

# Overview of the NYPA Synchrophasor Network: Past, Present, and Future

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# Outline

- ▶ Evolution of NYPA's synchrophasor system
  - Phasor measurement unit (PMU) installations
  - Local applications
- ▶ Present state of NYPA's synchrophasor network
  - System architecture
  - Applications
- ▶ Future development projects for the New York state synchrophasor network

# The NYPA Transmission System



# PMU Installations

- ▶ 1990 – Marcy 765 kV and Massena
  - Marcy – Massena 765 kV line
  - Virginia Tech prototype phasor measurement unit
- ▶ 10/1993 – Fraser and Robinson Rd. (NYSEG)
  - Oakdale, Coopers Corner, Edic lines
  - Static Var compensator current
  - Capacitor banks
- ▶ 12/1993 – Marcy 765 kV and Massena
  - Marcy – Massena 765 kV line
  - Massena – Chateauguay 765 kV line
- ▶ 1995 – Marcy 345 kV (two units)
  - Edic, Volney, Coopers Corner, New Scotland lines
  - EOVT equipment
  - Convertible Static Compensator StatCom current
- ▶ 1996 – Niagara 345 kV
  - Kintigh, Rochester, HydroOne lines
- ▶ 1998 – Blenheim Gilboa
  - New Scotland, Leeds, Fraser lines
- ▶ 2004 – East Garden City
  - Long Island Sound underwater cable
- ▶ 2011 – St. Lawrence

