- **Forecasting**
- **Media Event Voting**
- **Network Operations**
- **Customer Experience**
- **Non-syndromic**
- **Many more**

Call Detail Record Data Analysis

Example Analytic Techniques - Fraud:

- **Thresholds**

Call Duration > X

- **Signatures**

Day of Week	Region of World
Time of Day	% Countries Called
Call Duration	

- **Communities of Interest**