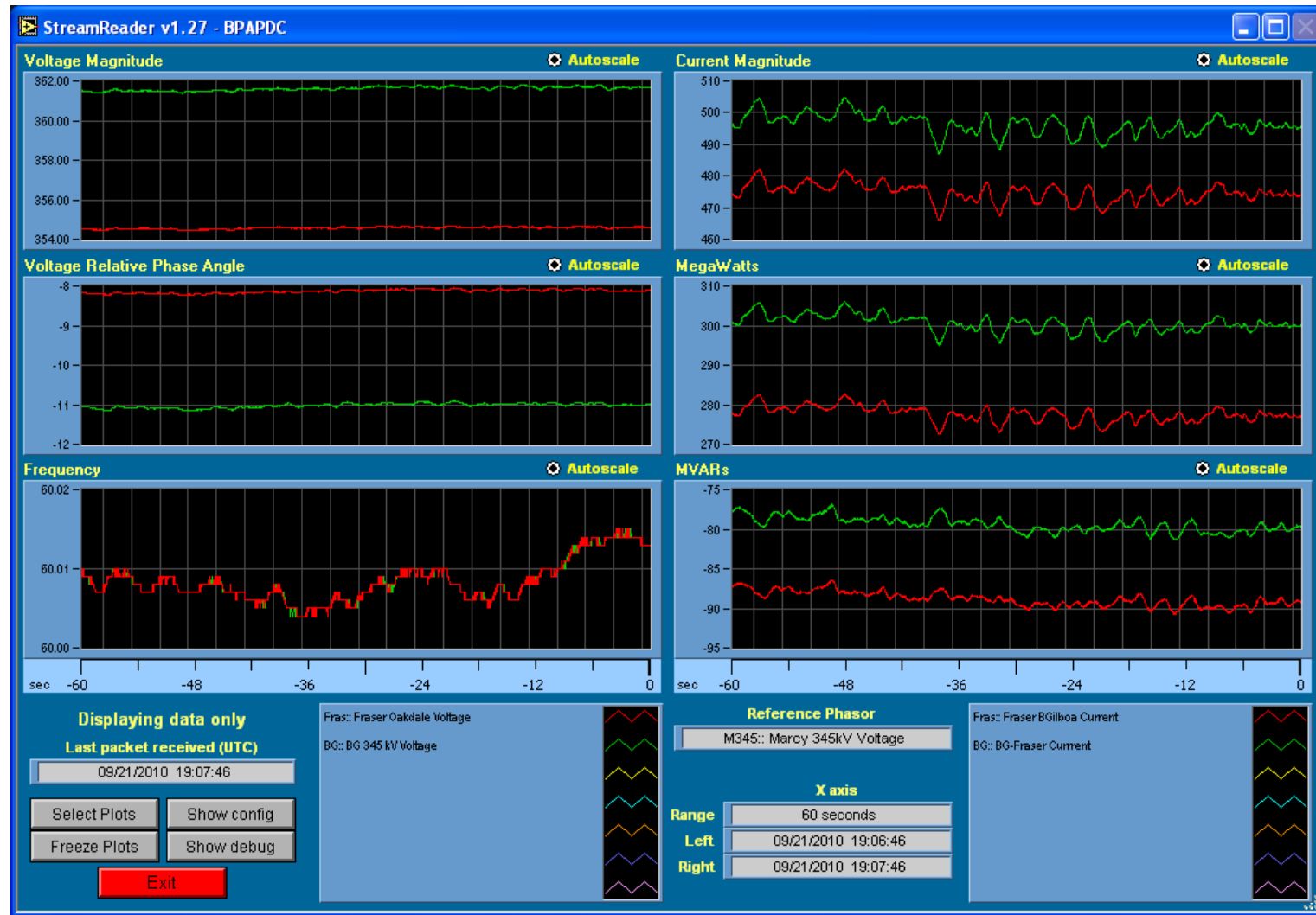
# Real-Time Synchrophasor Network

- ▶ Installation of a phasor data concentrator (PDC) at NYPA energy control center at Marcy (2004)
- ▶ Real-time data streaming over leased phone lines, fiber, or microwave link
- ▶ Data rates currently at 30 samples/sec

# Current PMU Data Applications

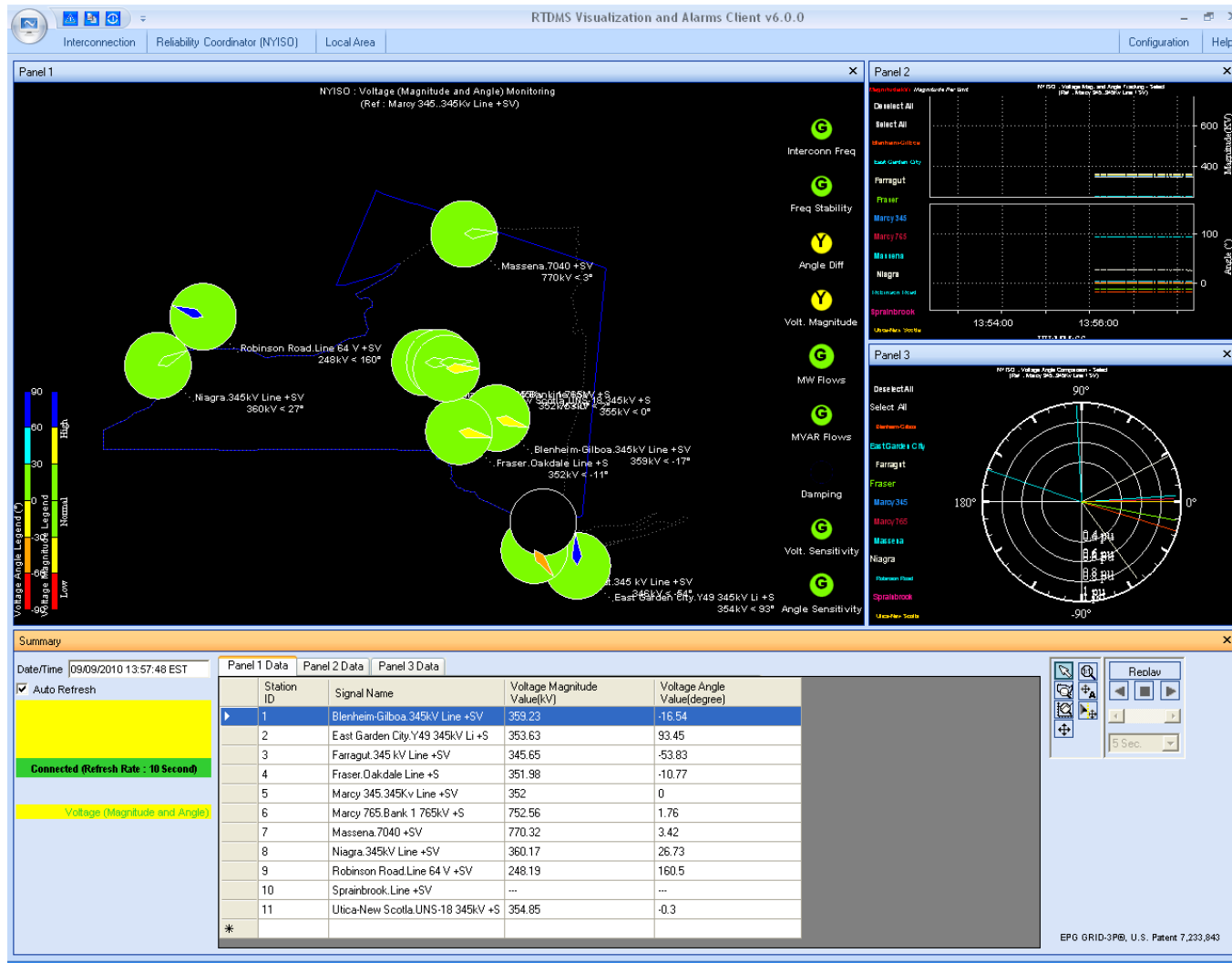
- ▶ Real-time data visualization
  - StreamReader
  - Real Time Dynamics Monitoring System (RTDMS)
- ▶ Harmonic monitoring system
  - Monitor system harmonics
  - Monitor system imbalances
  - Monitor substation state
- ▶ Geomagnetically-induced current (GIC) monitoring system
- ▶ Disturbance recording
- ▶ Data archiving

# Real-Time Data Visualization (StreamReader)



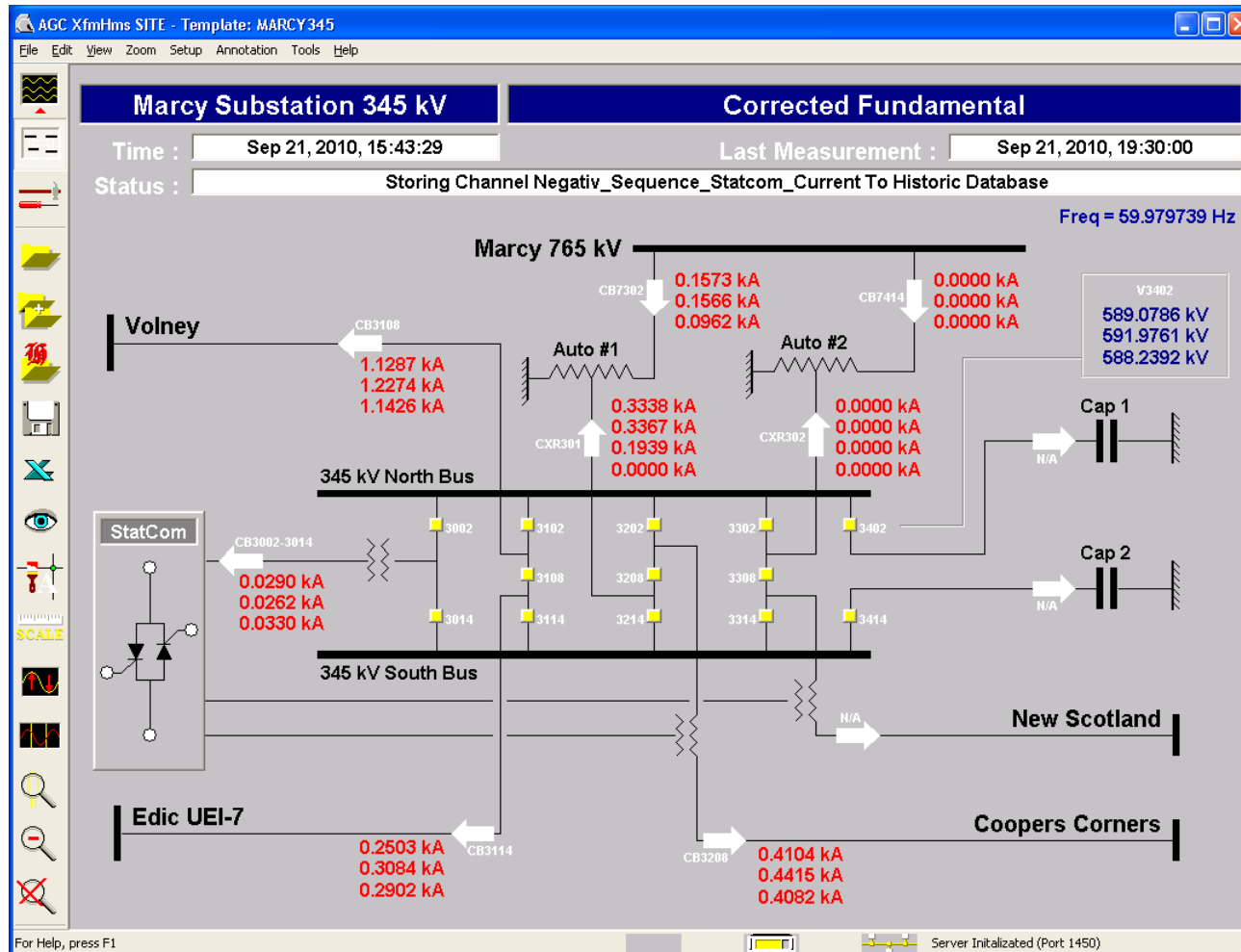


# Real-Time Data Visualization (RTDMS)



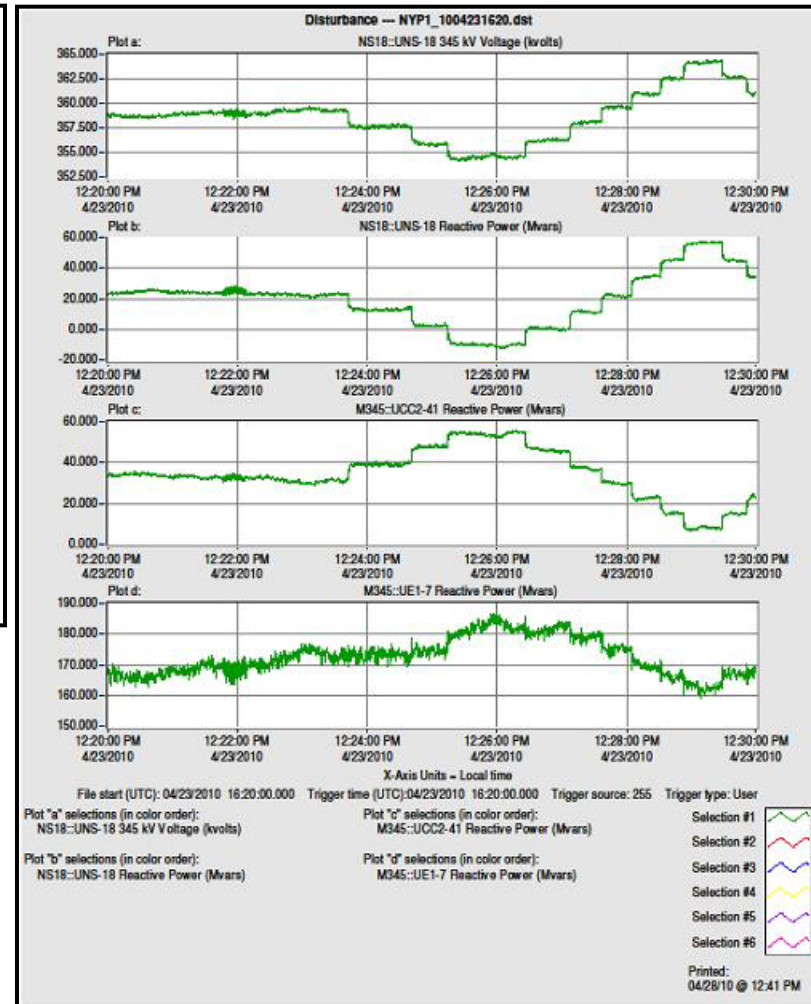
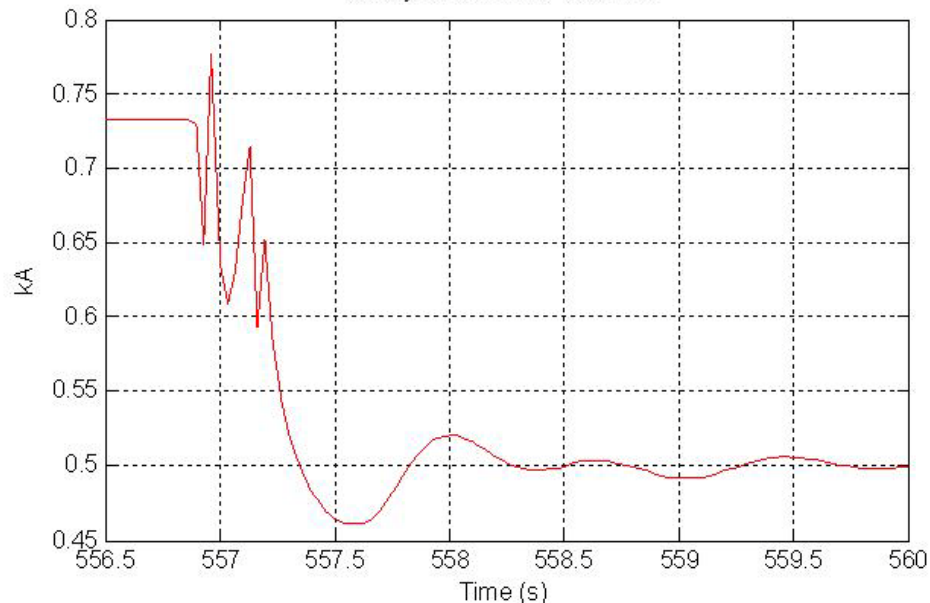


# Harmonic Monitoring System



- ▶ Substation state estimation at fundamental frequency
- ▶ Segregated phase model
- ▶ Used to detect and monitor system asymmetries and imbalances
- ▶ Used to detect substation problems

# Disturbance Recording and Real-Time Data Archiving



# Future Development Projects

- ▶ NYISO–DoE SGIG project
- ▶ NYSERDA synchrophasor project
- ▶ GA Tech DoE project
- ▶ PMU measurements in EMS and state estimator
- ▶ EPRI Northeastern Univ. strategic use of PMUs project
- ▶ Disturbance data retrieval project and PMU GUI upgrade